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Information technology — Radio frequency identification device conformance test methods —

Part 63: 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 63: Méthodes d'essai pour des communications d'une interface d'air entre 860 MHz et 960 MHz

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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.

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 or www.iec.ch/members_experts/refdocs).

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) or the IEC list of patent declarations received (see https://patents.iec.ch).

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For an explanation of 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 www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

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

A list of all parts in the ISO/IEC 18047 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

The ISO/IEC 18000 series defines the air interface 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 RFID devices that operate at frequencies from 860 MHz to 960 MHz

The ISO/IEC 18047 series provides air interface communication test methods to ensure conformance with the different parts of the ISO/IEC 18000 series.

Each part of the ISO/IEC 18047 series contains all measurements required to be made on a product to establish whether it conforms to the corresponding part of the ISO/IEC 18000 series.

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

This document specifies the conformance requirements for a passive-backscatter, interrogator-talks-first (ITF), radio-frequency identification (RFID) system operating in the 860 MHz to 960 MHz frequency range. The system comprises interrogators, also known as readers, and tags, also known as labels.

An Interrogator transmits information to a Tag by modulating a radiofrequency (RF) signal in the 860 MHz to 960 MHz frequency range. The Tag receives both information and operating energy from this RF signal. Tags are passive, meaning that they receive all of their operating energy from the Interrogator's RF waveform.

An Interrogator receives information from a Tag by transmitting a continuous-wave (CW) RF signal to the Tag; the Tag responds by modulating the reflection coefficient of its antenna, thereby backscattering an information signal to the Interrogator. The system is ITF, meaning that a Tag modulates its antenna reflection coefficient with an information signal only after being directed to do so by an Interrogator.

Interrogators and Tags are not required to talk simultaneously; rather, communications are half-duplex, meaning that Interrogators talk and Tags listen – or vice versa.

Clause 6 describes and specifies all necessary conformance tests for ISO/IEC 18000-63:2021, Clause 6.

Clause 7 describes all necessary conformance tests that are described in ISO/IEC 18000-63:2021, 7.1 to 7.4.

Clause 8 describes all necessary conformance tests for ISO/IEC 18000-63:2021, 7.5.

Clause 9 describes all necessary conformance tests for ISO/IEC 18000-63:2021, Clause 8.

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of a patent.

ISO and IEC take no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO and IEC that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO and IEC. Information may be obtained from the patent database available at www.iso.org/patents or https://patents.iec.ch.

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Information technology — Radio frequency identification device conformance test methods —

Part 63: Test methods for air interface communications at 860 MHz to 960 MHz

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1 Scope

This document specficies 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 18000-63.

This document does not apply to the testing of conformity with regulatory or similar requirements.

The test methods specify only the verification of the mandatory functions and any optional functions which are implemented. 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 directly affect 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 18000-63.

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 18000-63:2021, *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 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

3 Terms, definitions, symbols, abbreviated terms and notations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 18000-63 and ISO/IEC 19762 apply.

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

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

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

3.2 Symbols

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

D	distance between the interrogator and test antenna
T_{REPLY}	time between the Interrogator's command and the Tag's backscattered reply

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/Tpri = DR/TRcal)
CW	continuous-wave
DUT	device under test
ITF	interrogator-talks-first
ppm	parts per million
RBW	resolution bandwidth
RF	radiofrequency
RFID	radiofrequency identification
RNG	random or pseudo-random number generator
VSWR	voltage standing wave ratio

3.4 Notation

This document uses the following notational conventions as used in ISO/IEC 18000-63:

— States and flags are denoted in bold.

EXAMPLE 1 **ready**.

— Commands and variables are denoted in italics. Where there can be confusion between commands and variables, this document provides an explicit statement.

— Command parameters are underlined.

EXAMPLE 2 Pointer.

— For logical negation, labels are preceded by "~".

EXAMPLE 3 If **flag** is true, then **~flag** is false.

— The symbol, R=>T, refers to commands or signalling from an Interrogator to a Tag (Reader-to-Tag).

— The symbol, T=>R, refers to commands or signalling from a Tag to an Interrogator (Tag-to-Reader).

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4 Default conditions applicable to the test methods

4.1 Test environment

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

4.2 Pre-conditioning

4.2.1 General

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

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 center frequency of the tag backscatter signal.

Special attention shall be given to spurious emissions, for example, 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.

5 Conformance

To claim conformance to ISO/IEC 18000-63, a device shall pass the conformance tests in this document.

6 Conformance tests for ISO/IEC 18000-63:2021, Clause 6

This clause specifies conformance tests for product built according to ISO/IEC 18000-63:2021, Clause 6:

— conformance requirements for physical interactions (the signalling layer of the communications) between Interrogators and Tags;

— conformance requirements for Interrogator and Tag operating procedures and commands.

Testing for this clause shall be done with the test setups as defined in Annex A.

All tests are defined in Table 1; the column M/O indicates either mandatory (M) or optional (O).

NOTE 1 In case an error condition has multiple choices for the error codes, either of the error codes is valid and the test has to be evaluated as pass for any of these codes.

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For conformance evaluation, as in Table 1, the following conformance test methods shall apply:

— By design: for Protocol requirements that are verified by design, the method of technical analysis is at the discretion of the product vendor and, except in special cases, is not specified by this document. In general, the technical analysis shall have sufficient rigor and technical depth to be accepted by a test engineer knowledgeable of the Protocol that the requirement has been met.

— By demonstration: for Protocol requirements that are verified by demonstration, the test conditions are specified by this document.

NOTE 2 A competent demonstrator typically complies with ISO/IEC 17025.

— As implemented: if a Tag or Interrogator implements a subset of the Protocol, conformance shall be verified over the subset that is implemented. For example, although Interrogators may implement DSB-ASK, SSB-ASK or PR-ASK modulation, a manufacturer may choose to only implement DSB-ASK modulation. In this case, conformance testing shall only use DSB-ASK modulation. For parameters that are continuously variable, conformance shall be verified at the minimum and maximum values of the implemented range, unless the test conditions specifically state otherwise.

Table 1 — ISO/IEC 18000-63 protocol subclauses and requirements

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
1	6.1.1	Tags shall not be required to demodulate Interrogator commands while backscattering.	M	T	By design
2	6.1.1	A Tag shall not respond to a mandatory or optional command using full-duplex communications.	M	T	By design
3	6.3.1.1	Tags shall receive power from and communicate with Interrogators within the frequency range from 860 MHz to 960 MHz, inclusive.	M	T	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 25 µs RTcal: 62,5 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRcal: 100 µs DR: 8 M: 1 TRext: 0
4	6.3.1.1	Interrogators certified for operation in dense-Interrogator environments shall support, but are not required to always use, the dense-Interrogator mode described in ISO/IEC 18000-63:2021, Annex G.	M	I	By design
5	6.3.1.2	Interrogators shall use a fixed modulation format and data rate for the duration of an inventory round, where “inventory round” is defined in ISO/IEC 18000-63:2021, 4.1.	M	I	By design
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
6	6.3.1.2.1	Interrogators certified for operation in single- or multiple-Interrogator environments shall have appropriate frequency accuracy. Local regulations can apply to the frequency accuracy	M	I	By design
7	6.3.1.2.1	Interrogators certified for operation in dense-Interrogator environments shall have a frequency accuracy of ±10 ppm (parts per million) over the nominal temperature range (–25 °C to +40 °C) and ±20 ppm over the extended temperature range (–40 °C to +65 °C) while transmitting. Local regulations can apply to the frequency accuracy. Local regulations can specify a tighter frequency accuracy.	M	I	By demonstration. **Test conditions:** Temperature: maximum (–40 °C, minimum supported temperature) and minimum (65 °C, maximum supported temperature). If supported temperature range exceeds –25 °C or 40 °C then testing shall also be performed at –25 °C or 40 °C respectively. All temperatures are in °C (all ±3 °C). Frequency: 5 test points situated at the band edges and linearly spanning the supported band at valid channel frequencies. Test can be skipped if regulatory approval shows that these requirements have been fulfilled already. **Measurement equipment setting:** Resolution bandwidth: 1 kHz Video bandwidth: equal to the RBW. Sweep time: AUTO Span: 1 MHz Trace mode: max. hold sufficient to capture all emissions. Detection mode: averaging. Modulation method: continuous wave to allow exact measurement based on the clear peak.
8	6.3.1.2.2	Interrogators shall communicate using DSB-ASK, SSB-ASK, or PR-ASK modulation, detailed in ISO/IEC 18000-63:2021, Annex H.	M	I	By design
9	6.3.1.2.2	Tags shall demodulate all three modulation types.	M	T	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz. Power: 0 dBm at Tag antenna. Modulation: DSB-ASK, SSB-ASK and PR-ASK. Tari: 6,25 µs, 12,5 µs and 25 µs. RTcal: 2,5 × Tari. PW: minimum and maximum. Modulation depth: 90 % ASK, 200 % PR-ASK.

Key

M: mandatory

O : optional

T : tag

I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					DSB-ASK rise/fall time: ≤ 0,33 × Tari SSB-ASK rise/fall time: ≤ 0,33 × Tari PR-ASK rise/fall time: ≤ 0,62 × PW TRcal: 2 × RTcal DR: 8 M: 1 TRext: 0
10	6.3.1.2.3	The R=>T link shall use PIE, shown in ISO/IEC 18000-63:2021, Figure 6.1.	M	I	By design
11	6.3.1.2.3	Pulse modulation depth, rise time, fall time and PW shall be as specified in ISO/IEC 18000-63:2021, Table 6.5, and shall be the same for a data-0 and a data-1.	M	I	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented. Other transmit parameters: as implemented.
12	6.3.1.2.3	Interrogators shall use a fixed modulation depth, rise time, fall time, PW, Tari, data-0 length and data-1 length for the duration of an inventory round.	M	I	By design
13	6.3.1.2.3	The RF envelope shall be as specified in ISO/IEC 18000-63:2021, Figure 6.2.	M	I	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented. Other transmit parameters: as implemented.
14	6.3.1.2.4	Interrogators shall communicate using Tari values in the range of 6,25 µs to 25 µs.	M	I	By design
15	6.3.1.2.4	Interrogator conformance shall be evaluated using at least one Tari value between 6,25 µs and 25 µs with at least one value of the parameter *x*.	M	I	This document uses vendor preferred Tari and *x* values as consistent with the Protocol.
16	6.3.1.2.4	The tolerance on all parameters specified in units of Tari shall be ±1 %.	M	I	By demonstration **Test conditions:** Temperature: either a) or b) shown below
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					a) Single and Multi-Interrogators: (23 ± 3) °C b) Dense-Interrogators tested at modulation, data rate and encoding parameters specified in ISO/IEC 18000-63:2021, Annex G of the Protocol specification: maximum (–40 °C, minimum supported temperature) and minimum (65 °C, maximum supported temperature). If supported temperature range exceeds –25 °C or 40 °C then testing shall also be performed at –25 °C or 40 °C respectively. All temperatures are in °C (all ±3 °C). Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented. Other transmit parameters: as implemented.
17	6.3.1.2.4	The choice of Tari value and *x* shall be in accordance with local radio regulations.	M	I	By design
18	6.3.1.2.5	The R=>T RF envelope shall comply with ISO/IEC 18000-63:2021, Figure 6.2 and Table 6.1.	M	I	Tested in compliance with 6.3.1.2.3.
19	6.3.1.2.5	An Interrogator shall not change the R=>T modulation type (i.e. shall not switch between DSB-ASK, SSB-ASK or PR-ASK) without first powering down its RF waveform (see ISO/IEC 18000-63:2021, 6.3.1.2.7).	M	I	By design
20	6.3.1.2.6	The Interrogator power-up RF envelope shall comply with ISO/IEC 18000-63:2021, Figure 6.3 and Table 6.6.	M	I	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented.
21	6.3.1.2.6	Once the carrier level has risen above the 10 % level, the power-up envelope shall rise monotonically until at least the ripple limit M_l. The RF envelope shall not fall below the 90 % point in ISO/IEC 18000-63:2021, Figure 6.3 during interval T_s.	M	I	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented.
22	6.3.1.2.6	Interrogators shall not issue commands before the end of the maximum settling-time interval in ISO/IEC 18000-63:2021, Table 6.6 (i.e. before T_s).	M	I	By design

Key

M: mandatory

O : optional

T : tag

I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
23	6.3.1.2.7	The Interrogator power-down RF envelope shall comply with ISO/IEC 18000-63:2021, Figure 6.3 and Table 6.7.	M	I	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented.
24	6.3.1.2.7	Once the carrier level has fallen below the 90 % level, the power-down envelope shall fall monotonically until the power-off limit M_s.	M	I	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented.
25	6.3.1.2.7	Once powered off, an Interrogator shall remain powered off for a least 1ms before powering up again.	M	I	By design
26	6.3.1.2.8	An Interrogator shall begin all R=>T signalling with either a preamble or a frame-sync, both of which are shown in ISO/IEC 18000-63:2021, Figure 6.4.	M	I	By design
27	6.3.1.2.8	A preamble shall precede a *Query* command (see ISO/IEC 18000-63:2021, 6.3.2.12.2.1) and denotes the start of an inventory round.	M	I	By design – inherently tested with other tests
28	6.3.1.2.8	All other signalling shall begin with a frame-sync.	M	I	By design – inherently tested with other tests
29	6.3.1.2.8	The tolerance on all parameters specified in units of Tari shall be ±1 %.	M	I	Tested in compliance with 6.3.1.2.3.
30	6.3.1.2.8	PW shall be as specified in ISO/IEC 18000-63:2021, Table 6.5.	M	I	Tested in compliance with 6.3.1.2.3.
31	6.3.1.2.8	The RF envelope shall be as specified in ISO/IEC 18000-63:2021, Figure 6.2.	M	I	By design
32	6.3.1.2.8	A preamble shall comprise a fixed-length start delimiter, a data-0 symbol, an R=>T calibration (RTcal) symbol and a T=>R calibration (TRcal) symbol.	M	I	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented. Other transmit parameters: as implemented.
33	6.3.1.2.8	An Interrogator shall set RTcal equal to the length of a data-0 symbol plus the length of a data-1 symbol (RTcal = 0_{length} + 1_{length}).	M	I	By design
34	6.3.1.2.8	A Tag shall measure the length of RTcal and compute *pivot* = RTcal / 2.	M	T	By design
35	6.3.1.2.8	A Tag shall interpret subsequent Interrogator symbols shorter than *pivot* to be data-0s and subsequent Interrogator symbols longer than *pivot* to be data-1s.	M	T	By design

Key

M: mandatory

O : optional

T : tag

I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
36	6.3.1.2.8	A Tag shall interpret symbols longer than 4 × RTcal to be invalid.	M	T	By design
37	6.3.1.2.8	Prior to changing RTcal, an Interrogator shall transmit CW for a minimum of 8 × RTcal.	M	I	By design
38	6.3.1.2.8	An Interrogator shall specify a Tag's backscatter link frequency (its FM0 datarate or the frequency of its Miller subcarrier) using the TRcal and divide ratio (DR) in the preamble and payload, respectively, of a *Query* command that initiates an inventory round.	M	I	By design
39	6.3.1.2.8	A Tag shall measure the length of TRcal, compute BLF and adjust its T=>R link rate to be equal to BLF (ISO/IEC 18000-63:2021, Table 6.9 shows BLF values and tolerances).	M	T	Tested in compliance with 6.3.1.3.3.
40	6.3.1.2.8	The TRcal and RTcal that an Interrogator uses in any inventory round shall meet the constraints in ISO/IEC 18000-63:2021, Formula (2): 1,1 × RTcal ≤ TRcal ≤ 3 × RTcal.	M	I	By design – inherently tested with other tests
41	6.3.1.2.8	An Interrogator, for the duration of an inventory round, shall use the same length RTcal in a frame-sync as it used in the preamble that initiated the round.	M	I	By design
42	6.3.1.2.9	When an Interrogator uses frequency-hopping spread spectrum (FHSS) signalling, the Interrogator's RF envelope shall comply with ISO/IEC 18000-63:2021, Figure 6.5 and ISO/IEC 18000-63:2021, Table 6.8. The RF envelope shall not fall below the 90 % point in ISO/IEC 18000-63:2021, Figure 6.5 during interval T_{hs}.	M	I	By demonstration, for Interrogators that use FHSS: **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented.
43	6.3.1.2.9	Interrogators shall not issue commands before the end of the maximum settling-time interval in ISO/IEC 18000-63:2021, Table 6.8 (i.e. before T_{hs}).	M	I	By design
44	6.3.1.2.9	Local regulatory requirements apply to the maximum time between frequency hops and the minimum RF-off time during a hop.	M	I	By design
45	6.3.1.2.10	Local regulations apply for spread-spectrum channelization.	M	I	By design

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M: mandatory

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
46	6.3.1.2.10	Local regulations apply for interrogators certified for operation in multiple- or dense-Interrogator environments for spread-spectrum channelization. If channelization is unregulated, the channel plan in Reference [22] (see also ISO/IEC 18000-63:2021, Annex G, which describes multiple- and dense-Interrogator channelized signalling) applies.	M	I	By demonstration, for multiple- or dense-Interrogator certification. **Test conditions:** Temperature: (23 ± 3) °C Frequency: either a) or b) shown below a) Interrogators that are capable of commanding Tags to backscatter using subcarrier signalling: 50 discrete center frequencies as specified in ISO/IEC 18000-63:2021, Figure G.1, and b) Interrogators that are not capable of commanding Tags to backscatter using subcarrier signalling: All center frequencies supported by the Interrogator. NOTE The certification laboratory reserves the right to test a random subset of the Interrogator's supported center frequencies. Power: maximum Interrogator transmit power, as implemented. **Measurement equipment setting:** Resolution bandwidth: 1 kHz Video bandwidth: equal to the RBW. Sweep time: AUTO Span: 1 MHz Trace mode: max. hold sufficient to capture all emissions. Detection mode: averaging. Modulation method: continuous modulation. Test can be skipped if regulatory approval shows that these requirements have been fulfilled already.
47	6.3.1.2.11	Local regulations apply for out-of-channel and out-of-band spurious radio-frequency emissions.	M	I	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
48	6.3.1.2.11	Interrogators certified for operation in multiple-Interrogator environments, shall meet the Multiple-Interrogator Transmit Mask shown in ISO/IEC 18000-63:2021, Figure 6.6. Local regulations can apply.	M	I	By demonstration, for multiple-Interrogator certification. **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented. Channel width: 200 kHz for Interrogators certified for operation in Europe; A maximum of 500 kHz for Interrogators certified for operation in North America. Modulation: as implemented. Transmit data: either a) or b), below. a) a continuous repeating 9-bit maximum length sequence with polynomial x9 + x4 + 1, initially seeded with all ones, resulting in a repeating 511-bit sequence of FF83DF1732094ED1E7C-D8A91C6D5C4C44021184E5586F4D-C8A15A7EC92DF93533018CA34B-FA2C759678FBA0D6DD82D7D540A-57977039D27AEA243385ED9A-1DE0h, or b) a repeating Select command with a 252 bit Mask value set to ACBCD2114DAE1577C6DBF-4C91A3CDA2F169B340989C1D-32C290465E5C1423CCh. Bit sequences are listed MSB first. Other transmit parameters: as implemented. **Measurement equipment setting:** Resolution bandwidth: 1 kHz Video bandwidth: equal to the RBW. Sweep time: AUTO Span: 1 MHz Trace mode: max. hold sufficient to capture all emissions. Detection mode: averaging. Modulation method: continuous modulation.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
49	6.3.1.2.11	Multiple-Interrogator Transmit Mask: for an Interrogator transmitting random data in channel R and any other channel $S \neq R$, the ratio of the integrated power $P()$ in channel S to that in channel R shall not exceed the specified values: a) $\lvert R - S \rvert = 1$: $10\log_{10}(P(S) / P(R)) < -20$ dB b) $\lvert R - S \rvert = 2$: $10\log_{10}(P(S) / P(R)) < -50$ dB c) $\lvert R - S \rvert = 3$: $10\log_{10}(P(S) / P(R)) < -60$ dB d) $\lvert R - S \rvert > 3$: $10\log_{10}(P(S) / P(R)) < -65$ dB	M	I	Tested in compliance with ISO/ IEC 18000-63:2021, 6.3.1.2.11 and Figure 6.6.
50	6.3.1.2.11	Each channel that exceeds the mask shall be counted as an exception.	M		Tested in compliance with ISO/ IEC 18000-63:2021, 6.3.1.2.11 and Figure 6.6.
51	6.3.1.2.11	Interrogators certified for operation in dense-Interrogator environments shall meet the Dense-Interrogator Transmit Mask described below and shown in ISO/ IEC 18000-63:2021, Figure 6.7. Local regulations can apply.	M	I	By demonstration, for dense-Interrogator certification. **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented. Reference bandwidth: 2,5/Tari Modulation: as implemented. Transmit data: continuous modulation. Tari: according to vendor-selected value for normal operation. Backscatter data rate: one or more of the dense-interrogator data rates specified in ISO/IEC 18000-63:2021, Annex G, as implemented. Other transmit parameters: as implemented. **Measurement equipment setting:** Resolution bandwidth: 1 kHz Video bandwidth: equal to the RBW. Sweep time: AUTO Span: according to Tari ranges below. Tari ≥ 20 µs: 1 MHz 20 µs > Tari ≥ 10 µs: 2 MHz Tari < 10 µs: 3 MHz Trace mode: max. hold sufficient to capture all emissions. Detection mode: averaging. Modulation method: continuous modulation.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
52	6.3.1.2.11	Regardless of the mask used, Interrogators certified for operation in dense-Interrogator environments shall not be permitted the two exceptions to the transmit mask that are allowed for Interrogators certified for operation in multiple-Interrogator environments.	M	I	Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.2.11 and Figure 6.7. **Measurement equipment setting:** Resolution bandwidth: 1 kHz Video bandwidth: equal to the RBW. Sweep time: AUTO Span: 1 MHz Trace mode: max. hold sufficient to capture all emissions. Detection mode: averaging Modulation method: continuous repeated inventory sequence (no tags present)
53	6.3.1.2.11	For Interrogator transmissions centered at a frequency f_c, a 2,5/Tari bandwidth R_{BW} also centered at f_c, an offset frequency f_o = 2,5/Tari and a 2,5/Tari bandwidth S_{BW} centered at $(n \times f_o) + f_c$ (integer n), the ratio of the integrated power $P()$ in S_{BW} to that in R_{BW} with the Interrogator transmitting random data shall not exceed the specified values: a) $\lvert n \rvert = 1$: $10\log_{10}(P(S_{BW}) / P(R_{BW})) < -30$ dB b) $\lvert n \rvert = 2$: $10\log_{10}(P(S_{BW}) / P(R_{BW})) < -60$ dB c) $\lvert n \rvert > 2$: $10\log_{10}(P(S_{BW}) / P(R_{BW})) < -65$ dB	M	I	Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.2.11 and Figure 6.7. **Measurement equipment setting:** Resolution bandwidth: 1 kHz Video bandwidth: equal to the RBW. Sweep time: AUTO Span: 1 MHz Trace mode: max. hold sufficient to capture all emissions. Detection mode: averaging. Modulation method: continuous repeated inventory sequence (no tags present).
54	6.3.1.3	A Tag shall backscatter using a fixed modulation format, data encoding and data rate for the duration of an inventory round, where "inventory round" is defined in ISO/IEC 18000-63:2021, 4.1.	M	T	By design
55	6.3.1.3.1	Tag backscatter shall use ASK and/or PSK modulation.	M	T	By design
56	6.3.1.3.1	Interrogators shall demodulate both modulation types.	M	I	By design
57	6.3.1.3.2	Tags shall encode the backscattered data as either FM0 baseband or Miller modulation of a subcarrier at the data rate.	M	T	Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.3.2.1 and 6.3.1.3.2.3.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
58	6.3.1.3.2.1	The duty cycle of a 00 or 11 sequence, measured at the modulator output, shall be a minimum of 45 % and a maximum of 55 %, with a nominal value of 50 %.	M	T	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRext: 0 **Test # 1** Tari: 6,25 µs RTcal: 18,75 µs TRcal: 33,3 µs and 50 µs DR: 64/3 M: 1 **Test # 2** Tari: 12,5 µs RTcal: 31,25 µs TRcal: 66,7 µs, 83,3 µs DR: 64/3 M: 1
59	6.3.1.3.2.1	FM0 signalling shall always end with a "dummy" data-1 bit at the end of a transmission, as shown in ISO/IEC 18000-63:2021, Figure 6.10.	M	T	By design
60	6.3.1.3.2.2	T=>R FM0 signalling shall begin with one of the two preambles shown in ISO/IEC 18000-63:2021, Figure 6.11.	M	T	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0 and 1

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
61	6.3.1.3.2.2	The choice depends on the TRext value specified in the *Query* that initiated the inventory round, unless a Tag is replying to a command that uses a delayed or in-process reply (see ISO/IEC 18000-63:2021, 6.3.1.6), in which case a Tag shall use the extended preamble regardless of TRext (i.e. the Tag replies as if TRext = 1 regardless of the TRext value specified in the *Query* — see ISO/IEC 18000-63:2021, 6.3.2.12.3).	M	T	By demonstration Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
62	6.3.1.3.2.3	ISO/IEC 18000-63:2021, Figure 6.13 shows Miller-modulated subcarrier sequences; the Miller sequence shall contain exactly two, four, or eight subcarrier cycles per bit, depending on the M value specified in the *Query* command that initiated the inventory round (see ISO/IEC 18000-63:2021, Table 6.10).	M	T	By design
63	6.3.1.3.2.3	The duty cycle of a 0 or 1 symbol, measured at the modulator output, shall be a minimum of 45 % and a maximum of 55 %, with a nominal value of 50 %.	M	T	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRext: 0 **Test # 1** Tari: 6,25 µs RTcal: 18,75 µs TRcal: 33,3 µs and 50 µs DR: 64/3 M: 2, 4, 8 **Test # 2** Tari: 12,5 µs RTcal: 31,25 µs TRcal: 66,7 µs, 83,3 µs DR: 64/3 M: 2, 4, 8
64	6.3.1.3.2.3	Miller signaling shall always end with a "dummy" data-1 bit at the end of a transmission, as shown in ISO/IEC 18000-63:2021, Figure 6.14.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
65	6.3.1.3.2.4	T=>R subcarrier signalling shall begin with one of the two preambles shown in ISO/IEC 18000-63:2021, Figure 6.15.	M	T	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 2, 4, 8 TRext: 0 and 1
66	6.3.1.3.2.4	The choice depends on the TRext value specified in the *Query* that initiated the inventory round, unless a Tag is replying to a command that uses a delayed or in-process reply (see ISO/IEC 18000-63:2021, 6.3.1.6), in which case a Tag shall use the extended preamble regardless of TRext (i.e. the Tag replies as if TRext=1 regardless of the TRext value specified in the *Query*—see ISO/IEC 18000-63:2021, 6.3.2.10.3).	M	T	By demonstration Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
67	6.3.1.3.3	Tags shall support all R=>T Tari values in the range of 6,25 µs to 25 µs, over all parameters allowed by ISO/IEC 18000-63:2021, 6.3.1.2.3. Tags shall support the T=>R link frequencies and tolerances specified in ISO/IEC 18000-63:2021 Table 6.9 and the T=>R data rates specified in ISO/IEC 18000-63:2021, Table 6.10.	M	T	The FT requirements in ISO/IEC 18000-63:2021, Table 6.9 shall be verified by design. Tag manufacturers shall provide plots of worst-case FT error versus TRcal. Tag manufacturers shall also provide measured data used to generate the FT plots, including: a) Tag oscillator frequency tolerance; b) Tag oscillator frequency drift; c) TRcal measurement error budget; d) Other contributors to FT error. The frequency-variation during backscatter requirements in ISO/IEC 18000-63:2021, Table 6.9 shall be verified by demonstration. The testing laboratory shall measure the minimum, median and maximum symbol length (M = 1) or subcarrier period (M = 2, 4, 8) during backscatter of a 128-bit sequence (16-bit PC, 96-bit UII and a CRC-16). The minimum and maximum values shall not deviate by more than 2,5 % from the median. The test conditions are:

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRext: 0 **Test # 1** Tari: 6,25 µs RTcal: 18,75 µs TRcal: 33,3 × 0,99 µs, 33,3 µs and 33,3 × 1,01 µs DR: 64/3 M: 1, 2, 4, 8 For all TRcal values above, FT shall be verified with the value for TRcal = 33,3 µs. **Test # 2** Tari: 6,25 µs RTcal: 18,75 µs TRcal: 50 × 0,99 µs, 50 µs and 50 × 1,01 µs DR: 64/3 M: 1, 2, 4, 8 For all TRcal values above, FT shall be verified with the value for TRcal = 50 µs. **Test # 3** Tari: 25 µs RTcal: 75 µs TRcal: 200 × 0,99 µs, 200 µs and 200 × 1,01 µs DR: 8 M: 1, 2, 4, 8 For all TRcal values above, FT shall be verified with the value for TRcal = 200 µs.
68	6.3.1.3.4	Tags energized by an Interrogator shall be capable of receiving and acting on Interrogator commands within a period not exceeding the maximum settling-time interval specified in ISO/IEC 18000-63:2021, Table 6.6 or ISO/IEC 18000-63:2021, Table 6.8, as appropriate (i.e. within T_s or T_{hs}, respectively).	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
69	6.3.1.3.5	For a Tag certified to this protocol, the Tag manufacturer shall specify: a) free-space, sensitivity, b) minimum backscattered modulated power (ASK modulation) or change in radar cross-section or equivalent (phase modulation), and c) the manufacturer's normal operating conditions for the Tag mounted on one or more manufacturer-selected materials.	M	T	By design The Tag manufacturer shall provide this specification in the supplied documents.
70	6.3.1.4	The transmission order for all R=>T and T=>R communications shall be most-significant bit (MSB) first.	M	T and I	By design
71	6.3.1.4	Within each message, the most-significant word shall be transmitted first.	M	T and I	By design
72	6.3.1.4	Within each word, the MSB shall be transmitted first.	M	T and I	By design
73	6.3.1.5	To generate a CRC-16 a Tag or Interrogator shall first generate the CRC-16 precursor shown in ISO/IEC 18000-63:2021, Table 6.11 and then take the ones-complement of the generated precursor to form the CRC-16.	M	T and I	By design
74	6.3.1.5	A Tag or Interrogator shall verify the integrity of a received message that uses a CRC-16.	M	T and I	By design
75	6.3.1.5	Tags shall append a CRC-16 to those replies that use a CRC-16 — see ISO/IEC 18000-63:2021, 6.3.2.12 for command-specific replies.	M	T	By design
76	6.3.1.5	To generate a CRC-5 an Interrogator shall use the definition in ISO/IEC 18000-63:2021, Table 6.12.	M	I	By design
77	6.3.1.5	A Tag shall verify the integrity of a received message that uses a CRC-5.	M	T	By design
78	6.3.1.5	Interrogators shall append the appropriate CRC to R=>T transmissions as specified in ISO/IEC 18000-63:2021, Table 6.28.	M	I	By design
79	6.3.1.6	Tags and Interrogators that support Immediate Reply Type (see ISO/IEC 18000-63:2021, Table 6.28) shall meet all timing requirements shown in ISO/IEC 18000-63:2021, Table 6.16.	M	T and I	By demonstration **Interrogator test conditions:** Verify Interrogator meets T_2, T_3 and T_4. Temperature: (23 ± 3) °C Frequency: At channel frequency closest to center of supported band. Power: Maximum Interrogator transmit power, as implemented. Other transmit parameters: As implemented. **Tag test conditions:**

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Verify Tag meets T_1 over T_2 extremes. Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRext: 0 Minimum T_2 condition: Tari: 6,25 µs RTcal: 18,75 µs TRcal: 33,3 µs and 50 µs DR: 64/3 M: 1 Maximum T_2 condition: Tari: 25 µs RTcal: 75 µs TRcal: 200 µs DR: 8 M: 2, 4, 8
80	6.3.1.6	Tags and Interrogators that support Delayed Reply Type (see ISO/IEC 18000-63:2021, Table 6.28) shall meet all timing requirements shown in ISO/IEC 18000-63:2021, Table 6.16.	M	T and I	By demonstration **Interrogator test conditions:** Verify Interrogator meets T_2, and T_4. Temperature: (23 ± 3) °C Frequency: At channel frequency closest to center of supported band. Power: Maximum Interrogator transmit power, as implemented. Other transmit parameters: as implemented **Tag test conditions:** Verify Tag meets T_5 over T_2 extremes. Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRext: 1 Minimum T_2 condition: Tari: 6,25 µs RTcal: 18,75 µs TRcal: 33,3 µs and 50 µs DR: 64/3 M: 1 Maximum T_2 condition: Tari: 25 µs RTcal: 75 µs TRcal: 200 µs DR: 8 M: 2,4, 8
81	6.3.1.6	Tags and Interrogators that support In-process Reply Type (see ISO/IEC 18000-63:2021, Table 6.28) shall meet all timing requirements shown in ISO/IEC 18000-63:2021, Table 6.16.	M	T and I	By demonstration **Interrogator test conditions:** Verify Interrogator meets T_2 and T_4. Temperature: (23 ± 3) °C Frequency: At channel frequency closest to center of supported band. Power: Maximum Interrogator transmit power, as implemented. Other transmit parameters: as implemented. **Tag test conditions:** Verify Tag meets T_6 and T_7 over T_2 extremes. Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRext: 1 Minimum T_2 condition: Tari: 6,25 µs RTcal: 18,75 µs TRcal: 33,3 µs and 50 µs DR: 64/3 M: 1 Maximum T_2 condition: Tari: 25 µs RTcal: 75 µs TRcal: 200 µs DR: 8 M: 2, 4, 8
82	6.3.1.6	As described in ISO/IEC 18000-63:2021, 6.3.1.2.8, an Interrogator shall use a fixed R=>T link rate for the duration of an inventory round.	M	I	By design
83	6.3.1.6	Prior to changing the R=>T link rate, an Interrogator shall transmit CW for a minimum of 8×RTcal.	M	I	By design
84	6.3.1.6 Table 6.16	The maximum value for T_2 shall apply only to Tags in the reply or acknowledged states (see ISO/IEC 18000-63:2021, 6.3.2.6.3 and ISO/IEC 18000-63:2021, 6.3.2.6.4).	M	T	By demonstration Issue a Read command in Secured State. T_2 before the Read command shall be at least 10 ms. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
85	6.3.1.6 Table 6.16	For a Tag in the reply or acknowledged states, if T_2 expires (i.e. reaches its maximum value) without the Tag receiving a valid command, the Tag shall transition to the arbitrate state (see ISO/IEC 18000-63:2021, 6.3.2.6.2).	M	T	By design
86	6.3.1.6 Table 6.16	For a Tag in the reply or acknowledged states, if T_2 expires (i.e. reaches its maximum value) during the reception of a valid command, the Tag shall execute the command.	M	T	By design
87	6.3.1.6 Table 6.16	For a Tag in the reply or acknowledged states, if T_2 expires (i.e. reaches its maximum value) during the reception of an invalid command, the Tag shall transition to arbitrate upon determining that the command is invalid.	M	T	By design
88	6.3.1.6 Table 6.16	In all other states the maximum value for T_2 shall be unrestricted.	M	T	By design
89	6.3.1.6	$T_1 + T_3$ shall not be less than T_4	M	T	By design
90	6.3.1.6.2	After issuing a command that uses delayed reply timing an Interrogator shall transmit CW for at least the lesser of T_{REPLY} or $T_{5(max)}$, where T_{REPLY} is the time between the Interrogator's command and the Tag's backscattered reply.	M	I	By demonstration
91	6.3.1.6.2	When an Interrogator issues a command that uses delayed reply timing and the Tag successfully executes the command, after executing the command the Tag shall backscatter the reply shown in ISO/IEC 18000-63:2021, Table 6.13 and Figure 6.16, comprising a header (a 0-bit), the Tag's handle, and a CRC-16 calculated over the 0-bit and handle.	M	T	By demonstration Write the PC with value 0x3000. Verify that the Tag response is according to Table 6.13 and Figure 6.16. T_5 should meet the limit in Table 6.16. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
92	6.3.1.6.2	The reply shall meet the T_5 limits in ISO/IEC 18000-63:2021, Table 6.16.	M	T	By demonstration Tested in compliance with Item 91.

Key

M: mandatory

O : optional

T : tag

I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
93	6.3.1.6.2	When an Interrogator issues a command that uses delayed reply timing and the Tag encounters an error, the Tag shall backscatter an error code (see ISO/IEC 18000-63:2021, Annex I) during the CW period rather than the reply shown in ISO/IEC 18000-63:2021, Table 6.13.	M	T	By demonstration Write the Stored-CRC with value 0x0000. Verify that the Tag respond with an error message. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
94	6.3.1.6.2	A Tag shall ignore Interrogator commands while processing a prior command that specified a delayed reply.	M	T	By demonstration Write the PC with value 0x3000. Issue a *Req_RN* command before the Tag has time to respond. Verify that the Tag ignores the *Req_RN* command and only processes the Write operation (either with/without write error). **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: ≥ 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1 For this test, it shall be verified that the tag always has sufficient power available.

Key

M: mandatory

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
95	6.3.1.6.2	A delayed Tag reply shall use the extended preamble shown in ISO/IEC 18000-63:2021, Figure 6.11 or ISO/IEC 18000-63:2021, Figure 6.15, as appropriate (i.e. the Tag shall reply as if TRext=1 regardless of the TRext value in the *Query* that initiated the inventory round).	M	T	By design
96	6.3.1.6.3	An *in-process* reply may include multiple backscatter transmissions from Tag to Interrogator.	O	I	By demonstration Issue a valid command that employs an in-process reply. Verify that the Interrogator is able to decode all backscatter transmissions. The maximum number of backscatter transmissions shall be specified by the interrogator manufacturer. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
97	6.3.1.6.3	The first transmission shall meet the T_6 limits specified in ISO/IEC 18000-63:2021, Table 6.16; subsequent transmissions (if any) shall meet T_7.	M	T	By design
98	6.3.1.6.3	A Tag shall backscatter a transmission at least once every $T_{7(max)}$ while processing the command.	M	T	By demonstration Issue a valid command that employs an in-process reply. Verify that the Tag replies as shown in Table 6.14. T_6 and T_7 shall meet limits specified in Table 6.16. The number of backscatter transmissions shall be limited to MIN (maximum number of backscatter transmissions, 4). **Test conditions:** Temperature: (23 ± 3) °C

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
99	6.3.1.6.3	A Tag's *in-process* reply or replies shall be as shown in ISO/IEC 18000-63:2021, Table 6.14.	M	T	By demonstration Tested in compliance with Item 98.
100	6.3.1.6.3	The Tag replies shall be consistent for first and subsequent Tag transmissions – i.e. if the final reply includes length, then all intermediate replies shall include length and vice versa.	M	T	By design
101	6.3.1.6.3	While processing the command the Tag backscatters a transmission as shown in ISO/IEC 18000-63:2021, Table 6.14 at least once every $T_{7(max)}$. Done and header for these intermediate replies shall be zero, response shall be null, and if the replies include length, then length=0000_h.	M	T	By demonstration Tested in compliance with Item 98.
102	6.3.1.6.3	All replies shall meet the T_6 and T_7 limits specified in ISO/IEC 18000-63:2021, Table 6.16. If the Interrogator observes a final reply with header=0, then the command completed successfully.	M	T	By demonstration Tested in compliance with Item 98.
103	6.3.1.6.3	All replies shall meet the T_6 and T_7 limits specified in ISO/IEC 18000-63:2021, Table 6.16. If the Interrogator observes a final reply with header=1, then the Tag encountered an error (see ISO/IEC 18000-63:2021, Annex I).	M	T	By demonstration Issue a command with an unsupported parameter that employs an in-process reply. Verify that the Tag replies an error (see ISO/IEC 18000-63:2021, Table 6.14 and ISO/IEC 18000-63:2021, Annex I). T_6 and T_7 shall meet limits specified in Table 6.16. **Test conditions:** Temperature: (23 ± 3) °C
Key M : mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
104	6.3.1.6.3	Length shall comprise a 15-bit value field followed by an even parity bit (the number of 1's in the 16-bit length field shall be an even number, with length=0000_h an allowed value).	M	T	By design
105	6.3.1.6.3	A Tag shall ignore Interrogator commands while processing a prior command that specified an *in-process* reply.	M	T	By demonstration Issue a valid command that employs an in-process reply. Issue a *Req_RN* command before the Tag has time to respond. Verify that the Tag ignores the *Req_RN* command and only processes the in-process reply. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: ≥ 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1 For this test, it shall be verified that the tag always has sufficient power available.

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
106	6.3.1.6.3	After issuing a command that uses an *in-process* reply an Interrogator shall transmit CW until the Interrogator either a) observes a reply with done=1 indicating the Tag has finished executing the command, or b) fails to observe a reply for at least $T_{6(max)}$ or $T_{7(max)}$ (as appropriate) indicating that the Tag failed to execute the command.	M	I	By design
107	6.3.1.6.3	An *in-process* Tag reply shall use the extended preamble shown in ISO/IEC 18000-63:2021, Figure 6.11 or ISO/IEC 18000-63:2021, Figure 6.15, as appropriate (i.e. the Tag shall reply as if TRext=1 regardless of the TRext value in the *Query* that initiated the inventory round).	M	T	By design
108	6.3.1.6.4	A Tag that implements a *Challenge* command, or any access command (other than *AuthComm*) that employs an *in-process* reply, shall implement a C flag and a ResponseBuffer with the following properties:	M	T	By demonstration Tested in compliance with Item 109.
109	6.3.1.6.4	A Tag shall set C=0 upon either a) receiving an access command containing SenRep (c.f. ISO/IEC 18000-63:2021, 6.3.2.12.3.10), b) receiving a *Challenge* command, or c) when specified by a cryptographic suite, and shall set C=1 after storing a response (result or error code) in its ResponseBuffer.	M	T	By demonstration Read XPC_W1 value to verify that the initial value of C flag is '0'. Issue a *Challenge* or an *Authenticate* command with SenRep=0. Read XPC_W1 value to verify that the value of C flag has changed to '1'. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
110	6.3.1.6.4	The C flag shall be selectable using a *Select* command.	M	T	By demonstration **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
111	6.3.1.6.4	If an access command with SenRep=0 or a *Challenge* command specifies IncRepLen=0 then a Tag shall not include a length field with its stored response, so the first word of the stored response shall be at ResponseBuffer location 00_h.	M	T	By demonstration Issue a *Challenge* or an *Authenticate* command with SenRep=0 and IncRepLen=0. Verify that no length field is contained in the ResponseBuffer, by using the *ReadBuffer* command. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
112	6.3.1.6.4	If the command specifies IncRepLen=1 then ResponseBuffer bits 00_h – $0E_h$ shall contain the length of the stored response in bits, ResponseBuffer bit $0F_h$ shall contain an even parity bit that the Tag computes over bits 00_h – $0E_h$ and the first word of the stored response shall be at ResponseBuffer location 10_h. See ISO/IEC 18000-63:2021, Figure 6.17.	M	T	By demonstration Issue a *Challenge* or an *Authenticate* command with SenRep=0 and IncRepLen=1. Verify that the length field is contained in the ResponseBuffer, by using the *ReadBuffer* command. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
113	6.3.1.6.4	The maximum size of a stored response shall be 32 kbits.	M	T	By design
114	6.3.1.6.4	The maximum ResponseBuffer size shall be 32,784 bits (15 length bits, 1 parity bit, 32k response bits). A Tag manufacturer may limit the ResponseBuffer to a size less than this maximum.	M	T	By design
115	6.3.1.6.4	A Tag shall dynamically adjust its ResponseBuffer, on a command-by-command basis, to the required size.	M	T	By design
116	6.3.1.6.4	The ResponseBuffer shall be read-only to an Interrogator.	M	T	By Design
117	6.3.1.6.4	A Tag shall abort command processing and instead store an error code in its ResponseBuffer if and when it determines that response will overflow the ResponseBuffer (see ISO/IEC 18000-63:2021, Annex I).	M	T	By Design
118	6.3.1.6.4	A Tag shall retain data in its ResponseBuffer with the persistence of its C flag (see ISO/IEC 18000-63:2021, Table 6.20).	M	T	By demonstration Issue a *Challenge* or an *Authenticate* command with SenRep=0. Switch of the carrier after successful tag response. Read XPC_W1 after the persistence of the C flag. Verify that C=1. Issue a *ReadBuffer* command to verify that the Tag deallocated its ResponseBuffer. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 Tari Modulation depth: 90 % Rise/fall time: < 0,33Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
119	6.3.1.6.4	When C is 1, then a Tag shall maintain the data in its ResponseBuffer.	M	T	By demonstration Tested in compliance with Item 112.
120	6.3.1.6.4	When C is or becomes 0, then a Tag shall deallocate its ResponseBuffer.	M	T	By demonstration Tested in compliance with Item 119.
121	6.3.1.6.4	The maximum value for T_2 shall apply only to Tags in the reply or acknowledged states (see ISO/IEC 18000-63:2021, 6.3.2.6.3 and ISO/IEC 18000-63:2021, 6.3.2.6.4). For a Tag in the reply or acknowledged states, if T_2 expires (i.e. reaches its maximum value): — without the Tag receiving a valid command, the Tag shall transition to the arbitrate state (see ISO/IEC 18000-63:2021, 6.3.2.6.2), — during the reception of a valid command, the Tag shall execute the command, and — during the reception of an invalid command, the Tag shall transition to arbitrate upon determining that the command is invalid. In all other states the maximum value for T_2 shall be unrestricted. A Tag shall be allowed a tolerance of $20,0 \times T_{pri} \leq T_{2(max)} \leq 32 \times T_{pri}$ in determining whether T_2 has expired. "Invalid command" is defined in ISO/IEC 18000-63:2021, 6.3.2.12.	M	T	By design
122	6.3.1.6.4	$T_1 + T_3$ shall not be less than T_4.	M	T	By design
123	6.3.2.1	Tag memory shall be logically separated into four distinct banks, each of which may comprise zero or more memory words.	M	T	By demonstration Tested in compliance with Item 132.
124	6.3.2.1	Reserved memory shall contain the kill and/or access passwords, if passwords are implemented on the Tag.	M	T	By demonstration Tested in compliance with Item 132.
125	6.3.2.1	The kill password shall be stored at memory addresses 00_h to $1F_h$.	M	T	By design
126	6.3.2.1	The access password shall be stored at memory addresses 20_h to $3F_h$.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
127	6.3.2.1	UII memory shall contain a CRC-16 at memory addresses 00_h to $0F_h$, Protocol-Control (PC) bits at memory addresses 10_h to $1F_h$ and a code (such as a Unique Item Identifier, hereafter referred to as an UII) that identifies the object to which the Tag is or will be attached beginning at address 20_h.	M	T	By design
128	6.3.2.1	TID memory shall contain an 8-bit ISO/IEC 15963-1 allocation class identifier at memory locations 00_h to 07_h. TID memory shall contain sufficient identifying information above 07_h for an Interrogator to uniquely identify the custom commands and/or optional features that a Tag supports.	M	T	By demonstration Singulate the Tag, read its TID memory and verify the contents. **Tag test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0
129	6.3.2.1	The logical addressing of all memory banks and User-memory files shall begin at zero (00_h).	M	T	By design
130	6.3.2.1	The backscatter shall fall on word boundaries (except in the case of a truncated reply – see ISO/IEC 18000-63:2021, 6.3.2.10.1.1).	M	T	By design
131	6.3.2.1	MemBank shall be defined as follows: 00_2 Reserved 01_2 UII 10_2 TID 11_2 User	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
132	6.3.2.1	Operations in one logical memory bank shall not access memory locations in another bank.	M	T	By demonstration "Check for memory overruns" Initialise all (writable) memory locations in each bank with the value 0x0000. Issue a sequence of *Write* commands to write the PC with 0x3000 and the remaining UII memory with 0x1111. Verify, using the *Read* command, that no memory location in another bank has been overwritten. Issue a sequence of *Write* commands to write the entire USER memory bank with 0x2222. Verify, using the *Read* command, that no memory location in another bank has been overwritten. Issue a sequence of *Write* commands to write the entire RESERVED memory bank with 0x3333. Verify, using the *Read* command, that no memory location in another bank has been overwritten. Issue a sequence of *Write* commands to attempt to write the entire TID memory bank with 0x4444. Verify, using the *Read* command, that no memory location in TID or another bank has been overwritten. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
133	6.3.2.1	A *Write*, *BlockWrite*, or *BlockErase* shall not alter a Tag's killed status regardless of the memory address (whether valid or invalid) specified in the command.	M	T	By demonstration Tested in compliance with Item 132.
134	6.3.2.1	A Tag shall use the same block size for file allocation (see ISO/IEC 18000-63:2021, 6.3.2.11.3) as it does for the *BlockPermalock* command (see ISO/IEC 18000-63:2021, 6.3.2.12.3.9).	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
135	6.3.2.1.1	If a Tag does not implement the kill and/or access password(s), the Tag shall logically operate as though it has zero-valued password(s) that are permanently read/write locked (see ISO/IEC 18000-63:2021, 6.3.2.10.3.5) and the corresponding physical memory locations in Reserved memory need not exist.	M	T	By design
136	6.3.2.1.1.1	The default (unprogrammed) value shall be zero.	M	T	By design
137	6.3.2.1.1.1	A Tag that does not implement a kill password shall behave as though it has a zero-valued kill password that is permanently read/write locked.	M	T	By demonstration Issue a *Kill* command to a Tag that does not implement a kill password. Verify that the Tag does not execute the *Kill*. Tested in compliance with Item 138.
138	6.3.2.1.1.1	A Tag shall not execute a password-based kill if its kill password is zero (see ISO/IEC 18000-63:2021, 6.3.2.12.3.4)	M	T	By demonstration Issue a *Kill* command to a Tag with a zero-valued kill password. Verify that the Tag backscatters an error code and does not execute the *Kill*. **Tag test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0
139	6.3.2.1.1.2	The default (unprogrammed) value shall be zero.	M	T	By design
140	6.3.2.1.1.2	A Tag that does not implement an access password shall behave as though it has a zero-valued access password that is permanently read/write locked.	M	T	By demonstration Attempt to write the access password. A Tag that does not implement an access password shall respond with an error message. A Tag that implements an access password shall respond with a valid response. Attempt to read the access password. A Tag that does not implement an access password shall respond with an error message. A Tag that implements an access password shall respond with a valid response.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Tag test conditions: Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0
141	6.3.2.1.2	The StoredCRC, StoredPC, UII and XPC word(s) shall be stored MSB first (the UII MSB is stored in location 20_h).	M	T	By design
142	6.3.2.1.2.1	A Tag shall implement both a StoredCRC and a PacketCRC.	M	T	By design
143	6.3.2.1.2.1	A Tag shall compute and store its StoredCRC either a) when an Interrogator writes or overwrites bits in the UII (including in the StoredPC), or b) every time the Tag powers up.	M	T	By design
144	6.3.2.1.2.1	The Tag manufacturer shall choose whether the Tag implements a) or b).	M	T	By design
145	6.3.2.1.2.1	A Tag that implements case a) shall perform its computing and storing as follows: the Tag first writes or overwrites the bits, then computes and stores a new StoredCRC, all within the reply times specified in ISO/IEC 18000-63:2021, Table 6.16 for the command (Write, BlockWrite, BlockErase, or Untraceable) that wrote or overwrote the bits. A Tag shall delay backscattering the success reply shown in ISO/IEC 18000-63:2021, Table 6.13 or ISO/IEC 18000-63:2021, Table 6.14 for the command that wrote or overwrote the bits until it has stored the new StoredCRC. The Tag shall store its StoredCRC in nonvolatile memory so that the StoredCRC persists through subsequent Tag power cycles. Alternatively, a Tag that implements case b) shall perform its computing and storing as follows: the Tag computes and stores the StoredCRC before the end of interval Ts or Ths (as appropriate) in ISO/IEC 18000-63:2021, Figure 6.3 or ISO/IEC 18000-63:2021, Figure 6.5, respectively.	M	T	By design
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
146	6.3.2.1.2.1	For both cases a) and b), the Tag shall implement the StoredCRC by first calculating a CRC-16 (see ISO/IEC 18000-63:2021, 6.3.1.5) over the StoredPC and the UII specified by the length (L) bits in the StoredPC and then storing the thus-computed StoredCRC into UII memory 00h to 0Fh, MSB first.	M	T	By demonstration **Test for rewriteable Tags:** Sequentially write a Tag's UII, one 16-bit word at a time. Following each write, update the length field specified in the PC bits, power down the Tag, then power it up again and singulate it. Verify that the backscattered CRC-16 matches the backscattered UII after each write operation. **Test for prewritten Tags:** Power up the Tag and singulate it. Verify that the backscattered CRC-16 matches the backscattered UII. **Tag test conditions for either case:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0
147	6.3.2.1.2.1	The Tag shall calculate the StoredCRC on word boundaries, shall deassert all Tag-computed StoredPC bit values (XI and UMI if Tag-computed) when performing the calculation and shall omit XPC_W1 and XPC_W2 from the calculation.	M	T	By design
148	6.3.2.1.2.1	If an Interrogator attempts to write to UII memory 00h – 0Fh then the Tag shall not execute the write and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By demonstration Issue a Write command on the specified memory location. Verify that the Tag responds with an error message. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
149	6.3.2.1.2.1	A Tag shall compute the PacketCRC as specified in ISO/IEC 18000-63:2021, 6.3.1.5 over the PC word, optional XPC word(s) and backscattered UII and shall send the PacketCRC MSB first.	M	T	By design
150	6.3.2.1.2.1	As required by ISO/IEC 18000-63:2021, 6.3.1.5, an Interrogator shall verify the integrity of the received PC word, optional XPC word or words and UII using the PacketCRC.	M	I	By design
151	6.3.2.1.2.2	A Tag shall implement a StoredPC in addresses 10h–1Fh of UII memory. The bit assignments for this StoredPC shall be as shown in ISO/IEC 18000-63:2021, Table 6.18 and defined in ISO/IEC 18000-63:2021, Table 6.19.	M	T	By design
152	6.3.2.1.2.2	The StoredPC bits and values shall be as follows: Bits 10h – 14_h are written by an Interrogator and specify the length of the UII that a Tag backscatters in response to an ACK, in words.	M	I	By design
153	6.3.2.1.2.2	If a Tag only supports XI=0, the maximum value for the UII length field in the StoredPC shall be 11111_2 (allows a 496-bit UII), as shown above. If a Tag supports XI=1, the maximum value for the UII length field in the StoredPC shall be 11101_2 (allows a 464-bit UII).	M	T	By design
154	6.3.2.1.2.2	A Tag that supports XI=1 shall not execute a *Write*, *BlockWrite*, or *Untraceable* that attempts to write an UII length field larger than 11101_2 and shall instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
155	6.3.2.1.2.2	Bit 15_h may be fixed by the Tag manufacturer or computed by the Tag. In the former (fixed) case, if the Tag does not have and is incapable of allocating memory to File_0 then the Tag manufacturer shall set bit 15_h to 0_2; if the Tag has or is capable of allocating memory to File_0 then the Tag manufacturer shall set bit 15_h to 1_2.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
156	6.3.2.1.2.2	In the latter (computed) case, both at power-up and upon writing the first word (bits 00_h – $0F_h$) of File_0 a Tag shall compute the logical OR of bits 03_h – 07h of File_0 and shall map the computed value into bit 15_h; if the Tag does not have memory allocated to File_0 then the logical OR result shall be 0_2.	O	T	By design
157	6.3.2.1.2.2	Regardless of the UMI method (fixed or computed), when an Interrogator writes the StoredPC the Tag shall not write and instead ignore the data value the Interrogator provides for bit 15_h.	O	T	By design
158	6.3.2.1.2.2	For a computed UMI, if an Interrogator deallocates File_0 (see ISO/IEC 18000-63:2021, 6.3.2.11.3) then the Tag shall set bit 15_h to 0_2 upon deallocation.	O	T	By design
159	6.3.2.1.2.2	Also, for a computed UMI, the untraceability status of User memory (see ISO/IEC 18000-63:2021, 6.3.2.11.1) shall not change the UMI value (i.e. if UMI = 1 when a Tag is traceable, the UMI shall remain 1 even if an Interrogator instructs a Tag to untraceably hide User memory).	O	T	By design
160	6.3.2.1.2.2	If a Tag does not implement XPC_W1 then bit 16_h shall be fixed at 0_2 by the Tag manufacturer.	M	T	By design
161	6.3.2.1.2.2	If a Tag implements XPC_W1 then a Tag shall compute XI both at powerup and upon changing any bits of XPC_W1 (whether these bits are written or computed) and map the computed value into bit 16_h as follows: If T = 0, XI may be either a) the logical OR of bits 210_h–217_h of UII memory, or b) the logical OR of bits 210_h–218_h of UII memory; the Tag manufacturer shall choose whether the Tag implements a) or b). If T = 1, XI is the logical OR of bits 210_h–$21F_h$ of UII memory.	O	T	By design
162	6.3.2.1.2.2	Regardless of whether XI is fixed or computed, when an Interrogator writes the StoredPC the Tag shall not write and instead ignore the data value the Interrogator provides for bit 16_h.	M	T	By design
163	6.3.2.1.2.2	If bit 17_h is 0_2, then the application is referred to as a GS1 Application and PC bits 18_h – $1F_h$ shall be as defined in this protocol. If bit 17_h is 1_2, then the application is referred to as an ISO Application and PC bits 18_h – $1F_h$ shall be as defined in ISO/IEC 15961-1.	M	T	By demonstration **Tag test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0
164	6.3.2.1.2.2	Reserved for future use (RFU) or application family identifier (AFI), (bits 18_h – $1F_h$): if T=0 then the Tag manufacturer (if the bits are not writeable) or an Interrogator (if the bits are writeable) shall set these bits to 00_h. If T = 1 then the Tag manufacturer (if the bits are not writeable) or an Interrogator (if the bits are writeable) shall set these bits as specified in ISO/IEC 15961 -1.	M	T	By design
165	6.3.2.1.2.2	If an Interrogator attempts to write L bit values that the Tag does not support then the Tag shall not execute the write operation and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
166	6.3.2.1.2.2	A Tag that supports XI = 1 shall implement a PacketPC in addition to a StoredPC.	O	T	By design
167	6.3.2.1.2.2	Which PC word a Tag backscatters in reply to an *ACK* shall be as defined in ISO/IEC 18000-63:2021, Table 6.17.	M	T	By design
168	6.3.2.1.2.2	A PacketPC differs from a StoredPC in its L bits, which a Tag adjusts to match the length of the backscattered data that follow the PC word. Specifically, if XI = 1 but XEB = 0 then a Tag backscatters an XPC_W1 before the UII, so the Tag shall add one to (i.e. increment) its L bits. If both XI = 1 and XEB = 1 then the Tag backscatters both an XPC_W1 and an XPC_W2 before the UII, so the Tag shall add two to (i.e. double increments) its L bits. Because Tags that support XPC functionality have a maximum L value of 11101_2, double incrementing increases the value to 11111_2.	O	T	By design
169	6.3.2.1.2.2	A Tag shall not, under any circumstances, allow its L bits to roll over to 00000_2.	M	T	By design
170	6.3.2.1.2.2	If a Tag has T = 0, XI = 0, implements an XPC_W1 and is not truncating then the Tag substitutes the 8 LSBs of XPC_W1 (i.e. UII memory 218_h – $21F_h$) for the 8 LSBs of the StoredPC (i.e. PC memory 18_h – $1F_h$) in its reply. Because a Tag calculates its PacketCRC over the backscattered data bits (see ISO/IEC 18000-63:2021, 6.3.2.1.2.1), when the Tag does this substitution, then it shall calculate its PacketCRC over the 8 substituted PC_W1 LSBs rather than over the 8 StoredPC LSBs.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
171	6.3.2.1.2.2	An Interrogator shall support Tag replies with XI = 0, XI = 1, or both XI = 1 and XEB = 1.	M	I	By design
172	6.3.2.1.2.2	If a Tag has a response (result or error code) in its ResponseBuffer (i.e. C=1) and the Interrogator set immed = 1 in the *Challenge* command that preceded the inventory round then a Tag shall concatenate response and a CRC-16 calculated over response to its reply to an *ACK* (see ISO/IEC 18000-63:2021, Table 6.17).	O	T	By design
173	6.3.2.1.2.3	The UII (EPC) for a GS1 Application shall be as defined in the EPC Tag Data Standard.	O	T	By design
174	6.3.2.1.2.4	The UII for an ISO Application shall be as defined in ISO/IEC 15961-1.	O	T	By design
175	6.3.2.1.3	TID memory locations 00_h to 07_h shall contain either $E0_h$ or $E2_h$. ISO/IEC 15963-1 class-identifier value.	M	T	By design
176	6.3.2.1.3	TID memory locations above 07_h shall be defined according to the registration authority defined by this class-identifier value and shall contain, at a minimum, sufficient information for an Interrogator to uniquely identify the custom commands and/or optional features that a Tag supports.	O	T	By design
177	6.3.2.1.3	If the class identifier is $E2_h$, then TID memory above 07_h shall be configured as follows: — 08h: XTID (X) indicator (whether a Tag implements an XTID – see ISO/IEC 18000-63:2021, 5.2); — 09h: security (S) indicator (whether a Tag supports the Authenticate and/or Challenge commands); — 0Ah: file (F) indicator (whether a Tag supports the FileOpen command); — 0Bh to 13h: a 9-bit Tag mask-designer identifier (obtainable from the registration authority); — 14h to 1Fh: a Tag-manufacturer-defined 12-bit Tag model number; — above 1Fh: as defined in the GS1 EPC Tag Data Standard.	O	T	By design
178	6.3.2.1.4	If File_0 of User memory exists and has not yet been written then the 5 LSBs of the first byte (i.e. File_0 memory addresses 03_h to 07_h) shall have the default value 00000_2.	O	T	By design
179	6.3.2.1.4.1	If a Tag implements User memory then the file encoding shall be as defined in the GS1 EPC Tag Data Standard.	O	T	By design
180	6.3.2.1.4.2	If a Tag implements User memory then the file encoding shall be as defined in ISO/IEC 15961-1 and ISO/IEC 15962.	O	T	By design
181	6.3.2.2	Interrogators shall support and Tags shall provide four sessions (denoted S0, S1, S2 and S3).	M	T and I	By design
182	6.3.2.2	Tags shall participate in one and only one session during an inventory round.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
183	6.3.2.2	A Tag shall maintain an independent inventoried flag for each of its four sessions.	M	T	By design
184	6.3.2.2	Tags participating in an inventory round in one session shall neither use nor modify the inventoried flag for a different session.	M	T	By design
185	6.3.2.2	A Tag's inventoried flags shall have the set and persistence times shown in ISO/IEC 18000-63:2021, Table 6.20.	M	T	By design
186	6.3.2.2	A Tag shall power-up with its inventoried flags set as follows: the S0 inventoried flag shall be set to *A*.	M	T	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.3 and Table 6.20.
187	6.3.2.2	A Tag shall power-up with its inventoried flags set as follows: the S1 inventoried flag shall be set to either *A* or *B*, depending on its stored value, unless the flag was set longer in the past than its persistence time, in which case the Tag shall power-up with its S1 inventoried flag set to *A*.	M	T	By design
188	6.3.2.2	A Tag shall power-up with its inventoried flags set as follows: the S2 inventoried flag shall be set to either *A* or *B*, depending on its stored value, unless the Tag has lost power for a time greater than its persistence time, in which case the Tag shall power-up with the S2 inventoried flag set to *A*.	M	T	By design
189	6.3.2.2	A Tag shall power-up with its inventoried flags set as follows: the S3 inventoried flag shall be set to either *A* or *B*, depending on its stored value, unless the Tag has lost power for a time greater than its persistence time, in which case the Tag shall power-up with its S3 inventoried flag set to *A*.	M	T	By design
190	6.3.2.2	Tag shall refresh its S2 and S3 flags while powered, meaning that every time a Tag loses power its S2 and S3 inventoried flags shall have the persistence times shown in ISO/IEC 18000-63:2021, Table 6.20.	M	T	By design
191	6.3.2.2	A Tag shall not change the value of its S1 inventoried flag from *B* to *A*, as the result of a persistence timeout, while the Tag is participating in an inventory round, is in the midst of being inventoried, or is in the midst of being accessed.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
192	6.3.2.2	If a Tag's S1 flag persistence time expires during an inventory round then the Tag shall change the flag to *A* only a) as instructed by an Interrogator (e.g. by a *QueryAdjust* or *QueryRep* with matching session at the end of an inventory or access operation), or b) at the end of the round (e.g. upon receiving a *Select* or *Query*). In case a), if the Tag's S1 flag persistence time expires while the Tag is in the midst of being inventoried or accessed then the Tag shall change the flag to *A* at the end of the inventory or access operation. In case b), the Tag shall invert its S1 flag prior to evaluating the *Select* or *Query*.	M	T	By design
193	6.3.2.3	Tags shall implement a selected flag, SL, which an Interrogator may assert or deassert using a *Select* command.	M	T	By design
194	6.3.2.3	A Tag's SL flag shall have the set and persistence times shown in ISO/IEC 18000-63:2021, Table 6.20.	M	T	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.3 and Table 6.20.
195	6.3.2.3	A Tag shall power-up with its SL flag either asserted or deasserted, depending on the stored value, unless the Tag has lost power for a time greater than the SL persistence time, in which case the Tag shall power-up with its SL flag deasserted (set to ~SL).	M	T	By design
196	6.3.2.3	A Tag shall refresh its SL flag when powered, meaning that every time a Tag loses power its SL flag shall have the persistence times shown in ISO/IEC 18000-63:2021, Table 6.20.	M	T	By design
197	6.3.2.3, Table 6.20	For a randomly chosen and sufficiently large Tag population, 95 % of the Tag persistence times shall meet the persistence requirement, with a 90 % confidence interval.	M	T	By design Tag manufacturers shall provide data and analysis demonstrating that Tags meet the persistence requirements of ISO/IEC 18000-63:2021, Table 6.20.
198	6.3.2.4	A Tag's C flag (see ISO/IEC 18000-63:2021, 6.3.2.1.2.5) shall have the set and persistence times shown in ISO/IEC 18000-63:2021, Table 6.20.	O	T	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.3 and Table 6.20.
199	6.3.2.4	A Tag shall refresh its C flag when powered, meaning that every time a Tag loses power its C flag shall have the persistence shown in ISO/IEC 18000-63:2021, Table 6.20 (of course, if a Tag has a zero-second persistence time then even if the Tag powers down momentarily its C flag will be deasserted).	O	T	By design
200	6.3.2.5	If a Tag implements a security timeout then it shall use a single timeout timer, so a security timeout caused by one command failure (such as a failed *Challenge*) shall cause a Tag to disallow all commands for which the Tag implements a security timeout until the end of the timeout period.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
201	6.3.2.6	Tags shall implement the states and the slot counter shown in ISO/IEC 18000-63:2021, Figure 6.21.	M	T	By demonstration **Tag test:** Tag manufacturers shall supply a population of Tags for testing. The testing laboratory shall exercise all of the states and state transitions shown in ISO/IEC 18000-63:2021, Figure 6.21 by selecting, singulating, inventorying, reading, writing, accessing and (for Tags that implement *Kill*) killing the Tags. **Tag test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0
202	6.3.2.6.1	Tags shall implement a ready state.	M	T	By design – inherently tested with other tests. Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
203	6.3.2.6.1	Upon entering an energizing RF field, a Tag that is not killed shall enter ready.	M	T	By design
204	6.3.2.6.1	The Tag shall remain in ready until it receives a *Query* command (see ISO/IEC 18000-63:2021, 6.3.2.12.2.1) whose inventoried parameter (for the session specified in the *Query*) and sel parameter match its current flag values.	M	T	By design
205	6.3.2.6.1	Matching Tags shall draw a *Q*-bit number from their RNG (see ISO/IEC 18000-63:2021, 6.3.2.7), load this number into their slot counter and transition to the arbitrate state if the number is nonzero, or to the reply state if the number is zero.	M	T	By design
206	6.3.2.6.1	If a Tag in any state except killed loses power, it shall return to ready upon regaining power.	M	T	By design
207	6.3.2.6.2	Tags shall implement an arbitrate state.	M	T	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
208	6.3.2.6.2	A Tag in arbitrate shall decrement its slot counter every time it receives a *QueryRep* command (see ISO/IEC 18000-63:2021, 6.3.2.12.2.3) whose session parameter matches the session for the inventory round currently in progress and it shall transition to the reply state and backscatter an RN16 when its slot counter reaches 0000_h.	M	T	By design
209	6.3.2.6.2	Tags that return to arbitrate (e.g. from the reply state) with a slot value of 0000_h shall decrement their slot counter from 0000_h to $7FFF_h$ at the next *QueryRep* (with matching session) and, because their slot value is now nonzero, shall remain in arbitrate.	M	T	By design
210	6.3.2.6.3	Tags shall implement a reply state.	M	T	Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
211	6.3.2.6.3	Upon entering reply, a Tag shall backscatter an RN16.	M	T	By design
212	6.3.2.6.3	If the Tag receives a valid acknowledgement (*ACK*) it shall transition to the acknowledged state, backscattering the reply shown in ISO/IEC 18000-63:2021, Table 6.17.	M	T	By design
213	6.3.2.6.3	If the Tag fails to receive an *ACK* within time $T_{2(max)}$, or receives an invalid *ACK* or an *ACK* with an erroneous RN16, it shall return to arbitrate.	M	T	By design
214	6.3.2.6.3	Tag and Interrogator shall meet all timing requirements specified in ISO/IEC 18000-63:2021, Table 6.16.	M	T and I	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.6 and Table 6.16.
215	6.3.2.6.4	Tags shall implement an acknowledged state.	M	T	Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
216	6.3.2.6.4	If a Tag in the acknowledged state receives a valid *ACK* containing the correct RN16, it shall re-backscatter the reply shown in ISO/IEC 18000-63:2021 Table 6.17.	M	T	By design
217	6.3.2.6.4	If a Tag in the acknowledged state fails to receive a valid command within time $T_{2(max)}$, it shall return to arbitrate.	M	T	By design
218	6.3.2.6.4	Tag and Interrogator shall meet all timing requirements specified in ISO/IEC 18000-63:2021, Table 6.16.	M	T and I	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.6 and Table 6.16.
219	6.3.2.6.5	Tags shall implement an open state.	M	T	Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
220	6.3.2.6.5	A Tag in the acknowledged state whose access password is nonzero shall transition to open upon receiving a *Req_RN* command, backscattering a new RN16 (denoted handle) that the Interrogator shall use in subsequent commands and the Tag shall use in subsequent replies.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
221	6.3.2.6.5	If a Tag in the open state receives a valid *ACK* containing the correct handle, it shall re-backscatter the reply shown in ISO/IEC 18000-63:2021, Table 6.17.	M	T	By design
222	6.3.2.6.5	Tag and Interrogator shall meet all timing requirements specified in ISO/IEC 18000-63:2021, Table 6.16 except $T_{2(max)}$; in the open state the maximum delay between Tag response and Interrogator transmission is unrestricted.	M	T and I	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.6 and Table 6.16.
223	6.3.2.6.6	Tags shall implement a secured state.	M	T	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
224	6.3.2.6.6	A Tag in the acknowledged state whose access password is zero shall transition to secured upon receiving a *Req_RN* command, backscattering a new RN16 (denoted handle) that the Interrogator shall use in subsequent commands and the Tag shall use in subsequent replies.	M	T and I	By design
225	6.3.2.6.6	A Tag in the open state shall transition to secured following a successful *Access* command sequence or Interrogator authentication (where success in the latter case is defined by the cryptographic suite specified in the *Authenticate* command that initiated the authentication), maintaining the same handle that it previously backscattered when it transitioned from the acknowledged to the open state.	M	T	By design
226	6.3.2.6.6	If a Tag in the secured state receives a valid *ACK* containing the correct handle, then it shall re-backscatter the reply shown in ISO/IEC 18000-63:2021, Table 6.17.	M	T	By design
227	6.3.2.6.6	Tag and Interrogator shall meet all timing requirements specified in ISO/IEC 18000-63:2021, Table 6.16 except $T_{2(max)}$; in the secured state the maximum delay between Tag response and Interrogator transmission is unrestricted.	M	T and I	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.6 and Table 6.16.
228	6.3.2.6.7	Tags shall implement a killed state.	M	T	By design Tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
229	6.3.2.6.7	A Tag in either the open or secured states shall enter the killed state upon receiving a successful password-based *Kill*-command sequence with a correct nonzero kill password and handle.	M	T	By design
230	6.3.2.6.7	A Tag in the secured states shall enter the killed state upon a successful authenticated *Kill* (see ISO/IEC 18000-63:2021, 6.3.2.12.3.4).	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
231	6.3.2.6.7	Upon entering the killed state, a Tag shall notify the Interrogator that the kill operation was successful and shall not respond to an Interrogator thereafter.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.

Key

M: mandatory

O : optional

T : tag

I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
232	6.3.2.6.7	Killed Tags shall remain in the killed state under all circumstances and shall immediately enter killed upon subsequent power-ups.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
233	6.3.2.6.8	Tags shall implement a 15-bit slot counter.	M	T	By design
234	6.3.2.6.8	Upon receiving a *Query* or *QueryAdjust* command a Tag shall preload into its slot counter a value between 0 and 2^Q–1, drawn from the Tag's RNG (see ISO/IEC 18000-63:2021, 6.3.2.7).	M	T	By design
235	6.3.2.6.8	Tags whose slot counter reached 0000_h, who replied and who were not acknowledged (including Tags that responded to an original *Query* and were not acknowledged) shall return to arbitrate with a slot value of 0000_h and shall decrement this slot value from 0000_h to $7FFF_h$ at the next *QueryRep*.	M	T	By demonstration Test in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
236	6.3.2.6.8	The slot counter shall be capable of continuous counting, meaning that, after the slot counter rolls over to $7FFF_h$ it begins counting down again, thereby effectively preventing subsequent replies until the Tag loads a new random value into its slot counter.	M	T	By demonstration Test in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
237	6.3.2.7	Tags shall implement a random or pseudo-random number generator (RNG).	M	T	By design
238	6.3.2.7	The RNG shall meet the following randomness criteria independent of the strength of the energizing RF field, the R=>T link rate and the data stored in the Tag (including but not limited to the StoredPC, XPC word or words, UII and StoredCRC).	M	T	By design
239	6.3.2.7	Tags shall generate 16-bit random or pseudo-random numbers (RN16) using the RNG and shall have the ability to extract *Q*-bit subsets from its RN16 to preload the Tag's slot counter (see ISO/IEC 18000-63:2021, 6.3.2.6.8).	M	T	By design
240	6.3.2.7	Tags shall have the ability to temporarily store at least two RN16s while powered, to use, for example, as a handle and a 16-bit cover-code during password transactions (see ISO/IEC 18000-63:2021, Figure 6.24 or ISO/IEC 18000-63:2021, Figure 6.26).	M	T	By design
241	6.3.2.7	The probability that any RN16 drawn from the RNG has value RN16 = *j*, for any *j*, shall be bounded by $0,8/2^{16} < P(RN16 = j) < 1,25/2^{16}$.	M	T	By design Tag manufacturers shall provide data and analysis demonstrating that Tags meet the requirements of ISO/IEC 18000-63:2021, 6.3.2.7.
242	6.3.2.7	For a Tag population of up to 10,000 Tags, the probability that any two or more Tags simultaneously generate the same sequence of RN16s shall be less than 0,1 %, regardless of when the Tags are energized.	M	T	By design Tag manufacturers shall provide data and analysis demonstrating that Tags meet the requirements of ISO/IEC 18000-63:2021, 6.3.2.7.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
243	6.3.2.7	An RN16 drawn from a Tag's RNG 10 ms after the end of T_r in ISO/IEC 18000-63:2021, Figure 6.3 shall not be predictable with a probability greater than 0,025 % if the outcomes of prior draws from the RNG, performed under identical conditions, are known.	M	T	By design Tag manufacturers shall provide data and analysis demonstrating that Tags meet the requirements of ISO/IEC 18000-63:2021, 6.3.2.7.
244	6.3.2.11	A Tag shall execute access commands only in the states shown in ISO/IEC 18000-63:2021, Table 6.27.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
245	6.3.2.11	A Tag shall treat as invalid (see ISO/IEC 18000-63:2021, Table C.30) optional access commands that it does not support.	M	T	By design
246	6.3.2.11.1	A Tag, once killed, shall not respond to an Interrogator thereafter.	M	Tag	By design
247	6.3.2.11.1	If the Interrogator issues a command with new data or half-password, then it shall first issue a *Req_RN* to obtain a new RN16 and shall use this RN16 for the cover-coding.	M	I	By design
248	6.3.2.11.1	Neither Tag nor Interrogator shall consider themselves authenticated following an access-command sequence.	M	T and I	By design
249	6.3.2.11.1	A Tag or an Interrogator shall only consider themselves authenticated after executing a cryptographic authentication in accordance with a cryptographic suite.	M	T and I	By design
250	6.3.2.11.2	ISO/IEC 18000-63:2021, Table 6.28 shows which commands an Interrogator may and an authenticated Interrogator shall encapsulate in an *AuthComm*.	M	I	By design
251	6.3.2.11.2	ISO/IEC 18000-63:2021, Table 6.28 shows which commands an Interrogator may and an authenticated Interrogator shall, encapsulate in a *SecureComm*.	M	I	By design
252	6.3.2.11.2	The Tag manufacturer shall choose the number and type of cryptographic suites that a Tag supports; this assignment shall not be alterable in the field. An Interrogator selects one from among the implemented cryptographic suites using the CSI field in the *Challenge* and *Authenticate* commands.	M	T and I	By design
253	6.3.2.11.2	The Tag manufacturer shall choose the number of available keys and assign them to the cryptographic suite(s); this assignment shall not be alterable in the field.	M	T	By design
254	6.3.2.11.2	No two keys shall have the same number, even if used for different cryptographic suites.	M	T	By design
255	6.3.2.11.2	A Tag shall not indicate where in memory it stores its keys, nor shall it allow an Interrogator to read this memory location.	M	T	By design
256	6.3.2.11.2	A Tag that supports the *Untraceable* command shall provide the Tag privileges shown in ISO/IEC 18000-63:2021, Table 6.22.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
257	6.3.2.11.2	A Tag that supports one or more cryptographic suites shall provide the Tag privileges shown in ISO/IEC 18000-63:2021, Table 6.23.	O	T	By design
258	6.3.2.11.2	A Tag that implements the *TagPrivilege* command shall permit an Interrogator that authenticated itself as a crypto superuser in a cryptographic suite to: — change the value of any key in that cryptographic suite, including its own, using a *KeyUpdate*. — read or modify privileges (value in ISO/IEC 18000-63:2021, Table 6.23) for any key in that cryptographic suite, including its own.	O	T	By design
259	6.3.2.11.2	A Tag shall not permit an Interrogator that did not authenticate itself as a crypto superuser to: — change the value of any key other than the one it used to authenticate itself. — read or modify privileges (value in ISO/IEC 18000-63:2021, Table 6.23) for any key other than the one it used to authenticate itself — assert a deasserted privilege (value in ISO/IEC 18000-63:2021, Table 6.23) for the key it used to authenticate itself.	O	T	By design
260	6.3.2.11.2	A Tag that supports the *TagPrivilege* command shall permit an Interrogator that supplies the access password (even if zero-valued) or a key to deassert a privilege for the access password or that key, respectively, regardless of the CryptoSuperuser value.	O	T	By design
261	6.3.2.11.2	A Tag that receives a *TagPrivilege* that attempts to change an unchangeable Tag privilege value shall not execute the *TagPrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
262	6.3.2.11.2	After a successful Interrogator authentication a Tag in the open state shall transition to the secured state.	M	T	By design
263	6.3.2.11.2	The authenticated Interrogator shall subsequently encapsulate all commands designated "Mandatory Encapsulation" in ISO/IEC 18000-63:2021, Table 6.28 in an *AuthComm* or *SecureComm*.	M	T	By design
264	6.3.2.11.2	If a Tag receives such a command from an authenticated Interrogator without encapsulation then it shall not execute the command and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
265	6.3.2.11.2	A Tag shall transition back to the open state, reset its cryptographic engine and revert to open-state file privileges (see below) when an authenticated Interrogator loses its authentication.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
266	6.3.2.11.2	If the Tag was not previously authenticated by a *Challenge* or *Authenticate* command then it shall not execute the command and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
267	6.3.2.11.2	If a condition of a cryptographic suite causes a Tag to transition from the open or secured state to the arbitrate state then the Tag a) shall not change the value of its inventoried flag, and b) shall reset its cryptographic engine.	M	T	By design
268	6.3.2.11.3	A Tag that supports File_N, N > 0 shall implement *FileOpen*; it may implement *FileList*, *FileSetup* and *FilePrivilege* as well.	O	T	By design
269	6.3.2.11.3	If a Tag implements a single file then that file shall be File_0.	O	T	By design
270	6.3.2.11.3	A Tag with User memory shall open File_0 upon first entering the open or secured state.	O	T	By design
271	6.3.2.11.3	A Tag shall have only a single file open at any time. All access commands operate on the currently open file.	O	T	By design
272	6.3.2.11.3	Each file shall have an 8-bit FileType and a 10-bit FileNum, unless a Tag does not support any file-management access commands, in which case a Tag that implements File_0 may omit FileType and FileNum.	O	T	By design
273	6.3.2.11.3	A Tag manufacturer shall preassign a FileType to each file supported by the Tag.	O	T	By design
274	6.3.2.11.3	A Tag manufacturer shall preassign a unique FileNum to each file supported by the Tag.	O	T	By design
275	6.3.2.11.3	The files may have different size (including zero size). FileNum=0000000000_2 shall be reserved for the base file (File_0) of User memory	O	T	By design
276	6.3.2.11.3	FileNum=1111111111_2 shall be RFU. This protocol recommends, but does not require, that Tag manufacturers number files sequentially.	M	T	By design
277	6.3.2.11.3	Upon receiving a *FileOpen* a Tag shall first close the currently open file and then open the new file, with the new file's starting address mapped to 00_h of User memory.	O	T	By design
278	6.3.2.11.3	A Tag manufacturer shall precreate all files; the number of files shall not be changeable in the field.	O	T	By design
279	6.3.2.11.3	Static: A manufacturer of a *static* Tag shall preallocate all User memory to files.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
280	6.3.2.11.3	A Tag manufacturer shall decide where a Tag stores its FileType and FileNum data and may choose a readable portion of memory (if desired). Regardless of the location, a Tag shall not allow an Interrogator to modify a file's type by any command except *FileSetup* and shall not allow an Interrogator to modify a FileNum by any means.	O	T	By design
281	6.3.2.11.3	Files may range in size from a minimum of zero to a maximum of 1022 blocks. Commands that include a FileSize parameter use 10 bits to specify sizes from zero to 1022 blocks (0000000000_2 – 1111111110_2, respectively). FileSize 1111111111_2 shall be RFU.	O	T	By design
282	6.3.2.11.3	A Tag manufacturer shall predefine a single fixed, unchangeable block size that the Tag shall use for all file allocation as well as for the *BlockPermalock* command.	O	T	By design
283	6.3.2.11.3	Tag manufacturers shall not use block sizes exceeding 1024 words. Tag replies that return a BlockSize value use 10 bits to specify the size from one (0000000000_2) to 1024 (1111111111_2) words. BlockSize does not have an RFU value.	O	T	By design
284	6.3.2.11.3	If a Tag supports File_0 then it shall provide the file privileges shown in ISO/IEC 18000-63:2021, Table 6.24.	O	T	By design
285	6.3.2.11.3	If a Tag supports File_N, N > 0 then it shall also provide the file privileges shown in ISO/IEC 18000-63:2021, Table 6.25.	O	T	By design
286	6.3.2.11.3	A Tag with M files shall implement M 4-bit open-state file privileges, one for each file.	O	T	By design
287	6.3.2.11.3	A Tag with M files shall implement M 4-bit secured-state access-password file privileges, one for each file.	O	T	By design
288	6.3.2.11.3	A Tag with M files and N keys shall implement M × N 4-bit secured-state key file privileges.	O	T	By design
289	6.3.2.11.3	In this latter case, if an Interrogator sends a 4-bit privilege with either MSB being nonzero then the Tag shall not execute the *FilePrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
290	6.3.2.11.3	A Tag shall permit an Interrogator that accessed or authenticated itself as a file superuser to:	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
		— Read or assign a new 4-bit privilege for the open state, access password, or any key (including its own) regardless of the cryptographic suite to which the key is assigned, for the currently open file, using a *FilePrivilege* command. — Change the FileType of the currently open file using a *FileSetup* command, for a *static* or a *dynamic* Tag. — Resize the currently open file using a *FileSetup* command, but only if the file contains no permalocked or permaunlocked memory and only if the Tag is *dynamic*.			
291	6.3.2.11.3	A Tag shall not permit an Interrogator that did not access or authenticate itself as a file superuser to: — Read or assign the 4-bit privilege for the open state, for the currently open file. — Read or assign the 4-bit privilege for the access password or for any key other than the one it used to enter the secured state, for the currently open file. — Increase the privileges (move down one or more rows in ISO/IEC 18000-63:2021, Table 6.24 or ISO/IEC 18000-63:2021, Table 6.25) for the access password or for any key, for the currently open file.	O	T	By design
292	6.3.2.11.3	If the access password or key that a Tag used to enter the secured state has DecFilePriv=1 (see ISO/IEC 18000-63:2021, Table 6.22 and ISO/IEC 18000-63:2021, Table 6.23) then a Tag shall permit an Interrogator to self-reduce its privileges (move up one or more rows in ISO/IEC 18000-63:2021, Table 6.24 or ISO/IEC 18000-63:2021, Table 6.25) to the currently open file for this access password or key.	O	T	By design
293	6.3.2.11.3	If *Read* is "×" for a privilege value then a Tag shall behave as if the memory location does not exist.	O	T	By design
294	6.3.2.11.3	Otherwise, if *Write*, *BlockWrite*, or *BlockErase* are "×" then the Tag shall behave as if the memory location is permalocked; and if *Lock* or *BlockPermalock* are "×" then the Tag shall behave as if the memory location is neither lockable nor unlockable.	O	T	By design
295	6.3.2.11.3	If *FilePrivilege* or *FileSetup* are "×" then the Tag shall behave as if the Interrogator has insufficient privileges.	O	T	By design
296	6.3.2.11.3	If a Tag implements the *BlockPermalock* command then all files shall support the *BlockPermalock* command.	O	T	By design
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
297	6.3.2.11.3	If a Tag's User memory is untraceably hidden then the Tag shall only execute a *FileOpen*, *FileList*, *FileSetup*, or *FilePrivilege* issued by an Interrogator with an asserted Untraceable privilege (see ISO/IEC 18000-63:2021, Table 6.22 and ISO/IEC 18000-63:2021, Table 6.23); if the Interrogator has a deasserted Untraceable privilege then the Tag shall treat these commands' parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
298	6.3.2.11.3	A Tag shall not permit a permalocked portion of memory to be erased or overwritten, except for the L and U bits in UII memory, which an Interrogator with an asserted Untraceable privilege may overwrite.	M	T	By design
299	6.3.2.11.3	In some instances, a *dynamic* Tag may allow file resizing. Whether a Tag allows resizing shall depend on whether the Tag accepts a *FileSetup* command (varies by privilege and state), whether the Tag has free memory available for the resizing and whether the file or any blocks in it are permalocked or permaunlocked.	O	T	By design
300	6.3.2.12	Interrogator-to-Tag commands shall use the command codes, protection and parameters shown in ISO/IEC 18000-63:2021, Table 6.28.	M	I	By design
301	6.3.2.12	*QueryRep*, *ACK*, *Query*, *QueryAdjust* and *NAK* have the unique command lengths shown in ISO/IEC 18000-63:2021, Table 6.28. No other commands shall have these lengths.	M	I	By design
302	6.3.2.12	If a Tag receives one of these commands with an incorrect length then it shall treat the command as invalid (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
303	6.3.2.12	An authenticated *Kill* shall be encapsulated in a *SecureComm* or an *AuthComm*; a password-based *Kill* shall not be encapsulated.	M	I	By design
304	6.3.2.12.1.1	Interrogators and Tags shall implement the *Select* command shown in ISO/IEC 18000-63:2021, Table 6.29.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
305	6.3.2.12.1.1	A *Select* that modifies the SL flag shall not modify an inventoried flag and vice versa.	M	T	By design
306	6.3.2.12.1.1	A Tag shall ignore a *Select* whose Target is 101_2, 110_2 or 111_2.	M	T	By design
307	6.3.2.12.1.1	If MemBank = 00_2 then an Interrogator shall set Pointer to 00_h.	M	I	By design
308	6.3.2.12.1.1	If a Tag receives a *Select* with MemBank=00_2 and a nonzero Pointer value, it shall ignore the *Select*.	M	T	By design
309	6.3.2.12.1.1	If Mem-Bank = 00_2, an Interrogator shall set Length = 00001000_2.	M	I	By design
310	6.3.2.12.1.1	If a Tag receives a *Select* with MemBank = 00_2 and Length<>00001000_2, it shall ignore the *Select*.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
311	6.3.2.12.1.1	An untraceable Tag shall process a *Select* with MemBank=002 whose User memory is traceable, or with MemBank<>002 whose Mask operates on a completely traceable bit string.	M	T	By design
312	6.3.2.12.1.1	A Tag shall treat as not-matching a *Select* command whose Mask includes untraceably hidden memory.	M	T	By design
313	6.3.2.12.1.1	Truncate indicates whether a Tag's backscattered reply shall be truncated to those UII bits that follow Mask.	M	T	By design
314	6.3.2.12.1.1	If an Interrogator asserts Truncate and if a subsequent *Query* specifies Sel=10 or Sel=11, then a matching Tag shall truncate its *ACK* reply to the portion of the UII immediately following Mask, followed by a PacketCRC.	M	T	By design
315	6.3.2.12.1.1	If an Interrogator asserts Truncate, it shall assert it in the last *Select* that the Interrogator issues prior to sending a *Query* only if the *Select* has Target = 100_2 and only if Mask ends in the UII.	M	I	By design
316	6.3.2.12.1.1	Tags shall decide whether to truncate its backscattered UII on the basis of the most recently received valid *Select* (i.e. not ignored and matching or not-matching).	M	T	By demonstration: issue a *Select* command and a *Query* command to a Tag with a 96 bit UII and the UII starting with 001 and the parameters as follows: *Select* Command = 1010 Target = 100 Action = 000 MemBank = 01 Pointer = 0010 0000 Length = 0000 0011 Mask = 001 Truncate = 1 *Query* Command = 1000 DR = 0 M = 00 TRext = 0 Sel = 11 Session = 00 Target = 0 Q = 0000

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Verify that the tag replies with a truncated UII. Issue a *Select* command and a *Query* command to a Tag with a 96 bit UII and the UII starting with 001 and the parameters as follows: *Select* Command = 1010 Target = 100 Action = 100 MemBank = 01 Pointer = 0010 0000 Length = 0000 0011 Mask = 000 Truncate = 1 *Query* Command = 1000 DR = 0 M = 00 TRext = 0 Sel = 11 Session = 00 Target = 0 Q = 0000 Verify that the tag replies with a non-truncated UII. **Tag test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari Tari: 25 µs RTcal: 75 µs TRcal: 100 µs DR: 8 M: 1 TRext: 0
317	6.3.2.12.1.1	If a Tag receives a *Select* with Truncate=1 and Target<>100_2 or MemBank<>01_2 the Tag shall ignore the *Select*.	M	T	By design
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
318	6.3.2.12.1.1	If a Tag receives a *Select* in which Truncate=1, MemBank=01_2, but Mask ends outside the UII specified by the L bits in the StoredPC, then the Tag shall be not matching.	M	T	By design
319	6.3.2.12.1.1	A Tag shall preface its truncated reply with five leading zeros (00000_2) inserted between the preamble and the truncated reply.	M	T	By design
320	6.3.2.12.1.1	A Tag shall power-up with Truncate=0.	M	T	By design
321	6.3.2.12.1.1	Mask may end at the last bit of the UII, in which case a truncating Tag shall backscatter 00000_2 followed by a PacketCRC.	M	T	By design
322	6.3.2.12.1.1	An Interrogator shall prepend a *Select* command with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
323	6.3.2.12.1.1	A Tag shall not reply to a *Select*.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
324	6.3.2.12.1.2	Interrogators and Tags may implement the *Challenge* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.31.	O	T and I	By design
325	6.3.2.12.1.2	Upon receiving a *Challenge,* a Tag that supports the command shall return to the ready state and deassert its C flag.	M	T	By design
326	6.3.2.12.1.2	If the Tag supports, the CSI and can execute message then it shall perform the requested action(s); otherwise the Tag shall not execute message.	M	T	By design
327	6.3.2.12.1.2	A Tag shall not reply to a *Challenge*.	M	T	By design
328	6.3.2.12.1.2	A *Challenge* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	M	I	By design
329	6.3.2.12.1.2	If a Tag receives a *Challenge* containing nonzero RFU bits then it shall return to the ready state and deassert its C flag but not execute message.	M	T	By design
330	6.3.2.12.1.2	An Interrogator shall prepend a *Challenge* command with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
331	6.3.2.12.1.2	If a Tag supports the *Challenge* command, it shall implement the security (S) indicator (see ISO/IEC 18000-63:2021, 6.3.2.1.3).	M	T	By design
332	6.3.2.12.1.2	After executing a *Challenge* a Tag shall store its response (result or error code) in its ResponseBuffer.	M	T	By design
333	6.3.2.12.1.2	After executing and storing a response, a Tag shall assert its C flag.	M	T	By design
334	6.3.2.12.1.2	A Tag shall not assert its C flag until after it has computed and stored the entire response.	M	T	By design

Key

M: mandatory

O : optional

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
335	6.3.2.12.1.2	A Tag shall deassert its C flag upon a) receiving a subsequent *Challenge*, or b) exceeding the C flag persistence time in ISO/IEC 18000-63:2021, Table 6.20.	M	T	By design
336	6.3.2.12.1.2	If the most recent *Challenge* received and executable by a Tag asserts immed and if the Tag's C flag is asserted when it receives a subsequent *ACK*, then when replying to the *ACK* the Tag shall concatenate its ResponseBuffer contents to its UII and backscatter the concatenated reply. See ISO/IEC 18000-63:2021, Table 6.17 and Figure 6.23.	M	T	By design
337	6.3.2.12.1.2	If a Tag observes a properly formatted *Challenge* but there is a cryptographic error and the cryptographic suite specifies that the error requires a security timeout, then the Tag shall return to ready and enforce a security timeout as specified in ISO/IEC 18000-63:2021, 6.3.2.5.	M	T	By design
338	6.3.2.12.1.2	If a Tag that supports security timeouts for a *Challenge* receives a *Challenge* during a timeout then it shall return to ready but not act on or otherwise execute any portion of the *Challenge*.	M	T	By design
339	6.3.2.12.2.1	Interrogators and Tags shall implement the *Query* command shown in ISO/IEC 18000-63:2021 Table 6.32.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
340	6.3.2.12.2.1	An Interrogator shall prepend a *Query* with a preamble (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
341	6.3.2.12.2.1	An Interrogator shall not encapsulate a *Query* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	M	I	By design
342	6.3.2.12.2.1	If a Tag receives a *Query* with a CRC-5 error, it shall treat the command as invalid (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
343	6.3.2.12.2.1	Upon receiving a *Query*, Tags with matching Sel and Target shall pick a random value in the range $(0, 2^Q-1)$, inclusive and shall load this value into their slot counter.	M	T	By design
344	6.3.2.12.2.1	If a Tag, in response to the *Query*, loads its slot counter with zero, then its reply to a *Query* shall be as shown in ISO/IEC 18000-63:2021, Table 6.33 using the *immediate* reply type specified in ISO/IEC 18000-63:2021, 6.3.1.6.1; otherwise the Tag shall remain silent.	M	T	By design
345	6.3.2.12.2.1	If a Tag in the acknowledged, open or secured states receives a *Query* whose session parameter matches the prior session, it shall invert its inventoried flag (i.e. $A \rightarrow B$ or $B \rightarrow A$) for the session before it evaluates whether to transition to ready, arbitrate or reply.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
346	6.3.2.12.2.1	If a Tag in the acknowledged, open or secured states receives a *Query* whose session parameter does not match the prior session, it shall leave its inventoried flag for the prior session unchanged when beginning the new round.	M	T	By design
347	6.3.2.12.2.1	Tags shall support all DR and M values specified in ISO/IEC 18000-63:2021, Table 6.9 and ISO/IEC 18000-63:2021, Table 6.10, respectively.	M	T	By design
348	6.3.2.12.2.1	A Tag in any state other than killed shall execute a *Query* command, starting a new round in the specified session and transitioning to ready, arbitrate, or reply, as appropriate (see ISO/IEC 18000-63:2021, Figure 6.21).	M	T	By design
349	6.3.2.12.2.1	A Tag in the killed state shall ignore a *Query*.	M	T	By design
350	6.3.2.12.2.2	Interrogators and Tags shall implement the *QueryAdjust* command shown in ISO/IEC 18000-63:2021, Table 6.34.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 a Figure 6.21.
351	6.3.2.12.2.2	If a Tag receives a *QueryAdjust* whose session number is different from the session number in the *Query* that initiated the round, it shall ignore the command.	M	T	By design
352	6.3.2.12.2.2	If a Tag receives a *QueryAdjust* with an UpDn value different from those specified above, it shall treat the command as invalid (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
353	6.3.2.12.2.2	If a Tag whose *Q* value is 15 receives a *QueryAdjust* with UpDn = 110 then it shall change UpDn to 000 prior to executing the command; likewise, if a Tag whose *Q* value is 0 receives a *QueryAdjust* with UpDn = 011 then it shall change UpDn to 000 prior to executing the command.	M	T	By design
354	6.3.2.12.2.2	A Tag shall maintain a running count of the current *Q* value.	M	T	By design
355	6.3.2.12.2.2	An Interrogator shall prepend a *QueryAdjust* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
356	6.3.2.12.2.2	An Interrogator shall not encapsulate a *QueryAdjust* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	M	I	
357	6.3.2.12.2.2	If a Tag, in response to the *QueryAdjust*, loads its slot counter with zero, then its reply to a *QueryAdjust* shall be shown in ISO/IEC 18000-63:2021, Table 6.35 using the *immediate* reply type specified in ISO/IEC 18000-63:2021, 6.3.1.6.1; otherwise, the Tag shall remain silent.	M	T	By design
358	6.3.2.12.2.2	Tags shall respond to a *QueryAdjust* only if they received a prior *Query*.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
359	6.3.2.12.2.2	A Tag in any state except ready or killed shall execute a *QueryAdjust* command if, and only if, a) the session parameter in the command matches the session parameter in the *Query* that started the round, and b) the Tag is not in the middle of a *Kill* or *Access* command sequence (see ISO/IEC 18000-63:2021, 6.3.2.12.3.4 or ISO/IEC 18000-63:2021, 6.3.2.12.3.6, respectively).	M	T	By design
360	6.3.2.12.2.2	A Tag in the acknowledged, open or secured states that receives a *QueryAdjust* whose session parameter matches the session parameter in the prior *Query* and that is not in the middle of a *Kill* or *Access* command sequence (see ISO/IEC 18000-63:2021, 6.3.2.12.3.4 or ISO/IEC 18000-63:2021, 6.3.2.12.3.6, respectively), shall invert its inventoried flag (i.e. *A*→*B* or *B*→*A*, as appropriate) for the current session and transition to ready.	M	T	By design
361	6.3.2.12.2.3	Interrogators and Tags shall implement the *QueryRep* command shown in ISO/IEC 18000-63:2021, Table 6.36.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
362	6.3.2.12.2.3	If a Tag receives a *QueryRep* whose session number is different from the session number in the *Query* that initiated the round, it shall ignore the command.	M	T	By design
363	6.3.2.12.2.3	An Interrogator shall prepend a *QueryRep* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
364	6.3.2.12.2.3	An Interrogator shall not encapsulate a *QueryRep* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	M	I	
365	6.3.2.12.2.3	If a Tag, in response to the *QueryRep*, decrements its slot counter and the decremented slot value is zero, then its reply to a *QueryRep* shall be as shown in ISO/IEC 18000-63:2021, Table 6.37 using the *immediate* reply type specified in ISO/IEC 18000-63:2021, 6.3.1.6.1; otherwise the Tag shall remain silent.	M	T	By design
366	6.3.2.12.2.3	A Tag shall respond to a *QueryRep* only if they received a prior *Query*.	M	T	By design
367	6.3.2.12.2.3	A Tag in any state except ready or killed shall execute a *QueryRep* command if, and only if, a) the session parameter in the command matches the session parameter in the *Query* that started the round, and b) the Tag is not in the middle of a *Kill* or *Access* command sequence (see ISO/IEC 18000-63:2021 6.3.2.12.3.4 or ISO/IEC 18000-63:2021 6.3.2.12.3.6, respectively).	M	T	By design

Key

M: mandatory

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
368	6.3.2.12.2.3	A Tag in the acknowledged, open or secured state that receive a *QueryRep* whose session parameter matches the session parameter in the prior *Query* and that is not in the middle of a *Kill* or *Access* command sequence (see ISO/IEC 18000-63:2021, 6.3.2.12.3.4 or ISO/IEC 18000-63:2021, 6.3.2.12.3.6, respectively), shall invert its inventoried flag (i.e. *A*→*B* or *B*→*A*, as appropriate) for the current session and transition to ready.	M	T	By design
369	6.3.2.12.2.4	Interrogators and Tags shall implement the *ACK* command shown in ISO/IEC 18000-63:2021, Table 6.38.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
370	6.3.2.12.2.4	If an Interrogator issues an *ACK* to a Tag in the reply or acknowledged state, then the echoed RN16 shall be the RN16 that the Tag previously backscattered as it transitioned from the arbitrate state to the reply state.	M	T	By design
371	6.3.2.12.2.4	If an Interrogator issues an *ACK* to a Tag in the open or secured state, then the echoed RN16 shall be the Tag's handle (see ISO/IEC 18000-63:2021, 6.3.2.12.3.1).	M	T	By design
372	6.3.2.12.2.4	An Interrogator shall prepend an *ACK* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
373	6.3.2.12.2.4	The Tag reply to a successful *ACK* shall be as shown in ISO/IEC 18000-63:2021, Table 6.39, using the *immediate* reply type specified in ISO/IEC 18000-63:2021, 6.3.1.6.1.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
374	6.3.2.12.2.4	A Tag that receives an *ACK* with an incorrect RN16 or an incorrect handle (as appropriate) shall return to arbitrate without responding, unless the Tag is in ready or killed, in which case it shall ignore the *ACK* and remain in its current state.	M	T	By design
375	6.3.2.12.2.4	In either case a Tag's reply to an *ACK* shall not exceed 528 bits for the PC + UII + PacketCRC, optionally followed by a response field and its associated CRC-16 (see ISO/IEC 18000-63:2021, Table 6.17).	M	T	By design
376	6.3.2.12.2.5	Interrogators and Tags shall implement the *NAK* command shown in ISO/IEC 18000-63:2021, Table 6.40.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
377	6.3.2.12.2.5	A Tag that receives a *NAK* shall return to the arbitrate state without changing its inventoried flag, unless the Tag is in ready or killed, in which case it shall ignore the *NAK* and remain in its current state.	M	T	By design
378	6.3.2.12.2.5	An Interrogator shall prepend a *NAK* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
379	6.3.2.12.2.5	An Interrogator shall not encapsulate a *NAK* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	M	I	

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
380	6.3.2.12.2.5	A Tag shall not reply to a *NAK*.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
381	6.3.2.12.3	A Tag in the open or secured state that receives an access command with an incorrect handle but a correct CRC-16 shall behave as specified in ISO/IEC 18000-63:2021, Table C.30.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
382	6.3.2.12.3.1	Interrogators and Tags shall implement the *Req_RN* command shown in ISO/IEC 18000-63:2021, Table 6.41.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
383	6.3.2.12.3.1	When issuing a *Req_RN* to a Tag in the acknowledged state, an Interrogator shall include the Tag's last backscattered RN16 as a parameter in the *Req_RN*.	M	I	By design
384	6.3.2.12.3.1	If a Tag receives a *Req_RN* with a correct RN16 and a correct CRC-16 then it shall generate and store a new RN16 (denoted handle), backscatter this handle and transition to the open or secured state.	M	T	By design
385	6.3.2.12.3.1	A Tag in the acknowledged state that receives the *Req_RN* with an incorrect RN16 but a correct CRC-16 shall ignore the *Req_RN* and remain in the acknowledged state.	M	T	By design
386	6.3.2.12.3.1	When issuing a *Req_RN* to a Tag in the open or secured state, an Interrogator shall include the Tag's handle as a parameter in the *Req_RN*.	M	I	By design
387	6.3.2.12.3.1	If a Tag receives the *Req_RN* with a correct handle and a correct CRC-16 then it shall generate and backscatter a new RN16, remaining in its current state (open or secured, as appropriate). .	M	T	By design
388	6.3.2.12.3.1	The Tag that receives an *ACK* with a correct handle replies as specified in ISO/IEC 18000-63:2021, Table 6.39, whereas those that receive it with an incorrect handle shall return to arbitrate. NOTE If a Tag receives an *ACK* with an incorrect handle it returns to arbitrate, whereas if it receives an access command with incorrect handle it behaves as specified in ISO/IEC 18000-63:2021, Table C.30.	M	T	By design
389	6.3.2.12.3.1	The first bit of the backscattered RN16 shall be denoted the MSB; the last bit shall be denoted the LSB.	M	T	By design
390	6.3.2.12.3.1	An Interrogator shall prepend a *Req_RN* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
391	6.3.2.12.3.1	A Tag's reply to a *Req_RN* shall be as shown in ISO/IEC 18000-63:2021, Table 6.42 using the *immediate* reply type specified in ISO/IEC 18000-63:2021, 6.3.1.6.1.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
392	6.3.2.10.3.2	Interrogators and Tags shall implement the *Read* command shown in ISO/IEC 18000-63:2021, Table 6.44.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
393	6.3.2.10.3.2	*Read* commands shall apply to a single memory bank.	M	T	By design
394	6.3.2.10.3.2	If WordCount = 00_h then a Tag shall backscatter the contents of the chosen memory bank starting at WordPtr and ending at the end of the memory bank or file, however: — if MemBank = 01_2, then a Tag shall backscatter the memory contents specified in ISO/IEC 18000-63:2021, Table 6.43. — if MemBank=10_2 and part of TID memory is untraceably hidden (see ISO/IEC 18000-63:2021, 6.3.2.12.3.16), the Interrogator has a deasserted Untraceable privilege, and the memory address specified by WordPtr is in the traceable part of TID memory, then a Tag may either a) backscatter the traceable part of TID memory starting at WordPtr, or b) treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30), depending on the Tag manufacturer's implementation.	M	T	By design
395	6.3.2.10.3.2	An Interrogator shall prepend a *Read* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
396	6.3.2.10.3.2	An unauthenticated Interrogator may, and an authenticated Interrogator shall, encapsulate a *Read* command in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	M	I	By design
397	6.3.2.10.3.2	A Tag shall reply to a *Read* using the *immediate* reply type specified in ISO/IEC 18000-63:2021, 6.3.1.6.1.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
398	6.3.2.10.3.2	If all of the memory words specified in a *Read* exist and none are read-locked, all are traceable or the Interrogator has an asserted Untraceable privilege and for User memory the Interrogator has read privileges to the currently open file (see ISO/IEC 18000-63:2021, 6.3.2.11.3), then a Tag's reply to a *Read* shall be as shown in ISO/IEC 18000-63:2021, Table 6.45 comprising a header (a 0-bit), the requested memory words and the Tag's handle.	M	T	By design
399	6.3.2.10.3.2	Otherwise the Tag shall not execute the *Read* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
400	6.3.2.12.3.3	Interrogators and Tags shall implement the *Write* command shown in ISO/IEC 18000-63:2021, Table 6.46.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
401	6.3.2.12.3.3	*Write* commands shall apply to a single memory bank.	M	T and I	By design
402	6.3.2.12.3.3	Before each and every *Write* the Interrogator shall first issue a *Req_RN* command; the Tag replies by backscattering a new RN16.	M	I	By design
403	6.3.2.12.3.3	The Interrogator shall cover code the data by EXORing it with this new RN16 prior to transmission.	M	I	By design
404	6.3.2.12.3.3	A Tag shall only execute a *Write* in the open or secured state.	M	T	By design
405	6.3.2.12.3.3	If a Tag in the open or secured states receives a *Write* before which the immediately preceding command was not a *Req_RN* then it shall not execute the *Write* and instead treat the command as invalid (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
406	6.3.2.12.3.3	If an Interrogator attempts to write to the kill or access password, UII or TID memory banks, or File_0 and these memory locations are permalocked; or to the kill or access password, UII or TID memory banks, or File_0 and these memory locations are locked unwriteable and the Tag is in the open state; or to a permalocked block in File_N, N > 0 of User memory; or to memory that is untraceably hidden and the Interrogator has a deasserted Untraceable privilege; or to a file for which the Interrogator does not have sufficient privileges; then the Tag shall not execute the *Write* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By demonstration – see state machine. a) Attempt to write the PC value in open state, while the UII memory is locked. Verify that the Tag replies with an error message and that the memory has not been written. b) Attempt to write a permalocked memory location from secured state. Verify that the Tag replies with an error message and that the memory has not been written. c) Attempt to write a permalocked block in File_N, N > 0 of USER memory. Verify that the Tag replies with an error message and that the memory has not been written. d) Attempt to write to a memory location that is untraceably hidden with a deasserted Untracable privilege. Verify that the Tag replies with an error message and that the memory has not been written.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Test conditions: Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
407	6.3.2.12.3.3	An Interrogator shall prepend a *Write* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
408	6.3.2.12.3.3	An Interrogator shall not encapsulate a *Write* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	M	I	By design
409	6.3.2.12.3.3	Upon receiving a valid *Write* command a Tag shall write the commanded Data into memory.	M	T	By design
410	6.3.2.12.3.3	A Tag shall reply to a *Write* using the *delayed* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.2.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
411	6.3.2.12.3.4	Interrogators and Tags shall implement the *Kill* command shown in ISO/IEC 18000-63:2021, Table 6.47.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
412	6.3.2.12.3.4	To kill a Tag, an Interrogator shall follow the kill procedure shown in ISO/IEC 18000-63:2021, Figure 6.24.	M	I	By design
413	6.3.2.12.3.4	A Tag shall implement the password-based kill sequence shown in the left-side branch of the kill procedure in ISO/IEC 18000-63:2021, Figure 6.24.	M	T	By design
414	6.3.2.12.3.4	An Interrogator shall set these bits to 000_2.	M	I	By design
415	6.3.2.12.3.4	A Tag shall ignore these bits.	M	T	By design
416	6.3.2.12.3.4	An Interrogator shall prepend an unencapsulated *Kill* command with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
417	6.3.2.12.3.4	Each EXOR operation shall be performed MSB first (i.e. the MSB of each half-password shall be EXORed with the MSB of its respective RN16).	M	I	By design

Key

M: mandatory

O : optional

T : tag

I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
418	6.3.2.12.3.4	A Tag shall be capable of successively accepting two 16-bit subportions of the 32-bit kill password.	M	T	By design
419	6.3.2.12.3.4	An Interrogator shall not intersperse commands other than *Req_RN* between the two successive *Kill* commands.	M	I	By design
420	6.3.2.12.3.4	If a Tag, after receiving a first *Kill*, receives any valid command other than *Req_RN* before the second *Kill* then it shall not execute the command and instead treat it as improper (see ISO/IEC 18000-63:2021, Table C.30), unless the intervening command is a *Query*, in which case the Tag shall execute the *Query* and invert its inventoried flag if the session parameter in the *Query* matches that in the prior session.	M	T	By design
421	6.3.2.12.3.4	A Tag with a zero-valued kill password shall disallow itself from being killed by a password-based kill operation.	M	T	By demonstration Tested in compliance with Item 139.
422	6.3.2.12.3.4	A Tag with a zero-valued kill password shall respond to a password-based kill by not executing the kill operation and backscattering an error code, remaining in its current state. See ISO/IEC 18000-63:2021, Figure 6.24.	M	T	By demonstration Tested in compliance with Item 139.
423	6.3.2.12.3.4	A Tag shall reply to a first *Kill* using the *immediate* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.1.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
424	6.3.2.12.3.4	The Tag`s first reply shall be as shown in ISO/IEC 18000-63:2021 Table 6.48.	M	T	By design
425	6.3.2.12.3.4	The reply shall use the TRext value specified in the *Query* command that initiated the round.	M	T	By design
426	6.3.2.12.3.4	A Tag shall reply to the second *Kill* using the *delayed* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.2.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
427	6.3.2.12.3.4	If the kill succeeds then the Tag, after sending the final reply shown in ISO/IEC 18000-63:2021, Table 6.13, shall render itself silent and shall not respond to an Interrogator thereafter.	M	T	By design
428	6.3.2.12.3.4	If a Tag observes a properly formatted password-based *Kill* command sequence but the kill fails (as will happen if the Interrogator sends an incorrect kill password) then the Tag shall return to arbitrate and may enforce a security timeout as specified in ISO/IEC 18000-63:2021, 6.3.2.5.	M, O	T	By design
429	6.3.2.12.3.4	If a Tag that supports security timeouts for a password-based *Kill* command sequence receives such a sequence during a timeout then it shall behave as though it is not killable, backscatter an error code (see ISO/IEC 18000-63:2021, Annex I) and remain in its current state.	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
430	6.3.2.12.3.4	A Tag shall authenticate an Interrogator via an Interrogator or mutual authentication prior to executing an authenticated kill.	O	T	By design
431	6.3.2.12.3.4	The Interrogator may use any 16-bit value in the password field of the *Kill* command because a Tag shall ignore the kill password for an authenticated kill.	O	T	By design
432	6.3.2.12.3.4	A Tag shall only execute an authenticated kill if the Interrogator possesses an asserted AuthKill privilege (see ISO/IEC 18000-63:2021, Table 6.23) and the Tag is in the secured state.	O	T	By design
433	6.3.2.12.3.4	A Tag shall reply to an authenticated kill using an in-process reply (as required by a *SecureComm* or *AuthComm*), but with SenRep=1 regardless of the SenRep value actually specified in the *SecureComm* or *AuthComm*.	O	T	By design
434	6.3.2.12.3.4	If the kill succeeds then the Tag, after sending the final reply shown in ISO/IEC 18000-63:2021, Table 6.13, shall transition to the killed state and not respond to an Interrogator thereafter.	O	T	By design
435	6.3.2.12.3.4	If the kill fails then the Tag shall remain in its current state and backscatter an error code (see ISO/IEC 18000-63:2021, Annex I), unless the Tag is in the open state, the Interrogator is not authenticated, or the Interrogator does not have an asserted AuthKill privilege (see ISO/IEC 18000-63:2021, Table 6.23), in which case the Tag shall return to arbitrate and may enforce a security timeout as specified in ISO/IEC 18000-63:2021, 6.3.2.5.	O	T	By design
436	6.3.2.12.3.4	If a Tag that supports security timeouts for an authenticated *Kill* command receives an authenticated *Kill* command during a time-out then it shall behave as though it is not killable, backscatter an error code (see ISO/IEC 18000-63:2021, Annex I) and remain in its current state.	O	T	By design
437	6.3.2.12.3.5	Interrogators and Tags shall implement the *Lock* command shown in ISO/IEC 18000-63:2021, Table 6.49 and Figure 6.25.	M	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
438	6.3.2.12.3.5	A Tag shall interpret these bit values as follows: Mask = 0: Ignore the associated Action field and retain the current lock setting; Mask = 1: Implement the associated Action field and overwrite the current lock setting.	M	T	By design
439	6.3.2.12.3.5	A Tag shall interpret these bit values as follows: Action = 0: Deassert lock for the associated memory location; Action = 1: Assert lock or permalock for the associated memory location.	M	T	By design
440	6.3.2.12.3.5	The payload of a *Lock* command shall always be 20 bits in length.	M	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
441	6.3.2.12.3.5	If an Interrogator issues a *Lock* command whose Mask and Action fields attempt to change the lock status of a nonexistent memory bank, nonexistent File_0, or nonexistent password, then the Tag shall not execute the *Lock* command and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
442	6.3.2.12.3.5	If a Tag receives a *Lock* whose payload attempts to deassert a previously asserted permalock bit, then the Tag shall not execute the *Lock* command and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
443	6.3.2.12.3.5	If a Tag receives a *Lock* whose payload attempts to reassert a previously asserted permalock bit, then the Tag shall simply ignore this particular Action field and implement the remainder of the *Lock* payload.	M	T	By design
444	6.3.2.12.3.5	Regardless of the location, a field-deployed Tag shall not permit an Interrogator to change its lock bits except by means of a *Lock* command.	M	T	By design
445	6.3.2.12.3.5	A Tag shall implement memory locking and the *Lock* command.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
446	6.3.2.10.3.5	If a Tag receives a *Lock* it cannot execute because one or more memory locations do not exist, or one or more of the Action fields attempt to change a previously permalocked value, or one or more of the memory locations are either not lockable or not unlockable, the Tag shall not execute the *Lock* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	M	T	By design
447	6.3.2.10.3.5	The only exception to this general rule is for a Tag that a) does not support File_N, N>0, and b) whose only lock functionality is to permanently lock all memory (i.e. all memory banks and all passwords) at once; such a Tag shall execute a *Lock* whose payload is FFFFFh and shall backscatter an error code for any payload other than FFFFFh.	M	T	By design
448	6.3.2.12.3.5	A Tag in the secured state shall permit an Interrogator to write or erase memory locations with (pwd-write=1 AND permalock=0) or (pwd-read/write=1 AND permalock=0) without first issuing a *Lock* to change these fields.	M	T	By design
449	6.3.2.12.3.5	An Interrogator shall prepend a *Lock* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	M	I	By design
450	6.3.2.12.3.5	An unauthenticated Interrogator may, and an authenticated Interrogator shall, encapsulate a *Lock* command in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	M	I	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
451	6.3.2.12.3.5	Upon receiving a valid *Lock* command a Tag shall perform the commanded lock operation.	M	T	By design
452	6.3.2.12.3.5	A Tag shall reply to a *Lock* using the *delayed* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.2.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.6 and Figure 6.21.
453	6.3.2.12.3.6	Interrogators and Tags may implement an *Access* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.51.	O	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.
454	6.3.2.12.3.6	To access a Tag, an Interrogator shall follow the multi-step procedure outlined in ISO/IEC 18000-63:2021, Figure 6.25.	O	I	By design
455	6.3.2.12.3.6	Each EXOR operation shall be performed MSB first (i.e. the MSB of each half-password shall be EXORed with the MSB of its respective RN16).	O	I	By design
456	6.3.2.12.3.6	A Tag shall be capable of successively accepting two 16-bit subportions of the 32-bit access password.	O	T	By design
457	6.3.2.12.3.6	An Interrogator shall not intersperse commands other than a *Req_RN* between the two successive *Access* commands.	O	I	By design
458	6.3.2.12.3.6	If a Tag, after receiving a first *Access*, receives any valid command other than *Req_RN* before the second *Access* then it shall not execute the command and instead treat it as improper (see ISO/IEC 18000-63:2021, Table C.30), unless the intervening command is a *Query*, in which case the Tag shall execute the *Query* and invert its inventoried flag if the session parameter in the *Query* matches that in the prior session.	O	T	By design
459	6.3.2.12.3.6	An Interrogator shall prepend an *Access* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
460	6.3.2.12.3.6	An Interrogator shall not encapsulate an *Access* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
461	6.3.2.12.3.6	A Tag shall reply to an *Access* using the *immediate* reply specified in ISO/IEC 18000-63:2021 6.3.1.6.1.	O	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.
462	6.3.2.12.3.7	Interrogators and Tags may implement a *BlockWrite* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.42.	O	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.
463	6.3.2.12.3.7	*BlockWrite* commands shall apply to a single memory bank.	O	T	By design
464	6.3.2.12.3.7	If WordCount = 00_h, then a Tag shall treat the *BlockWrite* as invalid.	O	T	By design
465	6.3.2.12.3.7	If WordCount = 01_h, then a Tag shall write a single data word.	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
466	6.3.2.12.3.7	Data contains the 16-bit words to be written and shall be 16 × WordCount bits in length.	O	I	By design
467	6.3.2.12.3.7	A Tag shall only execute a *BlockWrite* in the open or secured state.	O	T	By design
468	6.3.2.12.3.7	If an Interrogator attempts to write to the kill or access password, UII or TID memory banks, or File_0 and these memory locations are permalocked; or to the kill or access password, UII or TID memory banks, or File_0 and these memory locations are locked unwriteable and the Tag is in the open state; or to memory that is untraceably hidden and the Interrogator has a deasserted Untraceable privilege; or to a file for which the Interrogator does not have sufficient privileges; or if WordPtr and WordCount include one or more permalocked blocks in File_N, N ≥ 0 of User memory; then the Tag shall not execute the *BlockWrite* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
469	6.3.2.12.3.7	An interrogator shall prepend a *BlockWrite* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
470	6.3.2.12.3.7	An unauthenticated Interrogator may, and an authenticated Interrogator shall, encapsulate a *BlockWrite* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	
471	6.3.2.12.3.7	Upon receiving a valid *BlockWrite* command a Tag shall write the commanded data into memory.	O	T	By design
472	6.3.2.12.3.7	A Tag shall reply to a *BlockWrite* using the delayed reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.2.	O	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.
473	6.3.2.12.3.8	Interrogators and Tags may implement a *BlockErase* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.44.	O	T and I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.
474	6.3.2.12.3.8	*BlockErase* commands shall apply to a single memory bank.	O	T	By design
475	6.3.2.12.3.8	If WordCount = 00_h the Tag shall treat the *BlockErase* as invalid.	O	T	By design
476	6.3.2.12.3.8	If WordCount = 01_h then a Tag shall erase a single data word.	O	T	By design
477	6.3.2.12.3.8	A Tag shall only execute a *BlockErase* in the open or secured state.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
478	6.3.2.12.3.8	If an Interrogator attempts to erase the kill or access password, UII or TID memory banks, or File_0 and these memory locations are permalocked; or the kill or access password, UII or TID memory banks, or File_0 and these memory locations are locked unwriteable and the Tag is in the open state; or to memory that is untraceably hidden and the Interrogator has a deasserted Untraceable privilege; or a file for which the Interrogator does not have sufficient privileges; or if WordPtr and WordCount include one or more permalocked blocks in File_N, N ≥ 0 of User memory; then the Tag shall not execute the *BlockErase* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
479	6.3.2.12.3.8	An Interrogator shall prepend a *BlockErase* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
480	6.3.2.12.3.8	Upon receiving an executable *BlockErase* command, a Tag shall erase the commanded memory words.	O	T	By design
481	6.3.2.12.3.8	A Tag shall reply to a *BlockErase* using the *delayed reply* specified in ISO/IEC 18000-63:2021, 6.3.1.6.2.	O	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.
482	6.3.2.12.3.8	An unauthenticated Interrogator may, and an authenticated Interrogator shall, encapsulate a *BlockErase* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
483	6.3.2.12.3.9	Interrogators and Tags may implement a *BlockPermalock* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.56.	O	T and I	By demonstration Issue a *BlockPermalock* command to permalock a single block of any File_N, N>0. After successful tag response, attempt to write the selected block to verify that it has been locked. The Tag shall not execute the *Write* and instead treat the command's parameters as unsupported. **Test conditions:** Temperature: (23 ± 3) °C

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
484	6.3.2.12.3.9	A Tag shall only execute a *BlockPermalock* in the secured state.	O	T	By design
485	6.3.2.12.3.9	ISO/IEC 18000-63:2021, Table 6.55 specifies how a Tag shall behave upon receiving a *BlockPermalock* targeting File_0 that follows a prior *Lock*, or vice versa (assuming Read/Lock=1).	O	T	By design
486	6.3.2.12.3.9	MemBank specifies whether the *BlockPermalock* applies to UII, TID or User memory. *BlockPermalock* commands shall apply to a single memory bank. Successive *BlockPermalocks* may apply to different memory banks.	O	T and I	By design
487	6.3.2.12.3.9	A Tag shall only execute a *BlockPermalock* command if MemBank = 11 (User memory); if a Tag receives a *BlockPermalock* with MemBank<>11 then it shall not execute the *BlockPermalock* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30). Future protocols may use these other MemBank values to expand the functionality of the *BlockPermalock* command.	O	T	By design
488	6.3.2.12.3.9	A Tag shall interpret the Read/Lock bit as follows:	O	T	By design
489	6.3.2.12.3.9	Read/Lock=0: A Tag shall backscatter the permalock status of blocks in the specified memory bank, starting from the memory block located at BlockPtr and ending at the memory block located at BlockPtr+(16×-BlockRange)–1.	O	T	By design
490	6.3.2.12.3.9	A Tag shall backscatter a "0" if the memory block corresponding to that bit is not permalocked and a "1" if the block is permalocked. An Interrogator omits Mask from the *BlockPermalock* when Read/Lock = 0.	O	T	By design
491	6.3.2.12.3.9	Read/Lock = 1: A Tag shall permalock those blocks in the specified memory bank that are specified by Mask, starting at BlockPtr and ending at BlockPtr+(16×BlockRange)–1.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
492	6.3.2.12.3.9	If BlockRange =00_h then a Tag shall not execute the *BlockPermalock* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
493	6.3.2.12.3.9	Read/Lock = 0: the Interrogator shall omit Mask from the *BlockPermalock*.	O	I	By design
494	6.3.2.12.3.9	Read/Lock = 1: the Interrogator shall include a Mask of length 16 × BlockRange bits in the *BlockPermalock*.	O	I	By design
495	6.3.2.12.3.9	The Mask bits shall be ordered from lower-order block to higher (i.e. if BlockPtr = 00_h then the leading Mask bit refers to block 0).	O	T and I	By design
496	6.3.2.12.3.9	The Tag shall interpret each bit of Mask as follows: Mask bit=0: Retain the current permalock setting for the corresponding memory block.	O	T	By demonstration Tested in compliance with Item 484.
497	6.3.2.12.3.9	Mask bit=1: Permalock the corresponding memory block. If a block is already permalocked then a Tag shall retain the current permalock setting. A memory block, once permalocked, cannot be un-permalocked.	O	T and I	By demonstration Tested in compliance with Item 484.
498	6.3.2.12.3.9	A *BlockPermalock* contains 8 RFU bits. An Interrogator shall set these bits to 00_h.	O	I	By demonstration Tested in compliance with Item 484.
499	6.3.2.12.3.9	A Tag in the secured state that receives a *BlockPermalock* with nonzero RFU bits shall not execute the *BlockPermalock* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30). Future protocols may use these RFU bits to expand the *BlockPermalock* command's functionality.	O	T	By design
500	6.3.2.12.3.9	If a Tag receives a *BlockPermalock* that it cannot execute because User memory does not exist, or User memory is untraceably hidden and the Interrogator has a deasserted Untraceable privilege, or in which one of the asserted Mask bits references a non-existent memory block, or because the Interrogator has insufficient file privileges (see ISO/IEC 18000-63:2021, 6.3.2.11.3) then the Tag shall not execute the *BlockPermalock* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
501	6.3.2.12.3.9	A Tag shall treat as invalid a *BlockPermalock* in which Read/Lock=0 but Mask is not omitted, or a *BlockPermalock* in which Read/Lock=1 but Mask has a length not equal to 16 × BlockRange bits (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
502	6.3.2.12.3.9	Certain Tags, depending on the Tag manufacturer's implementation, may be unable to execute a *BlockPermalock* with certain BlockPtr and BlockRange values, in which case the Tag shall not execute the *BlockPermalock* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
503	6.3.2.12.3.9	If an Interrogator issues a *BlockPermalock* in which BlockPtr and BlockRange specify one or more nonexistent blocks, but Mask only asserts permalocking on existent blocks, then the Tag shall execute the *BlockPermalock*.	O	T	By design
504	6.3.2.12.3.9	An Interrogator shall prepend a *BlockPermalock* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
505	6.3.2.12.3.9	An unauthenticated Interrogator may, and an authenticated Interrogator shall, encapsulate a *BlockPermalock* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
506	6.3.2.12.3.9	Upon receiving an executable *BlockPermalock* a Tag shall perform the requested operation, unless the Tag does not support block permalocking in which case it shall treat the command as invalid (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
507	6.3.2.12.3.9	If Read/Lock=0 then a Tag shall reply to a *BlockPermalock* using the *immediate* reply type specified in ISO/IEC 18000-63:2021, 6.3.1.6.1.	O	T	By design
508	6.3.2.12.3.9	If the Tag is able to execute the *BlockPermalock*, its reply shall be as shown in ISO/IEC 18000-63:2021, Table 6.57 comprising a header (a 0-bit), the requested permalock bits and the Tag's handle.	O	T	By design
509	6.3.2.12.3.9	If the Tag is unable to execute the *BlockPermalock* then it shall backscatter an error code (see ISO/IEC 18000-63:2021, Table C.30, unsupported parameters) rather than the reply shown in ISO/IEC 18000-63:2021, Table 6.57.	O	T	By design
510	6.3.2.12.3.9	The Tag's reply when Read/Lock=0 shall use the preamble specified by the TRext value in the *Query* that initiated the inventory round.	O	T	By design
511	6.3.2.12.3.9	If Read/Lock=1 then a Tag shall reply to a *BlockPermalock* using the *delayed* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.2.	O	T	By design

Key
M: mandatory
O : optional
T : tag
I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
512	6.3.2.12.3.10	Interrogators and Tags may implement the *Authenticate* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.58.	O	T and I	By demonstration Issue an *Authenticate* command configured according to a supported cryptographic suite. Verify that the Tag backscatters a valid response. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
513	6.3.2.12.3.10	An *Authenticate* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design
514	6.3.2.12.3.10	A Tag in the open or secured states that receives an *Authenticate* with nonzero RFU bits shall not execute the *Authenticate* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
515	6.3.2.12.3.10	An Interrogator shall prepend an *Authenticate* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
516	6.3.2.12.3.10	An Interrogator shall not encapsulate an *Authenticate* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
517	6.3.2.12.3.10	If a Tag supports the *Authenticate* command, it shall implement the security (S) indicator (see ISO/IEC 18000-63:2021, 6.3.2.1.3).	O	T	By design
518	6.3.2.12.3.10	An *Authenticate* command shall use the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3.	O	T	By design
519	6.3.2.12.3.10	If a Tag receives an *Authenticate* specifying an unsupported CSI, an improperly formatted or not-executable message, or an improper cryptographic parameter, then the Tag shall not execute the *Authenticate* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30)	O	T	By design

Key

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O : optional

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
520	6.3.2.12.3.10	If a Tag in the secured state receives an *Authenticate* that begins a new authentication, such as if the *Authenticate* contains a changed CSI, then the Tag shall transition to the open state, discontinue using and reset the current cryptographic engine and begin the new authentication.	O	T	By design
521	6.3.2.12.3.10	If a Tag receives a properly formatted *Authenticate* but there is a cryptographic error and the cryptographic suite specifies that the error requires a security timeout, the Tag shall set a security timeout as specified in ISO/IEC 18000-63:2021, 6.3.2.5.	O	T	By design
522	6.3.2.12.3.10	If a Tag that supports security timeouts for the *Authenticate* command receives an *Authenticate* during a timeout then it shall reject the command, backscatter an error code (see ISO/IEC 18000-63:2021, Annex I) and remain in its current state.	O	T	By design
523	6.3.2.12.3.11	Interrogators and Tags may implement the *AuthComm* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.59.	O	T and I	By demonstration Issue an *AuthComm* command configured according to a supported cryptographic suite. Verify that the Tag backscatters a valid response. Verify that the interrogator decodes the tag response according to the specification. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
524	6.3.2.12.3.11	An *AuthComm* shall always be preceded by a Tag, Interrogator or mutual authentication via an *Authenticate* or a *Challenge*.	O	T and I	By design
525	6.3.2.12.3.11	An Interrogator shall remove the command's preamble, handle and CRC before encapsulating it in an *AuthComm*.	O	I	By design
526	6.3.2.12.3.11	The encapsulated command shall not be encrypted or obscured.	O	T and I	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
527	6.3.2.12.3.11	An *AuthComm* contains 2 RFU bits. An Interrogator shall set these bits to 00_2	O	T and I	By design
528	6.3.2.12.3.11	A Tag in the open or secured states that receives an *AuthComm* with nonzero RFU bits shall not execute the *AuthComm* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
529	6.3.2.12.3.11	A Tag in the open or secured states that receives an *AuthComm* encapsulating a disallowed command, an unsupported command or a command that does not support encapsulation (see ISO/IEC 18000-63:2021, Table 6.28) shall not execute the *AuthComm* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
530	6.3.2.12.3.11	An Interrogator shall prepend an *AuthComm* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
531	6.3.2.12.3.11	A Tag shall only accept an *AuthComm* after a successful cryptographic authentication.	O	T	By design
532	6.3.2.12.3.11	Because an *Access* command sequence is not a cryptographic authentication, a Tag that most recently entered the secured state via a successful *Access* command sequence shall not execute an *AuthComm* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
533	6.3.2.12.3.11	When processing an *AuthComm*, a Tag shall first perform the functions/ analysis/state-change/error-handling for the *AuthComm* itself and then, if the *AuthComm* is successful, the functions/ analysis/state-change/error-handling for the command encapsulated in the *AuthComm*'s message field.	O	T	By design
534	6.3.2.12.3.11	A Tag shall reply to an *AuthComm* using the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3.	O	T	By design
535	6.3.2.12.3.11	The cryptographic suite shall specify the parameters that a Tag includes in its response, including at least the reply for the encapsulated command minus preamble, handle and CRC.	O	T	By design
536	6.3.2.12.3.11	Unlike other commands that use an *in-process* reply, *AuthComm* does not include a SenRep field because a Tag shall always send (i.e. never store) its reply to an *AuthComm*.	O	T	By design
537	6.3.2.12.3.11	If a Tag receives a properly formatted *AuthComm* but there is a cryptographic error and the cryptographic suite specifies that the error requires a security timeout, then the Tag shall set a security timeout as specified in ISO/IEC 18000-63:2021, 6.3.2.5.	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
538	6.3.2.12.3.11	If a Tag that supports security timeouts for the *AuthComm* command receives an *AuthComm* during a timeout then it shall reject the command, backscatter an error code (see ISO/IEC 18000-63:2021, Annex I) and remain in its current state.	O	T	By design
539	6.3.2.12.3.12	Interrogators and Tags may implement the *SecureComm* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.60.	O	T and I	By demonstration Issue a *SecureComm* command configured according to a supported cryptographic suite. Verify that the Tag backscatters a valid response. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
540	6.3.2.12.3.12	A *SecureComm* shall always be preceded by a Tag, Interrogator or mutual authentication via an *Authenticate* or a *Challenge*.	O	I	By design
541	6.3.2.12.3.12	An Interrogator shall remove the command's preamble, handle and CRC before encapsulating it in a *SecureComm*.	O	I	By design
542	6.3.2.12.3.12	The encapsulated command shall be encrypted.	O	I	By design
543	6.3.2.12.3.12	A *SecureComm* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design
544	6.3.2.12.3.12	A Tag in the open or secured states that receives a *SecureComm* with nonzero RFU bits shall not execute the *SecureComm* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
545	6.3.2.12.3.12	A Tag in the open or secured states that receives a *SecureComm* encapsulating a disallowed command, an unsupported command or a command that does not support encapsulation (see ISO/IEC 18000-63:2021, Table 6.28) shall not execute the *SecureComm* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design

Key

M: mandatory

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
546	6.3.2.12.3.12	An Interrogator shall prepend a *SecureComm* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	T	By design
547	6.3.2.12.3.12	A Tag shall only accept a *SecureComm* after a successful cryptographic authentication.	O	T	By design
548	6.3.2.12.3.12	Because an *Access* command sequence is not a cryptographic authentication, a Tag that most recently entered the secured state via a successful *Access* command sequence shall not execute a *SecureComm* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
549	6.3.2.12.3.12	When processing a *SecureComm,* a Tag shall first perform the functions/ analysis/state-change/error-handling for the *SecureComm* itself and then, if the *SecureComm* is successful, the functions/analysis/state-change/error-handling for the command encapsulated in the *SecureComm*'s message field.	O	T	By design
550	6.3.2.12.3.12	A Tag shall reply to a *SecureComm* using the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3.	O	T	By design
551	6.3.2.12.3.12	The cryptographic suite shall specify the parameters that a Tag includes in its response, including at least the reply for the encapsulated command minus preamble, handle and CRC.	O	T	By design
552	6.3.2.12.3.12	If a Tag receives a properly formatted *SecureComm* but there is a cryptographic error and the cryptographic suite specifies that the error requires a security timeout, then the Tag shall set a security timeout as specified in ISO/IEC 18000-63:2021, 6.3.2.5.	O	T	By design
553	6.3.2.12.3.12	If a Tag that supports security timeouts for the *SecureComm* command receives a *SecureComm* during a timeout then it shall reject the command, backscatter an error code (see ISO/IEC 18000-63:2021, Annex I) and remain in its current state.	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
554	6.3.2.12.3.13	Interrogators and Tags may implement the *KeyUpdate* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.61.	O	T and I	By demonstration Issue a *KeyUpdate* command configured according to a supported cryptographic suite. Verify that the Tag backscatters a valid response. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
555	6.3.2.12.3.13	A *KeyUpdate* shall always be preceded by an Interrogator or mutual authentication via an *Authenticate*.	O	I	By design
556	6.3.2.12.3.13	A *KeyUpdate* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design
557	6.3.2.12.3.13	A Tag in the secured state that receives a *KeyUpdate* with nonzero RFU bits shall not execute the *KeyUpdate* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
558	6.3.2.12.3.13	If a cryptographic suite allows sending a *KeyUpdate* in an *AuthComm* or without encapsulation then message in the *KeyUpdate* shall be encrypted.	O	I	By design
559	6.3.2.12.3.13	A Tag in the secured state shall only write a key if a) the Interrogator authenticated itself as a crypto superuser and KeyID is assigned to the same cryptographic suite as that specified by CSI in the *Authenticate* command that preceded the *KeyUpdate*, or b) KeyID is the same as that used by the Interrogator to authenticate itself.	O	T	By design
560	6.3.2.12.3.13	In all other instances, the Tag shall not execute the *KeyUpdate* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30). See ISO/IEC 18000-63:2021, 6.3.2.11.2 for a description of Tag privileges and the crypto superuser privilege.	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
561	6.3.2.12.3.13	Upon receiving an executable *KeyUpdate* a Tag shall overwrite its old key with the new key.	O	T	By design
562	6.3.2.12.3.13	If the Tag does not write the new key successfully then it shall revert to the prior stored key.	O	T	By design
563	6.3.2.12.3.13	An Interrogator shall prepend an unencapsulated *KeyUpdate* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
564	6.3.2.12.3.13	A Tag shall only accept a *KeyUpdate* after a successful cryptographic authentication.	O	T	By design
565	6.3.2.12.3.13	Because an *Access* command sequence is not a cryptographic authentication, a Tag that most recently entered the secured state via a successful *Access* command sequence shall not execute a *KeyUpdate* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
566	6.3.2.12.3.13	A Tag shall reply to a *KeyUpdate* using the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3.	O	T	By design
567	6.3.2.12.3.13	The cryptographic suite shall specify the parameters that a Tag includes in its response.	O	T	By design
568	6.3.2.12.3.13	If a Tag receives a properly formatted *KeyUpdate* but there is a cryptographic error and the cryptographic suite specifies that the error requires a security timeout, then the Tag shall set a security timeout as specified in ISO/IEC 18000-63:2021, 6.3.2.5.	O	T	By design
569	6.3.2.12.3.13	If a Tag that supports security timeouts for the *KeyUpdate* command receives a *KeyUpdate* during a timeout then it shall reject the command, backscatter an error code (see ISO/IEC 18000-63:2021, Annex I) and remain in its current state.	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
570	6.3.2.12.3.14	Interrogators and Tags may implement the *TagPrivilege* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.62.	O	T and I	By demonstration Issue a *TagPrivilege* command configured according to a supported cryptographic suite. Verify that the Tag backscatters a valid response. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
571	6.3.2.12.3.14	A *TagPrivilege* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design
572	6.3.2.12.3.14	A Tag in the secured state that receives a *TagPrivilege* containing nonzero RFU bits shall not execute the *TagPrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
573	6.3.2.12.3.14	An unauthenticated Interrogator may issue a *TagPrivilege*; if it does then it shall issue the *TagPrivilege* without encapsulation and with Target = 0 (i.e. specifying the access password).	O	I	By design
574	6.3.2.12.3.14	An authenticated Interrogator shall encapsulate a *TagPrivilege* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
575	6.3.2.12.3.14	If a Tag in the secured state receives an unencapsulated *TagPrivilege* from an authenticated Interrogator, then it shall not execute the *TagPrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
576	6.3.2.12.3.14	A Tag in the secured state shall only read or modify the access-password privileges if the Interrogator supplied the correct access password and is not attempting to assert a deasserted privilege.	O	T	By design
577	6.3.2.12.3.14	In all other instances the Tag shall not execute the *TagPrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design

Key

M: mandatory

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
578	6.3.2.12.3.14	A Tag in the secured state shall only read or modify a key's privileges if a) the Interrogator authenticated itself as a crypto superuser and KeyID is assigned to the same cryptographic suite as that specified by CSI in the *Authenticate* command that preceded the *TagPrivilege*, or b) KeyID is the same as that used by the Interrogator to authenticate itself and the Interrogator is not attempting to assert a deasserted privilege.	O	T	By design
579	6.3.2.12.3.14	If an Interrogator specifies Action = 0 in a *TagPrivilege,* it may use any value for privilege. A Tag shall ignore privilege when Action = 0.	O	T and I	By design
580	6.3.2.12.3.14	If Tag receives a *TagPrivilege* with Target = 0, it shall ignore the value that the Interrogator supplies for KeyID.	O	T	By design
581	6.3.2.12.3.14	Upon receiving an executable *TagPrivilege* with Action = 1, a Tag shall overwrite the old privileges with the new privileges.	O	T	By design
582	6.3.2.12.3.14	If the Tag does not write the new privileges successfully, it shall revert to the prior stored privileges.	O	T	By design
583	6.3.2.12.3.14	A Tag in the secured state that receives a *TagPrivilege* which attempts to assert one or more RFU privilege bits or to change an unchangeable privilege value shall not execute the *TagPrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table 6.30).	O	T	By design
584	6.3.2.12.3.14	An Interrogator shall prepend an unencapsulated *TagPrivilege* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
585	6.3.2.12.3.14	A Tag shall reply to a *TagPrivilege* using the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3.	O	T	By design
586	6.3.2.12.3.14	The Tag's response shall be as shown in ISO/IEC 18000-63:2021, Table 6.63 for Action = 0 or Action = 1.	O	T	By design
587	6.3.2.12.3.15	Interrogators and Tags may implement the *ReadBuffer* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.64.	O	T and I	By demonstration Tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.6.4.
588	6.3.2.12.3.15	BitCount specifies the number of bits to read. If BitCount = 000_h, then a Tag shall backscatter the contents of the ResponseBuffer starting at WordPtr and ending at the end of the allocated ResponseBuffer.	O	T	By design
589	6.3.2.12.3.15	A *ReadBuffer* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
590	6.3.2.12.3.15	A Tag in the open or secured states that receives a *ReadBuffer* with nonzero RFU bits shall not execute the *ReadBuffer* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021 Table C.30). Future protocols may use these RFU bits to expand the *ReadBuffer* command's functionality.	O	T	By design
591	6.3.2.12.3.15	An Interrogator may encapsulate a *ReadBuffer* in an *AuthComm* but shall not encapsulate it in a *SecureComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
592	6.3.2.12.3.15	If a Tag implements a ResponseBuffer, that Tag shall implement the *ReadBuffer* command.	O	T	By design
593	6.3.2.12.3.15	An Interrogator shall prepend an unencapsulated *ReadBuffer* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
594	6.3.2.12.3.15	A Tag shall reply to a *ReadBuffer* using the *immediate* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.1.	O	T	By design
595	6.3.2.12.3.15	If C = 1 and the memory bits specified in the *ReadBuffer* exist, the Tag's reply shall be as shown in ISO/IEC 18000-63:2021, Table 6.65 including a header (a 0-bit), the data bits and the Tag's handle.	O	T	By design
596	6.3.2.12.3.15	The reply includes a CRC-16 calculated over the 0-bit, data bits and handle. If one or more of the memory bits specified in the *ReadBuffer* do not exist, or if the C flag in XPC_W1 is zero-valued, then the Tag shall not execute the *ReadBuffer* and instead backscatter an error code (see ISO/IEC 18000-63:2021, Table C.30, unsupported parameters) within time T_1 in ISO/IEC 18000-63:2021, Table 6.16 rather than the reply shown in ISO/IEC 18000-63:2021, Table 6.65.	O	T	By design
597	6.3.2.12.3.16	Interrogators and Tags may implement the *Untraceable* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.66.	O	T and I	By demonstration Issue an *Untraceable* command that is configured to hide the User memory. Verify that the *Read* command is only executed for an Interrogator that has an asserted Untraceable privilege. Issue another *Untraceable* command, which is configured to expose the User memory. Verify that the *Read* command is executed independent from the Untraceable privilege of the Interrogator.
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
					Test conditions: Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: ≤ 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
598	6.3.2.12.3.16	Upon receiving an *Untraceable* command, a Tag that supports the U bit overwrites bit $21C_h$ of XPC_W1 with the provided U value regardless of the lock or permalock status of UII memory.	O	T	VOID ISO/IEC 18000-63:2021, changed the wording such that this is no longer a "shall" statement.
599	6.3.2.12.3.16	If the Tag does not support the U bit then the Tag shall ignore the provided U value but continue to process the remainder of the *Untraceable*.	O	T	By design
600	6.3.2.12.3.16	Upon receiving an *Untraceable* command a Tag overwrites its UII length field (Stored-PC bits 10_h – 14_h) with the provided length bits regardless of the lock or permalock status of UII memory.	O	T	VOID ISO/IEC 18000-63:2021, changed the wording such that this is no longer a "shall" statement
601	6.3.2.12.3.16	A Tag shall execute a range change prior to replying to the *Untraceable*.	O	T	By design
602	6.3.2.12.3.16	If a Tag does not support range reduction, it shall ignore range but continue to process the remainder of the *Untraceable.*	O	T	By design
603	6.3.2.12.3.16	An *Untraceable* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design
604	6.3.2.12.3.16	A Tag in the secured state that receives an *Untraceable* with nonzero RFU bits, TID=11_2, or range=11_2 shall not execute the *Untraceable* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
605	6.3.2.12.3.16	If a Tag in the secured state receives an *Untraceable* from an Interrogator with an asserted Untraceable privilege, it shall execute the command.	O	T	By design
606	6.3.2.12.3.16	If the Interrogator has a deasserted Untraceable privilege, the Tag shall not execute the command and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design

Key

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
607	6.3.2.12.3.16	An authenticated Interrogator shall encapsulate an *Untraceable* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
608	6.3.2.12.3.16	If a Tag in the secured state receives an unencapsulated *Untraceable* from an authenticated Interrogator, then it shall not execute the *Untraceable* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
609	6.3.2.12.3.16	*Untraceable* commands shall be atomic, meaning that a Tag, upon receiving an executable *Untraceable*, shall discard its prior memory and range settings and implement the new ones.	O	T	By design
610	6.3.2.12.3.16	A Tag that supports XI=1_2 shall not execute an *Untraceable* that specifies length bits greater than 11101_2 and shall instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
611	6.3.2.12.3.16	Regardless of these absolute bounds on length, if an *Untraceable* specifies a length value that a Tag does not support, then the Tag shall not execute the *Untraceable* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
612	6.3.2.12.3.16	A Tag that is operating with reduced range shall do so for all commands regardless of whether an Interrogator has an asserted or a deasserted Untraceable privilege.	O	T	By design
613	6.3.2.12.3.16	A Tag shall execute supported access commands that operate on untraceably hidden memory if the commanding Interrogator has an asserted Untraceable privilege, but shall not execute these commands if the Interrogator has a deasserted Untraceable privilege.	O	T	By design
614	6.3.2.12.3.16	In the latter case, a Tag shall behave as though untraceably hidden memory does not exist and treat the commands' parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
615	6.3.2.12.3.16	A Tag that is untraceably hiding UII memory shall not include any of the untraceably hidden UII memory bits when replying to an *ACK*.	O	T	By design
616	6.3.2.12.3.16	An Interrogator shall prepend an unencapsulated *Untraceable* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
617	6.3.2.12.3.16	The details of this irreversible untraceability, including whether a Tag with irreversibly hidden memory will still alter its operating range and vice versa, shall be Tag-manufacturer defined.	O	T	By design
618	6.3.2.12.3.16	A Tag shall reply to an *Untraceable* using the *delayed* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.2. Upon receiving an executable *Untraceable,* a Tag shall perform the specified actions.	O	T	By design

Key

M: mandatory

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
619	6.3.2.12.3.16	If a Tag receives an *Untraceable* a) with field values it supports but nonetheless cannot execute, such as if the *Untraceable* instructs the Tag to expose an irreversibly hidden portion of Tag memory or the Interrogator has a deasserted Untraceable privilege, or b) with field values it does not support, unless the unsupported fields are U or range, then the Tag shall not execute the *Untraceable* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
620	6.3.2.12.3.17	Interrogators and Tags may implement the *FileOpen* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.67.	O	T and I	By demonstration Issue a *FileOpen* command configured according to a supported cryptographic suite. Verify that the Tag backscatters a valid response. **Test conditions:** Temperature: (23 ± 3) °C Frequency: 860 MHz, 910 MHz and 960 MHz Power: 0 dBm at Tag antenna Modulation: DSB-ASK Tari: 12,5 µs RTcal: 31,25 µs PW: 0,5 × Tari Modulation depth: 90 % Rise/fall time: < 0,33 × Tari TRcal: 66,7 µs DR: 64/3 M: 3 TRext: 1
621	6.3.2.12.3.17	A *FileOpen* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design
622	6.3.2.12.3.17	A Tag in the open or secured states that receives a *FileOpen* with nonzero RFU bits or that specifies FileNum=1111111111_2 (RFU FileNum) shall not execute the *FileOpen* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
623	6.3.2.12.3.17	An authenticated Interrogator shall encapsulate a *FileOpen* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
624	6.3.2.12.3.17	If a Tag in the secured state receives an unencapsulated *FileOpen* from an authenticated Interrogator, then it shall not execute the *FileOpen* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design

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M: mandatory
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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
625	6.3.2.12.3.17	If an Interrogator or a Tag support File_N, N > 0, then that Interrogator or Tag shall implement a *FileOpen*.	O	T and I	By design
626	6.3.2.12.3.17	An Interrogator shall prepend an unencapsulated *FileOpen* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
627	6.3.2.12.3.17	If a Tag supports the *FileOpen* command, it shall implement the file (F) indicator (see ISO/IEC 18000-63:2021, 6.3.2.1.3).	O	I	
628	6.3.2.12.3.17	A Tag shall reply to a *FileOpen* using the *immediate* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.1.	O	T	By design
629	6.3.2.12.3.17	If the Tag has an allocated file at FileNum, it shall close the currently open file, open the specified file and reply as shown in ISO/IEC 18000-63:2021, Table 6.68.	O	T	By design
630	6.3.2.12.3.17	LastFile indicates whether the just-opened file has the largest assigned FileNum; if a Tag has a FileNum larger than that of the just-opened file, then it shall set LastFile to 0, otherwise it shall set LastFile to 1.	O	T	By design
631	6.3.2.12.3.17	If a Tag receives a *FileOpen* specifying the currently open file, it shall leave the file open and reply as specified in ISO/IEC 18000-63:2021, Table 6.68.	O	T	By design
632	6.3.2.12.3.17	If a Tag receives a *FileOpen* but does not have an allocated file at FileNum, or if User memory is untraceably hidden and the Interrogator has a deasserted Untraceable privilege, or if the Tag is otherwise unable to execute the *FileOpen*, then the Tag shall not execute the *FileOpen* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30), reverting to the currently open file (or to no file if the Tag doesn't have any allocated files or if User memory is untraceably hidden and the Interrogator has a deasserted Untraceable privilege).	O	T	By design
633	6.3.2.12.3.18	Interrogators and Tags may implement the *FileList* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.69.	O	T and I	By design
634	6.3.2.12.3.18	For example, if FileNum = 4 and AddlFiles = 2, then the Tag shall provide information for File_4 and for the next two higher-numbered files (which may be File_5 and File_6 if the Tag manufacturer assigned file numbers sequentially or may be other files if the numbering is not sequential).	O	T	By design
635	6.3.2.12.3.18	A *FileList* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
636	6.3.2.12.3.18	A Tag in the open or secured states that receives a *FileList* with nonzero RFU bits or that specifies FileNum = 1111111111_2 (RFU FileNum) shall not execute the *FileList* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30). Future protocols may use these RFU bits to expand the *FileList* command's functionality.	O	T	By design
637	6.3.2.12.3.18	An authenticated Interrogator shall encapsulate a *FileList* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
638	6.3.2.12.3.18	If a Tag in the secured state receives an unencapsulated *FileList* from an authenticated Interrogator, it shall not execute the *FileList* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
639	6.3.2.12.3.18	An Interrogator shall not specify AddlFiles = FF_h.	O	I	By design
640	6.3.2.12.3.18	If a Tag receives a *FileList* with AddlFiles = FF_h, then the Tag shall behave as though it had received a *FileList* with AddlFiles = FD_h.	O	T	By design
641	6.3.2.12.3.18	A Tag shall reply to a *FileList* using the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3.	O	T	By design
642	6.3.2.12.3.18	A Tag's response shall be as shown in ISO/IEC 18000-63:2021, Table 6.70 and includes a message for each file for which the Interrogator requested information.	O	T	By design
643	6.3.2.12.3.18	If a Tag is *static*, AvailFileSize shall be zero.	O	T	By design
644	6.3.2.12.3.18	If a Tag has more than 1022 blocks of free memory, AvailFileSize shall be 1111111111_2.	O	T	By design
645	6.3.2.12.3.18	If a Tag receives a *FileList* with an unsupported FileNum, or AddlFiles exceeds the number of files above FileNum, or User memory is untraceably hidden and the Interrogator has a deasserted Untraceable privilege, or the Tag is otherwise unable to execute the *FileList*, then the Tag shall not execute the *FileList* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
646	6.3.2.12.3.19	Interrogators and Tags may implement the *FilePrivilege* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.72.	O	T and I	By design
647	6.3.2.12.3.19	A *FilePrivilege* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design
648	6.3.2.12.3.19	A Tag in the secured state that receives a *FilePrivilege* with nonzero RFU bits shall not execute the *FilePrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design

Key

M: mandatory

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
649	6.3.2.12.3.19	An authenticated Interrogator shall encapsulate a *FilePrivilege* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
650	6.3.2.12.3.19	If a Tag in the secured state receives an unencapsulated *FilePrivilege* from an authenticated Interrogator, it shall not execute the *FilePrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
651	6.3.2.12.3.19	A Tag shall execute a *TagPrivilege* according to ISO/IEC 18000-63:2021, Table 6.71 which specifies, for each Action value, the privilege assignment that the Tag makes (if any), the fields in the *FilePrivilege* that the Tag ignores, the required Tag or file privilege to perform the requested operation and the reply that the Tag backscatters. An Interrogator may set an ignored field in a *FilePrivilege* to any value.	O	T	By design
652	6.3.2.12.3.19	Upon receiving an executable *FilePrivilege* with Action = 001_2, 011_2, 101_2, or 111_2, a Tag shall overwrite the current file privilege(s) with the new privilege.	O	T	By design
653	6.3.2.12.3.19	If the Tag does not write the new privilege successfully, then it shall revert to the prior stored privilege.	O	T	By design
654	6.3.2.12.3.19	An Interrogator shall prepend an unencapsulated *FilePrivilege* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
655	6.3.2.12.3.19	A Tag's response to the *FilePrivilege*, for incorporation into the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3, shall be as shown in ISO/IEC 18000-63:2021, Table 6.73.	O	T	By design
656	6.3.2.12.3.19	If a Tag receives a *FilePrivilege* that it cannot execute because the access password or key the Interrogator supplied has insufficient privileges, or the *FilePrivilege* contains an unsupported KeyID, or privilege is an RFU value, or User memory is untraceably hidden and the Interrogator has a deasserted Untraceable privilege, or the Tag is otherwise unable to execute the *FilePrivilege*, then the Tag shall not execute the *FilePrivilege* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
657	6.3.2.12.3.20	Interrogators and Tags may implement the *FileSetup* command; if they do, they shall implement it as shown in ISO/IEC 18000-63:2021, Table 6.74.	O	T and I	By design
658	6.3.2.12.3.20	A *FileSetup* contains 2 RFU bits. An Interrogator shall set these bits to 00_2.	O	I	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
659	6.3.2.12.3.20	A Tag in the secured state that receives a *FileSetup* with nonzero RFU bits shall not execute the *FileSetup* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30). Future protocols may use these RFU bits to expand the *FileSetup* command's functionality.	O	T	By design
660	6.3.2.12.3.20	A Tag shall only execute a *FileSetup* issued by an Interrogator with a file superuser privilege (see ISO/IEC 18000-63:2021, 6.3.2.11.3).	O	T	By design
661	6.3.2.12.3.20	An authenticated Interrogator shall encapsulate a *FileSetup* in a *SecureComm* or *AuthComm* (see ISO/IEC 18000-63:2021, Table 6.28).	O	I	By design
662	6.3.2.12.3.20	If a Tag in the secured state receives an unencapsulated *FileSetup* from an authenticated Interrogator, then it shall not execute the *FileSetup* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
663	6.3.2.12.3.20	A *static* Tag that supports the *FileSetup* command shall permit an Interrogator with the file superuser privilege to modify a file's type but never its size.	O	T	By design
664	6.3.2.12.3.20	A *static* Tag shall write the FileType in a *FileSetup* as the file's new type and shall ignore FileSize. An Interrogator may set FileSize to any value when communicating with a *static* Tag.	O	T	By design
665	6.3.2.12.3.20	A *dynamic* Tag shall permit an Interrogator with the file superuser privilege to modify a file's type and size.	O	T	By design
666	6.3.2.12.3.20	When increasing a file's size a *dynamic* Tag shall only allocate "free" memory (i.e. memory not currently allocated to another file) to the resized file.	O	T	By design
667	6.3.2.12.3.20	Regardless of whether a Tag is *static* or *dynamic*, after executing a *FileSetup* a Tag's response shall include both FileType and FileSize (even if the Tag made no changes to either one). See ISO/IEC 18000-63:2021, Table 6.75.	O	T	By design
668	6.3.2.12.3.20	An Interrogator shall prepend an unencapsulated *FileSetup* with a frame-sync (see ISO/IEC 18000-63:2021, 6.3.1.2.8).	O	I	By design
669	6.3.2.12.3.20	A Tag's response to the *FileSetup*, for incorporation into the *in-process* reply specified in ISO/IEC 18000-63:2021, 6.3.1.6.3, shall be as shown in ISO/IEC 18000-63:2021, Table 6.75.	O	T	By design

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
670	6.3.2.12.3.20	The response includes the FileNum, FileType and FileSize. If a Tag receives a *FileSetup* that it cannot execute because the access password or key that the Interrogator most recently supplied does not have a file superuser privilege, or User memory is untraceably hidden and the Interrogator has a deasserted Untraceable privilege, or the Tag is otherwise unable to execute the *FileSetup*, then the Tag shall not execute the *FileSetup* and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
671	6.3.2.12.3.20	If a *dynamic* Tag is unable to execute the FileSize in the *FileSetup* command, then it shall not execute any portion of the *FileSetup* (i.e. it shall not change the FileType) and instead treat the command's parameters as unsupported (see ISO/IEC 18000-63:2021, Table C.30).	O	T	By design
672	Annex A	Although a general EBV may contain blocks of varying lengths, Tags and Interrogators manufactured according to this specification shall use blocks of length 8 bits (EBV-8).	M	T and I	By design
673	Annex A	Tags and Interrogators shall use the EBV-8 word format specified in ISO/IEC 18000-63:2021, Table A.1.	M	T and I	By design
674	Annex B	State-transition ISO/IEC 18000-63:2021, Tables B.1 to B.7 shall define a Tag's response to Interrogator commands.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.
675	Table B.1	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field), (2) a command with a CRC error, or (3) an unsupported command.			Definition. Not verified.
676	Table B.2	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field), (2) a command with a CRC error, or (3) an unsupported command.			Definition. Not verified.
677	Table B.3	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field), (2) a command with a CRC error, or (3) an unsupported command.			Definition. Not verified.
678	Table B.4	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field), (2) a command with a CRC error, or (3) an unsupported command.			Definition. Not verified.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
679	Table B.5	"Unsupported parameters" shall mean an access command with a correct handle and CRC and that is recognizable by the Tag but contains or specifies (1) a nonzero or incorrect RFU value, (2) an unsupported CSI; (3) an encapsulated command that is unsupported or disallowed, (4) an unsupported or incorrect memory bank, memory location, address range, or FileNum, (5) a hidden or locked memory bank or location, (6) an unsupported file or files, (7) a command that requires encapsulation but is nonetheless unencapsulated (see ISO/IEC 18000-63:2021, Table 6.28), (8) a *delayed* or *in-process* reply and the specified operation causes the Tag to encounter an error, (9) an operation for which the Interrogator has insufficient privileges, (10) an unsupported cryptographic parameter, or (11) other parameters not supported by the Tag.	M		Definition. Not verified.
680	Table B.5	"Incorrect handle" shall mean an access command with a correct CRC and that is recognizable by the Tag but has an incorrect handle. The cryptographic suite indicated by CSI in the prior *Challenge* or *Authenticate* command may specify that a Tag reset its cryptographic engine upon receiving a security command with an incorrect handle.	M		Definition. Not verified.
681	Table B.5	"Improper" shall mean a command (except *Req_RN* or *Query*) that is recognizable by the Tag but is interspersed between successive *Kill* or *Access* commands in a password-based kill or access command sequence, respectively (see ISO/IEC 18000-63:2021, Figure 6.24 and ISO/IEC 18000-63:2021, Figure 6.26).	M		Definition. Not verified.
682	Table B.5	"Invalid" shall mean an erroneous command, an unsupported command, a command with invalid parameters, a command with a CRC error, a command (other than a *Query*) with a session parameter not matching that of the inventory round currently in progress, or any other command either not recognized or not executable by the Tag.			Definition. Not verified.
Key M: mandatory O : optional T : tag I : interrogator					

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
683	Table B.6	"Unsupported parameters" shall mean an access command with a correct handle and CRC and that is recognizable by the Tag but contains or specifies (1) a nonzero or incorrect RFU value, (2) an unsupported CSI; (3) an encapsulated command that is unsupported or disallowed, (4) an unsupported or incorrect memory bank, memory location, address range, lock payload, blockpermalock payload, KeyID, or FileNum, (5) a hidden or locked memory bank or location, (6) an unsupported file or files, (7) insufficient or unallocateable memory, (8) an unencrypted message that requires encryption, (9) a command that requires encapsulation but is nonetheless unencapsulated see ISO/IEC 18000-63:2021, Table 6.28), (10) a *delayed* or *in-process* reply and the specified operation causes the Tag to encounter an error, (11) an RFU privilege value, (12) an operation for which the Interrogator has insufficient privileges, (13) an unsupported cryptographic parameter, or (14) other parameters not supported by the Tag.			Definition. Not verified.
684	Table B.6	"Incorrect handle" shall mean an access command with a correct CRC and that is recognizable by the Tag but has an incorrect handle. The default next state is secured, but the cryptographic suite indicated by CSI in the prior *Challenge* or *Authenticate* command may specify that a Tag reset its crypto engine and transition to the open state upon receiving a security command with an incorrect handle.			Definition. Not verified.
685	Table B.6	"Improper" shall mean a command (*except Req_RN or Query*) that is recognizable by the Tag but is interspersed between successive Kill or Access commands in a password-based kill or access command sequence, respectively (see ISO/IEC 18000-63:2021, Figure 6.24 and ISO/IEC 18000-63:2021, Figure 6.26).			Definition. Not verified.
686	Table B.6	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field or a *BlockWrite*/*BlockErase* with a zero-valued WordCount), (2) a command with a CRC error, (3) an unsupported command, or (4) a *Write* command for which the immediately preceding command was not a *Req_RN*. The default next state is secured, but the cryptographic suite indicated by CSI in the prior *Challenge* or *Authenticate* command may specify that a Tag reset its cryptographic engine and transition to the open state upon receiving an invalid command.			Definition. Not verified.
687	Annex C	Command-response ISO/IEC 18000-63:2021, Tables C.1 to C.30 shall define a Tag's response to Interrogator commands.	M	T	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.2.4 and Figure 6.19.

Key
M: mandatory
O : optional
T : tag
I : interrogator

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
688	Table C.30	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field), (2) a command with a CRC error, or (3) an unsupported command.			Definition. Not verified.
689	Table C.30	"Unsupported parameters" shall mean an access command with a correct handle and CRC and that is recognizable by the Tag but contains or specifies (1) a nonzero or incorrect RFU value, (2) an unsupported CSI; (3) an encapsulated command that is unsupported or disallowed, (4) an unsupported or incorrect memory bank, memory location, address range, or FileNum, (5) a hidden or locked memory bank or location, (6) an unsupported file or files, (7) a command that requires encapsulation but is nonetheless unencapsulated (see ISO/IEC 18000-63:2021, Table 6.28), (8) a *delayed* or *in-process* reply and the specified operation causes the Tag to encounter an error, (9) an operation for which the Interrogator has insufficient privileges, (10) an unsupported cryptographic parameter, or (11) other parameters not supported by the Tag.			Definition. Not verified.
690	Table C.30	"Unsupported parameters" shall mean an access command with a correct handle and CRC and that is recognizable by the Tag but contains or specifies (1) a nonzero or incorrect RFU value, (2) an unsupported CSI; (3) an encapsulated command that is unsupported or disallowed, (4) an unsupported or incorrect memory bank, memory location, address range, lock payload, blockpermalock payload, KeyID, or FileNum, (5) a hidden or locked memory bank or location, (6) an unsupported file or files, (7) insufficient or unallocateable memory, (8) an unencrypted message that requires encryption, (9) a command that requires encapsulation but is nonetheless unencapsulated (see ISO/IEC 18000-63:2021, Table 6.28), (10) a delayed or in-process reply and the specified operation causes the Tag to encounter an error, (11) an RFU privilege value, (12) an operation for which the Interrogator has insufficient privileges, (13) an unsupported cryptographic parameter, or (14) other parameters not supported by the Tag.			Definition. Not verified.
691	Table C.30	"Incorrect handle" shall mean an access command with a correct CRC and that is recognizable by the Tag but has an incorrect handle. The cryptographic suite indicated by CSI in the prior *Challenge* or *Authenticate* command may specify that a Tag reset its cryptographic engine upon receiving a security command with an incorrect handle.			Definition. Not verified.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
692	Table C.30	"Incorrect handle" shall mean an access command with a correct CRC and that is recognizable by the Tag but has an incorrect handle. The default next state is secured, but the cryptographic suite indicated by CSI in the prior *Challenge* or *Authenticate* command may specify that a Tag reset its crypto engine and transition to the open state upon receiving a security command with an incorrect handle.			Definition. Not verified.
693	Table C.30	"Improper" shall mean a command (*except Req_RN or Query*) that is recognizable by the Tag but is interspersed between successive Kill or Access commands in a password-based kill or access command sequence, respectively (see ISO/IEC 18000-63:2021, Figure 6.24 and ISO/IEC 18000-63:2021, Figure 6.26).			Definition. Not verified.
694	Table C.30	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field or a *BlockWrite*/*BlockErase* with a zero-valued WordCount), (2) a command with a CRC error, (3) an unsupported command, or (4) a *Write* command for which the immediately preceding command was not a *Req_RN*. The cryptographic suite indicated by CSI in the prior *Challenge* or *Authenticate* command may specify that a Tag reset its cryptographic engine upon receiving an invalid command.			Definition. Not verified.
695	Table C.30	"Invalid" shall mean a command not recognizable by the Tag such as (1) an erroneous command (e.g. a command with an incorrect length field or a *BlockWrite*/*BlockErase* with a zero-valued WordCount), (2) a command with a CRC error, (3) an unsupported command, or (4) a *Write* command for which the immediately preceding command was not a *Req_RN*.. The default next state is secured, but the cryptographic suite indicated by CSI in the prior *Challenge* or *Authenticate* command may specify that a Tag reset its cryptographic engine and transition to the open state upon receiving an invalid command.			Definition. Not verified.
696	Annex G.1	When an Interrogator in a multiple- or dense-Interrogator environment instructs Tags to use subcarrier backscatter, the Interrogator shall adopt the channel plan found in Reference [22] for the regulatory region in which it is operating.	M	I	By design
697	Annex G.1	Local regulations apply when adopting a channel plan when an Interrogator in a multiple- or dense-Interrogator environment instructs Tags to use FM0 backscatter.	M	I	By design
698	Annex G.1	Interrogator signaling (both modulated and CW) shall be centered in a channel with the frequency accuracy specified in ISO/IEC 18000-63:2021, 6.3.1.2.1 (as appropriate). Local regulations can specify a tighter frequency accuracy.	M	I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.2.1.

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Table 1 *(continued)*

Item	ISO/IEC 18000-63: 2021 subclause	Requirement	M/O	Applies to	Conformance test method
699	Annex G.1	Interrogator transmissions shall satisfy the dense-Interrogator transmit mask in ISO/IEC 18000-63:2021, 6.3.1.2.11 (as appropriate). Local regulations can apply	O	I	By design Also tested in compliance with ISO/IEC 18000-63:2021, 6.3.1.2.11.
700	Annex G.1	If an Interrogator uses SSB-ASK modulation, the transmit spectrum shall be centered in the channel during R=>T signaling and the CW shall be centered in the channel during Tag backscatter.	O	I	By demonstration (only for Interrogators that implement SSB modulation in dense-Interrogator environments). **Test conditions:** Temperature: (23 ± 3) °C Frequency: at channel frequency closest to center of supported band. Power: maximum Interrogator transmit power, as implemented. Modulation: SSB Tari: 25 us Backscatter data rate: one or more of the dense-interrogator data rates specified in ISO/IEC 18000-63:2021, Annex G of the Protocol specification, as implemented. Other transmit parameters: as implemented. **Measurement equipment setting:** Resolution bandwidth: 1 kHz Video bandwidth: equal to the RBW. Sweep time: AUTO Span: 1 MHz Trace mode: max. hold sufficient to capture all emissions Detection mode: averaging Modulation method: continous repeated inventory sequence (no tags present).
701	Annex I.1	If a Tag is required to backscatter an error code, the Tag shall use one of the error codes shown in ISO/IEC 18000-63:2021, Table I.2	M	T	By design
702	Annex I.1	If a Tag supports error-specific codes, it shall use the error-specific codes shown in ISO/IEC 18000-63:2021, Table I.2.	M	T	By design
703	Annex I.1	If a Tag does not support error-specific codes, it shall backscatter error code 00001111_2 (indicating a non-specific error) as shown in ISO/IEC 18000-63:2021, Table I.2.	M	T	By design
704	Annex I.1	A Tag shall backscatter error codes only from the open or secured states.	M	T	By design
705	Annex I.1	A Tag shall not backscatter an error code if it receives an invalid or improper access command, or an access command with an incorrect handle.	M	T	By design

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