



# User Manual

**Smart Card Based Single Phase Pre-paid Energy Meter**

**Model No.: TSS-PPM560SP**

Supplied by: TSS Digital Meter Plant, TSS.

Partner: Shenzhen Kaifa Technology (Chengdu) Co., Ltd.

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## Document Map

The following documents are supplied for the pre-paid system installation, operation and maintenance.

### TSS-PPM560SP User Manual

The TSS-PP560SP User Manual gives an introduction of Smartcard Based Single phase Prepaid Energy Meter, include functions operation guide and product specification.

### TSS-PPMKP560SP User Manual

The TSS-PPMKP560SP User Manual gives an introduction of Keypad Based Single phase Prepaid Energy Meter, include functions operation guide and product specification.

### TSS-PPM10100TP User Manual

The TSS-PPM10100TP User Manual gives an introduction of Smartcard Based Poly phase Prepaid Energy Meter and GPRS communication module, include functions operation guide and product specification.

### TSS-PPMKP10100TP User Manual

The TSS-PPMKP10100TP User Manual gives an introduction of Keypad Based Poly phase Prepaid Energy meter and GPRS communication module, include functions operation guide and product specification.

### Smartset User Manual

Smartset User Manual gives an operation guide to set meter by tool software.

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## Safety Instructions



Read all safety information and operating instructions before using TSS-PPM560SP to avoid personal injury.

### Transport and Storage

Before you transport and storage the meter and communication module, read and observe the clause 7 titled “Transport and storage” in this document.

### Installation

Power must be cut off before install or remove TSS-PPM560SP.

Before you install or remove the meter and communication module, find and read the “Product Installation Guide” first.

### Operation

1. Do not break the seal and remove terminal cover without authorized operator.
2. Do not break the seal and remove communication module without authorized operator.
3. Never remove the meter cover or communication module cover while the meter is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the meter.
4. Meter working voltage must less than 130% nominal voltage ( $130\%U_n$ ), load current must be lesser than 120% maximum current ( $120\%I_{max}$ ). Long time over voltage and over load can lead to fire or damage to the meter.
5. Before you install or change external battery, read and observe the section 3.4 titled “external battery” in this document first. Incorrect operation may cause electrical shock!!
6. Do not operate the meter with wet hands.

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*For service and technical support information, please contact:*

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# 1 Product introduction

TSS-PPM560SP is a second generation smart card based single phase pre-paid energy meter for active energy measurement. Meter adopts advanced SLE4428 IC card with dynamic encryption technology, it keeps meter in a high level security performance. At the same time, SLE4428 can be used as the data exchange media and it can transfer meter data to POS (point of sale), so utility can get relevant meter information and have regular time meter usage supervision.

As a part of Kaifa smart pre-paid solution, this meter provides optical port and RS485 port communication for local and remote meter reading/setting and integrated smart metering functions as described in section 1.3., this meter can work as a sub meter and connect to main meter through RS485 cable. Kaifa HES can collect sub meter data through GPRS main meter, and it is possible to send recharge token by remote and reach over air recharge function by SMS or APPs in smart mobile phone.

## 1.1 Front view and Rear view

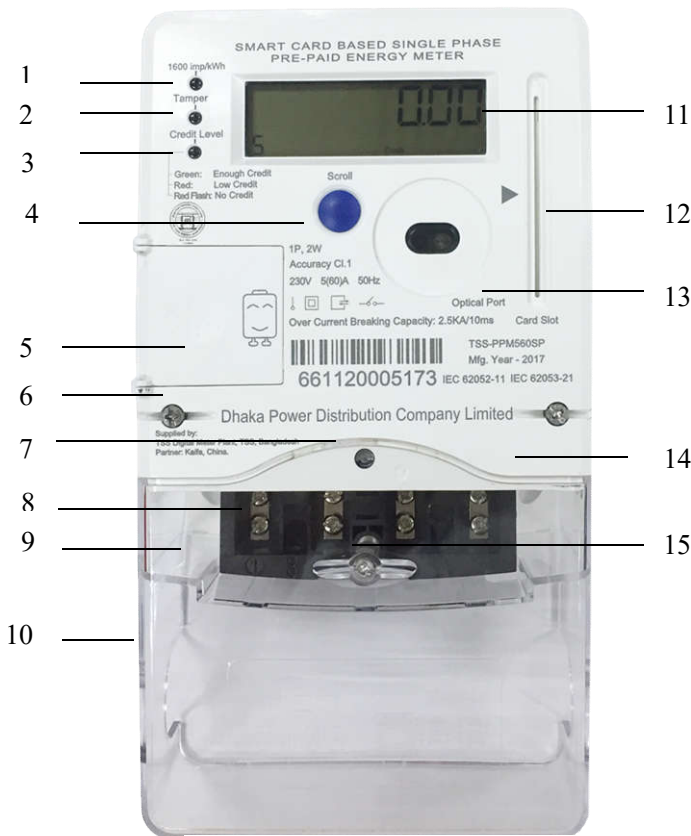


Figure 1 Front view

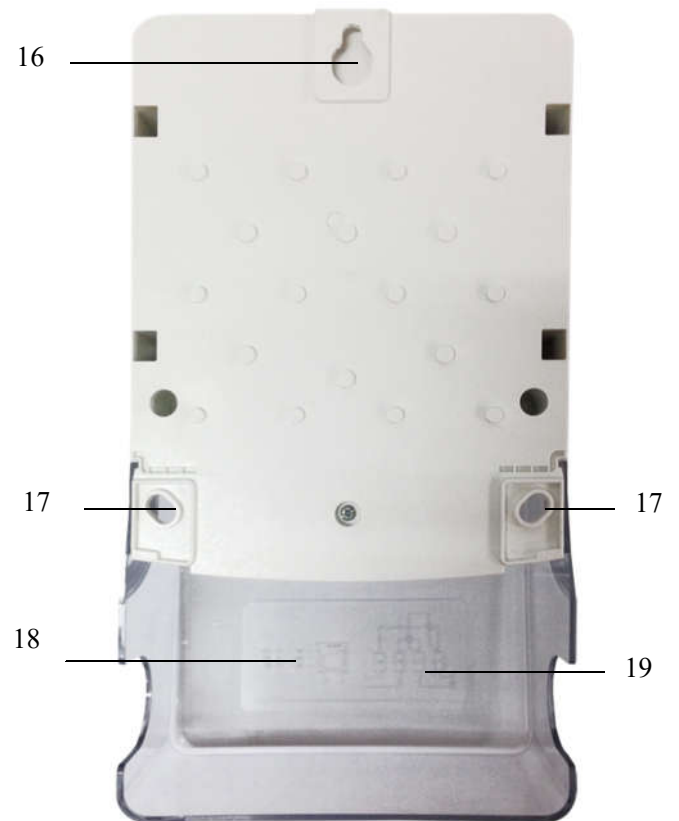
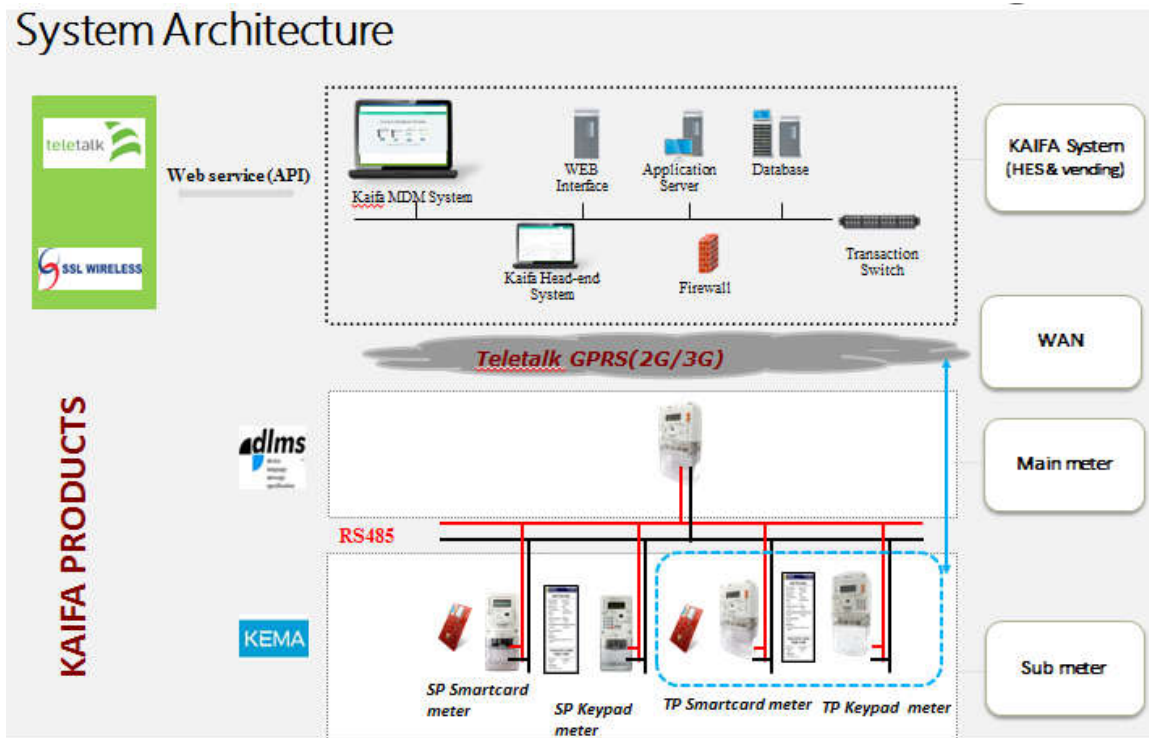


Figure 2 Rear view

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1. Active impulse LED	11. LCD window
2. Tamper LED	12. Card insertion port
3. Credit level LED	13. Optical port
4. Scroll button	14. RS485 Port
5. Battery Cover	15. Terminal cover sealing screw
6. Meter cover sealing screw	16. Hook
7. Terminal Cover open detect switch	17. Fix hole
8. Terminal Block	18. RS485 diagram
9. Terminal Cover	19. Connection diagram
10. Cable entry slot	

## 1.2 Smart Prepaid Meter System Architecture



## 1.3 Features List

<b>Accuracy</b>	Active: Class1.0
<b>Connection</b>	Single Phase two Wire
<b>Nominal Voltage(Un)</b>	230V
<b>Voltage range</b>	0.7-1.3Un
<b>Current</b>	Ib=5A, I <sub>max</sub> =60 A
<b>Starting current</b>	0.4%Ib
<b>Frequency</b>	50 Hz (± 5%)

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<b>Meter constant</b>	1600imp/kWh
<b>Power Consumption</b>	Voltage circuit: $\leq 2W/5VA$ Current circuit: $\leq 2.5VA$
<b>Degree of Protection</b>	IP51
<b>Communication protocol</b>	DLMS/COSEM
<b>LCD</b>	Big Segment type LCD with White backlight
<b>Communication interface</b>	Optical port/RS485
<b>Connect/disconnect relay</b>	Latching relay Max. Contact voltage: 250VAC Max. contact current:90A Contact resistance: 1m $\Omega$ max Operate time: $\leq 20$ ms; Release time: $\leq 20$ ms Bounce time: Max.5 ms; Mechanical life:10 <sup>5</sup> times Electrical endurance:5000 times
<b>RTC</b>	Comply with IEC62054-21
<b>Data retention</b>	10 years (minimum) in case of power failure.
<b>Battery</b>	Replaceable 3.6V/1200mAh lithium battery
<b>Environmental</b>	Operating temperature range: -25 $^{\circ}C$ ~ +55 $^{\circ}C$ Storage and transport temperature range: -25 $^{\circ}C$ ~ +70 $^{\circ}C$ Relative Humidity: Up to 95% non-condensing

## 1.4 Function characteristics

<b>Energy Parameters</b>	Current month active energy Current month active energy with tariff Current month reactive energy Current month reactive energy with tariff Cumulative active energy Cumulative active energy with tariff Cumulative reactive energy with tariff
<b>MD (Maximum demand)</b>	Active MD Active MD with tariff Reactive MD Reactive MD with tariff
<b>Instantaneous Parameters</b>	Voltage Current of phase Current of neutral Frequency Power factor APF Active power(import and export) Reactive power(import and export)



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<b>Daily Billing</b>	<p>Last 63 days daily billing data</p> <ol style="list-style-type: none"> <li>1.Clock</li> <li>2.Energy Cumulative +A total</li> <li>3.Energy Cumulative +R total</li> <li>4.Current Month Consumption amount</li> <li>5.Active Energy Cumulative rate 1</li> <li>6.Active Energy Cumulative rate 2</li> <li>7.Reactive Energy Cumulative rate 1</li> <li>8.Reactive Energy Cumulative rate 2</li> <li>9.Current Month Consumption Amount rate 1</li> <li>10.Current Month Consumption Amount rate 2</li> <li>11.The remaining balance</li> <li>12.Running Status</li> </ol>
<b>Monthly Billing</b>	<p>Previous 13 months historic energy data:</p> <ol style="list-style-type: none"> <li>1.Billing date and time</li> <li>2.Cumulative active energy</li> <li>3.Cumulative reactive energy</li> <li>4.Current month consumption active energy</li> <li>5.Current month consumption reactive energy</li> <li>6.The remaining balance</li> <li>7.Current month recharged credit</li> <li>8.Current month consumption credit</li> <li>9.Active MD</li> <li>10.Reactive MD</li> <li>11.Cumulative active energy T1</li> <li>12.Cumulative active energy T2</li> <li>13.Cumulative reactive energy T1</li> <li>14. Cumulative reactive energy T2</li> <li>15.Current month Consumption amount T1</li> <li>16. Current month Consumption amount T2</li> <li>17.Cumulative Power off counts</li> <li>18.Cumulative Sanctioned Load Exceeded counts</li> <li>19.Month Average power factor</li> </ol>
<b>Billing Mode</b>	<p>Automatic billing at 00:00 on the first day of every month Automatic billing at 00:00 in every day</p>
<b>Load Profile</b>	<p>90days ,30minutes load profile interval Cumulative active energy Cumulative reactive energy Active energy(increment value) Reactive energy(increment value) Clock Status</p>

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<b>Tariff</b>	Support 3 types programmable tariff structure Single tariff TOU tariff (maximum support 4 Tou) Step tariff(maximum support 11 step)
<b>Tamper Detection</b>	Top cover open detection Terminal cover open detection Current bypass Current reverse Neutral missing at source side External magnetic disturbance
<b>Event Log</b>	Last 4 times top cover open Last 4 times terminal cover open Last 4 times current bypass Last 4 times sanctioned load exceeded Last 4 times current reverse Power off count Last 4 times tariff program transaction record
<b>Event push</b>	Terminal cover open Top cover open Overload disconnect Low credit Negative credit Emergency mode No credit disconnect
<b>Disconnection Facility</b>	<ul style="list-style-type: none"> <li>■ On credit expiry</li> <li>■ Decommissioning state</li> <li>■ Exceed power threshold</li> <li>■ When tampered:             <ol style="list-style-type: none"> <li>a) Top cover open</li> <li>b) Terminal cover open</li> <li>c) Neutral missing at source side (the disconnection feature can be programmed to disable &amp; enable, the default is enabled.)</li> </ol> </li> </ul>
<b>Prepaid Features</b>	Charge credit Friendly hours Weekend Public holiday, support maximum 30 holidays Emergency credit limit programmable Maximum balance limit programmable

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## 2 Meter Installation

TSS-PPM560SP should be installed at a dry and well-ventilated place. The installation board should be fixed on a solid, fire-resistant and sturdy wall. The suggested installation height is about 1.2 meters.

Install environment temperature must not exceed meter operation temperature range (-25°C~ +55°C); Working voltage must in the range of 160Vac~300Vac, 50±5%Hz. Load current must not exceed 60A.

### 2.1 What should prepared

To install TSS-PPM560SP, you should prepare:

- Screw driver: PH2 screw driver for main terminal screw and terminal cover.
- Fixing screw and Hook screw: M5 slotted countersunk (flat) head tapping screw.

### 2.2 Meter Installation

#### Step 1: Inspect meter before install.

Before install, please make sure there is no damage, broken or other defect on meter. If defect is found, please don't install the meter.

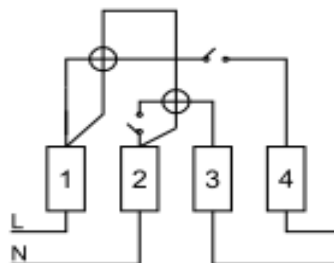
#### Step 2: Fixing

TSS-PPM560SP is a 3 point mounting meter, fixed by 1 hook and 2 fixing hole.

To fix TSS-PPM560SP, hang the meter by hook then fasten with two fixing screws.

#### Step 3: Connect power line

Connect power line according to the wiring diagram which marked on the terminal cover.



#### NOTICE

To insure the reliable connection, install torque must be higher than 2 N • m

#### Step 4:

##### ● Power on inspection

After correct connection, close the terminal cover, and turn on the power.

##### ● Display inspection:

After power on, Inspect display according to 3.2.2, if some abnormal display found, contact utility technical member.

##### ● Account open and Customization

New meter leave factory status is as follows:

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No.	Item	Description	Default factory setting																																	
1	Tariff	TOU	T1: 17:00-23:00 - 11.98 Tk./kWh T2: 23:00-17:00 - 8.45 Tk/kWh																																	
2	Low credit alarm threshold	/	40 taka																																	
3	EMC credit limit	/	200 taka																																	
4	Available credit of meter(Pre-loaded credit)	/	0 taka																																	
5	Sanctioned Load Exceeded, two periods (Maximum 18kw)	Power limit 1	13.8kw																																	
		Power limit 2	13.8kw																																	
6	Friendly hour and weekend	Default friendly hours	Enable																																	
		Weekend	Friday, Saturday																																	
		Friendly times	1																																	
7	Holiday	<p>For Recursive Holiday:</p> <table border="1"> <thead> <tr> <th>No</th> <th>Holiday Name</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Language Martyrs' Day</td> <td>21-02-2019</td> </tr> <tr> <td>02</td> <td>Sheikh Mujibur Rahman's birthday</td> <td>17-03-2019</td> </tr> <tr> <td>03</td> <td>Independence Day</td> <td>26-03-2019</td> </tr> <tr> <td>04</td> <td>Bengali New Year</td> <td>14-04-2019</td> </tr> <tr> <td>05</td> <td>May day/Labor Day</td> <td>01-05-2019</td> </tr> <tr> <td>06</td> <td>National Mourning Day</td> <td>15-08-2019</td> </tr> <tr> <td>07</td> <td>Victory Day</td> <td>16-12-2019</td> </tr> <tr> <td>08</td> <td>Christmas Day</td> <td>25-12-2019</td> </tr> </tbody> </table> <p>For General Holiday:</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Holiday Name</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Shab-e-Barat</td> <td>21-04-2019</td> </tr> </tbody> </table>	No	Holiday Name	Date	01	Language Martyrs' Day	21-02-2019	02	Sheikh Mujibur Rahman's birthday	17-03-2019	03	Independence Day	26-03-2019	04	Bengali New Year	14-04-2019	05	May day/Labor Day	01-05-2019	06	National Mourning Day	15-08-2019	07	Victory Day	16-12-2019	08	Christmas Day	25-12-2019	No.	Holiday Name	Date	01	Shab-e-Barat	21-04-2019	Enabled
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		02	Shab-e-Bara	22-04-2019	
		03	Buddha Purnima	19-05-2019	
		04	Shab-e-Qadr	02-06-2019	
		05	Shab-e-Qadr	03-06-2019	
		06	Eidul-fitr day1	04-06-2019	
		07	Eidul-fitr day2	05-06-2019	
		08	Eidul-fitr day3	06-06-2019	
		09	Eidul-Adha day1	11-08-2019	
		10	Eidul-Adha day2	12-08-2019	
		11	Eidul-Adha day3	13-08-2019	
		12	Eidul-Adha day4	14-08-2019	
		13	Ashura	10-09-2019	
		14	Ashura	11-09-2019	
		15	Durga Puja	08-10-2019	
		16	Eid e-Milad un Nabi	10-11-2019	
		17	Eid e-Milad un Nabi	11-11-2019	
8	Relay status	/			Disconnect due to no credit
9	Tamper disconnect feature	Terminal cover open, top cover open, neutral missing occur, meter will disconnect			Enabled

Before meter send to consumer house, utility need to customize parameters for all meter and charge, or else meter cannot work.

The first token is needed to send account open token, after then, meter will accept the another token, such as recharge token, tariff solution management toke , clear tamper token and so on.

- **Measurement inspection:**

Inspect measurement by impulse LED. If there is no current, the impulse LED will always off after power on.

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### 3 Meter Reading and Operation

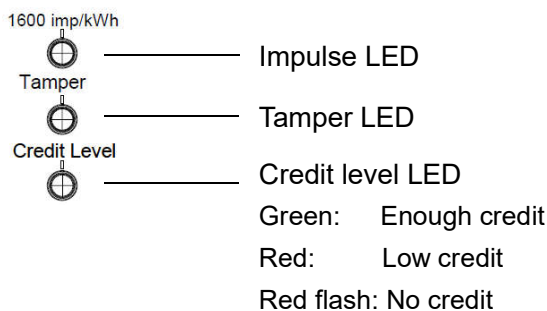
#### 3.1 Meter card operation

TSS-PPM560SP can read and write data to the SLE4428 smartcard, it can be managed by the token,

Operation	LCD display	Buzzer	Credit LED
Insert invalid card	"Invalid card"	Buzzer discontinuously sound if not remove the card	Red LED is lighted on
Insert valid card	Reading: "Read card"		Reading: Yellow LED flash
	Read success: "Success"	Success: sound continuously 3 seconds	Success: green LED is lighted on
	Invalid Token: "Invalid token"	Fail: sound discontinuously	Fail: Yellow LED is lighted on
	Duplicate Token: "Duplicate token"		
	Credit overflow: "Credit overflow"		
Key expired: "Key expired"			
Read failure: "Read failure"			
Used card : "Used card"			
Remove card	"Remove card"	/	/

#### 3.2 Meter reading

##### 3.2.1 LED indicate



##### 3.2.2 LCD Display

TSS-PPM560SP has six kinds of display mode for field meter reading.

- Auto Scroll Mode
- Prepaid mode
- Postpaid mode
- Push button mode
- Prepaid mode

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- Postpaid mode
- Power off mode
- Test mode
- Alarm mode
- Smartcard insertion mode

- **Auto Scroll Mode**

Auto Scroll Mode is default display mode. Items are displayed automatically and circularly with 3 sec interval time.

Meter support two types auto scroll display mode as per the prepaid mode and postpaid mode.

The default auto scroll display list and examples are as follows:

**Prepaid mode display:**

Display label	Parameter	Format	Display time
-	f/w version	VXXXX	5S
-	Display test	All segments on	5S
<b>Auto Display</b>			
1	Prepaid mode	Prepaid	5S
2	Meter Account status	OFF-Crdt/Emc-Use/Frid-Use/ Holy-Use/Crdt-use	5S
3	Meter ID-the first 7 digits	3 XXXXXX-	5S
3	Meter ID-the last 5 digits	3 XXXXX	
4	Tariff index <sup>1</sup>	4 XX	5S
5	The Remaining Credit	5 XXXXXX.XX	5S
6	The Total Consumption, kWh to date	6 XXXXXX.XX	5S
7	Taka used for the current billing period	7 XXXXXX.XX	5S
8	kWh for the current billing period	8 XXXXXX.XX	5S
9	Taka used for the last billing period	9 XXXXXX.XX	5S
10	kWh for the last billing period	10 XXXXXX.XX	5S
11	The power limit 1	11 P1 XXX.X	5S
12	The power limit 2	12 P2 XXX.X	5S
13	The current Tariff	13 Single /Step x/TOU x	5S
14	Current electricity rate	14 XX.XX	5S
15	Date	15 DD-MM-YYYY	5S
16	Time	16 HH:MM:SS	5S
17	Active power	17 XX.XXX	5S

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18	Voltage	18 XXX.X	5S
19	Current of L	19 L XXX.XX	5S
20	Current of N	20 N XXX.XX	5S
21	Power factor	21 PF X.XXX	5S
22	Token acceptance count	22 XXXXX	5S
23	Token rejection count	23 XXXXX	5S
24	Emergency credit limit	24 XXXXXX.XX	5S
25	Meter constant	25 Mt Const 1600	5S
26	Seq No.	26 XXX	5S
27	Friend hour <sup>2</sup>	Sun Friend hour	5S
		00:00—00:00	5S
		Mon Friend hour	5S
		00:00—00:00	5S
		Tue Friend hour	5S
		00:00—00:00	5S
		Wed Friend hour	5S
		00:00—00:00	5S
		Thu Friend hour	5S
00:00—00:00	5S		
28	Friend week <sup>2</sup>	Fri Friend week	5S
		Sat Friend week	5S
29	Holiday <sup>2</sup>	1 Jan Holiday	5S

## NOTICE

1. *Tariff index is tariff structure number which is programmed by system.*
2. *For friend hour, week and holiday display, meter will display detailed information according to utility configure, it may be different with this list, these formation is only for display format reference.*

### Postpaid mode display:

NO.	Parameter	Format	Display time
-	Display test	All segments on	5S
<b>Auto Display</b>			
1	Postpaid mode	1 Postpaid	5S
2	Meter ID-the first 7 digits	2 XXXXXX-	5S
2	Meter ID-the last 5 digits	2 XXXXX	5S
3	The Total Consumption, kWh to date	3 XXXXXX.XX	5S
4	Date	4 DD-MM-YYYY	5S



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5	Time	5 XX:XX:XX	5S
6	Active power	6 XX.X	5S
7	Voltage	7 XXX.X	5S
8	Current of L	8 L XX.XX	5S
9	Current of N	9 N XX.XX	5S
10	Power factor	10 PF X.XXX	5S
11	Meter constant	11 1600	5S
12	SEQ No.	12 XXX	5S

- **Push button mode**

In auto scroll mode, user can press the display button to enter into the alternate mode. The display content is same with auto scroll mode; user can switch the display content by pressing the display button.

If no display button is pressed for 10 seconds, meter will switch back to auto scroll mode.

- **Power off display**

When meter is power off, the LCD will enter the power off display mode automatically. User can check the item through push the upper button or see the LCD automatically scroll.

The power off display list for prepaid mode is as follows:

NO.	Parameter	Format	Display time
1	The Remaining Credit	XXXXXX.XX	5S
2	The Total Consumption, kWh to date	XXXXXX.XX	5S
3	Taka used for the current billing period	XXXXXX.XX	5S
4	kWh for the current billing period	XXXXXX.XX	5S
5	Emergency Credit Limit	XXXXXX.XX	5S

The power off display list for postpaid mode is as follows:

NO.	Parameter	Format	Display time
1	The Total Consumption, kWh to date	XXXXXX.XX	5S

- **Test Mode**

When insert the test card, meter will enter test mode, LCD will display "Test mode" at first, and then display the following parameters one by one as per the test token define.

Bit No.	Description	Display format	Display time
0	test all the contents		
1	test relay <sup>1</sup>	Relay ON Relay OFF	15S

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2	test LCD display	All segments on	15S
3	test total energy	Total energy XXXXXX.XX kWh	15S
4	test max power limit	Max Power P1 XXX.X kW P2 XXX.X kW	15S
5	display current meter status	Meter Status XXXXXXXXXXXXXXXXXX	15S
6	display current power	Current Power XX.XXX kW	15S
7	display meter software version	Software Version XX.XX	15S
8	display current tariff unit price	Rate Tk/kWh XX.XX Tk/kWh	15S
9	display overcurrent threshold	Over current XXX.XX A	15S
10	display recharge times	Recharges Times XXXXX	15S
11	display token sequence No.	Token Seq no. XXX	15S
12	display relay-off times	Relay OFF XXXXX	15S
13	accuracy test	Accuracy Test XXXXXX.XXXX kWh	1min
14-36	reserved		

Meter will keep in the test mode until user removes the test card.

## NOTICE

1. Test relay. Meter will connect & disconnect at three times.

### ● Status/Alarm Mode

When meter occur the following event, LCD will display the event reason and stop auto scroll display. If user wants to check the auto scroll display, they can insert and remove the user card to enter auto scroll display mode.

Event	LCD Display	Buzzer	Credit LED	Tamper LED
Overload disconnect	OFF-overload	/	/	/
Tamper disconnect	OFF-tampered	/	/	Light on
Neutral missing	Neutral Problem	/	/	Light on
No credit disconnect	No Credit	/	Red LED blinking	/
Decommission	DI-com	/	/	/

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disconnect				
Other tamper	Tampered	/	/	Light on
Low credit alarm	Low credit	Sound continuously 30 seconds in 5 minutes periods and user can silent the alarm through insert user card	Red LED light on	/
Emergency activated	EMC activated	/	Red LED light on	/
Emergency in use	EMC in use	/	Red LED blinking	/
Current friendly hours, Weekend	Friend in use	/	Red LED blinking	/
Holidays	Holidays in use	/	Red LED blinking	/
Relay failure	RL failure	✓	/	✓
EEPROM error	EEPROM error	✓	/	✓
Metering IC fault	Emm error	✓	/	✓
Low battery	Low battery	✓	/	✓
RTC error	RTC error	✓	/	✓

### 3.2.3 Smartcard inserting operation

Once insert the smartcard, meter LCD will give some friendly, readable display for user.

One smartcard can include the multi- token; meter will display the token result according to the token group. If there are multi-result need to display, then the display will every items one by one, every item display 3 seconds.

Card operation		LCD	Buzzer	Credit status LED
Insert the invalid card		Display " Invalid Card"	sound at all time and stop until remove card	Red LED is on at all time and off until remove card
Insert valid user card	Read card	Reading	/	Yellow LED flash
		Read end		
	Result		Display "Token Result"	/
		Success	pls see the success result list	All token success: sound for 3 seconds

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	Failure	pls see the failure result list	Sound at all time and stop until remove card	Yellow LED is on and off when remove card
	No token	Display "no token"	/	/
Remove card	Display "Remove card", enter the scroll display		/	/

Token success result display list:

Token type	LCD Display
Key change	"Key-Chg Success"
Recharge	"Vending Success", "Vend xxxxx.xx TK", "Bal xxxxxx.xx TK"
Clear balance	"Clr-Bal Success" "Bal xxxxxx.xx TK"
Configure friendly hour and weekend	"Friend Success"
Configure holiday	"Holiday Success"
Switch meter mode	"SwH-Mode Success" "Postpaid Mode" or "Prepaid Mode"
Configure single tariff	"Single Success" "Single xxx.xx TK"
Configure TOU tariff	"TOU Success" "TOU1 xxxxx.xx TK"
Configure emergency credit limit	"EMC-Cr Success" "EMC xxxxxx.xx TK"
Configure the maximum balance limit	"Max-Cr Success" "Max xxxxxx.xx TK"
Configure the low credit alarm limit	"Low-Cr Success" "Low xxxxxx.xx TK"
Configure maximum sanction load limit	"Max-PI Success" "P1 xxxxx.x kW" "Time1 xx:xx" "P2 xxxxx.x kW" "Time2 xx:xx"
Clear event status	"Clr-Evt Success"
Reset token	"Reset Success"
Test token	"Test Mode"

Token failure result display list:

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Token type	LCD Display
Invalid token	"XX Invalid"
Duplicate token	"XX Duplicate"
Credit overflow	"XX Cr Overflow"
Meter key expired	"Key Expired"
Read card failure	"Read Failure"
Used card	"Used Card"

Notes:

XX means how many token are sent to meter.

### 3.2.4 Software tools reading

Meter data and information include billing data, instantaneous data, tamper event, tariff, basic information, status words, and events etc. can be read from optical port by SMARTSET.

Detailed information will be given in relevant SMARTSET user manuals.

## 3.3 External battery

External changeable battery can provide backup energy for meter power on condition. If user found "Low battery" alarm on LCD or found low battery status word from smartcard, please contact the utility member for removing the battery as soon as possible, or else meter will shut down after one month.

Only authorize utility member can remove the battery, it is not allowable to remove battery for consumer..

The recommended battery size is ER 14250; please see the detailed dimension as following:



Figure 4 Dimensions of the battery

1) Power off the meter, remove the sealing, open the battery cover, change the battery, then sealing the cover.

2) If the battery voltage is lowers continuously for 1 month, the meter will shut down automatically and disconnect the relay, and consumer cannot use the electricity.

## 4 Anti-Tamper

- Current bypass

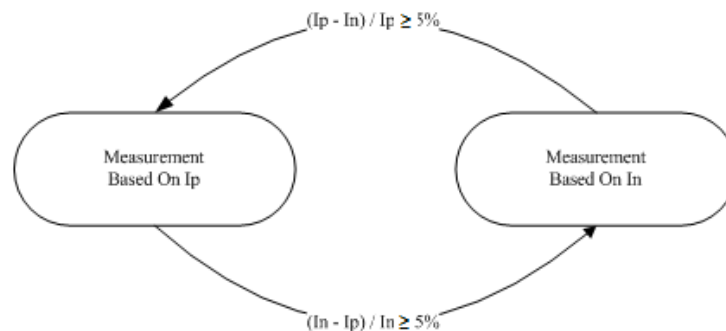
TSS-PPM560SP has two elements for measuring the phase and neutral current.

To anti current bypass tamper, meter will measure the energy basing on the bigger current channel.

The default unbalanced percentage threshold is  $\max(I_p, I_n) \geq 5\% I_b$ .

The unbalanced percentage can be programmed through smartset from 5%-99%.

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*Ip*: Phase line current;  
*In*: Neutral line current

Figure 6 Anti-tamper measurement

- Meter cover open and terminal cover detect
- Current reverse
- Magnetic detect
- Neutral missing at source side

## 5 Event Record

When the event occurred, meter can record it with date and time stamp, and the event can be transfer to the pre-paid system through smart card or optical port, it contains:

1. **Cover open**: when top cover is opened, the tamper LED will be lighted immediately, cover open status word will also be set. Meter can record last 4 times cover open event with date and time stamp.
2. **Terminal cover open**: when the meter terminal cover is opened, the tamper LED will be lighted immediately, and the terminal cover open status word will also be set. Meter can record last 4 times terminal cover open event with date and time stamp.

### Notes:

The terminal cover open and top cover open disconnection can be programmed to enable and disable, after disable it, meter will detect top cover open and terminal cover open event, no disconnection. The default status is enabled, only top management can program it through smartset.

3. **Current bypass**: if meter current meet the following condition:  $\max (Ip, In) \geq 5\%Ib$  and  $(Ip - In) / Ip \geq 5\%$  or  $(In - Ip) / In \geq 5\%$ , current bypass status word will also be set. The tamper LED will be lighted after 15 seconds. Meter can record last 4 times current reverse event with the snapshot, such as counts, date and time stamp.

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4. **Overload:** if the overload is occurred, meter can record last 4 times over load event with snapshot, such as counts, date and time stamp.  
If the overcurrent condition is over 1 minute, meter will disconnect, after 3 minutes reconnect the load automatically. The meter shall reconnect the load up to 5 times at 30 seconds intervals. If the over current still exist, the meter will wait a period of 30 minutes before attempting to reconnect the load.
5. **Power off:** when power off, meter can record the event with date and time stamp immediately
6. **Magnetic disturbance:** When meter detect the continuous magnetic attack for 60 seconds, the tamper LED will be lighted on, and meter will record the event.
7. **Neutral missing:** when neutral missing at source side, meter will record the neutral missing event; the detection time is 5 min. When meter is neutral missed, meter will disconnect.

**Notes:**

The disconnection features can be enabled and disabled through KAIFA PC software (smartset), after disable it ,meter will only detect and record event, but no disconnection.

The default status is enabled, meter will disconnect when detect neutral missing event.

## 6 Event Push

Meter can push the part of event to HES for instantaneous status alarm. Sub meter can push the event through RS 485 network to main meter. Main meter will transfer event to HES.

The push event type is as follows:

- a. Terminal cover open
- b. Top cover open
- c. Overload disconnect
- d. Low credit
- e. No credit
- f. Emergency mode
- g. No credit disconnect

The events push logic in the meter is as below:

- All event which can support push feature will be pushed to HES when 1st time occurrence.
- For terminal cover open, top cover open, overload disconnect event, if occur many times within 15 minutes, meter will only push to HES at one time.
- If meter enter emergency mode, meter will only push emergency mode event and no negative credit event push.
- If meter enter holiday and friendly hour, meter will push negative credit to HES.
- If meter disconnect due to no credit, meter will only push no credit disconnect event.
- If meter enter low credit, negative credit, emergency mode, no credit disconnect in a continuous time,

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meter will push to HES at two times in every day. The first time is at 07:00 – 09:00 in random, and the second time is at 14:00 -16:00 in random.

## 7 Tariff

The meter support single tariff structures as well as time-of-use tariff and stepped tariff, each tariff can be configured by the token.

- a. Each tariff uniquely identified using the tariff code.
- b. Each tariff has an activation date, being the date on which the tariff becomes effective.
- c. Step tariff has up to eleven steps (in kWh) for different levels of energy pricing.
- d. The rate describes the cost per kWh for energy consumption in that step.
- e. TOU tariff support maximum 4 TOU for different zone and price.

### 7.1 Tariff management in the meter

Tariffs entered into the meter via the two-way token or optical port. When the meter tariff is active, the current tariff cannot be overwritten.

When the tariff is loaded into meter, the time and date will be stamped.

In general, when a tariff has expired in the meter, the tariff is automatically deleted by the meter.

### 7.2 Tariff security and verification

The meter shall write the active tariff code to the token on each insertion.

### 7.3 Tariff switchover

When the meter detects that a new tariff is applicable (using the tariff activation date), the meter can execute the following steps:

- a. The meter begins the billing against the new tariff.
- b. The current tariff code is updated to reflect the new tariff code.
- c. The old tariff is deleted.
- d. New tariffs are activated at 00:00 on the first day of a month only.

### 7.4 Default tariff

The meter default tariff is as the below:

Start Time	Tariff	Unit price(TK/kWh)
17:00	T1	11.98
23:00	T2	8. 45

## 8 Billing

### 8.1 Monthly billing

The default billing time is at 00:00 of the first day of each calendar month, and it cannot be programmed, if at the billing point the meter is power off, and then power on the meter, meter will auto make the billing.

The billing contains last 13 months data:



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1. Billing date and time
2. Cumulative active energy
3. Cumulative reactive energy
4. Current month consumption active energy
5. Current month consumption reactive energy
6. The remaining balance
7. Current month recharged credit
8. Current month consumption credit
9. Active MD
10. Reactive MD
11. Cumulative active energy T1
12. Cumulative active energy T2
13. Cumulative reactive energy T1
14. Cumulative reactive energy T2
15. Current month Consumption amount T1
16. Current month Consumption amount T2
17. Cumulative Power off counts
18. Cumulative Sanctioned Load Exceeded counts
19. Month Average power factor Power off counts

## 8.2 Daily Billing

Meter will make the daily billing at 00:00 in every day, and meter can save last 63days daily billing data.

The daily billing data are as follows:

1. Clock
2. Energy Cumulative +A total
3. Energy Cumulative +R total
4. Current Month Consumption amount
5. Active Energy Cumulative rate 1
6. Active Energy Cumulative rate 2
7. Reactive Energy Cumulative rate 1
8. Reactive Energy Cumulative rate 2
9. Current Month Consumption Amount rate 1
10. Current Month Consumption Amount rate 2
11. The remaining balance
12. Running Status

## 9 Load Profile

Meter can record the load profile for 90days with 30minutes interval, the recorded object are as follows:

- a. Cumulative active energy
- b. Cumulative reactive energy
- c. Active energy(increment value)
- d. Reactive energy(increment value)

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- e. Clock
- f. Status

## 10 Pre-payment

The meter support two modes of operation: prepayment mode and postpaid mode, it can be switched by the token.

### 10.1 Postpaid mode

In this mode meter will calculate the cumulative consumption energy and don't record the credit related parameters. Utility will use smartcard as the data transfer media for billing data.

### 10.2 Prepayment mode

#### 10.2.1 Consumption

Meter can deduct the credit by each 0.01 unit consumption based on the tariff.

#### 10.2.2 Credit

The credit can be written to the meter through token, meter can receive the max credit amount is 999999.99.

#### 10.2.3 Emergency mode

Emergency credit facility will allow consumer to draw on an emergency credit, the basic feature are as follows:

- When the credit register value reaches a programmable Emergency Credit Threshold, the meter would buzz an alarm, user can insert the user card can active the emergency mode. In this mode, the power will not be disconnected.
- If all the available credit in the credit register is expired and power disconnected, user can insert the user card to activate the emergency credit.
- If emergency credit has been previously consumed, then the value of emergency credit used would be deducted from the next token inserted into the meter.
- This function can be activated only once before each time after recharging meter by positive credit.
- The emergency credit limit can be programmed through token.

#### 10.2.4 Friendly hours, weekend, holidays

The meter accommodates the "Friendly hours", "Weekend" and "Holidays" features. These are time periods during which the meter shall not cut-off power to consumer even if the credit becomes negative. It can be programmed through token, and this function can be enabled or disabled through token.

Meter support maximum 30 holiday program through token.

- For friendly hours and weekend, there is no any credit limit to use electricity for user, but there are times limit to user. The utility technician can configure this allowable times through token in unified system. Once the allowable times are finished, meter will start to deduct the emergency credit, if the emergency credit is also finished, meter will disconnect and user will have to recharge and pay for the debt.
  - For holiday, there is no any credit and times limit to use electricity for user. Meter can deduct money and become negative energy value.
  - The condition of meter for entering friendly hour and weekend are as follows:

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- a. Meter is low credit or have some available emergency credit
- b. Meter is connected status

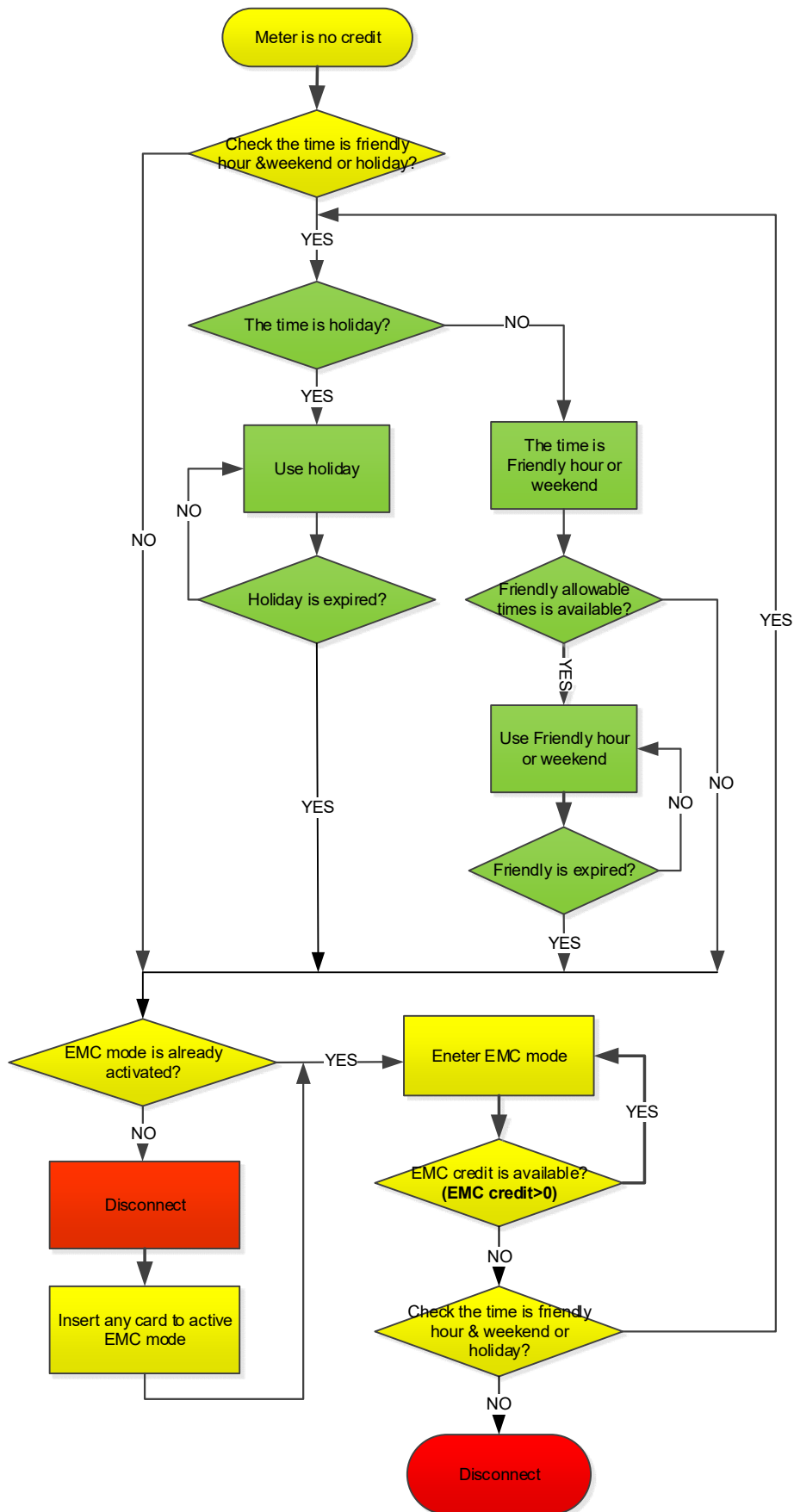
Once the meter is disconnected because of no credit or emergency credit is finished, meter cannot reconnect automatically even if the meter time is friendly hour and weekend, holiday. User has to recharge and pay for the debt.

### 10.2.5 Priority Process

There are three overdraw way for meter, emergency mode, friendly hour and weekend, holiday.

The priority level is as follows:

Item	Credit limit(YES or NO)	Times limit(YES or NO)	Priority
Emergency mode	YES	YES, only 1time	3
Friendly hours and weekend	NO	YES, the allowable times can be configured through token	2
Holiday	NO	NO	1



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**Deduction Rules:**

1. In holiday mode, emergency credit will not be deducted.
2. In friendly hours and weekend mode, emergency credit will not be deducted.
3. After finish friendly hour meter should use EMC credit again before recharge.
4. When emergency credit is expired, and at the same time meter isn't in friendly hour and weekend and holiday, meter will disconnect automatically.
5. All overdraw credit must be paid and exceed the minimum balance limit, meter will connect and provide power supply for consumer.
6. EMC credit limit is master switch to control disconnect and connect action.
7. If there is no enough EMC credit then meter will not enter into friendly hour again.
8. Friendly hour and weekend are together, the allowable times limitation can be used for friendly hour and weekend.
9. Meter will calculate the successively friendly hour and weekend days as one time friendly allowable.

**11 Load Control Management**

To protect user's load, load control management function can disconnect the relay automatically when the load is over the threshold for 1 minute. The meter would attempt to reconnect the load up to 5 times at 3minutes intervals. If the over-current condition still exists the meter shall wait a period of 30 minutes before attempting to reconnect the load.

Our meter can support 2 power limit configure with 2 validation time through token.

For example:

Power limit 1:08:00 3kw

Power limit 2:15:00 5kw

It means meter will use 3kw as an overload threshold from 08:00-15:00, and use 5kw as overload threshold from 15:00-23:59 and 00:00-08:00.

Default setting:

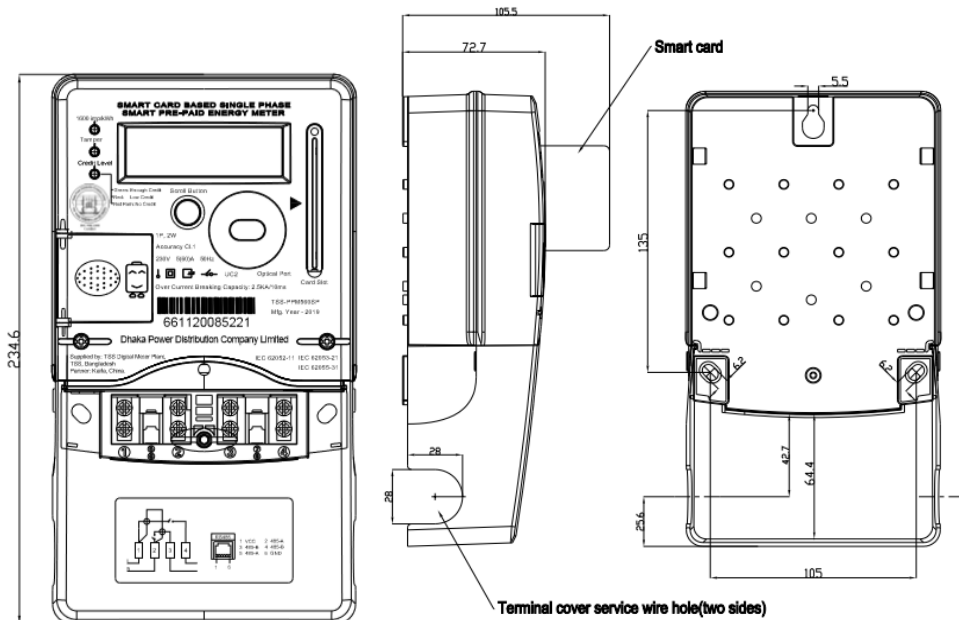
The meter Default overload threshold is 0, user can use the token to set this value and time period.

**12 Transport and Storage**

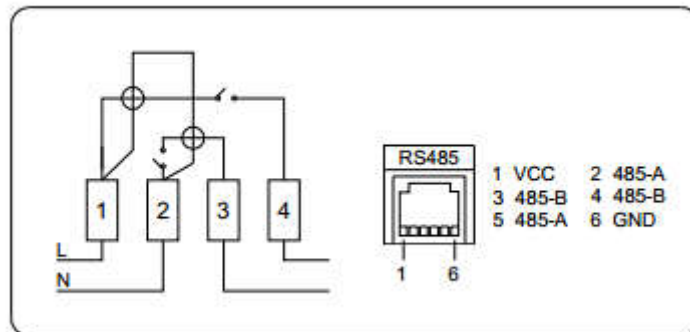
The meters should be placed on kickstands and the height should not exceed 5 layers. The storage condition should be clean, with an environmental temperature of between -25°C and +70°C, relative humidity of less than 95% and with an absence of rusty matter in the air.

## Annexure I Weight and Dimension

The meter weighs 864g and is shaped in a box with a dimension of 234.6mm x 130mm x 72.7mm .



Wire diagram and RJ12 type RS485 connector diagram



## Annexure II Meter status word

Bit No.	Description
0	clock has been set
1	low battery
2	open cover event
3	open terminal cover event
4	bypass
5	reverse energy
6	magnetic disturbance
7	relay status
8	relay failure

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9	overdraw has been used
10-11	tariff type of current month
	0: single tariff;
	1: TOU tariff;
	2: step tariff.
12	Register is negative value
13-15	Reserved

## Annexure III Referenced documents

IEC 514	Acceptance inspection of Class 1 alternating current watt-hour meters.
IEC 735	Testing equipment for electrical energy meters.
IEC 62052-11	Electricity metering equipment (AC)- General requirements, tests and test Conditions- Part 11: Metering equipment
IEC 62055	Part 21: Framework for standardization Part 31: Particular requirements- Static payment meters for active energy (classes 1).
IEC 62053-21	Electricity metering equipment (a.c.) - particular requirements - part 21 static meters for active energy (class 1 and 2)
IEC 62053-23	Electricity metering equipment (a.c.) - particular requirements -Parte 23 static meters for reactive energy (class 2 and 3)
IEC 1036	Alternating current static watt-hour meters (classes 1)
IEC 1038	Time switches for tariff and load control
IEC 1107	Data exchange for meter reading, tariff and load control and direct local data exchange
IEC 58	Shock and vibration, humidity, solar radiation and salt mist etc.
ISO 9001	Code of practice for quality systems part 1: Model for quality assurance in design/development, production, installation and servicing.
IEC 62054	Real Time Clock (RTC)
Others	All other relevant IEC specifications for metering equipment

## Annexure IV Enclosure

- The enclosure conforms to the requirements of BS 7856.
- The case is double insulated to protective class II.
- The case provides an ingress protection rating of IP51.
- The terminal cover provides the side entry groove for PVC pipe enter.
- The terminal cover can be sealed for limit access to the main meter connections.
- The terminal cover is transparent and will be laser printing the connection diagram.
- The main cover is molded with gray color, polycarbonate.
- The metal ring of the optical port is fixed under the main cover.
- Name plate of the meter will be laser printing.
- Micro switches for face cover and terminal cover opening detection.

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**\*\*\*End of Document \*\*\***