DCM230-2 ETL Series

DC Energy Meter

- Measures kWh, W, V, A etc.
- Bi-directional measurement IMP & EXP
- Pulse output
- RS485 Modbus
- Din rail mounting 35mm
- DC shunt connection
- Class 1

User Manual V1.2

Risk Reduction

Information for Your Own Safety

This manual does not contain all of the safety measures operating the equipment (module, device) for different conditions and requirements. However, it does contain information which you must know for your own safety and to avoid damages. These information are highlighted by a warning triangle indicating the degree of potential danger.

Warning

This means that failure to observe the instruction can result in death, serious injury or considerable material damage.

Caution

This means hazard of electric shock and failure to take the necessary safety precautions will result in death, serious injury or considerable material damage.

Qualified personnel

Operation of the equipment (module, device) described in this manual may only be performed by qualified personnel. Qualified personnel in this manual means person who are authorized to commission, start up, ground and label devices, systems and circuits according to safety and Regulatory standards.

Proper handling

The prerequisites for perfect, reliable operation of the product are proper transport, proper storage, installation and proper operation and maintenance. When operating electrical equipment, parts of this equipment automatically carry dangerous voltages. Improper handling can therefore result in serious injuries or material damage.

- ✧ Use only insulating tools.
- ✧ Do not connect while circuit is live (hot).
- ✧ Do not connect the meter to a AC network.
- ✧ Place the meter only in dry surroundings.
- ✧ Do not mount the meter in an explosive area or expose the meter to dust, mildew and insects.
- ✧ Make sure the wires are suitable for the maximum current of this meter.
- ✧ Make sure the DC wires are connected correctly before activating the current/voltage to the meter.
- ✧ Do not touch the meter connecting clamps directly with metal, blank wire and your bare hands as you may get electrical shock.
- ✧ Make sure the protection cover is placed after installation.
- ✧ Installation, maintenance and reparation should only be done by qualified personnel.
- ✧ Never break the seals and open the front cover as this might influence the function of the meter, and will cause no warranty.
- ✧ Do not drop, or allow strong physical impact on the meter as the high precisely components inside may be

damaged.

- ✧ Designed to be mounted inside of switchboards or cabinet on DIN RAIL
- ✧ This device must have a suitable sized Circuit Breaker feeding the Multi Function Energy Meter so it does not exceed the maximum rated current.
- ✧ The supply wiring of this device shall be suitable sized cable to match the installed circuit breaker.
- ✧ A Disconnection Device (Circuit Breaker) should be installed close to the Multi Function Energy Meter.
- ✧ The Disconnection Device shall be marked as the Disconnection Device for the Multi Function Energy Meter

Disclaimer

We have checked the contents of this publication and every effort has been made to ensure that the descriptions are as accurate as possible.

However, deviations from the description cannot be completely ruled out, so that no liability can be accepted for any errors contained in the information given. The data in this manual is checked regularly and the necessary corrections are included in subsequent editions. We are grateful for any improvements that you suggest.

Introduction

Eastron DCM230-2 ETL DC energy meters are designed for measuring and monitoring in DC systems. The din rail DC energy meters can measure of important DC parameters: Voltage, current, power and energy etc. It also support bi-directional measurement with pulse output.All data in the meter are accessible via RS485 using Modbus RTU. The meter has two versions working with DC power supply. Input voltage range up to 300, 600, 1000V DC, and current inputs are flexible with DC shunt and current sensors.
DCM230-2 is ETL listed by Intertek, which means it is qualiýed to enter the American market.

PART 1 Specification

General Specifications

Voltage DC Input:	Min.100V DC, Max. 1000V DC
Auxiliary Supply:	Min. 9V DC, Max. 40V DC
DC Shunt Input:	75mV (default)
Current Range:	0~2000A
Power consumption:	≤ 1W
AC voltage withstand:	4400V/ 1min
Impulse voltage withstand:	6.4kV - 1.2/50μS waveform
Pulse output:	1, 10, 100, 1000 imp/kWh (default)
Pulse duration:	60, 100 (default), 200mS
Pulse output indicate:	Total kWh/ import kWh/ export kWh
Display:	LCD with backlit
Max. Reading:	999999.9999kWh
Weight:	220g
Standard：	GB/T 33708-2017/ IEC62053-41

Unit Characteristics

The Unit can measure and display:

- voltage
- Currents
- Power
- Active energy imported and exported

Pulse output indicates real-time energy measurement. An RS485 output allows remote monitoring from another display or a computer.

Shunt Primary Current

The unit can be configured to operate with primary current and secondary input.
Primary current range: 0~2000A.
Second input: 75mV (default),60mV

RS485 Output for Modbus RTU

For Modbus RTU, the following RS485 communication parameters can be configured from the Set-up menu:

Baud rate 1200,2400, 4800, 9600,19200 bps
Parity none (default)/odd/even
Stop bits 1 or 2
RS485 network address *nnn* – 3-digit number, 001 to 247
Modbus™ Word order Hi/Lo byte order is set automatically to normal or reverse. It cannot be configured from the set-up menu.

Set-up screens are provided for setting up the RS485 port.

Pulse output

The unit provides a pulse output. The constant can be configured to below:

10000 imp/kWh
1000 imp/kwh
100 imp/kWh
10 imp/kWh
1 imp/kWh
Pulse width: 200/100(default)/60 ms.

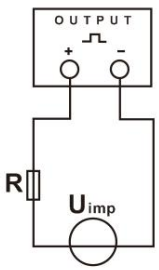
Note: the relationship between pulse constant and CT1

CT1 setting	Default pulse constant	Settable pulse constant
1 – 20	1000 imp/kWh	1000,100,10,1 imp/kWh
21 – 200	100 imp/kWh	100,10,1 imp/kWh
201 – 2000	10 imp/kWh	10,1 imp/kWh

*when the CT setting on meter is 2000A, the default pulse constant is 10 imp/kWh and it can be set to 10 imp/kWh or 1 imp/kWh.
*Over-current alarm: Alarm will happened when the current is over the CT1 value set on the meter. The Alarm LED will stay solid and the corresponding register value will be changed. The user can read this register through communication to determine whether an overcurrent alarm has occurred.

The pulse outputs can be set to generate pulses to represent Import kWh/ Export kWh/ total kWh.

The pulse output is passive type, complies with IEC62053-31 Class A.



ATTENTION: Pulse output must be fed as shown in the wiring diagram below. Scrupulously respect polarities and the connection mode. Opto-coupler with potential-free SPST-NO Contact. Contact range:5~27VDC Max. current Input:27mA DC.

Environment

Operating temperature	-30 ℃ to + 60℃
Reference temperature	23℃±2℃
Relative humidity	0 to 90%, non-condensing
Altitude	up to 2000m
Installation category	CATIII

Mechanical Environment	M1
Electromagnetic environment	E2
Degree of pollution	2

Mechanics

Din rail dimensions	36x100x63 (WxHxD) DIN 43880
Mounting	DIN rail 35mm
Ingress Protection	IP51 (indoor)
Material	Self-extinguishing UL94V-0

Line loss

Define: line loss impedance is a result of the impedance of the wire between the positive terminal of the Mains supply and the device itself Rline1 and of the impedance of the wire between the second terminal of the device to the positive terminal of the meters shunt Rline2. Therefore the overall line loss impedance can be calculated as sum of both wire impedance.

The calculation is described with the following:
Line Loss Impedance = RlineLoss = Rline1 + R line2
Remark: In this document the line loss impedance is mentioned several times. This refers to the overall line loss impedance. The same applies for the configurable line loss impedance.
In the two-wire line loss measurement mode, the line loss energy is calculated as:
Line Loss power = plineLoss(t) = $I_{shunt}^2(t) \cdot R_{line}$

Line Loss Energy = $\int_0^t P_{lineLoss}(t)\,dt$

Note: The Value for Ishunt refreshes with a maximal period of 1500ms. The same value is applied for the integration constant for the line loss energy. The energy integration cycle is synchronized with the line loss power cycle.

Import

For Import Energy Mode the register values for every point in time are given by:
Total Import Mains Energy = Total Import Device Energy + Total Import Line Loss Energy ,
with Rline = (Rline1 + Rline2) > 0, which is illustrated inFigure 28.
The exact calculation is given by:
Total Import Mains Power = PImportMains(t) = Ishunt(t) · uterminal(t)
Total Import Device Power = PImportDevice(t) = PImportMains(t) − PlineLoss(t)
Total Import Mains Energy = $\int_0^t$ PImportMains(t) dt.
Total Import Device Energy = $\int_0^t$ PImportDevice(t) dt.
As prior mentioned the refreshment cycle of the base values for the respective power calculation and integration cycle of the resulting energy are synchronized.

PART 2 Operation

Initialization Display

When it is powered on, the meter will initialize and do self-checking.

	Full Screen (stay 2s)
	Software Version (stay 2s) (This information is for reference only, in kind pervail.)
	Current Modbus address (stay 2s)

	Current baud rate (stay 2s)
	Total active energy(kWh) Total=Import+ Export Max read: 999999.9999 kWh

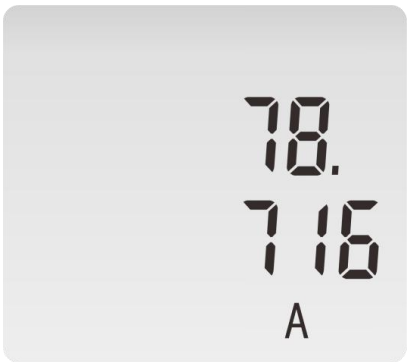
Buttons function

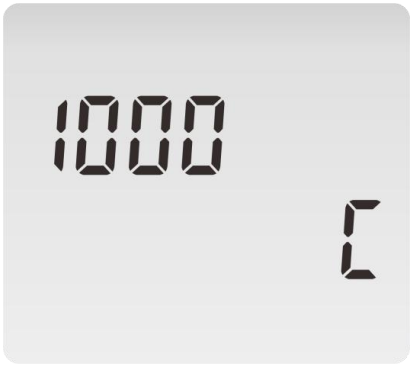
There are two buttons on the front panel.

	>Scroll the display for data checking. >Changing option at Set-up mode >Exit the Set-up mode
	>Set-up mode entry >Confirmation

Scroll display

After initialization and self-checking program, the meter displays the measured values. The default page is total kWh. If the user wants to check other information, please press the scroll button  on the front panel.

	Total active energy(kWh) Total=Import+ Export Display format: 6+4 999999.9999 -> 000000.0000
	Partial resettable active energy Display format: 6+4 999999.9999 -> 000000.0000
	Voltage
	Current

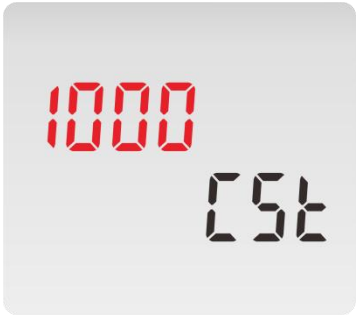
	Power Display format: <1000 W: XXX W <1000kW: XXX.XXX kW For other value: XXXX.XX kW
	Pulse constant
	CT1 Primary current
	Meter address

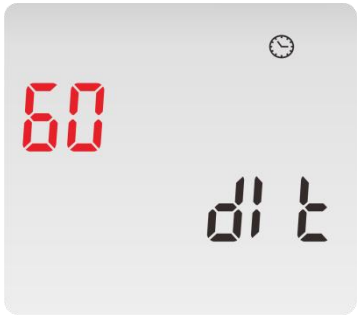
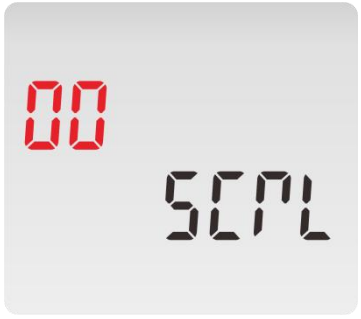
	Baud rate
	Parity
	Software Version

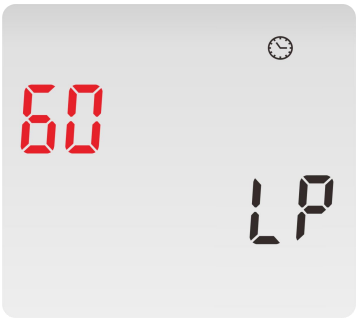
Set-up Mode

To get into Set-up Mode, the user need press the "Enter" button  for 3 seconds.

Page	Display	Descriptions
1		**Password** To get into Set-up mode, it asks a password confirmation. Default password: 1000 Use  and  to enter correct password.

2		Keep pressing for 3 second, the current selection will flash, use and to change the Modbus address. Options: 1~247 Keep press for 3s to confirm the selection.
3		Keep pressing for 3 second, the current selection will flash, use and to change the Baud rate. Options: 1.2k, 2.4k,4.8k,9.6k (default),19.2k Keep press for 3s to confirm the selection.
4		Keep pressing for 3 second, the current selection will flash, use and to change the Parity. Options: EVEN,ODD,NONE (default)
5		Keep pressing for 3 second, the current selection will flash, use and to change the type of Pulse Output. Options: total kWh, IMP kWh, EXP kWh
6		Keep pressing for 3 second, the current selection will flash, use and to change the pulse constant. Options: 1000, 100, 10, 1 imp/kWh *Default pulse constant is related to the CT1 setting

7		Keep pressing for 3 second, the current selection will flash, use and to change the pulse width. Options: 60, 100, 200, unit: ms
8		Use to select the CT1 option. Keep pressing for 3 second, the current selection will flash, use and to enter the Primary current. The range is from 0001 to 2000. For example, if using a 100A/75mV current transformer, the CT1 shall be 0100. Keep press for 3s to confirm the selection. Deafult : 1A
9		Keep pressing for 3 second, the current selection will flash, use and to change the DIT(Demand Integration Time). Options: 0,5,8,10,15,20,30,60(default)
10		Use to select the scroll display time option. Keep pressing for 3 second, the current selection will flash, use and to enter the options: 0~60s. Default: 0 s, represent do not scroll display

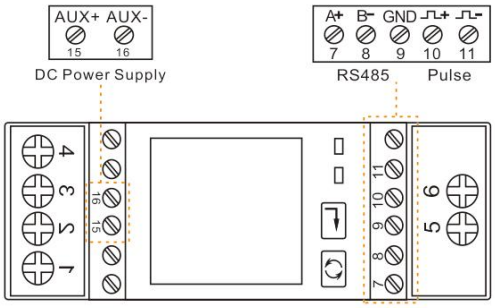
11		Use to select the backlit time option. Keep pressing for 3 second, the current selection will flash, use and to enter the options: 0,5,10,20,30,60 minutes. 0 means the light is always on. Default: 60 minutes
12		Use to select the Password option. Keep pressing for 3 second, the current selection will flash, use and to enter the new password. The range is from 0001 to 9999. Default: 1000
13		Shunt wiring Use to select the shunt connection option. Keep pressing for 3 second, the current selection will flash, use to choose the connection way. Option: N, P N: Negative type (default) P: Positive type

Keep pressing button to exit the set-up mold.

Wiring diagram

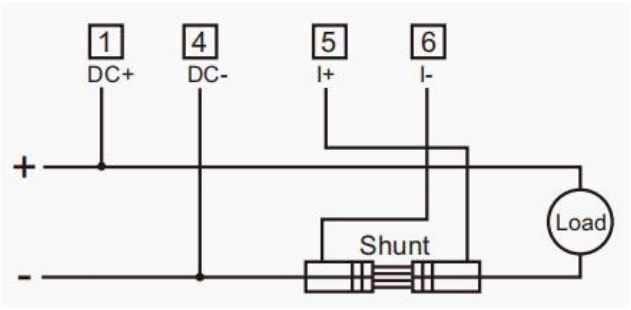
Terminal Connection

DC Power Supply:

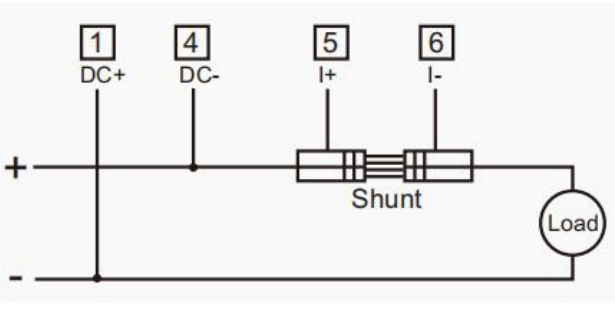


Shunt Connection

Positive Type:



Negative Type:

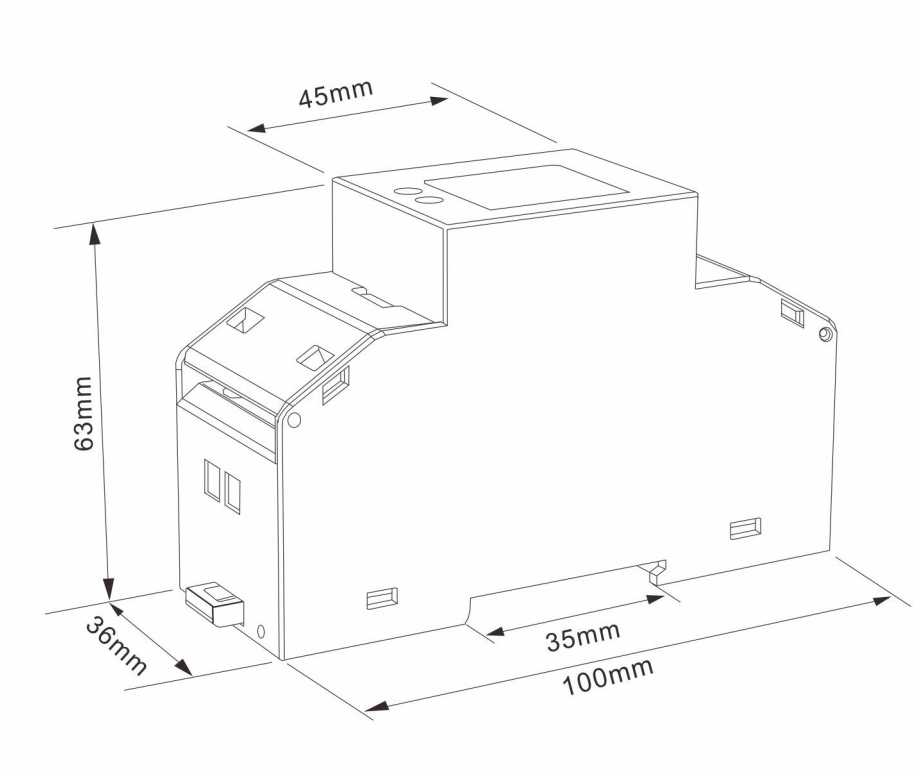


Terminals	Strip Length	Wire Range	Torque	Model
Aux. / RS485 / Pulse	5-6 mm	0.5-1.5mm^2	0.2Nm	PZ0
DC± /I ±	6-7 mm	0.5-2.5mm^2	0.2Nm	PZ0

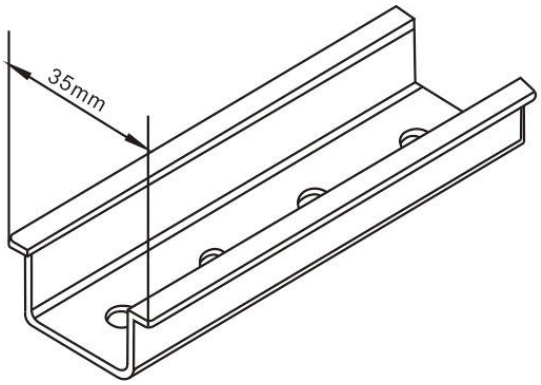
Symbols

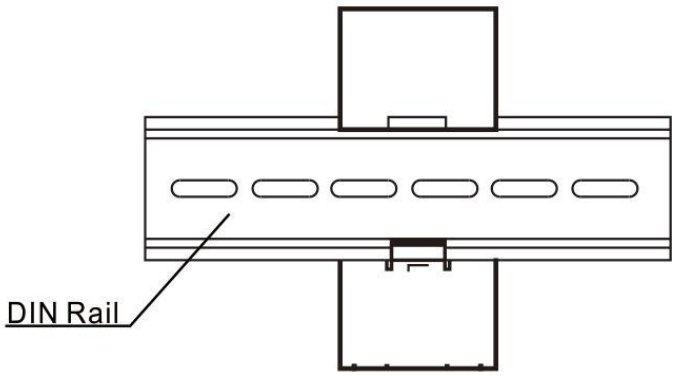
NO.	Symbol	Reference	Description
1	⎓	IEC60417-5031(2002-10)	Direct current
2	~	IEC60417-5032(2002-10)	Alternating current
3	⧈	IEC60417-5172(2003-02)	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
4	⚡		Caution, possibility of electric shock
5	⚠	ISO 7000-0434b(2004-01)	Caution*

Dimensions



Installation





PART 3 Modbus Protocol

Input registers are used to indicate the present values of the measured and calculated electrical quantities. Each parameter is held in two consecutive16 bit register. The following table details the 3X register address, and the values of the address bytes within the message. A (*) in the column indicates that the parameter is valid for the particular wiring system. Any parameter with a cross(X) will return the value zero. Each parameter is held in the 3X registers. Modbus Protocol function code 04 is used to access all parameters.

For example, to request: Amps 1 Start address=0006
No. of registers =0002
Amps 2 Start address=0008
No. of registers=0002

Each request for data must be restricted to 40 parameters or less. Exceeding the 40 parameter limit will cause a Modbus Protocol exception code to be returned.

Address (Register)	DCM230 Input Register Parameter				Modbus Protocol Start Address Hex	
	Description	Length (bytes)	Data Format	Units	Hi Byte	Lo Byte
30001	Line to neutral volts.	4	Float	V	00	00
30007	Current.	4	Float	A	00	06
30013	Active power.	4	Float	W	00	0C
30073	Import active energy	4	Float	kWh	00	48
30075	Export active energy	4	Float	kWh	00	4A
30085	Total system power demand	4	Float	W	00	54
30087	Maximum total system power demand	4	Float	W	00	56
30343	Total active energy	4	Float	kWh	01	56
30385	Resettable partial kWh	4	Float	kWh	01	80
316385	Line to neutral volts.	4	Float	V	40	00
316387	Current.	4	Float	A	40	02
316389	Active power.	4	Float	W	40	04
316391	Total system power demand	4	Float	W	40	06
316393	Maximum total system power demand	4	Float	W	40	08
316395	Import active energy	4	Float	kWh	40	0A
316397	Emport active energy	4	Float	kWh	40	0C
316399	Total active energy	4	Float	kWh	40	0E
316401	Current resettable total active energy	4	Float	kWh	40	10
316403	Current overload alarm 00 00 means no alarm 00 01 means Current overload alarm	2	Hex	None	40	12

Note:

(1): The method of power demand calculation is: Import- Export. When the import and export powers appear in the demand period, the import power subtract the export power during data processing.

(2) The red marked are commonly used registers which allow users to read continuously at one time.

Holding Registers

Holding registers are used to store and display instrument configuration settings. All holding registers not listed in the table below should be considered as reserved for manufacturer use and no attempt should be made to modify their values.

The holding register parameters may be viewed or changed using the Modbus Protocol. Each parameter is held in two consecutive 4X registers. Modbus Protocol Function Code 03 is used to read the parameter and Function Code 10 is used to write. Write to only one parameter per message.

Address Register	Parameter	Modbus Protocol Start Address Hex		Valid range	Mode
		High Byte	Low Byte		
40003	Demand Period	00	02	Write demand period: 0~60 minutes, default 60. Setting the period to 0 will cause the demand to show the current parameter value, and demand max to show the maximum parameter value since last demand reset. **Length : 4 byte** **Data Format : Float**	r/w
40005	Slide time	00	04	Default 1, min. Range ： 1 ~ (Demand Period -1). **Length : 4 byte** **Data Format : Float**	r/w
40013	Pulse Width	00	0C	Write pulse1 on period in Milliseconds: 60, 100 or 200, default 100. **Length : 4 byte** **Data Format: float**	r/w
40019	Network Parity and Stop	00	12	Write the network port parity/stop bits for MODBUS Protocol, where: 0 = 1 stop bit and none parity, default. 1 = 1 stop bit and even parity. 2 = 1 stop bit and odd parity. 3 = 2 stop bit and none parity. Requires a restart to become effective. **Length : 4 byte** **Data Format : Float**	r/w
40021	Modbus address	00	14	Write the Modbus address Address: 1 to 247 for MODBUS Protocol, default 1.	r/w

				Requires a restart to become effective. **Length : 4 byte** **Data Format : Float**	
40023	Pulse constant	00	16	Options： 0 means 1000 imp/kWh 1 means 100 imp/kWh 2 means 10 imp/kWh 3 means 1 imp/kWh 4 means 10K imp/kWh **Length : 4 byte** **Data Format: float**	r/w
40025	Password	00	18	Write password for access to protected registers. **Length : 4 byte** **Data Format : Float**	ro
40029	Baud Rate	00	1C	Options： 0 means 2400 bps 1 means 4800 bps 2 means 9600 bps 3 means 19200 bps 5 means 1200 bps Default：2 **Length : 4 byte** **Data Format: float**	r/w
40059	Auto-scroll display time	00	3A	Range: 0~60s. 0 means no scroll Default:0 **Length : 4 byte** **Data Format : Float**	r/w
40061	Backlit time	00	3C	Options:0,5,10,20,30,60 minutes 0 means the backlit always on Default：60 **Length : 4byte** **Data Format : Float**	r/w
40087	Pulse output type	00	56	Options： 1 means Import active energy 2 means total active energy 4 means Export active energy Default：2 **Length : 4 byte** **Data Format: float**	r/w
48193	Connection method of shunt	20	00	Setting on shunt connection. Option: 00 4E means Negative type (default)	r/w

				00 50 means Positive type **Length: 2 byte** **Data Format: Hex**	
461457	Reset	F0	10	00 00：Reset Maximum Demand 00 03：Reset Partial Energy **Length : 2 byte** **Data Format:Hex**	wo
463777	Energy Measurement model	F9	20	Options： 00 01：Total=Import 00 02：Total=Import+Export 00 03：Total=Export **Length : 2 byte** **Data Format: Hex**	r/w
464513	Serial number	FC	00	**Serial number** **Length: 4 byte** **Data Format: unsigned int32** **Note: Only read**	ro

PART 4 Shunt

ESFL-2A Series			
Primary Input	Rated Voltage Output	Accuracy	Dimension(mm)
10-50 A	75/60/45 mV	0.5%	25x120x22
75-100 A	75/60/45 mV	0.5%	23x109x11
150-200 A	75/60/45 mV	0.5%	22x118x22
300 A	75/60/45 mV	0.5%	26x127x22
400 A	75/60/45 mV	0.5%	36x127x22
500 A	75/60/45 mV	0.5%	46x127x22
600 A	75/60/45 mV	0.5%	55x127x22
750 A	75/60/45 mV	0.5%	76x127x22
1000 A	75/60/45 mV	0.5%	96x127x22
1500 A	75/60/45 mV	0.5%	113x127x22 or 87x200x97
2000 A	75/60/45 mV	0.5%	136x200x97

If you have any question, please feel free to contact our sales team.

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