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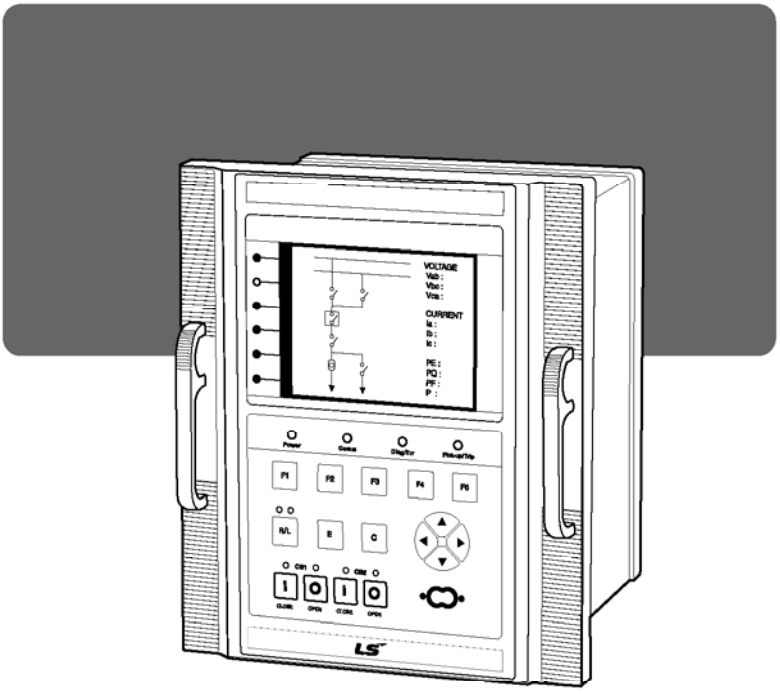
Digital Protection Relay

GIPAM 2000 **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.

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The table of contents

Safety caution

Please read carefully before product being taken into service to ensure safety and proper operation of GIPAM2000.

- Please keep the safety caution to prevent any accident Happened 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 even 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 hazardousness under the specific condition.
⚠	This symbol is for warning the electric shocks or any accidents under the specific condition.

This instruction shall be kept in the nearest place of GIPAM2200.

⚠ Caution

- Please do not wiring when 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 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.

⚠ Danger

■ Safety caution for installation & terminal wiring

- Apply the rated voltage to the power supply terminal; it may result in product 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 of 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.
- Specialist help shall be sought for the installation and maintenance of product; it may result in malfunction or accident.
- Specialist help shall be sought for the installation and maintenance of product; it may result in malfunction or accident.
- Please do not wiring when applied with power or on the operation;
  it may result in electric shock.
- Please use auxiliary relay to ON/OFF of circuit breaker;
  it may result in relay damage in Product.
- Please put to earth; it may result in electric shock.

■ Caution for management.

- Please Apply power input voltage again after setting the value.
  ; it may result in malfunction in production.

■ Inspection item before power supply being applied

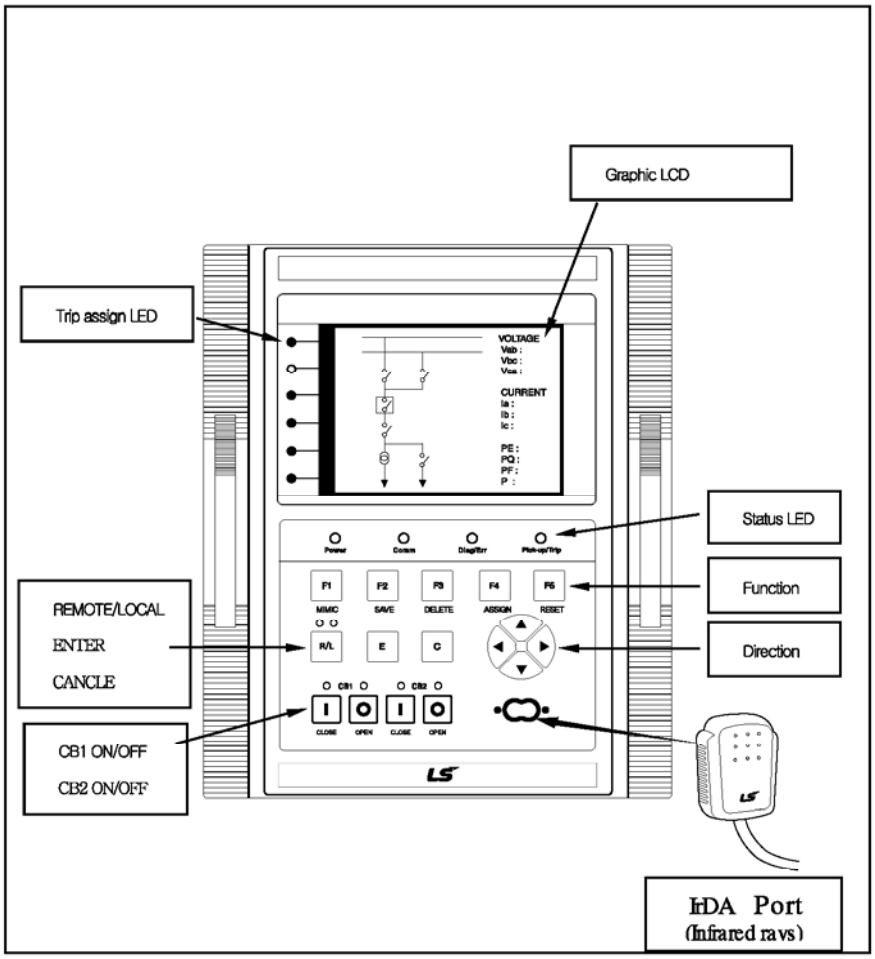
- Check the voltage or polarity of control power supply.
- Check the wiring condition of input/output terminal.

■ Caution for storage & handling

- Please store at dry & clean place.
- Please do not throw or put force on it during transport; It may result in malfunction or wrong operation
- Please stock the products in the way of FIFO (First-in First-out).
- Please do not load over 5 stories.

■ Caution for disposal

- Please dispose of it in accordance with industrial waste regulation.



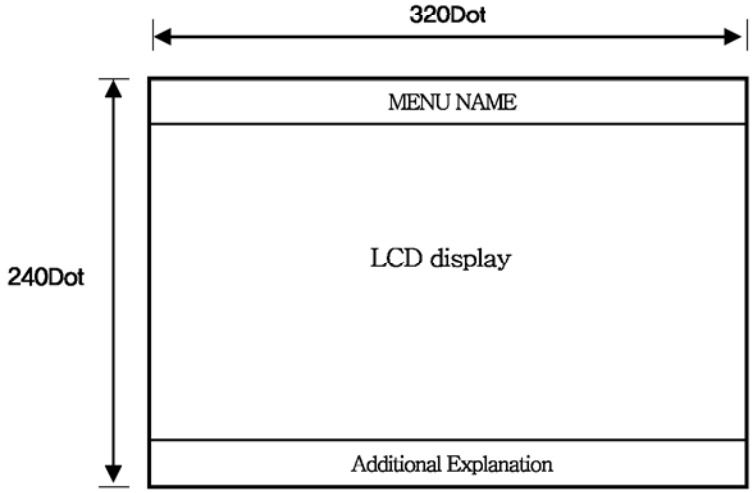
(PIC 1 : INPUT & OUTPUT interface of GIPAM2000)

1. MMI

1-1 The display window of GIPAM-2000

1-1-1. LCD

GIPAM-2000 has a 320 x 240 FSTN LCD to display various measurement data, event, and faults for the user's convenience. It supports ASCII English text & numbering code and also 20 special characters. The used fonts are 8 x 12(windows system) and 11 x 18(windows terminal). The various measurement data, event, and faults are displayed by text and picture on LCD. The number is decimal system. LCD backlight support users to see the display in dark space. And the backlight will be turned off by no using for 15 minutes.



1-1-2. LCD display components

As above picture, menu name and additional explanation can be located on above and below in case of need.

1-1-3. LED

The LED can be divided into trip assign LED, status LED and expert skill LED.

① Trip assign LED – It is with yellow and installed by user.(User can set that LED indicates what user wants.) GIPAM-2000 type has 6 LEDs. The LED which corresponds to detected faults is ON when GIPAM-2000 is tripped due to systematic faults. The LED for protection relay can be cancelled only by RESET KEY like the PICK-UP/TRIP LED.

② Status LED – GIPAM2000 has 4 status LED.

Power supply LED is green and indicates the status of power supply of GIPAM-2200.
For normal operation, it is kept with green light ON but for the abnormal operation,
it is blinking for every second.

Communication LED is orange and indicates the status of remote communication.
The LED is blinking while transmitting or receiving data under normal correspondence of communication card.

Diagnosis/Error LED is yellow, it is blinking if it occurs hardware error or program error while it is being under self-diagnosis. Under normal operation, it is OFF.
Please contact the official A/S center in case of blinking of LED.

PICK-UP/TRIP LED is red and indicates the protection relay of GIPAM-2200. It is blinking for every second if protection relay is in the condition of Pick-up by systematic faults. It is kept with red light ON if it is tripped by the operation of protection relay. This LED can be cancelled only by RESET KEY of protection relay or reset of it with remote communication.

③ Expert skill LED

REMOTE/LOCAL LED is green & red on the upper side of R/L KEY with and indicates the present control status of GIPAM-2200. GREEN LED is ON under REMOTE status and RED LED is ON under LOCAL status. These two LEDs shall not be ON or OFF at the same time.

CB CLOSE/OPEN LED is green & red on the upper side of CLOSE/OPEN KEY
and indicates the present status of circuit breaker which is connected to GIPAM-2200

1-1-4. LED setting and operation.

LED	operation		Setting
Trip assign	ON	Relay trip	F4 key on relay setting menu
	OFF	OFF in usual	
Power/run	ON	Power on	None(default)
	OFF	Power off	
Comm.	flickering	It flickers on communicating	
Diag/err	ON	Error detection	
	OFF	Put the F5 key after clear the reason of error. (error reset)	
Trip/pick-up	ON	Relay trip	
	flickering	The occurrence of relay trip	
	OFF	OFF in usual. Put the F5 key after clear the fault.(reset)	
R/L (remote/local)	GREEN	Remote mode	
	RED	Local mode	
CB1 ON	ON	CB1 is ON	
	OFF	CB1 is OFF	
CB1 OFF	ON	CB1 is OFF	
	OFF	CB1 is ON	
CB2 ON	ON	CB2 is ON	It doesn't operate in case that CB2 is set up to PO.
	OFF	CB2 is OFF	
CB2 OFF	ON	CB2 is OFF	
	OFF	CB2 is ON	

1-2 The input device of GIPAM-2000

User can set up or operate GIPAM2000 with front key. Gipam2000 has 16 keys and each has specific functions.

key	name	Operation	
F1	Function key1	Display mimic diagram	
F2	Function key2	Display all menu	Save the setting
F3	Function key3	Incident history	Event & fault menu. user can delete the accumulated data on Demand menu.
		measurement	Clear the accumulated data
F4	Function key4	Protective relay	Set up the trip assign LED
F5	Function key5	Reset the relay trip or device errors.	
R/L	Remote/local	Changing the remote/local. Red is local and green is remote.	
E	enter	Confirming or entering the menu.	
C	cancel	Cancellation or moving to upper menu.	
DIRECTIONAL KEY	-	Moving or change the values.	
CB1 ON	-	CB1 ON	
CB1 OFF	-	CB1 OFF	
CB2 ON	-	CB2 ON	It doesn't operate in case that CB2 is set up to PO.
CB2 OFF	-	CB2 OFF	

If the GIPAM2000 is on the 'remote' mode, user can't control the device by front keys. If want to control the device, user should set the GIPAM on 'local' mode.

All keys operate when user press the key more than 0.2 seconds. And the values of inputs by keys are not saved on buffer.

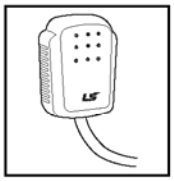
※ CB ON/OFF keys don't operate within 3 seconds after operation of CB. It is for the protection of mistake.

1. MMI

1-3 IrDA Serial communicational Device (Opto-master)

GIAPM2000 has IrDA communicational device. (Opto-master). User can connect the RS-232 Port of Opto-master to PC directly. And can control or monitor the status of GIPAM with G2K manager program. User can upload or down load data from PC to GIPAM. The communication speed is 38400bps.

*refer to G2K manual for more info.



Opto-master

1-4 Tables of MENU

GIPAM2000 has 5 primary menu. Each menu has upper & lower (detail) menu.

Primary menu	Model	Lower menu		remarks
		Lower menu1	Lower menu2	
PROTECTIVE RELAY	FI-TYPE	OVER CURRENT(50/51)		
		OVER CURRENT GROUND(50/51G)		
		NEGATIVE SEQ. OVER VOLTAGE(47)		
		PHASE OPEN(47)		
		RESIDUAL UNDER VOLTAGE(27R)		
		UNDER VLOTAGE(27)		
		OVER VOLTAGE(59)		
		OVER VOLTAGE GROUND(64G)		
		RECLOSING(79)		
		SENSITIVE D,G,R(67G)		
		DIRECTIONAL GROUND(67N)		
	M-TYPE	OVER CURRENT(50/51)		
		OVER CURRENT GROUND(50/51G)		
		NEGATIVE SEQ. OVER VOLTAGE(47)		
		PHASE OPEN(47)		
		NEGATIVE SEQ. OVER CURRENT(46)		
		SENSITIVE D,G,R(67G)		

	THERMAL RELAY(49)		
	LOCKED ROTOR(51LR)		
	DIRECTIONAL GROUND(67N)		
	UNDER VOLTAGE(27-1)		
PROTECTIVE RELAY T-TYPE	DIFFERENTIAL FAULT RELAY(87T)		
	OVER CURRENT RELAY(50/51-1)		
	OVER CURRENT RELAY(50/51-2)		
	OVER CURRENT RELAY(50/51-3)		
	OVER CURRENT GROUND1(50/51G)		
	OVER CURRENT GROUND2(50/51G)		
MEASUREMENT	VOLTAGE		
	CURRENT/FREQ(MType-%값 표시가능)		
	PHASE		
	POWER		
	ENERGY		
	POWER FACTOR/DPF		
	HARMONICS.SPECTRUM		
	VECTOR DIAGRAM		
	Voltage MIN/MAX		
INCIDENT HISTORY DI, DO SUPERVISION	EVENT HISTORY		
	FAULT HISTORY		
	DEMANE HISTORY	CURRENT(1)DEMAND	
		ACTIVE POWER DEMAND	
		REACTIVE POWER DEMAND	
		CURRENT(LA)DEMAND	
		CURRENT(LB)DEMAND	
		CURRENT(LC)DEMAND	
	FAULT WAVE PERIOD SET		
DI, DO SUPERVISION	DI MONITORING		
	DO MONITORING		
	PLC REG CONTROL		
	DI EVENT SET		
	DO EVENT/FAULT SET		
	DI FUNCTION SET		
	DO FUNCTION SET		
SYSTEM CONFIG	RELAY CONFIGURATION		
	TRANSFORMER SETTING(T-TYPE전용)		
	COMMUNICATION		
	CB FAIL CHECK		
	ENVIRONMENT CONFIG		
	SYSTEM INFORMATION		

1. MMI

1-5 The functions and operations of MMI

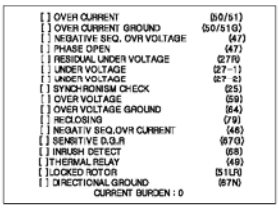
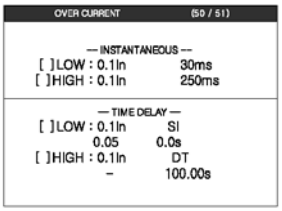
1-5-1. Protective relay

User can set up the relay and change the value on Protective relay menu.

① the components of lower menu.

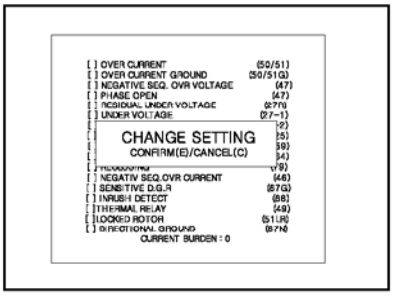
Lower menu	ANSI CODE
OVER CURRENT(50/51)	50/51
OVER CURRENT GROUND(50/51G)	50/51G
NEGATIVE SEQ. OVER VOLTAGE(47)	47
PHASE OPEN(47P)	47
RESIDUAL UNDER VOLTAGE(27R)	27R
UNDER VLOTAGE(27-1)	27
OVER VOLTAGE(59)	59
OVER VOLTAGE GROUND(64)	64
RECLOSING(79)	79
NEGATIVE SEQ. OVER CURRENT(46)	46
SENSITIVE D.G.R(67G)	67G
THERMAL RELAY(49)	49
LOCKED ROTOR(51LR)	51LR
DIRECTIONAL GROUND(67N)	67N

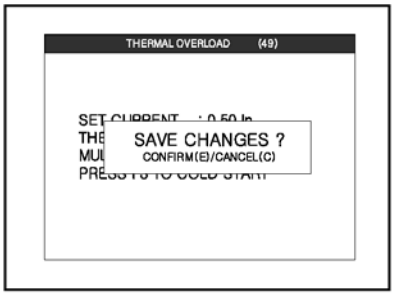
② Menu movement and operations of key.

	DISPLAY	EXPLAN	HANDLING METHOD
MENU		The primary menu of GIPAM. This menu is the top menu.	Moving up/down : Up, down directional Key. Moving to lower menu: Select the menu user wants and put the enter key.
LOWER MENU		This menu displays the available relay elements. You can set the on/off of the each relay elements.	Moving menu to menu: Up, down directional key Moving to top menu: cancel key Moving to detail setting menu: Select the menu user want and put the enter key. Select the on/off of relay elements: Select the relay elements and put the left/right key.
DETAIL		You can set up the detail value setting each relay on this menu.	Moving menu to menu: Left/right directional key Moving to upper menu: cancel key Change the setting values: Select the menu user want and put the up/down key. Save the changed: F2 Set the trip assign LED:F4.

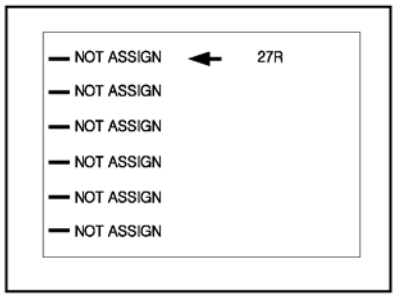
1. MMI

You can see the main menu by pressing the ESC or ENTER key on the primary display.
This main menu displays menu list for movement to sub menu.
User can move the cursor by pressing the Up, Down directional key and enter the sub menu by pressing ENTER key.
If you want to select/cancel the each relay element. Move curser to target relay element with Up/Down key and click the Light/Left key. And it will display confirming question to user. ENTER is confirmation of selection or changing and ESC is cancellation of selection or changing. This menu is used to set up the relay element.
If user wants to set up the relay elements. Move curser to target with Up/Down key and click ENTER key. And user can see the set up, changing point menu.





If user change the values, user can save that with F2 key. And it will display confirming question.
If user wants to set the trip assign LED. Push the F4 key on in relay setting menu and it will be displayed as follows.



If user want to set the relay elements to assign LED, should move cursor to wanted LED and put the left/right key. If you set the 27R relay elements to first trip assign LED. You can see the display like above picture.

1-5-2. MEASURMENT

This menu has lower, detail menu like PROTECTIVE RELAY menu.

It displays measurement data on the 9 menu as follows.

Lower menu	Displayed contents
Voltage	It displays the values of three phase voltage. If wiring is 3P3W, it can't display phase voltage.
Current/freq	It displays the values of current and frequency of each phase. M TYPE can display the load factor with %.
Phase	It displays the values of all phases.
Power	It displays the values of ACTIVE,REACTIVE,REV-ACTIVE power.
Energy	It displays the values of electric power
Power factor/DFR	Power factor, displacement power factor
Harmonics/spectrum	It displays the 2~13th harmonic distortions and total harmonic distortion with diagram.
Vector diagram	It displays three phase current, voltage with vector diagram.
Voltage MIN/MAX	It displays MIN value and MAX value about Voltage.

Measurement menu of GIPAM2000-T model.

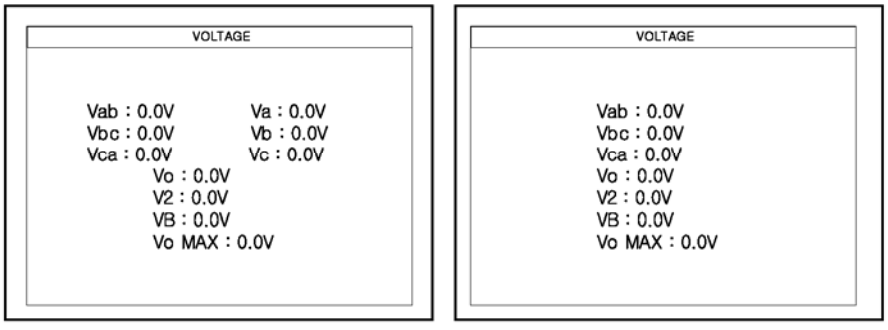
PHASE	Phase current, Differential current, Restraining current
ZERO PHASE CURRENT	Zero phase current and the peak value
VECTOR	Current vector diagram

1. MMI

How to operate the key.

	DISPLAY	EXPLAN	HANDLING METHOD
MENU	PROTECTIVE RELAY **MEASUREMENT** INCIDENT HISTORY DI, DO SUPERVISION SYSTEM CONFIG	The primary menu of GIPAM. This menu is the top menu.	Moving up/down : Up, down directional Key. Moving to lower menu: Select the menu user wants and put the enter key.
LOWER MENU	**VOLTAGE** CURRENT / FREQ PHASE POWER ENERGY POWER FACTOR / DPF HARMONICS / SPECTRUM VECTOR DIAGRAM VOLTAGE MIN/MAX	This menu displays all available measurements.	Moving menu to menu: Up, down directional key Moving to top menu: cancel key Moving to detail setting menu: Select the menu user want and put the enter key.
DETAIL	VOLTAGE Vab : 0.0V Va : 0.0V Vbc : 0.0V Vb : 0.0V Vca : 0.0V Vc : 0.0V Vo : 0.0V V2 : 0.0V VB : 0.0V Vo MAX : 0.0V	This menu displays details of each measurements .	Moving to upper menu: cancel key

Details are different by wiring type.



3P4W TYPE. 3P3W TYPE

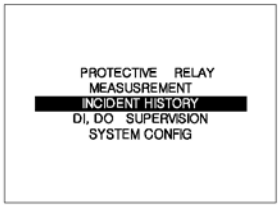
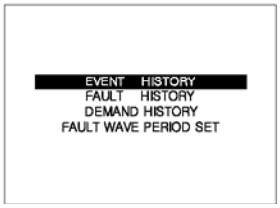
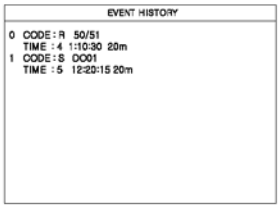
1-5-3. INCIDENT HISTORY

User can observe the information of EVENT, FAULT, DEMAND and set them in this menu. GIPAM2000 can save a total of 800 events and 200 faults information. And the device has demand information of W, VAR ,A. User can set up the time on the power demand menu from 5 minutes to 60 minutes with 5 unit. And can set up the time on the current demand menu from 10 seconds to 3600 seconds with 1 unit.
User can set up FAULT WAVE PERIOD (saved period) from 16 cycles to 512 cycles. The device can save the before and after wave of the fault. If user set up the FAULT WAVE PERIOD short, the number of saving will be increased. (max: 32)

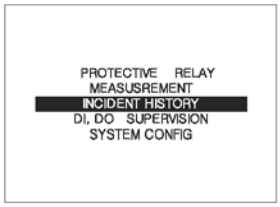
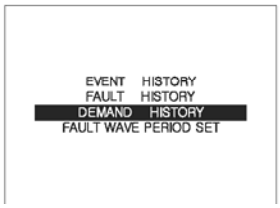
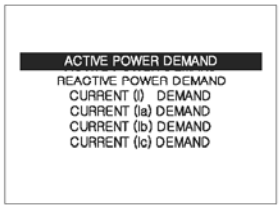
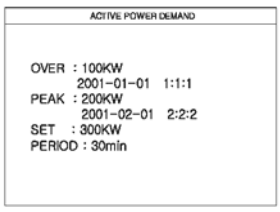
① The child menu of INCIDENT HISTORY

<table>
<tr><th>Child menu1</th><th>Child menu2</th><th>Contents</th></tr>
<tr><td colspan="2">EVENT HISTORY</td><td>It displays all events info (year, month, day, hour, minute, second, millisecond)</td></tr>
<tr><td colspan="2">FAULT HISTORY</td><td>It displays all faults info (year, month, day, hour, minute, second, millisecond) and fault wave</td></tr>
<tr><td rowspan="6">DEMAND HISTORY</td><td>CURRENT DEMAND</td><td rowspan="6">It saves the value and time info of demand.
User can set up the demand setting.
User can set up the time on the power demand menu from 5 minutes to 60 minutes with 5 unit. And can set up the time on the current demand menu from 10 seconds to 3600 seconds with 1 unit.</td></tr>
<tr><td>AC TVEPOWER DEMAND</td></tr>
<tr><td>REACTIVE POWER DEMAND</td></tr>
<tr><td>CURRENT(Ia) DEMAND</td></tr>
<tr><td>CURRENT(Ib) DEMAND</td></tr>
<tr><td>CURRENT(Ic) DEMAND</td></tr>
<tr><td colspan="2">FAULT WAVE PERIOD SET</td><td>User can set up the period of fault wave.
User can set up FAULT WAVE PERIOD (saved period) from 16 cycles to 512 cycles.</td></tr>
</table>

② how to operate the key in the EVENT & FAULT menu

	DISPLAY	EXPLAN	HANDLING METHOD
MENU		The primary menu of GIPAM. This menu is the top menu.	Moving up/down : Up, down directional Key. Moving to lower menu: Select the menu user wants and put the enter key.
LOWERMENU		This menu displays all available saved data -EVENT -FAULT -DEMAND	Moving menu to menu: Up, down directional key Moving to top menu: cancel key Moving to detail setting menu: Select the menu user want and put the enter key.
DETAIL		This menu displays Details of saved data It can display max 8 events and 6 faults on the screen.	Moving to upper menu: cancel key Moving to next page: right, left key (only EVENT, FAULT menu) Observing FAULT wave: Select the wave in list and click enter key.

③ DEMAND menu

	DISPLAY	EXPLAN	HANDLING
MENU		The primary menu of GIPAM. This menu is the top menu.	Moving up/down : Up, down directional Key. Moving to lower menu: Select the menu user wants and put the enter key.
LOWERMENU1		This menu displays the information of DEMAND	Moving menu to menu: Up, down directional key Moving to top menu: cancel key Moving to lower menu2 : Select the DEMAND HISTORY and put the enter key.
LOWERMENU2		This menu is available when user selects DEMAND menu on the lower menu1.	Moving menu to menu: Up, down directional key Moving to top menu: cancel key Moving to detail setting menu: Select the menu user want and put the enter key.
DETAIL		This menu displays the the information of demand. And user can set up the mode on this menu.	Moving to upper menu: cancel key Moving to next page: right, left key (only EVENT, FAULT menu) Observing FAULT wave: Select the wave in list and click enter key.

④ EVENT info display

GIPAM2000 displays info of EVENT & FAULTS as follows.

■ EVENT display

[EVENT No.] CODE: [EVENT type] [event information]

TIME: [EVENT TIME TAG]

1. EVENT No. : the order of latest EVENT. The small number means that this is latest EVENT.

2. EVENT type :

A: ALARM

R: RELAY operated.

S: STATUS

U: User managed.

3. EVENT information related with event type

3-1. The event related with RELAY elements

CODE: [R] [PU/OP] [RELAY elements] [I/T] [H/L] [REASON]

PU/OP: PU – RELAY pick – up.

OP – The RELAY operated.

RELAY elements: the relay element come about (it displayed with ANSI CODE)

I/T: I–instantaneous operation

T–time delay operation

H/L: H–HIGH SET, L–LOW SET

REASON: R,S,T– current and voltage

Vo, Io– zero phase current and voltage

V2. I2– negative seq. current and voltage

3-2. ALARM EVENT

CODE: [A] [DETAIL]

DETAIL: POWER FAIL– power failed

DIAG ERROE– system error

PRE ALARM– it means pre–alarm of all the relay elements.

NOT DEFINED– undefined operation was in the device

3-3. DI/DO EVENT

CODE: [S][DI/DO][ON/OFF][CHANGED DI/DO]

DI/DO: reason of the event

ON/OFF: action

CHANGED DI/DO: The number of changed DI/DO

3-4. and so on

CODE: [The information]

The information: it descriptions about the event directly.

■ FAULT display

[FAULT No.] CODE: [FAULT information related with FAULT type]

VALUE: [current, voltage value related with FAULT type]

TIME: [FAULT TIME TAG]

1. FAULT No. : the order of latest FAULT. The small number means that this is latest FAULT.

2. FAULT information related with fault type

CODE: [RELAY ELEMENT][INST/TIME][LOW/HIGH][R S T]

RELAY elements: the relay element come about

(it displayed with ANSI CODE)

IST/TIME: IST-instantaneous operation

TIME-time delay operation

HIGH/LOW: HIGH-HIGH SET, LOW-LOW SET

R S T: The phase where the fault generated

3. The voltage, current value of FAULT related with fault type

VALUE: [The voltage, current value of FAULT related with fault type]

It displays the fault value.

ANSI CODE	DISPLAY VLAUE	ANSI CODE	DISPLAY VLAUE
50/51	Phase Current	59	Phase Voltage
50/51G	Ground Current	64	Zero Voltage
47(NSOCR)	Negative Current	46	Negative Current
27R	Vb Voltage	68	2th harmonic Current
27	Phase Voltage	49	Phase Current
67N	Zero Current	51LR	Phase Current

4. Fault time tag

TIME: [THE TIME FAULT happened]

THE TIME FAULT happened: YEAR, MONTH, DAY, HOUR, MINUTE, SECOND, MILLI SECOND.

1-5-4. DI, DO SUPERVISION

GIPAM-2000 has 21 DI(DIGITAL INPUT POINT) and 20 DO(DIGITAL OUTPUT POINT). User can set up all functions of DI, DO and observe all status of DI, DO. And also can set the PLC input register.

① The child menu of DI, DO SUPERVISION

CHILD MENU	CONTENTS
DI MONITORING	User can observe DI status in this menu. The renewal time is 1 second It displays the DI with picture.
DO MONITORING	User can observe DO status in this menu. The renewal time is 1 second It displays the DO with picture.
PLC REG CONTROL	User can set the PLC input register in this menu. Available setting: status of Control Contact
DI EVENT SET	User can set the DI point which will be saved in history.
DO EVENT/FAULT SET	User can set the DO point which will be saved in history & fault.
DI FUNCTION SET	It displays the use of DI (ex: general DI, recloser use, CB2)
DO FUNCTION SET	It displays the use of DO (ex: general DO, recloser use, CB2) and user can set up the use of DO(PO, CB2)

② KEY INTERFACE

DI MONITORING. DO MONITORING

<table>
<tr><th></th><th>DISPLAY</th><th>EXPLAN</th><th>HANDLING</th></tr>
<tr><td>M
E
N
U</td><td>PROTECTIVE RELAY
MEASUSREMENT
INCIDENT HISTORY
DI, DO SUPERVISION
SYSTEM CONFIG</td><td>The primary menu
of GIPAM.
This menu is the
top menu.</td><td>Moving up/down :
Up, down directional
Key.
Moving to lower menu:
Select the menu user
wants and put the enter key.</td></tr>
<tr><td>L
O
W
E
R
M
E
N
U
1</td><td>DI MONITORING
DO MONITORING
PLC REG CONTROL
DI EVENT SET
DO EVENT/FAULT SET
DI FUNCTION SET
DO FUNCTION SET</td><td>This menu displays DI/DO
status and user can set up in
this menu</td><td>Moving menu to menu:
Up, down directional key
Moving to top menu: cancel key
Moving to detail setting menu:
Select the menu user want and
put the enter key.</td></tr>
<tr><td>L
O
W
E
R
M
E
N
U
2</td><td>INPUT PORT
50B CB1 DI23
51B CB1 DI24
DI03 DI31
DI04 DI32
DI11 DI33
DI12 DI34
DI13 DI35
DI14 DI36
DI21 DI37
DI22 DI38</td><td>This menu displays DO status
with picture</td><td>Moving to upper menu: cancel key</td></tr>
</table>

DI MORNITORING and DO MORNITORING is a supervision menu. It renews the DO/DI status at 1 second interval.

1. MMI

DI MORNITORING and DO MORNITORING is a supervision menu. It renews the DO/DI status at 1 second interval.

PLC REG CONTROL, DI EVENT SETE, DO EVENT/FAULT SET
DI FUNCTION SET, DO FUNCTION SET menu.

	DISPLAY	EXPLAN	HANDLING
MENU	PROTECTIVE RELAY MEASUSREMENT INCIDENT HISTORY **DI, DO SUPERVISION** SYSTEM CONFIG	The primary menu of GIPAM. This menu is the top menu.	Moving up/down : Up, down directional Key. Moving to lower menu: Select the menu user wants and put the enter key.
LOWERMENU	DI MONITORING DO MONITORING PLC REG CONTROL **DI EVENT SET** DO EVENT/FAULT SET DI FUNCTION SET DO FUNCTION SET	User can save the value of PLC input register value and set the DI,DO point which will be saved in history. This menu displays the use of DI,DO.	Moving menu to menu: Up, down directional key Moving to top menu: cancel key Moving to detail setting menu: Select the menu user want and put the enter key.
DETAIL	**DI EVENT SET** [ ] DI01 – 52A : CB1 MONITOR [ ] DI02 – 52B : CB1 MONITOR [ ] DI03 – 52A : CB2 MONITOR [ ] DI04 – 52B : CB2 MONITOR [ ] DI11 – 63CB : RECLOSE [ ] DI12 – 43RC : RECLOSE [ ] DI13 – EXT RECLOSER SYNC [ ] DI14 – EXT RECLOSER INIT [ ]DI21 [ ]DI22 [ ]DI23 [ ]DI24 [ ]DI31 [ ]DI32 [ ]DI33 [ ]DI34 [ ]DI35 [ ]DI36 [ ]DI37 [ ]DI38	User can set the PLC control contact and the use of DI,DO point.	Moving to upper menu: cancel key

※ DI, DO function set is related with EVENT, FAULT. So user cant set up EVENT, FAULT setting in some cases.

	Function setting	DI, DO EVENT/FAULT saved function	
DO FUNCTION SET [CB2 or PO]	CB2 (It is used to control CB.)	DI03,DI04	EVENT: Default . This is unchangeable(52A,52B)
		PO Fault/Event	FAULT, EVENT: Default . This is unchangeable.
	PO (It is used for general POWER OUT)	DI03,DI04	EVENT: user changeable
		PO Fault/Event	FAULT: Default . EVENT: user changeable
PROTECTIVE RELAY [RECLOSING ON/OFF]	RECLOSING 'ON'	DO11~DO15	EVENT: Default . This is unchangeable(RCL function)
		DI11,DI12	EVENT: Default . This is unchangeable(RCL function)
		DI13,DI14	EVENT: user changeable. (RCL function on/off)
	RECLOSING 'OFF' (used for general DLDO)	DO11~DO15	EVENT: user changeable
		DI11,DI12	EVENT: user changeable
		DI13,DI14	EVENT: user changeable

1-5-5. SYSTEM CONFIG

User can set up the system on SYSTEM CONFIG menu. And this menu displays information of communication.

① child menu of SYSTEM CONFIG

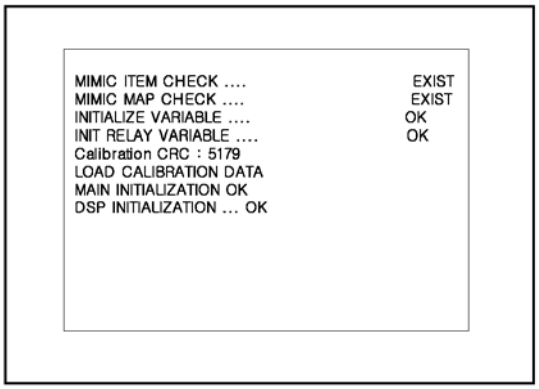
Child menu	Function
RELAY CONFIGURATION	Changeable menu: PT RATIO, CT RATIO, GPT RATIO, WIRNG TYPE, FREQUENCY AUTO RESET ON/OFF
COMMUNICATION	Changeable menu: I-NET ADDRESS, DNP ADDRESS, DNP BAUD RATE Supervision menu: the type of communication card.(the type is displayed when the device powered on)
CB FAIL CHECK	Changeable menu: trip relay checking on/off, the interval of checking, trip circuit checking on/off
SYSTEM INFORMATION	Changeable menu: device ID, TIME DATE
ENVIRONMENT CONFIG	Supervision menu: the hardware version, MMI software information, DSP software Information, the version of communication software, used period

② KEY INTERFACE

	DISPLAY	EXPLAN	HANDLING
MENU	PROTECTIVE RELAY MEASUSREMENT INCIDENT HISTORY DI, DO SUPERVISION SYSTEM CONFIG	The primary menu of GIPAM. This menu is the top menu.	Moving up/down : Up, down directional Key. Moving to lower menu: Select the menu user wants and put the enter key.
LOWERMENU	RELAY CONFIGURATION COMMUNICATION CB FAIL CHECK ENVIRONMENT CONFIG SYSTEM INFORMATION BURDEN INFORMATION	User can observe system on config menu	Moving menu to menu: Up, down directional key Moving to top menu: cancel key Moving to detail setting menu: Select the menu user want and put the enter key.
DETAIL	DEVICE CONFIGURATION PT RATIO PRI : 110 SEC : 110 GPT RATIO [√]Vn [ ]Vn•r3 CT RATIO PRI : 5 SEC : 5 NCT RATIO [ ]PRI : 5 SEC : 5 WIRING:3P4W Wye FREQ:60Hz [ ]PTF	This is a detail menu.	Moving to upper menu: cancel key Moving: right/left key Setting value: up/down key Saving the changed value: F2 key

1-5-6. Initialization

GIPAM2000 initializes inner variables memory and loads the saved setting value. And it displays the primary DSP setting.



MESSAGE on the primary DSP display

■ MIMIC ITEM CHECK

It displays whether MIMIC picture data is there or not. If mimic data exists, it displays "EXIST". And if mimic data doesn't exist, it displays "NONE".

■ MIMIC MAP CHECK

It confirms whether MIMIC MAP data is or not. MIMIC map means block plan drawn by user. If mimic data exist, it displays "EXIST". And if mimic data doesn't exist, it displays "NONE".

■ INITIALIZE VARIABLE

It initializes various variables for operating device.

■ INIT RELAY VARIABLE

It loads the data of saved setting data. If this is the first operating, device sets all value Max and uncheck all relay elements.

■ Calibration CRC : 1234

It displays CRC of calibration data. It is different from all devices. If this value has error, device initializes by itself.

■ LOAD CALIBRATION DATA

If calibration CRC data is available, RAM loaded. If calibration CRC data is not available, it displays "CALIBRATION DATA RESET TO 0".

■ MAIN INITIALIZATION OK

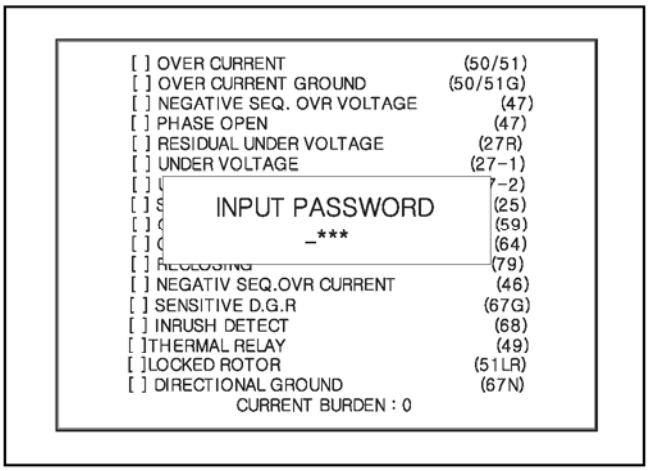
MAIN MMI CPU reset is ok.

■ DSP INITIALIZATION

It displays whether DSP initialization is ok or not. If DSP initialization is not available, it displays "NONE" and device can not be operated normally.

1-5-7. PASSWORD INPUT MENU

User can see following picture 'input password' when user change values or erase data. And for 10 minutes, it is unnecessary to input password. (The password can be changed at ENVIRONMENT CONFIG MENU.)



PASSWORD INPUT interface

Left/right key: moving the cursor.

Up/down key: changing the value.

E key: input complete.

C key: cancel

※ E key is enable when the cursor is right end.

1-5-8. LCD BACK LIGHT

If there is no input command for 15 minutes, the LCD back light will be turned off.

And if user inputs command again, it will be turned on.

※ If WIRING setting or communication setting is changed, user must RESET the device (power off)

2. PC interface (program option)

2-1 SUMMARY

This program supports user to set up GIPAM2000 and monitor the device operation.
For the program, user must connect PC and GIPAM2000 with serial port.

This program is provided with GIPAM2000. this program is specified with Win9X, Windows NT systems.

• Installation

1. Insert CD to the CD-rom and click setup.exe file.
2. Follow the program guidance.
3. User can select install folder. The default is 'C:₩PROGRAM₩LSIS₩GIPAM-2000 Setting'

The program name is G2K MANAGER.exe and the manual file guide.doc will be created automatically. And PLC manager program 'GMWIN' will be installed too.

2-2 PROGRAM operation

To operating program, follow the instructions.

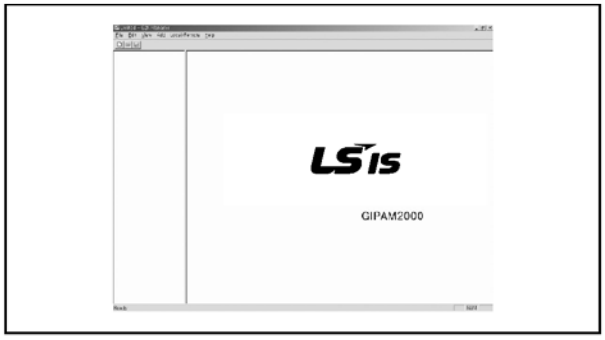
1. GIPAM2000 power ON

GIPAM2000 can operate with AC/DC 88~256V without tab or conversion switch.
But, DI input voltage is AC/DC 110V. Pay special attention to DI input and wiring.
And FRAME GROUND(F.G) must be confirmed.

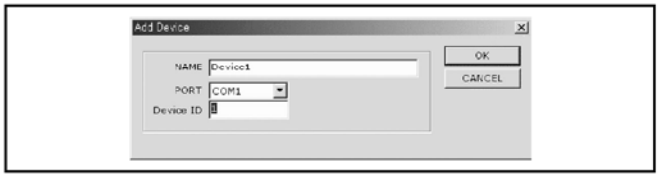
2. Connect the IrDA cable to PC serial port and put the IrDA device head to GIPAM2000 IrDA port. This device uses infrared rays to communicate with PC.

2. PC interface (program option)

Operate PC program. Following picture will be displayed.



To connect program with GIPAM2000, user must register GIPAM2000 to this program. Select and click Add/Device, following picture will be displayed.

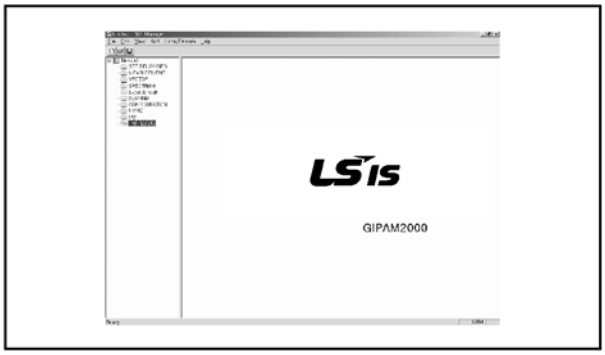


• NAME: user can input device name wants. Default name is 'Device1'.

• PORT: user must select serial port which used in PC in this menu. Default is 'COM1'.

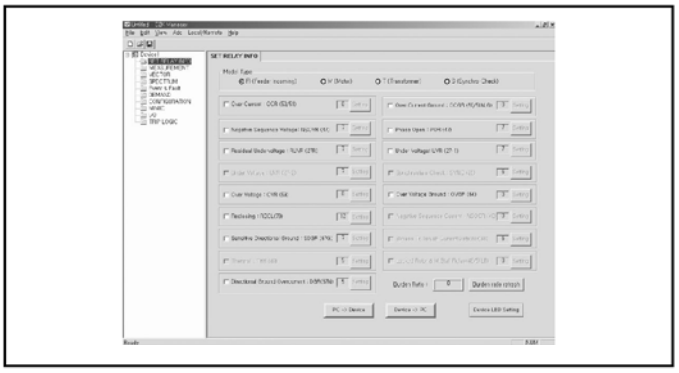
• Device ID: user must input the device ID of GIPAM2000. Device ID can be set up or supervised in SYSTEM CONFIG>ENVIRONMENT CONFIG menu in GIPAM2000.

And click OK, program will display follow picture.



SET RELAY INFO:

This menu provides relay elements setting function. Double click to use.



User can set up the 17 relay elements and change the values. If user wants to upload the changed values from PC to GIPAM, click PC->Device. And user can supervise the set value in GIPAM2000 by clicking Device->PC.

SETTING INTERFACE

1. The available relay elements are different by GIPAM2000 model type. Model type can be checked by clicking Device->PC.
2. Check the relay elements user wants. The setting button of each relay elements will be activated.
3. Click the setting button of each relay elements. And the setting window will be opened.
4. Set up properly and click OK.

- Instantaneous Char.: instantaneous characteristic
- op. time: operation time
- Time delay char: time delay characteristic
- Definite: definite time delay
- SI: standard inverse time delay
- VI: very inverse time delay
- EI: extremely inverse time delay
- LI: long inverse time delay

2. PC interface (program option)

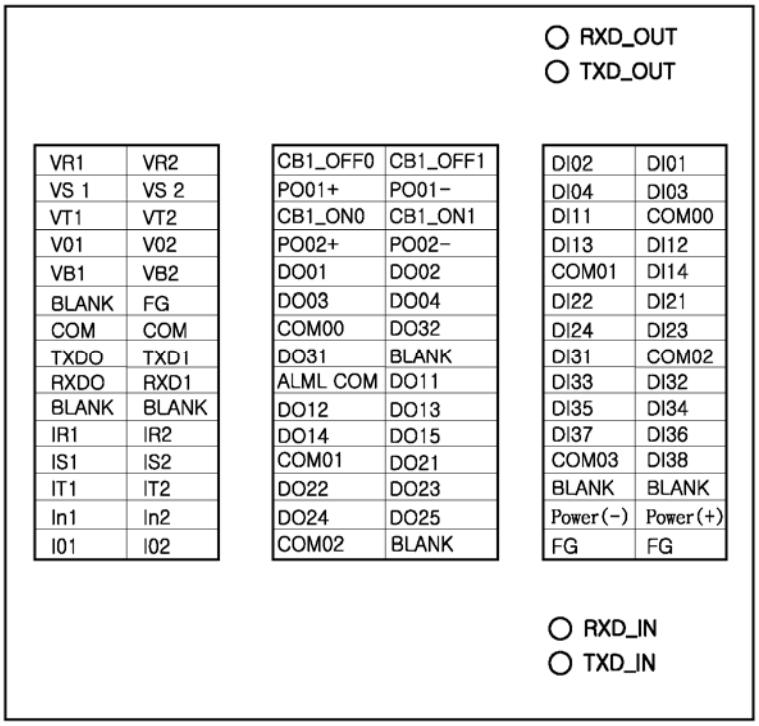
- KEPCO SI: Korea electricity SI
- KEPCO VI: Korea electricity VI

Each instantaneous or time delay has LOW set and HIGH set.

3-1 Terminal block

All connection blocks are located in behind of the GIPAM2000.

GIPAM2000 – FI/M



VR1	VR2
VS 1	VS 2
VT1	VT2
V01	V02
VB1	VB2
BLANK	FG
COM	COM
TXDO	TXD1
RXDO	RXD1
BLANK	BLANK
IR1	IR2
IS1	IS2
IT1	IT2
In1	In2
I01	I02

CB1_OFF0	CB1_OFF1
PO01+	PO01–
CB1_ON0	CB1_ON1
PO02+	PO02–
DO01	DO02
DO03	DO04
COM00	DO32
DO31	BLANK
ALML COM	DO11
DO12	DO13
DO14	DO15
COM01	DO21
DO22	DO23
DO24	DO25
COM02	BLANK

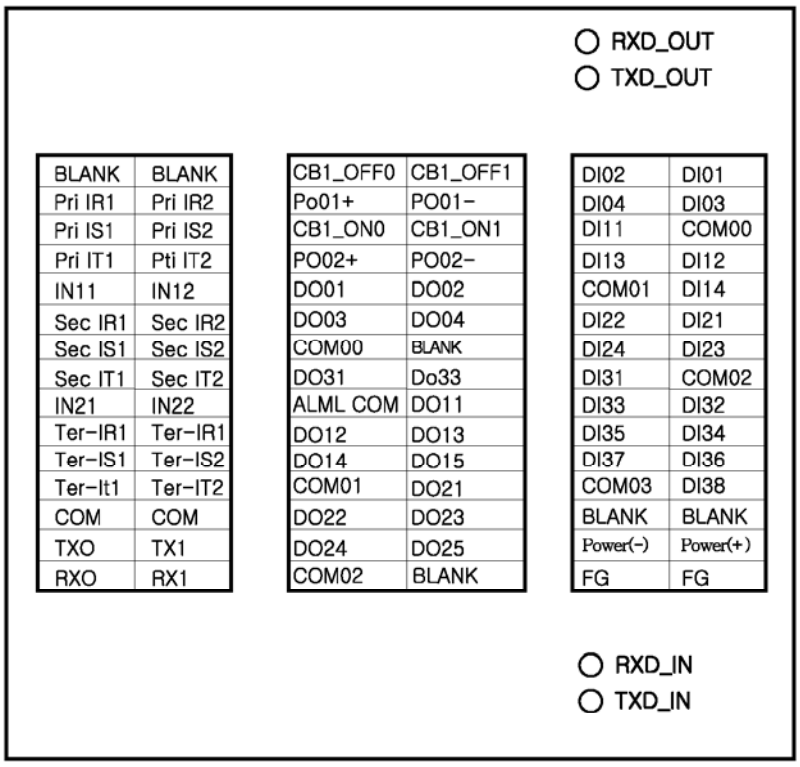
DI02	DI01
DI04	DI03
DI11	COM00
DI13	DI12
COM01	DI14
DI22	DI21
DI24	DI23
DI31	COM02
DI33	DI32
DI35	DI34
DI37	DI36
COM03	DI38
BLANK	BLANK
Power(-)	Power(+)
FG	FG

3. User interface

Input/output terminal interface. (FI/M TYPE)

terminal	number	Default use	Available use	remark
DI01	1	CB21status input(52a)	Default	
DI02	16	CB2 status input(52b)		
DI03	2	General DI	CB2 status input(52a)	It is available only when user sets PO to Trip in trip logic
DI04	17	General DI	CB2 status input(52b)	
DI11	18	General DI	Input for 63CB	user must set the wire when the 79(reclosing) relay Elements used
DI12	4	General DI	Input for 43RC	
DI13	19	General DI	General DI	79 sequence will start only when Logic high input
DI14	5	General DI	Ext. Reclosing init input	This contact can be used for variety use
DI21 ~DI38		General DI	General DI	
CB1_OFF0	46	output	Default	
CB1_OFF1	31			
CB1_ON0	48	output		
CB1_ON1	33			
PO01+	47	output	output	This contact can be used for CB2 only when PO set to Trip in trip logic
PO01-	32			
PO02+	49	output	output	
PO02-	34			
DO01	50	50/51(OCR)	General DO	50/51(OCR) — M-type output(Default) All port is possible to use for general DO.
DO02	35	50/51(OCGR)	General DO	50/51(OCGR)
DO03	51	67G/N(SGR/DGR)	General DO	67G/N(SGR/DGR)
DO04	36	27(UVR-Latch)	General DO	27(UVR-Latch)
DO11	39	27R(R-UVR)	79 Ready	46(NSOCR)
DO12	55	47P(POR)	79 Success	47P(POR)
DO13	40	47N(NSOVR)	79 Fail	47N(NSOVR)
DO14	56	General DO	79 Process	49(TTR)
DO15	41	General DO	79 Cancel	48/51LR
DO21	42	59(OVR)	General DO	General DO
DO22	58	64(OVGR)	General DO	General DO
DO23	43	27(UVR-Pulse)	General DO	27(UVR-Pulse)
DO24	59	86X(Lock-out)	General DO	86X(Lock-out)
DO25	44	BUZZER	General DO	BUZZER
DO31	53	DIGN-ERR	General DO	Self-diagnosis Alarm
DO32	37	PWR-FAIL	General DO	Power fail Alarm

GIPAM2000 – T



BLANK	BLANK
Pri IR1	Pri IR2
Pri IS1	Pri IS2
Pri IT1	Pti IT2
IN11	IN12
Sec IR1	Sec IR2
Sec IS1	Sec IS2
Sec IT1	Sec IT2
IN21	IN22
Ter-IR1	Ter-IR1
Ter-IS1	Ter-IS2
Ter-It1	Ter-IT2
COM	COM
TXO	TX1
RXO	RX1

CB1_OFF0	CB1_OFF1
Po01+	PO01-
CB1_ON0	CB1_ON1
PO02+	PO02-
DO01	DO02
DO03	DO04
COM00	BLANK
DO31	Do33
ALML COM	DO11
DO12	DO13
DO14	DO15
COM01	DO21
DO22	DO23
DO24	DO25
COM02	BLANK

DI02	DI01
DI04	DI03
DI11	COM00
DI13	DI12
COM01	DI14
DI22	DI21
DI24	DI23
DI31	COM02
DI33	DI32
DI35	DI34
DI37	DI36
COM03	DI38
BLANK	BLANK
Power(-)	Power(+)
FG	FG

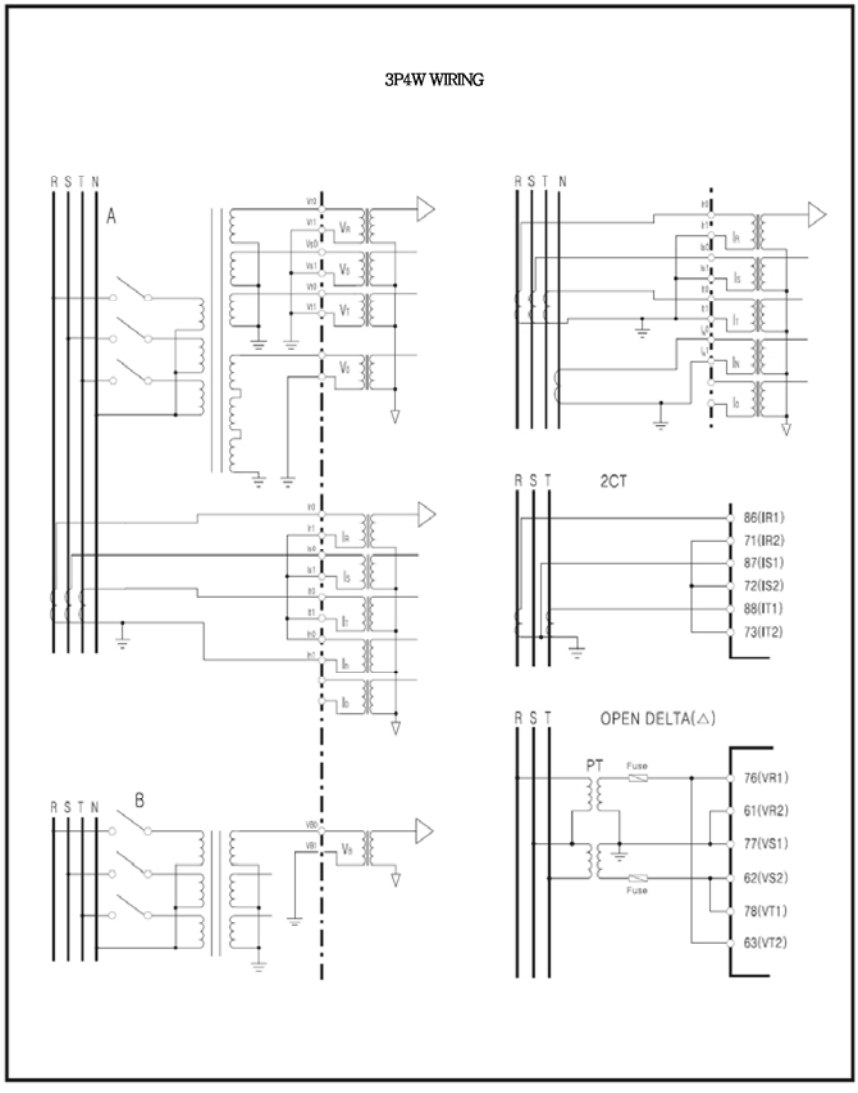
3. User interface

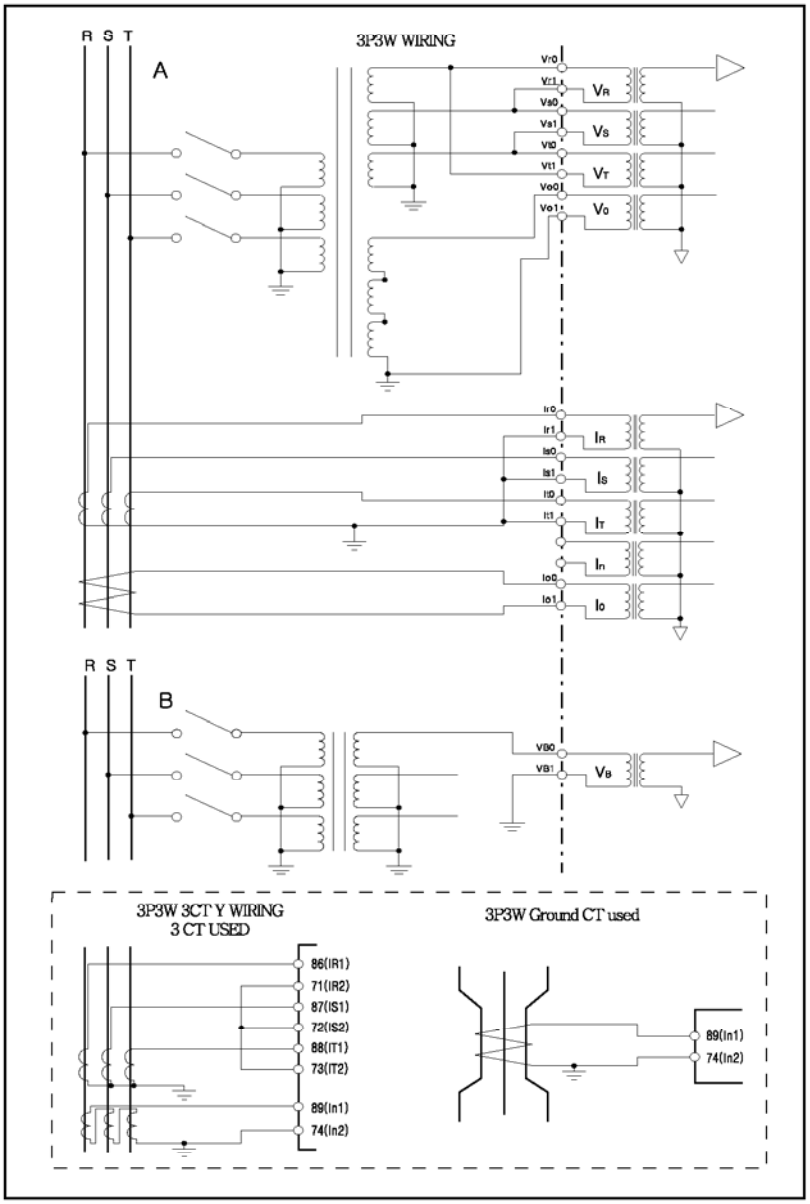
Input/output terminal interface. (T TYPE)

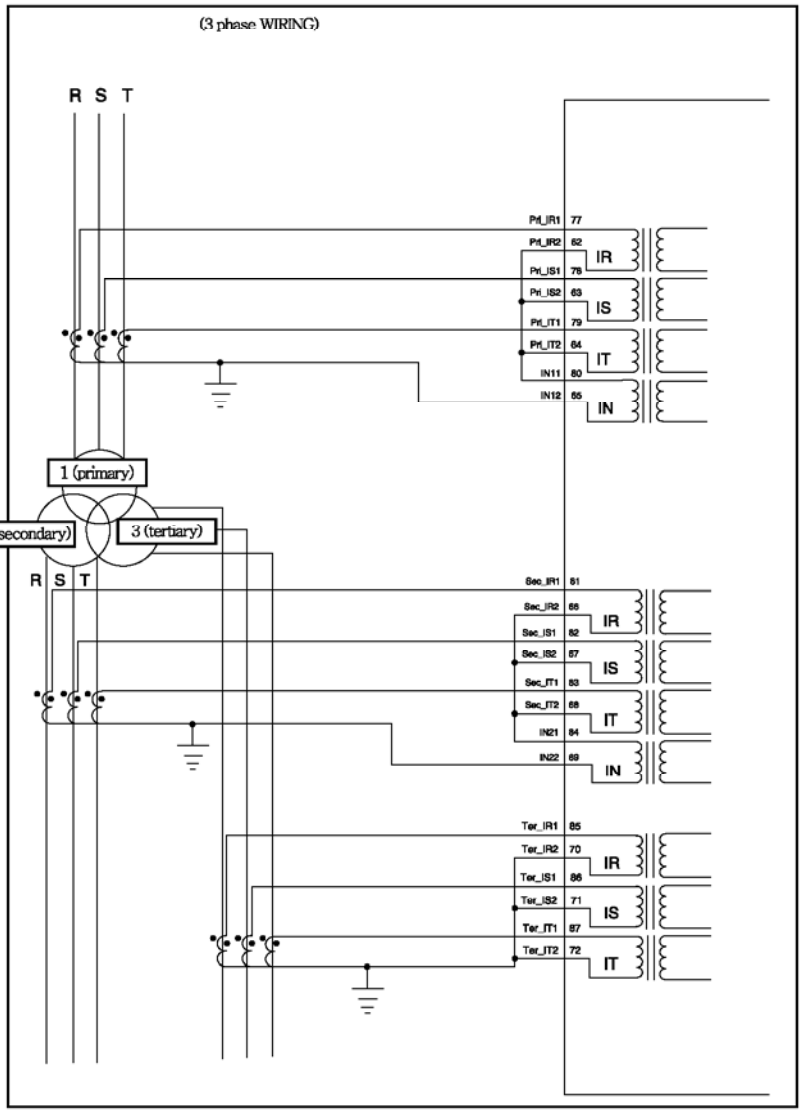
terminal	number	Default use	Available use	remark
DI01	1	CB21status input(52a)	Default	
DI02	16	CB21status input(52b)		
DI03	2	General DI	CB2 status input(52a)	This contact can be used for CB2 only when PO set to Trip in trip logic
DI04	17	General DI	CB2 status input(52b)	
DI11 ~DI38		16 General DI	16 General DI	This contact can be used for variety use
CB1_OFF0	46	CB1 OFF output	Default	
CB1_OFF1	31			
CB1_ON0	48	CB1 ON output		
CB1_ON1	33			
PO01+	47	POWER OUT 1 output	CB2 OFF output	This contact can be used for CB2 only when PO set to Trip in trip logic
PO01−	32			
PO02+	49	POWER OUT 2 output	CB2 ON output	
PO02−	34			
DO01	50	OCR1ALARM	General DO	
DO02	35	OCR2ALARM	General DO	
DO03	51	OCR3ALARM	General DO	
DO04	36	DFR ALARM	General DO	
DO11	39	General DO	General DO	
DO12	55	General DO	General DO	
DO13	40	OCGR1 ALARM	General DO	
DO14	56	OCGR2 ALARM	General DO	
DO15	41	General DO	General DO	
DO21	42	General DO	General DO	
DO22	58	General DO	General DO	
DO23	43	General DO	General DO	
DO24	59	86X (Lock-out)	General DO	
DO25	44	BUZZER	General DO	
DO31	53	DIAG_ERR	General DO	Self-diagnosis Alarm
DO32	37	PWR_FAIL	General DO	Power fail Alarm

3-2 CT/ PT INPUT INTERFACE

CT rating current : 5A/1A (Io : 1.5mA)
PT rating voltage : 110V (Vo : 190V, 190/√3[V])

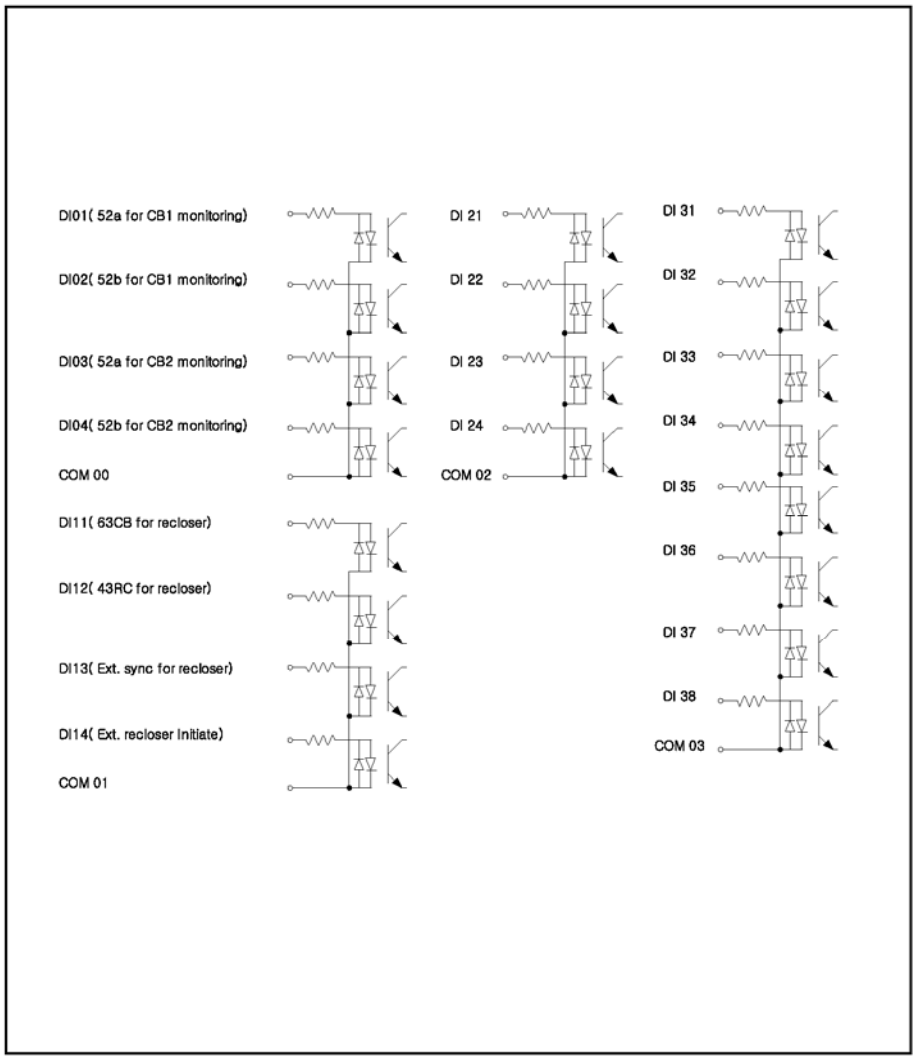



R S T
A
3P3W WIRING
Vr0
Vr1
Vs0
Vs1
VT0
Vt1
Vo0
Vo1
VR
VS
VT
VO
Ir0
Ir1
Is0
Is1
IT0
It1
In0
Io1
IR
IS
IT
In
Io
R S T
B
VB0
VB1
VB
3P3W 3CT Y WIRING
3 CT USED
86(IR1)
71(IR2)
87(IS1)
72(IS2)
88(IT1)
73(IT2)
89(In1)
74(In2)
3P3W Ground CT used
89(In1)
74(In2)


(3 phase WIRING)
R S T
Pri_IR1 77
Pri_IR2 62
IR
Pri_IS1 78
Pri_IS2 63
IS
Pri_IT1 79
Pri_IT2 64
IT
IN11 80
IN12 65
IN
1 (primary)
2 (secondary)
3 (tertiary)
R S T
Sec_IR1 81
Sec_IR2 66
IR
Sec_IS1 82
Sec_IS2 67
IS
Sec_IT1 83
Sec_IT2 68
IT
IN21 84
IN22 69
IN
Ter_IR1 85
Ter_IR2 70
IR
Ter_IS1 86
Ter_IS2 71
IS
Ter_IT1 87
Ter_IT2 72
IT

3-3 DIGITAL INPUT INTERFACE

The digital input contacts are common use for AC/DC and rating range is 110V/220.
But chattering can be generated within 85~95V.



3-4 DIGITAL OUTPUT INTERFACE

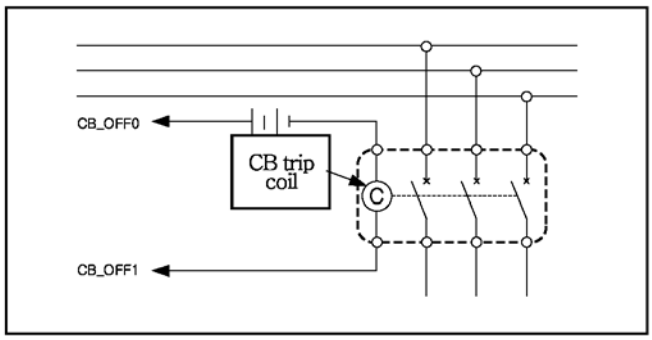
The rating value of digital output contacts is AC250V / 16A or DC30V / 16A(each register loaded)in case of CB control used. And it will be AC250V / 8A or DC30V / 8A in case of induction loaded. The capacity of make and break is AC4000VA max, DC480W max in case of register loaded and AC2000VA max, DC240W max in case of induction loaded.($\cos\theta$ = 0.4, L/R = 7ms). CB control relay is the contact to out the signal when the relay elements trip or do returning operation. And user can set the LOGIC of trip and returning operation.

The output contacts excepting CB controlling contact have AC250V / 5A or DC30V / 5A(each register loaded) rating value. And it will be AC250V 2A or DC30V / 2A.($\cos\theta$ = 0.4, L/R = 7ms). The capacity of make and break is AC1250VA max, DC150W in case of register loaded and AC500VA max, DC60W max in case of induction loaded.($\cos\theta$ = 0.4, L/R = 7ms).

The contacts(RCL _SUCC, RCL _FAIL, RCL _PROC) can be used as general contacts in case that Recloser(79) relay element is not used. The general contacts can be used as various logic types by PLC program.

1) CB trip sequence monitoring
CB1_OFF contacts is specified to CB trip. It can supervise the CB operation coil circuit with CB _OFF contact.
If there is some error, system operates the DIGN_ERR contact and memory save the event and also LCD displays the ERROR.

ATTENTION) If user uses PO 01 contact for CB trip sequence monitoring, user must set the CB2_OFF and CB2_ON to '1' on the Dedicated I/O setting menu.
And if user want to use Back trip function to supervise the CB tripping, user must set the contacts(DI01 or DI02 or DI03 or DI04)to '1'. Supervision(TCS,TRS) is not available if there is any device between CB trip coil and CB_OFF contact. So user must set the PLC LOGIC suitably.

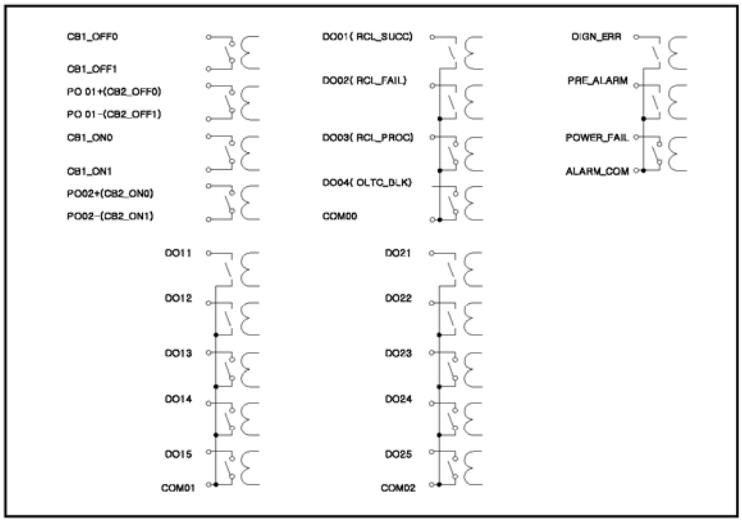


2) (on the output board) CB_OFF Relay contact.

It can supervise the CB1_OFF relay and CB2_OFF relay error at regular interval.

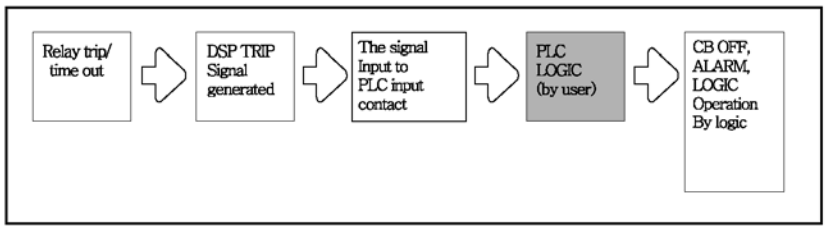
If there is some error, system operates the DIGN_ERR contact and save the event and also LCD displays the error. This function can be used by setting CB auto check and setting the CB_OFF relay check interval value. And the check can be done by manually.

ATTENTION) This function can be used only when the CB Trip Sequence is set up.



• PLC program

GIPAM2000 has PLC program logic which is constructed by user. And GIPAM is operated by the PLC logic. The logic includes all contacts and that is constructed on 'GMWIN' program. If user constructs logic on GMWIN, user must download the logic to GIPAM.



The PLC input/output contact table.

GIPAM2000 input contact	PLC input address
DI14	IX0.0.0
DI13	IX0.0.1
DI12	IX0.0.2
DI11	IX0.0.3
DI04	IX0.0.4
DI03	IX0.0.5
DI02	IX0.0.6
DI01	IX0.0.7
DI34	IX0.0.8
DI33	IX0.0.9
DI32	IX0.0.10
DI31	IX0.0.11
DI24	IX0.0.12
DI23	IX0.0.13
DI22	IX0.0.14
DI21	IX0.0.15
DI38	IX0.0.20
DI37	IX0.0.21
DI36	IX0.0.22
DI35	IX0.0.23

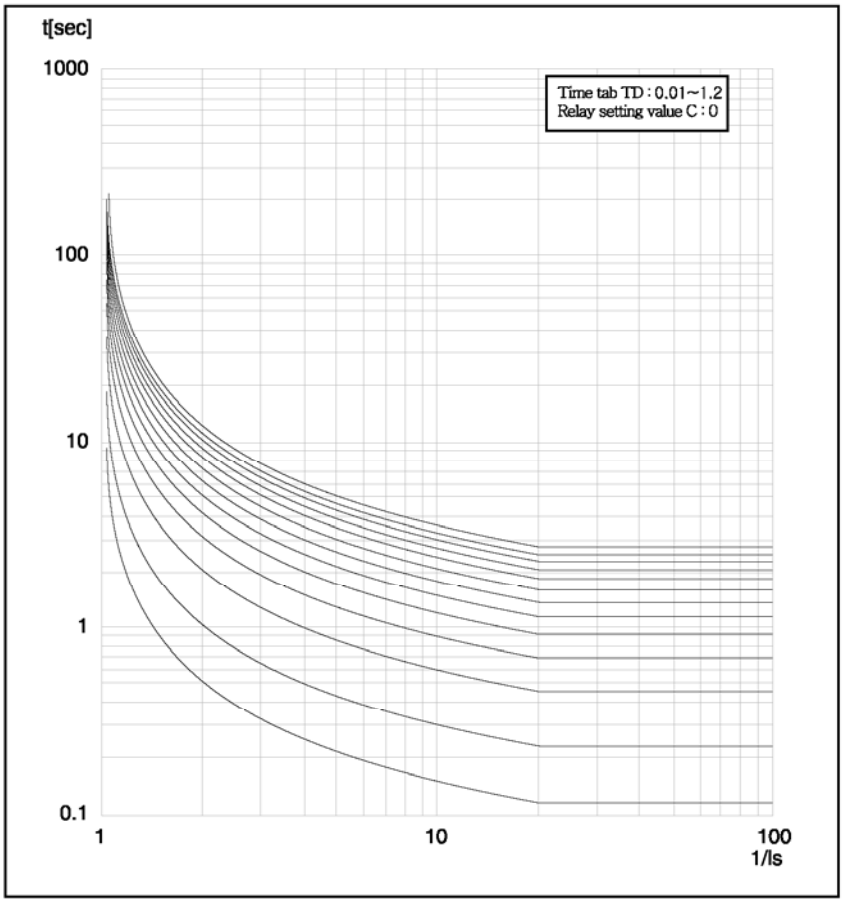
GIPAM2000 input contact	PLC input address
P001	QX0.0.0
P002	QX0.0.1
CB1 ON	QX0.0.2
CB1 OFF	QX0.0.3
D011	QX0.0.4
D012	QX0.0.5
D013	QX0.0.6
D014	QX0.0.7
D015	QX0.0.8
D021	QX0.0.9
D022	QX0.0.10
D023	QX0.0.11
D024	QX0.0.12
D025	QX0.0.13
D002	QX0.0.14
D001	QX0.0.15
D003	QX0.0.16
D031	QX0.0.17
D032	QX0.0.18
D004	QX0.0.19
RESERVE	QX0.0.20
RESERVE	QX0.0.21

3. User interface

※ The CB ON / OFF switch which is on the front cover of GIPAM2000 and their PLC address

GIPAM-2000 CB ONO FF Switch	PLC Input Address
CB1 ON SW	IX0.2.3
CB1 OFF SW	IX0.2.4
CB2 ON SW	IX0.2.5
CB2 OFF SW	IX0.2.6

4-1 Standard Inverse Time - SI

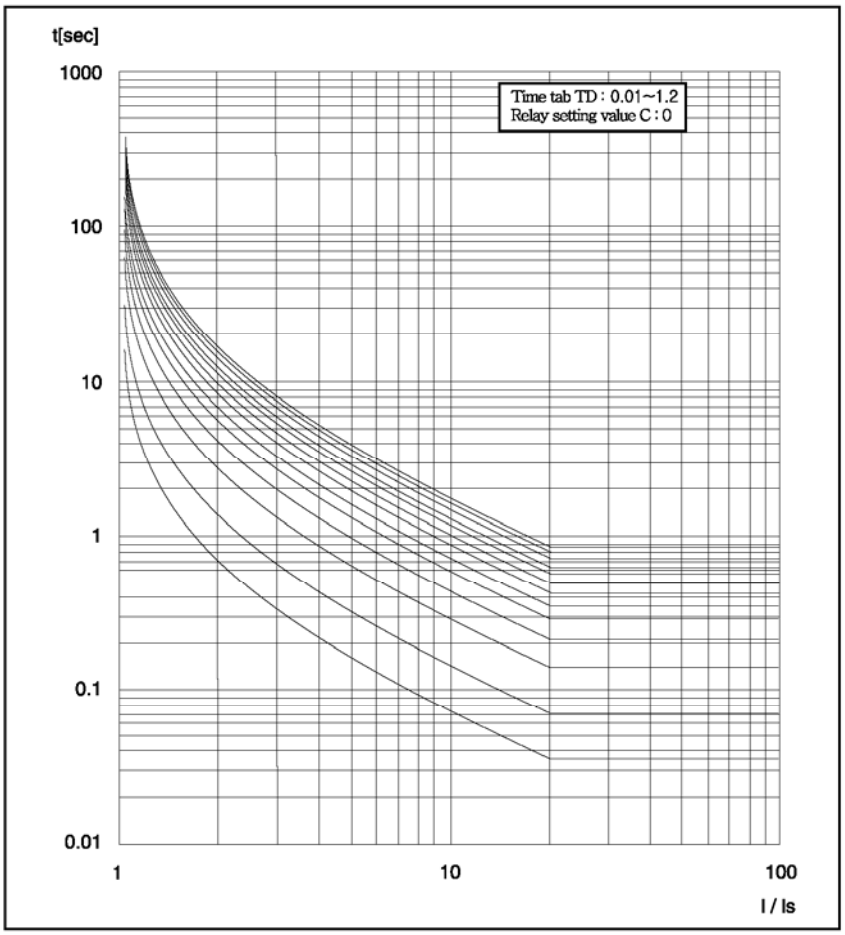


$$t = \frac{0.14}{(I/Is)^{0.02} - 1} \times TD + C$$

t = operating time
I = fault value
Is = setting value
TL = Time Lever

※ OCR(50/51, TD : 0.05~1.2), OCGR(50/51N, TD : 0.05~1.2)
OVGR(64, TD : 0.05~1.0), NSOCR(46, TD : 0.05~1.0)
OVR(59,TD:0.01~1.2)

4-3 Very Inverse Time - VI

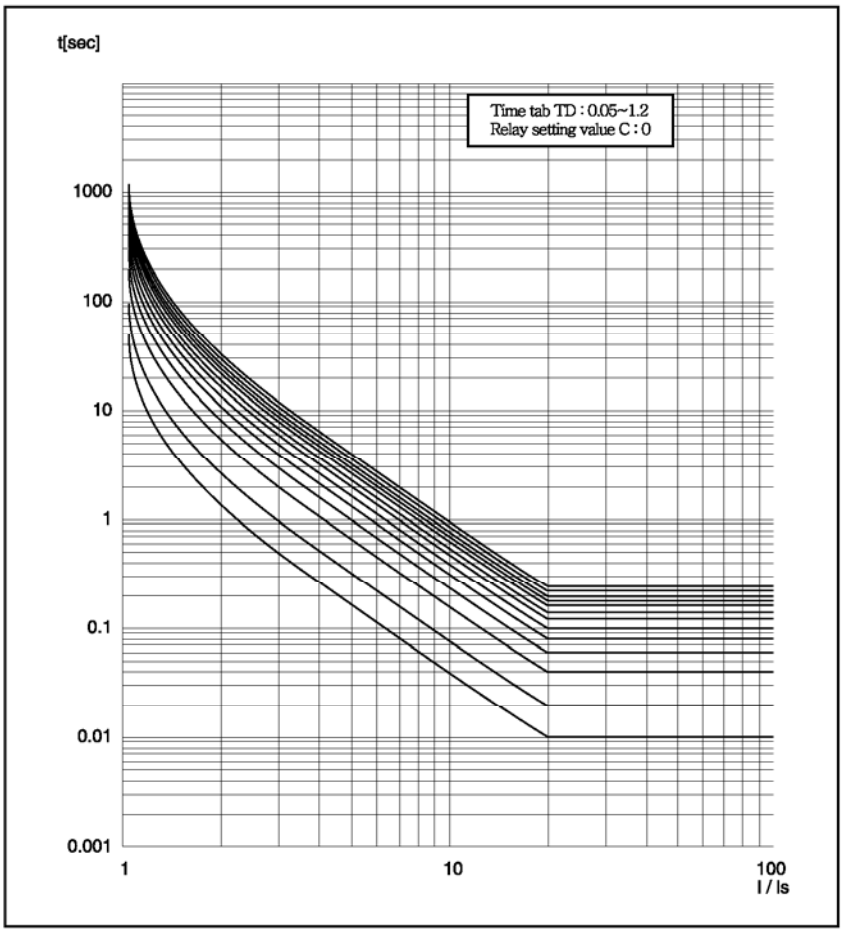


$$t = \frac{13.5}{(I/Is)^{1}} \times TD + C$$

t = operating time
I = fault value
Is = setting value
TL = Time Lever

※ OCR(50/51, TD : 0.05~1.2), OCGR(50/51N, TD : 0.05~1.2)
OVGR(64, TD : 0.05~1.0), NSOCR(46, TD : 0.05~1.0)
OVR(59, TD:0.01~1.2)

4-5 Extremely Inverse Time - EI



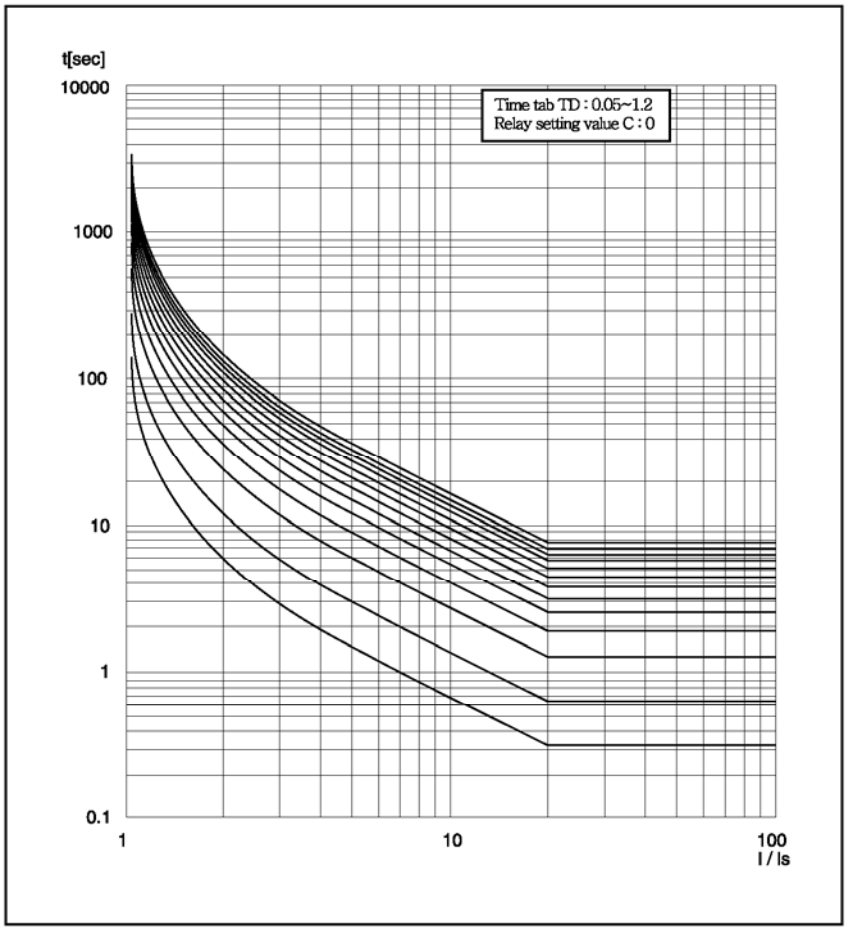
$$t = \frac{80}{(I/Is)^2 - 1} \times TD + C$$

t = operating time
I = fault value
Is = setting value
TL = Time Lever

※ OCR(50/51, TD : 0.05~1.2), OCGR(50/51N, TD : 0.05~1.2)
OVGR(64, TD : 0.05~1.0), NSOCR(46, TD : 0.05~1.0)

4. Characteristic Curve

4-6 Long Inverse Time - LI

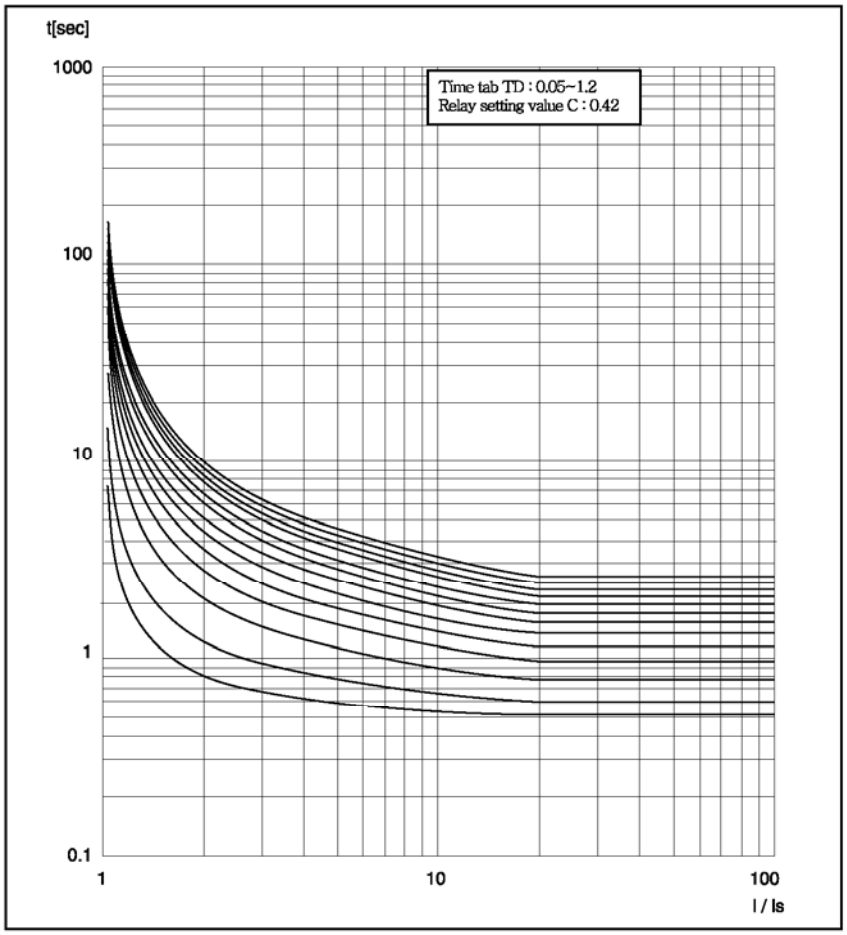


$$t = \frac{120}{(I/Is)^{-1}} \times TD + C$$

t = operating time
I = fault value
Is = setting value
TL = Time Lever

※ OCR(50/51, TD : 0.05~1.2), OCGR(50/51N, TD : 0.05~1.2)
NSOCR(46, TD : 0.05~1.0)

4-7 KEPKO - SI



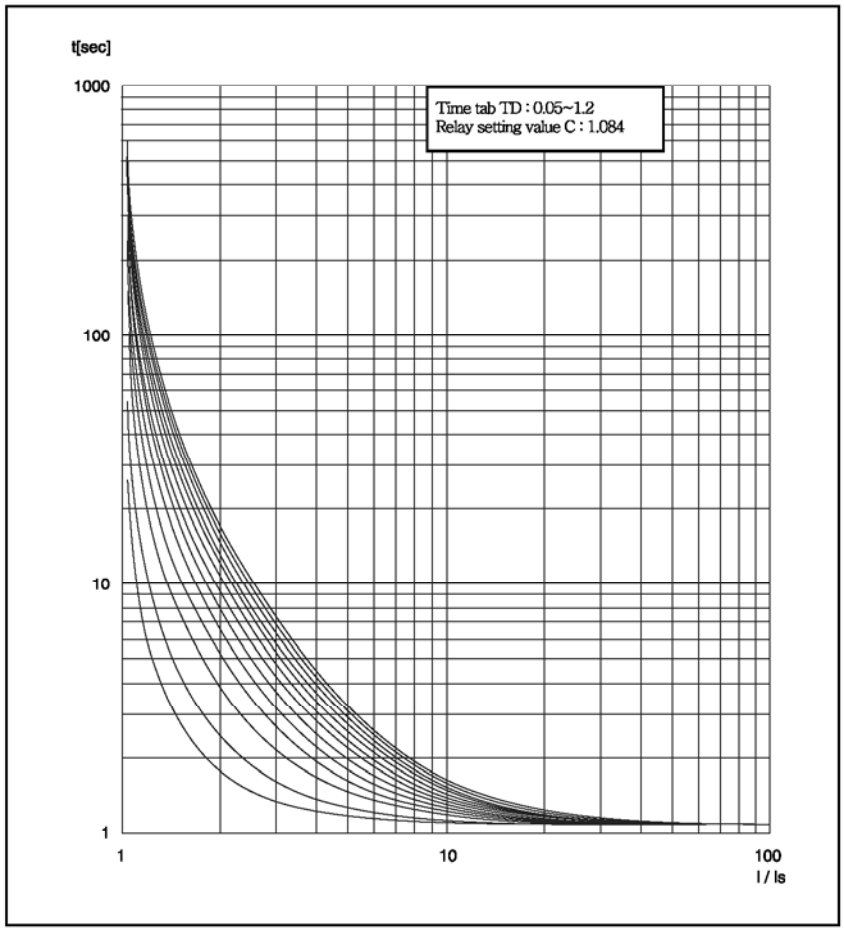
$$t = \frac{0.11}{(I/Is)^{0.02} - 1} \times TD + 0.42$$

t = operating time
I = fault value
Is = setting value
TL = Time Lever

※ OCR(50/51), OCGR(50/51N)

4. Characteristic Curve

4-8 KEPKO - VI

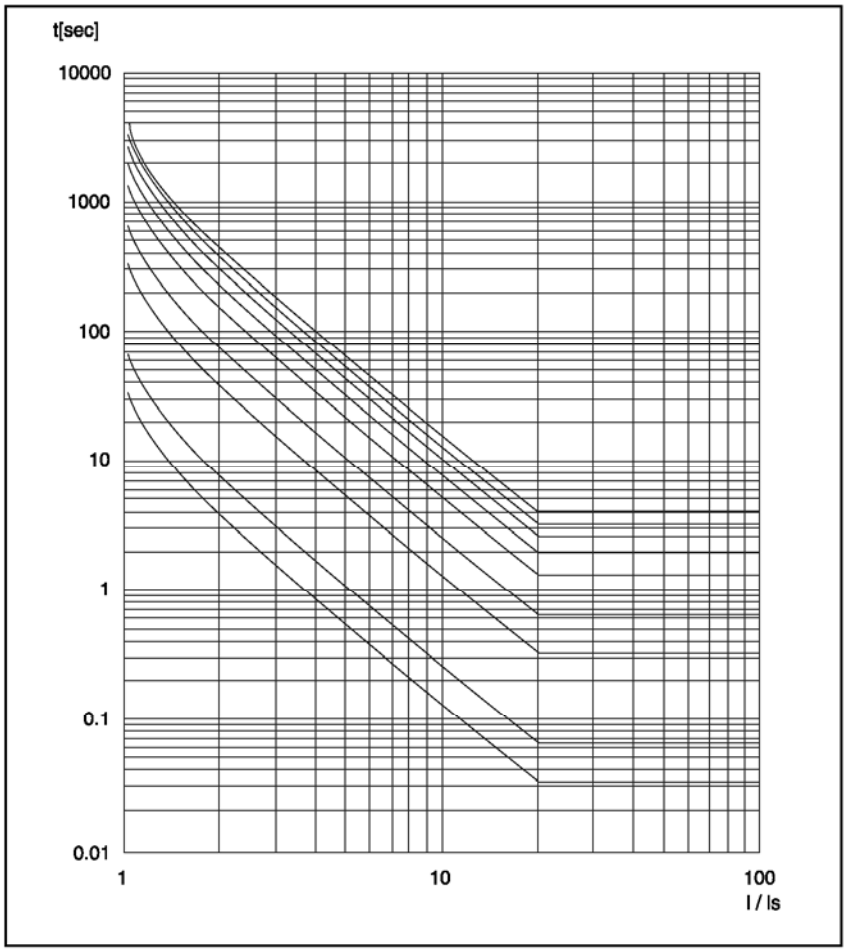


$$t = \frac{39.85}{(I/Is)^{1.95} - 1} \times TD + 1.084$$

t = operating time
I = fault value
Is = setting value
TL = Time Lever

※ OCR(50/51), OCGR(50/51N)

4-9 Thermal Curve (COLD)



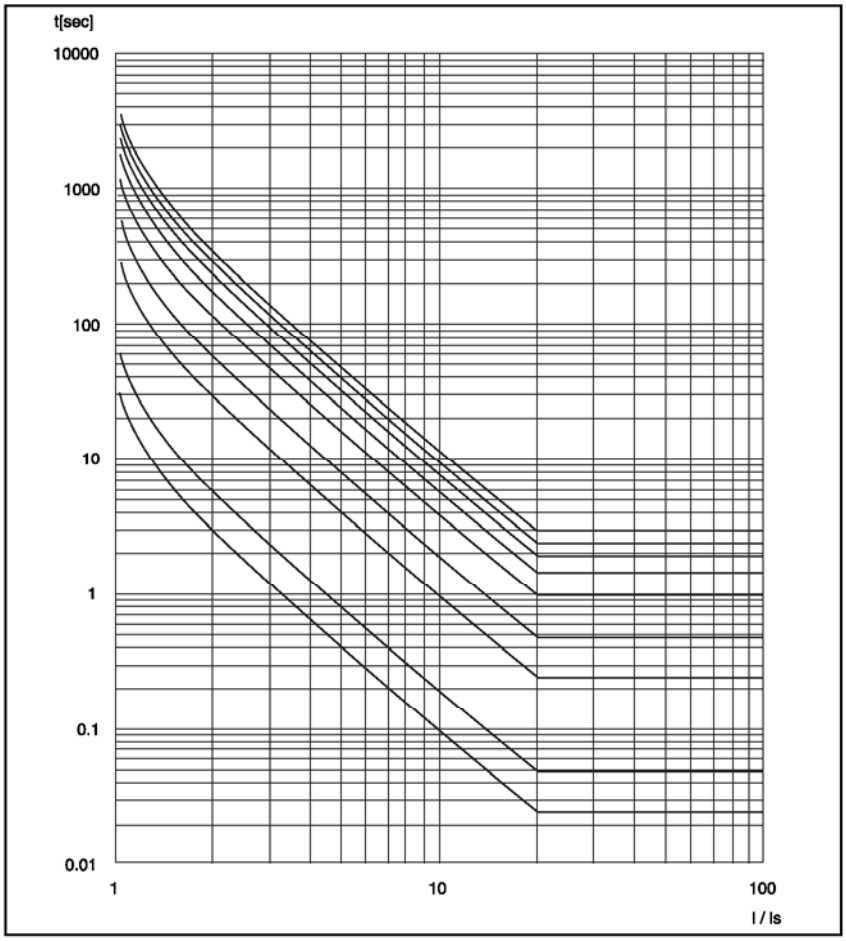
$t = \tau . \ln[(I^2)/\{I^2 - (k.I_B)^2\}]$

τ = 0.5, 1, 10, 20, 30, 40, 50, 60min

$k=1$, $I_B=1$

4. Characteristic Curve

4-10 Thermal Curve (HOT)



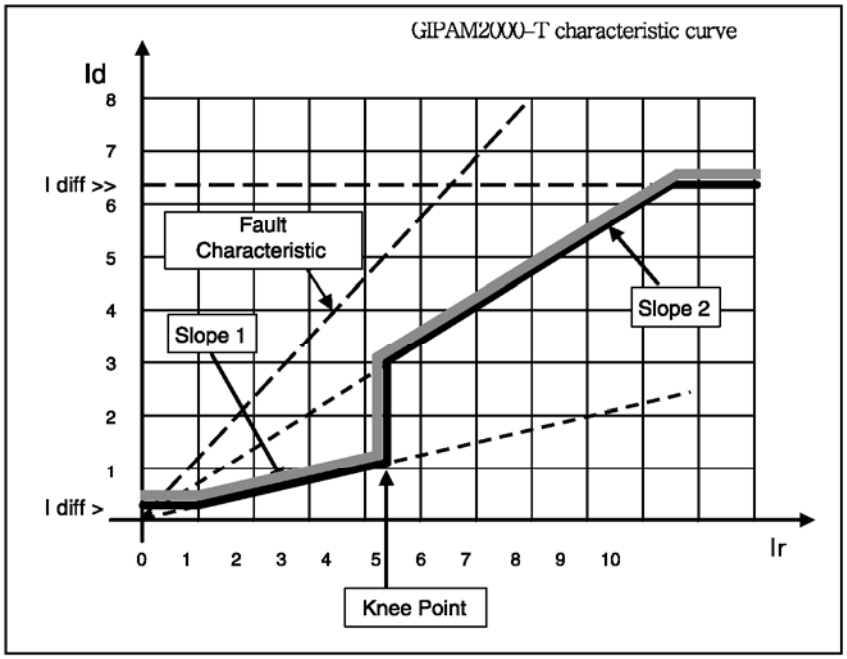
$$t = \tau . \ln[(I^2 - I_p^2) / \{I^2 - (k.I_B)^2\}]$$

$$\tau = 0.5, 1, 10, 20, 30, 40, 50, 60\text{min}$$

$$I_p = [0.5,\ k=1,\ I_B=1]$$

※ Ip : current before relay trip. Ib : rating current. K : positive number of over current
I : relay trip current. τ : thermal number

4-11 Different Curve



(2 wiring) : Id= |I1 . −I2. |, Ir= |I1 | + |I2| ,Slop=Id/Ir
(3 wiring) : Id= |I1 . −I2. −I3. |, Ir= |I1 | + |I2| + | 3 |,Slop=Id/Ir

※ Time delay I diff range(0.02~1.0In /0.01In)

Time delay Operation time range (0.05~10.00s / 10ms)

Slop1 range (0.15~1.00 / 0.01)

Knee Point range (1.0~20.0In / 0.1In)

Slop2 range (0.15~1.00 / 0.01)

Instantaneous I diff range(2.0~32.0In / 1.0In)

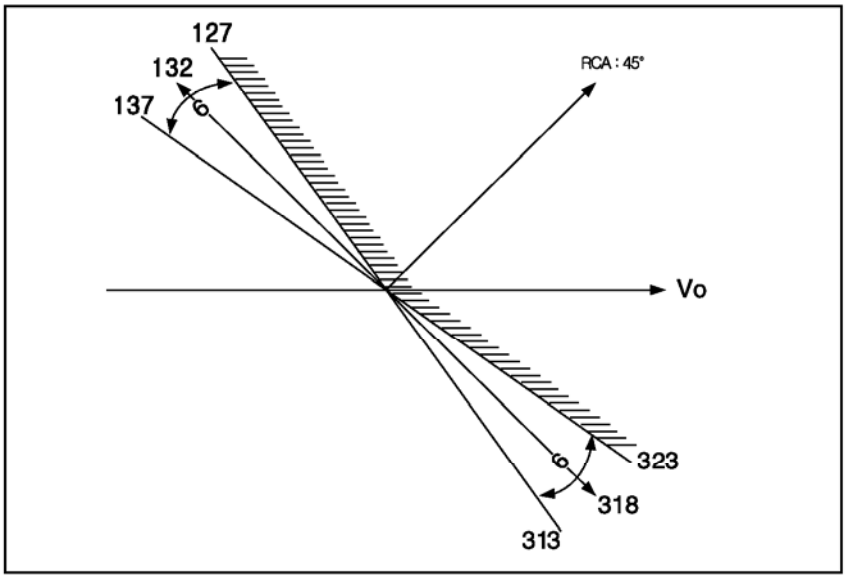
2th harmonic distortion tolerance range (5~50% / 1%)

INRUSH LOCK TIME range (0.02~60S / 0.01S)

※ I1, I2, I3 displayed at Vector

4. Characteristic Curve

4-12 The Curve of Sensitive Directional Ground Relay (SGR, DGR)



a. Relay pick-up range : 318°~ 132°

b. Drop-out after Pick up : 138°~ 312°

※ Vo > Vos

Io>Ios

$$\mathrm{RCA}-87^\circ \le \varphi(\mathrm{Vo})-\varphi(\mathrm{Io}) \le \mathrm{RCA}+87^\circ$$

※ RCA : relay characteristic angle

※ PLC Address Table

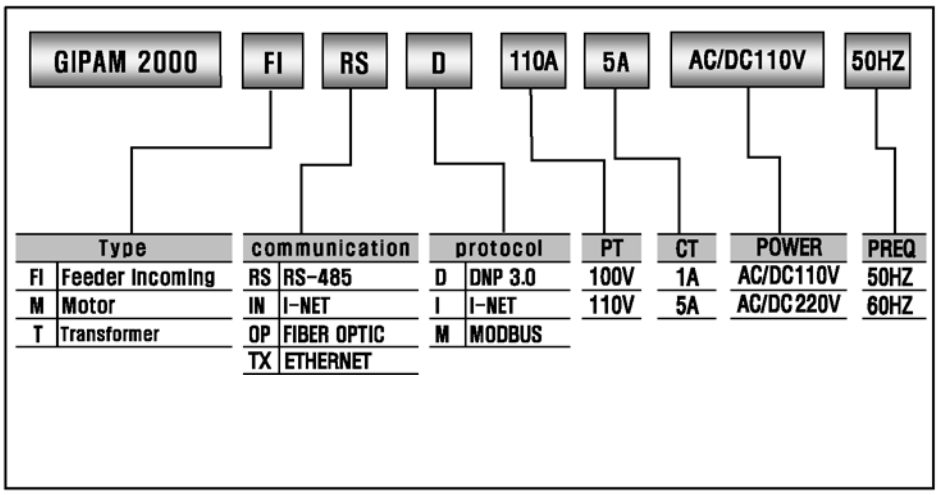
Relay elements Status & Control Signal	IEEE DEVICE NUMBER	PLC input address
PHASE INSTANTANEOUS OVER CURRENT1 LOW STAGE START (PULSE)	150PL – P	IX0.1.0 (Addr0.0)
PHASE INSTANTANEOUS OVER CURRENT1 LOW STAGE OPERATE (PULSE)	150PL – OP	IX0.1.1 (Addr0.1)
PHASE INSTANTANEOUS OVER CURRENT1 HIGH STAGE START (PULSE)	150PH – P	IX0.1.2 (Addr0.2)
PHASE INSTANTANEOUS OVER CURRENT1 HIGH STAGE OPERATE (PULSE)	150PH – OP	IX0.1.3 (Addr0.3)
PHASE TIME OVER CURRENT1 LOW STAGE START (PULSE)	151PL – P	IX0.1.4 (Addr0.4)
PHASE TIME OVER CURRENT1 LOW STAGE OPERATE (PULSE)	151PL – OP	IX0.1.5 (Addr0.5)
PHASE TIME OVER CURRENT1 HIGH STAGE START (PULSE)	151PH – P	IX0.1.6 (Addr0.6)
PHASE TIME OVER CURRENT1 HIGH STAGE OPERATE (PULSE)	151PH – OP	IX0.1.7 (Addr0.7)
GROUND INSTANTANEOUS OVER CURRENT1 LOW STAGE START (PULSE)	150NL – P	IX0.1.8 (Addr1.0)
GROUND INSTANTANEOUS OVER CURRENT1 LOW STAGE OPERATE (PULSE)	150NL – OP	IX0.1.9 (Addr1.1)
GROUND INSTANTANEOUS OVER CURRENT1 HIGH STAGE START (PULSE)	150NH – P	IX0.1.10 (Addr1.2)
GROUND INSTANTANEOUS OVER CURRENT1 HIGH STAGE OPERATE (PULSE)	150NH – OP	IX0.1.11 (Addr1.3)
GROUND TIME OVER CURRENT1 LOW STAGE START (PULSE)	151NL – P	IX0.1.12 (Addr1.4)
GROUND TIME OVER CURRENT1 LOW STAGE OPERATE (PULSE)	151NL – OP	IX0.1.13 (Addr1.5)
GROUND TIME OVER CURRENT1 HIGH STAGE START (PULSE)	151NH – P	IX0.1.14 (Addr1.6)
GROUND TIME OVER CURRENT1 HIGH STAGE OPERATE (PULSE)	151NH – OP	IX0.1.15 (Addr1.7)
NEGATIVE SEQUENCE OVER VOLTAGE START (PULSE)	47NE – P	IX0.1.16 (Addr2.0)
NEGATIVE SEQUENCE OVER VOLTAGE OPERATE (PULSE)	47NE – OP	IX0.1.17 (Addr2.1)
PHASE OPEN START (PULSE)	47PO – P	IX0.1.18 (Addr2.2)
PHASE OPEN OPERATE (PULSE)	47PO – OP	IX0.1.19 (Addr2.3)
RESIDUAL UNDER VOLTAGE START (PULSE)	27R – P	IX0.1.20 (Addr2.4)
RESIDUAL UNDER VOLTAGE OPERATE (PULSE)	27R – OP	IX0.1.21 (Addr2.5)
UNDER VOLTAGE #1 START (PULSE)	27-1 – P	IX0.1.22 (Addr2.6)
UNDER VOLTAGE #1 OPERATE (PULSE)	27-1 – OP	IX0.1.23 (Addr2.7)
VIRTUAL CONTACT #0 (50ms PULSE)		IX0.1.24 (Addr3.0)
TCS Result for CB1(1 for BAD) (Cond. PULSE)	TCS1	IX0.1.25 (Addr3.1)
TCS Result for CB2(1 for BAD) (Cond. PULSE)	TCS2	IX0.1.26 (Addr3.2)
PHASE TIME OVER VOLTAGE LOW STAGE START (PULSE)	59PL – P	IX0.1.27 (Addr3.3)
PHASE TIME OVER VOLTAGE LOW STAGE OPERATE (PULSE)	59PL – OP	IX0.1.28 (Addr3.4)
PHASE TIME OVER VOLTAGE HIGH STAGE START (PULSE)	59PH – P	IX0.1.29 (Addr3.5)

5. Appendix

PHASE TIME OVER VOLTAGE HIGH STAGE OPERATE (PULSE)	59PH – OP	IX0.1.30 (Addr3.6)
GROUND INSTANTANEOUS OVER VOLTAGE START (PULSE)	64 – IP	IX0.1.31 (Addr3.7)
GROUND INSTANTANEOUS OVER VOLTAGE OPERATE (PULSE)	64 – IOP	IX0.1.32 (Addr4.0)
GROUND TIME OVER VOLTAGE LOW STAGE START (PULSE)	64L – TP	IX0.1.33 (Addr4.1)
GROUND TIME OVER VOLTAGE LOW STAGE OPERATE (PULSE)	64L – TOP	IX0.1.34 (Addr4.2)
GROUND TIME OVER VOLTAGE HIGH STAGE START (PULSE)	64H – TP	IX0.1.35 (Addr4.3)
GROUND TIME OVER VOLTAGE HIGH STAGE OPERATE (PULSE)	64H – TOP	IX0.1.36 (Addr4.4)
INSTANTANEOUS NEGATIVE SEQUENCE OVER CURRENT START (PULSE)	46 – IP	IX0.1.37 (Addr4.5)
INSTANTANEOUS NEGATIVE SEQUENCE OVER CURRENT OPERATE (PULSE)	46 – IOP	IX0.1.38 (Addr4.6)
TIME NEGATIVE SEQUENCE OVER CURRENT START (PULSE)	46 – TP	IX0.1.39 (Addr4.7)
TIME NEGATIVE SEQUENCE OVER CURRENT OPERATE (PULSE)	46 – TOP	IX0.1.40 (Addr5.0)
SENSITIVE D.G.R START (PULSE)	67G – P	IX0.1.41 (Addr5.1)
SENSITIVE D.G.R OPERATE (PULSE)	67G – OP	IX0.1.42 (Addr5.2)
TRS Result for CB1(1 for BAD) (Cond. PULSE)	TRS1	IX0.1.43 (Addr5.3)
TRS Result for CB2(1 for BAD) (Cond. PULSE)	TRS2	IX0.1.44 (Addr5.4)
THERMAL RELAY START (PULSE)	49 – P	IX0.1.45 (Addr5.5)
THERMAL RELAY OPERATE (PULSE)	49 – OP	IX0.1.46 (Addr5.6)
MOTOR STALL RELAY START (PULSE)	48 – P	IX0.1.47 (Addr5.7)
MOTOR STALL RELAY OPERATE (PULSE)	48 – OP	IX0.1.48 (Addr6.0)
LOCKED ROTOR START (PULSE)	51LR – P	IX0.1.49 (Addr6.1)
LOCKED ROTOR OPERATE (PULSE)	51LR – OP	IX0.1.50 (Addr6.2)
DIRECTIONAL GROUND START (PULSE)	67N – P	IX0.1.51 (Addr6.3)
DIRECTIONAL GROUND OPREATE (PULSE)	67N – OP	IX0.1.52 (Addr6.4)
RECLOSING PREPARED (PULSE)	79 – PR	IX0.1.53 (Addr6.5)
RECLOSING DEAD TIMER #1 COUNTING (PULSE)	79 – DT1	IX0.1.54 (Addr6.6)
RECLOSING DEAD TIMER #2 COUNTING (PULSE)	79 – DT2	IX0.1.55 (Addr6.7)
RECLOSING DEAD TIMER #3 COUNTING (PULSE)	79 – DT3	IX0.1.56 (Addr7.0)
RECLOSING DEAD TIMER #4 COUNTING (PULSE)	79 – DT4	IX0.1.57 (Addr7.1)
RECLOSING DEAD TIMER #5 COUNTING (PULSE)	79 – DT5	IX0.1.58 (Addr7.2)
RECLOSING PROCESS (PULSE)	79–PC	IX0.1.59 (Addr7.3)
RECLOSING SHOT #1 (PULSE)	79 – S1	IX0.1.60 (Addr7.4)
RECLOSING SHOT #2 (PULSE)	79 – S2	IX0.1.61 (Addr7.5)

RECLOSING SHOT #3 (PULSE)	79 – S3	IX0.1.62 (Addr7.6)
RECLOSING SHOT #4 (PULSE)	79 – S4	IX0.1.63 (Addr7.7)
RECLOSING SHOT #5 (PULSE)	79 – S5	IX0.2.0 (Addr8.0)
RECLOSING SUCCESS (LATCH)	79 – SC	IX0.2.1 (Addr8.1)
RECLOSING FAIL/LOCK-OUT (LATCH)	79 – FL	IX0.2.2 (Addr8.2)
CB1 ON SW (PULSE)		IX0.2.3 (Addr8.3)
CB1 OFF SW (PULSE)		IX0.2.4 (Addr8.4)
CB2 ON SW (PULSE)		IX0.2.5 (Addr8.5)
CB2 OFF SW (PULSE)		IX0.2.6 (Addr8.6)
CB1 RECLOSE (PULSE)		IX0.2.7 (Addr8.7)
Control Contact 1 (PULSE/LATCH)		IX0.2.8 (Addr9.0)
Control Contact 2 (PULSE/LATCH)		IX0.2.9 (Addr9.1)
Control Contact 3 (PULSE/LATCH)		IX0.2.10 (Addr9.2)
Control Contact 4 (PULSE/LATCH)		IX0.2.11 (Addr9.3)
Control Contact 5 (PULSE/LATCH)		IX0.2.12 (Addr9.4)
Control Contact 6 (PULSE/LATCH)		IX0.2.13 (Addr9.5)
Control Contact 7 (PULSE/LATCH)		IX0.2.14 (Addr9.6)
Control Contact 8 (PULSE/LATCH)		IX0.2.15 (Addr9.7)
Remote / Local (LATCH)		IX0.2.16 (Addr10.0)
Alarm Reset(F5) (PULSE)		IX0.2.17 (Addr10.1)
Power Fail(Cond. PULSE)		IX0.2.18 (Addr10.2)
DIAG-ERROR(produced after 2004.05)		IX0.2.19 (Addr10.3)
CB1 Trip Relay Test(PULSE)	TRIP_TEST1	IX0.2.20 (Addr10.4)
CB2 Trip Relay Test(PULSE)	TRIP_TEST2	IX0.2.21 (Addr10.5)
RECLOSING CANCEL(LATCH)	79 – CC	IX0.2.22 (Addr10.6)
OVER WATT DEMAND ALARM (produced after 2004.05)		IX0.2.24
OVER VAR DEMAND ALARM (produced after 2004.05)		IX0.2.25
OVER 3P I DEMAND ALARM (produced after 2004.05)		IX0.2.26
RATIO DIFFERENTIAL RELAY LOW STAGE START(PULSE)	87L – P	IX0.2.32 (Addr12.0)
RATIO DIFFERENTIAL RELAY LOW STAGE OPERATE (PULSE)	87L – OP	IX0.2.33 (Addr12.1)
RATIO DIFFERENTIAL RELAY HIGH STAGE START (PULSE)	87H – P	IX0.2.34 (Addr12.2)
RATIO DIFFERENTIAL RELAY HIGH STAGE OPERAGE (PULSE)	87H – OP	IX0.2.35 (Addr12.3)
PHASE INSTANTANEOUS OVER CURRENT2 LOW STAGE START (PULSE)	250PL – P	IX0.2.40 (Addr13.0)

PHASE INSTANTANEOUS OVER CURRENT2 LOW STAGE OPERATE (PULSE)	250PL - OP	IX0.2.41 (Addr13.1)
PHASE INSTANTANEOUS OVER CURRENT2 HIGH STAGE START (PULSE)	250PH - P	IX0.2.42 (Addr13.2)
PHASE INSTANTANEOUS OVER CURRENT2 HIGH STAGE OPERATE (PULSE)	250PH - OP	IX0.2.43 (Addr13.3)
PHASE TIME OVER CURRENT2 LOW STAGE START (PULSE)	251PL - P	IX0.2.44 (Addr13.4)
PHASE TIME OVER CURRENT2 LOW STAGE OPERAGE (PULSE)	251PL - OP	IX0.2.45 (Addr13.5)
PHASE TIME OVER CURRENT2 HIGH STAGE START (PULSE)	251PH - P	IX0.2.46 (Addr13.6)
PHASE TIME OVER CURRENT2 HIGH STAGE OPERATE (PULSE)	251PH - OP	IX0.2.47 (Addr13.7)
PHASE INSTANTANEOUS OVER CURRENT3 LOW STAGE START (PULSE)	350PL - P	IX0.2.48 (Addr14.0)
PHASE INSTANTANEOUS OVER CURRENT3 LOW STAGE OPERATE (PULSE)	350PL - OP	IX0.2.49 (Addr14.1)
PHASE INSTANTANEOUS OVER CURRENT3 HIGH STAGE START (PULSE)	350PH - P	IX0.2.50 (Addr14.2)
PHASE INSTANTANEOUS OVER CURRENT3 HIGH STAGE OPERATE (PULSE)	350PH - OP	IX0.2.51 (Addr14.3)
PHASE TIME OVER CURRENT3 LOW STAGE START (PULSE)	351PL - P	IX0.2.52 (Addr14.4)
PHASE TIME OVER CURRENT3 LOW STAGE OPERATE (PULSE)	351PL - OP	IX0.2.53 (Addr14.5)
PHASE TIME OVER CURRENT3 HIGH STAGE START (PULSE)	351PH - P	IX0.2.54 (Addr14.6)
PHASE TIME OVER CURRENT3 HIGH STAGE OPERATE (PULSE)	351PH - OP	IX0.2.55 (Addr14.7)
GROUND INSTANTANEOUS OVER CURRENT2 LOW STAGE START (PULSE)	250NL - P	IX0.2.56 (Addr15.0)
GROUND INSTANTANEOUS OVER CURRENT2 LOW STAGE OPERATE (PULSE)	250NL - OP	IX0.2.57 (Addr15.1)
GROUND INSTANTANEOUS OVER CURRENT2 HIGH STAGE START (PULSE)	250NH - P	IX0.2.58 (Addr15.2)
GROUND INSTANTANEOUS OVER CURRENT2 HIGH STAGE OPERATE (PULSE)	250NH - OP	IX0.2.59 (Addr15.3)
GROUND TIME OVER CURRENT2 LOW STAGE START (PULSE)	251NL - P	IX0.2.60 (Addr15.4)
GROUND TIME OVER CURRENT2 LOW STAGE OPERATE (PULSE)	251NL - OP	IX0.2.61 (Addr15.5)
GROUND TIME OVER CURRENT2 HIGH STAGE START (PULSE)	251NH - P	IX0.2.62 (Addr15.6)
GROUND TIME OVER CURRENT2 HIGH STAGE OPERATE (PULSE)	251NH - OP	IX0.2.63 (Addr15.7)
PTF(Power Fuse Fail)		IX0.2.23 (Addr10.7)


GIPAM 2000
FI
RS
D
110A
5A
AC/DC110V
50HZ
Type
FI Feeder Incoming
M Motor
T Transformer
communication
RS RS-485
IN I-NET
OP FIBER OPTIC
TX ETHERNET
protocol
D DNP 3.0
I I-NET
M MODBUS
PT
100V
110V
CT
1A
5A
POWER
AC/DC110V
AC/DC220V
PREQ
50HZ
60HZ

7. Product Specification

ITEM		SPEC
Wiring connection		3P3W, 3P4W
Input	Frequency	60Hz (50Hz)
	Voltage	PT : 100V or 110V
		GPT:100V,100*r3Vor110V,190V
	Current	CT : 1A or 5A
		ZCT : 1.5mA
	Control power supply	AC/DC110V or 220V
	Power consumption	:Lessthan30W,Operation :lessthan70W
	Input burden	PT : 0.5VA
		CT : 1.0VA
	Input contact	AC/DC110V or 220V
Output contact	POWER 2EA	AC 250V 16A / DC 30V 16A Resistive Load
		4000VA, 150W
	ALARM 10EA	AC 250V 5A / DC 30V 5A Resistive Load
		1250VA, 150W
Operating temperature range		-10℃ ~ 55℃
Storage temperature range		-25℃ ~ 70℃
Relative humidity		30% ~ 80% of the daily average RH
Altitude		Less than 1000m
Others		Shall be no abnormal vibration & impact Shall be no severe air pollution
Applicable standard		KEMC 1120, IEC 60255

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