

# INTERNATIONAL STANDARD

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**Qi Specification version 2.0 –  
Part 2: Glossary**

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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.

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# Qi Specification

## *Glossary*

### *Definitions, Acronyms, and Symbols*

**Version 2.0**

**April 2023**

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## RELEASE HISTORY

Specification Version	Release Date	Description
2.0	April 2023	Initial release of the v2.0 Qi Specification.

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# Table of Contents

<b>1</b>	<b>Definitions.....</b>	<b>2</b>
<b>2</b>	<b>Acronyms.....</b>	<b>7</b>
<b>3</b>	<b>Symbols.....</b>	<b>9</b>

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# 1 Definitions

<b>Active Area:</b>	The part of the Interface Surface of a Power Transmitter Product or Power Receiver Product through which a sufficiently high magnetic flux penetrates when the Power Transmitter Product is providing power to the Power Receiver Product.
<b>Air Gap:</b>	The distance between the top surface of a Power Transmitter Product and the bottom surface of a Power Receiver Product. <b>NOTE:</b> The Air Gap also comprises any additional spacing between a Power Transmitter Product and a Power Receiver Product introduced by accessories added by a user to either product.
<b>Analog Ping:</b>	A short-duration Power Signal applied by a Power Transmitter with the purpose of detecting the presence of an object, without waking up a Power Receiver.
<b>Authentication:</b>	A tamper-resistant process of a Power Receiver verifying the identity of a Power Transmitter.
<b>Baseline Power Profile:</b>	A supported Power Profile.
<b>Baseline Protocol:</b>	The communications protocol introduced in version 1.0 of the <i>Qi Specification</i> .
<b>Certificate:</b>	A digital form of identification that provides information about a Certificate Authority, a manufacturer, or a Power Transmitter Product Unit, and certifies ownership of a public key.
<b>Certificate Authority:</b>	An organization that issues Certificates.
<b>Certificate Chain:</b>	A series of two or more Certificates where each Certificate is signed by the owner of the preceding Certificate in the chain.
<b>Communications and Control Unit:</b>	The functional part of a Power Transmitter or Power Receiver that controls the power transfer.
<b>Control Point:</b>	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.
<b>Data Stream Initiator:</b>	A Power Transmitter or Power Receiver that can open a data transport stream.
<b>Data Stream Responder:</b>	A Power Transmitter or Power Receiver that can accept a data transport stream.
<b>Detection Unit:</b>	The functional part of a Power Transmitter that detects the presence of a Power Receiver on the Interface Surface.
<b>Digital Ping:</b>	A Power Signal applied by a Power Transmitter with the purpose to wake up a Power Receiver.

**Evaluation Assurance Level:**

A numerical rating describing the depth and rigor of a security evaluation.

**Extended Protocol:** The communications protocol introduced in version 1.2 and enhanced in later versions of the *Qi Specification*.

**Extended Power Profile:** A supported Power Profile.

**Foreign Object:** An object that is neither part of a Power Transmitter Product nor of a Power Receiver Product and that can generate heat when exposed to a Power Signal.

**Foreign Object Detection:**

A process used by a Power Transmitter and Power Receiver to determine whether a Foreign Object is present in the Operating Volume and can generate heat beyond safe limits.

**Friendly Metal:** An integral part of a Power Receiver Product or a Power Transmitter Product that can unintentionally generate heat when exposed to a Power Signal.

**Guaranteed Load Power:**

A Load Power level agreed between the Power Receiver and the Power Transmitter.

**Interface Surface:** The flat part of the surface of a Power Transmitter Product that is closest to the Primary Coil(s).

**Intermediate Certificate:**

A Certificate that is positioned in a Certificate Chain between the Root Certificate and the Leaf Certificate.

**Issuer:** A Certificate-providing entity such as the WPC CA or a Manufacturer CA.

**Leaf Certificate:** The last Certificate in a Certificate Chain.

**Load:** A subsystem that can draw power from a Power Receiver.

**Load Power:** The power dissipated in the Load.

**Manufacturer CA Certificate:**

A Certificate that describes a manufacturer. It is signed by the Certificate Authority and is used as an Intermediate Certificate.

**Manufacturer Code:** A 16-bit number that identifies the manufacturer of the Power Transmitter or Power Receiver. This number is also referred to as the Power Transmitter Manufacturer Code (PTMC) or the Power Receiver Manufacturer Code (PRMC).

**Nonce:** A number used only once in any given context of the Authentication protocol.

<b>Operating Point:</b>	The combination of the frequency, duty cycle, and amplitude of the voltage that is applied to the Primary Cell.
<b>Operating Volume:</b>	The set of Power Receiver spatial positions at which the Power Transmitter can sustain a power transfer. <b>NOTE:</b> The Operating Volume varies with the Power Receiver design as well as with the power level.
<b>Policy:</b>	A set of rules defining the behavior of a Power Receiver depending on the outcome of Authentication.
<b>Potential Load Power:</b>	The highest Guaranteed Load Power level the Power Transmitter can negotiate.
<b>Power Conversion Unit:</b>	The functional part of a Power Transmitter that converts electrical energy to a Power Signal.
<b>Power Pick-up Unit:</b>	The functional part of a Power Receiver that converts a Power Signal to electrical energy.
<b>Power Profile:</b>	A set of features that define a compliance level of a Power Transmitter or a Power Receiver. <b>NOTE:</b> The <i>General</i> Section of the books in the <i>Qi Specification</i> lists the defined Power Profiles.
<b>Power Receiver:</b>	A subsystem that can extract electric power from a Power Signal.
<b>Power Receiver Product:</b>	A device containing a Power Receiver.
<b>Power Signal:</b>	An alternating magnetic field.
<b>Power Transfer Contract:</b>	A collection of settings and limits governing a power transfer.
<b>Power Transmitter:</b>	A subsystem that can generate a Power Signal.
<b>Power Transmitter Product:</b>	A device containing one or more Power Transmitters.
<b>Power Transmitter Product Unit:</b>	A Power Transmitter Product with a unique identity.
<b>Primary Cell:</b>	A single Primary Coil or a combination of Primary Coils that are used to provide a sufficiently high magnetic flux through the Active Area.
<b>Primary Coil:</b>	A component of a Power Transmitter that converts electric current to magnetic flux.
<b>Product Unit Certificate:</b>	A Certificate that describes a Power Transmitter Product Unit. It only occurs as a Leaf Certificate.
<b>Received Power:</b>	The power from the Power Signal dissipated by any component that is an integral part of the Power Receiver Product.

**Reference Quality Factor:**

The lowest quality factor of a reference Power Transmitter's tank circuit, measured with a Power Receiver positioned in the reference Power Transmitter's Operating Volume at five reference positions.

**NOTE:** The Reference Quality Factor is a design property of the Power Receiver and applies with the Power Receiver switched off.

**Reference Resonance Frequency:**

The highest resonance frequency of a reference Power Transmitter's tank circuit, measured with a Power Receiver positioned in the reference Power Transmitter's Operating Volume at five reference positions.

**NOTE:** The Reference Resonance Frequency is a design property of the Power Receiver and applies with the Power Receiver switched off.

**Reserved bits:**

The unused parts of data packets. Set to ZERO by an originator; ignored by a recipient.

**Reserved values:**

The unused ranges of values associated with defined fields in data packets. Not to be used by an originator; can cause undefined behavior by a recipient.

**Response Pattern:**

A sequence of eight consecutive bi-phase modulated bits transmitted by a Power Transmitter in response to a request from a Power Receiver.

**Revocation:**

The act of removing the validity of a Certificate. Revocation is performed by the WPC CA.

**Revocation List:**

A list identifying Certificates that have been revoked. The format of Revocation Lists is outside the scope of this specification.

**Root Certificate:**

The first Certificate in a Certificate Chain. This Certificate is self-signed.

**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 Power Transmitter Product, or a component in the Power Receiver that restricts magnetic fields to the appropriate parts of the Power Receiver Product.

**Supply Power:**

The power dissipated from the supply.

**Test Power Transmitter:**

A Power Transmitter Product designed to analyze and check the operation of a Power Receiver Product's wireless power functionality.

**Test Power Receiver:**

A Power Receiver Product designed to analyze and check the operation of a Power Transmitter Product's wireless power functionality.

**To Be Signed Authentication Data:**

The data that is used to generate the signature for a response to an authentication challenge.

**To Be Signed Certificate:**

The data that is used to generate the signature for a Certificate.

**Transmitted Power:** The power from the Power Signal dissipated by any object that is not an integral part of the Power Transmitter Product.

**WPID:** A 48-bit number that uniquely identifies a Qi-compliant device.

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## 2 Acronyms

<b>AC</b>	Alternating Current
<b>AWG</b>	American Wire Gauge
<b>BPP</b>	Baseline Power Profile
<b>CA</b>	Certificate Authority
<b>CCU</b>	Communications and Control Unit
<b>DC</b>	Direct Current
<b>DCR</b>	Direct Current Resistance
<b>EAL</b>	Evaluation Assurance Level
<b>EM</b>	Electro Magnetic
<b>EMC</b>	Electro Magnetic Compatibility
<b>EMF</b>	Electro Magnetic Fields
<b>EPP</b>	Extended Power Profile
<b>ESR</b>	Equivalent Series Resistance
<b>FET</b>	Field Effect Transistor
<b>FOD</b>	Foreign Object Detection
<b>FSK</b>	Frequency-Shift Keying
<b>lsb</b>	Least Significant Bit
<b>msb</b>	Most Significant Bit
<b>N/A</b>	Not Applicable
<b>NFC</b>	Near Field Communication
<b>PICC</b>	Proximity Integrated Circuit Card
<b>PID</b>	Proportional Integral Differential
<b>PRNG</b>	Pseudo-random Number Generator
<b>PRx</b>	Power Receiver
<b>PTx</b>	Power Transmitter
<b>RFID</b>	Radio Frequency Identification
<b>rms</b>	Root Mean Square
<b>TBSAuth</b>	To Be Signed Authentication data
<b>TBSCertificate</b>	To Be Signed Certificate
<b>TPR</b>	Test Power Receiver
<b>TPT</b>	Test Power Transmitter

<b>UART</b>	Universal Asynchronous Receiver Transmitter
<b>USB</b>	Universal Serial Bus
<b>WPC</b>	Wireless Power Consortium
<b>WPID</b>	Wireless Power Identifier

**NOTE:** See the *Qi Specification, Communications Protocol*, for data packet mnemonics.

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### 3 Symbols

By convention, an uppercase symbol represents an average or root-mean-square quantity and a lowercase symbol represents a peak quantity. For example,  $P_t$  represents an average amount of Transmitted Power, and  $p_t$  represents a peak Transmitted Power.

The addition of a prime to a symbol serves as a reminder that the physical quantity represented by that symbol changes with the relative positions of a Power Transmitter, Power Receiver, and/or Foreign Object(s). The non-primed symbol represents the nominal (unchanged) value of the physical quantity. For example,  $L_t$  represents the inductance of a Power Transmitter when its Operating Volume is empty, and  $L'_t$  represents the inductance as modified by the presence of a Power Receiver and/or Foreign Object(s). The coupling coefficient  $k$  is an exception to this rule. Whereas the coupling coefficient changes with the relative position of the Power Transmitter and Power Receiver, for ease of notation, its symbol does not add a prime.

$b_x$	Bit $x$ ( $x = 0, \dots, 7$ )
$B_x$	Byte $x$ ( $x = 0, \dots, 7$ )
$C_r$ and $C'_r$	Capacitance of a Power Receiver's tank circuit; in nanofarads
$C_t$ and $C'_t$	Capacitance of a Power Transmitter's tank circuit; in nanofarads
$C_d$	Capacitance parallel to the Secondary Coil; in nanofarads
$C_m$	Capacitance in the impedance matching network; in nanofarads
$C_p$	Capacitance in series with the Primary Coil; in nanofarads
$C_s$	Capacitance in series with the Secondary Coil; in nanofarads
$d$	Duty cycle of the inverter in the Power Transmitter
$D_S$	Distance between a coil and its Shielding; in millimeters
$D_z$	Distance between a coil and the Interface Surface; in millimeters
$f_{\text{CLK}}$	Clock frequency of the Load modulation communications, in kilohertz
$f_{\text{mod}}$	Modulated operating frequency; in kilohertz
$f_d$	Resonant detection frequency; in kilohertz
$f_{\text{op}}$	Operating Frequency; in kilohertz
$f_r$ and $f'_r$	Resonance frequency of a Power Receiver's tank circuit; in kilohertz
$f_s$	Secondary resonance frequency; in kilohertz
$f_t$	The Power Transmitter's resonance frequency when the Interface Surface is empty (temperature independent).
$f'_t$	The Power Transmitter's resonance frequency when an object is present on the Interface Surface (temperature independent).

$f_t^{(cal)}$	The Power Transmitter's resonance frequency at factory calibration (guaranteed empty Interface Surface); should be equal to $f_t$ .
$f_t^{(ref)}$	Reference Resonance Frequency; in kilohertz
$h$	Air Gap; in millimeters
$i_r$ and $I_r$	Current in a Power Receiver's tank circuit; in amperes
$i_t$ and $I_t$	Current in a Power Transmitter's tank circuit; in amperes
$i_t^{(lim)}$ and $I_t^{(lim)}$	Current limit of a Power Receiver's tank circuit; in amperes
$I_m$	Primary Coil current modulation depth; in milliamperes
$I_o$	Power Receiver output current; in milliamperes
$I_p$	Primary Coil current; in milliamperes
$k$	Coupling factor; dimensionless
$L_m$	Inductance in the impedance matching network; in microhenries
$L_p$	Primary Coil self-inductance (Power Receiver Product away from Base Station); in microhenries
$L_r$ and $L'_r$	Inductance of a Power Receiver's tank circuit; in microhenries
$L_t$ and $L'_t$	Inductance of a Power Transmitter's tank circuit; in microhenries
$L_s$	Secondary Coil self-inductance (Power Receiver Product away from Base Station); in microhenries
$L'_s$	Secondary Coil self-inductance (Power Receiver Product on top of Base Station); in microhenries
$L_t$	The inductance of the Power Transmitter's coil when the Interface Surface is empty (temperature independent).
$L'_t$	The inductance of the Power Transmitter's coil when an object is present on the Interface Surface (temperature independent).
$L_t^{(cal)}$	The inductance of the Power Transmitter's coil at factory calibration (guaranteed empty Interface Surface); should be equal to $L_t$ .
$M$	Mutual inductance; in microhenries
$p_{FO}$ and $P_{FO}$	Power loss to a Foreign Object; in watts
$p_i$ and $P_i$	Input Power to the Power Transmitter; in watts
$p_L$ and $P_L$	Load Power; in watts
$p_L^{(gtd)}$ and $P_L^{(gtd)}$	Guaranteed Load Power; in watts
$p_L^{(neg)}$ and $P_L^{(neg)}$	Negotiable Load Power; in watts
$p_L^{(pot)}$ and $P_L^{(pot)}$	Potential Load Power; in watts