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Digital Protection Relay

GIPAM 115 FI

MANUAL

Safety Instruction

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

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A table of contents

Safety Caution

Please read carefully before product being taken into Service to ensure safety and proper operation of GIPAM-115FI.

- 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 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

⚠ Warning

- **Please do not operate, inspect, and install by yourself.**
- **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 short-circuit the secondary part of PT;** it may result in fire.
- **Please do not disconnect the secondary part of CT;** it may result in fire or explosives.
- **Please do not wire or operate with wet hands;** it may result in electric shock.
- **Please do not use any damaged cable;** it may result in electric shock.
- **Please use the ring terminal when wiring the cable;** it may result in electric shock by bare wire.

⚠ Warning

■ **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 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.

- **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.

■ **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**

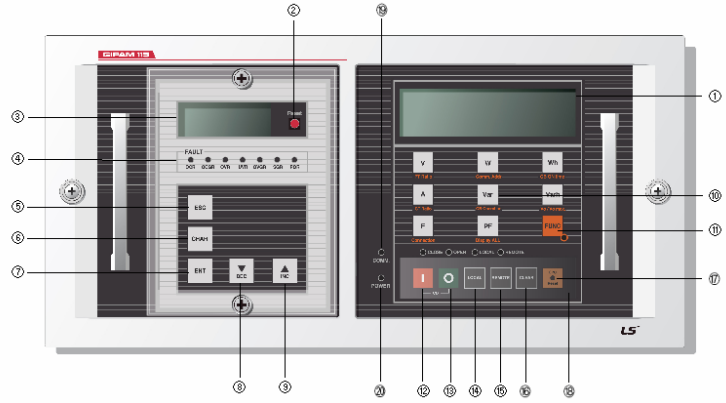
- **Please store dry & clean place.**
- **Please do not throw or put force on it during transport;** it may result in malfunction or wrong operation.

■ **Caution for disposal**

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

1. The Layout of MMI

1.1 The External View



1. LCD Display
2. Fault Indicator Reset Switch
3. 16 × 2 LCD
4. Fault Indicator LED
5. Relay Set / Run key
   - Transfer from initial menu to setting menu
6. ESC key
   - Cancel or Move to upper menu
7. Enter key
   - Saving of changed data / Clear execution
8. Decrement key
   - Decrease data or Move between items
9. Increment key
   - Increase data or Move between items
10. Display Select key
11. Function key (Red LED)
12. CB ON key (Red LED)
13. CB OFF key (Green LED)
14. Local key (Yellow LED)
    - Local output contact
    - Manual operation of CB ON/OFF
15. Remote key (Yellow LED)
    - Remote output contact
    - Remote operation of CB ON/OFF
16. Clear Key
    - Wh / Varh, The number of CB operation, CB conducting time, Clear max. Vo (zero)
17. CPU Reset Key
18. Protection Cover
19. COMM LED (Red)
    - Blinking during communication
20. POWER LED (Red)

1.2 Configuration

A) The basic function & operation of keys on GIPAM-115FI

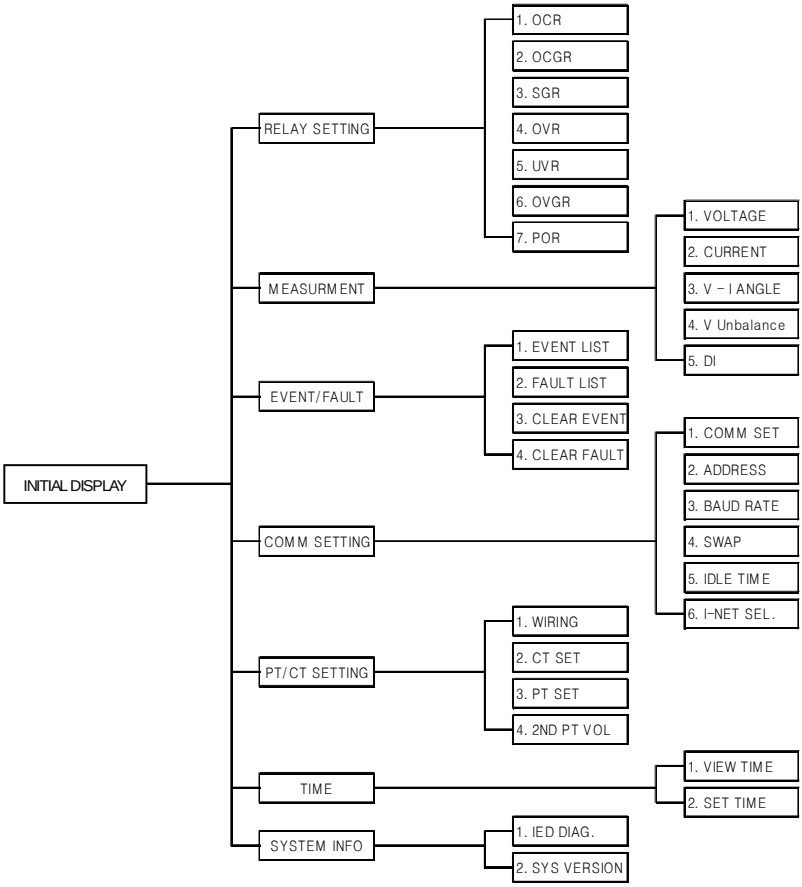
The key on the surface of GIPAM-115FI has its own function according to each menu.

The type of key	Applicable menu	Basic function
Direction key (Up, Down)/ (DEC, INC)	Menu tree	Move between items
	Correcting & setting menu	Move to the data which will be set
ENT key	Correcting & setting menu	The saving of changed data or removing of saved data
	Menu tree	Move to the menu where cursor is on
ESC key	Correcting & setting menu	The cancel of changed data
	Menu tree	Move to upper menu
SET/RUN key	Relay setting menu	Selecting the relay which will be used or Moving to relay setting menu
CLOSE key OPEN key	Menu tree	The control of CB Close Key is for the close of CB Open Key is for the open of CB
LOCAL key REMOTE key	Menu tree	The switching of Remote and Local
CLEAR key	Menu tree	Reset the accumulated values Ex) Wh, Varh, CB ON time, CB operation count, Vo max.

B) The basic function & operation of LED on GIPAM-115FI

The type of LED	Basic function
POWER LED	It is with red and indicates the status of power supply For normal operation it is kept with red light ON
COMM LED	It is with red and indicates the status of remote communication. The LED is blinking while transmitting or receiving data under normal correspondence of communication card.
PICK-UP/TRIP LED (OCR,OCGR,OVR,UVR, OVGR,SGR,POR)	It is with red and indicates the protection relay. It is blinking 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.
REMOTE/LOCAL	It is on the upper side of R/L KEY with yellow and indicates the present control status
CB CLOSE/OPEN	It is on the upper side of CLOSE/OPEN KEY with green & red and indicates the present status of circuit breaker which is connected to GIPAM-115FI. Red LED is ON when CB is closed and Green LED is ON when CB is opened.

1.3 Menu tree


INITIAL DISPLAY
RELAY SETTING
1. OCR
2. OCGR
3. SGR
4. OVR
5. UVR
6. OVGR
7. POR
MEASURMENT
1. VOLTAGE
2. CURRENT
3. V - I ANGLE
4. V Unbalance
5. DI
EVENT/FAULT
1. EVENT LIST
2. FAULT LIST
3. CLEAR EVENT
4. CLEAR FAULT
COMM SETTING
1. COMM SET
2. ADDRESS
3. BAUD RATE
4. SWAP
5. IDLE TIME
6. I-NET SEL.
PT/CT SETTING
1. WIRING
2. CT SET
3. PT SET
4. 2ND PT VOL
TIME
1. VIEW TIME
2. SET TIME
SYSTEM INFO
1. IED DIAG.
2. SYS VERSION

2. Ratings

2.1 The ratings and measuring specification

The ratings

Item		Spec.
Wiring connection		1P2W, 1P3W, 3P3W, 3P4W
Input contact	Frequency	60Hz (50Hz)
	Rated voltage	PT: AC110V or AC100V GPT : AC190V
	Rated current	CT : 5A
		ZCT : (SGR :1.5mA), (OCGR :5A)
	Control voltage	AC110V, DC110/125V (or DC110V±20%)
	Power consumption	Under 15W
	Input burden	PT : under 0.5VA
		CT : under 1.0VA
Output contact	Contact switching capacity	AC250V 16A / DC30V 16A
	Max. switching capacity	4000VA, 480W
Relay for signal	Contact switching capacity	AC250V 5A / DC30V 5A
	Max. switching capacity	1250VA, 150W
Operating temperature range		-10℃ ~ 55℃
Storage temperature range		-25℃ ~ 70℃
Relative humidity		Under 80% (Shall not reach the dew point)
Altitude		Under 2,000m
Others		Shall be no abnormal vibration & impact Shall be no severe air pollution
Applicable standard		KEMC 1120, IEC 60255, IEC 61000

Measuring specification

Type	Range	Remark
Voltage (V)	(0 .5~ 414,000V)	* PT ratio setting : (Primary)110 ~ 345000V/1V, (Secondary)110V or 100V
Zero phase voltage (Vo)	(0 .5~ 190V)	-
Line-to-line current (I)	(0, 0.05~7,200A)	* CT ratio setting : 5 ~ 6000A/1A
Power Factor (PF)	(Lead/Lag 0~1)	* PF=0 (Under min. measuring V or I) or (P<0) * Lead (Q<0), Lag (Q>=0)
Frequency (F)	(45 ~ 65 [Hz])	* F=0 (under 45[Hz] or over 65[Hz]) or (Secondary voltage of PT: under50V)
Active power (W)	(0 ~ 9,999[MW])	* W=0 (Under min. measuring Voltage or Current) or (PF<0)
Reactive power (VAR)	(0 ~ 9,999[MVAR])	* Var=0 (Under min. measuring Voltage or Current)
Active electric energy (MWH)	(0~999,999[MWh], Bar Graph 12ea)	*The increase of Graphic bar on LCE by 5EA in case of Roll_over
Reactive electric energy (MWH)	(0~999,999[MVARh], Bar Graph 12ea)	

GIPAM-115FI RELAY SETTING

Protection relay	Operation type	Operating value setting / Increase & Decrease, Operating time	Remark
OCR(50/51)	HIGH	Setting : Off, 2~24/1In (In = 5A) Operating time : 0.04~60.0/0.01s	Definite time : D2,D4,D8 Inver time curve: SI, VI, EI, LI OUT MODE : —, AL, TP
	LOW	Setting : Off, 0.2~10.0/0.1In Operating time : 0.05~1.20/0.01	
OCGR (50/51N)	HIGH	Setting : Off, 0.5~8.0/0.5In Operating time : 0.04~60.0/0.01s	Definite time : D2,D4,D8 Inver time curve : SI, VI, EI, LI OUT MODE : —, AL, TP
	LOW	Setting : Off, 0.1~0.5/0.02In Operating time : 0.05~1.20/0.01	
	OCGR block	Block Time : 0.1~60.0/0.1s	OCGR function is blocked during the setting time when starting motor (Applying over 2A of phase current).
SGR (67G)	-	Io setting : Off, 0.6~3.6/0.2Ion (Ion=1.5mA) Vo setting : 0.1~0.4/0.02Von (Von=190V) MTA: 45° Operating time : 0.1~60.00/0.01s GR MODE : ON/OFF (Only Io operates under GR MODE)	Non-earth type Definite time OUT MODE : —, AL, TP
OVR (59)	HIGH	Setting : OFF, 0.80~1.60Vn/0.02Vn (Vn = 100 or 110V) Operating time : 0.1 ~ 60.0s / 0.01s	Definite time OUT MODE : —, AL, TP
	LOW	Setting : OFF, 0.80~1.60Vn/0.02Vn Operating time : 0.1 ~ 60.0s / 0.01s	
UVR (27)	HIGH	Setting : OFF, 0.20~0.90Vn/0.02Vn Operating time : 0.1 ~ 60.0s / 0.01s	Definite time OUT MODE : —, AL, TP, TA
	LOW	Setting : OFF, 0.20~0.90Vn/0.02Vn Operating time : 0.1 ~ 60.0s / 0.01s	
	UVR LOCK	Do not operate under 15V (3 phase voltage)	
OVGR (64)	HIGH	Setting : OFF, 0.10~0.40Von/0.02Von (Von=190V) Operating time : 0.1 ~ 60.0s / 0.01s	Definite time OUT MODE : —, AL, TP
	LOW	Setting : OFF, 0.10~0.40Von/0.02Von (Von=190V) Operating time : 0.1 ~ 60.0s / 0.01s	

GIPAM-115FI RELAY SETTING

Protection relay	Operation type	Operating value setting / Increase & Decrease, Operating time	Remark
POR (47)	HIGH	Setting : OFF, 5~100%/1% Operating time : 0.1 ~ 60.0s / 0.01s	Definite time OUT MODE : —, AL, TP
	LOW	Setting : OFF, 5~100%/1% Operating time : 0.1 ~ 60.0s / 0.01s	

※ Definite time calculation

t = T × tap (second)

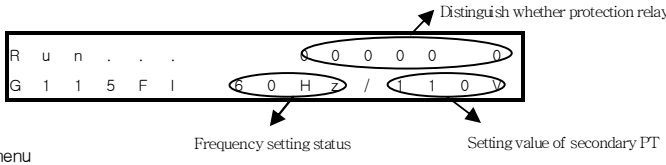
- Definite time (D2) T=2
- Definite time (D4) T=4
- Definite time (D8) T=8

4. MENU Setting

4.1 Relay part view

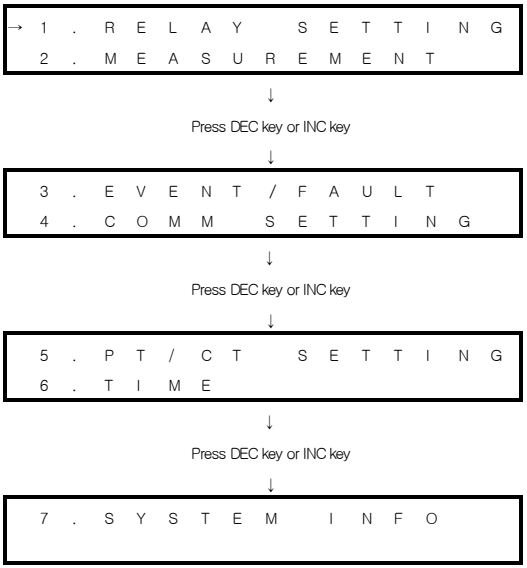
A) Initial window

The initial window will be displayed as shown in below after applying the power supply to the device



B) The window of basic menu

If pressing SET/RUN key from initial window, move to basic menu window. It is the most fundamental window which displays the lists of menu. DEC/INC key are used for the move of different menus and the detailed menu is available by pressing ENTER key.



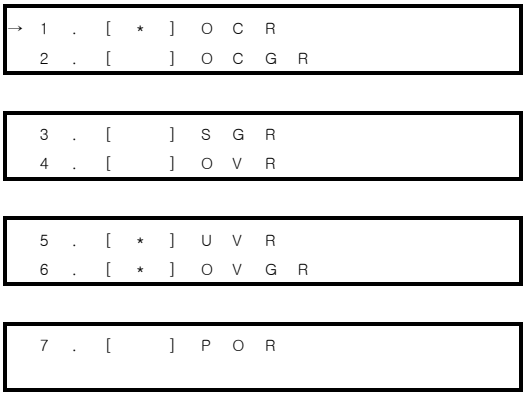
The basic menu window of GIPAM-115FI is as shown in above figures. The menu will be selected if pressing ENTER key after moving to the desirable menu by DEC/INC key.

4. MENU Setting

4.1 Relay part view

C) The subordinate menus

1. RELAY SETTING



(Fig.: It indicates that OCR, UVR, OVGR are selected from RELAY SETTING)

Press SET/RUN key to distinguish whether protection relay will be used or not after moving to the desirable protection relay by DEC/INC key.

OUT MODE: --, AL, TP, TA

* None (--): Pick up/Trip LED ON
* AL: Pick up/Trip LED ON + Alarm DO + Protection relay DO operation
* TP: Pick up/Trip LED ON + Alarm DO + Protection relay DO + CB OFF contact operation
* TA: Pick up/Trip LED ON + Alarm DO + Protection relay DO + CB OFF contact + Auto Reset

2. MEASUREMENT

4. MENU Setting

4.1 Relay part view

The following subordinate menus are available from 2. Measurement.

```
1 . V O L T A G E
2 . C U R R E N T
```

```
3 . V - I   A N G L E
4 . V     U N B A L A N C E
```

```
5 . D   I
```

3. EVENT / FAULT

```
→ 3 . E V E N T / F A U L T
  4 . C O M M   S E T T I N G
```

The following subordinate menus are available from 3. EVENT/FAULT.

```
1 . E V E N T   L I S T
2 . F A U L T   L I S T
```

```
3 . C L E A R   E V E N T
4 . C L E A R   F A U L T
```

3.1) Clear Event/Fault

```
→ 3 . C L E A R   E V E N T
  4 . C L E A R   F A U L T
```

↓

Press ENT key

↓

```
E V E N T   C L E A R ?
              N O
```

4.1 Relay part view

```
EVENT CLEAR?
          NO
```

↓

Select YES or NO by using DEC/INC key

↓

Event data will be cleared by pressing ENT key.

↓

Move to upper menu by pressing ESC key.

4. COMM Setting

```
 3. EVENT/FAULT
→4. COMM SETTING
```

The following subordinate menus are available from 4. COMM SETTING.

```
1. Comm Type
2. Address
```

```
3. Baud Rate
4. SwaP
```

```
5. Idle Time
6. I-NET Old ver
```

4-1) COMM Type: I-NET, MODBUS

4-2) Address: 1~254 / 1UNIT (I-NET)

1~247 / 1UNIT (MODBUS)

4-3) Baud Rate: 9600, 19200, 38400 (only MODBUS)

4-4) Swap: ON/OFF (only MODBUS)

4-5) I-NET old version: GIPAM115N (device ID 0x83) or GIPAM115F (device ID 0x93)

4. MENU Setting

4.1 Relay part view

5. PT / CT SETTING

The following subordinate menus are available from 5. PT/CT SETTING.

5-1) WIRING: The value can be changeable by pressing DEC/INC key (1P2W, 1P3W, 3P3W, 3P4W)

5-2) CT Set: The value can be changeable by pressing DEC/INC key (5~6000/1UNIT)

5-3) PT Set: The value can be changeable by pressing DEC/INC key (110~345000/1UNIT)

5-4) SECOND PT VOL: The value can be changeable by pressing DEC/INC key (100, 110)

* Caution: If changing the setting value of primary /secondary CT and PT, the values of WH and VARH are reset.

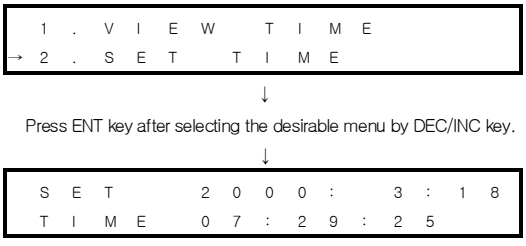
6. TIME

The following subordinate menus are available from 6. TIME.

4. MENU Setting

4.1 Relay part view

6-1) SET Time



Setting value can be changeable in the range of 2000.01 ~ 2099.12.31 23:59:59.

7. SYSTEM INFO

The following subordinate menus are available from 7. SYSTEM INFO.

4.1 Relay part view

D) The table of EVENT / FAULT

1. Event recording list: available to save 128 events.

Class	Contents	Remarks
Relay Pick Up	Picked-up Relay , Time Tag	
Relay Operation	Operated Relay , Time Tag	
Relay Trip (Fault)	Operated Relay, Time Tag	Relay Operation + CB open
DI COS	Change of DI Status, Time Tag	De-bounce Time
DO COS	Change of DO Status, Time Tag	
Control	CB, Control Contact, Power ON	
Relay Setting	Change of Relay Setting Parameter	
System Configuration	Change of System Configuration	

2. Fault recording list: available to save 32 faults

Fault Value: VR, VS, VT, IR, IS, IT, IN, Io, Vo, Vn, Anr, Ans, Ant, Ano

※ FAULT recording window

4.2 Measuring part view

The measured value can be checked by pressing the desirable keys on front measurement part.

: Voltage **[RN → SN → TN → RS → ST → RT]**

: Current **[Ir → Is → It]**

: Active power

: Reactive electric energy

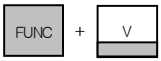
: Reactive power

: Frequency

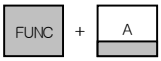
: Active electric energy

: Power factor

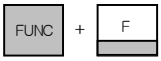
Particular function mode



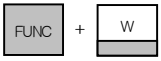
: Display of PT ratio



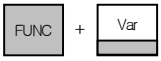
: Display of CT ratio



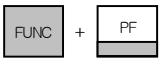
: Display of selected wiring connection



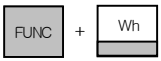
: Display of communication address preset in communication part of Main Board



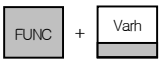
: Display of the operating numbers of CB



: V→A→W→Var→Wh→Varh→F→PF (Every phase of voltage/current)



: Display of CB ON time



: N1 –Display of zero phase voltage (Vo), N2 – Display of max. zero phase voltage (Vomax)

5. Self-diagnosis

5.1 Self-diagnosis configuration

Error Code is displayed on LCD of measurement part in case of being under self-diagnosis and the error codes are as follows.

The meaning of error code

- ERROR 101 : CT/PT Calibration error
- ERROR 102 : Interrupt error
- ERROR 103 : Software Run error
- ERROR 104 : Setting value error
- ERROR 105 : Calibration error
- ERROR 301 : CPU interface error

Error type	Operation
- Power Fail	GIPAM115 always checks system voltage. When the voltage drops under predetermined level, LCD shows "P-F". Once power fail status is released, the system returns to normal operation status. ※ It is cautious that WH, Varh can be cleared by CLEAR KEY during the operation of POWER FAIL.
- C/PT Calibration Error	GIPAM115 monitors the execution of CT/PT calibration and LCD shows "No Calib" if data is not valid or system is not calibrated correctly. When calibration is done, it turns back to normal.
- Watch Dog	GIPAM115 monitors whether CPU operation is normal or not. When CPU operates abnormally, watchdog IC forces CPU and periphery device to be reset. If performing reset, it reboots the operating system in the same order with power source booting and there are no other particular marks.
- Relay Setting Error	GIPAM115 displays as "SET" if problem occurs in setting value which relates to the operation of protection relays during booting it.
- AD Converting Part Error	GIPAM115 displays as "ADC" when problem occurs to the circuit of converting part of internal analog.

6. The specification of User Interface

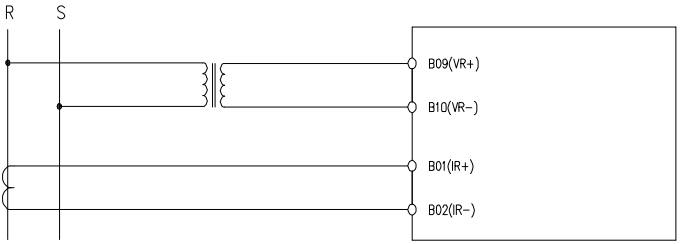
6.1 Configuration of terminal block

	[OUTPUT Terminal]		
A01	OCR	ALARM+	A02
A03	OCGR/SGR	ALARM-	A04
A05	OVR	Aux DI+	A06
A07	UVR	Aux DI-	A08
A09	OVGR	REMOTE	A10
A11	POR	LOCAL	A12
A13	F.G	L/R COM	A14
A15	ALARM COM	RX0	A16
A17	CB ON+	RX1	A18
A19	CB ON-	TX0	A20
A21	CB OFF+	TX1	A22
A23	CB OFF-	COMM GND	A24

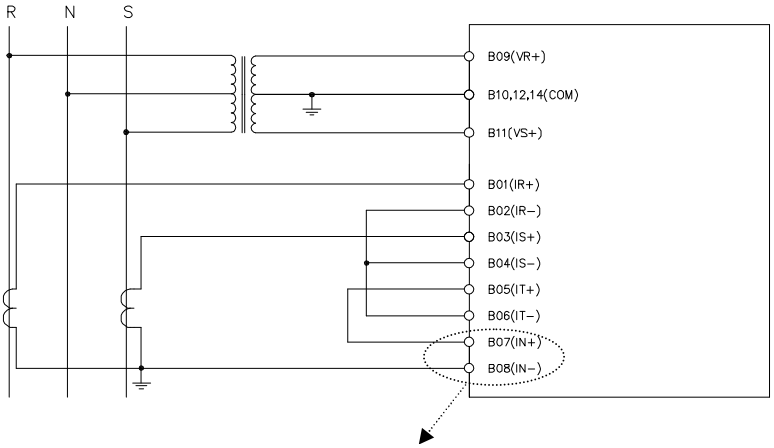
	[INPUT Terminal]		
B01	IR+	IR-	B02
B03	IS+	IS-	B04
B05	IT+	IT-	B06
B07	In+	In-	B08
B09	VR+	VR-	B10
B11	VS+	VS-	B12
B13	VT+	VT-	B14
B15	Io+	Io-	B16
B17	CB ON+	CB OFF+	B18
B19	CB ON-	CB OFF-	B20
B21	Vo(+)	DC+	B22
B23	Vo(-)	DC-	B24

6.2 Wiring diagram of GIPAM-115 FI

(1) 1P 2W: 1CT, 1PT



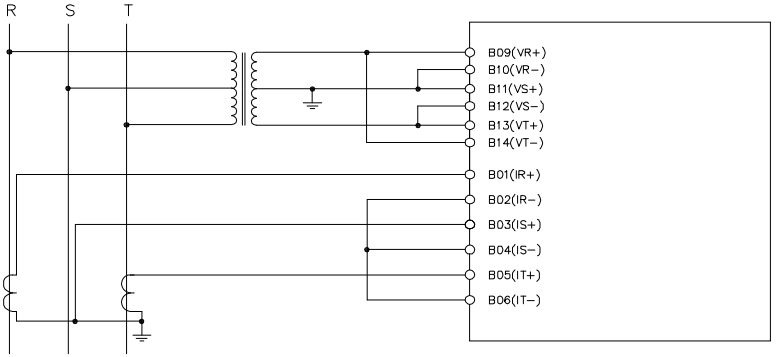
(2) 1P 3W: 2CT, 2PT



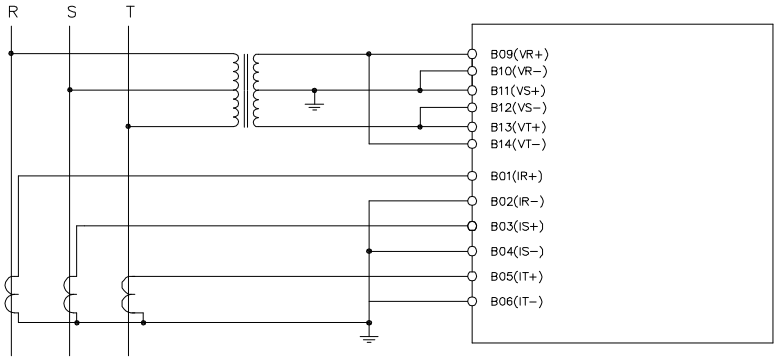
"ONLY with OCGR"

6.2 Wiring diagram of GIPAM-115 FI

(3) 3P 3W : 2CT, 2PT

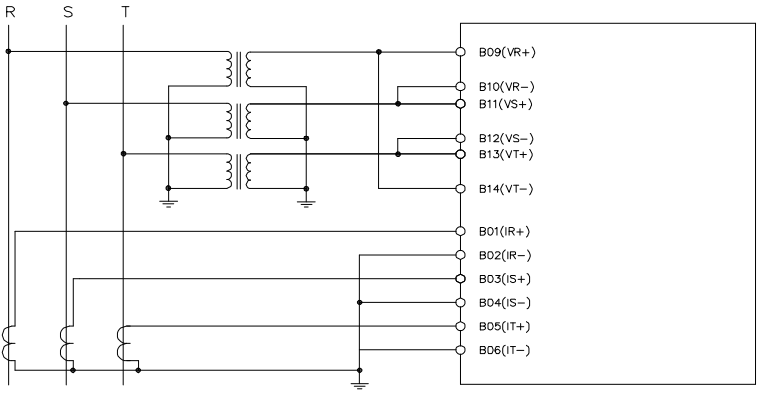


(4) 3P 3W: 3CT, 2PT

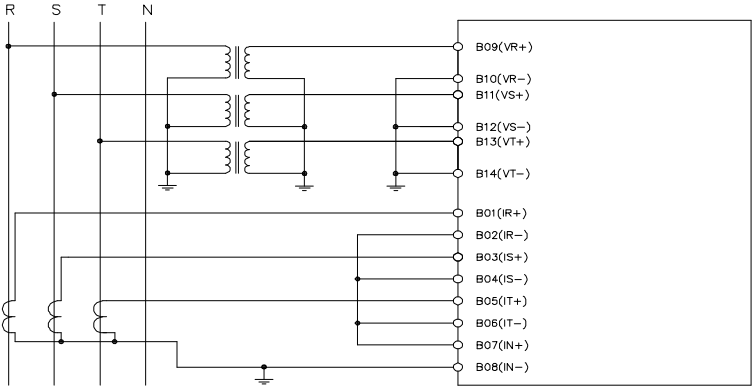


6.2 Wiring diagram of GIPAM-115 FI

(5) 3P 3W: 3CT, 3PT

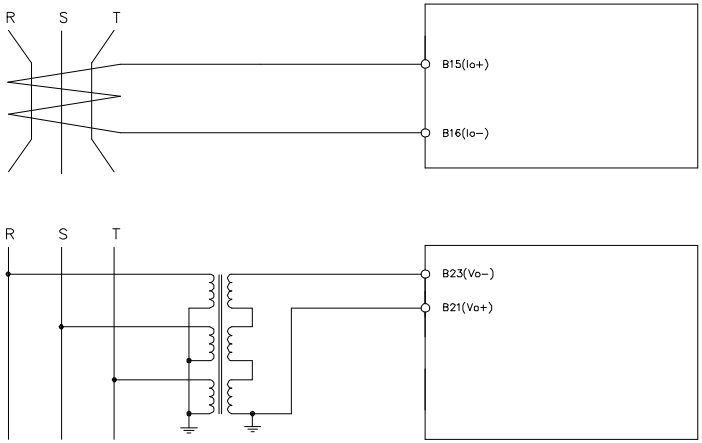


(6) 3P 4W: 3CT, 3PT

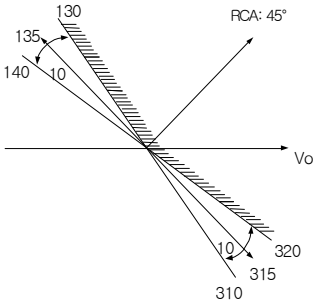


6.2 Wiring diagram of GIPAM-115 FI

(7) Wiring diagram of zero phase current and zero phase voltage



※ SGR operating range

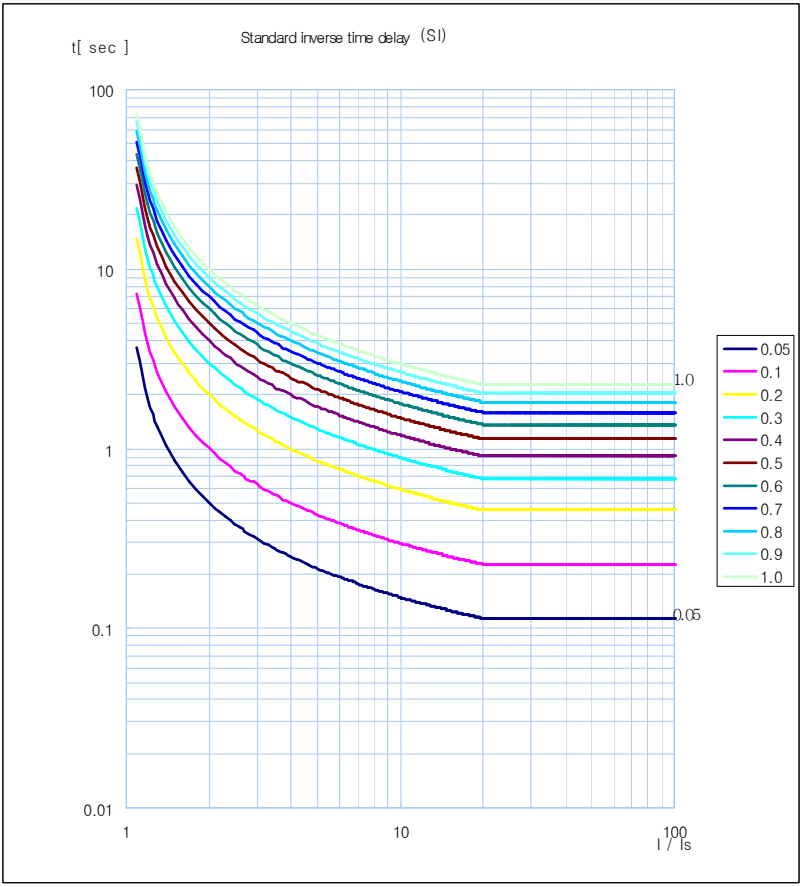


a. Relay pick-up range: 320°~ 130°

b. Drop-out after Pick up range: 140°~ 310°

7. Inverse time Curve

7.1 Standard Inverse Time



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

t = operating time

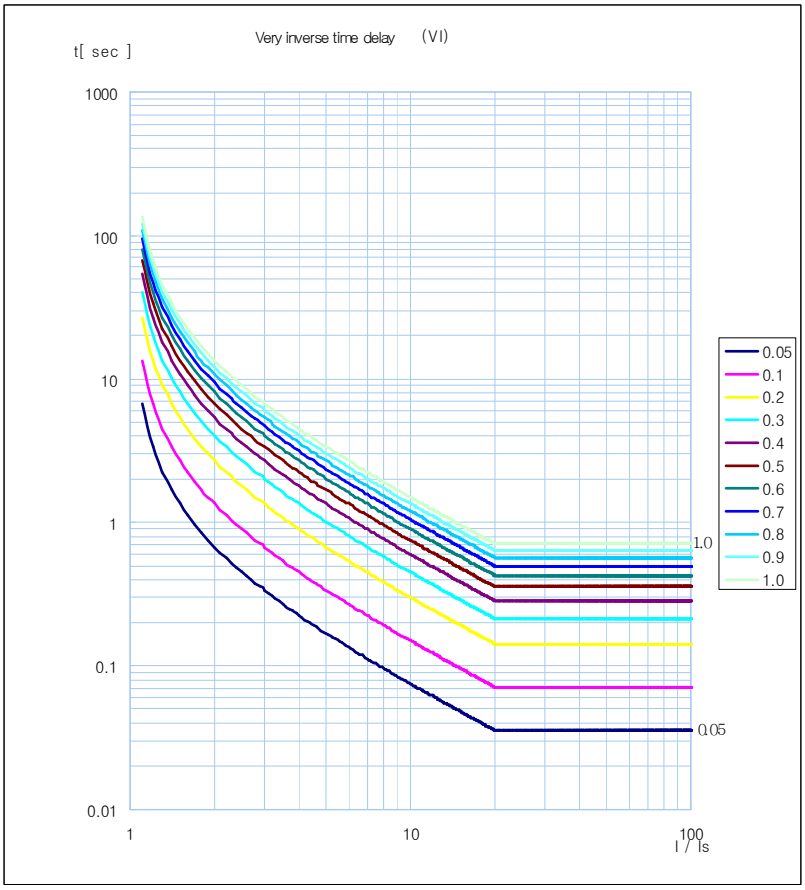
I = fault value

Is = setting value

TL = Time Lever

(Time setting value based on characteristic curve)

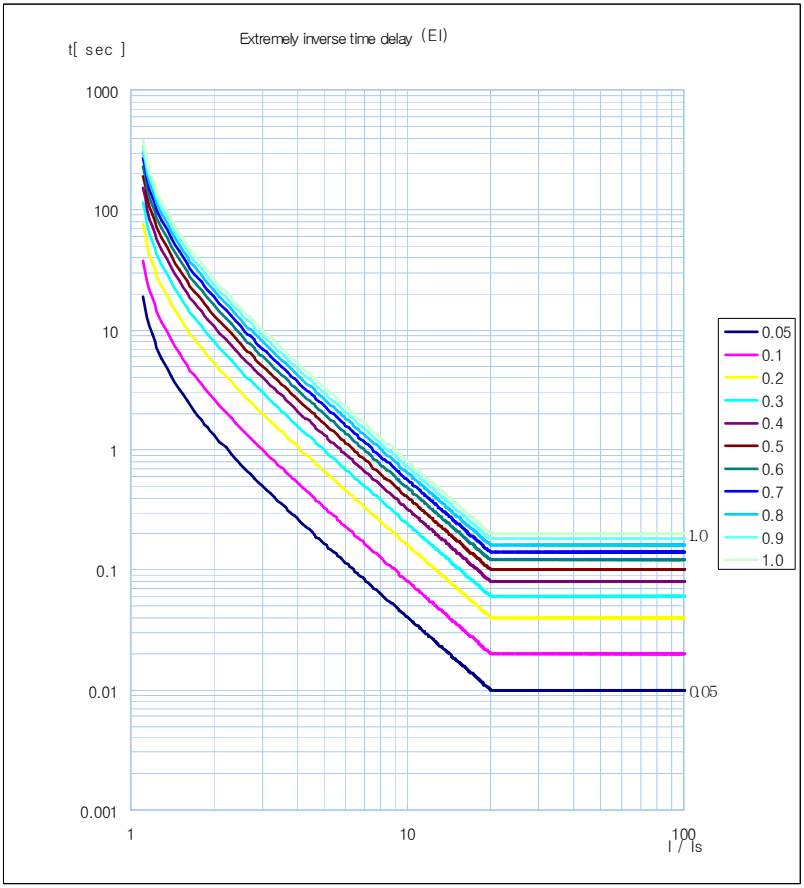
7.2 Very Inverse Time



$$t = \frac{13.5}{(I / Is) - 1} \times TL$$

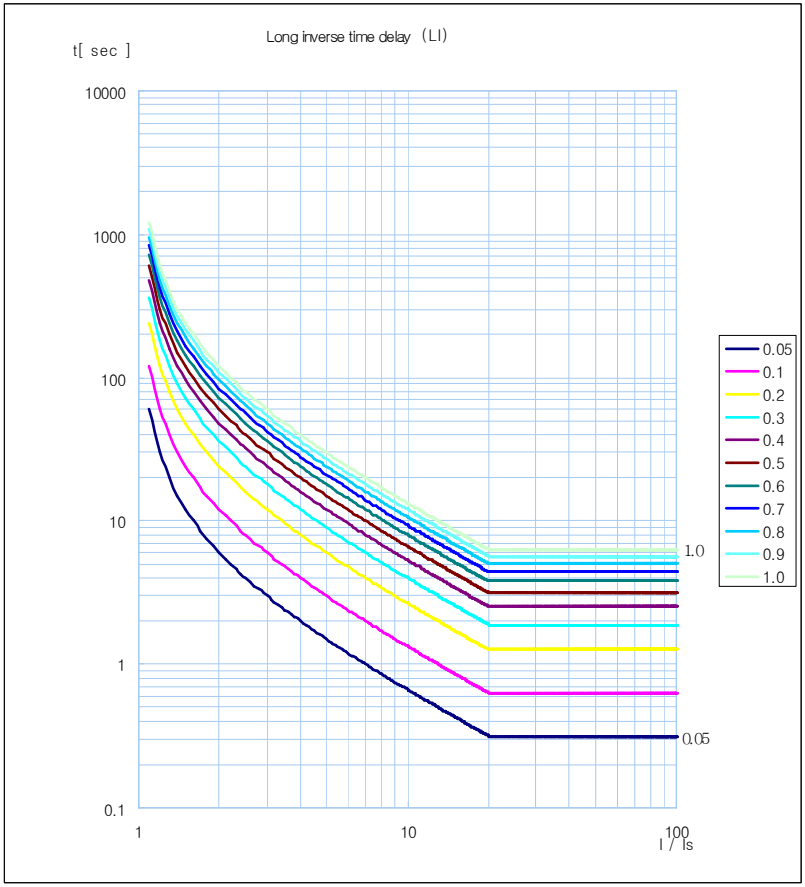
7. Inverse time Curve

7.3 Extremely Inverse Time



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

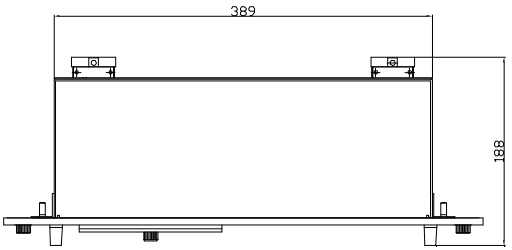
7.4 Long Inverse Time

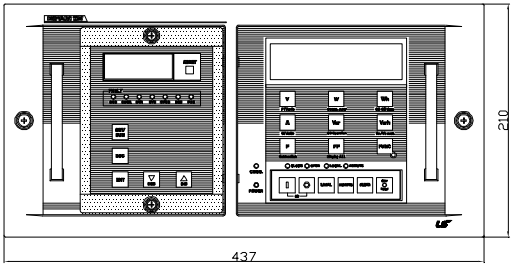


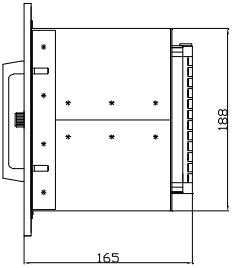
$$t = \frac{120}{(I / Is) - 1} \times TL$$

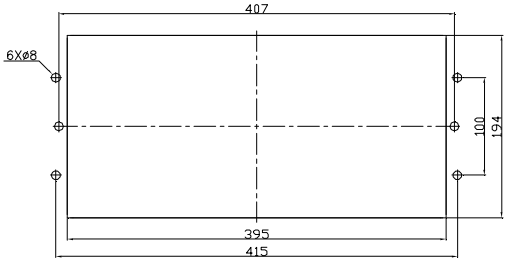
8. External dimension

8.1 External dimension of GIPAM-115 FI



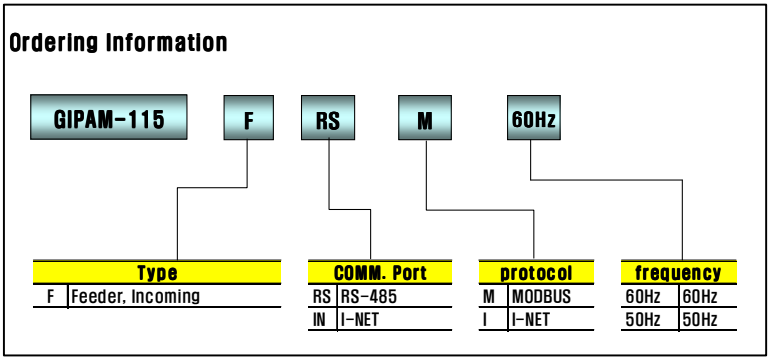






9. Ordering information

9.1 Ordering information of GIPAM-115 FI



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