KASHEF 701

Operation Manual

EECC Distribution Transformer Smart Monitoring System

Model: EECC-DTSMS

Version	Date	Formulation / Revision	Make	Verify
V1.0	2024.12.04	First Published	Fatema	Saleem

Contents

Part 1: Safety Requirements

- **Live Line Safety**: Maintain a safe distance from live lines during installation. Only trained personnel should handle the installation.

- **Proper Insulation**: Ensure that installation tools, like the insulating rod and adaptor, are in good condition to prevent electrical hazards.

- **No Power Shutdown**: The device can be installed without turning off the grid power. Installers should remain on the ground and use the correct safety equipment.

- **Personal Protective Equipment (PPE)**: Wear insulated gloves, boots, helmets, and other safety gear during installation.

- **Authorized Personnel**: Only qualified personnel should perform installation and maintenance.

- **Safe Distance**: Always maintain a safe working distance from live electrical components.

- **Site Safety**: Verify that the installation site is clear of hazards to ensure a safe installation.

- **Follow Local Regulations**: Comply with local electrical safety standards and guidelines during installation.

Part 2: General Description

The **EECC-DTSMS (Distribution Transformer Smart Monitoring System)** is an advanced monitoring solution designed to enhance the performance and reliability of distribution transformers. It continuously analyzes critical electrical parameters to ensure **power quality, minimize losses, and assess network health**.

The system utilizes **Current Transformers (CTs) and voltage sensors** to measure and monitor **power quality indicators**, including voltage stability, current balance, and power factor. Additionally, it detects **power losses**, enabling utilities to identify inefficiencies and optimize energy distribution.

A **smart MCU** processes the collected data, providing real-time analysis of network conditions. The system is fully integrated with **SCADA**, allowing remote monitoring and data acquisition. The collected information can be utilized by **smart meters and SCADA systems** for **advanced analytics, predictive maintenance, and operational improvements**.

By offering **real-time insights and seamless data communication**, the EECC-DTSMS supports utilities in enhancing grid stability, improving asset management, and ensuring efficient power distribution.

Device Outlook:

Internal Layout:

Part 3: Technical Description

1. Functional Characteristics

- Power Quality

  - Measures key power quality parameters such as voltage fluctuations, harmonics, power factor, and frequency variations.
  - Helps in identifying anomalies that may affect the performance of connected loads.

- Power losses.

  - Identifies technical and non-technical losses in the distribution network.
  - Provides data-driven insights to minimize energy wastage and improve system efficiency.

- Network Health.

  - Monitors transformer temperature, load conditions, and insulation health.
  - Detects early signs of potential failures, enabling predictive maintenance and reducing.

- Providing Data could be utilized by smart meters SCADA for analysis.

  - Collects and transmits real-time operational data to smart meters and SCADA systems.
  - Enables advanced analytics, fault detection, and optimization of grid performance.

2. Functional Description

The **EECC-DTSMS (Distribution Transformer Smart Monitoring System)** is an advanced solution designed to enhance the reliability and efficiency of distribution transformers. It continuously monitors critical electrical parameters such as voltage stability, current balance, and power factor using Current Transformers (CTs) and voltage sensors. Additionally, it detects both technical and non-technical power losses, helping utilities identify inefficiencies and optimize energy distribution. The system also assesses network health by tracking transformer temperature, load conditions, and insulation status, enabling predictive maintenance and reducing the risk of failures. A smart MCU processes real-time data and integrates seamlessly with SCADA and smart meters, allowing for remote monitoring, advanced analytics, and operational improvements. By providing actionable insights and real-time communication, the EECC-DTSMS supports utilities in improving grid stability, optimizing asset management, and ensuring efficient power distribution.

3. Technical Specifications

3.1 Ratings:

Current		
Channel input voltage range	0-900mVAC peak,636 mV RMS	
Measurement range	Different current sensors have different ranges	
Rcoil	50mV/kA@50Hz(0-12000A),@60Hz(0-10000A) 85mV/kA@50Hz(0-7000A),@60Hz(0-6000A) ...	
VCT	0~99999A	
Voltage		
Channel input voltage range	0~600VAC Phase Voltage	
Maximum range	720VAC Phase Voltage	
Power supply		
Power Supply	ME231N2	ME231N3
	95~265VAC/110~370VDC，45~60Hz	24VDC
Maximum power consumption	3.5VA	

3.2 Supported Functions:

Instantaneous value	
Phase Voltage	U1,U2,U3,AVG
Line Voltage	U12,U23,U31,AVG
Current	I1,I2,I3,AVG,IN
Grid Frequency	F1,F2,F3,∑
Power Factor PF	PF1,PF2,PF3,∑
Fundamental power factor DPF	DPF1,DPF2,DPF3,∑
Active power	P1,P2,P3,∑
Reactive power	Q1,Q2,Q3,∑
Apparent power	S1,S2,S3,∑
Energy	
Active energy Pos.	EP1,EP2,EP3,∑
Active Energy Neg.	EP1,EP2,EP3,∑
Reactive Energy Pos.	EQ1,EQ2,EQ3,∑
Reactive energy Neg.	EQ1,EQ2,EQ3,∑
Apparent Energy	ES1,ES2,ES3,∑
Tariff Energy	ET1,ET2, ET3,ET4, ET5,ET6
Harmonics	
Voltage Harmonic Distortion	THD (Total harmonic percentage), TOHD (Odd total harmonic percentage), TEHD (Even total harmonic percentage), phase L1.L2.L3 1-50th harmonic percentage, phase ABC 1-50th harmonic voltage value
Voltage Harmonic Value	
Current Harmonic Distortion	THD （Total harmonic percentage）, TOHD (Odd total harmonic percentage), TEHD (Even total harmonic percentage), phase L1.L2.L3 1- 50th harmonic percentage, phase ABC 1-50th harmonic current value
Current Harmonic Value	
Phasor diagram	
Phasor diagram	between voltage and current
Phase Sequence	voltage and current
Voltage Angle	U1,U2,U3

Current Angle	**I1,I2,I3**
UI Angle	**UI1,UI2,UI3**
Demand	
Demand	**P,Q,S**
Active power DMD Max.	**P and Time**
Reactive power DMD Max.	**Q and Time**
Apparent power DMD Max.	**S and Time**
Unbalance	
Voltage unbalance	**Negative Sequence, zero Sequence**
current unbalance	**Negative Sequence, zero Sequence**
Max.&Min.	
Phase Voltage	**U1,U2,U3,AVG**
Line Voltage	**U12,U23,U31,AVG**
Current	**I1,I2,I3,AVG,IN**
Active power	**P1,P2,P3,∑**
Reactive power	**Q1,Q2,Q3,∑**
Apparent power	**S1,S2,S3,∑**

3.3 Accuracy and Certification

Measuring accuracy	
current measurement accuracy	0.1%+Accuracy of current sensor
Voltage measurement accuracy	±0.2%(60V~600V AC)
Grid frequency	±0.01%(45~65Hz)
Power factor	±0.005
Active and apparent power	IEC62053-22 level 0.5S
Reactive power	IEC62053-21 level 1S
Active energy	IEC62053-22 level 0.5S
Reactive energy	IEC62053-21 level 1S
Environment condition	
Operating temperature	-20℃～+70℃
Storage temperature	-40℃～+85℃
Humidity range	5～95% RH, 50℃(non-condensing)
Class of pollution	2
Over voltage capability	CAT III 1000V, It is suitable for distribution system below 277 / 480VAC
Insulation strength	IEC61010-1
Altitude	3000m Max
Antipollution level	IP20（Meet the standard of IEC 60629）
Quality guarantee period	12 months
EMC（electromagnetic compatibility）	
Electrostatic discharge	Level IV(IEC61000-4-2)
Radiated immunity	Level III (IEC61000-4-3)
EFT Electrical fast burst immunity	Level IV (IEC61000-4-4)
Surge immunity	Level IV (IEC61000-4-5)
Conducted disturbance immunity	Level III (IEC61000-4-6)
Power frequency magnetic field immunity	0.5mT (IEC61000-4-8)
Conduction and radiation	Class B (EN55022)
Measurement standard	
EN 62052-11，EN61557-12，EN 62053-21，EN 62053-22，EN 62053-23，EN 50470-1，EN 50470-3，EN 61010-1，EN 61010-2，EN 61010-031	

Part 5: Communication Description

5.1 Communication Standards:

- **Network Compatibility**: GPRS/GSM, 2G, and 4G networks.
- **Cellular Bands**:
  - GSM/EDGE:850,900,1800MHz.
  - WCDMA:B1,B2,B5,B8.
  - FDD-LTE:B1,B3,B4,B5,B7,B8,B28.
  - TDD-LTE:B40.

- **Protocol**: Uses **IEC60870-5-104**, where the indicator serves as the **Master** and the SCADA system as the **Slave**.

5.2 SIM Card

- When inserting/removing a SIM card, make sure the device is turned off.
- Make sure the device is placed flatly like the above picture when inserting or removing SIM card.

5.3 LED Indicator

LED Indicator Introduction			
		Status	Description
PWR	Power Supply	Always ON	Power on
		OFF	Failure
RUN	Running	Flickering	Device is running
		OFF	Failure
LINK	Ethernet, 4G, WiFi	Flickering	Ethernet communication
		Always ON	4G or WiFi is working
		OFF	Failure

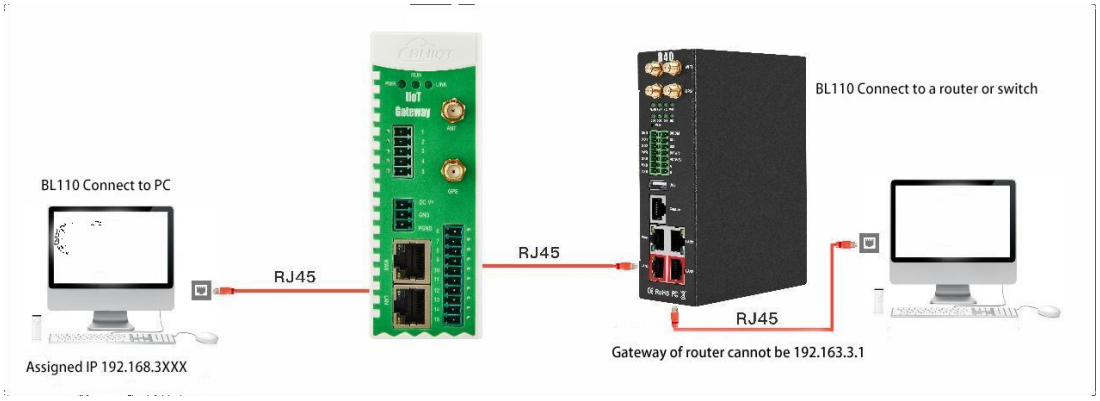
5.4WAN Port and LAN Port:

Ethernet Port			
Indicator	Color	Status	Description
Speed	Green	Always ON	100Mbps mode
		OFF	10Mbps mode
LINK	Yellow	Always ON	Connected
		Flickering	Transmitting data
		OFF	Connection disconnected

5.5 Configuration Software:

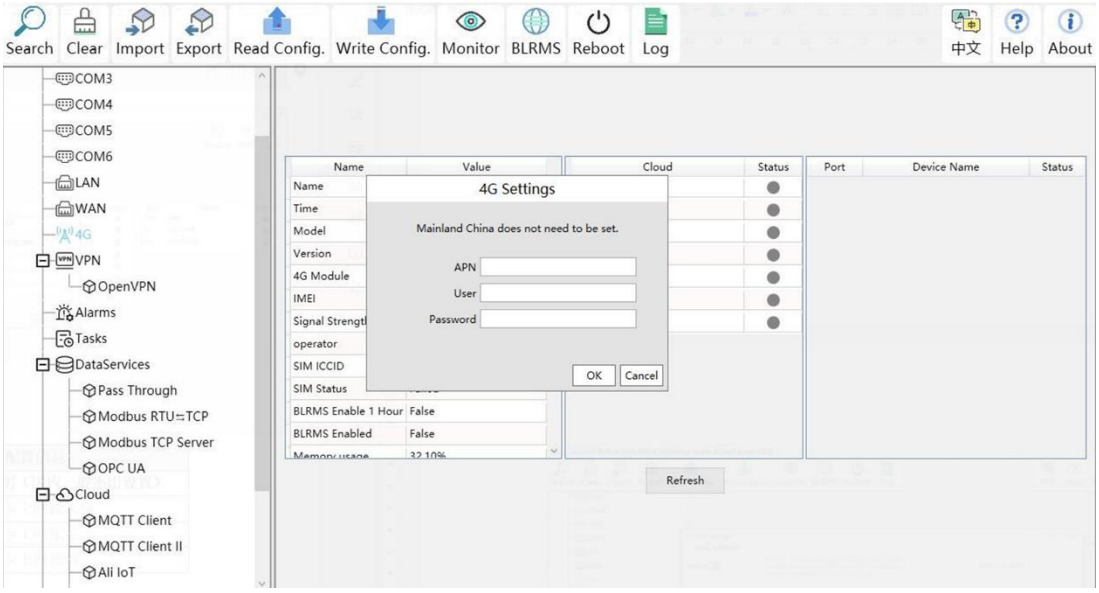
WAN port IP is retrieved automatically, LAN port IP is 192.168.3.1

Connect to a router or switch, or connect directly as follows:



5.6 Cellular Network Registeration:

Set the APN of the SIM card, you don't need to set this if the device doesn't come with a 4G module. It's not necessary to set APN for some 4G network operators.



4G Settings	
Function	**Description**
APN	SIM card Internet access point
User	SIM card user name
Password	SIM card password

5.7IEC104 Signals List:

5.7.1 Voltage, current, power, power factor

Alias	IOA	R/W	Size	Type	Unit	Description
Current						
I1	1000	R	2	Float32	A	Phase L1 current
I2	1002	R	2	Float32	A	Phase L2 current
I3	1004	R	2	Float32	A	Phase L3 current
Current Avg	1006	R	2	Float32	A	Average value of L1L2L3 three-phase current
IN	1008	R	2	Float32	A	Phase N current
Phase voltage						
U1	1010	R	2	Float32	V	U1-UN voltage
U2	1012	R	2	Float32	V	U2-UN voltage
U3	1014	R	2	Float32	V	U3-UN voltage
Phase Voltage Avg	1016	R	2	Float32	V	Average value of L1L2L3 three-phase phase voltage
U0	1018	R	2	Float32	V	zero sequence voltage
Line voltage						
U12	1020	R	2	Float32	V	U1-U2 voltage
U23	1022	R	2	Float32	V	U2-U3 voltage
U31	1024	R	2	Float32	V	U3-U1 voltage
Line Voltage Avg	1026	R	2	Float32	V	Average value of three-phase line voltage
Active power						
P1	1028	R	2	Float32	kW	Phase L1 Active power
P2	1030	R	2	Float32	kW	Phase L2 Active power
P3	1032	R	2	Float32	kW	Phase L3 Active power
PTotal	1034	R	2	Float32	kW	Total Active power

Reactive power						
Q1	**1036**	**R**	**2**	**Float32**	**kVAR**	**Phase L1 Reactive power**
Q2	**1038**	**R**	**2**	**Float32**	**kVAR**	**Phase L2 Reactive power**
Q3	**1040**	**R**	**2**	**Float32**	**kVAR**	**Phase L3 Reactive power**
QTotal	**1042**	**R**	**2**	**Float32**	**kVAR**	**Total Reactive power**
Apparent power						
S1	**1044**	**R**	**2**	**Float32**	**kVA**	**Phase L1 Reactive power**
S2	**1046**	**R**	**2**	**Float32**	**kVA**	**Phase L2 Reactive power**
S3	**1048**	**R**	**2**	**Float32**	**kVA**	**Phase L3 Reactive power**
STotal	**1050**	**R**	**2**	**Float32**	**kVA**	**Total Reactive power**
Power factor						
PF1	**1052**	**R**	**2**	**Float32**	**-**	**Phase L1 Power factor**
PF2	**1054**	**R**	**2**	**Float32**	**-**	**Phase L2 Power factor**
PF3	**1056**	**R**	**2**	**Float32**	**-**	**Phase L3 Power factor**
PFTotal	**1058**	**R**	**2**	**Float32**	**-**	**Total Power factor**
Fundamental harmonic power factor						
DPF1	**1060**	**R**	**2**	**Float32**	**-**	**Phase L1 Fundamental harmonic power factor**
DPF2	**1062**	**R**	**2**	**Float32**	**-**	**Phase L2 Fundamental harmonic power factor**
DPF3	**1064**	**R**	**2**	**Float32**	**-**	**Phase L3 Fundamental harmonic power factor**
DPFTotal	**1066**	**R**	**2**	**Float32**	**-**	**Total Fundamental harmonic power factor**
Frequency						
Freq1	**1068**	**R**	**2**	**Float32**	**Hz**	**Phase L1 Frequency**
Freq2	**1070**	**R**	**2**	**Float32**	**Hz**	**Phase L2 Frequency**
Freq3	**1072**	**R**	**2**	**Float32**	**Hz**	**Phase L3 Frequency**
FreqTotal	**1074**	**R**	**2**	**Float32**	**Hz**	**Total Frequency**

5.7.2 Energy

There are two types of energy, possive energy and reverse energy.
When the total electric energy reaches 1.0 x 10^9 kwh, 1.0 x 10^9 kvarh, or 1.0 x 10^9 KVAh, the electric energy of each phase will be cleared automatically.

Alias	IOA	R/W	Size	Type	Unit	Description
UInt32 Energy						
Active Energy- UInt32						
EP1Imp	2600	R	2	UInt32	kWh	Phase L1 Positive active energy
EP2Imp	2602	R	2	UInt32	kWh	Phase L2 Positive active energy
EP3Imp	2604	R	2	UInt32	kWh	Phase L3 Positive active energy
EPImp	2606	R	2	UInt32	kWh	Total Positive active energy
EP1Exp	2608	R	2	UInt32	kWh	Phase L1 Reverse active energy
EP2Exp	2610	R	2	UInt32	kWh	Phase L2 Reverse active energy
EP3Exp	2612	R	2	UInt32	kWh	Phase L3 Reverse active energy
EPExp	2614	R	2	UInt32	kWh	Total Reverse active energy
Reactive energy- UInt32						
EQ1Imp	2616	R	2	UInt32	kVARh	Phase L1 Positive reactive
EQ2Imp	2618	R	2	UInt32	kVARh	Phase L2 Positive reactive energy
EQ3Imp	2620	R	2	UInt32	kVARh	Phase L3 Positive reactive energy
EQImp	2622	R	2	UInt32	kVARh	Total Positive reactive energy
EQ1Exp	2624	R	2	UInt32	kVARh	Phase L1 Reverse reactive energy
EQ2Exp	2626	R	2	UInt32	kVARh	Phase L2 Reverse reactive energy
EQ3Exp	2628	R	2	UInt32	kVARh	Phase L3 Reverse reactive energy
EQExp	2630	R	2	UInt32	kVARh	Total Reverse reactive energy
Apparent Energy-UInt32						
ES1	2632	R	2	UInt32	kVAh	Phase L1 Apparent Energy
ES2	2634	R	2	UInt32	kVAh	Phase L2 Apparent Energy
ES3	2636	R	2	UInt32	kVAh	Phase L3 Apparent Energy
ES	2638	R	2	UInt32	kVAh	Total Apparent Energy

5.7.3 Tariff Energy

Tariff Energy types are Int64 and UInt32, whose unit size is different.
When the rate of electricity reaches 1.0 x 10^9 kWh, 1.0 x 10^9 kVarh, or v1.0 x 10^9 kVah, each Tariff Energy will be automatically cleared to zero.

Alias	IOA	R/W	Size	Type	Unit	Description
Tariff Energy-Int64						
ET1	2700	R	4	Int64	Wh	Tariff 1 Active Energy
ET2	2704	R	4	Int64	Wh	Tariff 2 Active Energy
ET3	2708	R	4	Int64	Wh	Tariff 3 Active Energy
ET4	2712	R	4	Int64	Wh	Tariff 4 Active Energy
ET5	2716	R	4	Int64	Wh	Tariff 5 Active Energy
ET6	2720	R	4	Int64	Wh	Tariff 6 Active Energy
Tariff Energy-UInt32						
ET1	2750	R	2	UInt32	kWh	Tariff 1 Active Energy
ET2	2752	R	2	UInt32	kWh	Tariff 2 Active Energy
ET3	2754	R	2	UInt32	kWh	Tariff 3 Active Energy
ET4	2756	R	2	UInt32	kWh	Tariff 4 Active Energy
ET5	2758	R	2	UInt32	kWh	Tariff 5 Active Energy
ET6	2760	R	2	UInt32	kWh	Tariff 6 Active Energy

5.7.4 Demand register

Alias	IOA	R/W	Size	Type	Unit	Description
Basic parameters of demand						
DMDMethod	3000	R/WC	1	UInt16	-	Demand calculation method: 0= sliding type 1= fixed
DMD block	3001	R/RC	1	UInt16	Minute	Demand interval
PDMD Reset Time	3002	R	4	Date time	-	Peak demand reset date and time
Power demand						
P1Demand	3020	R	2	Float32	kW	Current active power demand of phase L1
P1PeakDemand	3022	R	2	Float32	kW	Peak demand of phase L1 active power
P1PeakDemand Date	3024	R	4	Date time	-	Occurrence time of peak demand of phase L1 active power
P2Demand	3028	R	2	Float32	kW	Current active power demand of phase 2
P2PeakDemand	3030	R	2	Float32	kW	Peak demand of phase 2 active power
P2PeakDemand Date	3032	R	4	Date time	-	Occurrence time of peak demand of phase 2 active power
P3Demand	3036	R	2	Float32	kW	Current active power demand of phase 3
P3PeakDemand	3038	R	2	Float32	kW	Peak demand of phase 3 active power
P3PeakDemand Date	3040	R	4	Date time	-	Occurrence time of peak demand of phase 3 active power
PSUMDemand	3044	R	2	Float32	kW	Current total active power demand

PSUMPeakDemand	3046	R	2	Float32	kW	Peak demand of total active power
PSUMPeakDemandDate	3048	R	4	Date time	-	Occurrence time of peak demand of total active power
Q1Demand	3052	R	2	Float32	kVar	Current reactive power demand of phase L1
Q1PeakDemand	3054	R	2	Float32	kVar	Peak demand of phase L1 reactive power
Q1PeakDemandDate	3056	R	4	Date time	-	Occurrence time of peak demand of phase L1 reactive power
Q2Demand	3060	R	2	Float32	kVar	Current reactive power demand of phase L2
Q2PeakDemand	3062	R	2	Float32	kVar	Peak demand of phase L2 reactive power
Q2PeakDemandDate	3064	R	4	Date time	-	Occurrence time of peak demand of phase L2 reactive power
Q3Demand	3068	R	2	Float32	kVar	Current reactive power demand of phase L3
Q3PeakDemand	3070	R	2	Float32	kVar	Peak demand of phase L3 reactive power
Q3PeakDemandDate	3072	R	4	Date time	-	Occurrence time of peak demand of phase L3 reactive power
QSUMDemand	3076	R	2	Float32	kVar	Current total reactive power demand
QSUMPeakDemand	3078	R	2	Float32	kVar	Peak demand of total reactive power
QSUMPeakDemandDate	3080	R	4	Date time	-	Occurrence time of peak demand of total reactive power
S1Demand	3084	R	2	Float32	kVa	Current apparent power demand of phase L1
S1PeakDemand	3086	R	2	Float32	kVa	Peak demand of phase L1 apparent power
S1PeakDemandDate	3088	R	4	Date time	-	Occurrence time of peak demand of phase L1 apparent power
S2Demand	3092	R	2	Float32	kVa	Current apparent power demand of phase L2
S2PeakDemand	3094	R	2	Float32	kVa	Peak demand of phase L2 apparent power
S2PeakDemandDate	3096	R	4	Date time	-	Occurrence time of peak demand of phase L2 apparent power

Alias	IOA	R/W	Size	Type	Unit	Description
S3Demand	3100	R	2	Float32	kVa	Current apparent power demand of phase L3
S3PeakDemand	3102	R	2	Float32	kVa	Peak demand of phase L3 apparent power
S3PeakDemand Date	3104	R	4	Date time	-	Occurrence time of peak demand of phase L3 apparent power
SSUMDemand	3108	R	2	Float32	kVa	Current total apparent power demand
SSUMPeakDemand	3110	R	2	Float32	kVa	Peak demand of total apparent power
SSUMPeakDemandDate	3112	R	4	Date time	-	Occurrence time of peak demand of total apparent power

5.7.5 Voltage and current harmonic register

Alias	IOA	R/W	Size	Type	Unit	Description
Current harmonic percentage						
I1THD	4000	R	2	Float32	%	Phase L1 current total harmonic percentage
I2THD	4002	R	2	Float32	%	Phase L2 current total harmonic percentage
I3THD	4004	R	2	Float32	%	Phase L3 current total harmonic percentage
I1TOHD	4006	R	2	Float32	%	Phase L1 current odd total harmonic percentage
I2TOHD	4008	R	2	Float32	%	Phaese L2 current odd total harmonic percentage
I3TOHD	4010	R	2	Float32	%	Phase L3 current odd total harmonic percentage
I1TEHD	4012	R	2	Float32	%	Phase L1 current even total harmonic percentage
I2TEHD	4014	R	2	Float32	%	Phase L2 current even total harmonic percentage
I3TEHD	4016	R	2	Float32	%	Phsee L3 curremt even total harmonic percentage
I1HD1	4018	R	2	Float32	%	1st harmonic percentage of phase L1 current
I2HD1	4020	R	2	Float32	%	1st harmonic percentage of phase L2 current

I3HD1	4022	R	2	Float32	%	1st harmonic percentage of phase L3 current
…	4024-4311	…	…	…	…	The 2nd-49th harmonic percentage of L1L2L3 phase current
I1HD50	4312	R	2	Float32	%	The 50th harmonic percentage of phase L1 current
I2HD50	4314	R	2	Float32	%	The 50th harmonic percentage of phase L2 current
I3HD50	4316	R	2	Float32	%	The 50th harmonic percentage of phase L3 current
Current harmonic value						
I1HDV1	4400	R	2	Float32	A	Fundamental current value of phase L1 current
I2HDV1	4402	R	2	Float32	A	Fundamental current value of phase L2 current
I3HDV1	4404	R	2	Float32	A	Fundamental current value of phase L3 current
…	4406-4693	…	…	…	…	The 2nd-49th harmonic current value of L1L2L3 phase current
I1HDV50	4694	R	2	Float32	A	The 50th harmonic current value of phase L1 current
I2HDV50	4696	R	2	Float32	A	The 50th harmonic current value of phase L2 current
I3HDV50	4698	R	2	Float32	A	The 50th harmonic current value of phase L3 current
Voltage harmonic percentage						
U1THD	5000	R	2	Float32	%	Phase L1 volage total harmonic percentage
U2THD	5002	R	2	Float32	%	Phase L2 voltage total harmonic percentage
U3THD	5004	R	2	Float32	%	Phase L3 voltage votal harmonic percentage
U1TOHD	5006	R	2	Float32	%	Phase L1 voltage odd total harmonic percentage
U2TOHD	5008	R	2	Float32	%	Phase L2 voltage odd total harmonic percentage
U3TOHD	5010	R	2	Float32	%	Phase L3 voltage odd total harmonic percentage
U1TEHD	5012	R	2	Float32	%	Phase L1 voltage even total harmonic percentage
U2TEHD	5014	R	2	Float32	%	Phase L2 voltage even total harmonic percentage

U3TEHD	5016	R	2	Float32	%	Phase L3 voltage even total harmonic percentage
U1HD1	5018	R	2	Float32	%	The 1st harmonic percentage of phase L1 voltage
U2HD1	5020	R	2	Float32	%	The 1st harmonic percentage of phase L2 voltage
U3HD1	5022	R	2	Float32	%	The 1st harmonic percentage of phase L3 voltage
…	5024-5311	…	…	…	…	The 2nd-49th harmonic percentage of L1L2L3 phase voltage
U1HD50	5312	R	2	Float32	%	The 50th harmonic percentage of phase L1 voltage
U2HD50	5314	R	2	Float32	%	The 50th harmonic percentage of phase L2 voltage
U3HD50	5316	R	2	Float32	%	The 50th harmonic percentage of phase L3 voltage
Voltage harmonic value						
U1HDV1	5400	R	2	Float32	V	The 1st harmonic voltage value of phase L1 voltage
U2HDV1	5402	R	2	Float32	V	The 1st harmonic voltage value of phase L2 voltage
U3HDV1	5404	R	2	Float32	V	The 1st harmonic voltage value of phase L3 voltage
…	5406-5693	…	…	…	…	The 2nd-49th harmonic voltage value of L1L2L3 phase voltage
U1HDV50	5694	R	2	Float32	V	The 50th harmonic voltage value of phase L1 voltage
U2HDV50	5696	R	2	Float32	V	The 50th harmonic voltage value of phase L2 voltage
U3HDV50	5698	R	2	Float32	V	The 50th harmonic voltage value of phase L3 voltage

5.7.6 Max.&Min.

Alias	IOA	R/W	Size	Type	Unit	Description
Current max / min						
I1Max	6000	R	2	Float32	A	Phase L1 Maximum current
I2Max	6002	R	2	Float32	A	Phase L2 Maximum current
I3Max	6004	R	2	Float32	A	Phase L3 Maximum current

I1VGMax	6006	R	2	Float32	A	Maximum three phase average current
IN Max	6008	R	2	Float32	A	Phase N Maximum current
I1Min	6010	R	2	Float32	A	Phase L1 Minimum current
I2Min	6012	R	2	Float32	A	Phase L2 Minimum current
I3Min	6014	R	2	Float32	A	Phase L3 Minimum current
I1VGMin	6016	R	2	Float32	A	Minimum three phase average current
IN Min	6018	R	2	Float32	A	Phase N Minimum current
Voltage max / min						
U1Max	6020	R	2	Float32	V	U1-UN Maximum phase voltage
U2Max	6022	R	2	Float32	V	U2-UN Maximum phase voltage
U3Max	6024	R	2	Float32	V	U3-UN Maximum phase voltage
Phase UAVG Max	6026	R	2	Float32	V	Maximum value of average value of three-phase phase voltage.
U1Min	6030	R	2	Float32	V	U1-UN Minimum phase voltage
U2Min	6032	R	2	Float32	V	U2-UN Minimum phase voltage
U3Min	6034	R	2	Float32	V	U3-UN Minimum phase voltage
U1VGMin	6036	R	2	Float32	V	Minimum value of average value of three-phase phase voltage.
U12Max	6040	R	2	Float32	V	U1-U2 Maximum wire voltage
U23Max	6042	R	2	Float32	V	U2-U3 Maximum wire voltage
U31Max	6044	R	2	Float32	V	U3-U1 Maximum wire voltage
LineUAVGMax	6046	R	2	Float32	V	Maximum value of average value of three-phase phase voltage.
U12Min	6050	R	2	Float32	V	U1-U2 Minimum phase voltage
U23Min	6052	R	2	Float32	V	U2SS-U3 Minimum phase voltage
U31Min	6054	R	2	Float32	V	U3-U1 Minimum phase voltage
LineUAVGMin	6056	R	2	Float32	V	Minimum value of average value of three-phase phase voltage.
Maximum / minimum power						
P1Max	6060	R	2	Float32	kW	Maximum active power of phase L1
P2Max	6062	R	2	Float32	kW	Maximum active power of phase L2
P3Max	6064	R	2	Float32	kW	Maximum active power of phase L3
PSUMMax	6066	R	2	Float32	kW	Maximum value of three-phase total active power

P1Min	**6070**	**R**	**2**	**Float32**	**kW**	**Minimum active power of phase L1**
P2Min	**6072**	**R**	**2**	**Float32**	**kW**	**Minimum active power of phase L2**
P3Min	**6074**	**R**	**2**	**Float32**	**kW**	**Minimum active power of phase L3**
PSUMMin	**6076**	**R**	**2**	**Float32**	**kW**	**Minimum value of three-phase total active power**
Reactive Power Max / min						
Q1Max	**6080**	**R**	**2**	**Float32**	**kVar**	**Maximum value of phase L1 reactive power**
Q2Max	**6082**	**R**	**2**	**Float32**	**kVar**	**Maximum value of phase L2 reactive powe**
Q3Max	**6084**	**R**	**2**	**Float32**	**kVar**	**Maximum value of phase L3 reactive powe**
QSUMMax	**6086**	**R**	**2**	**Float32**	**kVar**	**Maximum value of three-phase total reactive power**
Q1Min	**6090**	**R**	**2**	**Float32**	**kVar**	**Minimum value of phase L1 reactive power**
Q2Min	**6092**	**R**	**2**	**Float32**	**kVar**	**Minimum value of phase L2 reactive power**
Q3Min	**6094**	**R**	**2**	**Float32**	**kVar**	**Minimum value of phase L3 reactive power**
QSUMMin	**6096**	**R**	**2**	**Float32**	**kVar**	**Minimum value of three-phase total reactive power**
Apparent power max / min						
S1Max	**6100**	**R**	**2**	**Float32**	**kVa**	**Maximum apparent power of phase L1**
S2Max	**6102**	**R**	**2**	**Float32**	**kVa**	**Maximum apparent power of phase L2**
S3Max	**6104**	**R**	**2**	**Float32**	**kVa**	**Maximum apparent power of phase L3**
SSUMMax	**6106**	**R**	**2**	**Float32**	**kVa**	**Maximum three-phase total apparent power**
S1Min	**6110**	**R**	**2**	**Float32**	**kVa**	**Minimum apparent power of phase L1**
S2Min	**6112**	**R**	**2**	**Float32**	**kVa**	**Minimum apparent power of phase L2**
S3Min	**6114**	**R**	**2**	**Float32**	**kVa**	**Minimum apparent power of phase L3**
SSUMMin	**6116**	**R**	**2**	**Float32**	**kVa**	**Minimum three phase total apparent power**

5.7.7 Unbalance

Alias	IOA	R/W	Size	Type	Unit	Description
Current negative sequence unbalance	7000	R	2	Float32	%	Current negative sequence unbalance
Current zero sequence unbalance	7002	R	2	Float32	%	Current zero sequence unbalance
Voltage negative sequence unbalance	7004	R	2	Float32	%	Voltage negative sequence unbalance
Voltage zero sequence unbalance	7006	R	2	Float32	%	Voltage zero sequence unbalance

5.7.8 Current K-factor and crest factor register

Alias	IOA	R/W	Size	Type	Unit	Description
Current K factor						
KFI1	8000	R	2	Float32	-	Current K factor of phase L1
KFI2	8002	R	2	Float32	-	Current K factor of phase L2
KFI3	8004	R	2	Float32	-	Current K factor of phase L3

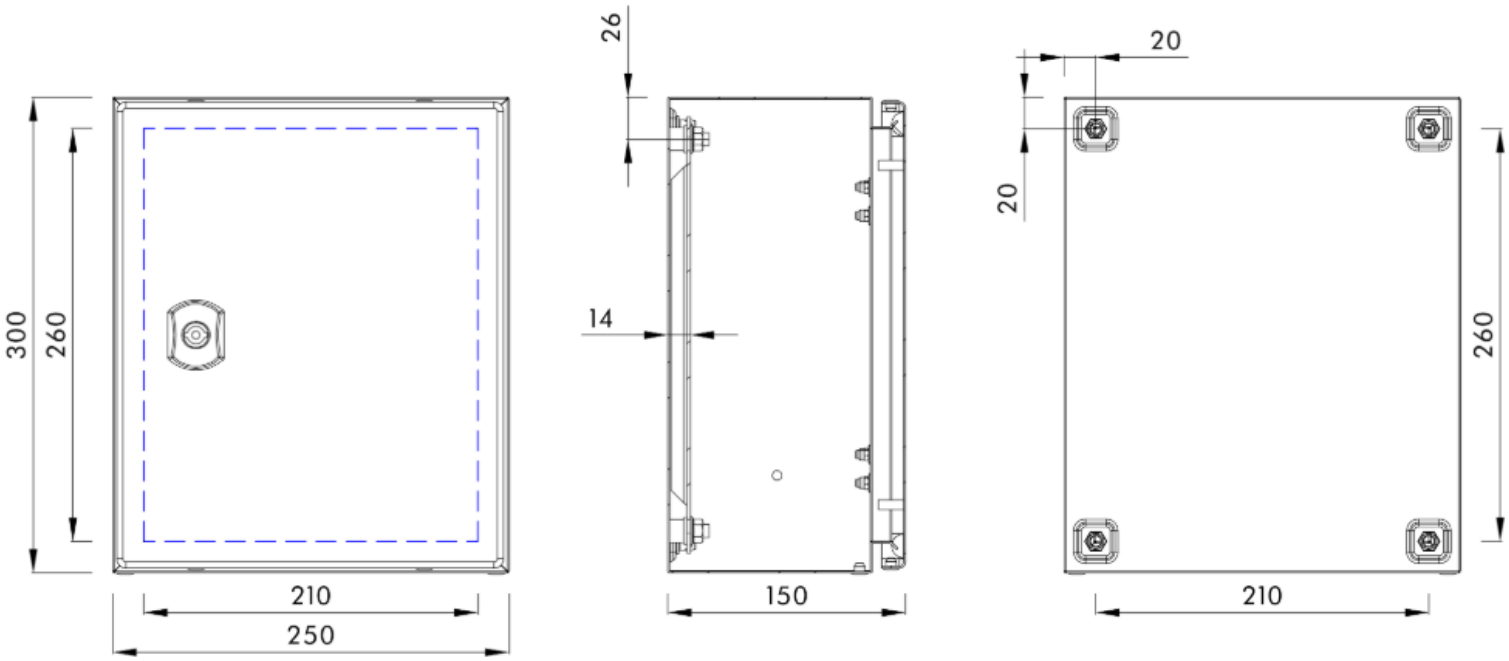
5.7.9 Voltage and current angle register

Alias	IOA	R/W	Size	Type	Unit	Description
Angle voltages:						
U1	8100	R	2	Float32	°	Angle phase L1 voltage
U2	8102	R	2	Float32	°	Angle phase L2 voltage
U3	8104	R	2	Float32	°	Angle phase L3 voltage
Angle currents:						
I1	8106	R	2	Float32	°	Angle phase L1 current
I2	8108	R	2	Float32	°	Angle phase L2 current
I3	8110	R	2	Float32	°	Angle phase L3 current

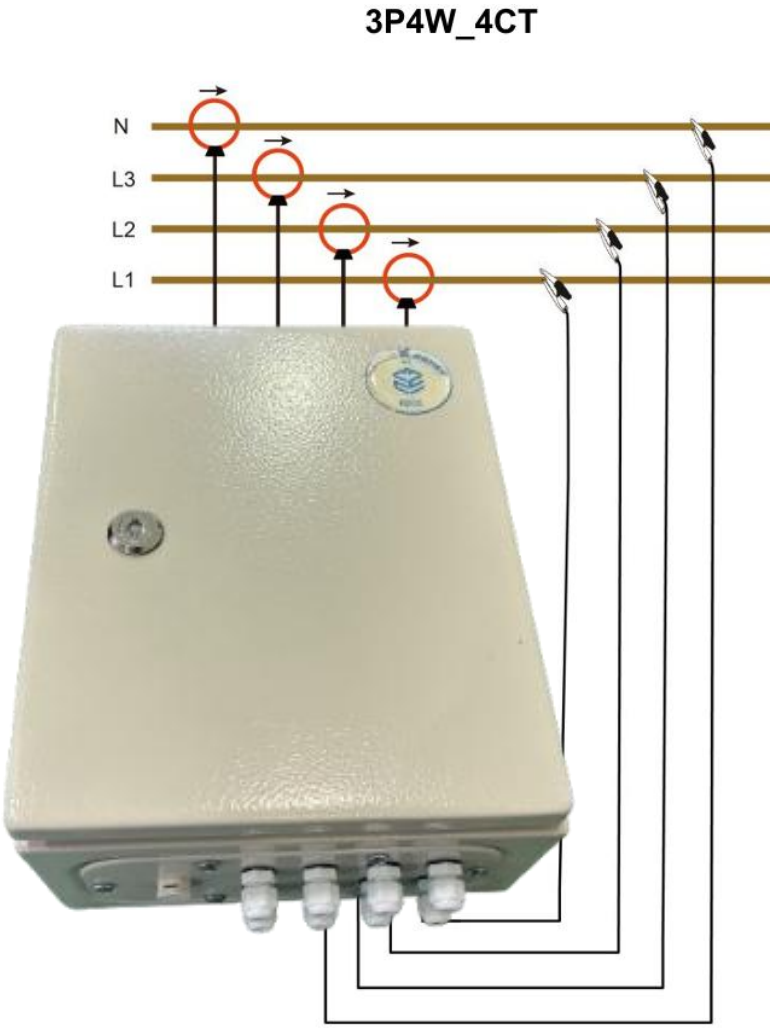
Angle between voltage and current:						
UI1	**8112**	**R**	**2**	**Float32**	**°**	**Angle between voltage and current of phase L1**
UI2	**8114**	**R**	**2**	**Float32**	**°**	**Angle between voltage and current of phase L2**
UI3	**8116**	**R**	**2**	**Float32**	**°**	**Angle between voltage and current of phase L3**

Part 6: Dimensions & Installation

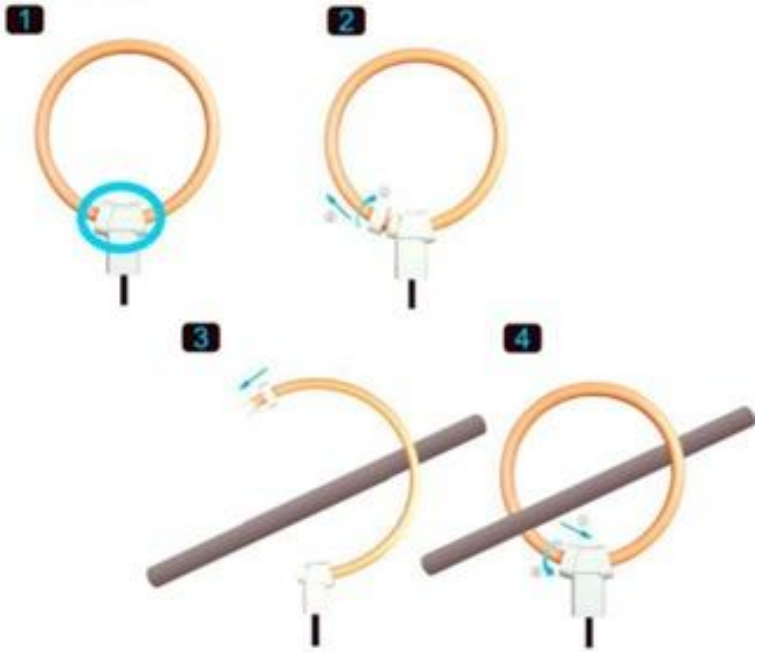
1. Unit Dimensions:



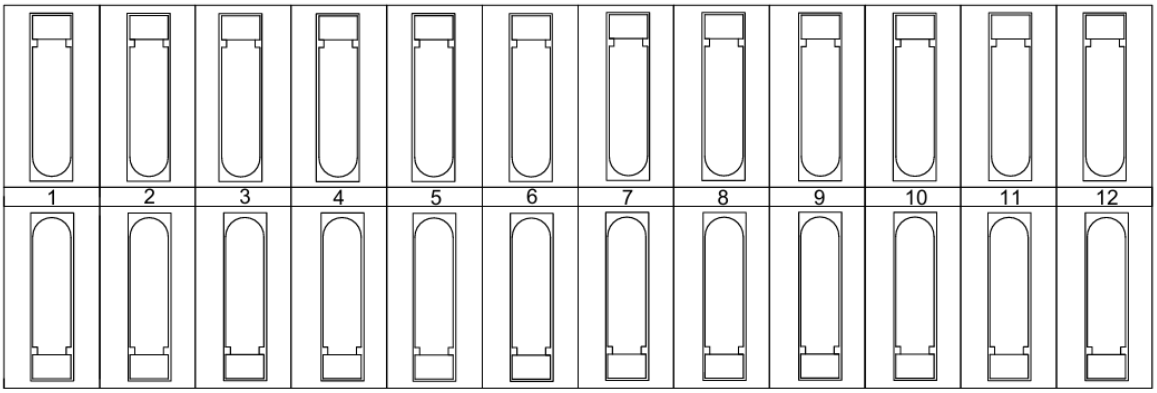
2. Wiring System Connection diagram:



3. Current Sensor Installation Steps:



4. Terminal Block Connection:



Point number	Point name	Point function	Point type	Remarks
1	Vn	N-phase voltage input	Voltage input	Measurement voltage input channel
2	V3	L3-phase voltage input		
3	V2	L2-phase voltage input		
4	V1	L1-phase voltage input		
5	In+	Phase N current input positive	Current input	Current channel
6	In-	Phase N current input negative		
7	I3+	Phase L3 current input positive		
8	I3-	Phase L3 current input negative		
9	I2+	Phase L2 current input positive		
10	I2-	Phase L2 current input negative		
11	I1+	Phase L1 current input positive		
12	I1-	Phase L1 current input negative		

Part 6: Order Placement Tips

For orders, additional information or technical support, reach us on email,
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