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# Digital Power Measuring Device GIMAC1000

GIMAC Series

User's Manual



## Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

**LS**ELECTRIC



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# Contents

## Notice

## Symbol

< Table 1 Symbols >

| Number | Symbol                                                                            | Reference                   | Description                                                                  |
|--------|-----------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------|
| 1      |  | IEC 60417-5172<br>(2003-02) | Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION |
| 2      |  | ISO 7000-0434B<br>(2004-01) | Caution                                                                      |

## Safety precaution

The attention subject for the safety.



Warning

- **Please do not operate, inspect, and install by yourself.**
- **Please do not wiring operation when it is applied with power or on the operation ; it may result in electric shock.**
- **Please do not all the wiring operation with the live bus bar ; it may result in electric shock or fire and property damage by charging voltage of current transformer**
- **Please put to earth ; it may result in electric shock**
- **Please do not attempt to disassemble even when the power not applied ; it may result in electric shock by charging current remained in the product**
- **Please do not short-circuit the secondary part of PT ; it may result in fire.**
- **Please do not disconnection the secondary part of CT ; it may result in fire or explosives.**
- **Please do not wire or operate with wet hands ; it may result in electric shock.**
- **Please do not use any damaged cable ; it may result in electric shock**
- **Please use the ring terminal when wiring the cable ; it may result in electric shock by bare wire**
- **Please work after wearing safety gear.**
- **Please work after installing the safety caution sign.**
- **Please perform the withstanding voltage test or the insulation resistance test of the switchboard installed with products after disconnecting all wires.**

## Safety precaution

The attention subject for the safety.



Caution

- **Safety caution for installation & terminal wiring**
  - **Apply the rated voltage to the power supply terminal** ; it may result in property damage or fire
  - **Please keep away product from screws, metals, water, or oil** ; it may result in fire
  - **Please keep the rated load and polarity for input & output contacts** ; it may result in property damage or fire
  - **Please wire to the terminal block after checking the terminal number** ; it may result in property damage or fire.
  - **Please assemble terminal cover after wiring the terminal.**
  - **Specialist help shall be sought for the installation and maintenance of product** ; it may result in malfunction or accident
- **Inspection item before power supply being applied**
  - **Check the voltage or polarity of control power supply.**
  - **Check the wiring condition of input / output terminal.**
- **Caution for storage & handling**
  - **Please store dry & clean place.**
  - **Please do not throw or put force on it during transport** ; it may result in malfunction or wrong operation.
  - **Please do not load over 10 stories .**
- **Caution for disposal**
  - **Please dispose of it in accordance with industrial waste regulation.**

< PIC 1 The configuration of terminal & wiring connection >



# 1 . The information of installation

- 1) Please cut in accordance with DIN 96 or AINSI 4 to the installation position.  
Please refer to "External Dimensions & Cut-out" for the detail.
- 2) Please connect the power supply line  
Please do not close the power supply before finishing the PT/CT Wiring connection . The rating of power supply is in the range of AC/DC100 ~ 240V $\pm$ 10%
- 3) Please connect the corresponding wires to voltage & current input terminal side. Please refer to "Wiring connection" for the detail
- 4) Please connect the communication cable if the product has the function of communication. Please refer to "The wiring connection of communication cable" for the detail .
- 5) Apply the power supply after closing the Fuse of voltage input Terminal side and opening CT SHORTING BLOCK
- 6) Please do the device setting  
Please refer to "Setting method" for the detail
- 7) Please install GIMAC1000 indoors.  
If it is installed it outdoors, Please install it in the enclosure.
- 8) Please Use a circuit breaker of 10A capacity or more when you connecting control power.

## < Simple setting method >

- Move to "Setting Menu" if pressing [UP], [DOWN] KEY at the Same time.
- The initial window of setting window displays the wiring connection as "Conn".
- Press [UP],[DOWN] KEY to move between setting items.
- If pressing [ENTER] KEY at setting item, it will be blinking to indicate its possible setting change.
- After changing the setting by [UP], [DOWN] KEY, press [ENTER] KEY to store it.
- If pressing [UP], [DOWN] KEY at the same time after finishing all setting, it turns back to the measurement window.



## 2. The characteristic of GIMAC1000

GIMAC1000 is the digital integrated equipment for measuring/displays the various electricity quantities ( Three-phase voltage/current, electric power, electric energy, PF, frequency, Demand current, MAX ).

It is device used for switchboard and available for 1 P 2W, 1 P 3W, 3P 3W Delta, 3P 3W Y, 3P 4W connection

GIMAC1000 is convenient to use for customer with following characteristics

◆ The high measuring accuracy

It guarantees the high reliability by keeping the accuracy even in which the frequency is variable, 0.3 % ( Real Scale ) for voltage at the rated voltage of 10V~452V, 0.3% ( Full Scale ) for current at the current of 0.05~6A (CT 5A), 0.01~1.2A (CT 1A) and 0.5 Class in accordance with IEC1 036 for electric power and energy

◆ The wide range of PT input voltage (AC380V) It is and easy to install as the voltage of AC 10~380V + 120% (AC1 O ~ 452V) can be input directly without extra primary PT

◆ The various measurements It has 3 windows which measure/display the measuring values, 13 measuring values for Non-Extensible Type (NO TYPE) and 40 measuring values for Extensible Type (EX TYPE)

## 2. The characteristic of GIMAC1000

### ◆ Compact size of external dimension & Cutting Size of Panel

The external dimension is 110(W) x 110(H) x 84.6(0) mm and Cutting Size of Panel is designed to comply with DIN 96 and AINSI 4.

### ◆ RS485/ETHERNET MODBUS

It provides MODBUS RTU protocol on RS 485 and MODBUS TCP/IP protocol on ETHERNET

### ◆ Free voltage of control power

It is available for the various control power environment with the range of AC/DC 100-240V $\pm$ 10%.

### ◆ The check of wrong connection

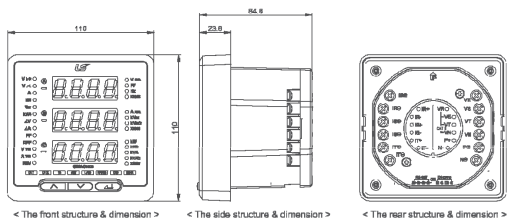
The wrong connection of PT can be prevented by displaying it to user after judging the faults based on the phase rotating direction of voltage. ( Only of 3P4W & 3P 3WY Connection )

### ◆ Automatic Scroll

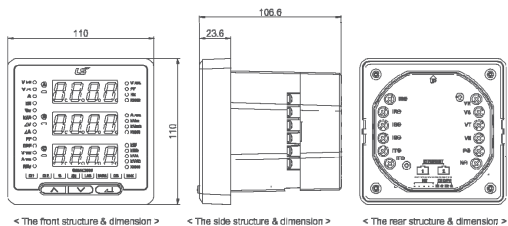
If pressing [DOWN] KEY(  ) & [ENTER] KEY(  ) at the same time, Measuring elements are automatically scrolled every 10 secs.

### 3. The structure of product

#### ► NOCOMM/M485 TYPE



#### ► ETHERNET TYPE



< PIC 3 The external structure >

## 4. The Rating & Specification

### 4.1 The standard using condition

This product shall be used under standard using condition except the extra condition specified

1) Temperature

- Operating temperature range :  $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$
- Storage temperature range :  $-25^{\circ}\text{C} \sim 70^{\circ}\text{C}$

2) Humidity : Less than 80% ( But, shall not reach the dew point )

3) Using condition

- Altitude : Less than 2,000m
- Measurement Category : CATIII
- Pollution Degree 2, Installation Category II
- Shall be no abnormal vibration or impulse

### 4.2 Input rating

< Table 1 Input rating >

| Type                | Applicable range                           | Remark                                              |
|---------------------|--------------------------------------------|-----------------------------------------------------|
| Wiring connection   | 1P2w, 1P3W, 3P3W(Y),<br>3P3W(Delta), 3P4W  |                                                     |
| The rated frequency | 60 Hz or 50 Hz                             | Separate use of 50Hz,<br>60Hz                       |
| Measuring voltage   | 10~452V                                    | The voltage applied<br>between VR, VS, VT<br>and FG |
| Measuring current   | 0.05~6A(5A), 0.01~1.2A(1A)                 |                                                     |
| CT rated current    | 5A or 1A                                   |                                                     |
| PT Input burden     | Less than 0.1 VA                           |                                                     |
| CT Input burden     | Less than 0.5 VA                           |                                                     |
| Control power       | AC/DC 100~240V $\pm$ 10%<br>(Free Voltage) |                                                     |
| Power consumption   | Less than 4.5 W                            |                                                     |

## 4. The Rating & Specification

### 4.3 Noise rating

This product shall comply with the noise rating table given below.

< Table 2 Noise rating >

| Item                                 | Condition                                  | Applicable standard               |
|--------------------------------------|--------------------------------------------|-----------------------------------|
| Insulation resistance                | 500 V, Over 10MΩ                           | IEC60255 – 5                      |
| Power Frequency withstand voltage    | AC 2 kV (1.5 kV)                           | IEC60255 – 5                      |
| Lighting impulse withstand voltage   | 5 kV(3 kV)                                 | IEC60255 – 22<br>IEC61000 – 4     |
| Vibrating surge voltage              | 2,5 ~ 3 kV                                 | IEC60255 – 22<br>EN61000 – 4      |
| Surge Immunity                       | Control power,<br>Transformer : 6kV 5times | IEC60255 – 22<br>EN61000 – 4 – 5  |
| Fast Transient Burst                 | Control power,<br>Transformer : 4kV 1min   | IEC60255 – 22<br>EN61000 – 4 – 4  |
| Impulse Noise Immunity               | Control power,<br>Transformer : 3kV 1min   | -                                 |
| Static electricity ESD               | Air : 8kV, Contact : 6kV                   | IEC60255 – 22<br>IEC61000 – 4 – 2 |
| Radio frequency Radioactive immunity | 10 V/M                                     | IEC60255 – 22                     |
| Radio frequency conductivity         | 10 V                                       | IEC60255 – 22                     |
| Electromagnetic wave conduction      | 0.15 ~ 0.5 MHz                             | IEC60255 – 22                     |

## 4. The Rating & Specification

### 4.4 Measurement item & Accuracy rate

< Table 3 The measurement item & Accuracy rate >

| Type              | Measuring element                    | Measuring element<br>In detail                      | NO<br>Type | EX<br>Type | Accuracy<br>(%) | Remark      |
|-------------------|--------------------------------------|-----------------------------------------------------|------------|------------|-----------------|-------------|
| Voltage           | Average voltage                      | Vavg                                                | O          | O          | 0.30%           |             |
|                   | Line voltage                         | Vab, Vbc, Vca                                       | O          | O          | 0.30%           |             |
|                   | Phase voltage                        | Va, Vb, Vc                                          | O          | O          | 0.30%           |             |
| Current           | Average current                      | Iavg                                                | O          | O          | 0.30%           | F/S         |
|                   | Line current                         | Ia, Ib, Ic                                          | O          | O          | 0.30%           | F/S         |
|                   | Load factor                          | Load factor Ia, Ib, Ic                              | O          | O          | -               |             |
| Phase             | Line-to-line<br>voltage              | $\angle VabVbc$ ,<br>$\angle VabVca$                | X          | O          | 0.5°            | 3P3W        |
|                   | Between line-to<br>-current          | $\angle VabIa$ , $\angle VabIb$ ,<br>$\angle VabIc$ | X          | O          | 0.5°            | 3P3W        |
|                   | Between phase<br>voltage             | $\angle VaVb$ , $\angle VaVc$                       | X          | O          | 0.5°            | 3P4W        |
|                   | Between phase<br>voltage and current | $\angle Vala$ , $\angle VbIb$<br>$\angle VcIc$      | X          | O          | 0.5°            | 3P4W        |
| Electric<br>Power | Total active<br>power (reverse)      | P                                                   | O          | O          | 0.50%           | IEC<br>1036 |
|                   | Active<br>power(reverse)             | Pa, Pb, Pc                                          | X          | O          | 0.50%           | IEC<br>1036 |
|                   | Total reactive<br>power(reverse)     | Q                                                   | O          | O          | 0.50%           | IEC<br>1036 |
|                   | Reactive<br>power(reverse)           | Qa, Qb, Qc                                          | X          | O          | 0.50%           | IEC<br>1036 |
|                   | Total apparent<br>power              | S                                                   | O          | O          | 0.50%           | IEC<br>1036 |
|                   | Apparent power                       | Sa, Sb, Sc                                          | X          | O          | 0.50%           | IEC<br>1036 |

## 4. The Rating & Specification

### 4.4 Measurement item & Accuracy rate

|                 |                                  |                                                              |   |   |                       |                 |
|-----------------|----------------------------------|--------------------------------------------------------------|---|---|-----------------------|-----------------|
| Electric Energy | Active electric energy           | WH                                                           | O | O | 0.50%                 | IEC 1036        |
|                 | Reactive electric energy         | VARH                                                         | O | O | 0.50%                 | IEC 1036        |
|                 | Reverse active electric energy   | rWH                                                          | X | O | 0.50%                 | IEC 1036        |
|                 | Reverse reactive electric energy | rVARH                                                        | X | O | 0.50%                 | IEC 1036        |
|                 | Apparent electric energy         | VAH                                                          | O | O | 0.50%                 | IEC 1036        |
| Freq            | Frequency                        | Frequency (Hz)                                               | O | O | 0.05Hz                |                 |
| Power Factor    | Total PF                         | PF                                                           | O | O | Following phase error | +:Lag<br>-:Lead |
|                 | PF                               | Pfa, PFb, PFc                                                | X | O | Following phase error |                 |
|                 | Fundamental PF (DFP)             | DPFa, DPFb, DPFc                                             | X | O | Following phase error |                 |
| THD             | Voltage THD                      | THD of Va(ab), Vb(bc), Vc(ca)                                | X | O | -                     | -               |
|                 | Current THD                      | THD of Ia, Ib, Ic                                            | X | O | -                     | -               |
| TDD             | Current TDD                      | TDD of Ia, Ib, Ic                                            | X | O | -                     | -               |
| Harmonics       | Voltage harmonics                | 1 <sup>st</sup> ~ 31 <sup>st</sup> of Va(ab), Vb(bc), Vc(ca) | X | O | -                     | -               |
|                 | Current harmonics                | 1 <sup>st</sup> ~ 31 <sup>st</sup> Harmonics of Ia, Ib, Ic   | X | O | -                     | -               |
| Demand          | Active electric power            | Demand W                                                     | X | O | -                     | -               |
|                 | Demand current                   | Demand Ia, Ib, Ic, Iavg                                      | X | O | -                     | -               |
| MAX             | Current                          | max Ia, max Ib, max Ic, max Iavg                             | X | O | -                     | -               |

## 5. Wiring connection

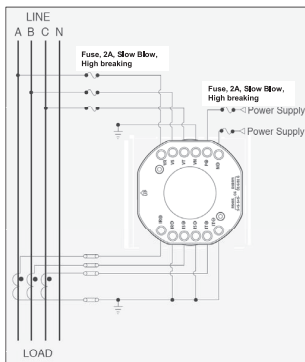
### 5.1 The wiring connection of PT/CT



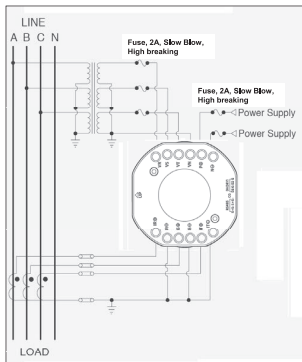
- The secondary part of PT/CT & VN terminal shall be grounded.
- Cable of adequate size is from AWG14 to AWG12 (2.1~3.3mm<sup>2</sup>).
- The tightening torque of terminal is less than 10kg-cm.

#### 1) 3P4W Connection

- The possible voltage range which can be set directly without PT is 10~380V(+120%) based on the phase voltage
- The setting value of wiring connection is "5" for 3P4W.



< PIC 4 3P 4W direct connection >



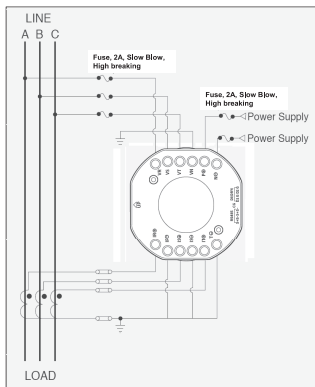
< PIC 5 3P 4W connection with 3PT >

## 5. Wiring connection

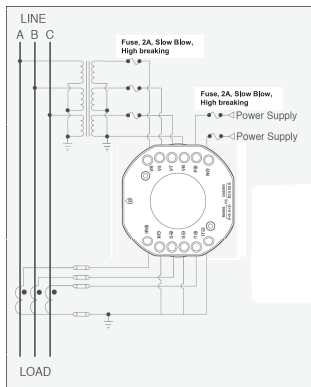
### 5.1 The wiring connection of PT/CT

#### 2) 3P3W - Y Connection

- The possible voltage range which can be set directly without PT is 17.3~658.2V based on the phase voltage
- The setting value of wiring connection is "4" for 3P3W Y.



< PIC6 3P3W direct connection >



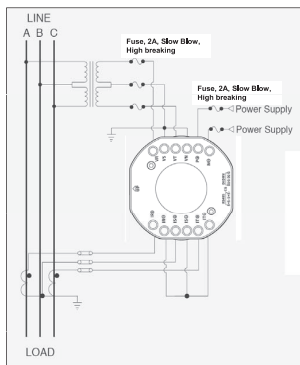
< PIC7 3P3W connection with 3PT >

## 5. Wiring connection

### 5.1 The wiring connection of PT/CT

#### 3) 3P3W - Open Delta Connection

- The setting value of wiring connection is "3" for 3P3W Delta.



< PIC8 3P3W delta connection with 2PT, 2CT >

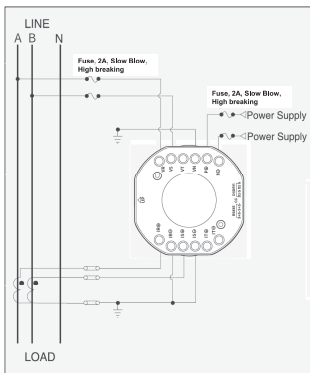
- The voltage of  $V_{ca}$  is calculated by the combination of  $V_{ab}$  and  $V_{cb}$  in case of using 2PT. Thus, there will be a voltage error of  $V_{ca}$  will unbalanced voltage.
- The S phase current is calculated by the combination of A and C phase current in case of using 2CT. Thus, there will be a current error in B phase current with the unbalanced load.
- There will be error in electric power with unbalanced load. Thus, please use with balanced load.

## 5. Wiring connection

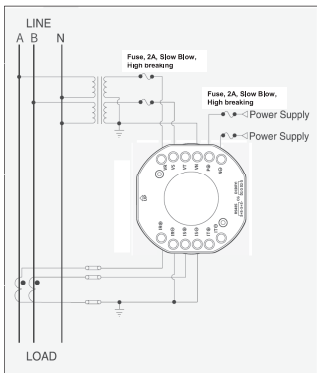
### 5.1 The wiring connection of PT/CT

#### 4) 1P3W Connection

- The possible voltage range which can be set directly without PT 10~380V(+120%) based on the phase voltage
- The setting value of wiring connection is "2" for 1P3W



< PIG9 1P3W direct connection >



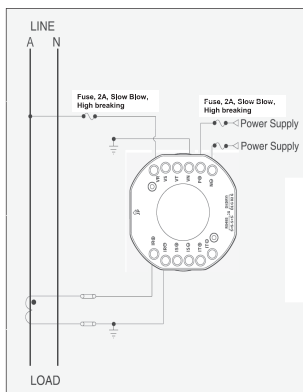
< PIG10 1P3W connection with PT >

## 5. Wiring connection

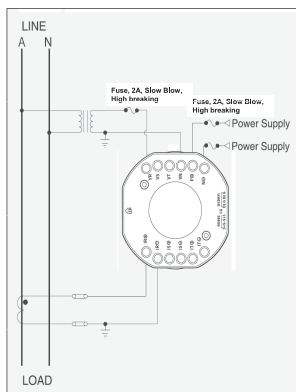
### 5.1 The wiring connection of PT/CT

#### 5) 1P2W Connection

- The possible voltage range which can be set directly without PT is 10-380V(+120%) based on the phase voltage.
- The setting value of wiring connection is "1" for 1P2W.



< PIG11 1P2W direct connection >

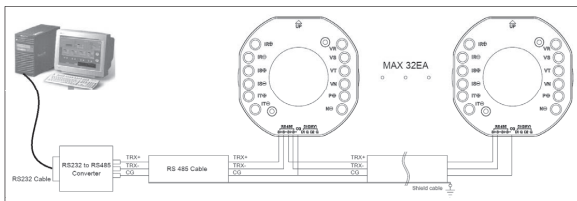


< PIG12 1P2W connection with PT >

## 5. Wiring connection

### 5.2 Communication Wiring Connection

- 1) The spec of communication cable : AWG22, Twisted Shield Pair Cable
- 2) RS- 485 Communication Wiring Connection



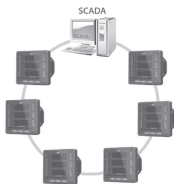
< PIG13 RS-485 Communication Wiring Connection >

- The shield of communication cable shall be connected and be grounded.
- The maximum unit which can be connected is 32 units.
- The maximum communication distance is 1.2km.
- The COMM LED is turned on when corresponding with the signal.
- If necessary, set the RS485 Termination Switch (in-product setting menu) 'ON' for the end-of-communication product.  
When set to ON, it is the same as 130 ohms of resistance installed between the communication terminals (TRX+, TRX-).
- Be sure to ground the VN terminals of the product.  
\*If the VN terminal is not grounded, the internal communication driver of the product may be damaged, causing a communication failure.
- CG terminals must be connected between products and do not connect CG terminals to FG terminals.  
\*When the CG terminal is connected to the FG terminal, it can cause a defect in a product.
- When connecting CG terminals between products, we recommend using AWG 22, Triple Shield Cable.

## 5. Wiring connection

### 5.2 Communication Wiring Connection

#### 3) Ethernet Communication Wiring Connection

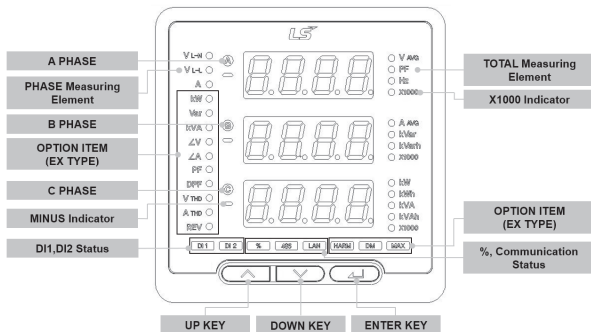


〈PIG14 Ring type network configuration〉

- Port specification : RJ-45, 2port
- Communication Speed : 10/100 Mbps
- Network Topology : Ring, Star, Daisy-chain
- Maximum transmission distance : 100 m (between HUB and Terminal)
- Transmission medium : UTP (CAT.3, CAT.5)
- The GIMAC1000 ETH (Ethernet) model supports Rapid Spanning Tree Protocol (RSTP) redundancy.
  - \*After the communication line disconnected due to a failure, the RSTP switches communication line rapidly to another communication line in a normal state.
- Within 10 seconds of cutting time in single ring network configuration
  - \*Performance satisfied only when using RSTP Hub
  - \*Performance cannot be guaranteed when using a generic hub.
  - \*Maximum number of connected products : 32
- Single Ring, Star, Daisy-chain network configuration with a generic hub.
  - \*Do not configure with multiple ring networks.
- Use a dedicated network.
  - \*Communication performance may not be satisfied when mixed with other networks (company local network).
- When configuring the ring network using the RSTP function, if there is a Broadcast packet that continuously flows in at intervals of less than 10 ms, packet looping may occur and cause communication failure.

## 6. Operation & Setting

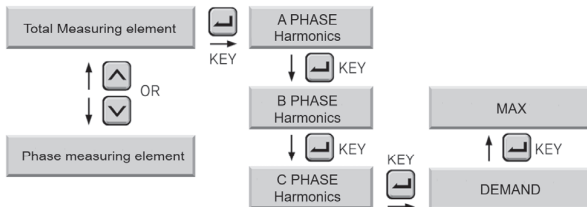
### 6.1 Measuring DISPLAY MODE & Operation



< FIG15 The configuration of display >

Total measuring element, Phase measuring element, harmonics, Demand, MAX are checked from Measuring DISPLAY MODE.

The order of measuring display mode is as follows



## 6. Operation & Setting

### 6.1 Measuring DISPLAY MODE & Operation

#### 1) The indication of X1000

X1000 LED indicates that displayed value shall be multiplied by 1,000(ON) or 1,000,000(Blinking) to know the real value, When X1000 LED is ON, the real value shall be multiplied by 1,000. When X1000 LED is blinking, the real value shall be multiplied by 1,000,000. Refer to the following example.

| Display value | X1000LED | Real value       |
|---------------|----------|------------------|
| 110.0         | ON       | 110 X 1,000      |
| 5.000         | OFF      | 5,000            |
| 220.4         | Blinking | 220.4 X1,000,000 |

< PIC16 X1000 LED >

#### 2) The indication of X1000

< Table4 Total measuring element >

|                                                                                                            |                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>○ <b>V AVG</b></li> <li>○ <b>PF</b></li> <li>○ <b>Hz</b></li> </ul> | <ul style="list-style-type: none"> <li>● V<sub>AVG</sub> is for average voltage which indicates the average of phase voltages in case of 3P4W and 1P3W and that of line voltages in case of 3P3W. The marking unit is V.</li> <li>● PF display Total PF. The value is in the range of -1.0 ~ 1.0.</li> <li>● Hz indicates the frequency.</li> </ul> |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 6. Operation & Setting

### 6.1 Measuring DISPLAY MODE & Operation

|                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>○ <b>A AVG</b></li> <li>○ <b>kVar</b></li> <li>○ <b>kVarh</b></li> </ul>                  | <ul style="list-style-type: none"> <li>● <b>A<sub>AVG</sub></b> is the average current and it indicates the average value of three currents incase of 3P3W/3P4W and that of two currents in case of 1P3W. The marking unit is A.</li> <li>● <b>kVar</b> is Total reactive power and it indicates the reactive power with "+" and reverse reactive power with "-". The marking unit is kVar.</li> <li>● <b>kVarh</b> is reactive energy and accumulated to the maximum of 1,000,000,000,000 Varh. If it is over the maximum value, it is accumulated from 0Varh again. The marking unit is kVarh.</li> </ul>                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>○ <b>kW</b></li> <li>○ <b>kWh</b></li> <li>○ <b>kVA</b></li> <li>○ <b>kVAh</b></li> </ul> | <ul style="list-style-type: none"> <li>● <b>kW</b> is the Total active power and it indicates the active power with "+" and reverse active power with "-". The marking unit is kW.</li> <li>● <b>kWh</b> is the active energy and accumulated to the maximum of 1,000,000,000,000 Wh. If it is over the maximum value, it is accumulated from 0Wh again. The marking unit is kWh.</li> <li>● <b>kVA</b> is apparent power and marking unit is kVA.</li> <li>● <b>kVAh</b> is apparent energy and accumulated to the maximum of 1,000,000,000,000 Vah. If it is over the maximum value, if is accumulated from 0VAh again. The marking unit is kVAh.</li> <li>● When reading Electric Energy communication, read values less than giga unit and values more than giga unit separately.</li> </ul> |

## 6. Operation & Setting

### 6.1 Measuring DISPLAY MODE & Operation

#### 3) The indication of phase measuring element

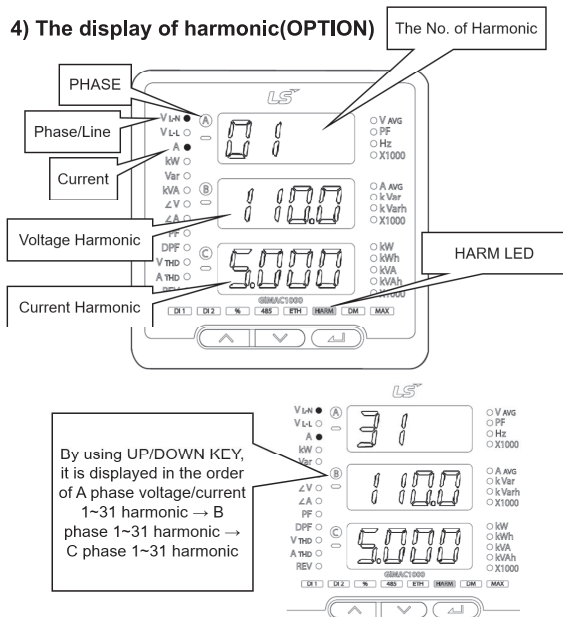
< Table5 The display of phase measuring element >

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VL-N ○ (A) | <ul style="list-style-type: none"> <li>● VL-N is for phase voltage, and the marking unit is V.</li> <li>● VL-L is for line voltage, and the marking unit is V.</li> <li>● A is for current, and the marking unit is A.</li> <li>● A and % LED is for load rate, the marking unit is %.</li> </ul> <p>The load ate is the current which is in the proportion of the rated current(5A or 1A)</p>                                                       |
| VL-L ○     |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| A ○        |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| kW ○       | <p>— The following below is for EX TYPE —</p> <ul style="list-style-type: none"> <li>● kW is for active power for each phase, It is active power with "+" and reverse active power with "-".</li> </ul> <p>The marking unit is kW.</p>                                                                                                                                                                                                               |
| Var ○      | <ul style="list-style-type: none"> <li>● kVar is reactive power for each phase. It is reactive power with "+" and reverse reactive power with "-".</li> </ul> <p>The marking unit is kVar.</p>                                                                                                                                                                                                                                                       |
| kVA ○ (B)  | <ul style="list-style-type: none"> <li>● kVA is apparent power for each phase, and the marking unit is kVA.</li> </ul>                                                                                                                                                                                                                                                                                                                               |
| ∠V ○       | <ul style="list-style-type: none"> <li>● ∠V is the phase for voltage-to-voltage. In case of 3P4W, b and c phase voltage are indicated with the standard of a phase. In case of 3P3W, bc and ca phase voltage are indicated with the standard of ab phase line voltage.</li> </ul>                                                                                                                                                                    |
| ∠A ○       | <ul style="list-style-type: none"> <li>● ∠A is for current phase. In case of 3P4W, each phase current are indicated to the standard of a phase. In case of 3P3W, each phase current is indicated with the standard of ab phase line voltage.</li> </ul>                                                                                                                                                                                              |
| PF ○ (C)   | <ul style="list-style-type: none"> <li>● PF is for power factor for each phase, and it is in the range of -1.0 ~ 1.0 "-" is for lead.</li> </ul>                                                                                                                                                                                                                                                                                                     |
| VTHD ○     | <ul style="list-style-type: none"> <li>● DPF is for fundamental power factor for each phase and it is in the range of -1.0 ~ 1.0. "-" is for lead.</li> </ul>                                                                                                                                                                                                                                                                                        |
| ATHD ○     | <ul style="list-style-type: none"> <li>● VTHD is for voltage total harmonic distortion, and the unit is %. It is displayed as % LED. THD of phase voltage is for 3P4W and that of line voltage for 3P3W.</li> </ul>                                                                                                                                                                                                                                  |
| REV ○      | <ul style="list-style-type: none"> <li>● ATHD is for current total harmonic distortion, and the unit is %. It is displayed as % LED.</li> <li>● ATHD (LED Blink) is for current total demand distortion, and the unit is %. It is displayed as % LED.</li> <li>● REV LED and kVarh LED is for total reverse reactive energy and the unit is kVarh.</li> <li>● REV LED and kWh LED is for total reverse active energy and the unit is kWh.</li> </ul> |

## 6. Operation & Setting

### 6.1 Measuring DISPLAY MODE & Operation

#### 4) The display of harmonic(OPTION)



< PIC17 The display of Harmonics >

It goes to the Harmonic display mode in case of EX TYPE, if pressing [ENTER] KEY from TOTAL of PHASE measuring display. Harmonic is

## 6. Operation & Setting

### 6.1 Measuring DISPLAY MODE & Operation

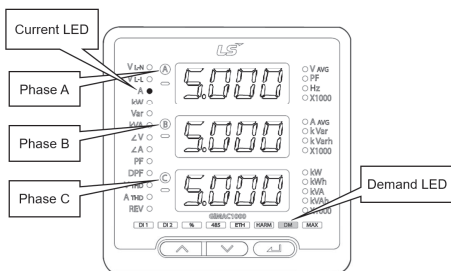
measured from 1<sup>st</sup> harmonic to 31<sup>th</sup> harmonic and it is moved to following harmonic number by pressing [UP], [DOWN] KEY, [ENTER] KEY.

It is displayed in following order : A phase voltage/current first harmonic ↔ 31<sup>th</sup> harmonic → (Pressed [ENTER] KEY) B phase voltage/current first harmonic ↔ 31<sup>th</sup> harmonic → (Pressed [ENTER] KEY) C phase voltage/current first harmonic ↔ 31<sup>th</sup> harmonic.

VL-N LED is turned on in case of 3P4W to indicate it is the harmonics for phase voltage and VL-L LED is turned on in case of 3P3W to indicate It is the harmonics for line voltage.

#### 5) The display of DEMAND(OPTION)

It goes to the Demand display mode in case of EX TYPE, if pressing [ENTER] KEY from the Harmonic display mode.



## 6. Operation & Setting

### 6.1 Measuring DISPLAY MODE & Operation

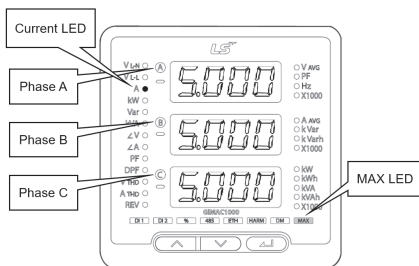
Current DEMAND for each phase or average current DEMAND/TOTAL active power DEMAND can be displayed at the same time by pressing [UP] or [DOWN] KEY.

- A AVG
- kVar
- kVarh
- X1000
- kW
- kWh
- kVA
- kVAh
- X1000

< PIC18 The display of DEMAND >

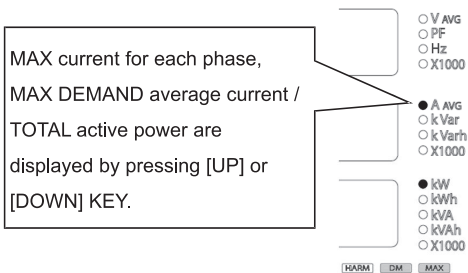
Demand display mode is indicated by turning DM LED on and the measuring elements of demand such as current demand for each phase, the average current demand, and total active power demand are displayed by pressing [UP] / [DOWN] KEY.

#### 6) The display of MAX(OPTION)



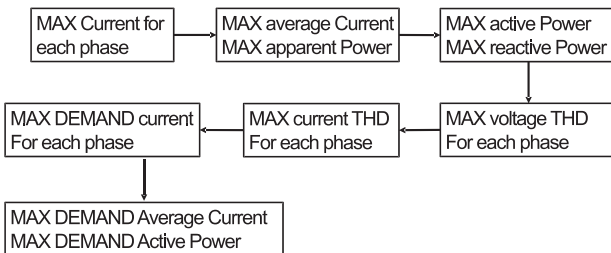
## 6. Operation & Setting

### 6.1 Measuring DISPLAY MODE & Operation



< PIC19 The display of MAX >

MAX display mode is displayed in the following order below.



## 6. Operation & Setting

### 6.2 Setting method

- ◆ If pressing [UP], [DOWN] KEY at the same time, it moves to the setting mode or back from it.
- ◆ It is available to move and search between setting menus by pressing [UP], [DOWN] KEY.
- ◆ If pressing [ENTER] KEY from setting display mode, setting value is blinking and it can be changed.
- ◆ If pressing [ENTER] KEY after changing the setting value by [UP], [DOWN] KEY, setting value is turned on and stored.
- ◆ If pressing [UP], [DOWN] KEY at the same time after finishing all settings, it turns back to the initial window of measuring display mode.
- ◆ The order and items of setting mode as follows.

## 6. Operation & Setting

### 6.2 Setting method

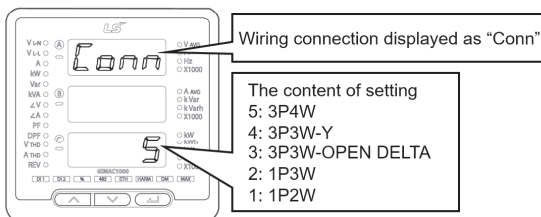
< Table6 Setting Menu >

| Order | Setting Menu               | Displayed as | Setting Value                                                                                                                                                                                                                                                                                                                                                                                    | Default       | Remark                                                                                                                        |
|-------|----------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------|
| 1     | Wiring Connection          | 'Conn'       | 1 : 1P2W<br>2 : 1P3W<br>3 : 3P3W-D<br>4 : 3P3W-Y<br>5 : 3P4W                                                                                                                                                                                                                                                                                                                                     | 5             |                                                                                                                               |
| 2     | PT Ratio                   | 'Pt.'        | 1,000 ~ 1400,0000                                                                                                                                                                                                                                                                                                                                                                                | 1             |                                                                                                                               |
| 3     | CT Ratio                   | 'Ct.'        | 1 ~ 2000(5A), 1~9999 (1A)                                                                                                                                                                                                                                                                                                                                                                        | 1             |                                                                                                                               |
| 4     | DEMAND Time                | 'dE. t'      | 1, 2, 3, 4, 5, 6, 10, 15, 20, 30, 60                                                                                                                                                                                                                                                                                                                                                             | 15(min)       |                                                                                                                               |
| 5     | Communication Address      | 'Addr'       | 1 ~ 247                                                                                                                                                                                                                                                                                                                                                                                          | 1             |                                                                                                                               |
| 6     | Communication Speed        | 'bPS'        | 1 : 9600bps<br>2 : 19200bps<br>3 : 38400bps                                                                                                                                                                                                                                                                                                                                                      | 3             |                                                                                                                               |
|       | The swap of float Variable | 'S'          | On : Yes    Off : No                                                                                                                                                                                                                                                                                                                                                                             | On            |                                                                                                                               |
| 7     | TX delay time              | 'X .t'       | 10~200 msec                                                                                                                                                                                                                                                                                                                                                                                      | 20(msec)      | Displayed on ETH type only.                                                                                                   |
| 8     | IP Address                 | 'ICP' 'Adr.' | 1.0.0.0 ~ 233.255.255.255                                                                                                                                                                                                                                                                                                                                                                        | 192.168.0.100 | Displayed on ETH type only.                                                                                                   |
| 9     | Subnet Mask                | 'ICP' 'Sub.' | 0.0.0.0 ~ 255.255.255.255                                                                                                                                                                                                                                                                                                                                                                        | 255.255.255.0 | Displayed on ETH type only.                                                                                                   |
| 10    | Gateway                    | 'ICP' 'Gat.' | 1.0.0.0 ~ 233.255.255.255                                                                                                                                                                                                                                                                                                                                                                        | 192.168.0.1   | Displayed on ETH type only.                                                                                                   |
| 11    | Mac Address                | 'C-Ad'       | 00-00-00 ~ FF-FF-FF                                                                                                                                                                                                                                                                                                                                                                              | -             | Unavailable to set<br>Displayed on ETH type only.                                                                             |
| 12    | TCP Idle Time              | 'id. t'      | 10 ~ 60 sec                                                                                                                                                                                                                                                                                                                                                                                      | 10(sec)       | Displayed on ETH type only.                                                                                                   |
| 13    | TCP SWAP                   | 'ICP' 'S'    | On : Yes    Off : No                                                                                                                                                                                                                                                                                                                                                                             | On            | Displayed on ETH type only.                                                                                                   |
| 14    | DI1 Debounce time          | 'dEb' '1'    | 10 ~ 200 msec                                                                                                                                                                                                                                                                                                                                                                                    | 10(msec)      |                                                                                                                               |
| 15    | DI2 Debounce time          | 'dEb' '2'    | 10 ~ 200 msec                                                                                                                                                                                                                                                                                                                                                                                    | 10(msec)      |                                                                                                                               |
| 16    | RS485 Termination Switch   | 'tEr'        | On : Yes    Off : No                                                                                                                                                                                                                                                                                                                                                                             | Off           | When set to ON,<br>it is the same as 1300Ω of<br>resistance installed between<br>the communication<br>terminals (TRX+, TRX-). |
| 17    | Data Reset                 | 'rSt.'       | 0 : All Data Reset<br>1 : Wh Reset<br>2 : Varh Reset<br>3 : Vah Reset<br>4 : rWh Reset<br>5 : rVarh Reset<br>6 : Demand A Reset<br>7 : Demand W Reset<br>8 : Max A Reset<br>9 : Max W Reset<br>10 : Max Var Reset<br>11 : Max VA Reset<br>12 : Max V THD Reset<br>13 : Max A THD Reset<br>14 : Max Demand A Reset<br>15 : Max Demand W Reset<br>16 : DI1 Counter Reset<br>17 : DI2 Counter Reset | -             | Data from 4 to 15 is<br>ONLY displayed<br>and reset with EX<br>type.                                                          |
| 18    | LED TEST                   | 'Led' 'tES'  | On : Yes    Off : No                                                                                                                                                                                                                                                                                                                                                                             | Off           |                                                                                                                               |
| 19    | Version display            | 'vEr.'       | XX.XX / X.X                                                                                                                                                                                                                                                                                                                                                                                      | -             | Unavailable to set                                                                                                            |

## 6. Operation & Setting

### 6.2 Setting method

#### 1) Wiring connection setting



#### < PIC20 Wiring connection setting >

- ◆ The wiring connection is displayed as "Conn." at upper segment. Press [ENTER] KEY, if there is difference between wiring connection which is set at bottom segment and which will be set.
- ◆ Change to the desirable wiring connection by pressing [UP], [DOWN] KEY after checking whether the setting content at bottom segment is blinking to be changed.
- ◆ If pressing [ENTER] KEY after setting change, blinking setting content is turned on and stored at non-volatile memory

#### 2) PT Ratio setting

PT Ratio indicates the ratio of PT primary voltage to the secondary voltage and can be input to the forth decimal place for GIMAC1000.

For Example, if the primary voltage is 22,900V and PT secondary voltage is 110V, PT ratio is  $22,900/110 = 208.1818182$

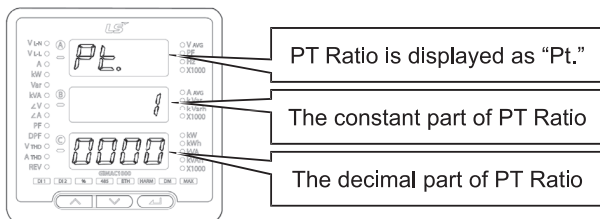
## 6. Operation & Setting

### 6.2 Setting method

The PT Ratio shall be input as 208.1818 for GIMAC1000.

The amount of difference rounded up or cut away is included in error rate but it does not have any influence on accuracy rate.

The minimum value of PT Ratio is 1.000 and maximum value of it is 1400.0000. The constant part of PT is displayed at middle segment and the decimal part is displayed at bottom one.



#### < PIC21 PT Ratio setting >

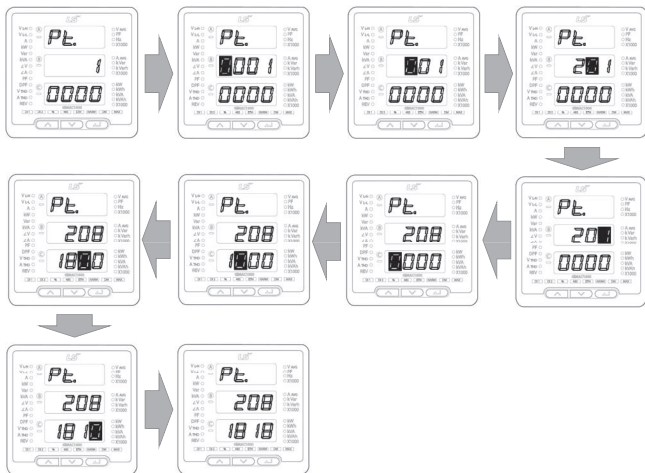
- ◆ Press [ENTER] KEY if the constant part displayed at middle segment and decimal part displayed at bottom segment are different from PT Ratio which will be set.
- ◆ The first value in middle segment is displayed and blinking.
- ◆ Change the blinking value to desirable value by pressing[UP], [DOWN] KEY and then press [ENTER] KEY.
- ◆ Press [ENTER] KEY after changing the second value which is blinking in middle segment to desirable value by pressing [UP], [DOWN] KEY.
- ◆ If pressing [ENTER] KEY after finishing entering the value to the last

## 6. Operation & Setting

### 6.2 Setting method

one at middle segment with the same way above, the first value at bottom segment will be blinking

- ◆ If pressing [ENTER] KEY after entering the value to the last one at bottom segment, the blinking last value is turned on and PT Ratio setting is stored at non-volatile memory and then setting change is finished



< PIC22 The example of PT Ratio setting >

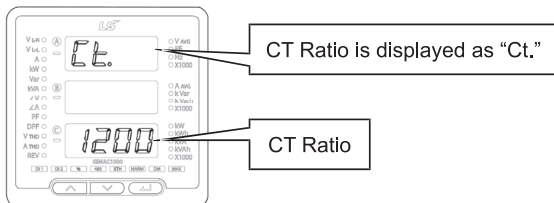
## 6. Operation & Setting

### 6.2 Setting method

#### 3) CT Ratio setting

CT Ratio indicates the ratio of CT primary current to the secondary current, For example, if primary current of CT is 6,000A and secondary current of it is 5A, CT ratio is  $6,000\text{A} / 5\text{A} = 1,200$  and will be input as 1,200 for GIMAC1000

The minimum value of CT Ratio is 1 and maximum is 2,000(5A) or 9999(1A)



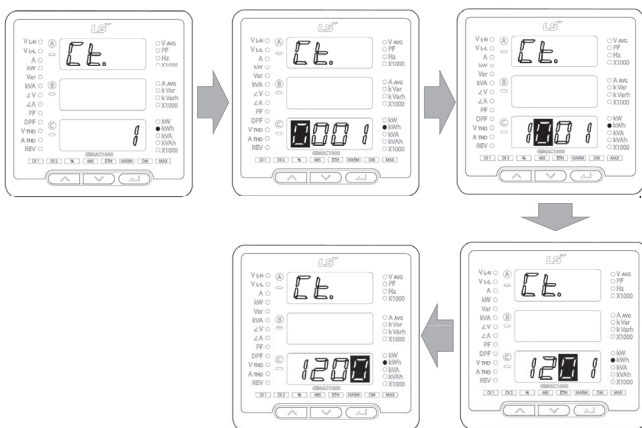
< PIC23 CT Ratio setting >

- ◆ CT Ratio is displayed as “Ct.” in upper segment. Press [ENTER] KEY if the displayed CT ratio value in bottom segment is different from the one which will be set.
- ◆ The first value at bottom segment is displayed and blinking.
- ◆ Press [ENTER] KEY after changing blinking value to desirable one by pressing [UP], [DOWN] KEY.
- ◆ Press [ENTER] KEY after changing the second value which is blinking at bottom segment to the desirable value by pressing [UP], [DOWN] KEY.
- ◆ If pressing [ENTER] KEY after finishing entering the value to the last one

## 6. Operation & Setting

### 6.2 Setting method

at bottom segment with the same way above, the last blinking value is turned on, stored at non-volatile memory and CT Ratio setting is changed.

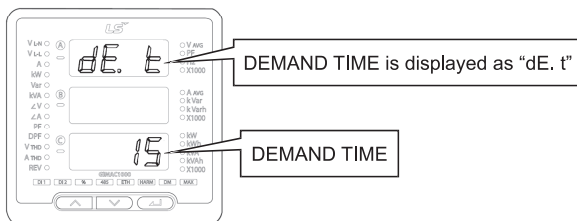


< PIC24 The example of CT Ratio setting >

## 6. Operation & Setting

### 6.2 Setting method

#### 4) DEMAND TIME setting



#### < PIC25 DEMAND TIME setting >

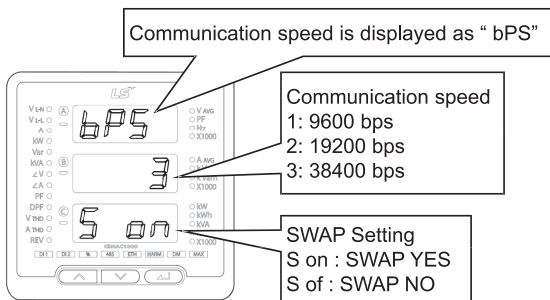
- ◆ Demand time is displayed as “dE. t” at upper segment and press [ENTER] KEY if the demand time which is set at bottom segment is different from the one which be changed.
- ◆ Change demand time to desirable value by pressing [UP], [DOWN] KEY after checking whether the setting content at bottom segment is blinking to be changed
- ◆ The minimum value of DEMAND TIME is 5mins and that of maximum is 60 mins.
- ◆ If pressing [ENTER] KEY after changing setting value, the blinking setting value is turned on and stored at non-volatile memory.



## 6. Operation & Setting

### 6.2 Setting method

#### 6) Communication speed & SWAP setting



#### < PIC27 Communication speed & SWAP setting >

- ◆ The communication speed is displayed as "bPS" in upper segment. Press [ENTER] KEY if communication speed at middle segment is different from the one which will be changed.
- ◆ Change to desirable communication speed by pressing [UP], [DOWN] KEY after checking whether the setting content at middle segment is blinking to be changed.
- ◆ The minimum value of communication speed is 9600bps (Setting value : 1) and the maximum value of it is 38400bps (Setting value : 3).

## 6. Operation & Setting

### 6.2 Setting method

- ◆ S displayed at bottom segment indicates whether to swap the float variable or not. If setting SWAP with NO, the data is transmitted in the order of DIGN, EXPONENT and FRACTION from the lowest number of MODBUS FLOAT ADDRESS as specified in IEE754. If setting SWAP with YES, the data is transmitted in the reverse order specified above; changing host word with subordinate word.

EX) If changing 100.0 into float variable, it is displayed as 0x 42 C8 00 00

SWAP : NO ⇒ Transmitted in the order of 0x 42 C8 00 00

SWAP : YES ⇒ Transmitted in the order of 0x 00 00 42 C8

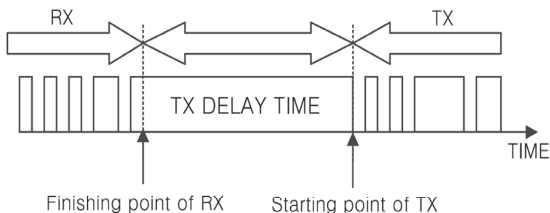
- ◆ Default value is as follows : Communication speed(38400 bps),  
SWAP YES
- ◆ If pressing [ENTER] KEY after changing setting value, the blinking setting value is turned on and stored at non-volatile memory and communication speed and swap setting change is finished.

## 6. Operation & Setting

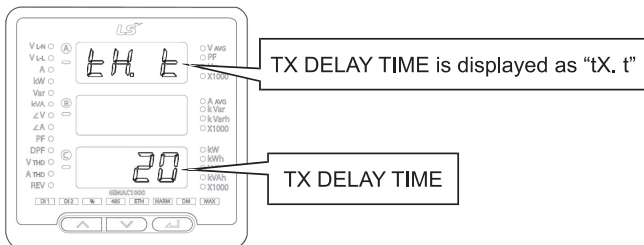
### 6.2 Setting method

#### 7) TX DELAY Time Setting

TX DELAY TIME means the time interval which takes to transmit the response data after receiving the last data.



The minimum value of TX DELAY TIME is 10msec and the maximum value is 200msec. The real TX DELAY TIME is (Setting time +3~15msec)



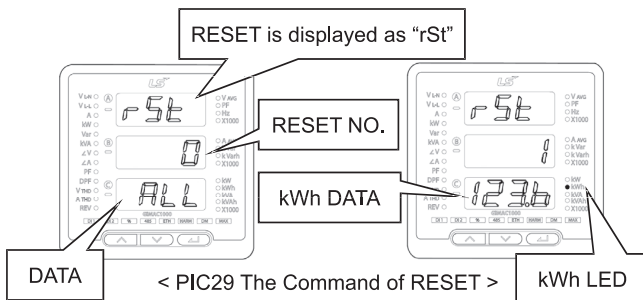
< PIC28 TX DELAY TIME Setting >

## 6. Operation & Setting

### 6.2 Setting method

- ◆ TX DELAY TIME is displayed as “tX. t”. Press [ENTER] KEY if TX DELAY TIME displayed at bottom segment is different from the TX DELAY TIME which will be changed
- ◆ Change to the desirable TX DELAY TIME by pressing [UP], [DOWN] KEY after checking whether the setting content at bottom segment is blinking to be changed.
- ◆ If pressing [ENTER] KEY after changing setting value, the blinking setting value is turned on and stored at non-volatile memory and TX DELAY TIME setting change is finished.

#### 8) The command of RESET



RESET Command can be classified according to RESET NO., DATA which will be reset, and corresponding LED.

## 6. Operation & Setting

### 6.2 Setting method

RESET No. as follows :

< Table7 RESET NO. & Content >

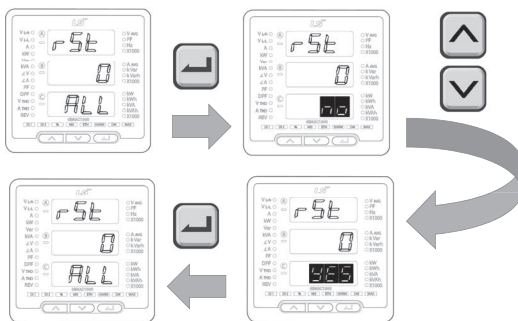
| RESET NO. | The content of RESET                                                                | Indicating LED                                                 | Remark |
|-----------|-------------------------------------------------------------------------------------|----------------------------------------------------------------|--------|
| 0         | ALL RECORD DATA RESET                                                               | -                                                              |        |
| 1         | Active electric energy (Wh) RESET                                                   | kWh                                                            |        |
| 2         | Reactive electric energy (Varh) RESET                                               | kVarh                                                          |        |
| 3         | Apparent electric energy (VAh) RESET                                                | kVAh                                                           |        |
| 4         | Reverse active electric energy (rWh) RESET                                          | REV, kWh                                                       | OPTION |
| 5         | Reverse reactive electric energy (rVarh) RESET                                      | REV, kVarh                                                     | OPTION |
| 6         | DEMAND A RESET<br>(Each phase DEMAND A & DEMAND A <sub>AVG</sub> RESET)             | DM, A <sub>AVG</sub> , A<br>(Phase)A, B, C                     | OPTION |
| 7         | DEMAND W RESET                                                                      | DM, kW                                                         | OPTION |
| 8         | MAX A RESET<br>(Each phase MAX A & MAX A <sub>AVG</sub> RESET)                      | MAX A <sub>AVG</sub> , A<br>(Phase)A, B, C                     | OPTION |
| 9         | MAX W RESET                                                                         | MAX, kW                                                        | OPTION |
| 10        | MAX Var RESET                                                                       | MAX, kVar                                                      | OPTION |
| 11        | MAX VA RESET                                                                        | MAX, kVA                                                       | OPTION |
| 12        | MAX VTHD RESET                                                                      | MAX, V <sub>THD</sub> , V <sub>L-N</sub> , %<br>(Phase)A, B, C | OPTION |
| 13        | MAX ATHD RESET                                                                      | MAX, V <sub>THD</sub> , A, %<br>(Phase)A, B, C                 | OPTION |
| 14        | MAX DEMAND A RESET<br>(Each phase MAX DEMAND A & MAX DEMAND A <sub>AVG</sub> RESET) | DM, MAX, A, A <sub>AVG</sub><br>(Phase)A, B, C                 | OPTION |
| 15        | MAX DEMAND W RESET                                                                  | DM, MAX, kW                                                    | OPTION |
| 16        | DI1 COUNTER RESET                                                                   | DI1                                                            |        |
| 17        | DI2 COUNTER RESET                                                                   | DI2                                                            |        |

## 6. Operation & Setting

### 6.2 Setting method

◆ The example of RESET ALL

1. Press [ENTER] KEY after checking whether reset no. is 0 and the content of reset is All.
2. The content of reset "ALL" is blinking with displaying "no".
3. If pressing [ENTER] KEY after changing the content of reset to "YES" by pressing [UP], [DOWN] KEY, the content of reset is changed to "ALL" and then turned on.
4. The data which will be reset is from No.1 through No. 17 in above Table 7 RESET No. & content.
5. Press [UP] + [DOWN] KEY at the same time when intend to cancel the reset during reset procedure.



< PIC30 The example of RESET ALL Command >

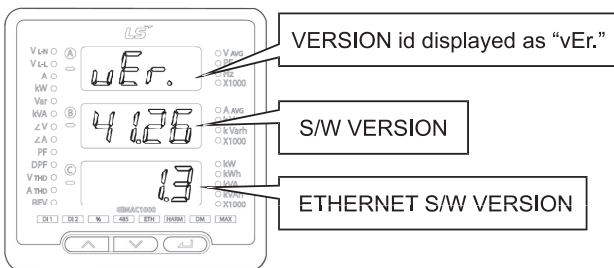
## 6. Operation & Setting

### 6.2 Setting method

#### ◆ The example of Wh RESET

1. Press [ENTER] KEY after checking whether reset no. is 1, LED turned on is for kWh, and the content of reset is the kWh data which has been accumulated up to now.
2. The content of RESET(Electric energy) is blinking.
3. Electric energy is reset to "0.000" if pressing [ENTER] KEY while blinking.
4. Press [UP] + [DOWN] KEY at the same time when intend to cancel the reset during reset procedure.

#### 9) The display of program information



< PIC31 The display of program information >

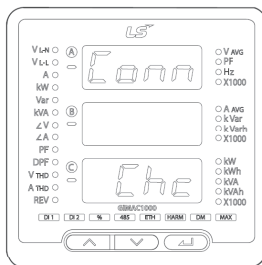
It displays the S/W version of GIMAC1000

## 6. Operation & Setting

### 6.3 The display of wiring connection check & self-diagnostic

#### 1) The check of wiring connection

GIMAC1000 displays the message to check wiring connection in case the direction of phase rotation is counterclockwise compared with that of voltage phase (In case of B phase voltage less than C phase).



#### < PIC32 The check of Wiring Connection >

The above message has occurred with 3 phase 4 wire and 3 phase 3 wire Y connection and if pressing [ENTER] KEY, the display moves back to measurement window.

In case above message has occurred, check the wiring connection.

## 6. Operation & Setting

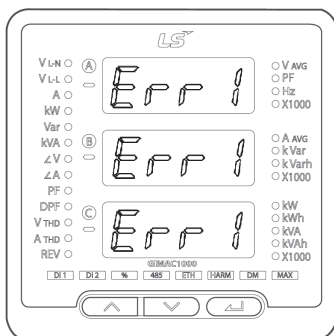
### 6.3 The display of wiring connection check & self-diagnostic

#### 2) The display of self-diagnostic

GIMAC1000 displays the self diagnostics as follows.

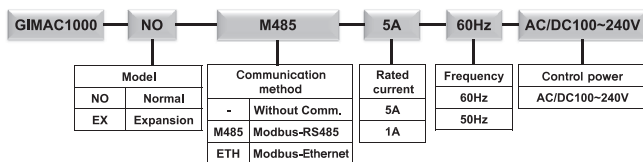
- ◆ ERROR 1 : MEMORY ERROR
- ◆ ERROR 3 : OPTION ERROR
- ◆ ERROR 4 : SETTING DATA ERROR

When ERROR has occurred, contact the nearest service center, agent or sales representatives in your local place for close inspection.



< PIC33 The display of ERROR >

## 7. Type designation







[www.ls-electric.com](http://www.ls-electric.com)

**LS ELECTRIC Co., Ltd.**

**79562724007**



Technical Question or After-sales Service

Customer Center - Quick Responsive Service, Excellent technical support  
TEL. **82-1644-5481** | Home page. [www.ls-electric.com](http://www.ls-electric.com)

Specifications in this instruction manual are subject to change without notice due to continuous products development and improvement.

**GIMAC1000 / 2023.03**