

Electricity Meters
Residential BS / IEC

British Standard

5235 Single Phase Credit Meter



User Manual & Technical Specification

Revision History

Issue	Date	Comments
1.	10/10/04	New document
2.	10/01/05	Added section on the No power read and Appendix B. Added Document number.
3.	01/11/05	Added new amendments
4.	15/02/06	Added D-L version removed F version (reactive energy still needs adding)
5.	18/11/08	Revised manual to new branding guidelines and layout

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1 Introduction

Introducing the 5235, single and multi-rate tariff options, Single Phase BS Standard Credit Meter

1.1 Purpose

This document details the functions for the following variants of the 5235 Single Phase Credit Meters, active energy only.

- Single Rate, kWh meter
- Single Rate, kWh meter with class A pulse output
- Multi-rate Externally switched meter

1.2 Meter Overview

The meter is a whole current static electricity meter capable of measuring kWh in single and two rate variants. An additional option to have a pulsed output is also available on the single rate version. The meter is approved to IEC62052 – 11: 2003 & IEC62053 – 21:2003 classes 1.0 and 2.0 and has been given a 20 year certification life by OFGEM.

The meter is sealed for life by a liquid welding process and therefore does not carry an external wire seal.

All meter types feature an optical port used for reprogramming. The metrology LED is incorporated into this port and pulses at a rate of 1000 impulses per kWh.

All facia details are permanently laser etched directly onto the meter front. Options would normally include property details, serial numbering and various barcode options. Other details may be printed such as customer logo's and meter type codes etc.

1.3 Model versions

A character denotes meter version after the model number:

A - Single rate only active only

B - Single rate with pulsed output active only

D - Externally switched two-rate active only

1.4 Reference Standards

The meter has been tested by OFGEM and has the following certification. IEC62052 – 11: 2003. IEC62053 – 21:2003. Alternating current static watt-hour meters for active energy (Classes 1 & 2). Other standards are in the technical summary.

1.5 20 Year Certification Life

This meter has been given a certification life of 20 years by OFGEM the UK regulatory body. This has been achieved by proving the reliability of each of the components in the meter and by using mathematical models provided

by OFGEM. This modelling has shown a reliability of better than 97% over twenty years. The OFGEM approval number for this meter is 986.

OFGEM certificates and lifetime reports are available upon request. Please contact sales@landisgyr.com

2 Safety Information

Attention is drawn as follows in the individual chapters of this user manual with classified word symbols and pictographs to the relevant danger level, i.e. the severity and probability of any danger:



Definition of Danger

This symbol is used to indicate a possibly dangerous situation which could result in severe physical injury or a fatality.



Definition of Warning

This symbol is used to indicate a possibly dangerous situation which could result in minor physical injury or material damage.



Definition of Note

This symbol is used to indicate general details and other useful information.

In addition to the danger level, all safety information also describes the type and source of the danger, its possible consequences and measures to counteract the danger.

2.1 Responsibilities

The owner of the meters – normally the utility – is responsible that all persons engaged on work with meters:

- Have read and understood the relevant sections of the user manual.
- Are sufficiently qualified for the work to be performed.
- Strictly observe the safety regulations (according to section 1.6) and the operating information in the individual chapters.

In particular, the owner of the meters bears responsibility for the protection of persons, prevention of material damage and the training of personnel (Landis+Gyr. provides training courses for this purpose on specific equipment; please contact the relevant agent if interested).

2.2 Safety Regulations



The following safety regulations must be observed at all times:

- This equipment does not contain a disconnection device. Means for disconnection from the supply must be provided as part of the building installation. Do not work on the equipment unless the

supply is disconnected. If disconnection is done by removal of fuses or other cut-outs, the removed disconnection devices must be kept secure from replacement while work is performed. If disconnection is provided by a switch, the switch shall conform to the requirements of IEC 947-1 and IEC 947-3 or equivalent.

- This equipment does not contain an overcurrent protection device. Overcurrent protection must be provided as part of the building installation. Maximum overcurrent device rating is 100 Amp at 415 Volts, conforming to the requirements of BS1361, or equivalent.
- The maximum rating of the meter is 100A and requires connecting conductors of 25mm². Failure to do so could result in irreparable damage to the meter. If smaller connecting conductors are used an appropriate mains fuse must be used.
- Only suitably trained and qualified personnel shall be allowed to work on the equipment. Local safety standards shall be observed and shall take precedence over these regulations in points of conflict.
- The meters must be held securely during installation. They can cause injuries if dropped.
- Meters that have fallen must not be installed, even if no damage is apparent, but must be returned for testing to the service and repair department responsible (or the manufacturer). Internal damage can result in functional disorders or short-circuits.
- The meters must on no account be cleaned with running water or with high-pressure devices. Water penetrating can cause short-circuits.
- The meter terminal cover should be secured in place before any load is supplied.

3 Operational Functions

The standard operational functions of the 5235

3.1 Measurement

The Meter is a 120V or 220-240Vac, 50Hz or 60Hz, 5 to 100A Single Phase Credit Meter. It contains a measuring element capable of measuring active energy (kWh). The meter measures and registers kWh up to class 1.0. accuracy. The metrology LED is incorporated into the optical port and pulses at a rate of 1,000 impulses per kWh for energy registration. All variants offer a test mode, which shows 3 decimal places and is reset when voltage is removed.

3.2 Anti-creep

Below starting current, the meter enters into an anti-creep mode. In this state the metrology LED is permanently lit and the registers do not increment. The LED remains lit until the meter current is increased in a forward direction beyond the starting current. The starting current is shown in the technical summary.

3.3 Meter Memory

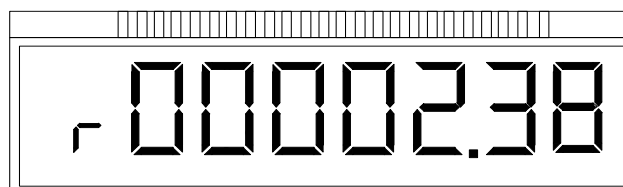
All the meters data is to be recorded in a Ferroelectric Random Access Memory (FRAM) under the control of the microprocessor. All the kWh registers are stored in the FRAM and will be updated periodically and on power-fail. The FRAM is able to be re-written throughout the life of the meter and will hold the information, if required for over twenty years.

3.4 Reverse / Export Energy registration

Three factory configurable reverse energy modes can be set as follows:

Export Energy Registration

A reverse / export energy register stores the value of kWh recorded by the meter in a reverse direction. The register may be configured as part of the display cycle of the meter. Alternately the register is held in memory and can be read from the meter via the IEC 1107 port. The Reverse energy register can be displayed with 0, 1 or 2 decimal places. Export energy will be recorded in the same way as forward (Import) flowing energy using identical starting currents etc.

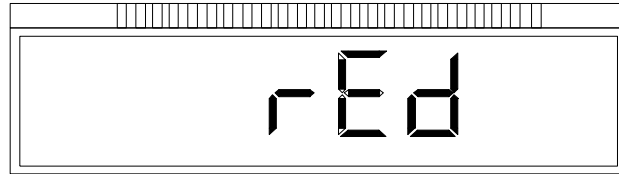


Total Reverse

Reverse Energy Detection

A configurable option within the meter will alternate a warning message on the display should a fraud attempt be made by running current backwards

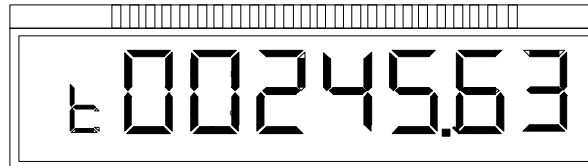
through the meter. The reverse energy warning message is triggered when the reverse power exceeds a programmable threshold level of between 1-10 Amps for a period of 10Wh. Once this level is reached the message below will be displayed which can only be reset via the IEC 1107 port. Whilst in this mode the LED will remain lit whilst there is reverse energy detected.



Reverse Energy Detection Message

Unidirectional Register

An optional requirement is to accumulate both import and export energy into the same register. Basically this will be the sum of adding both forward and reverse energy registers. The register would be shown as the normal kWh display as below:



Total Display

No Power Read (option)

This allows the user to take meter readings when there is no mains electricity supply. This is achieved by installing a battery supply board that powers the meter. The user applies a magnet to the outside of the meter case and the meter powers up for 20 to 30 seconds. During this time the meter displays the sign on and then displays the energy registers.

4 User Interfaces

The inputs and outputs of the 5235

4.1 Register Displays

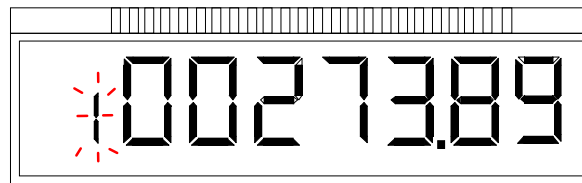
Single rate version -versions A & B

Single rate meters display the total kWh reading only. The display is configurable to show either whole numbers, 1 or 2 decimal places. The meter is also factory configurable to display either 5 or 6 digits with roll over to zero at 99999 or 999999.

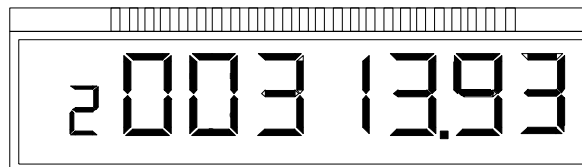
Two-rate meter (external time switch) - D version only

kWh are recorded at a particular rate and displayed using the rate enunciators on the left hand side of the display. The rate registers are displayed between 0 and a maximum of 2 decimal places unless configured to 3 decimal places of testing purposes via the optical port.

The rate register range is 00000.00 – 99999.99 kWh unless factory configured to six digits. The diagram shows a display sequence for a four-rate meter and total register below. In the two rate variant the meter may be configured to operate between 1 and 2 rates via the Optical port.



Rate 1 display. Flashing enunciator indicates active rate



Rate 2 Display

4.2 Pulsed Output (Option)

The type B meter has an optically isolated, voltage free open collector Pulse Output that is configurable to between 1 and 1000 pulses per kWh. To maximise operation with external monitoring devices, the pulse width can also be configured to between 20 and 260 mS in 20 mS steps. Configuration is made through the IEC 1107 port.

The output meets IEC62053-31: 1998 Class B, Maximum voltage 15Vdc.

4.3 Switching inputs (D model)

The configuration is factory set allowing the meter to operate as a single or two rate meter. Rate switching is achieved by switching neutral or live to the input terminal. See wiring diagram for the D model.

5235D-L Live switching model

5235D-N Neutral switching model

5 Installation

Construction, Mounting and wiring of the 5235

5.1 Construction

The Credit Meter case meets the requirements of BS5685 and is manufactured from following materials: -

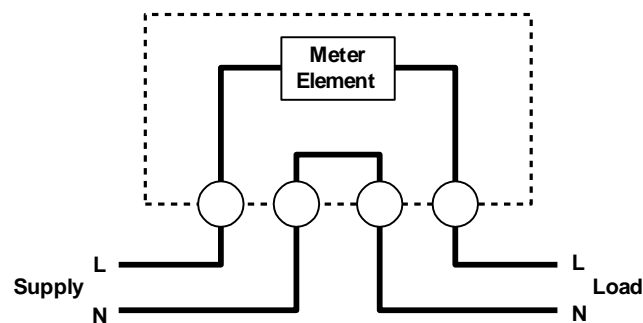
Meter Base:	Flame Retardant and UV stabilised Polycarbonate
Meter Top:	Flame Retardant and UV Stabilised Polycarbonate
Terminal Cover:	Flame Retardant and UV Stabilised Polycarbonate
Terminals:	Solid Brass extrusion, 8.3mm diameter with 2 screws

5.2 Meter fixing

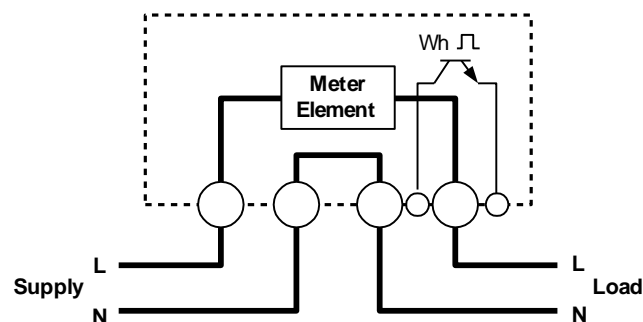
The meter is mounted using the two fixing holes found either side of the terminal housing. To aid terminal cover sealing, the screw boss has four raised indicators that should be aligned against the indicator on the cover.

5.3 Wiring

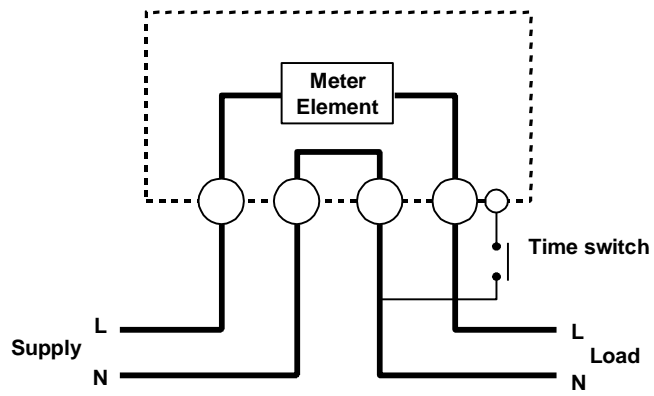
Terminal arrangement conforms to BS5685, Part1, 1979. Wiring diagrams can be put onto the terminal covers of the meters.



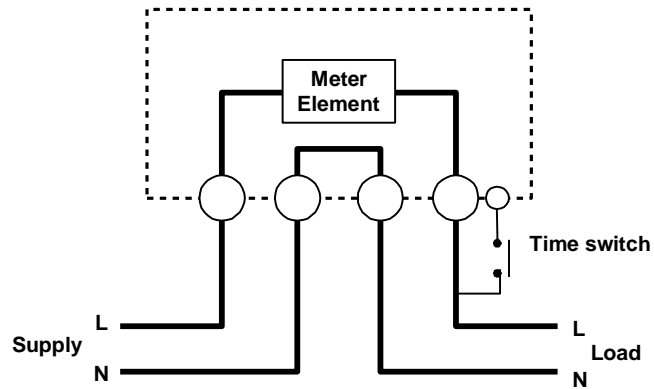
Meter type 5235 A and F



Meter type 5235 B



Meter type 5235 D - N



Meter type 5235 D - L

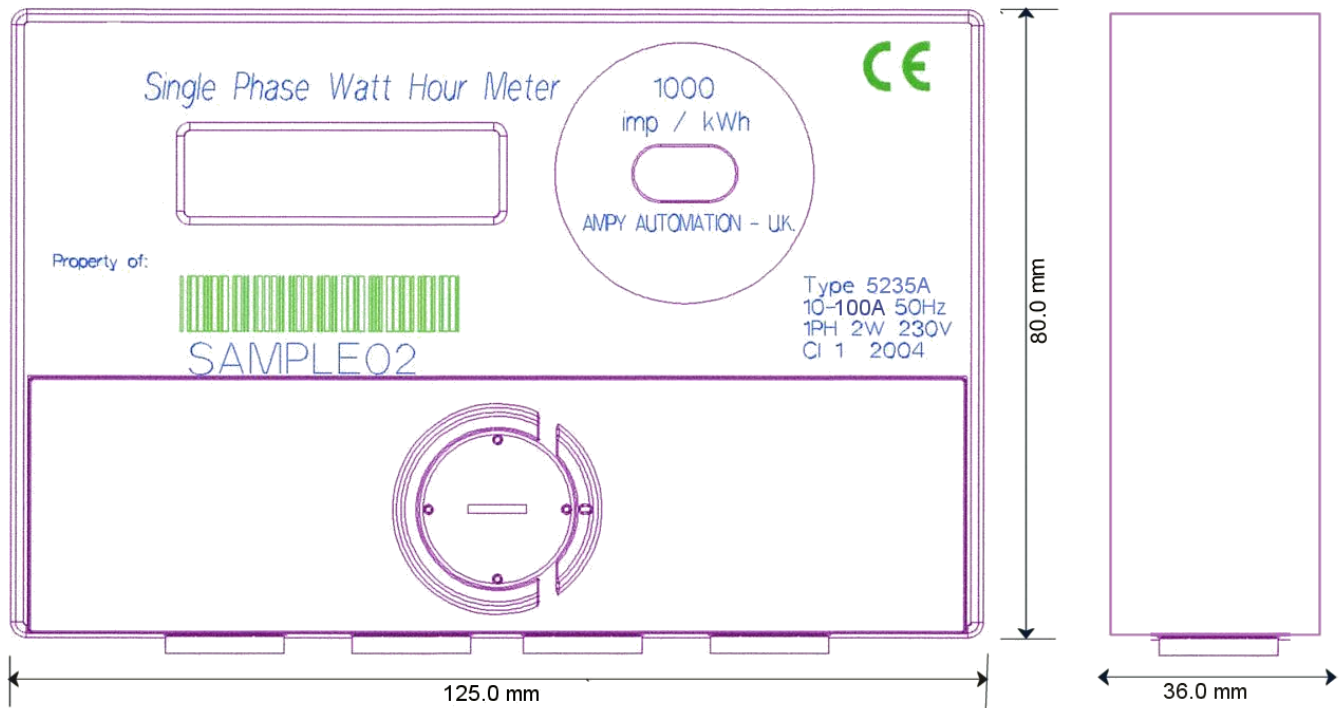
6 Technical Summary

The technical specifications of the 5235

6.1 Technical Summary

System Voltage	Single element meters	240Vac Phase to Neutral 230Vac Phase to Neutral 220Vac Phase to Neutral 210Vac Phase to Neutral
	Supply variation	+15% to -20%
	Voltage withstand	415V continuous 10kV impulse @105J
Current (Base)	Direct connection I _b	5A, 10A, or 20A
Current (Max)	I _{max}	40A, 60A, 80A or 100A
Starting Current	(IEC)	0.4% of I _b
Max measuring range		20mA up to 100A
Measuring Accuracy	IEC 62053-21	Class 1 and 2
Burdens	Voltage Circuit @ 230Vac	0.9W 7.7VA
	Current Circuit @ I _b	0.1VA
Supply Frequency	Nominal	50Hz or 60Hz
	Frequency Variation	+/- 5%
Temperature Range	Limit operating ranges	-20°C to 55°C
	Storage range	-25°C to 70°C
Meter Constant		1000 imp/kWh
Pulse output		The output meets IEC62053-31: 1998 Class B, Maximum voltage 15Vdc
Display	Type – 7 character, 7segment LCD	Character size – 8x3.5 mm.
Quality	Manufactured to:	ISO 9001:1994
Ofgem approval number		986
Certificated life		20 years
Reference standards	IEC62052 – 11: 2003 & IEC62053 – 21:2003 Alternating current static watt-hour meters for active energy. (Classes 1 & 2) BS5685: 1979: Part 1:Specification class 0.5, 1.0 and 2.0 Single phase and Polyphase, single rate and multi-rate watt-hour meters. IEC62056 – 21: 2002.Data Exchange for Meter Reading, Tariff and Load Control. Direct Local Exchange. SI1566: 2003The Meters (Certification) Regulations 1990.	
Construction		Flame Retardant and UV Stabilised Polycarbonate
Terminal arrangement		BS5685
Terminal size		8.3 mm diameter.
Weight	Standard Terminal Cover	304g
	Extended Terminal Cover	338g
Dimensions (mm)	Standard Terminal Cover	H 80 x W 125 x D 36
	Extended Terminal Cover	H 113 x W 126 x D 41

6.2 Dimensions



7 Maintenance and Service

7.1 Meter Check

While it isn't necessary, under normal circumstances, to perform any maintenance on the installed meter, the following are check points that should be observed during scheduled periodic meter visits.

- Is the meter dry and clean, particularly the LCD display and the optical interface?
- Does the meter display a legible and sensible display? i.e. does the meter appear in a serviceable condition.
- Check all factory fitted and company fitted seals are in place secure and intact.
- Observe display for any error messages or notifications
- Confirm that the energy registers have changed to a reasonable degree since the last visit.
- If irregularities are found, continue as in section 8.

7.2 Meter Testing

The testing of meters, either random sample or on all meters, should be carried out periodically according to national regulations. The meter must be removed as described in section 8.3 and replaced with a meter of similar type for the duration of the tests.

7.3 Post Installation Configuration Changes

With the aid of a laptop computer or other suitable hand held device a flag probe and Landis+Gyr specific software, it is possible to amend the factory configured options of the meter. It is beyond the scope of this manual to describe in any further detail the procedure. Landis+Gyr sales team would be happy to discuss specific requirements.

8 Measures in the Event of Faults

8.1 Operating Faults

If the LCD window is illegible or the data readout does not function, the following points should be checked.

Is the mains voltage present? – Are the preliminary fuses intact?

Has the minimum or maximum recommended ambient temperature been exceeded?

Is the LCD window clear of all debris? – Not misted over, painted over or soiled in any way.

If none of the above are causing the fault the meter should be disconnected as per section 8.2, replaced if required as detailed in section 5 and returned to Landis+Gyr as described in section 8.3.

8.2 Disconnecting the Meter



Remove preliminary fuses before continuing

The connecting conductors should not be Live when removing the meter. Electrically Live parts are a life threatening hazard. Preliminary fuses should be removed and kept in a safe place until all work is complete, where they cannot be replaced by anyone unnoticed.

Proceed as follows:

- Remove the company seal on the terminal cover (if fitted).
- Release the two terminal cover screws and remove terminal cover.
- Check with a suitable voltage testing device that the phase connections are not live. If they are live then remove the preliminary fuses and keep in a safe place until all work is complete, where they cannot be replaced by anyone unnoticed.
- Remove the signal inputs and outputs by releasing the auxiliary terminal screws.
- Remove the phase connections by releasing the main terminal screws.
- If required fit a suitable replacement meter as described in section 5.

8.3 Repairing the Meter

There are no user serviceable parts inside the meter. Breaking factory calibration seals will invalidate the calibration status of the meter. In the event of a meter requiring repair, proceed as follows.

- Remove the meter from the installation as detailed in section 8.2.
- Attach a label, which describes the fault as accurately as possible, to the meter and include name and contact details of person responsible in case of inquiries.

- Package the meter to ensure no further damage can occur during transit.
- Send the meter back to Landis+Gyr.

9 Decommissioning and Disposal



The procedure for the safe removal of the meter from the installation is described in section 8.3. Please ensure that ALL SAFETY PRECAUTIONS are met before proceeding.

Based on the environmental certificate ISO 14001, the components used to manufacture the meter can, in the main, be broken down into constituent parts and sent for suitable recycling or disposal.



The following are general guidelines and should NOT take priority over local disposal and environmental policies which should be adhered to without compromise.

Component Parts	Disposal
Printed Circuit Boards	
LCD Display	Treated as per disposal of Electronic Equipment
Metal Components	Sorted and delivered to collective recycling point
Plastic Components	Sorted and delivered for re-granulation if at all possible

10 Glossary of Terms and Standards

10.1 Acronyms

Acronym	Definition
BS	British Standard
DFS	Direct Field Sensor
DIN	Deutsches Institut für Normung (German Institute For Standardisation)
ECD	External Connection Diagram
EEPROM	Electrically Erasable Programmable Read Only Memory (E2)
IEC	International Electrotechnical Commission
ISO	International Standards Organisation
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MD	Maximum Demand
MID	Metering Industry Directive
NPR	No Power Read
OFGEM	The Office of Gas and Electricity Markets
PTR	Photo-transistor
RED	Reverse Energy Detected

10.2 Measurement Units

A	Ampere (unit of current)
Hz	Hertz (unit of frequency)
Iref	MID reference current
Kg	Kilogramme (unit of weight)
kVAh	Kilo Volt Ampere hour
kvarh	kilo Volt Amps reactive hour
kWh	kilo Watt-hour
mm	millimetre (unit of distance)
mO	milliohm (unit of resistance)
ms	millisecond
Nm	Newton meter (unit of torque)
°C	Degree Celsius (unit of temperature)
UN	Rated supply voltage of meter
UT	Rated external switch voltage
V	Volt