

# Intimate Communications Hub

## Interface Specification

Author
DCC
<del>V2.43.0</del>
<del>03 February 2023</del> <u>XX</u> <u>January 2024</u>

## Contents

<b>Part A Framework.....</b>	<b>6</b>
A1.0 Introduction .....	6
A1.1 Applicability.....	6
A2.0 Scope.....	6
A2.1 In-Scope .....	6
A2.2 Out of Scope.....	6
A3.0 References to Standards.....	7
A4.0 Detail of Products .....	9
A5.0 Glossary .....	10
A6.0 Revision history .....	13
<b>Part B Mechanical Interface.....</b>	<b>15</b>
B1.0 General requirements for mechanical interface .....	15
B1.1 Details of mechanical dimensions.....	15
B1.2 Reference drawing of the Host.....	16
B1.3 Reference drawing of the Device interface.....	17
B1.4 DC and signalling connector details .....	18
B1.5 Ingress Protection rating .....	19
B1.6 Physical security .....	19
B1.7 Interface mechanical performance .....	20
B1.8 General mechanical and environmental requirements for Hosts and Devices	20
B2.0 Specific requirements for mechanical interface.....	21
B2.1 Specific requirements for Communications Hubs.....	21
B2.2 Specific requirements for single phase ESMEs.....	21
B2.3 Specific requirements for twin element ESMEs.....	21
B2.4 Specific requirements for polyphase ESMEs .....	21
B2.5 Specific requirements for Hot Shoes.....	22
B2.6 Specific requirements for Blanking Plates .....	22

B2.7	Specific requirements for Cradles .....	22
B2.8	Specific requirements for Adaptors .....	22
B3.0	Optional Features and Information .....	23
B3.1	Optional AC signalling connector .....	23
B3.2	For information only .....	24
B3.3	Requirement for Communication Hub .....	25
<b>Part C</b>	<b>DC Power.....</b>	<b>26</b>
C1.0	Requirements for Provision of DC Power .....	26
C1.1	Details of the mechanical DC connector .....	26
C1.2	DC power management .....	26
C1.3	Power Supply Safety Considerations – Intimate Connection.....	31
C2.0	Specific requirements for the provision of DC power .....	32
C2.1	Specific requirements for Communications Hubs.....	32
C2.2	Specific requirements for single phase ESMEs.....	32
C2.3	Specific requirements for single phase, twin element ESMEs .....	32
C2.4	Specific requirements for polyphase ESMEs .....	32
C2.5	Specific requirements for Hot Shoes.....	32
C2.6	Specific requirements for Adaptors and Cradles .....	32
C3.0	Other DC Power Considerations (For information only) .....	33
C3.1	Considerations for fusing $L_{supply}$ , $L_{load}$ , and DC connections .....	33
C3.2	Power Supply References.....	34
<b>Part D</b>	<b>Optional AC Signalling Provision .....</b>	<b>35</b>
<b>Part E</b>	<b>Digital Signalling Pins .....</b>	<b>36</b>
E1.0	Introduction .....	36
E1.1	Purpose .....	36
E1.2	Pin Positioning .....	36
E1.3	Specific Requirements for Host and Hubs.....	37
E2.0	General requirements for Digital Signalling Pins.....	39

E2.1	Performance Requirements for Open-collector Outputs.....	39
E2.2	EMC Requirements on Data Lines.....	39
E2.3	Voltage and Current Limits.....	40
E3.0	Section Not Used .....	40
<b>Part F</b>	<b>RF Implementation.....</b>	<b>41</b>
F1.0	Design Requirement.....	41
F1.1	Rationale .....	41
F1.2	Antenna Placement.....	41
F1.3	Section Not Used.....	42
F2.0	Testing Methodology for Hosts .....	42
F2.1	ICHIS Test Specification .....	43
F2.2	Section Not Used.....	43
F2.3	Section Not Used.....	43
F2.4	Section Not Used.....	43
F3.0	Section Not Used. ....	43
F4.0	Methodology for Testing Multiple ESME .....	44
F4.1	Informative.....	44
F4.2	Test Requirement .....	44
F4.3	Retesting Requirements .....	44
F4.4	Test Method.....	45
F4.5	Pass Criteria for 423MHz, 454MHz, 868MHz, 900MHz frequency bands:.....	45
F4.6	Pass criteria for 2.1GHz and 2.4GHz frequency bands .....	47
F4.7	Pass criteria for 454MHz band EDM I Fyl DBCH CHAS.....	47
F5.0	Installation of a Host emitting RF noise at 423MHz .....	47
F5.1	.....	47
F5.2	.....	47
F5.3	.....	47
F6.0	Installation of a Host emitting RF noise in the 900MHz band.....	47

F6.1 .....	47
F6.2 .....	48
F6.3 .....	48
F7.0     Installation of a Host emitting RF noise in the 2.4GHz (HAN) band .....	48
F7.1 .....	48
F7.2 .....	48
F8.0     Installation of a Host emitting RF noise in the 868MHz (HAN) band .....	48
F8.1 .....	48
F8.2 .....	48
F9.0     Installation of Hosts in specific CSP areas.....	48
<b>Part G   Security .....</b>	<b>49</b>
G1.0   Physical security.....	49
G1.1   Mechanical security .....	49
G1.2   Tamper detection.....	49
G1.3   Scope of secure perimeter .....	49
G2.0   Out of scope areas .....	49
<b>Appendix A –   CHAS Details.....</b>	<b>50</b>
<b>Appendix B –   Noise Limits .....</b>	<b>55</b>
<b>Appendix C –   Communications Hub Dielectric Tests.....</b>	<b>56</b>

## Part A Framework

### A1.0 Introduction

The ICHI specification defines the mandatory features required to ensure that an ICH can be used with any ICHIS compliant Host, as well as defining features reserved for future use or for CSP specific implementation.

This specification has been produced by and is owned and maintained by SmartDCC Ltd. It is published on the SmartDCC Ltd website, and is free to access and use. Once published, the specification is managed under the SmartDCC Ltd's change control process.

The specification shall be reviewed by SmartDCC Ltd and its ICHIS WG on an annual basis to ensure it remains fit for purpose and use. Outside of the annual review, if a user of the specification should identify any changes or updates that are required, please contact SmartDCC Ltd via email to [contact@smartdcc.co.uk](mailto:contact@smartdcc.co.uk) detailing the proposed change and accompanying rationale for the change. Should proposed changes be identified by either the annual review process or via a formal change request the document will be revised by SmartDCC Ltd and any proposed changes consulted with SEC (Smart Energy Code) parties. Where the specification is updated following this process it will be re-published via the SmartDCC Ltd's website and consultation response.

### A1.1 Applicability

Updates to the ICHIS do not require Devices which have successfully completed testing against a previous version of the ICHIS, which was the current version at the time of design and approval for manufacture, to be retested.

## A2.0 Scope

### A2.1 In-Scope

This document will define the interfaces for the:

- Intimate Communications Hub and similar Devices defined in [Part A4.0](#) using the same interface; and
- ESME and similar Hosts defined in [Part A4.0](#) using the same interface.

The definitions cover the:

- Mechanical interface;
- Power supply provided from a Host to a Communications Hub;
- Tamper detection; and
- External dependencies and recommended good practice.

This document also provides descriptions for interoperability testing required to ensure compliance, including testing for RF interference between the ESME and CH.

### A2.2 Out of Scope

The items below are outside the scope of this specification.

- All functionality otherwise provided by the CH
- All functionality otherwise provided by the Host
- Protocols for communications and data transfer including security between a Host and a CH
- Requirements of protective covers used for covering the ICHI during shipping which will not be left in place by installers (as opposed to Blanking Plates used throughout the rest of this document which are intended to stay affixed to a Host after Installation).
- Aesthetics of the Host and the CH unit
- Physical dimensions of the Host and the CH that are not otherwise covered or prohibited by this specification
- HMI (Human Machine Interface) of Hosts or Devices

### **A3.0 References to Standards**

Item	Standard Number	Title
1	BS EN 50470-1:2006 + A1:2018	Electricity metering equipment (a.c.) – Part 1: General requirements, tests and test conditions – Metering equipment (class indexes A, B and C)
2	BS EN 50470-3:2006 +A1:2018	Electricity metering equipment (a.c.) – Part 3: Particular requirements – Static meters for active energy (class indexes A, B and C)
3	BS EN 55032:2015 +A11:2020	Electromagnetic compatibility of multimedia equipment. Emission Requirements
4	BS EN 60529:1992 +A2:2013	Specification for degrees of protection provided by enclosures (IP code)
5	BS EN 60603-8:1998 Part C	Connectors for frequencies below 3MHz for use with Printed boards
6	BS EN 61204-3:2018	Low voltage power supplies DC output, electromagnetic compatibility (EMC)
8	ETSI EN 301 489-1 v2.2.3	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

Item	Standard Number	Title
9	BS EN 62052-31:2016	Electricity metering equipment (AC) — General requirements, tests and test conditions  Part 31: Product safety requirements and tests
10	BS7671:2018/2020	Requirements for Electrical Installations. IET Wiring Regulations
11	BS EN 50565-1:2014	Electric cables. Guide to use for cables with a rated voltage not exceeding 450/750 V (U0/U). General guidance

**Note:** The above list addresses the requirements relevant to the interface between the Host and the CH. It does not necessarily address all the requirements for the Host or the CH.



## A4.0 Detail of Products

This specification covers a number of products which may implement the ICHIS. These products fall into two distinct roles, which are used as generic terms in this document. These roles correspond loosely to providing DC power and mechanical support (Host), or mounting on a Host to draw power or simply cover the interface (Device).

To be compliant to this Intimate Communications Hub Interface Specification a manufacturer shall declare which of these product types the product complies to and shall comply with all of the General Requirements of this specification, as well as all of the Specific Requirements for that product type.

The products are described below:



Product	Description	Role
ESME	An ESME capable of providing physical mount for an ICHIS Device, as well as providing power.  This Device is further defined in SMETS2.	Host
GSME	An GSME only when designed capable of providing a physical mount for an ICHIS Device, as well as providing power.  This Device is further defined in SMETS2.	Host
Communications Hub	The CH draws power from a Host, as well as being physically mounted via it.  This Device is further defined in CHTS.	Device
Hot Shoe	The Hot Shoe converts an ICH to a SACH by providing: <ul style="list-style-type: none"> <li>▪ A physical mount separate to an ESME, connected to the mains supply (eg meter tails)</li> <li>▪ DC power as an output to the Devices supply for the CH.</li> </ul>	Host
Blanking Plate	The Blanking Plate covers the ICHIS interface on an ESME when no other ICHIS Device is in use. There are no active electronics in a Blanking Plate. It is simply a cover to provide the Host with appropriate ingress and security/safety protection.	Device


Product	Description	Role
Adaptor	The Adaptor mounts on an ICHIS-compliant ESME or Hot Shoe and supplies power to a Cradle via a flying lead. The Adaptor provides appropriate protection to the flying lead, depending on which signals it carries from the ESME.	Device
Cradle	The Cradle draws power from an Adaptor, providing power and physical mounting to an ICHIS Communications Hub.	Host

## A5.0 Glossary

Term	Description
AC	Alternating Current
Adaptor	The Adaptor mounts on an ICHIS-compliant ESME or Hot Shoe and supplies power to a Cradle via a flying lead.
BEAMA	The British Electrotechnical and Allied Manufacturers Association
Blanking Plate	A cover to provide the Host with appropriate ingress and security protection when no other ICHIS Device is in use.
CH	Communications Hub compliant with Communications Hub Technical Spec (CHTS) and this ICHIS, mounted as either an ICH or SACH.
CHAS	Communication Hub Antenna Structure
CHTS	Communications Hub Technical Specification
Cradle	A mount for an ICHIS Device, attached via a flying lead to an Adaptor mounted to a Host, allowing an installer to place the Communications Hub on a Cradle in a different location to the ESME or Hot Shoe.
CSP	Communications Service Provider, as contracted to the Data Communications Company in Great Britain. Arqiva is the CSP in the North region, Telefónica are the CSP in the Central and South regions
DC	Direct Current

Term	Description
DCC	Data Communications Company in Great Britain.
Device	The side of an ICHIS interface which draws power from an ICHIS Host, and derives physical stability from the mount.
DSP	Data Service Provider, as contracted to the Data Communications Company in Great Britain.
ESD	Electrostatic Discharge
ESME	Electricity Smart Metering Equipment, as defined in SMETS2
GSME	Gas Smart Metering Equipment as defined in SMETS2
HAN	Home Area Network
Host	The side of an ICHIS interface which provides power and a physical mount for a Device.
Hot Shoe	<p>The Hot Shoe converts an ICH to a SACH by providing:</p> <ul style="list-style-type: none"> <li>▪ A physical mount separate to an ESME</li> <li>▪ A safe power supply connected to the mains as an input.</li> <li>▪ DC power as an output to the Device.</li> </ul> <p>The Hot Shoe allows an installer to place the Communications Hub in a different location to the ESME, and/or to provide power to the Communications Hub without an ICHIS compliant ESME.</p>
ICH	Communications Hub compliant with Communications Hub Technical Spec (CHTS) and this ICHIS, mounted directly on an ESME.
ICHI	Intimate Communications Hub Interface
ICHIS	This document - the Intimate Communications Hub Interface Specification
ICHIS Test Specification	The document detailed in Part F2.1 that sets out how Hosts are tested.

Term	Description
ICHIS WG	Intimate Communications Hub Interface Specification Working Group. This group is chaired by DCC and is attended by meter manufacturers and Communication Service Providers (CSPs). Suppliers. Other relevant experts can also attend meetings if requested and at DCC's discretion.
Installation	Any combination of Hosts and Devices, including any intermediate flying leads.
L <sub>load</sub>	The connection to the consumers wiring – connected to the right hand main terminal of a single phase ESME.
L <sub>supply</sub>	The connection from the public supply network – connected to the left hand main terminal of a single phase ESME.
N	Neutral
Noise Limit	The maximum level of noise originating from the Host in dB above thermal noise.
PLC	Power Line Communication
PSU	Power Supply Unit
RF	Radio Frequency
RMM	Reserved for Meter Manufacturer
SACH	Stand-Alone Communications Hub, not directly connected to an ESME via the intimate interface.
SMETS2	Smart Metering Equipment Technical Specifications, version 2 onwards
WAN	Wide Area Network
WG	Working Group
 0.25A	AC output symbol
 1A	Fuse output symbol

Term	Description
	PPTC Fuse symbol

## A6.0 Revision history

Version	Date	Reason for release
0.1	2013-04-05	BEAMA-produced draft for SMIP ISFT
0.3	2013-12-23	SmartDCC Ltd draft version published for consultation, including updates to mechanical drawings following tolerance review
1.0	2014-02-28	Initial SmartDCC Ltd iteration following consultation feedback
1.1	2018-11-12	Changes to Part F on installation of a Host emitting RF noise at 423MHz
1.2	2018-12-20	Changes to Part F on installation of a Host emitting RF noise in the 900MHz, 2.4GHz (HAN) and 868MHz (HAN) frequency bands.
2.0	2019-07-09	<p>Changes as a result of a review and consultation. Including:</p> <ul style="list-style-type: none"> <li>▪ Removing the Bit Error Rate (BER) test requirement;</li> <li>▪ Moving the Radio Frequency Noise Limits from the Communications Hub (Comms Hub) datasheets to ICHIS;</li> <li>▪ Replacing current test content in ICHIS with a new Test Specification link;</li> <li>▪ Adding requirements to test multiple meters;</li> <li>▪ Retesting considerations;</li> <li>▪ Adding a new appendix for CHAS information; and</li> <li>▪ Making other minor changes to the specification.</li> </ul>

Version	Date	Reason for release
2.1	2019-09-30	Changes to Part F on installation of a Host emitting RF noise in the 423MHz, 900MHz, 2.4GHz (HAN) and 868MHz (HAN) frequency bands.
2.2	2020-04-22	<p>Introduction of Fylingdales frequency band and EDM I Fylingdales DBCH CHAS (updates to Part F, Appendix A and Appendix B).</p> <p>Editorial updates to Parts B, C and D to ensure consistency that the AC connection pins are forbidden on the Communications Hub.</p> <p>Editorial updates to Part C.</p> <p>Update to Part F sub-section 4.5 to correct an error in the drafting of the 8 meter 2SD and 3SD limits introduced in ICHIS V2.0.</p> <p>Update to Part E to clarify voltage limits on the digital signalling connector.</p>
2.3	2021-06-01	<p>Updates to Part 1.3, C2.1, C2.5, C2.6 and new Appendix C to clarify the risks and the associated insulation testing with the power supply from the ICHIS Host to the ICHIS Device</p> <p>Updates to the referenced standards to ensure they are current and appropriate for the ICHIS content.</p>
2.4	2023-02-03	Changes to end dates in Part F for installation of a Host emitting RF noise in the 423MHz, 900MHz, 2.4GHz (HAN) and 868MHz (HAN) frequency bands.
<a href="#">3.0</a>	<a href="#">2023-01-XX</a>	<a href="#">Introduction of new 4G Communications Hub operating on LTE CAT 1 frequency bands 20 and 28a, a new Toshiba 4G Cellular DB CHAS (updates to Part F and Appendix B)</a>

## Part B Mechanical Interface

### B1.0 General requirements for mechanical interface

All dimensions within this ICHI Specification are in millimetres (mm).

#### B1.1 Details of mechanical dimensions

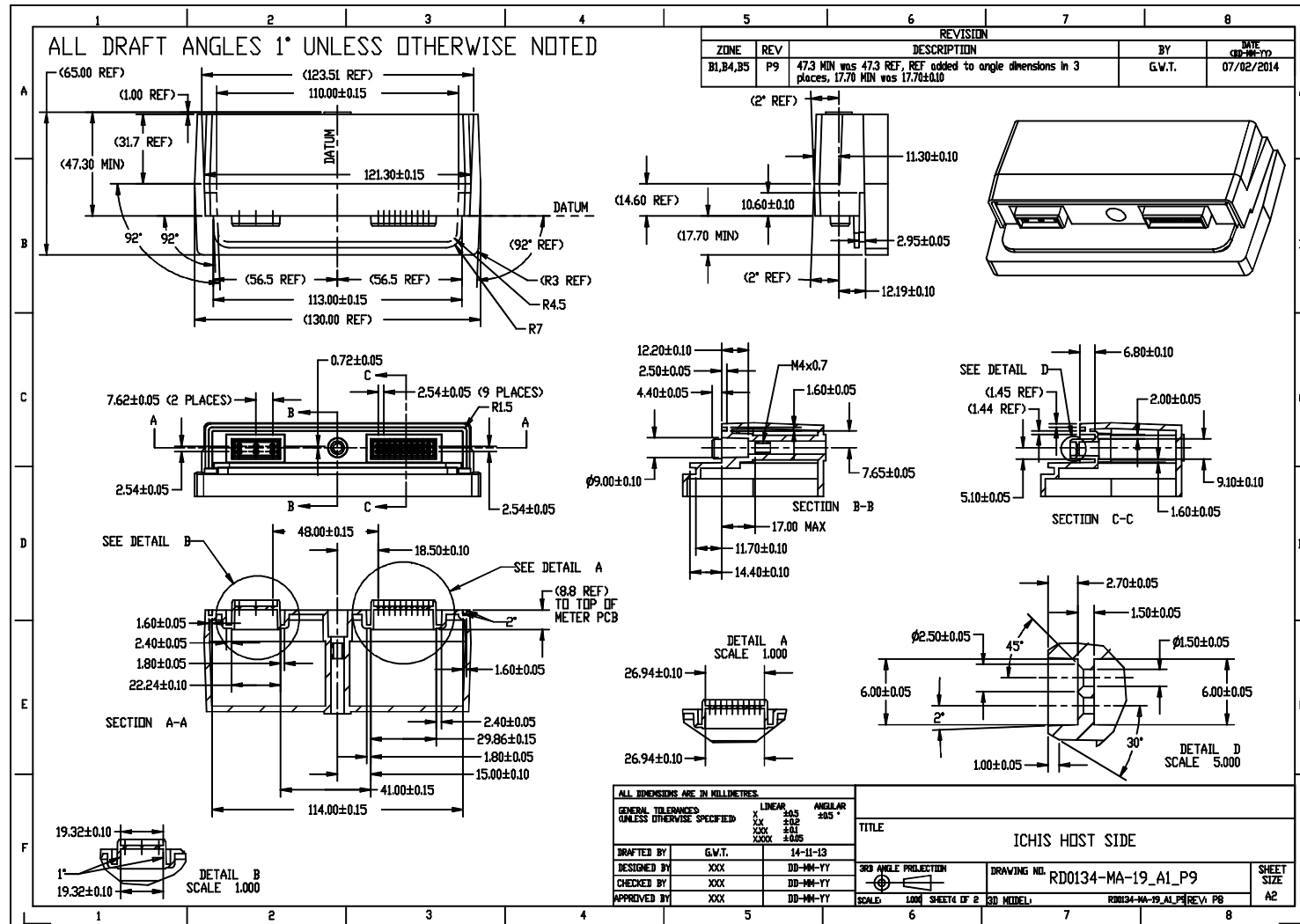
This section describes the mandatory mechanical requirements for each side of the Intimate Communications Hub Interface.

It allows a Device to be fitted to a Host

The 2D reference drawings in Part B1.2 and B1.3 are the definitions of this mechanical interface – high resolution copies and CAD files are available on the SmartDCC Ltd website. The 3D models available on the SmartDCC Ltd website have been provided as information only for manufacturers. If there is any conflict between any of the above, the drawings listed below serve as the reference. (Note: For QA purposes the datum location in the drawings may need to be changed to a more stable part of the moulding)

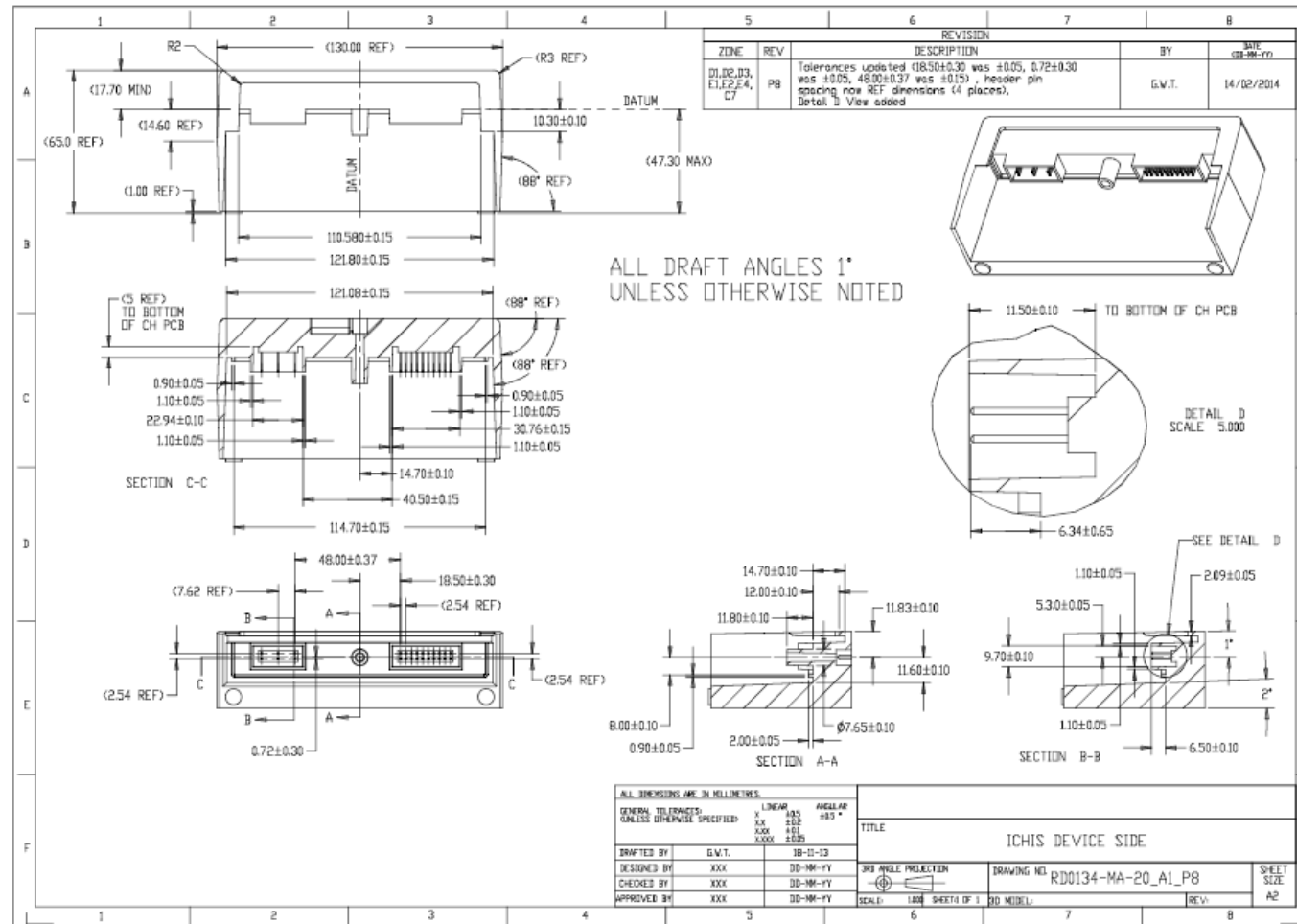
Role	Reference document
Device	RD0134-MA-20_A1_P8.pdf
Host	RD0134-MA-19_A1_P9.pdf

## B1.2 Reference drawing of the Host



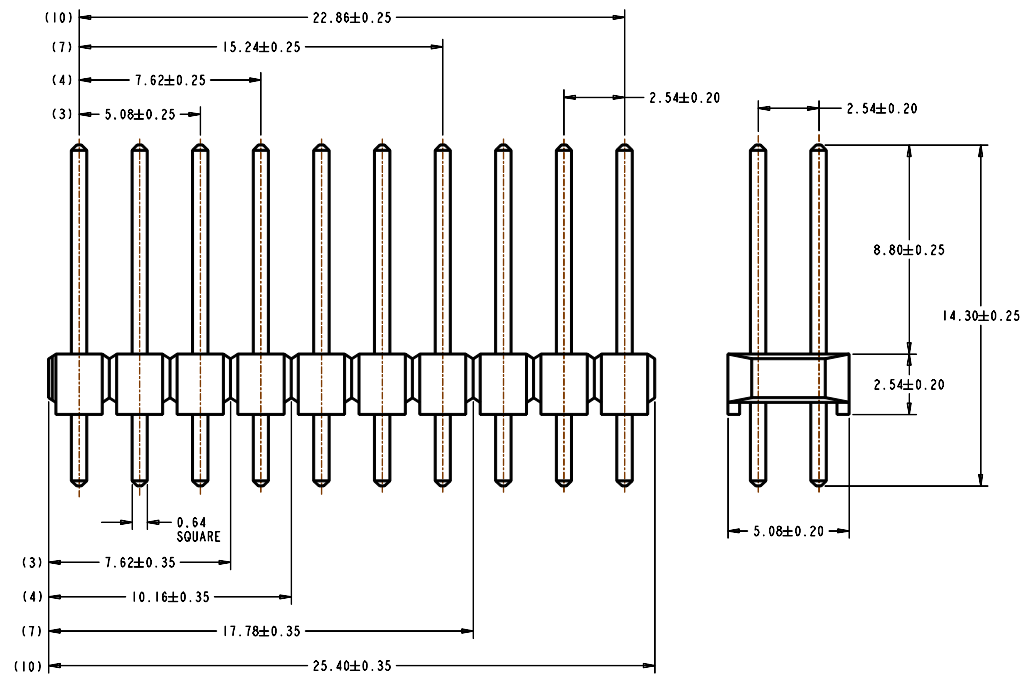


### B1.3 Reference drawing of the Device interface



## B1.4 DC and signalling connector details

### B1.4.1 Specific requirements for Devices



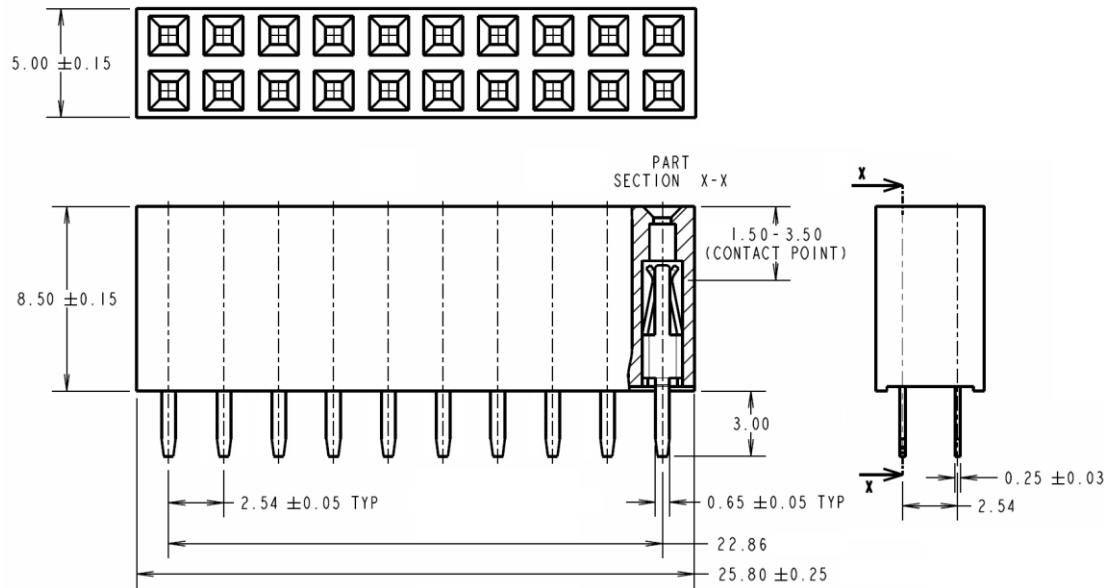
**Figure B1.4-1 Connector Diagram**

Figure B1.4-1 shows the dimensions of an example of the male header used on the Device. The Device shall populate a 2x3 pin DIL header (IEC-C203MS-S1 or IEC-C203MR-S1), in order to support power supply and tamper detection. Refer to Part E for the mandatory and optional pins of each Device type.

#### B1.4.1.1 Standards applicable to the male connector

The connector shall conform to BS EN 60603-8 style “C” in all respects other than the fixed contact length, which shall be increased to 8.8mm as shown in the drawing above. This increased length is to allow for mouldings between the male and female headers.

## B1.4.2 Specific Requirements for Hosts



**Figure B1.4-2 Socket Diagram**

Figure B1.4-2 shows the dimensions of the female header used on Hosts. It is a mandatory requirement that at least a 2x3 DIL header (IEC-C203FS-S1) be provided, although a Host shall also be able to accept a connection from a Device with the full 2x10 CH pin positions populated. This may be achieved with a larger connector with all positions populated, a large connector left partially populated, or a small connector together with voids in the moulding.

The connector shall be selected and positioned to ensure that the male pins on the Device can reliably connect with the female contacts.

### B1.4.2.1 Standards applicable to the female connector

The connectors conform to BS EN 60603-8 style “C”.

## B1.5 Ingress Protection rating

The interface shall achieve an IP rating of IP53 as the ICH shall be able to achieve a rating of IP53 when fitted to a Host.

The minimum IP rating for an ESME compliant with BS EN 50470-1 Section 5.9 is IP51 with a Device fitted.

The definition of IP ratings is found in BS EN 60529.

## B1.6 Physical security

### B1.6.1 Sealing screw – Device to Host

The Device shall be secured to the Host by a typical metering sealing screw, which shall engage a threaded metal insert in the Host and be positioned on the centre-line of the interface. Only the dimensions of the female threaded portion are defined in B1.2, as other aspects of the sealing screw are allowed to vary.

### **B1.6.2 Sealing Screw – Device**

The Device sealing screw itself is not defined in this ICHI Specification, but shall be selected to ensure that it is suitable for use with the female thread and associated recess defined in B1.2; in particular, the minimum length. To ensure reliable engagement and avoid any possible interference the end of the screw should be between 25.0mm and 30.0mm from the datum plane (placing the minimum at 8mm engagement past maximum depth of the threaded Host insert from datum plane). Device manufacturers should also ensure that the sealing screw selected can be used if the threaded Host insert is not placed at the maximum permitted depth.

### **B1.7 Interface mechanical performance**

The implementation of the mechanical interface of the Device, or Host, shall at least comply with, or being able to handle, the following parameter values:

- Max Device weight  $\leq 2\text{Kg}$
- Pull off force of screw  $> 800\text{N}$
- Maximum force withstand on any face of the Device except rear face (wall side)  $100\text{N}$
- Torque limit for sealing screw  $< 2\text{Nm}$
- Insertion force  $< 45\text{N}$
- Removal force  $< 45\text{N}$

### **B1.8 General mechanical and environmental requirements for Hosts and Devices**

All Hosts and Devices shall comply with the following sections of the metering standard BS EN 50470-1 where the word 'meter' in the standard is replaced as appropriate by:

- Hot Shoe;
- Cradle;
- Adaptor;
- Blanking Plate; or
- Communications Hub.

There are a few minor exceptions in the device applicability for some of these requirements. These exceptions are identified below.

#### **5.1 – General Mechanical Requirements**

#### **5.2 – Case**

##### **5.2.1 – Requirements**

##### **5.2.2 – Mechanical tests**

5.2.2.1 – Spring hammer test

5.2.2.2 – Shock test

5.2.2.3 – Vibration test

5.5 – Terminal Cover (only applies to the Host devices ESME and Hot Shoe)

5.6 – Clearance and creepage distances

5.7 – Insulating encased meter of protective class II

5.8 – Resistance to heat and fire

5.9 – Protection against penetration of dust and water (for indoor use)

5.13 – Accompanying information

6.1 – Temperature ranges (excludes Communications Hubs which have the operational temperature range defined in CHDS)

6.2 – Relative humidity

6.3 – Test of the effect of the climatic environments

6.3.1 – Dry heat test

6.3.2 – Cold test

6.3.3 – Damp heat cyclic test

## **B2.0 Specific requirements for mechanical interface**

### **B2.1 Specific requirements for Communications Hubs**

A Communications Hub shall comply with Part B1.8 where 'Communications Hub' shall replace the word 'meter' in the standard as appropriate.

### **B2.2 Specific requirements for single phase ESMEs**

There are no specific requirements for single phase ESMEs. All general requirements apply.

### **B2.3 Specific requirements for twin element ESMEs**

There are no specific requirements for 5 terminal or twin element ESMEs. Note, however, that if the ESME is wider than a standard single phase ESMEs, the ESME manufacturer should ensure that water is not able to gather on the exposed surfaces.

### **B2.4 Specific requirements for polyphase ESMEs**

There are no specific requirements for polyphase ESMEs. Note, however, that if the ESME is wider than a standard single phase ESME, the ESME manufacturer should ensure that water is not able to gather on the exposed surfaces.

### **B2.5 Specific requirements for Hot Shoes**

A Hot Shoe shall comply with Part B1.8 where 'hot shoe' shall replace the word 'meter' in the standard as appropriate.

### **B2.6 Specific requirements for Blanking Plates**

A Blanking Plate shall comply with Part B1.8 where 'blanking plate' shall replace the word 'meter' in the standard as appropriate.

### **B2.7 Specific requirements for Cradles**

A Cradle shall comply with Part B1.8 where 'cradle' shall replace the word 'meter' in the standard as appropriate.

### **B2.8 Specific requirements for Adaptors**

An Adaptor shall comply with Part B1.8 where 'adaptor' shall replace the word 'meter' in the standard as appropriate.

## B3.0 Optional Features and Information

### B3.1 Optional AC signalling connector

The AC connection pins are forbidden on the Communication Hub. The following sections are retained in ICHIS to enable all device designs to allow for the design envelope and prevent any device mating issues.

#### B3.1.1 AC Connector details for Devices

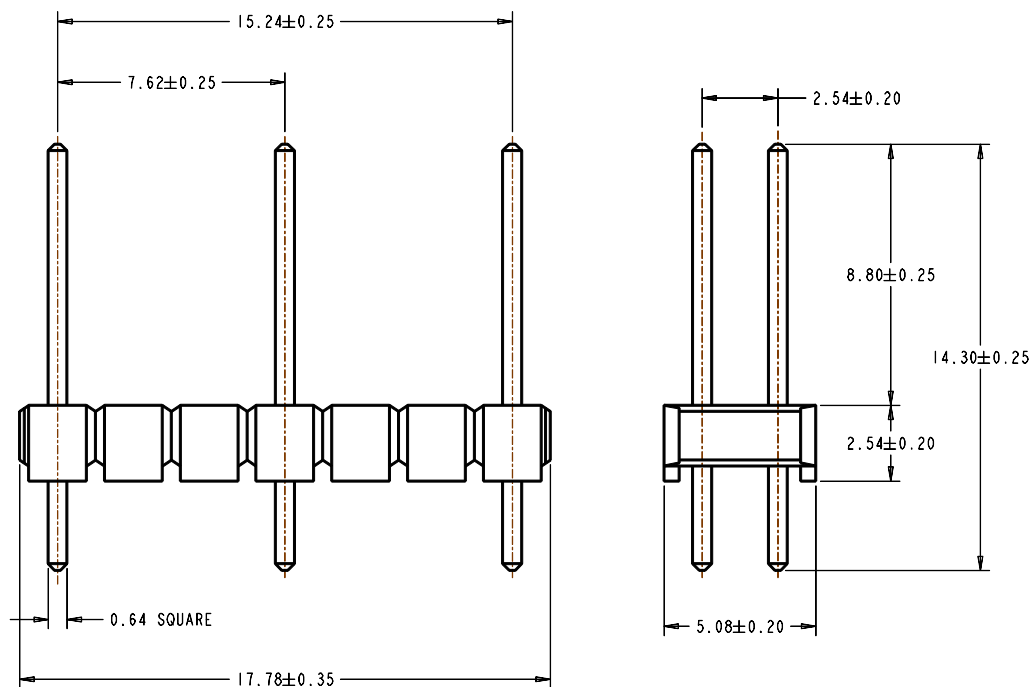


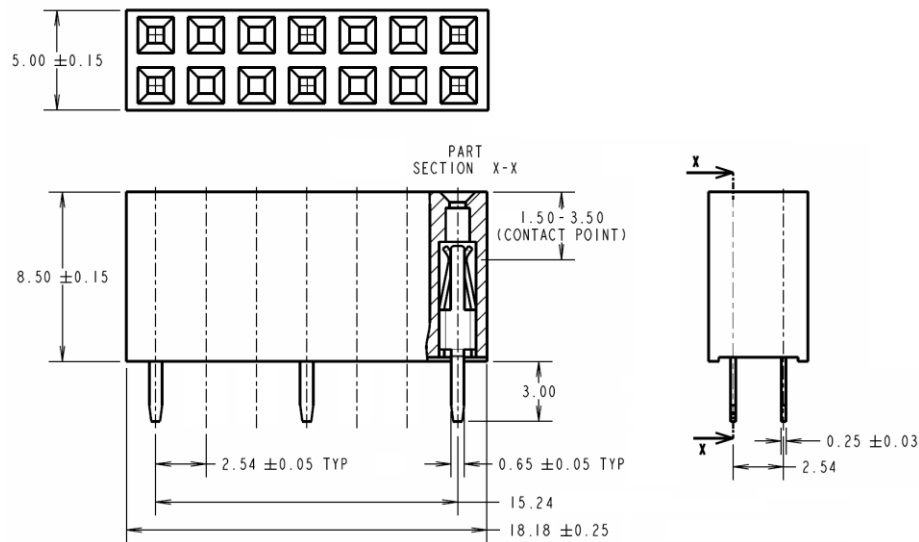
Figure B3.1-1 Connector Diagram

Figure B3.1-1 shows an example of the AC mains connector on the CH. This connector is formed from a 2x7 DIL header (IEC-C207MS-S1 or IEC-C207MR-S1 as defined in BS EN 60603-8), with the exception that specific fixed contacts are not populated. Pins are present only in columns 1, 4 and 7.

##### B3.1.1.1 Standards applicable to the male connector

The connector shall conform to BS EN 60603-8 style “C” in all respects other than the fixed contact length, which shall be increased to 8.8mm as shown in the drawing above. This increased length is to allow for mouldings between the male and female headers.

### B3.1.2 AC Connector details for Hosts



**Figure B3.1-2 Socket Diagram**

Figure B3.1-2 shows the AC mains connector fitted to a Host. It is formed from a 2x7 DIL connector (IEC-C207FS-S1 as defined in BS EN 60603-8) with the exception that specific fixed contacts do not need to be populated. Contacts are only required to be present in columns 1, 4 and 7; other contacts may be populated as long as this does not compromise electrical safety, particularly around creepage and clearance requirements. Hosts shall be able to accept a connection from a Device with all permitted Device positions populated. This may be achieved with a connector with voids in the moulding.

#### B3.1.2.1 Standards applicable to the female connector

The connectors conform to BS EN 60603-8 style “C”.

### B3.2 For information only

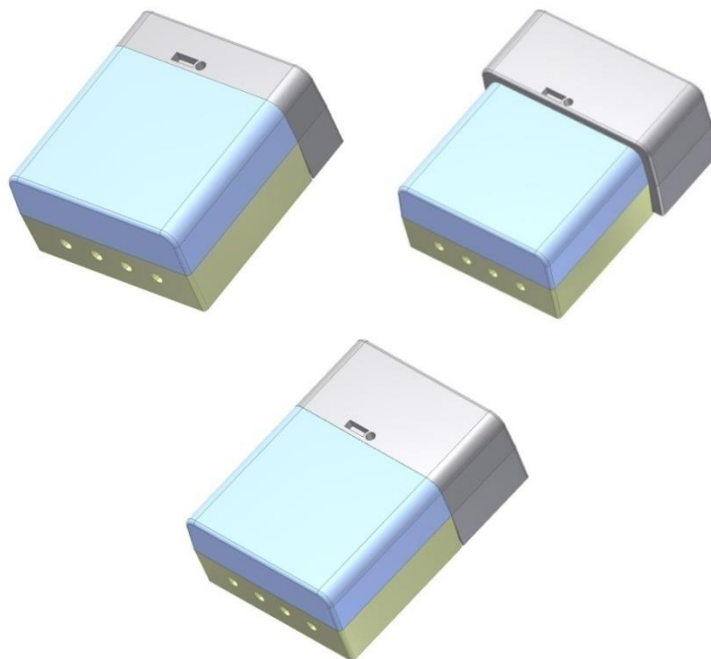
#### B3.2.1 Details of CH mechanical dimensions

- Height:
  - The height of the Hosts and Devices are out of scope of this document.
- Width:
  - The widths of Hosts are out of scope of this document. The outer dimensions are for specification by the relevant Host manufacturer providing the whole of the mating mechanism is accommodated.
  - The Device should be at least as wide as the nominal single phase ESME width (130mm) to ensure there is no lip left at the top of the Host. If the Host is wider, the Host manufacturer shall ensure that water does not accumulate in order to ensure that the interface maintains IP53 rating.



- Depth of the CH towards the back face:
  - To avoid the CH fouling on the wall to which a minimum depth ESME has been mounted, the theoretical maximum depth of the CH (from the datum plane) is 47.3 mm.
  - The Host manufacturer shall ensure that water does not collect behind the interface if the CH does not extend the full 47.3mm behind the datum, or if the Host places the datum more than 47.3mm in front of the back face.
- Depth of CH towards the front of the Host:
  - The depths of Hosts and Devices are out of scope of this document. The outer dimensions are for specification by the relevant manufacturer providing the whole of the mating mechanism is accommodated.
  - The Communications Hub design should place the front face at least 17.7 mm from the datum plane.
  - The Host manufacturer shall ensure that water does not collect in front of the interface if the Host places the datum more than 17.7mm behind the front face.

Figure B3.2-1 shows some possible CH shapes – these are examples and should not be taken as guides.



**Figure B3.2-1 Possible shapes for the CH – for guidance only**

### **B3.3 Requirement for Communication Hub**

The AC connection pins are forbidden on the Communication Hub.

## Part C DC Power

### C1.0 Requirements for Provision of DC Power

#### C1.1 Details of the mechanical DC connector

Details of the connector are given in B1.4.

The connection details are given in the table below:

Pin Number	Function	Pin Number	Function
1	DC - +12V	2	DC - +12V
3	DC – Common	4	DC - Common

Full details of the connector, including diagrams and the purpose of all other pins, are given in Part E.

#### C1.2 DC power management

The power supply pins shall be connected to a single supply from the Host – ideally by connecting pins 1 to 2 and 3 to 4 directly at the connector block.

It is not mandatory for the DC power supply to be isolated in the Host. The Host manufacturer may choose for it to be referenced to the phase conductor (which shall be likely in ESMEs using a resistive shunt for current measurement), or to the mains neutral conductor. Therefore, the Device design shall include appropriate insulation or isolation if it includes any exposed parts.

If the supply is not isolated, then the Host must ensure that all used pins on the 'DC and signalling connector' (sections C1 and E1 of this document) are referenced to the same Conductor (either a Phase or Neutral Conductor). Limits to support this are set out in within Part E Digital Signalling Pins.

All unused pins (no circuit connected) should not be fitted or have sufficient isolation to prevent any current paths that would fail isolation tests set out elsewhere in this document.

### C1.2.1 Mandatory Characteristics

**Note:** The values specified here are those at the connector of the Communications Hub Interface. If the ICH is mounted directly to an ESME or a Hot Shoe, this should be identical to what is produced by the ESME or Hot Shoe. If the ICH is mounted to a Cradle, powered via a flying lead and Adaptor, the installer shall verify that the quality of the DC power supply at the Cradle meets these specifications.

Parameter <sup>1</sup>	Symbol	Value	Unit	Tolerance	Description
Voltage	$V_{DC}$	12	V	+/-25%	This specifies the limits of the DC voltage from the interface, provided not more than $W_{max}$ is being drawn. The DC voltage from the interface may be at any value between these limits; the nominal value should not be taken as typical.
Ripple	$V_{ripple}$	400	mVpp	Maximum	This specifies the maximum ripple at frequencies up to 150kHz.
Power	$W_{max}$	6	W	Minimum	This is the minimum power guaranteed to be made available to the Device by the interface during normal supply conditions <sup>2</sup> . Hence, this is the maximum power which the Device is entitled to draw, except as specified under Cut-off delay.
Cut-off delay	$t_{ov}$	30	ms	Minimum	If the Device attempts to draw more power than $W_{max}$ , the Host is entitled to reduce the voltage as far as needed to limit the power to $W_{max}$ or to limit the current to a value equivalent to $W_{max}/V_{DC}$ . For the avoidance of doubt, the quantity for $V_{DC}$ in the above function is the nominal value defined under $V_{DC}$ earlier in this table.

<sup>1</sup> The values specified here are those at the connector of the Communications Hub Interface. If the ICH is mounted directly to an ESME or a Hot Shoe, this should be identical to what is produced by the ESME or Hot Shoe. If the ICH is mounted to a Cradle, powered via a flying lead and Adaptor, the installer shall verify that the quality of the DC power supply at the Cradle meets these specifications.

<sup>2</sup> See under Mains Power Failure for behaviour during mains power loss and restoration, and abnormal mains supply conditions.

Parameter <sup>1</sup>	Symbol	Value	Unit	Tolerance	Description
					<p>As defined above, the limiter characteristic in the Host shall approximate to a power-limit function or to a current-limit function, or to a blend of the two characteristics.</p> <p>If the load condition causing the Host to enter this power-limit state persists for longer than time <math>t_{OV}</math>, the Host is entitled to cut off the DC voltage supply. The purpose of the cut-off delay is to allow for the presence of uncharged capacitance at the supply input to the Device under “hot swap” conditions, up to 220uF (nominal). If ultra-caps or similar high-capacitance energy storage is used in the Device in support of “last gasp” or similar features, the charging of these capacitances shall be managed by the Device.</p> <p>Note: Once the limiting function of the Host has been triggered, in order to guarantee exit of the DC Voltage supply from the limiting state, and without entering cut-off, the Device would need to reduce both its load current below <math>W_{max}/V_{DC}</math> and its input power below <math>W_{max}</math>. This process can be automatic, without elaborate design precautions in the Device. The input capacitance of the Device shall charge to the target <math>V_{DC}</math> value, and the Device shall then start up. It is recommended that the Device does not start up until the DC voltage supply at the input to the Device has stabilised within the range specified under <math>V_{DC}</math>.</p> <p><b>Note:</b> The Host is not obliged to limit the power drawn to <math>W_{max}</math>, or to cut off the DC Voltage supply at time <math>t_{OV}</math> under this load condition, except as specified under Guaranteed cut-off.</p> <p><b>Warning:</b> Cut-off of the DC voltage supply is regarded as a fault condition in the Device, and designers of Devices should not attempt to use the assumed cut-off characteristic of the Host as part of a power management strategy. The cut-off characteristic of the DC voltage may vary considerably from one model of Host to another within the bounds of this specification.</p>

Parameter <sup>1</sup>	Symbol	Value	Unit	Tolerance	Description
					The Host may log instances of cut-off and this log may be used to determine a need to swap out the Device.
Re-try timer	$t_{RT}$	10-40 x $t_{OV}$ min	ms		If the Host cuts off the DC voltage supply as described under cut-off delay or guaranteed cut-off, the Host shall re-connect the supply after $t_{RT}$ . If the load which caused cut-off is still present, the Host shall cycle through the cut-off delay process or guaranteed cut-off process as described under the respective headings.
Guaranteed cut-off level	$W_{cutoff}$	2 x $W_{max}$	W	Maximum	If the Device draws more than $W_{cutoff}$ , the Host shall cut off the DC Voltage supply within time $t_{GC}$ . Note that the Host is not obliged to supply more than $W_{max}$ , but if it does, it is obliged to not supply more than $W_{cutoff}$ for longer than $t_{GC}$ .
Guaranteed cut-off timer	$t_{GC}$	45	ms	Maximum	See under Guaranteed cut-off level.
Cut-off leakage current	$I_{co}$	1	mA	Maximum	In the cut off state, the leakage current from the Host into the load of the Device shall not exceed $I_{co}$ . The purpose of specifying a maximum value for this parameter is to enable the designers of Devices to ensure that the Device shall be fully reset by the cut-off action of the Host.
Mains supply failure: Hold-up time	$t_{HU}$	0	ms	Minimum	The DC voltage supply is not intended to provide a “hold-up” function to the Device. The characteristics defined variously above for the DC voltage supply apply while the mains supply to the Host is between the minimum and maximum

Parameter <sup>1</sup>	Symbol	Value	Unit	Tolerance	Description
					<p>operating voltages specified for the Host to support the DC Voltage supply to the Device.<sup>3</sup></p> <p>If the supply at any time falls below the minimum operating voltage defined for the Host for support of DC Voltage to Device, the Host is entitled to cut off the DC Voltage supply without warning. This may apply to a short break in the mains, during which an ESME maintains metering function.</p> <p>Warning: If the Device has a need for a “hold-up” function, whereby an early warning is given of Host power failure, this shall be provided internally to the Device.</p>
Mains supply failure: Restoration delay	$t_{PU}$	5	s	Maximum	<p>When the mains supply to the Host rises above the minimum operating voltage specified for support for DC voltage supply to Device, the Host shall restore the DC Voltage supply without a delay of more than <math>t_{PU}</math>.</p> <p>During restoration of the DC voltage supply, the voltage may fall outside the limits specified under <math>V_{DC}</math>, except that the voltage shall never exceed the maximum value specified under <math>V_{DC}</math>.</p>

<sup>3</sup> If the minimum and maximum operating voltages specified for the ESME are wider than the minimum regulatory requirements, the supplier of the ESME may choose to apply the minimum regulatory requirements for support of DC Voltage to the CH.

### **C1.3 Power Supply Safety Considerations – Intimate Connection**

DC power supply isolation from mains conductors in the Host is not mandatory. As a result, the DC power supply may be referenced to live or neutral. It is the responsibility of the Host manufacturer to ensure safe operation of the Host.

The Device manufacturer needs to ensure appropriate protection in the Device against fault conditions; the Host shall remain safe if a fault occurs in the flying lead or CH that results in a low impedance connection to ground or mains neutral.

The previous option for the AC signalling connection is now forbidden see section B3.1.

#### **C1.3.1 Power Supply Safety – Device Design Guidance**

This subsection provides more detailed design guidance for manufacturers, please note that any reference to standards are examples only and that other standards may be relevant too.

For an Installation to be considered safe, as well as conforming to the relevant safety standards, when tested for the effects of short circuit and overload currents at least the following statements should be true:

- Any material or hot gas that is ejected by the Host and Device assembly shall not cause fire.
- Insulation between mains circuits and accessible conducting parts, including low-voltage auxiliary circuits shall remain intact. Test references for ICHIS Hosts and Devices are specified in Parts C2.1 to 2.6. The requirements for the associated creepage and clearance are specified in Part B1.8.

Any fuse incorporated in the Host is not intended to provide protection against electrical shock and shall not be represented as such. The risk remains equivalent to accessing the main ESME terminals.

The design of a Device shall not be based on any assumption that the Host contains additional impedances which would limit the prospective short circuit current values at the mains input of the Device. Hosts compliant with this ICHI Specification are not required to include short-circuit current limiting impedances between their main terminals and the live AC connections, including phase referenced DC connections made available in the interface.

The specification for the mechanical design of the interface ensures that the contacts become inaccessible before the male and female parts make electrical contact.

#### **C1.3.2 Safety Consideration – External Metal – Device**

As the DC power supply from the Host may not be isolated from the AC mains, any external metal on the Device (including a connector for an external antenna) shall be isolated from the DC power supply within the Device.

## **C2.0 Specific requirements for the provision of DC power**

### **C2.1 Specific requirements for Communications Hubs**

A Communications Hub shall comply with the following tests, aligned with the comparable tests required of ESMEs:

#### **C2.1.1 Insulation and testing**

The Device shall retain adequate dielectric qualities under normal conditions of use, taking into account the effects of the climatic environment and different voltages to which it is subjected under normal conditions of use.

The dielectric testing for the Communications Hub is specified in Appendix C. The testing is aligned with BS EN 50470-1 section 7 which in turn references BS EN 62052-31.

### **C2.2 Specific requirements for single phase ESMEs**

The DC power shall be derived from the unmetered side of the ESME before any measurement element. The DC power supplied by the ESME shall be the same as specified in C1.2.

### **C2.3 Specific requirements for single phase, twin element ESMEs**

The DC power shall be derived from the unmetered side of the main circuit in the ESME before any measurement element. The DC power supplied by the ESME shall be the same as specified in C1.2.

### **C2.4 Specific requirements for polyphase ESMEs**

The DC power shall be derived from the unmetered side of the ESME before any of the measurement elements. The DC power supplied by the ESME shall be the same as specified in C1.2.

The DC power shall continue to be supplied from the ESME in case of any loss of phase as per BS EN 50470-3 – Table 9 Note (a).

### **C2.5 Specific requirements for Hot Shoes**

The DC power supplied by the Hot Shoe shall be the same as specified in C1.2.

It is the responsibility of the Hot Shoe manufacturer to ensure safe operation of the Hot Shoe.

Related to the ICH interface the following are directly relevant:

- A Hot Shoe shall comply with the EMC requirements set out in BS EN 61204-3
- A Hot Shoe shall comply with the insulation testing in BS EN 62052-31 for the dielectric tests aligned with the ESME.

### **C2.6 Specific requirements for Adaptors and Cradles**

The DC interface of the ESME may be used to provide DC power for a remote CH via an Adaptor, flying lead and Cradle. The protection of the flying lead and the CH shall be the responsibility of the manufacturer of the Adaptor, flying lead and Cradle.



The DC power supplied by the Cradle shall be the same as specified in C1.2. It shall be up to the manufacturer to ensure compatible ESMEs and / or CH provide adequate margin on DC voltage to compensate for any voltage drop across the Adaptor, flying lead and Cradle.

The connection methodology for the flying lead shall not compromise any of the electrical or safety considerations of the ESME and CH interfaces prescribed under this Part C.

DC power supply isolation from mains conductors is not mandatory. As a result, the DC power supply may be referenced to live or neutral. It is the responsibility of the Adaptor, flying lead and Cradle manufacturer to ensure safe operation of the Installation.

The Adaptor shall provide overcurrent and fault current protection for all the conductors in the cable, including the “DC-Common” and “DC - +12V” lines. This protection shall address the case of damage to the cable, or where an attempt was made to extract un-metered energy from the end of the flying lead remote from the ESME.

The Adaptor shall be fitted with appropriate fuse(s).

The insulation system provided in the cable of the flying lead shall provide adequate functional and safety insulation commensurate with the conductors of the flying lead being connected to the mains network very close to the point of entry of the mains supply into the building (before the consumer distribution unit). The strength of the insulation shall be adequate for the expected phase to ground over-voltages at this point. Installation of the flying lead shall conform to BS7671 and BS EN 50565-1:2014.

There must be no expectation that the ESME shall provide any attenuation or clamping of phase to ground over-voltages.

A Cradle shall comply with the EMC requirements set out in BS EN 61204-3 and the dielectric tests specified in BS EN 62052-31.

### **C3.0 Other DC Power Considerations (For information only)**

#### **C3.1 Considerations for fusing $L_{\text{supply}}$ , $L_{\text{load}}$ , and DC connections**

Any fuse provided in the Host or Device shall coordinate with the service cut-out fuse and shall create an open circuit (“blow”) first under all circumstances. This is not seen to be an issue where the cut-out fuse is rated at 60A, 80A or 100A, but would need to be given careful consideration if very low value (5A, 10A) cut-out fuses were ever used.

The rating of the fuse shall be able to cope with 10kA maximum prospective fault currents.

The ESME cannot be assumed to include any fusing or other protection on its outputs, but individual ESME manufacturers may design-in additional levels of protection as best practice or as acceptable to procuring energy suppliers.

This specification advises CH suppliers that the DC power supply output of the ICHI from the Host may not necessarily be isolated from the mains supply in all circumstances. The DC-Common connectors may be directly connected, through low impedance circuits, to the  $L_{\text{supply}}$  terminal of the Host. Alternatively, it may be connected to the Neutral of the mains, or it may be floating.

If the DC-common is connected to  $L_{\text{supply}}$ , then it follows that there shall be galvanic connections between the DC - +12V connections and  $L_{\text{supply}}$ .

The specification for the DC power supply output of the ESME (Part C1.2) includes the requirement for protection against overcurrent and short circuits between the “DC-Common” and “DC - +12V” connector pins. That specification does not address the risks of fault currents flowing from the “DC-Common” and or “DC - +12V” connections and mains live or protective earth conductors.

Suppliers of CH shall ensure that the Devices provide adequate protection against contact with the potentially live internal circuits. This shall be true even if the ICH only connects to the DC power supply output from the ESME.

Where the CH is to be mounted remotely from the ESME and connected by a flying lead linking an ESME-mounted Adaptor and a Cradle, the Adaptor shall provide overcurrent and fault current protection for all the conductors in the flying lead, including the “DC-Common” and “DC - +12V” lines. This protection shall address the case of damage to the flying lead, or where an attempt was made to extract un-metered energy from the end of the flying lead remote from the ESME.

### **C3.2 Power Supply References**

The DC power supply may be referenced to live or neutral dependent on the Host design. To be interoperable, an ICH shall function safely and correctly regardless of whether it is installed onto a Host with live reference or neutral referenced DC power supply output.

## **Part D Optional AC Signalling Provision**

The part previously defined the connections for AC signalling. Use of these pins are forbidden in ICHIS Communications Hubs, however the mechanical design of all devices should allow for the design envelope defined in Part B3.

## Part E Digital Signalling Pins

### E1.0 Introduction

#### E1.1 Purpose

There are 16 digital signalling pins on the same connector as the mandatory DC power supply pins.

These hardwired pins are (or can be) used for interaction between the Host and the Device.

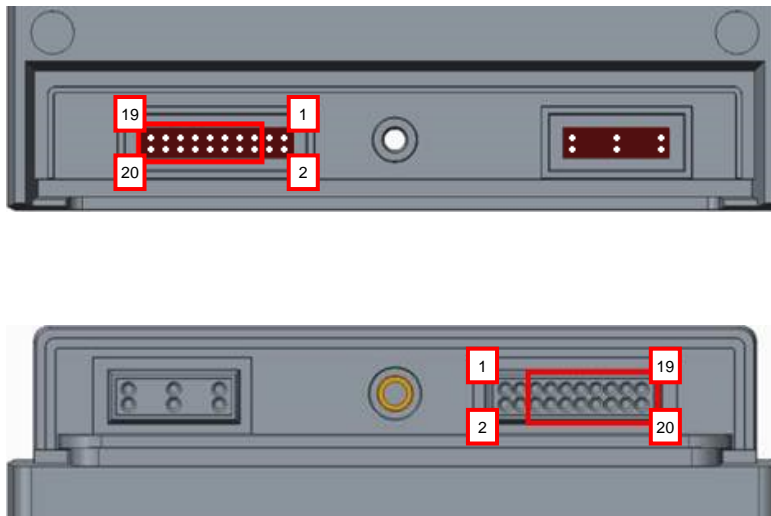


Figure E1.1-1 Digital Signalling Pins

#### E1.2 Pin Positioning

1 12V	3 Com- mon	5 CH_ PR	7 TX_ MT	9 AC_ LO	11 CSP_ B	13 RMM_ B	15 RMM_ D	17 RMM_ F	19 CSP_ E
2 12V	4 Com- mon	6 MT_ PR	8 RX_ MT	10 CSP_ A	12 CSP_ C	14 RMM_ C	16 RMM_ E	18 CSP_ D	20 CSF_ F

### E1.3 Specific Requirements for Host and Hubs

Connector								Connection on Device <sup>10</sup>					
Pin No.			Name	Symbol	I/O	Pull-up	Function	ESME	CH	BlankingPlate	Hot Shoe/ Cradle	Adapter	Notes
1	1	1	+12V	+12V	-	-	12VDC power supply rail	M	M	F	M	M	From host to power CH
2	2	2	+12V	+12V	-	-	12VDC power supply rail	M	M	F	M	M	From host to power CH
3	3	3	Common	COM	-	-	Common DC power supply rail	M	M	M	M	M	
4	4	4	Common	COM	-	-	Common DC power supply rail	M	M	F	M	M	
5	5	5	Device Present	CH_PR	Input	Y	Active low (CH present)	M	M	M	M	M	Generated internally by Blanking Plate/CH. Maximum 10Ω link to COM. For Adaptors this signal shall not be carried over a flying lead to a Cradle
6	6	6	Host Present	MT_PR	Output	Y	Active low (Host Present)	M	M	F	M	O	Generated internally by host. Maximum 10Ω link to COM. If low host is present.
-	7	7	Transmit Data	TX_MT	Output	Y	Serial NRZ line code, logic0=high	O	O	F-	O	O	UART connection, protocol undefined in this
-	8	8	Receive Data (Rx)	RX_MT	Input	Y	Serial NRZ line code, logic0=high	O	O	F-	O	O	UART connection, protocol undefined in this document. For future use.

-	9	9	AC Lost	AC_LO	Output	Y	Active high (no AC present)	O	O	F-	O	O	Rapid signal for AC presence lost detected by Host. Not for use with CSP CH
-	10	10	-	CSP_A	-	-	For use by CSP	F	O	F-	F	O	
-	11	11	-	CSP_B	-	-	For use by CSP	F	O	F-	F	O	
-	12	12	-	CSP_C	-	-	For use by CSP	F	O	F	F	O	
-	13	13	-	RMM_B	-	-	Reserved for use by ESME manufacturer	O	F	F-	O	O	
-	14	14	-	RMM_C	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	15	-	RMM_D	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	16	-	RMM_E	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	17	-	RMM_F	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	18	-	CSP_D	-	-	For use by CSP	F	O	F-	F	O	
-	-	19	-	CSP_E	-	-	For use by CSP	F	O	F-	F	O	
-	-	20	-	CSP_F	-	-	For use by CSP	F	O	F-	F	O	

Notes:

- 'M', 'O' and 'F' demote mandatory, optional and forbidden respectively
- Column heading notes:
  - I/O - Inputs and outputs are defined from the perspective of the Host
  - Pull-up - resistors are required on specified data lines within the Communications Hub, except for RX\_MT, in which it is fitted internal to the ESME. Data lines are open-collector / open-drain with a maximum of 5V output
- Pins that are optional for both host and CH may be used by either but the Host manufacturer must declare this use to the DCC via its ICHIS WG and for publishing on DCC website

### E1.3.1 MT\_PR

MT\_PR is used by a Communications Hub to detect the presence (or lack thereof) of the female socket of the ICHI provided by a Host. A Host shall provide a low impedance connection of no more than 10Ω between MT\_PR and COM.

### E1.3.2 CH\_PR

CH\_PR is used by an ESME to detect the presence (or lack thereof) of the male connector of the ICHI provided by a Device. A Device shall provide a low impedance connection of no more than 10Ω between CH\_PR and COM.

### E1.3.3 TX\_MT / RX\_MT

TX\_MT and RX\_MT are UART data transmission connections. They are not used for this iteration of the ICHIS, but are defined as data connections for future use.

### E1.3.4 AC\_LO, RMM\_B-F

AC\_LO and RMM\_B, C, D, E, F will not be used for UK application in this iteration of ICHIS. These pins are reserved for ESME manufacturers' use in foreign markets, and/or potential use in future iterations of ICHIS for use in Great Britain.

### E1.3.5 CSP\_A-F

CSP\_A, B, C, D, E, F are reserved for use by the CSPs. Hosts shall not connect to these pins (though shall cater for their physical presence).

## E2.0 General requirements for Digital Signalling Pins

For all digital signalling pins a Logical High Voltage shall be between 3V to 5V referenced to COM.

### E2.1 Performance Requirements for Open-collector Outputs

Symbol	Connector	Logical Low Voltage, $R_{pull-up} \geq 1.0 \text{ k}\Omega$	Logical High Voltage, $R_{pull-up} \leq 100 \text{ k}\Omega$
TX_MT	ESME	$\leq 1.0 \text{ V}$	$\geq (V_{logic} - 0.5 \text{ V})$
AC_LO	ESME	$\leq 1.0 \text{ V}$	$\geq (V_{logic} - 0.5 \text{ V})$
RX_MT	CH	$\leq 1.0 \text{ V}$	$\geq (V_{logic} - 0.5 \text{ V})$

#### Notes:

1. Applicable over declared operating temperature range.
2. For DC rails of  $3.0 \text{ V} \leq V_{logic} < 5.0 \text{ V}$ .
3. Current drawn from each pin may not exceed 4mA.

### E2.2 EMC Requirements on Data Lines

ESME manufacturers may assume that the CH generates conducted emissions onto the data lines within the limits given in ETSI EN 301 489-1, section 8.7.3 (i.e. compliant

with the class B equipment limits for telecommunication ports given in BS EN 55032). The ESME shall have a compatible level of immunity at its data line connections.

ESME manufacturers may assume that the CH has a level of immunity to common mode RF signals on its data line connections as is specified in ETSI EN 301 489-1 section 9.5 – for radio equipment for use with cables longer than 3m. The common mode RF emissions from the ESME, on the data line connections, shall be limited so as to be compatible with this level of immunity.

### **E2.3 Voltage and Current Limits**

All unused pins on the DC and signalling connector should not be fitted or have sufficient isolation to prevent any current paths that would fail isolation tests set out in part C1.3.

All pins on the 'DC and signalling connector' (excluding pins 1 and 2):

V max = +6.0 V relative to COM (+20 % on nominal 5 V maximum in E2.0)

V min = 0.0 V relative to COM

Maximum current per pin under every condition = 250 mA. This includes loads from +6.0 V to 0.0 V relative to COM.

### **E3.0 Section Not Used**



## **Part F RF Implementation**

### **F1.0 Design Requirement**

#### **F1.1 Rationale**

Due to the close proximity of the Host and ICH, it is necessary to consider the influence of the Host and Device on one another in more detail than that provided by the International Standards, in which testing is carried out at 3 metres. It is important to note that the International Standards do not consider Near Field Effects which are expected to play a significant role at the distances and frequencies critical to ICH performance.

The design of the Host shall be such that it does not radiate noise beyond the specified Noise Limit (see Appendix B) in order that the CSP can deliver maximum coverage and reliability from the ICH. The following sections provide information how to test radiated noise.

This Part F is in addition to all other RF requirements, either within ICHIS or other applicable specifications for a Host or an ICH. Consideration shall be made during development of an ICH to avoid adverse effects on the operation of the Host, but any ESME acting as Host shall be required to conform to the existing metering standards concerning measurement impact from external RF noise.

#### **F1.2 Antenna Placement**

Due to the diverse nature of Host and ICH designs, it is not possible to mandate exact placement of antenna in either Host or Device, so a prohibited zone around the interface is defined.

ESME manufacturers shall place their antenna as far away from the ICHI as practical, no closer than 20mm from the horizontal datum through the centre of the ESME interface. Placement outside this prohibited zone will also take into consideration any impact on the metrology components and impact on performance relating to the presence of AC power or metalwork.

ICH manufacturers shall place their antenna(s) as far away from the ICHI as practical, no closer than 15mm from the horizontal datum through the centre of the ICH interface connector. Placement outside this prohibited zone will also take into consideration any impact on the ICH internal components and the impact on performance relating to the potential presence multiple radios/antennas.

Placement of an antenna outside of the prohibited zone cannot be interpreted as a guarantee of satisfactory performance. Device and Host manufacturers must still follow the test procedure in this document in order to ensure compliance.

Figure F1.2-1 shows the antenna exclusion area, using an example ESME and ICH. Antennas shall not be placed in the grey shaded area.

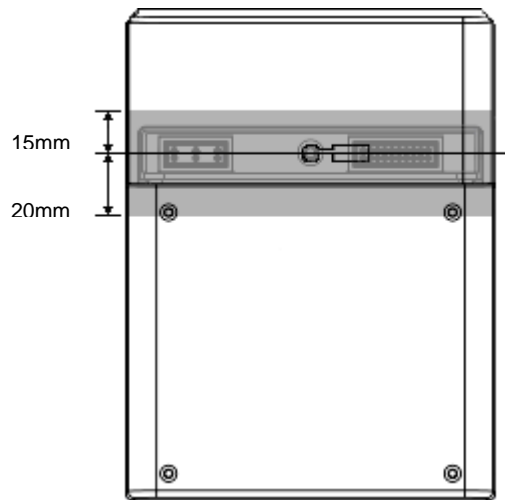


Figure F1.2-1 Prohibited antenna area (not to scale)

### F1.3 Section Not Used

## F2.0 Testing Methodology for Hosts

The Frequency bands are given below and testing of the Host against these frequencies is conducted using a CHAS. The CHAS variants that are required to be tested against to provide a result for each of the frequency bands are included in Appendix A. The ICHIS Test Specification defines test equipment setting to test these different frequency bands.

The ICHIS Test Specification defines test equipment settings to test these different frequency bands.

Frequency Band (MHz)	Start Frequency (MHz)	Stop Frequency (MHz)	Mid Frequency (MHz)	HAN/WAN
423	422	424	423	WAN (includes 'buddy mode')
454	453	455	454	WAN (includes 'buddy mode')
<a href="#">800</a>	<a href="#">801</a>	<a href="#">811</a>	<a href="#">806</a>	<a href="#">WAN (B20, DL)</a>
868	863	876	870	HAN ( <del>Sub-GHz</del> )
900	925	960	943	WAN ( <a href="#">B8, DL</a> )
2100	2110	2170	2140	WAN ( <a href="#">B1, DL</a> )
2400	2402.5	2482.5	2442	HAN( <a href="#">2.4GHz</a> )
869	869	870	869.5	WAN ( <a href="#">MESH</a> )

## **F2.1 ICHIS Test Specification**

The latest version of the ICHIS Test Specification as reviewed by the ICHIS WG and published on the SmartDCC Ltd website at the following location:

<https://www.smartdcc.co.uk/document-centre/communications-hubs/intimate-communications-hub-interface-specification/>

## **F2.2 Section Not Used**

## **F2.3 Section Not Used**

## **F2.4 Section Not Used**

## **F3.0 Section Not Used.**

## **F4.0 Methodology for Testing Multiple ESME**

### **F4.1 Informative**

It is recognised that a variety of factors may influence the testing outcome, including variation within the measurement environment or the Host devices. Testing multiple Hosts will provide a better indication of the performance of a given Host model (hardware and firmware version) and therefore the extent to which it meets the relevant Noise Limit. This section is written from the perspective of the ESME but a similar approach can be used for other Hosts.

Appendix B – specifies the Noise Limit. The Noise Limit quoted represents a specified limit, against which a Host is tested using Part F2.1 and should be used as a minimum to demonstrate compliance of tested Host by using the methodology to equate the Noise Limit to the measured RF implementation test results, including an allowance for measurement and host variability.

### **F4.2 Test Requirement**

For a given Host to meet the RF implementation requirements set out in Part F of this document the following is required:

- A minimum of 8 ESME are required to achieve a pass using the test specification at F2.1 and the method and pass criteria outlined in F4.5 and F4.6 . Each of the ESME must be identical (same hardware and firmware versions);
- Each ESME must be tested once with each of the CHAS units (except the EDM I Fyl DBCH CHAS) detailed in Appendix A - for all frequencies on each CHAS.
- Testing for the Fylingdales band with the EDM I Fyl DBCH CHAS is set out separately in section F4.7.

### **F4.3 Retesting Requirements**

A variety of factors can influence the performance of a Host. Such factors may impact the ability of the Host to meet the RF implementation requirements in Part F and therefore consideration must be given to these factors and the need to retest and validate that the Host remains compliant with the Noise Limits.

The factors include:

- Changes to Host hardware or firmware. Every change to firmware or hardware of the Host should be assessed as to the extent to which it may impact its ability to meet the RF Noise Limits and hence the need for retest.
- Changes to Host manufacturing processes. These could include intended changes, such as the move to a new manufacturing process or facility, or unintended changes which may result from manufacturing tolerances and any drift in these tolerances. These and other factors should be considered and a methodology should be developed to validate that the performance of the Host remains consistent with respect to its ability to meet the RF Noise Limits including any triggers for retest.

The test methodology set out in this section has been through various iterations. Hosts that have been installed on the basis of testing using a previous test approach are not required to be retested.

#### F4.4 Test Method

Initial Condition: ESME to be tested must have any radio disabled, as per the ICHIS Test Specification.

Test Steps: ESME must be tested for all applicable HAN and WAN frequencies of the CHAS units detailed in Appendix A – according to the ICHIS Test Specification.

#### F4.5 Pass Criteria for 423MHz, 454MHz, 800MHz 868MHz, 900MHz frequency bands:

This subsection applies to all CHAS devices, except for the EDM I Fyl DBCH CHAS, for the 423MHz, 454MHz, 800MHz, 868MHz, 900MHz frequency bands. Testing for the 454MHz band requires additional testing using the EDM I Fyl DBCH CHAS is defined in section F4.7.

For a “pass” test result, the following criteria must be met:

1. Mean of Noise Result  $\leq$  Noise Limit + Measurement Accuracy

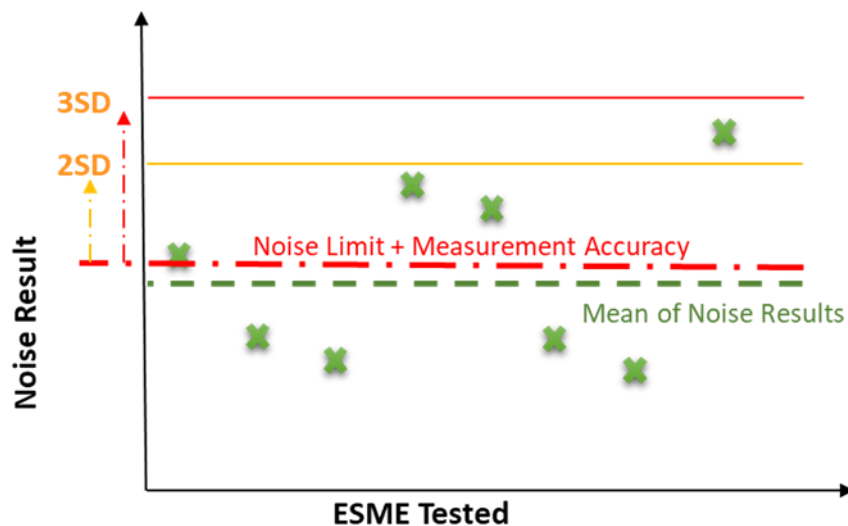
Where:

- Mean of Noise Result is calculated by taking the mean of the 8 Noise Results from the 8 ESME tested at a given frequency.
    - Noise Result is the individual noise value for an ESME at a given frequency as measured and calculated using the ICHIS Test Specification
    - Noise Limit for the given frequency is defined in Appendix B –
  - Measurement Accuracy of the test equipment used (as defined in the ICHIS Test Specification, must be less than 0.5dB)
2. At least seven Noise Results must be lower than:  $2SD + \text{Noise Limit} + \text{Measurement Accuracy}$ . 2SD is defined in the table below for each frequency band and is a reflection of the measurement variability (standard deviation) associated with testing an ESME multiple times.
  3. No Noise Result can be greater than:  $3SD + \text{Noise Limit} + \text{Measurement Accuracy}$ . 3SD is defined in the table below for each frequency band and is a reflection of the measurement variability (standard deviation) associated with testing an ESME multiple times.
  4. ~~Four~~Five plots of Noise Results (corresponding to 423MHz, 454MHz, 800MHz, 868MHz and 900MHz) should be provided for review by DCC and CSPs (as per example below).

Definition of 2SD and 3SD values used in pass criteria for 423MHz, 454MHz, 800MHz, 868MHz and 900 MHz frequency bands:

Frequency Band	2SD	3SD
423MHz	1.4dB	2.1dB
454MHz	1.4dB	2.1dB
<a href="#">800MHz</a>	<a href="#">1.1dB</a>	<a href="#">1.6dB</a>
868MHz	1.1dB	1.6dB
900MHz	2.0dB	3.1dB

Example Noise Result plot for pass criteria for 423MHz, 454MHz, [800MHz](#) 868MHz and 900MHz frequency bands:



## **F4.6 Pass criteria for 2.1GHz and 2.4GHz frequency bands**

For a “pass” test result, the following criteria must be met by all 8 meters:

Noise Result  $\leq$  Noise Limit + 1.0dB

## **F4.7 Pass criteria for 454MHz band EDM I Fyl DBCH CHAS**

This section is for testing using the EDM I Fyl DBCH CHAS only. All eight ESME samples shall be tested at the 454MHz band on the EDM I DBCH CHAS with the pass criteria as defined in section F4.5.

Two of the eight ESME samples shall be tested on the EDM I Fyl DBCH CHAS at the 454MHz band, where the two are representative samples (within 2SD defined as +/- 1.4dB) of the mean measurement from the testing in section F4.5 at 454MHz, or if this is not feasible, the closest one above the mean and the closest one below the mean. Pass Criteria: Mean of Noise Result from the 2 samples  $\leq$  Noise Limit + Measurement Accuracy

The plots of Noise Results should be provided for review by DCC and CSPs.

## **F5.0 Installation of a Host emitting RF noise at 423MHz**

### **F5.1**

Notwithstanding the provisions in Part F, for the period up to 31 March 2022 a Host that emits a level of RF noise less than or equal to 17dB at the 423MHz frequency will be considered to have met the provisions of Part F.

### **F5.2**

The provisions of Part F5.1 are applicable only if the Host is installed in those postcode areas specified by the version of the SM WAN Coverage Database relevant to the installation at the time.

### **F5.3**

Hosts that are installed up to and including 31 March 2022 in accordance with the provisions of Part F5.1 shall continue to be considered to have met the provisions of Part F beyond 31 March 2022.

## **F6.0 Installation of a Host emitting RF noise in the 900MHz band**

### **F6.1**

Notwithstanding the provisions in Part F, for the period up to 31 March 2022 a Host that emits a level of RF noise less than or equal to 6.5dB in the 900MHz frequency band will be considered to have met the provision of Part F.

## **F6.2**

Notwithstanding the provisions in Part F, for the period up to 31 March 2022 a Host that emits a level of RF noise above 6.5dB in the 900MHz frequency band will be considered to have met the provision of Part F providing it has received written confirmation from the DCC as to having undergone successful RF noise evaluation.

## **F6.3**

Hosts that are installed up to and including 31 March 2022 in accordance with the provisions of F6.1 or F6.2 shall continue to be considered to have met the provisions of Part F beyond 31 March 2022.

## **F7.0 Installation of a Host emitting RF noise in the 2.4GHz (HAN) band**

### **F7.1**

Notwithstanding the provisions in Part F, for the period up to 31 March 2022 a Host that emits a level of RF noise less than or equal to 4dB in the 2.4GHz (HAN) frequency band will be considered to have met the provision of Part F.

### **F7.2**

Hosts that are installed up to and including 31 March 2022 in accordance with the provisions of Part F7.1 shall continue to be considered to have met the provisions of Part F beyond 31 March 2022.

## **F8.0 Installation of a Host emitting RF noise in the 868MHz (HAN) band**

### **F8.1**

Notwithstanding the provisions in Part F, for the period up to 31 March 2022 a Host that emits a level of RF noise less than or equal to 7dB in the 868MHz (HAN) frequency band will be considered to have met the provision of Part F.

### **F8.2**

Hosts that are installed up to and including 31 March 2022 in accordance with the provisions of F8.1 shall continue to be considered to have met the provisions of Part F beyond 31 March 2022.

## **F9.0 Installation of Hosts in specific CSP areas**

Notwithstanding the provisions in Part F, the Host needs to meet the WAN and HAN Noise Limits for the CSP Area it is installed in as defined in Appendix B.



## **Part G Security**

### **G1.0 Physical security**

#### **G1.1 Mechanical security**

Mechanical security for the ICHIS is provided by the sealing screw, as defined in Part B1.6.1 and B1.6.2.

#### **G1.2 Tamper detection**

Electronic tamper detection for the Host and Device is provided by the pins means described in Part E.

#### **G1.3 Scope of secure perimeter**

The secure perimeter has been defined as covering only Hosts and Devices which are directly connected. As such, it excludes any flying lead between an Adaptor and Cradle, but it will detect removal of the CH from the Cradle, or the Adaptor from the ESME.

### **G2.0 Out of scope areas**

This specification does not cover security of any protocols used to communicate with either the ESME or ICH. This includes any protocols used over ZigBee HAN, SMWAN or wired HAN (including PLC), as well as any custom interfaces offered by the ESME or ICH for manufacturer purposes.

No consideration is made for other interfaces offered by an ICH or ESME, for instance a port for an external aerial. Such interfaces shall be secured appropriately by the ICH or ESME manufacturer.

## Appendix A – CHAS Details

### CHAS Units used for Test

#### Introduction

This appendix section details the CHAS units (below) which are used for testing against the ICHIS Test Specification. Testing on these CHAS variants will give a result that can be relied upon against all relevant frequencies, regardless of the CH variant the Host is joined to. Further rationale is provided below.

#### CHAS Units used for Test

- WNC DBCH CHAS
- [TOSHIBA DBCH CHAS \(SKU7\)](#)
- [TOSHIBA 4G CELLULAR DB CHAS](#)
- EDM I SBCH CHAS
- EDM I DBCH CHAS
- EDM I Fyl DBCH CHAS

Any Host that has passed the HAN 868MHz enduring limit (as per Appendix B) is also considered to have passed the WAN 869MHz (Mesh Frequency) enduring limit (which therefore is not included in Appendix B).

#### Power Consumption

The CHAS unit is a passive device, and as such will not have an active power consumption. To simulate a power draw, a resistive element is placed across the ICHIS power pins that consumes less than 6W.

#### Rationale for CHAS selection

S.N	CHAS	Reason for Selection
1.	WNC DBCH	<ul style="list-style-type: none"> <li>• WAN and HAN Antenna position are different for Dual Band WNC and Dual Band Toshiba</li> <li>• WAN and HAN Antenna position of WNC Single Band CHAS and WNC Dual Band CHAS is similar. Only difference in HAN is the antenna to include Sub-GHz frequencies</li> </ul> <p>WNC DB CHAS units are based on a DBCH cellular</p>

S.N	CHAS	Reason for Selection
2.	TOSHIBA DBCH (SKU7)	<ul style="list-style-type: none"> <li>• WAN and HAN Antenna positions are different for Dual Band WNC and Dual Band Toshiba unit</li> <li>• WAN and HAN Antenna positions of Toshiba Single Band CHAS and Toshiba Dual Band CHAS are similar</li> <li>• Only difference in HAN antenna to include Sub-GHz frequencies</li> <li>• Toshiba DB CHAS (SKU7) units are based on a DBCH Cellular</li> </ul>
3.	EDMI SBCH	<ul style="list-style-type: none"> <li>• WAN and HAN antennas are in different positions for EDM I SBCH and EDM I DBCH due to the difference in height of Single Band CHAS and Dual Band CHAS</li> </ul>
4.	EDMI DBCH	<ul style="list-style-type: none"> <li>• WAN and HAN antennas are in different positions for EDM I SBCH and EDM I DBCH due to the difference in height of Single Band CHAS and Dual Band CHAS</li> </ul>
5	EDMI Fyl DBCH	<ul style="list-style-type: none"> <li>• WAN antenna is tuned for 454MHz which is only required in the Fylingdales area.</li> <li>• HAN performance does not need to be measured on this CHAS as it is common with the EDM I DBCH (4)</li> </ul>
<u>6</u>	<u>TOSHIBA 4G Cellular DB</u>	<ul style="list-style-type: none"> <li>• <u>WAN and HAN Antenna positions in the Toshiba 4G Cellular DB CHAS differ from those in WNC or EDM I CHAS units</u></li> <li>• <u>WAN and HAN Antenna positions of Toshiba 4G Cellular DB CHAS and Toshiba Dual Band (SKU 7) CHAS are essentially the same.</u></li> </ul>



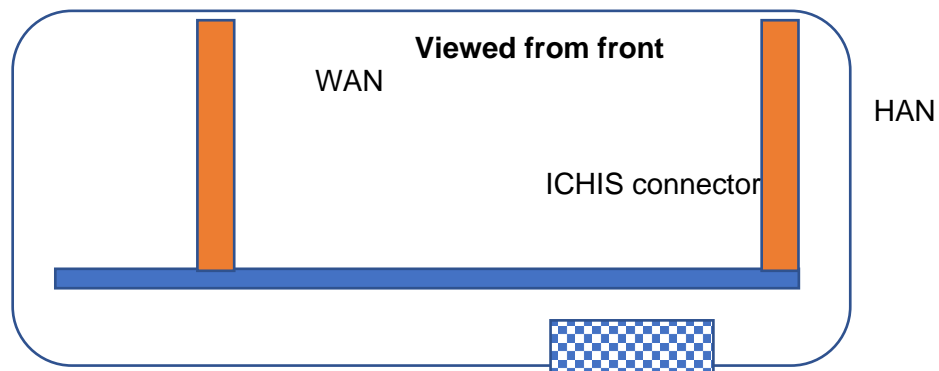
## CHAS Antenna Placement

### Introduction

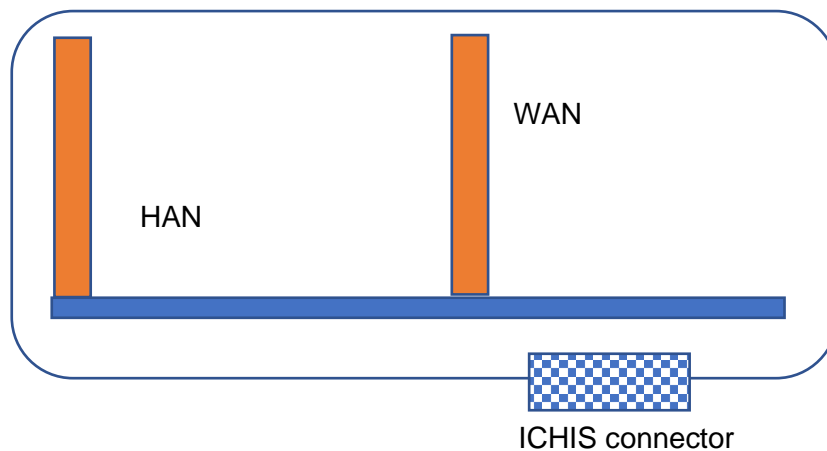
This appendix section details the antenna placements in the CHAS (and therefore relevant CH variant).

The following diagrams represent the antenna positioning within the CHAS representing each Communications Hub

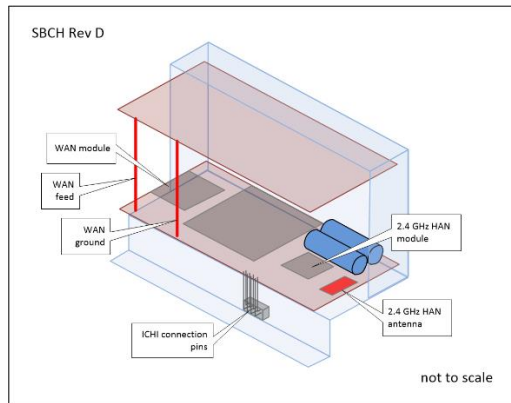
### WNC CHAS



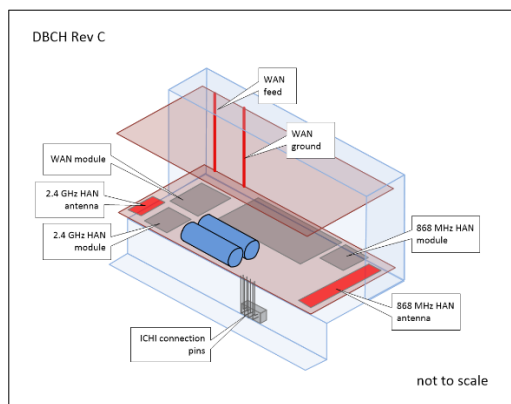
### TOSHIBA CHAS (SKU7 [and 4G CELLULAR DB](#))



## EDMI SBCH

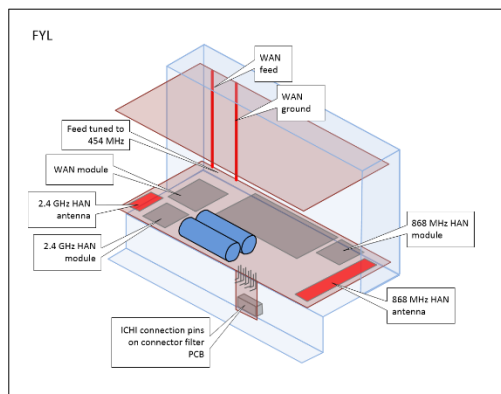


## EDMI DBCH



## EDMI FyI DBCH

This is based on the EDMI DBCH but with the full height WAN antenna (same height as the EDMI SBCH)



## Appendix B – Noise Limits

### Noise Limits

#### Introduction

This appendix section details the Noise Limits for each frequency band.

Frequency Band (MHz)	Noise Limit (dB)	CHAS	WAN/HAN	CSP Area
423	≤7.0	EDMI (SBCH/DBCH)	WAN	CSP-N excluding Fylingdales
<a href="#">800</a>	<a href="#">≤3.0</a>	<a href="#">TOSHIBA (4G CELLULAR DB)</a>	<a href="#">WAN</a>	<a href="#">CSP-C&amp;S</a>
900	≤3.5	WNC/TOSH (SKU7) (DBCH)	WAN	CSP-C&S
2100	≤3.0	WNC/TOSH(SKU7) (DBCH)	WAN	CSP-C&S
2400	≤3.5	All CHAS units	HAN	All
868	≤5.0	EDMI DBCH/WNC DBCH/TOSH DBCH	HAN	All
454	≤7.0	EDMI DBCH and EDMF Fyl DBCH	WAN	CSP-N Fylingdales

## Appendix C – Communications Hub Dielectric Tests

The testing is aligned with the comparative testing for the ESME i.e. BS EN 50470-1 and BS EN 62052-31. The relevant sections within BS EN 62052-31 are 6.10.4.2 & 6.10.4.3.

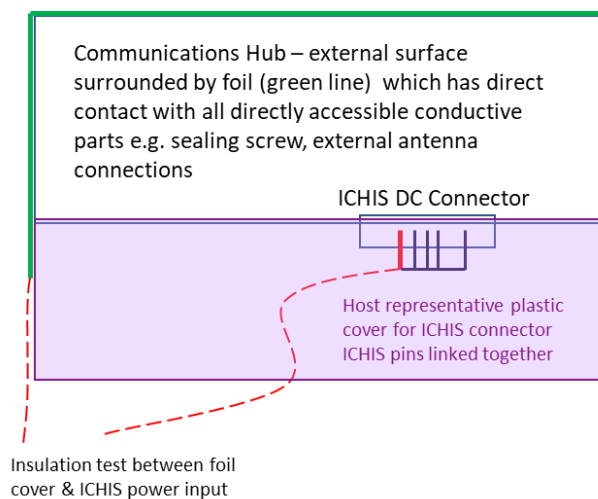
The tests shall be carried out on a Communications Hub without a Host but including the plastic housing cover for the ICHIS connector representative of a Host to avoid false test issues around the ICHIS connector. i.e. the Communications Hub can be treated as the Equipment Under Test (EUT) without an ESME present. This is representative of an ESME directly routing a live mains voltage through to one of the reference ICHIS DC power connectors.

Testing shall be applied between the ICHIS connection and the external surface. All ICHIS pins shall be linked together for the test.

The testing does not need to include the in-circuit surge tests as the Communications Hub cannot have a live mains differential across the ICHIS connector pins.

BS EN 62052-31 6.10.4.2 specifies the humidity preconditioning that should be undertaken before conducting dielectric testing

BS EN 62052-31 6.10.4.3.2 provides the test method. Option (b) should be used as the case is made of insulating material, the “earth” is a conductive foil wrapped around the Communications Hub touching all accessible conductive parts and connected to the flat conducting surface on which the Communications Hub is placed. This is illustrated below.



BS EN 62052-31 6.10.4.3.3 specifies where the impulse voltage should be applied. For the Communications Hub the connections would be HLV terminals (i.e. the connector as at mains voltage) and the foil the earth (including antenna connection if present).

BS EN 62052-31 6.10.2.3 specifies the impulse characteristics. (Note this is an impulse test and not a surge test where the pulse contains a lot more energy). The impulse voltage reference is 4kV as assessed and agreed by the UK BSI standards group for electricity meters PEL13.



BS EN 62052-31 6.10.4.3.3 defines the impulse voltage testing

BS EN 62052-31 6.10.4.3.4 specifies where the AC voltage should be applied. From Table 25 this is a) for Protective class II, referring to Table 11 which gives a voltage of 3 000 V (rms) for 1 minute.