FnIO G-Series

GT-3911

GT-3911(3Phase AC Measurement, Lx-Ly 500Vac, 5A)

Table of Contents

History

REV.	PAGES	REMARKS	DATE	Editor
1.00	ALL	New Document	11.16.2020	HS KIM

1. Environment Specification

Environmental Specification	
Operation Temperature	-40℃ ~ 60℃
UL Temperature	-20℃ ~ 60℃
Non-Operating Temperature	-40℃ ~ 85℃
Relative Humidity	5% ~ 90% Non-condensing
Operating Altitude	2,000m
Mounting	DIN Rail
General Specification	
Shock Operating	IEC 60068-2-27 : 2008 / 15g, 11ms
Vibration Resistance	Based on IEC 60068-2-6 DNVGL-CG-0039 : Vibration Class B, 4g
Industrial Emissions	EN61000-6-4/All : 2011
Industrial Immunity	EN61000-6-2 : 2005
Installation Position	Vertical and horizontal installation is available
Product Certifications	CE, FCC

2. GT-3911 (3Phase AC Measurement, Lx-Ly 500Vac, 5A)

2.1. GT-3911 Specification

*** As a product used for high voltage and high current, RTB is not removable for safety purposes.**

Items	Specification
Input Specification	
Number of Channel	3Ch Voltage Input, 3Ch Current Input via CT
Indicators	1 Green Status 3 LEDs : VL1, VL2, VL3 3 LEDs : IL1, IL2, IL3
Maximum Input Voltage Range	V_{LN} = 288VAC V_{LL}=500VAC
Input resistance voltage path	1200KΩ
Measuring Current	5A(MAX), CT 1 : 4000(MAX)
Input resistance current path	5mΩ
Resolution	24bits
Input Frequency range	45Hz~65Hz
Measured values	Angle, Voltage, Current, Power, Energy, Frequency, Power Factors
Measuring error	Voltage&Current = 0.3%@25°C Voltage&Current = 0.5%@ -20°C~40°C Voltage&Current = 1%@ -20°C~50°C Voltage&Current = 1.5%@ -40°C~60°C Frequency = ±0.1Hz Phase angle = ±0.6º
General Specification	
Power Dissipation	Max. 125 mA @ 5Vdc
Isolation	I/O to Logic : Photocoupler Isolation Field Power : Non-Isolation
Field Power	Supply Voltage : 24Vdc nominal Voltage Range : 18~30Vdc Power dissipation: 0mA @ 24Vdc
Wiring	I/O Cable Max. 2.0mm^2 (AWG#14)
Weight	63g
Module Size	12mm x 109mm x 70mm
Environment Condition	**Refer to '1. Environment Specification'**

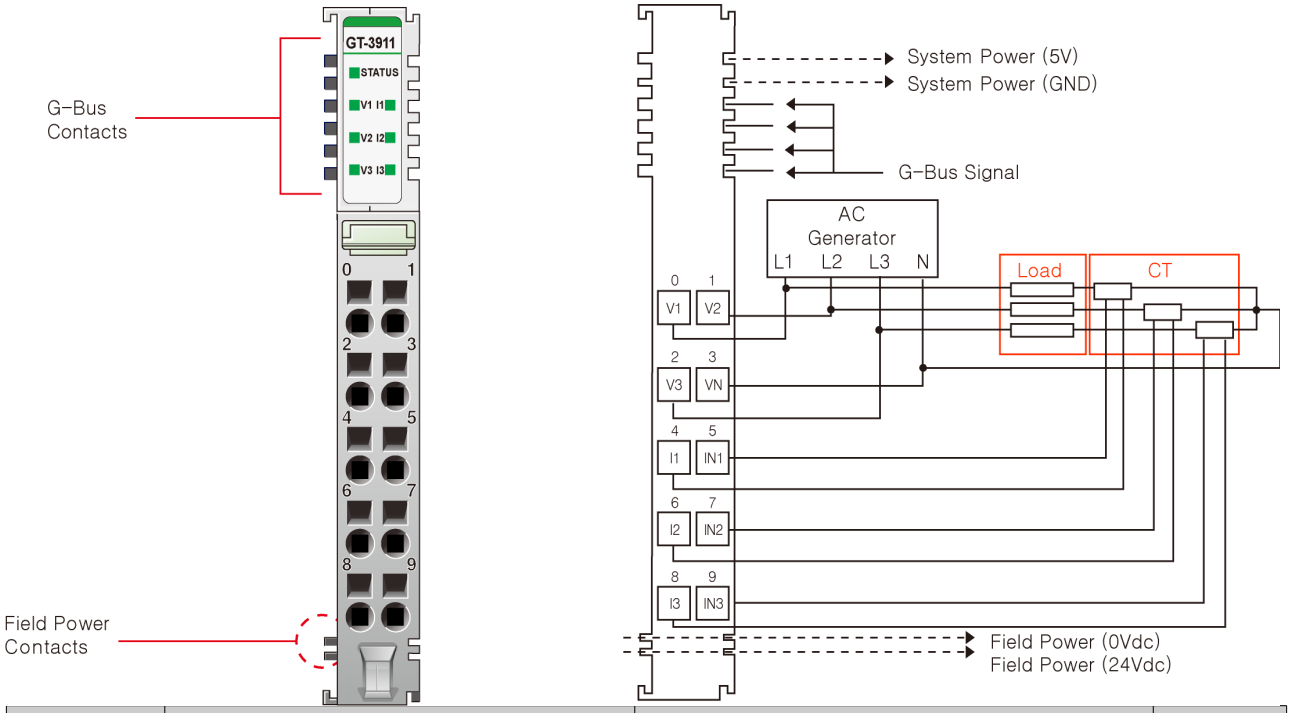
* The measuring accuracy is reduced, if the extended temperature range is used(-40°C ~ 60°C)

* If the input value is small, the error of calculation value can be large (Please input 10% or more of the whole range)

2.2. Update cycle of process data

Read Data	Update Time
	Max
Rms Voltage	300us
Max. Rms Voltage	300us
Min. Rms Voltage	300us
Rms Current	300us
Max. Rms Current	300us
Min. Rms Current	300us
Apparent Power	250us
Active Power	350us
Max. Active Power	350us
Min Active Power	350us
Reactive Power	2000us
Apparent Energy	100ms
Total Apparent Energy	100ms
Active Energy	100ms
Total Active Energy	100ms
Reactive Energy	100ms
Total Reactive Energy	100ms
cos phi	200us
Supply Network Frequency	200us
Max. Supply Network Frequency	200us
Min. Supply Network Frequency	200us
Phase Angle phi	300us

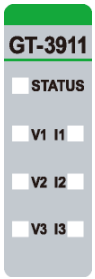
2.3. GT-3911 Wiring Diagram



Pin No.	Signal Description	Signal Description	Pin No.
0	Voltage Input 0 (L1)	Voltage Input 1 (L2)	1
2	Voltage Input 2 (L3)	Voltage Input Common(Neutral)	3
4	Current Input L1	Current Input N1	5
6	Current Input L2	Current Input N2	7
8	Current Input L3	Current Input N3	9

2.4. GT-3911 LED Indicator

2.4.1. LED Indicator



LED No.	LED Function / Description	LED Color
0	Status	Green
1	Voltage Input Channel 1	Green
2	Current Input Channel 1	Green
3	Voltage Input Channel 2	Green
4	Current Input Channel 2	Green
5	Voltage Input Channel 3	Green
6	Current Input Channel 3	Green

2.4.2. Channel Status LED

Status	LED	To indicate
Over Voltage	Voltage Input LED : Off	Error Occurred
	Voltage Input LED : Green	Nomal Operation
Under Voltage	Voltage Input LED : Off	Error Occurred
	Voltage Input LED : Green	Nomal Operation
Over Current	Current Input LED : Off	Error Occurred
	Current Input LED : Green	Nomal Operation
No Signal	Voltage Input LED : Off Current Input LED : Off	Error Occurred
	Voltage Input LED : Green Current Input LED : Green	Nomal Operation
G-Bus Status	Status LED : Off	Disconnection
	Status LED : Green	Connection

* Please refer to Input Image Data.(Error Byte)

2.5. Mapping Data into the Image Table

byte	Output data	Input data
0	Control byte 0	Status byte 0
1	Control byte 1	Status byte 1
2	Control byte 2	Status byte 2
3	Control byte 3	Status byte 3
4	Not used	Error Byte 0
5		Error Byte 1
6		Error Byte 2
7		Reserved
8		Process value1
9		
10		
11		
12		Process value2
13		
14		
15		
16		Process value3
17		
18		
19		
20		Process value4
21		
22		
23		

- **Input Image Value**

Status byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RES	Measure Select			CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angle 5 =Frequency 6 =Energy 7 =reserved						
RES	Resetting all of the min/max/energy values						
CON_ID	CON_ID						
Status byte 1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved	Measure Select			CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angle 5 =Frequency 6 =Energy 7 =reserved						
CON_ID	CON_ID						
Status byte 2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved	Measure Select			CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angle 5 =Frequency 6 =Energy 7 =reserved						
CON_ID	CON_ID						
Status byte 3							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved	Measure Select			CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angle 5 =Frequency 6 =Energy 7 =reserved						
CON_ID	CON_ID						

Error byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ERR_VL2	VL2_Error code			ERR_VL1	VL1_Error code		
ERR_VL1	Phase 1 Voltage Input ERROR 0 =OK 1 =Error occurred						
ERR_VL2	Phase 2 Voltage Input ERROR 0 =OK 1 =Error occurred						
Error byte 1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ERR_IL1	IL1_Error code			ERR_VL3	VL3_Error code		
ERR_VL3	Phase 3 Voltage Input ERROR 0 =OK 1 =Error occurred						
ERR_IL1	Phase 1 Current Input ERROR 0 =OK 1 =Error occurred						
Error byte 2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ERR_IL3	IL3_Error code			ERR_IL2	IL2_Error code		
ERR_IL2	Phase 2 Current Input ERROR 0 =OK 1 =Error occurred						
ERR_IL3	Phase 3 Current Input ERROR 0 =OK 1 =Error occurred						
Error code	0 =No Error 1 =Over Input 2 =Under Input 3 =No Connect						

Process value 0–0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[7 : 0]							
Proc0[7 : 0]	Process value 0 of Status Byte 0						
Process value 0–1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[15 : 8]							
Proc0[15 : 8]	Process value 0 of Status Byte 0						
Process value 0–2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[23 : 16]							
Proc0[23 : 16]	Process value 0 of Status Byte 0						
Process value 0–3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[31 : 24]							
Proc0[31 : 24]	Process value 0 of Status Byte 0						
Process value 1–0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[7 : 0]							
Proc1[7 : 0]	Process value 1 of Status Byte 1						
Process value 1–1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[15 : 8]							
Proc1[15 : 8]	Process value 1 of Status Byte 1						
Process value 1–2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[23 : 16]							
Proc1[23 : 16]	Process value 1 of Status Byte 1						
Process value 1–3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[31 : 24]							
Proc1[32 : 24]	Process value 1 of Status Byte 1						
Process value 2–0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[7 : 0]							
Proc2[7 : 0]	Process value 2 of Status Byte 2						
Process value 2–1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[15 : 8]							
Proc2[15 : 8]	Process value 2 of Status Byte 2						
Process value 2–2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[23 : 16]							
Proc2[23 : 16]	Process value 2 of Status Byte 2						
Process value 2–3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[31 : 24]							
Proc2[31 : 24]	Process value 2 of Status Byte 2						
Process value 3–0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[7 : 0]							
Proc3[7 : 0]	Process value 3 of Status Byte 3						
Process value 3–1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[15 : 8]							
Proc3[15 : 8]	Process value 3 of Status Byte 3						
Process value 3–2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[23 : 16]							
Proc3[23 : 16]	Process value 3 of Status Byte 3						
Process value 3–3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[31 : 24]							
Proc3[31 : 24]	Process value 3 of Status Byte 3						

- **Output Image Value**

Control byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RESET		Measure Select		CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angel 5 =Frequency 6 =Energy 7 =reserved						
RESET	Resetting all of the min/max/energy values						
CON_ID	CON_ID						
Control byte 1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved		Measure Select		CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angel 5 =Frequency 6 =Energy 7 =reserved						
CON_ID	CON_ID						
Control byte 2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved		Measure Select		CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angel 5 =Frequency 6 =Energy 7 =reserved						
CON_ID	CON_ID						
Control byte X3							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved		Measure Select		CON_ID			
Measure Select	0 =Voltage 1 =Current 2 =Power 3 =PF 4 =Phase Angel 5 =Frequency 6 =Energy 7 =reserved						
CON_ID	CON_ID						

CON_ID	Measured Value	Data Type	Scaling
Measure Select =Voltage			
00	RMS Voltage L1-N	uint32	0.01V
01	RMS Voltage L2-N	uint32	0.01V
02	RMS Voltage L3-N	uint32	0.01V
03	Max. RMS Voltage L1-N	uint32	0.01V
04	Max. RMS Voltage L2-N	uint32	0.01V
05	Max. RMS Voltage L3-N	uint32	0.01V
06	Min. RMS Voltage L1-N	uint32	0.01V
07	Min. RMS Voltage L2-N	uint32	0.01V
08	Min. RMS Voltage L3-N	uint32	0.01V
09			
0A			
0B			
0C	reserved		
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select =Current			
00	RMS Current L1-N	uint32	0.001A
01	RMS Current L2-N	uint32	0.001A
02	RMS Current L3-N	uint32	0.001A
03	Max. RMS Current L1-N	uint32	0.001A
04	Max. RMS Current L2-N	uint32	0.001A
05	Max. RMS Current L3-N	uint32	0.001A
06	Min. RMS Current L1-N	uint32	0.001A
07	Min. RMS Current L2-N	uint32	0.001A
08	Min. RMS Current L3-N	uint32	0.001A
09			
0A			
0B			
0C	reserved		
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select =Power			
00	Apparent power L1	uint32	0.01VA
01	Apparent power L2	uint32	0.01VA
02	Apparent power L3	uint32	0.01VA
03	Active power L1	int32	0.01W
04	Active power L2	int32	0.01W
05	Active power L3	int32	0.01W
06	Max. active power L1	int32	0.01W
07	Max. active power L2	int32	0.01W
08	Max. active power L3	int32	0.01W
09	Min. active power L1	int32	0.01W
0A	Min. active power L2	int32	0.01W
0B	Min. active power L3	int32	0.01W
0C	Reactive power L1	int32	0.01VAR
0D	Reactive power L2	int32	0.01VAR
0E	Reactive power L3	int32	0.01VAR

CON_ID	Measured Value	Data Type	Scaling
Measure Select =Energy			
00	Apparent energy L1	uint32	Set the Parameter
01	Apparent energy L2	uint32	
02	Apparent energy L3	uint32	
03	Total Apparent Energy	uint32	
04	Active energy L1	int32	
05	Active energy L2	int32	
06	Active energy L3	int32	
07	Total Active Energy	int32	
08	Reactive Energy L1	int32	
09	Reactive Energy L2	int32	
0A	Reactive Energy L3	int32	
0B	Total Reactive Energy	int32	
0C	reserved		
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select =Power Factor			
00	Power Factor L1	int32	0.01
01	Power Factor L2	int32	0.01
02	Podwr Factor L3	int32	0.01
03	reserved		
04			
05			
06			
07			
08			
09			
0A			
0B			
0C			
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select =Frequency			
00	Supply network frequency L1	uint32	0.01Hz
01	Supply network frequency L2	uint32	0.01Hz
02	Supply network frequency L3	uint32	0.01Hz
03	Max. Supply network frequency L1	uint32	0.01Hz
04	Max. Supply network frequency L2	uint32	0.01Hz
05	Max. Supply network frequency L3	uint32	0.01Hz
06	Min. Supply network frequency L1	uint32	0.01Hz
07	Min. Supply network frequency L2	uint32	0.01Hz
08	Min. Supply network frequency L3	uint32	0.01Hz
09	reserved		
0A			
0B			
0C			
0D			
0E			

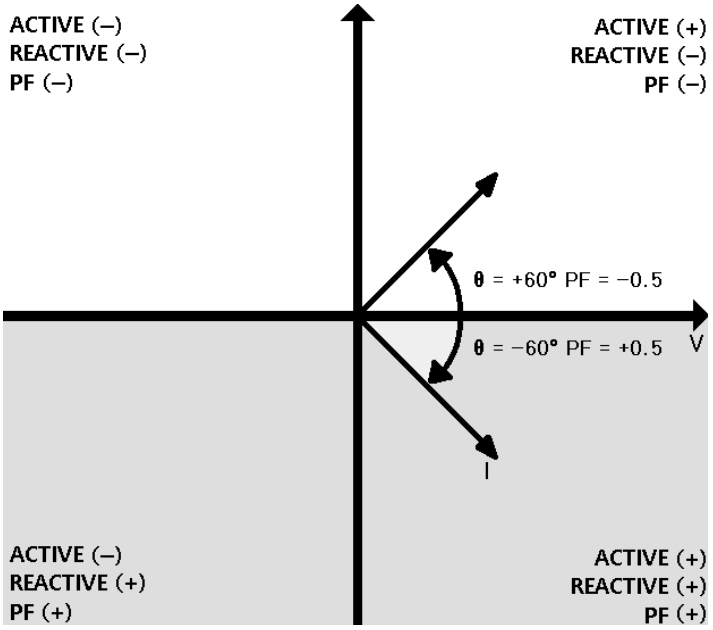
CON_ID	Measured Value	Data Type	Scaling
Measure Select =Phase angle			
00	Phase angle phi L1	uint32	0.01 °
01	Phase angle phi L2	uint32	0.01 °
02	Phase angle phi L3	uint32	0.01 °
03	reserved		
04			
05			
06			
07			
08			
09			
0A			
0B			
0C			
0D			
0E			
0F			

2.6. Parameter Data

- **Valid Parameter length : 5 Bytes**
- **Parameter Data**

Byte#0	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
	CT sensor 1 : x							
	Value for the current transformer ratio divisor							
Byte#1	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
	Frequency	Scaling for energy values			CT sensor 1 : x			
	0 =45~55Hz	0 =1m Wh/VARh/VAh			Value for the current transformer ratio divisor			
	1 =55~65hz	1 =0.01 Wh/VARh/VAh						
		2 =0.1 Wh/VARh/VAh						
		3 =1 Wh/VARh/VAh						
		4 =0.01k Wh/VARh/VAh						
		5 =0.1k Wh/VARh/VAh						
		6 =1k Wh/VARh/VAh						
		7 =reserved						
Byte#2	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
	Overvoltage threshold Lx (value) Resolution 0.2V							
	Overvoltage threshold =250V+value*0.2V. (MAX 300V)							
Byte#3	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
	Undervoltage threshold Lx (value) Resolution 0.5V							
	Undervoltage threshold =0V+value*0.5V. (MAX 125V)							
Byte#4	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
	Overcurrent threshold Lx (value) Resolution 2mA							
	Overcurrent threshold =0.8A+value*0.002A. (MAX 1.3A)							

* Set Frequency to get the correct Power Factor & Energy.



*the reactive power measurement is negative when the load is capacitive, and when the load is inductive. The sign of the reactive power can therefore be used to reflect the sign of the power factor.

Power Factor = (Sign Fundamental Reactive Power) * (abs(Active Power)/Apparent Power)

- **Example of Setting**

  - Read data : Phase1 Rms Voltage/Rms Current/Apparent power/Active power.

  - Input Value : 220V, 1000A, PF 0.5

  - Parameter : CT 1 : 1000, Input Frequency 55~65Hz, Overvoltage threshold 260V, Other is Default(0).

  - Overvoltage Threshold = (260V(User Setting Value) – 250V(default Setting Value))/0.2V. Resolution : 0.2V

  - ex) OverCurrent Threshold = 1000A (User Setting CT 1 : 1000) = ((1A(User Setting Value)-0.8(default Setting Value))/0.001)*1000(CT). Resolution : 0.001A

  * All of default value is 0

-Step#1

-Set the Parameter

Parameter	Value
CT sensor 1 : x (12 bit)	001111101000 (bit) Set CT 1000
Scaling for energy values (3 bit)	000 (bit) Set 1m Wh/VARh/VAh
Frequency (1 bit)	1 (bit) Set 55~65Hz
Overvoltage Threshold Lx (8 bit)	00110010 (bit) Set 260V
Undervoltage Threshold Lx (8 bit)	00000000 (bit) Set 0V(default)
Overcurrent Threshold Lx(8 bit)	00000000 (bit) Set 0.8A(default)
All of Parameter	E8 83 32 00 00 (Byte hex)

-Step#2

-Set the Control Byte (See Output Image Value)

	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
Control Byte #0	RES	Measure Select (Voltage)			CON_ID (Rms Voltage L1-N)			
	0	0	0	0	0	0	0	0
Control Byte #1	reserved	Measure Select (Current)			CON_ID (Rms Current L1-N)			
	0	0	0	1	0	0	0	0
Control Byte #2	reserved	Measure Select (Power)			CON_ID (Apparent Power L1)			
	0	0	0	2	0	0	0	0
Control Byte #3	reserved	Measure Select (Power)			CON_ID (Active Power L1)			
	0	0	0	2	0	0	1	1

-Step#3

-Check the Status Byte, When Status Byte and Control Byte are same, the Process value is updated.

	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
Status Byte #0	RES	Measure Select (Voltage)			CON_ID (Rms Voltage L1-N)			
	0	0	0	0	0	0	0	0
Status Byte #0	reserved	Measure Select (Current)			CON_ID (Rms Current L1-N)			
	0	0	0	1	0	0	0	0
Status Byte #0	reserved	Measure Select (Power)			CON_ID (Apparent Power L1)			
	0	0	0	2	0	0	0	0
Status Byte #0	reserved	Measure Select (Power)			CON_ID (Active Power L1)			
	0	0	0	2	0	0	1	1

-Step#4

-Check the Process value

Process value#0(Rms Voltage)	000055F0(Dword hex) 22000(Dec) 220V
Process value#1(Rms Current)	000F4240(Dword hex) 1000000(Dec) 1000A
Process value#2(Apparent power)	014FB180(Dword hex) 22000000(Dec) 220kVA
Process value#3(Active power)	00A7D8C0(Dword hex) 11000000(Dec) 110kW