Honeywell

AS302P

SINGLE PHASE SMART METER
OPERATING INSTRUCTIONS
M450 001 1D
23RD MAY 2019

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Disclaimer

Contents

1. FOREWORD

HEALTH AND SAFETY

Compliance with Instructions in this Manual

The instructions and information in this manual are provided in compliance with Section 6 of the UK Health and Safety at Work Act, as amended by Schedule 3 of the Consumer Protection Act 1987.

The purchaser is responsible for making sure that everyone, whether in his employment or not, who will be associated with the products supplied by Honeywell, and to which these instructions and information apply, are made familiar with the contents of this manual.

This applies to all persons who may be involved in activities such as unpacking, inspecting, testing, setting, cleaning, installing, commissioning, operating, maintaining, decommissioning or disposing of the products.

Safety of Persons using Electrical Products

Employers have a duty to ensure, as far as is reasonably practicable, the Health, Safety and Welfare at Work of all their employees. Employers must therefore ensure that employees are informed, trained and supervised and use proper working procedures to ensure the safety of themselves and others.

The information provided in this manual is intended to ensure that products are properly installed and otherwise handled in order to maintain them in a safe condition.

In countries outside the UK, Employers should ensure proper compliance with the Health and Safety Legislation that is applicable to them.

Putting into Service

Products supplied by Honeywell have been designed and manufactured, in accordance with appropriate standards, to operate under specified conditions, when properly installed.

The purchaser or delegated contractor is responsible for the "Putting into Service" of any Honeywell products that have been supplied as "Non-connected".

All related activities must therefore be carried out with due regard to any applicable legislation, standards and good practice.

2. WARNINGS

Internal Electronic Circuits

Parts of the internal electronic circuits of these meters are, due to technical necessity, connected to PHASE VOLTAGES.

WARNINGS (continued)

Removal of Covers

All supplies connected to the meter must be isolated before any attempt is made to remove the meter terminal cover. Failure to do so may result in electric shock or death.

Live parts will be exposed when the terminal cover or main cover is removed.

Removal of the communications module is permissible whilst the meter is still energised.

Removal of the main cover invalidates the certification of certified meters.

Liquid Crystal Display

Liquid crystals are toxic. If a display is damaged, avoid contact with the liquid. If the liquid makes contact with the skin it must be washed off immediately with water.

Seek medical advice.

Batteries

The meter contains an internal 3.0V Lithium Coin Cell.

This battery is completely safe under normal conditions. However, it must never be recharged, disassembled, short-circuited, heated above 100° C, incinerated, or have the contents exposed to water.

Fire, explosion or severe burns may result if these instructions are disregarded.

In the interests of safety, environmental protection and relevant legislation, Lithium batteries require careful disposal. Before arranging for the disposal of these cells, users should satisfy themselves that the proposed means of disposal is both safe and compliant with local legislation requirements.

Honeywell would like to draw the user's attention to the International Standard for Lithium Batteries - IEC 60086-4 - which gives further information about the handling, storage, transport and disposal of lithium cells.

Honeywell should be contacted by the user should difficulties arise in arranging proper disposal. They will if practical help the user identify safe disposal means.

Transferring Meters from Cold to Humid Conditions

The AS302P meter can be safely stored in the temperature range of -25° C to +70° C.

However a sudden change in temperature can cause condensation which if present can compromise the safety and operation of the meter.

On installation, a meter that has been stored in cold conditions should be removed from its packing and acclimatised at site temperature for at least one hour before connecting to the mains supply to allow all traces of condensation to evaporate.

Auxiliary Relay

The 230V a.c. relay current must not exceed 2A.

The installer is responsible for the type and gauge of cable used and must ensure the cable is protected by a suitable fuse (≤ 2A).

All supplies connected to the meter must be isolated before connecting the cable.

3. COMPLIANCE WITH STANDARDS AND EUROPEAN DIRECTIVES

Meters are marked with the European CE mark, in accordance with the Marking Directive 93/68/EEC, to indicate compliance with the requirements of the EMC Directive 2014/30/EU, Measuring Instruments Directive 2014/32/EU, the Low Voltage Directive 2014/35/EU, the Radio Equipment Directive 2014/53/EU and the RoHS Directive 2011/65/EU.

The meter complies with Class M2 Mechanical environment and Class E2 Electromagnetic Environment as defined in the Measuring Instruments Directive 2014/32/EU.

The AS302P meter has been designed and manufactured to comply with the relevant requirements of the following Directives and Specifications.

Document	Title
BS 7856: 2013	Code of practice for special design and other features of alternating current Watt hour meters for active energy (MID Accuracy Classes A and B) for use in the UK
EN 50470-1:2006	Electricity Metering Equipment (a.c.). General requirements, tests and test conditions. Metering equipment (class indexes A, B and C)
EN 50470-3:2006	Electricity Metering Equipment (a.c.). Particular requirements. Static meters for active energy (class indexes A, B and C))
EN 61000-6-2: 2005	Generic EMC Standard, section 2: Immunity – Industrial
EN 61000-6-3: 2007	Generic EMC Standard, section 3: Emissions - Residential, commercial and light industry
2014/53/EU	The “Radio Equipment” Directive (“RED”)
2002/95/EC and 2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
EN 62052-11: 2003	Electricity Metering Equipment (a.c.). General requirements, tests and test conditions. Metering equipment
EN 62052-31:2016	Electricity Metering Equipment (ac) General Requirements, Test and test conditions Part 31: Product Safety Requirements.
EN 62053-21: 2003	Electricity Metering Equipment (a.c.). Particular requirements. Static meters for active energy (Classes 1 and 2)
EN 62053-23: 2003	Electricity Metering Equipment (a.c.). Particular requirements. Static meters for reactive energy (Classes 2 and 3)
EN 62053-61: 1998	Electricity Metering Equipment (a.c.). Particular requirements. Power consumption and voltage requirements
EN 62054-21: 2004	Electricity Metering Equipment (a.c.). Tariff and load control. Particular requirements for time switches
EN 62055-31:2005	Electricity Metering Payment Systems – Part 31 particular requirements – Static payment meters for active energy (Classes 1 and 2)
EN 62056-42: 2002	DLMS – Electricity Metering. Data exchange for meter reading, tariff and load control. Physical layer services and procedures for connection-oriented asynchronous data exchange
EN 62056-46: 2002	DLMS – Electricity Metering. Data exchange for meter reading, tariff and load control. Data link layer using HDLC protocol
EN 62056-53: 2007	DLMS – Electricity Metering. Data exchange for meter reading, tariff and load control. COSEM application layer
EN 62056-61: 2006	Electricity Metering. Data Exchange for meter reading, tariff and load control. Object identification system (OBIS)
EN 62056-62: 2007	DLMS – Electricity Metering. Data exchange for meter reading, tariff and load control. Interface classes

2006/66/EC	The “Batteries” Directive
2014/30/EU	The EMC Directive
2014/32/EU	The Measuring Instruments Directive (MID)
2014/35/EU	“Electrical Equipment designed for use within certain voltage limits” (Low Voltage Directive, LVD)
SMETS2 v2.0	Smart Metering Equipment Technical Specification _Version_2 (SMETS2)
ICHIS DCC v1.0	DCC Intimate Communications Hub Interface Specification
ZigBee Document 105368	HAN physical layer
ZigBee SEP 1.2b	Smart Energy Profile Cluster data definition
ETS1 EN300.328 V2.1.1 (2016.11)	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
IEEE 802.15.4g : 2012	IEEE Standard for Local and Metropolitan Area Networks— Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs) Amendment 3: Physical Layer (PHY) Specifications for Low-Data-Rate, Wireless, Smart Metering Utility Networks
SMLT-SC-0002 ESME v1-2	CPA Security Characteristic - Electricity Smart Metering Equipment – V1.2, November 2015 (CPA DiscoverID 53997244)
DLMS Blue, Green & Yellow books	Implementation Guidance Notes - Available from DLMS User Association
GBCS v1.0 8 Nov 16	Great Britain Companion Specification - sec-5-0-schedule-8---gb-companion-specification

4. APPROVALS

Type Approvals under the Measurement Instrument Directive and Radio equipment Directive are given by SGS following assessment against the relevant standards listed above.

5. INTRODUCTION

This Manual covers the features of the AS302P SMETS2 product. The SMETS2 meter is designed specifically for the UK market and conforms to all DECC published requirements (GBCS V1.1, SMETS2 v2.0).

The AS302P is a Multi-tariff Residential Smart Meter that can be programmed by the Supplier to operate as a Credit or Prepayment Meter.

The meter offers connection to a Modular Communications Hub that conforms to the ICHI Specification. This Module can be exchanged without removing power to the meter. The meter offers ZigBee Communications for tunnelling information to the Comms Hub and to provide Customer Information for use with Type 1 or Type 2 Devices.

The meter provides extensive security features, in line with CPA Requirements.

The meter contains a contactor, thus allowing the meter to be used in Prepayment Mode, Load Limiting functionality and also allows Disconnection of Supply if premises are not occupied.

The display sequence is supported by two modes of operation, Scroll Mode and through a Menu System Mode with English Text Descriptors.

The Application Firmware can be downloaded to the meter, ensuring a future proof solution, without affecting the metrological code.

The meters are approved to:

EU Directive 2014/32/EU (MID) - EN 50470-1, EN 50470-3 Class A or Class B

IEC 62053-23 for kvarh accuracy Class 2 or Class 3

2014/53/EU - The “Radio Equipment” Directive (“RED”)

CPA Security Characteristic - Electricity Smart Metering Equipment – V1.2, November 2015

The meter has an Ingress Protection Rating of IP53 to IEC 60529

Features

- Credit and Prepayment Mode
- Integrated Disconnect Switch
- Measurement Capability
  - Import/Export kWh
  - Import/Export kvarh
- Flexible Tariff
  - 48 TOU Import kWh
  - 8 TOU x 4 Blocks Import kWh
- Menu Driven, Flexible Display
- 2 Pushbuttons
- DLMS Protocol
- ZigBee Interface
- Firmware Download
- Load Profiling
- Instrumentation
- Power Quality Monitoring
- Extensive Security Data
- Historic Billing Information
- Daily/Weekly/Monthly Customer Data
- Load Limit functionality
- Comms Hub Modular Interface
- 2A Auxiliary Relay (Optional)
- IP53 Protection

Tariff Structure

- 48 TOU Import kWh
- 8 TOU x 4 Blocks Import kWh
- 4 Seasons
- 4 Week Profiles
- 16 Day Profiles
- 200 Switching Points
- 50 Special Days
- Deferred Tariff Program

6. GENERAL DESCRIPTION

Meter Nameplates (See 34.3 for example) are marked with the rated current, reference voltage, frequency and the relevant meter constants (pulses/kWh, pulses/kvarh).

A Connection Diagram is shown underneath the terminal cover (See 34.4).

The AS302P meter measures a single energy flow.

The meter will resume its previous operating state following any power interruption.

6.1. Current and Voltage Ratings

The Meter Rating is stated on the Nameplate (See 34.3). The following ratings are available:

Reference voltage: 230V

Frequency: 50 Hz

Current MID ratings, Imin - Iref (Imax):

1.0 - 20(100)A 0.5 - 10(100)A 0.25 - 5(100)A

Current (IEC ratings, Ib - Imax):

20 - 100A 10 - 100A 5 - 100A

6.2. Terminal Arrangements

Current Terminals	8.2mm diameter bore, 2 x M6 Combi pinch screws Screw material - Steel, Zinc Chromate plated
Auxiliary Terminals (Relay)	Screw Terminals

See 34.4.

6.3. Energy Measurement

The meter measures the following:

kWh Import (+A)

kWh Export (-A)

kvarh Import (+R)

kvarh Export (-R)

6.4. Meter Accuracy

The AS302P meter measures Active Energy, in accordance with the requirements of:

- EU Directive 2014/32/EU (MID) - Class A or Class B (EN 50470-1, EN 50470-3)

The meter measures Reactive Energy in accordance of the requirements of:

- EN / IEC 62053-23 (reactive energy) - Class 2 or Class 3

The design of the meter ensures lifelong stability, there are no on-site adjustments required.

6.5. Meter Case

The Case is Double Insulated to Protective Class II.

The Case provides an Ingress Protection Rating of IP53 in accordance with IEC 60529.

The Base with its Integral Terminal Block is Coloured Glass Filled Polycarbonate.

The Meter Terminal Cover (moulded in polycarbonate) is a Short Terminal Cover.

The Main Cover is moulded in Polycarbonate.

A Communications Module can be fitted to the meter provided it conforms to the DCC Intimate Communications Hub Specification.

The Main Cover is secured by two screws (shear head)

A separate sealable screw secures the Terminal Cover.

A separate sealable screw secures the Comms Hub.

The Outline and Fixing Dimensions are shown in 34.5.

6.6. Unauthorised Physical Access (Tamper Detection)

If a Tamper Event is detected the meter can be configured to open the Main Contactor. In this event the contactor can only be closed again by a Command from DCC.

Communications Hub Removal Detection

Pins are provided on the Comms Hub or in the ICHI Blanking Plate that allow the meter to electronically detect if the Comms Hub is present or not.

The Removal of a Comms Hub event is stored in the Security Log with a Time and Date Stamp.

Magnetic Field Detection

The AS302P has a sensor which detects if a Strong Magnetic Field has been detected or removed.

The detection or removal of a Magnetic Field is logged in the Security Log with a Time and Date Stamp.

Detection Level of a Magnetic Field (three planes) is:

Range 25 to 60 Gauss (2.5 to 6.0 milli-Tesla).

When there is no power to the meter, only the first tamper event will be recorded:

Main Cover and Terminal Cover Removal Detection

The Main Cover and Terminal Cover are fitted with Tamper Switches to detect removal.

The Removal of a Cover Event is stored in the Security Log with a Time and Date Stamp.

7. TEST OUTPUT DEVICES & ANTI CREEP INDICATION

Test Output Devices

An Optical Test Output is provided (Normally indicates kWh, reprogrammable to show kvarh).

The indicator pulses for both Import and Export Energy.

The indicator is not modulated.

The Test Indicator Pulse Rates are set at manufacture to 4,000 pulses/kWh (kvarh).

The Pulse Duration is set at 5ms (default).

The Pulse Rate configured is shown on the Meter Nameplate.

Anti-creep

The Watt and var anti-creep thresholds are set at Manufacture.

The kWh (kvarh) Test Indicator is continuously illuminated when the Active Energy Anti-creep Lock is operating.

8. FEATURES

The meter contains numerous features; combinations of which can be selected to provide the required metering function.

The meter stores 4 types of data:

- Operational Data (See Appendix D for details) - Created/updated by the meter, this can be read by the DCC at any time.
    - It is expected that data read from the meter should be verified in the Suppliers backend system e.g. to ensure cumulative registers have advanced etc.
- Configuration Data (See Appendix D for details) - Can be read and configured by the DCC at any time
    - If this data is configured then an event is stored in the Event Log with a Time and Date Stamp
- Constant Data (See Appendix D for details) - configured during manufacture and can be read by the DCC at any time
- Internal Data (See Appendix D for details) – this data is not available outside the meter

8.1. Registration of Quantities

kWh (Active Energy)

- kWh Import (+A)
- kWh Export (-A)

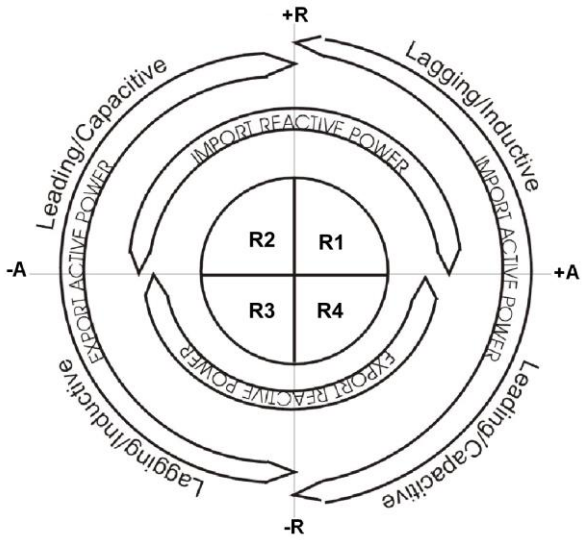
kvarh (Reactive Energy)

- kvarh Import Reactive (+R)
- kvarh Export Reactive (-R)

kvarh is derived using the phase shift method.

The resolution of registration is 0.001kWh (kvarh).

Total Import and Export Quantities are registered separately. The measurement discrimination is such that as the power factor of any load from 0.05Ib to Imax is varied over 360°, the import and export registers will never advance together.



Note: The diagram shows a representation of the quadrants. The quadrant of the present load can be shown on the display.

8.2. Demand Registers

A Demand Register is associated with the Import and Export kWh Registers.

The Demand Period is set at 30 minutes.

9. OPERATING MODES

The AS302P can be configured to operate in Credit or Prepayment Mode. If no parameters are sent the meter will remain as programmed during Manufacture. The following mode switching configurations are available:

Credit to Prepayment

Prepayment to Credit

Credit to Credit

Prepayment to Prepayment

The mode of operation is available on the display and through the HAN for other devices.

9.1. Change of Operating Mode

On any change of mode the following actions occur:

- A Set of Billing Data is Recorded
- The Time and Date is Recorded
- The Meter Balance is Set to Zero

Credit Mode to Prepayment Mode (or Credit to Credit)

- As above.

Prepayment to Credit Mode (or Prepayment to Prepayment)

- As above
- Prepayment Billing Information is recorded

GBCS Use Case ECS03 “Set ESME Payment Mode to Prepayment” is used to switch the Meter to Prepayment mode. On using this use case the following parameters are configured in the meter:

- New account in Prepayment mode
- Disablement threshold
- Suspend Debt Disabled and Suspend Debt Emergency
- Activation time for the new account, Disablement Threshold and Suspend Debt Disabled / Emergency parameters

GBCS Use Case ECS02 “Set ESME Payment Mode to Credit” is used to switch the Meter to Credit mode. On using this use case the following parameters are configured in the meter:

- New account in Credit mode
- Suspend Debt Disabled and Suspend Debt Emergency – Note: these are not actually used in credit mode
- Activation time for the new account and Suspend Debt Disabled / Emergency parameters

10. CHANGE OF SUPPLIER AND TENANCY

The AS302P can be programmed with an Activation Time/Date for a New Supplier or a New Tenant (Restrict Data). This will be actioned by a command from DCC.

10.1. Contact Details

Name and Phone Number for the Supplier is available on the Meter Display and can be configured as follows:

- Supplier Details – 15 characters
- Supplier Phone Number – 18 characters

10.2. Restrict Data

A dedicated Restriction of Data Notification Command is used to restrict the data made available on the display and to Type 1 & Type 2 Devices. This command will contain a date from which the data is restricted (this date can be in the past). All data will still be available to read via the DCC.

11. TARIFF

11.1. Deferred (Pending) Tariff

There is a Command from DCC to set a Tariff on the meter.

This will contain the following information:

- Tariff TOU Price Matrix (at least one has to be populated)
- Tariff Block Price Matrix,
- Tariff Switching Table
- Tariff Thresholds
- Standing Charge
- Currency Units (£ or €)

The Tariff previously set in the meter will continue to be used until the newly downloaded tariff is activated.

Each of these items can have their own Activation Date/Time. If an Activation Date/Time is set in the past, this will be actioned immediately. It is possible for an Activation Date/Time to be set significantly far enough in the future so that any new tariff element will never be activated.

A Cancellation Command can be sent to prevent any part of the tariff becoming active.

When the meter changes its tariff structure then Billing Data is captured. If in Prepayment Mode, Billing and Prepayment Data will be captured.

11.2. Tariff Structure

The meter can operate in either TOU Mode or TOU Block Mode.

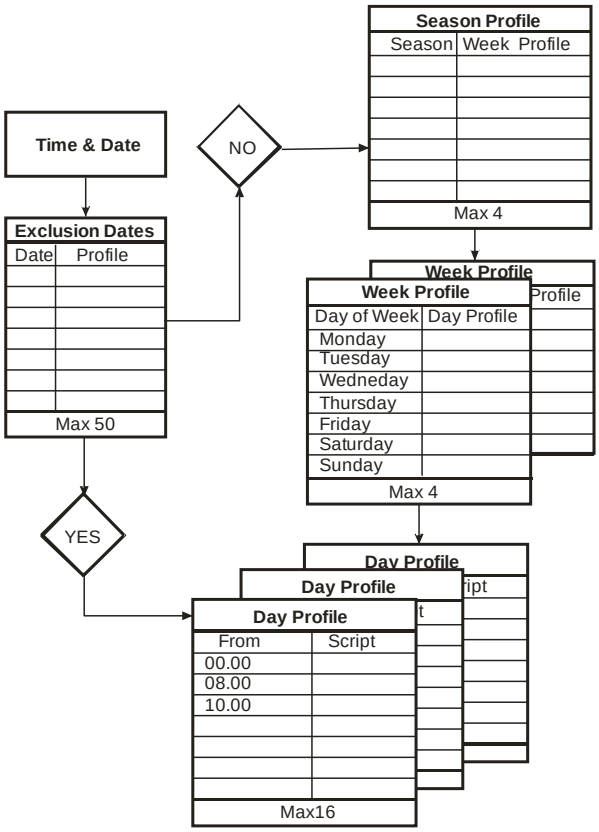
Switching times on the TOU can be subject to a Randomisation Offset. This is based on:

- Randomised Offset Limit (A value in seconds in the range 0 to 1799)
- Randomised Offset Number (A randomly generated value between 0 and 1)

11.2.1. TOU Mode

Independent Switching for 48 TOU Registers based on Imp KWh.

Tariff Structure



The script defines the rates to turn 'On' or turn 'Off' at a particular time.

11.2.2. Tariff Switching Table

The Tariff supports a maximum of 200 Switching Points. These can be used in any combination over the maximum number of Seasons/Week/Day Profiles given below.

11.2.3. Seasons

Up to 4 Seasons may be specified and at least one Season must be programmed for the TOU Registers to be available.

The old Season ends at the instant the new Season starts.

A new Season starts at 00.00 of the specified date.

Start dates are specified as absolute (dd.mm) dates.

The example in the diagram shows four Seasons. Season 1 is in operation from January to February, Season 2 from March to May, Season 3 from June to September, Season 4 from October to December.

The Season Profile defines which week profile is active through that period.

11.2.4. Week Profile

A Week Profile allows different Day Profiles to be specified for each day of the week.

There is a maximum of 4 Week Profiles.

A minimum of one Week Profile is required for tariff operation.

A Day Profile is required to be defined for each day of the week.

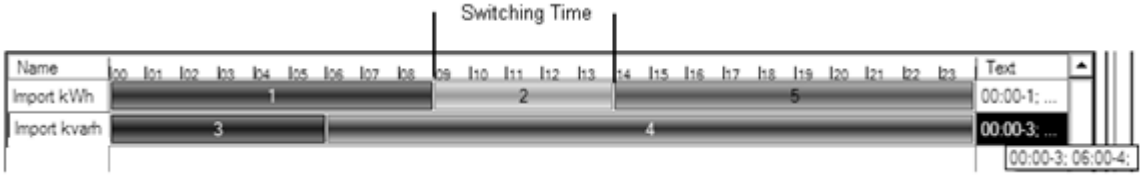
11.2.5. Day Profiles

There are a maximum of 16 Day Profiles.

Each Day Profile can be used in any Week Profile (There is no limit in the number of times a Day Profile can be used.)

A minimum of one Day Profile is required for tariff operation.

Each Day Profile is a number of Switching Times, these are configured and occur on 30mins Boundaries.



11.2.6. Special Days

Up to 50 'Special Days' can be specified, the specification can include 'Wild Cards'. These days can switch to any defined Day Profile.

11.2.7. TOU Price Matrix

The Price Matrix sets the cost (in Pounds to 5 decimal places) of energy for each TOU. This information can be shown to the Customer locally on the meter display or sent to Type 1 or Type 2 Devices. Price Information is also used for the Prepayment Application and to calculate Cost Information.

The AS302P contains the 'Active' and a 'Deferred' Price Matrix which must be configured for each TOU Rate.

The Price Matrix is for Import Active Energy only.

The Price Matrix applies to all 48 TOU Registers i.e. they all need to be sent at the same time (it is not possible to update a single TOU Price).

The Price Matrix for future cost of energy can be programmed to activate at a specified Time and Date.

When the Price Matrix is changed then an entry in the Billing Data Log set is created.

The current Active Tariff Price is determined by the current TOU and the associated Price from the Price Matrix.

Rate	Price
Rate 1	0.000
Rate 2	0.000
Rate 3	0.000
Rate 4	0.000
Rate 5	0.000
Rate 6	0.000
Rate ...	....
Rate 48	0.000

11.2.8. Standing Charge

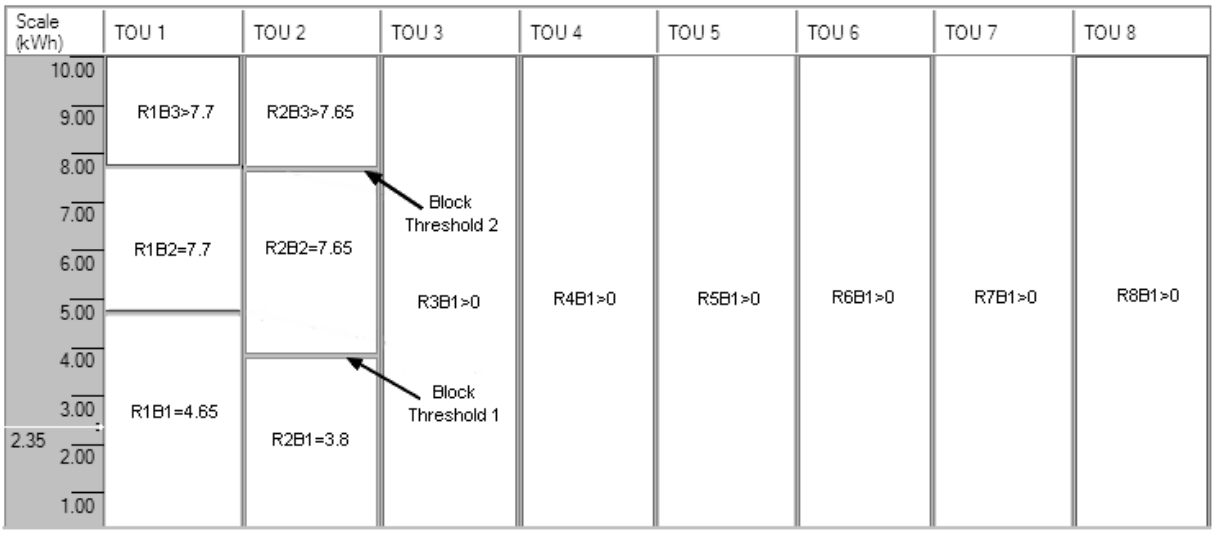
A Standing Charge with associated Activation Date/Time can be configured in the meter.

The Standing Charge is deducted every day at Midnight.

11.3. TOU Block Tariff

TOU Block

TOU Block Tariffs can have 8 TOU Registers with a maximum of 4 Blocks for each TOU Register. The diagram below shows a 2 Rate Tariff, TOU1 having 3 Blocks and TOU2 having 3 Blocks. The Block Thresholds are configurable.



For each TOU, the Energy usage (in kWh's) is accumulated until Block Threshold 1 is reached. The sequence is then repeated up to Block Threshold 2, with any Energy usage above the Block 2 Threshold accumulated in Block 3.

The Maximum Block Configuration is 8 TOU, 4 Blocks, allowing up to 32 Price Bands in total.

The TOU Rate Definitions are defined in the same way as the TOU Tariff.

Special Days can be programmed to override the Block Tariff.

The Tariff Block Register Counters (rising) will be reset in line with the Billing Calendar, these can also be reset on receipt of a command.

11.3.1. TOU Block Price Matrix

The TOU Block Price Matrix is for Import Active Energy only and contains 8 x 4 prices.

The TOU Block Price Matrix can be programmed to be activated at a specified Activation Date/Time.

The TOU Block Price Matrix for the TOU Block Tariff is shown below:

Rate	Block 1 (p/kWh)	Block 2 (p/kWh)	Block 3 (p/kWh)	Block 4 (p/kWh)
Rate 1	0.000	0.000	0.000	0.000
Rate 2	0.000	0.000	0.000	0.000
Rate 3	0.000	0.000	0.000	0.000
Rate 4	0.000	0.000	0.000	0.000
Rate 5	0.000	0.000	0.000	0.000
Rate 6	0.000	0.000	0.000	0.000
Rate 7	0.000	0.000	0.000	0.000
Rate 8	0.000	0.000	0.000	0.000

11.3.2. Maximum Demands

The AS302P calculates and stores the following Maximum Demands:

- Maximum Demand Active Power Import Value
- Maximum Demand (Configurable Time Active Power Import Value)
- Maximum Demand Active Power Export Value

These values can be reset on a receipt of an appropriate command (any value or all values can be reset with this command).

11.3.2.1. Maximum Demand Active Power Import Value

This stores the largest Average Value of Active Power Import recorded in any 30 Minute Period since it was last reset, along with its UTC Time of Occurrence.

11.3.2.2. Maximum Demand (Configurable Time) Active Power Import Value

This stores the largest Average Value of Active Power Import Recorded in any 30 Minute Period, within a Configurable Time Period, since it was last reset, along with its UTC Time of Occurrence.

11.3.2.3. Maximum Demand Active Power Export Value

This stores the largest Average Value of Active Power Export recorded in any 30 Minute Period since it was last reset, along with its UTC Time of Occurrence.

12. BILLING DATA

The meter stores several different sets of data under the description of Billing Data according to the SMETS2 / GBCS Definition.

12.1.1. Periodic/Calendar Billing Data Log

There are 12 entries in the Billing Data Log, these are captured with a UTC Date and Time Stamp.

The meter is configured with a Capture Date, which includes Wild Cards i.e. the Billing will happen at the same Time and Date every month (period).

The Capture Date can be set to Zero in which case no Automatic Billing will occur. If a Single Date is set i.e. No Wild Cards then once the capture has been completed the date will be removed from the meter as it will be stored with the billing Set. (Capture Date is set to zero, therefore no Automatic Billing will occur).

The following Billing Data is available in the Billing Data Log:

Credit Mode

- Tariff TOU Registers
- Tariff TOU Block Registers
- Active Import Register

Prepayment Mode

- Credit Information above
- Meter Balance
- Emergency Credit Balance
- Accumulated Debt
- Remaining Payment Debt
- Remaining Time Debt 1 and 2

An Alert is sent via the HAN Interface containing the most recent entries in the Billing Data.

The Meter Balance is immediately reset, if the mode is changed.

12.1.2. Change of Mode / Tariff Billing Data Log

A set of Billing Data will be recorder when:

- The meter changes from Prepayment to Credit Mode or vice versa
- The meter changes Tariff/Price Structure

There are 12 entries in the Billing Data Log that are captured with a UTC Date and Time Stamp. The following Billing Data is available in the Billing Data Log, (a single log which covers Credit & Prepayment info):

- Tariff TOU Registers
- Tariff TOU Block Registers
- Active Import Register
- Meter Balance
- Emergency Credit Balance
- Accumulated Debt
- Remaining Payment Debt
- Remaining Time Debt 1 and 2

12.1.3. Payment Billing Data Log

The Data Log will be updated when Credit is added to the meter,

- The last 5 Prepayment Credits

12.1.4. Payment Based Debt Recovery Billing Data Log

The Data Log will be updated when Billing Payment Based Debt is recovered.

- The last 10 Payment Based Debt Payments

12.2. Daily Read / Billing Data Logs

The meter stores 3 Daily Read Data Logs. These are stored with a UTC Date and Time Stamp.

31 sets of data are stored for each of the 3 logs.

12.2.1. Import Daily Read log

- Tariff TOU Register Matrix
- Tariff TOU Block Register Matrix
- Active Import Register

12.2.2. Export Daily Read Log

- Active Export Register

12.2.3. Prepayment Daily Read Log

- Meter Balance
- Emergency Credit Balance
- Accumulated Debt
- Remaining Payment Debt
- Remaining Time Debt 1 and 2

13. CUSTOMER COST INFORMATION

13.1. Consumption Data

The AS302P stores the following data for Daily, Weekly and Monthly Billing:

- Import kWh
- Estimated Cost for kWh Import

Daily Cost is calculated by taking the advance in each TOU or TOU Block Register and multiplying this by the Current Price plus Standing Charge.

All values are calculated per second.

These values are stored at Midnight Local Time.

Historical Consumption and Cost of Consumption Estimate Reporting

Daily - Current Day and Previous 8 Days (Current day 00.00 to Present Time)

Weekly - Current Week and Previous 5 Weeks (00.00 Monday to 23.59.59 Sunday)

Month - Current Month and Previous 13 Months (00.00 First Day of Month to 23.59.59 Last Day of Month).

13.2. Meter Balance – Credit Mode

Meter Balance can be viewed on the display.

The Meter Balance is calculated using the following factors:

- Energy usage * Price applicable at the time (based on TOU Rate or TOU Block Rate)
- Standing Charge
    - If the meter is Powered Down for a Period then all missed Standing Charges will be added when the meter is next powered up.

The Meter Balance is updated every second.

The Meter Balance can be adjusted or set to zero on receipt of an appropriate command. An Event will be created in the Event Log.

14. COST OF INSTANTANEOUS CONSUMPTION

The instantaneous cost of consumption is based on the Active Power Import and the current Active Tariff Price.

This is calculated at least every 5s.

15. POWER THRESHOLD STATUS

The AS302P has 2 configurable Ambient Power Thresholds, these are set for:

- Low - Medium Power Threshold
- Medium - High Power Threshold

These Thresholds are used to determine if the current consumption level is Low, Medium or High.

This information will be available for the Type 1 or Type 2 Devices.

16. PROFILES

The meter supports Five Load Profiles as follows:

Profile 1 - Import kWh

Profile 2 - Export Log

Profile 3 - Import kvarh

Profile 4 - Average RMS Voltage

Profile 5 - Daily Consumption Log

All profiles are a FIFO Data Storage.

16.1. Profile 1 – Profile Data Log Import

Import kWh (amount of energy consumed in the 30min Period)

13 Months of Data for One Channel for 30min

16.2. Profile 2 - Profile Data Log Export

kWh Export (amount of energy consumed in the 30min Period)

kvarh Export (amount of energy consumed in the 30min Period)

3 Months Days of data (30 minutes period)

16.3. Profile 3 – Profile Data Log kvarh Import

kvarh Import (amount of energy consumed in the 30min Period)

3 Months Days of Data (30 Minutes Period)

16.4. Profile 4 – Profile Data Log Average RMS Voltage

Average RMS Voltage, over a Configurable Period.

4320 entries

16.5. Profile 5 – Daily Consumption log

kWh Import – Amount of kWh consumed in a Day

- Captured at Midnight UTC
- 731 Days Storage

17. PREPAYMENT MODE

This Section describes features applicable to Prepayment Mode only.

17.1. Introduction

The AS302 can be configured to act as Credit or a Prepayment Meter. When configured in Prepayment Mode, relevant Prepayment Information needs to be configured in the meter.

The main meter functionality remains the same for Credit Mode and Prepayment Mode. The meter will continue to operate in Prepayment Mode regardless of connection to the WAN.

17.2. Meter Balance - Prepayment

The Meter Balance can be viewed on the display.

The Meter Balance is increased when credit is added to the meter.

The Meter Balance can be adjusted (positive or negatively) by receipt of an appropriate command.

The Meter Balance can be reduced by the following individual factors:

- Energy usage - Price applicable at the time
- Recovery of any Debt configured in the meter
- Recovery of Standing Charge

The Meter Balance is updated every second.

The Meter Balance can be reset to zero on receipt of an appropriate command. This will also reset the Accumulated Debt and Emergency Credit Balance. An event will be created in the Event Log.

If the contactor is in the Open and Unlocked state, any adjustment to the Meter Balance that causes it to rise above the Disablement Threshold will Arm the Contactor (the Contactor symbol will flash on the display).

17.2.1. Low Credit Warning

The Low Credit Threshold is a configurable monetary value that is used to alert the consumer that the Meter Balance (and if activated the Emergency Credit Balance) is low.

The meter issues a Low Credit Warning on the display to the consumer if the Meter Balance (and if activated the Emergency Credit Balance) is equal to or less than the Low Credit Threshold and sends an alert on the HAN and WAN.

The Low Credit Warning, on the display, is removed if the Meter Balance (and if activated the Emergency Credit Balance) rises to a value greater than the Low Credit Threshold.

An Audible Alarm can be sounded when the Low Credit situation is entered (This is configurable during the manufacturing process only).

17.3. Disablement Threshold

The Disablement Threshold is a configurable monetary value used to control the opening of the contactor. The meter contactor will open if the Meter Balance (and if activated Emergency Credit Balance) is less than the Disablement Threshold unless scheduled otherwise in the Non-disconnection Calendar. This will create a message on the display and send an Alert on the WAN.

The contactor cannot be closed by the consumer until the Meter Balance (and if activated Emergency Credit Balance) rises to a value equal to or greater than the Disablement Threshold.

The contactor will not open if the Meter Balance (and if activated Emergency Credit Balance) is equal to or less than the Disablement Threshold during periods on non-disconnection as defined by the Non-disconnection calendar. If this situation occurs an Alert will be sent by the HAN.

See 34.9 for operation of the Disablement Threshold.

17.4. Add Credit

Credit can be added to the meter in the following ways:

- From DCC via the WAN/HAN, known as a PTUT (Payment Top-up Transaction)
- By the Customer entering a UTRN using the Pushbuttons on the meter User Interface
- By the Customer entering a UTRN using a PPMID connected to the HAN

A UTRN (Unique Transactional Reference Number), is a 20 Digit Code unique to a particular Smart Meter.

When the PTUT or UTRN is received by the meter it will perform the following checks:

1. Compare the Credit Value with the Maximum Credit Threshold, if the Credit Value is largest then the UTRN will be rejected
2. Compare the projected new Meter Balance with the Maximum Meter Balance Threshold, if the new Balance is largest then the UTRN will be rejected
3. Verify the Authenticity of the UTRN
4. Verify it is intended for this meter
5. Generate a PTUT Counter and compare this against the last 100 verified PTUT entries and reject any duplicate presentation of verified UTRN's and PTUTs
6. Count the number of Invalid Number of UTRN's Entered and Processed

If the PTUT or UTRN is rejected for reasons 1, 2, 3, 4, 5 above then the meter will generate an entry in the Security Log.

The new Meter Balance will be updated once any appropriate reductions are made (See Section – Allocation for Credit Top Up), if the Meter Balance rises above the Disablement Threshold then the Contactor will be Armed (the contactor symbol will flash). An Alert will be sent on the HAN Interface, indicating the Contactor is Armed.

On successful application of an Addition of Credit, the Billing Data Log will be updated and an Alert containing a UTC Date and Time stamped Meter Balance value will be sent via the HAN.

The last 10 Top Ups can be viewed on the display.

Top Up Information is shown on the display:

- Top Up Amount (£0.00)
- Top Up Date and Time (dd-mm-yy hh:mm)

If incorrect UTRN attempts are made from the PPMID or the User interface then:

- A count of the incorrect UTRN attempts is incremented
- If this count equals 10 then
    - further attempts are locked out for a 30 minute period
    - an Event is raised

If a remote UTRN is received then this will be validated regardless of the state of the lock-out. If this UTRN is also invalid then the counter will be incremented.

On receipt of a valid UTRN the Lock-out Counter will be reset to zero.

The meter completes all SMETS / GBCS requirements to ensure only valid UTRNs / PTUTs are accepted and processed. It is also recommended that the Supplier reads the meter to ensure that the UTRNs /PTUTPs accepted by the meter are aligned with the Financial Transactions seen through the Backend Systems. It is also recommended that the Security Log is also read on a regular basis to identify if incorrect UTRNs / PTUTs are being entered on a regular basis.

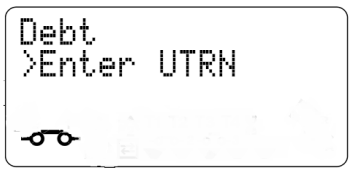
17.4.1. Credit Top Up – WAN / HAN

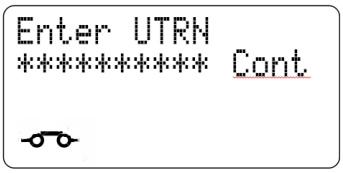
PTUTs can be sent via the DCC to the meter.

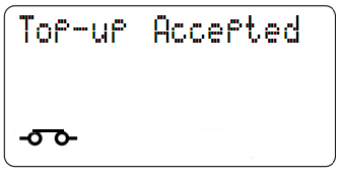
17.4.2. Manual Entry Credit Top up

The Consumer can enter a UTRN either on the meter or on the PPMID.

The process for adding this code on the meter is described below:







The UTRN code is fixed to 20 characters long.

Only numeric characters are allowed (0...9). First 10 are shown on the first line of the display, the last 10 on the second line.

Select Button

- A short button press at any character position will move the cursor forward (to the next character position).

- A short button press at the 20th character position will bring the cursor back to the 1st character position of the UTRN code. This will help the user to re-enter any incorrect values before validating it.

- A long button press at the 20th character position indicates that the code entry is complete and that the code can now be validated by the meter.

Next Button

- Enables user to change the UTRN character by increasing the value from 0 to 9 and then wrapping around back to 0.

The character currently selected will flash until the "SELECT" button is pressed. Once a code has been selected the cursor will move to the right immediately (to enable the next character selection).

If the UTRN code validation is successful the meter shows the following message: TopUp Accepted.

If the UTRN code validation is unsuccessful, the meter shows the following message: TopUp Rejected. A short press of the "SELECT" button will show: "Retry?" - first line, "Yes/No" - second line. In this case:

- "SELECT" button: allows the user to select an option.

- "NEXT" button: allows the user to navigate between options. The selected option will flash.

If "Yes" is selected then UTRN entry menu is shown again.

If "No" is selected then the meter returns to parent menu.

After 10 successive invalid entries, the e-meter removes the UTRN code entry offer for 30 minutes [if this is active then the e-meter shows: "Restricted" - first line, "for xxx sec"- second line]

17.4.3. Allocation of Credit Top up

Before Credit is added to the Meter Balance appropriate charges need to be deducted.

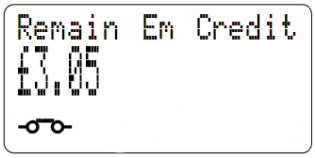
Payment Based Debt (subject to Debt Recovery Cap – See Section 17.7.2)

Accumulated Debt (See Section 17.7.3)

Emergency Credit Used (See Section 17.7.5)

See 34.10 for the logical operation of the TopUp Allocation.

17.5. Emergency Credit



Emergency Credit can be offered to a Customer if their Meter Balance is below the Emergency Credit Threshold (which is a configurable monitory value). An Alert will also be sent:

- Via the HAN to notify the Customer
- Via the WAN to the Supplier

The amount of Emergency Credit Available (Emergency Credit Limit) to the Customer is a configurable monetary amount. The Emergency Credit Threshold and Emergency Credit Limit can be changed at any time, however if Emergency Credit is already Accepted / In Use / Used, then the original values will be maintained until the Emergency Credit becomes Unavailable or Available again. The Transition States for Emergency Credit is shown in 34.11.

The Emergency Credit Balance (the amount of Emergency Credit available to use) will be available on the display for the Customer.

The Emergency Credit Balance will reduce once the Meter Balance is exhausted. This reduction is based on:

- Energy Usage – Price applicable at the time
- Recovery of any Debt configured in the meter
- Recovery of Standing Charge (if not suspended)

The Emergency Credit Balance is updated every second.

This Emergency Credit Balance will be reset if a command is received by the meter to reset the Meter Balance.

The amount of Emergency Credit Used will be added to the Debt to Clear amount.

Once Emergency Credit is offered to the Customer it can be accepted in one of 3 ways:

- Emergency Credit is accepted by pressing the Top Pushbutton.
- Emergency Credit is accepted by use of the PPMID
- A Command to activate Emergency Credit, this will be rejected if the meter is in Credit Mode

The meter changes the Emergency Credit Status to ‘Accepted’.

If the contactor is open and if the combined credit of the Meter Balance and the Emergency Credit Balance rises above the Disablement Threshold then the contactor will be armed (unless the Supply State is locked).

The status of the Contactor is shown on the display.

An Alert that the Contactor is armed is generated on the HAN.

While the Emergency Credit is available, the top 4 characters will alternate showing "spaceECspace". While the Emergency Credit is in use the top 4 characters will alternate showing “*EC*”. (These are visible only if PIN is disabled)

Once all the Emergency Credit is used then the meter will send an alert on the HAN & WAN and store an event in the Event Log.

17.6. Non-disconnection Calendar

Non-disconnect (Friendly Credit) Periods are times defined by the Supplier when a Customer’s supply will not be disconnected if their Meter Balance, plus Emergency Credit Balance, drops below the Disablement Threshold.

If the Contactor is open when the Friendly Credit period is entered then the Contactor will remain open.

While the Friendly Credit Period is active and in use the top 4 characters will alternate showing “ND”.

A switching table defines the periods for non-disconnection.

The following parameters can be defined:

- 5 Day Types
- 20 Special Days, if one of these are not active then the meter will use the Day Type defined in the Week Profile
- 2 Week Profiles, each containing a maximum of 2 Day Profiles
- Three Seasons

Dates and Days operate from Midnight to Midnight and the Time of Day applies to all other days not specified by a Date or Day.

During this period any charge for energy used is accumulated in Debt to Clear.

17.7. Debt Collection

The meter supports Three Different Debts.

The Debt Registers can be configured and adjusted (positively or negatively). Any changes to the debt information are stored in the Billing Data Log. Any change to debt will only be accepted if the meter is in Prepayment Mode, if in Credit Mode the command will be rejected with an Alert advising so sent to the WAN.

Debt Information can be viewed on the meter display.

17.7.1. Time Based Debt – 1 & 2

Two separate Time Based Debts can be collected in the meter.

These debts are defined as:

- The amount of Debt (Outstanding)
- The Daily Recovery Rate

The Daily Recovery Rate is collected (configured during Manufacture Only):

- Hourly
- Daily

Until the debt is fully recovered.

If there is a Power Outage then debt will be recovered for the period of the outage when power is restored e.g. if £1.00 is to be collected daily and there has been a Power Outage for 3 days then £3.00 will be recovered at power restoration.

If the Daily Recovery Rate is greater than the amount of Debt Outstanding then the Debt Outstanding will reduce to zero and the difference between DRR and DO will remain on the Meter Balance.

17.7.2. Payment Based Debt – 3

A Payment Based Debt can be collected by the meter when credit is added to the meter. This is calculated as a percentage of each Credit Top Up.

The Payment Based Debt is defined as:

- The Total Amount Outstanding
- Debt Recovery Per Payment (%)
- Debt Recovery Cap (maximum amount that can be recovered in a week)

The processing of this debt is shown in 34.9.

17.7.3. Accumulated Debt

Accumulated Debt =The debt resulting from the collection of Standing Charge and / or Time-based Debt when Emergency Credit is in use as configured by Suspend Debt Emergency, when operating in Prepayment Mode. This value will be reset if a command is received by the meter to reset the Meter Balance.

17.7.4. Aggregated Debt

The Aggregated Debt = Debt 1 Outstanding + Debt 2 Outstanding + Debt 3 Outstanding.

17.7.5. Debt to Clear

Debt to Clear is calculated by the meter as:

i. Difference between the Meter Balance and the Disablement Threshold plus
ii. Amount of Accumulated Debt plus

iii. Amount of Emergency Credit used by the Customer

iv. Amount of any Payment Based Debt (this is calculated as the payment base % of items i to iii)

Debt to clear amount is calculated every second and is available on the display.

17.7.6. Debt Collection Suspension Settings

Standing Charge and Debt 1 / 2 collections may be suspended in situations where the Contactor is Open and/or Emergency Credit is in use.

The process flow behind the Debt Suspension Operation is shown in 34.8.

17.7.7. Suspend Debt Disabled

The Suspend Debt Disabled Configuration is used to suspend the collection of Standing Charge and Debt 1 / 2 depending on the state of the Contactor.

Standing Charge and Debt Collection is suspended if the Contactor is Open and the Suspend Debt Disabled parameter has been set to 'On'.

Standing Charge and Debt Collection is not suspended if the Contactor is Open and the Suspend Debt Disabled Parameter has been set to 'Off'.

17.7.8. Suspend Debt Emergency

The Suspend Debt Emergency setting is used to suspend Standing Charge and Debt 1 / 2 collection depending on if Emergency Credit is in operation or not.

Any Debt that should have been collected during the suspension period will be stored in the Accumulated Debt Register.

Standing Charge and Debt collection is suspended if the Emergency Credit Status is "in use" and the Suspend Debt Emergency Parameter has been set to 'On'.

Standing Charge and Debt Collection is not suspended if the Emergency Credit Status is "in use" and the Suspend Debt Emergency Parameter has been set to 'Off'.

18. LOAD LIMIT

The meter has a Load Limiting Function. This monitors Active Import Power against a Configurable Threshold and if it remains above this threshold for a Configurable Period of Time then a Load Limit Event occurs.

When a Load Limit Event occurs, the following happens:

- Event Stored in the Event Log
- An indication of the Event is shown on the Display
- A count the number of the Event is incremented. This count can be reset by an appropriate command
- The meter Ignores the Non-Disconnect Calendar and Disables the Supply (by opening the contactor) where the Load Limit Supply State is configured to require disablement, and then:
  - Immediately Arms the Supply
  - Enables the Supply after the 'restoration time' has been exceeded and sets the Load Limit Supply State to unchanged
  - Sends an Alert to the HAN

When operating in Prepayment Mode this will take presidency for Opening the Contactor.

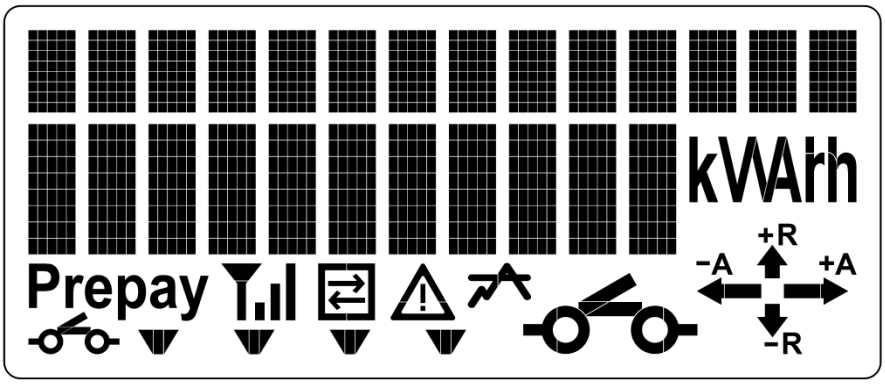
Once the value for active power reaches 90% of the Load Limit Threshold the meter should trigger an audible alarm (configurable during manufacturing only).

19. DISPLAY AND PUSHBUTTONS

19.1. Introduction

The meter is fitted with a High Contrast Liquid Crystal Display that can be viewed from a wide angle.

The Display is shown below.



A list of displays is shown in 34.6.

Displays are selected by using the 2 pushbuttons.

19.2. Display Resolution

The Display Resolution is included in the Table in 34.6

19.2.1. Dial Test

Dial Test is fixed to 5 Digits plus 3 Decimal Places.

The following Cumulative Registers are displayed:

Import kWh	xxxxx.xxx (will always be available as MID Requirement)
Export kWh	xxxxx.xxx
Import kvarh	xxxxx.xxx
Export kvarh	xxxxx.xxx

The displays are accessible from the Utility Menu.

19.3. Display Modes

The display has the following 2 possible modes of operation, either of which can be configured at manufacture only:

Scroll Mode

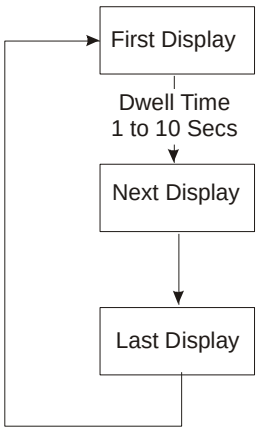
If Scroll Mode is set up to 40 items can be configured.

Menu Mode

If Menu Mode is set 34.6 shows all displayable items available.

19.3.1. Scroll Mode

Displays are shown in a continuous sequence as a series of records or readings without manual interaction. The display shows information for a configurable time. This is called the Dwell Time and is configurable between 1 and 10 seconds.



Display Order (example)

First Display	Meter Serial Number
Display A	Identification String, Data and Units
Display B	Identification String, Data and Units
“	“
Last Display	Date and Time

19.3.2. Menu Mode

Menu Mode is entered by pressing the Top Pushbutton. The Top Pushbutton is also used to select Context Sensitive Menus on the display.

Once a menu is entered use the Bottom Pushbutton to step through the Selected Menu Display Items.

To return to the previous Menu press the top pushbutton.

Menu Items Available

Boost (if applicable)

Prepayment

General

Registers

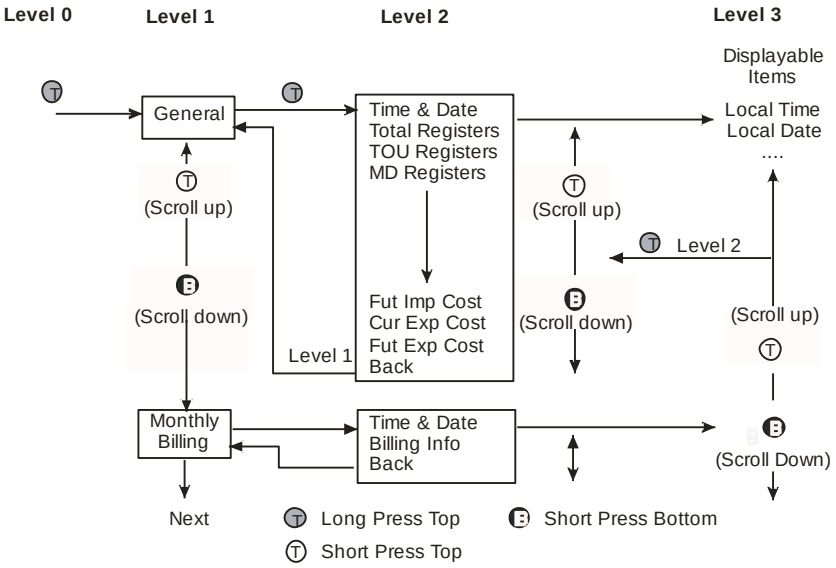
Account

Historical

Utility

Logs

Engineering



19.3.3. Auto Configuration of Active TOU Registers

The meter can be configured to automatically display Active TOU kWh Registers in Scroll and Menu Mode Display Sequences. This feature allows tariffs to be changed without reconfiguring the display.

19.4. Displayable Data

A full list of Displayable Data Items is given in 34.6. The Main Displays are shown below:

- The Payment Mode, currently in operation, being Prepayment Mode or Credit Mode [PIN];
- The Tariff TOU Register Matrix or the Tariff TOU Block Register Matrix and the Tariff Block Counter Matrix;
- The Active Import Register;
- The Active Export Register;
- The Meter Balance [PIN];
- The Debt to Clear [PIN];

- The Customer Identification Number [PIN];
- Whether Emergency Credit is available for activation [PIN];
- Whether the Disablement of Supply is suspended during a period defined in the Non-Disablement Calendar [PIN];
- The Emergency Credit Balance, where Emergency Credit is activated [PIN];
- Any Low Credit Condition [PIN];
- The Supply State [PIN];
- Any Time-Based Debts and Time-Based Debt Recovery Rates [PIN];
- Any payment-based debt [PIN];
- Any Accumulated Debt Recorded in the Accumulated Debt Register [PIN];
- Any Standing Charge [PIN];
- The Meter Point Administration Numbers (MPAN)[PIN];
- The Local Time;
- The Contact Details;
- The Active Tariff Price [PIN]; and
- The Event Log (with the exception of any Personal Data)

The monetary items can be shown with either a £ or Euro symbol.

[PIN] items which have this identification have the option of only being viewed when a Privacy (Customer) PIN is entered (See Section 19.9).

19.5. Display Configuration

Displays can only be configured during the Manufacturing Process.

Any items can be configured to be available in the Scroll Sequence.

In Menu Mode all items are available to be displayed but the Supplier can choose not to make all items available. This is only configurable during Manufacturing.

The Security Log can only be viewed once the Meter Terminal Cover, Main Cover or Comms Hub Cover has been removed. This display is available while any of the above are open and for a configurable time (at Manufacture) after the cover has been replaced.

19.6. Display Backlight

There is an optional Backlight for the Display.

The Backlight will turn ‘On’ when a Pushbutton is pressed.

The Backlight turns ‘Off’ after a configurable (during Manufacture) number of seconds after the last Pushbutton Press.

During the Installation Process the Backlight will be ‘On’.

19.7. Display Indicators

Meter Error Alarm

Energy Direction Indicators (+A, -A, +R, -R)

Load Control Indicator (Icon flashes when over limit)

Auxiliary relay, indicates open or closed (smaller icon)

Main contactor, indicates open or closed (larger icon)

HAN – Blinking fast – Communicating (future release)

Fixed – On a comms network (future release)

WAN Signal strength indicator

19.8. Display Function Triggers

The following triggers override the display when the meter is in Scroll Mode. They will remain on the display until a Pushbutton is pressed.

Trigger	Action
Failed manual entry of UTRN	Display reason for failure until a button is pressed
Emergency Credit becomes Available	Display offer of Emergency Credit until accepted/rejected or Emergency Credit becomes unavailable
Low Credit Warning Threshold Reached	Sound Audible Alarm (optional). Override display with Low Credit Warning message (optional), until Available Credit exceeds Low Credit Warning Threshold or button is pressed.
Load Limit	Indication that the Load Limit Threshold has been exceeded for a configurable length of time.

19.9. Privacy (Customer) PIN

Privacy (Customer) PIN Protection enables access to certain displays / functions via the display/pushbuttons*. Access to these PIN protected displays can be gained by:

- Input of a number, 4 digits, that matches the Privacy PIN

To enter the code:

- Use the Top Button to increment the first digit (The digit to be entered will be flashing)
- Long Press the Top Pushbutton to move to the next digit
- Repeat above 2 steps for all 4 digits
- On the 4th digit, hold the Two Pushbutton together for a Long Press to indicate the entry is complete

The User can:

- Set a new value for the Privacy PIN (via the Pushbuttons)
  - This will Change the PIN, if it was previously Enabled
  - This will Enable the PIN, if previously Disabled
- Disable the PIN

Command from the WAN can be sent to:

- Disable Privacy PIN Protection

An event will be created in the Event Log (with appropriate code) when the PIN is disabled or changed via the Pushbuttons.

Honeywell suggests that the Utility providing the meter includes in its User Guide advice on: selection, secure handling or entry of the user PIN.

*Note – 1 Minute Timeout

20. POWER QUALITY MONITORING

The meter calculates the Average RMS Voltage over a configurable period.

20.1. Voltage Monitoring

The Meter monitors the following Events:

- Average RMS Over Voltage
- RMS Extreme Over Voltage
- RMS Voltage Swell
- Average RMS Under Voltage
- RMS Extreme Under Voltage
- RMS Voltage Sag

All of these Events have the same features:

- The event is created when the RMS Voltage is compared to a Configurable Threshold, over a Configurable Period (if set to zero then the monitoring will not happen), providing that during the previous period the meter did not record an event i.e., the event is raised for the first period following a period where an event was not detected. If an Event is created the meter will:
  - Create an Event (with UTC Time & Date Stamp) in the Power Event Log
  - Generate and Send an Alert via the HAN
- When the average returns inside the threshold the meter will:
  - Create an Event (with UTC Time & Date Stamp) in the Power Event Log
  - Generate and Send an Alert via the HAN

In addition the Average RMS Over and Under Voltage has the following meter function:

- A Count of the number of each type of Event
- This Count can be Reset by a Command from the DCC

20.2. Supply Outage Reporting

The meter records with a UTC Date and Time Stamp:

- When Power was Interrupted
- When Power was Restored

This will generate an Event in the Power Event Log and on restoration an Event will be sent via its HAN

20.3. Long Power Fail

If the time between the Power Fail and the Power Restoration is equal to or greater than 3mins, then this will be logged as a long Power Fail Event (with UTC Time & Date Stamp) in the Power Event Log.

21. COMMUNICATIONS

A Communications Hub complying with the DCC ICHI Specification may be mounted on the meter. The meter provides a nominal 12V DC power supply for use by the Comms Hub and communicates to the Comms Hub using ZigBee protocol.

21.1. Local Communications Port

The meter does not support an Optical Port. No Non-Operational Interfaces are available from the meter.

21.2. Direct Communications Connection to the Comms Hub

The Comms Hub Interface allows provision for a Hardwired Interface between the Meter and the Module.

This feature is not supported by the AS302P meter.

21.3. HAN Communications Connections to the Comms Hub

The meter provides a HAN Interface that conforms to the following standards:

ZigBee Alliance as compliant with the ZigBee SEP v1.2b

Requirements described in the Great Britain Companion Specifications v1.1

This HAN Interface allows the meter to join a ZigBee SEP v1.2b Smart Metering Home Area Network which:

- Operates within the 2400 – 2483.5 MHz Harmonised Frequency Band
- Supports the Communications Links as follows:
    - Link to a Communications Hub
    - Communications Link with Type 1 Devices Type 2 Devices
- Support Security Credentials for each device:
    - Add Security Credentials for Type 1 and Type 2
        - Device Credentials are stored in a Device Log
        - These will be verified
        - Command and outcome are stored in the Security Log
    - Remove Security Credentials for Type 1 and Type 2 Devices
        - Remove them from the Device Log
        - Command and outcome recorded in the Security Log
    - Replace Security Credentials for Type 1 and Type 2 Devices
        - Maintaining the Command's Transactional Atomicity
        - Command and outcome recorded in the Security Log
- Capable of Executing the Commands set out in GBCS
    - Immediate or future dated (UTC defined)
    - Future dated commands can be overwritten if they require cancelling, an appropriate response will be sent to acknowledge this cancellation
    - All Commands received and their outcomes are logged in the Event Log
    - The meter capability includes
        - Sending out commands as described in GBCS
        - Receiving corresponding Responses
        - Where required by a Response, taking the relevant action
        - Control of HAN Connected Auxiliary Load Control Switches

- On joining a ZigBee SEP v1.2 Smart Metering Home Area Network, the AS302P is capable of generating and sending an Alert to that effect via its HAN Interface.
- Restricting Personal Data Available for Type 1 and Type 2 Devices from a defined UTC Date and Time
- A command to re-establish communications is supported. This will - seek the appropriate frequency; re-establish communications links above; generate an event in the Event Log; generate an alert via the HAN.
  Where the meter has Communications Links already established it shall be capable of not executing the Command.

21.4. Communications with DCC

The meter communicates with the DCC WAN through the Comms Hub via the ZigBee HAN.
The meter is able to:

- Receive Commands
- Send Responses
- Send Commands
- Send Information
- Send Alerts

The Commands that are support to DCC are given in Appendix C.

21.5. Communications with Type 1 Devices

The meter is capable of supporting seven communication links with Type 1 Devices (of which five are reserved for HCALCS). For each Type 1 Device the meter can:

- Receive Commands
- Send Responses
- Send Commands
- Send Information
- Send Alerts

The Data that is provided to a Type 1 Device is given in Appendix D.

The Alerts that are defined to be sent on the HAN are given in Appendix B.

21.6. Communications with Type 2 Devices

The meter is capable of supporting four communication links with Type 2 Devices. For each Type 2 Device the meter can:

- Send Information
- Send Alerts (these will be same Alerts as sent to the Type 1 Devices)

The Data that is provided to a Type 2 Device is given in Appendix D.

The alerts that are defined to be sent on the HAN are given in Appendix B.

21.7. Supplier Message

The meter stores Messages from the Supplier that need to be provided to the Customer on either a Type 1 or a Type 2 Device.

22. FIRMWARE

22.1. Firmware Integrity

At every meter power up, the bootloader checks if a backup image exists for the current firmware. If there is no backup image or the backup image is obsolete (different than the current one), the bootloader creates and stores a backup image from the current firmware.

An integrity check on current executing firmware is done on every power up by the bootloader. If the integrity fails, then the bootloader restores the image from backup or if a pending image is available that has been transferred completely and successful verified, the meter will activate this new image.

"Firmware backup" is launched only if the restoration process is finished successfully. The integrity of the Firmware backup is verified on backup creation and before backup restoration.

If integrity check fails, the backup image is verified for integrity and launched. After the backup is successfully launched, the backup image will log an entry in logbook and send a corresponding alert. The current (backup) image will continue to run on the meter after sending this alert.

22.2. Firmware Download

The meter allows new firmware to be downloaded at any time. The mechanism is robust to ensure against Loss of Data.

Only Firmware received from an Authorised and Authenticated source is allowed.

The Firmware must be verified for Authenticity and Integrity before it is allowed to run on the meter, Distribution Receipt Alerts identifying success or failure are provided. Also an event is created in the Security Log.

New images can be activated by a Firmware Activation Command.

The Firmware Image is verified before being activated.

The Firmware includes a Version Number which, once activated, is available to read by the DCC and is available on the Meter Display.

22.3. Firmware Download Process

Firmware Update Process contains three stages:

- Distribution of the Image (this is performed using OTA Cluster)
- Verification of the Image (this is performed by the AS302P)
- Activation of the Image (this is performed using a GBCS Command)

If the Firmware Image is larger than 750kB then the Image will be fragmented.

If the Image is fragmented and the first Fragment is received again then previously received fragments are ignored.

22.3.1. Distribution of the Image

- The Comms Hub receives a New Image from the DCC
- The Comms Hub notifies the AS302P that a New Firmware Image is available
- The AS302P downloads the new Image, via the ZigBee OTA process, when it is aware of the availability of a suitable Upgrade Image

22.3.2. Verification of the Image

- The AS302P verifies the Upgrade Image contained within the OTA Upgrade Image. In the verification process the AS302P checks the following:
  - If the Firmware is received from an Authorized and Authenticated source (checks the Remote Party Role and the corresponding Remote Party Signature)
  - If the Firmware is signed using Honeywell Signature
  - The CRC on the Firmware
  - The size of the Firmware

- If the verification is successful, the AS302P constructs and sends a Firmware Distribution Receipt Alert and stores the Manufacturer Image contained within the OTA Upgrade Image
- If the verification is not successful, the AS302P discards the OTA Upgrade Image, and sends a Firmware Verification Failed Alert

22.3.3. Activation of the Image

- The activation of a New Image is performed after the defined date and time of a successfully received “Activation Command” from the DCC (which can be future dated)
- The “Activation Command” is a Critical Command and is checked accordingly
- If all Critical Command Verifications succeed, the Device calculates the Manufacturer Image Hash of the Manufacturer Image it holds and compares that with the Manufacturer Image Hash specified in the Activate Firmware Image Command.
- If the two Hashes match, the Device attempts to activate the Firmware Image.
- If the two Hashes do not match, the Device does not attempt to activate the Firmware Image.
- The Device issues a relevant Activate Firmware Image Response detailing the success or failure
- If the image is successfully activated, the AS302P updates the value stored for the active Firmware Version.

22.3.4. Restrictions

- If the verification fails then the New Image cannot be activated
- The AS302P can only have one Active Image and only one Image that is pending for activation.
- The AS302P allows a New Image to be downloaded at any time.
- The AS302P verifies its Firmware at every Power On to check that it is the same as the last Verified and Running Firmware. If the verification fails then an entry in the Security Log will be made and an Alert will be generated on the HAN.
- The AS302P doesn’t allow the activation of the same image or older (the pending image version must be incremental to the current image running).
- Each Command performed by the AS302P (verification/activation of a new image) triggers a new Alert.

22.3.5. Firmware identification format

The AS302P firmware image is identified by a version string of the form: ASPXX.YY.ZZ-RRRRR

with:

- ASP - Application FW for Single Phase meter ACOR FW)
- XX - product related version number (AS302P = 09)
- YY - major version number (feature level – new, changed or removed feature)
- ZZ - minor version number (patch level – bug fix)
- RRRRR – revision number

The operational version of Firmware of the Device could be read using GBCS use-case "ECS52 Read ESME/Comms Hub Firmware Version". The value of this attribute is 4 bytes long.

- Byte 3 – major version number as BCD
- Byte 2 – minor version number as BCD
- Byte 1,0 – revision number as HEX representation

This can also be seen on meter display, in the menu Utility->FW info in YY:ZZ:RR:RR format

22.3.6. OTA format

In line with GBCS specifications OTA Upgrade Images shall be the following concatenation:

OTA Header || Upgrade Image

Upgrade Images shall be the following concatenation:

Manufacturer Image || Force Replace || 0x40 || Authorising Remote Party Signature

where:

- Manufacturer Image shall contain the firmware image the Device is to apply and any manufacturer specific data needed
- Force Replace shall be a single octet where Force Replace = 0x00 shall mean do not force the replacement of the currently stored image; and
- Authorising Remote Party Signature shall be calculated across the Manufacturer Image using the Authorising Remote Party's Private Digital Signing Key

23. AUDIBLE ALARM

It is possible to configure an Audible Alarm to warn customers of events such as Low Credit Warning, Emergency Credit Available and Load Limit. At present this is not implemented and is not a SMETS2 Requirement

24. AUXILIARY SWITCHES

24.1. Load Control Switch / HAN Auxiliary load control switch

The Meter Firmware can support up to five Auxiliary Load Control Switches (ALCS) or HAN Auxiliary Load Control Load Switches (HCALCS). A single On-board Auxiliary Relay can be supplied as an option. This relay is rated at 230V, 2A. The internal Auxiliary Load Control Switch will always be defined as Switch 1, it is not possible to reconfigure this from DCC. Any calendar or commands intended for the internal switch need to be configured for and sent to Switch 1.

The display will show / allow the following information for each of the ALCS or HCALCS:

- The status of the Optional On-board ALCS is shown by a dedicated icon on the display.
- Status of each of the HCALCS is shown via the Chevrons:
  - Chevron On = HCALCS On,
  - Chevron Flashing = HCALCS Off,
  - Chevron Off = Not Programmed
- Status of each HCALCS is available via a menu display item
- Option to exercise / test each of the ALCS / HCALCS:
  - This will change the state of the switch for a 5 minute period
  - The status of the test (available or in progress)

An event will be raised in the Event Log every time an ALCS / HCALCS is tested.

The current status for all the ALCS / HCALCS will be stored by the meter.

If the Main Meter Contactor is open the ALCS or HCALCS cannot be closed. If the power is restored to the meter and a command should have been in operation, then this operation runs for the remaining period.

If there is a command received this takes precedence over the ALCS Switching Calendar.

24.2. Auxiliary Load Control Switch Calendar

The meter contains an ALCS / HCALCS Switching Calendar that defines the state, open or closed, for up to five ALCS / HCALCS.

The calendar specifies which Day Profile is to be used. Up to 20 Special Days can be specified, if one of these is not specified then the Day Profile is taken from the Week Profile information. The Switching Table (stored in UTC) contains 60 switching rules across all Day Profiles.

Under certain circumstances no action will be taken:

- If the switch has already received a command with a fixed time, then this takes precedence
- If the Main Contactor is open or armed, then the Auxiliary Switch will not close

24.2.1. Randomisation Offset

A Random Time Offset is applied to the switching times of the ALCS or HCALCS. This is defined as the Randomisation Offset. The Randomisation Offset is the product of the following numbers (rounded to the nearest second):

- Randomisation Offset Number, this is a number between 0 & 1 generated automatically during the manufacturing process.
- Randomisation Offset Limit, this is a configurable value between 0 and 1799

24.3. Auxiliary Load Control Commands

The following Commands are available to control the state of the ALCS / HCALCS. All Commands can be set to control any of the available switches.

User Commands

- A User Interface Command, to test the ALCS / HCALCS, this will change its state of the ALCS / HCALCS for 5 mins and then it reverts back to the Switching Calendar

DCC Commands

- A command from DCC that defines:
  - To Open for a specified period
  - To Close for a specified period
  - Reset (this reverts to the switching table)
- When executing the command the meter records the command and the outcome in the ALCS Event log.

HCALCS Command

- A command asking the meter to send information relating the current state of the HCALCS
- A command to control the state of the HCALCS, in accordance with the rules of the ALCS Switching Calendar, this will contain the remaining time until the next Switching Event (taking into account the Randomised Offset).

24.4. Boost Functionality

The meter has the functionality that allows the Customer to turn on the ALCS / HCALCS for a period of time. This will only be possible if the meter has been configured so that a particular ALCS / HCALCS will operate in accordance with the Boost Switch. This configuration can be done and changed at any time from the DCC. All ALCS / HCALCS configured to operate in accordance with the Boost Button will operate simultaneously i.e. there will be no local option to individually select which ALCS / HCALCS will operate.

The Boost Function is initiated by pressing the Push Buttons when the meter is displaying an appropriate display (or from a Type 1 Device).

The Boost Function will allow the ALCS / HCALCS to be switched on for either 15, 30, 45 or 60 minutes after which time the ALCS / HCALCS will revert to normal operation (using the ALCS Switching Calendar). If the auxiliary is closed by the boost functionality the top right hand 5 characters of the display will show ‘boost’.

Once Boost is selected the following options are available:

- Cancel the Boost
- Extend the Boost by 15, 30, 45 mins, providing the total boost time of 60mins is not exceeded

If a Power Outage occurs during a Boost Period then the meter will stop the Boost Period in line with the current amount of boost select e.g., if the meter had a Boost Period configured from 7:30 to 8:00 (30min Boost) and there was a Power Cut from 7:40 to 7:50 then the Boost Period still finishes at 8:00.

While Boost functionality is active there will be 2 displays added to the General Display Menu:

- Activate Boost:

Choose one of the available periods: 15, 30, 45 or 60.

Use "NEXT" button to navigate between options.

Use Long press on "SELECT" button to active a boost period. After the Boost period is activated the meter will display a message: Activate with XX min

- Extend Boost:

Choose one of the possible available periods: 15, 30 or 45.

Use "NEXT" button to navigate between options.

Use Long press on "SELECT" button to extend the boost period. After the Boost period is extended the meter will display a message: Extend with XX min

- Cancel Boost:

Use Long press on "SELECT" button to cancel the boost period. After the Boost period is cancelled the meter will display a message: Boost cancelled

Entries in the Boost Log will be made for:

- Every time the Boost Functionality is Activated including Start and Finish Time
- Every time the Boost Functionality is Cancelled including Start and Finish Time (both values are the same)
- Every time the Boost is Extended including Start and Finish Time

24.5. ALCS Event Log

Entries in ALCS Event Log are triggered by the following actions:

- A switch in Auxiliary Load Control Switch Calendar
- On receipt of a Request Control of HAN Connected Auxiliary Load Control Switch command (this represents the command received by the meter from HCALCS)
- On receipt of a Reset HAN Connected Auxiliary Load Control Switch [n] State command (Give control back to Calendar)
- On receipt of a Set HAN Connected Auxiliary Load Control Switch [n] State command (Open or Close)
- execution of Test Auxiliary Load Control Switch [n] command

All commands, except the third one (Revert to Calendar), have as a result two entries captured in the ALCS event log (Revert to Calendar triggers three entries).

WARNING

Before connecting an external circuit to the Auxiliary Relay Terminals, read the Warnings in Section 2 of this manual.

25. CONTACTOR

A single pole, 100A Contactor is provided in the AS302P.

Contactor Technical Details are given in Section 29.2.

Note that in normal use, the user can Enable the Supply if the Contactor state is Ready for connection (Armed) using the meter display. Go to General/Contactor and a long press on the "SELECT" button will show PIN code entry for validation (if enabled). If validation is successful, the Supply status is changed from Armed to Enabled.

The Contactor Display Icon will be ‘Flashing’ when it is ‘Armed’.

Once Armed the Contactor can be Closed By:

- The Customer pressing a Pushbutton on the Display (PIN)
- The Customer using the PPMID (PIN)
- A Command from DCC

The Contactor State will be Locked If:

- A Disable Command is received from the DCC
- A Tamper Event is detected and the meter is configured to Disable the Supply

If the Contactor is in a ‘Locked’ state (Contactor Open and Supply Disabled), this will be shown on the display. It can only be re-enabled by a Command from the DCC to either Arm or Enable the Supply.

Once the Arm Command is received then the meter changes the state from Locked to Unlocked and needs to determine what state the Contactor should be in (according to the Meter Logic):

- If it should be Disabled, the Contactor Remains Open
- If it should be Armed or Enabled, the Contactor will be put into the Armed State

Once the Enable Command is received, the meter changes the state from Locked to Unlocked and needs to determine what state the Contactor should be in (according to the Meter Logic):

- If it should be Disabled, the Contactor Remains Open
- If it should be Armed or Enabled, the Contactor is put into the Enabled State

The status of the Contactor can be determined from the meter display or via the HAN for display on any Type 1 or 2 Devices.

Display

Contactor Open  Contactor Armed (Flashing)  to " " Contactor Closed 

26. INTERNAL CLOCK

The AS302P compares its Time with the Comms Hub and adjusts as necessary. No event is recorded, providing the time difference is no greater than 10s.

If the Time Difference is greater than 10s then the meter does not adjust its time but generates an Event in the Security Log and sends an Alert over the HAN.

The Clock can also be changed by a 'Set Clock Command' (this can only occur once in a 24hr period). The meter compares its Time with the Comms Hub and providing the Time is within the Validity Window then the Time will be aligned to the Comms Hub. This will create an Event in the Event Log. If the Time is outside the Validity Window then an Event is stored in Security Log and an Alert is raised.

When the Time is changed (by Adjust or Command) then the meter ensures it has not missed any required actions.

The Clock uses the notation 00:00 to 23:59. The Calendar automatically caters for Leap Years.

Note: - For Time Stamps 00:00 indicates the start of the day and 23:59 the end of the day.

The Time Base for the clock is derived from a Crystal Controlled Oscillator.

Crystal Calibration achieves an internal accuracy of better than 0.5 of a second per day at reference temperature. In the event of a Supply Failure a Backup Battery supports the Crystal Oscillator.

In the absence of Mains Voltage the meter maintains Date and Time for a period exceeding two years. The Internal Clock meets the requirements of BS EN 62054-21.

26.1. Local Time

The meter display shows Local Time.

The meter provides 2 Daylight Savings Dates whereby the Clock can be adjusted by one hour at the start of the summer and can be restored at the end of the summer.

27. SECURITY

27.1. Access Control

The meter supports a number of different Role Based Access Levels, as defined in GBCS. These are:

- Supplier – Critical
- Supplier – Non-Critical
- Supplier – Top Up
- Network Operator – Critical
- Network Operator – Non-Critical
- Access Control Broker – Non-Critical
- Security, Transitional Change of Supplier – Critical
- Public (DLMS Mandatory)

If the Old Supplier requires any information from the meter, then this must be obtained through the Access Control Broker.

The meter will check the following items before executing a Command:

- Authenticity of any Command
- The Sender of the Command is authorised to do so
- The Integrity of the Command, which includes:
    - The Structure of the Command (MAC Header, Group Header, Signature etc.)
    - The Command Payload:
        - Where Constants are Defined, they are correct
        - Where a Range is Defined, they are within the boundaries
        - For Tariff, check if all Component Parts are included
        - For Prepayment, check that it is in the Correct Mode

If any of the above items fail then the meter will generate an Event which: will be saved in the Security Log and will generate an Alert. The meter will report Command Execution Successful (event code 0x8154) or Failed (event code 0x8155) to the Sender of the Command. If this is a Future Dated Command then a Response will be sent indicating the Command has been received and on activation one of the following events 0x8F66 (Success) and 0x8F67 (Failure) will be triggered (based on the command outcome).

27.2. Security Credentials

The AS302P generates Public-Private Keys to support Cryptographic Algorithms, initiated by a Command. These are the Device, Signing and Key Agreement Certificates.

Once a device has been installed then the Supplier should send an 'Issue Security Credentials Command' to the meter within seven days of installation. It is recommended that these are unique to that meter.

All Keys that are stored in the Meter are unique to that Meter (therefore will not be on any other Meter), so a Breach of Security on a Single Device will not affect any other Meter in the population.

The Meter securely stores the Private Keys and has the capability of formatting and sending via its HAN Interface a Certificate Signing Request containing the corresponding Public Key and Meter Identifier.

A Command from the DCC will be received to replace the Security Certificates on the Device, an Alert is sent showing Success or Failure. An entry is saved in the Security Log.

The meter also stores the Public Key Agreement Values for the roles that will communicate with it, these are received from the DCC during the Install and Commission Process.

For the Public Key Certificate, the meter securely holds the Security Credentials from the Certificates. During replacement of the Security Credentials the meter ensures the existing Credentials are securely held until the replacement process is complete.

The meter supports:

- Elliptic Curve DSA
- Elliptic Curve DH
- SHA-256

In executing and creating any Command, Response or Alert, the meter is capable of applying Cryptographic Algorithms (alone or in combination) for:

- Digital Signing
- Digital Signature Verification
- Hashing
- Message Authentication
- Encryption and Decryption

27.3. Confidentiality and / or Data Integrity

The Meter is designed, taking all reasonable steps to prevent Unauthorised Physical Access and Unauthorised Communications (through any of it interfaces) or through its Secure Perimeter that could compromise the Confidentiality and/or Data Integrity of.

- Personal Data:
  - Historical Consumption (Daily, Weekly, Monthly)
  - Profile Data (Import kWh, export, kWh, imp kvarh, export kvarh, average RMS voltage)
  - Daily Consumption (731 Cumulative)
- Consumption Data used for Billing:
  - Billing Data (including PP where applicable)
  - Daily Reads
- Security Credentials
- Firmware and Data essential for ensuring its integrity
- Random Number Generator, capable of:
  - Generating Random Number using Monotonic Time of the meter as its seed
  - Checking that Each Number Generated is different from the Previous Number Generated
  - Where the Number is the Same as the Previous Number the Meter will discard the number and generate another number

While the meter undertakes all reasonable steps to ensure data integrity, Honeywell would still recommend the Utility regularly does a reconsolidation of the data with what might be expected e.g. the cumulative Import kWh increments on each successive read.

27.4. Physical Security

The Meter maintains a Secure Perimeter, through its Case Design. Where access to the Meter is necessary, a cover is provided which attaches to the meter using a Traditional Seal. Each area that requires a Cover to be fitted is equipped with a switch that detects when the cover has been removed. Any detection of such an attempt generates an Event in the Security Log and sends an Alert to the HAN.

If there is no power attached to the meter only the First Tamper Event is logged.

If an Unauthorised Physical Access is detected and the Meter is configured to do so, the Main Contactor will open and become locked. The Contactor can then only be closed again by a command from the DCC.

27.5. Replay Attacks

The Meter employs techniques to protect against Replay Attacks, on any communications.

27.6. Security Log

The AS302P has a Security Log to store any Security Related Events (See Section 28), this Log cannot be cleared unless the Physical Boundary is breached.

It is expected that the Supplier should read the Security Log on regular occasions to ensure there are no unexpected entries. This should be done frequently enough to ensure the Log is not overwritten.

27.7. Data Retention

All Cumulative Registers and Time of Use Data are saved to memory once every hour.

All Data is retained for the nominal life of the Meter, regardless of a Power Outage.

28. METER LOGS

The AS302P stores a number of Event Logs to record events that have occurred in the Metering Device.

These Logs are:

- Security Log
- Event Log
- Power Quality Log

All Logs are stored on a FIFO basis and each event is stored with a UTC Date and Time Stamp.

28.1. Security Log

This Log:

- Holds 100 Events in a FIFO structure
- Cannot be Cleared
- Stores Sensitive Events

28.2. Event Log

This Log:

- Holds 100 Events in a FIFO structure
- Can be Cleared by a Command (an entry will be raised in the Security Log when this occurs)

28.3. Power Event Log

This Log:

- Holds 100 Events in a FIFO structure
- Cannot be Cleared

28.4. Event and Alert Filters

The Meter Functionality is designed to support filters. The only filter currently available is the Alerts Configuration Setting, however others could be implemented if required in future changes of SMETS2.

29. TECHNICAL DATA

29.1. AS302P Meter

Current: IEC Ratings MID/EN Rating Frequency Reference Voltage Voltage Operating Range	Ib - Imax = 5 - 100A, 10 - 100A, 20 - 100A Imin - Itr(Imax) = 1.0 - 20(100)A, 0.5 10(100)A, 0.25 - 5(100)A 50 Hz 230V a.c. ±20%
Short Circuit Current Insulation Voltage Impulse Withstand - Live to Neutral - Live and Auxiliary Outputs	Short Circuit Current Withstand: 30 Imax 4000 Vac 1 min 12kV (40 ohm source) 6kV (40 ohm source)
Power Consumption (At reference conditions and stated current) Voltage Circuit Current Circuit @ Basic Current	Max 0.8W Average < 4W under normal operating conditions 0,02VA
Display Viewing Angles	High Contrast, 2 Line Display Vertical - 10˚ above, 40˚ below the horizontal Horizontal - 30˚ either side of vertical
Meter Constant (pulsing LED output) Pulse Width	4000 Pulses/kWh (kvarh) Wavelength 640nm 5 ms
Auxiliary Relay	230V, 2A, a.c.
Product Design Life Service Design Life	20 years 15 years
Temperature Humidity	Specified Operational Range: -25° C to +55°C Limit Operating Range: -25° C to +70°C Storage Range: -25° C to +70°C Non - Condensing Annual Mean 75% (95% for 30 days spread over one year)
Dimensions	125mm (H) x 130mm (W) x 65mm (D)
Accuracy Class kWh	EC Directive 2014/22/EC (MID) - Class A or Class B. (EN 504703) IEC 62053-21, Class 1 or Class 2
Case	BS 7856:2013 IP53 to IEC 60529:1989
Terminals Main	8.2mm Diameter Bore, 2 x M6 Combi Pinch Screws (Screw Material - Steel, Coated with Zinc Chromate) Max Torque 2.8 N m

29.2. Contactor

Contact Data	
Contact Arrangement	Single Pole Magnetically Latched Bi-stable
Maximum Switching Power	27,700 VA
Maximum Switching Voltage	440 VAC
Maximum Switching Current	100A
Mechanical Life	10,000 Operations (BS EN 62055-31, Annex C)
Standards	
Short Circuit Withstand	BS EN 62055-31, UC3
Overcurrent Withstand	BS 7856:2013. 120A Continuous, 145A for 2 Hours

30. INSTALLATION, COMMISSIONING AND DECOMMISIONING

30.1. HAN Setup

The Installer should check all HAN Devices for suitability for joining the HAN

1. Install meters / Comms Hub and power up AS302P & Comms Hub.
2. Comms Hub automatically detects the WAN, Initiates comms with the DCC and requests to join the WAN.
   - After validating the Comms Hub Device ID the DCC:
     - Records the Comms Hub Device ID and WAN Address Mapping in its Inventory
     - Confirms WAN joining to the Comms Hub
     - Establishes Valid UTC Time to the Comms Hub
     - Records the Comms Hub Device ID Mapping to the Gas Proxy Function Device ID Mapping in its Inventory
     - Updates the Status of the Comms Hub to be Commissioned
3. Installer recognises that the Comms Hub has successfully registered (WAN) and scans asset data IDs - AS302P, Comms Hub and Gas Meter
4. Sends Asset Data ID's to the Supplier
5. Supplier updates HAN Device Log and requests that devices be registered at the MPxN specified
6. The DCC, on receipt of such a Request, instructs the Comms Hub to:
   1. Add the Devices to the Comms Hub Device Log
   2. Allow joining (set the Comms Hub to "pairing mode")
7. HES instructs Comms Hub to allow HAN Device Joining for Fixed Time Period. Comms Hub is set to "Pairing Mode" for a minimum of 3600 seconds (1 hour)
8. Comms Hub successfully creates HAN
9. Installer advised that meters can be joined to HAN and initiates Meter Join

30.2. Meter Commissioning

1. Installer Initiate Request for IHD & AS302P to join HAN
2. Power up the AS302P, if it is not connected to a network then it will show the commissioning screen
   - This screen will remain present for one of the following lengths of time, whichever is shortest:
     - 30 seconds
     - Until the commissioning process starts
     - Until a pushbutton is pressed to step through the display
   - The meter also allows navigation to this screen though the menu structure.
   - Pressing and holding the top button activates the Commissioning process.
   - The screen will change to a HAN Status screen, this will step through the following items (see steps below):
     - Scanning for Network
     - Doing key establishment
     - Scan for tunnel
3. AS302P sends NWK Join Request with Certificate Based Key Exchange
4. AS302P and IHD join HAN with ZigBee Network and Link Connections to Comms Hub. There is no IHD to AS302P data at this stage.

5. AS302P– Joins Time Server {Time Invalid/Unreliable}
6. Establish Tunnel for End to End Communications via the Comms Hub to allow End to End Messages meter to/from DCC.
7. AS302P sends an Automatic Commissioning Alert Notification
8. Supplier sends Commission Device (via DCC) message to AS302P
9. AS302P performs Clock Sync with Comms Hub and displays MPAN
10. The meter now offers the opportunity to join other HAN devices to the meter, this could be up to:
    7 - Type 1 devices (which could be up to 5 HCALCS, therefore 2 other Type 1 devices could be added)
    4 - Type 2 devices
11. This is achieved with a Service Request (SR) which writes the Device ID of the devices to be joined to the HAN into the Device Log of the AS302P. (Method B Join)
    If configured to be shown during the manufacturing process, information on the devices connected to the meter will be available to view in the HAN info menu.
12. AS302P verifies the Cryptographic Protection, updates its Device Log & undertakes the ZigBee Key Establishment Process with the other devices
13. The Supplier configures the Meter through further Service Requests (SRs) via the DCC.

30.3. Meter Installation – Temp No WAN

In case of a No WAN Availability, the process follows the process above, except Message Delivery and Response is via DCC back to Supplier to a HHT to the Comms Hub with the following observations:

- HHT Process to Connect to the Comms Hub is still not confirmed via GBCS Change and TBDG.
- HHT needs a robust connection to Suppliers Systems to make the Installation Viable due to sequencing of Commands and Responses
- The AS302P is likely to remain on its Own Time (from factory) but identified in GBCS terms as “Unreliable” until a Comms Hub WAN connection is established
- Suppliers could provide all Configuration and Certificate Updates (where required) delivered via HHT, but there could be some requirements for Buffering/Message Sequencing via the HHT
- The Device Certificate Process update obligation on Suppliers post installation is expected to be dependent on establishing a WAN Connection.

30.4. Meter Decommission and Removal

Honeywell would recommend the following process is followed (assuming meter is still communicating to DCC).

- Supplier requests and obtains Closing Reads, Financial Status. Event Logs, etc.
- Supplier issues Set Tenancy Date to restrict data (Electricity or Gas Proxy Function)
- Supplier issues Unjoin Commands to remove Meter Connections from IHDs, PPMIDS, HCALCS
- Supplier issues Remove Device from Comms Hub Log, to Remove the Device from the ZigBee Network with the Comms Hub
- Supplier issues Decommission Request to DCC (DUIS Interface no meter impacts)
- Meter returned and subsequent actions dependent on reason for removal.

If the meter is not being used again e.g., being disposed of, then the Utility is responsible for ensuring that all sensitive data is removed before disposal of the device.

31. INSTALLATION AND COMMISSIONING OF HARDWARE

31.1. Unpacking

Remove the meter from its packaging and inspect for damage.

Check that there is no movement or loose parts within the meter enclosure.

If damage has been sustained in transit, an immediate claim should be made to the Transport Company, and a report sent to the Honeywell branch office or agent.

WARNING

Removal of the main cover seals will invalidate certification.

The meter type and rating must be correct for the intended application.

31.2. Handling

Once removed from the packaging, meters must be treated with care and not subjected to excessive shock or mechanical vibration.

Care should be taken to avoid marking or scratching the meter case and polycarbonate cover.

31.3. Storage

If the meter is not required for immediate use, it should be returned to the original packing and stored in a clean, dry environment.

Storage temperature: -25° C to + 70° C

31.4. Installation Site

Read the Warning ‘Transferring Meters from Cold to Humid Conditions in Section 2.

The installation site should be a dry indoor environment and, as far as is practicable, away from direct sunlight and free from mechanical shock and vibration.

31.5. Electromagnetic Compatibility (EMC)

The AS302P meter has been designed and tested for compliance with the EMC Directive.
It is, however, the responsibility of the installer for ensuring that a system conforms to the Directive.

In order to assist the installer, the following guidelines are given: -

1. Ancillary equipment must also be CE marked
2. If interposing relays are used, then these must be correctly and adequately suppressed

31.6. Fixing and Connection

WARNING

Installations must always be carried out by appropriately trained and qualified personnel in accordance with normal metering custom and practice.

The installer is responsible for the choice of connecting cables which must be appropriate for the voltage and current rating of the meter and for ensuring that the supply is protected by an appropriately rated fuse. Failure to do so may result in damage or fire.

Refer to the connection diagrams inside the terminal cover, paying particular attention to the auxiliary terminal configuration.

Isolate all circuits before carrying out the installation.

Refer to the nameplate to ensure that the correct meter is being installed.

Failure to comply with these instructions may result in damage, fire and/or electric shock.

To mount the meter on the meter board

Remove the meter terminal cover.

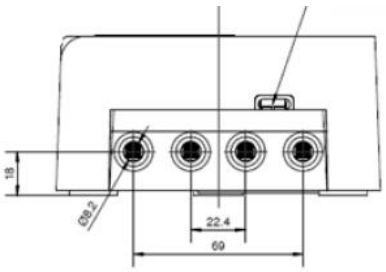
Fix a 5mm dia. x 13mm long round headed screw into the meter board to accommodate the keyhole fixing aperture at the back of the meter. Leave the shank of the screw projecting from the board by 4.5 mm.

Hang the meter on the screw and align it to be vertical.

Secure the lower end of the meter to the board using two 5mm dia. x 13mm long round head screws through the lower mounting holes in the area of the terminal chamber.

Tighten screws just sufficiently to prevent movement of the meter.

WARNING
Do not over-tighten the screws or the meter base may be damaged.



For connecting to the large diameter terminals, wire the meter using appropriately sized, colour-coded cable according to local applicable standards, strip back the cable insulation by 26mm. The terminal block dimensions on the AS302P meter have a maximum sectional area of 50mm^2.

Fully insert cables into the terminals so that the insulation butts up into the counter-sunk recesses in the bottom face of the terminal block.

Using a Number 2 Pozidrive or flat blade screwdriver, tighten the M6 terminal screws to a torque of between 2.2N m (minimum), 2.8N m (maximum).

Auxiliary terminal connections should be completed with appropriately sized cable.

31.7. Commissioning

WARNING

Commissioning must only be carried out by appropriately trained and qualified personnel.

Check that the supply rating on the meter nameplate corresponds to the system rating.

Removal of the meter cover seals will invalidate certification.

With the system de-energised, check the cable connections are secure and correct to the wiring diagram fitted under the terminal cover.

Refit and seal the terminal cover. Energise and load the system.

Check that the display is cycling through the display sequence.

Check that the LED test indicator is illuminated or flashing.

Check Meter Main Seal, Terminal Cover Seal and Communications Hub/ blanking Cover Seal (If fitted) are free from damage.

Carry out load checks as necessary.

32. MAINTENANCE

No maintenance is necessary during the meter's normal working life.

It is recommended that every time that a meter reader / inspector visits the property the seals are checked to ensure they are the correct type and are still intact.

33. DISPOSAL AND RECYCLING

Liquid Crystal Display

Liquid crystals are toxic. If a display is damaged, avoid contact with the liquid. If the liquid makes contact with the skin it must be washed off immediately with water. Seek medical advice.

Recycling Materials

The following meter materials are recyclable: polycarbonates, metals and printed circuit board
(See Safety Warning in Section 2).

Major plastic parts are marked with recycling information. On the disposal of a meter, every endeavour should be made to comply with local environmental legislation regarding recovering materials and waste disposal.

Batteries

If the main cover is removed from the meter, then a Lithium manganese dioxide battery will be exposed.

This battery is completely safe under normal conditions. However, it must never be disassembled, heated above 100°C, incinerated, nor have the contents exposed to water.

Fire, explosion or severe burns may result if these instructions are disregarded.
In the interests of safety, environmental protection and possible legislation, Lithium batteries require careful disposal.

Before arranging for the disposal of these cells, users should satisfy themselves that the proposed means of disposal is both safe and compliant with local legislation requirements.

Honeywell would like to draw the user's attention to the International Standard for Lithium Batteries - IEC 60086-4 which gives further information about the handling, storage, transport and disposal of Lithium cells.

The user should contact Honeywell should difficulties arise in arranging proper disposal. They will if practical, help the user identify safe disposal means.

34. FIGURES & TABLES

34.1. Sample Model Code

SINGLE PHASE (AS302P) MODEL CODE

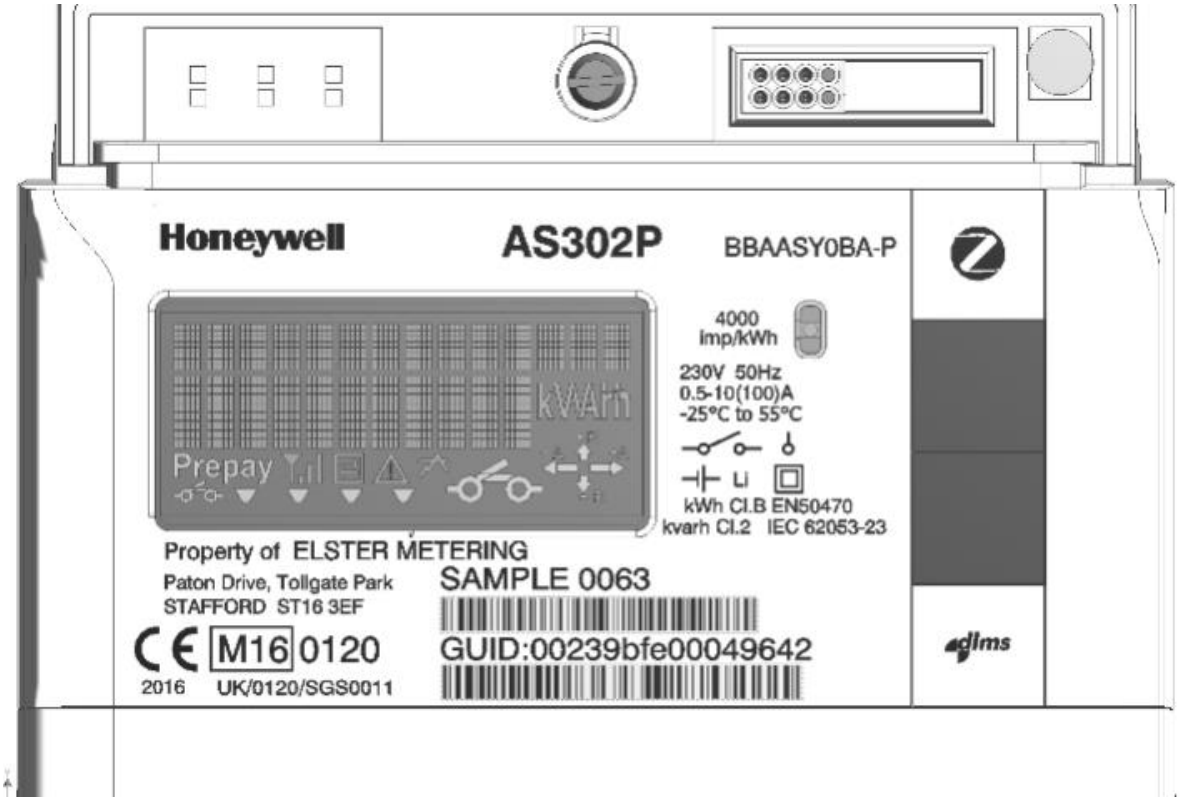
MODEL																							
TYPE (Nameplate ▼)	▼	▼	▼	▼	▼	▼		▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
TYPE/MODEL	A	S	3	0	2	P	-	B	A	B	A	A	S	Y	A	A	A	-	P	A	A
CONNECTION/TERMINATION																					
Single Phase, BS terminal arrangement (L-N-N-L)								B													
CURRENT RANGE																					
Direct Connected 20A – * (* is any multiple of Ib/Iref up to 100A max.)									A												
Direct Connected 10A – * (* is any multiple of Ib/Iref up to 100A max.)									B												
Direct Connected 5A – * (* is any multiple of Ib/Iref up to 100A max.)									C												
VOLTAGE/ ACCURACY CLASS																					
220 – 240V 50 Hz Cl.B kWh,(EN 50470-3) Cl.1 kWh, Cl.2 kvarh (IEC 62053-21, 23)-- see note 2)										B											
220 – 240V 50 Hz Cl.A kWh,(EN 50470-3) Cl.2 kWh, Cl.3 kvarh (IEC 62053-21, 23) --see note 2)										A											
MAIN FEATURE OPTIONS (Firmware Dependant)																					
UK Compliant SMETS2 meter MSP 09.02.05-46010											A										
UK Compliant SMETS2 meter MSP 09.02.07-55603											B										
DISPLAY OPTION																					
Dot Matrix Display 2 line no backlight												A									
Dot Matrix Display 2 line with backlight												B									
DISCONNECT SWITCH																					
Single Pole Switch													S								
None													N								
TERMINAL, MAIN COVER & MAGNETIC DETECTION (does not include ICHI tamper)																					
All														Y							
None														N							
OUPUT OPTIONS ICHI (Intimate Communications Hub Interface)																					
ICHI 12V DC connection, mandated connections only															A						
ADDITIONAL OUTPUT OPTIONS																					
No auxiliary relay output																A					
230V 2A auxiliary relay output																H					
ZigBee Communication																					
ZigBee SEP (Firmware version 5.8.1)																	A				
FIRMWARE (FEATURE SET)																		-			
Original SMETS2																			P		
REVISIONS FIRMWARE SUFFIX																					
ASP09.01.23-57858																				A	
REVISIONS HARDWARE																					
None																					A
Rev G PCBA																					B
Rev G2 PCBA & Shallow slotted screws																					C
Rev H PCBA & Shallow slotted screws																					D

Pulse Output Values

For all meter ratings the normal pulse value for the Test LED will be 4000 pulses / kWh (kvarh).

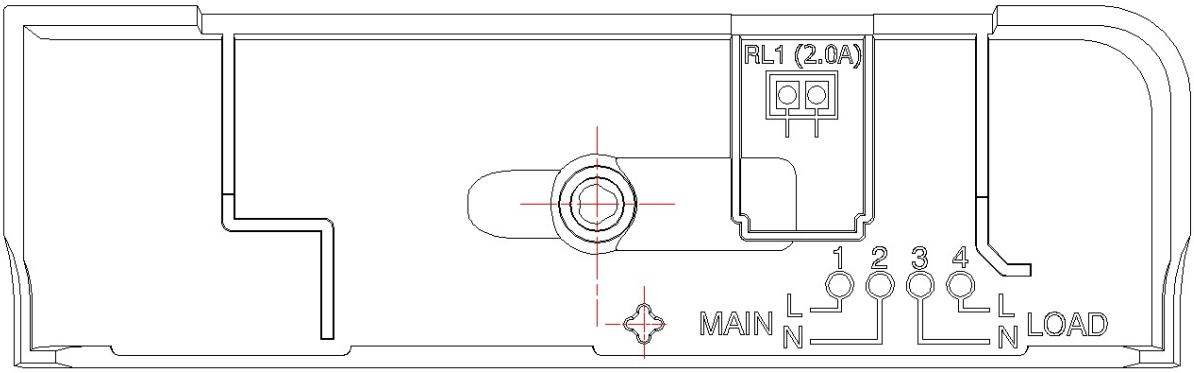
34.2. AS302P Front View

34.3. AS302P Example Nameplate

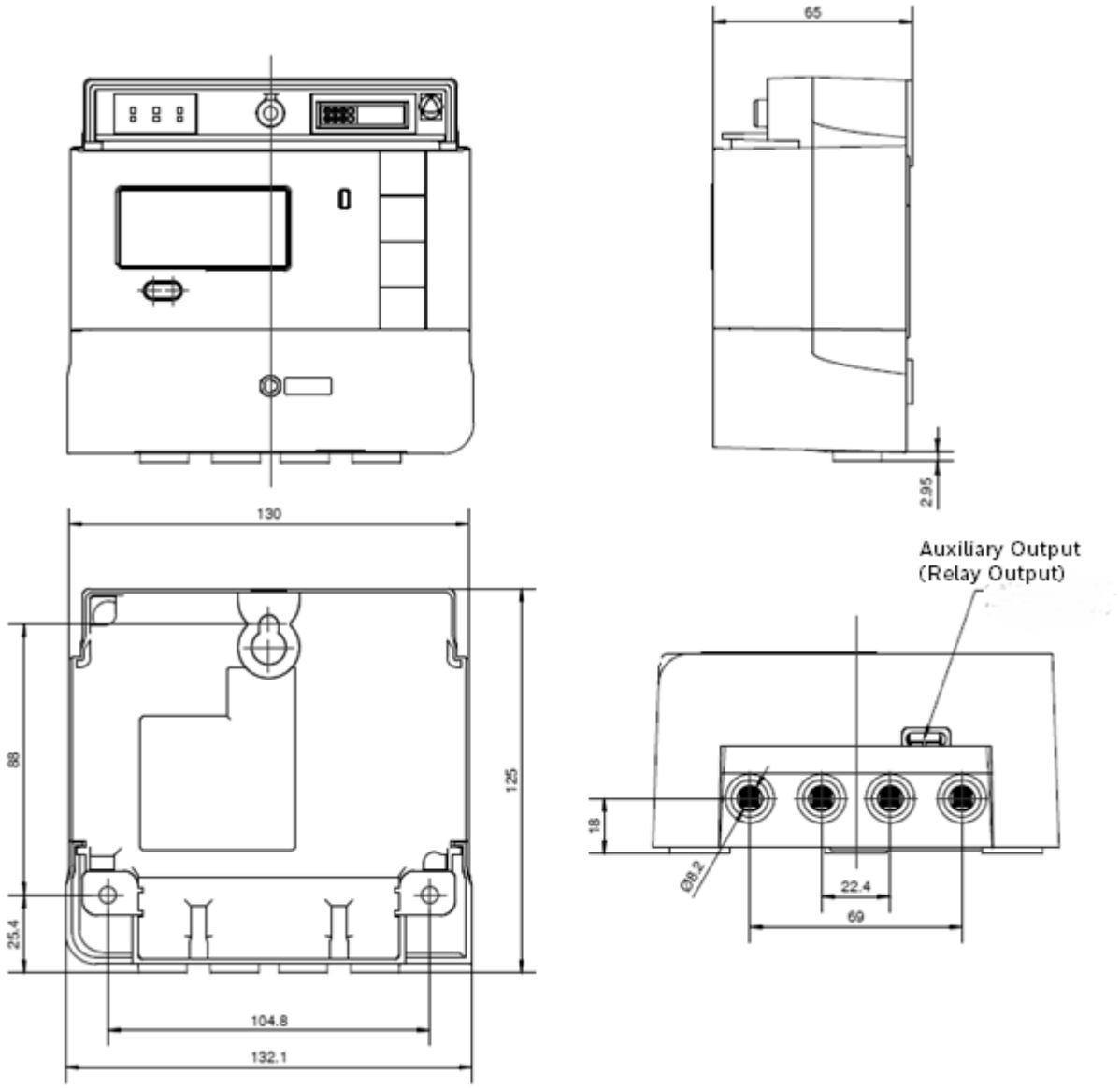


Note: The Nameplate will be laser printed on the cover

34.4. Terminal arrangements / wiring diagram



34.5. Dimensions and Fixing Centres



34.6. Displayable Items

Symbol	Meaning
✓	Available in both TOU-only and TOU/Block mode
T	Only available in TOU-only mode
B	Only available in TOU/Block mode
x	Not available

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
Prepayment				**ONLY shown if in Prepayment Mode**		x	✓	x
	Financial			Display PIN Code entry display for validation (if configured) before its content				
		Meter Balance		Remaining Credit	£0.00	x	✓	x
		EC Balance		Remaining Emergency Credit	£0.00	x	✓	✓
		Em Credit Status		Emergency Credit Status; Unavailable, Available, Accepted, In Use, Used		x	✓	✓
		Accept EC		Emergency Credit offer display with Accept/Reject. Only display if Emergency Credit is Available.		x	✓	x
		Debt to Clear		Amount of Debt Accumulated	£0.00	x	✓	x
	Enter UTRN			Enter Top-up Code, get response message; Accepted or Rejected	****	x	✓	✓
	Debt			Display PIN Code entry display for validation (if configured) before its content		x	✓	x
		Debt to Clear						
		Acc Debt			Acc Debt	x	✓	✓
		Time D1 val		Remaining Amount	£0.00	x	✓	✓
		Time D1 DRR		Rate	£0.00	x	✓	✓
		Time D2 val		Remaining Amount	£0.00	x	✓	✓
		Time D2 DRR		Rate	£0.00	x	✓	✓
		Prep D val		Remaining Amount	£0.00	x	✓	✓
		Prep D RR		Percentage	0.00%	x	✓	✓
		Prep D Cap		Max collected for Payment Based Debt	£0.00	x	✓	✓
	Info			Will display PIN Code entry display for validation (if configured) before its content		x	✓	x
		Low Credit		Credit below Low Credit Threshold		x	✓	x
		ND Status		Status of the none disconnect period		x	✓	x
	UTRN History							
		UTRN		Will display PIN Code entry display for validation (if configured) before its content	****			
				Date & time and top-up amount		x	✓	x

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
General								
	Time and Date							
		Local Time		Current Local Time	hh:mm:ss	✓	✓	
		Local Date		Current Local Date	DD.MM.YY	✓	✓	✓
	Contact							
		Supp Name		Name of the Supplier	xxxxxxxxxxxxxx	✓	✓	
		Supp Phone		Telephone Number of the Supplier	xxxxxxxxxxxxxxxxx	✓	✓	
	MPAN			Will display PIN Code entry display for validation (if configured) before its content				
		MPAN Import		Meter Point Administration Number (Combined MPANS)		✓	✓	
		MPAN Export		Meter Point Administration Number (Export MPANS)		✓	✓	
	Customer							
		Customer ID		Customer Identification Number	xxxx	✓	✓	x
	Contactor							

		Supply State	Enabled, Disabled or Armed		✓	✓	

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
Boost				Only Shown if Boost Enabled				
	Active					✓	✓	
		15 Minutes				✓	✓	
		30 Minutes				✓	✓	
		45 Minutes				✓	✓	
		60 Minutes				✓	✓	
	Extend	15 Minutes						
		30 Minutes						
		45 Minutes						
	Cancel			Cancel the Boost		✓	✓	

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
Register Mode								
	Cumulative							
		Cum Imp (Active)		Cumulative Active Import Energy	00000.0 kWh	✓	✓	✓
		Cum Exp (Active)		Cumulative Active Export Energy	0000.0 kWh	✓	✓	✓
		Cum Imp (Reac)		Cumulative Reactive Import Energy	0000.0 kvarh	✓	✓	✓
		Cum Exp (Reac)		Cumulative Reactive Export Energy	0000.0 kvarh	✓	✓	✓
	Rates in Use							
		Imp R Rates 1 - 4		Import Register Rates 1 to 4 shown if active				
	Rates 1 to 48			Active rate will show “Act” on display				
		Rates 1 -48		TOU Import Active Energy	00000.0 kWh	T	T	T
	Block Rate in Use			If R1 – R4 is active in the tariff these show in the menu item				
		Imp RxBy T		Tariff Register for Time-of-Use with Block Pricing	0000.0 kWh	T	T	T
	Block Rate All							
		Imp RxBy T		Tariff Register for Time-of-Use with Block Pricing	0000.0 kWh	B	B	B
	Block Rate Counter							
		Imp RxBy R		Block Counters for Block Pricing	0000.0 kWh	B	B	B

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
Account Mode								
	Pay Mode							
		Pay Mode		Payment Mode in Use	0.000p	✓	✓	
	Active Price							
		Active Price		Current Price for Import Active Energy	0.00p	✓	✓	✓
	Meter Balance							
		Meter Balance		Prepayment Mode: Amount of Credit Available Credit Mode: Amount of Money due from Consumer	0.000P	✓	✓	✓
	Standing Charge							
		Standing Charge		Standing Charge levied		✓	✓	✓
	Tariff Info							
		Tariff Name		Calendar Name	xxxxxxxxxxx	✓	✓	✓

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
PIN Mode								
	Disable PIN			Only shown if PIN Enabled	One of the following enabled	x	x	
		PIN Status		Disable Privacy PIN Protection				
	Set PIN							

		New PIN	Change PIN	**xxxx**	✓	✓	

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
Utility Mode								
	Segment Test							
		Segment Test						
	Ident							
		ESME ID		Globally unique identifier	xxxxxxxx	✓	✓	✓
		Model Type		Model Type of ESME	AS302P	✓	✓	✓
		Meter Var		Indicates ESME is single element	A	✓	✓	✓
		Manuf ID		Identity of the ESME Manufacturer	HON	✓	✓	✓
		Serial Number		ESME Serial Number	xxxxxxxxxxxxxxx	✓	✓	✓
		Config		Configuration used for ESME	xxxxxxxxxxxxxxx	✓	✓	✓
		PAYG ID		Pay as You Go Identifier (Production)	xxxxxxxxxxxxxxx	✓	✓	✓
		F/W Version		Short firmware Version (Production)	xxyy	✓	✓	✓
	FW Info							
		ACOR F/W			ASO09.xx.yy	✓	✓	✓
		MCOR F/W			MSP09.xx.yy	✓	✓	✓
		BOOT F/W			BSP09.xx.yy	✓	✓	✓
		MCOR CRC APR			0xXXX	✓	✓	✓
		MCOR CRC CAL			0xXXX	✓	✓	✓
		ACOR CRC			0xXXXXXXXX	✓	✓	✓
	Dial Test							
		Cum Imp (Act)		Cumulative Import Active Energy	00000.000 kWh	✓	✓	✓
		Cum Exp (Active)		Cumulative Export Active Energy	00000.000 kWh	✓	✓	✓
		Cum Imp (Reac)		Cumulative Import Reactive Energy	00000.000 kvarh	✓	✓	✓
		Cum Exp (Reac)		Cumulative Export Reactive Energy	00000.000 kvarh	✓	✓	✓
	Inst Values							
		Vrms		Instantaneous Voltage	000.0 V	✓	✓	✓
		Irms		Instantaneous Current	0000.0 A	✓	✓	✓
		Inst Act Pw		Instantaneous Active Power	0000.00 kW	✓	✓	✓
		Inst React Pw		Instantaneous React Power	0000.00 kvar	✓	✓	✓
		PF		Instantaneous Power Factor	0.000 / -,---	✓	✓	✓
		Freq		Instantaneous Frequency	000.0° / ---,-	✓	✓	✓

Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
Logs Mode								
	Event Log			Event captured in Event Log				
		Log 1 Time Date		Log Time and Date	dd-mm-yy – hh:mm	✓	✓	✓
		Log 2 EVID		Event Code	xxxxH	✓	✓	✓
	Power Log							
		Log 1 Time Date		Log Time and Date	dd-mm-yy – hh:mm	✓	✓	✓
		Log 2 EVID		Event Code	xxxxH	✓	✓	✓
	Security Log			**ONLY available if cover is open**				
		Log 1 Time Date		Log Time and Date	dd-mm-yy – hh:mm	✓	✓	
		Log 2 EVID		Event Code	xxxxH	✓	✓	

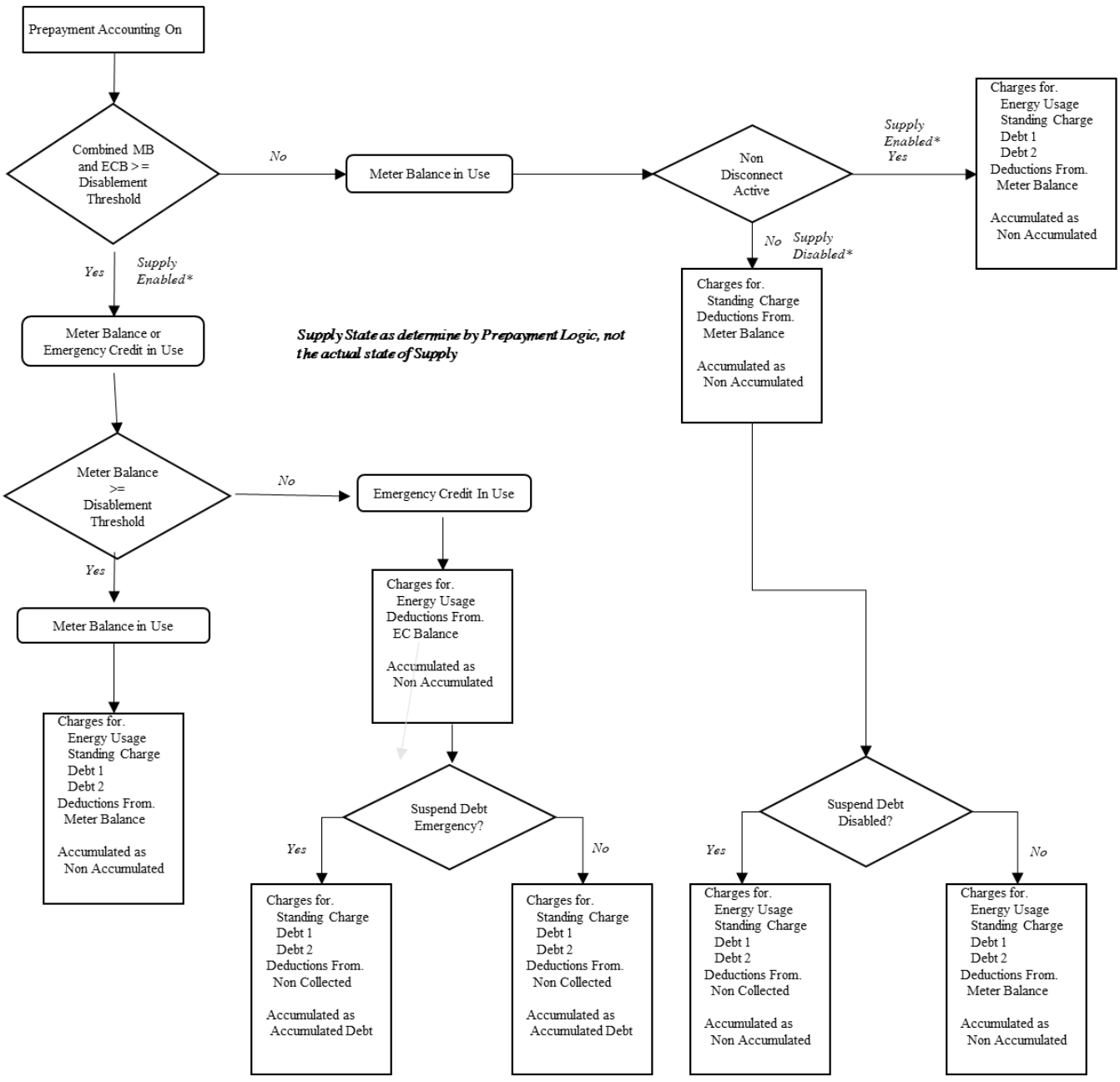
Level 1	Level 2	Level 3	Level 4	Description	Display Format	Credit Mode	Prepay Mode	Scroll Mode
Engineering Mode								
	ZigBee Commissioning							
		Join						
		Comms Status						
		Leave		Only visible if terminal cover is open				
	ZigBee Info							
		Status						
		Network Info						
		Channel						
		Node ID						
		PAN ID						
		XPAN ID						
		EUID						
		Signal						
	ALCS 1							
		State		Shows ALCS State		✓	✓	
		Test		Long Press on SELECT Button changes State of ALCS for 5 minutes		✓	✓	
	ALCS 2							
		State		Shows ALCS State		✓	✓	
		Test		Long Press on SELECT Button changes State of ALCS for 5 minutes		✓	✓	
	ALCS 3							
		State		Shows ALCS State		✓	✓	
		Test		Long Press on SELECT Button changes State of ALCS for 5 minutes		✓	✓	
	ALCS 4							
		State		Shows ALCS State		✓	✓	
		Test		Long Press on SELECT Button changes State of ALCS for 5 minutes		✓	✓	
	ALCS 5							
		State		Shows ALCS State		✓	✓	
		Test		Long Press on SELECT Button changes State of ALCS for 5 minutes		✓	✓	
	LED							
		State		State Change Active/Reactive or Reactive/Active		✓	✓	

34.7. Identification Data

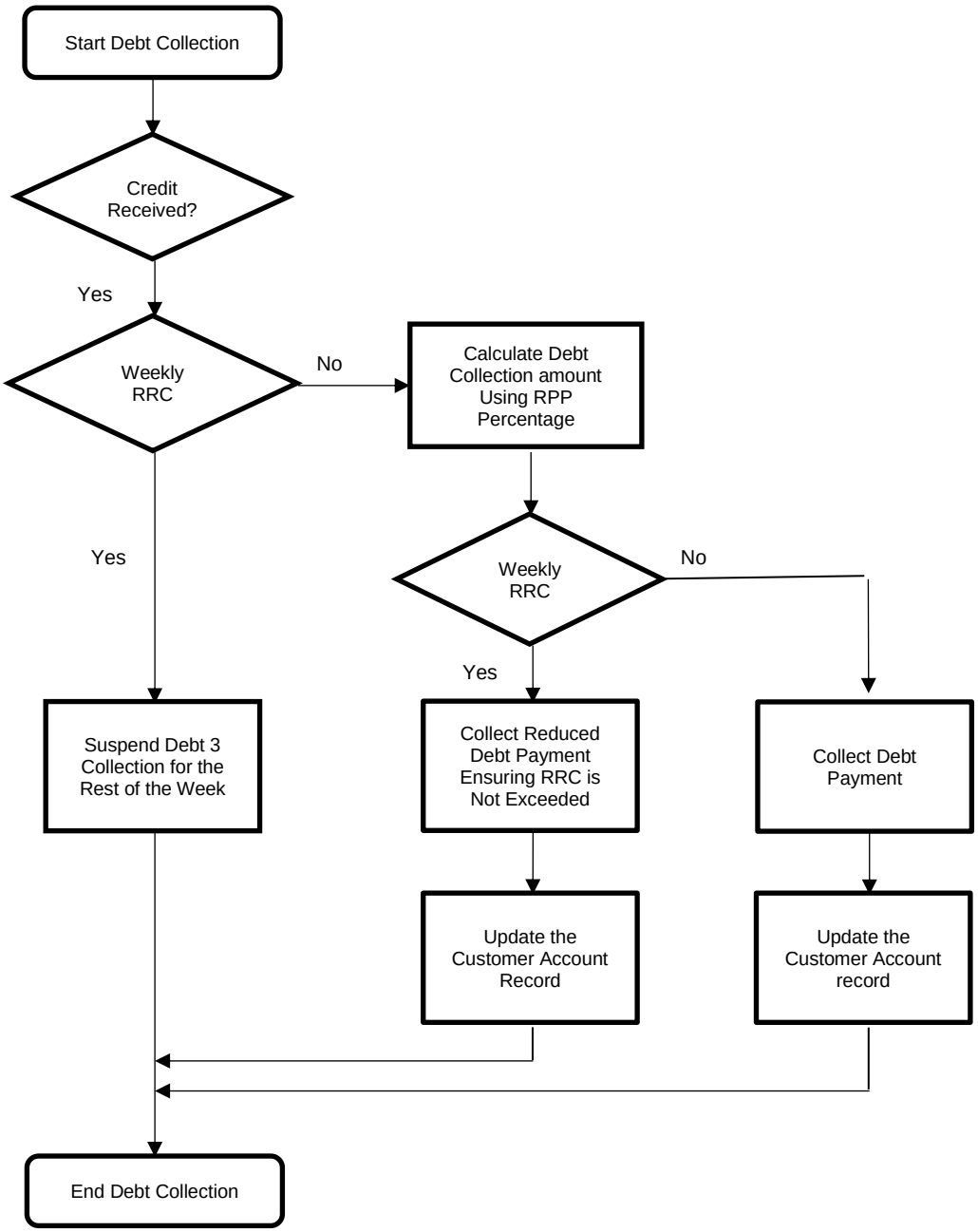
The Meter stores the following Identification Data:

- Manufacturing (Honeywell) Serial Number (Octet sting 16)
- Manufactures Name (Honeywell)
- Manufacture Id (Octet sting of 3)
- Configuration Number (non-tariff features)
- Device Identifier (GUID)
- Meter Variant (A for single element meter)
- Model Type (8 Characters)
- Customer Identification Number (octet sting – 4)
- Supplier Serial Number (16 characters, ASCII)
- MPAN Import (Octet string 26, using 13 for the first element MPAN)
- MPAN Export (Octet string – 13)
- Firmware Details ACOR (version)
- Firmware Code Checksum
- Firmware Details MCOR (version number)
- Metrological Firmware Code Checksum
- Firmware Bootloader (version)
- Firmware ZigBee stack (version)
- ZigBee Chip
- MAC Address
- PCB (bar code) Identifier

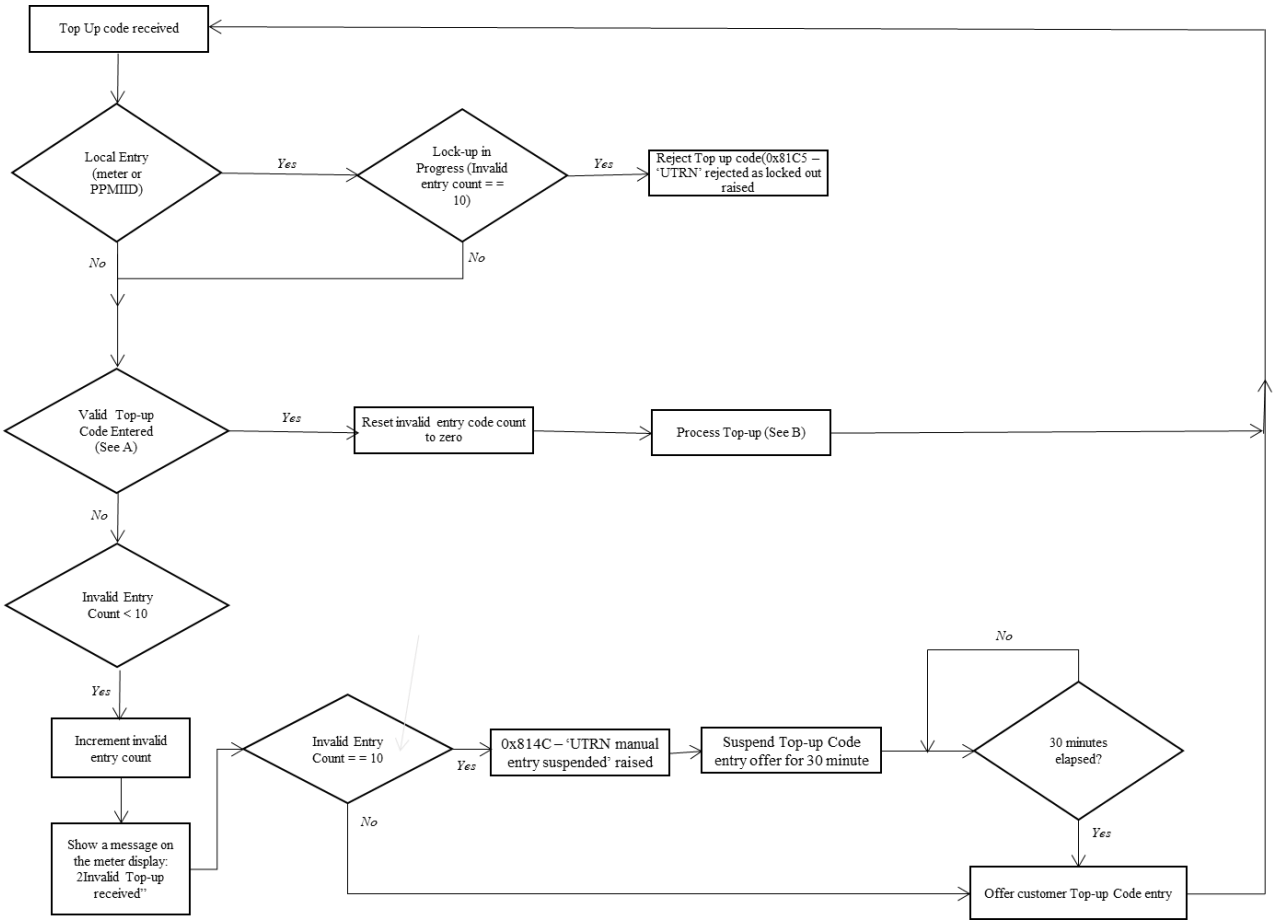
34.8. Order of Accounting



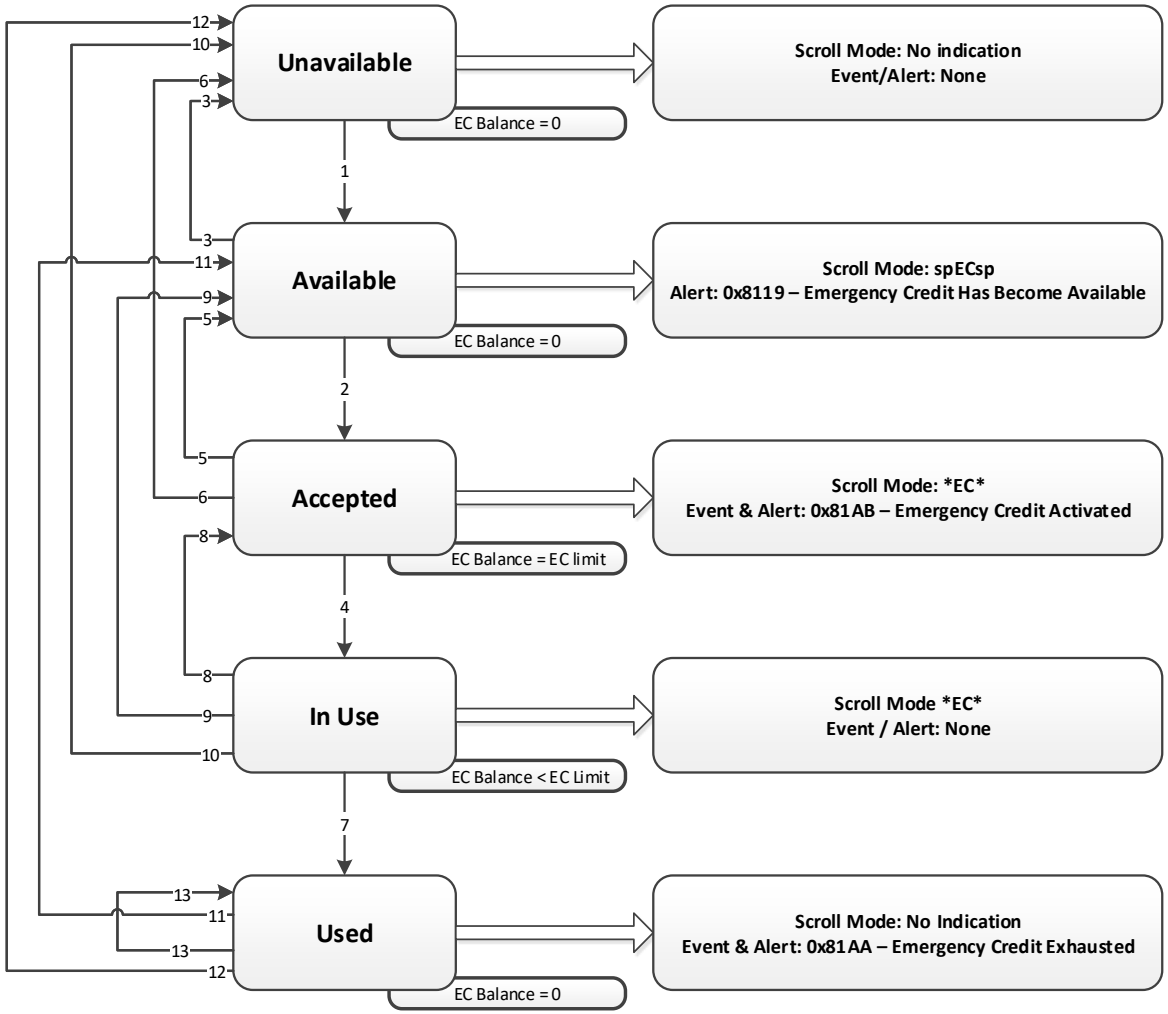
34.9. Payment Based Debt Collection



34.10. UTRN Processing



34.11. Emergency Credit Transitions



1. MB < EC Threshold
2. The customer accepts the EC manually OR a command is received remotely to accept EC. In either case no emergency credit has yet been used
3. Local or HAN TopUp accepted by the prepayment application takes the MB above / equal to EC threshold
4. Some of the EC that has been granted has been used and MB is below disablement threshold.
5. Local or HAN TopUp accepted by the prepayment application makes the MB below the EC threshold.
6. Local or HAN TopUp accepted by the prepayment application takes the MB above / equal to the EC threshold
7. The EC is all used
8. Meter balance adjustment, received while EC is in use, accepted by the prepayment application takes MB above Disablement Threshold
9. Local or HAN TopUp accepted by the prepayment application is sufficient to repay any EC owed (where EC owed < EC limit) and take the MB above the Disablement threshold but below the EC threshold
10. The Local or HAN TopUp accepted by the prepayment application is sufficient to repayany EC owed (where EC owed < EC limit) and take the MB above / equal to the EC threshold
11. Local or HAN TopUp accepted by the prepayment application is sufficient to repay any debts and take the MB above the Disablement threshold but below the EC threshold
12. Local or HAN TopUp accepted by the prepayment application is sufficient to repay any debts and take the MB above / equal to EC threshold
13. The top up credit accepted by the prepayment application is insufficient to repay all debts, including emergency credit debt (where initial EC owed = EC Limit) and take the prepaid credit above the disablement threshold.

35. APPENDICES

35.1. APPENDIX A - Checking kWh and kvarh Registration Accuracy

WARNING

Only trained and competent personnel, familiar with meter test procedures should carry out the following operation.

Introduction

Various methods of checking the accuracy of registration of the AS302P meter are available.
Methods using the LED test indicator and Register advances are described below.
Note: The AS302P meter does not have potential disconnect links. Where multiple meters are to be tested, a multi-secondary voltage transformer will be required.

1) Checking Meter Accuracy Using the LED Test Indicator

The kWh (if configured kvarh) test indicator pulses for both import and export energy measurement

2) Comparing LED Pulses with Substandard Meter Register Advance

What you will need
Suitable test equipment with a sensor to detect LED pulses
A suitable substandard meter
A counter for counting the number of LED pulses

Checking registration
In order to achieve a repeatability of 0.1% the test time at any load needs to be a minimum of 60 seconds.

1. Connect the test equipment and a suitable load to the meter, then power up the meter
2. The Test LED pulses for kWh (kvarh)
3. Run the test for a suitable duration and check the amount the substandard has advanced and the number of pulses detected

Calculate the registration by dividing the number of pulses by the meter constant. e.g.

$$\frac{994 \text{ (LED count)}}{4000 \text{ (meter constant)}} = 0.2485 \text{ kWh (kvarh) advance.}$$

Compare this kWh (kvarh) advance with the amount the substandard has advanced.

3) Comparing LED Pulses with Substandard Meter Pulses

This method may be used where the test equipment has the facility to calculate meter errors based on the pulse output from a substandard meter. It will be necessary to set the pulse value of the meter under test (shown on the meter nameplate) into the meter test equipment.

The duration of each test must be at least 60 seconds

The number of LED pulses should be greater than:-

$$\frac{Itest \times V \times PF \times K}{60}$$

Itest = Test current

V = System voltage

PF = Power factor of test load

K = LED pulse value, impulses/kWh

35.2. APPENDIX B - Event/Alarm Logs

Events Logs are structured as follows:

Security Log

Event / Alert Code Meaning	Event / Alert Code	Mandated / Non-mandated	Alert WAN (Alert Type)	Alert HAN
Clock not adjusted (adjustment greater than 10 seconds) or outside the validity period if via a set clock command	0x8F0C	Mandated	Y (1)	N
Comms Hub Device Log Changed	0x8F12	Mandated	Y (2)	N
Firmware Verification Failed	0x8F1C	Mandated	Y (2)	N
Integrity check of content or format of command failed	0x8F1E	Mandated	Y (1)	N
Unauthorised Communication Access attempted	0x8F3E	Mandated	Y (1)	N
Unauthorised Physical Access - Tamper Detect	0x8F3F	Mandated - conditional group 1	Y (1)	N
Change in the executing Firmware version	0x8F43	Mandated	N	N
Credit would cause Meter Balance to exceed Maximum Meter Balance Threshold	0x8F47	Mandated	N	N
Device joining failed	0x8F48	Mandated	N	N
Device joining succeeded	0x8F49	Mandated	N	N
Device Unjoining failed	0x8F4A	Mandated	N	N
Device Unjoining succeeded	0x8F4B	Mandated	N	N
Device's own Digital Signing Certificate replacement failed	0x8F4C	Mandated	N	N
Device's own Digital Signing Certificate replacement succeeded	0x8F4D	Mandated	N	N
Device's own Key Agreement Certificate replacement failed	0x8F4E	Mandated	N	N
Device's own Key Agreement Certificate replacement succeeded	0x8F4F	Mandated	N	N
Duplicate UTRN entered	0x8F51	Mandated	N	N
Event Log Cleared	0x8F52	Mandated	N	N
Failed Authentication or Authorisation not covered by other codes	0x8F53	Mandated	N	N
UTRN exceeds Maximum Credit Threshold	0x8F5B	Mandated	N	N
Unusual numbers of malformed, out-of-order or unexpected Commands received	0x8F60	Mandated	N	N
UTRN not Authentic	0x8F63	Mandated	N	N
UTRN not for this Device	0x8F64	Mandated	N	N
Update Security Credentials	0x8F70	Mandated	N	N
Firmware Verification Successful	0x8F72	Mandated	Y (2)	N
Unauthorised Physical Access - Meter Cover Removed	0x8F74	Mandated - conditional group 1	Y (1)	N

Security Log (Contd)

Event / Alert Code Meaning	Event / Alert Code	Mandated / Non-mandated	Alert WAN (Alert Type)	Alert HAN
Unauthorised Physical Access - Strong Magnetic field	0x8F75	Mandated - conditional group 1	Y (1)	N
Unauthorised Physical Access - Terminal Cover Removed	0x8F76	Mandated - conditional group 1	Y (1)	N
Unauthorised Physical Access – Comms Hub removal	0x8F78	Mandated - conditional group 1	Y (1)	N
Remaining Battery Capacity reset	0x8F82	Mandated	Y (1)	N
Firmware Verification Failed at Power On	0x8F1B	Mandated	Y (1)	N

Event Log

Event / Alert Code Meaning	Event / Alert Code	Mandated / Non-mandated	Alert WAN (Alert Type)	Alert HAN
Active Power Import above Load Limit Threshold	0x8F01	Mandated	Y (1)	Y
Low Battery Capacity	0x8F1F	Mandated	Y (1)	N
Clock adjusted (within tolerance), following a set command (not a normal adjustment)	0x8145	Mandated	N	N
Immediate HAN Interface Command Received and Successfully Actioned	0x8154	Mandated	N	N
Immediate HAN Interface Command Received but not Successfully Actioned	0x8155	Mandated	N	N
User Interface Command Input and Successfully Actioned (Boost)	0x8161	Mandated	N	N
User Interface Command Input but not Successfully Actioned (Boost)	0x8162	Mandated	N	N
Future – dated HAN Interface Command Successfully Actioned	0x8F66	Mandated	Y (2)	N
Future – dated HAN Interface Command not Successfully Actioned	0x8F67	Mandated	Y (2)	N
Device joined SMHAN	0x8183	Mandated	Y (1)	N
Tap Off Message Response or Alert Failure	0x819E	Mandated	Y (1)	N
Comms Hub Connected to AS302P	0x81A2	Non-mandated	N	N
Comms Hub Disconnected from AS302P	0x81A3	Non-mandated	N	N
Close Tunnel Command Rejected	0x81A4	Non-mandated	Y (1)	N
Customer Acknowledged Message on HAN Device	0x81A6	Non-mandated	Y (1)	N
Debt Collection Completed - Time Debt 1	0x81A7	Non-mandated	Y (1)	N
Debt Collection Completed - Time Debt 2	0x81A8	Non-mandated	Y (1)	N
Debt Collection Completed - Payment Debt	0x81A9	Non-mandated	Y (1)	N
Emergency Credit Exhausted	0x81AA	Non-mandated	Y (1)	Y
Emergency Credit Activated	0x81AB	Non-mandated	Y (1)	Y
Error Measurement Fault	0x81AC	Non-mandated	Y (1)	N
Error Metrology Firmware Verification Failure	0x81AD	Non-mandated	Y (1)	N
Error Non-Volatile Memory	0x81AE	Non-mandated	Y (1)	N
Error Program Execution	0x81AF	Non-mandated	Y (1)	N
Error Program Storage	0x81B0	Non-mandated	Y (1)	N
Error RAM	0x81B1	Non-mandated	Y (1)	N
Error Unexpected Hardware Reset	0x81B2	Non-mandated	Y (1)	N

Event Log (Contd)

Event / Alert Code Meaning	Event / Alert Code	Mandated / Non-mandated	Alert WAN (Alert Type)	Alert HAN
Error Watchdog	0x81B3	Non-mandated	Y (1)	N
Meter Cover Closed	0x81B9	Non-mandated	Y (1)	N
Request Tunnel Command Rejected	0x81BA	Non-mandated	Y (1)	N
Strong Magnetic Field Removed	0x81BC	Non-mandated	Y (1)	N
Supply Connect Failure (Valve or Load Switch)	0x81BD	Non-mandated	Y (1)	N
Supply Disabled Then Locked - Supply Tamper State Cause	0x81BE	Non-mandated	Y (1)	N
Supply Disconnect Failure (Valve or Load Switch)	0x81C0	Non-mandated	Y (1)	N
Terminal Cover Closed	0x81C1	Non-mandated	Y (1)	N
UTRN Manual Entry Suspended	0x81C4	Non-mandated	Y (1)	Y
UTRN rejected as locked out	0x81C5	Non-mandated	Y (1)	N

Power Event Log

Event / Alert Code Meaning	Event / Alert Code	Mandated / Non-mandated	Alert WAN (Alert Type)	Alert HAN
Average RMS Voltage above Average RMS Over Voltage Threshold (current value above threshold; previous value below threshold)	0x8002	Mandated	Y (1)	N
Average RMS Voltage below Average RMS Under Voltage Threshold (current value below threshold; previous value above threshold)	0x8006	Mandated	Y (1)	N
RMS Voltage above Extreme Over Voltage Threshold (voltage rises above for longer than the configurable period)	0x8020	Mandated	Y (1)	N
RMS Voltage above Voltage Swell Threshold (voltage rises above for longer than the configurable period)	0x8024	Mandated	Y (1)	N
RMS Voltage below Extreme Under Voltage Threshold (voltage falls below for longer than the configurable period)	0x8028	Mandated	Y (1)	N
RMS Voltage below Voltage Sag Threshold (voltage falls below for longer than the configurable period)	0x802C	Mandated	Y (1)	N
Supply Outage Restored	0x8F35	Mandated	Y (2)	N
Supply Outage Restored - Outage >= 3 minutes	0x8F36	Mandated	Y (2)	N
Supply Outage Restored on Phase 1	0x8F37	Mandated	Y (2)	N
Supply interrupted	0x8157	Mandated	N	N
Average RMS Voltage below Average RMS Over Voltage Threshold (current value below threshold; previous value above threshold)	0x8085	Mandated	Y (1)	N
Average RMS Voltage above Average RMS Under Voltage Threshold (current value above threshold; previous value below threshold)	0x8089	Mandated	Y (1)	N
RMS Voltage above Extreme Over Voltage Threshold (voltage returns below for longer than the configurable period)	0x808D	Mandated	Y (1)	N
RMS Voltage above Voltage Swell Threshold (voltage returns below for longer than the configurable period)	0x8091	Mandated	Y (1)	N
RMS Voltage below Extreme Under Voltage Threshold (voltage returns above for longer than the configurable period)	0x8095	Mandated	Y (1)	N
RMS Voltage below Voltage Sag Threshold (voltage returns above for longer than the configurable period)	0x8099	Mandated	Y (1)	N

Power Event Log (Contd)

Event / Alert Code Meaning	Event / Alert Code	Mandated / Non-mandated	Alert WAN (Alert Type)	Alert HAN
Incorrect phase sequencing	0x81B7	Non-mandated	Y (1)	N
Over Current	0x8010	Non-mandated	Y (1)	N
Power Factor Threshold Below	0x8014	Non-mandated	Y (1)	N
Power Factor Threshold Ok	0x8015	Non-mandated	Y (1)	N
Reverse Current	0x81BB	Non-mandated	Y (1)	N

ALCS Event Log

Event / Alert Code Meaning	Event / Alert Code	Mandated / Non-mandated	Alert WAN (Alert Type)	Alert HAN
Failure of Ad hoc Change to HAN connected Auxiliary Load Control switch	0x811A	Mandated	N	N
Failure of Calendar Based Change to HAN connected Auxiliary Load Control switch	0x811B	Mandated	N	N
Successful Ad hoc Change to HAN connected Auxiliary Load Control switch	0x8131	Mandated	N	N

- Alert type 1 - Payload comprises Alert Code and Timestamp only
- Alert type 2 - Payload comprises Alert Code, Timestamp and Use Case specific data as defined in GBCS

35.3. APPENDIX C – Interface Commands

SMETS2 reference	Description	Meter	PPMID via HAN Type 1 device	DCC/HHT via HAN
User Interface Commands				
Activate Emergency Credit	Activate Emergency Credit in Prepayment Mode	Y	Y	
Add Credit	Accept Credit in Prepayment Mode	Y	Y	
Allow Access to User Interface	Temp Access to Restricted Display Items	Y	Y	
Disable Privacy PIN Protect	Disables Privacy Pin Protection	Y	Y	
Enable Supply	Enable Supply if Supply Armed	Y	Y	
Find Smart Metering Home Area Network and Re-establish Comms Links	Re-establish the Home Area Network, Generate an Event and send an Alert	Y	Y	
Set Privacy PIN	Set the Privacy PIN	Y	Y	
HAN Interface Commands				
Activate Emergency Credit	Activate Emergency Credit in Prepayment Mode			Y
Activate Firmware	Activate the Firmware			Y
Add Credit	Accept Credit in Prepayment Mode			Y
Add Device Security Credentials	Add a Device 1 or Device 2 Security Credentials			Y
Adjust Debt	Apply Debt Adjustment			Y
Adjust Meter Balance	Adjust the Meter Balance			Y
Arm Supply	Return Meter to Unlocked State			Y
Clear Auxiliary Load Control Switch Event Log	Clear Entries Auxiliary Load Control Switch Event Log			Y
Clear Event Log	Clear Event Log Entries			Y
Disable Privacy PIN Protection	Disable Privacy PIN Protection			Y
Enable Supply	Enable Supply if Supply Armed			Y
Issue Device Security Credentials	Generate Public-Private Key Pair			Y
PPMID Enable Supply	PPMID enable Supply			Y
Read Configuration Data	Read Value of Constant Data Items			Y
Read Operational Data	Read Operational Data			Y
Receive Firmware	Receive Firmware			Y
Remove Device Security Credentials	Remove Security Credentials			Y
Request Control of HAN Connected Load Auxiliary Control Switch	Control HAN Connected Auxiliary Load Control Switch			Y
Reset Average RMS Over Voltage Counter	Reset Over Voltage Counter			Y
Reset Average RMS Under Voltage Counter	Reset Under Voltage Counter			Y
Reset HAN Connected Auxiliary Load Control switch State	A Command to Revert to the Auxiliary Load Switch Calendar			Y
Reset Load Limit Counter	Resets Load Limit Counter			Y
Reset Max Demand Active Power Import Value	Reset Max Demand Active Power Import Value			Y
Reset Max Demand Active Power Export Value	Reset Max Demand Active Power Export Value			Y
Reset Max Demand Active Power (Configurable Time) Import Value	Reset Max Demand Active Power (Configurable Time) Import Value			Y
Reset Meter Balance	Reset Meter Balance to Zero			Y
Reset Tariff Block Counter Matrix	Tariff Block Counter Matrix to Zero			Y
Restrict Data	Restrict Personnel Data			Y

Interface Commands (Contd)

Set Clock	Set the Clock Via the HAN			Y
Set HAN Connected Auxiliary Load Control Switch state	Issue an Auxiliary Load Control Switch Command			Y
Set Payment Mode	Set Prepay or Credit Mode			
Set Tariff	Accept New Tariff Values			Y

HAN Interface Commands Issued by AS302P				
Control HAN Connected Auxiliary Load Control Switch	Open/Close Auxiliary Load Control switch for Specified Time			Y

35.4. APPENDIX D – Data

Operating Data

SMETS2 reference	Description
Accumulated Debt Register	The debt resulting from the collection of Standing Charge and/or time-based debt when Emergency Credit is in use as configured by Suspend Debt Emergency, when operating in Prepayment Mo.
Active Export Register	The register recording the cumulative Active Energy Exported
Active Import Register	The register recording the cumulative Active Energy Imported
Active Power Import	The import of Active Power measured by AS302P
Auxiliary Load Control Switch Event Log	A log capable of storing one hundred UTC date and time stamped entries of events related to Auxiliary Load Control Switch(s) or HAN Connected Auxiliary Load Control Switch(s)
Average RMS Over Voltage Counter	Number of times the average RMS voltage has been above Average RMS Overvoltage Threshold
Average RMS Under Voltage Counter	Number of times the average RMS voltage has been above Average RMS Under Voltage Threshold
Average RMS Voltage Profile Data Log	A Log of RMS entries for each Period
Billing Data Log	A log capable of storing UTC date and time stamped entries of Billing Data
Cost of Instantaneous Active Power Import	The indicative cost in Currency Units of maintaining the Active Power Import for an hour at the Price(s) currently active
Cumulative and Historical Value Store	A store capable of holding 9 Days, 6 Weeks, 14 Months of Consumption Data
Daily Read Log	A log capable of storing thirty one UTC date and time stamped entries of TOU Reg Matrix, TOU Block Reg Matrix, Active Import, Active Export
Daily Consumption Log	A log capable of storing 731 date stamped entries of Consumption
Emergency Credit Balance	The amount of Emergency Credit available to the Consumer after it has been activated by the Consumer
Event Log	A log capable of storing one hundred UTC date and time stamped entries of non-security related information
Firmware Version	The active version of Firmware of meter
Load Limit Counter	The number of times the Active Power Import has exceeded the Load Limit Period, Load Limit Power threshold
Maximum Demand Active Power Import Value	A store capable of holding the largest average value of Active Power Import recorded in any 30-minute period
Maximum Demand (Configurable Time) Active Power Import Value	A store capable of holding the largest average value of Active Power Import recorded in any configured time period
Maximum Demand Active Power Export Value	A store capable of holding the largest average value of the Active Power Export recorded in any 30-minute period
Meter Balance	The amount of money in Currency Units as determined by AS302P.
Payment Debt Register	Debt to be recovered as a percentage of payment when using Payment-based Debt Recovery in Prepayment Mode.
Power Threshold Status	An indication of the Active Power level, being low, medium or high
Power Event Log	A log capable of storing one hundred UTC date and time stamped entries of non-security related information
Prepayment Daily Read Log	A log capable of storing thirty-one UTC date and time stamped entries of Meter Balance, Emerg Credit Balance, Accumulated debt, Payment Debt register Time debt register
Profile Data Log	A log capable of storing UTC date and time-stamped half hourly data (the amount of energy Imported or Exported in a half hour period) - 13 months of Consumption - 3 months of Active Energy Exported - 3 months of Reactive Energy Imported - 3 months of Reactive Energy Exported
Randomised Offset	Product of Randomised Offset Limit and randomised offset Number
Reactive Export Register	A register recording the cumulative Reactive Energy Exported
Reactive Import Register	A register recording the cumulative Reactive Energy Imported
Security Log	A log capable of storing one hundred UTC date and time stamped entries of security related information for diagnosis and auditing
Supply State	The state of the Supply being Enabled, Disabled or Armed.

Operating Data (Contd)

Tariff Block Counter Matrix	Matrix for storing Block Counters for Block Pricing
Tariff TOU Register Matrix	Matrix for storing Tariff Registers for Time-of-use Pricing.
Tariff TOU Block Register Matrix	Matrix for storing Tariff Registers for Time-of-use with Block Pricing.
Time Debt Registers [1 … 2]	Two registers recording independent debts to be recovered over time when operating Time-based Debt Recovery in Prepayment Mode.

Constant Data

SMETS2 reference	Description
AS302P Identifier	A globally unique identifier used to identify an individual AS302P based on the EUI-64 Institute of Electrical and Electronic Engineers standard.
Manufacturer Identifier	An identifier used to identify the manufacturer of the meter
Model Type	An Identifier used to identify the model of the meter
Meter Variant	An Identifier used to identify if the meter is Single, Twin element or Polyphase
Randomised Offset Number	Randomly Generated 0 or 1

Internal Data

SMETS2 reference	Describes Data that Remains Constant and is not Available Outside the Meter
Installation Credentials	Credentials Unique to the Meter

Configuration Data

SMETS2 reference	Description
Alerts Configuration settings	Generate/Send an Alert
Auxiliary Load Control Switch Calendar	Set of Switching Rules for up to 5 Auxiliary Load Control switches
Auxiliary Load Control Switch Description	Description of Control of Each Auxiliary Load Control Switch
Average RMS Over Voltage	The average RMS voltage above which an over voltage condition is reported
Average RMS Under Voltage Threshold	The average RMS voltage below which an under voltage condition is reported.
Average RMS Voltage Measurement Period	The length of time in seconds over which the RMS voltage is averaged.
Billing Calendar	A calendar defining billing dates for the storage of billing related information
Contact Details	The name and contact telephone number of the Supplier.
Currency Units	The Currency Units currently used by the meter (Pound/Euros)
Customer Identification Number	A number issued to meter for display on the User Interface.
Debt Recovery per Payment	The percentage of a payment to be recovered against debt
Debt Recovery Rates [1 … 2]	Two debt recovery rates in Currency Units per unit time
Debt Recovery Rate Cap	The maximum amount in Currency Units per unit time that can be recovered
Device Log	The Security Credentials for each of the Type 1 Devices and Type 2 Devices
Disablement Threshold	The threshold in Currency Units for controlling when to Disable the Supply
Emergency Credit Limit	The amount of Emergency Credit in Currency Units to be made available to a Consumer
Emergency Credit Threshold	The threshold in Currency Units below which Emergency Credit Balance may be activated
Meter Security Credentials	The Security Credentials for Meter
Load Limit Period	Length of time in which Active Power Import continuously exceeds the Load Limit Power threshold before Load Limit Event Occurs
Load Limit Power Threshold	The Active Power threshold in kW above which the measurement of a Load Limit Period is commenced.
Load Limit Restoration Period	The length of time in seconds after the Supply has been Armed following a Load Limiting Event before the Supply is Enabled by AS302P.

Configuration Data (Contd)

Load Limit Supply State	Control the state of the Supply in the case of a load limiting occurring, being Disabled or unchanged.

Low Credit Threshold	Threshold in Currency Units below which a low credit Alert is signalled.
Maximum Demand Configurable Time Period	Time period of up to 24 hours comprising a number of half-hour periods (commencing at the start of minutes 00 and 30 in each hour) during which recording to the Maximum Demand (Configurable Time) Active Power Import Value (0) is active.
Maximum Meter Balance Threshold	Threshold in Currency Units above which an Add Credit Command is rejected.
Meter Point Administration Numbers (MPAN)	The reference numbers identifying an electricity metering point for Import and Export.
Medium High Power Threshold	A value in kW defining the threshold between an indicative medium and high Active Power Import Level
Non-Disablement Calendar	A Switching Table comprising a set of rules specifying periods during which the Supply will not be Disabled
Payment Mode	The current mode of operation, being Prepayment Mode or Credit Mode.
Public Key Security Credentials Store	Store for Security Credentials relating to Public Keys.
Randomised Offset Limit	A value in seconds in the range 0 to 1799.
RMS Extreme Over Voltage Measurement Period	Duration in seconds used to measure an extreme over voltage condition.
RMS Extreme Over Voltage Threshold	RMS voltage above which an extreme over voltage condition is reported.
RMS Extreme Under Voltage Measurement Period	RMS Extreme Under Voltage Measurement Period
RMS Extreme Under Voltage Threshold	RMS voltage below which an extreme under voltage condition is reported.
RMS Voltage Sag Measurement Period	Duration in seconds used to measure a voltage sag condition.
RMS Voltage Swell Measurement Period	The RMS voltage below which a sag condition is reported
Standing Charge	A charge to be levied in Currency Units per unit time when operating in Credit Mode and Prepayment Mode.
Supplier Message	Message issued to, and held on, AS302P for provision to the Consumer
Supply Tamper State	Setting to control the state of the Supply in the case of Unauthorised Physical Access being detected, being Locked or unchanged.
Suspend Debt Disabled	Setting controlling whether standing charge and debt should be collected when AS302P is operating in Prepayment Mode and Supply is Disabled
Suspend Debt Emergency	A setting controlling whether standing charge and debt should be deducted from the Emergency Credit Balance
Tariff Block Price Matrix	Set of rules for allocating half-hourly Consumption to a Tariff Register
Tariff Threshold Matrix	Matrix capable of holding thresholds in kWh for controlling Block Tariffs
Tariff TOU Price Matrix	Matrix containing prices for Time-of-use Pricing.

36. GLOSSARY

Active Energy

The integral with respect to time of the Active Power in units of watt-hours (Wh) or standard multiples thereof (for example, kWh).

Active Power

The product of voltage and the in-phase component of alternating current measured in units of watts (W) or standard multiples thereof (for example, kW).

Aggregate Debt

The sum of all time-based and payment-based debt registers on ESME or GSME operating in Prepayment Mode.

Aggregate Debt Recovery Rate

The sum of the Time-based Debt Recovery rates on ESME or GSME operating in Prepayment Mode.

Alarm

A short-lived audible signal.

ALCS

Auxiliary Load Control Switch

Alert

A message generated by a Device including in response to a problem or the risk of a potential problem.

Ambient

The representation of information in a form that can be understood at a glance.

Arm

To establish a state whereby Supply will be Enabled in response to a Command to Enable Supply; ‘Armed’ and ‘Arming’ shall be construed accordingly.

Authentication

The method used to confirm the identity of entities or Devices wishing to communicate and ‘Authenticated’ and ‘Authenticity’ shall be construed accordingly.

Authorisation

The process of granting access to a resource and ‘Authorised’ shall be construed accordingly.

Auxiliary Load Control Switch (ALCS)

A switch or other means of controlling a load on the Supply.

Battery

A component that produces electricity from a chemical reaction.

Block Counter

Storage for recording Consumption for the purposes of combined Time-of-use and Block Pricing.

Block Pricing

A pricing scheme used in conjunction with Time-of-use Pricing where Price varies based on Consumption over a given time period.

Block Register

A Tariff Register for recording Consumption for the purposes of combined Time-of-use and Block Pricing.

Block Tariff

A Tariff for Block Pricing.

Certificate

An electronic document that binds an identity, and possibly other information, to a Public Key.

Certificate Signing Request

A message requesting the issue of a Certificate by a Certification Authority.

Certification Authority (CA)

A trusted entity which issues Certificates.

CESG

The UK Government's national technical authority for information assurance.

Clock

A timing mechanism that has a minimum resolution of 1 second.

Command

An instruction to perform a function received or sent via any interface.

Commercial Product Assurance Security Characteristics for GB Smart Metering

The documents forming part of the Smart Energy Code describing the requirements for evaluation and certification of ESME, GSME, HCALCS and Communications Hubs under CESG's Commercial Product Assurance scheme.

Communications Hub Date and Time

The date and time held on the Communications Hub as described at Section 4 in the Communications Hub Technical Specifications.

Communications Hub Physical Interface

A physical interface to connect to the Communications Hub.

Communications Hub Date and Time

The date and time provided by the Communication Hub

Communications Hub Technical Specifications (CHTS)

The document designated by the Secretary of State to describe the minimum capabilities of communications hubs.

Communications Link

The exchange of Commands, Responses, Alerts and other information between a system or Device and another system or Device which is independent of the transport mechanism used.

Confidentiality

The state of information, in transit or at rest, where there is assurance that it is not accessible by Unauthorised parties through either unintentional means or otherwise.

Consumer

A person who lawfully resides at the Premises that is being Supplied.

Consumption

In the context of ESME Electricity Consumption.

Contact Details

The name and contact telephone number of the current gas or electricity Supplier (as appropriate).

Credit Mode

A mode of operation of GSME or ESME whereby Consumers are billed for some or all their Consumption retrospectively.

Critical Commands

Those Commands which relate to Supply being affected, financial fraud or the compromise of the security of Devices in Consumer Premises.

Cryptographic Algorithm

An algorithm for performing one or more cryptographic functions which may include: Encryption, Decryption, Digital Signing or Hashing of information, data, or messages; or exchange of Security Credentials.

Currency Units

The units of monetary value in major and minor units.

Customer Identification Number

A number used to verify that an individual requesting a service is present in the Consumer Premises.

DRR

Daily Recovery Rate

Data Integrity

The state of data where there is assurance that it has not been altered by Un-authorised parties.

Data Store

An area of a Device capable of storing information for future retrieval.

Day

The period commencing 00:00:00 Local Time and ending at the next 00:00:00.

Day Profile

For the purposes of Time-of-use Pricing and Time-of-use with Block Pricing, the rules defined in a Switching Table specifying the Tariff Register to which Consumption is allocated for the day (in the context of GSME Time-of-use Pricing and Time-of-use with Block Pricing) and for each half-hour period within the day (in the context of the ESME Time-of-use Pricing and Time-of-use with Block Pricing).

For the purposes of setting the commanded state of Auxiliary Load Control Switches or HAN Connected Auxiliary Load Control Switches, the rules defined in a Switching Table specifying the commanded state of each Auxiliary Load Control Switch or HAN Connected Auxiliary Load Control Switch, for all times within the day.

For the purposes of Non-Disablement Periods the rules defined in a Switching Table specifying the times during the day when a Non-Disablement Period is active.

DCC

Data Communications Company

Debt Register

Storage for recording an amount of debt to be recovered.

Debt to Clear

The amount of credit the consumer needs to add to ESME or GSME to cause the Meter Balance to rise to the disablement threshold when operating in Prepayment Mode.

DECC

Department Energy and Climate Change

Decryption

The process of converting Encrypted information by an Authorised party to recover the original information and like terms shall be construed accordingly.

Device

ESME, a GPF, a CHF, a Type 1 Device or a Type 2 Device.

Device Language Message Specification (DLMS) Companion Specification for Energy Metering (COSEM)

The Green Book (DLMS User Association 1000-2 Edition 8) and the Blue Book (DLMS User Association 1000-1 Edition 12.0).

Digital Signature

The piece of information appended to a message which is created using the sender’s Private Key, can be verified using the Public Key contained in the sender's Certificate and provides the receiver with assurance that the sender is who they claim to be, the message is as sent by the sender and that the sender sent the message.

Digital Signing

The creation of a Digital Signature.

Disable

The act of interrupting the flow of electricity by opening the Load Switch(s) and like terms shall be construed accordingly.

Domestic Premises

The meaning given to that term in standard condition 1 of electricity supply licences.

Electricity Consumption

The Active Energy Imported into the Premises and 'Consumed' shall be construed accordingly.

Electricity Meter

An instrument used to measure, store and display the amount of electrical energy passing through an electrical circuit or circuits.

Emergency Credit

Credit that can be made available to ensure that the Supply is not interrupted in circumstances (including situations of emergency) defined by the Supplier to the Premises.

Enable

The act of restoring the flow of electricity to the Premises by closing the Load Switch and like terms shall be construed accordingly.

Encryption

The process of converting information in order to make it unintelligible other than to Authorised parties and like terms shall be construed accordingly.

Energy Consumption

The amount of electricity in kWh Supplied to the Premises.

ESME

Electricity Smart Metering Equipment.

Export

The flow of electricity out of the Premises, and like terms shall be construed accordingly.

Firmware

The embedded software programmes and / or data structures that control Devices.

Great Britain Companion Specification

The document forming part of the Smart Energy Code describing nature of Communications Links that ESME, GSME, HCALCS, IHD and PPMID must be capable of forming via their HAN Interfaces. The current version of Great Britain Companion Specification can be found here: *https://www.smartenergycodecompany.co.uk/sec/the-developing-sec*

Hashing

A repeatable process to create a fixed size and condensed representation of a message of any arbitrary data. Hash and like terms shall be construed accordingly.

HAN

Home Area Network

HCALCS

HAN Connected ALCS, which is a Type 1 Device.

HCALCS Technical Specifications

The document brought into force by the Secretary of State to describe the minimum capabilities of equipment installed to satisfy the HCALCS licence conditions.

Home Area Network Interface (HAN Interface)

A component of GSME, ESME, IHD or other Device that is capable of sending and receiving information to and from other Devices.

Key

Data used to determine the output of a cryptographic operation.

ICHI

Intimate Communications Hub Interface

Key Agreement

A means to calculate a shared Key between two parties.

IHD

In-home Display.

IHD Source Device

ESME or the Gas Proxy Function.

IHD Technical Specifications

The document brought into force by the Secretary of State to describe the minimum capabilities of equipment installed to satisfy the IHD licence conditions.

Import

The flow of electricity into the Premises, and like terms shall be construed accordingly.

LCD

Liquid Crystal Display

Load Switch

A component or combination of components that can close or open (including on receipt of a Command to that effect) to Enable or Disable the flow of electricity to and from the Premises.

Local Time

The UTC date and time adjusted for British Summer Time.

Lock

To establish a state whereby the Supply is Disabled and can only be Enabled or Armed in response to a Command to Arm or Enable the Supply; 'Locked' and 'Locking' shall be construed accordingly.

Message Authentication

The process by which the receiver of a message is provided with assurance that the sender is who they claim to be and that the message is in the form originally sent.

MPAN

Meter Point Administration Number.

MPRN

Meter Point Reference Number.

Non-Disablement Period

A period of time during which the combined credit of the meter balance and Emergency Credit balance falling below the disablement threshold will not be cause the Supply to be Disabled when ESME or GSME is operating in Prepayment Mode.

Outcome

The result of executing a Command, expressed as success or failure.

Payment-based Debt Recovery

A means of recovering debt based on a percentage of a payment.

Personal Data

Any information comprising Personal Data as such term is defined in the Data Protection Act 1998 at the date the SMETS is brought into force.

PIN

Personnel Identification Number

PPMID Technical Specifications

The document brought into force by the Secretary of State to describe the minimum capabilities of equipment installed to satisfy the PPMID licence conditions.

Prepayment Interface Device (PPMID)

A Type 1 Device that provides a User Interface for Prepayment Mode related information and Commands.

Prepayment Top-up Transaction (PTUT)

A cryptographic code used to convey credit to GSME or ESME operating in Prepayment Mode.

Premises

The premises which is Supplied.

Prepayment Mode

A mode of operation of ESME whereby payment is generally made in advance of Consumption.

Price

The amount of money in Currency Units charged for one kWh of electricity Consumed via the relevant measuring element for ESME.

Privacy PIN Protection

The prevention of the display of information and access to Commands on the User Interface of GSME or ESME.

Private Key

The Key in a Public-Private Key Pair which must be kept secure by the entity to which it relates.

PTUT Counter

A number derived from a PTUT or a UTRN.

Public Key

The Key in a Public-Private Key Pair which can be distributed to other parties.

Public-Private Key Pair

Two mathematically related numbers that are used in Cryptographic Algorithms.

Random Number Generator

A component used to generate a sequence of numbers or symbols that lack any predictable pattern.

Reactive Energy

The integral with respect to time of Reactive Power in units of volt-amperes reactive-hours (varh) or standard multiples thereof (for example, kvarh).

Reactive Power

The product of voltage and the out of phase component of current measured in units of volt-amperes reactive (var) or standard multiples thereof (for example, kvar).

Replay Attack

A form of attack on a Communications Link in which a valid information transmission is repeated through interception and retransmission.

Response

Sent on, or received from the User Interface or HAN Interface or any other interface containing information in response to a Command.

RMS

Root mean squared.

Role

The entitlement of a party to execute one or more Commands.

Season Profile

Rules defined in a Switching Table specifying a Week Profile for each week of a season.

SECAS

The Smart Energy Code Administrator and Secretariat.

Secure Perimeter

A physical border surrounding ESME or the PPMID.

Security Credentials

Information used to identify and / or Authenticate a Device, party or system.

Sensitive Event

Each of the following events:

a failed Authentication or Authorisation;

a change in the executing Firmware version; and

unusual numbers of malformed, out-of-order or unexpected Commands received.

SHA-256

The Hashing algorithm of that name approved by the NIST (see *http://csrc.nist.gov/groups/ST/toolkit/secure_hashing.html*).

Single Electricity Metering Equipment

Electricity metering equipment containing a single measuring element.

Smart Metering Equipment Technical Specifications (SMETS)

The document brought into force by the Secretary of State to describe the minimum capabilities of equipment installed to satisfy the roll-out licence conditions.

Smart Metering Home Area Network

A communications network allowing the exchange of information between Devices.

Smart Metering Wide Area Network

A communications network allowing the exchange of information between Devices and the Utility

Special Day

A day defined in a Switching Table where allocation to Tariff Registers, setting the commanded state of Auxiliary Load Control Switches or HAN Connected Auxiliary Load Control Switches, or specifying Non-Disablement Periods is based on a specified Day Profile.

Supplier

A person authorised by licence to Supply electricity to Premises for ESME.

Supply

The supply of electricity to Premises for ESME and ‘Supplied’ shall be construed accordingly.

Switching Table

Separate rules for:

allocating Consumption to Tariff Registers for the purposes of Time-of-use Pricing;

setting the commanded state of Auxiliary Load Control Switches or HAN Connected Auxiliary Load Control Switches; and

the purposes of specifying Non-Disablement Periods.

Tariff

The structure of Prices and other charges relating to a Supply.

Tariff Register

Storage for recording Consumption for the purposes of Time-of-use Pricing.

Time-based Debt Recovery

A means of recovering debt based on an amount in Currency Units per unit time.

Time-of-use Band

A contiguous or non-contiguous number of Days for GSME or half-hour periods for ESME over which Tariff Prices are constant.

Time-of-use Pricing

A pricing scheme with one or more Time-of-use Bands.

Time-of-use Tariff

A Tariff for Time-of-use Pricing.

Timer

A mechanism for measuring a time period.

TOU

Time-of-use.

Transactional Atomicity

The type and order of the constituent parts of a Command.

Trusted Source

A source whose identity is confidentially and reliably validated**.**

Twin Element Electricity Metering Equipment

Electricity metering equipment containing two measuring elements.

Type 1 Device

A Device, other than GSME, ESME, Communications Hub Function or Gas Proxy Function, that stores and uses the Security Credentials of other Devices for the purposes of communicating with them via its HAN Interface.

Type 2 Device

A Device that does not store or use the Security Credentials of other Devices for the purposes of communicating with them via its HAN Interface.

Unauthorised Physical Access

Unauthorised access to the internal components of GSME, ESME or the PPMID through its Secure Perimeter.

Unique Transaction Reference Number (UTRN)

A truncated PTUT.

Unlocked

To establish a state whereby the state of the Supply is determined by GSME or ESME; ‘Unlocked’ and ‘Unlocking’ shall be construed accordingly.

User Interface

An interface for providing local human interaction with GSME, ESME, IHD or PPMID which supports input and visual output.

UTC

Coordinated Universal Time.

UTRN

Unique Transaction Reference Number

WAN

Wide Area Network

Week

The seven day period commencing 00:00:00 Monday Local Time and ending at 00:00:00 on the immediately following Monday.

Week Profile

Rules defined in the Switching Table specifying the Day Profile for each day of a week.

ZigBee Smart Energy Profile (SEP) Version 1.2

The ZigBee Smart Energy Profile Specification 1.2a v1.0 (reference 07-5356r19:

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