# A1120/40 Programmable Polyphase Meter

## Chapter 2 - Operating & Maintenance Instructions

M181 001 2H
11.2011

# 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 Elster Metering Systems, 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 the UK, employers have duties under the Health and Safety at Work Act 1974 and the various regulations stemming therefrom.

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 Elster Metering Systems 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 Elster Metering Systems 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

**WARNINGS**

## Internal Electronic Circuits

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

## Dangerous voltages are present

A Terminal Cover Plate must always be fitted to the A1120/40 meter to protect the main meter terminals. If the Terminal Cover Plate is **not** fitted to the A1120/40 meter, all supplies to the meter **must** be isolated before a module, module peripheral equipment or external battery module is installed or removed.

Failure to do so may result in electric shock.

**Caution**

Installation of a faulty module or module peripheral equipment may affect the main meter functionality.

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 Lithium manganese dioxide primary cell. This battery is completely safe under normal conditions. However, it must never be recharged, disassembled, 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 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.

Elster Metering Systems 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.

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

An optional External Battery Module supports the display and optical communications during power outages. A non-rechargeable “alkaline” (alkaline zinc manganese dioxide) PP3 (IEC 6LR61) battery is used.

This battery is completely safe under normal conditions. It must not be recharged, disassembled, short-circuited, overheated or incinerated. It contains corrosive materials.

Used batteries should be disposed of in compliance with local legislation requirements.

## 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 89/336/EEC.

Safety requirements for meters are addressed in specific metering standards outlined below.

The CE Mark does not denote compliance with the European Low Voltage Directive 73/23/EEC, which specifically excludes electricity meters.

The A1120/40 meter measures active energy, according to the requirements of - EN 62053-21/22:2003 for indoor kWh meters of Protective Class II and Accuracy Class 0.5s, 1 or 2 (MID) - Annex MI-003, kWh Class A, B or C.

The meter measures reactive energy in accordance with EN 62053-23:2003, Class 2 or Class 3.

Meters displaying OBIS Identification Codes meet the requirements of IEC 62056-61.

The degree of ingress protection is to IP53, IEC 60529:1989.

The meter complies with DIN 43857 Part 2 and Part 4 - dimensional requirements (except for the top fixing centres).

The meter complies with the essential requirements of the EC Directive 2004/22/EC on Measuring Instruments (MID).

The meter complies with the general requirements and particular requirements of EN 50470 Parts 1 & 3, and complies with Class M2 Mechanical environment and Class E2 Electromagnetic Environment.

Devices for metering and billing electrical energy described in this manual are supplied for use in a ‘Fixed Installation’ only. Devices described are a ‘component of a system only’ and therefore outside the scope of European Directives 2002/95/EC RoHS (Restriction of the Use of Certain Hazardous Substances in Electrical Equipment) and 2002/96/EC WEEE (Waste Electrical and Electronic Equipment).

## 4 APPROVALS

kWh/kvarh energy meters are approved by the Office of Gas and Electricity Markets (OFGEM) in compliance with European and British metering legislation.

# 5 INTRODUCTION

The A1120/40 has been designed to meet the changing needs of the Electricity Supply Industry.

The meter offers a 'modular' solution for remote communications, allowing the meter to be integrated into an AMR system at any time. Flexibility in communications provides the Utility with the means to employ the most cost effective communications method. The RJ11 connector provides power for a modem removing any requirement for external connections.
The modem fits neatly under the terminal cover providing a high degree of protection against fraud or tampering.

Communications are provided via the optical (IEC 62056-21) port and are supported by data stream mode, allowing fast reading of meter data. The A1140 permits up to 90 days of load profile data to be collected in less than 30 seconds. The RJ11 socket provides optional RS232 communications allowing remote access to the same data as the optical port. This port can be multi-dropped, allowing access to up to 10 meters in a single installation. A further option allows a pulsed output to be transmitted via the meter's auxiliary terminals.

The meter is available in a number of variants that measure combinations of active energy, four quadrant reactive energy and kVAh. Two customer defined registers can be used to summate energy from any like unit registers. Instrumentation quantities to aid installation can be included in the display sequence.

Firmware Version C allows 12 External Registers to display data from an external source such as a gas or water meter. The registers are written to by an intelligent source via the RS232 port.

The meter offers extensive security data which includes a programming log with user ID.
Further security can be provided as an option with terminal cover and main cover removal detection. As an alternative option, the latter detection switch can instead be used to allow the CT ratio to be changed.

The Liquid Crystal Display (9.8mm) has large characters that can be viewed from a wide angle.
The display sequence is programmable and can be auto-cycle, step or utility. Displayed information can have English language identifiers or OBIS (Object Identification System) codes. The OBIS codes can be changed via the Power Master Unit.

Power Master Unit software provides a user-friendly Windows™ graphical interface for programming the meter and reading meter data.

The meters are approved to:

EN 62053-21/22 for kWh accuracy - Class 0.5s, 1 or 2
EC Directive 2004/22/EC (MID) - Class A, B or C
EN 62053-23 for kvarh accuracy - Class 2 or Class 3

The meter has an ingress protection rating of IP53 to IEC 60529:1989.

The following main variants of the meter (configured at manufacture) are available:

Import kWh

Import kWh, Q1 and Q4 kvarh

Import kWh, Q1, Q2, Q3, Q4 kvarh, kVAh 1

Import/Export kWh

Import/Export kWh, Q1, Q2, Q3, Q4 kvarh

Import/Export kWh, kVAh 1-2

Import/Export kWh, Q1, Q2, Q3, Q4 kvarh, kVAh 1-2

Import/Export kWh, Q1, Q2, Q3, Q4 kvarh, kVAh 1-2, Cumulative Import/export kWh phase A, B and C (Model Code Feature Set F only)

The main available manufacturing options of the meter are tabulated below:

| | A1120 | A1140 |
|---|---|---|
| **Pulse Output** | Optional | Optional |
| **Load Profile** | Not available | Standard |
| **RS232 Port** | Optional | Optional |
| **Accuracy EN 62053 - 21/22(kWh)**<br>**2004/22/EC (MID)** | Class 0.5s, 1 or 2<br>Class A, B or C | Class 0.5s, 1 or 2<br>Class A, B or C |

## Features

- Accuracy kWh Class 0.5s, 1 or 2 (EN 62053 -21/22)
  kWh Class A, B or C (EC Directive 2004/22/EC [MID])
  kvarh Class 2 or Class 3
- Comprehensive tariff structure
- Twelve external registers (Firmware Version C only)
- Large digit (9.8 mm register digits) Liquid Crystal Display
- IEC 62056-21 (formerly IEC 61107) optical communications port
- Internal clock and calendar with battery back-up
- 15 years product life
- Comprehensive security data
- Display of external register information
- Compact design
- DIN (BS) double insulated, glass filled polycarbonate case
- IP53 in accordance with IEC 60529 : 1989

**Options**

- RS 232 serial communications
- Load profiling (A1140)
- Module/battery carrier
- SO (EN 62053-31) or relay pulsed output
- Terminal cover removal detection switch
- Main cover removal detection or CT ratio programming switch
- Terminal cover with cut-out
- Read without power option (battery support)

## Tariff Structure

- 8 time-of-use (TOU) registers
- 4 maximum demand registers
- 48 switching times
- 12 seasons
- 24 change of season dates
- 32 exclusion dates
- Daly Billing (Model Code Feature Set F only)
- 13 end of billing dates

Independent day control
Daylight saving
Deferred tariff
Tariff scheme CRC

# 6 GENERAL DESCRIPTION

## 6.1 Basic Meter Types

LM… DIN/BS Termination

## 6.2 Current and Voltage Ratings

Unless otherwise indicated on the nameplate, the following meter ratings are available:

| Voltage | Current | Frequency |
|---|---|---|
| **3 Element Meters** | 20 - 100A (Direct connected) | 50 or 60Hz |
| *220 - 240V L-N | 10 - 100A (Direct connected) | |
| 105 - 127V L-N | 5 - 100A (Direct connected) | |
| **2 Element Meters** | 1 - 2A (CT operated) | |
| 220 - 240V L-L | *5 - 10A (CT operated) | |
| 105 - 127V L-L | 1 - 10A (CT operated) | |

* Ratings available for Class 0.5s, CT operated variant

Note - 105 - 127V meters and 60Hz meters are not OFGEM or MID approved.

## 6.3 System Connections

Meters can be supplied for direct connected or CT, 3 element (3 phase, 4 wire) or 2 element (3 phase 3 wire) applications and have the following connection capability:

| Number of Elements | Connection capability |
|---|---|
| 3 | * 3 phase, 4 wire<br>2 phases of 3 phase, 4 wire<br>2 phase, 3 wire<br>1 phase, 3 wire<br>1 phase, 2 wire |
| 2 | * 3 phase, 3 wire |

* Connections available for Class 0.5s, CT operated variant

## 6.4 Terminal Arrangements

| | |
|---|---|
| Current Terminals | 8.2mm diameter bore, 2 x M6 Combi pinch screws<br>9.0mm diameter bore, 2 x M6 Combi pinch screws<br>9.5mm diameter bore, 2 x M6 Combi pinch screws |
| Auxiliary Terminals | 3.2mm diameter bore, M3 Combi pinch screws |

Meter nameplates (see Figure 3 for example) are marked with the rated current, reference voltage, frequency and the relevant meter constant (pulses/kWh, pulses/kvarh).

Connection diagrams (See Figure 5A for examples) are shown underneath the terminal cover.

A Terminal Cover Plate must be fitted to protect the meter Main Terminals.

### 6.5 Meter Accuracy

The A1120/40 meter measures active energy, in accordance with the requirements of - EN 62053-21/22 for indoor kWh meters of protective Class II and accuracy Class 0.5s, 1 or 2, EC Directive 2004/22/EC (MID) - Class A, B or C

The design of the meter ensures life long stability. There are no on-site adjustments.

The meter measures reactive energy in accordance of the requirements of EN 62053-23 for kvarh meters for reactive energy Class 2 or Class 3.

Typical accuracy curves are shown in Figure 4.

### 6.6 Meter Case

The case is double insulated to protective Class II.

The case provides an ingress protection rating of IP53 in accordance with IEC 60529:1989.

The base is light beige coloured polycarbonate.

A separate phenolic terminal block conforms to DIN 43857 Part 2 and 4.

The extended terminal cover is moulded in light beige coloured polycarbonate.
An option with a cut-out is available.

The main cover is moulded in tinted, clear polycarbonate.

Figure 6 illustrates the outline and fixing dimensions.

The main cover is secured by two sealable screws. Two separate sealable screws secure the terminal cover.

The terminal cover plate protects the meter main terminals.

A holder for a module/battery that attaches to the base under the terminal cover is available as an option.

## 7 OVER VOLTAGE OPERATION

The meter has been designed to withstand a phase - neutral voltage of $\sqrt{3}$ x 1.1 Uref (i.e. 440V for 230V meters) for an indefinite period. When tested over a 12 hour duration the change in meter error was less than 0.4%.

## 8 IMPORT ACTIVE REGISTRATION

Import Active registration can be configured at manufacture to one of the following:

**Import Active Units Only** – Import Active Units measures the sum of all phases, when the total system flow is positive.

Positive (kWh [$L_1$] + kWh [$L_2$] + kWh [$L_3$])

**Power Flow Insensitive Mode -** Power Flow Insensitive Mode allows the meter to increment its main kWh register regardless of whether the system energy flow is import or export.

$\left|\text{(kWh [}L_1\text{] + kWh [}L_2\text{] + kWh [}L_3\text{])}\right|$

The Reverse Energy Event Alarm, Reverse Energy Count and Reverse kWh Register respond only to reverse power flow and continue to function as in normal operation.

**Theft Resistant Measurement -** Theft Resistant Measurement mode measures the sum of the modulus of each phase ($|kWh[L_1]| + |kWh[L_2]| + |kWh[L_3]|$)

The Reverse Energy Event Alarm, Reverse Energy Count and Reverse kWh Register respond only to reverse power flow and continue to function as in normal operation.

**Note 1**: Power Flow Insensitive Mode and Theft Resistant Measurement may not be allowed in certain countries due to local regulations.

**Note 2:** Theft resistant measurement is not appropriate for meters connected to 3 phase 3 wire systems.

## 9 TEST INDICATORS & ANTI-CREEP

### Test Indicators

Two red test output LEDs (for kWh and kvarh) are provided which pulse in accordance to the following configurations:

Import only meter - The LED pulses for forward system energy only

Import meter with Power Flow Insensitive enabled - The LED pulses for forward and reverse system energy

Import meter with Theft Resistant measurement enabled – The pulsing LED reflects theft resistant measurement.

Import/export meter - The LED pulses for import and export energy

See Section 25 (Technical Data) for LED specification.

### Anti-creep

The Wh and varh anti-creep threshold is set at manufacture to a value appropriate to the meter rating and accuracy class. For a 4 wire meter connected with less than 3 elements energised, the value adjusts to maintain an appropriate current threshold level. Each Test Indicator LED is continuously illuminated when the meter's anti-creep lock is operating for kWh and kvarh respectively.

## 10 FEATURES OF THE A1120/40 METER

The meter contains numerous features, combinations of which can be selected to provide the required metering function. Main variants are selected at manufacture (See Section 5). Programmable features are selected using Power Master Unit Software that runs on an IBM or compatible PC.

This software is available from Elster Metering Systems and is described in M181 001 3.

Note: The features available will depend on the meter variant (See Section 5).

## 10.1 Registration of Quantities

### 10.1.1 kWh

kWh total import (active energy)

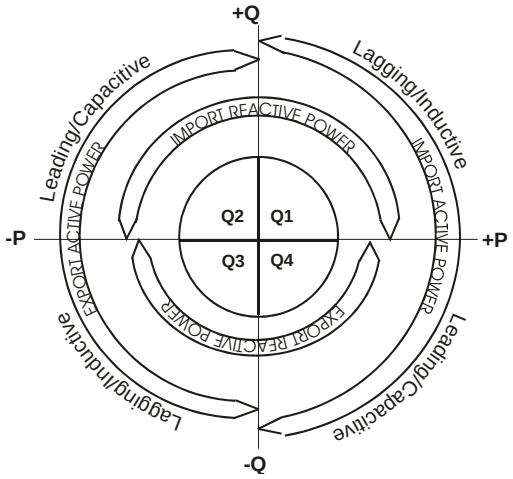
kWh total export (active energy)

Total import and total 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. The resolution of registration is 1mWh.

(Model Code Feature Set F only) A cumulative kWh record for each phase is recorded as follows:

Import kWh phase A, B and C

Export kWh phase A, B and C




### 10.1.2 kvarh

Q1 kvarh Inductive Import

Q2 kvarh Capacitive Import

Q3 kvarh Inductive Export

Q4 kvarh Capacitive Export

All four quadrants are registered separately. The resolution of registration is 1mvarh.

kvarh is derived using the phase shift method.

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

### 10.1.3 kVAh

kVAh is derived from the measured kWh and kvarh values

The calculation uses the formula: $kVAh = \sqrt{([kWh]^2 + [kvarh]^2)}$

There are two kVAh registers. These can each be configured to accept pulses from any combination of quadrants e.g.

| | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|
| kWh | * | | | * |
| kvarh | * | * | | |

kVAh - to match 2 electromechanical meters

Note: Real and reactive energy for each phase is respectively summated prior to kVAh calculation.

### 10.1.4 Customer Defined Registers

Two **C**ustomer **D**efined (CD) Registers are provided. These are cumulative registers which can be used throughout the tariff scheme and load profile data and are programmable to accept consumption from any two of the following like-unit registers:

kWh import

kWh export

Q1 kvarh

Q2 kvarh

Q3 kvarh

Q4 kvarh

kVAh 1

kVAh 2

Import kWh phase A, B or C (Model Code Feature Set F only)

Export kWh phase A, B or C (Model Code Feature Set F only)

Examples of their use are:

| | | |
|---|---|---|
| CD Register 1 | Total kWh | kWh import + kWh export = Total kWh |
| CD Register 2 | Total Import kvarh | Q1 + Q2 = Total Import kvarh |

The contents of the Customer Defined Registers can be viewed on the display.

## 11 TARIFF STRUCTURE

The tariff structure repeats year on year and comprises the following features:

8 Time-of-use (TOU) registers
4 Maximum demand registers
48 Switching times
12 Seasons
24 Change of season dates
32 Exclusion dates
Daily Billing (Model Code Feature Set F only)
13 End of billing dates

Daylight savings
Independent day control
Deferred tariff
Tariff scheme CRC

At least one Season must be programmed into the meter for TOU registers to be available.

## 11.1 Time-of-use Registers

A total of 8 Time-of-use (TOU) registers are provided. Each TOU register has a single source that can be selected from one of the following:

Import kWh

Export kWh

Q1 kvarh

Q2 kvarh

Q3 kvarh

Q4 kvarh

kVAh 1

kVAh 2

kWh Import Phase A, B, or C (Model Code Feature Set F only)

kWh Export Phase A, B or C (Model Code Feature Set F only)

Customer Defined Register 1

Customer Defined Register 2

Each TOU Register is independently time controlled so that registration can take place over a restricted time period.

The contents of each TOU Register can be viewed on the display along with the active rate(s).

## 11.2 Demand Registers

The A1120/40 provides the rising demand value associated with each of the registered quantities specified in Section 11.1. The demand integration period can be 1, 2, 3, 4, 5, 6, 10, 15, 20, 30 or 60 minutes.

In A1140 meters the integration period used for the demand registers is the same as the load profile integration period.

During any period, the rising demand value is calculated by measuring the energy consumed to a point in a period, then scaling the measured value by a factor equal to the ratio of the demand period to a total hour interval.

$$\text{Rising Demand} = \text{Energy recorded in current period} \times \frac{60}{\text{minutes in demand period}}$$

The contents of each Rising Demand Register can be viewed on the display.

### 11.2.1 TOU Maximum Demand Registers

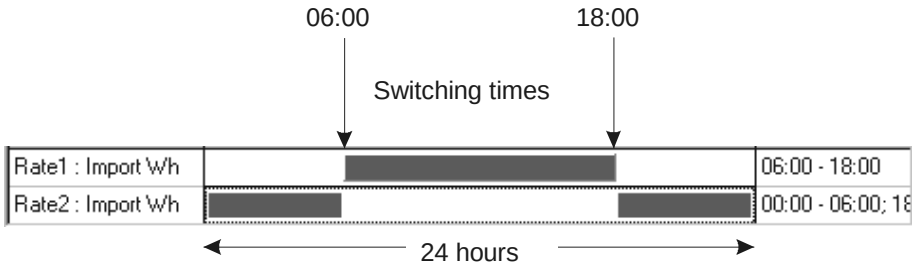
The meter has 4 maximum demand registers, each with an independent source selectable from one of the rising demands.

The meter records the three highest maximum demand values (along with time and date stamp) that can be sampled on a continuous basis (24-hour period) or over a restricted time period. At the end of each billing period, the greatest of the three demands is added to a corresponding cumulative maximum demand register. The maximum demand registers are then set to zero.

## 11.3 Switching Times

Up to 48 switching times can be set, each allocated to a specified season.
Each switching event can be enabled for any combination of days of the week.
These are the transition times when one or more TOU registers become active or inactive.

Each switching time is defined in hours and minutes. A 24-hour clock is used.




The above diagram shows the tariff for TOU1 and TOU2. TOU1 is active from 06:00 to 18:00. TOU2 is active from 18:00 to 06:00. It is possible for none or multiple TOU registers to be programmed to be active at any particular time period.

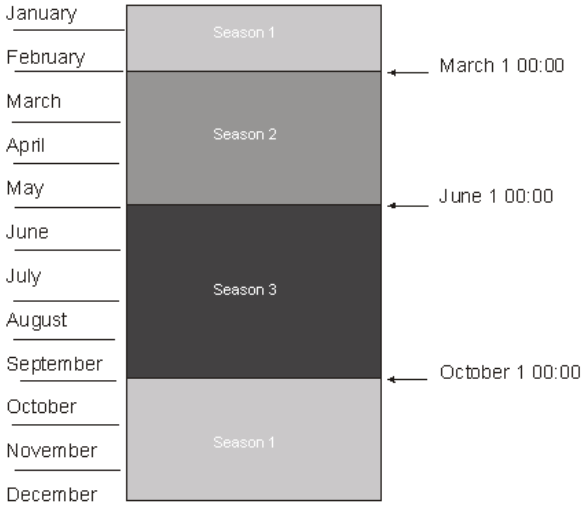
## 11.4 Seasons and Change of Season Dates

Up to 12 Seasons may be specified and at least one Season must be programmed for the TOU registers to be available. Each Season is activated by one or more Change of Season Dates.

Up to 24 Change of Season Dates are available, each date specifying the start of a new Season. These may refer to a different Season, or the same Season may be used more than once in a year.

The old Season ends at the instant the new Season starts.
A new Season starts at 00.00 of the specified day.
Start dates are specified as absolute (dd.mm) dates.

The diagram shows three Seasons. Season 1 is in operation from October to February, Season 2 from March to May and Season 3 from June to September.




## 11.5 Exclusion Dates

There may be special days in the year when the tariff does not follow the normal pattern, e.g. public holidays. These can be taken care of by invoking Exclusion Dates.

Up to 32 Exclusion Dates can be programmed.

These dates will fall into one of three categories:

1 Dates which are fixed for every year e.g. December 25th - programmed by absolute dd.mm

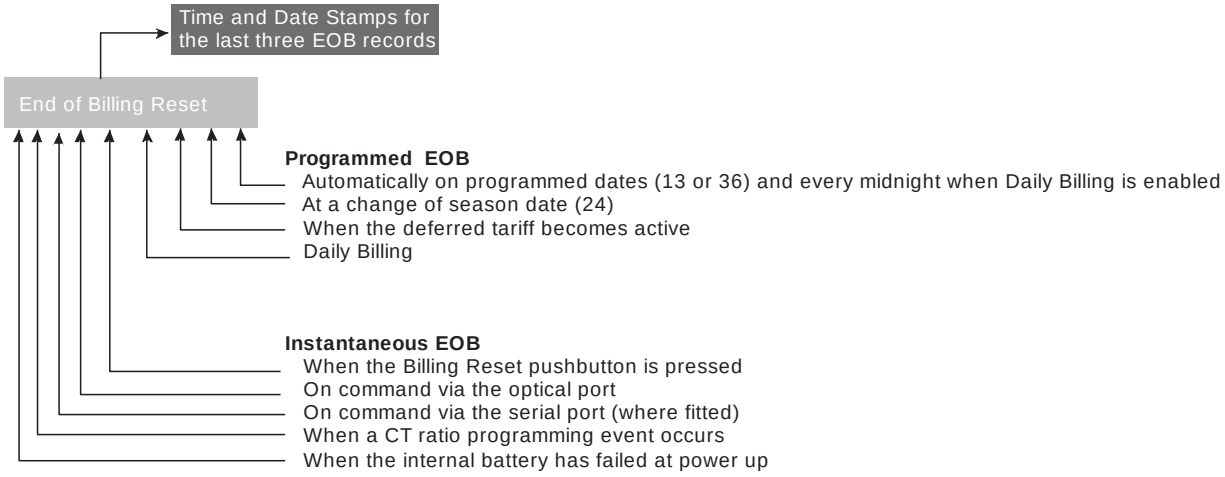
2 Dates which fall on the same day of the month every year e.g. the first Monday in May

3 Dates which vary from year to year e.g. Easter Monday - defined using dd.mm.yy

For each Exclusion Date the meter may be programmed to:

- Use the switching times for a different weekday of the current season
- Use the switching times for the same weekday but a different season
- Use the switching times for a different weekday of a different season

## 11.6 End of Billing (EOB)




When a snapshot of meter data is required to allow a bill to be prepared reflecting consumption to a specified date, the End of Billing feature should be used (See Section 13.3 for a description of the data captured).

An Automatic End of Billing can be programmed for:

13 dates (model code number)

36 dates (model code number)

More than one End of Billing request may occur at the same time (for example, a deferred tariff introduced at the start of a new season), but only a single End of Billing event will take place. The cause of each of the End of Billing events is recorded but the End of Billing Counter is only incremented by one.

If an End of Billing Reset is required when the current tariff is manually overwritten by a new current tariff, it should be manually requested as part of the communications session.

A message that a Billing Reset has been initiated is displayed with a code showing the cause of the reset (See Figure 8, Display Table).

At each Billing Reset the oldest of the fifteen historical data records is overwritten. Time and date stamps, together with causes are stored for the last three End of Billing events.

**End of Billing Lock-out**

A further End of Billing can be inhibited via the Power Master Unit for either:

- Up to 255 minutes

- Until the next midnight boundary

Note: This only inhibits instantaneous end of billing requests, either via the pushbutton or communications setting, not programmed End of billing events.

**Model Code Feature Set F only)**

A Daily End of Billing occurs every midnight. A maximum of 14 records are stored (See Section 13.3 for a description of the data captured).

If a Daily End of Billing event should have occurred during a power down, then a billing event will take place immediately following the next power up. If several requests were missed then a single billing event is created, the cause reflecting all billing events that were missed.

Daily Billing initiates a Billing Reset every midnight. When Daily Billing is enabled there is an option to inhibit the reset of the Maximum Demand Registers.

## 11.7 Daylight Savings

The meter provides 2 Daylight Savings dates whereby the clock can be advanced by one or two hours at the start of the summer and can be retarded by one or two hours at the end of the summer.

The day on which a Daylight Saving occurs is programmable, with the choice of the first, second, third, fourth or last specified weekday in a specified month.

The algorithm used will identify the correct calendar dates for the next 50 years.

All of the following will reflect Daylight Savings:

Automatic End of Billing

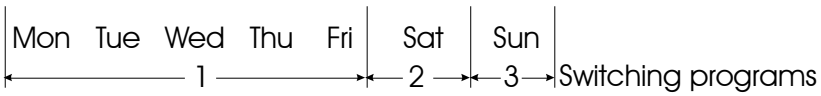
Switching times within the tariff definition

Time and date stamps (For firmware Version C meters, daylight savings time and date stamps can be referenced to base time or daylight savings time)7.

Optionally load profile (A1140 only)

## 11.8 Independent Day Control

The meter has the facility to have a different switching program consisting of several switching times running on different days of the week. An example of a switching program is below.



### 11.9 Deferred Tariff and Deferred Tariff Changeover Date

A second tariff can be programmed in the meter that will take effect from a programmed date.

An option to perform an End of Billing on the Deferred Tariff Changeover Date is available as part of the deferred tariff structure.

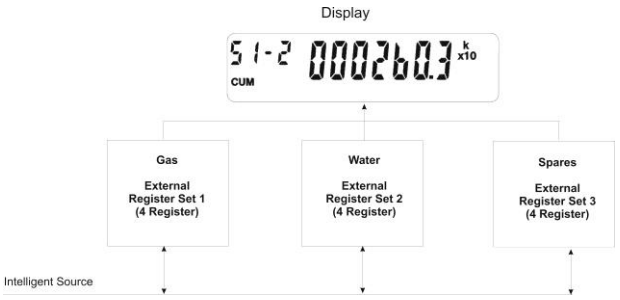
### 11.10 Tariff/Display Scheme Verification

The meter generates a checksum (CRC-16) of the tariff/display scheme currently residing in the meter. The checksum can be included as part of the display sequence, and also compared with a tariff checksum generated by the Power Master Unit. This allows quick verification, either locally or remotely, that the correct tariff/display scheme resides within the meter.

## 12 EXTERNAL REGISTERS (FIRMWARE VERSION C ONLY)

Firmware Version C of the A1120/40 has 12 External Registers that can be used to display data from an external source such as a gas or water meter. The registers are accessed via an intelligent source (such as a modem) and can be viewed on the A1120/40 meter display.

The registers are configured as three sets, External set 1, External set 2 and External set 3.




Each register set has four associated registers and has its own formatting options that can be configured using the Power Master Unit (Number of digits, Number of decimal places and display scale).

The Display shows Register 2 of External Set 1

Each register has 16 digits. The user is able to select English text or create an OBIS code for each of the twelve external registers.

# 13 SECURITY FEATURES

**Password Protection**

The A1120/40 meter uses a Password as part of the security algorithm. The passwords must be entered in upper case. Password protection can be disabled at manufacture if required.
Four levels of access are available.

Entering the correct password for levels 0, 1, 2 and 3 allows the functions in Figure 9 to be performed, higher levels giving access to the lower levels. Passwords may also be set to defaults using the Power Master Unit.

It is important to note that the integrity of the A1120/40 meter passwords should always be protected. This can be achieved by ensuring the ability to change passwords is controlled and only made available to Administrative Personnel.
The level 3 password should be changed at regular intervals. It may be appropriate for no more than 100 meters to be protected by the same level 3 password.

Calibration values, zeroing of registers etc. are protected by a security link that is removed at the factory before the meter is sealed.

## 13.1 Data Retention

All cumulative register and time of use data is saved to non-volatile memory every time the power to the meter fails and also every 2 hours. The data is recovered when power is restored to the meter.

All data is retained for the nominal life of the meter.

## 13.2 Recordable Security Features

The following security features are available and can be included in the display sequence:

### 13.2.1 Phase Present/Phase Fail Indication

The meter detects and stores the number of phase fail events to a maximum of 65535.
The register will then roll over to 0. A time and date stamp of the three most recent events is recorded. The phase fail threshold can be set between 0 and 250 V.

Phase indication on the display (L1, L2, L3) has the following options:

Indicator ‘on’ when phase present

Indicator ‘on’ when phase failed

Where a meter is to be used on a supply with less than 4 wires, it is possible to disable the monitoring and display of phases L2 and L3.

### 13.2.2 Reverse Energy Flow

**Reverse run event count**

The meter detects and stores the number of reverse running events to a maximum of 65535.
The register will then roll over to 0.

A time and date stamp of the three most recent events is recorded.

The count and time and date stamps can be included in the display sequence.
An event is detected if the meter runs in reverse for a period greater than 5 seconds.

**Reverse energy reading**

Irrespective of whether the meter is set to import only power flow insensitive mode, reverse kWh power flow will be independently recorded.

**Theft Resistant Measurement**

Theft Resistant Measurement mode measures the sum of the modulus of each phase

$(|kWh\ [L_1]| + |kWh\ [L_2]| + |kWh\ [L_3]|)$

The Reverse Energy Event Alarm, Reverse Energy Count and Reverse kWh Register respond only to reverse power flow and continue to function as in normal operation.

**Reverse energy Alarm (Import only meter)**

The reverse run indication, which responds to the total system power flow, can be inhibited if required.

**Per Phase Reverse Run Indication**

Any phase in reverse run can be indicated on the Liquid Crystal Display by flashing the $L_1$, $L_2$ or $L_3$ phase indicators.

### 13.2.3 Power Fail

A count of the cumulative number of power downs to a maximum of 65,535 is recorded.
The register will then roll over to 0.

A time and date stamp of the three most recent events is recorded. The count and time and date stamps can be included in the display sequence.

### 13.2.4 End of Billing Event

A count of the number of end of billing events to a maximum of 65,535 is recorded.
The register will then roll over to 0. Time and date stamps together with the source of the billing reset for the three most recent events is recorded. The count and time and date stamps can be included in the display sequence.
The message ‘Reset’ is displayed each time an End of Billing event takes place.

### 13.2.5 Programming Event Log

A count of the number of programming events to a maximum of 65,535 is recorded. A time and date stamp of the three most recent events together with the source (optical or RS232 data port) is recorded. The identity of the programming user is also stored. The count and time and date stamps can be included in the display sequence.

Note: Programming events are communications sessions where the meter configuration or data has been changed. Reading data only does not count as a programming event.

### 13.2.6 CT Ratio Programming

The CT ratio can be displayed as a ratio or as a scalar quantity. A count of the number of CT Ratio reprogramming events to a maximum of 65,535 is recorded together with source (Optical or RS232 port) and time and date stamps for the three most recent events. The identity of the programming user is also stored. The count and time and date stamp can be included in the display sequence.

Note: CT Ratio Reprogramming Events are communications sessions where the primary or secondary value of the CT has been changed.

An End of Billing Reset can be requested with a CT ratio change.

A CT Programming switch can be fitted as a manufacturing option. The switch must be activated in order to change the CT ratio. The switch is under the terminal cover and may be protected by a paper seal.

### 13.2.7 Watchdog (Transient Reset)

A count of the number of watchdog resets to a maximum of 65,535 is recorded together with time and date stamps for the three most recent events. The count and time and date stamps can be included in the display sequence.

### 13.2.8 In Service Hours

The elapsed time counter records the cumulative time (to a resolution of 1 hour) the meter has been powered up. The count can be included in the display sequence.

The amount of storage is in excess of 25 years.

### 13.2.9 Meter Errors

An alarm can be displayed if an error occurs. The alarm and error message (See Figure 8, Display table) can be disabled via the Power Master Unit.

Access to the data is via the optical port, the RS232 data port or on the LCD.
A time and date stamp of the three most recent non-fatal error events is recorded where possible.

In the unlikely event that any of the above meter errors occur, a catastrophic failure has been detected and the meter should be returned to Elster Metering for failure investigation.

### 13.2.10 Cover Removal Detection

**Main Cover**
As a manufacturing option the main cover can be fitted with a tamper switch to detect removal. The number of times the cover has been removed to a maximum of 65,535 is recorded together with the time and date stamps of the last three occurrences. The count and time and date stamps can be included in the display sequence.

Note: The main cover removal option is not available when the meter is configured for CT Ratio Programming Switch.

**Terminal Cover**
As a manufacturing option the meter can be fitted with a tamper switch to detect removal of the terminal cover. The number of times the cover has been removed to a maximum of 65,535 is recorded together with the time and date stamps of the last 3 occurrences.

The count and time and date stamps can be included in the display sequence.

### 13.2.11 Remaining Internal Battery Life

The A1120/40 provides a count of the number of hours of life left in the internal battery. The count can be included in the display sequence.

The count is calculated by subtracting the amount of time the meter has been supported during power outages from the initial battery life estimate.

## 13.3 Historical Data

At each End of Billing the following data is stored to historical registers:

**Meter Data**

- Cumulative Registers
- TOU Registers
- TOU MD Registers

There are 15 sets of historical registers

**Event Data**

- Reverse running count, last 3 time and date stamps
- Billing events count, last 3 time and date stamps
- Power failures count, last 3 time and date stamps
- Meter errors, last 3 time and date stamps of non fatal errors
- Watchdog resets count, last 3 time and date stamps
- Programming events count, last 3 time and date stamps
- Phase failures ($L_1$, $L_2$ or $L_3$) count, last 3 time and date stamps
- CT ratio programming events count, last 3 time and date stamps
- External battery failures count, last 3 time and date stamps
- Number of times the terminal cover has been removed, last 3 time and date stamps
- Number of times the main cover has been removed, last 3 time and date stamps
- In-service hours
- Internal battery life

Note that for Version C meters the Time and Date Stamps can be in Base Time or daylight Savings Time.

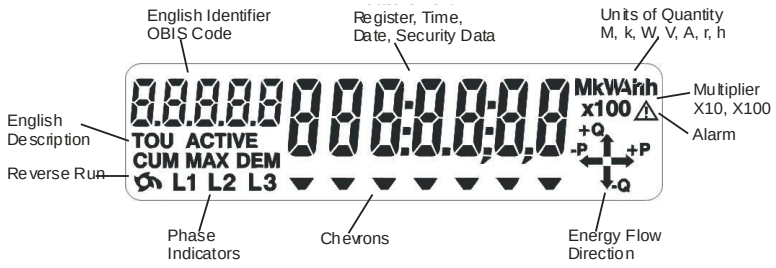
# 14 METER DISPLAY

## 14.1 Introduction

The A1120/40 meter is fitted with a high contrast liquid crystal display that can be viewed from a wide angle. The main display characters are 9.8mm high.

The display can be configured using the Power Master Unit to display data with English descriptors or OBIS (**Ob**ject **I**dentification **S**ystem**)** format.

The Test Display with a description of the displayed legend (English or OBIS) is shown below.




## 14.2 General

### Display Resolution

The resolution of the display can be set at manufacture to 7, 6 or 5 digits.
The decimal point indicator can be configured to be a point or a comma and set to 0, 1 or 2 places.

kWh Wh mWh

Internal storage is :- 1 2 3 4 5 6 7 8 9 0 1 2 3. 4 5 6

The display is a window of this. e.g. 1 2 3 4 5 6 7 8 9 0 1 2 3. 4 5 6

| Seven Digits | Six Digits | Five Digits |
|---|---|---|
| 4 5 6 7 8 9 0 | 5 6 7 8 9 0 | 6 7 8 9 0 |
| 5 6 7 8 9 0. 1 | 6 7 9 9 0. 1 | 7 8 9 0. 1 |
| 6 7 8 9 0. 1 2 | 7 8 9 0. 1 2 | 8 9 0. 1 2 |

### Units of Quantity and Multiplier

The Units of Quantity (Wh, kWh, MWh) and multiplier (x10, x100) displayed are selectable by the Power Master Unit and displayed in the top right corner of the display.


The display opposite shows kWh, x10.

## 14.3 Display Modes

The display has two modes of operation, Default Mode and Utility Mode. Up to 40 displays can be made available for each mode of operation.

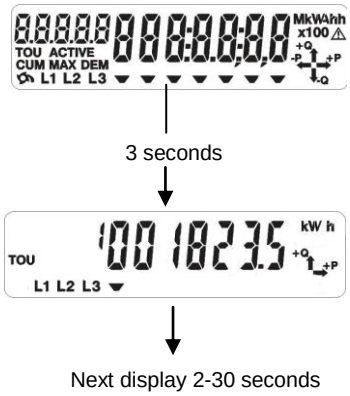
### 14.3.1 Default Mode

The Default Mode can operate in two ways, Auto-cycle or single step.

**Auto-cycle**

At power up the segment test pattern is shown. This will remain displayed for a period of 3 seconds.

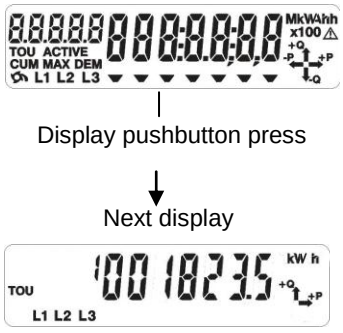
The display will then sequence through the programmed displays, remaining on each display item for one step duration time, called the Auto-cycle step duration (2-30 seconds).




**Step**

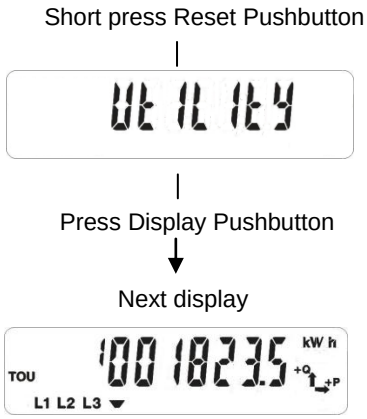
Step mode is entered by a single press of the Display Pushbutton. The first display in the autocycle sequence is displayed. Further presses of the pushbutton allow the consumer to step through the autocycle display items, and then through the single step display items.

The display will default to autocycle mode at a programmed time after the last press of the display pushbutton.



### 14.3.2 Utility Mode

It is necessary to break the seal on the Reset Pushbutton to enter 'Utility' mode.
The mode is entered by pressing the Reset Pushbutton. 'Utility' appears on the display.
Single presses of the Display pushbutton will then step through the utility displays.
The display will default to autocycle mode at a programmed time after the last press of the Display Pushbutton, or if the Reset Pushbutton is again pressed.

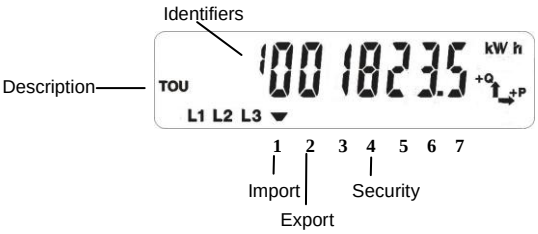



### 14.3.3 English Display

**Chevrons & Identifiers**

The chevrons on the display have the following meaning:

| Chevron/Description | |
|---|---|
| 1 | Import |
| 2 | Export |
| 3 | - |
| 4 | Security |
| 5 | - |
| 6 | - |
| 7 | - |




The display identifiers give a description of the main register displayed.

Examples of the display are shown in Figures 7.

A full list of displays is given in Figure 8.

### 14.3.4 OBIS Display

The OBIS code gives a description of the main register displayed.

Chevron 7 indicates the register is active.

Examples of displays and a full list of displays are given in Figures 7 and 8 respectively.

## 14.4 Displayable Data

A full list of displayable data items is given in Figure 8. Items available will depend on the meter variant.

Segment Test Pattern

Cumulative Registers

Customer Defined Registers

Rising Demand Registers

TOU Maximum Demand

TOU Registers

Historical Registers

Security

Instrumentation

Phase Failure

CT Ratio

Tariff CRC

Meter Errors

### Dial Test

For dial testing, the cumulative kWh and kvarh displays can be set to a higher resolution by using the Power Master Unit.

The resolution of the display can be configured to 0, 1, 2, 3 or 4 decimal places

Note: If the display is configured for Wh with no multiplier set, the maximum resolution of the display is 3 decimal places.

The meter will cease using dial test resolution when instructed by the Power Master Unit, or after a programmable number of power cycles.

## Display Indicators

System Reverse Run Indicator

Phase Failure Indication

Per Phase Reverse Run Indication

Error/Alarm

Energy Direction Indicators

## Communications Indication

When communications are taking place the following indicators are displayed in the top left corner of the display.

o Optical communication

r RS232 Communication

Figure 7 shows examples of the display. The indicators can be disabled via the Power Master Unit.

# 15 USING THE PUSHBUTTONS

Two pushbuttons can be provided as an option. Their use is as follows:

**Default Display Mode**
A short press of the display (right pushbutton) enters consumer display mode at the first display in the autocycle display sequence. Single presses of the display pushbutton allow the user to step through the consumer display sequence. The display will default to auto cycle mode at a programmed time after the last press of the consumer display pushbutton.

**Utility Display Mode**

A short press of the Reset (left pushbutton) enters the utility display mode at the first display in the utility sequence. Single presses of the display (right pushbutton) allow the user to step through the utility display sequence. The display will default to auto cycle mode at a programmed time after the last press of the display pushbutton, or if the Reset pushbutton is presses again.

**Billing Reset**

A Billing Reset can be initiated by holding both of the pushbuttons pressed for approximately 3 seconds. The billing reset pushbutton can be disabled by using the Power Master Unit.

As a further option, a message that a billing ‘reset’ has been initiated can be displayed.

**External Battery Support** (Optional)

Pressing either pushbutton allows the displays to be read and optical communications to be established during power outages (See Appendix D).

# 16 COMMUNICATIONS

Communications with an A1120/40 can be established via the IEC 62056-21(formerly 1107) port or via the optional RS232 Port. A symbol can be displayed in the top left corner of the display which gives an indication of the type of communications currently taking place.

## 16.1 Optical Communications Port

A bi-directional infra red communications port is provided to allow reading of all stored data (measurement, diagnostic and current personality) and programming of "personality" data. Data Stream Mode (See Section 16.3) allows a fast method of retrieving all data from the meter.

The port is accessible through the front of the main cover and interfaces to a hand held unit or computer. In normal operation the port only operates when the meter is powered from the a.c. supply.

An optional battery (See Section 20) supports the port during power outages. This facility is limited to reading data only.

The port can operate at baud rates of up to 9600.

## 16.2 Optional RS232 Port

An RJ11 connector provides RS232 communications. The port allows access to the same data as the optical port, using the same protocol. The port operates at speeds of up to 9600 baud. Data Stream Mode (See Section 16.3) allows a fast method of retrieving all data.

The RS232 port supports multi drop mode, allowing up to 10 meters (RS232) or 32 meters (RS485) to be accessed from a PC (See Appendix B).

### 16.2.1 Modem Power Supply

The RS232 port allows different modules to be added that can support different means of communications (PSTN, Ethernet, GSM etc).

An isolated internal d.c. supply to power the modem is provided via the RJ11 socket

Nominal Voltage: ≥+6V with mean load ≤500mA

The power is sufficient to support a GSM modem

### 16.2.2 Resetting the Power Supply

If a modem is installed which draws too much power from the meter, a transient reset occurs and the modem power supply is disabled to prevent continuous resetting of the meter. On early versions of A1120/40 meter only, the RS232 port may also be disabled. The power supply (and RS232 port on early versions of the meter) can be re-enabled using the PMU via the IEC 1107 port or by using the following sequence:

Step to the ‘GSM (HAN) signal strength’ display in the General Display section of the meter

Press the display and utility pushbuttons together for several seconds until ‘PSU On’ is displayed

If the meter generates another reset, an alternative modem should be fitted and the power supply re-enabled as above.

### 16.2.3 Signal Strength

The HAN and WAN Signal strength can be shown on the display.

## 16.3 Data Stream Mode

Data stream mode allows fast reading of all metering data (90 days of 30 minute, one channel data in 30 seconds). To achieve this, the meter and modem device must be configured to 8 bits, no parity, 1 stop bit (Selectable via the Power Master Unit).

## 17 PROGRAMMING THE METER

The meter can be programmed via the optical port or via the RS232 port. The optical port can be connected either directly to a PC (IBM compatible) or to a Hand Held Unit. In both cases an IEC 62056-21 (formerly 1107) Probe is required.

Information for the meter is first prepared on forms within the Power Master Unit Software (Refer to Master Unit Software M181 001 3).

The meter does not check to ensure that reprogramming has been completed, therefore at the end of a reprogramming session all data should be read back to confirm the meter is programmed correctly.

If communications fail during programming a failure message is displayed.

Each time the meter is reprogrammed, the programming counter is incremented and the time and date of the event is recorded. The user who created the scheme in the PMU is recorded.

Note: The programming counter does not increment when a 'Set time' or 'Time and date adjustment' only is programmed to the meter.

## 18 REAL TIME CLOCK AND CALENDAR

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 24:00 the end of the day.

The time base for the clock is a programmable option. It can be derived from either the a.c. supply frequency or from a crystal controlled oscillator.

When the clock is synchronised to the mains frequency, it maintains synchronisation for variations of up to +/- 5% of nominal mains frequency. Outside these limits the meter switches to the crystal oscillator and then switches back to mains when the frequency is back within limits.

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, which maintains timekeeping.

There are two methods of adjusting the meter clock:

1. The time and date of the clock may be set via the IEC 62056-21 optical port or RS232 communications port (if fitted) provided the correct (level 2 or higher) password is used.
2. If a request for a small adjustment (-7.5 minutes to +7.5 minutes) to the current setting is made (with appropriate password), this adjustment will be applied by shortening or lengthening subsequent demand periods by 5 seconds until the whole of the adjustment has been achieved.

# 19 BATTERY BACK-UP

The A1120/40 has an internal battery that supports the clock and calendar.

An optional external battery that supports the reading of meter data and display facilities during power outages can be provided.

## 19.1 Internal Battery

In the event of an a.c. failure, an internal battery (a Lithium 'coin' cell) supports the real time clock.

The battery is soldered onto the printed circuit board.

The meter can be programmed to initiate one of the following courses of action should the supply fail and the battery become exhausted. When the supply returns: -

a. Freeze the TOU registers and increment the total cumulative registers only
b. Assume the last known time and continue to use the TOU registers

See Section 29 for battery disposal.

### 19.1.1 Internal Battery Monitoring

The battery provides support for the life of the meter. The following functions are provided on the Battery Monitor: -

**Elapsed Time -** The total amount of battery support time is monitored. The elapsed time counter decrements to represent the use/shelf life of the battery.

**Remaining Time -** The remaining battery life is calculated by subtracting the elapsed time from the expected time. The remaining life may be read via the optical or RS232 communications port and its value optionally included in the display sequence.

If the remaining time falls to zero, a 'flag' is set which can be read by via the optical port or RS232 port.

**Failed Battery -** The occurrence of total battery fail is monitored each time the meter is energised. A flag is set and the time and date recorded when the meter last powered down.

## 20 MODULE/BATTERY CARRIER

A Special housing can be supplied as an option for a Module or External Battery.

### 20.1 Communications Module

Simple installation

Snap in position

Sealable (under the terminal cover)

Connects to the meter via a 'RJ11' connector

Refer to Chapter 3 (M181 001 3) Communications Modules

### 20.2 External Battery Module

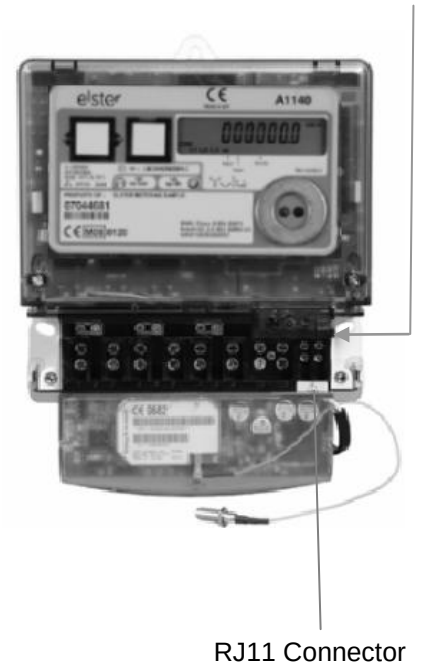
Simple installation

Snap in position

Sealable (under the terminal cover)

Connects to the meter via a 'Molex' connector

Refer to Appendix D, External Battery Module




## 21 OUTPUT

An optional output can be provided. This output can be set at manufacture to one of the following options:

SO output, floating, customer configurable pulse duration/value

SO output, floating, replicating the kWh LED

SO output, floating, replicating the kvarh LED

100mA relay output, floating, customer configurable pulse duration/value

100mA relay output, floating, replicating the kWh LED

100mA relay output, floating, replicating the kvarh LED

300mA relay output, floating, customer configurable pulse duration/value

The outputs have the following characteristics:

| | SO Output |
|---|---|
| Maximum voltage (Umax) | 27V d.c. |
| Maximum current in On-state | 27 mA |
| Minimum current in On-state | 10 mA |
| Maximum current in Off-state | 2 mA |

| 100 mA Relay Output |
|---|
| 230V a.c or d.c |
| 100mA |

| 300mA Relay Output |
|---|
| 230V a.c |
| 300mA |

The output is connected using two 3.2mm diameter terminals (See Figure 5).

The pulse output meets the requirements of IEC 62053-31.

WARNING

See Warning in Section 26.6 regarding additional protection for circuits connected to the auxiliary terminals.

## 21.1 Customer Configurable Auxiliary Output (SO and Relay)

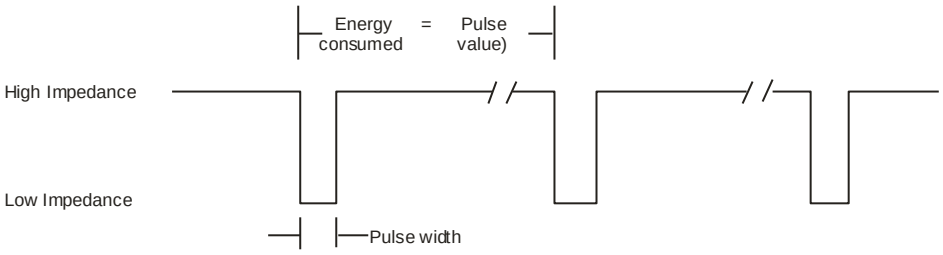
**Retransmit**

The customer configurable auxiliary output can be sourced (using the Power Master Unit) to transmit pulses from one of the following registers:

- Cumulative registers (Import or export Wh - Q1, Q2, Q3 or Q4 - VAh 1 or VAh 2)
- Customer defined registers (Register 1 or Register 2)

The pulse value and width can be configured as follows:

| | |
|---|---|
| Pulse value | 1, 2, 4, 5, 10, 20, 40, 50, 100, 200, 250 |
| Pulse width (ms) | 10, 20, 30, 40, 50, 60, 80, 100, 120, 160, 200, 250 |




**Caution**

Care should be taken in selecting the combination of pulse width and pulses/unit.
Avoid combinations that may give insufficient spacing between pulses at maximum load.

To ensure correct operation a maximum of 10 pulses/sec should not be exceeded.

When the meter is in anti-creep mode the output does not pulse.

**Rate Indication**

The output can be sourced (using the Power Master Unit) to provide indication of an active rate.

The output becomes low impedance if any one of a selected combination of TOU or MD TOU tariffs is activate.

### 21.2 Test Indication (Manufacturing option)

The output can be configured at manufacture to generate pulses that replicate the kWh LED or the kvarh LED.

This option is desirable if meter accuracy verification must be performed without using optical pickups. When configured in this way the auxiliary output pulse width and LED pulse width are the same (approximately 6 ms).

## 22 ADDITIONAL VOLTAGE TERMINALS

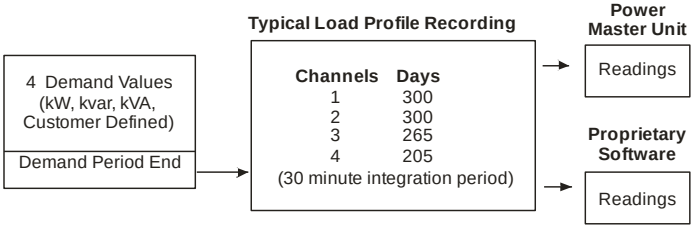
As an option the A1120/40 can be supplied with additional terminals that allow external equipment to be powered from the meter (See Figure 5).

**WARNING**

Connections made to these terminals will only be protected by the installation's main fuse cut-out.

The installer must ensure that additional local protection is provided for any circuits connected to these terminals.

## 23 LOAD PROFILE RECORDING (A1140)




The A1140 can be programmed to record up to four values from any of the rising demand registers at the end of each integration period. Up to 300 days of 30 minute data can be stored for a single channel. The number of day's storage is reduced if Instrumentation Profiling is configured, the Number of Channels stored is increased or the Integration Period is reduced.

Integration period - 1, 2, 3, 4, 5, 6, 10, 15, 20, 30, 60 minutes. Common with the demand period.

Load profile data is stored with reference to either base time or daylight saving time.

- Base Time - Daylight savings have no effect on the demand period and 48 periods are stored (assuming 30 minute integration period).
- Daylight savings time - When the clock advances, 46 periods will be stored. When the clock retards, 50 periods will be stored (assuming 30 minute integration period).

Status information is also stored with each integration:

- Load profile event indication with time and date stamps – Power up, Power down, Time change, Configuration change, New day, Daylight savings, Forced end of demand.
- Load profile status indication per period – Transient reset, Time synchronisation, Data change, CT ratio change, Internal battery failure, Reverse run, Phase failure (one or more phases).

When storage is full, new data overwrites the oldest stored data.

Using Data Stream Mode (9600 baud rate), 90 days of single channel, 30 minute demand period data can be read in less than 30 seconds.

Two methods of reading load profile data are provided:

- Number of day's data up to and including the current day
- From day x up to and including day y.

Load profiles can be transferred to the Power Master Unit and viewed in Readings.

## 24 INSTRUMENTATION

The A1120/40 calculates the following instrumentation values:

| | |
|---|---|
| Volts | (Phase A, B, C) |
| Current | (Phase A, B, C) |
| Watts | (Phase A, B, C, System) |
| Phase Angle | (Phase A, B, C) |
| Phase Rotation | (Phase A, B, C) |
| Power Factor | (Phase A, B, C, System) |
| Frequency | (Phase A, B, C) |

Instrumentation values can be included in the display sequence.

## 25 TECHNICAL DATA

| | |
|---|---|
| Current: Standard Range (direct connected)<br>Extended Range (direct connected)<br>Standard Range (CT operated)<br>Extended Range (CT operated)<br>Frequency<br>Reference Voltage<br><br><br><br>Voltage Operating range<br>System Connection - 2 element meter<br>- 3 element meter | 20 - 100A, 10 - 100A<br>5 - 100A<br>1 - 2A, 5 - 10A<br>1 - 10A<br>50 or 60Hz<br>220V - 240V (L – N)<br>220V - 240V (L – L)<br>105V - 127V (L – N)<br>105V - 127V (L – L)<br>±20%<br>3 phase 3 wire<br>3 phase 4 wire<br>2 phases of 3 phase 4 wire<br>2 phase 3 wire<br>1 phase 3 wire<br>1 phase 2 wire |
| Short Circuit Current<br>Burden of Voltage Circuits 230V<br>Burden of Current Circuits (10 – 100A meter)<br>Burden of CT Operated Meters<br>Insulation<br>Impulse Withstand | 30 Imax<br>0.8W, 1.3VA<br>4VA @ 100A/phase [max]<br>0.22VA per phase<br>4kV RMS<br>12kV 1.2/50μs 40 ohm source |
| Display | 9.8mm characters, high contrast, wide viewing angle |
| Meter Constant (pulsing LED output) | 1,000 p/kWh (kvarh) Direct connected<br>10,000p/kWh (kvarh) CT Operated<br>Approximately 6ms Pulse width |
| Pulse Output Specification<br>SO Output (12 kV isolation)<br>100mA Relay Output (12 kV isolation)<br>300mA Relay Output (12 kV isolation) | <br>27V d.c. 27 mA, IEC 62053-31 (Transistor Output)<br>230V a.c or d.c, 100mA<br>230V a.c 300mA |
| Product Life<br>Certified Life | 15 years<br>10 years |
| Temperature<br><br>Humidity | Operational range: -25° C to +65° C<br>Storage Range: -25° C to +85° C<br>Condensing (See note below)<br>Annual Mean 75% (95% for 30 days spread over one year) |
| Maximum Dimensions<br>Weight | 233mm (High) x 174 mm (Wide) x 50mm (Deep)<br>904 grams |
| Accuracy Class kWh<br>kWh<br>kvar | EN 62053-21/22 - Class 0.5s, 1 or 2<br>EC Directive 2004/22/EC (MID) - Class A, B or C<br>EN 62053-23 - Class 2 or Class 3 |
| Case | DIN 43857 Part 2 and Part 4 (except for top fixing centre)<br>IP53 to IEC 60529:1989<br>EMC Directive 89/336/EEC |
| Terminals Main<br><br>Auxiliary | 8.2mm bores, M6 Terminal Screws – max torque 2.8 N m<br>9.0mm bores, M6 Terminal Screws – max torque 2.8 N m<br>9.5mm bores, M6 Terminal Screws – max torque 2.8 N m<br>3.2 mm bores, M3 Terminal Screws – max torque 0.45 N |

Note: Sample meters have successfully passed the “Damp heat cyclic” test given in section 6.3.4 of EN50470-1. However, for maximum operational life, it is recommended that installation sites are chosen where condensation is unlikely to occur.

# 26 INSTALLATION

## 26.1 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 Elster Metering Systems 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.

## 26.2 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.

## 26.3 Storage

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

Storage temperature: -25° C to +85° C

## 26.4 Installation Site

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.

## 26.5 Electromagnetic Compatibility (EMC)

The A1120/40 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. Keep a.c. circuits and d.c. circuits separated by a minimum of 50mm where possible
2. Where a.c. and d.c. circuits must cross, do so at right angles to each other
3. The cables for each circuit must be bunched together to minimise the loop
4. area enclosed
5. The cables for the pulsing output must use a twisted pair. Where the environment is electrically hostile, screened twisted pair cable may be required. The screen must be connected to earth at one point only
6. Ancillary equipment must also be CE marked
7. If interposing relays are used (a.c. or d.c.) then these must be correctly and adequately suppressed

## 26.6 Fixing and Connection

**WARNING**

Installation 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 properly fused. For direct current meters, 25mm$^2$ cables are recommended. Meters must be protected by fuses equal to the meter rating. i.e. 100A fuse for a 100A meter. Failure to do so may result in damage or fire.

Connections to the auxiliary voltage terminals will only be protected by the installation's main fuse cut-out. The installer must ensure that additional local protection is provided for any circuits connected to these terminals.

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 wood screw into the meter board to accommodate the keyhole fixing aperture at the back of the meter. Note that a choice of two fixing points is available for the upper fixing screw (see figure 6). 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, strip back the cable insulation by 26mm.

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 Phillips 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.
The M3 terminal screws should be tightened using a Number 1 Phillips or flat blade screwdriver to a maximum torque of 0.45N m.

Where connections are taken from the auxiliary voltage terminals, appropriate fuses should be incorporated to protect these circuits.

If a battery (for read without power) is installed in the module housing, the battery must be connected before mains supplies are energised.

It is also recommended that connections to the meter's RJ11 connector are made with the meter supplies isolated.

## 27 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

At power-up, ensure all segments of the LCD show in the test pattern

Check that the display is cycling through the display sequence

Check that the LED test indicators are illuminated or flashing

Check the operation of the pulse output (if fitted)

Check operation of the RS232 port (if fitted)

Carry out load checks as necessary

## 28 MAINTENANCE

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

## 29 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.

Elster Metering Systems 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 Elster Metering Systems should difficulties arise in arranging proper disposal. They will if practical, help the user identify safe disposal means.

An optional battery may be housed in a module housing attached to the meter.
The battery is a non re-chargeable, alkaline zinc manganese dioxide, PP3 size. Where local legislation places restraint on the disposal of this type of battery, the requirements of that legislation should be obeyed.

**POLYPHASE (A1120/A1140) MODEL CODE**

| $V_{ref}$ | | $I_b$ | $I_{max}$ |
|---|---|---|---|
| L-L | L-N | | |
| | | | |

**MODEL**

**TYPE** (nameplate)

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *example:* | **L** | **M** | **3** | **A** | **A** | **B** | **N** | **N** | **B** | **B** | B | N | N | B | - | A | **N** |
| **PRODUCT/TERMINATION** | | | | | | | | | | | | | | | | | |
| Polyphase, BS/DIN termination | **L** | **M** | | | | | | | | | | | | | | | |
| **SERVICE TYPE** | | | | | | | | | | | | | | | | | |
| 3Ph 4W for use on: | | | **3** | | | | | | | | | | | | | | |
| 3Ph 3W | | | **2** | | | | | | | | | | | | | | |
| **CURRENT RANGE** | | | | | | | | | | | | | | | | | |
| Direct Connected 20A – * (* is any multiple of Ib up to 100A maximum) | | | | **A** | | | | | | | | | | | | | |
| Direct Connected 10A – * (* is any multiple of Ib up to 100A maximum) | | | | **B** | | | | | | | | | | | | | |
| Direct Connected 5A – * (* is any multiple of Ib up to 100A maximum) | | | | **C** | | | | | | | | | | | | | |
| CT Operated 1A – 2A | | | | **L** | | | | | | | | | | | | | |
| CT Operated 5A – 10A | | | | **M** | | | | | | | | | | | | | |
| CT Operated 1A – 10A | | | | **N** | | | | | | | | | | | | | |
| Direct Connected (10A - 100A) -40˚ to 70˚C operation | | | | **P** | | | | | | | | | | | | | |
| **VOLTAGE** | | | | | | | | | | | | | | | | | |
| 220 - 240V (L - N) (See note 2 for Ref voltage ranges) | | | | | **A** | | | | | | | | | | | | |
| 220 - 240V (L - L) (See note 2 for Ref voltage ranges) (LM2****** variants only) | | | | | **B** | | | | | | | | | | | | |
| 105 - 127V (L - N) (See note 2 for Ref voltage ranges) Not OFGEM Approved/MID Approved | | | | | **C** | | | | | | | | | | | | |
| 105 - 127V (L - L) (See note 2 for Ref voltage ranges) (LM2****** variants only) Not OFGEM Approved/MID Approved | | | | | **D** | | | | | | | | | | | | |
| ACCURACY CLASS | | | | | | | | | | | | | | | | | |
| 50Hz Cl.0.5 kWh, Cl.2 kvarh (IEC 62053-22, 23 see note 1) Cl.C kWh, (EN 50470 - 3)<br>Note:- Class 0.5 or Class C is applicable to 5-6/10A "3 Ph 4W and 3 Ph 4W variant only" | | | | | | **A** | | | | | | | | | | | |
| 50 Hz Cl.1 kWh, Cl.2 kvarh (IEC 62053-21, 23 see note 1) Cl.B kWh, (EN50470-3) | | | | | | **B** | | | | | | | | | | | |
| 50 Hz Cl.2 kWh, Cl.3 kvarh (IEC 62053-21, 23 see note 1) Cl.BA kWh, (EN50470-3) | | | | | | **C** | | | | | | | | | | | |
| 60 Hz Cl.1 kWh, Cl.2 kvarh (IEC 62053-21, 23 see note 1) Not OFGEM Approved/MID Approved | | | | | | **E** | | | | | | | | | | | |
| 60 Hz Cl.2 kWh, Cl.3 kvarh (IEC 62053-21, 23 see note 1) Not OFGEM Approved/MID Approved | | | | | | **F** | | | | | | | | | | | |
| **HARDWARE - SWITCHES** | | | | | | | | | | | | | | | | | |
| No tamper detect switches | | | | | | | **N** | | | | | | | | | | |
| Two tamper detect switches | | | | | | | **B** | | | | | | | | | | |
| Terminal cover tamper detect switch and CT ratio programming protection switch | | | | | | | **C** | | | | | | | | | | |
| **HARDWARE - BUTTONS** | | | | | | | | | | | | | | | | | |
| No buttons | | | | | | | | **N** | | | | | | | | | |
| Two buttons | | | | | | | | **B** | | | | | | | | | |
| Backlit LCD with no buttons | | | | | | | | **C** | | | | | | | | | |
| Backlit LCD with twom buttons | | | | | | | | **D** | | | | | | | | | |
| **HARDWARE - BATTERY** | | | | | | | | | | | | | | | | | |
| No external battery connection | | | | | | | | | **N** | | | | | | | | |
| External Battery connection. Note! External battery module cannot be fitted when an RS232 comms module is fitted | | | | | | | | | **B** | | | | | | | | |
| Supercapacitor/External battery/RS485 module connection | | | | | | | | | **C** | | | | | | | | |
| **OPERATIONAL MODES** | | | | | | | | | | | | | | | | | |
| Import kWh only | | | | | | | | | | **B** | | | | | | | |
| Import kWh, Q1 and Q4 kvarh | | | | | | | | | | **C** | | | | | | | |
| Import kWh, Q1, Q2, Q3, Q4 kvarh and Imp kVAh | | | | | | | | | | **D** | | | | | | | |
| Imp/Exp kWh | | | | | | | | | | **E** | | | | | | | |
| Imp/Exp kWh, Q1, Q2, Q3, and Q4 kvarh | | | | | | | | | | **F** | | | | | | | |
| Imp/Exp kWh and Imp/Exp kVAh | | | | | | | | | | **G** | | | | | | | |
| Imp/Exp kWh, Q1, Q2, Q3, Q4 kvarh and Imp/Exp kVAh | | | | | | | | | | **H** | | | | | | | |
| Import kWh only (Power Flow Insensitive) | | | | | | | | | | **J** | | | | | | | |
| Import kWh, Q1 and Q4 kvarh (Power Flow Insensitive) | | | | | | | | | | **K** | | | | | | | |
| Import kWh, Q1, Q2, Q3, Q4 kvarh and Imp kVAh (Power Flow Insensitive) | | | | | | | | | | **L** | | | | | | | |
| Import kWh only (Theft Resistant Measurement) | | | | | | | | | | **R** | | | | | | | |
| Import kWh, Q1 and Q4 kvarh (Theft Resistant Measurement) | | | | | | | | | | **S** | | | | | | | |
| Import kWh, Q1, Q2, Q3, Q4 kvarh and Imp kVAh (Theft Resistant Measurement) | | | | | | | | | | **T** | | | | | | | |
| **TARIFFS** | | | | | | | | | | | | | | | | | |
| A1120 Multi Rate | | | | | | | | | | | B | | | | | | |
| A1140 Multi Rate (with load profile) | | | | | | | | | | | C | | | | | | |
| A1120 Multi Rate with password protected register zeroing and zero level time shift | | | | | | | | | | | D | | | | | | |
| A1140 (with load profile) Multi Rate with password protected register zeroing and zero level time shift | | | | | | | | | | | E | | | | | | |
| **AUXILIARY OUTPUT** | | | | | | | | | | | | | | | | | |
| No Output | | | | | | | | | | | | N | | | | | |
| SO output, floating, 2 aux terminals. 12 kV isolation (Configurable pulse duration/value) 27V DA only | | | | | | | | | | | | P | | | | | |
| SO output, floating, 2 aux terminals. 12 kV isolation, replicating centre LED (kWh) 27V DA only | | | | | | | | | | | | A | | | | | |
| SO output, floating, 2 aux terminals. 12 kV isolation, replicating left hand LED (kvarh) 27V DA only | | | | | | | | | | | | R | | | | | |
| Relay output, floating, 2 aux terminals. 12 kV isolation (Configurable pulse duration/value) 230V AC, DC | | | | | | | | | | | | S | | | | | |
| Relay output, floating, 2 aux terminals. 12 kV isolation, replicating centre LED (kWh) 230V AC, DC | | | | | | | | | | | | D | | | | | |
| Relay output, floating, 2 aux terminals. 12 kV isolation, replicating left hand LED (kvarh) 230V AC, DC | | | | | | | | | | | | U | | | | | |
| 300mA Relay output, floating, 2 aux terminals, 12kV isolation, indicating tariff/MD state, 230V a.c only | | | | | | | | | | | | T | | | | | |
| **COMMUNICATIONS** | | | | | | | | | | | | | | | | | |
| No Serial Comms | | | | | | | | | | | | | N | | | | |
| RS232 serial Comms Note! RS232 Comms module cannot be fitted when an external battery module is fitted | | | | | | | | | | | | | R | | | | |
| **OTHER OPTIONS** | | | | | | | | | | | | | | | | | |
| Standard (Extended) Terminal cover | | | | | | | | | | | | | | B | | | |
| Standard (Extended) Terminal cover with cut-out | | | | | | | | | | | | | | C | | | |
| Standard (Extended) Terminal plus 9.0mm main terminal bores | | | | | | | | | | | | | | D | | | |
| Short Terminal Cover | | | | | | | | | | | | | | E | | | |
| Standard (Extended) Terminal cover with additional voltage terminals | | | | | | | | | | | | | | F | | | |
| Standard (Extended) Terminal cover with cut-out and additional voltage terminals | | | | | | | | | | | | | | G | | | |
| Standard (Extended) Terminal cover plus 9.0 mm mail terminal bores and additional voltage terminals | | | | | | | | | | | | | | H | | | |
| Standard (Extended) Terminal cover plus 9.5 mm main terminal bores | | | | | | | | | | | | | | J | | | |
| Standard (Extended) Terminal cover and main cover with voltage disconnect protection | | | | | | | | | | | | | | K | | | |

## Figure 1 - Model Code

| | | | | | |
|---|---|---|---|---|---|
| Standard (Extended) Terminal cover with slotted head screws | L | | | | |
| Standard (Extended) Terminal cover with cut-out and slotted head screws | M | | | | |
| Short terminal cover with slotted head screws | P | | | | |
| Standard (Extended) Terminal cover with cut-out plus 9.0 mm mail terminal bores | Q | | | | |
| Standard (Extended) Terminal cover with cut-out and main cover with voltage disconnect protection | R | | | | |
| **Feature Set** | | | | | |
| 8 TOU Registers, 4 MD Registers, 15 Historical Registers, DSM - see Note 4 for scheme compatibility | | | - | **A** | |
| 8 TOU Registers, 4 MD Registers, 15 Historical Registers, DSM, DLS time stamps and 12 external registers - Note! All new customers from November 2007 - see Note 4 for scheme compatibility | | | - | **C** | |
| 8 TOU Registers, 4 MD Registers, 15 Historical Registers, DSM, DLS Time stamps, 12 External Registers, Daily Billing and Per Phase Registration. see Note 4 for scheme compatibility. Note This feature set requires the use of PMU version 3.1.4216 or later. | | | | **F** | |
| 8 TOU Registers, 4 MD Registers, 15 Historical Registers, DSM, DLS Time stamps, 12 External Registers - Note! Register zeroing by use of "Register Zeroing Tool" is NOT available in this option. See Note 4 for scheme compatibility. | | | | **G** | |
| 8 TOU Registers, 4 MD Registers, 15 Historical Registers, DSM, DLS Time stamps, 12 External Registers and tamper flag in Load Profile. See Note 4 for scheme compatibility. | | | | **H** | |
| **Revision Suffix** | | | | | |
| Firmware 2-01178-Q (Version A only). Enhanced GPRS and COP 10 | | | | | Q |
| Firmware 2-01322-K (Version C and H) Enhanced GPRS and COP 10 | | | | | L |
| Firmware 2-01340-B (Version F) Daily Billing and per phase registration (Note: requires PMU version 3.51.4216 or later) | | | | | D |
| Firmware 2-01345-A (Version G) Enhanced GPRS & COP 10. No register zeroing | | | | | Z |
| **SPECIAL ADDITIONS FIRMWARE** | | | | | |
| None | | | | | N |
| Additional Firmware Function for ESCOM only (Phase angle definition as A1700 | | | | | A |
| SPECIAL ADDITIONS HARDWARE | | | | | |
| NONE | | | | | N |

**Note 1: CURRENT RATINGS -** IEC/EN 62052-11 defines **only** Basic, Reference and Maximum currents as follows:

| | |
|---|---|
| Basic Current (Ib) **Direct Connected** | Standard values: 5, 10, 15, 20, 30, 40, 50A<br>Exceptional values: 80A. |
| Reference Current (In) **CT Operated** | Standard values: 1, 2, 5A<br>Exceptional values: 1.5, 2.5A |

**Direct Connected** Maximum current (Imax) shall preferably be an integral multiple of Ib.

Direct Connected A1120/A1140 meters may have Imax values ***up to a maximum of 100A***

**CT Operated** shall have maximum currents of 1.2 In, 1.5 In and 2 In

**CT Operated A1120/A1140 meters may be**:

1 - 2A (suitable for use as 1 - 1.2A, 1 - 1.5A, or 1 - 2A)
5 - 10A (suitable for use as 5 - 6A, 5 - 7.5A, or 5 - 10A)
1 - 10A (suitable for use with any of the above 6 ratings)

EN 50470-1 (MID) defines basic values or Itr from which Imin, Iref and Imax can be derived

| | | |
|---|---|---|
| Basic values of Itr | Direct Connected | 0.5, 1, 1.5, 2A |
| Basic values of Itr | CT Operated | 0.05, 0.1, 0.25 |

Imin, Iref and Imax have been chosen so that the following relationships are met

| | | | |
|---|---|---|---|
| Direct Connected, Class A | Imin $\leq$ 0.5 x Itr | Iref = 10 x Itr | Imax $\geq$ 50 x Itr |
| CT Operated, Class A | Imin $\leq$ 0.4 x Itr | In = 20 x Itr | Imax $\geq$ 1.2 x In |
| Direct Connected, Class B | Imin $\leq$ 0.5 x Itr | Iref = 10 x Itr | Imax $\geq$ 50 x Itr |
| CT Operated, Class B | Imin $\leq$ 0.2 x Itr | In = 20 x Itr | Imax $\geq$ 1.2 x In |

**Note 2: VOLTAGE RATINGS** - Of the values IEC/EN 62052-11 defines for reference voltages, the following may be accepted

Ref Voltages for meters not connected through current transformers

| | |
|---|---|
| Std values | 120, 230, 400V |
| Exceptional values | 100, 127, 200, 220, 240, 380, 415V |

EN 50470- 1 (MID) defines for reference voltages, the following standards and exceptional values

Ref Voltages for **Direct Connected**

| | |
|---|---|
| Std values | 230/400V |
| Exceptional values | 220/380V, 240/415V |

**Meters with marked currents and voltages other than the above values CANNOT be provided when the nameplate shows the IEC/EN Standard Number.**

If a valid requirement exists for meters with marked values within the acceptable ranges, but not listed above, specific arrangements to provide nameplates not showing the IEC/EN standard must be made.

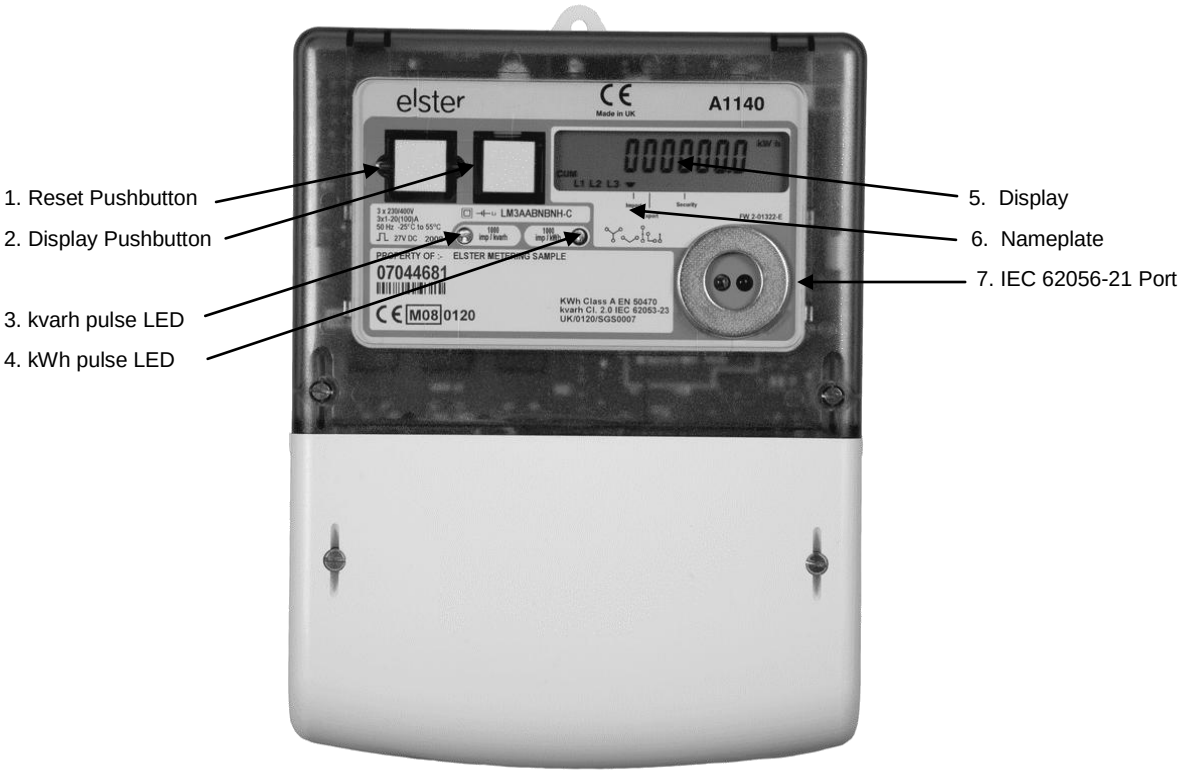
**Note 3: TEST INDICATOR OUTPUT VALUES** - The following values are to be used for the Test Indicator LED outputs:

Direct Connected: 1,000 p/kWh (kvarh) CT Operated: 10,000 p/kWh (kvarh)

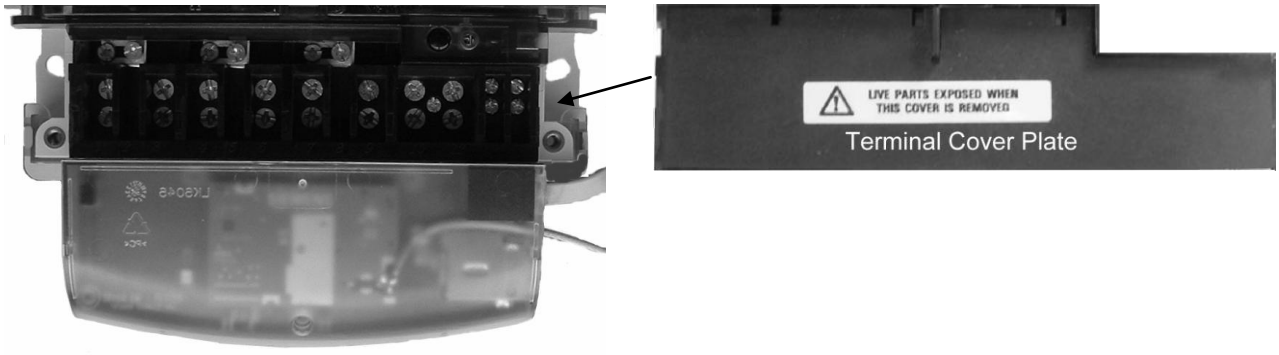
**Note 4: SCHEME COMPATIBILITY** - Schemes generated for VERSION 'A' meters are not compatible with VERSION 'C' meters

**Note 5: SPECIAL ADDITIONS** - Early issues of this code used the final (16th) digit for SPECIAL ADDITIONS and an 'A' in this position indicates "with additional voltage terminals".

## Figure 1 - Model Code (Continued)




| | |
|---|---|
| 1 | Reset Pushbutton (See Section 15) |
| 2 | Display Pushbutton (See Section 15) |
| 3 | kvarh Pulse Indicator (See Section 9) |
| 4 | kWh Pulse Indicator (See Section 9) |
| 5 | Display (See Section 14) |
| 6 | Nameplate (See Figure 3) |
| 7 | IEC 62056-21 Port (See Section 16) |


Module Carrier (Fits under the terminal cover)

**Figure 2 – A1120/40 Meter**

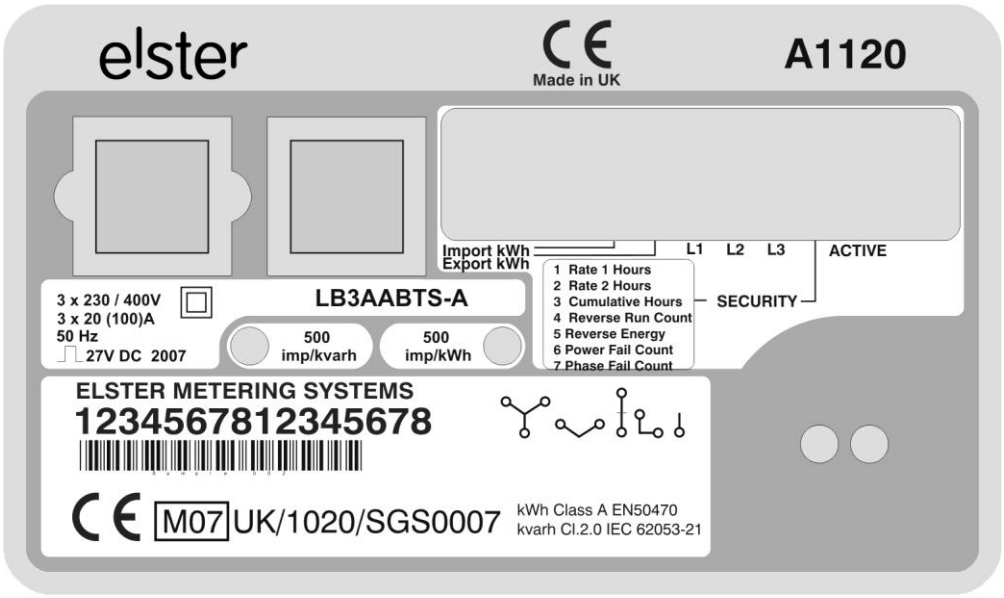



**Figure 3 - Typical Nameplate**

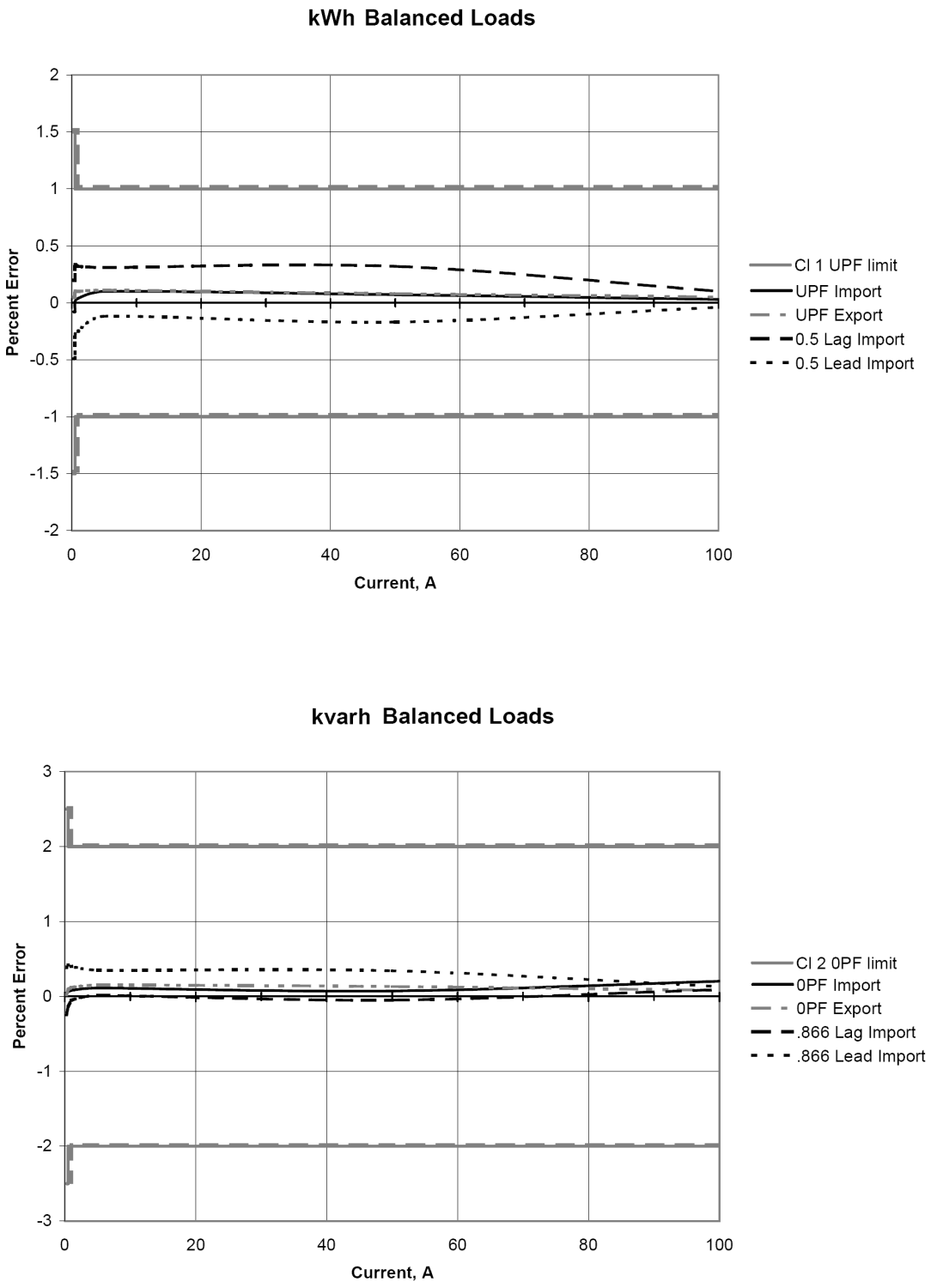
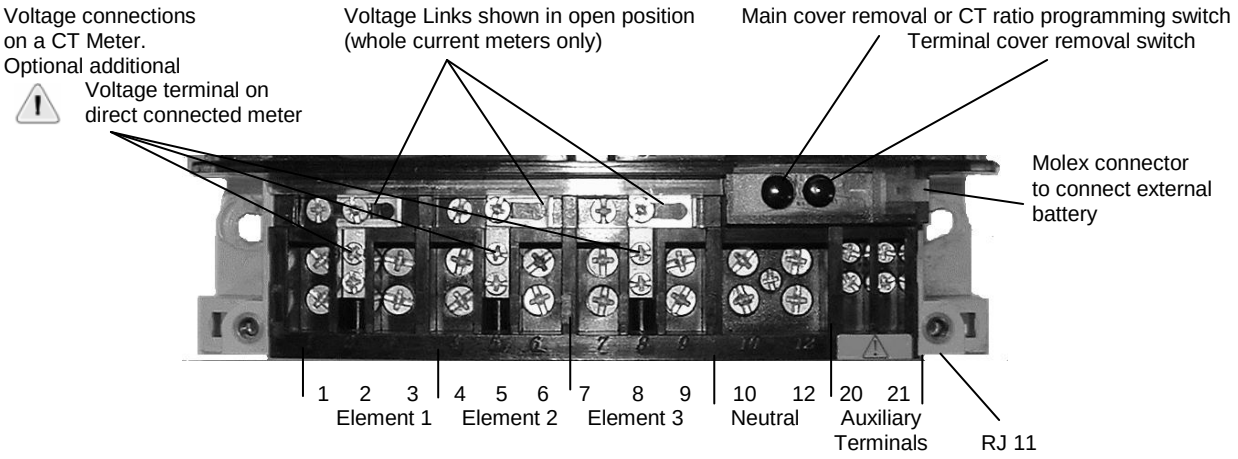
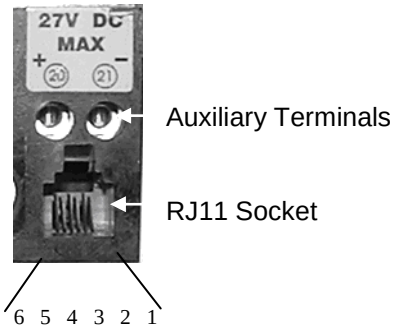



**Figure 4 - Load Curves**

## **Terminal Block** (3 phase 4 wire shown)




**RJ 11 and Auxiliary Terminals**



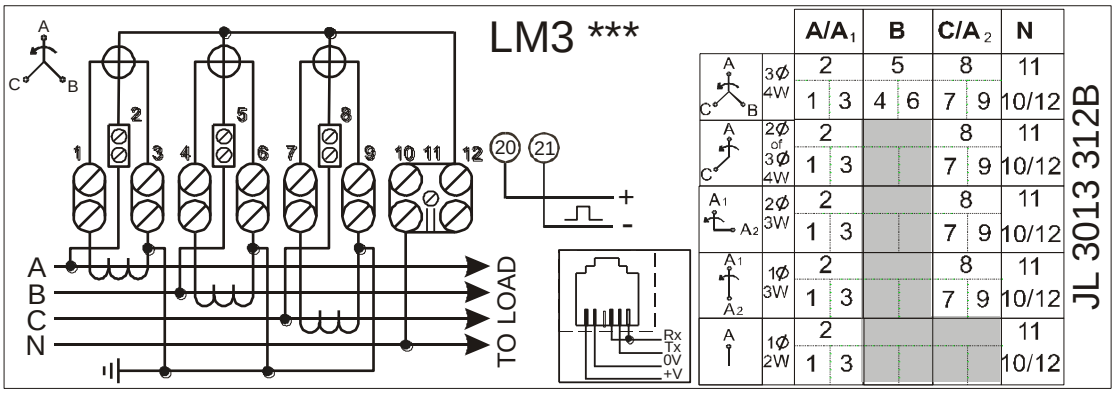

**Terminal & RJ11 Numbering**

| Terminal | |
|---|---|
| 1<br>2<br>3 | Element 1 - Line in<br>- Voltage terminal<br>- Line out |
| 4<br>5<br>6 | Element 2 - Line In<br>- Voltage Terminal<br>- Line Out |
| 7<br>8<br>9 | Element 3 - Line In<br>- Voltage Terminal<br>- Line Out |
| 10<br>12 | Neutral In<br>Neutral Out |
| Auxiliary | 20 positive<br>21 negative |

| RJ11 | |
|---|---|
| 1 | Rx (Input) |
| 2 | Tx (Output) |
| 3 | Rx (Input) |
| 4 | No Connection |
| 5 | Zero Volts |
| 6 | Modem Power Supply (+) Output |

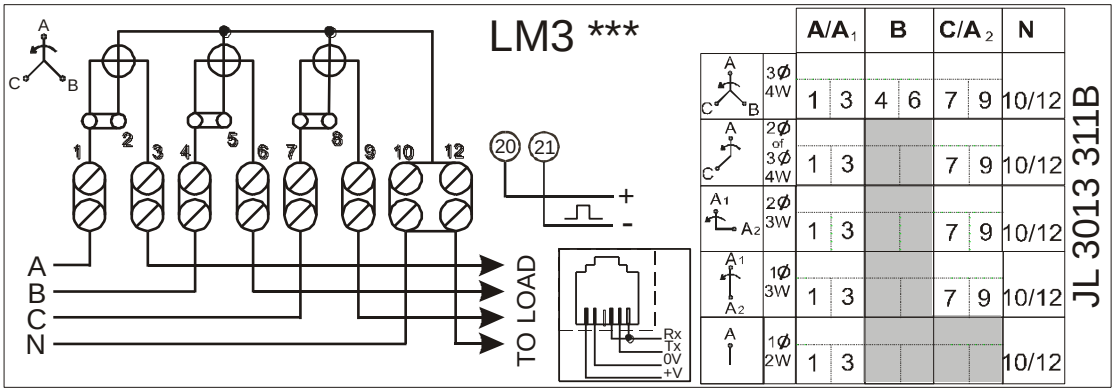
See Warning in Section 22 regarding protection for additional voltage terminals.

**Figure 5 - Terminal Arrangements**




| | | A/A1 | B | C/A2 | N |
|---|---|---|---|---|---|
| 3Ø 4W | | 2 | 5 | 8 | 11 |
| | | 1 3 | 4 6 | 7 9 | 10/12 |
| 2Ø of 3Ø 4W | | 2 | | 8 | 11 |
| | | 1 3 | | 7 9 | 10/12 |
| 2Ø 3W | | 2 | | 8 | 11 |
| | | 1 3 | | 7 9 | 10/12 |
| 1Ø 3W | | 2 | | 8 | 11 |
| | | 1 3 | | 7 9 | 10/12 |
| 1Ø 2W | | 2 | | | 11 |
| | | 1 3 | | | 10/12 |

3 phase 4 wire, CT operated




| | | A/A1 | B | C/A2 | N |
|---|---|---|---|---|---|
| 3Ø 4W | | | | | |
| | | 1 3 | 4 6 | 7 9 | 10/12 |
| 2Ø of 3Ø 4W | | | | | |
| | | 1 3 | | 7 9 | 10/12 |
| 2Ø 3W | | | | | |
| | | 1 3 | | 7 9 | 10/12 |
| 1Ø 3W | | | | | |
| | | 1 3 | | 7 9 | 10/12 |
| 1Ø 2W | | | | | |
| | | 1 3 | | | 10/12 |

3 phase 4 wire, Direct connected

**Note:** These diagrams are examples only.

WARNING

Meters must be connected according to the diagram fitted under the meter terminal cover.

**Figure 5A – Terminal Configurations**

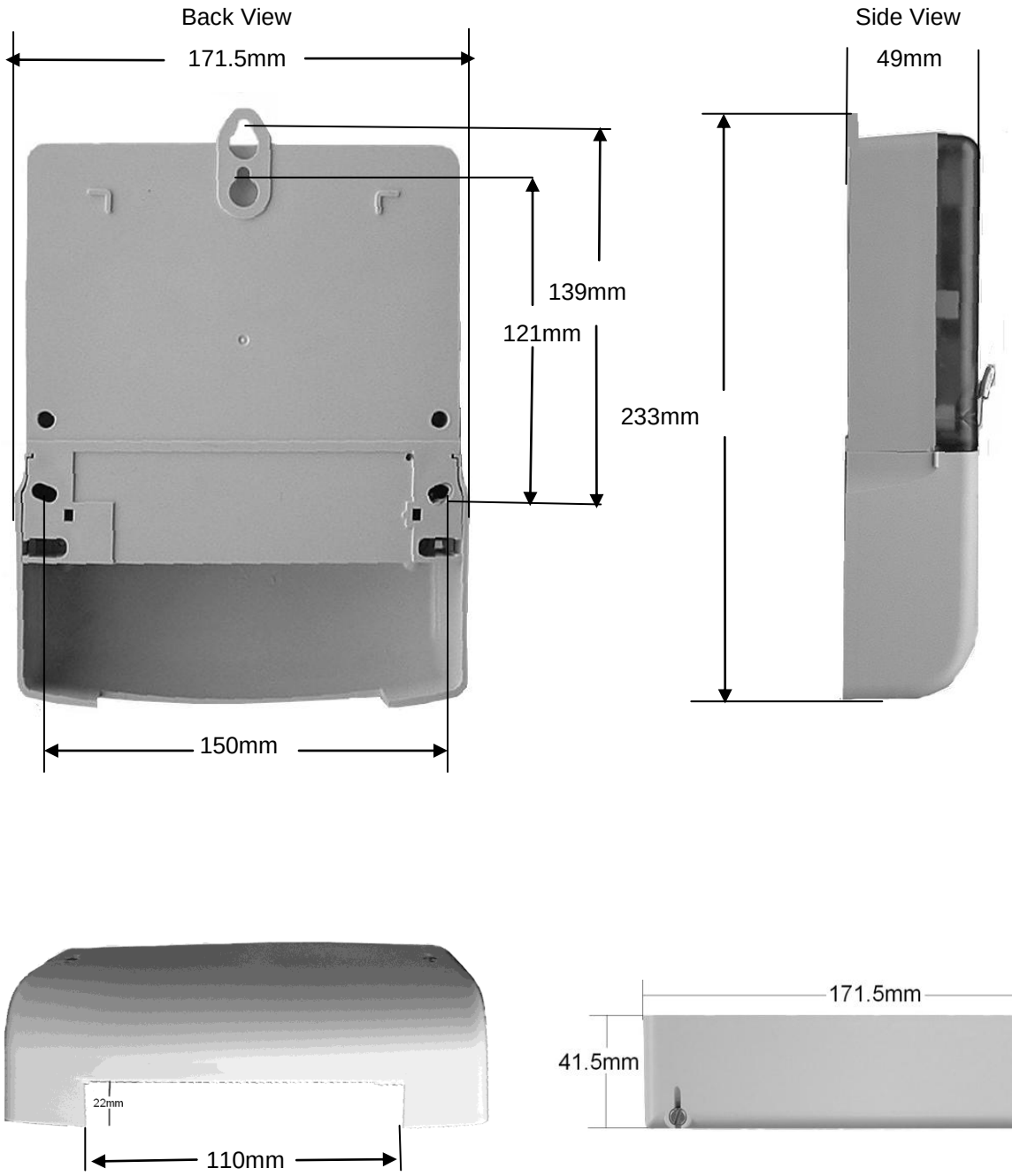



**Figure 6 – Dimensions, Fixing Centres**

| English Displays | OBIS Displays |
|---|---|
| Segment Test | |
|  |  |
| Cumulative | |
|  |  |
| Customer Defined (1-2) | |
|  |  |
| Rising Demand (Export) | |
|  |  |
| Maximum Demand (1-4) | |
|  |  |
| Maximum Demand (1-4) Date | Time |
|  |  |
| Cumulative Maximum Demand (1-4) | |
|  |  |
| Time of Use (1-8) | |
|  |  |

**Figure 7 - A1120/40 Displays**

| English Displays | OBIS Displays |
|---|---|
| Historical | |
|  |  |
| Security (Reverse Run Event Count) | |
|  |  |
| Instrumentation (Phase A Voltage) | |
|  |  |
| Dial Test | |
|  |  |
| Communications Indicators<br>Optical | Remote RS232 |
|  |  |
| End of Billing (Change of Season) | End of Billing (Internal Battery Fail) |
|  |  |
| Error (Power Fail Data) | Error (Internal Battery Fail) |
|  |  |
| CT (Scalar) | CT (Ratio) |
|  |  |
| External Registers | |
|  | |

**Figure 7 - A1120/40 Displays (continued)**

| Description | Units | | OBIS Display Code | | English Display | | |
|---|---|---|---|---|---|---|---|
| | Note 1** | | | | Identifier | Chevron | Index |
| Segment Test | - | | - | | - | - | - |
| Current Time | - | | 0.9.1 | | - | - | - |
| Current Date | - | | 0.9.2 | | - | - | - |
| **Cumulative** | | | | | | | |
| Total Import kWh | kWh | | 1.8.0 | | CUM | 1 | - |
| Total Export kWh | kWh | | 2.8.0 | | CUM | 2 | - |
| Q1 kvarh | kvarh | | 5.8.0 | | CUM | - | ↳ 1 |
| Q2 kvarh | kvarh | | 6.8.0 | | CUM | - | ↵ 2 |
| Q3 kvarh | kvarh | | 7.8.0 | | CUM | - | ↰ 3 |
| Q4 kvarh | kvarh | | 8.8.0 | | CUM | - | ↱ 4 |
| kVAh 1 | kVAh | | D.8.0 | | CUM | - | - |
| kVAh 2 | kVAh | | E.8.0 | | CUM | - | - |
| Total Import kWh Phase A * | kW | | 21.8.0 | | CUM | 1 | A |
| kWh Phase B * | kW | | 41.8.0 | | CUM | 1 | B |
| kWh Phase C * | kW | | 61.8.0 | | CUM | 1 | C |
| Total Export kWh Phase A * | kW | | 21.8.0 | | CUM | 2 | A |
| kWh Phase B * | kW | | 41.8.0 | | CUM | 2 | B |
| kWh Phase C * | kW | | 61.8.0 | | CUM | 2 | C |
| Customer Defined 1 | ** | | A.8.0 | | CUM | - | Cd 1 |
| Customer Defined 2 | ** | | B.8.0 | | CUM | - | Cd 2 |
| **Rising Demand** | | | | | | | |
| Total Import kW | kW | | 1.4.0 | | DEM | 1 | - |
| Total Export kW | kW | | 2.4.0 | | DEM | 2 | - |
| Q1 kvar | kvar | | 5.4.0 | | DEM | - | ↳ 1 |
| Q2 kvar | kvar | | 6.4.0 | | DEM | - | ↵ 2 |
| Q3 kvar | kvar | | 7.4.0 | | DEM | - | ↰ 3 |
| Q4 kvar | kvar | | 8.4.0 | | DEM | - | ↱ 4 |
| kVA 1 | kVA | | D.4.0 | | DEM | - | - |
| kVA 2 | kVA | | E.4.0 | | DEM | - | - |
| Total Import kWh Phase A * | kW | | 21.4.0 | | DEM | 1 | A |
| kWh Phase B * | kW | | 41.4.0 | | DEM | 1 | B |
| kWh Phase C * | kW | | 61.4.0 | | DEM | 1 | C |
| Total Export kWh Phase A * | kW | | 21.4.0 | | DEM | 2 | A |
| kWh Phase B * | kW | | 41.4.0 | | DEM | 2 | B |
| kWh Phase C * | kW | | 61.4.0 | | DEM | 2 | C |
| CD 1 | ** | | A.4.0 | | DEM | - | Cd 1 |
| CD 2 | ** | | B.4.0 | | DEM | - | Cd 2 |
| **Cumulative MD (1-4)** | | | | | | | |
| Total Import kW | kW | | 1.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| Total Export kW | kW | | 2.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| Q1 kvar | kvar | | 5.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| Q2 kvar | kvar | | 6.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| Q3 kvar | kvar | | 7.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| Q4 kvar | kvar | | 8.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| kVA 1 | kVA | | D.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| kVA 2 | kVA | | E.2.(1 - 4 | | CUM MAX DEM | - | 1 - 4 |
| 1 - 4 CD 1 | ** | | A.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| 1 - 4 CD 2 | ** | | B.2.(1 - 4) | | CUM MAX DEM | - | 1 - 4 |
| **Maximum Demand (1-4)** | | | | | | | |
| 1 - 4 Import kW | kW | | 1.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Import Time | - | | 1.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Import Date | - | | 1.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Export kW | kW | | 2.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Export Time | - | | 2.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Export Date | - | | 2.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q1 kvar | kvar | | 5.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q1 Time | - | | 5.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q1 Date | - | | 5.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q2 kvar | kvar | | 6.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q2 Time | - | | 6.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q2 Date | - | | 6.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q3 kvar | kvar | | 7.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q 3 Time | - | | 7.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q3 Date | - | | 7.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q4 kvar | kvar | | 8.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q4 Time | - | | 8.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 Q4 Date | - | | 8.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 kVA 1 | kVA | | D.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 kVA 1 Time | - | | D.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 kVA 1 Date | - | | D.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 kVA 2 | kVA | | E.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 kVA 2 Time | - | | E.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 kVA 2 Date | - | | E.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 CD 1 | ** | | A.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 CD 1 Time | ** | | A.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 CD 1 1 Date | ** | | A.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 CD 2 | ** | | B.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 CD 2 Time | ** | | B.6.(1 - 4) | | MAX DEM | - | 1 - 4 |
| 1 - 4 CD 2 Date | ** | | B.6.(1 - 4) | | MAX DEM | - | 1 - 4 |

**Figure 8 - Display Table**

| Description | Units | | OBIS Display Code | | English Display | | |
|---|---|---|---|---|---|---|---|
| | Note 1** | | | | Identifier | Chevron | Index |
| **TOU (1-8)** | | | | | | | |
| 1 - 8 Import kWh | kWh | | 1.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 Export kWh | kWh | | 2.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 Q1 kvarh | kvarh | | 5.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 Q2 kvarh | kvarh | | 6.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 Q3 kvarh | kvarh | | 7.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 Q4 kvarh | kvarh | | 8.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 kVAh 1 | kVAh | | D.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 kVAh 2 | kVAh | | E.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 CD 1 | ** | | A.8.(1 - 8) | | TOU | - | 1 - 8 |
| 1 - 8 CD 2 | ** | | B.8.(1 - 8) | | TOU | - | 1 - 8 |
| **External Registers** | | | | | | | |
| Register Set 1 (1-4) | - | | User selectable | | Cum | - | S1 - (1 - 4) |
| Register Set 2 (1-4) | - | | User selectable | | Cum | - | S2 - (1 - 4) |
| Register Set 3 (1-4) | - | | User selectable | | Cum | - | S3 - (1 - 4) |
| **Security** | | | | | | | |
| Program Event Count | - | | C.2.0 | | - | 4 | 1 |
| Program Event Time | - | | C.2.0 | | - | 4 | 1 |
| Program Event Date | - | | C.2.0 | | - | 4 | 1 |
| CT Ratio Change Count | - | | C.72.0 | | - | 4 | 2 |
| CT Ratio Change Time | - | | C.72.0 | | - | 4 | 2 |
| CT Ratio Change Date | - | | C.72.0 | | - | 4 | 2 |
| Phase Fail Event Count | - | | C.54.0 | | - | 4 | 3 |
| Phase Fail Event Time | - | | C.54.0 | | - | 4 | 3 |
| Phase Fail Event Date | - | | C.54.0 | | - | 4 | 3 |
| Power Fail Event Count | - | | C.7.0 | | - | 4 | 4 |
| Power Fail Event Time | - | | C.7.0 | | - | 4 | 4 |
| Power Fail Event Date | - | | C.7.0 | | - | 4 | 4 |
| Rev Run Event Count | - | | C.53.0 | | - | 4 | 5 |
| Rev Run Event Time | - | | C.53.0 | | - | 4 | 5 |
| Rev Run Event Date | - | | C.53.0 | | - | 4 | 5 |
| End Billing Count | - | | 0.1.0 | | - | 4 | 7 |
| End Billing Time | - | | 0.9.6 | | - | 4 | 7 |
| End Billing Date | - | | 0.9.7 | | - | 4 | 7 |
| Main Cov RemCount | - | | C.70.0 | | - | 4 | 8 |
| Main Cov Remove Time | - | | C.70.0 | | - | 4 | 8 |
| Main Cov Remove Date | - | | C.70.0 | | - | 4 | 8 |
| Term Cov Rem Count | - | | C.71.0 | | - | 4 | 9 |
| Term Cov Remove Time | - | | C.71.0 | | - | 4 | 9 |
| Term Cov Remove Date | - | | C.71.0 | | - | 4 | 9 |
| Est Battery Life Remain | - | | C.6.0 | | - | 4 | 10 |
| In Service Hours | - | | C.8.0 | | - | 4 | 11 |
| Active Tariff CRC | - | | C.80.1 | | - | 4 | CrC1 |
| Deferred Tariff CRC | - | | C.80.4 | | - | 4 | CrC4 |
| CT Ratio | - | | 0.4.2 | | | 4 | Ct |

| EOB Events (All Meters) | Code (HEX) | | Display | | | | |
|---|---|---|---|---|---|---|---|
| Program Date or Midnight | 01 | | rESEt | | | | |
| Change of Season | 02 | | rESEt | | | | |
| Deferred Tariff | 04 | | rESEt | | | | |
| Serial Port Command | 08 | | rESEt | | | | |
| Optical Port Command | 10 | | rESEt | | | | |
| Billing Pushbutton Press | 20 | | rESEt | | | | |
| CT Programming Event | 40 | | rESEt | | | | |
| Battery Fail | 80 | | rESEt | | | | |
| **Meter Errors** | - | | | | | | |
| Power fail data | - | | FF 0040 | | Error 0040 | | |
| Period backup data error | - | | FF 0080 | | Error 0080 | | |
| ROM checksum error | - | | FF 0100 | | Error 0100 | | |
| I²C Bus error | - | | FF 0200 | | Error 0200 | | |
| Internal battery life exceeded | - | | FF 0400 | | Error 0400 | | |
| Internal battery fail | - | | FF 0800 | | Error 0800 | | |

**Figure 8 - Display Table (continued)**

| Description | Units | OBIS Display Code | English Display | | |
|---|---|---|---|---|---|
| | Note 1** | | Identifier | Chevron | Index |
| **Historical (Most recent only)** | | | | | |
| Total Import kWh | kWh | 1.8.0.1 | CUM | - | H1 |
| Total Export kWh | kWh | 2.8.0.1 | CUM | - | H1 |
| Q1 kvarh | kvarh | 5.8.0.1 | CUM | - | H1 |
| Q2 kvarh | kvarh | 6.8.0.1 | CUM | - | H1 |
| Q3 kvarh | kvarh | 7.8.0.1 | CUM | - | H1 |
| Q4 kvarh | kvarh | 8.8.0.1 | CUM | - | H1 |
| Import kVAh | kVAh | D.8.0.1 | CUM | - | H1 |
| Export kVAh | kVAh | E.8.0.1 | CUM | - | H1 |
| Total Import kWh Phase A * | kW | 21.8.0.1 | CUM | 1 | H1 A |
| kWh Phase B * | kW | 41.8.0.1 | CUM | 1 | H1 B |
| kWh Phase C * | kW | 61.8.0.1 | CUM | 1 | H1 C |
| Total Export kWh Phase A * | kW | 21.8.0.1 | CUM | 2 | H1 A |
| kWh Phase B * | kW | 41.8.0.1 | CUM | 2 | H1 B |
| kWh Phase C * | kW | 61.8.0.1 | CUM | 2 | H1 C |
| Customer Defined 1 | ** | A.8.0.1 | CUM | - | H1 |
| Customer Defined 2 | ** | B.8.0.1 | CUM | - | H1 |
| **Historical MD's** | | | | | |
| 1 - 4 Import kW | kW | 1.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Import Time | - | 1.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Import Date | - | 1.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Export kW | kW | 2.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Export Time | - | 2.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Export Date | - | 2.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q1 kvar | kvar | 5.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q1 Time | - | 5.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q1 Date | - | 5.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q2 kvar | kvar | 6.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q2 Time | - | 6.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q2 Date | - | 6.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q3 kvar | kvar | 7.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q 3 Time | - | 7.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q3 Date | - | 7.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q4 kvar | kvar | 8.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q4 Time | - | 8.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 Q4 Date | - | 8.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 kVA 1 | kVA | D.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 kVA 1 Time | - | D.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 kVA 1 Date | - | D.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 kVA 2 | kVA | E.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 kVA 2 Time | - | E.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 kVA 2 Date | - | E.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 CD 1 | ** | A.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 CD 1 Time | ** | A.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 CD 1 Date | ** | A.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 CD 2 | ** | B.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 CD 2 Time | ** | B.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| 1 - 4 CD 2 Date | ** | B.6.(1 - 4).1 | MAX DEM | - | H1 (1 - 4) |
| **Historical Registers** | | | | | |
| CUM MD 1- 4 Import kW | kW | 1.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD 1 - 4 Export kW | kW | 2.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD Q1 1 - 4 kvar | kvar | 5.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD Q2 1 - 4 kvar | kvar | 6.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD Q3 1 - 4 kvar | kvar | 7.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD Q4 1 - 4 kvar | kvar | 8.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD kVA 1 1 - 4 kVA | kVA | D.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD kVA 2 1 - 4 kVA | kVA | E.2.(1 - 4) 1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD CD 1 1 - 4 | ** | A.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 - 4) |
| CUM MD CD 2 1 - 4 | ** | B.2.(1 - 4).1 | CUM MAX DEM | - | H1 (1 -4) |
| TOU 1 - 8 Import kWh | kWh | 1.8.(1 - 8).1 | TOU | - | H1 (1 -8) |
| TOU 1 - 8 Export kWh | kWh | 2.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 Q1 kvarh | kvarh | 5.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 Q2 kvarh | kvarh | 6.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 Q3 kvarh | kvarh | 7.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 Q4 kvarh | kvarh | 8.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 kVAh 1 | kVAh | D.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 kVAh 2 | kVAh | E.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 CD 1 | ** | A.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| TOU 1 - 8 CD 2 | ** | B.8.(1 - 8).1 | TOU | - | H1 (1 - 8) |
| Rev Run Count | - | C.53.0.1 | - | 4 | H1 5 |
| Phase Fail Count | - | C.54.0.1 | - | 4 | H1 3 |
| Power Fail Count | - | C.7.0.1 | - | 4 | H1 4 |
| Program Count | - | C.2.0.1 | - | 4 | H1 1 |
| CT Ratio Change Count | - | C.72.0.1 | - | 4 | H1 2 |
| Main Cover Remove Count | - | C.70.0.1 | - | 4 | H1 8 |
| Term Cover Remove Count | - | C.71.0.1 | - | 4 | H1 9 |
| End Billing Count | - | 0.1.0.1 | - | 4 | H1 7 |
| In Service Hours | - | C.8.0.1 | - | 4 | H1 11 |
| Estimated Battery Life | - | C.6.0.1 | - | 4 | H1 10 |

**Figure 8 - Display Table (continued)**

| Description | Units | | OBIS Display Code | | English Display | | |
|---|---|---|---|---|---|---|---|
| | Note 1** | | | | Identifier | Chevron | Index |
| **Instrumentation** | | | | | | | |
| Volts Phase A | V | | 32.7.0 | | - | - | Ins A |
| Volts Phase B | V | | 52.7.0 | | - | - | Ins B |
| Volts Phase C | V | | 72.7.0 | | - | - | Ins C |
| Current Phase A | A | | 31.7.0 | | - | - | Ins A |
| Current Phase B | A | | 51.7.0 | | - | - | Ins B |
| Current Phase C | A | | 71.7.0 | | - | - | Ins C |
| Watts Phase A | kW | | 21.7.0 | | - | - | Ins A |
| Watts Phase B | kW | | 41.7.0 | | - | - | Ins B |
| Watts Phase C | kW | | 61.7.0 | | - | - | Ins C |
| Watts Phase System Import | kW | | 1.7.0 | | - | - | Ins |
| Watts Phase System Export | kW | | 2.7.0 | | - | - | Ins |
| Phase Angle Phase A | - | | 81.7.4 | | - | - | Ins A |
| Phase Angle Phase B | - | | 81.7.15 | | - | - | Ins B |
| Phase Angle Phase C | - | | 81.7.26 | | - | - | Ins C |
| Phase Rotation | - | | C.90.0 | | - | - | Ins |
| Power Factor Phase A | - | | 33.7.0 | | - | - | Ins A |
| Power Factor Phase B | - | | 53.7.0 | | - | - | Ins B |
| Power Factor Phase C | - | | 73.7.0 | | - | - | Ins C |
| PF Phase System | - | | 14.7.0 | | - | - | Ins |
| Frequency Phase A | - | | 34.7.0 | | - | - | Ins A |
| Frequency Phase B | - | | 54.7.0 | | - | - | Ins B |
| Frequency Phase C | - | | 74.7.0 | | - | - | Ins C |

Note 1 - ** Units depend on register selected

* Available for Model Code Feature Set F only

**Figure 8 - Display Table (Instrumentation)**

| **Level 0** (Correct level 0 password [Read only]) |
|---|
| Meter Serial Number |
| Meter Scheme Id |

| **Level 1** (Correct level 1 password [Read only]) |
|---|
| All data listed at level 0 |
| Half hourly values of Load Profile |
| Total cumulative Active Energy |
| Total cumulative Reactive Energy |
| Total cumulative VA |
| Maximum Demand Registers (MD) |
| Time of Use Registers |
| Measurement transformer ratios |
| Measurement transformer error factor |
| Alarm indications |

| **Level 2** (Correct level 2 password [Read and Program]**)** |
|---|
| All data listed in level 0 and 1 |
| Correction to the time and date |
| End of Billing |
| Time set |

| **Level 3** (Correct level 3 password [Read and Program]**)** |
|---|
| All operations listed in levels 0, 1 and 2 |
| Programming |
| Setting the passwords for Levels 1, 2 and 3 |
| Protocol Timeouts |

**Figure 9 – Password Access Levels**

## 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.

### A1 Introduction

Various methods of checking the accuracy of registration of the A1120/40 meter are available. Methods using the LED test indicators and Register advances are described below.

### A2 Checking Meter Accuracy Using the LED Test Indicator

The LED test indicators are configured at manufacture to pulse for import kWh and import kvarh (import only meter) or pulse for import plus export kWh and kvarh (import/export or power flow insensitive meters).

### A2.1 Comparing the number of 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 (set to the same system configuration as the meter under test)

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 right hand Test LED pulses for kWh
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. $\frac{994}{1000}$ (LED count) (meter constant) = 0.994 kWh advance.

Compare this kWh advance with the amount the substandard has advanced.

Repeat for kvarh using left hand Test LED.

### A2.2 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:-

$$\frac{Itest \times V \times Pf \times N \times K}{1000 \times 60}$$

Itest = Test current

V = System voltage

Pf = Power factor of test load

N = Number of system elements

K = LED pulse value, impulses/kWh

## A3 Checking Meter Registration Accuracy from Register Advances

For these methods the advance of the meter register is used rather than the LED Test Indicator.

### A3.1 Using the 'Dial Test' values on the meter display

Meters may be set to show cumulative kWh and kvarh registers with increased resolution by using Power master Unit instructions via the optical or RS232 port. Dial test displays can be programmed to 0, 1, 2, 3 or 4 decimal places.


Import

The display resolution will revert to normal when a further appropriate instruction (Setting power down count to zero) is received, or after a programmable number of power cycles.

**What you will need**

A suitable supply and load or a meter test bench.

Substandard meter with a kWh (kvarh) display.

For each measured quantity:

1. Connect the meter and substandard meter to the supply
2. Instruct the meter to show register to suitable dial test resolution
3. Record initial values of the meter and substandard meter registers
4. Apply a suitable load to cause a significant register advance
5. Switch off the load to stop the register advancing. Leave the supply connected
6. Record the final register readings, compute the advances and compare the meter advance with the substandard advance

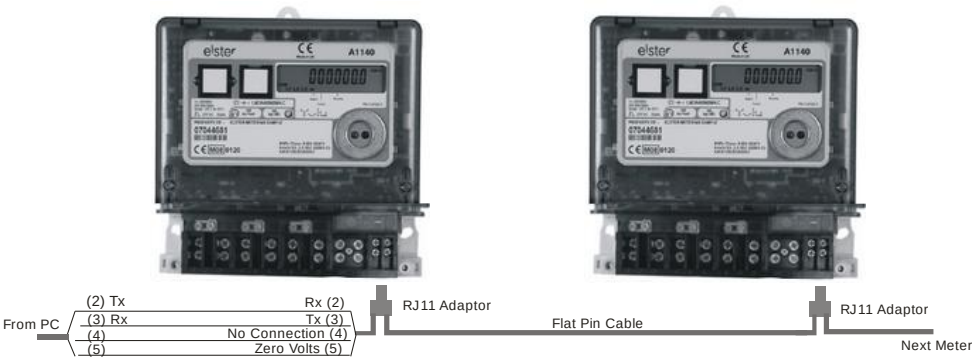
## APPENDIX B - RS232 Multi-drop Mode

A1120/40 meters allow up to 12 meters to be connected in RS232 multi-drop configuration. Two-way RJ11 adaptors will be required to link each meter in the chain.

### B1 RS232 Multi-drop Installation Procedure

The connection diagram for RS232 multi-drop mode is shown below

1. Observe all **Safety Warnings**, **Warnings, Precautions for handling electrostatic discharge sensitive devices** and **EMC Guidelines** in Section 2
2. Remove the terminal cover from the meters. If the terminal cover plate is not in place, switch off all supplies to the meter.
3. Connect a two-way RJ11 adaptor to the RJ11 port of the first meter in the multi-drop chain
4. Connect an RS232 cable from the PC to the first port of the RJ11 as shown below
5. Connect a Flat Pin Cable to the second port of the RJ11 adaptor
6. Replace the terminal cover and fit appropriate seals
7. Connect a two-way RJ11 adaptor to the RJ11 port of the second meter in the multi-drop chain
8. Connect the flat pin cable from the first meter to the RJ11 adaptor of the second meter in the multi-drop chain
9. Connect a Flat Pin Cable to the second port of the RJ11 adaptor
10. Replace the terminal cover and fit appropriate seals
11. Continue as steps 7 to 10 to the next meter
12. When all multi-drop connections are made and all terminal covers are in place, switch on the supplies

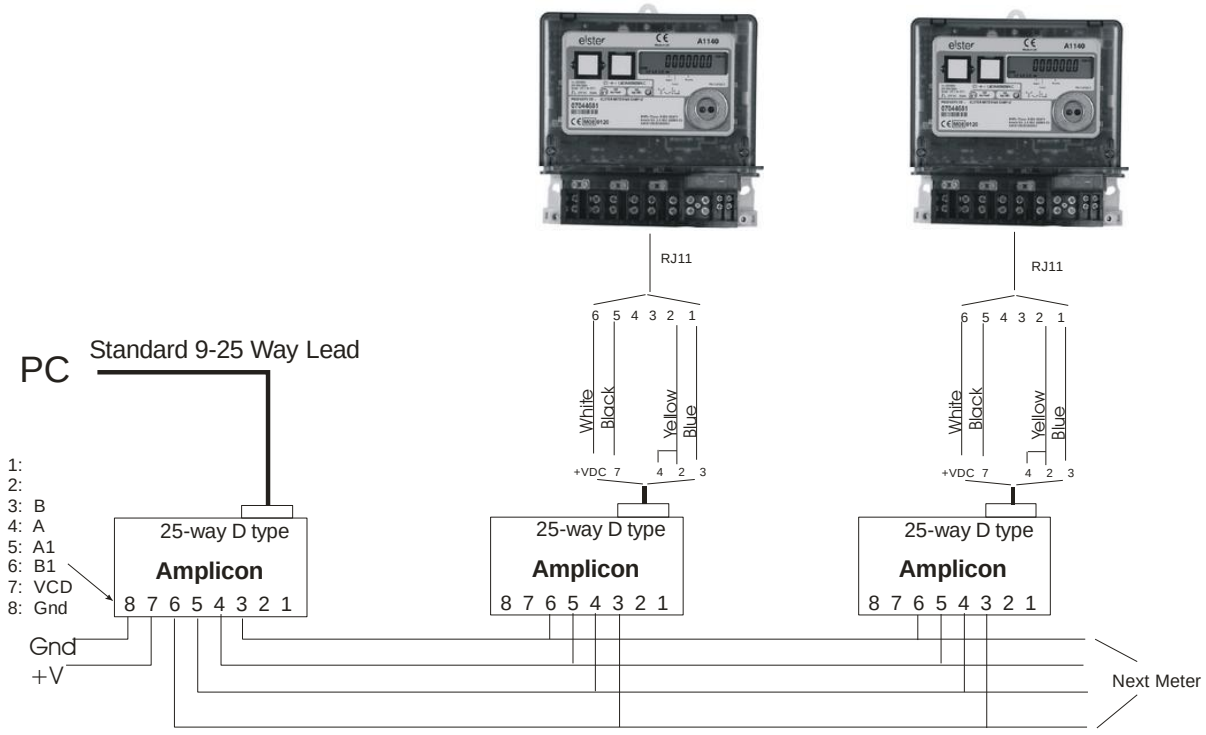



RJ11 Connector

6 5 4 3 2 1

## APPENDIX C - RS485 Multi-drop Mode

A1120/40 meters allow up to 12 meters to be connected in RS485 multi-drop configuration. Two-way RJ11 adaptors will be required to link each meter in the chain.



## APPENDIX D - External Battery Module

### D1 External Battery Module


An External Battery Module can be fitted as an option which allows reading of meter data via the optical port and access to the display facilities during power outages. The battery is housed in the Module Carrier that fits below the meter terminal cover.

The Battery Module connects to the meter via a special ‘Molex’ connector.

The 'Molex' connector is optional. The use of the External Battery Module must be specified at the time the meters are ordered.

#### External Battery Status

The battery voltage is monitored to detect if it has failed. A new battery install date can be programmed and can be read back from the meter.

#### Using the External Battery Facility during Power Outages

The External Battery facility will only operate when power has been removed from the meter. The module is energised by pressing the display pushbutton.

Once the module has been energised-

Displays can cycled in the normal way using the pushbuttons

Meter data can be read via the optical port (note that the communications session will always be completed before power is removed)

External Battery Module power will be removed from the meter if the 'No button time-out' (programmable from 10 to 120 seconds using the Power Master Unit) has expired.

## D2 Installation

WARNINGS

Read Section 2 (Warnings) before installing the Battery Module.

Check that the terminal cover plate is in place before installing the module.
If the terminal cover plate is **not** in place, all supplies to the meter **must** be isolated.

For correctly installed 3 phase 4 wire meters, one of the battery connections will be at 'Mains Neutral' potential. Under fault conditions, this connection could be raised to a 'Fatally Dangerous Potential'.

For 3 phase 3 wire meters, one of the battery connections will be at 'Mains Phase Potential'.

The External Battery Module and its connection leads are double insulated. No attempt should be made to modify the assembly or open the module housing. A replacement assembly must be used if the battery becomes exhausted.

Failure to follow these instructions may result in electric shock or death.

**Installing the Module**

1. Read the **Warnings** above
2. Remove the meter terminal cover
3. If the terminal cover plate is **not** in place, do **not** attempt to install the module unless all supplies to the meter have been isolated
4. Clip the Battery Module over the Terminal Block as shown in Section D1
5. Connect the 'Polarised Molex connector' to the 'Molex socket' making sure the cable is routed in the recess by the 'Terminal Block Screw Holder' as shown in Section D1
6. Replace the terminal cover

**Technical Information**

| | |
|---|---|
| Battery Type | (Alkaline zinc manganese dioxide) +9 Volt PP3 (IEC 6LR61) |
| Battery Life | 5 years with one reading session each month |
| Battery Safety | See Warnings, Section 2 |
| Specifications | 550 mA hours |

## MANUFACTURER'S DECLARATION OF CONFORMITY

**Article 10** Directive 89/336/EEC
**Article 5** Directive 93/68/EEC
**Article 1** Directive 93/465/EEC

**The Product** A1120 and A1140 Meters
Model Numbers:

| | | Followed by any one character from each column: | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L | M | 2<br>3 | A<br>B<br>C<br>L<br>M<br>N | A<br>B<br>C<br>D<br>E | B<br>C<br>E<br>F | N<br>B<br>C | N<br>B | N<br>B | B<br>C<br>D<br>E<br>F<br>G<br>H | B<br>C<br>D<br>E | N<br>P<br>A<br>R<br>S<br>D<br>U | N<br>R | B<br>C<br>D | - | * | * |

**has been designed and manufactured in accordance with the following Harmonised Standards :**

| Number | Date of Issue |
|---|---|
| EN 62052-11 | 2003 |
| EN 62053-21 | 2003 |
| EN 62053-23 | 2003 |

**following the Provisions of the Electromagnetic Compatibility Directive of the European Union as of this day.**

Furthermore, the UK Office of Gas and Electricity Markets (OFGEM) have issued type approval (number 998) for these meter types in accordance with the above named EN standards.

**Issued at Stafford, Staffordshire on this day** 11th April 2007

**By :** Elster Metering Systems
Tollgate Business Park
Beaconside
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Staffordshire ST16 3HS
United Kingdom

**Signed :** 

**Name :** Jeremy Lancaster : Acting Managing Director

**Certificate of Conformity**