Modbus Protocol Implementation - Continued

Part 2 Register - to be written with function code 10, and read by function code 03:

Address (Register)	Input Register Parameter		Modbus Protocol Start Address Hex		Key
	Parameter	Format	High Byte	Low Byte	
40021	Meter Address ID	Float	00	14	A
40029	Baud Rate	Float	00	1C	B
463745	Time of Display in turns	BCD	F9	00	C
463761	Pulse 1 Output	Hex	F9	10	D
463777	Measurement Mode	Hex	F9	20	E
463793	Pulse 1 Output Mode	Hex	F9	30	F

Key:
A - Ranges from 001-247, requires a restart to become effective. Default ID is 1.
B - Unit is BPS - 5=1200, 0=2400 (Default), 1=4800, 2=9600, requires a restart to become effective.
C - 0-30 seconds, Default is 0 (does not display in turns).
D - Unit is kWh/imp - 0000=0.001, 0001=0.01, 0002=0.1, 0003=1.0 - Example 0003=1 Pulse Per kWh.
E - 0001=Import Engergy (Default), 0002=Import + Export Energy, 0003=Import - Export Energy.
F - 0000=LED flashes for Import & Export (Default), 0001=LED flashes for Import, 0002=LED flashes for Export.

Dimensions & Wiring Diagram

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RS
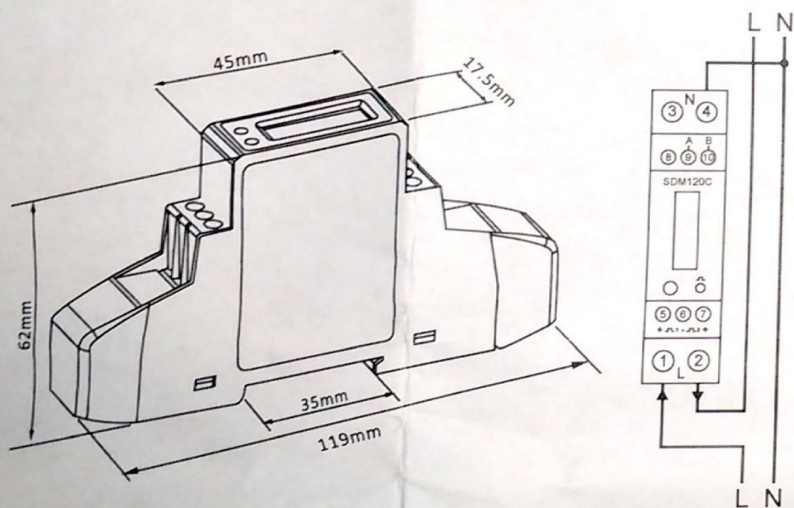
Professionally approved products.

Instruction Manual
1 Phase Multi-function kWh Meter 45A
DIN Rail Power Meter.

(UK)

CE   RoHS

UK

The 871-8302 is a single-module power monitor that will measure and display electrical power quality parameters. It has been engineered to cover most applications (Single Phase networks / Built in Pulsed and RS485 Modbus / Import and Export kWh), replacing the need for several different models of this power meter.

The 871-8302 is produced to the highest quality and utilizes the latest microprocessors and technology. It has a backlit display and 10 different measuring parameters. With built in pulsed outputs and RS485 Modbus RTU it is fully compatible for integration with BMS and remote monitoring systems.

Parameters
- Voltage
- Frequency
- Current
- Power Factor
- kW
- kVA
- kVAr
- Import kWh
- Export kWh
- Total kWh

Performance Criteria
- Operating Humidity ≤ 85%
- Storage Humidity ≤ 95%
- Operating Temperature -25°C - 55°C (3K6)
- Storage Temperature -30°C - 70°C
- International Standard IEC62053-21
- Accuracy Class 0.5 or 1.0
- Protection (Dust/Water) IP51

Specifications

Measured Parameters
The unit can monitor and display the following parameters of a single phase two wire (1p2w) system.

Features
- Class 1 kWh according to EN62053-21
- Class B according to EN50470-3
- Class 1 kVarh according to EN62053-23
- Accuracy 0.5 Current, Voltage & Power
- Maximum Energy Reading 99999.9 kWh/kVarh
- 1-DIN Module
- Self-supplied Auxiliary Power Supply
- IP51
- 2 Pulsed Outputs
- RS485 Communication Port
- MODBUS RTU Protocol

Meter Specifications
- Nominal voltage 230V AC 110V AC
- Operational voltage 0.7-1.3Un
- Insulation capabilities:
  - AC Voltage Withstand 4kV for 1 minute
  - Impulse Voltage Withstand 6kV-1.2µS waveform
- Basic Current (Ib) 5A
- Maximum Rated Current (Imax) 45A
- Operational Current Rage 0.4% Ib-Imax
- Over Current Withstand 20Imax for 0.01s
- Operational Frequency Range 50-60Hz ±2%
- Internal Power Consumption ≤ 2W / 10Va
- Test Output Flash Rate (Red LED) 1000imp/kWh
- Pulse Output Rate 1000imp/kWh
- Data Communication Port RS485 Modbus RTU
- Data Save > 20 years when power off.

RS485 Communication Specifications
- Bus Type RS485
- Protocol MODBUS RTU With 16bit CRC
- Baud Rate 1200(default), 4800, 9600
- Address Range 1-247 User Settable
- Bus Loading 32 Meters Per Bus
- Range 1000m
- Parity EVEN (default), Odd, None
- Stop Bit 1
- Data Bits 8

Modbus Protocol Implementation

This section provides basic information for interfacing the Smart meter to a Modbus Protocol network. RS485 is a bidirectional, full or half-duplex communication bus structure consisting of a single Master and at least one Slave. The maximum number of slaves can vary widely from system to system however; most manufacturers cap the max number of slaves between 16 and 32. Most RS485 signals operate ideally on a DC bias of 5 volts. The signals are driven alternately from each other. That is, each line operates inversely from the other and each is also referenced to the other from an electrical standpoint. The receiver looks at the difference, not the absolute voltage value, of the two signals. This is referred to as the "Line Bias" and it is critical in RS-485 applications. A bias difference of higher than 0.3v is generally accepted as valid but can be as high as 0.7v, depending on the system. Absolute values below this are considered "undefined" or "grey" and may result in either a high or low reading by the receiver. In many nonisolated applications, a "signal ground" or "shield" connection is provided in addition to the 2 data lines however, this is not necessary as the signals are referenced to each other and not to absolute ground. It is only provided as a ground point for the communication cable shielding. It is important to note that the shield ground should only be connected at a single trunk end in non-isolated applications. If grounds are tied together in non-isolated systems, even a slight voltage difference, between the absolute ground points, will create a "ground loop" condition which can cause serious damage to the equipment. Note that in isolated equipment, the above does not apply as there is no direct connection between the ground points however, in all applications, proper cable shield grounding should be practiced to eliminate and/or reduce electrical interference.

The electrical interface is 2-wire RS485, via 2 screw terminals. Connection should be made using twisted pair screened cable (Typically 22 gauge Belden 8761 or equivalent). All "A" and "B" connections are daisy chained together. Line topology may or may not require terminating loads depending on the type and length of cable used. Loop (ring) topology does not require any termination load. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (0.25 Watt min.) resistor. A total maximum length of 3900 feet (1200 meters) is allowed for the RS485 network. A maximum of 32 electrical nodes can be connected, including the controller. The address of each the meters can be set to any value between 1 and 247. Broadcast mode (address 0) is not supported.

The modbus protocol function code used to read data is 04/03, the modbus protocol function code to write data is 10.

Part 1 Register - to be read by function code 04:

Address (Register)	Input Register Parameter				Modbus Protocol Start Address Hex	
	Parameter	Units	Format		High Byte	Low Byte
30001	Voltage	V	Float		00	00
30007	Current	A	Float		00	06
30013	Power	W	Float		00	0C
30019	Active Apparent Power	VA	Float		00	12
30025	Reactive Apparent Power	VAr	Float		00	18
30031	Power Factor	None	Float		00	1E
30071	Frequency	Hz	Float		00	46
30073	Import Active Energy	kWh	Float		00	48
30075	Export Active Energy	kWh	Float		00	4A
30343	Total Active Energy	kWh	Float		01	56