



BSI Standards Publication

The Qi wireless power transfer system power class 0 specification

Parts 1 and 2: Interface Definitions

National foreword

This Published Document is the UK implementation of IEC PAS 63095-1:2017.

The UK participation in its preparation was entrusted to Technical Committee EPL/100, Audio, video and multimedia systems and equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2017
Published by BSI Standards Limited 2017

ISBN 978 0 580 96399 5

ICS 29.240.99

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 November 2017.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------



IEC PAS 63095-1

Edition 1.0 2017-05

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD



**The Qi wireless power transfer system power class 0 specification –
Parts 1 and 2: Interface Definitions**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.240.99

ISBN 978-2-8322-415-5

Warning! Make sure that you obtained this publication from an authorized distributor.

Contents

1	General.....	8
1.1	Introduction.....	8
1.2	Scope.....	8
1.2.1	Current Specification structure (introduced in version 1.2.1).....	8
1.2.2	Earlier Specification structure (version 1.2.0 and below).....	9
1.3	Main features of the Qi Wireless Power Transfer System.....	9
1.4	Conformance and references.....	10
1.4.1	Conformance.....	10
1.4.2	References.....	10
1.5	Definitions.....	11
1.6	Acronyms.....	14
1.7	Symbols.....	16
1.8	Conventions.....	17
1.8.1	Cross references.....	17
1.8.2	Informative text.....	17
1.8.3	Terms in capitals.....	17
1.8.4	Units of physical quantities.....	17
1.8.5	Decimal separator.....	17
1.8.6	Notation of numbers.....	18
1.8.7	Bit ordering in a byte.....	18
1.8.8	Byte numbering.....	18
1.8.9	Multiple-bit fields.....	19
1.9	Operators.....	19
1.9.1	Exclusive-OR.....	19
1.9.2	Concatenation.....	19
1.10	Measurement equipment.....	19

Currently in preview, click buy full version

PART 1: Primary Interface Definition	20
2 Mechanical interface	21
2.1 Power Receiver design requirements (PRx).....	21
2.1.1 Interface Surface	21
2.1.2 Alignment Aid	21
2.2 Power Transmitter design requirements (PTx).....	22
3 Electromagnetic interface	23
3.1 Power Receiver design requirements (PRx).....	23
3.1.1 Dual resonant circuit	26
3.1.2 Rectification circuit.....	28
3.1.3 Sensing circuits	28
3.1.4 Communications modulator.....	28
3.1.5 Communications demodulator.....	28
3.1.6 Output disconnect.....	28
3.1.7 Meaningful functionality	29
3.1.8 Shielding	29
3.2 Power Transmitter design requirements (PTx).....	30
3.2.1 Load step and load dump (informative)	30
3.2.2 Load step test procedure	30
3.2.3 Load dump test procedure	32
3.2.4 Power Receiver over-voltage protection	35
4 Thermal interface	42
4.1 Interface Surface temperature rise	42
5 Information interface	43
5.1 System Control.....	43
5.1.1 Overview (informative)	43
5.1.2 Power Transmitter (PTx) perspective.....	48
5.1.3 Power Receiver (PRx) perspective.....	69
5.1.4 State diagram (informative)	83
5.2 Power Receiver to Power Transmitter communications interface.....	84
5.2.1 Introduction.....	84
5.2.2 Physical and data link layers (PRx to PTx).....	84
5.2.3 Logical layer (PRx to PTx).....	89

5.3	Power Transmitter to Power Receiver communications interface.....	104
5.3.1	Introduction.....	104
5.3.2	Physical and data link layers (PTx to PRx).....	104
5.3.3	Logical layer (PTx to PRx).....	110
PART 2: Secondary Interface Definition		112
6	External Power Input (Informative).....	113
6.1	Available power—Extended Power Profile only	113
7	Power Levels—Extended Power Profile only	114
7.1	Guaranteed Power	114
7.2	Light load	114
8	System Efficiency (Informative).....	115
8.1	Definition	115
8.2	Power Transmitter efficiency.....	116
8.2.1	Baseline Power Profile.....	116
8.2.2	Extended Power Profile.....	117
8.3	Power Receiver efficiency.....	118
9	Stand-by Power (Informative).....	119
9.1	Transmitter Measurement Method.....	119
10	Object Detection (Informative).....	120
10.1	Resonance shift.....	120
10.2	Capacitance change	122
11	Foreign Object Detection	123
11.1	Introduction	123
11.2	Baseline Power Profile without FOD extensions.....	124
11.3	FOD based on quality factor change—FOD extensions	125
11.3.1	Q-factor measurement (Informative).....	126
11.3.2	Expected operation (Informative)	127
11.3.3	Definition of the Reference Quality Factor	128

currently in preview, click buy full version

11.4	FOD based on calibrated power loss accounting—FOD extensions	129
11.4.1	Introduction.....	129
11.4.2	Received Power accuracy	131
11.4.3	Calibration	132
11.5	FOD by Power Receiver (Informative)	135
12	Unintentional Magnetic Field Susceptibility (Informative).....	136
12.1	Limits.....	136
12.2	Protection	136
12.3	Power Transmitter detection.....	136
13	User Interface	137
13.1	User interaction with a Base Station	137
13.2	User interaction with a Mobile Device	138
Annex A	EMC Standards and Regulations (informative).....	139
A.1	EMC.....	139
A.1.1	Regulatory obligation	139
A.1.2	Product category	139
A.1.3	Applicable standards	139
A.2	User Exposure to Magnetic Fields (informative)	140
A.2.1	Introduction.....	140
A.2.2	Applicable standards	140
A.2.3	Measurement method	141
A.2.4	Limits (reference levels)	141
A.2.5	Intended use.....	145
A.2.6	Application notes.....	145
Annex B	Power Receiver Localization (Informative).....	146
B.1	Guided Positioning	146
B.2	Primary Coil array based Free Positioning	146
B.2.1	Single Power Receiver covering multiple Primary Cells.....	146
B.2.2	Two Power Receivers covering two adjacent Primary Cells.....	147
B.2.3	Two Power Receivers covering a single Primary Cell	148
B.3	Moving Primary Coil based Free Positioning	149

B.4 User-assisted positioning 151

 B.4.1 Example 1 151

 B.4.2 Example 2 153

Annex C Power Receiver design guidelines (informative)..... 154

 C.1 Large-signal resonance check 154

 C.2 Power Receiver coil design 155

Annex D Mechanical Design Guidelines (Informative)..... 156

 D.1 Base Station 156

 D.2 Mobile Device 156

 D.3 Base Station Alignment Aid..... 157

 D.4 Mobile Device Alignment Aid 157

Annex E History of Changes..... 158

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Parts 1 and 2: Interface Definitions

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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC PAS 63095-1 has been processed by subcommittee 15: Wireless Power Transfer, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this PAS is based on the following document:

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
100/2826/PAS	100/2864/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single period up to a maximum of 3 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

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, designated Power Class 0, 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, *Parts 1 and 2: Interface Definitions*, defines the interface between a Power Transmitter and a Power Receiver, i.e. 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, e-readers, and battery packs, in the Baseline Power Profile (≤ 5 W) and Extended Power Profile (≤ 15 W).

1.2.1 Current Specification structure (introduced in version 1.2.1)

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

- ***Parts 1 and 2: Interface Definitions*** (this document)
 - *Part 1: Primary Interface Definition*
 - *Part 2: Secondary Interface Definition*
- *Part 3: Compliance Testing*
- *Part 4: Reference Designs*

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.