

# PUBLICLY AVAILABLE SPECIFICATION PRE-STANDARD



The Qi wireless power transfer system – Power class 0 specification –  
Part 2: Reference Designs Version 1.1.2  
(standards.iteh.ai)

[IEC PAS 63095-2:2017](#)

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# PUBLICLY AVAILABLE SPECIFICATION

## PRE-STANDARD



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# Contents

<b>1</b>	<b>General.....</b>	<b>6</b>
1.1	Introduction .....	6
1.2	Scope.....	6
1.2.1	Current Specification structure (introduced in version 1.2.1).....	6
1.2.2	Earlier Specification structure (version 1.2.0 and below) .....	7
1.3	Main features.....	7
1.4	Conformance and references .....	8
1.4.1	Conformance .....	8
1.4.2	References.....	8
1.5	Definitions.....	9
1.6	Acronyms .....	12
1.7	Symbols.....	14
1.8	Conventions .....	15
1.8.1	Cross references .....	15
1.8.2	Informative text.....	15
1.8.3	Terms in capitals.....	15
1.8.4	Units of physical quantities .....	15
1.8.5	Decimal separator .....	15
1.8.6	Notation of numbers .....	16
1.8.7	Bit ordering in a byte.....	16
1.8.8	Byte numbering .....	16
1.8.9	Multiple-bit fields .....	17
1.9	Operators .....	17
1.9.1	Exclusive-OR .....	17
1.9.2	Concatenation .....	17
1.10	Measurement equipment.....	17
<b>2</b>	<b>Power Transmitter reference designs.....</b>	<b>18</b>
2.1	Introduction .....	18
2.2	Baseline Power Profile designs that activate a single Primary Coil at a time .....	18
2.2.1	Power Transmitter design A1 .....	19
2.2.2	Power Transmitter design A2.....	20
2.2.3	Power Transmitter design A3.....	25
2.2.4	Power Transmitter design A4.....	29

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2.2.5	Power Transmitter design A5 .....	35
2.2.6	Power Transmitter design A6 .....	36
2.2.7	Power Transmitter design A7 .....	43
2.2.8	Power Transmitter design A8 .....	47
2.2.9	Power Transmitter design A9 .....	52
2.2.10	Power Transmitter design A10 .....	53
2.2.11	Power Transmitter design A11 .....	60
2.2.12	Power Transmitter design A12 .....	66
2.2.13	Power Transmitter design A13 .....	72
2.2.14	Power Transmitter design A14 .....	78
2.2.15	Power Transmitter design A15 .....	84
2.2.16	Power Transmitter design A16 .....	89
2.2.17	Power Transmitter design A17 .....	95
2.2.18	Power Transmitter design A18 .....	101
2.2.19	Power Transmitter design A19 .....	106
2.2.20	Power Transmitter design A20 .....	112
2.2.21	Power Transmitter design A21 .....	117
2.2.22	Power Transmitter design A22 .....	124
2.2.23	Power Transmitter design A23 .....	130
2.2.24	Power Transmitter design A24 .....	136
2.2.25	Power Transmitter design A25 .....	142
2.2.26	Power Transmitter design A26 .....	148
2.2.27	Power Transmitter design A27 .....	154
2.2.28	Power Transmitter design A28 .....	160
2.2.29	Power Transmitter design A29 .....	167
2.2.30	Power Transmitter design A30 .....	172
2.2.31	Power Transmitter design A31 .....	177
2.2.32	Power Transmitter design A32 .....	182
2.2.33	Power Transmitter design A33 .....	190
2.2.34	Power Transmitter design A34 .....	199
2.3	Baseline Power Profile designs that activate multiple Primary Coils simultaneously .....	205
2.3.1	Power Transmitter design B1 .....	205
2.3.2	Power Transmitter design B2 .....	213
2.3.3	Power Transmitter design B3 .....	218
2.3.4	Power Transmitter design B4 .....	225
2.3.5	Power Transmitter design B5 .....	233
2.3.6	Power Transmitter design B6 .....	242
2.3.7	Power Transmitter design B7 .....	250

2.4	Extended Power Profile Power Transmitter designs .....	257
2.4.1	Power Transmitter design MP-A1 .....	257
2.4.2	Power Transmitter design MP-A2 .....	264
2.4.3	Power Transmitter design MP-A3 .....	272
2.4.4	Power Transmitter design MP-A4 .....	278
2.4.5	Power Transmitter design MP-A5 .....	286
<b>3</b>	<b>Power Receiver reference designs (Informative) .....</b>	<b>291</b>
3.1	Power Receiver example 1 (5W).....	291
3.1.1	Mechanical details.....	291
3.1.2	Electrical details.....	293
3.2	Power Receiver example 2 (5W).....	295
3.2.1	Mechanical details.....	295
3.2.2	Electrical details.....	297
3.3	Power Receiver example 3 (8 W).....	298
3.3.1	Mechanical details.....	298
3.3.2	Electrical details.....	300
3.4	Power Receiver example 4 (15 W).....	301
3.4.1	Mechanical details.....	301
3.4.2	Electrical details.....	303
3.5	Power Receiver example 5 (12 W).....	305
3.5.1	Mechanical details.....	305
3.5.2	Electrical details.....	306
<b>Annex A</b>	<b>History of Changes .....</b>	<b>308</b>

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IEC PAS 63095-2:2017

<https://standards.iteh.ai/catalog/standards/sist/c2c7cb37-d660-4961-b87e->

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**THE QI WIRELESS POWER TRANSFER SYSTEM –  
POWER CLASS 0 SPECIFICATION –**

**Part 2: Reference Designs Version.1.1.2**

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This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
100/2827/PAS	100/2862/RVDPAS

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# 1 General

## 1.1 Introduction

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 is wireless charging of low and medium power devices, such as mobile phones and tablet computers. The Wireless Power Consortium maintains the Qi logo for this application area.

## 1.2 Scope

This document, *Part 4: Reference Designs*, comprises reference designs for Power Class 0 Base Stations and Mobile Devices. Power Class 0 is the WPC designation for flat-surface devices, such as chargers, mobile phones, tablets, cameras, and battery packs, in the Baseline Power Profile ( $\leq 5$  W) and Extended Power Profile ( $\leq 15$  W).

### 1.2.1 Current Specification structure (introduced in version 1.2.1) (standards.iteh.ai)

The Qi Wireless Power Transfer System for Power Class 0 Specification consists of the following documents.

- *Parts 1 and 2: Interface Definitions* <https://standards.iteh.ai/catalog/standards/sist/c2c7cb37-d660-4961-b87e-4dbaa69616/iec-pas-63095-2-2017>
  - *Part 1: Primary Interface Definition*
  - *Part 2: Secondary Interface Definition*
- *Part 3: Compliance Testing*
- ***Part 4: Reference Designs*** (this document)

NOTE WPC publications prior to version 1.2.1 were structured differently, and are listed in Section 1.2.2 below. In particular, the Low Power and Medium Power publications were divided into separate System Description documents. Beginning with version 1.2.1, the Low Power and Medium Power System Descriptions have been merged into the Specification structure shown in this section. Additionally, the terms *Low Power* and *Medium Power* have been replaced in the current Specification by the terms *Baseline Power Profile* and *Extended Power Profile* respectively.

## 1.2.2 Earlier Specification structure (version 1.2.0 and below)

Before release 1.2.1, the Wireless Power Transfer specification comprised the following documents.

- System Description, Wireless Power Transfer, Volume I: Low Power, Part 1: Interface Definition.
- System Description, Wireless Power Transfer, Volume I: Low Power, Part 2: Performance Requirements.
- System Description, Wireless Power Transfer, Volume I: Low Power, Part 3: Compliance Testing.
- System Description, Qi Wireless Power Transfer, Volume II: Medium Power.

## 1.3 Main features

- A method of contactless power transfer from a Base Station to a Mobile Device that is based on near field magnetic induction between coils.
- A Baseline Power Profile supporting transfer of up to about 5 W and an Extended Power Profile supporting transfer of up to about 15 W of power using an appropriate Secondary Coil (having a typical outer dimension of around 40 mm).
- Operation at frequencies in the 87...205 kHz range.
- Support for two methods of placing the Mobile Device on the surface of the Base Station:
  - Guided Positioning helps a user to properly place the Mobile Device on the surface of a Base Station that provides power through a single or a few fixed locations of that surface.
  - Free Positioning enables arbitrary placement of the Mobile Device on the surface of a Base Station that can provide power through any location of that surface.
- A simple communications protocol enabling the Mobile Device to take full control of the power transfer.
- Considerable design flexibility for integration of the system into a Mobile Device.
- Very low stand-by power achievable (implementation dependent).

## 1.4 Conformance and references

### 1.4.1 Conformance

All provisions in The Qi Wireless Power Transfer System, Power Class 0 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 Annex H of ISO/IEC Directives, Part 2. For clarity, the word “**shall**” indicates a requirement that is to be followed strictly in order to conform to The Qi Wireless Power Transfer System, Power Class 0 Specification, and from which no deviation is permitted. The word “**should**” indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that in the negative form a certain possibility or course of action is deprecated but not prohibited. The word “**may**” indicates a course of action permissible within the limits of The Qi Wireless Power Transfer System, Power Class 0 Specification. The word “**can**” indicates a possibility or capability, whether material, physical, or causal.

### 1.4.2 References

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For undated references, the most recently published Specification applies. The most recent WPC publications can be downloaded from <http://www.wirelesspowerconsortium.com>. (See Section 1.2.1 for a list of documents included in The Qi Wireless Power Transfer System for Power Class 0 Specification.) In addition, the following documents are referenced within The Qi Wireless Power Transfer System for Power Class 0 Specification.

- Product Registration Procedure Web page (WPC Web site for members, Testing & Registration section)
- Qi Product Registration Manual, Logo Licensee/Manufacturer
- Qi 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

## 1.5 Definitions

Active Area	The part of the Interface Surface of a Base Station or Mobile Device through which a sufficiently high magnetic flux penetrates when the Base Station is providing power to the Mobile Device.
Base Station	A device that is able to provide near field inductive power as specified in The Qi Wireless Power Transfer System, Power Class 0 Specification. A Base Station carries a logo to visually indicate to a user that the Base Station complies with The Qi Wireless Power Transfer System, Power Class 0 Specification.
Baseline Power Profile	The minimum set of features applying to Power Transmitters and Power Receivers that can transfer no more than around 5 W of power.
Communications and Control Unit	<p>The functional part of a Power Transmitter or Power Receiver that controls the power transfer.</p> <p style="text-align: center;"><b>ITeh STANDARD PREVIEW</b> (standards.iteh.ai)</p> <p>NOTE With regard to implementation, the Communications and Control Unit may be distributed over multiple subsystems of the Base Station or Mobile Device.</p>
Control Point	<p><a href="https://standards.iteh.ai/catalog/standards/sist/c2c7cb37-d660-4961-b87e-cc4dbaa09616/iec-pas-63095-2-2017">https://standards.iteh.ai/catalog/standards/sist/c2c7cb37-d660-4961-b87e-cc4dbaa09616/iec-pas-63095-2-2017</a></p> <p>The combination of voltage and current provided at the output of the Power Receiver, and other parameters that are specific to a particular Power Receiver implementation.</p>
Detection Unit	The functional part of a Power Transmitter that detects the presence of a Power Receiver on the Interface Surface.
Digital Ping	The application of a Power Signal in order to detect and identify a Power Receiver.
Extended Power Profile	The minimum set of features applying to Power Transmitters and Power Receivers that can transfer power above 5 W.
Free Positioning	A method of positioning a Mobile Device on the Interface Surface of a Base Station that does not require the user to align the Active Area of the Mobile Device to the Active Area of the Base Station.
Foreign Object	Any object that is positioned on the Interface Surface of a Base Station, but is not part of a Mobile Device.

**Foreign Object Detection**

A process that a Power Transmitter or Power Receiver executes in order to determine if a Foreign Object is present on the Interface Surface.

**Friendly Metal**

A part of a Base Station or a Mobile Device in which a Power Transmitter's magnetic field can generate eddy currents.

**Guaranteed Power**

The amount of output power of an appropriate reference Power Receiver that the Power Transmitter ensures is available at any time during the power transfer phase. For Power Transmitters that comply with the Baseline Power Profile, the reference is TPR#1A, which is defined in *Part 3: Compliance Testing*. For Power Transmitters that comply with the Extended Power Profile, the reference is TPR#MP1B, which is also defined in *Part 3: Compliance Testing*.

**Guided Positioning**

A method of positioning a Mobile Device on the Interface Surface of a Base Station that provides the user with feedback to properly align the Active Area of the Mobile Device to the Active Area of the Base Station.

**Interface Surface**

The flat part of the surface of a Base Station that is closest to the Primary Coil(s), or the flat part of the surface of the Mobile Device that is closest to the Secondary Coil.

**Maximum Power**

The maximum amount of power that a Power Receiver expects to provide at its output throughout the power transfer phase. The Maximum Power serves as a scaling factor for the Received Power Values that a Power Receiver reports in its Received Power Packets.

**Mobile Device**

A device that is able to consume near field inductive power as specified in The Qi Wireless Power Transfer System, Power Class 0 Specification. A Mobile Device carries a logo to visually indicate to a user that the Mobile Device complies with the Specification.

**Operating Frequency**

The oscillation frequency of the Power Signal.

**Operating Point**

The combination of the frequency, duty cycle, and amplitude of the voltage that is applied to the Primary Cell.

**Packet**

A data structure for communicating a message from a Power Receiver to a Power Transmitter or vice versa. A Packet consists of a preamble, a header byte, a message, and a checksum. A Packet is named after the kind of message that it contains.

Potential Power	The amount of output power by an appropriate reference Power Receiver that the Power Transmitter can make available during the power transfer phase. For Power Transmitters that comply with the Baseline Power Profile, the reference is TPR#1A, which is defined in <i>Part 3: Compliance Testing</i> . For Power Transmitters that comply with the Extended Power Profile, the reference is TPR#MP1B, which is also defined in <i>Part 3: Compliance Testing</i> .
Power Conversion Unit	The functional part of a Power Transmitter that converts electrical energy to a Power Signal.
Power Factor	The ratio of the active power consumed and the apparent power drawn. The active power is expressed in watts. The apparent power typically is expressed in volt-amperes (VA).
Power Pick-up Unit	The functional part of a Power Receiver that converts a Power Signal to electrical energy.
Power Receiver	The subsystem of a Mobile Device that acquires near field inductive power and controls its availability at its output, as defined in The Qi Wireless Power Transfer System, Power Class 0 Specification. For this purpose, the Power Receiver communicates its power requirements to the Power Transmitter. <a href="https://standards.iteh.ai/catalog/standards/sist/c2c7cb37-d660-4961-b87e-c0b8c661c11e-163095-23817">https://standards.iteh.ai/catalog/standards/sist/c2c7cb37-d660-4961-b87e-c0b8c661c11e-163095-23817</a>
Power Signal	The oscillating magnetic flux that is enclosed by a Primary Cell and possibly a Secondary Coil.
Power Transfer Contract	A set of boundary conditions on the parameters that characterize the power transfer from a Power Transmitter to a Power Receiver. Violation of any of these boundary conditions causes the power transfer to abort.
Power Transmitter	The subsystem of a Base Station that generates near field inductive power and controls its transfer to a Power Receiver, as defined in The Qi Wireless Power Transfer System, Power Class 0 Specification.
Primary Cell	A single Primary Coil or a combination of Primary Coils that are used to provide a sufficiently high magnetic flux through the Active Area.
Primary Coil	A component of a Power Transmitter that converts electric current to magnetic flux.

Received Power	The total amount of power dissipated inside a Mobile Device, due to the magnetic field generated by a Power Transmitter. The Received Power includes the power that the Power Receiver makes available at its output for use by the Mobile Device, any power that the Power Receiver uses for its own purposes, as well as any power that is lost within the Mobile Device.
Reference Quality Factor	The quality-factor of Test Power Transmitter #MP1's Primary Coil at an Operating Frequency of 100 kHz, with a Power Receiver positioned on the Interface Surface and no Foreign Object nearby.
Response	A sequence of eight consecutive bi-phase modulated bits transmitted by a Power Transmitter in response to a request from a Power Receiver.
Secondary Coil	The component of a Power Receiver that converts magnetic flux to electromotive force.
Shielding	A component in the Power Transmitter that restricts magnetic fields to the appropriate parts of the Base Station, or a component in the Power Receiver that restricts magnetic fields to the appropriate parts of the Mobile Device.
Specification	The set of documents, Parts 1 through 4, that comprise The Qi Wireless Power Transfer System, Power Class 0 Specification (see Section 1.2.1).
Transmitted Power	The total amount of power dissipated outside the Interface Surface of a Base Station, due to the magnetic field generated by the Power Transmitter.
WPID	A 48-bit number that uniquely identifies a Qi-compliant device.

## 1.6 Acronyms

AC	Alternating Current
ACK	Acknowledge
AWG	American Wire Gauge
BSUT	Base Station Under Test
CEP	Control Error Packet
DC	Direct Current
DCR	Direct Current Resistance