Power Meter Installation Manual

IMPRINT

Original AlphaESS Storion-Series Power Meter User Manual

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Copyright Statement

Content

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1. General

The DTSD1352 (ADL3000) electricity meter is a new generation of miniature electricity meters developed by Acrel Electric. This manufacturer possesses many years of experience in designing electricity meters and provides now an advanced product to complete the AlphaESS Storage System.

The power meter contains a LCD display and an electricity pulse output function. Beside the normal function of the clock, the rate period parameters can be set through this additionally. Via the integrated RS485 communication the meter can exchange data with the AlphaESS energy management system and facilitate the automated power administration.

This power meter has the advantages of a smaller volume, a higher precision, a good EMC, an easily installing and even more. It also meets the related technical requirements of electronic power meters in the GB/T 17215, GB/T 17883 and DL/T 614 standards.

2. Product Specification

Type	Accuracy class	Rated voltage	Current specification	Pulse constant
DTSD 1352 (ADL3000)	0.5	3 x 220 / 380V	3 x 1.5 (6) A	6400imp/kWh
			3 x 5 (20) A	1600imp/kWh
			3 x 10 (40) A	800imp/kWh
			3 x 20 (80) A	400imp/kWh

Table 1. Product Specification

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3. Technical Parameter

Item	Technical Value
	DTSD1352 (ADL3000)
Accuracy class	Active: 0.5 Class ; Reactive: 2 Class
Rated voltage UN	3 x 220 / 380V
Current specification	1.5 (6) A, 5 (20) A, 10 (40) A, 20 (80) A
Operational voltage	Normal Operational voltage rage: 0.9~1.1 Un Limit Operational voltage range: 0.7~1.2 Un
Reference frequency	50Hz or 60Hz
Starting current — Direct connecting	0.004Ib
Starting current — Via CT connecting	0.002In
Power Consumption — Voltage line	≤5VA/phase
Power Consumption — Current line	<4VA/phase
Electricity pulse output	Pulse width: 80ms ± 20ms Photo isolator, collector open output
Digital communication	RS485, MODBUS-RTU
Clock error	≤0.5s/d
Temperature range	Normal working temperature: -10°C - +45°C Limit working temperature: -20°C - +55°C Storage temperature: -40°C - +70°C
Relative humidity	≤95% (No condensation)
Outline Dimension (WxDxH)	126 x 109 x 74 (mm)
Mean time between failures (h)	≥50.000

Table 2. Technical Parameter

4. Meter Description
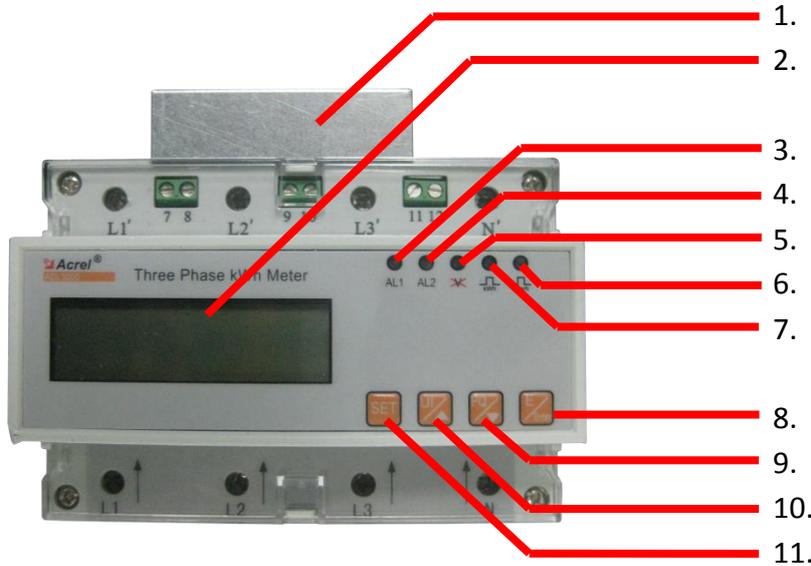
Figure 1. Meter - Description

No	Name	Status	Function
1	RS485 Plug-In		RS485 terminal
2	LCD		LCD display
3	Alarm	Indicator lights	Abnormal meter instructions
4	Phase sequence	Indicator lights	Phase sequence error indication
5	Pressure loss	Indicator lights	Loss of pressure status indication
6	Reactive	Indicator lights	Reactive energy pulse indication
7	Active	Indicator lights	Active energy pulse indication
8	Enter Button		Confirm button
9	Down Button		Display the Down button
10	Up Button		Display the Up button
11	SET Button		Set button

Table 3. Meter - Description

4.1 Outline Dimensions
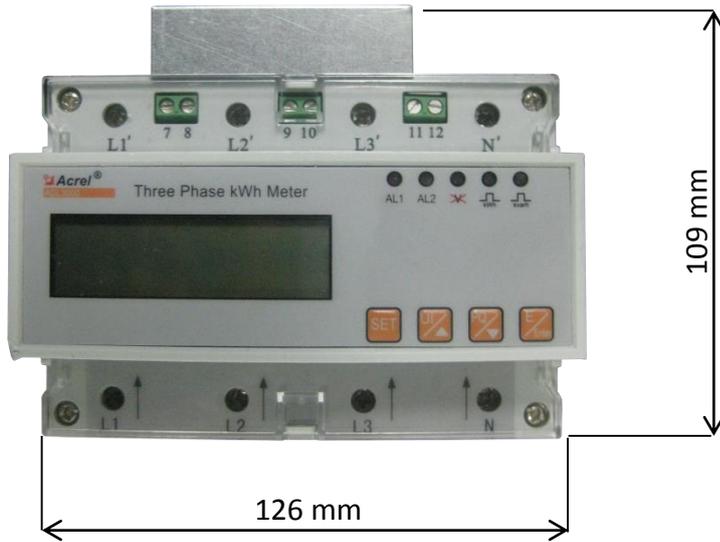

Figure 2. Meter - Front view
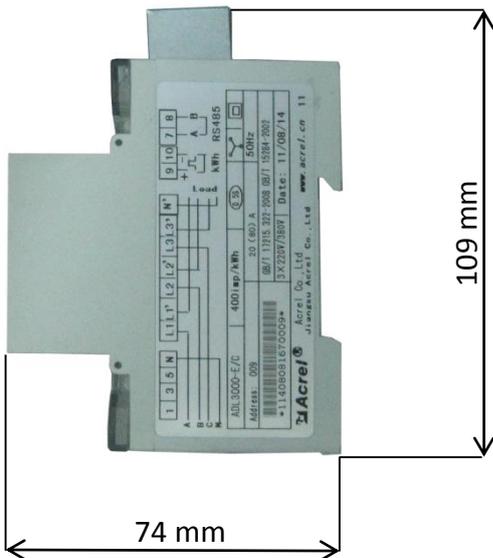
Figure 3. Meter - Side view

5. Installing and Wiring

5.1 Installation diagram

The power meter must be mounted on a standard 35mm guide rail shown in figure 4:
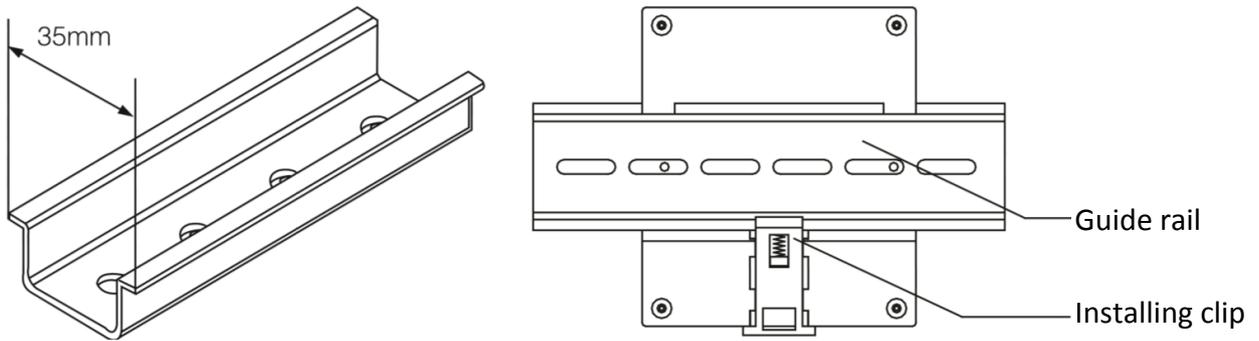
Figure 4. Installation diagram

5.2 Wiring diagram

This power meter supports the two connection modes of direct connecting or connecting via a current transformer CT.
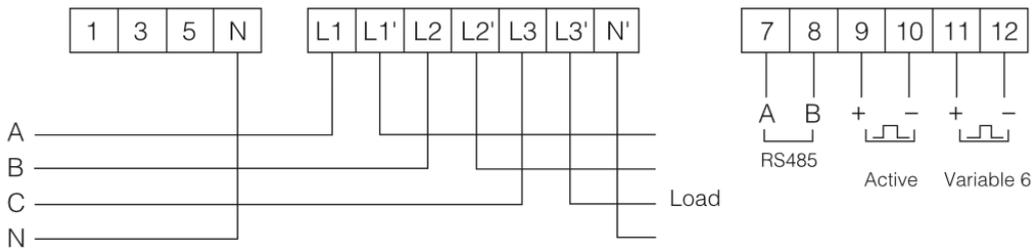

Figure 5. Three phase four wire direct connection
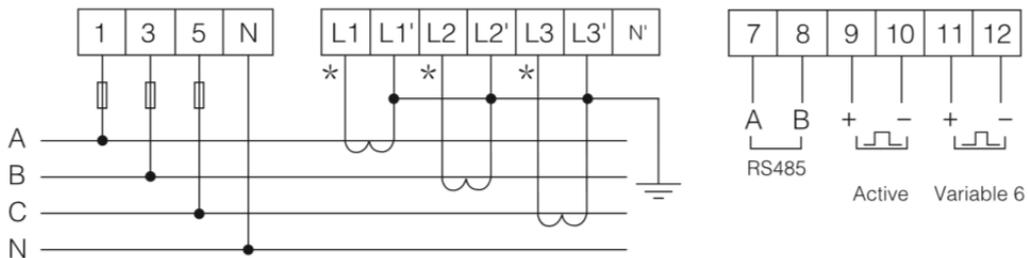
Figure 6. Three phase four wire connection via CT

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5.3 Installation Notice

This electric energy meter should be only installed for indoor use with dry and proper ventilation conditions on a 35mm standard guide rail.

We recommend the use of copper connectors. For the direct connecting mode, please pay attention to the direction of inlet and outlet and keep the screws tightened to prevent an abnormal work of the electric energy meter due bad contact. When you connect the electric energy meter via a current transformer, please pay attention to the polarity of the current transformer secondary.

6. Installation with the AlphaESS Storion Series

The power meter shall be installed and connected in the distribution box, so as to measure the TOTAL consumption of the household. It is needed to assemble a standard 35mm guide rail. The installation of the necessary additional components is shown at the side of the power meter.

On the faceplate of the power meter are four buttons:

1. Enter button
2. Down button
3. Up button
4. SET button
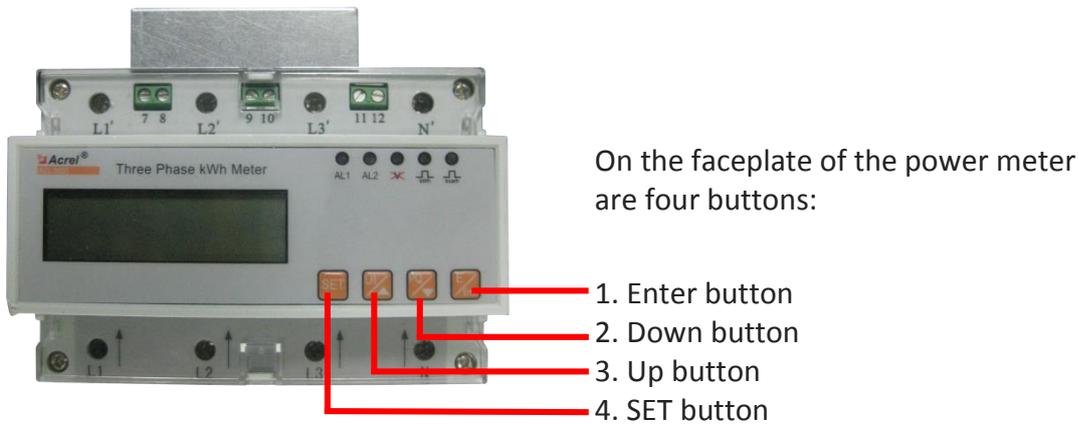
Figure 7. Power Meter – Faceplate

Note:
A network cable to connect the power meter is not included in the delivery!

6.1 Connection of Power Meter on System with Plug-In

Figure 8. Power Meter – Connection 1

The power meter uses RS485 to communicate with the EMS.

Connect the power meter at the marked position with a RS485 cable.
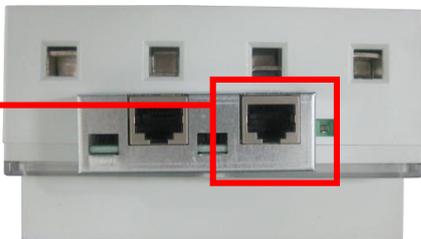
Figure 9. Power Meter – Connection 2

Choose the right slot to connect the power meter with the system.

6.2 Connection of Power Meter on System with Plug-In
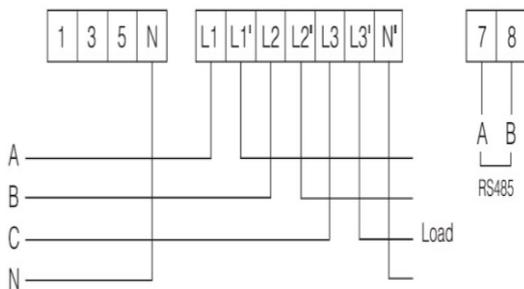
Figure 10. Power Meter – Connection without Plug-In - 1

Connect the power meter: Three phase four wire direct connecting.
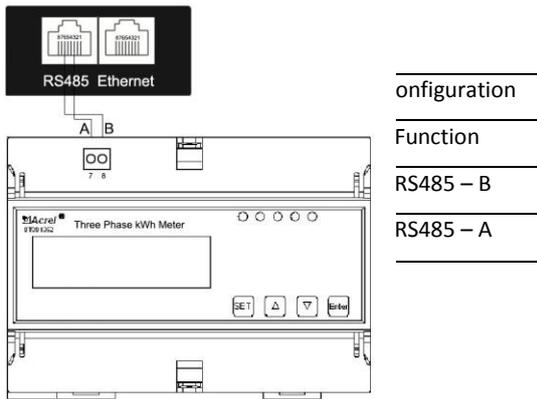
The power meter uses RS485 to communicate with the EMS.

The RS485 communication port of the cabinet defines the RJ-45 pin 3 as A (slot 7 on meter) & 6 as B (slot 8 on meter).

Figure 11. Power Meter – Connection without Plug-In - 2

Plug the free end of the RS485 cable into the slot on the backside of the cabinet.

Figure 12. Backside - RS485 cable

⚠️ **Caution:**
If the system is installed as an AC solution, a second meter needs to be installed.

AC solution is used for a customer who had already installed an on-grid PV system. For AC solution the system needs two power meters: The known grid meter (as in the standard installation) and the additional PV meter.
The PV meter measures the output power from the on-grid inverter which is generated by PV system.

6.3 Connection of the second Power Meter by AC solution

Connect the second power meter (2) to the position shown in this picture.
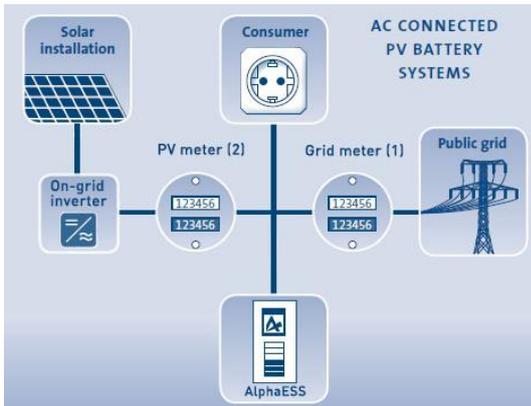
Figure 13. Second Power meter - Scheme

The second power meter also uses RS485 to communicate with the first power meter. Connect both power meters now with RS485 cables at each free RS485 slots of the power meters.
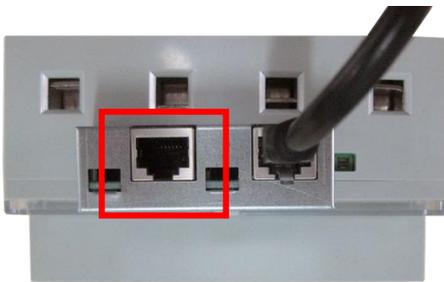
Figure 14. Second Power meter – Communication

Option 2 <u>without</u> Plug-in:
The second power meter uses RS485 to communicate with the first power meter. Please connect it like it is shown in this picture.
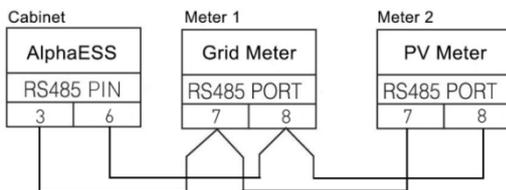
Figure 15. Second Power meter – Communication without Plug-In

For the RS-485 communication, the IP address of the second power meter needs to be changed. Please ensure that all connection (power and communication) is done correctly as shown before).

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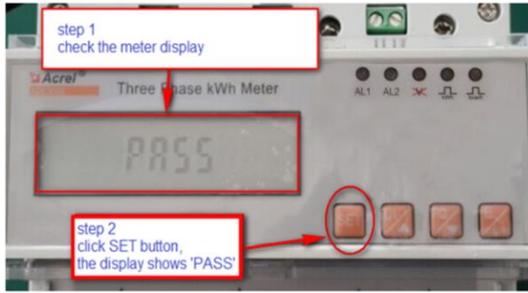
Figure 16. Power meter - ID change (1)

Check the display if it turns on. Press now the "SET" button and "PASS" will be shown on the screen.
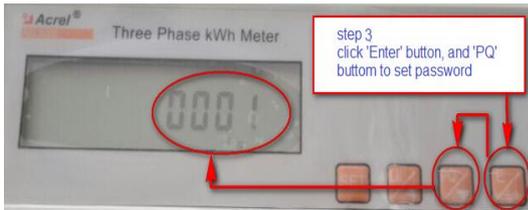
Figure 17. Power meter - ID change (2)

1. Click the "Enter" button, the display shows now '0000',
2. Click the "PQ" button one time, the display shows now '0001'.
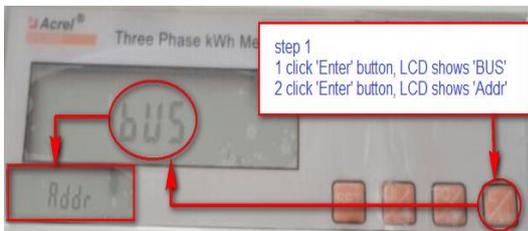
Figure 18. Power meter - ID change (3)

Click the "Enter" button, the LCD shows now 'BUS', then click the "Enter" button again, the LCD shows now 'Addr'.
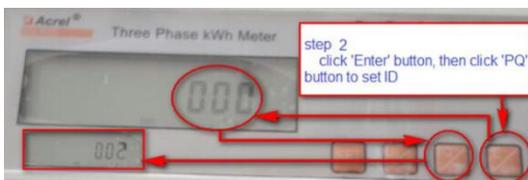
Figure 19. Power meter - ID change (4)

Click "Enter" again, the LCD shows '000', then click the "PQ" button twice until the LCD shows '002'.
Now the meter ID has been changed.
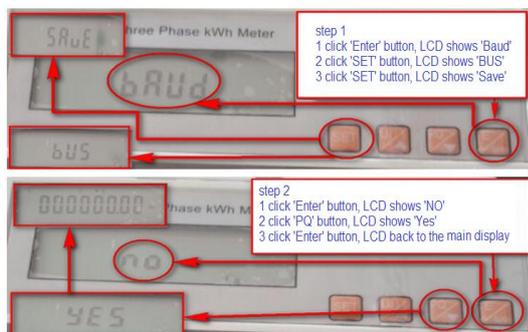
Figure 20. Power meter - ID change (5)

Save the parameters. Therefore press the "ENTER" button until ´baud´ is shown. Click "SET" twice until the LCD shows ´save´.
Confirm with „Enter", the LCD will show now ´no´. Click "PQ" to change to ´yes´.
Press „Enter" to save and return to the main screen.

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If all settings are done correctly, the marked sign will be flashing.

Figure 21. Power meter - ID change (6)

7. Function description

7.1 Metering

- The DTSD1352 (ADL3000) can measure positive, reversing active electric energy and input and output reactive electric energy. At the same time it can also measure the three-phase voltage, three-phase current and by each phase the total active power, reactive power, apparent power, power factor, power frequency and maximum demand record. The electric energy is accumulated and stored according to total, peak, flat and valley power respectively.
- The meter has an electric energy data freezing function; three months of frozen data can be stored in the meter. All saved data is kept for more than 10 years after the last power off.

7.2 Clock and period of time rate

- The clock has a deviation within 0.5s/day and provides an automatic switching function for calendar, clocking and leap year.
- The clock can be programmed with two time zones of one year, two time tables, eight periods for one day and the rate of spike, peak, flat and valley.

7.3 Display

- The display has a 7 bits wide LCD screen.
- The display provides a data cycling and data buttons display functions. It can inquiry all display items by panel buttons. If no button is pressed within 8 seconds, it switches automatically to the cycling display state with complete cycles of 4s.
- The electricity pulse and current rate period are indicated by red and green LEDs.

7.4 Output

- The function of active electric energy pulse output is used for calibration and collecting electric energy.
- The meter provides a passive photo-electro isolating type output port with following pulse width: 80ms ± 20ms

7.5 Communication

- Communication interface: RS485
- Communication protocol: MODBUS-RTU
- Communication rate: 9600bps (default), 4800bps, 2400bps, 1200bos optional

7.6 Programming function

- Meter address setting
- Time date setting
- Rate period of time setting

7.7 Meter reading and power management functions

- The meter provides RS485 or ZIGBEE and is composed of a wired or wireless network for remote automatic meter reading, to achieve power of intelligent management.

8. Display Description

Under default condition the DTSD1352 (ADL3000) meter displays related information of time, date, total active power, total reactive power, total reverse active power, total reverse reactive power, current active power and meter number periodically. The time for one complete cycle is 4s. The LCD display content and data format is described as follows:

No.	Name	Format	Description	
1	Current time and rate	hh : mm : ss	Hour : minute : second	**12:00:00**
	Displaying content shows current time: 12:00:00			
	If peak rate indicator lights, it shows current rate as peak rate			

No.	Name	Format	Description	
2	Date	yy . mm . dd	Year . Month . Day	**080201**
	Displaying content means current date is 2008.02.01			

No.	Name	Format	Description	
3	Total kWh	XXXXX.XX or XXXXXX.X	5 bit integer, 2 bit decimal or 6 bit integer, 1 bit decimal	**00057.52** kWh
	(kWh display decimal place may be floating, same as below)			
	Displaying content means current total kWh is 57.52kWh			

No.	Name	Format	Description	
4	Spike kWh	XXXXX.XX or XXXXXX.X	5 bit integer, 2 bit decimal or 6 bit integer, 1 bit decimal	**00011.20** kWh
	Displaying content means current spike kWh is 11.20kWh			

No.	Name	Format	Description	
5	Peak kWh	XXXXX.XX or XXXXXX.X	5 bit integer, 2 bit decimal or 6 bit integer, 1 bit decimal	**00024.12** kWh
	Displaying content means current peak kWh is 24.12kWh			

No.	Name	Format	Description	
6	Flat kWh	XXXXX.XX or XXXXXX.X	5 bit integer, 2 bit decimal or 6 bit integer, 1 bit decimal	***0001 12.10*** kWh
	Displaying content means current flat kWh is 12.10kWh			

No.	Name	Format	Description	
7	Valley kWh	XXXXX.XX or XXXXXX.X	5 bit integer, 2 bit decimal or 6 bit integer, 1 bit decimal	***0001 10.10*** kWh
	Displaying content means current valley kWh is 10.10kWh			

No.	Name	Format	Description	
8				***0005 7.52*** kWh
	Communication status indication: when the communication mark appears at bottom left corner of the display, it means that existing meter is in communication status.			

8.1 Cycling display function

No.	Name	Format	Description	
1	Total active power	XXXXX.XX or XXXXXX.X	5 bit integer, 2 bit decimal or 6 bit integer, 1 bit decimal	***0005 7.52*** kWh
	(kWh display decimal place may be floating, same as below)			
	Displaying content shows total active power is 57.52kWh			

No.	Name	Format	Description	
2	Total reactive power	XXXXX.XX or XXXXXX.X	5 bit integer, 2 bit decimal or 6 bit integer, 1 bit decimal	***0005 7.52*** kvarh
	(kWh display decimal place may be floating, same as below)			
	Displaying content shows total reactive power is 57.52kvarh			

No.	Name	Format	Description	
3	Total reserve active power	XXXXX.XX	5 bit integer, 2 bit decimal	***0005 7.52*** kWh
	Displaying content shows total reserve active power is 57.52kWh			

No.	Name	Format	Description	
4	Total reserve reactive power	XXXXX.XX	5 bit integer, 2 bit decimal	`0002755` kvarh
	Displaying content shows total reserve reactive power is 27.55kvarh				

No.	Name	Format	Description	
5	Current active power	XXX.XX	3 bit integer, 2 bit decimal	`Pt00752` kW
	Displaying content shows current active power is 7.52kW				

No.	Name	Format	Description	
6	Current meter No.	XXX	3 bit integer	`002`
	Displaying content shows current meter number is 2				

8.2 Button display function

The DTSD1352 (ADL3000) provides button display functions. Through the last and next button on the panel, it can switch to show the measurement of A, B, C three-phase current, voltage, active power, reactive power, apparent power, power factor, power frequency, with / without total active power, spike, peak, flat, valley power, with / without total reverse active power, spike, peak, flat, valley power, table addresses, software version number, display self-test, etc. The liquid crystal display content data format is described as follows:

No.	Name	Format	Description	
1	Existing current value	XX.XX	2 bit integer, 2 bit decimal	`IC  05.00` A

No.	Name	Format	Description	
2	Current voltage value	XXX.X	3 bit integer, 1 bit decimal	`UC  220.0` V

No.	Name	Format	Description	
3	Current active power	XXX.XX	3 bit integer, 2 bit decimal	`PA00752` kW

No.	Name	Format	Description	
4	Current reactive power	XXX.XX	3 bit integer, 2 bit decimal	`9600572` kvar

No.	Name	Format	Description	
5	Current apparent power	XXXX.X	4 bit integer, 1 bit decimal	`SC 0275.0` VA

No.	Name	Format	Description	
6	Current C phase power factor	X.XX	1 bit integer, 2 bit decimal	`PFC 1.00`

No.	Name	Format	Description	
7	Current power frequency	XX.X	2 bit integer, 1 bit decimal	`50.0` Hz

(i) **Note:**

The logo characters of the active power, reactive power, apparent power, power factor, current voltage of A, B, C phase is shown for each phase as PA, Pb, PC, qA, qb, qC, SA, Sb, SC, PFA, PFb, PFC, UA, Ub, UC, IA, Ib, IC.

8.3 Communication

- Communication interface: RS485
- Communication connection mode: two-wire (RS485+, RS485-), shielded cable with twisted pair conductors
- Communication working mode: half-duplex
- Communication speed: 9600bps (default), 4800bps, 2400bps, 1200bps optional
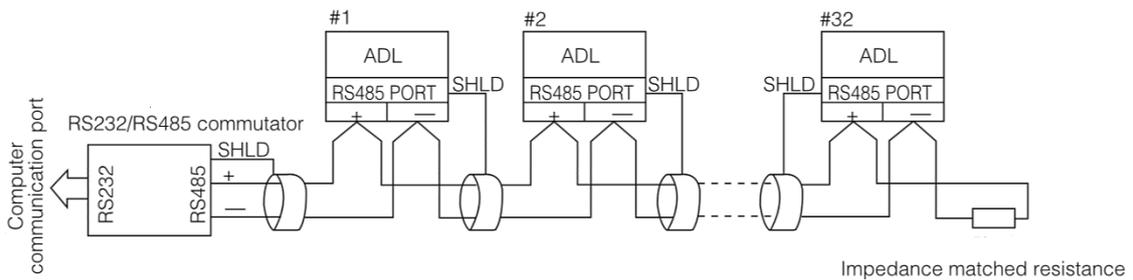
Figure 22. Scheme - Power Meter Communication

Ring connection mode with Communication connection:
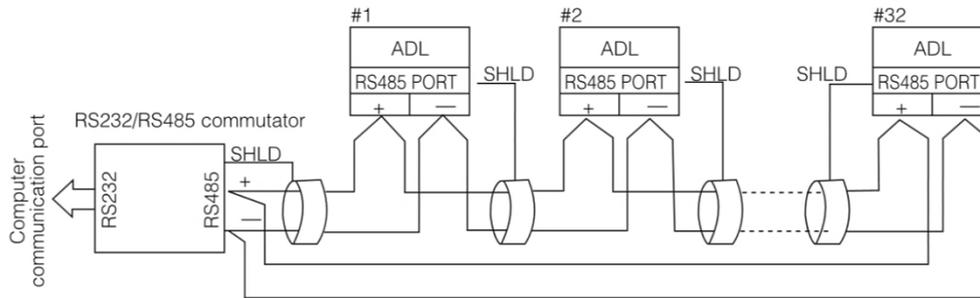
Figure 23. Scheme - Power Meter Communication with ring connection

8.4 Notice

The loading capacity of the electric energy meter is 0.05lb – lmax (direct connecting) or 0.02 – lmax (connecting via current transformer). If this loading capacity range is exceeded, the electric energy metering will be incorrect or damageable.

When the electric energy meter is directly connected, its electric energy reading value is the actual kWh; when the electric energy meter is equipped with a current transformer, the electric energy reading value must be multiplied with the current transformer multiplying power to obtain the actual kWh.

Thank you for reading the AlphaESS User Manual Meter. If you have any problems, please feel free to send an e-mail to info@alpha-ess.com.