

# SLOVENSKI STANDARD oSIST prEN IEC 63563-6:2024

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Različica specifikacije Qi 2.0 - 6. del: Komunikacijski protokol (Hitri postopek)

Qi Specification version 2.0 - Part 6: Communications protocol (Fast track)

## iTeh Standards

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	omrežji za prenos in	power transmission and
	distribucijo električne energije	distribution networks
	•	Other audio, video and audiovisual equipment
35.200	Vmesniška in povezovalna	Interface and interconnection

equipment

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		Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.		
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## **Qi Specification**

## **Communications Protocol**

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Version 2.0

**April 2023** 

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	v2.0 Final Draft	April 2023	Initial release of the v2.0 Qi Specification.	

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## 1 General

The Wireless Power Consortium (WPC) is a worldwide organization that aims to develop and promote global standards for wireless power transfer in various application areas. A first application area comprises flat-surface devices such as mobile phones and chargers in the Baseline Power Profile (up to 5 W) and Extended Power Profile (above 5 W).

## 1.1 Structure of the Qi Specification

#### **General documents**

- Introduction
- Glossary, Acronyms, and Symbols

#### **System description documents**

- Mechanical, Thermal, and User Interface
- Power Delivery
- Communications Physical Layer Standards
- Communications Protocol
- Foreign Object Detection
- NFC Tag Protection
- Authentication Protocol

#### Reference design documents

- Power Transmitter Reference Designs
- Power Receiver Design Examples

#### **Compliance testing documents**

- Power Transmitter Test Tools
- Power Receiver Test Tools
- Power Transmitter Compliance Tests
- Power Receiver Compliance Tests

**NOTE:** The compliance testing documents are restricted and require signing in to the WPC members' website. All other specification documents are available for download on both the WPC public website and the WPC website for members.

## 1.2 Scope

The *Qi Specification, Communications Protocol* (this document) defines the messaging between a Power Transmitter and a Power Receiver. The primary purpose of this messaging is to set up and control the power transfer. As a secondary purpose, it provides a transport mechanism for higher-level applications such as Authentication. The communications protocol comprises both the required order and timing relations of successive messages.

## 1.3 Compliance

All provisions in the *Qi Specification* are mandatory, unless specifically indicated as recommended, optional, note, example, or informative. Verbal expression of provisions in this Specification follow the rules provided in ISO/IEC Directives, Part 2.

Table 1: Verbal forms for expressions of provisions

Provision	Verbal form	
requirement	"shall" or "shall not"	
recommendation	"should" or "should not"	ds
permission	"may" or "may not"	:4 - 1 1 ·
capability (1100)	"can" or "cannot"	iten.ai

## 1.4 References

publications can be downloaded from http://www.wirelesspowerconsortium.com. In addition, the *Qi Specification* references documents listed below. Documents marked here with an asterisk (\*) are restricted and require signing in to the WPC website for members.

- Product Registration Procedure Web page\*
- Qi Product Registration Manual, Logo Licensee/Manufacturer\*
- Oi Product Registration Manual, Authorized Test Lab\*
- Power Receiver Manufacturer Codes,\* Wireless Power Consortium
- The International System of Units (SI), Bureau International des Poids et Mesures
- · Verbal forms for expressions of provisions, International Electotechnical Commission

For regulatory information about product safety, emissions, energy efficiency, and use of the frequency spectrum, visit the regulatory environment page of the WPC members' website.

## 1.5 Conventions

#### 1.5.1 Notation of numbers

- Real numbers use the digits 0 to 9, a decimal point, and optionally an exponential part.
- Integer numbers in decimal notation use the digits 0 to 9.
- Integer numbers in hexadecimal notation use the hexadecimal digits 0 to 9 and A to F, and are prefixed by "0x" unless explicitly indicated otherwise.
- Single bit values use the words ZERO and ONE.

#### 1.5.2 Tolerances

Unless indicated otherwise, all numeric values in the *Qi Specification* are exactly as specified and do not have any implied tolerance.

#### 1.5.3 Fields in a data packet

A numeric value stored in a field of a data packet uses a big-endian format. Bits that are more significant are stored at a lower byte offset than bits that are less significant. Table 2 and Figure 1 provide examples of the interpretation of such fields.

Table 2: Example of fields in a data packet

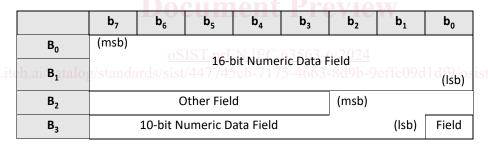
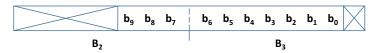


Figure 1. Examples of fields in a data packet

16-bit Numeric Data Field



10-bit Numeric Data Field



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### 1.5.4 Notation of text strings

Text strings consist of a sequence of printable ASCII characters (i.e. in the range of 0x20 to 0x7E) enclosed in double quotes ("). Text strings are stored in fields of data structures with the first character of the string at the lowest byte offset, and are padded with ASCII NUL (0x00) characters to the end of the field where necessary.

**EXAMPLE:** The text string "WPC" is stored in a six-byte fields as the sequence of characters 'W', 'P', 'C', NUL, NUL, and NUL. The text string "M:4D3A" is stored in a six-byte field as the sequence 'M', ':', '4', 'D', '3', and 'A'.

#### 1.5.5 Short-hand notation for data packets

In many instances, the *Qi Specification* refers to a data packet using the following shorthand notation:

<MNEMONIC>/<modifier>

In this notation, <MNEMONIC> refers to the data packet's mnemonic defined in the *Qi Specification, Communications Protocol*, and <modifier> refers to a particular value in a field of the data packet. The definitions of the data packets in the *Qi Specification, Communications Protocol*, list the meanings of the modifiers.

For example, EPT/cc refers to an End Power Transfer data packet having its End Power Transfer code field set to 0x01.

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### 1.6 Power Profiles

A Power Profile determines the level of compatibility between a Power Transmitter and a Power Receiver. Table 3 defines the available Power Profiles.

- *BPP PTx*: A Baseline Power Profile Power Transmitter.
- *EPP5 PTx*: An Extended Power Profile Power Transmitter having a restricted power transfer capability, i.e.  $P_{\rm L}^{\rm (pot)} = 5$  W.
- *EPP PTx*: An Extended Power Profile Power Transmitter.
- BPP PRx: A Baseline Power Profile Power Receiver.
- *EPP PRx*: An Extended Power Profile Power Receiver.

Table 3: Capabilities included in a Power Profile

Feature	ВРР РТх	EPP5 PTx	ЕРР РТх	BPP PRx	EPP PRx
Ax or Bx design	Yes	Yes	No	N/A	N/A
MP-Ax or MP-Bx design	No	No	Yes	N/A	N/A
Baseline Protocol	Yes	Yes	Yes	Yes	Yes
Extended Protocol	No	Yes	Yes	No	Yes
Authentication	N/A	Optional	Yes	N/A	Optional
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## 2 Overview

When a user places a Power Receiver within the Operating Volume of a Power Transmitter, the two start to communicate with the aim to configure and control the power transfer. The Power Signal provides the carrier for all communications. The *Qi Specification, Communications Physical Layer* defines the low-level formats of data bits, data bytes, and data packets. The *Qi Specification, Communications Protocol* (this document) defines the payloads of the data packets and their use in the power control protocols.

## 2.1 Protocol phases

The Qi Specification defines two communications protocols.

- Baseline Protocol—the original protocol introduced in version 1.0 of the Qi Power Class 0 Specification, which uses Power Receiver to Power Transmitter communications only.
- Extended Protocol—added in version 1.2 of the Qi Power Class 0 Specification to support bidirectional communications and enhanced Foreign Object Detection (FOD) features. Version 1.3 of the Qi Specification adds data transport stream functionality and authentication options.

As shown in Figure 2, the communications protocol comprises several phases. The negotiation phase is not present in the Baseline Protocol.



Figure 2. Protocol phases

Ping phase. The Power Transmitter tries to establish communications with a Power Receiver.

Before doing so, it typically performs measurements to determine if there are objects such as bankcards, coins or other metals, which can damage or heat up during the power transfer.

These measurements proceed without waking up the Power Receiver. See the *Qi Specification*,

Power Delivery, for restrictions on such measurements.

**NOTE:** The Power Transmitter typically postpones a conclusion whether detected metals are Foreign Objects or Friendly Metals to the negotiation phase, after obtaining design information from the Power Receiver. See the *Qi Specification, Foreign Object Detection,* for details about recommended methods.

Configuration phase. The Power Receiver sends basic identification and configuration data to
the Power Transmitter. Both sides use this information to create a baseline Power Transfer
Contract. Moreover, the Power Transmitter and Power Receiver decide whether to continue
with the Baseline Protocol or the Extended Protocol.

**NOTE:** A Power Receiver can only make use of features such as enhanced FOD, data transport streams, and authentication if it implements the Extended Protocol.

- Negotiation phase. This phase is not present in the Baseline Protocol. The Power Transmitter
  and Power Receiver establish an extended Power Transfer Contract containing additional
  settings and limits. The Power Receiver also provides design information to the Power
  Transmitter, which the latter can use to complete FOD before switching to the power transfer
  phase. See the *Qi Specification, Foreign Object Detection,* for details about this information.
- Power transfer phase. This is the phase in which the power transfer to the Power Receiver's
  Load occurs. In the Extended Protocol, the Power Transmitter and Power Receiver perform a
  system calibration at the start of this phase. See the *Qi Specification, Foreign Object Detection,*for details about calibration. Occasional interruptions of this phase may occur to renegotiate
  an element of the Power Transfer Contract. However, the power transfer continues during
  such renegotiations.

Table 4 summarizes the main features of the two protocol variants.

Table 4: Comparison of the Baseline Protocol and the Extended Protocol

Feature	Baseline Protocol	Extended Protocol
Power Transmitter design	Type Ax and type Bx designs only	All designs
Power Receiver to Power Transmitter Communications	Load modulation at a fixed 2 kHz clock	Load modulation at a fixed 2 kHz clock
Power Transmitter to Power Receiver Communications	N/A://standard	Frequency shift keying at a frequency dependent clock of $f_{\rm op}/512$
Operating phases	Ping, configuration, and power transfer	Ping, configuration, negotiation, and power transfer
Power level calibration	N/A SIST prEN IEC 63563-6	At the start of the power transfer phase
Authentication	N/A	Using data transport streams in the power transfer phase

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