IEC 63652-1

Edition 1.0 2026-02

INTERNATIONAL STANDARD

NFC Forum Specifications -
Part 1: NFC Wireless Charging

ICS 33.160.60

ISBN 978-2-8327-0981-8

IEC 63652-1:2026-02(en)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

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

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

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

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 It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

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

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

NFC Forum Specifications - Part 1: NFC Wireless Charging

FOREWORD

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

IEC 63652-1 has been prepared by technical area 15: Wireless Power Transfer, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

It is based on Wireless Charging Technical Specification Version 2.0 and was submitted as a Fast-Track document.

The text of this International Standard is based on the following documents:

Draft	Report on voting
100/4399/FDIS	100/4434/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

The structure and editorial rules used in this publication reflect the practice of the organization which submitted it.

This document was developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

NOTE In accordance with ISO/IEC Directives, Part 1, IEC PASs are automatically withdrawn after 4 years.

Wireless Charging

Technical Specification

Version 2.0

2021-08-19

[WLC]

NFC Forum™

Contents

Figures

Tables

Requirements

1 Introduction

NFC technology allows power to be transferred to a Tag in order to enable communication. This is achieved by providing a constant carrier signal.

This specification expands this scope by using the NFC communication link to control the power transferred. Thus the pure communication purpose of NFC is extended to wireless charging.

The transferred power can charge small NFC enabled devices such as smartwatches, activity trackers, headsets and many other consumer electronics products.

The benefits of NFC technology for wireless charging include:

- Use of the existing NFC specification for controlling the received power to provide charging
- Sharing the same antenna for both communication and power transfer.

1.1 Objectives

This document specifies a method and procedures for Wireless Power Transfer between two NFC wireless devices. The provided technical foundations use NFC technology for the initiation, control and execution of 13.56 MHz power transfer.

1.2 Applicable Documents or References

The following documents contain provisions that are referenced in this specification. The latest version (including all published amendments) applies unless a publication date is explicitly stated.

[ACTIVITY]	Activity Technical Specification, NFC Forum
[ANALOG]	Analog Technical Specification, NFC Forum
[DIGITAL]	Digital Protocol Technical Specification NFC Forum
[MANU]	Register of IC manufacturers, ISO/IEC JTC1/SC17, Standing Document 5
[NDEF]	NFC Data Exchange Format (NDEF) Technical Specification, NFC Forum
[RFC2119]	Key words for use in RFCs to Indicate Requirement Levels, RFC 2119, S. Bradner, March 1997, Internet Engineering Task Force
[RTD]	NFC Record Type Definition Specification NFC Forum
[RTD-DI]	Device Information RTD Technical Specification, NFC Forum
[T2T]	Type 2 Tag Technical Specification, NFC Forum

[T3T]	Type 3 Tag Technical Specification, NFC Forum
[T4T]	Type 4 Tag Technical Specification, NFC Forum
[T5T]	Type 5 Tag Technical Specification, NFC Forum
[WLC_TC]	Test Specification/Cases for Wireless Charging Technical Specification, NFC Forum

1.3 Administration

The NFC Forum Wireless Charging Specification is an open specification supported by the Near Field Communication Forum, Inc., located at:

401 Edgewater Place, Suite 600
Wakefield, MA, 01880

Tel.: +1 781-876-8955
Fax: +1 781-610-9864

http://www.nfc-forum.org/

The NFC Forum, Inc. maintains this specification.

1.4 Trademark and Logo Usage

The Near Field Communication Forum's policy regarding the use of trademarks and logos is described in the NFC Forum Brand Identity Guidelines and N-Mark Usage Guidelines, which can be found on the NFC Forum website.

1.5 Intellectual Property

The Wireless Charging Specification conforms to the Intellectual Property guidelines specified in the NFC Forum's Intellectual Property Rights Policy, as outlined in the NFC Forum Rules of Procedure. These documents are available on the NFC Forum website.

1.6 Special Word Usage

The key words "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT" and "MAY" in this document are to be interpreted as described in [RFC2119].

1.7 Requirement Numbering

Requirements in this document are uniquely numbered with the number appearing next to each requirement. For example:

Table 1: Sample Requirement

1.7.1.1	A car SHALL have four wheels.

A requirement can have different numbers in different versions of the specifications. Hence, all references to a requirement need to include the version of the document as well as the requirement's number.

1.8 Notational Conventions

1.8.1 Notations

The notations shown in Table 2 apply in this document.

Table 2: Notational Conventions

Notation	Description
0xXY	Hexadecimal notation. Hexadecimal numbers are represented using the numbers 0 - 9 and the characters A − F. An "0x" is added as prefix. The most significant byte (MSB) is shown on the left; the least significant byte (LSB) on the right. Example: 0xF5
xyb	Binary notation. Binary numbers are represented by strings of the digits 0 and 1, shown with the most significant bit (msb) on the left and the least significant bit (lsb) on the right. A "b" is added at the end. Example: 11110101b
xy	Decimal notation Decimal numbers are represented without any tailing character. Example: 245
⌈..⌉	A roundup integer function is expressed by the brackets ⌈..⌉ Example: ⌈7/8⌉ = 1, ⌈8/8⌉ = 1, ⌈9/8⌉ = 2
Specially Defined Names	Terms defined in the Glossary or other NFC Technical Specification Glossaries are written with initial capital letters.
STATE	Names of defined States are written in bold all-capital **COURIER FONT** letters.
COMMAND and RESPONSE	The defined Command and Response names are written in non-bold all-capital letters.
PARAMETER	Parameter names are written in non-bold all-capital letters. Parameter names start with one of the following prefixes: CON_ Prefix for Configuration Parameters (e.g., CON_DEVICES_LIMIT_A). INT_ Prefix for variables used in the Activities (e.g., INT_COLL_PEND). GRE_ Prefix for variables used in the Greedy Collection (e.g., GRE_POLL_A).

1.8.2 Values of Parameters

Throughout the document, symbols are used to identify the values of parameters. The actual values of the parameters are listed in Appendix B. Symbols referenced in Appendix B are written in **Arial bold** to distinguish them in the text.

1.9 Abbreviations

The abbreviations and acronyms used in this document are defined in Table 3.

Table 3: Abbreviations

Abbreviation	Description
AM	Amplitude Modulation
bFOD	background Foreign Object Detection
BOM	Bill of Materials
DEP	Data Exchange Protocol
DUT	Device Under Test
DVR	Delta $\mathbf{V_{OV}}$ Ratio
FO	Foreign Object
FOD	Foreign Object Detection
iFOD	initial Foreign Object Detection
JiFOD	Joint initial Foreign Object Detection
NDEF	NFC Data Exchange Format
NFC LE	NFC Link Establishment
NVM	Non-Volatile Memory
PCB	Printed Circuit Board
RF	Radio Frequency
VNA	Vector Network Analyzer
WCC	Wireless Charging Control
WCCA	Wireless Charging Control Activation
WLC	Wireless Charging
WLC_CAP	Wireless Charging Capability
WLC-L	Wireless Charging Listener device
WLC-P	Wireless Charging Poller device
WLC OV	Wireless Charging Operating Volume
WLCL_CTL	Wireless Charging Listen Control
WLCP_INFO	Wireless Charging Poll Information
WLCS	Wireless Charging System
WPT	Wireless Power Transfer

1.10 Glossary

Activity

A process within an NFC Forum Device.

Background FOD

Mechanism to provide Foreign Object Detection (FOD) of Foreign Objects (FOs) that are inserted into the Wireless Charging Operating Volume (WLC OV) during Wireless Power Transfer (WPT).

Command

An instruction transmitted from one device to another device in order to move the other device through a state machine.

Foreign Object

Any metallic object or tag, excluding Wireless Charging Listeners (WLC-Ls), that can be heated or be damaged when exposed to a Radio Frequency (RF) field in which the field strength exceeds $\mathbf{V_{OV,RX,MAX}}$. For example: a contactless tag or a metallic object such as coin or paperclip.

Initial FOD

Initial Foreign Object Detection (iFOD) is used before entering Wireless Power Transfer (WPT) to detect foreign objects (FOs) that cannot be detected by the NFC Polling FOD.

Joint Initial FOD

Joint initial Foreign Object Detection (JiFOD) requires both a Wireless Charging Poller device (WLC-P) and a Wireless Charging Listener device (WLC-L) to agree on a specific initial Foreign Object Detection (iFOD) method. It also implies an agreed time interval prior to the Wireless Power Transfer (WPT) in which the JiFOD is performed.

Listen Mode

The mode of an NFC Forum Device where it receives Commands and sends Responses.

NDEF Message

The basic message construct defined by the NFC Data Exchange Format Specification. An NDEF Message contains one or more NDEF Records.

NDEF Payload

The application data carried in an NDEF Record.

NDEF Record

An NDEF Record contains a payload described by a type, a length, and an optional identifier.

Negotiated WLC Control Protocol

A variant of the Wireless Charging (WLC) Control Protocol which uses the Wireless Charging Capability (WLC_CAP) message to inform the Wireless Charging Poller device (WLC-P) about the Wireless Charging Listener device (WLC-L) capabilities and uses the WLCP_INFO and WLCL_CTL messages to negotiate the parameters for the next Wireless Power Transfer (WPT) phase.

NFC-DEP Target

Role of an NFC Forum Device, reached when the Listener has gone through a number of Activities. In this mode the NFC Forum Device communicates using the NFC-DEP Protocol.

NFC Forum Device

A device that supports at least one communication protocol for at least one communication mode defined by the NFC Forum specifications. Currently the following NFC Forum Devices are defined: NFC Universal Device, NFC Mobile Device, NFC Tag Device and NFC Reader Device.

NFC Forum Tag

A contactless tag or (smart) card supporting NDEF.

NFC Link Establishment

Process to establish an NFC communication link.

NFC Mobile Device

An NFC Forum Device that supports the Reader/Writer Mode and Card Emulator.

NFC Polling FOD

Mechanism to detect Foreign Objects (FOs) during NFC Link Establishment.

NFC Reader Device

An NFC Forum Device that supports the following Modus Operandi: Reader/Writer. It can also support Initiator.

NFC Tag Device

An NFC Forum Device that supports at least one communication protocol for Card Emulator and NDEF.

NFC Universal Device

An NFC Forum Device that supports the following Modus Operandi: Initiator, Target, and Reader/Writer. It can also support Card Emulator.

NFC Wireless Charging Device

An NFC Forum Device that supports either the Modus Operandi for the Reader/Writer or a Tag and additionally supports the wireless charging technology defined by this specification.

No Remote Field Sensed

A condition that indicates the absence of the Remote Field for a certain time.

Operating Field

The radio frequency field created by the NFC Forum Device or Reference Wireless Charging Poller (WLC-P).

Operating Field Off

A condition of the Operating Field when the field strength is below a well-defined threshold.

Operating Field On

A condition of the Operating Field when the field strength is equal to or higher than a well-defined threshold for a minimum period of time.

Poll Mode

The mode of an NFC Forum Device in which it sends Commands and receives Responses.

Poller

An NFC Forum Device in Poll Mode.

Reader/Writer

Role of a Poller when it has gone through a number of Activities. In this mode the Poller communicates with Type 2 Tags, Type 3 Tags, Type 4 Tags or Type 5 Tags.

Reference WLC-L

The part of the NFC Forum Reference Equipment employed to evaluate the radio frequency (RF), power and digital characteristics of Wireless Charging Pollers (WLC-Ps).

Reference WLC-P

The part of the NFC Forum Reference Equipment employed to evaluate the radio frequency (RF), power and digital characteristics of Wireless Charging Listeners (WLC-Ls).

Remote Field

The Radio Frequency (RF) field generated by a remote device and sensed by the NFC Forum Device.

Remote Field Off

A condition in which the Remote Field is below a certain threshold defined in [ANALOG].

Remote Field On

A condition of the Remote Field being stable and strong enough to put the NFC Forum Device in a state that it can operate in Passive Communication Mode. Defined in [ANALOG].

Response

Information sent from one device to another device upon receipt of a Command. The information received by the other device allows it to continue the data exchange.

Static WLC Control Protocol

A variant of the WLC Control Protocol in which only the Wireless Charging Capability (WLC_CAP) message is used.

Wireless Charging Control

A process, performed using NFC communication methods as defined by the NFC Forum, to control the wireless power delivery between a Wireless Charging Poller (WLC-P) and a Wireless Charging Listener (WLC-L).

Wireless Charging Listener

An NFC Forum Device having NFC Wireless Charging capability, which allows such device to receive power from a Wireless Charging Poller (WLC-P).

Wireless Charging Operating Volume

The three dimensional space, as defined by the NFC Forum, in which a Wireless Charging Poller can communicate with and charge a Wireless Charging Listener.

Wireless Charging Poller

An NFC Forum Device having NFC Wireless Charging capability, which allows such device to perform Wireless Power Transfer (WPT) to a Wireless Charging Listener (WLC-L).

Wireless Charging Technology

General term referring to any wireless charging technology existing in the market today or in the future, including the NFC Wireless Charging.

Wireless Power Transfer

A process during which power is wirelessly transferred from a Wireless Charging Poller (WLC-P) to a Wireless Charging Listener (WLC-L).

WLC Control Protocol

The protocol used to control the Wireless Power Transfer (WPT) between a Wireless Charging Poller (WLC-P) and a Wireless Charging Listener (WLC-L). The Wireless Charging Control Protocol exists in two variants: the Static WLC Control Protocol and the Negotiated WLC Control Protocol.

WLC Protocol Error

Wireless Charging (WLC) Semantic Error: A correct WLC record is received when it is not expected.

WLC Syntax Error: An NFC Data Exchange Format (NDEF) record is received with invalid content.

WPT Stop

An impedance change pattern that is sent in order to stop the Wireless Power Transfer (WPT) phase.