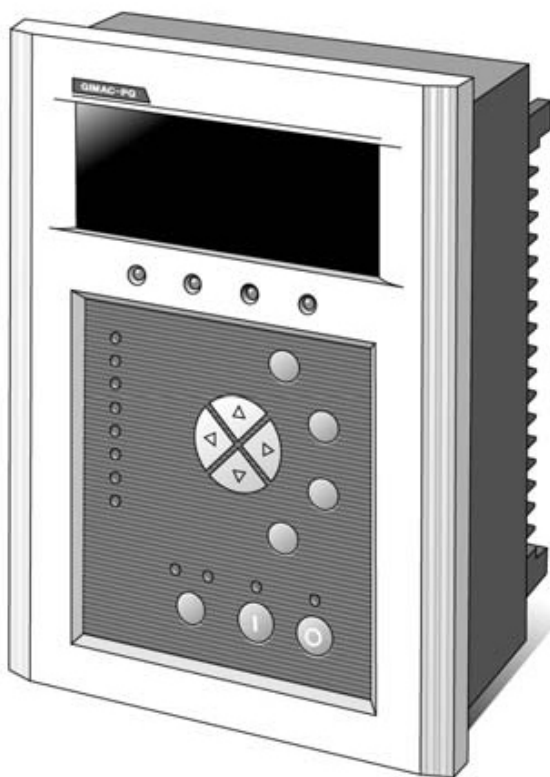


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Power Quality Meter GIMAC-PQ User Manual

HIGH MEASURING ACCURACY



Safety Instructions

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

LSIS

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Safety caution



Please read carefully before product being taken into service to ensure safety and proper operation of GIMAC-PQ

- Please keep the safety caution to prevent any accident may happen by using the products incorrectly.
- Safety caution is classified with caution and danger and indication of them as follows.



Caution

Not following the instruction may result in serious injury or eve death



Danger

Not following the instruction may result in serious injury or property damage

- Symbols used in this manual indicate as follows ;



This symbol is for warning the hazardous condition so that the procedure with it shall be read carefully and observed for your safety.



This symbol indicates that not following the procedure identified with it may result in the electric shocks or any accidents in the specific condition.

- This instruction shall be kept in the nearest place of GIMAC-PQ.



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.

Safety caution

- 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 input, output wires.



Caution

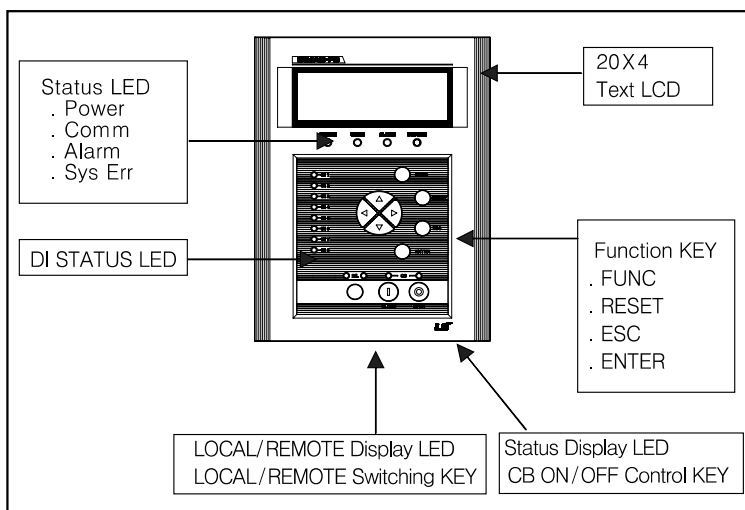
- Safety caution for installation & terminal wiring
 - Apply the rated voltage to the power supply terminal ; it may result in property damage or fire.
 - Please keep away product from screws, metals, water, or oil ; it may result in fire.
 - Please keep the rated load and polarity for input & output 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.
 - Please use aux. relay for closing/opening of breaker; it may result in the burn of inside relay if the breaker controlled directly.
 - Please replace communication card after disconnecting the power supply. Be careful with all DOs as they are returned with the initial state when the power supply disconnected.
- 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 & handing
 - 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.

1. The characteristic of GIMAC-PQ

- GIMAC-PQ is the digital integrated equipment for metering & controlling various values in the electric power system as well as analyzing power quality such as Sag, Swell, Interruption, Under voltage, Over voltage, Harmonics, ON/OFF function of breaker, and monitoring the fault condition of protection relay.
- GIMAC-PQ has obtained remarkable reliability by upgrading the additional functions and dimension of GIMAC-II which has been manufactured and used at the real field over 10years.
- GIMAC-PQ performs the high accuracy by 0.2% error rate for various measurement items such as voltage, current, phase as it is embedded with DSP for metering the values with the high performance and high speed.
- GIMAC-PQ displays the basic measurement items such as voltage, current as well as phase data so that it makes easy to check wrong connection and the condition of load.
- GIMAC-PQ can detect and analyze the deterrent factors which lower the power quality occurred at 3-phase such as SAG, SWELL, INTERRUPTION as well as record the 3 phase voltage and current waveform to the maximum of 60 cycles/a event for the further analysis.
- GIMAC-PQ can record and save the event of abnormal power quality which has recently occurred up to 256 events.
- The function of power statistics of GIMAC-PQ is to record and renew the max. value (occurred time), min. value(occurred time), the average value of the all Scalar which can be measured by GIMAC-PQ (Voltage, Current, Power, Power Factor, Frequency, Unbalanced rate, THD) for the duration set by user(1min~60min).
- GIMAC-PQ has obtained the high reliability with the function of SBO (Select Before Operation) for the user's password setting change and the control.
- GIMAC-PQ can alert the accident as it is with the function of self-diagnostic to detect the faults from external system(Wrong connection, Disconnection, and Abnormal frequency) and internal function(Memory).
- GIMAC-PQ provides the user's past fault records by saving 256 events occurred recently.
- Various measurement data and events are displayed on the 20x4 Character LCD for the user's convenience.

2. External view and configuration

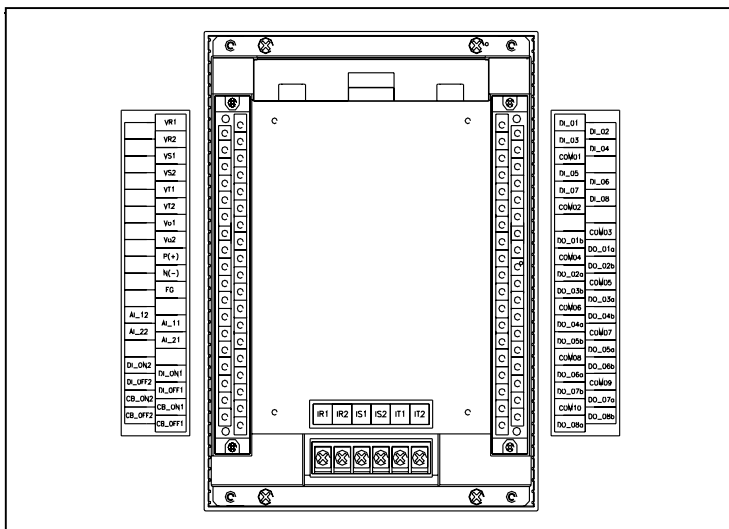
2.1 External view and configuration



The type of KEY	Applicable Menu	Basic Function
Direction key (up & down)	Normal display tree	Move between items(Voltage→Current)
	Setting menu tree	Move between items or change setting value
Direction key (left & right)	Normal display tree	Move to lower display (Phase voltage→Line voltage)
	Setting menu tree	Move between items or change of setting value
FUNC KEY	Normal display Tree	Move to setting menu
	Setting menu tree	Move to normal display menu
ENTER KEY	Saving confirmation menu	Saving of changed data
	Password input menu	Putting a password
ESC KEY	Setting menu tree	Move to upper menu
	Saving confirmation menu	Cancel to save the changed data
RESET KEY	SYS ERR Menu	Back to Screen
	Except above menus	Turing back of FAULT, ALARM RESET & ALARM DO
R/L	All menus	Switching of LOCAL/REMOTE
CLOSE/OPEN KEY	All menus	Manual control of circuit breaker

2. External view and configuration

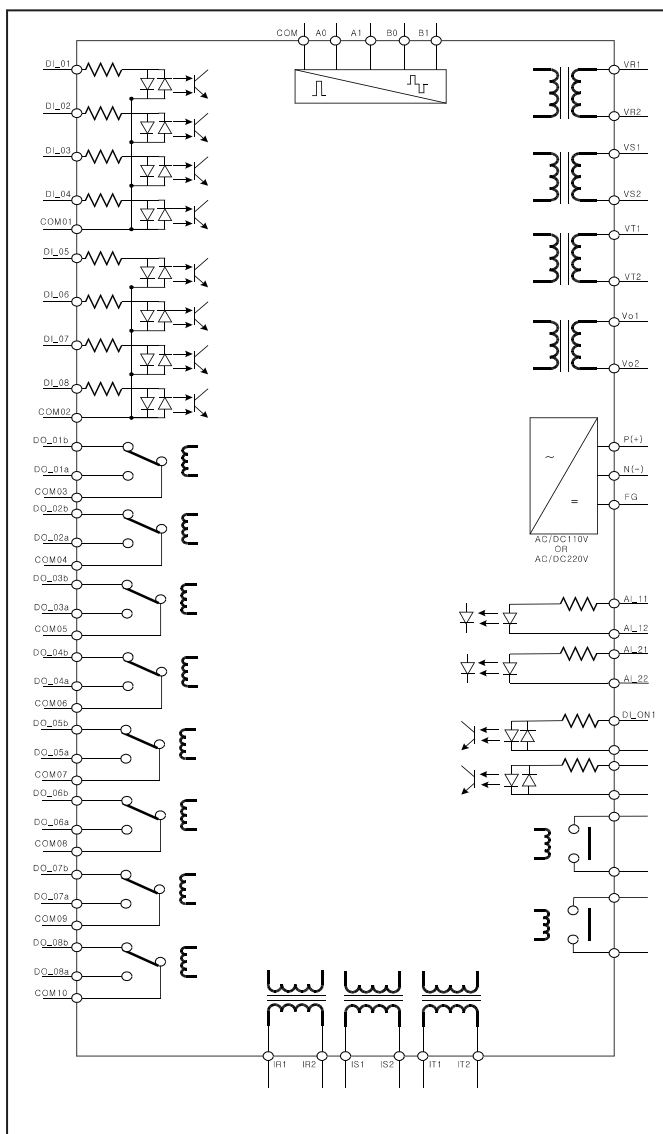
2.2 The configuration of terminal



The name of terminal	Use	Remark
Vx1 ~ Vx2	Voltage input terminal	
Ix1 ~ Ix2	Current input terminal	
P(+), N(-)	Control power supply input terminal	⚠ Please do earth
FG	Ground terminal	
AL11, AL12	AI(DC4 ~ 20 mA) (+)polarity Input terminal	
AL21, AL22	AI(DC4 ~ 20 mA) (-)polarity Input terminal	
DLON1, DLON2	Input terminal for ON condition of breaker	
DLOFF1, DLOFF2	Input terminal for OFF condition of breaker	
CB_ON1, CB_ON2	Output terminal for ON condition of breaker	
CB_OFF1, CB_OFF2	Output terminal for OFF condition of breaker	
DL01, DL02, DL03, DL04	Input terminal of DI1 ~ 4	
COM01	Input common terminal of DI1 ~ 4	
DL05, DL06, DL07, DL08	Input terminal of DI5 ~ 8	
COM02	Input common terminal of DI5 ~ 8	
DO_x a	"a" contact output terminal of DO x	
DO_x b	"b" contact output terminal of DO x	
COM03 ~ COM10	COM terminal of DO 1 ~ 8	

2. External view and configuration

2.3 Internal structure



3. Ratings

3.1 Standard using condition

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

1) Temperature

- The normal use : $-10^{\circ}\text{C} \sim 55^{\circ}\text{C}$
- The storage : $-25^{\circ}\text{C} \sim 70^{\circ}\text{C}$

2) Humidity : Under 80% (Shall not reach the dew point)

3) Using condition

- Altitude : Under 2,000m
- Shall be no abnormal vibration or impact
- The ambient air shall not be severely polluted

3.2 Input ratings

Type	Use range	Remark
Connection type	3P4W, 3P3W(Y), 3P3W(DELTA), 1P3W,1P2W	
The rated frequency	50Hz or 60Hz	Separate use for 50Hz,60Hz
Measuring voltage	10 ~ 230V	Applied voltage at both ends of PT
Zero phase Measuring voltage	2.2 ~ 230V	Applied voltage at both ends of PT
The range of measuring current	0.05 ~ 6A	
The rated current of CT	5A	
The control power supply of ratings	AC/DC 110V or AC/DC 220V	Separate use for 110V, 220V
Digital Input power supply	AC/DC 110V or AC/DC 220V	
The number of Digital Input	Common DI: 8ea, Breaker DI: 2ea	
PT&CT Input burden	Under 1 VA for each	
Zero phase voltage burden	1 VA	
Power consumption	Normally Under 10W Operation : Under 30W	

3. Ratings

3.3 Output ratings

Type		Use range	Remark
Relay for breaker Note1)	Contact switching capacity	AC230V 16A / DC30V 16A	Resistance load $\cos\Phi = 1$
	Max. switching capacity	3680 VA, 480 W	
	Contact switching capacity	AC230V 8A / DC30V 8A	Inductance load ($\cos\Phi = 0.4$, L/R = 7 ms)
	Max. switching capacity	1840 VA, 240 W	
Relay for signal	Contact switching capacity	AC230V 12A / DC25V 12A	Resistance load $\cos\Phi = 1$
	Max. switching capacity	2760 VA, 300 W	
	Contact switching capacity	AC230V 6A / DC25V 6A	Inductance load ($\cos\Phi = 0.4$, L/R = 7 ms)
	Max. switching capacity	1880 VA, 150 W	

Note1) Relay for circuit breaker shall be opened with no voltage.

3.4 Noise ratings

GIMAC-PQ is fully observed with the noise rating standard as follows.

Item	Condition	Applicable standard
Insulation resistance	500 V, Over 10 M Ω	KEMC1110, 1120
Power frequency withstand voltage	AC 2 kV (1 kV)	KEMC1110, 1120
Lighting impulse withstand voltage	5 kV(3 kV)	IEC60255-22 IEC61000-4
Vibrating surge voltage	2.5 ~ 3 kV	IEC60255-22 EN61000-4
Surge Immunity	Control power supply, Transformer: 6 kV 5times Signal: 3 kV 5times	IEC60255-22 EN61000-4
Fast Transient Burst	Control power supply, Transformer: 4 kV 3mins Signal: 1 kV 3mins	LSIS EMC Standard
Impulse Noise Immunity	Control power supply, Transformer: 3 kV 10mins Signal: 1 kV 10mins	LSIS EMC Standard
Static electricity ESD	Air: 8 kV Contact: 6 kV	IEC60255-22 IEC61000-4
Radio frequency Radiated Susceptibility	10 V/m	IEC60255-22
Radio frequency Conducted Susceptibility	10 V	IEC60255-22
Electromagnetic wave conduction	0.15 ~ 0.5 MHz: 79(66) dBuV 0.5 ~ 30 MHz: 73(60) dBuV	IEC60255-22

4. Measuring function & Allowable error

4.1 Measurement item & Accuracy rate

Type	Measuring item	Detailed measuring item	Accuracy	Remark
Voltage	Line voltage	Vab, Vbc, Vca	0.2 %	F / S
	Phase voltage	Va, Vb, Vc	0.2 %	F / S
	Zero phase voltage	Vo, Vo_max	0.5 %	F / S
	Normal voltage	V1(No accuracy)	Measuring from 1.1 V	
	Reverse voltage	V2(No accuracy)	Measuring from 1.1 V	
Current	Line current	Ia, Ib, Ic	0.2 %	F / S
	Normal current	I1(No accuracy)	-	
	Reverse current	I2(No accuracy)	-	
Phase	Phase per 3P3W	$\angle VabIa, \angle VabIb, \angle VabIc,$ $\angle VabVbc, \angle VabVca$	0.5 °	
	Phase per 3P4W	$\angle VaVb, \angle VaVc$ $\angle Vala, \angle Vblb, \angle Vclc$	0.5 °	
Electricity	Active power	Pa(ab), Pb(bc), Pc(ca), ΣP	0.5 %	F / S
	Reactive power	Qa(ab), Qb(bc), Qc(ca), ΣQ	0.5 %	F / S
	Apparent power	Sa(ab), Sb(bc), Sc(ca), ΣS	0.5 %	F / S
Electric energy	Active electric energy	WHa(ab), WHb(bc), WHc(ca), ΣWH	0.5 %	F / S
	Reactive electric energy	VARHa(ab), VARHb(bc), VARHc(ca), $\Sigma VARH$	0.5 %	F / S
	Reverse active electric energy	rWHa(ab), rWHb(bc), rWHc(ca), ΣrWH	0.5 %	F / S
Frequency	Frequency	Frequency F(Hz)	0.05 Hz	
Power Factor	Power Factor(PF)	PFa(ab), PFb(bc), PFc(ca), PF	Following phase error	
Harmonics	Harmonic voltage	Va(ab), Vb(bc), Vc(ca) of 1 nd ~15 th Harmonics & THD	-	-
	Harmonic current	Ia, Ib, Ic of 1 nd ~ 15 th Harmonics & THD, TDD, K-FACTOR	-	-
Demand	Active power	Peak demand	-	-
	Current Demand	Peak demand	-	-
AI	AI	4 ~ 20 mA	0.5 %	F / S

4. Measuring function & Allowable error

4.1 Measurement item & Accuracy rate

4.1.1 Voltage

- 1) The voltage applied to PT inside product (PT ratio : 1.000)
 - Phase voltage (Line voltage) : 10 ~ 230V
 - Normal voltage, Reverse phase voltage : 1.1 ~ 230V
 - Zero phase voltage : 2.2 ~ 230V
- 2) Accuracy (Standard: Voltage applied to PT)
 - Phase voltage : F/S 0.2%
 - Line voltage : F/S 0.2%
 - Zero phase voltage : F/S 0.5%
 - Normal voltage, Reverse phase voltage : No standard for measuring accuracy

4.1.2 Current

- 1) The current applied to CT inside product (CT ratio : 1) : 0.05 ~ 6A
- 2) Accuracy : F/S 0.2%
- 3) Normal voltage, Reverse phase voltage : No standard for measuring accuracy

4.1.3 Phase

- 1) Phase error between voltage and current
 - Voltage over 30V, Current Over 0.3A : 0.5 °
 - Angle other than specified above : 2 °
- 2) Phase error between voltages
 - Voltage over 30V : 0.5 °
 - Angle other than specified above : 2 °

4.1.4 Active power, Reverse active power, Apparent power, Active electric energy, Reverse active electric energy

- 1) Error : F/S 0.5%

4.1.5 Reactive power, Reactive electric energy

- 1) Error : F/S 0.5%

The meaning of signal with electric energy & reactive power

- 1) “+” : Indication of power consumption
Active and reactive power occurs and active and reactive electric energy are accumulated when PF exists in active power on the 1 & 4 quadrants and reactive power on the 3 & 4 quadrants

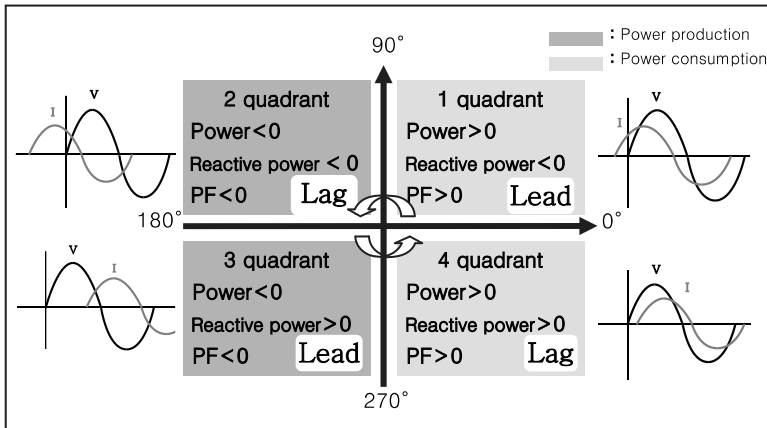
4. Measuring function & Allowable error

4.1 Measurement item & Accuracy rate

- 2) “-” : Indication of power production

Reverse active and reactive power occurs and reverse active electric energy are accumulated when PF exists in active power on the 2 & 3 quadrants.

4.1.6 Power factor



- 1) PF error : Following phase error.
- 2) Marking method of PF (Shall be no confusion with the mark of PF specified in picture above)
 - In case of Lead : “-” mark
 - In case of Lag : “+” mark
 - On the 1 & 4 quadrant : “(F)” mark indicating electricity consumption
 - On the 2 & 3 quadrant : “(R)” mark indicating electricity production

4.1.7 Frequency

- 1) Measuring range : 45 ~ 70 Hz
- 2) Measuring error : 0.05 Hz
- 3) Excluding any frequency out of measuring range

4.1.8 Harmonics & THD, TDD, K-Factor

- 1) Measuring : 15 harmonics
- 2) Accuracy : No standard

4. Measuring function & Allowable error

4.1 Measurement item & Accuracy rate

4.1.9 AI

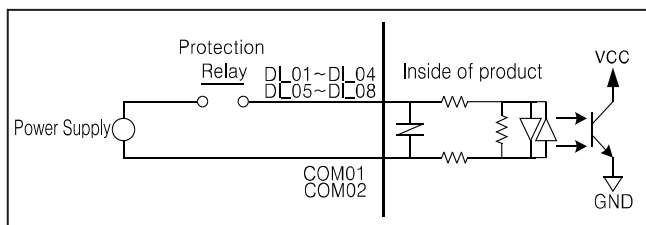
- 1) The number of PORT : 2 PORT
- 2) Measuring range : DC 4 ~ 20 mA
- 3) Error : F/S 0.5 %
- 4) No measuring and indication for less than 4 mA

Type		Unit	Marking method		Remark	
			Indication			Measuring range
Voltage		kV	under10	X.XXX	10.00 V ~ 999.99 KV	
		V	more than10	XXX.XX		
Current		kA	under10	X.XXX	0.050 A ~ 999.99 KA	
		A	more than10	XXX.XX		
Phase		°	under10	X.XXX	0.000 ~ 360.00	
			more than10	XXX.XX		
Power	(Reverse) Active power	W	under10	±X.XXX	0.000 W ~ ±99999.9 MW 0.000 VAR ~ ±99999.9 MVAR 0.000 VA ~ ±99999.9 MVA	“-” mark indicating the reverse
		KW				
		MW				
	Reactive power	VAR	more than10	±XXXX.XX		
		KVAR				
		MVAR				
	Apparent power	VA	more than 10000 M	±XXXXX.X		
		KVA				
MVA						
Electric energy	(Reverse) Active electric energy	WH	under10	X.XXX	0.000 Wh ~ 99999.9 MWh 0.000 VARh ~ 99999.9 MVARh	Reset to the “0” in case of electric energy over 100,000
		KWH				
		MWH	more than10	XXXX.XX		
	Reactive electric energy	VARH				
		KVARH				
		MVARH				
PF		—	—	±X.XXX		+: lag -: lead
Unbalanced factor, Unbalanced rate		%	under10	X.XXX	0.000 ~ 100.00	
			more than10	XXXX.XX		
Harmonics, THD		V, A	under10	X.XXX	0.000 ~ 999.99 kV	
			more than10	XXXX.XX		
AI		mA	—	X.XXX	4.000 ~ 20.00 mA	

5. DI/DO & Indication function

5.1 The function of DI

5.1.1 Wiring diagram



5.1.2 De-bounce Time : 100msec (It can be recognizable in case DI input Signal is being held at least 100msec.)

5.1.3 COM1 for DI 1~4, COM2 for DI 5~8

5.1.4 Power supply : AC/DC 110V or AC/DC 220V

(Applicable according to the product type)

5.1.5 Maximum consumption current : MAX 5mA

5.2 The function of DO

5.2.1 DO control authority

Type	DO control	CB control	Remark
LOCAL	KEY : O Communication : X	KEY : O Communication : X	
REMOTE	KEY : X Communication : O	KEY : X Communication : O	

5. DI/DO & Indication function

5.2 The function of DO

5.2.2 CB control : 500msec of pulse output (The function of SBO)

DO setting state	Output condition	Output method	Return condition
FAULT DO	Input of FAULT DI	LATCH output of “a” contact	Return when cancelling FAULT DI input or FAULT RESET command input
LOCAL/REMOTE	GIMAC-PQ R/L	LATCH output of “a” contact in the condition of remote	No condition for return
FAULT DI	Input of FAULT DI	LATCH output of “a” contact	Return when cancelling FAULT DI input or FAULT RESET command input

5.3 The function of LED indication

5.3.1 The indication of FAULT

The setting state of DI	Normal	Abnormal (Input of FAULT DI signal)	Reset after troubleshooting		Troubleshooting after reset	
			Troubleshooting	RESET	RESET	Troubleshooting
FAULT DI	OFF	Blink	Blink	OFF	ON	OFF

5.3.2 The indication of ALARM LED

Type	Normal	EVENT	RESET before troubleshooting of EVENT	Troubleshooting of EVENT
ALARM LED	OFF	Blink	ON	OFF

5.3.3 The indication of SYSTEM ERROR

Type	Normal	EVENT	RESET before troubleshooting of EVENT	Troubleshooting of EVENT
Sys Err LED	OFF	Blink	ON	OFF

6. Self-diagnosis

6.1 Frequency ERROR

6.1.1 Condition : Applying the rated frequency by $\pm 5\text{Hz}$

6.1.2 Indication

- 1) LCD : Display of "FREQUENCY ERROR"
- 2) LED : Blinking of Sys Err LED

6.1.3 Return condition : RESET or the phenomenon will be disappeared automatically

6.1.4 Others : No consideration for the sample value measured out of the frequency measuring range

6.2 Connection ERROR

6.2.1 Condition : The case the phase rotating direction of voltage is not counterclockwise (S-phase is less than T-phase)

6.2.2 Indication

- 1) LCD : Display of "WIRING ERROR"
- 2) LED : Blinking of Sys Err LED

6.2.3 Return condition : RESET or the phenomenon will be disappeared automatically

6.2.4 Others : Only applicable to 3 Phase-4 wire and 3 Phase-3 wire

6.3 Breaker control ERROR

6.3.1 Condition : No change for 500msec after commanding the circuit breaker to open/close

6.3.2 Indication

- 1) LCD : Display of "CB CONTROL ERROR"
- 2) LED : Blinking of Sys Err LED

6.3.3 Return condition : RESET

6. Self-diagnosis

6.4 Power Fail

6.4.1 The purpose of detecting Power Fail : The problem of control power supply is considered as the accident in system so that it is forbidden to control and operate the device to ensure the safety

6.4.2 The operation of Power Fail

- 1) The detecting voltage of Power Fail : Detected in the range of 60V ~ 80V for the DC
- 2) The function of Display, KEY recognition and Control : Malfunction
- 3) LED : Blinking of Sys Err LED and POWER LED

6.4.3 Return condition : Power will be normally returned with more than 88V for DC

Type	The condition of EVENT	The content of operation with ERROR
Frequency ERROR	Being occurred with the frequency exceeding the setting frequency by ± 5 Hz	Display of "FREQUENCY ERROR" on the LCD monitor The blinking of SYSTEM ERROR LED Return to normal monitor in case of RESET or ERROR cleared
Wrong connection ERROR	S-phase is less than T-phase in 3 phase wiring system (Wrong connection of S & T phase voltage)	Display of "WIRING ERROR" on the LCD monitor The blinking of SYSTEM ERROR LED Return to normal monitor in case of RESET or ERROR cleared
Circuit breaker control ERROR	No change for 500msec after commanding the control of circuit breaker	Display of "DO CONTROL ERROR" on the LCD monitor Blinking of SYSTEM ERROR LED Return to normal monitor in case of RESET
Power Fail	Control power supply less than DC 60~80V	Malfunction of display, KEY recognition, and control The blinking of SYSTEM ERROR LED and POWER LED Return to normal function if power being supplied normally

7. Power Quality Detecting & Analysis

7.1 Sag

7.1.1 Condition : The RMS value with 0.1~0.9PU of the rated voltage being held for 0.5~30 cycle (Instantaneous SAG), for 30cycle~3sec (Momentary SAG), for 3sec~1min (Temporary Sag)

7.1.2 The record and analysis

- 1) Waveform : The cycle set by user can be stored to the maximum of 60 cycles and three phase voltage and current waveform can be stored in case of setting option to save waveform
- 2) The content of Event : Recording the Year/Month/Day/Hour/Min/Sec/ms of event and the maximum and minimum value among SAG events

7.1.3 Extra operation

- 1) The operation of Alarm LED
- 2) The output of contact set by Event among the output of DO

7.2 Swell

7.2.1 Condition : The RMS value with 1.1~1.8PU of the rated voltage being held for 0.5~30 cycle (Instantaneous Swell), for 30cycle~3sec (Momentary Swell), for 3sec~1min (Temporary Swell)

7.2.2 The record and analysis

- 1) Waveform : The cycle set by user can be stored to the maximum of 60 cycles and three phase voltage and current waveform can be stored in case of setting option to save waveform
- 2) The content of Event : Recording the Year/Month/Day/Hour/Min/Sec/ms of event and the maximum and minimum value among Swell events

7. Power Quality Detecting & Analysis

7.2 Swell

7.2.3 Extra operation

- 1) The operation of Alarm LED
- 2) The output of contact set by Event among the output of DO

7.3 Interruption

7.3.1 Condition : The RMS value of voltage under 0.1PU of the rated voltage being held for 0.5cycle~3sec (Momentary Interruption), for 3sec~1min (Temporary Interruption)

7.3.2 The record and analysis

- 1) Waveform : The cycle set by user can be stored to the maximum of 60 cycles and three phase voltage and current waveform can be stored in case of setting option to save waveform
- 2) The content of Event : Recording the Year/Month/Day/Hour/Min/Sec/ms of event and the maximum and minimum value among Interruption events

7.3.3 Extra operation

- 1) The operation of Alarm LED
- 2) The output of contact set by Event among the output of DO

7.4 Under voltage

7.4.1 Condition : The RMS value with 0.8~0.9PU of the rated voltage being held over 1min (Under voltage)

7.4.2 The recording and analysis

- 1) Waveform : The cycle set by user can be stored to the maximum of 60cycles and three phase voltage and current waveform can be stored in case of setting option to save waveform
- 2) The content of Event : Recording the Year/Month/Day/Hour/Min/Sec/ms of event and the maximum and minimum value among Under voltage events

7.4.3 Extra operation

- 1) The operation of Alarm LED
- 2) The output of contact set by Event among the output of DO

7. Power Quality Detecting & Analysis

7.5 Over voltage

7.5.1 Condition : The RMS value with 1.1~1.2PU of the rated voltage being held over 1min (Over voltage)

7.5.2 The record and analysis

- 1) Waveform : The cycle set by user can be stored to the maximum of 60cycles and three phase voltage and current waveform can be stored in case of setting option to save waveform
- 2) The content of Event : Recording the Year/Month/Day/Hour/Min/Sec/ms of event and the maximum and minimum value among Over voltage events

7.5.3 Extra operation

- 1) The operation of Alarm LED
- 2) The output of contact set by Event among the output of DO

Quality Event Information	1) The type of PQ 2) The phase(a, b, c) 3) The existence of waveform 4) The occurred time of Event (Unit : msec, 1/1000) 5) Event lasting time 6) The maximum value 7) The minimum value 8) The starting point of waveform 9) The ending point of waveform	*The type of PQ : Sag, Swell, Interruption, Under Volt, Over Volt *The existence of waveform : Wave, No Wave, Power Fail, Wave Erase *The occurred date: Year/Mon/Day/Hr/Min/Sec/ms *Lasting time : sec. ms
The cycle of waveform record	32 Sample/cycle	
The number of waveform recorded	1) 2 cycles before Event 2) The setting cycle of user (Up to 60cycles)	Maximum: The record of 5300cycles (89sec) The event of 20 cycles: Recording up to 265 events
The content of waveform record	3phase voltage/current	Instantaneous waveform
Extended record	Record the Event and waveform in case of another Event being occurred during Event	

7. Power Quality Detecting & Analysis

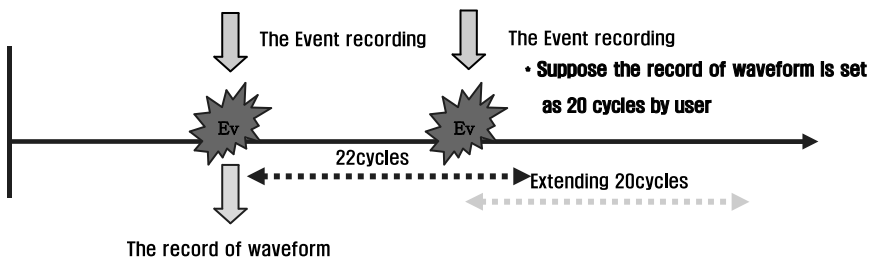
7.6 The handling of extended event

7.6.1 Condition : Apply to the case the waveform of another event also
Should be recorded as it occurs while saving the
waveform of previous event

7.6.2 Operation

- 1) Waveform : Record the additional waveform set by user from the
previous waveform recorded. The waveform is continuous.
- 2) The content of Event : Recording the Year/Month/Day/Hour/Min/Sec/ms
of event and the maximum and minimum value
among Under voltage events

7.6.3 The sequence of other operation



8. The handling of statistical data

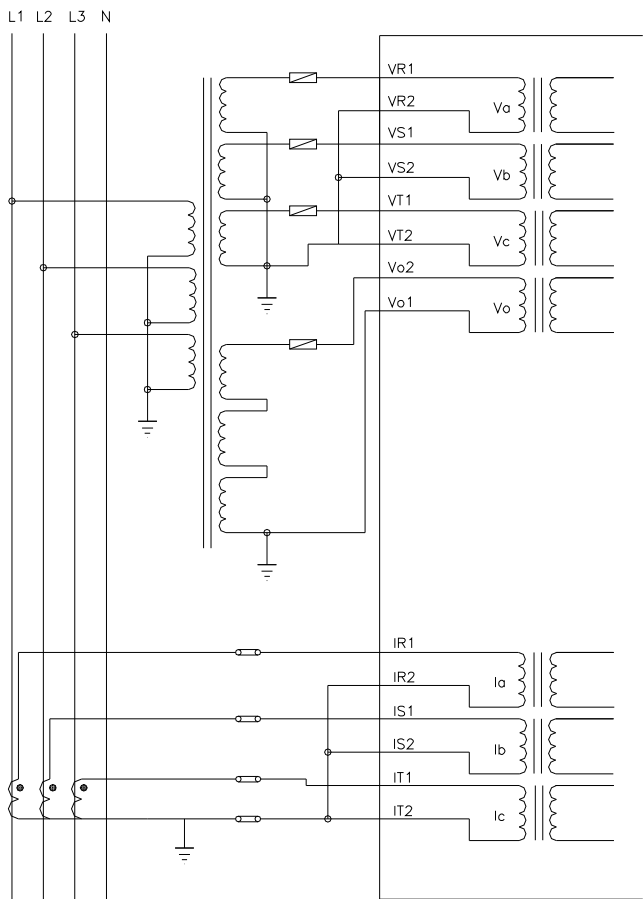
8.1 The maximum, minimum, and average value

8.1.1 The statistical data : 3 phase voltage, current, zero phase voltage
3 phase active/reactive/apparent power, Total active/
reactive/apparent power, 3 phase PF, Total PF, Frequency,
3 phase voltage/current THD, Max. & Min. value for
unbalanced rate of 3 phase voltage and current

8.1.2 Method : Handling the maximum/minimum/average value occurred
during the user setting time(1min ~ 60min) update the
prior data after setting time

9. Wiring diagram

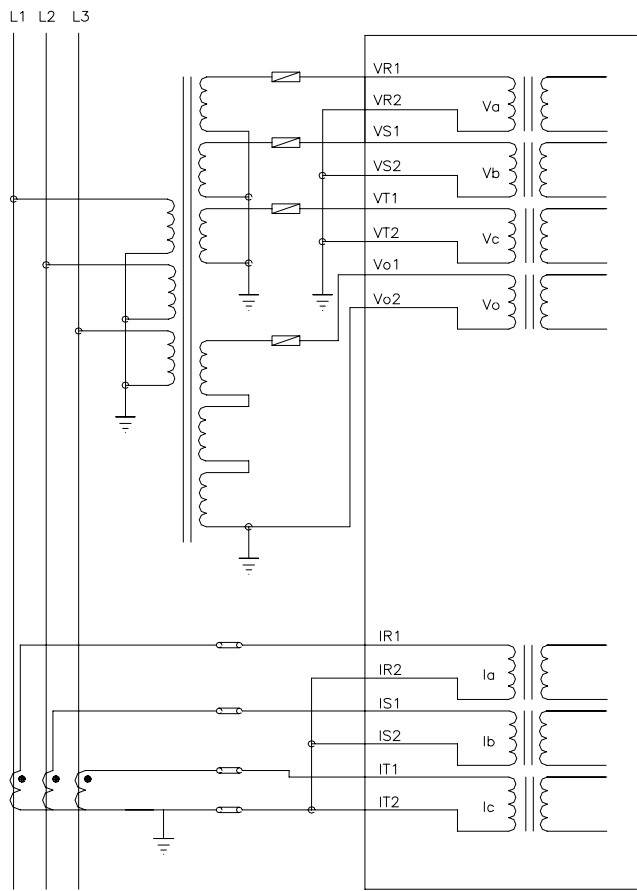
9.1 The wiring diagram of CT/PT with 3P4W connection



The wiring diagram of 3P4W Connection

9. Wiring diagram

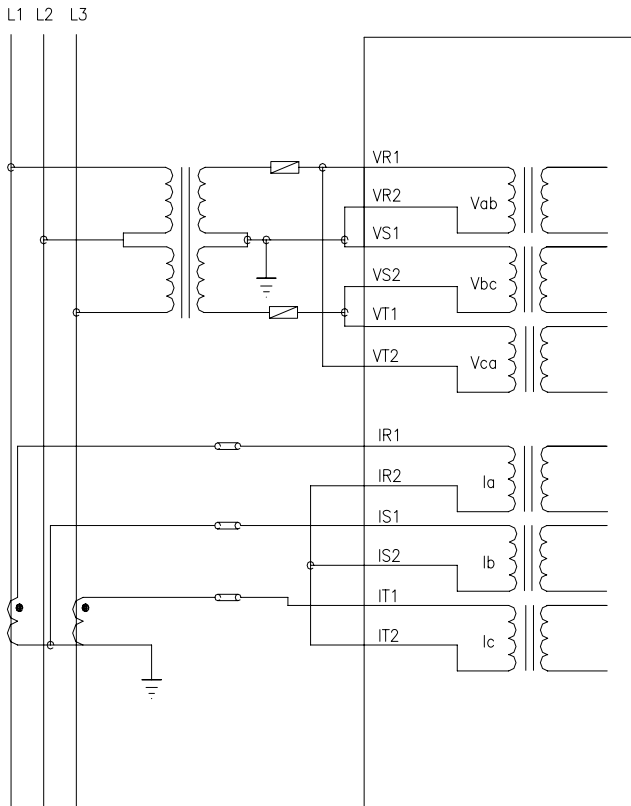
9.2 The wiring diagram of CT/PT with 3P3W Y connection



Wiring diagram of 3P3W Y-connection

9. Wiring diagram

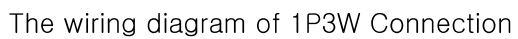
9.3 The wiring diagram of CT/PT with 3P3W Delta connection



The wiring diagram of 3P3W DELTA (2PT, 2CT)

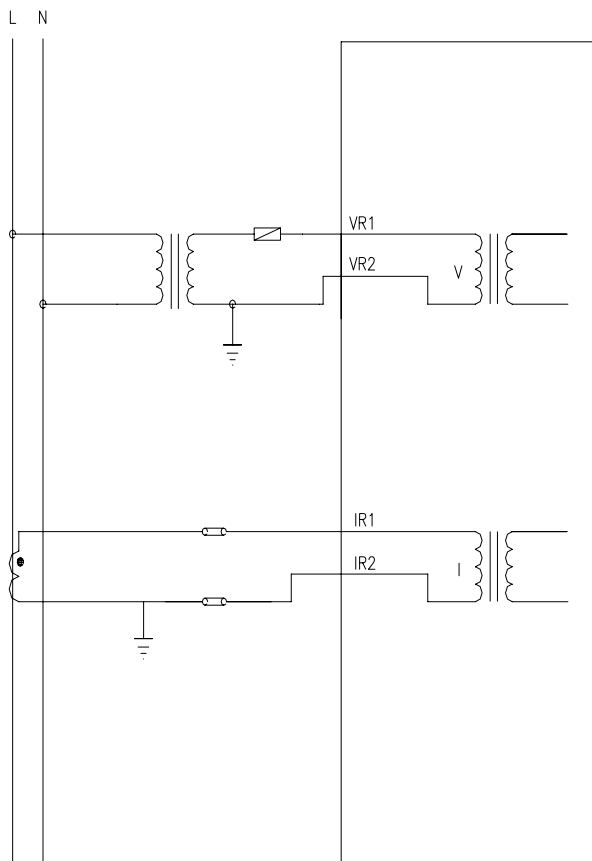
※Use with the balanced load. There might be error with unbalanced load.

9.4 The wiring diagram of CT/PT with 1P3W connection



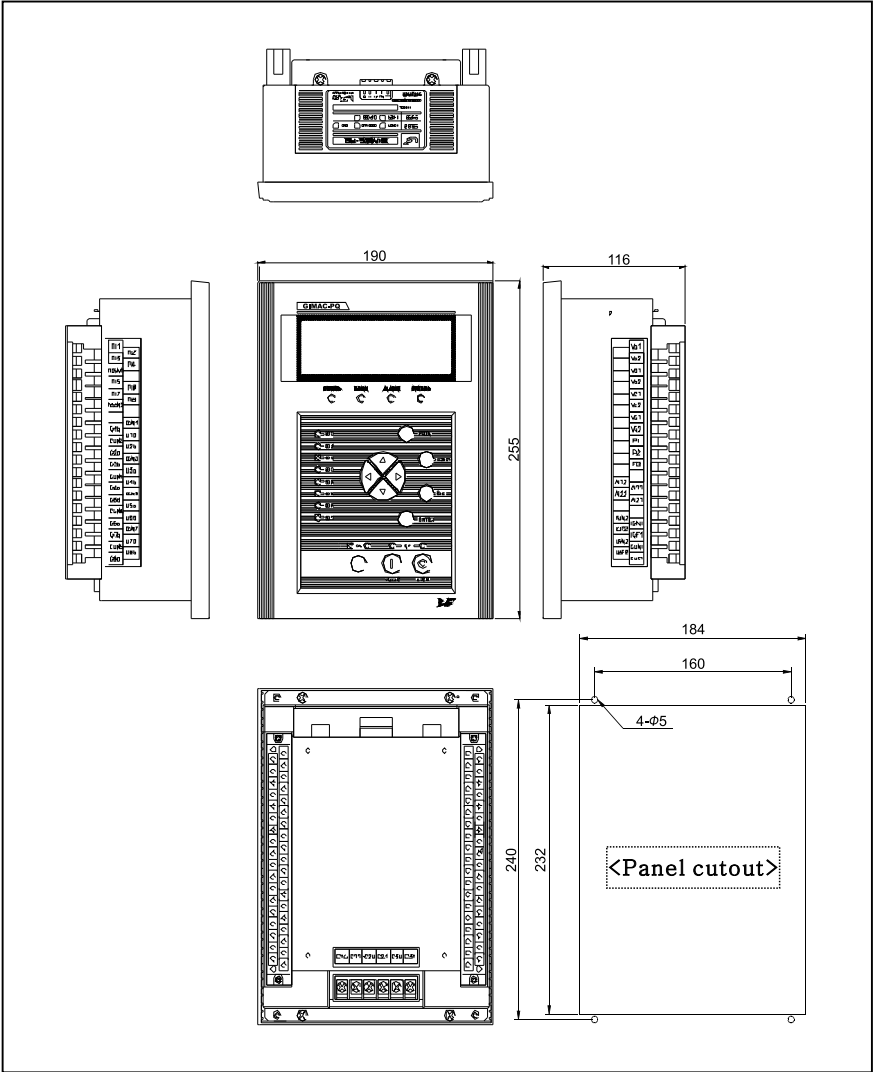
9. Wiring diagram

9.5 The wiring diagram of CT/PT with 1P2W connection

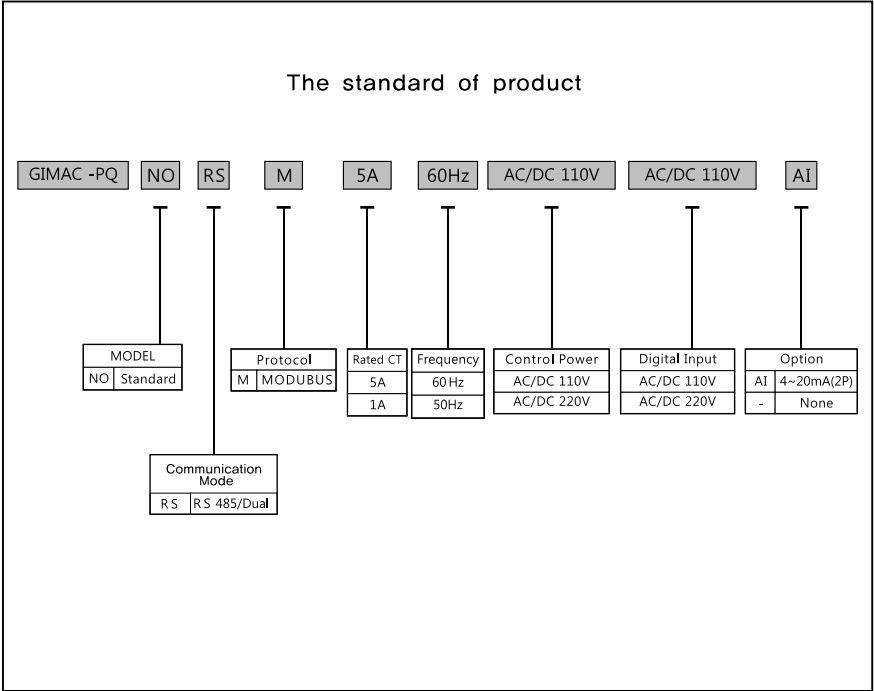


The wiring diagram of 1P2W Connection

10. External dimension



11. Ordering information





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