

EM512 Type700 JV1

Technical and user guide

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Introduction to Prepayment

Prepayment electricity meters enable supply authorities to collect revenue from consumers more efficiently. Consumers are obliged to pay for their electricity prior to actual consumption.

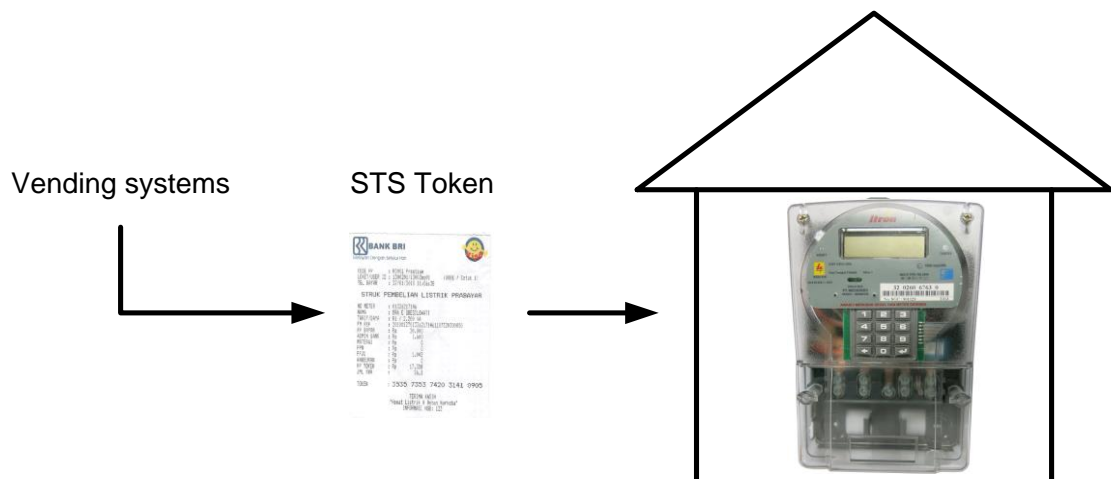
This means that if a prepayment meter is installed in the house, the meter would monitor electricity consumption and compare that to the available credit purchased by the consumer. If the consumer would exceed this credit limit, the power will be disconnected.

Credit can be added by entering a valid credit token. The credit token must be purchased from the supply authority or an approved vendor. When a consumer buys electricity from a vendor, the consumer will receive a receipt with a 20-digit code/token. This token must be entered into the meter in order to credit the equivalent kWh on the meter.

For Example: A consumer goes to the local grocery store (vendor) to buy electricity. The consumer will supply the vendor with a meter ID card (or meter serial number) and the amount that he/she wishes to purchase. The vendor will in return supply the consumer with a receipt with a 20-digit token printed on it. The consumer will enter this token into his/her meter in the house, and the equivalent amount in kWh will be credited to the meter. The display of the meter will indicate the amount of credit available in kWh.
1kWh = burning of 100W globe for 10 hours

Vendors from different areas make use of different rates or tariff indexes. This means that each area has a specific rate at which electricity is charged.

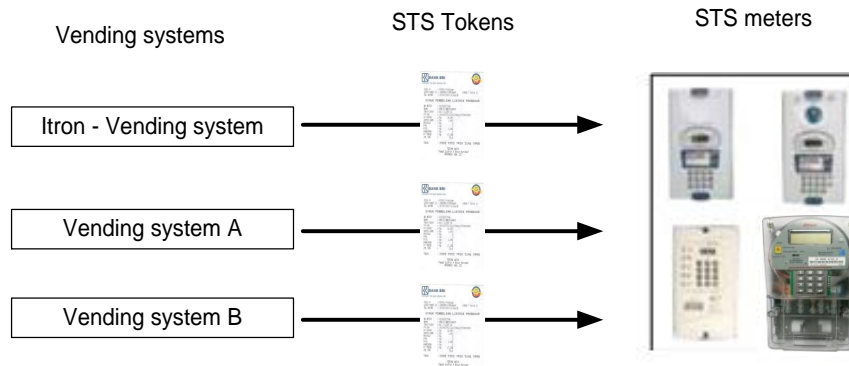
All tokens are meter serial number specific, which means that a token can only be used on one specific meter. If a consumer buys electricity from a vendor and would for some reason lose the token, no one would be able to use the token (on a different meter) unless it is entered into the initial buyer's meter.



Prepayment meters make use of the Standard Transfer Specification or STS protocol to vend tokens to meters. This means that any vending authority can vend tokens to a STS compatible prepaid meter. Read more on STS in the following section.

Standard Transfer Specification (STS)

STS is a standardized protocol that enables different vending systems to vend tokens to any STS compatible prepayment meter.



Tokens generated using this algorithm can only be used once and must be supplied by an approved authority. Tokens are meter and area specific, which means that a token can only be used on one specific meter and not on any other. Tokens that are lost or stolen can only be entered into the meter that the token was generated for. This makes the STS prepayment protocol a very safe and controlled environment.

STS allows the use of equipment from different suppliers. It is a secure procedure that prevents the following:

- Duplicate generation of tokens through legitimate vending devices
- Fraudulent generation of tokens through stolen vending devices
- Duplicate generation of tokens through legitimate vending devices outside the supply authority's area
- Fraudulent use of previously used tokens
- Tampering with legitimate tokens (i.e. changing information)

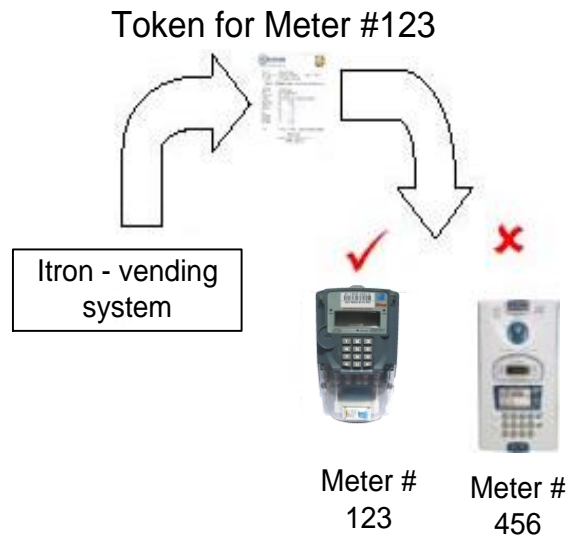
Token security

There are two different types of dispenser tokens used in the STS protocol. These types are: Dispenser specific tokens and non-specific tokens.

Dispenser specific token

Can only be generated by a vending device, which is authorized to vend to the intended meter range.
This means that tokens:

- Can only be accepted by the meter, which it is intended for.
- Cannot be modified after the tokens have been issued to the user.

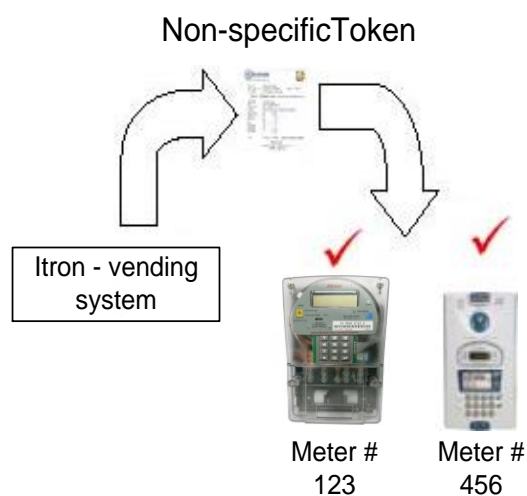


Non-specific Token

These tokens are special tokens that are vended from vending authorities and have the following characteristics:

- Can be generated by any vending device, which is authorized to vend credits
- Can be accepted by any STS meter
- Can be used repeatedly on any STS meter.

Please see the STS User Guide for more information concerning the STS protocol.



These tokens are mainly used to perform maintenance checks on meters. Examples are: 'Display Tariff Index' token and 'Test display token'.

Purchasing a token

The vending of prepayment electricity tokens is a one-way system in which tokens cannot be refunded upon returned. This is because once a token has been issued, the only way that the supply authority could verify if the token has been entered into the meter is to physically check the meter registry on the meter.

The user purchases credit tokens from a vending authority using the supplied user I.D card and the amount the user wishes to purchase.

The 20-digit token is generated combining various elements such as the meter serial number, supply group code and the date on which the token was vended.

When the user I.D card is not available or supplied, it is still possible to purchase electricity supplying the vending authority with one of the following:

- Meter serial number
- Stand or property number
- Name of property owner
- Physical address



The receipt will look similar to the one below:

When the users purchases a token from the vending authority a receipt is handed to the user displaying the following information

- Receipt number
- Date
- Time of transaction
- Monetary value of the transaction
- Kilowatt-hour (units) received
- 20-digit token
- Name of consumer
- Address
- Tariff type
- Tariff index
- Meter serial number

Actaris Metering Systems		
Credit Transfer		
17/08/9		11:45:2
MAKING LIFE A LITTLE EASIER		
ENERGY MEASUREMENTS		
Stand		
Meter No. :		
1234 5678 9123 4567 8901		
R 25.00		120.7 KWh
CASH		
Operator : William		
BRINGING ELECTRICITY TO THE PEOPLE		
Rec No:	23093	1 / 702

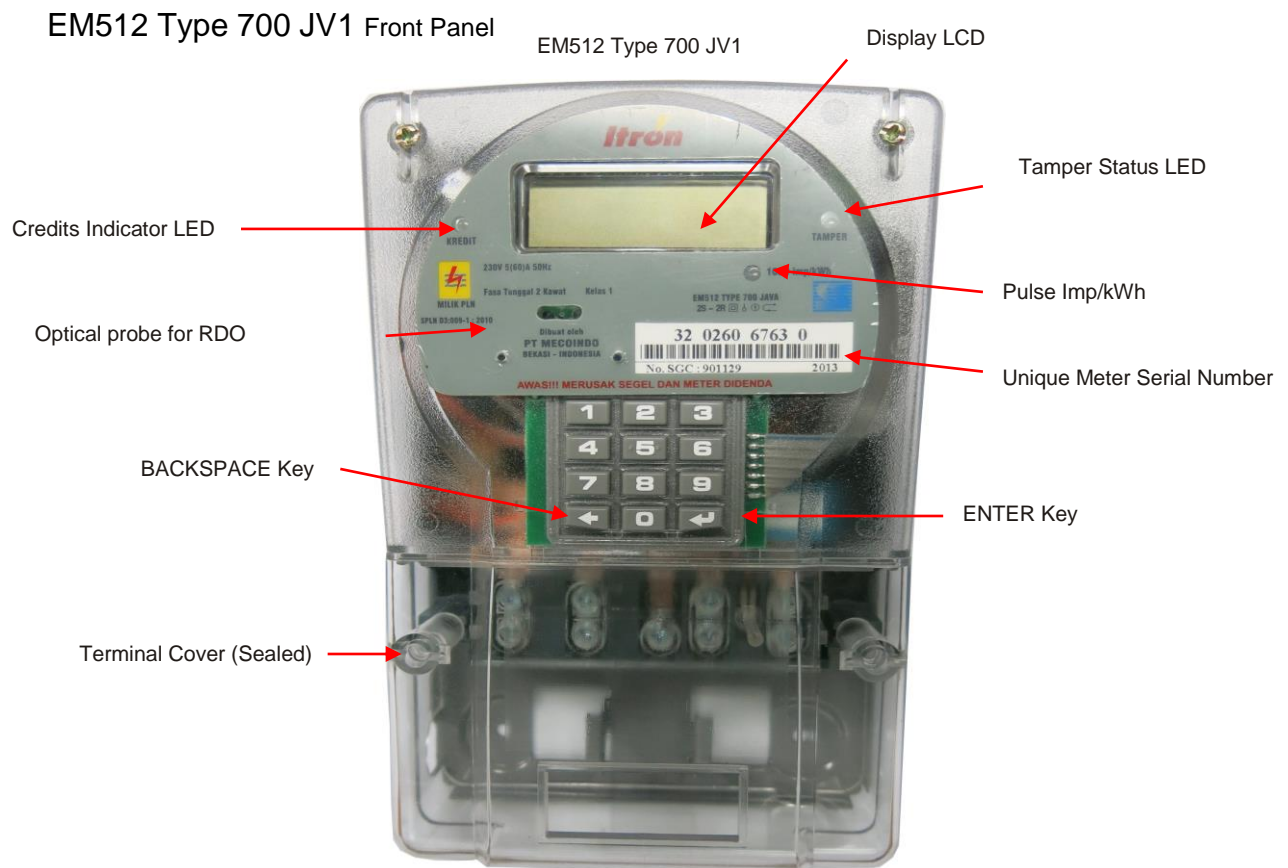
Product Introduction

The EM512 Type 700 JV1 (Prepayment meter Double sensor) meter was developed to expand the product portfolio of high quality Prepayment Products manufactured by Itron.

The products are designed to be compatible with the standardized prepayment protocol, STS (Standard Transfer Specification).



Understanding the front panel of the meter



Display LCD

Visually displays the credit remaining on the meter on LCD segments.

Pulse Imp/kWh

Indicates the rate at which energy is consumed. 1000 flashes = 1kWh

Meter serial number

Unique number assigned to the meter. This number is used when electricity tokens are vended for a meter. The serial number contains 11 digits, Example = 32 XXXX XXXX X

Tamper Indicator LED

Indicates the tamper during tamper occurred and latching until the meter get clear the tamper.

When the meter get tamper, the LCD will display



Credit indicator

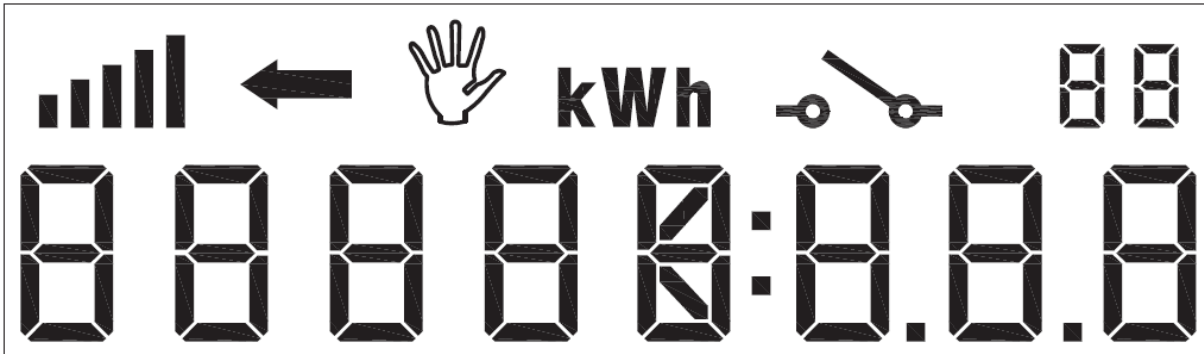
Indicates the number of credits meters. When the credit meters above the low credit threshold, LED become green color and when the credit below the low credit threshold, LED become red and blinking, the buzzer will be sound. To stop the buzzer sound by press any keys.






Optical probe

For reading the data from the meters

Annunciations

Annunciation icons are described below.



Icons	Descriptions
	Indicate the power consumption of the users. The Bar graphic base on Power limit of meter, each bar equal to 20% of power limit.
	Reverse current Indicator
	Tamper Indicator
kWh	The Icon will appear when display show remain credits and Total cumulative kWh
	Contactors open Indicator
	Number of digits token was input

Meter programmable features

The EM512 TYPE 700 JV1 product is equipped with programmable features, which can be customized to each customer's specific needs.

Audible Low Credit Warning and Credits Indicator LED

When the credit available on the meter reaches the low credit threshold, the meter will signal this by change the color of Credits Indicator LED from Green to Red (Blinking).

The value at which the Low Credit Threshold would enable can be set with a token. This feature can be done onsite with a token supplied to the user. This token can work on any meter.

The Audible Low Credit Warning is a programmable feature, which will warn the user of a low credit level by making an audible beep sound, the beep of sound more louder when the credit near to zero.

This is in addition to change the color of LED credit. This feature cannot be changed with a token.

User Programmable Features

The programming or setting of these features can be done by the user in the field

- Low Credit Threshold

The Low Credit Threshold can be setting by using short code 456XX, where the XX is energy in kWh (minimum 05 kWh)

Example:



The low credit = 20 kWh

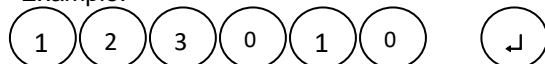
- Programmable interval Buzzer time

When the credit reaches the limit value is low, LED indication green turns to red flashes and buzzer sounds, the sound can be stopped by pressing any key on the keypad.

If in XXX minutes later, no credit token is entered, the buzzer sounds again. The lower the credit token so the faster the duration of sound.

The XXX minutes at the sound of buzzer can be adjusted by using short code 123XXX, where the XXX is the time in minutes

Example:









The interval Buzzer time = 10 minutes

Anti-Tamper features

The EM512 TYPE 700 JV1 product ranges are equipped with anti-tamper features. The meter equipped with tamper switch, Magnet detector, Dual sensors and dual contactors.

In the event of tampering, the meter will continue counting the energy consumption based on class limit. In this case, the register will be automatically protected and will record a missing energy measurement as a result of tampering or energy theft.

Table of Tamper

Tamper Even	LCD Display		Tamper LED	Optional
	Characters	Symbol		
Terminal cover open when meter power on	CALL		On	Yes
Terminal cover open when meter power off	CALL		-	Yes
Reverse current	CALL		On	NO
Earth tamper	CALL		On	NO
Magnet Tamper	CALL		On	No
By Pass Tamper	CALL		On	No

*Optional: It configurable during Manufacture.

Terminal cover open detection can be configurated disconnect or no disconnected the load



Negative Credit

When the meter credit reaches zero, the meter automatically disconnects the power supply to the house until a credit token is entered. The EM512 Type 700 JV1 programmed with negative credit. This means that when zero credit level has been reached and the contactor does not disconnect due to tampering or any other reason, the meter will display negative credit. When a token is entered, the negative credit displayed on the meter will be subtracted from the token unit value.

Tamper Switch

The EM512 Type 700 JV1 assembled with a tamper switch. The switch is toggled when the terminal cover is removing from the meter base. The meters automatically record the numbers of the terminal cover opened and not disconnect the contactor.

Tampering Mode

When the EM512 Type 700 JV1 in tampers Mode with display , we can check what kind tamper occurred by Use the keypad and type in the following 

Tamper Number(SC08)	Tamper Definition	Notes
-----1	Open Cover while power on	
-----2_	Open Cover while power off	
-----3_	Reverse	
-----4_	Bypass	
-----5_	Reverse+Bypass	
---6-----	Earth while mains >200V	
_7-----	Earth while mains <200V	
8-----	Magnet	

Examples:

When meter display 5, so the tamper was occurred: Reverse + BypassTamper

*Optional : It configurable during Manufacture.



The meter can be configurated to block on no block any token during tamper mode.

When the in tamper mode, the meter will not accept any token credit. The meter only accepts the Clear tamper Token or clear credit token.

So if the meter in tamper mode, the user needs to clear tamper (by clear temper token) before add the credits.

Entering a Token

Once a token has been purchased from the supply authority it must be entered into the meter in order to credit the amount kWh to the meter. Please enter the token following these easy steps:

- Key in the 20-digit code that appears on the receipt (left to right)
- Verify entered numbers on LCD
- Use the backspace key if token is entered incorrectly 
- After all 20 digits have been entered, press the ENTER  key to confirm the token
- If the token was entered correctly the following will be displayed on the LCD



ACCEPT

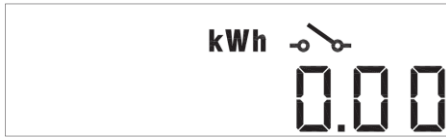
- If the token is rejected the following will be displayed on the LCD



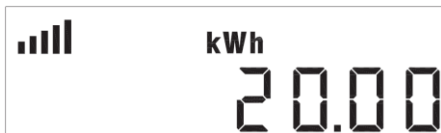
rEJECT

Meter displays

The following images illustrate the displays given on the LCD and what they would mean to the user.



There is no credit (kWh) available on the meter



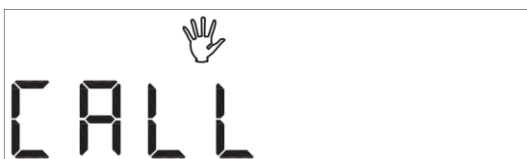
The credit available on the meter is 20.00kWh. There is a load connected to the meter



The token entered was accepted.



Power overload



The meter in tamper states



The meter has entered a lock out



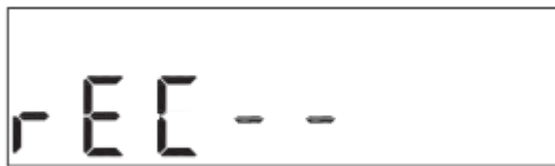
The token that was entered is old and cannot be accepted.



The token was either entered incorrectly or not intended for this meter and could not be decoded by the meter.



The token entered has been used before and the token cannot be accepted.



The meter gets error

STATUS	Display String on LCD
ERR_READ_KEY	Rec key
ERR_READ_SECURE_STORE	Rec SSS
ERR_READ_ENERGY	Rec bill
ERR_DATA_METROLOGY	Rec \bar{n} tr

Examples:

When meter display Rec bill, so the error → Error read data energy.

Input token Via RC-5 Remote

EM512 type 700 JV1 have Infra-Red port for input the 20 digits token via Remote. The remote shall be comply with RC-5

DBO Data Format

Here the list data of data burst output via Optical probe:

Data output are:

01	Remaining Credit
02	Accumulated Energy
03	Voltage
04	Current
05	Power Instantaneous
06	Power Limit
07	Meter ID
08	Tariff Index
09	Trip Count due to over power
10	Power Failure count
11	Alarm Duration
12	Low Limit Alarm
13	KT-KRN
14	Tamper Status
15	Total Tamper
16 – 65	Event Log
66 – 115	50 credit token accepted

Example data:

```
_<1>Remain Credit:(001038.15*kWh)
<2> Cumulative Energy:(000005.84*kWh)
<3> Vrms:(000231.93*V)
<4> Irms:(000000.00*A)
<5> InsPower:(000000.00*kW)
<6> Power Limit:(000016.56*kW)
<7> ID :(000000000000)
<8> Tariff Index :(00000001)
<9> Trip Count Overload :(00000000)
<10> Power Off Count:(00000026)
<11> Alarm Duration:(00000010)
<12> Low Limit KWh :(00000020)
<13> KT - KRN :(2-2)
<14> Tamper status :(0)
<15> Total tamper :(00000016)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Earth tamper)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Reverse tamper)
<22/06/22 22:22><Bypass tamper)
<22/06/22 22:22><Reverse tamper)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Earth tamper)
<22/06/22 22:22><Earth tamper)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Bypass tamper)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Reverse tamper)
<22/06/22 22:22><Reverse tamper)
<22/06/22 22:22><Meter off)
<22/06/22 22:22><Meter off)
```

CLEANING THE METER

To clean any meter within the EM512 TYPE 700 JV1 product range it is best advised to use a soft cloth dampened with methanol. Wipe cloth gently across cover of meter. This should be repeated until the meter cover has been cleaned. The meter cover must be wiped off gently once a month. This is to avoid any build-up of dust that could effect the meter operation.

Cleaning methods to be avoided

- DO NOT use a sharp object to clean the meter as it can scratch the surface of the cover;
- DO NOT use a soaked cloth on the meter as it could damage the meter functionality;
- DO NOT splash any wet substances on the meter;

EM512 TYPE 700 JV1 Installation procedure

The following steps forms part of the installation of an EM512 TYPE 700 JV1 meter:

- Installation of the EM512 TYPE 700 JV1 meter
- First power up
- Commissioning instructions

It is vital that the prepayment meter is installed correctly as this could determine the meter functionality and lifespan. Please follow the prescribed procedures carefully!

General

The meter has a standard mounting footprint. This affords:

- Easy installation, independent of the supply authority, by an electrical contractor.
- Easy meter exchange, i.e. the possibility of selection from a range of energy dispensers made by different manufacturers.

When selecting a suitable position for the EM512 TYPE 700 JV1 meter, consider the following:

- Legal requirements of the relevant statutory authorities
- Internal procedures stipulated by the supply authority
- Security (indoors or outdoors) against tampering
- General safety in terms of possible electric shock, fire, etc.
- For safety reasons, and also to avoid damage to the dispenser, position the dispenser at least 1m away from a water tap
- To prevent damage, the dispenser should not be installed above a stove or heater
- Avoid damage to the dispenser from doors opening
- Installation height should be 1.5 to 1.8m above floor level
- Mobility of residents and furniture should not be impeded
- Future positioning of e.g. kitchen cupboards in a newly constructed home should be kept in mind
- General accessibility is important

Meter Handling

The EM512 TYPE 700 JV1 product range has been tested extensively to verify its toughness to external factors. Please avoid the following actions:

- Do not drop meter during installation;
- Do not try to clean meter in water;
- Do not use sharp objects to cut the plastic covering the meter as this can damage the cover of the meter;
- Do not pack meters with face facing the floor, as this would scratch the surface of the cover;
- Do not slide meters on any surface with it's face facing downwards;
- Do not throw a meter;
- Do not store meters in damp enclosure;
- Do not use meter as a hammering tool;
- Do not attempt to open the meter;
- Do not apply any additional or external voltages to the meter other than what is specified by the supplier.

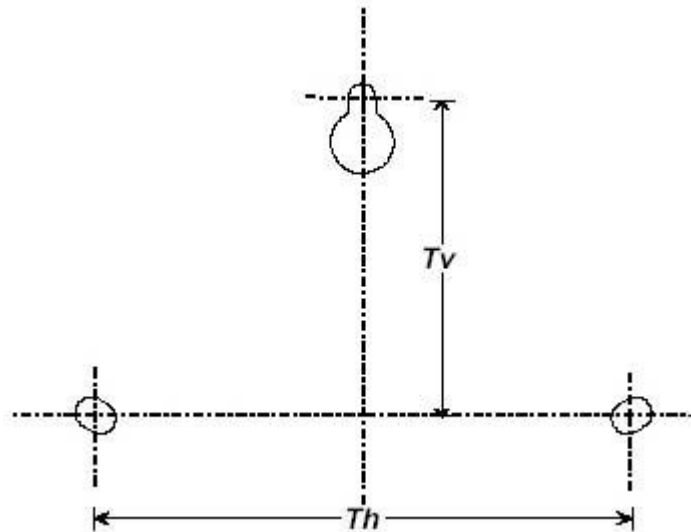
Installation

When installing the EM512 TYPE 700 JV1 Meter please remember to always switch off the power supply to the house/dwelling. The meter is designed to be mounted vertically, directly hooked on a metering board using a three triangular arrangement points.

The meter is removable from its mounting board only after breaking the terminal cover seals.

Mounting the EM512 TYPE 700 JV1 Meter must be done as follow:

- Select suitable space to mount the EM512 TYPE 700 JV1 Meter.
- Tape the mounting template on the selected space on the wall. Make sure the arrow indicating the top is in an upright position. Refer to the dimensions as shown in the diagram below.
- Using a 6mm masonry drill bit, drill holes through relevant positions on the template.
- Mount EM512 TYPE 700 JV1 meter on the wall.



Meter	Th (mm)	Tv (mm)
EM512 TYPE 700 JV1	109	131

DO NOT use countersunk screws. If the wall is uneven, rather mount the EM512 TYPE 700 JV1 meter on a wooden or metal plate. Make sure that the unit is firm and not warped. Do not over tighten screws.

NB! The total length of the meter including the terminal cover = 213.2mm

Connections

Safety Warning: Switch off the network supply before connecting the meter.

Main Connections

The terminals permit the connection of solid or stranded wires (terminal diameter 8mm, 2 X M6 screws per terminal). For aluminum cables (multi strand), the use of a tin plated copper sheath on each conductor is compulsory to avoid corrosion and terminal heating.

Final Inspection

Please ensure that the following instructions are covered:

- Check that the meter is properly secured to the wall
- Make sure that it is not warped
- Double-check that the incoming supply is connected to the incoming supply terminals
- Ensure again that the outgoing load wires are connected to the load terminals
- Double-check that all electrical terminal screws are tight, and that the electrical connections are secure and neat
- Ensure that the inside of the base is clean and dry
- All holes should be sealed properly

Short Codes and Descriptions

The following short codes are available for EM512 Type 700 JV1

Short Code	Description
00	Test All
01	Trip test
02	Test LCD display and buzzer
03	Total kWh
04	Display KT & KRN
05	Display Tariff Index
07	Display power limit
08	Display tamper status
09	Display power consumption
10	Display software version
37	Remaining Credit kWh (kWh)
38	Total credit kWh (kWh) accepted
41	Instantaneous Voltage rms
44	Instantaneous Current rms
47	Instantaneous Power (W)
53	Total number of token accepted
54	Last credit token accepted
55	Last 2nd credit token accepted
56	Last 3rd credit token accepted
57	Last 4th credit token accepted
58	Last 5th credit token accepted
59	Last credit kWh
60	Last 2nd credit kWh
61	Last 3rd credit kWh
62	Last 4th credit kWh
63	Last 5th credit kWh
64	Total technical token accepted
65	Last technical token accepted
66	Last 2nd technical token accepted
67	Last 3rd technical token accepted
68	Number of contactor off due to over power
69	Number of power failure
70	Total terminal cover open
72	Total tampering
73	Energy consumption negative credit
74	Hardware version
75	No ID meter
76	Meter Constanta
77	Supply Group Code (SGC)
78	Interval Alarm (minutes)
79	Low Credit threshold

Technical Specifications

Meter Type	Prepaymnet Single Phase meter
Standard	<ul style="list-style-type: none"> - IEC 62055-31: 2005-09, Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2) - IEC 62055-41: 2007-05, Electricity metering – Payment system – Part 41: Standard transfer specification (STS) – Application layer protocol for one-way token carrier systems - IEC 62055-51: 2007-05, Electricity metering – Payment system – Part 51: Standard transfer specification (STS) – Physical layer protocol for one-way numeric and magnetic card token carriers. - IEC 62052-11: 2003, Electricity metering equipment (AC) – General requirements, tests and test conditions, Part 11: Metering equipment - IEC 62053-21: 2003, Electricity metering equipment – Part 21: Static meter for active energy (classes 1 and 2)
Network	Single Phase 2 wires
Measuring Scope	Active Energy
Class Index	Class 1
Reference voltage & frequency	120V 60Hz / 220V, 230V, 240V 50Hz/60Hz
Operating Voltage Range	-30%Un to +15%Un
Power Consumption	<2W and <10VA
Basic Current	5A
Maximum current	60A/80A
Starting Current	0.2% Ib
Operating Temperature range	-25°C to +55°C
Limit temperature Range to transport and storage	-25°C to + 85°C
Degree of Protection	IP 54
Immunity to impulse voltage	6kV
Relative Humidity	Up to 95%
Meter Weight	1.3 kg
Meter constant	1000 pulse/kWh
User Interface	12 digits keypad with audio feedback 7 segment LCD with special symbols LED Indicator Optical probe Infra-Red