A1100

Electronic Polyphase Meter

Operating & Maintenance Instructions

M180 001 1E
7.2005

Contents

1 FOREWORD

HEALTH AND SAFETY

Compliance with Instructions in this Manual

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

The purchaser is responsible for making sure that everyone, whether in his employment or not, who will be associated with the products supplied by 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.

Removal of Terminal Cover

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

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

Removal of the 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.

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 A1100 meter measures active energy, according to the requirements of EN 61036 1996 (plus amendment 1:2000) for indoor kWh meters of protective Class II and accuracy Class 1 or Class 2. 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).

4 APPROVALS

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

5 INTRODUCTION

The A1100 is an electronic polyphase meter for domestic, commercial and light industrial CT or direct connected applications.

Two main versions of the A1100 meter are available. The liquid crystal display version of the meter can be supplied with one or two rates. The meter is available as import only or import and export. The display has a customer defined display sequence that can include security information. Chevrons and legends on the nameplate identify the data being displayed.

The stepper register version of the meter is available for kWh import one rate applications only. Five LED's are used to identify the status of the meter/system.

Communication is provided via the IrDA (Infrared Data Association) port allowing the meter registers and security data to be read electronically using a hand-held device. This greatly reduces the possibility of manual meter reading errors. The meter can be configured at manufacture to provide the same absolute serial data as the IrDA port via the meter auxiliary terminals.

As an alternative to serial data the auxiliary terminals can be configured at manufacture to give SO type kWh consumption pulses.

Automatic Meter Reading (AMR) is facilitated by either the IrDA port, serial data stream or the pulsed output. AMR allows the meter to be read remotely by either radio, mains signalling or over a telephone line. Fast, accurate meter readings can be obtained for use in energy management systems.

Meters can be supplied to meet accuracy Class 1 or Class 2 requirements.

Features

- Accuracy - Class 1 or Class 2
- 3 element or 2 element
- 16 year product life
- Large figure display
- Extensive security data
- IrDA output for transmitting billing, security and status data
- 12 kV isolation
- Compact design
- Double insulated polycarbonate case
- Conforms to DIN 43857 part 2 and part 4 (except for top fixing centres)
- IP53 in accordance with IEC 60529:1989

Options

- Liquid crystal display or mechanical stepper register
- One rate or two rates controlled by an external device
- CT or direct connected
- kWh import or kWh import and export (LCD version only)
- SO output or serial data output configured via the auxiliary terminals
- Extended terminal cover with or without cut-out (See Figure 6)

6 GENERAL DESCRIPTION

6.1 Basic Meter Types

LB… DIN/BS Termination - 8.2mm bores

6.2 Current and Voltage Ratings

Unless otherwise indicated on the nameplate, all meter types are for use with 230V, 50 Hz systems.

A1100	Current (Standard)	Current (Extended)	Voltage
LBxA (direct connected)	20 - 100A (BS)	5 - 100A (BS)	220 - 240V
LBxB (direct connected)	10 - 60A (DIN)	5 - 85A (DIN)	220 - 240V
LBxC (CT operated)	5 -10A	1 - 2A	220 - 240V

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	System Voltage (Nominal)
3	3 phase, 4 wire 2 phases of a 3 phase, 4 wire 2 phase, 3 wire 1 phase, 3 wire 1 phase, 2 wire (LCD version only)	220 - 240V Phase to Neutral
2	3 phase, 3 wire	220 - 240V Phase to Phase

Terminal Arrangements

Current Terminals	8.2mm 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 relevant meter constant (pulses/kWh).

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

6.4 Meter Configurations

LCD Meter

Single rate, kWh

Single rate, kWh import plus reverse (power flow insensitive)

Single rate, kWh with separate import and export registers

Two rate, kWh import

Two rate, kWh import plus reverse (power flow insensitive)

Two rate, kWh with separate import and export registers

Stepper Register Meter

Single rate, kWh import

Single rate, kWh import plus reverse (power flow insensitive)

6.5 Meter Accuracy

The A1100 meter measures active energy, in accordance with the requirements of EN 61036:1996 (plus amendment 1:2000) for indoor kWh meters of protective Class II and accuracy Class 1 or Class 2. Typical accuracy curves are shown in Figure 4.

The meter's temperature coefficient is such that the error variation over the whole operating range is well within the accuracy class.

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

6.6 Meter Case

The meter is supplied with an extended terminal cover. A terminal cover with a cut-out is available as an option (See Figure 6). The terminal arrangements are shown in Figure 5 and Figure 5A.

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 terminal cover is moulded in light beige coloured polycarbonate.

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.

7 TIME OF USE REGISTERS

The time of use input is controlled by an external timeswitch. Where an SO output is not provided, access is available to both ends of the rate select circuit.

The contacts operate as follows:

a) External switch contacts open - rate select terminal open circuit

b) External switch contacts closed - rate select terminal connected to a phase conductor

See Figure 5 (auxiliary configurations) for connections to 3 phase 4 wire or 3 phase 3 wire meters.

According to customer requirement the meter can be configured during manufacture as follows:

Option 1

a)	Energy stored in Rate 1 register
b)	Energy stored in Rate 2 register

or

Option 2

a)	Energy stored in Rate 2 register
b)	Energy stored in Rate 1 register

Following a successful rate change, further rate changes are held off for a 10 minute period.
To aid testing the meter, this mechanism is inhibited for either 1 minute or 1 hour (configured at manufacture) after power up to allow any external rate select devices to be tested.

8 OVER VOLTAGE OPERATION

The meter has been designed to withstand a voltage of √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%.

9 POWER FLOW INSENSITIVE MODE

Power Flow Insensitive Mode is an optional feature that allows the meter to increment its main kWh register regardless of whether the meter is measuring import or reverse energy.

When this option is enabled, the pulsing LED indicates identically for both import and reverse.
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. Power Flow Insensitive Mode is enabled at time of manufacture.

Note: Power Flow Insensitive Mode may not be allowed in certain countries due to local regulations.

10 TEST INDICATOR & ANTI-CREEP

Test Indicator

A red test output LED is provided which pulses in accordance to the following configurations:

Import only meter - The LED pulses for forward energy only

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

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

For loads above import and export starting current, this gives 40ms pulses modulated at approximately 8kHz to provide improved detection by electronic meter test equipment.

Anti-creep

The Wh anti-creep threshold is set at manufacture to a value suitable for the number of elements in the meter. The Test Indicator LED is continuously illuminated when the meter's anti-creep lock is operating.

11 SECURITY FEATURES

Table 1 below shows security features for each meter type:

Table 1

Security Features				
	LCD Meter		Stepper Meter	
Event	LCD*	IrDA/ Serial	LED	IrDA/ Serial
Phase A Present (at time of reading)	✓	✓	✓	✓
Phase B Present (at time of reading)	✓	✓	✓	✓
Phase C Present (at time of reading)	✓	✓	✓	✓
Reverse Event Count	✓	✓		✓
Reverse Run Energy Reading	✓	✓		✓
Reverse Alarm	✓		✓	
Power Fail Count	✓	✓		✓
Phase Fail Count	✓	✓		✓
Elapsed Hours Rate 1	✓	✓		✓
Elapsed Hours Rate 2	✓	✓		
Elapsed Hours Cumulative Display	✓			
Meter Error	✓	✓	✓	✓
Watchdog Reset Count		✓		✓

* Details of how the data is displayed are given in Section 12.3.

11.1 Data Retention

Registration and configuration data is saved to non-volatile memory every time the power to the meter fails, every 2 hours and also on a rate change. The data is recovered when power is restored to the meter.

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

11.2 Phase Present/Phase Fail Indication

Phase indication has the following manufacturing options:

Phase indicator ‘on’ if phase is present (default) or ‘off’ if a phase is present

Phase threshold (default 80% of nominal phase value)

LCD Register Meter - The meter has three chevrons that give visible indication that phase A, phase B and phase C are present.

Stepper Register Meter - The meter has three LED's that give visible indication that phase A, phase B and phase C are present.

Note: The ‘B’ phase indication is not shown on 3phase 3wire meters.

11.3 Recordable Security Features

The list of recordable security features indicates if the data/status is stored in the meter and can be accessed in accordance with Table 1 (See Section 11).

11.3.1 Reverse Energy Flow

Reverse run event count
The meter detects and stores the number of reverse running events to a maximum of 255.
The register will then roll over to 1. An event is detected if, in a single occurrence, an amount of reverse energy exceeding a programmable threshold (default 5Wh) is measured.
Two rate meters store a single count of reverse running events.

Reverse energy reading

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

Reverse energy Alarm (Import meter only)

The reverse run indication can be inhibited at manufacture if required. The indicator will remain displayed until the meter is powered off.

11.3.2 Power Fail Count

A count of the cumulative number of power downs is stored to a maximum of 65,535.
The register will then roll over to 1.

11.3.3 Phase Fail Count

A count of the cumulative number of times any phase has failed is stored to a maximum of 65,535.
The register will then roll over to 1. (Phase failures are stored to non-volatile memory on a two hourly cycle after power up).

11.3.4 Elapsed Hours - Rate 1 and Rate 2

Each complete hour the meter is active in Rate 1 and Rate 2 is recorded in separate registers.

11.4 Meter Errors

The A1100 detects and reports the following errors according to the meter type:

Error Type	LCD Meter	Stepper Register Meter
Hardware	Er 00001	Meter Alarm
Configuration Checksum	Er 00010	Meter Alarm
Billing Data Checksum	Er 00100	Meter Alarm

Example: Er 00011 = Hardware error and Configuration checksum error.

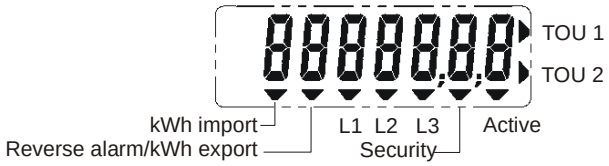
In the unlikely event that any of the above meter errors occur, a catastrophic failure has been detected and the meter should be returned to Elster Metering for failure investigation.

12 METER REGISTER AND DISPLAYS

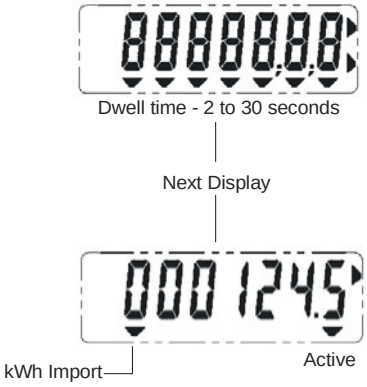
The A1100 meter can be fitted with a mechanical stepper type register or a liquid crystal display. Two rate meters and import/export meters are available only with the LCD meter.

12.1 Liquid Crystal Display

The LCD is a high contrast display that can be viewed from a wide angle. The display characters are 9.8mm high x 3.5mm wide. Nine chevrons identify displayed information. This identification is marked on the nameplate and can be in any language. Typical display sequences and a quick reference to display data are shown in Figure 7.



At power up the segment test pattern is shown. This will remain displayed for a period configurable at manufacture (2 to 30 seconds) called the dwell time. The default dwell time is 6 seconds.
The display will then sequence through the programmed displays, remaining on each display item for one ‘dwell time’.



Note: the values displayed are frozen for the dwell time - even if the source register increments.

12.2 Display Modes

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.

Seven digit resolution to one decimal place
Point separator

Six digit resolution to one decimal place
Comma separator

Seven Digits	Six Digits	Five Digits
1 2 3 4 5 6 7	2 3 4 5 6 7 *	3 4 5 6 7
2 3 4 5 6 7. 8	3 4 5 6 7. 8	4 5 6 7. 8
3 4 5 6 7. 8 9	4 5 6 7. 8 9	5 6 7. 8 9

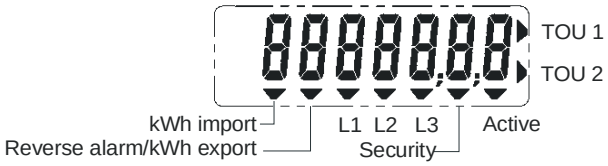
Internal storage is :- 1 2 3 4 5 6 7. 8 9 0

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

* (six digit register with no decimal points).

12.3 Displayable Data

The chevrons on the display have the following meaning:



kWh import currently displayed

kWh export currently displayed (or reverse alarm)

L1 - Phase A present/failed

L2 - Phase B present/failed

L3 - Phase C present/failed

Security data

Active rate – Rate displayed is currently active

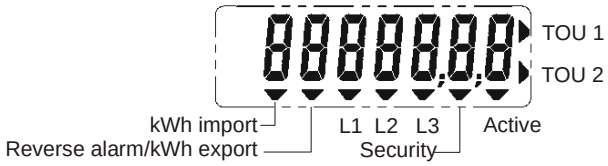
TOU 1 currently displayed

TOU 2 currently displayed

The following data items may be included in the display sequence, in the order shown.

Segment Test Pattern

The test display is always displayed at power up.
All segments should be 'on'.
The test pattern is optional in the display sequence.



Dial Test

Dial test can be displayed as a manufacturing option for the first one hour or two hours after power up. Dial test mode is a meter calibration aid that shifts the register two decimal places to the left.

Normal 1 2 3 4 5 6 kWh

Test 3 4 5 6. 7 8 kWh

The mode is displayed for import kWh (import only meters) or import and export kWh (import/export meters).

Import/Export Meter

Displayed Chevrons	Action
1 - kWh Import	Dial test for kWh import
2 - kWh Export	Dial test for kWh export

kWh Import

One or two rate meters are available. The active chevron (7) and the TOU chevrons are not used for a one rate meter.

1 Rate Meter

kWh

Displayed Chevrons	Action
1 - kWh import	Import kWh

2 Rate Meter

kWh, Rate 1, Active

kWh, Rate 2

kWh, Cumulative

Displayed Chevrons	Action
1 - kWh Import	Import kWh
7 - Active	The rate displayed is currently active
TOU 1	TOU 1 import kWh register reading
TOU 2	TOU 2 import kWh register reading
TOU 1 and TOU 2	Cumulative (TOU 1 plus TOU 2) register reading

Import/Export Meters

One or two rate import/export meters are available. The chevron action is identical to the import only meter with the exception of chevron 2 that identifies export energy.

Single Rate

kWh Export

Displayed Chevrons	Action
2 - kWh export	Export kWh

2 Rate

kWh Export, Rate 1 Active

kWh Export, Rate 2

kWh Export, Cumulative

Displayed Chevrons	Action
2 - kWh Export	Exporting kWh
7 - Active	The rate displayed is currently active
TOU 1	TOU 1 export kWh register reading
TOU 2	TOU 2 export kWh register reading
TOU 1 and TOU 2	Cumulative export kWh (TOU 1 plus TOU 2) register reading

Phase Present/Phase Failure

Three Chevrons are used to indicate if a phase is present or failed. Chevron 3 (phase A), chevron 4 (phase B) and chevron 5 (phase C) can be programmed at manufacture to be 'on' (default condition) if a phase is present or to be 'off' when a phase is present. The number of times a phase has failed is also stored (see phase fail counter).

Chevrons programmed to be 'on' when a phase is present (3 phase 4 wire meter)

Phase B failed | Phase C failed | Phase B and C failed

Note: For 3 phase, 3 wire system (only two phases being used), chevron L2 (phase B) is not used and is not marked on the meter nameplate.

Phase Failure and Security Data

Elapsed Time

Each full hour the meter has been active in Rate 1and Rate 2 is recorded and can be included in the display sequence. The cumulative (Rate 1 + Rate 2) can also be included in the display sequence.

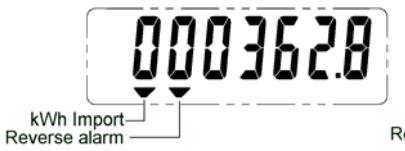
Note: After 99,999 hours (11.4 years) the counter will continue to increment normally but the display will appear to wrap to zero.

Time in Rate 1 | Time in Rate 2 | Cumulative Time

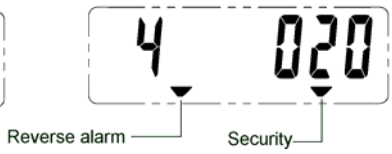
Displayed Chevron	Reference Indicator	Action
6 - Security	1	Time in Rate 1
6 - Security	2	Time in Rate 2
6 - Security	3	Cumulative Hours

Reverse Run

For import only meters, chevron 2 (Reverse alarm) is illuminated and locked on the display if a reverse run event is detected. The reverse run alarm is cleared when the meter is powered down. A count of the number of reverse run events (up to 255) and the amount of energy consumed when the meter is in reverse can be included in the display sequence. Note that for energy consumed the display is truncated to five digits.



Reverse alarm set



Count of reverse events
Reverse alarm set

Reverse energy consumed
Reverse alarm cleared

Displayed Chevron	Reference Indicator	Action
2 - Reverse alarm	-	Reverse run event detected
6 - Security	4	Count (maximum 255) of reverse run events
6 - Security	5	Amount of energy consumed in reverse

Power Fail Count

A Power Fail Counter is incremented each time the meter is powered up. This count (maximum 65535) can be included in the display sequence.

Displayed Chevron	Reference Indicator	Action
6 - Security	6	Power Fail Counter

Phase Failure Count

Each time a phase failure is detected a counter is incremented. This count (maximum 65535) can be included in the display sequence.

Displayed Chevron	Reference Indicator	Action
6 - Security	7	Phase Failure Counter

12.4 Display Multiplier (CT operated meters)

The CT operated meter does not allow a CT ratio to be entered into the meter, only a transformer secondary value. To calculate the actual meter reading the displayed value must be multiplied by the transformer ratio.

12.5 Meter Errors

LCD Meter

Errors for the LCD meter are shown in the following format:

Error	Description
Er00001	Hardware error
Er00010	Configuration checksum error
Er00100	Billing data checksum error

The example shows 'Configuration Checksum error'.

If an error has occurred it will be displayed after each normal display in the display sequence. If no errors exist the display is skipped.

There is an option to disable the error display.

12.6 Mechanical Stepper Type Register

Stepper Meter Register

The mechanical stepper register has 7 number wheels, with digits 6.7mm high x 3.5mm wide. The most significant digit of the register can be blanked off by fitting a special nameplate to the meter at manufacture. Nameplate information can be in any language.
The register has 1/10 kWh resolution for direct connected meters and 1/100 kWh resolution for CT connected meters. The decimal point number wheels are red.

Seven number wheels:	1	2	3	4	5	6.	7
	1	2	3	4	5.	6	7
Six number wheels:		2	3	4	5	6.	7
		2	3	4	5.	6	7

13 COMMUNICATIONS

Communications to external equipment is provided via the IrDA (Infrared Data Association) communications port. There is an option to provide the same absolute data via the auxiliary terminals.

13.1 IrDA Communications

The IrDA (Infrared Data Association) communications port provides one way communications, continuously transmitting a data stream from the meter to an external device. The data stream includes a start and end mechanism, ensuring only a complete stream of data is recorded.

An error-checking algorithm protects the integrity of the data stream. The data stream uses the OBIS data format (see Appendix A for a description of the data format).

IrDA communications offer low cost, low power consumption and high noise immunity.

A manufacturing option allows the port to be set to transmit at one the following baud rates: 2400 (default rate), 4800 or 9600. The port will transmit over a distance of 250mm.

A typical device to read the IrDA output is a Laptop Computers with a communications probe or a PDA with an IrDA interface.

13.2 Optional Serial Data Port

The auxiliary terminals can be configured at manufacture to transmit the same absolute data stream as the IrDA port. The format of the data steam (See Appendix A) is non-standard 'return to zero' and requires the use of a special external interface. If this option is used the baud rate is the same for both ports and can be set to either 2400 or 4800 baud. The port will transmit over a distance of up to 3m.

13.3 Transmitted Data

The following data is available via the IrDA and Serial Data port (optional):

1. Absolute meter readings
2. Security register, status and identification data

The following data is transmitted via the IrDA port and serial data port.

- Product Code (Product code number)
- Firmware Rev Code (Firmware revision)
- Manufacturing Serial Number (Specified serial number)
- Utility Serial Number (Utility specified serial number - 16 character maximum))
- Configuration Number (Programmed configuration)
- Energy Registers (Including reverse run energy reading)
- Status Flags Including present import/export status
- Phase Failure(s) Phase(s) failed at time of reading
- Error Flags
- Rate 1 Time Number of whole hours Rate 1 has been active
- Rate 2 Time Number of whole hours Rate 2 has been active
- Power Fail Count Total number of power fails
- Watchdog Reset Count Total number of watchdog timer resets
- Reverse Energy Event Count Number of times reverse energy was detected
- Phase Fail Count Number of phase failures

Note: For the data format of the IrDA output, see Appendix A.

14 PULSING OUTPUT

An opto-isolated pulsing output can be provided as an option. The output is available in the following configurations:

Single rate meter - The output is connected to the meter's two auxiliary terminals and is fully isolated.

Two rate meter - The output is referenced to neutral and brought out to one auxiliary terminal.

For 3 phase 4 wire meters the meter is non-isolated.

For 3 phase 3 wire meters the meter isolated.

The output will provide pulses proportional to:

- Import pulses only (Import kWh meter)
- Import + export pulses (Import/export meters and power flow insensitive meters)

The pulsed output pulse value can be configured independently of the test indicator pulse value. The pulse duration is set at manufacture to one of the values shown below.

Output Characteristics

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

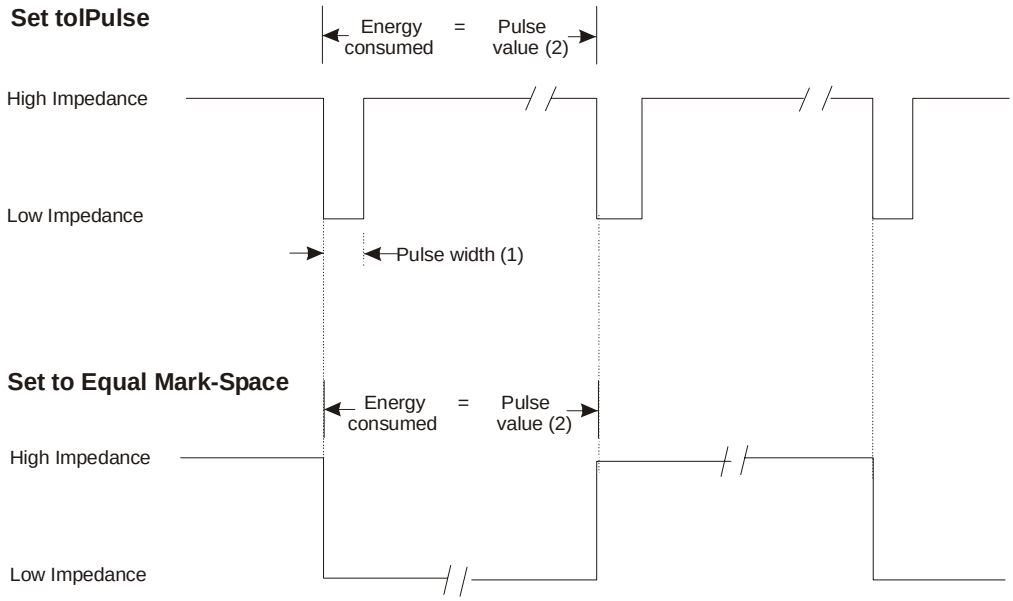
The pulse/kWh and pulse width is configured as indicated below.

Pulse width (ms)	10, 20, 30, 40, 50, 60, 80, 100, 120, 160, 200, 250 or equal mark-space (1)
Pulses/kWh	10, 20, 25, 50, 100, 200, 250, 500 or 1000 (Direct connected) 100, 200, 250, 500, 1000, 2000, 2500, 5000 or 10000 (CT operated)
Wh/pulse (2)	100, 50, 40, 20, 10, 5, 4, 2 or 1 (Direct connected) 10, 5, 4, 2, 1, 0.5, 0.4, 0.2, or 0.1 (CT operated)
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

(1), (2) see below re: representation of consumption.

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

Pulsing Output



Note: When configured for equal mark-space, each transition indicates the consumption of the specified energy value.

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

See Figure 5 (Terminal Arrangements) for connections.

15 AUXILIARY VOLTAGE TERMINALS

As an option the A1100 can be supplied with additional terminals that allow external equipment to be powered from the meter (See Figure 5).

16 TECHNICAL DATA

Current: Standard Range (Direct connected) Extended Range (Direct connected) Standard Range (CT operated) Extended Range (CT operated) Frequency Reference Voltages Voltage Operating Range System Connection - 2 element meter - 3 element meter	20 - 100A (BS), 10 – 60A (DIN) 5 - 100A (BS), 5 – 85A (DIN) 5 - 10A 1 - 2A 50 Hz 220-230-240V (3ph, 4wire), 220-230-240 (3ph-3wire) +/- 20% 3 phase 3 wire 3 phase 4 wire 2 phases of a 3 phase 4 wire 2 phase 3 wire 1 phase 3 wire 1 phase 2 wire (LCD meter only)
Starting Current Short Circuit Current Burden of Voltage Circuits 230V Burden of Current Circuits (10 – 100A meter) Dielectric Strength Impulse Withstand	0.004Ib (Class 1), 0.005Ib (Class 2) 30 Imax 0.9W, 9VA capacitive burden per phase [max] 2VA at 100A per phase [max] 4kV RMS 12kV 1.2/50µs 50 ohm source
Display Stepper Register	LCD 9.8 x 3.5mm characters, high contrast, wide viewing angle 7 digits, each 6.7mm x 3.5mm. 1/10 or 1/100 kWh resolution
Meter Constant (pulsing LED output)	500 p/kWh (Direct Connected) 5000p/kWh (CT Operated)
Pulse Output Specification Max Rating Pulse Width/value (Default)	IEC 62053-31 (Transistor Output) 27V d.c. 27 mA 100 ms pulse 500p/kWh (= 5Wh/pulse)
Product Life Certified Life	16 years 10 years
Temperature Humidity	Operational range: -40° C to +55° C Limit Range: -40° C to +65° C Storage Range: -40° C to +85° C Annual Mean 75% (95% for 30 days spread over one year)
Dimensions Weight	221mm (High) x 174 mm (Wide) x 50mm (Deep) 904 grams (LCD Meter) 943 grams (Stepper Meter)
Accuracy Class kWh	Class 1 or Class 2 - EN 61036:1996 (plus amendment 1:2000)
Case	DIN 43857 Part 2 and Part 4 (except for top fixing centre) IP53 to IEC 60529:1989 EMC Directive 89/336/EEC
Terminals Main Auxiliary Auxiliary Voltage	8.2mm bores, M6 Terminal Screws – max torque 3.0 N m 3.2 mm bores, M3 Terminal Screws – max torque 0.45 N m 3.2 mm bores, M3 Terminal Screws – max torque 0.45 N m

Note 1 The contrast of the LCD may be impaired at temperatures lower than -20° C. This will not however damage the display and the contrast will return to normal when the temperature rises above -20° C.

17 INSTALLATION

17.1 Unpacking

Remove the meter from it's 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 meter seals will invalidate certification.

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

17.2 Handling

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

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

17.3 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: -40° C to +85° C

17.4 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.

17.5 Electromagnetic Compatibility (EMC)

The A1700 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 circuits must be bunched together to minimise the loop area enclosed

4. 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
5. Ancillary equipment must also be CE marked
6. If interposing relays are used (a.c. or d.c.) then these must be correctly and adequately suppressed

17.6 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 current circuits, 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.

For TOU circuits the phase supply to the timeswitch contact MUST be protected by a fuse rated at a maximum of 2A.

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 are 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-bored 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, 3.0N m maximum.

Connections to rate select and/or pulsing output auxiliary terminals should be completed with appropriately sized cable. The M3 terminal screw should be tightened using a Number 1 Phillips or flat blade screwdriver to a maximum torque of 0.45N m.

Note the requirements to adequately fuse the TOU Circuit.

18 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 pulse LED is illuminated or flashing

Check the operation of the pulse output (if fitted)

Check operation of the serial data output (if fitted)

Carry out load checks as necessary

Confirm the operation of rate select for 2-rate meters

Note: After an initial 'test' period, the meter will only respond to a rate change if at least 10 minutes has elapsed since the meter last changed rate.

19 MAINTENANCE

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

20 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.

	MODEL													
	TYPE (nameplate)													
	Example:	L	B	3	A	A	B	B	B	S	N	N	S	-	A	N
PRODUCT/TERMINATION																
Poly- Phase, BS/DIN termination		L	B													
SERVICE TYPE																
3Ph 4W (Plus 1 ph 2w for LCD version)				3												
3ph 3w				2												
CURRENT RANGE																
Direct Connected 20A – 100A Standard Range (For extended range see note 1)					A											
Direct Connected 10A – 60A (For extended range, see note 1)					B											
CT Operated 5A – 10A Standard Range IEC 61036 (for extended range see note 1)					D											
VOLTAGE																
220 – 240V (L-N) (See note 2 for Ref voltage ranges) (LB3****** variants)						A										
220 – 240V (L-L) (See note 2 for Ref voltage ranges) (LB2****** variants)						B										
105 – 127V (L–N)) (See note 2 for Ref voltage ranges) (LB3****** variants) Not OFGEM						C										
105 – 127V (L–N)) (See note 2 for Ref voltage ranges) (LB2****** variants) Approved						D										
ACCURACY CLASS																
Class 1 50 Hz (EN 61036 see note 1 & 2)							B									
Class 2 50 Hz (EN 61036 see note 1 & 2)							C									
Class 1 60 Hz (EN 61036 see note 1 & 2) Not OFGEM							E									
Class 2 60 Hz (EN 61036 see note 1 & 2) Approved							F									
TARIFF CONFIGURATION Source of import register configured at time of manufacture																
Mechanical & LCD																
Single Rate kWh import only								B								
LCD Only																
Single Rate kWh Import register and Export register								D								
Two Rate kWh Import only, switch to any live (3ph 4w)								R								
Two Rate kWh Import register and export register switched to any live (3ph 4w)								T								
Two Rate kWh Import only floating 2 auxiliary terminals								V								
Two Rate kWh Import register and Export register floating 2 auxiliary terminals								X								
DISPLAY CONFIGURATION (see option tables)																
Mechanical																
Mechanical Register 7 digit 1/10 kWh resolution (Direct connected)									B							
Mechanical Register 6 digit 1/10 kWh resolution (Direct connected)									C							
Mechanical Register 7 digit 1/100 kWh resolution (CT connected)									D							
Mechanical Register 6 digit 1/100 kWh resolution (CT connected)									E							
LCD Only																
Customer specific display configuration loaded at time of manufacture									S							
DISPLAY CYCLE (LCD Only)																
Customer specific display sequence loaded at time of manufacture										S						
AUXILIARY OUTPUT (see important note 3 overleaf and option tables)																
No Output											N					
SO (Pulsing) tied to neutral 1 auxiliary terminal (Not 2 rate floating) 3 phase 4 wire only											P					
SO (Pulsing) floating 2 auxiliary terminals (1-Rate only)											Q					
IrDA tied to neutral 1 auxiliary terminal (Not 2 rate floating) 3 phase 4 wire only)											S					
IrDA floating 2 auxiliary terminals (1 Rate only)											T					
IrDA floating 2 auxiliary terminals (RJ 11 connector only) – Sweden only)											V					
COMMUNICATIONS																
IrDA optical serial port, data rate set at time of manufacture to 2400, 4800 or 9600												S				
OTHER OPTIONS																
Standard (Extended) Terminal cover													B			
Standard (Extended) Terminal cover with cut-out													C			
Standard (Extended) Terminal cover plus 9.5mm main terminal bores													D			
VERSION																
Original (changed to denote hardware and firmware changes, not functionality														-	A	
SPECIAL ADDITIONS																
None available																N
Additional 2 screw voltage terminal																A

Figure 1 - Model Code

Notes

Note 1:- IEC/EN 61036 defines **only** Basic and Maximum currents as follows:

Basic Current (Ib) **Direct Connected (DIN Range)**	Standard values: 10, 15, 20, 30, 40, 50A Extended Range: 5A
Basic Current (Ib) **Direct Connected (BS Range)**	Standard values: 20, 30, 40, 50A Extended Range: 5, 10, 15A Exceptional values: 80A
Basic Current (In) **CT Operated (BS/DIN Range)**	Standard value: 5A Extended range: 1A, 2A Exceptional Value: 2.5A

Maximum current (Imax**) Direct Connected**

DIN shall preferably be an integral multiple of Ib ***up to a maximum of 60A***

(e.g. 6 x basic current). Due to 8mm termination the range can be extended to 85A

BS shall preferably be an integral multiple of Ib ***up to a maximum of 100A***

(e.g. up to 5 x basic current for Ib = 20, range can be extended to 10A Ib)

Maximum current (Imax) **CT Operated**

BS/DIN shall have maximum currents of 1.2 In, 1.5 In and 2 In
e.g. for In 5A I max = 6A (1.2 x 5A), or Imax = 7.5A (1.5 x 5A), or I max = 10A (2 x 5A)
e.g. for In 1A I max = 1.2A (1.2 x 1A), or Imax = 1.5A (1.5 x 1A), or I max = 2A (2 x 1A)

Note 2:- IEC/EN 61036 defines the following relevant reference voltages:

Ref Voltage (V_{ref}) for **Direct connected**	Std values 230V Exceptional values 220, 240V

Meters with reference 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 reference 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:- PULSE OUTPUT VALUES

The following values are for the Test Indicator LED output

Direct Connected: 500 p/kWh

CT Operated: 5000 p/kWh (CT ratio cannot be entered

Figure 1A - Model Code (continued)

1	Nameplate (see Figure 3)
2	Display (see Section 12.1)
3	Chevron Indicators (see Section 12.1)
4	Pulse LED (see Section 10)
5	IrDA Port LED (see Section 13.1)

Figure 2 – Liquid Crystal Display Meter

1	Nameplate (see Figure 3)
2	Stepper Motor Register (see Section 12.6)
3	Meter Alarm LED (see Section 11.4)
4	Reverse Run LED (see Section 11.3.1)
5	Phase Present/Phase Failed LED's L1, L2 and L3 (see Section 11.2)
6	Pulse LED (see Section 10)
7	IrDA Port LED (see Section 13.1)

Figure 2A – Stepper Register Meter

LCD Nameplate

Stepper Register Nameplate

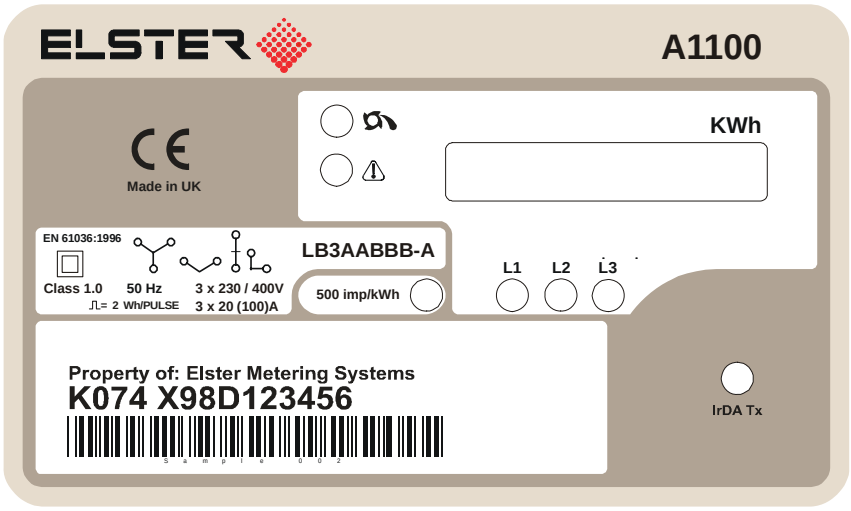
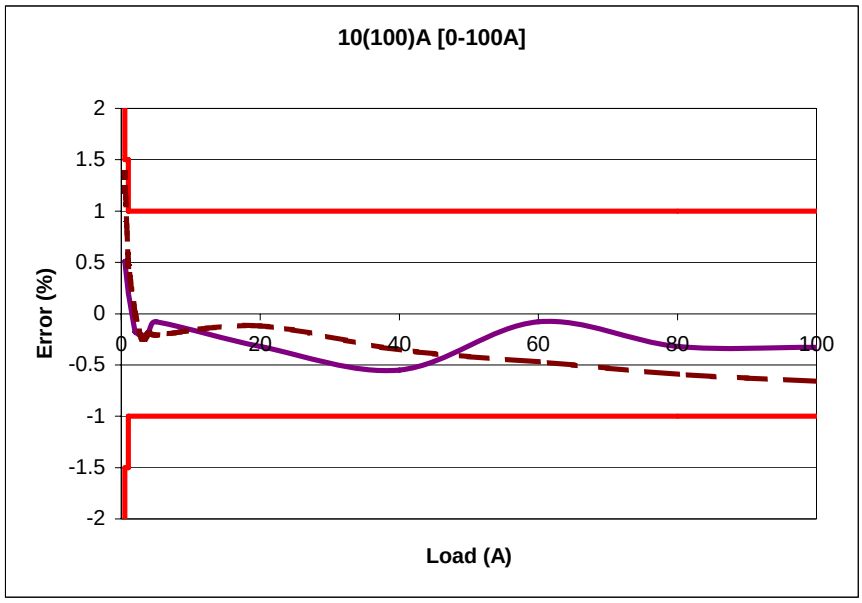
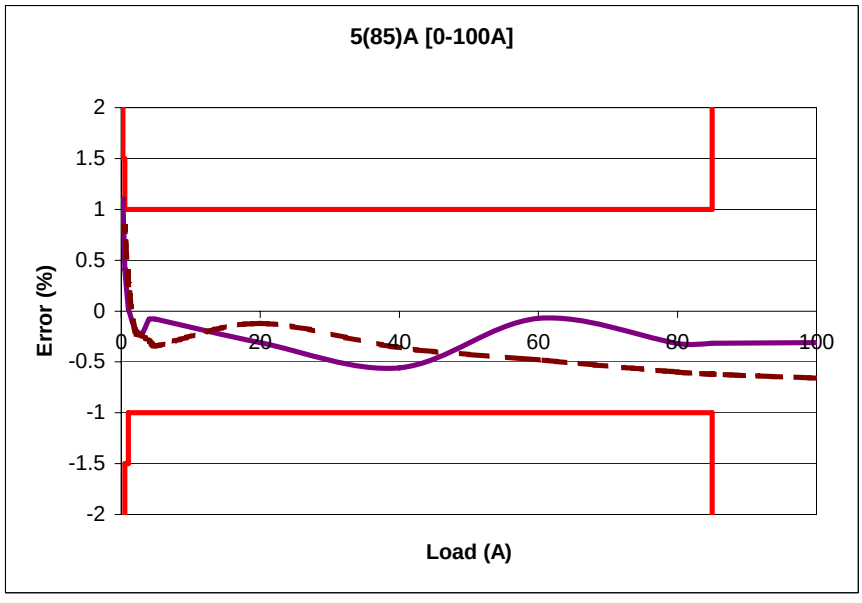


Figure 3 - Nameplates

Load Curve 10 – 100A Meter



Load Curve 5 – 85A Meter



Legend:

Class 1 +ve/-ve UPF Limit

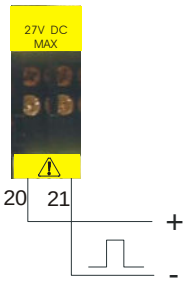
UPF Error

0.5PF Lag Error

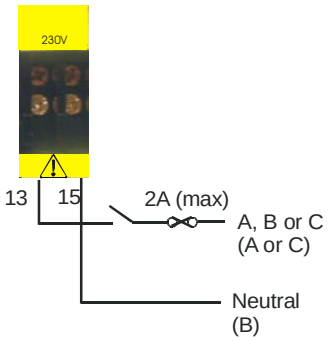
Figure 4 - Load Curves (Class 1 Limits)

Auxiliary Configurations 3phase 4 wire meters

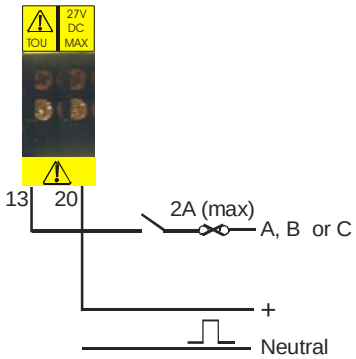
Note: Connections available for 3 phase 3 wire meters are shown in brackets



Floating SO



Two Rate (No SO)



SO and Two Rate

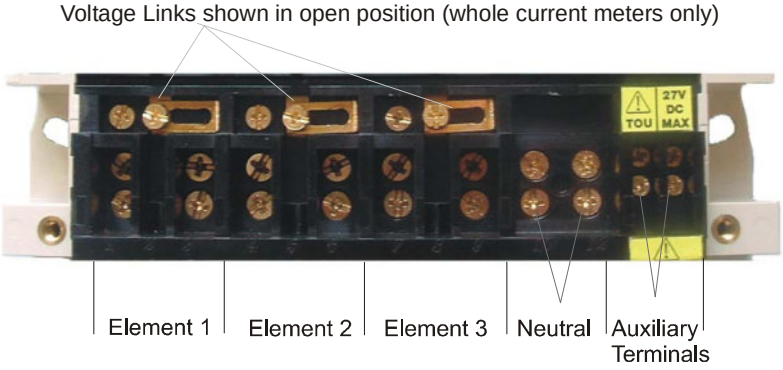
Terminal Numbering

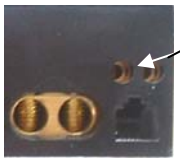
1 2 3	Element 1 - Line in - Voltage terminal - Line out
4 5 6	Element 2 - Line In - Voltage Terminal - Line Out
7 8 9	Element 3 - Line In - Voltage Terminal - Line Out
10 12	Neutral In Neutral Out
Auxiliary	See Auxiliary configurations above

Auxiliary Voltage Terminals (Optional)

Terminal Block

Voltage Links shown in open position (whole current meters only)



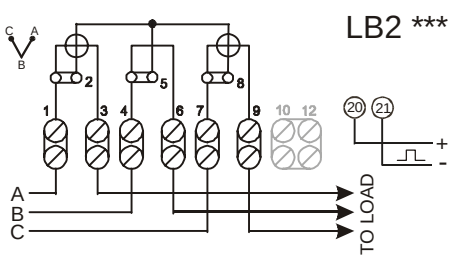


Note: These diagrams are examples only.

WARNING

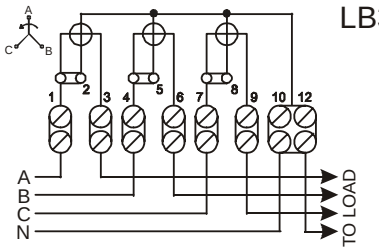
Meters must be wired as shown on the diagram fitted under the meter terminal cover.

Figure 5 - Terminal Arrangements



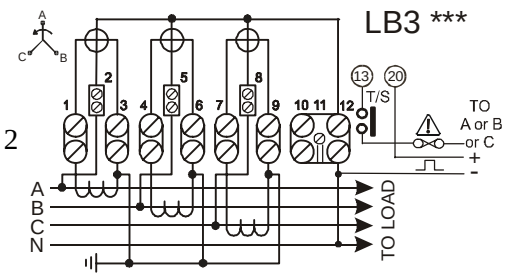
	A	B	C
3Ø 3W	1 3	4 6	7 9

3ph 3w, direct connected, pulsed output



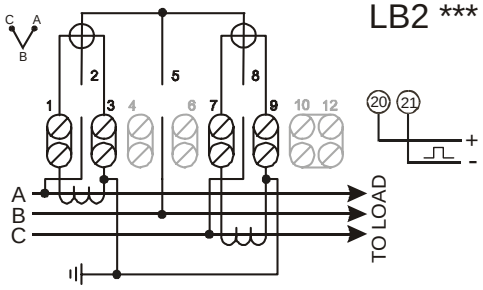
	A/A1	B	C/A2	N
3Ø 4W	1 3	4 6	7 9	10/12
2Ø or 3Ø 4W	1 3		7 9	10/12
2Ø 3W	1 3		7 9	10/12
1Ø 3W	1 3		7 9	10/12
1Ø 2W	1 3			10/12

3ph 4w, direct connected



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

Rate, 3ph 4w, CT operated, pulsed output (tied to neutral)



	A	B	C
3Ø 3W	2 1 3	5	8 7 9

Note: 1ph 2w connection is not available for stepper register meters

Note: These diagrams are examples only.

WARNING

Meters must be wired as shown on the diagram fitted under the meter terminal cover.

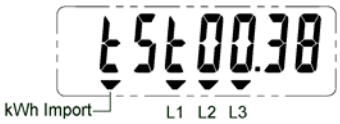
Figure 5A – Terminal Configurations

Figure 6 – Dimensions, Fixing Centres and Terminal Cover with Cut-out

Display 1

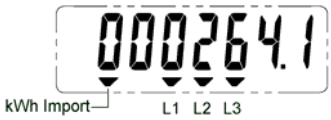
Segment Test

Display 2



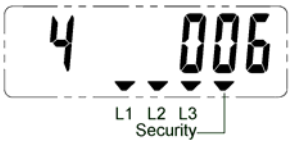
Dial Test Display
For 1 or 2 hours after each power up

Display 3



kWh Cumulative

Display 4



Reverse Run Count

Display 5

Reverse Energy kWh

Chevron Position on Display With Typical Nameplate

1. kWh import
2. Reverse alarm (or export kWh)
3. L1 - Phase A present/failed
4. L2 - Phase B present/failed
5. L3 - Phase C present/failed
6. Security data

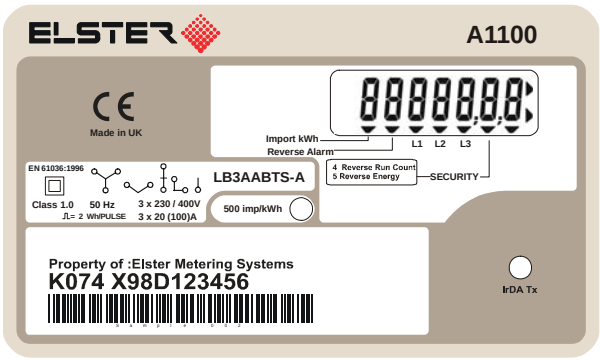


Figure 7 - Typical Single Rate Import Meter Display

Display 1

Segment Test

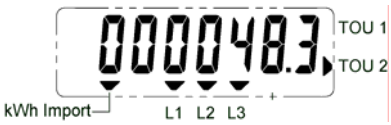
Display 2

kWh Import - Cumulative

Display 3

kWh Import - Rate 1
- Rate 1 Active

Display 4

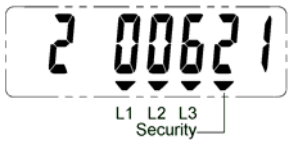


kWh Import - Rate 2
- Rate 2 not Active

Display 5

Hours in Rate 1

Display 6



Hours in Rate 2

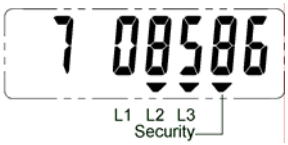
Display 7

Cumulative Hours
Rate 1 Plus Rate 2

Display 8

Power Fail Count

Display 9



Phase Fail Count
Phase A Not present

Chevron Position on Display with Typical Nameplate

1. kWh
2. Reverse alarm
3. L1 - Phase A present/failed
4. L2 - Phase B present/failed
5. L3 - Phase C present/failed
6. Security data
7. Active tariff
8. TOU 1 - Rate 1 kWh
9. TOU 2 - Rate 2 kWh

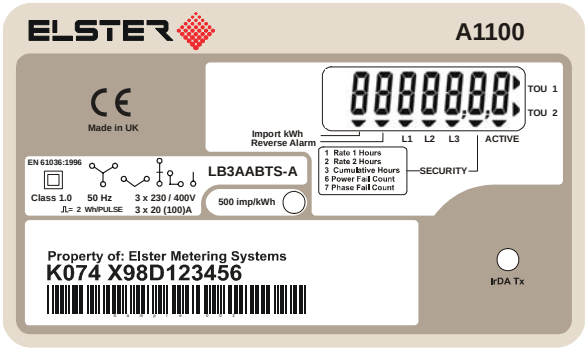
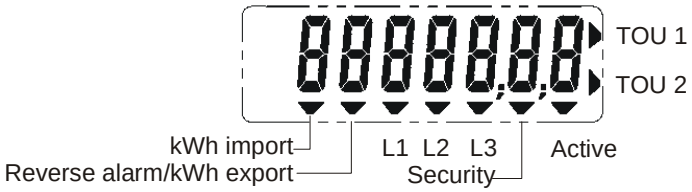


Figure 7A - Typical Two Rate Import Meter Display



Chevron	**Function**
1 - Import	Import kWh
2 - Reverse Alarm 2 - Export	Import meter only (optional at manufacture) Export meter only
3 - L1 Phase A Present 4 - L2 Phase B Present 5 - L3 Phase C Present	Chevron 'On' for phase present (default) Chevron 'Off' for phase present (manufacturing option)
6 - Security	See below
7 - Active	2 rate meter only
8 - TOU 1 9 - TOU 2	2 rate meter only 2 rate meter only

Security Identifier		**Display Identifier (Optional in display sequence)**
Elapsed Time	1	Time in rate 1
	2	Time in rate 2
	3	Cumulative time (rate 1 plus rate 2)
Reverse Run	4	Count of reverse run events
	5	Reverse energy consumed
Power Fail	6	Power fail count
Phase Fail	7	Phase fail count

Other Options	**Option (set at manufacture)**
Number of Digits	5, 6 or 7
Decimal Point Separator	Point or comma
Number of Decimal Places	2 or 1
Display Dwell Time	2 to 30 seconds
Dial Test	For 1 or 2 hours after power up

Error Reporting	**Error (Optional)**
Hardware Error	Er00001
Configuration Checksum Error	Er00010
Billing Data Checksum Error	Er00100

Figure 7B – Display Data (LCD Meter)

APPENDIX A – IRDA DATA FORMATS

A1 Introduction

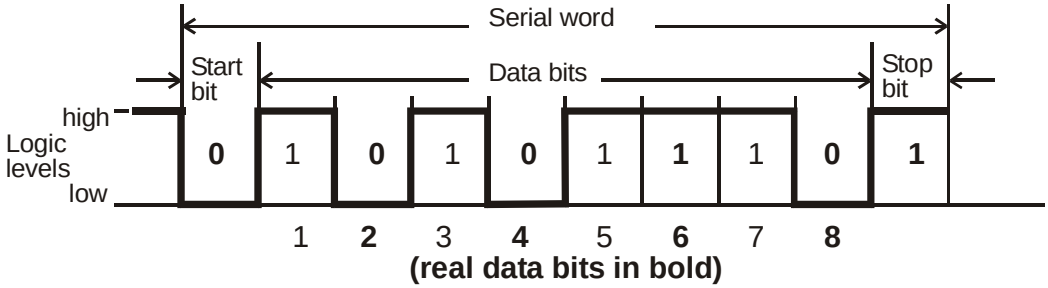
The A1100 uses the **OBIS** (**OB**ject **I**dentification **S**ystem to IEC 62056-61) data identifiers to transmit data via its IrDA Port and serial data port. The port continuously transmits the meters registration, security and status data.

The IrDA baud rate is configurable at manufacture to 2400, 4800 or 9600 baud. A PC or a PDA with an IrDA optical probe can be used to read the IrDA data.

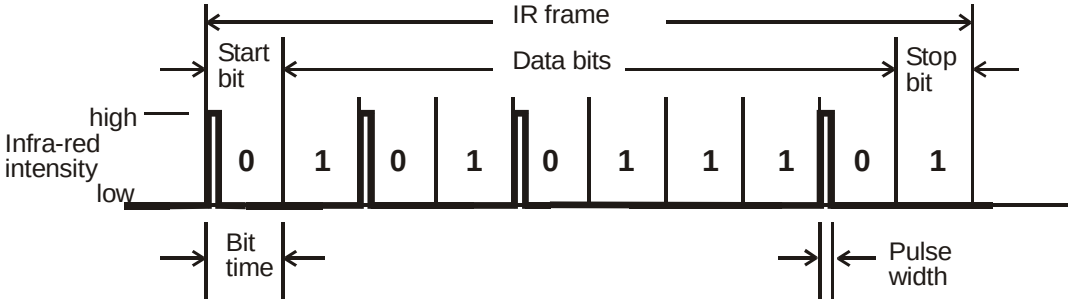
A2 IrDA Output Message

The port transmits registration, security and status data once every 4 seconds. The format of each data word is shown below:

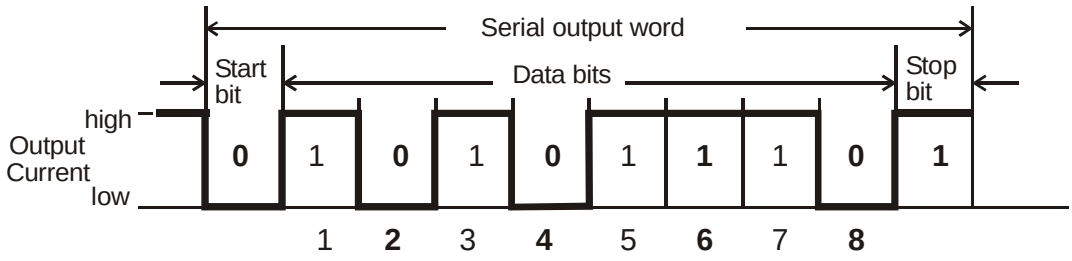
Serial Word Format



IrDA Output



Serial Data Output



Note: each IR frame only carries one nibble of data.
For the IrDA output a pulse of approximately 5µs is output on the occurrence of a logic ‘1’ to ‘0’ transition. No output is present when a logic ‘1’ is transmitted.

For the serial data output the bit period is set by the baud rate.

A3 IrDA Data Bits

Each serial word transmitted contains eight data bits plus the Start and Stop bits.

These data bits actually only represent one nibble, four bits, of real data – these bits are interspersed with a logic‘1’ to achieve the logic‘1’ to logic‘0’ transition thereby creating an infra-red pulse when a real data bit is logic‘0’.

Consequently, a real data byte of 8 bits is transmitted as two serial words. The low nibble is transmitted first, followed by the high nibble.

For example, if the real data byte is **51h** then the transmitted data will be two serial words representing **01h** followed by **05h**, but since the bits within the nibbles are separated by logic‘1’s the actual transmitted data will be:-

01h = 0000**0001**b => **0**1**0**1**0**1**1**1b = **57h**

05h = 0000**0101**b => **0**1**1**1**0**1**1**1b = **77h**

Note that the bits are actually transmitted least significant bit first – thereby the first data bit is always a logic’1’.

Transmission Translation Table :-

Data Nibble (4 bit hex)	Transmitted Data (8 bit hex)
0	55
1	57
2	5D
3	5F
4	75
5	77
6	7D
7	7F
8	D5
9	D7
A	DD
B	DF
C	F5
D	F7
E	FD
F	FF

A4 IrDA Message Format

The IrDA message format is as follows:

SOH	FMT 1	FMT 2	STX	DATA	ETX	BCC
01	NN	NN	02	NN NN …	03	NN

SOH	Start of header character (hex 01).
FMT 1	Indicates the format of the data stream. Hex 4F: ASCII ‘O’ describes OBIS Codes.
FMT 2	Hex 42: ASCII ‘B’ for OBIS Codes
STX	Start of text character (hex 02).
DATA	Meter registration, security and status - complete with OBIS Codes.
ETX	End of text character (hex 03).
BCC	One’s complement binary checksum of all message bytes between SOH and ETX (inclusive) – including OBIS Codes.

A5 IrDA Transmission Table: Status and Billing Data

This table contains status and billing data that is transmitted over the IrDA port. The table cannot be accessed via the manufacturing communications protocol. The table is made up of non-contiguous memory. It includes data stored in RAM, ROM, and EEPROM.

FIELD NAME	OBIS Code	Description
Product Code	**96.1.1**	Product code. Eg: "A1100"
Firmware Rev Code	**0.2.0**	Firmware revision code. Eg: "2-01162-A"
Mfg Serial Number	**96.1.0**	Manufacturing serial number Eg. “000000”
Utility Serial Number	**0.0.0**	Utility-specified serial number Eg. “0000000000000000”
Configuration Number	**0.2.1**	Copy of configuration number. Stored in EEPROM Eg. “0000”
R1 kWh	**1.8.1** **128.8.1**	Rate 1 Import Register (kWh) Value: 0000000.0 – 9999999.9 For Power flow Insensitive meters, this register holds the sum of Import and Reverse for Rate 1.
R1 kWh Export	**2.8.1**	Rate 1 Export Register (kWh) Value: 0000000.0 – 9999999.9

FIELD NAME	OBIS Code	Description
R2 kWh	**1.8.2**	Rate 2 Import Register (kWh) Value: 0000000.0 – 9999999.9
	128.8.2	For Power Flow Insensitive meters, this register holds the sum of Import and Reverse for Rate 2
R2 kWh Export	**2.8.2**	Rate 2 Export Register (kWh) Value: 0000000.0 – 9999999.9
Cumulative Import	**1.8.0**	Cumulative (Rate1+Rate2) Import Register (kWh) Value: 0000000.0 –99999999.9
Cumulative Export	**2.8.0**	Cumulative (Rate1+Rate2) Export Register (kWh) Value: 0000000.0 – 9999999.9
Status Flags	**96.5.0**	General status flags: Bit 7: Reverse State. Shows present import/reverse (export) status of the active energy measurement; 0 = import, 1 = reverse (export) Bit 6: Reserved Bit 5: Reserved Bit 4: Present active rate; 0 = rate one, 1 = rate two Bit 3: Reserved Bit 2: Number of rates enabled; 0 = single rate, 1 = two rates Bit 1: Reverse energy flag; 0 = no reverse energy detected since last power-up, 1 = reverse energy detected since last power-up Bit 0: Present kWh anti-creep status; 0 = not in anti-creep, 1 = in anti-creep
Phase Fail Flags	**96.4.0**	Phase fail flags: Bit 7: not applicable Bit 6: not applicable Bit 5: not applicable Bit 4: Phase A Failed. 1 = failure Bit 3: Phase B Failed. 1 = failure Bit 2: Phase C Failed. 1 = failure Bit 1: not applicable Bit 0: not applicable

FIELD NAME	OBIS Code	Description
Error Flags	**97.97.0**	Error flags: Bit 7-6: Reserved Bit 5 ROM checksum error; 1 = error Bit 4 Table 1 checksum error; 1 = error Bit 3: Table 0 checksum error; 1 = error Bit 2: Billing data checksum error; 1 = error Bit 1 Not used Bit 0: I2c bus error; 1 = error
Rate1 Time	**96.8.1**	Total time in service in Rate 1, in hours (0-99999). Incremented once an hour for each hour the meter is in this rate Eg. “999999” Hrs
Rate2 Time	**96.8.2**	Total time in service in Rate 2, in hours (0-99999). Incremented once an hour for each hour the meter is in this rate Eg. “999999” Hrs
Power fail Count	**96.7.0**	Power fail counter. Indicates the number of power fails. Rolls over to 1 from maximum value of 65535. Incremented on power-up Eg. “065535”
Watchdog Count	**96.52.0**	Total number of watchdog timer resets. Does not roll over upon reaching its maximum value of 255. Eg. “000255”
Reverse Warning Count	**96.53.0**	Reverse energy event count. Indicates the number of separate incidents when reverse energy was detected. Rolls over to 1 from maximum count of 255 Eg. “000255”
Phase Fail Count	**96.54.0**	Indicates the number of phase failure incidents. Rolls over to 1 from maximum count of 65535 Eg. “065535”

APPENDIX B - CHECKING KWH REGISTRATION ACCURACY

WARNING

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

B1 Introduction

Various methods of checking kWh accuracy of registration of the A1100 meter are available. Methods using the LED and Register advances are described below.

B2 Checking Meter Accuracy Using the Test LED

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

B2.1 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 (configured 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% in the accuracy of the A1100 test indicator, the test time at any load needs to be a minimum of 35 seconds.

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

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

e.g. $\frac{994 \text{ (LED count)}}{500 \text{ (meter constant)}} = 1.988$ kWh advance.

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

B2.2 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:-

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

Itest = Test current

V = System voltage

p.f = Power factor of test load

N = Number of system elements

K = LED pulse value, impulses/kWh

B3 Checking Meter Registration Accuracy from Register Advances

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

B3.1 Using the 'Test' values on the meter display

Meters may be configured (at time of manufacture) to include special test displays for the first one or two hours each time the meter is powered up. For two rate meters, these test displays show the sum of the internal Rate 1 and Rate 2 registers. Irrespective of the resolution of the normal register displays, the test displays have 2 decimal digits of kWh.

What you will need

A suitable supply and load or a meter test bench.

Substandard meter with a kWh display.

For each measured quantity:

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

B3.2 Using the register readings from the IrDA output

Register advances may be determined from the IrDA output using the methods outlined below.

What you will need to receive the IrDA data

IrDA Receiver - This must be set to the same baud rate as the meter

Laptop, PC or PDA

IrDA Software - Various software packages are available. The software package described in Appendix C is available from Elster Metering Systems. It is suggested that this software is installed in a folder called A1100 IrDA Reader.

B3.2.1 Comparing the IrDA register reading advance with that of a substandard meter

The method described in B3.1 is used, but the register readings are taken from the PC display described in Appendix C1.1, 'Registration'. Even higher resolution is available than that shown on the meter 'Test displays'.

Checking Registration

1. Connect the IrDA receiver to a suitable port on the PC
2. Open the software, select registration and press Start. A message 'Waiting IrDA data' is displayed in the bottom left corner of the display
3. Hold the IrDA receiver within 250mm of the IrDA transmitter port to capture the data. Receiving IrDA data is displayed in the bottom left corner of the display
4. Remove the IrDA receiver and press stop

APPENDIX C - IRDA DATA SOFTWARE

C1 Introduction

Elster Metering System IrDA Software allows meter register data, security data and identification data to be collected via the IrDA port. The IrDA data can be collected using a Laptop computer or PDA (Personnel Digital Assistant).

For collecting from a PC it is suggested the software is installed in a folder called A1100 IrDA Reader. An IrDA data receiver will be required. This should be connected to a suitable port on the PC.

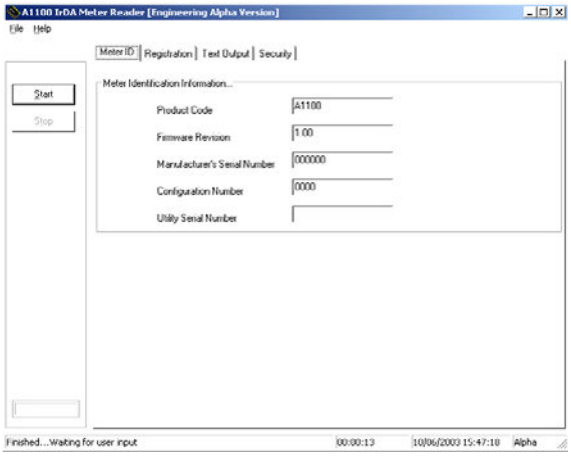
C1.1 Installing the Software

The IrDA software is provided on a CD.

To install the software:

1. Open the IrDA/Disk 1 folders
2. Press Setup.exe
3. Follow the on screen prompts

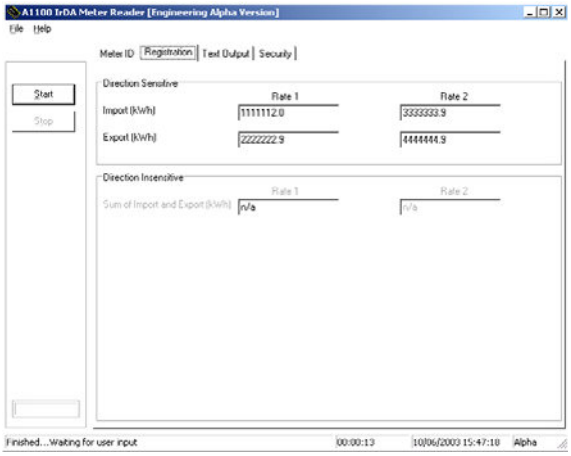
C1.2 Collecting Data Using a Laptop



1. Open the software and press Meter Id. The screen opposite is displayed
2. Press Start. Waiting IrDA data is displayed in the bottom left corner of the display
3. Hold the IrDA receiver within 250mm of the IrDA transmission port for 8 seconds to allow the data to be captured. Receiving data is displayed in the bottom left corner
4. Remove the receiver and press Stop

Meter Id

This allows the following meter parameters to be displayed:



Product Code

Firmware Version

Manufacturers Serial Number

Configuration Number

Utility Serial Number

Registration

The following information is displayed:

Import kWh, Rate 1 and Rate 2

Export kWh, Rate 1 and Rate 2 (When applicable)

Direction Insensitive (When applicable)

Security

The following information is displayed:

System Errors

System Status

Total time powered

Time powered in rate 1

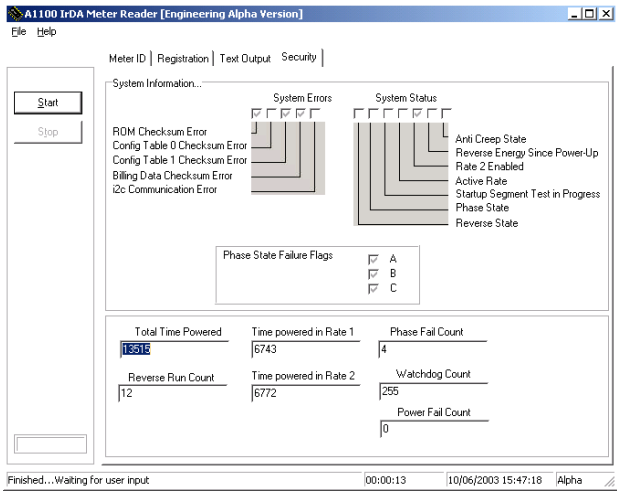
Time powered in rate 2

Phase fail count

Power fail count

Watchdog count

Reverse run count



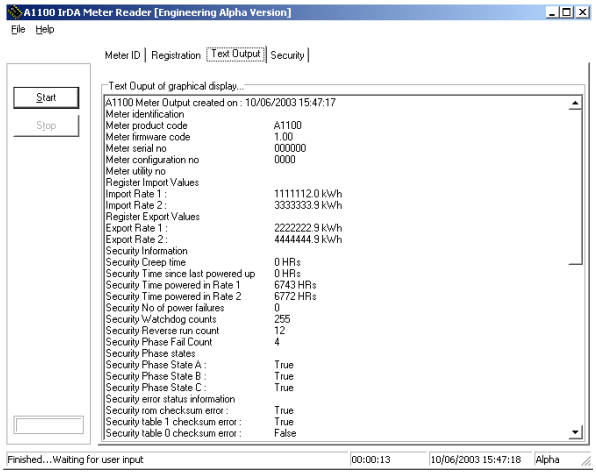
Text Output

The text output allows the following meter data to be viewed:

Meter identification

Meter data

Status information



C1.3 Collecting Data Using a PDA

The PDA must be loaded with relevant A1100, IrDA meter reading software. To read the data the PDA should be held pointing reasonably square to the IrDA port at a distance of approximately 10cm to 30 cm.

To read the meter data, on the PDA:

Press Start

Select Programs

Select IrDA Meter Reader

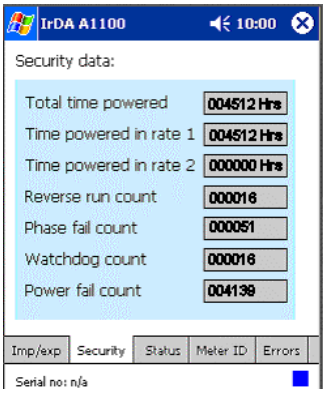
Point the PDA at the A1100 IrDA port

The PDA will read the meter data.

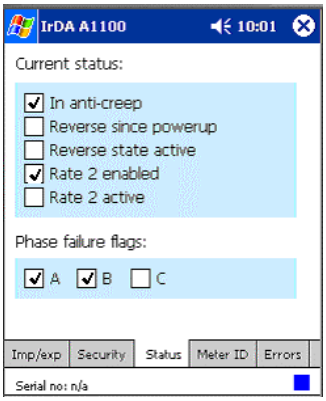
The following data is collected by the PDA

Import/Export

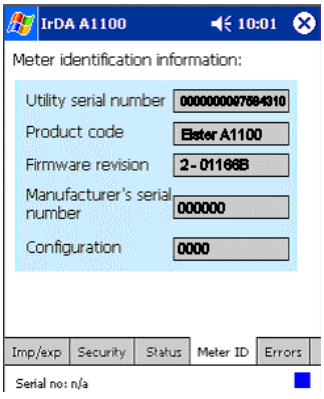
Security



Status



Meter ID



Errors