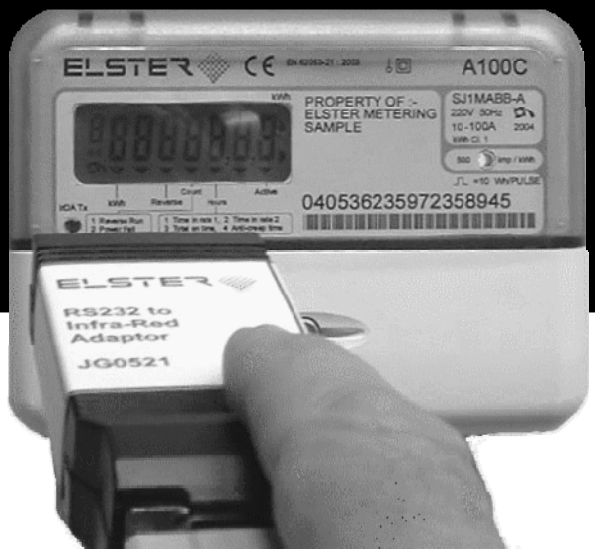
A100C
BS Electronic Single Phase Meter

Operating & Maintenance Instructions



Meter Variants

All variants are available with IrDA or IEC 62056-21 communications

- Import kWh - one rate
- Import kWh - two rate
- Import kWh, Power flow insensitive - one rate
- Import kWh, Power flow insensitive - two rate
- Import and export kWh - one rate
- Import and export kWh - two rate

M130 300 2C
5.2007

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Leading the World in Metering Technology

A100C Single Phase Meter

Operating & Maintenance Instructions

M130 300 2C
5.2007

Other Products in this Series

A100C DIN	Electronic single phase meter	M130 300 1
A102C BS	Electronic Single Phase Meter with kvarh measurement capability	M130 400 1
A102C DIN	Electronic Single Phase Meter with kvarh measurement capability	M130 400 2
A120 BS	Electronic Single Phase Meter with Load Profiling	M130 004 1
A120 DIN	Electronic Single Phase Meter with Load Profiling	M130 003 1

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 WARNING

Internal Electronic Circuits

The internal electronic circuits of these meters are, due to technical necessity, connected to MAINS LIVE.

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.

The main cover is permanently fixed. It cannot be removed without destroying the meter.

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 A100C meter measures active energy according to the requirements of EN 62053-21:2003 for indoor kWh meters of protective Class II and accuracy Class 1 or 2.
The degree of protection is to IP53, IEC 60529:1989.

The meter complies with BS7856:1996 - dimensional requirements.

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

Variables of the A100C are approved by the Office of Gas and Electricity Markets (OFGEM) in compliance with European and British metering legislation (Approval Number 984). These are identified in the model code. Other variants will be approved by International Authorities in line with local requirements

5 GENERAL DESCRIPTION

The A100C is a single phase meter for domestic applications of up to 100A.
The meter offers Class 1 or 2 accuracy, the option of IrDA or IEC 62056 - 21 (formerly IEC 1107) communications and security data as standard.

The following versions of the A100C are available:

Import kWh – one or two rates

Import kWh – one or two rates, Power flow insensitive (See Section 9)

Import and export kWh – one or two rates

A high contrast, large character Liquid Crystal Display that uses chevrons to indicate the active element can support any language by appropriate legends on the nameplate.
The meter stores comprehensive security data that can be included in the display sequence.

The A100C has the option of IrDA or IEC 62056 -21 communications.
The IrDA variant is read only and reads the meter data electronically using a PC or handheld device. As an option the meter auxiliary terminals can be configured at manufacture to transmit the same absolute data as the IrDA port or to transmit a pulsed output.

The IEC 62056 - 21 variant of the meter offers bi-directional communications allowing reading of all stored data and the programming of ‘personality’ data. Access to the various items is controlled by a multi-level password system. As a manufacturing option, a pulsed output is available via the meters auxiliary terminals.

5.1 Features

- Accuracy Class 1 or Class 2
- kWh import or kWh import and export
- 20 years certification life
- Large digit (9.8mm) multilingual display with chevron information identification
- Extensive security data
- 12kV impulse withstand
- High security, compact design (97mm High x 130mm Wide x 47mm Deep)
- BS double insulated, glass filled polycarbonate case
- Permanently fixed main cover
- IP53 in accordance with IEC 60529:1989

5.2 Options

- One or two rates controlled by an external device
- IrDA or IEC 62056 – 21 communications
- Power flow insensitive mode (import plus export)
- Auxiliary terminals configured for:
  - SO output (IEC 62053-31)
  - Serial data output (IrDA communications only)
- Standard or extended terminal cover

6 GENERAL DESCRIPTION

6.1 Basic Meter Types

SJ… BS Case

6.2 Current Ratings

The A100C can be supplied for use with 120V or 230V single phase two wire systems at 50 or 60Hz. The following current ratings and pulses/kWh are available:

OFGEM Approved

A100C	Current	Voltage	Frequency
SJ1LA..	20 - 100A	220 - 250V	50Hz
SJ1MA..	10 - 100A	220 - 250V	50Hz
SJ1NA..	5 - 100A	220 - 250V	50Hz

Other Variants

SJ1LA..	20 - 100A	220 - 250V	60Hz
SJ1MA..	10 - 100A	220 - 250V	60Hz
SJ1NA..	5 - 100A	220 - 250V	60Hz
SJ1LC..	20 - 100A	110 - 127V	50 or 60Hz
SJ1MC..	10 - 100A	110 - 127V	50 or 60Hz
SJ1NC..	5 - 100A	110 - 127V	50 or 60Hz

Other current ratings are available. Contact Elster Metering Systems.

See Figure 1 for full model code details.

6.3 Connections

Meters are designed for direct connection to 50 Hz or 60 Hz supplies. They may be marked for use at reference voltages in the range 220 - 250V or 110 - 127V, and are rated to a maximum current 100A $I_{max.}$

Terminal Arrangements

Main terminals	8.2mm diameter bores, M6 cross/slot head combination screws
Auxiliary terminals	3.2mm diameter bore, M3 cross/slot head combination screws

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

Connection diagrams are shown inside the terminal cover.

6.4 Meter Accuracy

The A100C measures active energy in accordance with the requirements of IEC 62053-21:2003 for indoor kWh meters of protective Class II and accuracy Class 1 or Class 2.

Typical accuracy curves are shown in Figure 4.

The design of the meter ensures life long stability. No adjustments are required in the field.

6.5 Meter Case

The terminal arrangements are shown in Figure 5.

The main meter cover is fixed permanently to the base at manufacture.

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, with its integral terminal block is moulded in glass-filled polycarbonate.

The terminal cover (standard or extended) is moulded in light beige coloured polycarbonate.

The main cover is moulded in tinted, clear polycarbonate.

Figure 6 illustrates the outline fixing dimensions.

7 TIME OF USE REGISTERS

One or two rate meters are available. The rate select for a two rate meter is controlled by an external timeswitch.

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 neutral

According to customer requirements specified prior to manufacture, the effect of these two conditions is as follows:

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

7.1 Rate Change Lockout

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 OVERVOLTAGE OPERATION

The meter has been designed to withstand a voltage of $\sqrt{3}$ x Uref (i.e. 400V for 230V meters, 208V for 120V meters) for an indefinite period. When tested over a 12 hour duration, the application of 400V on a 230V meter caused permanent registration error changes of less than 0.4%.

9 POWER FLOW INSENSITIVE MODE

Power Flow Insensitive Mode is a security feature that allows an import only meter to increment its main kWh registers regardless of whether the meter is importing or exporting energy.

When this option is enabled, the pulsing LED indicates identically for both import and export. The Reverse Energy Event Flag, Reverse Energy Counts and Reverse kWh Register respond only to reverse (export) power flow and continue to function as in normal operation. Power flow Insensitive Mode is enabled at time of manufacture.

10 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 reverse energy

The LED is permanently illuminated when in anti-creep (i.e. below starting current) for all configurations.

The test indicator pulses are 40ms wide. The pulse value is 1000 p/kWh for all meter ratings and is marked on the meter nameplate.

The LED is not modulated.

11 SECURITY FEATURES

The following security features are available.

11.1 Data Retention

All data is retained for the nominal life of the meter and is stored in non volatile memory.

Registration data for the currently active rate is saved approximately every 2 hours; when a rate changes to become inactive; when a power fail is detected.

Security data is saved approximately every 2 hours or if a power fail is detected.

11.2 Recordable Security Features

Recordable security features are listed below. They can be read as follows:

IrDA communications port and optional serial data port (IrDA meter)

IEC 62056 - 21 port (IEC 1107 meter)

Security features are optional in the display sequence.

11.2.1 Reverse Energy

Reverse Run Count

The meter detects and stores:

The number of reverse energy events to a maximum of 255. The register will then roll over to 1

Reverse energy event Flag

An event is detected if, in a single occurrence, an amount of reverse energy exceeding a preset threshold (Configurable at manufacture between 1Wh and 250Wh, [default 5Wh]) is measured. Two rate meters store a single count of reverse running events.

Reverse Energy Event Flag

The Reverse Energy Event Flag is set when an event occurs as defined in Reverse Run Count.
This can be inhibited at manufacture if required. Once detected, this flag will remain set until the power to the meter is removed, then restored.

Reverse Energy Reading

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

11.2.2 Power Fail Counter

A count of the cumulative number of power downs is stored to a maximum of 65535. The register will then roll over to 1.

11.2.3 Time - Rate 1 and Rate 2

Each complete hour the meter is active in Rate 1 and Rate 2 is recorded in separate registers.
A count of 999999 is recordable. The register will then roll over to 1.

11.2.4 Cumulative Time in Anti-creep

This feature detects and stores each full hour the meter is in kWh anti-creep mode. This detects abnormal consumer load patterns.

11.2.5 Watchdog Reset Counter

The Watchdog Reset Counter stores a count of the occasions when the CPU is restarted due to abnormal operation. The maximum count is 255.

11.3 Power Flow Insensitive Mode

For import meters the meter can be configured (at time of manufacture) so that the kWh registers (Cumulative, Rate 1, Rate 2) increment for both import and export energy consumption. The pulsing LED indicates identically for both import and export.

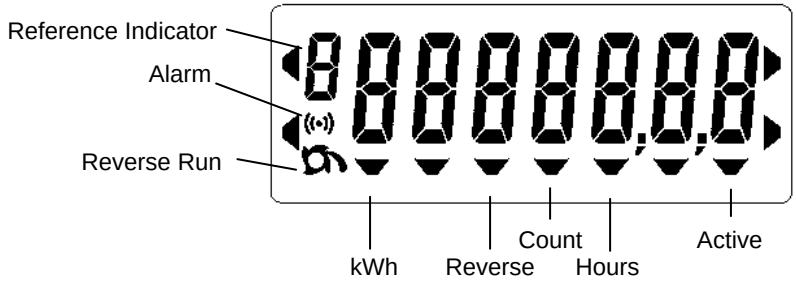
The reverse energy event flag, reverse energy event counts and indicators operate in the same manner in power flow insensitive mode.

12 DISPLAY

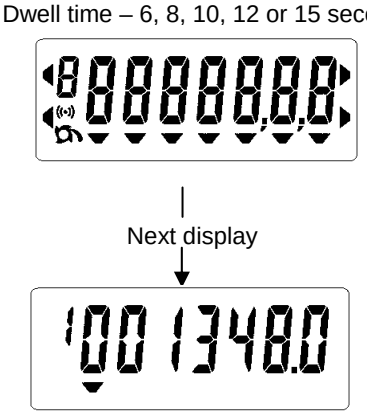
12.1 Introduction

The A100C meter is fitted with a high contrast, wide viewing angle liquid crystal display with seven large digits (9.8mm x 3.5mm). The smaller digit (reference indicator) may identify the parameters being displayed. Seven chevrons identify displayed information. This identification is marked on the nameplate.

Typical display sequences and a list of displayable data are shown in Figures 7.



At power up the segment test pattern is shown. This will remain displayed for a period set at manufacture (6, 8, 10, 12 or 15 seconds) called the dwell time.
The display will then sequence through the programmed displays.



Note: the values displayed are frozen whilst shown on the display - even if the source register increments. If only one display is shown, the register will be updated at the dwell time.

The nameplate may be printed in any language, to suit customer requirements.
This is a manufacturing process that cannot be changed in the field. See Figure 3 for typical nameplate details.

Reverse Run Indicator

The Reverse Run Indicator will be set if, in a single occurrence, an amount of reverse energy exceeding a programmed threshold value is measured.
This value is normally set to 5Wh.

The indicator can be cleared by removing, then restoring the meter power.

As an option the display of this indicator may be hidden from the customer during the manufacturing configuration process.

12.2 Display Modes (all meter types)

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

7 Digits	6 Digits	5 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

For 6 digit registration the display is display is a window of this.

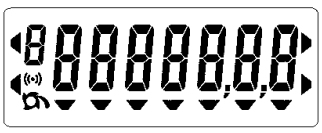
e.g. 1 2 3 4 5 6 7 8 9 0

12.3 All Meter Types

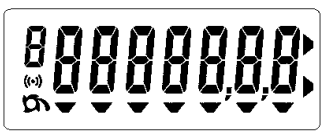
The following items may be included in the display sequence.

Segment Test Pattern

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



Power Up



Display Sequence

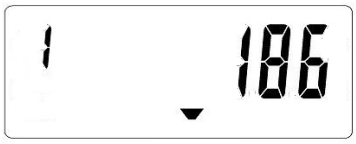
Note: The two chevrons to the left vertical of the display are included in the Test Pattern only at power up.

Count

Reverse run/Power fail

The Reverse Run Count display is shown below (for export meters the display shows the number of instances the meter has been exporting).

Chevrons	Reference id
4 - Count	1 - Reverse Run (Max 255) 2 - Power Fail (Max 65535)



Count

Hours

The following durations can be displayed:

Time in Rate 1

Time in Rate 2

Total energised time

Cumulative kWh anti-creep time

The format of the display is shown as the number hours (hhhhhh). The total on time of 6852 hours for Rate 2 is shown below.

Chevrons	Reference id
5 - Hours	1 - Time in Rate 1 2 - Time in Rate 2 3 - Total on Time 4 - Cum kWh Anti-creep Hours

Hours

Error Codes

Errors are shown in the following format.

Er 00001	Hardware Error
Er 00010	Configuration Checksum Error
Er 00100	Billing Data Checksum Error

The example shows 'Configuration Checksum Error'. If no errors exist, this display is skipped.

The following manufacturing options are available:

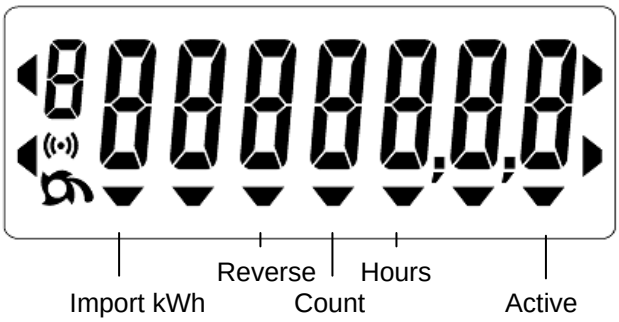
1. Omit the error display from the display sequence if an error occurs
2. Display or omit the alarm indicator from the display if an error occurs

Alarm Indicator

The alarm indicator can be displayed if a meter error is displayed or omitted from the display if errors are not displayed. Errors that will cause the alarm to be set are - Hardware error, configuration checksum error or billing checksum error.

12.4 Import Only, One/Two Rate Meter Displays

The chevrons on the meter display have the following meaning:



(Chevrons with no identification are not used)

Dial Test

Dial test can be displayed as a manufacturing option for the first one hour or two hours after power up. It is prefixed with 'tSt' and includes 2 decimal digits. Chevron 1 indicates that import kWhs is being displayed. Chevron 3 indicates that reverse energy is displayed (Optional).
For 2 Rate meters the display values are the sum of the Rate 1 and Rate 2 register values.

Chevrons	Reference id
1 - kWh 3 - Reverse energy	No used

Reverse

Single Rate kWh - normal operation

Chevron 1 indicates kWh is displayed. Chevron 3 indicates that reverse energy is being displayed (optional).

Chevrons	Reference id
1 - kWh 3 - Reverse energy	Not used

kWh

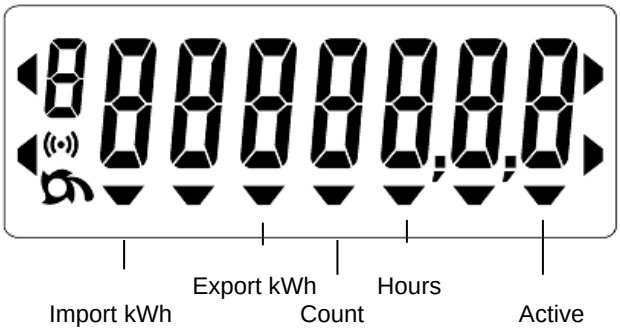
2 Rate kWh – normal operation

Chevron 1 indicates kWh for Rate 1, Rate 2 or cumulative is displayed.

The 'reference id' identifies the rate being displayed. Chevron 3 indicates that reverse energy is being displayed (optional). Chevron 7 indicates when the rate displayed is currently active.

Chevrons	Reference id
1 - kWh	1 = Rate 1
3 - Reverse energy	2 = Rate 2
7 - Active rate	C = cumulative (Rate 1 + Rate 2)

12.5 Import/Export



(Chevrons with no identification are not used)

Dial Test (Import/Export Meter)

Dial test can be displayed as a manufacturing option for the first one hour or two hours after power up. It is prefixed with ‘tSt’ and includes 2 decimal digits. Chevron 1 indicates import kWhs being displayed. Chevron 3 indicates that export kWhs is being displayed (optional). For 2 Rate meters the display values are the sum of the Rate 1 and Rate 2 register values.

Chevrons	Reference id
1 - kWh (import) 3 - kWh (export)	Not used

Single Rate kWh Import/Export Meter – normal operation

Chevron 1 indicates Import kWh is displayed. Chevron 3 indicates that export kWhs is being displayed.

Chevrons	Reference id
1 - kWh (import) 3 - kWh (export)	Not used

2 Rate kWh Import/Export Meter – normal operation

Chevron 1 indicates Import kWh for Rate 1, Rate 2 or cumulative is displayed. The 'reference id' identifies the rate being displayed. Chevron 3 indicates that export kWhs is displayed.

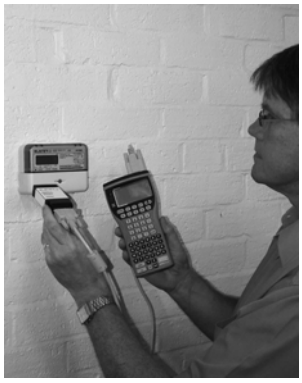
Chevron 7 indicates that rate being displayed is currently active.

Chevrons	Reference id
1 - kWh (import)	1 = Rate 1
3 - kWh (export)	2 = Rate 2
7 - Active Rate	C = Cumulative (Rate 1 + Rate 2)

13 COMMUNICATIONS

The A100C has the option of IrDA or optical IEC 62056 -21 (Formerly IEC 1107) communications. Both methods of communication allow the meter registers and security data to be read electronically by a laptop or hand held device, greatly reducing the possibility of manual reading errors. The IEC 62056 version allows the programming of ‘personality’ data.

13.1 IrDA Meter Communications



The IrDA communications port provides one way communications, transmitting a continuous data stream from the meter to an external device. The data stream includes a start and end mechanism to identify the start and end of the data stream (see Appendix A1 for IrDA data format). An error-checking algorithm protects the integrity of the data stream.

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 baud (default rate)

4800 baud

9600 baud

The port will transmit over a distance of 250mm and takes approximately 1 second (2400 baud) to transmit a complete message.

13.1.1 IrDA Meter Optional Serial Data Output

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 A1) is non-standard 'return to zero', which requires the use of a special external interface.
If this option is used, the baud rate for communications can be set to the following rates:

2400 baud (default rate)

4800 baud

The port will transmit over a distance of up to 3m.

13.2 IEC 62056 - 21 Meter Communications

A bi-directional infra red communications port is protected by multi level passwords and allows reading of all stored data (measurement, security and current personality) and programming of 'personality' data. The port is accessible through the front of the main cover and interfaces to a hand held unit or computer.

The following baud rates are available:

2400 baud

4800 baud

Optical Probe (Mandatory)

ABACUS Electronics, Zero Power IEC 1107 (FLAG) RED Optical Probe
Model F6Z - P - D09F - 1 (2 or 3, cable length) R (Red optics)

13.3 Data Available (IrDA Meter)

The following data is available via the IrDA and Serial Data port or IEC 62056 port:

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

The following information is available:

- 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 Register Definitions
- Energy Registers Readings
- Status Flags Including present import/export status
- Error Flags
- Anti-creep Time Number of hours the meter has been in kWh anti-creep
- Time Powered-up Time since last power up
- Time in Rate 1 Number of whole hours Rate 1 has been active
- Time in Rate 2 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

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

14 PULSING OUTPUT

14.1 Output Configurations

An opto-isolated pulsing output can be provided as an option. The output is available via the meter auxiliary terminals 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 - This output is referenced to neutral and brought out to one auxiliary terminal. The output is non-isolated.

14.2 Output Characteristics

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

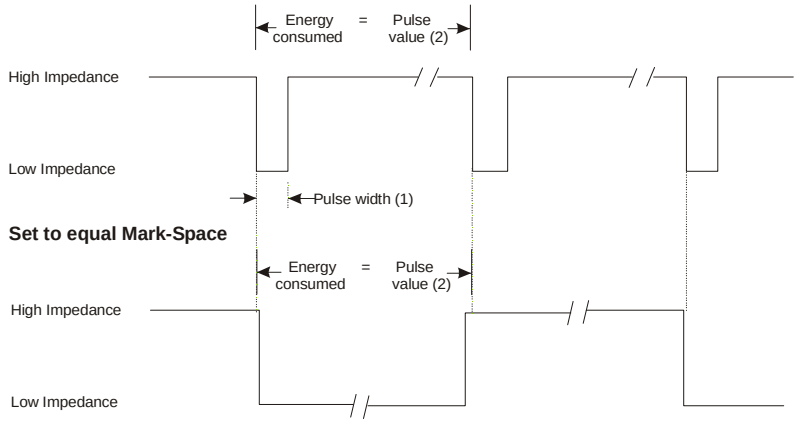
The pulse/kWh and pulse width is configured as indicated below.

Pulse width – nominal (ms)	10, 20, 30, 40, 50, 60, 80, 100, 120, 160, 200, 250 or equal mark-space (1)									
Pulses/kWh	10	20	25	40	50	100	200	250	500	1000
Wh/pulse (2)	100	50	40	25	20	10	5	4	2	1
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 4 (Terminal Arrangements) for connections.

15 TECHNICAL DATA

Rated Maximum Current (I_{max})	100A
Basic Current (I_b)	5A, 10A, 20A
Frequency	50 Hz or 60 Hz
Voltage Operating Range (230V meter)	220 - 250V
Voltage Operating Range (120V meter)	110 - 127V
System Connection	1 phase 2 wire
Starting Current	0.004 Ib (Class 1), 0.005 Ib (Class 2)
Accuracy Range	Ib/20 to Imax
Short Circuit Current	3000A (duration single half cycle)
Burden of Voltage Circuits 230V	0.66W, 8.5 VA (capacitive burden)
120V	0.66W, 5.0 VA (capacitive burden)
Burden of Current Circuits	4.0 VA at 100A
Dielectric Strength	4 kV RMS
Impulse Withstand	12kV, 1.2/50µs, 40 ohm source
Display	LCD (9.8 x 3.5) mm characters, high contrast, wide viewing angle)
Meter Constant (pulsing LED output)	1000 p/kWh
Pulse Output Specification	IEC 62053-31 (Transistor Output)
Max Rating	27V d.c. 27 mA
Pulse Width/value (variable)	Default / 100 ms pulse, 200p/kWh (=5Wh/pulse)
Product Life - Certified	20 years
Temperature	Operational range -20° C to +55° C
	Storage Range -25° C to +65° C
	Limit Range -25° C to +85° C
Humidity	Annual Mean 75% (95% for 30 days spread over one year)
Dimensions	130mm (wide) x 97mm (high) x 47mm (deep)
Weight	345 grams
Accuracy Class kWh	Class 1 or Class 2 - EN 62053-21:2003
Terminals Main	8.2mm bores, M6 terminal screws – Max torque 2.8 N m
Auxiliary	3.2mm bores, M3 terminal screws – Max torque 0.45 N m
Case	BS7859:1996
	IP53 to IEC 60529:1989

16 INSTALLATION

16.1 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 meter seal will invalidate certification.

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

16.2 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.

16.3 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

Humidity:Annual mean 75% (for 30 days spread over one year, 95%)

16.4 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.

16.5 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 that must be appropriate for the voltage and current rating of the meter and for ensuring that the supply is properly fused. It is recommended that meters are 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.

Isolate all circuits before carrying out the installation.

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

Refer to the connection diagram inside the terminal cover.

Failure to comply with these instructions may result in damage 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. 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.

Tighten the M6 terminal screws to a torque of between 2.2N m minimum, 2.8N m maximum.

Connections to rate select and/or pulsing output terminals should be completed with appropriately sized cable. The M3 terminal screw should be tightened to a maximum torque of 0.45N m.

17 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.

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)

Carry out load checks as necessary

Confirm the operation of rate select for 2-rate meters

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

18 MAINTENANCE

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

19 DISPOSAL AND RECYCLING

Liquid Crystal Display

WARNING

Observe the ‘Liquid Crystal Display Safety Warning’ in Section 1 of this manual.

The following meter materials are recyclable: polycarbonates, metals and printed circuit board.

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.

U_n	I_b	I_{max}

SINGLE PHASE (A100C) MODEL CODE

MODEL

TYPE (nameplate)

	S	J	1	L	A	B	E	S	S	G	N	S	J	-	B	N	
PRODUCT/TERMINATION																	
Single Phase, BS terminal arrangement (L-N-N-L)	**S**	**J**															ofgem
SERVICE TYPE																	
1-phase 2-wire			**1**														ofgem
CURRENT RANGE																	
20-100A BS only (Imax any integral of Ib up to 100A)				**L**													ofgem
10-100A BS only (Imax any integral of Ib up to 100A)				**M**													
5-100A BS only (Imax any integral of Ib up to 100A)				**N**													
VOLTAGE																	
220 – 250V					**A**												ofgem
110 – 127V					**C**												-
FREQUENCY, ACCURACY CLASS																	
50 Hz, Class 1 kWh (IEC62053-21) – see note 1, 4						**B**											ofgem
50 Hz, Class 2 kWh (IEC62053-21) – see note 1						**C**											
60 Hz, Class 1 kWh (IEC62053-21) – see note 1, 4						**E**											-
60 Hz, Class 2 kWh (IEC62053-21) – see note 1						**F**											-
TARIFF & HARDWARE CONFIGURATION																	
Single Rate, kWh registration							**B**										ofgem
Two-rate, kWh registration, switched to neutral							**E**										
DISPLAY CONFIGURATION																	
Customer specified display configuration								S									ofgem
DISPLAY CYCLE, REGISTER SOURCES																	
Customer specified display sequence and register sources									S								ofgem
TEST INDICATOR(S) (see important note 3)																	
Non-modulated 40ms pulses										G							ofgem
PULSING/ABSOLUTE OUTPUT(see important note 3 overleaf)																	
No pulse or serial data output											N						ofgem
SO pulse output, tied to neutral, one auxiliary terminal (2-rate only)											P						
SO pulse output, floating, two auxiliary terminals (1-rate only)											Q						
Absolute serial data output - tied to neutral, one auxiliary terminal (2-rate only, not with 1107 port)											S						
Absolute serial data output - floating, two auxiliary terminals (1-rate only, not with 1107 port)											T						
COMMUNICATIONS																	
IrDA optical port, data rate set at time of manufacture												S					ofgem
IEC 1107 bidirectional optical port, max baud rate and 20ms turnaround option set at manufacture												T					
OTHER OPTIONS																	
Non – extended BS terminal cover													J				ofgem
Extended BS terminal cover, no cut-out for cables													K				-
Extended BS terminal cover, with cut-out for cables													U				-
Clear short non-removing terminal cover, slotted brass large head main terminal screws													X				-
Supplied without terminal cover													Z				-
VERSION																	
Original (changed to denote hardware and firmware changes, not functionality) OBSOLETE														-	**A**		ofgem
Firmware 2-01168-D (FLAG)														-	**B**		
Firmware 2-01167-E (IrDA)														-	**C**		
SPECIAL ADDITIONS																	
None available																N	ofgem

ofgem - Indicates types approved by OFGEM, Approval Number 984

Figure 1 - Model Code

Note 1:- IEC62052-11 (to which IEC62053-21 refers) defines **only** Basic and Maximum currents as follows:

Basic Current (Ib) **Direct Connected**	Standard values: 5, 10, 15, 20, 30, 40, 50A
	Exceptional values: 80A

and states that Maximum current (Imax) is preferably an integral multiple of Ib:

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

(e.g. up to 10 x a basic current of 10A)

Note 2:- IEC62052-11 (to which IEC62053-21 refers) defines the following relevant reference voltages:

Ref Voltage (U_n) for **Direct connected**	Std values 120, 230V
	Exceptional values 100, 127, 200, 220, 240,

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.

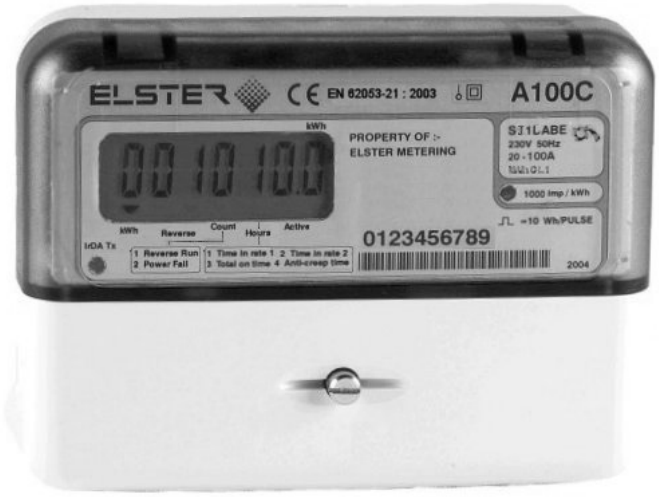
Note 3:- PULSE OUTPUT VALUES

For all meter ratings the normal pulse value for the Test LED will be 1000 pulses / kWh.

The pulse value for the SO pulsing output will be chosen when the customers requirements are entered into the Configuration Tool software, from the choice of values offered in the software.

Note 4:- BS meters with Ib = 5A are only to be offered with Class 2 kWh accuracy

Figure 1A – Model Code (Continued)

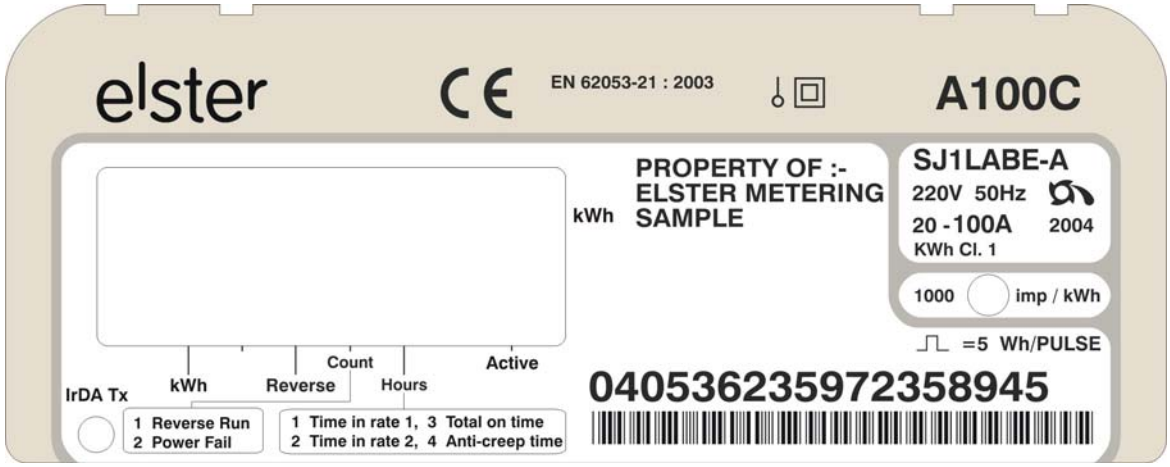


A100C with IrDA communications

A100C with Optical IEC 62056 – 21 Port

Figure 2 - A100C Meter

Typical IrDA Meter Nameplate



Typical FLAG Meter Nameplate

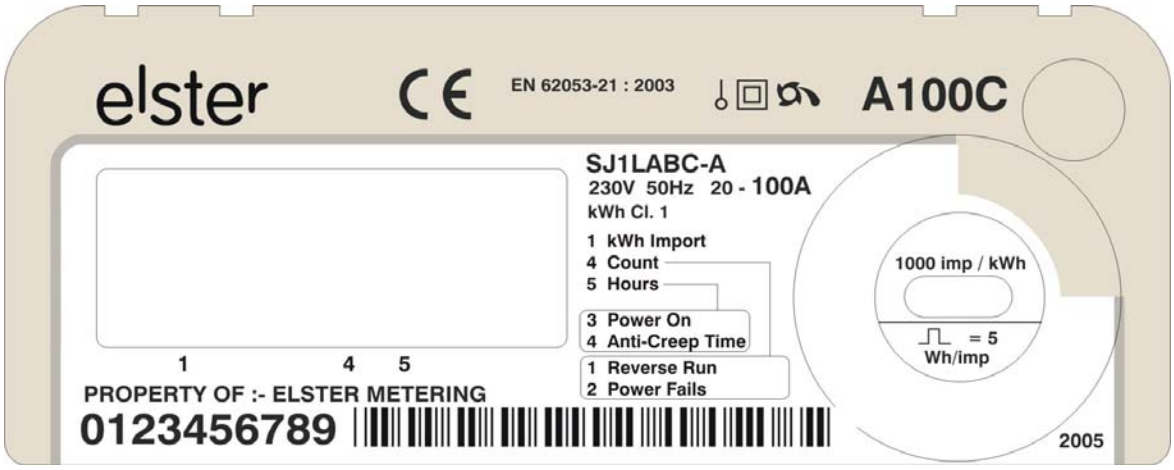


Figure 3 - Typical A100C Nameplates

A100C Typical kWh Load Curve 10 – 100A & Class 1 Limits

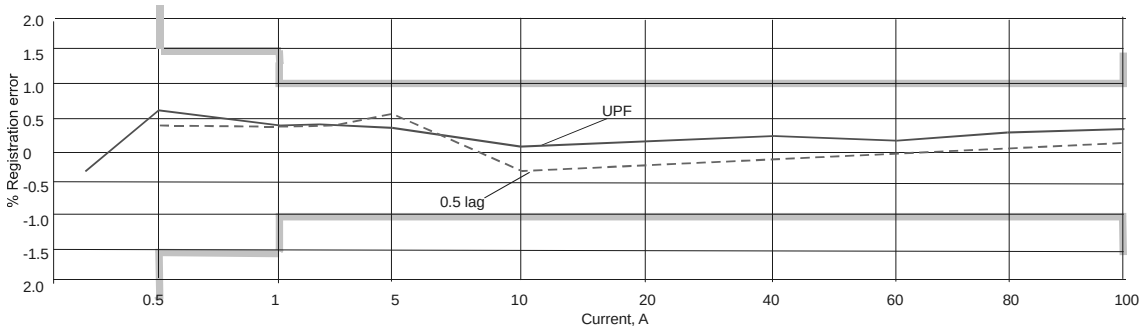
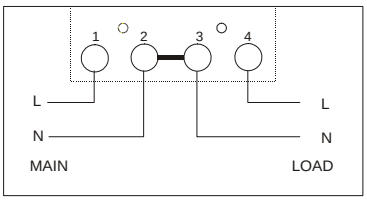


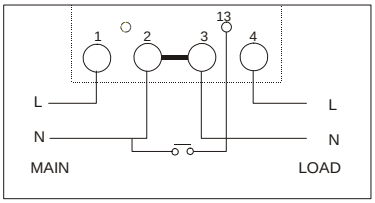
Figure 4 - Load Curve

Typical wiring diagrams

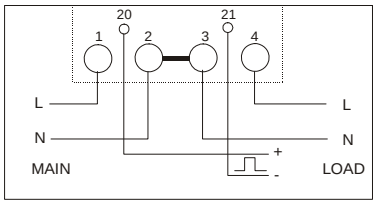
Single rate



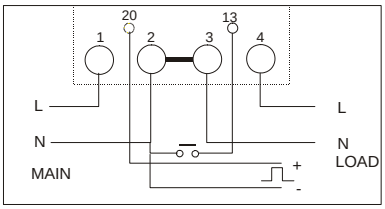
Two rate



Single rate – SO output



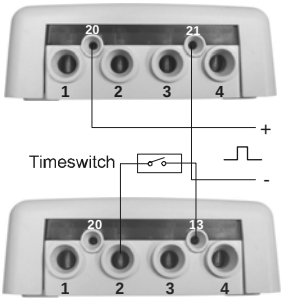
Two rate - SO non-isolated output



Auxiliary Terminal Numbering

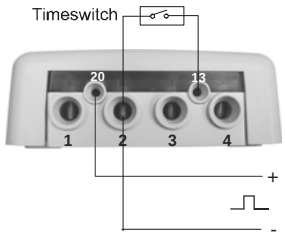
Terminal numbers		Configuration
		One Rate, no SO
	13	Two Rate
20	21	One Rate, Isolated SO
20	13	Two Rate, Non Isolated SO

Auxiliary Terminal Configurations

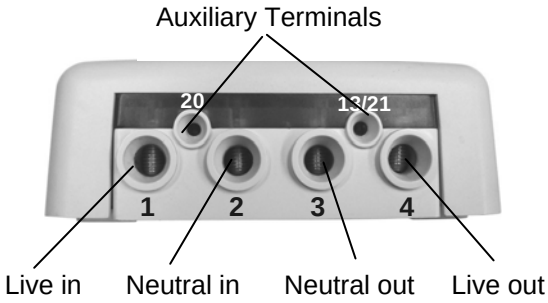


SO – 1 Rate

2 – Rate



SO – 2 Rate



WARNING

These diagrams are for reference purposes only.

Meters should always be wired to the diagram supplied on the inside of the meter terminal cover.

Figure 5 - Terminal Arrangements

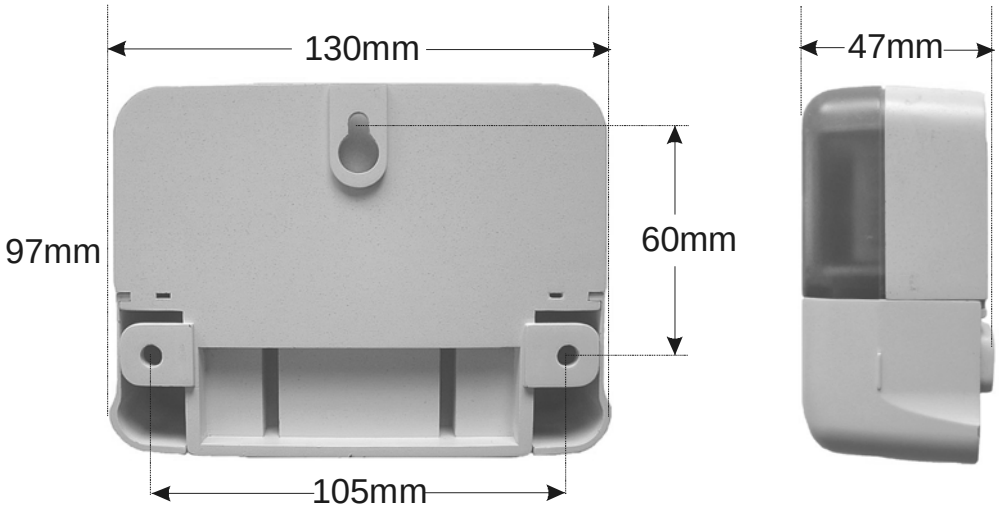
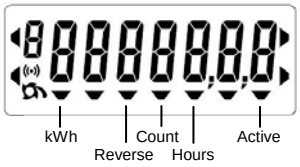


Figure 6 - Dimensions and Fixing Centres

Display 1



Segment Test
One dwell period on power up
Optional in display sequence

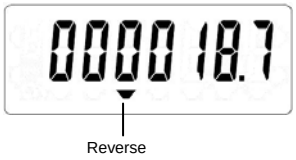
Display 2

Test Display
Optional in display sequence for
1 or 2 hours after each power up

Display 3

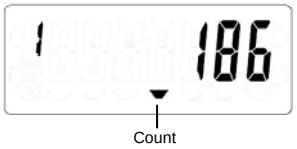
kWh Cumulative

Display 4



Reverse kWh
Optional in display sequence

Display 5



Reverse Energy Count
Optional in display sequence

Display Nameplate

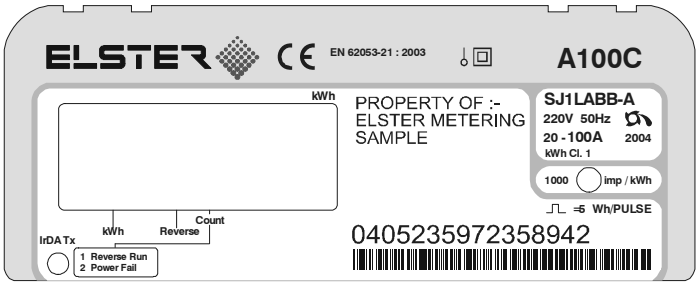
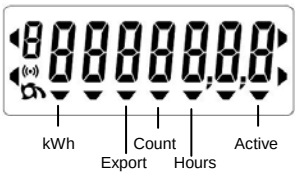


Figure 7 - Typical Single Rate, Import Meter Display

Display 1



Segment Test
One dwell period on power up
Optional in display sequence

Display 2

kWh Import Cumulative
Optional in display sequence

Display 3

kWh Import Rate 1 - Active

Display 4

kWh Import Rate 2 - Inactive

Display 5

kWh Export Cumulative
Optional in display sequence

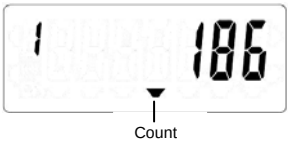
Display 6

kWh Export Rate 1 - Active

Display 7

kWh Export Rate 2 - Inactive

Display 8



Reverse Run Count
Optional in display sequence

Display Nameplate

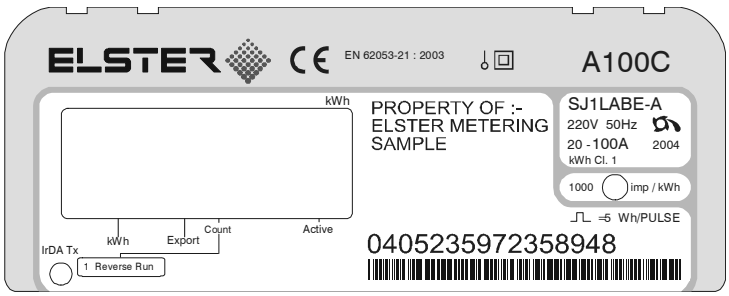


Figure 7A - Typical 2 Rate Import/Export Meter Display

Displayed Data	Chevron	Index Digit	Function
kWh Import (1 Rate) kWh Import (2 Rate) kWh Import (2 Rate) kWh Import (2 Rate)	1 1 1 1	- 1 2 C	kWh Displayed kWh Rate 1 Displayed kWh Rate 2 Displayed kWh Cumulative (Rate 1 + Rate 2) Displayed
Reverse Energy Export	3 3		Import Meter Only Export Meter Only
Count	4	1 2	Reverse Run Count Power Fail Count
Hours	5	1 2 3 4	Cumulative Hours in Rate 1 Cumulative Hours in Rate 2 Total Energised Hours Cumulative kWh Anti-creep Hours
Active	7		Active Rate is Displayed (2 rate meter only)
Dial Test			For 1 or 2 hours after power up (optional)
Alarm			Meter Error has Occurred (optional)
Reverse Icon (1 Rate)			Meter in Reverse (optional)

Other Options	Option (set at manufacture)
Number of Digits	5, 6 or 7
Decimal Point Separator	Point or comma
Number of Decimal Places	0, 1 or 2
Display Dwell Time	1 to 30 seconds

Error Reporting	ERROR (OPTIONAL)
Hardware Error	Er00001
Configuration Checksum Error	Er00010
Billing Data Checksum Error	Er00100

Figure 7B – Displayable Data

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
Total cumulative Active Energy
Time of Use Registers
Alarm indications

Level 2 (Correct level 2 password [Read and Program]**)**
All data listed in level 0 and 1

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 8 – Password Access Levels (IEC 62056 – 21 Meter)

APPENDIX A

A1 IrDA Data Serial Output

The A100C's IrDA port and optional Serial Data Port are transmit only. The ports transmit billing, security and status data once every second.

The data rate is programmed at time of manufacture and is dependent on the meter port configuration.

Baud rates for the following port configurations are available:

IrDA Port Only	9600 baud	4800 baud	2400 baud
IrDA and Serial Port	-	4800 baud	2400 baud

The character format is one start bit, followed by 8 data bits and one stop bit (no parity).

The IrDA output data adheres to the following format:

SOH	NULL	LEN	STX	DATA[LEN]	ETX	BCC
01	00	NN	02	NN NN …	03	NN

SOH	Start of header character (hex 01).
NULL	Null character hex 00
LEN	Data length (hex 00-FF). Indicates the number of bytes between ETX and STX, exclusive.
STX	Start of text character (hex 02).
DATA[LEN]	Meter registration, security and status data. Format is defined below
ETX	End of text character (hex 03).
BCC	Binary checksum of all message bytes from SOH to ETX (inclusive).

NOTE: For multi-byte binary data items, the data is transmitted in little-endian format – the least significant byte first, the most significant byte last.

For BCD data items, the most significant byte is transmitted first, with the most significant decimal digit in the most significant nibble.

For ASCII data items, the left-most character of a text string is transmitted first.

The table below describes the format of the billing, security and status data.

Any data in fields marked Reserved can be ignored.

FIELD NAME	Len	Format	Description
Product Code	12	ASCII	Product code. Example: "A100C"
Firmware Rev Code	9	ASCII	Firmware revision code. Example: "2-01167-A"
Mfg Serial Number	3	Binary	Manufacturing serial number.
Config Number	2	Binary	Configuration number.
Utility Serial Number	16	ASCII	Utility-specified serial number.

FIELD NAME	Len	Format	Description		
Meter Definitions	3	Bit field	Import/reverse 01 00 02	Import/Export 03 00 02	Power Flow Insensitive 03 00 02
Rate 1 Reg 1	5*	BCD	Import kWh	Import kWh	Import + Export kWh
Rate 1 Reg 2	5*	BCD	Reserved	Reserved	Reserved
Rate 1 Reg 3	5*	BCD	Reverse kWh	Reverse kWh	Export kWh
Rate 2 Reg 1	5*	BCD	Import kWh	Import kWh	Import + Export kWh
Rate 2 Reg 2	5*	BCD	Reserved	Reserved	Reserved
Rate 2 Reg 3	5*	BCD	Reverse kWh	Reverse kWh	Export kWh
* Represents 7 integer digits and 3 or 5 decimal digits of kWh					
Reserved	1	Binary			
Status Flags	1	Bit field	General status flags: Bit 7: Reverse State. Shows present import/export status of the active energy measurement. Bit 6: Reserved Bit 5: Reserved Bit 4: Present active rate: 0 = rate one, 1 = rate two. Bit 3: LED mapping in force: 0 = normal operation, 1 = LED mapping to Reg2 or Reg3 Bit 2: Number of active rates; 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 = inactive, 1 = active.		

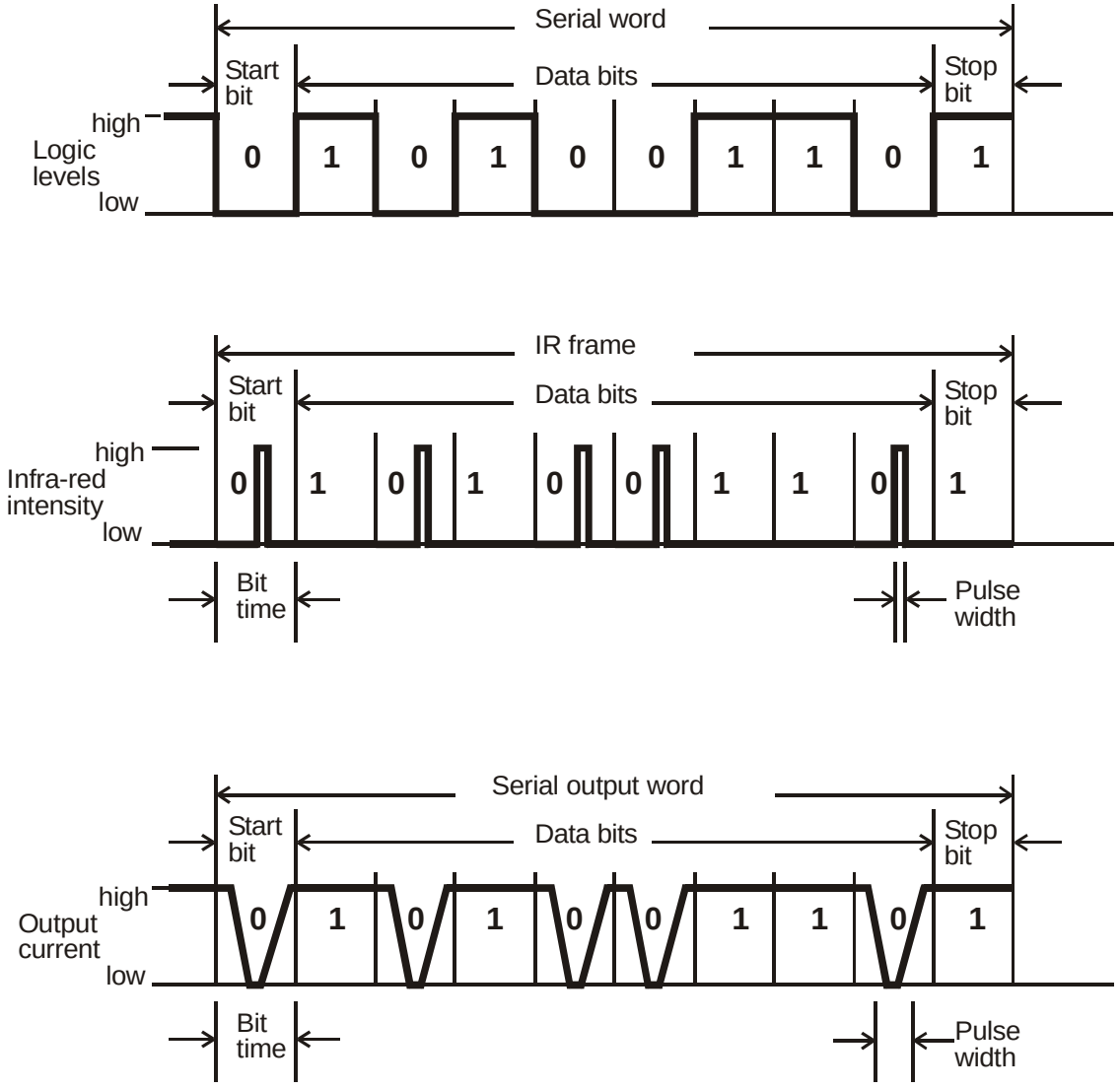
FIELD NAME	Len	Format	Description
Error Flags	1	Bit field	Error flags: Bit 7-6: Reserved. Bit 5: ROM checksum error, 0 = no error, 1 = error. Bit 4: Table 1 checksum error; 0 = no error, 1 = error. Bit 3: Table 0 checksum error; 0 = no error, 1 = error. Bit 2: Billing data checksum error; 0 = no error, 1 = error. Bit 1: Reserved Bit 0: I^2C bus error; 0 = no error, 1 = error.
Anti Creep Time	3	BCD	Anti-creep time in hours (0-999999). Indicates total amount of time meter has been in anti-creep. Incremented once an hour for each whole hour the meter is in anti-creep. Partial hours in anti-creep are not counted.
Rate 1 Time	3	BCD	Total time in Rate 1 in hours (0-999999). Incremented once an hour for each hour the meter is in this rate. Partial hours in Rate 1 are not counted.
Rate 2 Time	3	BCD	Total time in Rate 2, in hours (0-999999). Incremented once an hour for each hour the meter is in this rate. Partial hours in Rate 2 are not counted.
Power Up Time	3	BCD	Elapsed time since last power fail in hours (0-999999). Incremented once an hour for each hour meter is powered. Resets to 0 on power up.
Power Fail Count	2	Binary	Power fail counter indicates the number of power fails. Rolls over to 0 from maximum value of 65535. Incremented on power-up.
Watchdog Count	1	Binary	Total number of watchdog timer resets. Does not roll over upon reaching its maximum value of 255. Incremented on power-up if a watchdog timer reset was determined to have caused the MCU to execute its reset vector.
Reverse Warning Count	1	Binary	Reverse warning incident count indicates the number of separate incidents when reverse energy was detected. Rolls over to 1 from maximum count of 255.
Reserved	10	Binary	
Byte Total	**104**		

Identifying the Start of a Message

As the message data is in binary format it might very well contain the SOH, STX and ETX characters that makes finding the start of a message more challenging. To simplify the process of identifying the start of a message it is probably best to wait for the quiet time that occurs between each message.

The meter transmits a message once a second. We suggest that the receiver program should wait approximately 100 ms without receiving a character from the meter to identify the quiet time preceding the SOH character that marks the start of the next message. Message parsing should then proceed to verify that the message is properly framed and that the BCC is valid.

A2 IrDA Serial Word Formats



Encoding of Infra-red and absolute serial data output pulses to represent serial word

A standard serial signal may be reconstructed by triggering a monostable (τ = 1/baud rate, seconds) on receipt of each infra-red or serial pulse.

APPENDIX B - Checking kWh Registration Accuracy

B1 Introduction

Various methods of checking kWh accuracy of registration of the A100C 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 a number of LED pulses with a substandard meter register advance

What you will need

Suitable test equipment with a sensor to detect LED pulses

A suitable substandard meter

A counter for counting the number of LED pulses

Checking registration

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. $\frac{1988 \text{ (LED count)}}{1000 \text{ (meter constant)}}$ = 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 test duration must be at least 100 seconds.

The number of LED pulses should be greater than:-

$$\frac{Itest \times V \times PF}{36}$$

Itest = Test current

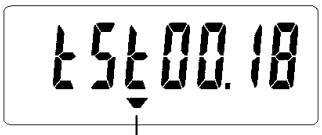
V = System voltage

PF = Power factor of test load

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 decima kWh

What you will need

Suitable supply and load or meter test bench.

Substandard meter with 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 or PC

IrDA Software - Various software packages are available. The software package described is available from Elster Metering Systems. It is that suggested this software is installed in a folder called A100C.

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.

B3.2.2 Comparing IrDA register advances with values calculated by the IrDA receiving PC

This method is only suitable when using a meter test bench that provides known voltage, current and power factor output of high accuracy.

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. It is suggested the software is installed in a folder called A100C.

An IrDA data receiver will be required. This should be connected to a suitable port on the PC.

C1.1 Running the Software

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 2 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:

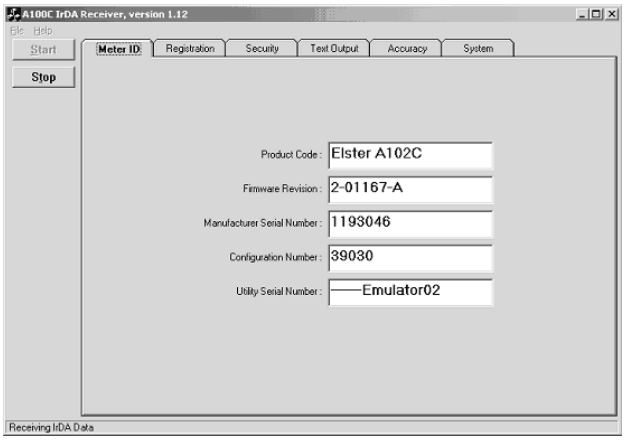
Product Code

Firmware Version

Manufacturers Serial Number

Configuration Number

Utility Serial Number



Registration

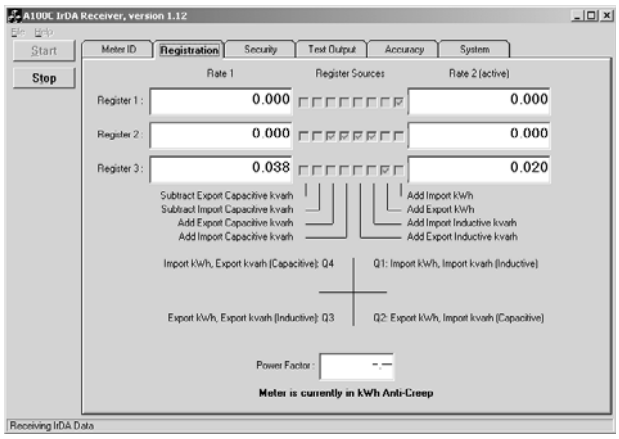
The following information is displayed:

Register 1, Register 2 and Register 3 readings for Rate 1 and Rate 2

The register sources

The current four quadrant measurement

The Power factor



Security

The following information is displayed:

System Errors

System Status

Total time powered

Time since last power up

Total anti-creep time

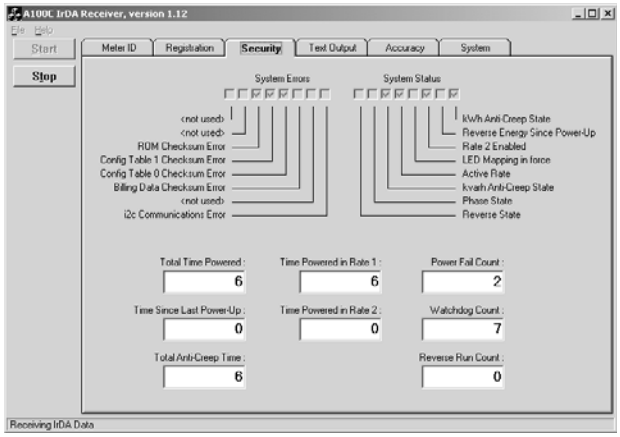
Time powered in rate 1

Time powered in rate 2

Power fail count

Watchdog count

Reverse run count



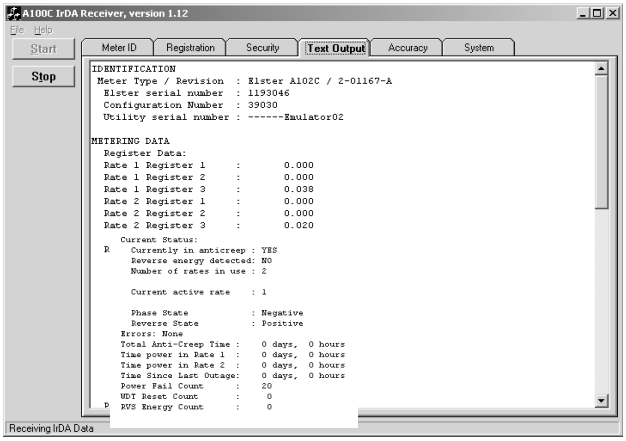
Text Output

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

Meter identification

Meter data

Status information



About Elster Group

Elster Group is the world's leading manufacturer and supplier of highly accurate, high quality, integrated metering and utilisation solutions to the gas, electricity and water industries.

In addition, through its subsidiary Ipsen International, it is the leading global manufacturer of high-level thermochemical treatment equipment.

The group has over 9,000 staff and operations in 38 countries, focused in North and South America, Europe and Asia. Elster's high quality products and systems reflect the wealth of knowledge and experience gained from over 170 years of dedication to measuring energy and scarce natural resources.

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