Top 100
Global
Innovator
for 10 years

Smart-MEC

DIGITAL PROTECTION & MEASUREMENT DEVICE

LS ELECTRIC


XGIPAM-F
PROTECTIVE RELAY
MONITORING
RECORDS
POWER SYSTEM CONFIGURATION
MEASUREMENT
DEVICE CONFIGURATION
DATA MANAGEMENT
DEVICE INFORMATION
USER DEFINED DISPLAY

neXt Generation Intelligent Device (XGIPAM)

Digital Integrated Protection & Monitoring Equipment (GIPAM3000)

Digital Integrated Protection & Monitoring Equipment (GIPAM2200)

Digital Integrated Protection & Monitoring Equipment (GIPAM115 FI)

Digital Protection Relay (DPR1000)

Digital Protection Relay (GIPAM10)

Digital Integrated Metering & Control Device / Power Quality Meter / Automatic Power Factor Controller (GIMAC-V)

Digital Integrated Metering & Control Device / Automatic Power Factor Controller / Demand Controller (GIMAC-IV)

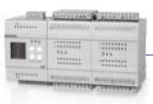
Digital Integrated Metering & Control Device / Power Quality Meter (GIMAC-PQ)

Digital Integrated Metering & Control Equipment (GIMAC-II Plus)

Digital Power Measuring Device (GIMAC1000)

Energy Measuring Device (GIMAC-B)

Digital Power Meter / Digital DC (GIMAC-DC)



Network System (μ - RTU)

It provides total solution of power system for power equipment failure, monitoring and protection.

Protection Device

Protection Device

Digital Power Protection and Monitoring Device
for High Reliability of Plant Facilities
XGIPAM opens the future of intelligent switchgear.

XGIPAM

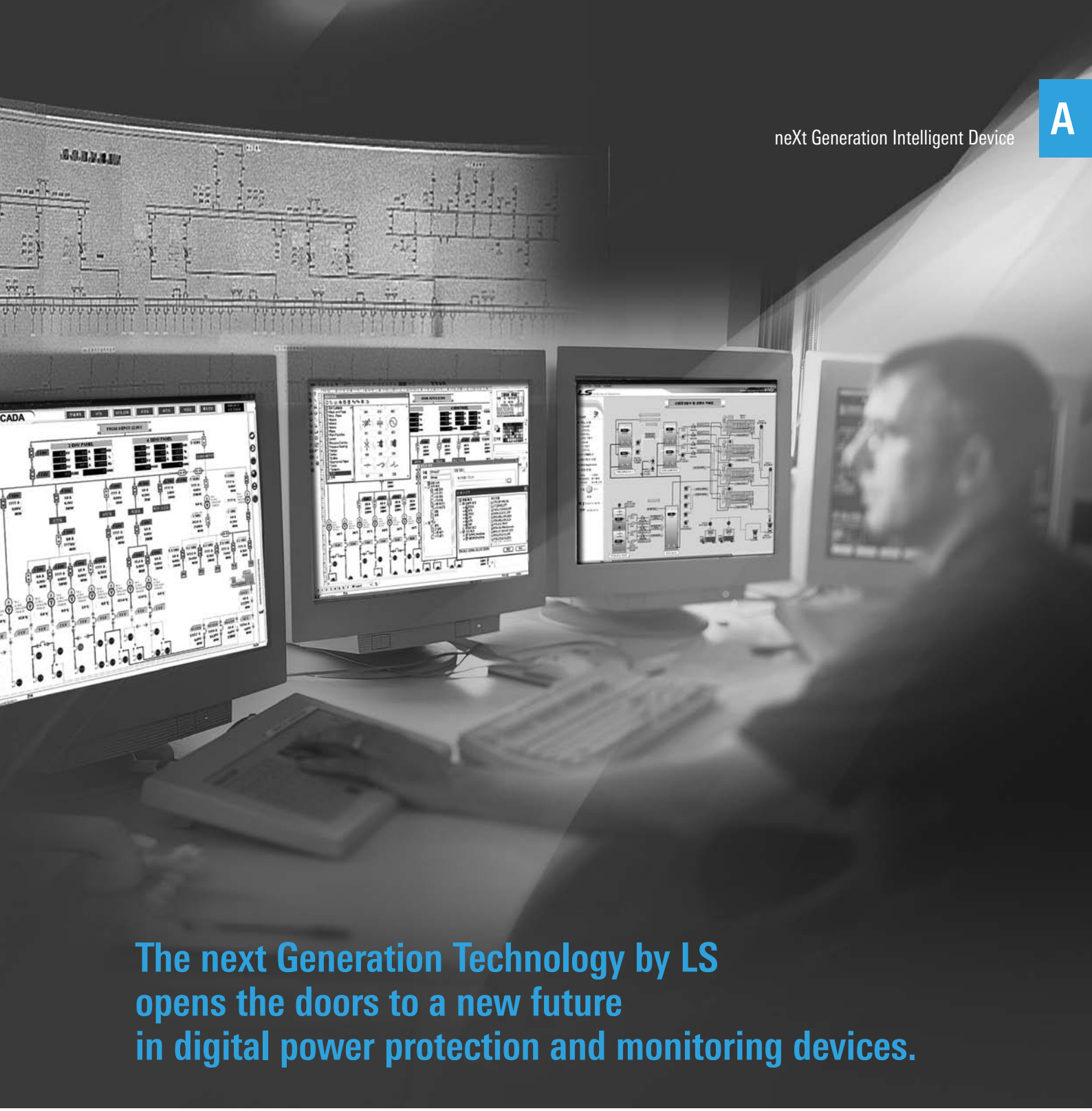
XGIPAM

neXt Generation Intelligent Device

- 0.2% of Voltage and Current Measuring accuracy
- Analysis for sag, swell, interruption, and up to 63th harmonics.
- High reliability with TCS/TRS, CBF/PTF and SBO
- Intelligent monitoring system with Setting Group and CB Capacity
- Arc Protection function (XGIPAM option)
- Communication duplexing and IEC 61850 KEMA certification
- 8.4" color touchscreen supporting Korean/English

Contents

XGIPAM is a next-generation digital power monitoring protection product that can establish power protection monitoring system with IEC61850, setting group, power PQ and various monitoring and control functions.



The next Generation Technology by LS opens the doors to a new future in digital power protection and monitoring devices.

XGIPAM
neXt Generation Intelligent Device

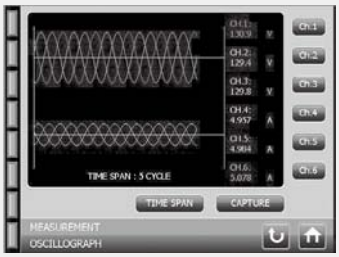
LS leads the Intelligent switchgear market through its range of digital power monitoring, protection and monitoring devices that are used in the monitoring and protection of power equipment, the GIPAM series and digital measurement control device, GIMAC series.

XGIPAM is the next generation digital power protection and monitoring device developed with LS's accumulated experiences and technology in power industry, and it offers a user-oriented module structure as well as a convenient interface which supports AI functions and application systems.

Features

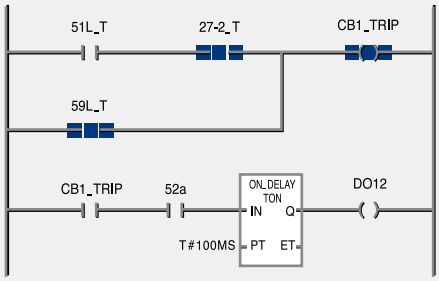
Various measurement items and monitoring

- Voltage and current measurement accuracy 0.2%
- Graphic display of the load rate factor
- Recording peak/demand value of current and power
- Available to wave-capture for voltage and current
- Easy to check wiring by VECTOR diagram in color LCD
- Color display during relay operation and DI/PO operation



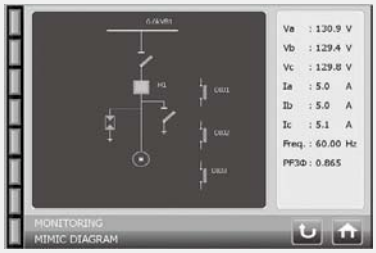
Trip Logic & PLC Function

- Real-time monitoring of contact and logic status
- Available logic programming with relay operation, DIO status and various events
- LS PLC Programming tool XG5000 applied
- XG5000 supported OS specification
  : Windows 2000/XP/Vista/Windows 7 & 8
  (contact LS if Windows 10 is used)



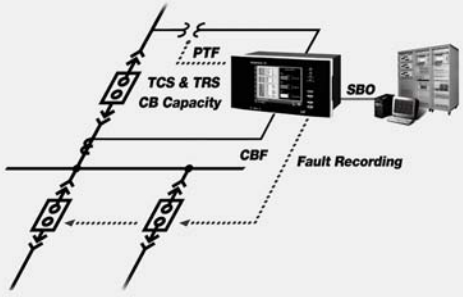
Mimic Diagram

- Convenient monitoring by graphic mimic diagram on device
- Check and control the status by touching the symbol on the screen.



Various monitoring, control and Fault recording

- SBO (Select Before Operating)
- CBF (Circuit Breaker Failure), PTF (PT Failure)
- Saves 1,000 events, 200 Fault Data
- Saves 62 Fault Waveforms of 128 cycles
  (select before/after fault)

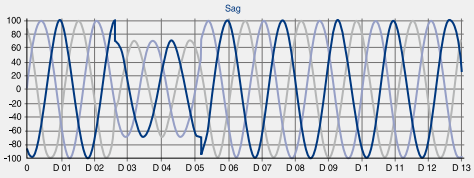


Expanded Power Quality(PQ) Measurement

- Sag, Swell, Interruption analysis/measurement
- Support up to 63rd order of harmonic analysis spectrum (1-63th harmonic wave and THD, TDD, k-factor)
- Current, voltage measurement accuracy 0.2%
- Power measurement accuracy 0.5%

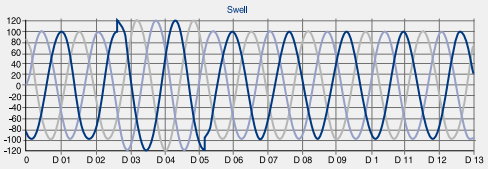
- **SAG (voltage drop)**
  The phenomenon when the effective value is at 0.1 ~ 0.9pu of the rated voltage
  - Instantaneous sag : 0.5 ~ 30 cycles
  - Momentary sag : 30 cycles ~ 3sec
  - Temporary sag : 3sec ~ 1min

  Sag phenomenon cannot be prevented by measures such as Battery Backup, and transformers, cables, switch gears and CT & PT are also not influenced by Sag.



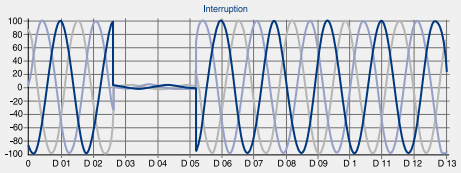
- **SWELL (voltage rise)**
  The phenomenon when the effective value is at 1.1 ~ 1.8pu of the rated voltage
  - Instantaneous swell : 0.5 ~ 30 cycles
  - Momentary swell : 30 cycles ~ 3sec
  - Temporary swell : 3sec ~ 1min

  Devices sensitive to frequency are influenced by Swell.
  Devices requiring accurate speed, computer and electronic control devices are instantly disturbed by Swell.



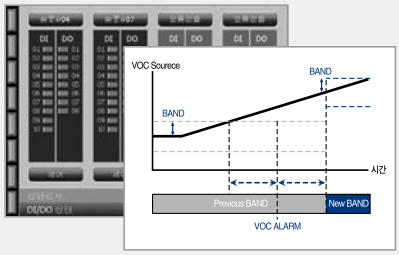
- **Interruption (blackout)**
  The phenomenon when the effective value is less than 0.1pu
  - Instantaneous interruption : 0.5 ~ 30 cycles
  - Momentary interruption : 30 cycles ~ 3sec
  - Temporary interruption : 3sec ~ 1min

  Interruption can cause malfunctions in electronic control, computer and rotating device control. It also hinders the inductivity of electric motor contacts and can influence soft-starter devices.



I/O Status Monitoring

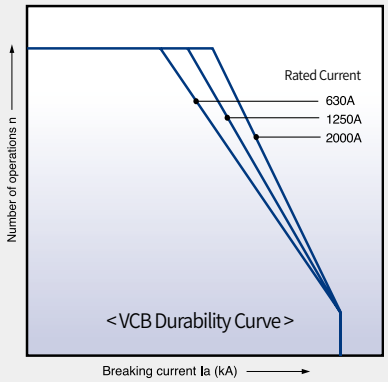
- VOC (Value Of Change) setting with DI and measurement values
- Implementation of control functions with digital I/O status display
- 6-point switch control with large capacity contacts
- PLC Virtual Output and waveform recording through event behavior and digital input combination



Features

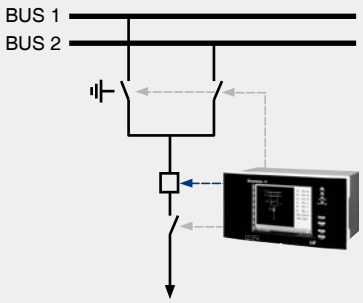
CB Capacity Limit Monitoring Function

- Calculation accumulating value of breaking current and operating times
- Tolerance monitoring of circuit break vacuum interrupter
- Prevention of accident prevention



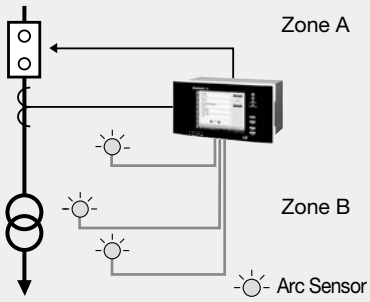
Bay Controller

- Reclosing(79) and directional overcurrent protection (67)
- Various types of ground fault protection (50NG, 51NG, 67N, 67G)
- Overvoltage/Low voltage protection (59, 27)
- High frequency/low frequency protection (81O, 81U)
- Switching device control with application of 3 basics (CB, DS, ES)
- Expandable DI/DO structure



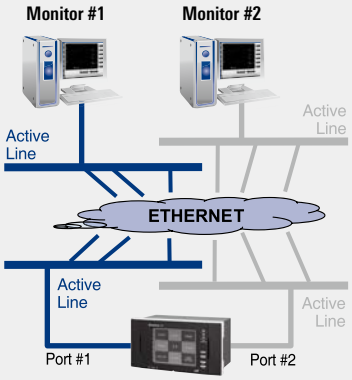
Arc Protection Module

- High-speed operation of 15msec with an arc and current detection
- Minimization of secondary damage due to power system's arc accident
- Active high-speed protection system minimizes secondary damage caused by arc accidents in power systems



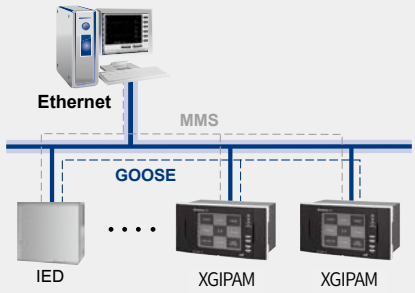
Communication redundancy

- support Independent dual system through two built-in communication ports
- Communicates with multiple monitoring SCADA simultaneously without switching between communication ports (Basic local network)
- Building a fail-safe communication system with Preliminary communication lines
- RSTP(Rapid Spanning Tree Protocol) communication is supported



IEC 61850 communication

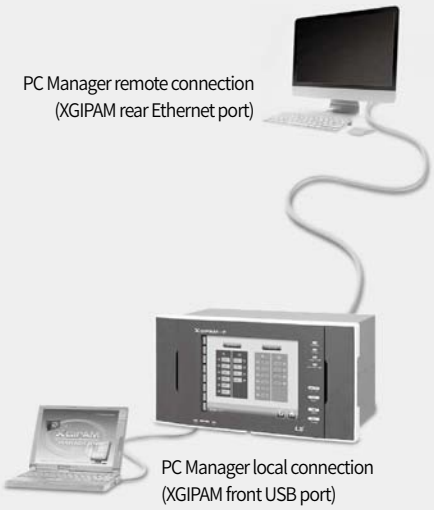
- Provides Ethernet-based bidirectional high-speed communication and interoperability
- Support all control, report defined in IEC61850 standard
- Maximizing inter-operability between devices
- Connected to other vendor' IEDs to build a system



PC MANAGER with advanced functions

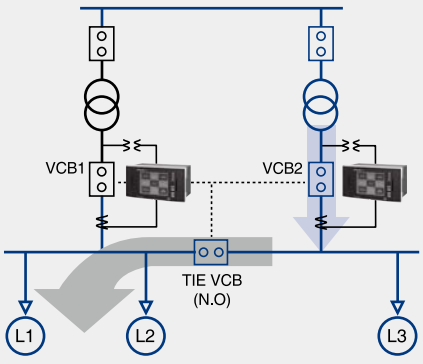
- Setting of protection relay elements, circuit breaker, switch and control system, etc.
- Setting/editing/monitoring of DI/DO, AI/AO, VOC, SWITCH, Mimic
- Monitoring voltage, frequency, current, power, power quality and harmonic wave
- Accident waveform analysis (COMTRADE type support)
- Inquiry / save / analysis of recorded data such as accidents, events and waveforms
- Relay protection collaboration (characteristic curve's plot function)
- PQ analysis (Sag, Swell, harmonic analysis)
- Simultaneous implementation of OWS[1)] and EWS[2)] (IEC61850, RS485)
- Waveform analysis function (Wave classification, DI/O status display)
- Field connection using front USB port and Remote connection is possible using the rear Ethernet communication port.

Note) 1. OWS(Operating Work Station)
2. EWS(Engineering Work Station)



Group Setup function

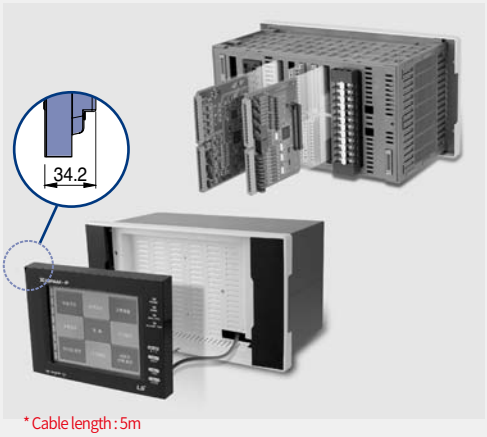
- Available to configure up to 4 setting groups for each protection element
- Possible to change setting values automatically depending on field status.
- Auto-recognition of power system's status change



Features

Flexible modular structure

- Reliability Improvement by Independent module structure
- Expandable DI/DO boards (DI: 40, DO: 32 points)
  Expandable AI/AO boards (AI: 12, AO: 8 points)
- Prevention of incorrect wiring with PT secondary rating setting
  (110 or 110/√3)
- 7 optional modules available
- Easy configuration and installation of switchboard by detachable HMI option



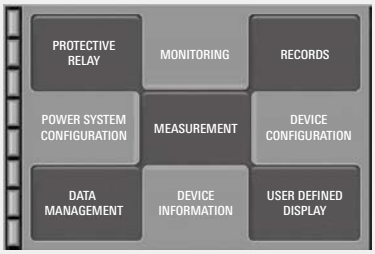
* Cable length : 5m

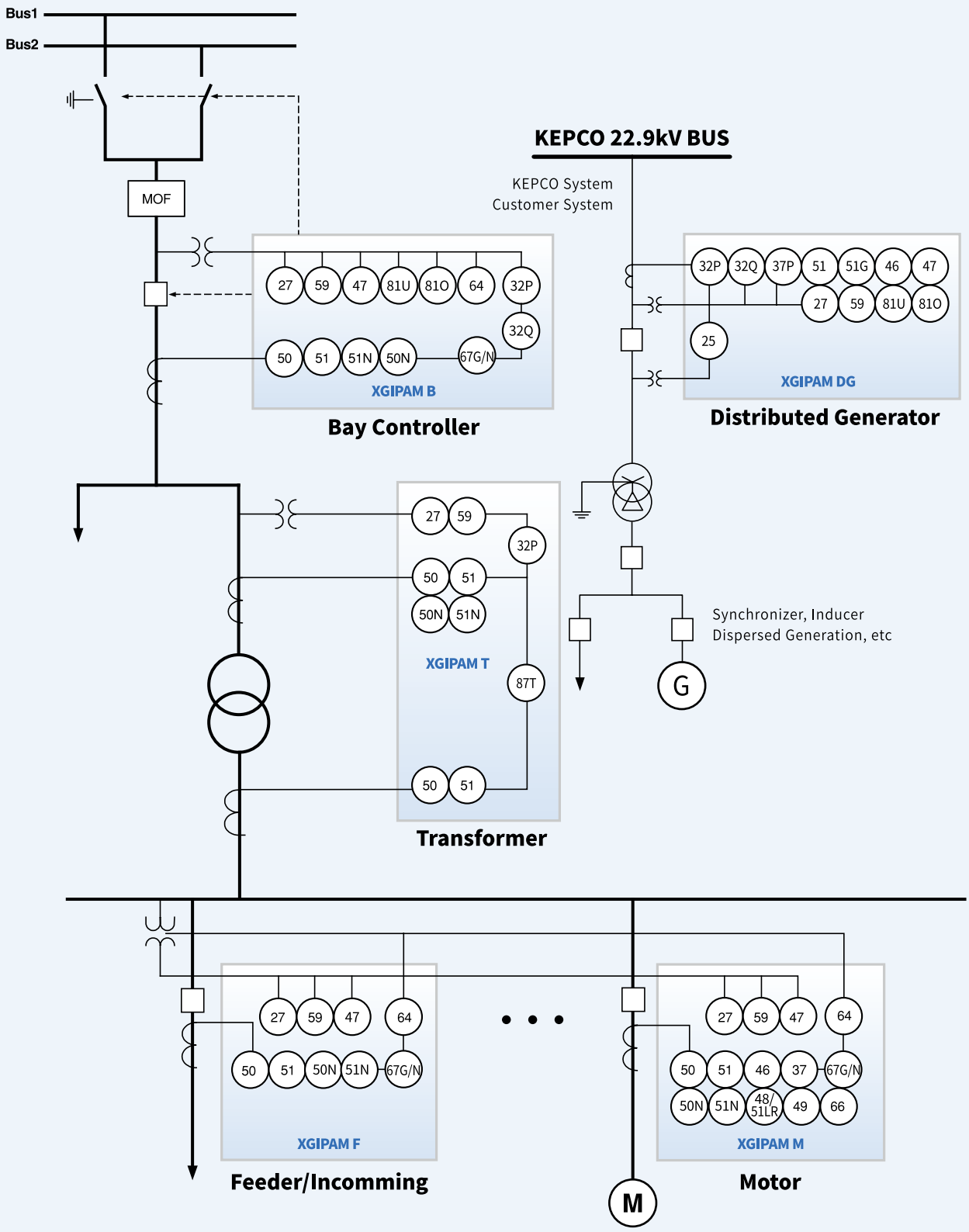
8.4″ inches of large color Touch screen

- Convenient operation by 8.4″ large color touch screen
- Easy management by graphic color LCD
- Intuitive display of various diagrams, pictures and charts

Multi-language selection and User selective menu

- Language selection: Korean/English
- Display Selection: Max. 3




Bus1
Bus2
MOF
KEPCO 22.9kV BUS
KEPCO System
Customer System
27 59 47 81U 81O 64 32P
32Q
50 51 51N 50N 67G/N
XGIPAM B
Bay Controller
32P 32Q 37P 51 51G 46 47
27 59 81U 81O
25
XGIPAM DG
Distributed Generator
27 59
32P
50 51
50N 51N
XGIPAM T
87T
50 51
Transformer
Synchronizer, Inducer
Dispersed Generation, etc
G
27 59 47 64
50 51 50N 51N 67G/N
XGIPAM F
Feeder/Incomming
27 59 47 64
50 51 46 37 67G/N
50N 51N 48/51LR 49 66
XGIPAM M
Motor
M

Function & Rating

Protection element by type

Type	Usage	Protection Elements
XGIPAM F	Feeder/Incomming	OCR(50/51), OCGR(50/51N), UVR(27), OVR(59), SGR(67G), DGR(67N)[Note1], OVGR(64I/D), NSOVR(47N), POR(47), SYNC Check(25), Reclosing(79), Temperature(38)
XGIPAM B	Bay Controller	OCR(50/51), OCGR(50/51N), UVR(27), OVR(59), SGR(67G), DGR(67N)[Note1], OVGR(64I/D), NSOVR(47N), POR(47), SYNC Check(25), eclosing(79), emperature(38), DOCR(67I/D), NSOCR(46I/D), UFR(81U), OFR(81O), DPR(32P), DQR(32Q)
XGIPAM M	Motor	OCR(50/51), OCGR(50/51N), UVR(27), OVR(59), SGR(67G), DGR(67N)[Note1], OVGR(64I/D), NSOVR(47N), POR(47), Temperature(38), Stall/Locked Rotor(48/51LR), THR(49), DOCR(67I/D), UCR(37), NCH(66), NSOCR(46I/D)
XGIPAM T	Transformer	OCR(50/51)×2, OCGR(50/51N), UVR(27), OVR(59), Temperature(38), DPR(32P), DFR(87T)
XGIPAM DG	Distributed Generation	OCR(50/51), OCGR(50/51N), UVR(27), OVR(59), DPR(32P), UPR(37P), DQR(32Q), UFR(81U), OFR(81O), DGR(67N)[Note1], SYNC Check(25), DOCR(67I/D), NSOCR(46I/D), POR(47), NSOVR(47N), ROCOF(81R), SGR(67G), OVGR(64I/D)
XGIPAM 3wT	Transformer (3wT)	OCR(50/51)×3, OCGR(50N/51N), UVR(27), OVR(59), OVGR(64I/D), DFR(3W87T)

Note) 1. DGR is identical to DOCGR

Power quality functions

Power quality	Effective voltage	Fault wave recording	Remarks
Sag	0.1 ~ 0.9V_n	Record cycle set to the event trigger point 0.9V_n or less and Record waveforms before and after the set cycle	If the waveform continues for more than one cycle, it will be logged (Set by applying PLC logic)
Swell	1.1 ~ 1.4V_n	Record cycle set to the event trigger point 1.1V_n or more and Record waveforms before and after the set cycle	
Interrption	0.1V_n or less	Record cycle set to the event trigger point 0.1V_n or less and Record waveforms before and after the set cycle	

Measurement

Item		Range	Accuracy	Remarks
Voltage	Phase voltage	0.0V ~ 999.999 kV	±0.2%	
	Line voltage	0.0V ~ 999.999 kV	±0.2%	
	Reverse phase voltage	0.0V ~ 999.999 kV	±1.0%	V_2
	Zero-Phase Voltage	0.0V ~ 999.999 kV	±2.0%	V_o
	Bus voltage	0.0V~999.999kV	±0.2%	V_B
	Unbalanced voltage rate	0.0%~200.00%	±2.0%	IEEE Std. 141
Current	Phase Current	0.0A ~ 999.999 kA	±0.2%	
	Reverse current	0.0A ~ 999.999 kA	±1.0%	I_2
	Zero-Phase Current (I_{CT4})	0.0A ~ 999.999 kA	±2.0%	I_n
	Zero-Phase Current (I_{ZCT})	0.0A ~ 999.999 kA	±2.0%	I_o
Phase	Line voltage	0.0~360.0°	±5°	
	Line voltage-current			
	Phase voltage			
	Phase voltage-current			
	Phase current			
Power	Active power	0.00W ~ 9999.999MW	±0.5%	+ Forward, - Reverse
	Reactive power	0.00VAR ~ 9999.999MVar	±0.5%	-
	Reverse active power	0.00W~9999.999MW	±0.5%	-
	Apparent power	0.00VA ~ 9999.999MVA	±1.0%	-
Energy	Active energy	0.00Wh~99999.999MWh	±0.5%	+ Forward, - Reverse
	Reactive energy	0.00Varh~99999.999MVarh	±0.5%	
	Reverse active energy	0.00Wh~99999.999MWh	±0.5%	
Frequency	Frequency (V_a)	45Hz ~ 65Hz	±0.005Hz	
	Frequency (V_b)	45Hz ~ 65Hz	±0.005Hz	
Power Factor	Power Factor(PF)	-1.000~1.000	±1.0%	+ Forward, - Reverse
	1st harmonic power factor (DPF)	-1.000~1.000	±1.0%	
Harmonics	Line voltage	0.00~100.00%	±5.0%	
	Phase voltage	0.00~100.00%	±5.0%	
	Phase current	0.00~100.00%	±5.0%	
	Voltage THD	0.00~100.00%	±5.0%	2^{nd} ~ 63^{th} Harmonics, THD, TDD and K-FACTOR
	Current THD	0.00~100.00%	±5.0%	
	TDD [Note1]	0.00~100.00%	±5.0%	
	K-FACTOR	0.00~100.00%	±5.0%	
Demand	Active power demand	0.00W~9999.999MW	-	Total peak demand
	Reactive power demand	0.00Var~9999.999MVar	-	
	Current demand	0.3A~999.999kA	-	Each phase and total peak demand
Load factor		0.0% ~ 100.000%	±0.2%	Each phase current

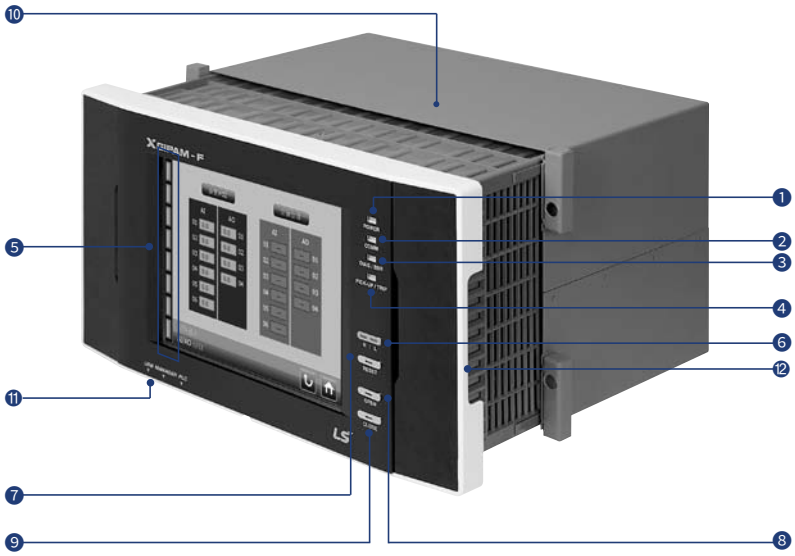
Note) 1. For TDD measurement, please enable (USE) the demand current setting of each phase.

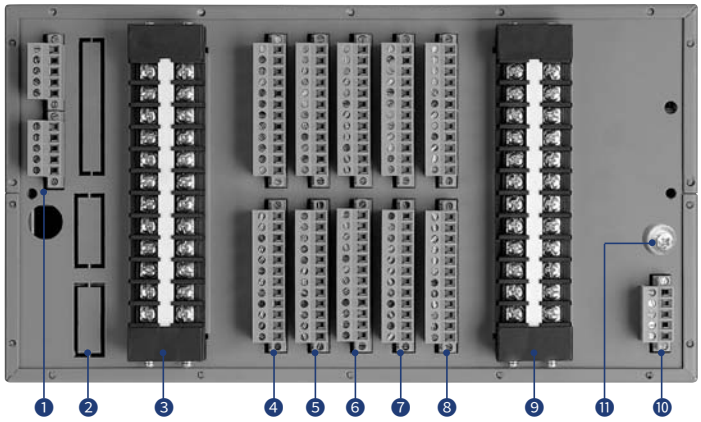
Ratings

Type			Specification
Wiring			3P3W, 3P4W
Rating	Frequency		60Hz, 50Hz *
	Voltage	PT	100/√3, 110/√3, 120/√3, 190/√3, 100, 110, 120V
		GPT	100~190V
	Current	CT	5A
		ZCT	1.5mA
	Power		AC 110V, DC 110~125V
	Power consumption		30W or less : Stanby 70W or less : Operation
	Burden		0.5VA or less : PT 1.0VA or less : CT
Input contact	for general		Digital Input AC/DC 110V
Output contact	for trip		Rated Capacity: AC 250V 10A/DC 30V 10A, Resistive Load Opening Capacity: AC 2500VA, DC 300W
	for alarm		Closed Capacity: AC 250V 5A/DC 30V 5A, Resistive Load Opening Capacity: AC 1250VA, DC150W
Insulation Resistance			DC 500V 10MΩ : All electric circuits 5MΩ : Between Electrical circuits 5MΩ : Between contact circuit terminals
Dielectric Strength			AC 2kV/1min : Between Electric circuit and earth AC 2kV/1min : Between Electrical circuits AC 1kV/1min : Between contact circuit terminals
Overload withstand	Current circuit		Withstand 2 times of rated current for 3 hours. Withstand 20 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV : power or calculating circuit input 2kV : digital input or digital output circuit input 1kV : other input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Altitude			1,500m or less
Environment			A place not subject to abnormal vibration and shock. A place where the surrounding air pollution is not remarkable.
Applied Standards			IEC 60255-22-1: 1MHz Burst disturbance tests IEC 60255-22-2: Electrostatic discharge tests IEC 60255-22-3: Radiated radio frequency electromagnetic field IEC 60255-22-4: Electrical fast transient/burst immunity test IEC 60255-22-5: Surge immunity test IEC 60255-22-6: Immunity to conducted disturbances induced by radio frequency fields IEC 60255-22-7: Power frequency immunity test IEC 60255-11: Interruptions to and alternating component (ripple) in d.c. auxiliary quantity of measuring relay IEC 60255-25: Electromagnetic emission tests for measuring relays and protection equipment KEMC 1120 IEC 61850-6, 7-1, 7-2, 7-3, and 8-1
Dimension(mm)			360x190x207: HMI built-in type 424x190x239: HMI separate type
Weight			7kg 2kg : Detachable HMI
Communication			RS485 : Modbus, DNP3.0 Ethernet TE : Modbus, DNP3.0, DNP3.0 RSTP, IEC61850, IEC61850 RSTP Ethernet FE : Modbus, DNP3.0, IEC61850, IEC61850 RSTP, DNP3.0 RSTP

* Please contact us for 50Hz separately.

Appearance





❶ **Main Processing Module** : Master module equipped with integrated main processor and Bus Controller and RS485 communication

❷ **Communication Module**: Module for expanded communication

❸ **Calculation Module**: Dedicated calculation module with CT and PT, and consists of DSP PCB and CT/PT PCB 1 or 2 of them can be installed, and in case of 2, Slot#3 is synchronized as the Master

❹ ~ ❺ **AIO**: 6 Analog Inputs and 5 Analog Outputs, consisted of 2 connectors with 12-pin

❻ ~ ❽ **DIO Clamp terminal type module**:
10 Digital Inputs and 6 Digital Outputs Module consists of 2 external connection 12-pin combicon type connectors

❾ **DIO Screw terminal type module**: Digital I/O module consisting of 10 Digital Inputs, 2 Power Digital Outputs and 6 Digital Outputs Module consists of 2 external connection 12-pin combicon type connectors

Calculation module (3wT only): Dedicated calculation module with CT and PT, and consists of DSP PCB and CT/PT PCB

❿ **Power module**: Product control and power input terminal (AC 110V, DC 110~125V)

⓫ **FG terminal**: It is a Frame Ground terminal which must establish a ground connection with distribution ox panel exterior.

Product Status Display LED

❶ **POWER LED (Green)** :
Power supply status

❷ **COMM LED (Yellow)** :
Blinks when data transfer is made from the device

❸ **DIAG/ERR LED (Red)** :
Blinks when product error occurs

❹ **PICK-UP/TRIP LED (Red)** :
Blinks during PICK-UP function
Lights up during TRIP

❺ **Fault assign LED (Virtual)** :
Relay element, DI/DO. Vo status

Front Key

❻ **R/L**: Remote (green)/
Local (red) change

❼ **RESET**: Screen Message Clear
(red: Trip status)

❽ **OPEN**: Open control of SW & DO
(green: main CB Open status)

❾ **CLOSE**: SW & DO close control
(red: main CB Close status)

Other

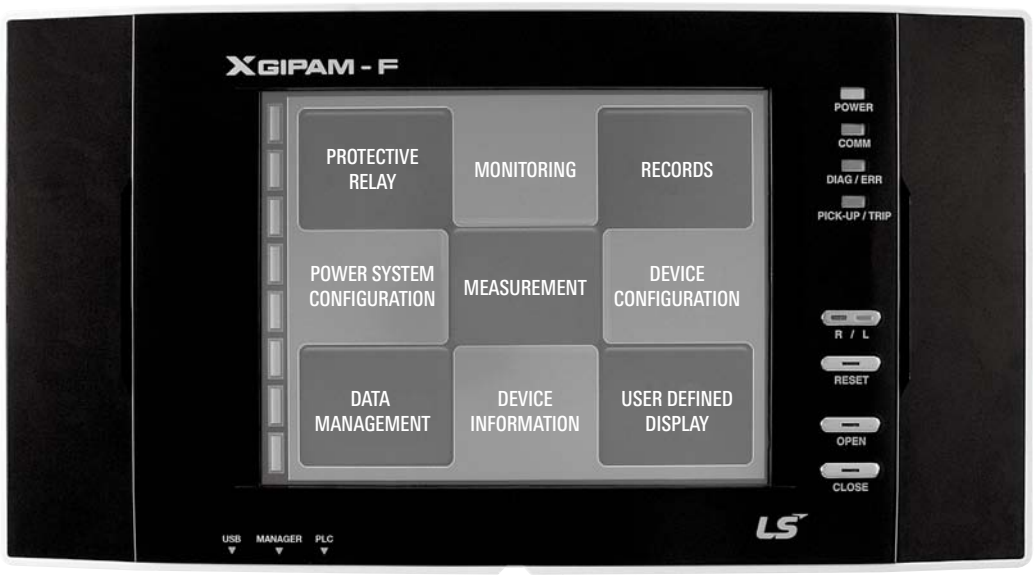
❿ XGIPAM Case

⓫ USB (USB Memory, PC, PLC)

⓬ Draw-Out handle

Slot Number	Equipable Module
❶ Main Processing	Main Processing Module mounting (exclusive use)
❷ Slot #0	Extended communication Module
❸ Slot #1	Calculation (exclusive use)
❹ Slot #2	AIO Module (Option)
❺ Slot #3	AIO Module
❻ Slot #4	DIO Module(Standard)
❼ Slot #5	DIO Module(Bay, DG)
❽ Slot #6	DIO Module(Option)
❾ Slot #7	Calculation or DIO Module
❿ Power module	
⓫ FG terminal	

Touchscreen menus can not only set up various relay elements but can also display measurements, fault and event data logging, DI/DO monitoring and XGIPAM setting easily.



Protectvie Relay

Relay Element Setting Change

- Operation value time setting/status check
- Analog Source setting

Monitoring

Digital/Analog I/O Monitoring & Management

- DI/DO status monitoring
- AI/AO status monitoring
- Circuit breaker status monitoring

Records

EVENT/FAULT/WAVE Information Monitoring & Management

- EVENT
- FAULT

Power System configuration

System Status Setting & Management

- PT/CT setting
- Wiring
- CB/SW setting
- Control authority setting

Measurement

Measurement of Voltage, Current, Power, Harmonic Wave, etc.

- Voltage/Frequency
- Current
- Power
- Electric Energy
- Power Factor
- Electricity Demand
- Harmonic Wave
- Wave Form

Device Configuration

Product Operation Parameter Setting

- Language setting
- Password and WAVE setting
- LED/Group setting
- User selection screen setting
- VOC setting
- Communication setting
- AI/AO Setting

Data Management

Save & Manage Various Device Data

- Delete measurement/recorded data
- USB memory connection
- Touchscreen adjustment
- Reset password

Device Information

Information about Manufacturing & Version

- Version information
- Device rating
- Time stamp information

User Defined Display

Screen set by the user is displayed in cycle
(up to 3 screens)

Operation & Setting

XGIPAM B

*Note) Protection elements menu for Bay controller, The configuration menu depending on the model.
*Note) Menus are available in Korean/English.

XGIPAM 3wT

*Note) Menus are available in Korean/English.

Communication

**XGIPAM supports RS485 communication type MODBUS and DNP Standard Protocol,
and it supports also Ethernet communication of MODBUS-TCP and DNP-LAN Standard Protocol and IEC61850.
In addition, communication redundancy and user map support are possible using two independent ports.**

Supported Protocols

IEC61850, DNP3.0, MODBUS-RTU, DNP-LAN, MODBUS-TCP

RS485 (DNP3.0, MODBUS-RTU)

- Operation Mode: Differential
- Distance: max. 1.2km
- Cable: Universal RS485, 2Wire cable
- Speed: 9600bps~38.4kbps in general
- Transfer Method: Half-Duplex
- Max. In/Out Voltage: ±6V

10BASE-T Ethernet (DNP-LAN, MODBUS-TCP)

- Speed: Max.10MBps • Topology: Star-type
- Cable : UTP(CAT.3, CAT.5)
- Access Control: CSMA/CD, Transfer Code: Manchester
- Distance: Max. up to 100m between hub and terminal

100BASE-TX Ethernet (DNP-LAN, MODBUS-TCP)

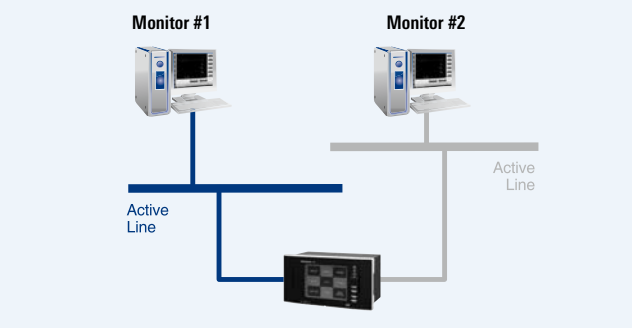
- Speed: Max.100MBps • Topology: Star-type
- Cable: UTP (CAT.5), STP (Level 3)
- Access Control: CSMA/CD, Transfer Code: 4B/5B + MLT-3
- Distance: Max. Up to 100m between hub and terminal

100BASE-FX Ethernet (DNP-LAN, MODBUS-TCP)

- Speed : Max.100MBps • Topology: Star-type
- Cable :
  -Wavelength: 1,300nm
  -Multi-Mode fiber
  -Fiber Size: 62.5/125, 50/125um
  -Optic Connector: SC type
- Access Control: CSMA/CD, Transfer Code: 4B/5B+NRZI
- Distance: Max. 2km per segment

Duplex Communication

- Independent communication using 2 ports
- Simultaneous communication with monitoring unit without causing any disturbance between ports
- Fail safe communication network established with secondary line



IEC61850 Communication Module

IEC61850 Communication

- High-speed bidirectional communication based on Ethernet
- It is compatible with the control and report defined in the IEC standard and maximizes interoperability.
- Rapid Spanning-tree Protocol support

Specification

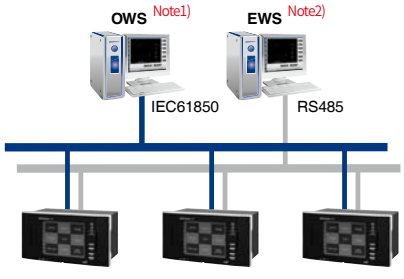
- Detachable in XGIPAM slot 0 in the form of communication card
- Ethernet 100 Base-T support
- IEC61850 KEMA certification

IEC61850 Features

1) Report: If the data set value changes, reporting the event to the client system
2) Control: Direct control, SBO control
3) Time Sync: Synchronizes SNTP server and time using SNTP v4 stack

Support simultaneous communication with OWS and EWS

- Support simultaneous communication with operation and engineering systems
- OWS Communication: IEC61850
- EWS Communication: 1:N connection with PAM-Master with dedicated RS485 Protocol



*Note1) OWS (Operation Work Station)
2) EWS (Engineering Work Station)

XGIPAM Manager, PAM-Master

PAM-Master connects PC and XGIPAM to execute variable setting, status monitoring and analysis on PC.

Specification

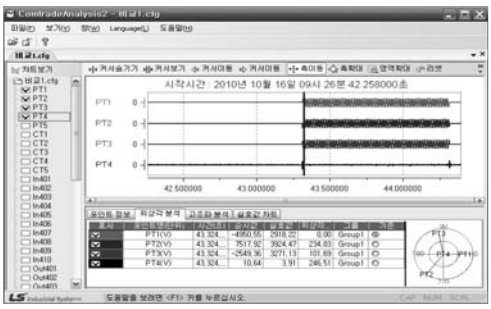
- Windows 9X/ME/NT/2000/XP/7/10
- IBM compatible PC with Pentium or higher (Pentium III or higher recommended)
- RAM of 32MB or higher

Product Package

- Manager CD 1 (for PC installation)
- RS232 to USB Cable (for PLC programming)
- USB Mini 5P Cable (for PAM-Master)

Characteristics

- Protection, device and system setup
- System wiring, fault analysis
- Real-time measurement/monitoring
- RS485, engineering dedicated protocol
  -Fault waveform analysis (Comtrade file analysis)
  -Harmonic waves, phase, effective value view
  -Classifies waves in phases allowing easy analysis
  -DI/DO status monitoring



Power & Regular DI/O Module

Digital Input/output module

- DI/O module with high capacity contacts for CB, ES and DS control, and built-in TCS (Trip Circuit Monitoring) and TRS (Trip Relay Monitoring) circuits
- Consists of 6 PO contacts and 6 DI contacts

<POWER DI/O>

1	DI 01
2	DI 02
3	COM0
4	Blank
5	DI 03
6	DI 04
7	COM1
8	Blank
9	DI 05
10	DI 06
11	COM2
12	Blank

13	PO 02+
14	PO 02-
15	PO 01+
16	PO 01-
17	PO 03+
18	PO 03-
19	PO 04+
20	PO 04-
21	PO 05+
22	PO 05-
23	PO 06+
24	PO 06-

<Regular DI/O>

1	DI 01
2	DI 02
3	DI 03
4	DI 04
5	DI 05
6	COM0
7	DI 06
8	DI 07
9	DI 08
10	DI 09
11	DI 10
12	COM1

13	DO 02+(PO)
14	DO 02-(PO)
15	DO 01+(PO)
16	DO 01-(PO)
17	DO 03
18	DO 04
19	DO 05
20	COM 0
21	DO 06
22	DO 07
23	DO 08
24	COM 1

Contact Comparison

Item	Power DI/O	Regular DI/O
Capacity	10A 250V AC, 10A 30V DC (max. 300W)	5A 250V AC, 5A 30V DC (max. 150W)
Electric Durability	more than 100,000	more than 100,000
Operation/hr	1,200/hr (3A 250V resistance load)	1,200/hr (10A 250V resistance load)
Contact Structure	• PO Contacts: 6 • DI Contacts: 6	• PO Contacts: 2 • Regular DO: 6 • Regular DI: 10
Standard Module Equipment	• F/M/T/3wT: 2 regular DI/O modules • B/DG: 3 regular DI/O modules	
Module	• 3wT: 3 expansion DI/O module, contact and logic structure (refer to Contact & Logic Structure)	

Note) Power DI/O module can be installed on Slot #5 and #6, and there is 1 contact for direct switch control

Option

Arc Protection Module

Arc Protection Module is a protection system that detects arc faults in the incoming panel and distribution panel,
and activates the circuit breaker as soon as possible to minimize the equipment damage due to heat and pressure of the arc.

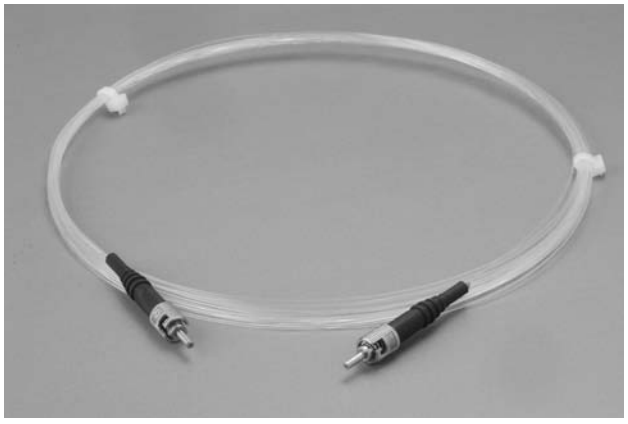
Rating

Item	Specification
Sensor type	Point or Loop
Sensor Input Channel	3Ch (Point) or 1Ch (Loop)
Trip output time after arc accident	< 15 ms
Accident Determination Method	I & L
Current Setting	User Setting
Sensor Self-Diagnosis	Periodic Self check
Arc Accident History Management	Event Save
Protection Element	50PAF, 50NAF (Arc Protection)

*Arc Protection Module is only available on F/M models.
**Please contact the Sales Department prior to designing and ordering.

Optical Sensor

Point Sensor
- Easy to install and is suited for installing in specific locations
- Easy to identify arc accident locations
- Easy to maintain and relocate after installation



Loop Sensor
- Suited for monitoring of large area
- Specification: 20m, 30m, 60m

XGIPAM F protection element operation characteristics

Protection	Operating part	Setting Range	Operating Characteristic	Operating time	Delay time	Remarks
OCR (50)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCR (51)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
OCGR (50N)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCGR (51N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
SGR (67G)	Stage 1 Stage 2	OFF, 0.6 ~ 6.0mA/0.1mA Vo : 0V, 8V ~ 80V/1V Characteristics angle : 0 ~ ±90°C/1°C	Definite	0.050 ~ 10.000s/0.001s		-
DGR (67N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In Vo: 8 ~ 80V/1V Characteristics angle: 0~±90°C/1°C Operating range: 60 ~ 87°C/1°C operation Direction: Forward/Reverse	Instantaneous Definite Inverse	50msec and below 0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- - 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
UVR (27)	Stage 1 Stage 2	OFF, 0.10 ~ 1.10Vn/0.01Vn Auto Reset: Enable/Disable	Definite	0.050 ~ 300.000s/0.001s	-	Dead Voltage Block : 0.05Vn Prevention of protection operation display
OVR (59)	Stage 1 Stage 2	OFF, 0.80 ~ 1.60Vn/0.01	Definite Inverse	0.050 ~ 300.000s/0.001s 0.01 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI Prevention of protection operation display
OVGR (64I)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OVGR (64D)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- 0 ~ 300.00s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
NSOVR (47N)	Stage 1 Stage 2	OFF, 11 ~ 120V/1V	Definite	0.050 ~ 300.000s/0.001s	-	-
POR (47)	Stage 1 Stage 2	OFF, 2.0 ~ 100%/1%	Definite	0.050 ~ 300.000s/0.001s	-	-
Synchro-check (25)	Stage 1	V Diff : OFF, 2 ~ 50V/1V Phase Diff: OFF, 5 ~ 45/1°C F Diff: 0.01 ~ 0.50/0.01Hz Dead V: 0.2 ~ 0.4Vn/0.01Vn	-	After the synchronous Conditions are satisfied, it operate within 1sec.	-	Synchronous Allowed Voltage 0.5Vn ~ 1.2Vn
Temperature(38)	Stage 1 Stage 2	OFF, 20 ~ 180°C/1°C	Definite	0.050 ~ 300.000s/0.001s	-	Requires range setting for AI set for protection
Reclosing (79)	Stage 1	Reclosing counts: 1 ~ 5 times • Prepare Timer: 0.020 s ~ 60.000 s (0.001 s) • Dead Timer: Max 5 , 0.060 s ~ 300.000 s (0.001 s) • CB Operation Timer: 0.05 s ~ 0.500 s (0.001s) • Reclaim Time: 1.000 s ~ 300.000 s (0.001s) • Scheme: Dead Bus-Dead Line, Dead Bus-Live Line, Live Bus-Dead Line, Live Bus-Live Line • Dead: 0 ~ 0.1Vn • Live: 0.5Vn ~				

*If relay element OVGR (64I)is set for instantaneous operation with VectorSum (Vo), it operates within 50msec
*Relay element SGR (67G) cannot use VectorSum function (Source input is fixed to Vo and Io)

Operation Characteristics

XGIPAM B protection element operation characteristics

Protection	Operating part	Setting Range	Operating characteristic	Operating time	Delay time	Remarks
OCR (50)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCR (51)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI
OCGR (50N)	Stage 1 Stage 2	OFF, 0.1 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCGR (51N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI
SGR (67G)	Stage 1 Stage 2	OFF, 0.6 ~ 6.0mA/0.1mA Vo : 0V, 8V ~ 80V/1V Characteristics angle: 0 ~ ±90°C/1°C	Definite	0.050 ~ 10.000s/0.001s		-
DGR (67N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In Vo: 8 ~ 80V/1V Characteristics angle: 0~±90°C/1°C Operating range: 60 ~ 87°C/1°C operation Direction: Forward/Reverse	Instantaneous Definite Inverse	50msec and below 0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- - 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
UVR (27)	Stage 1 Stage 2	OFF, 0.10 ~ 1.10Vn/0.01Vn Auto Reset: Enable/Disable	Definite	0.050 ~ 300.000s/0.001s	-	Dead Voltage Block :0.05Vn Prevention of protection operation display
OVR (59)	Stage 1 Stage 2	OFF, 0.80 ~ 1.60Vn/0.01	Definite Inverse	0.050 ~ 300.000s/0.001s 0.01 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI Prevention of protection operation display
OVGR (64I)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OVGR (64D)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	0 ~ 300.00s/0.001s	IEC SI/VI/EI/LI, ANSI SI/VI/LI, KEPCO SI/VI
NSOVR (47N)	Stage 1 Stage 2	OFF, 11 ~ 120V/1V	Definite	0.050 ~ 300.000s/0.001s	-	-
POR (47)	Stage 1 Stage 2	OFF, 2.0 ~ 100%/1%	Definite	0.050 ~ 300.000s/0.001s	-	-
Synchro-check (25)	Stage 1	V Diff: OFF, 2 ~ 50V/1V Phase Diff: OFF, 5 ~ 45/1°C F Diff: 0.01 ~ 0.50/0.01Hz Dead V: 0.2 ~ 0.4Vn/0.01Vn	-	After the synchronous Conditions are satisfied, it operate within 1sec.	-	Synchronous Allowed Voltage 0.5Vn ~ 1.2Vn
Temperature(38)	Stage 1 Stage 2	OFF, 20 ~ 180°C/1°C	Definite	0.050 ~ 300.000s/0.001s	-	Requires range setting for AI set for protection
UFR (81U)	Stage 1 Stage 2 Stage 3 Stage 4	OFF, 50 ~ 60Hz/0.05Hz Block : 0.50 ~ 0.90Vn/0.01Vn	Definite	0.100 ~ 300.000s/0.001s	-	Input PT Selection PT #1 or PT #5
OFR (81O)	Stage 1 Stage 2 Stage 3 Stage 4	OFF, 60 ~ 70Hz/0.05Hz Block : 0.50 ~ 0.90Vn/0.01Vn	Definite	0.100 ~ 300.000s/0.001s	-	
DPR (32P)	Stage 1 Stage 2	OFF, 0.01 ~ 1.50Pn/0.01Pn Forward/Reverse	Definite	0.100 ~ 300.000s/0.001s	-	-
DQR (32Q)	Stage 1 Stage 2	OFF, 0.02 ~ 1.50Qn/0.01Qn Forward/Reverse	Definite	0.100 ~ 300.000s/0.001s	-	-
DOCR (67I)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In Characteristics angle : 0~±90°C/1°C Operating range : 60 ~ 87°C/1°C Operation Direction : Forward/Reverse	nstantaneous Definite	50msec and below 0.050 ~ 300.000s/0.001s	- 0 ~ 300.000s/0.001s	-
DOCR (67D)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In Reference voltage: $V_{(a-b)}$, $V_{(b-c)}$, $V_{(c-a)}$ Characteristics angle: 0 ~ ±90°C/1°C Operating range: 60 ~ 87°C/1°C Operation Direction: Forward/Reverse	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01		IEC SI/VI/EI/LI, ANSI SI/VI/LI, KEPCO SI/VI
NSOCR (46I)	Stage 1 Stage 2	OFF, 0.1 ~ 2.0/0.01In	nstantaneous Definite	50msec and below 0.050 ~ 300.000s/0.001s	-	-
NSOCR (46D)	Stage 1 Stage 2	OFF, 0.05 ~ 2.00/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI
Reclosing (79)	Stage 1	Reclosing counts: 1 ~ 5 times • Prepare Timer: 0.020 s ~ 60.000 s (0.001 s) • Dead Timer: Max 5 , 0.060 s ~ 300.000 s (0.001 s) • CB Operation Timer: 0.05 s ~ 0.500 s (0.001s) • Reclaim Time: 1.000 s ~ 300.000 s (0.001s) • Scheme: Dead Bus-Dead Line, Dead Bus-Live Line, Live Bus-Dead Line, Live Bus-Live Line • Dead: 0 ~ 0.1Vn • Live: 0.5Vn ~				

*If relay element OVGR (64I)is set for instantaneous operation with VectorSum (Vo), it operates within 50msec
*Relay element SGR (67G) cannot use VectorSum function (Source input is fixed to Vo and Io)

XGIPAM M protection element operation characteristics

Protection	Operating part	Setting Range	Operating characteristic	Operating time	Delay time	Remarks
OCR (50)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCR (51)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI
OCGR (50N)	Stage 1 Stage 2	OFF, 0.1 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCGR (51N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI
SGR (67G)	Stage 1 Stage 2	OFF, 0.6 ~ 6.0mA/0.1mA Vo : 0V, 8V ~ 80V/1V Characteristics angle : 0 ~ ±90°C/1°C	Definite	0.050 ~ 10.000s/0.001s		-
DGR (67N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In Vo : 8 ~ 80V/1V Characteristics angle : 0~±90°C/1°C Operating range : 60 ~ 87°C/1°C operation Direction : Forward/Reverse	Instantaneous Definite Inverse	50msec and below 0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- - 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
UVR (27)	Stage 1 Stage 2	OFF, 0.10 ~ 1.10Vn/0.01Vn Auto Reset : Enable/Disable	Definite	0.050 ~ 300.000s/0.001s	-	Dead Voltage Block :0.05Vn Prevention of protection operation display
OVR (59)	Stage 1 Stage 2	OFF, 0.80 ~ 1.60Vn/0.01	Definite Inverse	0.050 ~ 300.000s/0.001s 0.01 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI Prevention of protection operation display
OVGR (64I)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OVGR (64D)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	0 ~ 300.00s/0.001s	IEC SI/VI/EI/LI, ANSI SI/VI/LI, KEPCO SI/VI
NSOVR (47N)	Stage 1 Stage 2	OFF, 11 ~ 120V/1V	Definite	0.050 ~ 300.000s/0.001s	-	-
POR (47)	Stage 1 Stage 2	OFF, 2.0 ~ 100%/1%	Definite	0.050 ~ 300.000s/0.001s	-	-
DOCR (67I)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In Characteristics angle : 0~±90°C/1°C Operating range : 60 ~ 87°C/1°C Operation Direction : Forward/Reverse	nstantaneous Definite	50msec and below 0.050 ~ 300.000s/0.001s	-	-
DOCR (67D)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In Reference voltage: $V_{(a-b)}$, $V_{(b-c)}$, $V_{(c-a)}$ Characteristics angle : 0~±90°C/1°C Operating range : 60 ~ 87°C/1°C Operation Direction : Forward/Reverse	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI, ANSI SI/VI/LI, KEPCO SI/VI
NSOCR (46I)	Stage 1 Stage 2	OFF, 0.1 ~ 2.0/0.01In	nstantaneous Definite	50msec and below 0.050 ~ 300.000s/0.001s	-	-
NSOCR (46D)	Stage 1 Stage 2	OFF, 0.05 ~ 2.00/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI
THR (49)	• FLC(Full Load Current) : 0.20 ~ 2.00 / 0.01In • OLC(Over Load Constant) : 0.8 ~ 1.2 / 0.01 • SF(Service Factor) : 0.8 ~ 1.2 / 0.01 • Setting range : OFF, 50 ~ 100 / 1%		Inverse	τ1 τ2 : 2.0 ~ 60min/0.1min	-	Time characteristics Hot, Cold * k factor = SF×OLC
Stall (48)	Operating time 1.0~300.0S	OFF, 0.2 ~ 10.0In/0.01In	Definite	0.05 ~ 300s/0.001	-	Rotator lock during operation
Lock (51LR)		OFF, 0.2 ~ 10.0In/0.01In	Inverse	T/L: 0.05 ~ 1.20/0.01 0.05 ~ 300.0/0.001sec	0 ~ 300.000s/0.001s	IEC VI, IEC EI
UCR (37)	Stage 1 Stage 2	OFF, 0.1 ~ 0.9 In/0.01In	Definite	0.100 ~ 300.000s/0.001s	-	Dead Current Block : 0.1A or less
NCH(66	• Starts number : OFF, 1 ~ 5time • Base time : OFF, 1 ~ 60min • Time between starts block : 10 ~ 60min • Thermal : OFF, 10 ~ 80%					
Temperature (38)	Stage 1 Stage 2	OFF, 20 ~ 180°C/1°C	Definite	0.050 ~ 300.000s/0.001s	-	Requires range setting for AI set for protection

*If relay element OVGR (64I)is set for instantaneous operation with VectorSum (Vo), it operates within 50msec
*Relay element SGR (67G) cannot use VectorSum function (Source input is fixed to Vo and Io)

Operation Characteristics

XGIPAM T protection element operation characteristics

Protection	Operating part	Setting Range	Operating characteristic	Operating time	Delay time	Remarks
OCR -1(50)	Stage 1	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous	30msec and below 0.050 ~ 300.000s/0.001s	-	-
	Stage 2		Definite			
OCR-1 (51)	Stage 1	OFF, 0.02 ~ 10.00In/0.01In	Definite	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI
	Stage 2		Inverse			
OCGR (50N)	Stage 1	OFF, 0.1 ~ 32.00In/0.01In	Instantaneous	30msec and below 0.050 ~ 300.000s/0.001s	-	-
	Stage 2		Definite			
OCGR (51N)	Stage 1	OFF, 0.02 ~ 10.00In/0.01In	Definite	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/EI, KEPCO SI/VI
	Stage 2		Inverse			
OCR -2(50)	Stage 1	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous	30msec and below 0.050 ~ 300.000s/0.001s	-	-
	Stage 2		Definite			
OCR-2 (51)	Stage 1	OFF, 0.02 ~ 10.00In/0.01In	Definite	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
	Stage 2		Inverse			
UVR (27)	Stage 1	OFF, 0.10 ~ 1.10Vn/0.01Vn Auto Reset: Enable/Disable	Definite	0.050 ~ 300.000s/0.001s	-	Dead Voltage Block :0.05Vn Prevention of protection operation display
	Stage 2					
OVR (59)	Stage 1	OFF, 0.80 ~ 1.60Vn/0.01	Definite	0.050 ~ 300.000s/0.001s 0.01 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/EI, KEPCO SI/VI Prevention of protection operation display
	Stage 2		Inverse			
DPR (32P)	Stage 1	OFF, 0.01 ~ 1.50Pn/0.01Pn (Forward/Reverse)	Definite	0.100 ~ 300.000s/0.001s	-	-
	Stage 2					
Temperature(38)	Stage 1	OFF, 20 ~ 180°C/1°C	Definite	0.050 ~ 300.000s/0.001s	-	Requires range setting for AI set for protection
	Stage 2					
DFR (67I)	Stage 1	OFF, 2 ~ 32 In/0.01In	Inrush Block not applied		40ms and below	-
	Stage 2	OFF, 0.2 ~ 1.0In/0.01In Slope 1: 15 ~ 100%/1% Slope 2: 15 ~ 100%/1% Knee Point: 1.0 ~ 20.0In/0.1In Inrush Inhibit: ON (5 ~ 50%/1%) : OFF Io Elimination: ON/OFF	Definite	-	0, 0.05 ~ 300s/0.001s	-

* Io Elimination applies on both Stage 1 and 2
* Primary measurement of transformer is identical to F/BAY except for zero-sequence
* Secondary measurement of transformer displays phase information based on phase current and Va
* 50/51N (only one of primary or secondary can be selected)

XGIPAM DG protection element operation characteristics

Protection	Operating part	Setting Range	Operating characteristic	Operating time	Delay time	Remarks
OCR (50)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCR (51)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI
OCGR (50N)	Stage 1 Stage 2	OFF, 0.1 ~ 32.00In/0.01In	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OCGR (51N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.2/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI
DGR (67N)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In Vo: 8 ~ 80V/1V Characteristics angle: 0~±90°C/1°C 270~359°C/1°C Operating range: 60 ~ 87°C/1°C Operation Direction: Forward/Reverse	Instantaneous Definite Inverse	50msec and below 0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- - 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
SGR (67G)	Stage 1 Stage 2	OFF, 0.6 ~ 6.0mA/0.1mA Vo: 0V, 8V ~ 80V/1V Characteristics angle: 0 ~ ±90°C/1°C 270~359°C/1°C	Definite	0.050 ~ 10.000s/0.001s		-
UVR (27)	Stage 1 Stage 2	OFF, 0.10 ~ 1.10Vn/0.01Vn Auto Reset: Enable/Disable	Definite	0.050 ~ 300.000s/0.001s	-	Dead Voltage Block: 0.05Vn Prevention of protection operation display
OVR (59)	Stage 1 Stage 2	OFF, 0.80 ~ 1.60Vn/0.01	Definite Inverse	0.050 ~ 300.000s/0.001s 0.01 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ,ANSI SI/VI/EI, KEPCO SI/VI Prevention of protection operation display
OVGR (64I)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Instantaneous Definite	30msec and below 0.050 ~ 300.000s/0.001s	-	-
OVGR (64D)	Stage 1 Stage 2	OFF, 5 ~ 80V/1V	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	0 ~ 300.00s/0.001s	IEC SI/VI/EI/LI, ANSI SI/VI/LI, KEPCO SI/VI
NSOVR (47N)	Stage 1 Stage 2	OFF, 11 ~ 120V/1V	Definite	0.050 ~ 300.000s/0.001s	-	-
POR (47)	Stage 1 Stage 2	OFF, 2.0 ~ 100%/1%	Definite	0.050 ~ 300.000s/0.001s	-	-
DPR(32P)	Stage 1 Stage 2	OFF, 0.01 ~ 1.50Pn/0.01Pn (Forward/Reverse)	Definite	0.100 ~ 300.000s/0.001s	-	-
DQR(32Q)	Stage 1 Stage 2	OFF, 0.01 ~ 1.50Pn/0.01Qn (Forward/Reverse)	Definite	0.100 ~ 300.000s/0.001s	-	$Q_a=I_aV_a\sin(0)$, $Q_a=I_a(V_b-V_c)$
Synchro-cheak (25)	Stage 1	V Diff: OFF, 2 ~ 50V/1V Phase Diff: OFF, 5 ~ 45/1°C F Diff: 0.01 ~ 0.50/0.01Hz Dead V: 0.2 ~ 0.4Vn/0.01Vn	-	After the synchronous Conditions are satisfied, it operate within 1sec.	-	Synchronous Allowed Voltage 0.5Vn ~ 1.2Vn
DOCR (67I)	Stage 1 Stage 2	OFF, 0.10 ~ 32.00In/0.01In Characteristics angle: 0~±90°C/1°C 270~359°C/1°C Operating range: 60 ~ 87°C/1°C Operation Direction: Forward/Reverse	nstantaneous Definite	50msec and below 0.050 ~ 300.000s/0.001s	-	-
DOCR (67D)	Stage 1 Stage 2	OFF, 0.02 ~ 10.00In/0.01In Reference voltage: $V_{(a-b)}$, $V_{(b-c)}$, $V_{(c-a)}$ Characteristics angle: 0~±90°C/1°C 270~359°C/1°C Operating range: 60 ~ 87°C/1°C Operation Direction: Forward/Reverse	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
UFR (81U)	Stage 1 Stage 2 Stage 3 Stage 4	OFF, 50 ~ 60Hz/0.05Hz Block: 0.50 ~ 0.90Vn/0.01Vn	Definite	0.100 ~ 300.000s/0.001s	-	Input PT Selection PT #1 or PT #5
OFR (81O)	Stage 1 Stage 2 Stage 3 Stage 4	OFF, 60 ~ 70Hz/0.05Hz Block: 0.50 ~ 0.90Vn/0.01Vn	Definite	0.100 ~ 300.000s/0.001s	-	
NSOCR (46I)	Stage 1 Stage 2	OFF, 0.1 ~ 2.0/0.01In	nstantaneous Definite	50msec and below 0.050 ~ 300.000s/0.001s	-	-
NSOCR (46D)	Stage 1 Stage 2	OFF, 0.05 ~ 2.00/0.01In	Definite Inverse	0.050 ~ 300.000s/0.001s 0.05 ~ 1.20/0.01	- 0 ~ 300.000s/0.001s	IEC SI/VI/EI/LI ANSI SI/VI/LI
UPR(37P)	Stage 1 Stage 2	OFF, 0.02 ~ 0.80/0.01Pn	Definite	0.10~300.00/0.001s	-	Dead Current Block : 0.1A or less
ROCOF(81R)	Stage 1 Stage 2 Stage 3 Stage 4	0.1~2.0/0.1Hz/s UV Block : 50~100/1V	Definite	0.2 ~ 60.0/0.001s	-	-

*If relay element OVGR (64I)is set for instantaneous operation with VectorSum (Vo), it operates within 50msec
*Relay element SGR (67G) cannot use VectorSum function (Source input is fixed to Vo and Io)

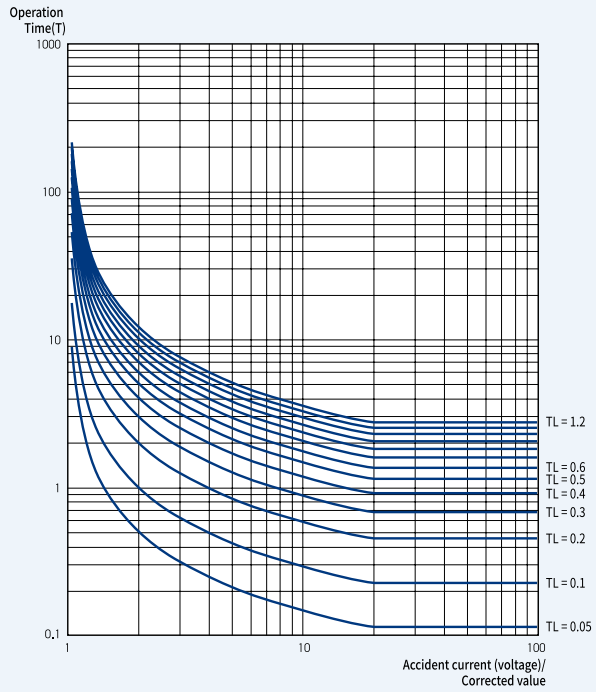
Operation Characteristics

XGIPAM 3wT protection element operation characteristics

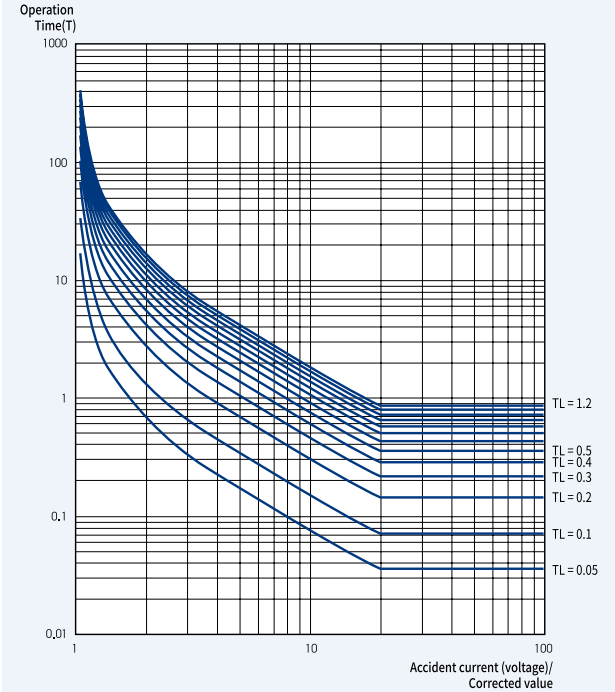
Protection	Operating part	Setting Range	Operating characteristic	Operating time	Delay time	Remarks
OCR -1(50)	Stage 1	OFF, 0.10 ~ 32.00In/0.01In	Instantaneous	30msec and below	-	-
	Stage 2		Definite	0.05s ~ 300.00s/0.001s		
OCR-1(51)	Stage 1	OFF, 0.02 ~ 10.00In/0.01In	Definite	0.05s ~ 300.00s/0.001s	-	IEC - SI/VI/EI/LI ANSI - SI/VI/EI KEPCO - SI/VI
	Stage 2		Inverse	0.05 ~ 1.2/0.01	0 ~ 300.00s/0.001s	
OCGR-1(50N)	Stage 1	OFF, 0.1 ~ 32.00In/0.01In	Instantaneous	30msec and below	-	-
	Stage 2		Definite	0.05s ~ 300.00s/0.001s		
OCGR-1(51N)	Stage 1	OFF, 0.02 ~ 10.00In/0.01In	Definite	0.05s ~ 300.00s/0.001s	-	IEC - SI/VI/EI/LI ANSI - SI/VI/EI KEPCO - SI/VI
	Stage 2		Inverse	0.05 ~ 1.2/0.01	0 ~ 300.00s/0.001s	
OVGR (64I)	Stage 1	OFF, 5 ~ 80V/1V	Instantaneous	30msec and below	-	-
	Stage 2		Definite	0.05s ~ 300.00s/0.001s		
OVGR (64D)	Stage 1	OFF, 5 ~ 80V/1V	Definite	0.05s ~ 300.00s/0.001s	-	IEC SI/VI/EI/LI ANSI SI/VI/LI KEPCO SI/VI
	Stage 2		Inverse	0.05 ~ 1.20/0.01	0 ~ 300.00s/0.001s	
UVR (27)	Stage 1	0.10 ~ 1.10Vn/0.01Vn Auto Reset: Enable/Disable	Definite	0.05s ~ 300.00s/0.001s	-	Dead Voltage Block: 0.05Vn Prevention of protection operation display
	Stage 2					
OVR (59)	Stage 1	0.80 ~ 1.60Vn/0.01	Definite	0.05s ~ 300.00s/0.001s	-	IEC SI/VI/EI/LI ANSI SI/VI/EI, KEPCO SI/VI Prevention of protection operation display
	Stage 2		Inverse	0.01 ~ 1.20/0.01	0 ~ 300.00s/0.001s	
OCR-2(50)	Stage 1	OFF, 0.10In~32.00In/0.01In	Instantaneous	30msec and below	-	-
	Stage 2		Definite	0.05s ~ 300.00s/0.001s		
OCR-2(51)	Stage 1	OFF, 0.02In~10.00In/0.01In	Definite	0.05s ~ 300.00s/0.001s	-	IEC - SI/VI/EI/LI ANSI - SI/VI/EI KEPCO - SI/VI
	Stage 2		Inverse	0.05 ~ 1.20/0.01	0 ~ 300.00s/0.001s	
OCR-3(50)	Stage 1	OFF, 0.10In~32.00In/0.01In	Instantaneous	30msec and below		
	Stage 2		Definite	0.05s ~ 300.00s/0.001s		
OCR-3(51)	Stage 1	OFF, 0.02In~10.00In/0.01In	Definite	0.05s ~ 300.00s/0.001s	-	IEC - SI/VI/EI/LI ANSI - SI/VI/EI KEPCO - SI/VI
	Stage 2		Inverse	0.05 ~ 1.20/0.01	0 ~ 300.00s/0.001s	
DFR (3W87T)	High set	OFF, 2.0In~32.0In/0.01In Io Elimination: Enable/Disable Inrush Inhibit: Enable/Disable	Instantaneous	50msec and below	-	-
			Definite	0.05s ~ 300.00s/0.001s		
	Low set	0.2In~1.0In/0.01In Slope1: 15%~100%/1% Slope2: 15%~100%/1% Knee point: 1.0In~20.0In/0.1In Io Elimination: Enable/Disable Inrush Inhibit: Enable/Disable 2nd Harmonics Ratio: 5%~50%/1% Inrush Inhibit Time: 0.05s~10.0s/0.01s	Instantaneous	50msec and below	-	-
			Definite	0.05s ~ 300.00s/0.001s		

Characteristic Curve

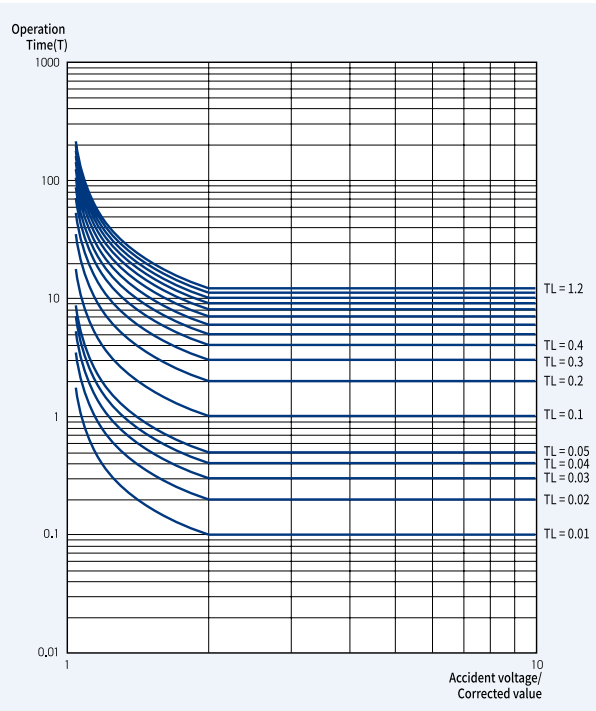
Standard Inverse Time - SI



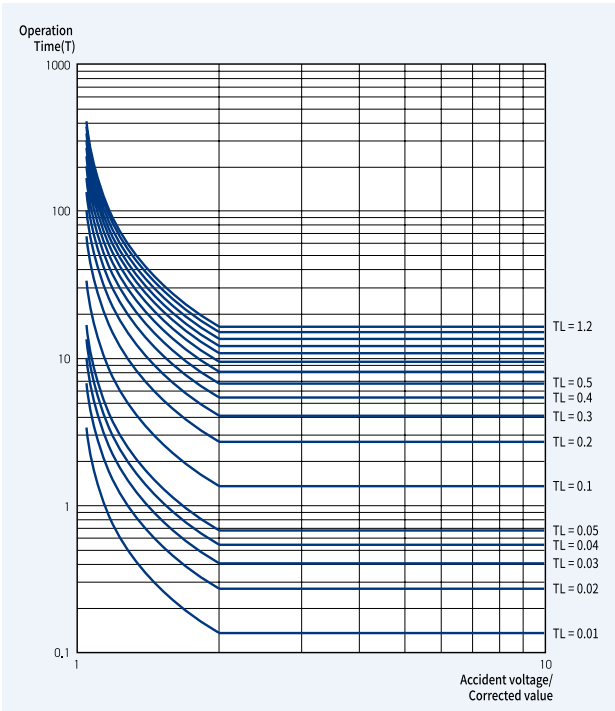
Very Inverse Time - VI



Standard Inverse Time - SI(OVR)



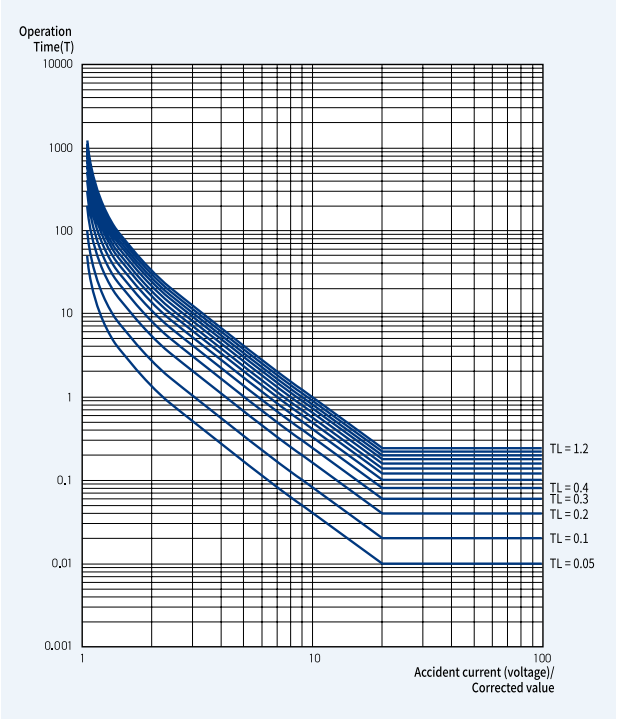
Very Inverse Time - VI(OVR)



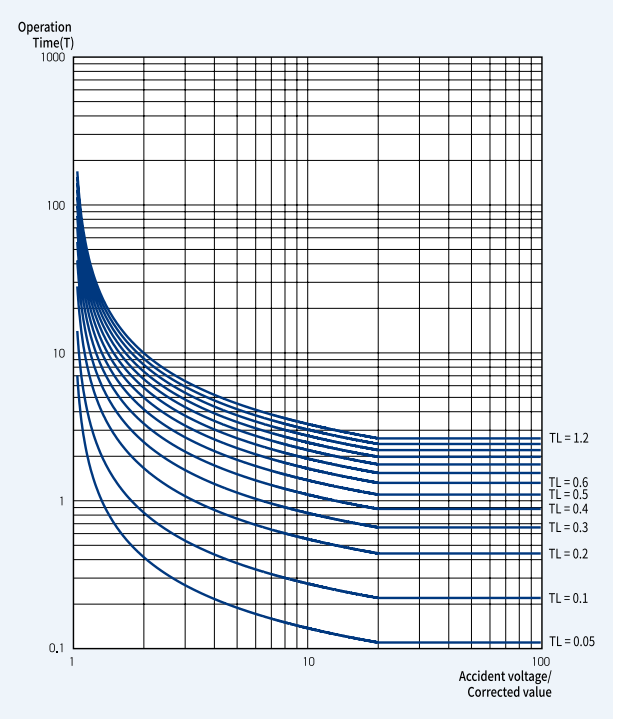
Note) If time characteristics curve operation time is shorter than instantaneous operation, then set instantaneous operation time as the standard.

Characteristic Curve

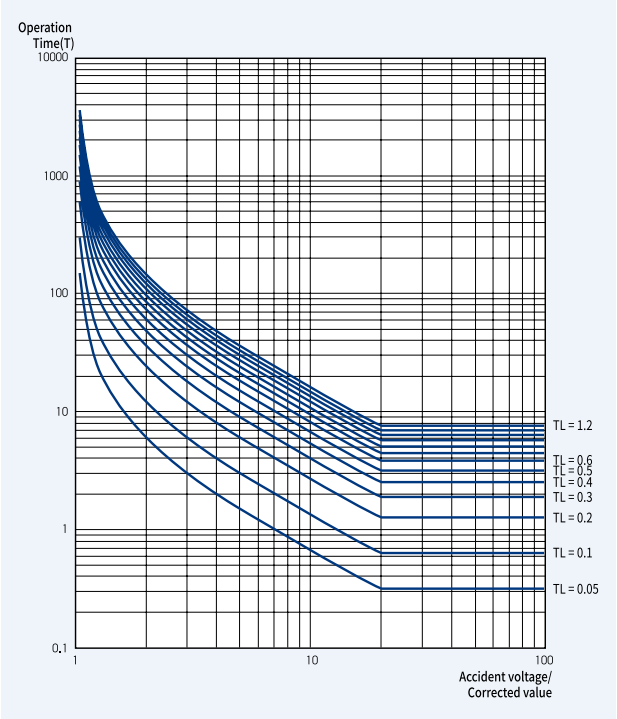
Extremely Inverse Time - EI



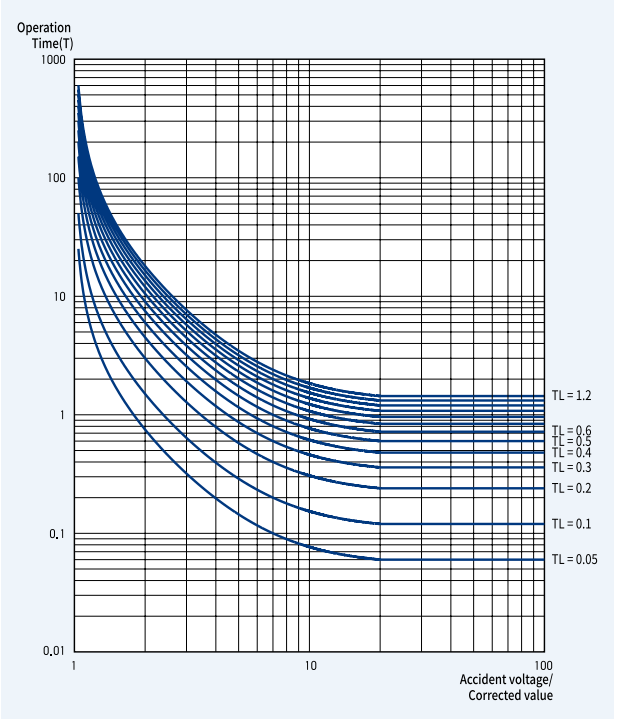
KEPCO-SI



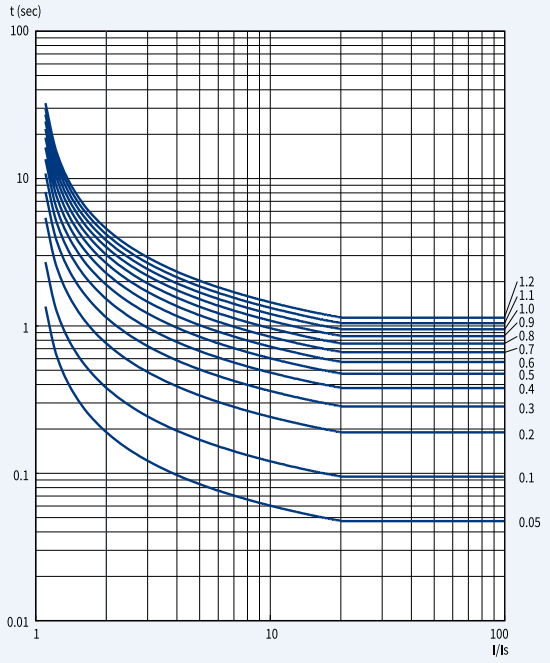
Long Inverse Time - LI



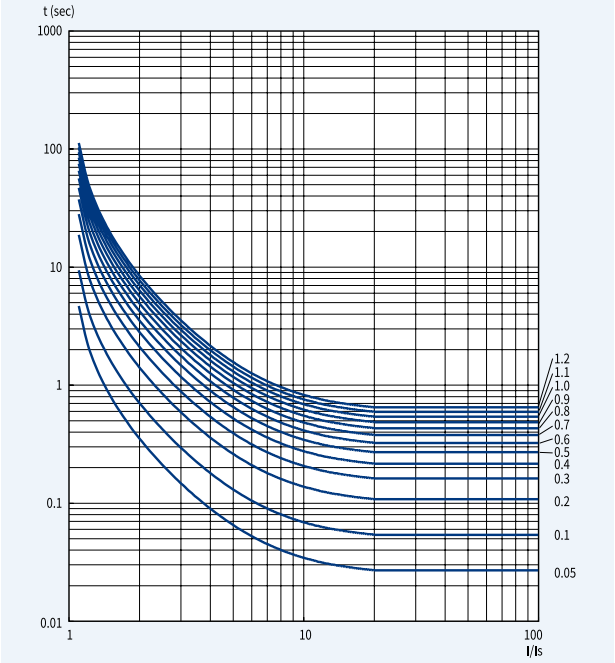
KEPCO-VI



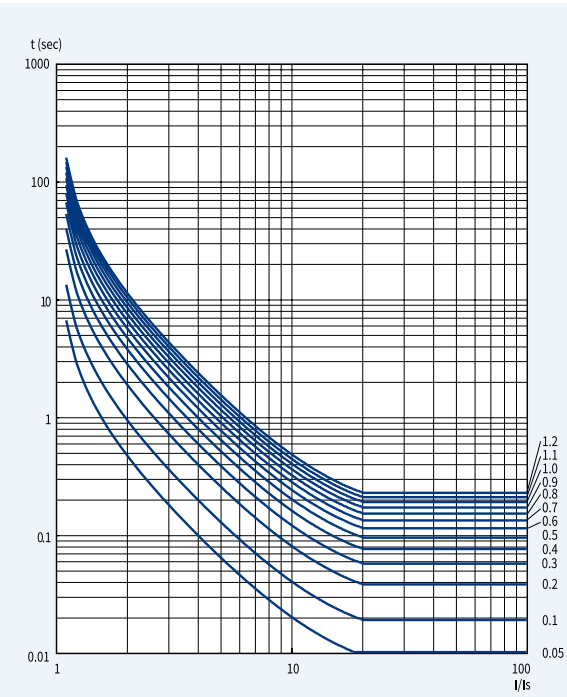
IEEE MI (Moderately Inverse)



IEEE VI (Very Inverse)



IEEE EI (Extreme Inverse)



Note) If time characteristics curve operation time is shorter than instantaneous operation, then set instantaneous operation time as the standard.

Inverse time curve characteristics value

OCR, OCGR, DOCR, DOCGR, OVR, NSOCR time characteristic standard formula

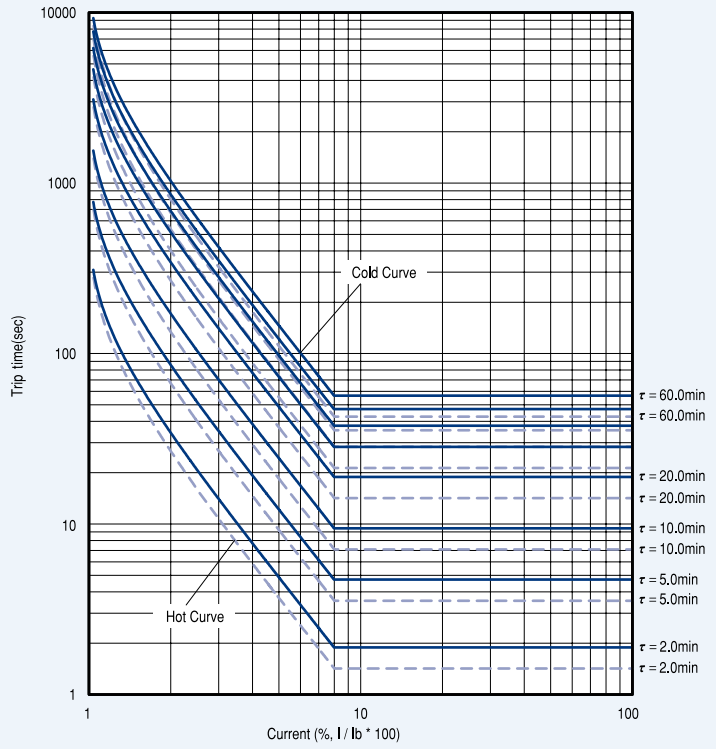
$$\text{Trip Time} = \left\{ \frac{A}{\left(\frac{I_F}{I_S} \right)^B - 1} + C \right\} \times TL + DT$$

Item	Type	A	B	C
IEC	SI	0.14	0.02	0
	VI	13.5	1	0
	EI	80	2	0
	LI	120	1	0
IEEE [ANSI]	MI	0.0515	0.02	0.114
	VI	19.61	2	0.491
	EI	28.2	2	0.1217
KEPCO	SI	0.11	0.02	0.42
	VI	39.85	1.95	1.084

* TL = 0.05 ~ 1.20 / 0.01 DT = 0 ~ 300s/0.001s
* I_S: Setting current, I_F: Fault Current

Characteristic Curve

Thermal Curve



• Apply : Thermal overload relay(49)

· HOT : $t = \tau_h \cdot \ln \frac{I^2 - I_P^2}{I^2 - (k \cdot I_B)^2}$

$\tau_h = 2.0 \sim 60.0\text{min}$

· COLD : $t = \tau_c \cdot \ln \frac{I^2}{I^2 - (k \cdot I_B)^2}$

$\tau_c = 2.0 \sim 60.0\text{min}$

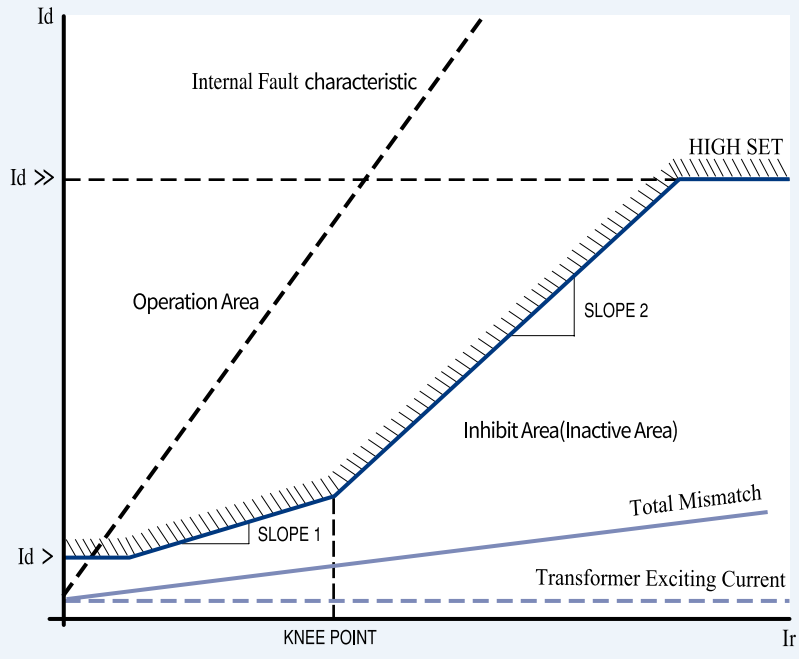
In case of $\begin{cases} I_P = 0.5 \\ k = 1 \\ I_B = 1 \end{cases}$

· k=SF · OLC

I_P: Load current before fault
I_B: Rated load current
k: Overload constant
I: Fault current
τ_h (τheating): Thermal time constant during operation
τ_c (τcooling): Thermal time constant during cooling

· Cold state is $I_P = 0$
· SF: Service Fator
· OLC: Over Load Constant

Ratio Differential Curve



•Apply: Transformer protection differential ratio relay(87T-P)

I_d = Idifferential = $|\bar{I}_1 - \bar{I}_2|$ (Vector sum.)

I_r = Irestraint = $|I_1| + |I_2|$ (Scalar sum.)

SLOPE = $[\frac{I_d}{I_r}]$

Fault Characteristic
: Transformer interior complete fault characteristics
($I_{1st} = I_f$, $I_{2nd} = 0$)

I_d: Differential current

I_r: Inhibitory current

$I_{d>}$: Time differential current (Low set: 0.2 ~ 1.0)

$I_{d>>}$: Instantaneous differential current
(High set: 2.0 ~ 32.0)

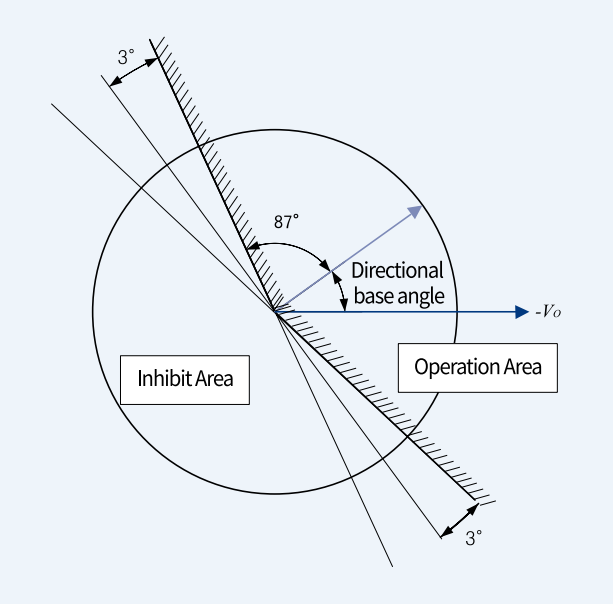
KNEE POINT: Inflection point

SLOPE 1: Characteristic gradient 1

SLOPE 2: Characteristic gradient 2

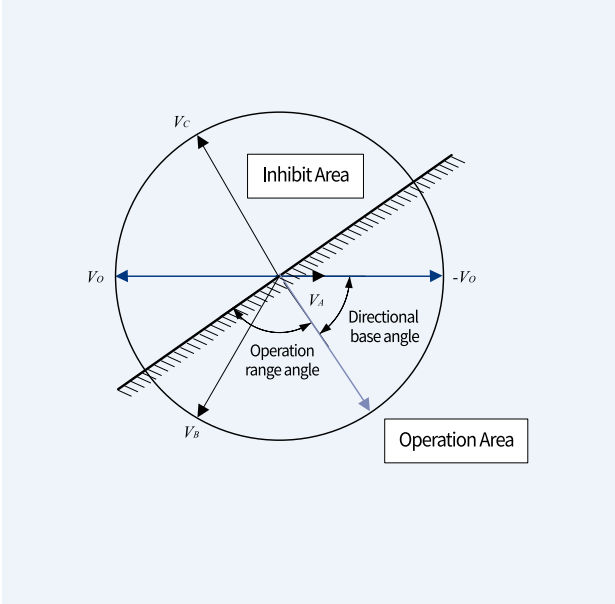
Directional Element Operation Characteristics

SGR



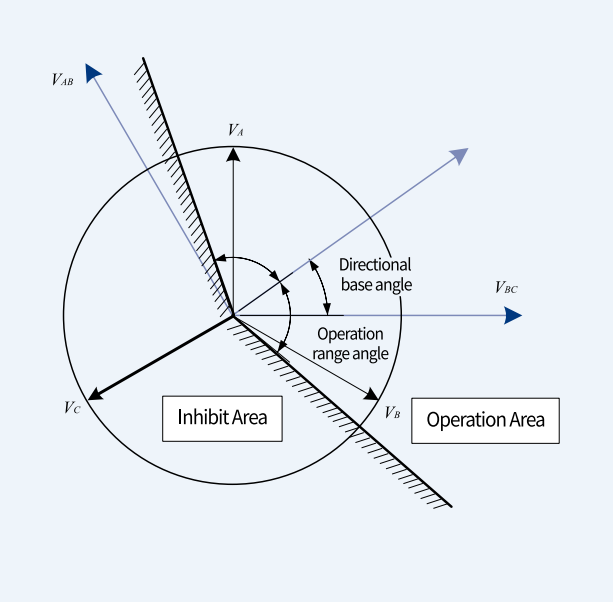
• **SGR relay operation area**
Base sensitivity phase angle – 87° ≤ (∠Io - ∠Vo)
≤ Base sensitivity phase angle + 87°

DGR, DOCGR



• **DGR, DOCGR relay operation area**
Base sensitivity phase angle – Operation range angle
≤ (∠Io - ∠Vo)
≤ Base sensitivity phase angle + Operation range angle

DOCR

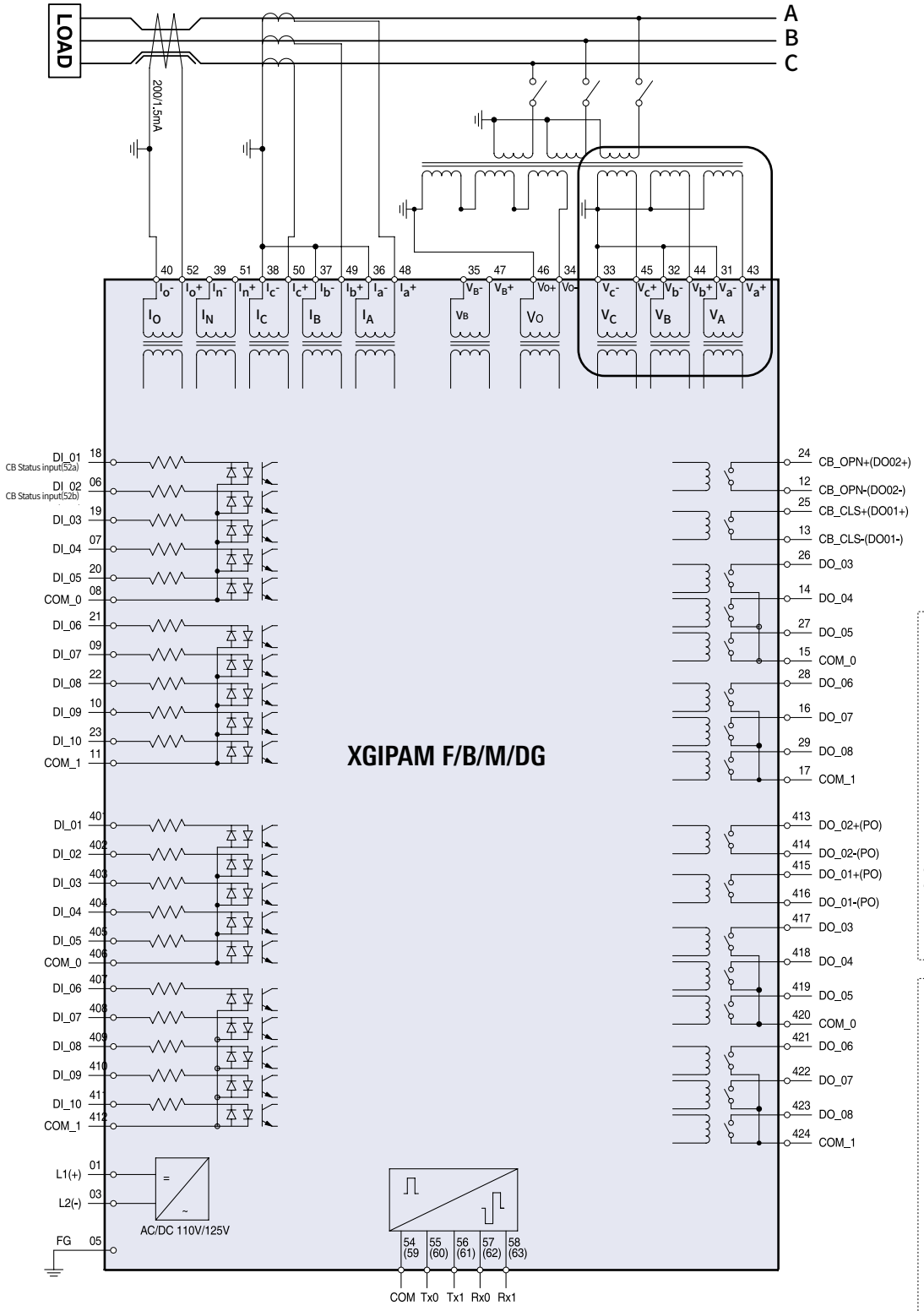


• **DOCR relay operation area**
Base sensitivity phase angle – Operation range angle
≤ (∠Operation current - ∠Base voltage)
≤ Base sensitivity phase angle + Operation range angle

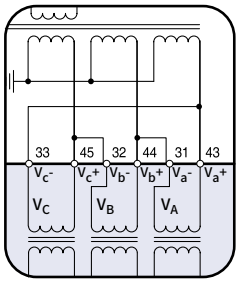
phase	Operation current	Polarity voltage(Vpol)
A(L1)	I_a	$V_{bc} = V_b - V_c$
B(L2)	I_b	$V_{ca} = V_c - V_a$
C(L3)	I_c	$V_{ab} = V_a - V_b$

Wiring

XGIPAM F/B/M/DG (3P3W)

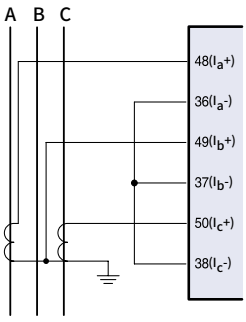


*The number 413 on the wiring diagram refers to 4 = Solt #4, 13 = Terminal 13.

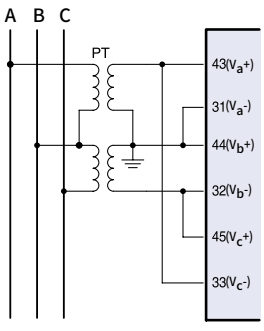


*In high/low voltage non-grounded long-range cables, if voltage imbalance occuring due to capacitance imbalance, in that situation DELTA wiring as depicted in the above is recommended.
(However, in Zero-Phase Voltage detection using 3PT Vector SUM, the relay recognizes between wire voltage due to DELTA wiring, so it is not able to detect ground faults. Ground fault detection must be made with Zero-Phase Voltage through GPT.)
*If WYE, DELTA wiring is applied, make sure to select the correct PT ratio.

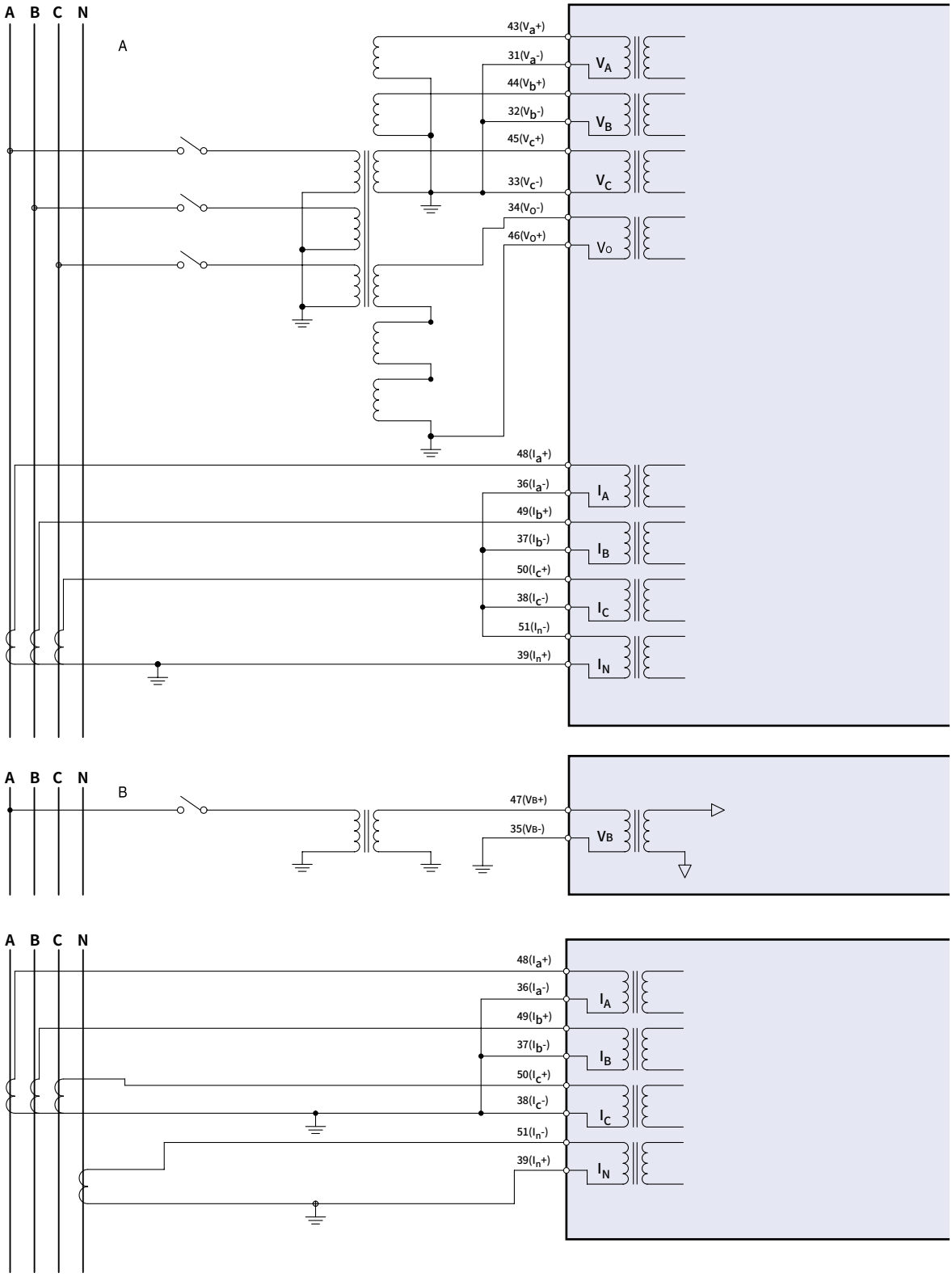
Apply two CTs



Apply two CTs (open delta wiring)



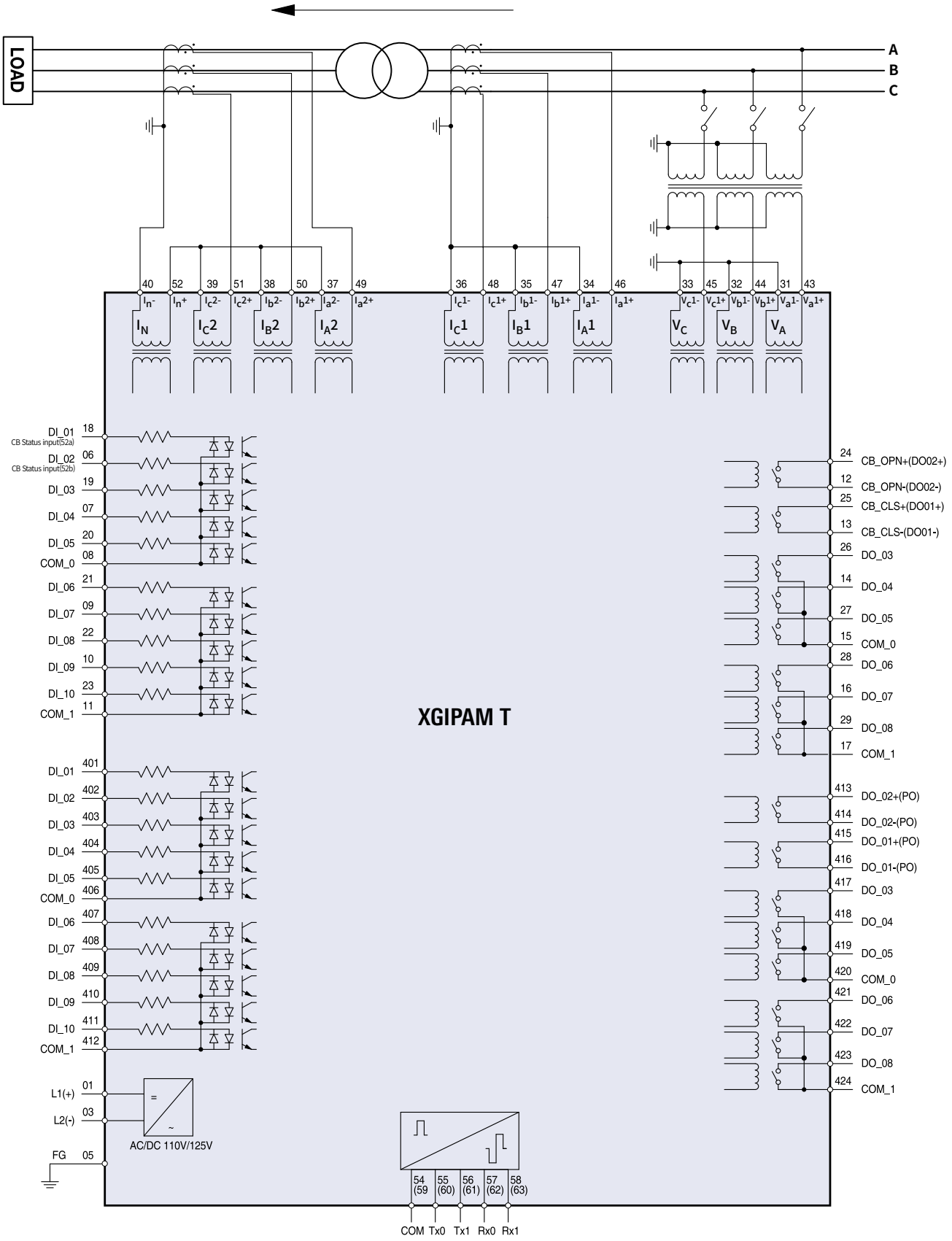
XGIPAM F/B/M/DG (3P4W)



*If DG is applied on the distributed power system linkage (reverse feed prohibited condition) to protect the linked cable, then the PTP with secondary rating of $\frac{110}{\sqrt{3}}$ is recommended for system TP.

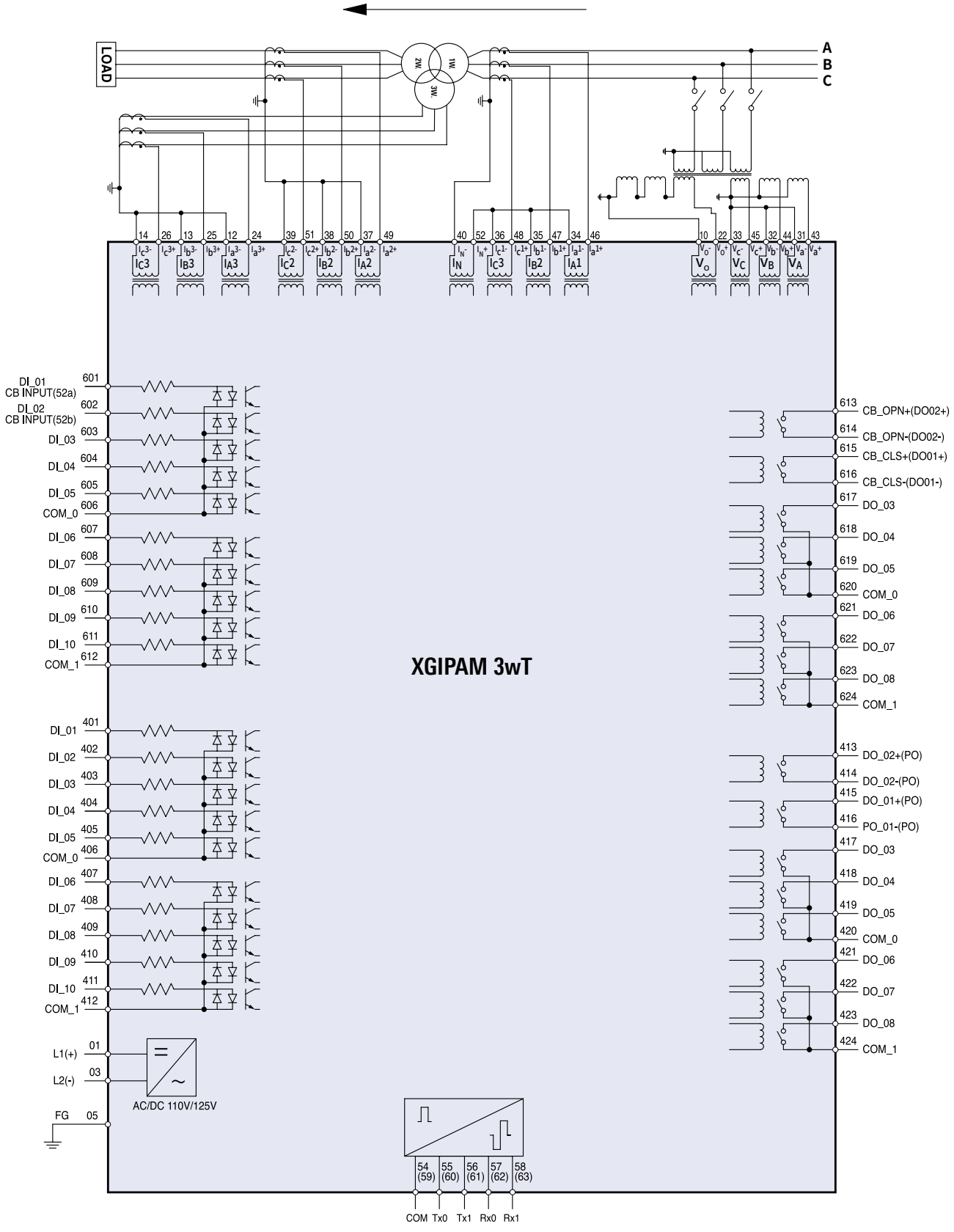
Wiring

XGIPAM T



*The number 413 on the wiring diagram refers to 4 = Solt #4, 13 = Terminal 13.

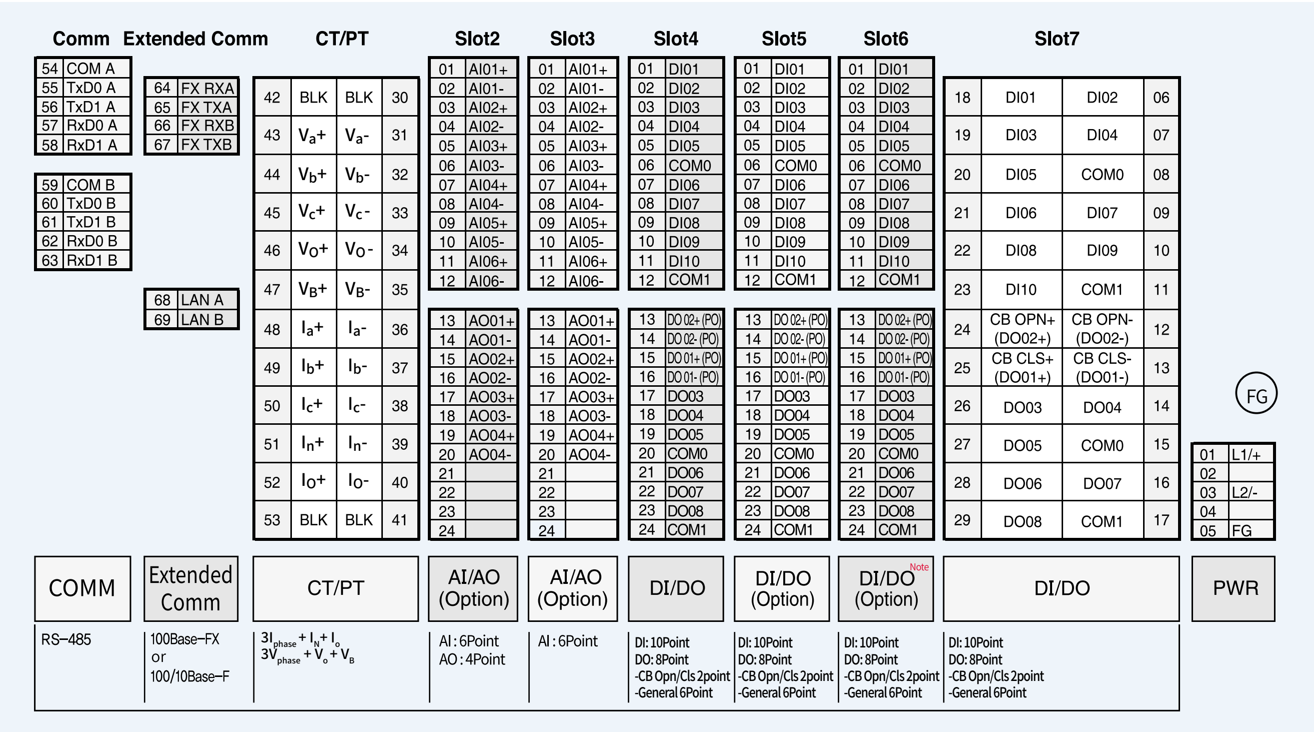
XGIPAM 3wT



*The number 613 on the wiring diagram refers to 6 = Solt #6, 13 = Terminal 13.

Contact Configuration

XGIPAM F/B/M/DG



Note) B, DG model uses standard DI/DO.

Select I/O options

XGIPAM - F

Slot4

DI 01	SW_A
DI 02	SW_B
DI 03	-
DI 04	-
DI 05	-
COM0	-
DI 06	-
DI 07	-
DI 08	-
DI 09	PNL Reset
DI 10	Buzzer Stop
COM1	-
DO 01	SW_Close
DO 02	SW_Open
DO 03	OCR
DO 04	OCGR/SGR/DGR
DO 05	UVR
COM0	-
DO 06	OVR
DO 07	OVGR
DO 08	Power Fail
COM1	-

Slot5/6 (options)

●●●

Slot7

DI 01	SW_A
DI 02	SW_B
DI 03	-
DI 04	-
DI 05	-
COM0	-
DI 06	-
DI 07	-
DI 08	-
DI 09	-
DI 10	-
COM1	-
DO 01	SW_Close
DO 02	SW_Open
DO 03	POR/NSOVR
DO 04	SYNC. Check
DO 05	TPR(38)
COM0	-
DO 06	UVR_Pulse
DO 07	86X
DO 08	Buzzer
COM1	-

XGIPAM - M

Slot4

DI 01	SW_A
DI 02	SW_B
DI 03	-
DI 04	-
DI 05	-
COM0	-
DI 06	-
DI 07	-
DI 08	-
DI 09	PNL Reset
DI 10	Buzzer Stop
COM1	-
DO 01	SW_Close
DO 02	SW_Open
DO 03	OCR/DOCR
DO 04	OCGR/SGR/DGR
DO 05	UVR
COM0	-
DO 06	UCR
DO 07	THR
DO 08	Power Fail
COM1	-

Slot5/6 (options)

●●●

Slot7

DI 01	SW_A
DI 02	SW_B
DI 03	-
DI 04	-
DI 05	-
COM0	-
DI 06	-
DI 07	-
DI 08	-
DI 09	-
DI 10	-
COM1	-
DO 01	SW_Close
DO 02	SW_Open
DO 03	POR/NSOVR
DO 04	NSOCR
DO 05	TPR(38)
COM0	-
DO 06	Stall/Lock
DO 07	86X
DO 08	Buzzer
COM1	-

Note) 1. The sw number of each slot is assigned depending on whether an option is added.
Ex1) Slot7(SW1) → Slot6(SW2) → Slot5(SW3) → Slot4(SW4)
Ex2) Slot7(SW1) → Slot4(SW2)
2. Set the OVGR(64) element as the default alarm.
3. PQ, PTF, CBF, I2t, TCS/TRS are provided as Extra Fault contact alarm.
4. Bay model stage1 is composed of 3 phase OR, stage2 is composed of 32Q and each phase AND.
5. DG model stage1 is composed of 3 phase AND, stage2 is composed of 32Q and each phase AND.
6. Contact Control is a switch for relay output contact test, and operation can be checked in the device without a tester.
7. Slot4 DO08 contact is for Power Fail only, so it can't be changed to direct DO contact.

Select I/O options

XGIPAM - B

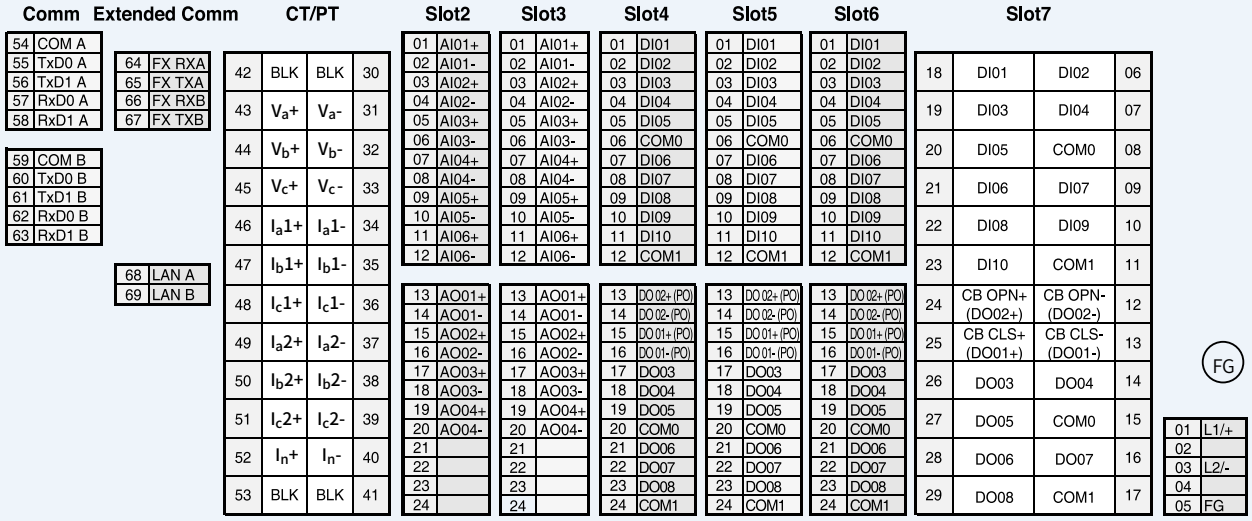
Slot4		Slot5		Slot6 (options)	Slot7	
DI 01	SW_A	DI 01	SW_A	●●●	DI 01	SW_A
DI 02	SW_B	DI 02	SW_B		DI 02	SW_B
DI 03	-	DI 03	-		DI 03	-
DI 04	-	DI 04	-		DI 04	-
DI 05	-	DI 05	-		DI 05	-
COM0	-	COM0	-		COM0	-
DI 06	-	DI 06	-		DI 06	-
DI 07	-	DI 07	-		DI 07	-
DI 08	-	DI 08	-		DI 08	-
DI 09	PNL Reset	DI 09	-		DI 09	-
DI 10	Buzzer Stop	DI 10	-		DI 10	-
COM1	-	COM1	-		COM1	-
DO 01	SW_Close	DO 01	SW_Close		DO 01	SW_Close
DO 02	SW_Open	DO 02	SW_Open		DO 02	SW_Open
DO 03	OCR/DOCR	DO 03	DPR		DO 03	POR/NSOVR
DO 04	OCGR/SGR/DGR	DO 04	DQR		DO 04	NSOCR
DO 05	UVR	DO 05	URF		DO 05	TPR(38)
COM0	-	COM0	-		COM0	-
DO 06	OVR	DO 06	OFR		DO 06	UVR_Pulse
DO 07	OVGR	DO 07	Extra Fault		DO 07	86X
DO 08	Power Fail	DO 08	SYNC. Check		DO 08	Buzzer
COM1	-	COM1	-		COM1	-

XGIPAM - DG

Slot4		Slot5		Slot6 (options)	Slot7	
DI 01	SW_A	DI 01	SW_A	●●●	DI 01	SW_A
DI 02	SW_B	DI 02	SW_B		DI 02	SW_B
DI 03	-	DI 03	-		DI 03	-
DI 04	-	DI 04	-		DI 04	-
DI 05	-	DI 05	-		DI 05	-
COM0	-	COM0	-		COM0	-
DI 06	-	DI 06	-		DI 06	-
DI 07	-	DI 07	-		DI 07	-
DI 08	-	DI 08	-		DI 08	-
DI 09	PNL Reset	DI 09	-		DI 09	-
DI 10	Buzzer Stop	DI 10	-		DI 10	-
COM1	-	COM1	-		COM1	-
DO 01	SW_Close	DO 01	SW_Close		DO 01	SW_Close
DO 02	SW_Open	DO 02	SW_Open		DO 02	SW_Open
DO 03	OCR/DOCR	DO 03	DPR		DO 03	NSOVR
DO 04	OCGR/DGR	DO 04	DQR		DO 04	NSOCR
DO 05	UVR	DO 05	URF		DO 05	Extra Fault
COM0	-	COM0	-		COM0	-
DO 06	OVR	DO 06	OFR		DO 06	UVR_Pulse
DO 07	UPR	DO 07	ROCOF		DO 07	86X
DO 08	Power Fail	DO 08	SYNC. Check		DO 08	Buzzer
COM1	-	COM1	-		COM1	-

Note) 1. The sw number of each slot is assigned depending on whether an option is added.
Ex1) Slot7(SW1) → Slot6(SW2) → Slot5(SW3) → Slot4(SW4)
Ex2) Slot7(SW1) → Slot4(SW2)
2. Set the OVGR(64) element as the default alarm.
3. PQ, PTF, CBF, I2t, TCS/TRS are provided as Extra Fault contact alarm.
4. Bay model stage1 is composed of 3 phase OR, stage2 is composed of 32Q and each phase AND.
5. DG model stage1 is composed of 3 phase AND, stage2 is composed of 32Q and each phase AND.
6. Contact Control is a switch for relay output contact test, and operation can be checked in the device without a tester.
7. Slot4 DO08 contact is for Power Fail only, so it can't be changed to direct DO contact.

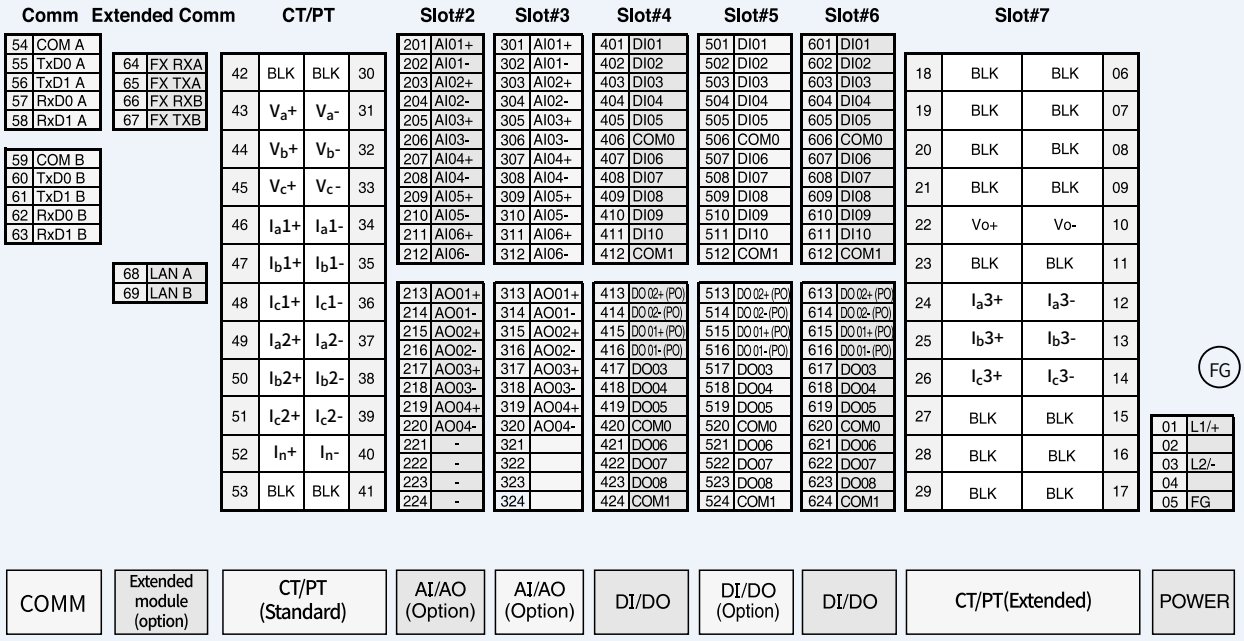
XGIPAM T



*PO01+, PO01-, PO02+ and PO02- contacts of Slot 4 can be used for CB OPN+, CB OPN-, CB CSL+ and CB CLS- respectively
*Terminal number abbreviations installed on Slot 2, 3, 4, 5 and 6 are identified individually with the Slot number at the front of each terminal number (i.e. Slot 6, DI01→601)

Contact Configuration

XGIPAM 3wT



Select I/O options

XGIPAM - T

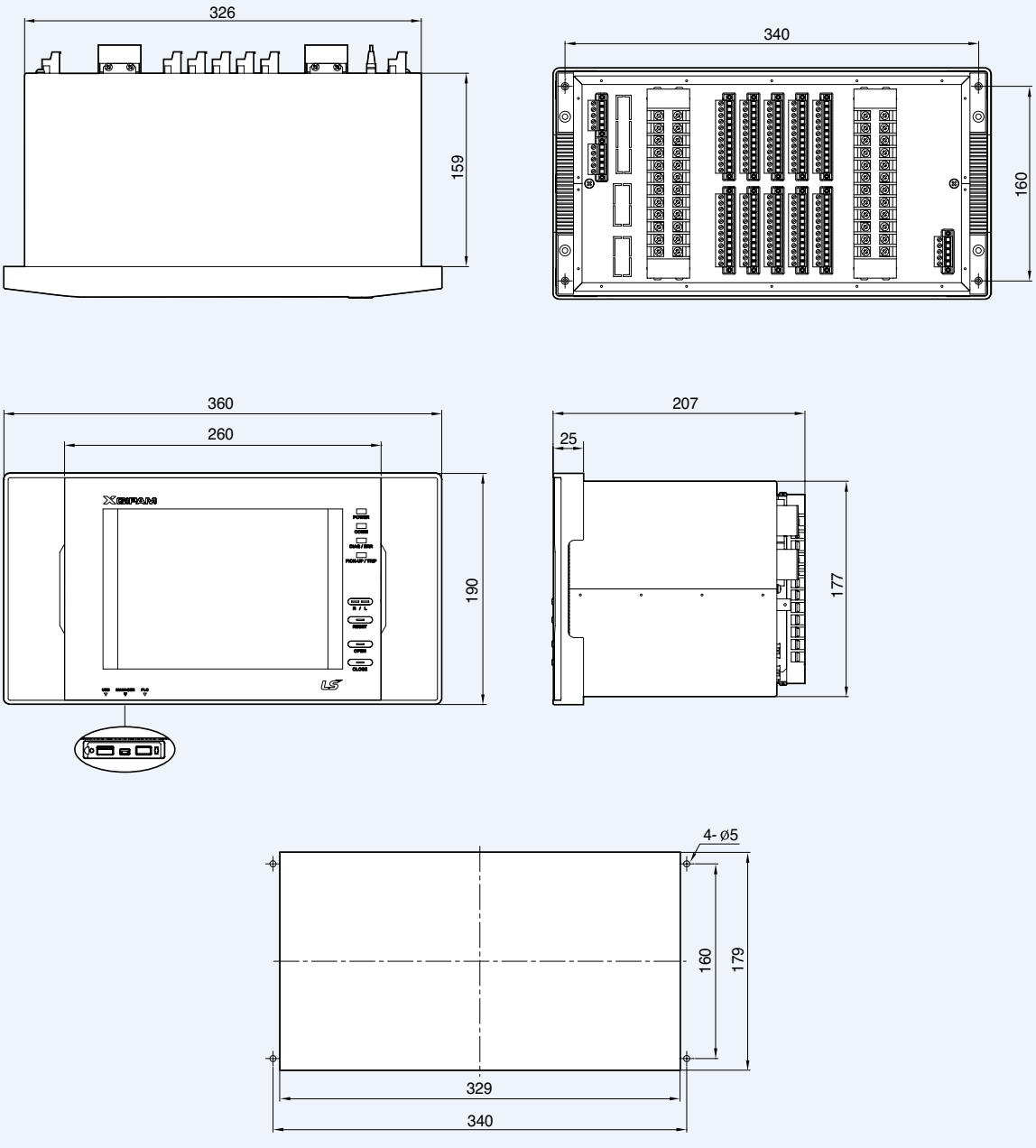
Slot4		Slot5/6 (options)	Slot7	
DI 01	SW_A	●●●	DI 01	SW_A
DI 02	SW_B		DI 02	SW_B
DI 03	-		DI 03	-
DI 04	-		DI 04	-
DI 05	-		DI 05	-
COM0	-		COM0	-
DI 06	-		DI 06	-
DI 07	-		DI 07	-
DI 08	-		DI 08	-
DI 09	PNL Reset		DI 09	-
DI 10	Buzzer Stop		DI 10	-
COM1	-		COM1	-
DO 01	SW_Close		DO 01	SW_Close
DO 02	SW_Open		DO 02	SW_Open
DO 03	OCR(1st)		DO 03	DPR
DO 04	OCGR/SGR/DGR		DO 04	OCR(2nd)
DO 05	UVR		DO 05	TPR(38)
COM0	-		COM0	-
DO 06	OVR		DO 06	Extra Fault
DO 07	DFR		DO 07	86X
DO 08	Power Fail		DO 08	Buzzer
COM1	-		COM1	-

XGIPAM - 3wT

Slot4		Slot5 (options)	Slot6	
DI 01	SW_A	●●●	DI 01	SW_A
DI 02	SW_B		DI 02	SW_B
DI 03	-		DI 03	-
DI 04	-		DI 04	-
DI 05	-		DI 05	-
COM0	-		COM0	-
DI 06	-		DI 06	-
DI 07	-		DI 07	-
DI 08	-		DI 08	-
DI 09	PNL Reset		DI 09	-
DI 10	Buzzer Stop		DI 10	-
COM1	-		COM1	-
DO 01	SW_Close		DO 01	SW_Close
DO 02	SW_Open		DO 02	SW_Open
DO 03	OCR(1st)		DO 03	OVGR
DO 04	OCGR		DO 04	OCR(2nd)
DO 05	UVR		DO 05	OCR(3rd)
COM0	-		COM0	-
DO 06	OVR		DO 06	Extra Fault
DO 07	DFR		DO 07	86X
DO 08	Power Fail		DO 08	Buzzer
COM1	-		COM1	-

Note) 1. The sw number of each slot is assigned depending on whether an option is added.
Ex1) Slot7(SW1) → Slot6(SW2) → Slot5(SW3) → Slot4(SW4)
Ex2) Slot7(SW1) → Slot4(SW2)
2. Set the OVGR(64) element as the default alarm.
3. PQ, PTF, CBF, I2t, TCS/TRS are provided as Extra Fault contact alarm.
4. Bay model stage1 is composed of 3 phase OR, stage2 is composed of 32Q and each phase AND.
5. DG model stage1 is composed of 3 phase AND, stage2 is composed of 32Q and each phase AND.
6. Contact Control is a switch for relay output contact test, and operation can be checked in the device without a tester.
7. Slot4 DO08 contact is for Power Fail only, so it can't be changed to direct DO contact.

Integrated HMI

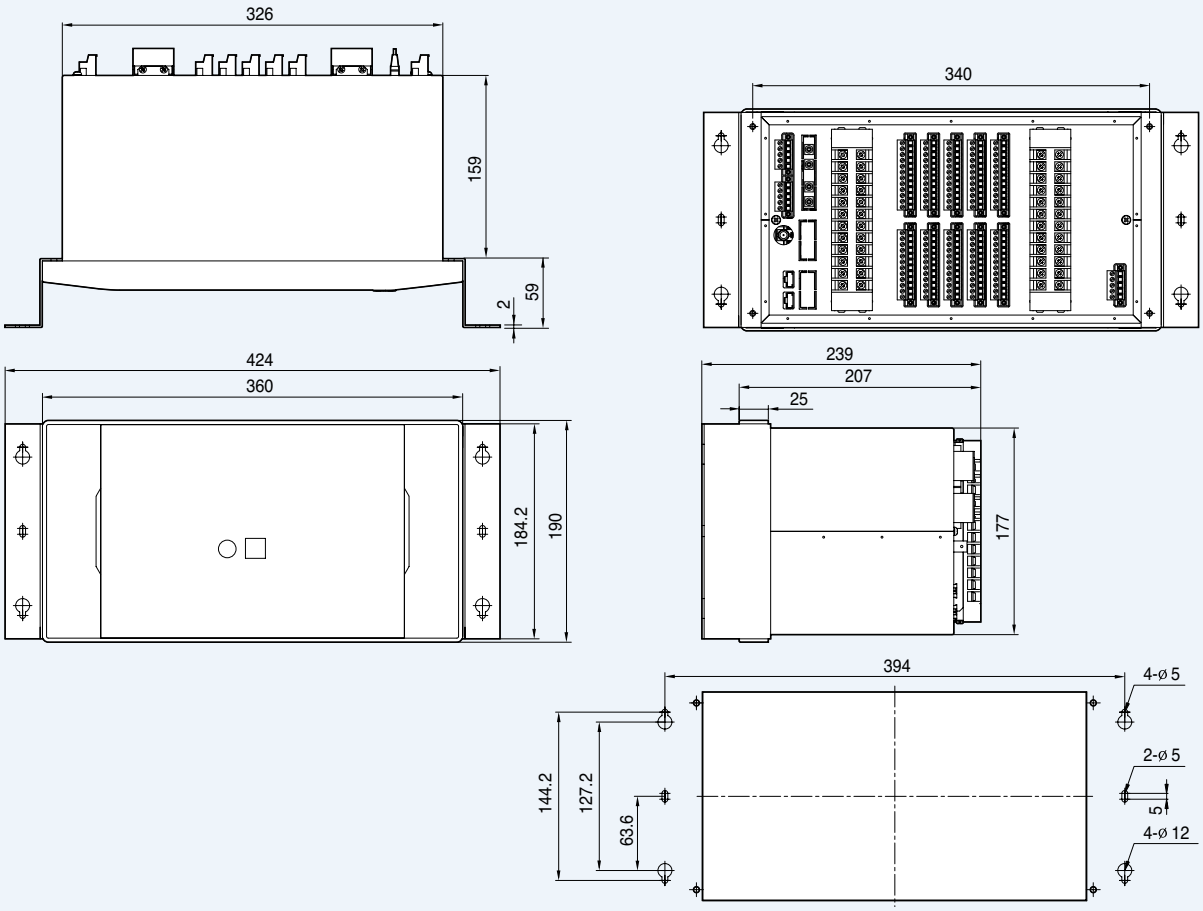


Cut size (329×179)

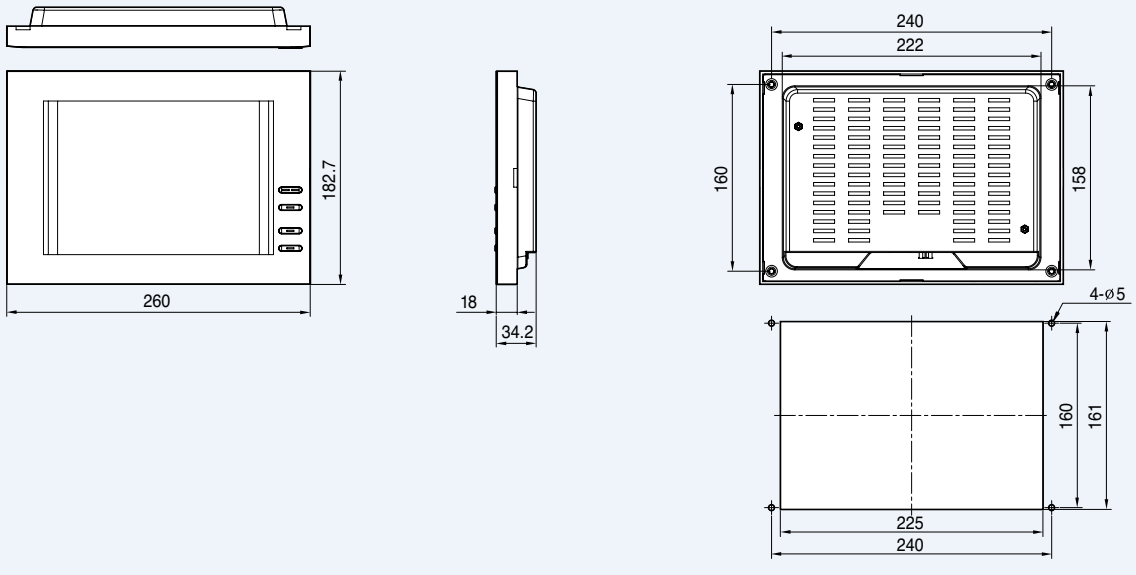
Dimensions

Separated HMI

Main



HMI



* Cable length for HMI separation is 5m

Ordering

XGIPAM

F

Protection Usage	
F	Feeder/Incoming
B	Bay Controller
M	Motor
T	Transformer
DG	Distributed Generation
3wT	3 Winding Transformer

RS

Communication	
RS	RS485
TE	100/10 Base-T Ethernet
FE	100 Base-FX Ethernet

M

Protocol	
M	MODBUS
D	DNP3.0
DR	DNP3.0 RSTP
C	IEC61850
CR	IEC61850 RSTP

s2AI

Slot#2	
-	N/A
AI	Adding 1st AI/O module

s3AI

Slot#3	
-	N/A
AI	Adding 2nd AI/O module

s4DI

Slot#4	
DI	1st DI/O module (Fixing)

s5DI

Slot#5	
-	N/A
DI	Adding 2nd DI/O module (BAY/DG default)
PO	Adding 1st PI/O module

s6DI

Slot#6	
-	N/A
DI	Adding 3th DI/O module
PO	Adding 2nd PI/O module
AP	Arc Protection

Note) 1. AP is only able to perform Modbus communication of F/M models

s7TI

Slot#7	
TI	T/B type DI/O module

Note) 1. s4DI and s7TI are standard in F/M/T models
2. s4DI, s5DI and s7TI are standard in B/DG models
3. s4DI and s6DI are standard, and s7TI is unavailable in 3wT model

SE

HMI options	
-	Integrated HMI
SE	Separated HMI

Note) In the case of an HMI separated type, the cable length is 5m

5A

CT Rating
5A
1A(Note)

Note) Export only, 3wT type not available

60Hz

Frequency
60 Hz
50 Hz

Note) Please contact us for 50Hz separately.

AC/DC 110V

Control Power
AC/DC 110V

DI_AC/DC 110V

Digital Input Power
AC/DC 110V

PAM - MASTER — XGIPAM Manager S/W

neXt Generation Technology

XGIPAM

Digital Protection & Measurement Device

Certifications

UCA International Users Group

KERI

IEC 61850 Certificate Level A[1]

Ref. No: 2015TS02059

Issued to:
LSIS Co., Ltd.
LS Tower, 127 LS-RO, DONGAN-GU,
ANYANG-SI, GYEONGGI-DO
Republic of Korea

For the server product:
XGIPAM
Multifunctional Protective Relay
Software version 3.0

Issued by:
Korea Electrotechnology Research Institute

The server product has not shown to be non-conforming to:

IEC 61850 First Edition Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1

Communication networks and systems in substations.

The conformance test has been performed according to IEC 61850-10, UCA International Users Group Device Test Procedures version 2.3 with TPCL[2] 1.7, product's protocol, model and technical issue implementation conformance statements: "Protocol Implementation Conformance Statement for the IEC 61850 interface in XGIPAM, v1.0", "Model Implementation Conformance Statement for the IEC 61850 interface in XGIPAM, v1.0", "TISSUES Implementation Conformance Statement for the IEC 61850 interface in XGIPAM, v1.0" and product's extra information for testing "Protocol Implementation eXtra Information for Testing (PIXIT) for the IEC 61850 interface in XGIPAM, v1.0".

The following IEC 61850 conformance blocks are tested with a positive result (number of relevant and executed test cases / total number of test cases) :

1	Basic Exchange (21/24)	9a	GOOSE Publish (8/13)
2	Data Sets (3/6)	9b	GOOSE Subscribe (10/11)
2+	Data Set Definition (23/23)	12a	Direct Control (6/12)
4	Setting Group Selection (3/3)	12b	SBO Control (8/14)
5	Unbuffered Reporting (16/19)	12c	Enhanced Direct Control (6/13)
6	Buffered Reporting (18/21)	12d	Enhanced SBO Control (11/19)
		13	Time Synchronization (4/5)
		14	File Transfer (4/7)

This Certificate includes a summary of the test results as carried out at KERI in Republic of Korea with UniCA 61850 Client simulator version 4.29.03 with test suite version 3.29.00(TPCL 1.7) and UniCA 61850 analyzer version 5.29.02. This document has been issued for information purposes only, and the original paper copy of the KERI report: 2015TS02059 will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to KERI by LSIS Co., Ltd. The manufacturer's production process has not been assessed. This Certificate does not imply that KERI has approved any product other than the specimen tested.

Republic of Korea, August 18, 2015

Y. J. Lee
Executive Director
Power Apparatus Testing and Evaluation Division

J. I. Jeong
Technical Manager

[1] Level A – Independent Tester with certified ISO 17025 Quality System
[2] TPCL - Test procedures change list

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Tel: +82-31-8040-4421 Fax: +82-31-8040-4439 sgl@keri.re.kr http://www.keri.re.kr

UCA International Users Group

KERI

Applicable Test Procedures from the UCA International Users Group Device Test Procedures version 2.3 with TPCL 1.7

Conformance Block	Mandatory	Conditional
1: Basic Exchange	Ass1, Ass2, Ass3, AssN2, AssN3, AssN4, AssN5 Srv1, Srv2, Srv3, Srv4, Srv5, SrvN1abcd, SrvN4	Srv6, Srv7, Srv8, SrvN1e, SrvN1f, SrvN2, SrvN3
2: Data Sets	Dset1, Dset10a, DsetN1ae	
2+: Data Sets Definition	Dset2, Dset3, Dset4, Dset5, Dset6, Dset7, Dset8, Dset9 DsetN1cd, DsetN2, DsetN3, DsetN4, DsetN5, DsetN6, DsetN7, DsetN8, DsetN9, DsetN10, DsetN11, DsetN12, DsetN13, DsetN14, DsetN15	
4: Setting Group Selection	Sg1, Sg3, SgN1a	
5: Unbuffered Reporting	Rp1, Rp2, Rp3, Rp4, Rp7, Rp10, Rp12 RpN1, RpN2, RpN3, RpN4	Rp5, Rp6, Rp8, Rp9, RpN5
6: Buffered Reporting	Br1, Br2, Br3, Br4, Br7, Br8, Br9, Br12, Br14 BrN1, BrN2, BrN3, BrN4, BrN5	Br5, Br6, Br10, Br11
9a: GOOSE publish	Gop2, Gop3, Gop4, Gop7, Gop9, Gop10a	Gop1, GopN1
9b: GOOSE subscribe	Gos1a, Gos2, Gos3, GosN1, GosN2, GosN3, GosN4, GosN5, GosN6	Gos1b
12a: Direct control	CltN3, CtlN8 DOns1	Ctl2, CtlN11 DOns3
12b: SBO control	Ctl3, CtlN1, CtlN2, CtlN3, CtlN4, SBOns2	Ctl2, CtlN11
12c: Enhanced Direct control	CltN3, CtlN8 DOes2, DOes5	Ctl2, CtlN11
12d: Enhanced SBO control	Ctl3, CltN1, CltN2, CltN3, CltN4, CtlN9 SBOes1, SBOes2, SBOes3	Ctl2, CtlN11
13: Time sync	Tm1, Tm2, TmN1	TmN2
14: File transfer	Ft1, Ft2ab, Ft4, FtN1ab	

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Tel: +82-31-8040-4421 Fax: +82-31-8040-4439 sql@keri.re.kr http://www.keri.re.kr

Multifunctional digital power protection monitoring device
with various protection elements and measurement elements

GIPAM3000

GIPAM3000

Digital Integrated Protection & Monitoring Equipment

- With 34 types of protection elements in 2 models, the distribution system fully protected
- Enhanced analysis function through various saved event data (up to 1,000 events are saved)
- Trip logic and sequence with Programmable Logic Controller and 1,024 in/output port
- Extended power quality monitoring
- Select Before Operating(SBO) and Check Before Operating(CBO)
- Vector diagram
- Trip Circuit Supervision(TCS) and Trip Relay Supervision(TRS)
- Sequence of Event(SOE)
- PT(VT) failure detection
- Circuit Breaker Failure(CBF)
- Cold Load Pickup(CLP)
- Root Mean Square(RMS) trend
- Disk emulation
- Various communication compatibility(MODBUS, DNP, IEC61850)
- Remote access using PC Manager
- Self-diagnosis and sequence monitoring
- HMI with enhanced visibility and convenience
- Convenient lever withdrawal structure
- Long-life and reliable parts applied
- Fully compatible with previous models (GIPAM2000/2200)

Contents

GIPAM3000

Digital Integrated Protection & Monitoring Equipment

GIPAM3000 series are multifunction microprocessor-based protection equipments suitable for all types of application such as distribution feeders.

It can be also be used for management backup protection of incomings, feeders, high tension motors, Bus, transformers and Generators

Over current protection function includes protection elements such as over current, over current ground fault, selective ground fault current, directive ground fault current, negative sequence over current in each phase with regard to time delay or instantaneous elements.

Under voltage protection has a operation function independently of each other, and it also has a function of 5 Recloser.

In addition, PLC CPU is built inside, so it is easy to set up not only programmable logic input and output but also user-specific usage, and has extensive monitoring and measurement functions.

It has internal memory to store 1,000 recent events, 200 Faults, and each significant 64 cycles of Fault waveform data.

The convenience features include self-diagnosis while operationg, alarm output function in case of abnormalities, RS-485 and Ethernet port for communication with higher systems as well as separate USB 2.0 ports for computer connection, and support MODBUS, DNP3.0, and IEC61850 international standard protocols.

The high-resolution 6.5" color graphics LCD and touchscreen make it easy to see the power system with relays, as well as Fault and Event data and Fault waveforms, harmonic spectrum and Vector Diagram.

The program for PC interface supports a variety of functions, including setting, monitoring, and control of all relay elements.

B


LS
POWER
COMM.
DIAG ERR
PICK UP TRIP
PROTECTIVE RELAY
MONITORING
RECORDS VIEW
POWER SYSTEM CONFIGURAITON
MEASUREMENT
DEVICE CONFIGURATION
DATA MANAGEMENT
DEVICE INFORMATION
USER DEFINED DISPLAY
GIPAM 3000
F1
F2
R/L
ENTER
CANCEL
VECTOR DIAGRAM
MEASUREMENT CURRENT
MEASUREMENT HARMONIC DIAGRAM
상태감시 CB 상태
상태감시 DI/DO 상태
MONITORING MIMIC DIAGRAM

Features

With 34 types of protection elements in 2 models, the distribution system fully protected

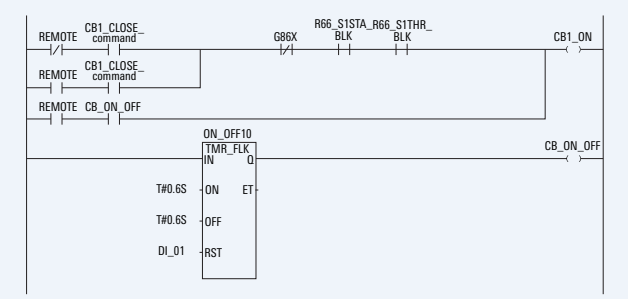
The GIPAM3000 is a total of 35 types of protection elements in two models, Feeder/Incoming, Motor, Distributed Power Source Protection FI Model and Transformer Protection T Model. Complete protection of various distribution systems.

Enhanced analysis function through various saved event data (up to 1,000 events are saved)

The GIPAM3000 records up to 1,000 events in the relay, including relay behavior, various settings, deletion of records, CB,DI,DO,VO,CC,GOOSE status changes, and all event records can be viewed by using FILTER functions by dividing them into relay settings, status changes, system settings changes, control commands, and device information.
The fault record function is the status of relay operation (Pick Up/ Operation/) among recorded events.
Reset) Only the information is extracted separately and stores a total of 200 accident records.
PQ recording is a feature that is supported only by FI type and stores a total of 200 PQ records by extracting only PQ activity records, such as PQ (Sag, Swell, Interruption), End, Duration, Phase Voltage Size and Phase, Peak Voltage, Control Authority, and Time of Occurrence among recorded events.
The fault waveform recording function stores the fault waveforms of voltage and current during relay operation for accurate fault analysis in the event of a systematic accident caused by relay operation, and can record up to 16 waveforms.
The RMS recording function can facilitate analysis of the system during motor start-up (CB ON)
The system's three-phase voltage and current can be recorded as RMS values for 60 seconds to record up to 10 waveforms.
The DEMAND recording function is only supported by FI type and is a feature that records Peak Demand and Over Demand according to user setting value and time.

Trip logic and sequence with Programmable Logic Controller and 1,024 in/output port

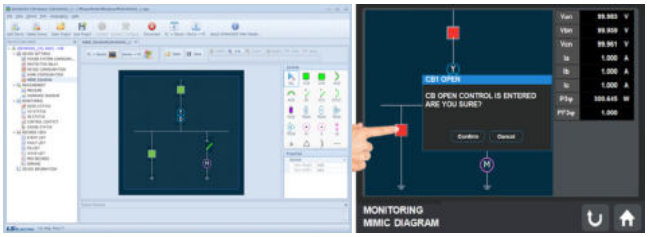
The GIPAM3000 has a built-in PLC logic function, so all I/O contacts and relay elements, including Trip Relay, can be operated by a user-generated Trip Logic. When the relay element is activated, the signal is passed to the input contacts of the PLC and operates according to the program. Sequence, such as interlocks between relay devices or switchboards, can also be easily implemented with PLC. A separate PLC operating program (XG5000) must be used to create logic



* You can download the latest version of the XG5000 for free from our website.
* XG5000 Supported OS Specifications is Windows XP, Vista, 7, 8 and 10

MIMIC diagram

MIMIC Diagram shows the open circuit diagram of the power system in which the product is used, along with voltage, current, power, and power factor measurements. It can be edited and entered through PC Manager, and can check and control the status of breakers, DIs, and CCs.



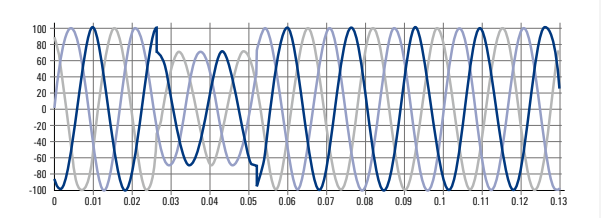
Extended power quality monitoring

The PQ measurement function is supported only for FI type and records PQ generation, shutdown, duration, phase voltage size and phase, peak voltage, control authority, and time of occurrence.

- Analysis and monitoring for Sag, Swell, Interruption
- Harmonics Analysis Spectrum up to 13th (1~13th harmonics and THD, TDD, k-factor)
- 0.5% precision for voltage, current
- 1.0% precision for power , energy

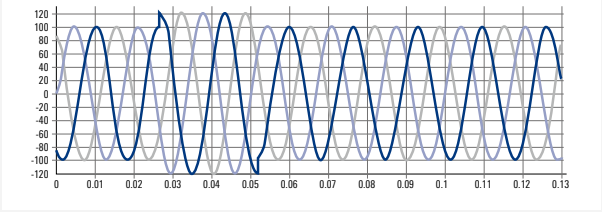
- **SAG** (VOLTAGE DROP)

The RMS value of the voltage is called Instantaneous Sag when 0.5 to 30 cycles occur with 0.1 to 0.9pu of rated voltage, and the state when 30 cycles to 3 seconds is called Temporary Sag, and the state when it lasts for 3 seconds to 1 minute is called Temporary Sag.
The Sag phenomenon cannot be prevented by battery backup, etc., and the transformer,Cables, switchgear, CT & PT, etc. are not affected by Sag.



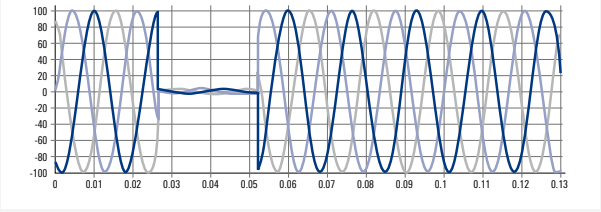
- **SWELL** (VOLTAGE RISE)

The RMS value of the voltage is 1.1 to 1.8pu of the rated voltage, and the status of 0.5 to 30 cycles is called Instantaneous Swell, the state of 30 cycles to 3 seconds, and the state of 3 seconds to 1 minute is called Temporary Swell. In particular, frequency-sensitive equipment is heavily influenced by Swell.
What's really affected by the Swell phenomenon is the equipment that requires the correct speed,
Computer, electronic control equipment, etc. are affected by immediate failure.



- **Interruption**

When the effective value of the voltage is less than 0.1pu and occurs for 0.5 to 3 seconds,
The status is "Momentary Interruption". , the state when it lasts for 3 seconds to 1 minute is called Temporary Interruption. Interruptions can cause malfunctions such as electronic control, computer, or rotor control. It also reduces the induction of motor contact and can affect soft-starter equipment.

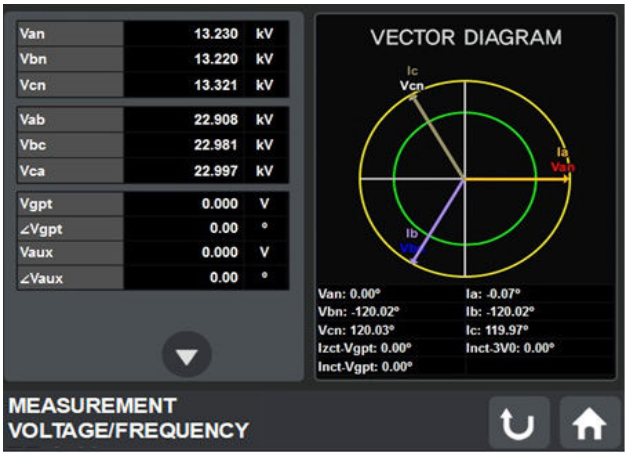


Select Before Operating(SBO) and Check Before Operating(CBO)

By choosing controlling Points first before sending out orders to where it is desired to control, control orders are executed only along with normal responses. This function enhances to control reliability and security. GIPAM2000/2200 applies SBO/CBO functions at CB control's power contact points. For selected
control point, it will wait for control orders for 5 seconds after its response. If the control order won't be delivered within 5 seconds, it will be reset. The control functions will be executed only on the normal condition when orders were delivered within 5 seconds.

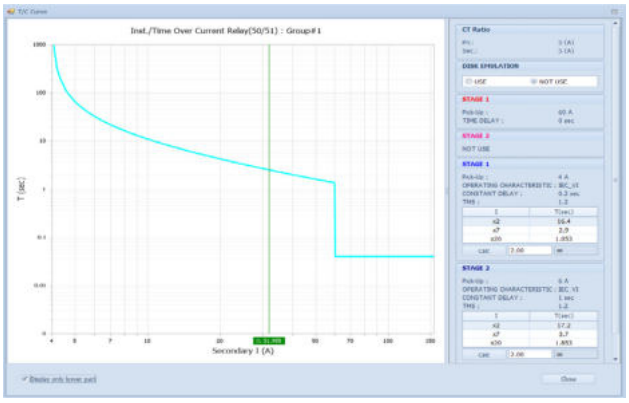
VECTOR DIAGRAM

GIPAM3000 displays Vector Diagram for the voltage, current, and phase of the system. This allows you to check the amount of electricity to easily identify the condition of the system.



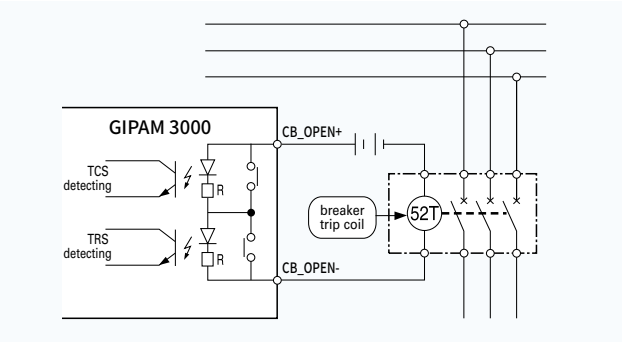
Precise protection is possible with various operating characteristic curves (IEC/IEEE/KEPCO)

For GIPAM3000, enter the settings for each relay element.
You can use the PC Manager to immediately view the Time Characteristic Curve for each setting. It calculates and displays operating hours for 200%, 700%, and 2,000% of the settings, making it easy to configure protection cooperation between protective devices.



Trip Circuit Supervision(TCS) and Trip Relay Supervision(TRS)

Trip Circuit Supervision (TCS) is a function that monitors the trip circuit of the breaker for faults.
It is supposed to be monitored at all times while the breaker is closed. Trip Relay Supervision (TRS) function monitors the relay for OPEN control inside the GIPAM3000 at a specified monitoring interval to indicate an abnormal condition.
(Monitoring interval: 1 to 365 days / 1 day) However, for CB2, the function selection must be set to CB, not PO, to perform the TCS, TRS functions.



* Terminal between The CB_OPEN contactors may always have a resistance of around 200 kΩ, which may not operate normally when used for any purpose other than TRIP.

Sequence of Event(SOE)

GIPAM300 supports the SOE function that makes easy for reviewing fault analysis and operation information by recording events in sequence at 1ms' intervals regarding internal protection relay, breaker operation, or self-diagnosis abnormalities such as alarm contact output and others.
These events including the latest registered one can be stored as many as 1,000.
Each event can be verified in detail under the "EVENT RECORDS" section from the initial screen of "RECORDS VIEW"Menu. In addition, it is possible to save as files with GIPAM3000 Manager.

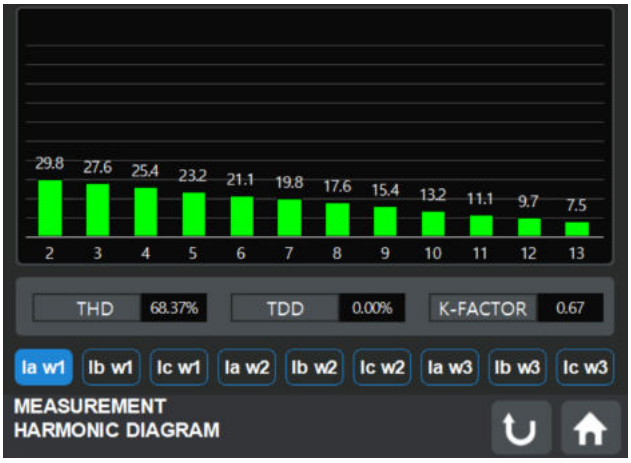
Features

PT(VT) failure detection

By detecting PT 2nd fuse melt-down in advance, it's possible to collect alarm message and logic prints which can be used to prevent unnecessary system cutoffs by protection relay operation of UVR and NSOVR. It does not activate under under-voltage or blackout situation, it compares with voltage current and on breaker conditions to decide PT fuse opening.
By utilizing DO output, it can generate alarm signal and it can also make Trip Block to disable trip function.
Replacing PT fuse will reset it immediately.

Harmonic spectrum monitoring

GIPAM3000 provides harmonics analysis SPECTRUM.
Display the 2nd to 13th harmonics for current and voltage.
It also displays Total Harmonic Distortion (THD), Total Demand Distortion (TDD) and k-factor.



Circuit Breaker Failure(CBF)

The 50BF is a function that can prevent further extension of accident by controlling upper circuit breaker to trip, when lower circuit breaker failed to act despite protection relay was activated and sent trip signal for problems in the circuit.

In/output port status monitoring

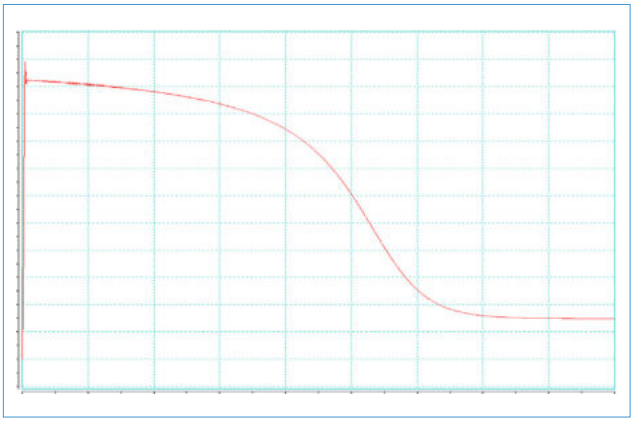
It has Virtual Output(VO) and Control Contact(CC) functions for monitoring the input/output status of the relay.
A total of 64 virtual outputs can be set, and VO function is designated as DO to check the incorrect connection of sequence wiring in the switchboard.
A total of 32 control contacts can be set, and CC function is used to verify the DO operation and wiring assigned to the relay element and to perform CB control check and communication test.

Cold Load Pickup(CLP)

This is a function that increases the OCR/OCGR setting value for a certain time after the breaker is turned on to prevent the OCR/OCGR from inadvertently operating due to the inrush current of the load when the breaker is turned on.
If the CLP holding time (1~60sec) and CLP set value (120~1,000%) are set before using the relay, the accident is judged by comparing with the CLP set value instead of the OCR/OCGR set value during the CLP hold time when the breaker is turned on. And it operates, and after the holding time, it operates with the original setting value. However, it is recommended to set the CLP setting value higher than the inrush current and lower than the expected short-circuit current.

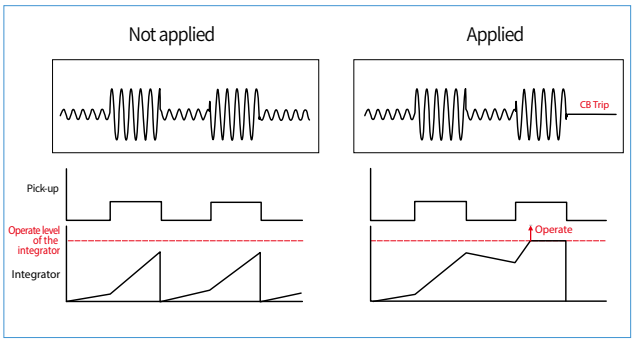
Root Mean Square(RMS) trend

The RMS Trend function records the RMS values of voltage and current for 60 seconds when the circuit breaker is turned on, and up to 10 can be recorded.
This enables analysis of the motor starting current, enabling precise protection relay settings. FI model can record 3 phase voltage, current, T model can record 1 winding current and 2 harmonic current respectively.



Disk emulation

If a ground fault/short circuit occurs due to insulation breakdown due to system aging, the signs of an intermittent accident are repeated several times, leading to a final accident.
The Disk Emulation function detects the signs of an initial accident and helps to block it safely before it spreads to a major accident.



Various communication compatibility (MODBUS, DNP, IEC61850)

The GIPAM 3000 includes media from RS-485, TCP/IP, Fiber Optic, and Supports MODBUS, DNP3.0, IEC61850 Ed1/Ed2 protocol.
(The IEC61850 protocol does not support RS-485 communication.)
Connect to your PC via USB 2.0 port (Type-B) on the front of your product to upload and download communications settings.

Easy setup with PC Manager

The GIPAM3000 PAM-Master, available for setup of the GIPAM3000, makes it easy to set up and verify all the functions, including all the settings of the relay.
On-Line or Off-Line PC, enter each setting and connect to the front communication port (B Type, USB 2.0) of the GIPAM3000 series to download to complete the setup.

Remote access using PC Manager

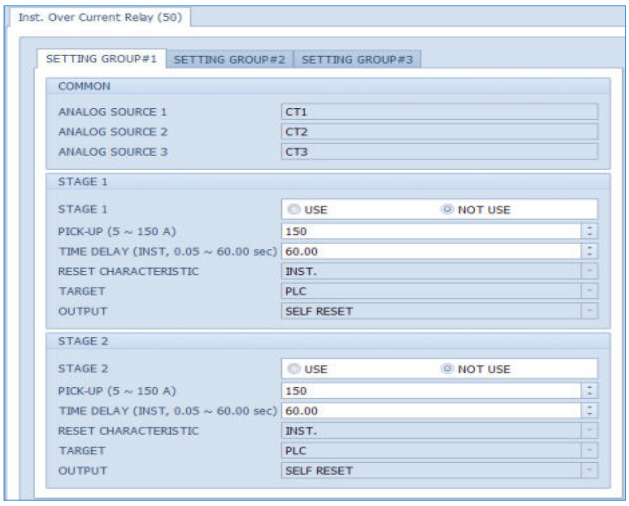
This is a function that enables event, fault, accident waveform analysis, etc. by connecting PC Manager from a remote area using Serial and Ethernet Port for remote communication on the back of the product.

Type		SCADA terminal	Manager terminal	Remark
Protocol	Media			
MODBUS, DNP	SERIAL(485)	TRX1+, TRX1+	TRX2+, TRX2+	A separate line is required.
MODBUS,DNP IEC61850	Ethernet	Ethernet com. port		Communication lines can be used in common.

Setting group function

It is a function that composes optimal protection coordination with digital input depending on the situation such as system changes and facility maintenance by correcting multiple correction values on one protection relay element. Up to three groups can be specified.

※ Path : GIPAM3000 PAM-Master - DEVICE SETTINGS - PROTECTIVE RELAY



Self-diagnosis and sequence monitoring

Self-diagnosis is performed by applying monitoring and redundancy circuits to the main circuits so that the equipment does not malfunction due to malfunction of internal components or circuits.

- Measurement and relay monitoring: ADC IC abnormality is monitored at all times and measured and compared with one analog input and two channels for abnormality monitoring.
- Communication monitoring: When a relay is booted, communication between the board and the board is monitored for abnormality of communication with the board.
- SMPS monitoring: Always monitor the internal SMPS power supply for abnormalities.
- CPU/DSP Watchdog: Always monitors for abnormalities with CPU and DSP Watchdog and performs H/W reset recovery when an error occurs.
- Memory redundancy: Performs error check for each memory data section, and double-backs up to a separate memory area to recover data from backup when an error occurs.

HMI with enhanced visibility and convenience

The GIPAM3000 is equipped with a 6.5” Color Touch Graphic LCD and a Key button, which enhances visibility and convenience by providing an intuitive GUI, convenient MMI function, and various information screens.

- User convenience is enhanced by applying touch screen and key buttons.
- MIMIC displays the system disconnection diagram, measured values, and breaker control.
- Various measurement information is provided in various forms such as figures, graphs, and charts, so that intuitive information can be grasped.

User favorite screen setting

If you select and set up to three of the status monitoring, record viewing, and measurement screens that are frequently used by users, it provides a function to cycle through the registered screens every 5 seconds.

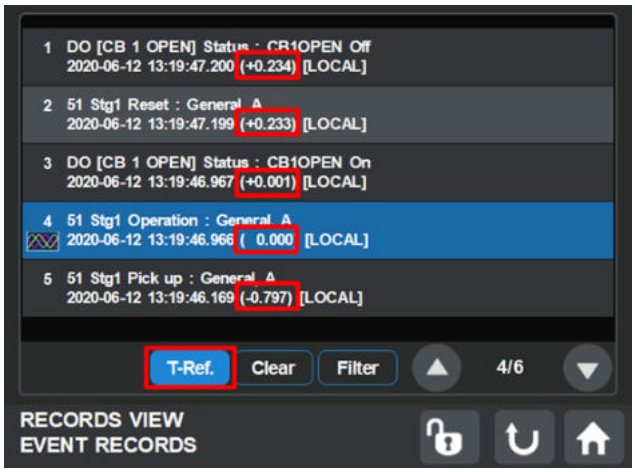
Features

Convenient Lever withdrawal structure applied

When the lever mounted at the bottom of the front of the relay is raised up, it can be pulled out and combined with only a small amount of force with the principle of lever.

Event time calculation display(T-Ref)

When displaying various event records on the relay HMI, this function additionally displays the time interval between the first selected event and the other events. This is a convenient function that eliminates the need for manual calculation of how much time lag occurs when an important event occurs one after another.



Long-life and reliable parts applied

The reliability of the product has been further improved by applying polymer capacitors, super capacitors, and MRAM memory, which are long-life parts.

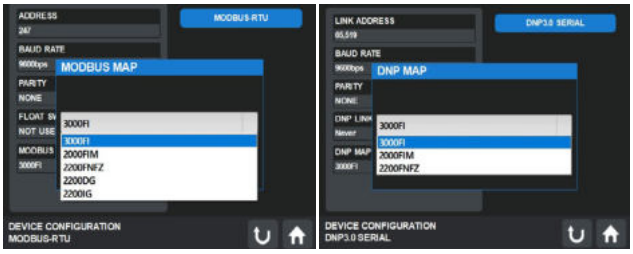
- Application of hybrid polymer capacitor: Minimize dry-up phenomenon of electrolytic capacitor applied to all electronic products.
- Super Capacitor application: For power backup of RTC operation in case of power failure, use Super Capacitor that can be used for a long time when charged instead of the primary battery.
- MRAM memory application: Among non-volatile memories used to store important relay settings, events and wave records, MRAM memory applied with the latest semiconductor technology is applied.
- Application of strong parts in high temperature and high humidity environment: Gold plated surface treatment and hole plug-in method are applied to prevent PCB surface corrosion.

Provide a wider range of use environments

Provides the use temperature (-25°C ~ 60°C) which is extended by more than 30% compared to the use temperature (-15°C ~ 55°C) of our other relays, and the storage temperature (-40°C ~70°C) which is expanded compared to the existing by providing also available in more severe environments.

Fully compatible with previous models (GIPAM2000/2200)

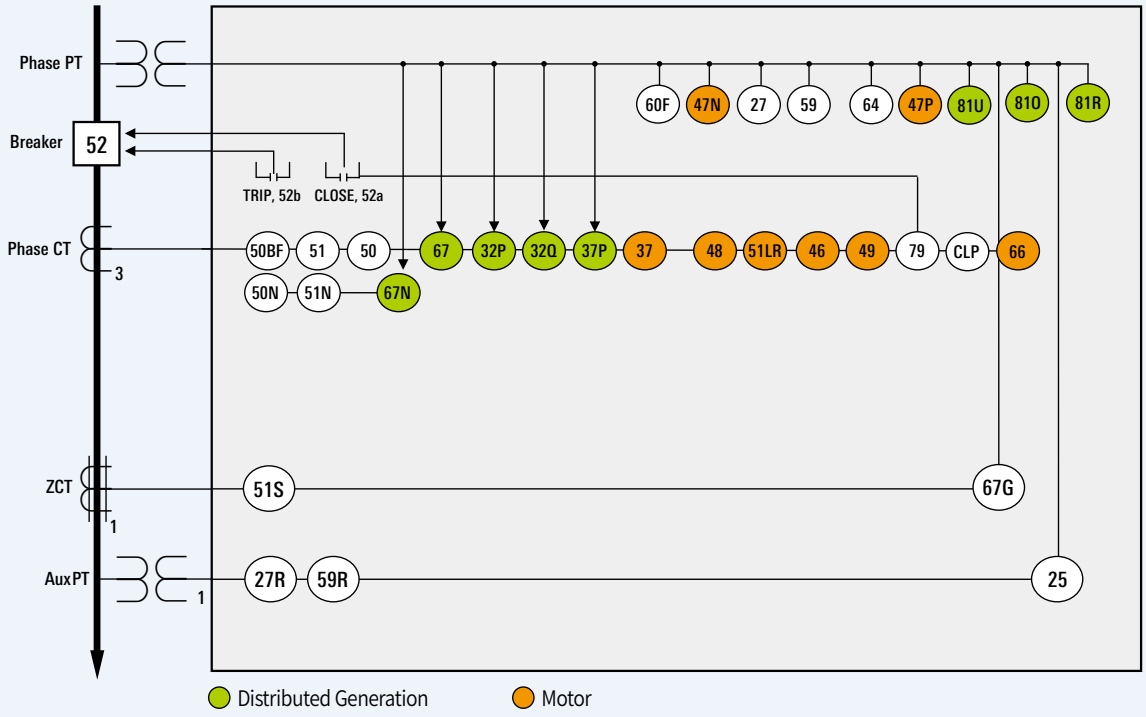
It is fully compatible with the cutting size, mounting hole and terminal block of GIPAM2000, its existing equivalent model, and the cutting size and mounting hole of another equivalent model, GIPAM2200.
MODBUS and DNP3.0 communication settings with GIPAM2000/2200 models installed through communication map settings are fully compatible.



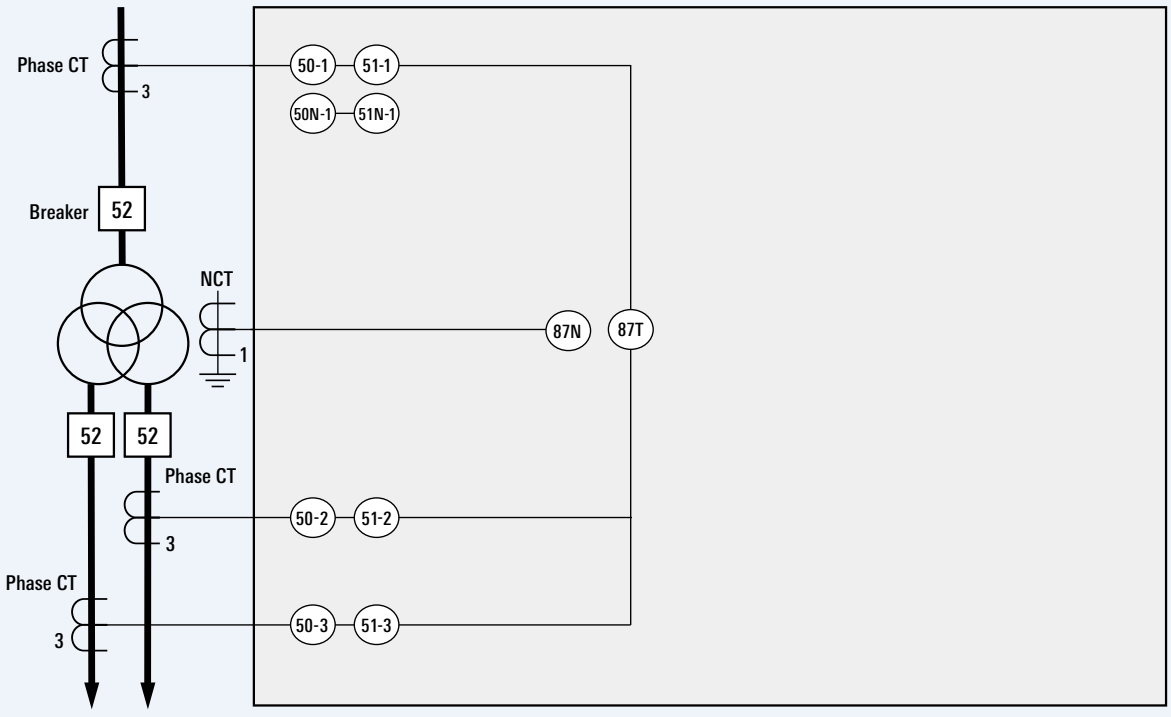
Functional Block Diagram

B

GIPAM3000 FI



GIPAM3000 T



Function & Rating

Protection

Type	Usage	Protection Elements		
GIPAM3000 FI	Feeder/Incoming Motor Distributed Generation	OCR (50/51) SEF (51S) Note 1) UVRR (27R) OVGR (64) Note 3) DPR (32P) UFR (81U) NSOCR (46) UPR (37) RECLOSING (79) PTF (60F)	OCGR (50/51N) DOCGR (67NI/67ND) Note 2) OVR (59) NSOVR (47N) DQR (32Q) OFR (81O) THR (49) UCR (37) NCH (66) CLP	SGR (67G) UVR (27) OVRR (59R) POR (47P) DOCR (67I/67D) ROCOF(81R) STALL-LOCK (48/51LR) SYNC (25) CBF (50BF) LOCK--OUT (86) Note 4)
GIPAM3000 T	Transformer	OCR (50/51w1) OCGR (50/51N-1) DFRG (87N)	OCR (50/51w2) OCGR (50/51N-2) LOCK--OUT (86) Note 4)	OCR (50/51w3) DFR (87T) Note 5)

Note) 1. Sensitive Earth Fault (SEF) is a relay element that detects the earth current in the event of an earth accident in the non-ground
2. DOCGR is the same as DGR.
3. OVGR is ALRAM with no breaker TRIP In factory-shipped products
4. Lock-out (86) can be configured with PLC Trip Logic
5. The Inrush Detector (68) element is included in the DFR (87T) element.

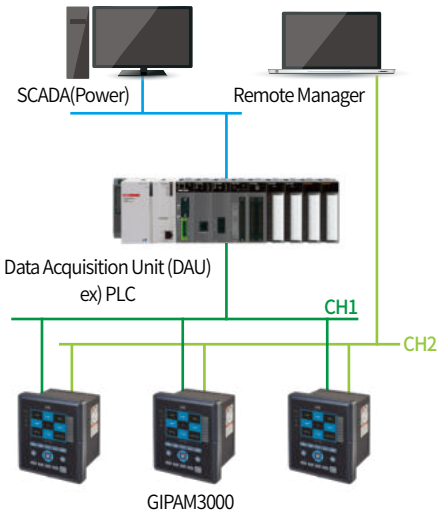
Measurement

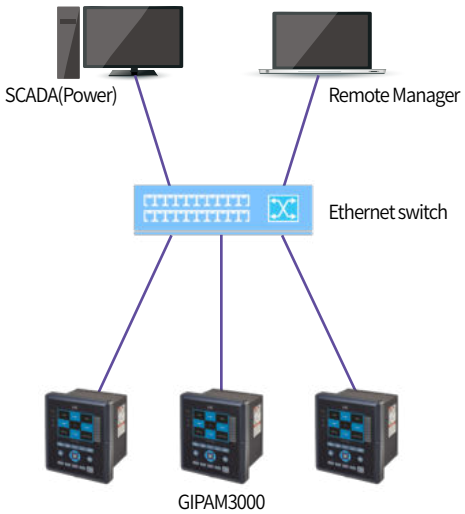
Measurement		Display range	Accuracy (%)	Remarks
Voltage	Voltage (V)	0.0V ~ 9999.999kV	±0.5%	Phase voltage, Line voltage
	Normal/reverse voltage (V_1/V_2)	0.0V ~ 9999.999kV	±5.0%	
	Zero phase voltage (V_{gpt})	0.0V ~ 9999.999V	±5.0%	
	Bus voltage (V_{aux})	0.0V ~ 9999.999kV	±5.0%	
	Voltage unbalance rate (%)	0.0% ~ 300.00%	±5.0%	
Current	Current (A)	0.0A ~ 999.999kA	±0.5%	Phase current (1A~6A)
	Normal/reverse current (I_1 / I_2)	0.0A ~ 999.999kA	±5.0%	
	Zero phase current (I_{nct})	0.0A ~ 999.999kA	±5.0%	I_{nct}
	Zero phase current (I_{zct})	0.0A ~ 999.999A	±5.0%	I_{zct}
Phase		-180.0°~180.0° (Phase display range)	±5°	
Power	Active power	0.00 ~ 9999.999 MW	±1.0%	+Forward, -Reverse (0.866 ≤ PF ≤ 1 , 1A ≤ Phase ≤ 6A)
	Reactive power	0.00 ~ 9999.999 MVar	±1.0%	+Forward, -Reverse (0 ≤ PF ≤ 0.5, 1A ≤ Phase ≤ 6A)
	Apparent power	0.00 ~ 9999.999 MVA	±5.0%	
Energy	Active energy	0.00 ~ 99999.999 MWh	±1.0%	+Forward, -Reverse (0.866 ≤ PF ≤ 1 , 1A ≤ Phase ≤ 6A)
	Reactive energy	0.00 ~ 99999.999 MVarh	±1.0%	+Forward, -Reverse (0 ≤PF ≤ 0.5, 1A ≤ Phase ≤ 6A)
	Apparent energy	0.00 ~ 99999.999 MVah	±5.0%	
Frequency	Frequency (V_a)	35 ~ 78Hz	±0.01Hz	Containing within 5% harmonics ±0.05Hz
	Frequency (V_{aux})	35 ~ 78Hz	±0.01Hz	Containing within 5% harmonics ±0.05Hz
Power factor	Power factor (PF)	-1.000 ~ 1.000	±0.02	Forward/Reverse (1A ≤Phase current ≤ 6A, 46V ≤Phase voltage ≤ 132V), Harmonic : 0%
	60hz power factor (DPF)	-1.000 ~ 1.000	±0.02	Forward/Reverse (1A ≤Phase current ≤ 6A, 46V ≤Phase voltage ≤ 132V), Harmonic : 0%
Harmonic	Voltage harmonic	0.00 ~ 100.00%	±5.0%	2^{nd} ~ 13^{th} Harmonic & THD, TDD, K-Factor (46V ≤ Harmonic & THD ≤ 220V)
	Current harmonic	0.00 ~ 100.00%	±5.0%	2^{nd} ~ 13^{th} Harmonic & THD, TDD, K-Factor (1A ≤Phase current ≤ 20A)
Demand	Active power demand	0.00 ~ 9999.999 MW	-	Total Peak Demand
	Reactive power demand	0.00 ~ 9999.999 MVar	-	Total Peak Demand
	Current demand	0.00 ~ 999.999 kA	-	Total Peak Demand

Note) Active power is an error in the rating when PF=1.

Communication

Type	RS-485	Ethernet
Protocol	DNP3.0 SERIAL MODBUS-RTU	DNP3.0 TCP MODBUS-TCP IEC61850 Ed.1/Ed.2
Specification	• Distance : Max. 1.2km • Speed : 9600, 19200, 38400bps • Cable : RS485 standard cable, 22AWG twisted shield pair cable • Mode : Differential • Method : Half-Duplex • Max input/output voltage : -7V ~ +12V	[10/100Base-TX] • Distance : Max. 100m per segment • Speed : Max 100Mbps • Cable : UTP(CAT.5), STP(Level 3) • Topology : Star type [100Base-FX] • Distance : Max. 2km per segment • Speed : 100Mbps Full-Duplex • Cable - . Wavelength : 1300nm - . Multi-Mode fiber - . Fiber Size : 62.5/125, 50/125um - . Optic Connector : LC type • Topology : Star type
Wiring	• Comm. terminal - CH 1 (8th terminal) : SCADA only - CH 2 (9th terminal) : Manager only, the REMOTE MANAGER setting should be set to 'USE'	• Comm. terminal : Don't care if the IP address is correct, communication is possible

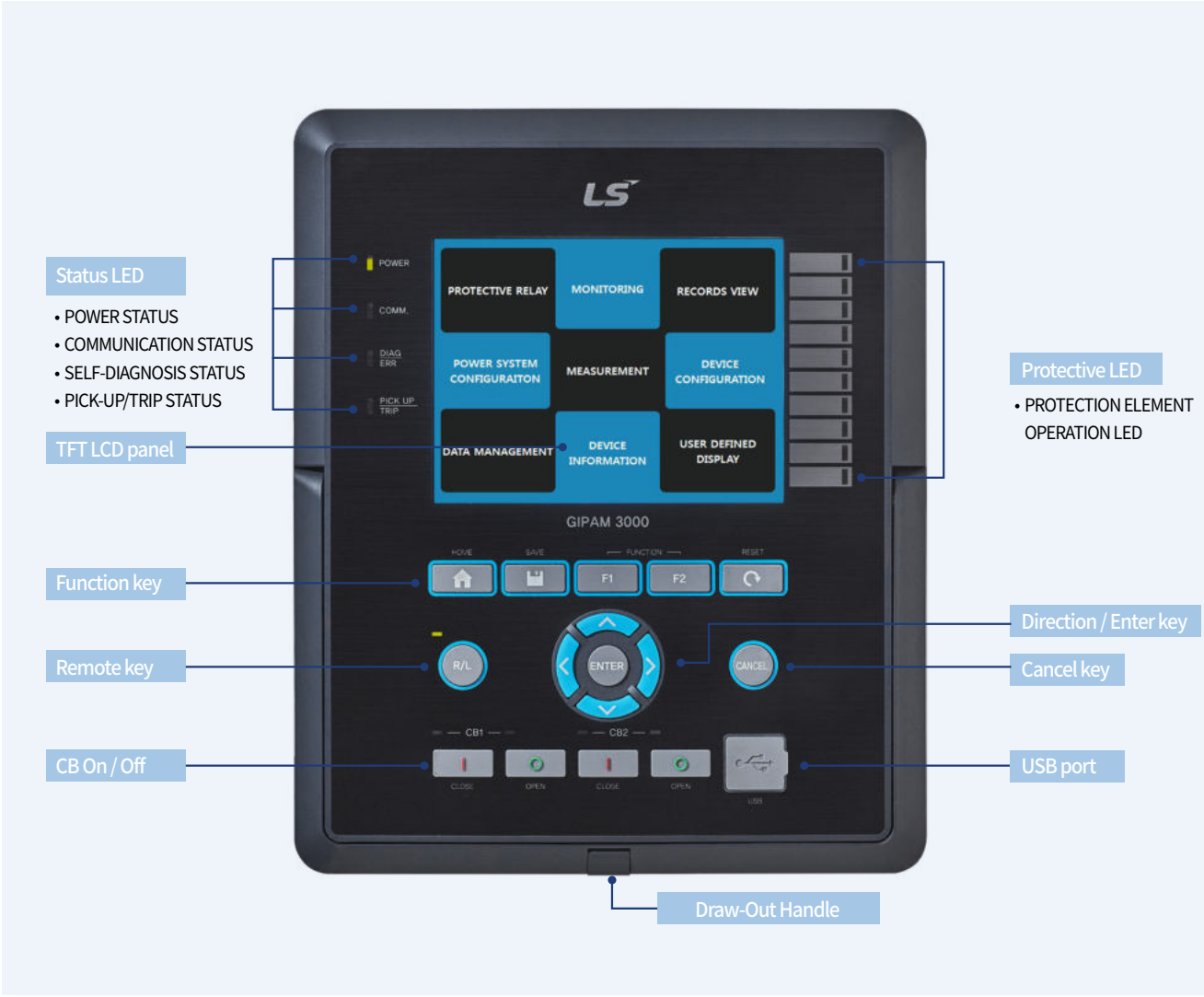




Function & Rating

Rating

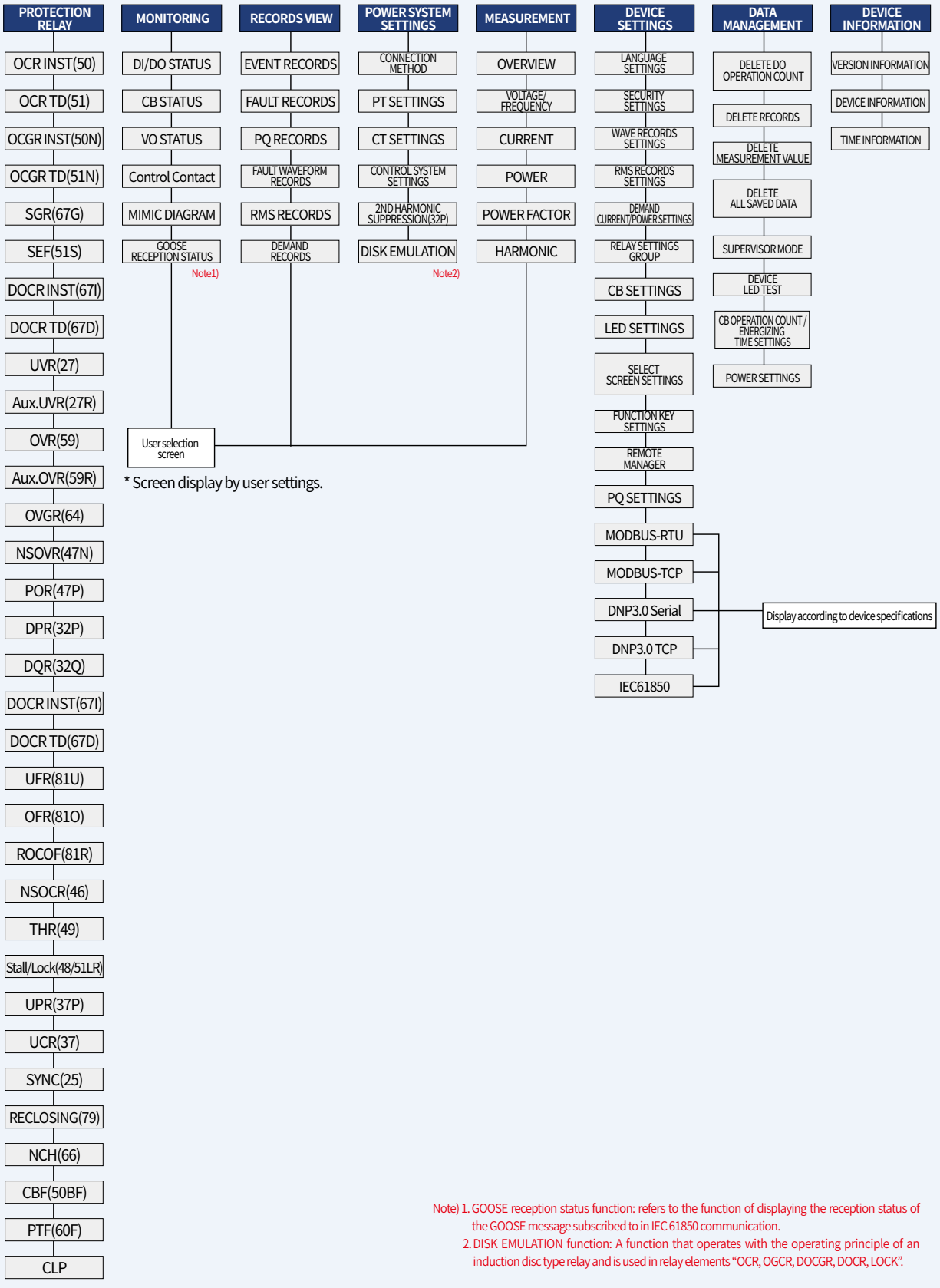
Type			Specification
Wiring			3P3W(2PT-D), 3P4W(3PT-Y)
Rating	Frequancy		60Hz, 50Hz
	Voltage	PT	110V (55~125V)
		GPT	Vn*√3 Vn : PT secondary rating voltage
	Current	CT	5A
		ZCT	1.5mA
	Power		AC/DC110V, DC125V
	Power consumption		30W or less : Stanby / 50W or less : Operation
	Burden		0.5VA or less : PT 1.0VA or less : CT
Input contact	for general		Digital Input AC/DC 110V, DC125V
Output contact	for trip		AC 250V 16A/DC 30V 16A, Resistive Load : Rated Capacity AC 4000VA, DC 480W : Opening Capacity
	for alarm		AC 250V 5A/DC 30V 5A, Resistive Load : Closed Capacity AC 1250VA, DC 150W : Opening Capacity
Tolerance	Operation Value		±5%
	Operation Time		±5% or ±35ms
Insulation Resistance			DC 500V 100MΩ or more
Insulation Voltage			AC 2kV(1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 1.2 times of rated current continuously Withstand 2 times of rated current for 3 hours. Withstand 20 times of rated current for 2 seconds. Withstand 40 times of rated current for 1 second.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV : power input 2kV : other input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-25°C ~ 60°C
	Storage		-40°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Altitude			2,000m or less
Environment			A place not subject to abnormal vibration and shock.
Applied Standards			KEMC 1120 IEC 60255-26 IEC 61850-6, 7-1, 7-2, 7-3, 7-4, and 8-1
Dimension(mm)			209(W)x185.8(D)x260(H) : Cutting Size
Weignt			10.3kg
Communication			RS485 : Modbus, DNP3.0 Ethernet TE : Modbus, DNP3.0, IEC61850 Ethernet FE : Modbus, DNP3.0, IEC61850



Menu	Function
	Back to the main menu
	Save the setting value
	Go directly to a preset menu (Setting Menu : DEVICE SETTINGS – FUNCTION KEY SETTINGS)
	Reset the relay status
	Switch the Remote and Local LED : Green (Remote) / Red (Local)
	Enter : Select item and confirm setting Cancel : cancels the selected item, changes or cancels the setting value.

Operation & Setting

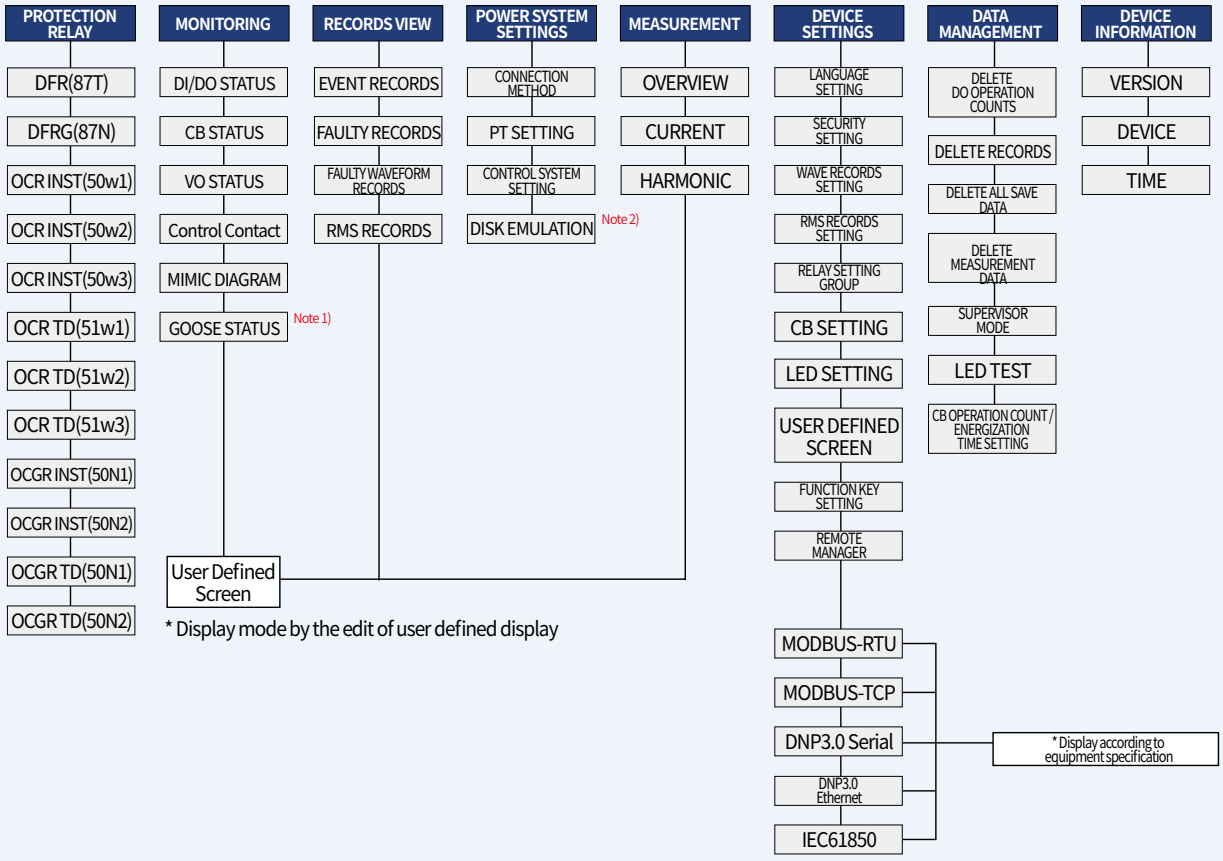
GIPAM3000 FI



Note) 1. GOOSE reception status function: refers to the function of displaying the reception status of the GOOSE message subscribed to in IEC 61850 communication.
2. DISK EMULATION function: A function that operates with the operating principle of an induction disc type relay and is used in relay elements "OCR, OGCR, DOCGR, DOCR, LOCK".

B

GIPAM3000 T



Note) 1. GOOSE reception status function: refers to the function of displaying the reception status of the GOOSE message subscribed to in IEC 61850 communication.
2. DISK EMULATION function: A function that operates with the operating principle of an induction disc type relay and is used in relay elements "OCR, OGCR, DOCGR, DOCR, LOCK".

Operation Characteristics

GIPAM3000 FI

Protection	Operating part	Pick-up range (Not USE, range/unit)	Operating characteristics	Operating time range	Delay time range	Remark
OCR (50)	Stage1	NOT USE, 5A ~ 150A/1A	Instantaneous	Operating within 40msec	-	-
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
OCR (51)	Stage1	NOT USE, 0.5A ~ 20A/0.05A	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
	Stage2		Inverse	0.05 ~ 1.20/0.01 (IEC) 0.05 ~ 15.00/0.01 (IEEE)	0~10.00s/0.01s	
OCGR (50N)	Stage1	NOT USE, 5A ~ 40A/1A	Instantaneous	Operating within 40msec	-	-
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
OCGR (51N)	Stage1	NOT USE, 0.1A ~ 10A/0.05A	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
	Stage2		Inverse	0.05 ~ 1.20/0.01 (IEC) 0.05 ~ 15.00/0.01 (IEEE)	0~10.00s/0.01s	
SGR (67G)	Stage1	NOT USE, 1 ~ 20mA/0.1mA, 8~80V/1V, 0~359°/1° (Direction reference angle)	Definite	0.05s ~ 60.00s/0.01s	-	-
SEF (51S)	Stage1	NOT USE, 1 ~ 20mA/0.1mA	Definite	0.05s ~ 60.00s/0.01s	-	-
DOCGR (67NI)	Stage1	NOT USE, 0.5A ~ 40A/0.1A, 0~359°/1°(Direction reference angle)	Instantaneous	Operating within 50msec	-	-
			Definite	0.05s ~ 60.00s/0.01s		
DOCGR (67ND)	Stage1	NOT USE, 0.1A ~ 10A/0.05A, 0~359°/1°(Direction reference angle)	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
			Inverse	0.05 ~ 1.20/0.01 (IEC) 0.05 ~ 15.00/0.01 (IEEE)	0~10.00s/0.01s	
UVR (27)	Stage1	NOT USE, 10V~110V/1V, NOT USE/USE(Auto return), NOT USE/USE(Dead voltage block), NOT USE/USE(No display), PLC, DO04(output)	Definite	0.05s ~ 60.00s/0.01s	-	Dead voltage block: 6V fixed ✓ Please Set the stage2 to use 32Q
	Stage2					
UVRR (27R)	Stage1	NOT USE, 10V~110V/1V(Vaux), NOT USE/USE(Auto return), NOT USE/USE(Dead voltage block), NOT USE/USE(No display)	Definite	0.05s ~ 60.00s/0.01s	-	Dead voltage block: 6V fixed ✓ Under voltage Relay for other BUS with PT5
OVR (59)	Stage1	NOT USE, 40V ~ 180V/1V	Definite	0.05s ~ 60.00s/0.01s	-	-
	Stage2					
OVRR (59R)	Stage1	NOT USE, 40V ~ 180V/1V	Definite	0.05s ~ 60.00s/0.01s	-	-
OVGR (64)	Stage1	NOT USE, 5V ~ 80V/1V	Definite	0.05s ~ 60.00s/0.01s	-	-
	Stage2					
NSOVR (47N)	Stage1	NOT USE, 11V ~ 110V/1V	Definite	0.05s ~ 60.00s/0.01s	-	-
	Stage2					
POR (47P)	Stage1	NOT USE, 5% ~ 100%/1% Calculation method : XGIPAM, GIPAM2000, NEMA	Definite	0.05s ~ 60.00s/0.01s	-	-
	Stage2					
DPR (32P)	Stage1	NOT USE, 15W ~ 500W/1W, FORWARD/REVERSE	Definite	0.1s ~ 60.00s/0.01s	-	Operates with 3-phase active power ✓ When 32P operates , only DO08 OUTPUT activates and CB OFF output is not available, Please modify the LOGIC if necessary.
	Stage2					
DQR (32Q)	Stage1	NOT USE, 11VAR ~ 500VAR/1VAR, FORWARD/REVERSE	Definite	0.1s ~ 60.00s/0.01s	-	Operates with individual reactive power(Q_a, Q_b, Q_c) $Q_a = I_a * (V_b - V_c)$ ✓ Please Set the 27 of stage2 to use 32Q
	Stage2					

Note) GIPAM2000 sets the rated unit (Vn=110V, In=5A), and GIPAM3000 sets the size unit (voltage value, current value)
Ex) When operating value 110V, 5A is set, GIPAM2000: 1Vn, 1In, GIPAM3000: 110V, 5A

Protection	Operating part	Pick-up range (Not USE, range/unit)	Operating characteristics	Operating time range	Delay time range	Remark
DOCR (67I)	Stage1	NOT USE, 5A ~ 150A/1A, 0~359°/1° (Direction reference angle)	Instantaneous	Operating within 50msec	-	Operating range angle: ±87°
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
DOCR (67D)	Stage1	NOT USE, 0.5A ~ 20A/0.05A, 0~359°/1° (Direction reference angle)	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation Operating range angle: ±87°
	Stage2		Inverse	0.05 ~ 1.20/0.01 (IEC) 0.05 ~ 15.00/0.01 (IEEE)	0~10.00s/0.01s	
UFR (81U)	Stage1	NOT USE, 50Hz ~ 60Hz/0.01Hz	Definite	0.1s ~ 60.00s/0.01s	-	Low voltage block: 40V
	Stage2					
	Stage3					
	Stage4					
OFR (81O)	Stage1	NOT USE, 60Hz ~ 70Hz/0.01Hz	Definite	0.1s ~ 60.00s/0.01s	-	Low voltage block: 40V
	Stage2					
	Stage3					
	Stage4					
ROCOF (81R)	Stage1	NOT USE, 0.1Hz/s ~ 2.0Hz/s/0.01Hz/s	Definite	0.2s ~ 1.00s/0.01s	-	Low voltage block: 40V
	Stage2					
	Stage3					
	Stage4					
NSOCR (46)	Stage1	NOT USE, 0.5A ~ 5A/0.1A	Definite	0.1s ~ 60.00s/0.01s	-	-
	Stage2					
THR (49)	Stage1	NOT USE, 1A ~ 10A/0.05A, Alarm : USE/NOT USE, 70% ~ 90%/1%	Inverse	2 ~ 32min/0.5min, 0.8 ~ 1.2/0.01	-	-
STALL/LOCK (48/51LR)	Stage1	NOT USE, 1A ~ 50A/0.05A,	Definite	0.05s ~ 60s/0.01s	-	IEC-VI, EI, Disk Emunlation
			Inverse	0.05 ~ 1.00/0.01 (IEC)		
UPR (37P)	Stage1	NOT USE, 15W ~ 500W/1W, FORWARD/REVERSE	Definite	0.1s ~ 60.00s/0.01s	-	Dead power block: 15W
	Stage2					
UCR (37)	Stage1	NOT USE, 0.5A ~ 4.5A/0.1A	Definite	0.1s ~ 60.00s/0.01s	-	Dead current block: 0.1A
	Stage2					
SYNC (25)	Stage1	NOT USE, 2V~50V/1V(V diff), 5°~45°/1°(Phase diff), 0.01Hz~0.5Hz/0.01Hz(F diff), 10V~30V/1V(Dead Voltage)	Definite		-	Synchronous voltage: 40V ~ 132V
Reclose (79)	Stage1	NOT USE, 1~5time/1time NOT USE/USE (Limiting operation during the second input)	Definite	1~180s/0.1s(Preparation time) 0.2~60s/0.1s(Dead voltage time1) 0.2~60s/0.1s(Dead voltage time 2) 0.2~60s/0.1s(Dead voltage time 3) 0.2~60s/0.1s(Dead voltage time 4) 0.2~60s/0.1s(Dead voltage time 5) 1.0~180.0s/0.1s(Return time)	-	- Operation protection: OCR/OCGR/DOCR/DOCG - Protection description: It is a function to block instantaneous operation after one operation of reclosed.
NCH (66)	Stage1	NOT USE, 1~5time/1time, 10 ~ 80%/1%	Definite	1 ~ 60min/1min	-	-
CBF (50BF)	Stage1	NOT USE, 1A ~ 5A/0.5A	Definite	0.1s ~ 1.00s/0.01s	-	Operation condition : breaker closed status
PTF (60F)	Stage1	NOT USE, 10V ~ 70V/1V	Definite	Operating within 40msec	-	Operation condition : breaker closed status , 0.1A<Phase current<5A, I_{ub}(%) : 20%or less , Operation time : 40ms or less, NEMA : $I_{ub} = (Max(I_{line} - I_{avg}))/I_{avg}$

Note) GIPAM2000 sets the rated unit (Vn=110V, In=5A), and GIPAM3000 sets the size unit (voltage value, current value)
Ex) When operating value 110V, 5A is set, GIPAM2000: 1Vn, 1In, GIPAM3000: 110V, 5A

Operation Characteristics

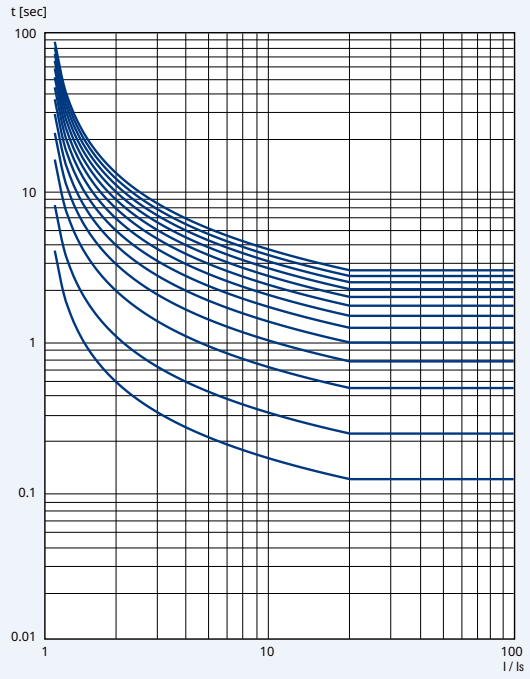
GIPAM3000 T

Protection	Operating part	Pick up range (Not USE, range/unit)	Operating characteristics	Operating time range	Delay time range	Remark
CLP	Stage1	NOT USE, 120%~1,000%/5%	Definite	1.0s~60.0s/0.1s	-	Operation protection: 50/51/50N/51N Restart time: 10 sec
OCR (50 w1)	Stage1	NOT USE, 5A ~ 150A/1A	Instantaneous	Operating within 40msec	-	-
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
OCR (50 w2)	Stage1	NOT USE, 5A ~ 150A/1A	Instantaneous	Operating within 40msec	-	-
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
OCR (50 w3)	Stage1	NOT USE, 5A ~ 150A/1A	Instantaneous	Operating within 40msec	-	-
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
OCR (51 w1)	Stage1	NOT USE, 0.5A ~ 20A/0.05A	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
	Stage2		Inverse	0.05 ~ 1.20/0.01(IEC) 0.05 ~ 15.00/0.01(IEEE)	0~10.00s/0.01s	
OCR (51 w2)	Stage1	NOT USE, 0.5A ~ 20A/0.05A	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
	Stage2		Inverse	0.05 ~ 1.20/0.01(IEC) 0.05 ~ 15.00/0.01(IEEE)	0~10.00s/0.01s	
OCR (51 w3)	Stage1	NOT USE, 0.5A ~ 20A/0.05A	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
	Stage2		Inverse	0.05 ~ 1.20/0.01(IEC) 0.05 ~ 15.00/0.01(IEEE)	0~10.00s/0.01s	
OCGR (50N_1)	Stage1	NOT USE, 5A ~ 40A/1A	Instantaneous	Operating within 40msec	-	-
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
OCGR (50N_2)	Stage1	NOT USE, 5A ~ 40A/1A	Instantaneous	Operating within 40msec	-	-
	Stage2		Definite	0.05s ~ 60.00s/0.01s		
OCGR (51N_1)	Stage1	NOT USE, 0.1A ~ 10A/0.05A	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
	Stage2		Inverse	0.05 ~ 1.20/0.01(IEC) 0.05 ~15.00/0.01(IEEE)	0~10.00s/0.01s	
OCGR (51N_2)	Stage1	NOT USE, 0.1A ~ 10A/0.05A	Definite	0.05s ~ 60.00s/0.01s	-	IEC-SI, VI, EI, LI, IEEE-VI, EI, MI, KEPCO-SI, VI, Disk Emulation
	Stage2		Inverse	0.05 ~ 1.20/0.01(IEC) 0.05 ~ 15.00/0.01(IEEE)	0~10.00s/0.01s	
DFR (87T)	High set	NOT USE, 5A ~ 100A/0.5A	Instantaneous	Operating within 50msec	-	-
			Definite	0.05s ~ 10.00s/0.01s		
	Low set	NOT USE, 1A~5A/0.5A, 15%~80%/1%(Slope#1), 15%~80%/1%(Slope#2), 5A~100A/0.5A(Critical point), NOT USE/USE (Zero current removal), NOT USE/USE (Harmonic removal), NOT USE, 5%~50%/1% (Harmonic ratio)	Definite	0.05s ~ 10.00s/0.01s	-	-
DFRG (87N)	Stage1	NOT USE, 0.25A ~ 5A/0.05A, Slope : 15% ~ 80%/1%	Definite	0.05s ~ 10.00s/0.01s	-	-

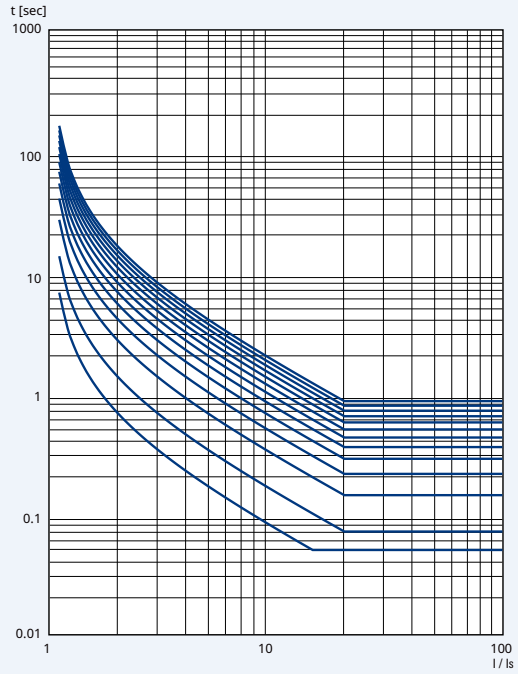
Note) GIPAM2000 sets the rated unit (Vn=110V, In=5A), and GIPAM3000 sets the size unit (voltage value, current value)
Ex) When operating value 110V, 5A is set, GIPAM2000: 1Vn, 1In, GIPAM3000: 110V, 5A

Characteristic Curves

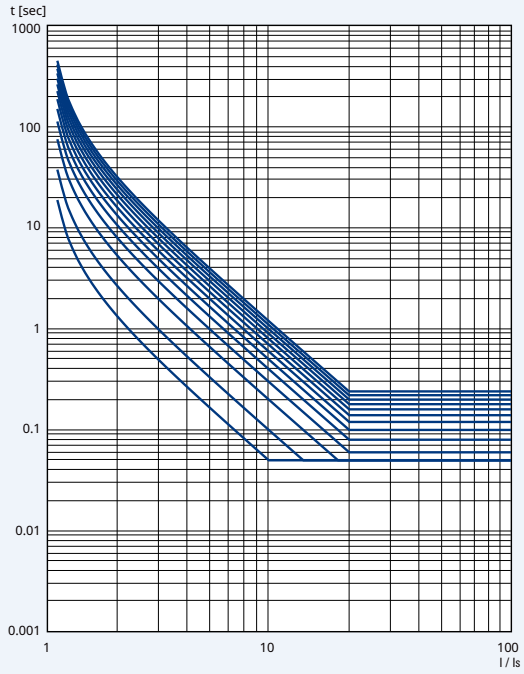
IEC-SI:Standard Inverse Time



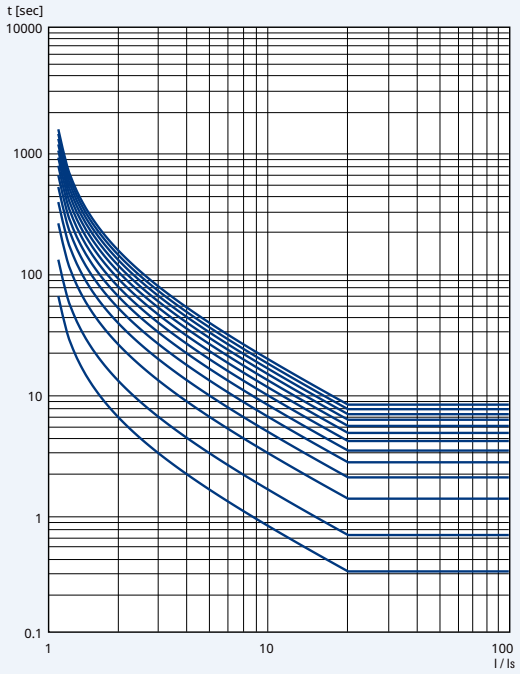
IEC-VI:Very Inverse Time



IEC-EI:Extremely Inverse Time



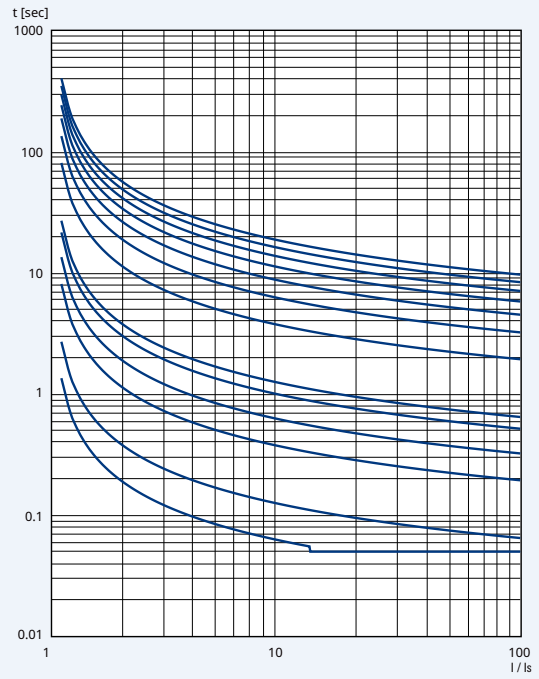
IEC-LI:Longtime Inverse Time



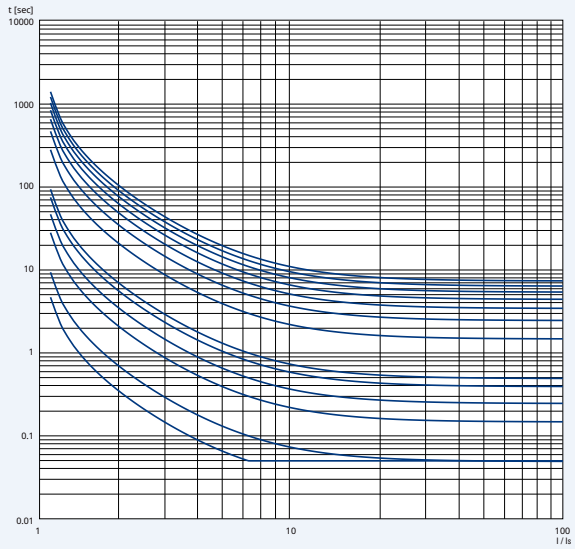
Note) If the operation time of the time-limited characteristic curve is shorter than the instantaneous operation, it is based on the instantaneous operation time.

Characteristic Curves

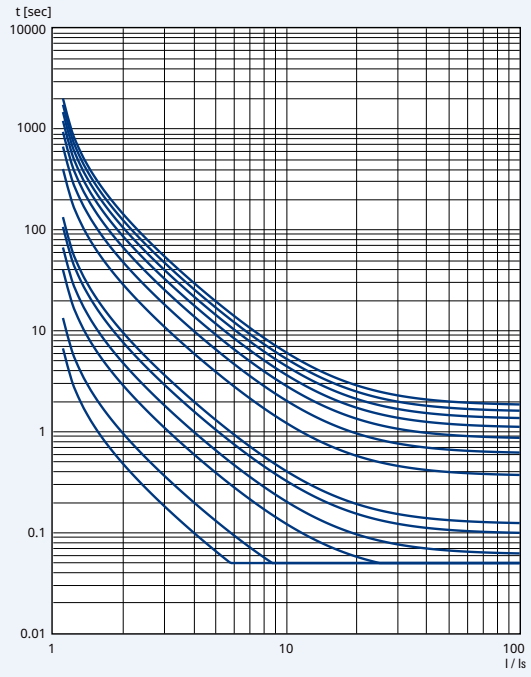
IEEE-MI : Moderately Inverse Time)



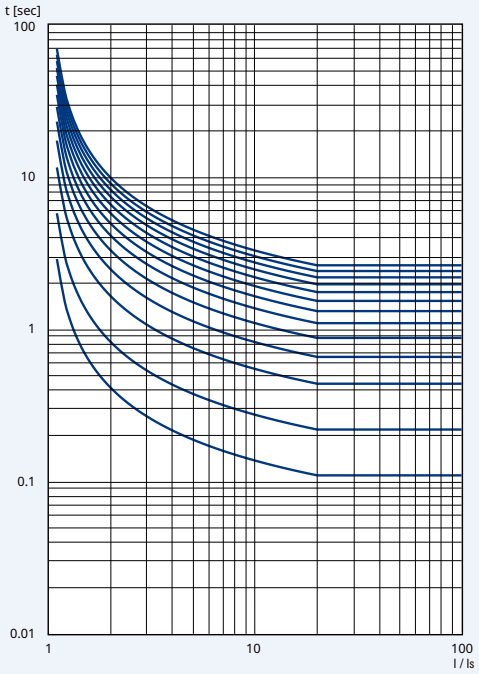
IEEE-VI:Very Inverse Time)



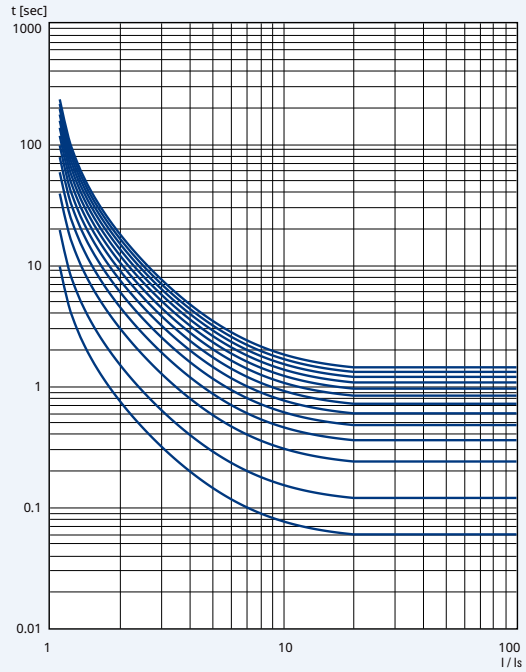
IEEE-EI:Extreme Inverse Time)



KEPCO-SI



KEPCO-VI



Inverse time curve characteristic value

Operating time formula

$$t(s) = TMS \times \left(\frac{k}{\left(\frac{G}{G_S} \right)^{\alpha} - 1} + C \right) + CD$$

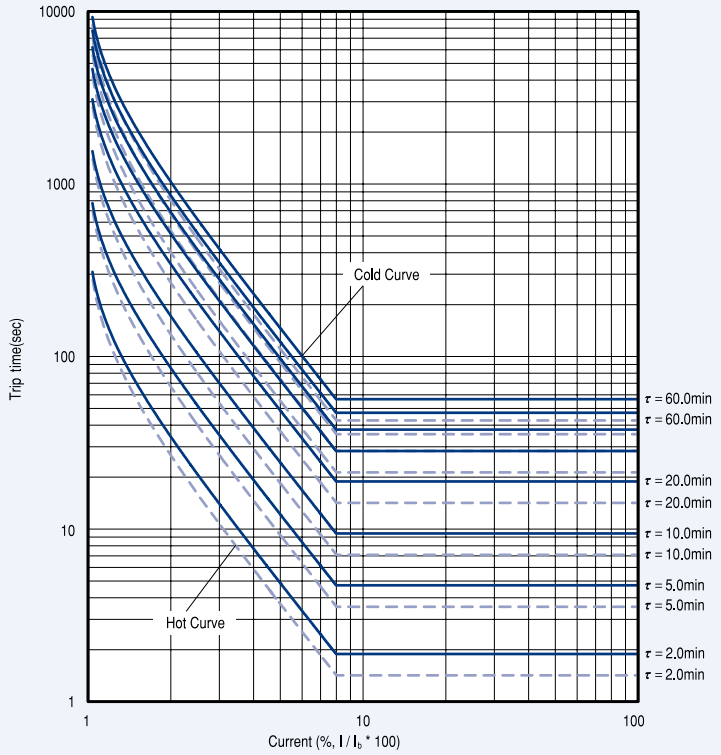
TMS(Time Multiplier Setting): Inverse time characteristic value, GS: Setting current, G: fault current
k, α, c: Factor for each curve, CD: Constant Delay

Curve model	TYPE	TMS range	TMS Step	k	c	α	tr	β
IEC	SI	0.05 ~ 1.20	0.01	0.14	0	0.02	9.7	2
	VI			13.5	0	1	43.2	2
	EI			80	0	2	58.2	2
	LI			120	0	1	80	2
IEEE	MI	0.05 ~ 15.0	0.01	0.0515	0.114	0.02	4.85	2
	VI			19.61	0.491	2	21.6	2
	EI			28.2	0.1217	2	29.1	2
KEPCO	SI	0.05 ~ 1.20	0.01	0.11	0.42	0.02	-	-
	VI			39.85	1.084	1.95	-	-

Note) OCR, OCGR, DOCR, DOCGR apply IEC(4), IEEE(3), KEPCO(2) curves.
LOCK apply IEC VI, EI only.

Characteristic Curves

Thermal Curve



• Apply : THR(49)

· HOT : $t = \tau h \cdot I_n \frac{I^2 - I_P^2}{I^2 - (k \cdot I_B)^2}$

$\tau h = 2.0 \sim 60.0 min$

· COLD : $t = \tau c \cdot I_n \frac{I^2}{I^2 - (k \cdot I_B)^2}$

$\tau c = 2.0 \sim 60.0 min$

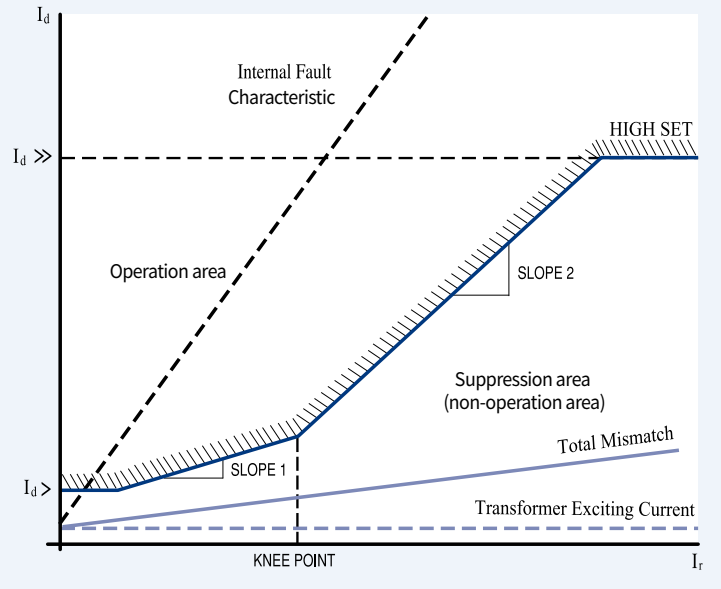
$\begin{pmatrix} I_P = 0.5 \\ k = 1 \\ I_B = 1 \end{pmatrix}$

· k = SF

I_P : Failure load current
I_B : Rated load current
k : Overload constant
I : Fault current
τh (τheating) : Thermal time constant during operation
τc (τcooling) : Thermal time constant during cooling

· Cold state is $I_P = 0$
· SF : Service Fator

Ratio Differential Curve



• Apply : DFR(87T-P)

$I_d = I_{differential} = |\bar{I}_1 - \bar{I}_2|$ (Vector sum.)

$Ir = I_{restraint} = |I_1| + |I_2|$ (Scalar sum.)

$SLOPE = [\frac{I_d}{I_r}]$

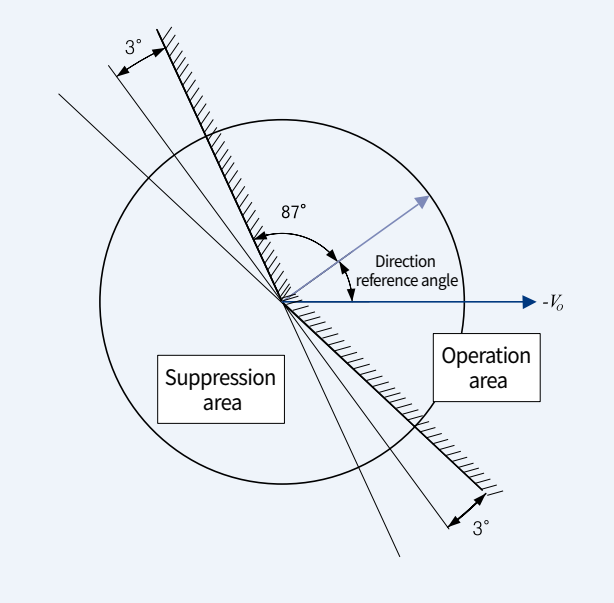
Fault Characteristic: Fault Characteristic
($I_{1st} = If$, $I_{2nd} = 0$)

I_d : Differential current
I_r : Suppression current
$I_{d>}$: Time difference current (Low set : 5~100 A)
$I_{d>>}$: Instantaneous differential current
(High set : 1~5 A)
KNEE POINT : Inflection point
SLOPE 1 : Characteristic slope 1
SLOPE 2 : Characteristic slope 2

B

Directional element operation characteristics

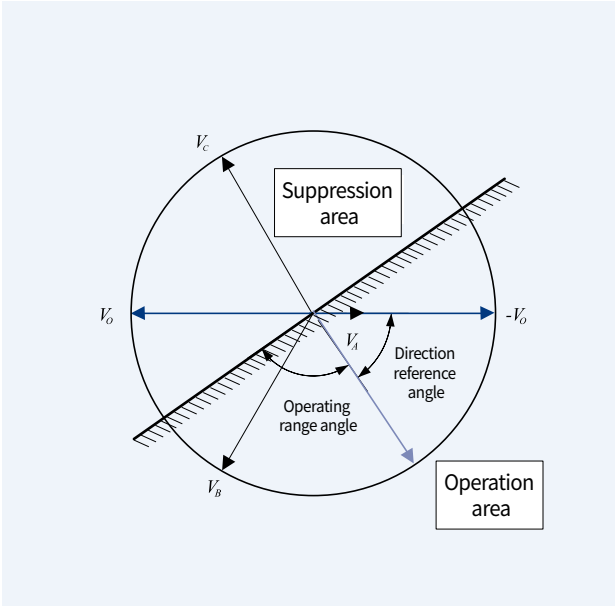
SGR



• **SGR Relay operating area**

Reference sensitivity phase angle – 87° ≤ ($\angle I_o - \angle V_o$) ≤ Reference sensitivity phase angle + 87°

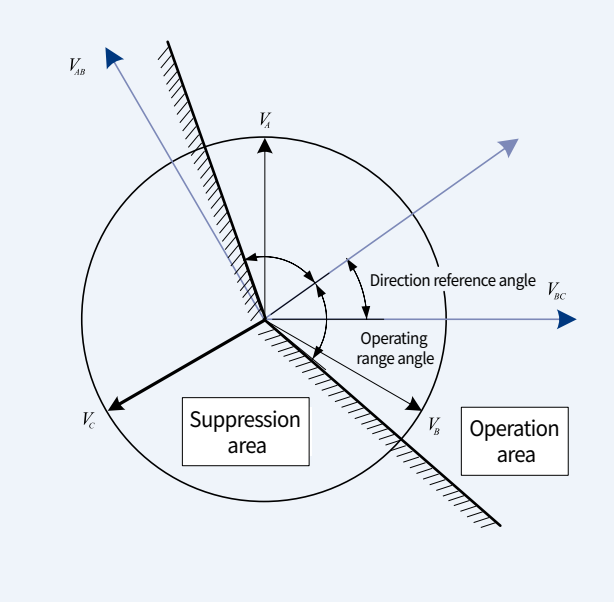
DGR, DOCGR



• **DGR, DOCGR Relay operating area**

Reference sensitivity phase angle – Operating range angle ≤ ($\angle I_o - \angle V_o$) ≤ Reference sensitivity phase angle + Operating range angle

DOCR



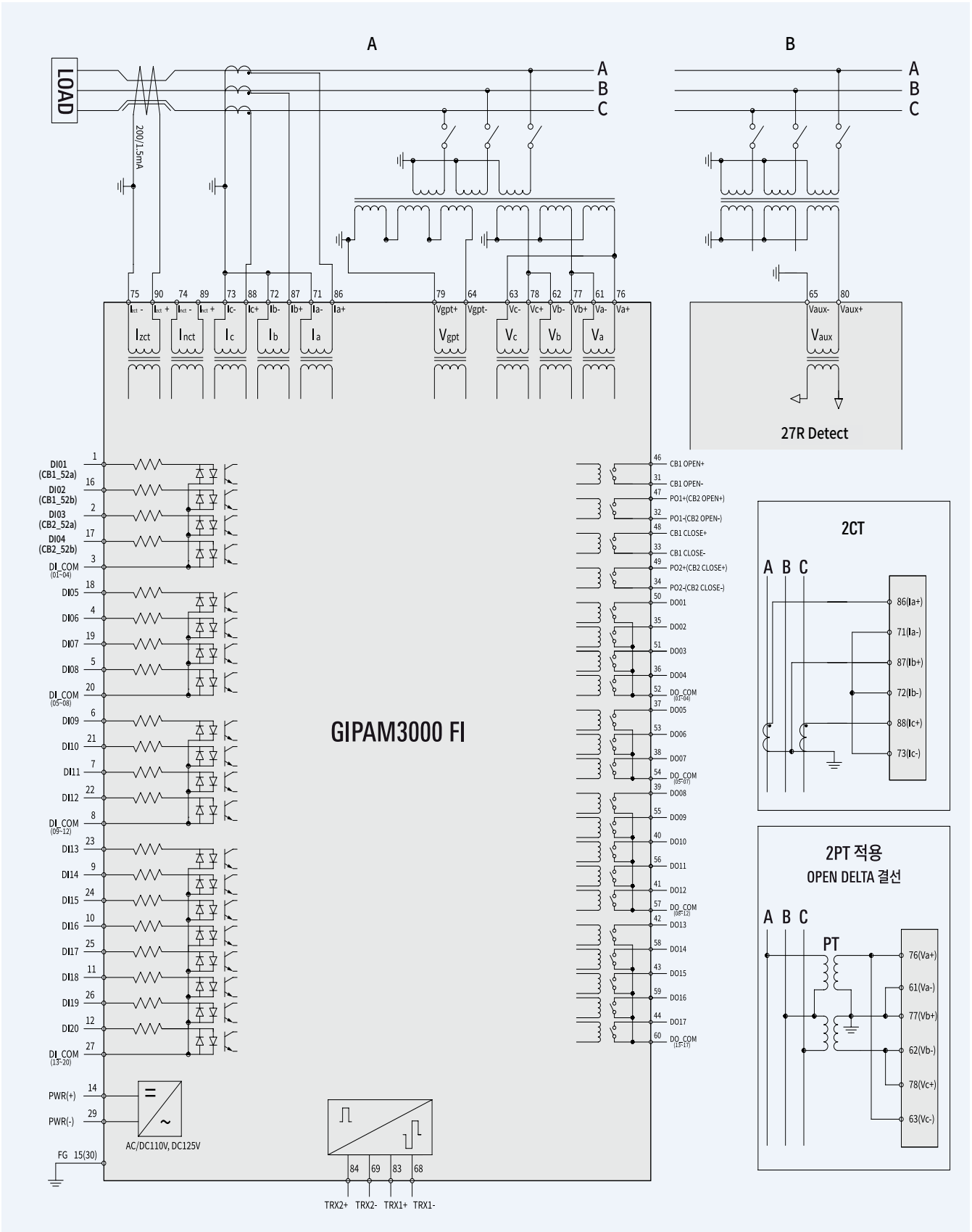
• **DOCR Relay operating area**

Reference sensitivity phase angle – Operating range angle ≤ (∠Operating current - ∠Reference voltage) ≤ Reference sensitivity phase angle + Operating range angle

Phase	Operating current	Polarity voltage(Vpol)
A(L1)	I_a	$V_{bc} = V_b - V_c$
B(L2)	I_b	$V_{ca} = V_c - V_a$
C(L3)	I_c	$V_{ab} = V_a - V_b$

Wiring

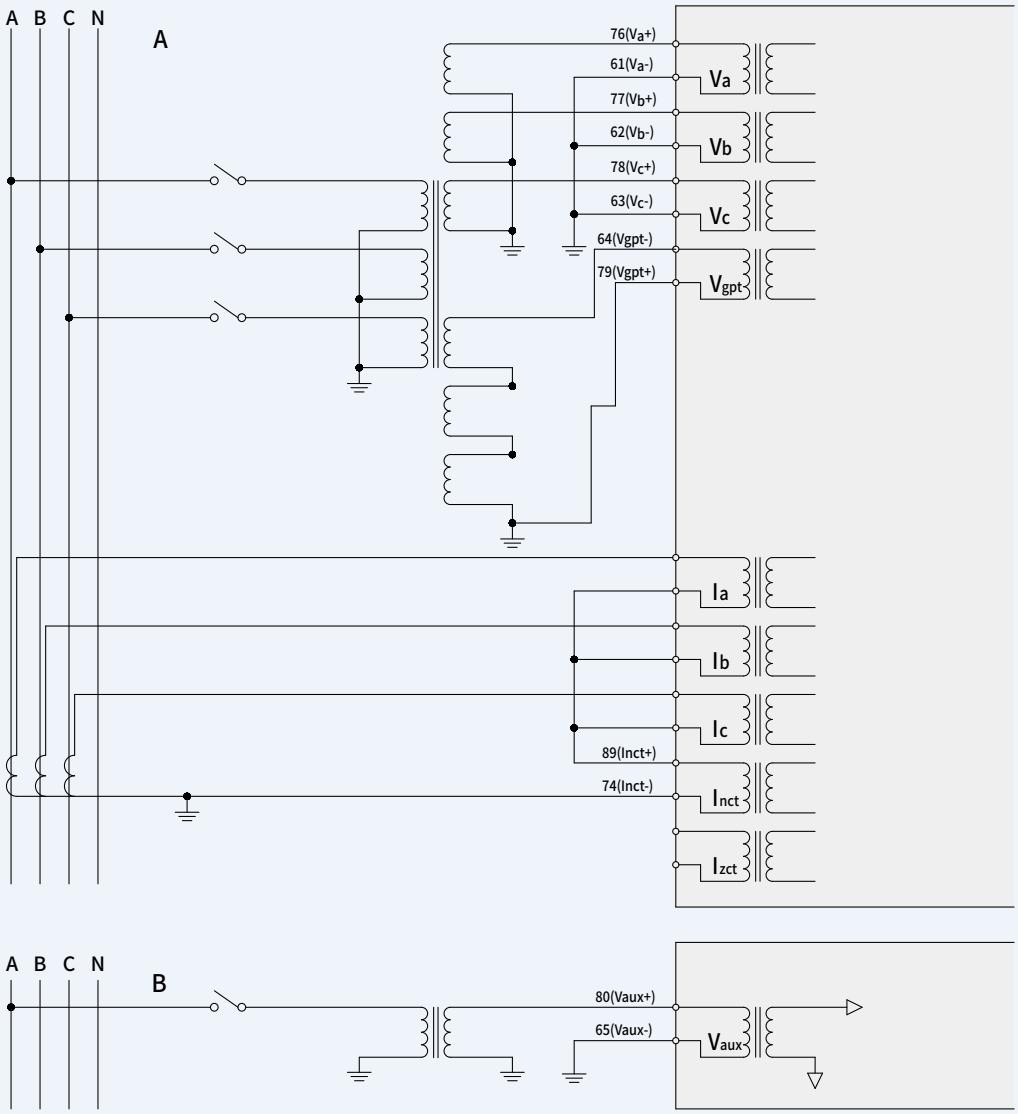
GIPAM3000 FI Wiring (3P3W)



Note) GIPAM3000 recommends 3PT Y connection for optimal system protection.

B

GIPAM3000 FI Wiring (3P4W)

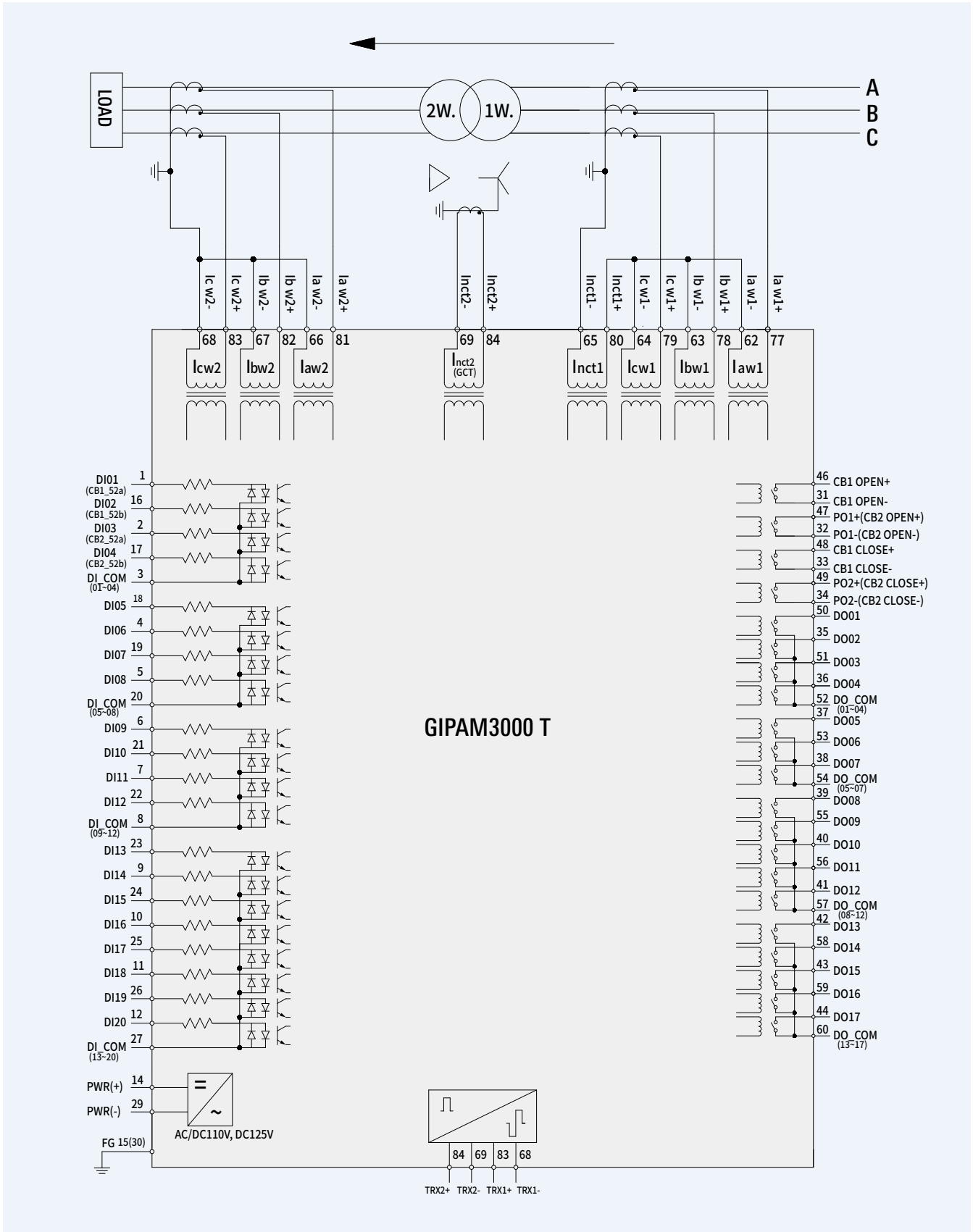


*In case of using three winding CT as 3CT Y winding in the 3-phase 3-wire resistance grounding system

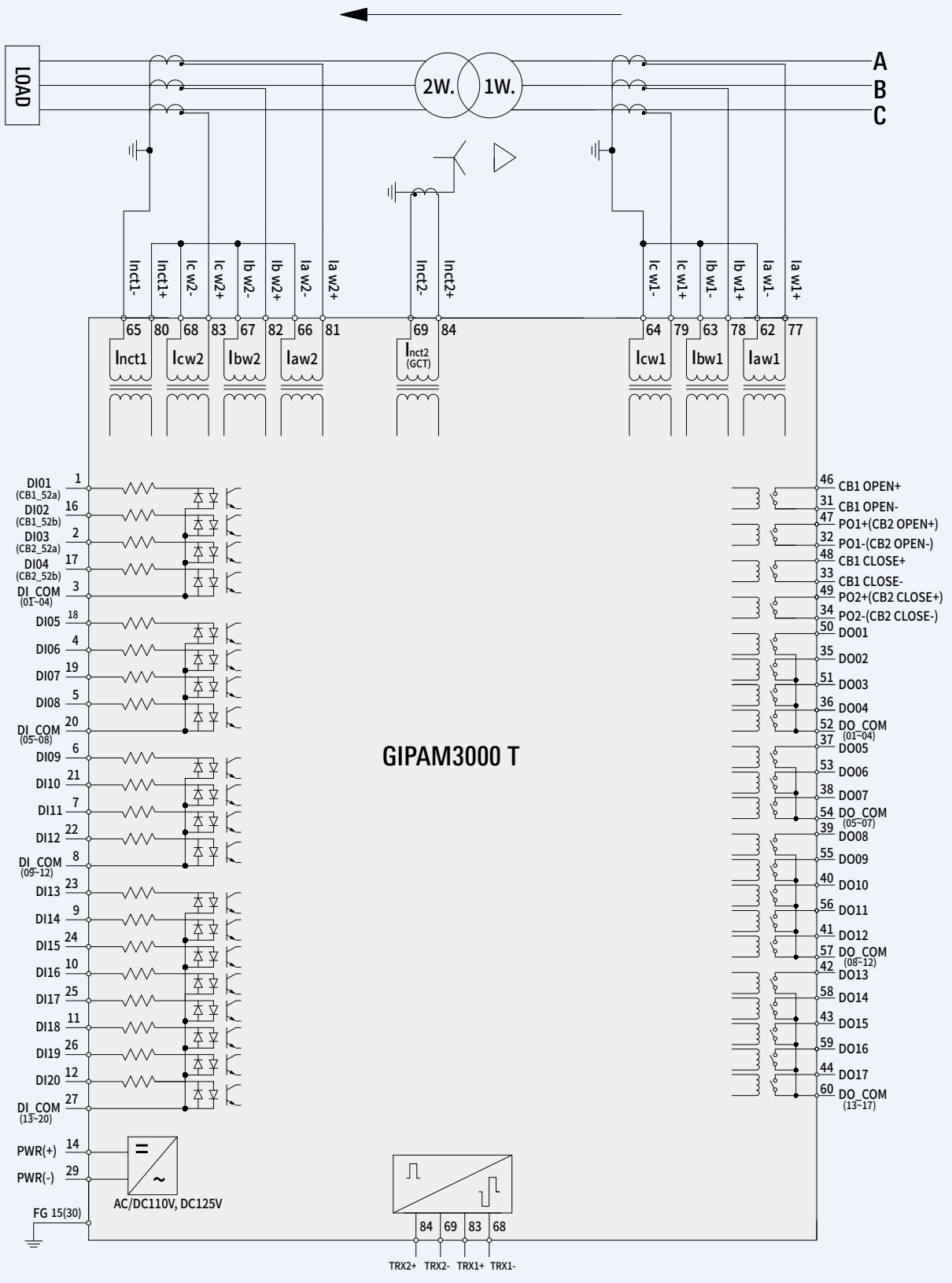
*Ground fault detection in case of using ground CT in the 3-phase 3-wire resistance grounding system

Wiring

GIPAM3000 T Wiring (2wire)

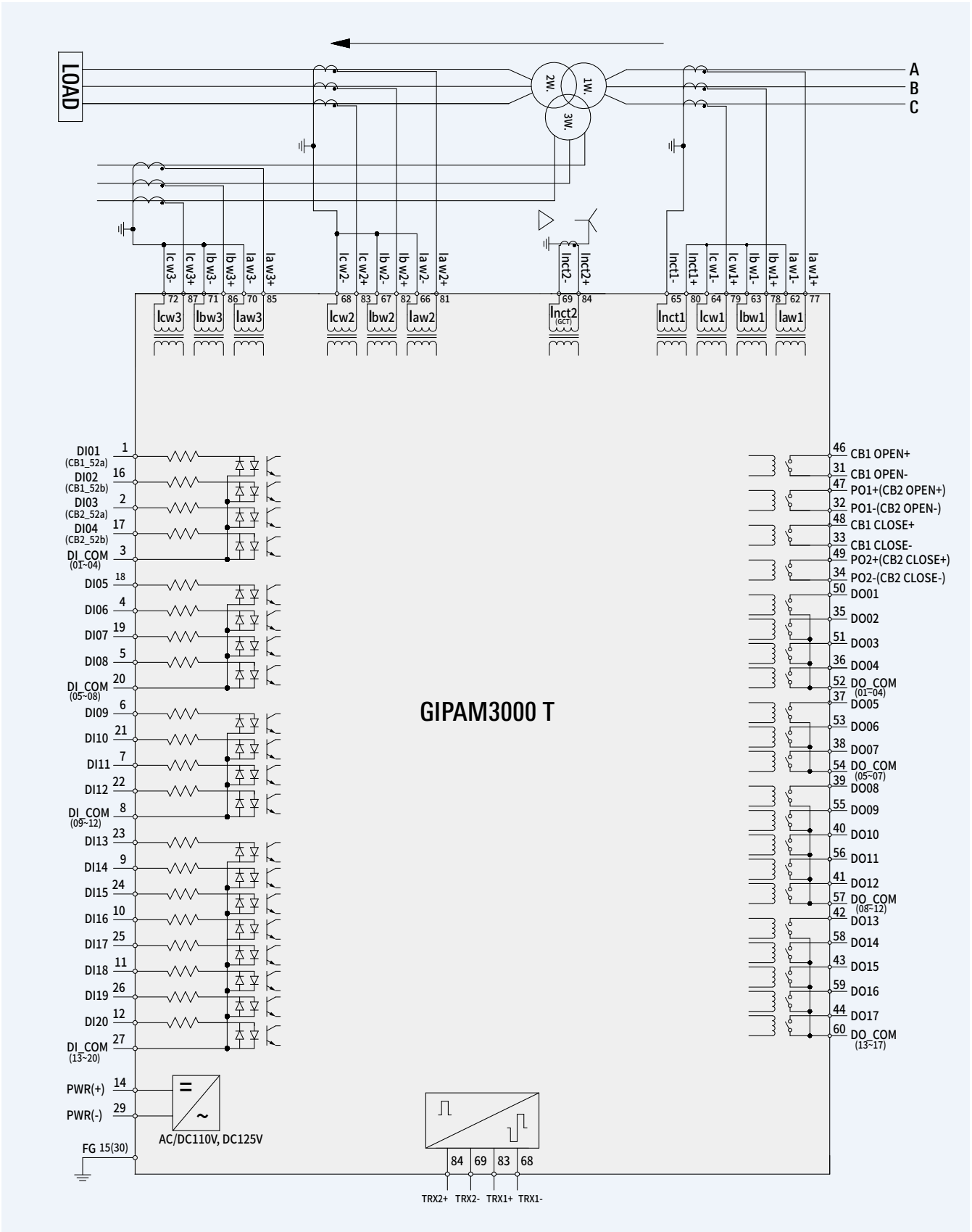


B

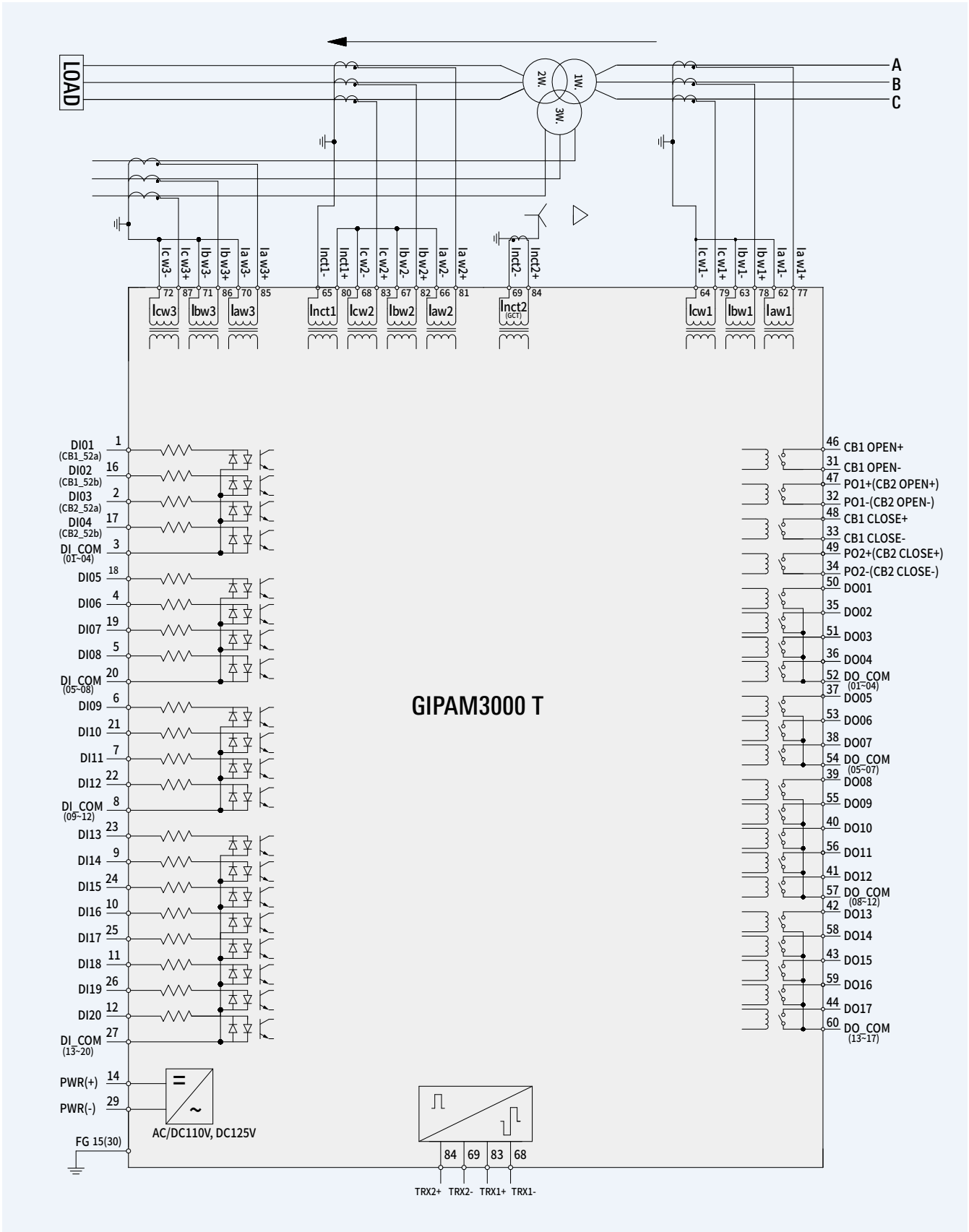

LOAD
2W.
1W.
A
B
C
Inct1-
Inct1+
Ic w2-
Ic w2+
Ib w2-
Ib w2+
Ia w2-
Ia w2+
Inct2-
Inct2+
Ic w1-
Ic w1+
Ib w1-
Ib w1+
Ia w1-
Ia w1+
65 80 68 83 67 82 66 81
69 84
64 79 63 78 62 77
Inct1
Icw2
Ibw2
Iaw2
Inct2 (GCT)
Icw1
Ibw1
Iaw1
GIPAM3000 T
DI01 (CB1_52a) 1
DI02 (CB1_52b) 16
DI03 (CB2_52a) 2
DI04 (CB2_52b) 17
DI_COM (01~04) 3
DI05 18
DI06 4
DI07 19
DI08 5
DI_COM (05~08) 20
DI09 6
DI10 21
DI11 7
DI12 22
DI_COM (09~12) 8
DI13 23
DI14 9
DI15 24
DI16 10
DI17 25
DI18 11
DI19 26
DI20 12
DI_COM (13~20) 27
PWR(+) 14
PWR(-) 29
FG 15(30)
AC/DC110V, DC125V
84 69 83 68
TRX2+ TRX2- TRX1+ TRX1-
46 CB1 OPEN+
31 CB1 OPEN-
47 PO1+(CB2 OPEN+)
32 PO1-(CB2 OPEN-)
48 CB1 CLOSE+
33 CB1 CLOSE-
49 PO2+(CB2 CLOSE+)
34 PO2-(CB2 CLOSE-)
50 DO01
35 DO02
51 DO03
36 DO04
52 DO_COM (01~04)
37 DO05
53 DO06
38 DO07
54 DO_COM (05~07)
39 DO08
55 DO09
40 DO10
56 DO11
41 DO12
57 DO_COM (08~12)
42 DO13
58 DO14
43 DO15
59 DO16
44 DO17
60 DO_COM (13~17)

Wiring

GIPAM3000 T Wiring (3wire)



B


LOAD
A
B
C
2W.
1W.
3W.
Icw3-
Icw3+
Ibw3-
Ibw3+
Iaw3-
Iaw3+
Inct1-
Inct1+
Icw2-
Icw2+
Ibw2-
Ibw2+
Iaw2-
Iaw2+
Inct2-
Inct2+
Icw1-
Icw1+
Ibw1-
Ibw1+
Iaw1-
Iaw1+
72 87 71 86 70 85
65 80 68 83 67 82 66 81
69 84
64 79 63 78 62 77
Icw3
Ibw3
Iaw3
Inct1
Icw2
Ibw2
Iaw2
Inct2
(GCT)
Icw1
Ibw1
Iaw1
DI01 (CB1_52a) 1
DI02 (CB1_52b) 16
DI03 (CB2_52a) 2
DI04 (CB2_52b) 17
DI_COM (01~04) 3
DI05 18
DI06 4
DI07 19
DI08 5
DI_COM (05~08) 20
DI09 6
DI10 21
DI11 7
DI12 22
DI_COM (09~12) 8
DI13 23
DI14 9
DI15 24
DI16 10
DI17 25
DI18 11
DI19 26
DI20 12
DI_COM (13~20) 27
PWR(+) 14
PWR(-) 29
FG 15(30)
AC/DC110V, DC125V
GIPAM3000 T
84 69 83 68
TRX2+ TRX2- TRX1+ TRX1-
46 CB1 OPEN+
31 CB1 OPEN-
47 PO1+(CB2 OPEN+)
32 PO1-(CB2 OPEN-)
48 CB1 CLOSE+
33 CB1 CLOSE-
49 PO2+(CB2 CLOSE+)
34 PO2-(CB2 CLOSE-)
50 DO01
35 DO02
51 DO03
36 DO04
52 DO_COM (01~04)
37 DO05
53 DO06
38 DO07
54 DO_COM (05~07)
39 DO08
55 DO09
40 DO10
56 DO11
41 DO12
57 DO_COM (08~12)
42 DO13
58 DO14
43 DO15
59 DO16
44 DO17
60 DO_COM (13~17)

Contact Configuration

GIPAM3000 FI

CT/PT

76	V_a+	V_a-	61
77	V_b+	V_b-	62
78	V_c+	V_c-	63
79	Vgpt+	Vgpt-	64
80	Vaux+	Vaux-	65
81	BLANK	BLANK	66
82	BLANK	BLANK	67
83	TRX1+	TRX1-	68
84	TRX2+	TRX2-	69
85	BLANK	BLANK	70
86	I_a+	I_a-	71
87	I_b+	I_b-	72
88	I_c+	I_c-	73
89	Inct+	Inct-	74
90	Izct+	Izct-	75

※ CB2 OFF, CB2 ON can be set to PO.

DO

46	CB1 OPEN+	CB1 OPEN-	31
47	PO1+	PO1-	32
48	CB1 CLOSE+	CB1 CLOSE-	33
49	PO2+	PO2-	34
50	DO01	DO02	35
51	DO03	DO04	36
52	DO_COM (01~04)	DO05	37
53	DO06	DO07	38
54	DO_COM (05~07)	DO08	39
55	DO09	DO10	40
56	DO11	DO12	41
57	DO_COM (08~12)	DO13	42
58	DO14	DO15	43
59	DO16	DO17	44
60	DO_COM (13~17)	BLANK	45

COMM

FE1	RX
FE2	RX
	RJ45 PORT
	TE1
	TE2

DI & POWER

16	DI02	DI01	1
17	DI04	DI03	2
18	DI05	DI_COM (01~04)	3
19	DI07	DI06	4
20	DI_COM (05~08)	DI08	5
21	DI10	DI09	6
22	DI12	DI11	7
23	DI13	DI_COM (09~12)	8
24	DI15	DI14	9
25	DI17	DI16	10
26	DI19	DI18	11
27	DI_COM (13~20)	DI20	12
28	BLANK	BLANK	13
29	PWR(-)	PWR(+)	14
30	FG	FG	15

FI Model I/O contact composition

Contact name	Number	Basic usage	Optional usage	CC number	Remark
DI01	1	CB1 Status input(52a)	Cannot be changed	-	
DI02	16	CB1 Status input(52b)	Cannot be changed	-	
DI03	2	CB2 Status input(52a)	General DI	-	
DI04	17	CB2 Status input(52b)	General DI	-	
DI05~DI18	-	General DI	General DI	-	
DI19	26	Buzzer Stop	General DI	-	When the Push Button is attached to the PNL, connect to the corresponding DI. (A contact is used)
DI20	12	Panel Reset	General DI	-	
CB1 OPEN	31, 46	CB1 OPEN output	Cannot be changed	-	
CB1 CLOSE	33, 48	CB1 CLOSE output	Cannot be changed	-	
PO1	32, 47	POWER OUT1 output	General DO	-	When selecting PO, it is used as General DO, When selecting CB, it is used as output for CB2 control
PO2	34, 49	POWER OUT1 output	General DO	-	
DO01	50	50/51/67I/67D	General DO	CC01	
DO02	35	50/51N(OCGR)	General DO	CC02	
DO03	51	67G/51S/67NI/67ND	General DO	CC03	
DO04	36	UVR Latch(Self maintenance)	Cannot be changed	CC04	Output can be changed to NORMAL in UVR setting
DO05	37	POWER FAIL	Cannot be changed	-	Operates by direct control and is used for alarming power failure
DO06	53	81U/81O/81R	General DO	CC06	
DO07	38	46/37P/59R	General DO	CC07	
DO08	39	27R/32P/32Q	General DO	CC08	When 32P operates , only DO08 OUTPUT activates and CB OFF output is not available, Please modify the LOGIC if necessary.
DO09	55	47P/47N	General DO	CC09	
DO10	40	25(SYNC-OP)	General DO	CC10	
DO11	56	CB_ON_LAMP	General DO	CC11	When attaching breaker's status lamp to PNL, connect it to the appropriate DO terminal.
DO12	41	CB_OFF_LAMP	General DO	CC12	
DO13	42	59/49	General DO	CC13	
DO14	58	64,48/51R	General DO	CC14	
DO15	43	27(UVR-OP),37/66	General DO	CC15	UVR(OP) is NORMAL output.
DO16	59	86X(Lock-out)	General DO	CC16	
DO17	44	BUZZER	General DO	CC17	

Note) 1. OVGR(64) element is set as the default alarm
2. UVR(27) can be used as Latch contact (DO04) and Normal contact (DO15) without changing PLC
3. CC: Switch for relay output contact test to check operation on the device without a tester

B

GIPAM3000 T

CT/PT

76	BLANK	BLANK	61
77	I_a w1+	I_a w1-	62
78	I_b w1+	I_b w1-	63
79	I_c w1+	I_c w1-	64
80	Inct1+	Inct1-	65
81	I_a w2+	I_a w2-	66
82	I_b w2+	I_b w2-	67
83	I_c w2+	I_c w2-	68
84	Inct2+	Inct2-	69
85	I_a w3+	I_a w3-	70
86	I_b w3+	I_b w3-	71
87	I_c w3+	I_c w3-	72
88	BLANK	BLANK	73
89	TRX1+	TRX1-	74
90	TRX2+	TRX2-	75

※ CB2 OFF, CB2 ON can be set to PO.

DO

46	CB1 OPEN+	CB1 OPEN-	31
47	PO1+	PO1-	32
48	CB1 CLOSE+	CB1 CLOSE-	33
49	PO2+	PO2-	34
50	DO01	DO02	35
51	DO03	DO04	36
52	DO_COM (01~04)	DO05	37
53	DO06	DO07	38
54	DO_COM (05~07)	DO08	39
55	DO09	DO10	40
56	DO11	DO12	41
57	DO_COM (08~12)	DO13	42
58	DO14	DO15	43
59	DO16	DO17	44
60	DO_COM (13~17)	BLANK	45

COMM

FE1	RX
FE2	RX
	RJ45 PORT
	TE1
	TE2

DI & POWER

16	DI02	DI01	1
17	DI04	DI03	2
18	DI05	DI_COM (01~04)	3
19	DI07	DI06	4
20	DI_COM (05~08)	DI08	5
21	DI10	DI09	6
22	DI12	DI11	7
23	DI13	DI_COM (09~12)	8
24	DI15	DI14	9
25	DI17	DI16	10
26	DI19	DI18	11
27	DI_COM (13~20)	DI20	12
28	BLANK	BLANK	13
29	PWR(-)	PWR(+)	14
30	FG	FG	15

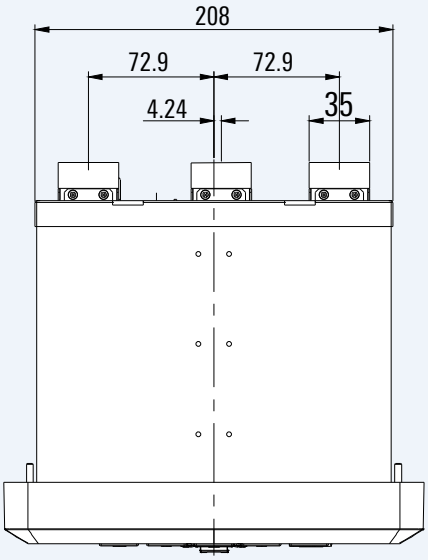
T Model I/O contact composition

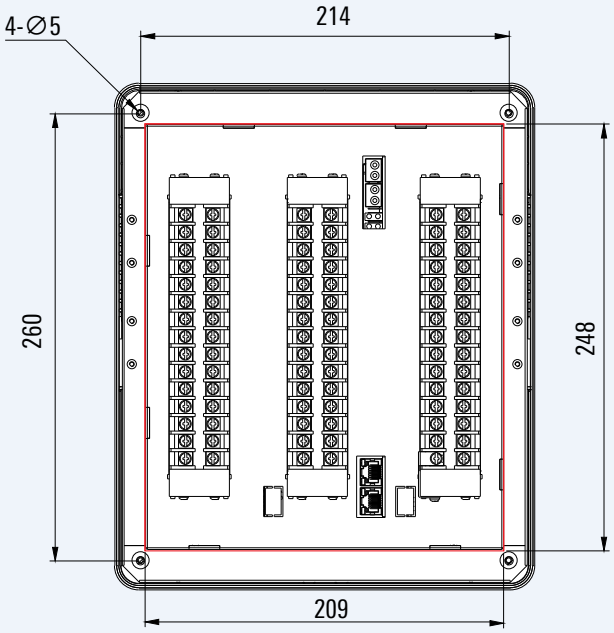
Contact name	Number	Basic usage	Optional usage	CC number	Remark
DI01	1	CB1 Status input(52a)	Cannot be changed	-	
DI02	16	CB1 Status input(52b)	Cannot be changed	-	
DI03	2	CB2 Status input(52a)	General DI	-	
DI04	17	CB2 Status input(52b)	General DI	-	
DI05~DI18	-	General DI	General DI	-	
DI19	26	Buzzer Stop	General DI	-	When the Push Button is attached to the PNL, connect to the corresponding DI. (A contact is used)
DI20	12	Panel Reset	General DI	-	
CB1 OPEN	31, 46	CB1 OPEN output	Cannot be changed	-	
CB1 CLOSE	33, 48	CB1 CLOSE output	Cannot be changed	-	
PO1	32, 47	CB2 OPEN output	General DO	-	When selecting PO, it is used as General DO, When selecting CB, it is used as output for CB2 control
PO2	34, 49	CB2 CLOSE output	General DO	-	
DO01	50	50/51(OCR 1wire)	General DO	CC01	
DO02	35	50/51(OCR 2wire)	General DO	CC02	
DO03	51	50/51(OCR 3wire)	General DO	CC03	
DO04	36	87T(DFR)	General DO	CC04	
DO05	37	POWER FAIL	Cannot be changed	-	Operates by direct control and is used for alarming power failure
DO06	53	87N(DFRG)	General DO	CC06	
DO07	38	General DO	General DO	CC07	
DO08	39	50/51N(OCGR 1차)	General DO	CC08	
DO09	55	50/51N(OCGR 2차)	General DO	CC09	
DO10	40	General DO	General DO	CC10	
DO11	56	CB_ON_LAMP	General DO	CC11	When attaching breaker's status lamp to PNL, connect it to the appropriate DO terminal.
DO12	41	CB_OFF_LAMP	General DO	CC12	
DO13	42	General DO	General DO	CC13	
DO14	58	General DO	General DO	CC14	
DO15	43	General DO	General DO	CC15	
DO16	59	86X(Lock-out)	General DO	CC16	
DO17	44	BUZZER	General DO	CC17	

Note) 1. CC: Switch for relay output contact test to check operation on the device without a tester

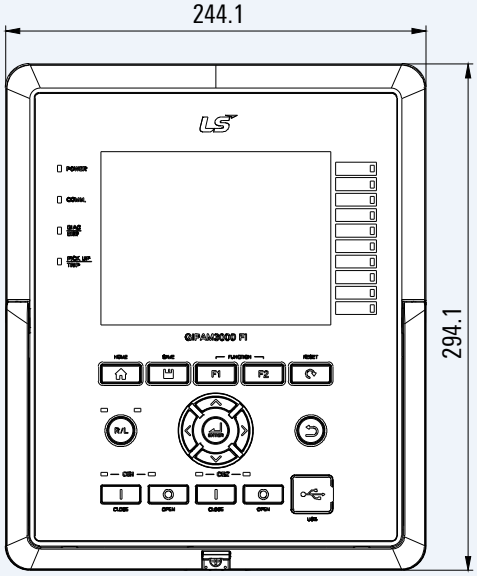
Dimensions & Ordering

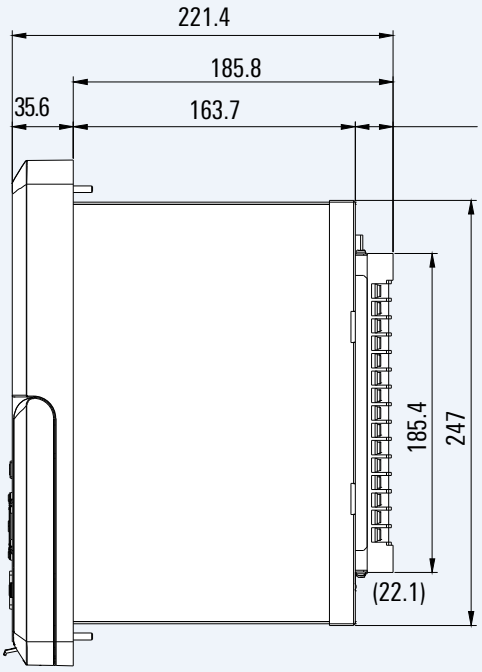
Dimensions





[Panel Cutting Size]





B

Ordering

GIPAM3000

FI

Protection	
FI	Feeder, Incoming, Motor, Distributed Generation
T	Transformation

RS

Communication	
RS	RS-485
TE	100/10 BASE-T Ethernet
FE	100 BASE-FX Ethernet

Note) IEC61850 communication protocol does not support RS-485 method.

M

Protocol	
M	MODBUS
D	DNP 3.0
C	IEC61850

5A

CT type
5A

60Hz

Frequency
50Hz
60Hz

AC/DC110V, DC125V

Control power
AC/DC110V, DC125V

DI Control Power

DI Input power
AC/DC110V, DC125V

GIPAM3000 - PAM MASTERR (Manager S/W)

Note) Manager Software can be downloaded from the website, and please purchase a universal USB A to B cable.

Certifications

KERI

UCA International Users Group

IEC 61850 Certificate Level A[1]

Ref. No: 2018TS01615

Issued to:
LSIS Co., Ltd.
LS Tower, 127 LS-RO, DONGAN-GU, ANYANG-SI,
GYEONGGI-DO, Republic of Korea

For the server product:
GIPAM3000
Multifunctional Protection Relay
Firmware version 1.00

Issued by:
Korea Electrotechnology Research Institute
111, Hanggaul-ro, Sangnok-gu, Ansan-si, Gyeonggi-do, 15588, Republic of Korea

The server product has not been shown to be non-conforming to:

IEC 61850 First Edition Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1

Communication networks and systems in substations.

The conformance test has been performed according to IEC 61850-10, UCA International Users Group Device Test Procedures version 3.1, the product's protocol, model and technical issue implementation conformance statements: "Protocol Implementation Conformance Statement for the IEC 61850 interface in GIPAM3000, v1.00", "Model Implementation Conformance Statement for the IEC 61850 interface in GIPAM3000, v1.00", "TISSUES Implementation Conformance Statement for the IEC 61850 interface in GIPAM3000, v1.00" and product's extra information for testing "Protocol Implementation eXtra Information for Testing (PIXIT) for the IEC 61850 interface in GIPAM3000, v1.00".

The following IEC 61850 conformance blocks are tested with a positive result (number of relevant and executed test cases / total number of test cases) :

1	Basic Exchange (23/24)	9a	GOOSE Publish (10/12)
2	Data Sets (3/6)	9b	GOOSE Subscribe (11/11)
2+	Data Set Definition (24/24)	12a	Direct Control (6/11)
4	Setting Group Selection (3/3)	12b	SBO Control (9/14)
5	Unbuffered Reporting (18/18)	12c	Enhanced Direct Control (7/13)
6	Buffered Reporting (25/27)	12d	Enhanced SBO Control (12/19)
		13	Time Synchronization (4/5)
		14	File Transfer (4/7)

This Certificate includes a summary of the test results as carried out at KERI in Republic of Korea with UniCA 61850 Client simulator version 4.29.03 with test suite version 3.29.05(TP 3.1) and UniCA 61850 analyzer version 5.31.00. This document has been issued for information purposes only, and the original paper copy of the KERI report: 2018TS01615 will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to KERI by LSIS Co., Ltd. The manufacturer's production process has not been assessed. This Certificate does not imply that KERI has approved any product other than the specimen tested.

Republic of Korea, August 9, 2018

Park Soung jae

S. J. Park
Executive Director
Power Apparatus Testing and Evaluation Division

S. P. Ahn
Technical Manager

1 Level A – Independent Tester with certified ISO 17025 Quality System

KERI

UCA International Users Group

Applicable Test Procedures from the UCA International Users Group Device Test Procedures version 3.1

Conformance Block	Mandatory	Conditional
1: Basic Exchange	Ass1, Ass2, Ass3, AssN2, AssN4, AssN5 Srv1, Srv2, Srv3, Srv4, Srv5, SrvN1abcd, SrvN4	AssN3 Srv6, Srv7, Srv8, Srv9, Srv10, SrvN1e, SrvN1f, SrvN2, SrvN3
2: Data Sets	Dset1, Dset10a, DsetN1ae	
2+: Data Sets Definition	Dset2, Dset3, Dset4, Dset5, Dset6, Dset7, Dset8, Dset9 DsetN1cd, DsetN2, DsetN3, DsetN4, DsetN5, DsetN6, DsetN7, DsetN8, DsetN9, DsetN10, DsetN11, DsetN12, DsetN13, DsetN14	DsetN15a, DsetN15b
4: Setting Group Selection	Sg1, SgN1a, Sg3	
5: Unbuffered Reporting	Rp1, Rp2, Rp3, Rp4, Rp9, RpN1, RpN2, RpN3, RpN4, RpN8	Rp5, Rp6, Rp7, Rp8, Rp10, Rp11, Rp12, RpN5
6: Buffered Reporting	Br1, Br2, Br3, Br4, Br9, Br20, Br21, Br22, Br25, Br26, Br27, Br28 BrN1, BrN2, BrN3, BrN4, BrN5, BrN8	Br5, Br6, Br7, Br8, Br10, Br11, Br12
9a: GOOSE publish	Gop2, Gop3, Gop4, Gop9, Gop10a	Gop1, Gop6, Gop7, Gop10b, GopN1
9b: GOOSE subscribe	Gos1a, Gos2, Gos3, GosN1, GosN2, GosN3, GosN4, GosN5, GosN6	Gos1b, Gos4
12a: Direct control	CtlN3 DOns1	Ctl2, Ctl7, CtlN11 DOns3
12b: SBO control	CtlN1, CtlN2, CtlN3, CtlN4, SBOns2	Ctl2, Ctl3, Ctl7, CtlN11
12c: Enhanced Direct control	CtlN3 DOes2, DOes5	Ctl2, Ctl7, CtlN8, CtlN11
12d: Enhanced SBO control	CtlN1, CtlN2, CtlN3, CtlN4, CtlN9 SBOes1, SBOes2, SBOes3	Ctl2, Ctl3, Ctl7, CtlN11
13: Time sync	Tm1, Tm2	TmN1, TmN2
14: File transfer	Ft1, Ft2ab, Ft4, FtN1ab	

All configuration file and data model tests have been successfully performed for the product variants using the same communication hardware and software version:

- GIPAM3000-F Feeder, Motor and Dispersed Generation Protection and Control Relay
- GIPAM3000-T Transformer Protection and Control Relay

KERI 111, Hanggaul-ro, Sangnok-gu, Ansan, Gyeonggi-do
Tel: +82-31-8040-4421 Fax: +82-31-8040-4439 sgl@keri.re.kr

Certifications

KERI

UCA International Users Group

IEC 61850 Certificate Level A[1]

Ref. No: 2018TS01647

Issued to:
LSIS Co., Ltd.
LS Tower, 127 LS-RO, DONGAN-GU, ANYANG-SI,
GYEONGGI-DO, Republic of Korea

For the server product:
GIPAM3000
Multifunctional Protection Relay
Firmware version 1.00

Issued by:
Korea Electrotechnology Research Institute
111, Hanggaul-ro, Sangnok-gu, Ansan-si, Gyeonggi-do, 15588, Republic of Korea

The server product has not been shown to be non-conforming to:

IEC 61850 Edition 2 Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1

Communication networks and systems for power utility automation.

The conformance test has been performed according to IEC 61850-10 Edition 2, the UCA International Users Group Edition 2 Server Test Procedures version 1.0 with TPCL[2] version 1.2.6 with product's protocol, model and technical issue implementation conformance statements: "Protocol Implementation Conformance Statement for the IEC 61850 interface in GIPAM3000, v1.00", "Model Implementation Conformance Statement for the IEC 61850 interface in GIPAM3000, v1.00", "TISSUES Implementation Conformance Statement for the IEC 61850 interface in GIPAM3000, v1.00" and product's extra information for testing: "Protocol Implementation eXtra Information for Testing (PIXIT) for the IEC 61850 interface in GIPAM3000, v1.00".

The following IEC 61850 conformance blocks are tested with a positive result (number of relevant and executed test cases / total number of test cases) :

1	Basic Exchange (23/26)	9a	GOOSE Publish (10/13)
2	Data Sets (4/7)	9b	GOOSE Subscribe (13/14)
2+	Data Set Definition (24/24)	12a	Direct Control (9/18)
4	Setting Group Selection (4/4)	12b	SBO Control (16/27)
5	Unbuffered Reports (21/21)	12c	Enhanced Direct Control (11/20)
6	Buffered Reports (28/30)	12d	Enhanced SBO Control (17/28)
		13	Time Synchronization (4/7)
		14	File Transfer (5/8)

This Certificate includes a summary of the test results as carried out at KERI in Republic of Korea with UniCA 61850 Client simulator version 4.29.03 with test suite Ed2 3.28.05(TPCL 1.2.6) and UniCA 61850 analyzer version 5.31.00. This document has been issued for information purposes only, and the original paper copy of the KERI report: 2018TS01647 will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to KERI by LSIS Co., Ltd. The manufacturer's production process has not been assessed. This Certificate does not imply that KERI has approved any product other than the specimen tested

Republic of Korea, August 10, 2018

Park Seungjae

S. J. Park
Executive Director
Power Apparatus Testing and Evaluation Division

S. P. Ahn
Technical Manager

[1] Level A – Independent Tester with certified ISO 17025 Quality System
[2] TPCL – Test procedures change list

KERI

UCA International Users Group

Applicable Test Procedures from the UCA International Users Group Edition 2 Server Test Procedures version 1.0 with TPCL version 1.2.6

Conformance Block	Mandatory	Conditional
1: Basic Exchange	sAss1, sAss2, sAss3, sAssN2, sAssN3, sAssN4, sAssN5, sSrv1, sSrv2, sSrv3, sSrv4, sSrv5, sSrvN1abcd, sSrvN4	sSrv6, sSrv8, sSrv9, sSrv10, sSrv12 sSrvN1e, sSrvN1f, sSrvN2, sSrvN3
2: Data Sets	sDs1, sDs10a, sDsN1ae	sDs15
2+: Data Sets Definition	sDs2, sDs3, sDs4, sDs5, sDs6, sDs7, sDs8, sDs9, sDs11, sDs13, sDs14, sDsN1cd, sDsN2, sDsN3, sDsN4, sDsN5, sDsN6, sDsN7, sDsN8, sDsN9, sDsN10	sDs12, sDsN11, sDsN12
4: Setting Group Selection	sSg1, sSg3, sSgN1	sSg11
5: Unbuffered Reporting	sRp1, sRp2, sRp3, sRp4, sRp5, sRp9, sRp14, sRp15, sRpN1, sRpN2, sRpN3, sRpN4, sRpN8	sRp6, sRp7, sRp8, sRp10, sRp11, sRp12, sRp13, sRpN5
6: Buffered Reporting	sBr1, sBr2, sBr3, sBr4, sBr5, sBr9, sBr14, sBr15, sBr20 sBr21, sBr22, sBr25. sBr26, sBr27, sBr28, sBrN1, sBrN2, sBrN3, sBrN4, sBrN5, sBrN8	sBr6, sBr7, sBr8, sBr10, sBr11, sBr12, sBr13
9a: GOOSE publish	sGop2a, sGop3, sGop4, sGop9, sGop10, sGop11	sGop1, sGop6, sGop7 sGopN1
9b: GOOSE subscribe	sGos1, sGos2, sGos3, sGop5, sGop6a, sGop7, sGosN1, sGosN2, sGosN3, sGosN4, sGosN5, sGosN6	sGos4
12a: Direct control	sCtl5, sCtl10, sDOns1, sDOns2	sCtl2, sCtl7, sCtl13, sCtl15, sCtl16
12b: SBO control	sCtl5, sCtl8, sCtl9, sCtl10, sCtl11, sCtl25, sSBOns1, sSBOns2, sSBOns6	sCtl2, sCtl4, sCtl6, sCtl7, sCtl15, sCtl16, sCtl27
12c: Enhanced Direct control	sCtl5, sCtl10, sDOes1, sDOes2	sCtl2, sCtl7, sCtl13, sCtl14, sCtl15, sCtl16, sCtl26
12d: Enhanced SBO control	sCtl5, sCtl8, sCtl9, sCtl10, sCtl11, sCtl25, sSBOes1, sSBOes2, sSBOes6, sSBOes8	sCtl2, sCtl4, sCtl6, sCtl7, sCtl15, sCtl16, sCtl26
13: Time sync	sTm1, sTm2, sTmN1	sTmN2
14: File transfer	sFt1, sFt2ab, sFt4, sFt5, sFtN1ab	

All configuration file and data model tests have been successfully performed for the product variants using the same communication hardware and software version:

- GIPAM3000-F Feeder, Motor and Dispersed Generation Protection and Control Relay
- GIPAM3000-T Transformer Protection and Control Relay

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GIPAM2200

Multi-function Digital Power Protection Surveillance Device
with a wide range of Protection Elements and Measurement Elements

C

GIPAM2200

Digital Integrated Protection & Monitoring Equipment

- Variety of Protection Functions per Protection Use
- EVENT & FAULT RECORDING
- TRIP LOGIC & SEQUENCE
- Select Before Operating (SBO) & Check Before Operating (CBO) functions
- VECTOR DIAGRAM
- Time Characteristic Curve
- TRIP CIRCUIT SUPERVISION (TCS) & TRIP RELAY SUPERVISION (TRS)
- Sequence of Event (SOE) functions
- PT (VT) FAILURE
- ANALOG INPUT (Option)
- CIRCUIT BREAKER FAILURE (CBF)
- Wide Range of Communication Compatibilities
- Convenient GIPAM2200 Setting

Contents

GIPAM2200 is a multi-function digital power protection surveillance device featuring a wide variety of protection elements and measurement elements for fault surveillance, protection and comprehensive monitoring of receiving and distribution panels.
GIPAM2200 series can be used for incoming, feeder and high-voltage motor and transformer protection.

GIPAM2200

Digital Integrated Protection & Monitoring Equipment

Overcurrent protection function includes protection elements of overcurrent, ground fault overcurrent, selective ground fault, directional ground fault, reverse phase overcurrent protection elements for each phase and neutral points with time and instantaneous elements. It also features differential ratio and ground fault differential relay elements for a transformer's protection by allowing 2 wiring transformer protection.

GIPAM2200 can also configure logic with an easy-to-use PLC program for I/O contacts allowing it to be applied to various sequences, and it also allows the system to be easily configured to the specific use designated by the user.

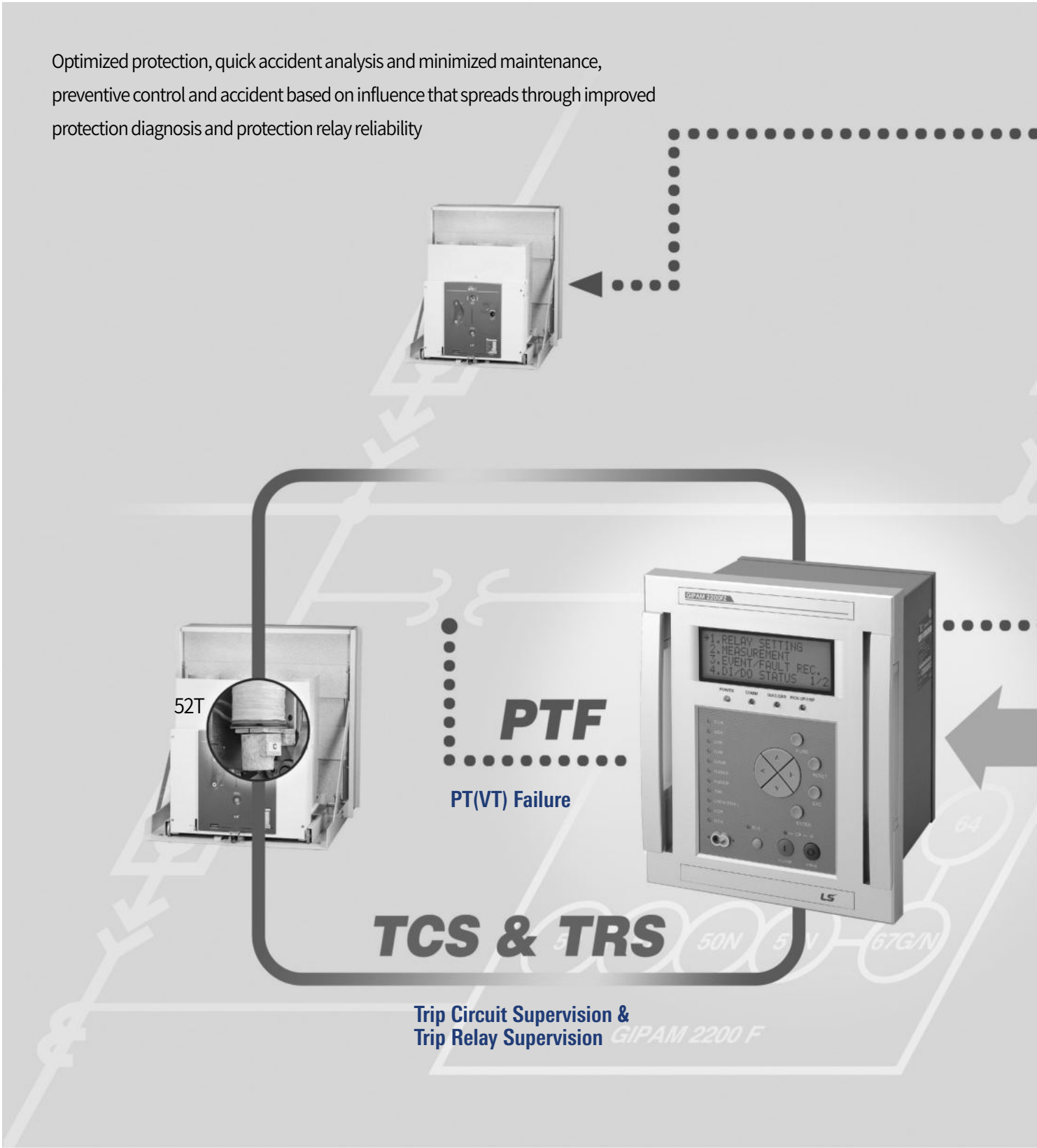
GIPAM2200 supports various monitoring and measurement functions, and it is capable of storing 800 recent events, 200 faults and up to 64 cycles of fault waveform data allowing convenient accident analysis. It also performs self-diagnosis even during operation, and generates an alarm upon detecting a fault.

GIPAM2200 features an IrDA (infrared) serial port for computer connections, as well as port for optical communication (optic) and RS485 with upper systems, and supports DNP3.0 and MODBUS protocols which are the most commonly used protocols in the industrial power field.

Through the operation program for PC interface, the user will be able to setup and check various functions the protection element and monitoring the product supports.


GIPAM 2200FZ
→1.RELAY SETTING
2.MEASUREMENT
3.EVENT/FAULT REC.
4.DI/DO STATUS 1/2
POWER
COMM
DIAG/ERR
PICK-UP/TRIP
OCR
SGR
UVR
OVR
OVGR
NSOVR
NSOCR
THR
LOCK/STALL
UCR
NCH
FUNC
RESET
ESC
ENTER
R/L
CB
CLOSE
OPEN
LS

Optimized protection, quick accident analysis and minimized maintenance, preventive control and accident based on influence that spreads through improved protection diagnosis and protection relay reliability



Select Before Operating (SBO) & Check Before Operating (CBO)

Control after selecting an item prior to executing the control command

Improved reliability and security for all circuit breaker controls

Trip Circuit Supervision (TCS) & Trip Relay Supervision (TRS)

Circuit breaker trip circuit surveillance (TCS)
Relay trip contact surveillance (TRS)

Circuit Breaker Failure (CBF)

Circuit breaker failure outputs upper level circuit breaker output
Prevention of the accident's influence spreading (protection collaboration)

CBF

SBO & CBO

Select Before Operating &
Check Before Operating

EVENT & FAULT RECORDING

PT(VT) Failure (PTF)

Prevent unnecessary system blocking
by detecting secondary PT fuse opening
(differentiation with abnormal system voltage)

Features

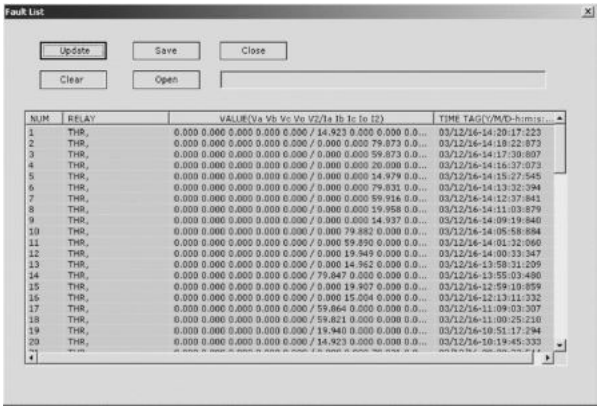
Variety of Protection Functions per Protection Use

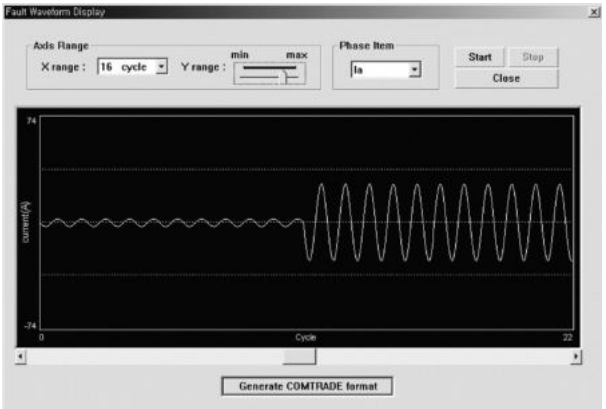
Prevent unnecessary system blocking by detecting secondary PT fuse opening
(differentiation with abnormal system voltage)

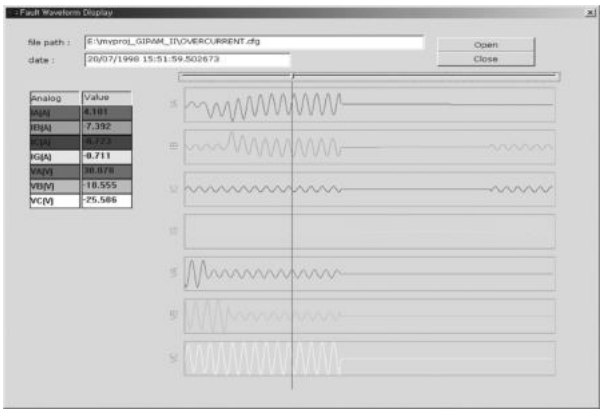
- Overcurrent relay: 50/51
- Ground overcurrent relay: 50/51N
- Negative sequence overcurrent relay: 46
- Undervoltage relay: 27
- Overvoltage relay: 59
- Ground overvoltage relay: 64
- Negative sequence overvoltage relay: 47
- Sensitive directional ground relay: 67G
- Directional reactive power relay: 32Q
- Over frequency relay: 81O
- Ratio frequency relay: 81R
- Synchronizing-check relay: 25
- Directional ground relay: 67N
- Thermal overload relay: 49
- Stall/Locked rotor relay: 48/51LR
- Under current relay: 37
- Notching or jogging relay: 66
- Ratio differential relay: 87T-P
- Ground ratio differential relay: 87T-G
- Directional active power relay: 32P
- Under current relay: 37P
- Under frequency relay: 81U
- Directional overcurrent relay: 67P
- Directional overcurrent ground relay: 67N

EVENT & FAULT RECORDING

GIPAM2200 can save up to 800 events such as relay operation, circuit breaker operation, contact operation, control history and auto-inspection results. If a fault occurs in the cable or load side, GIPAM2200 will save up to 200 fault details including cause of fault, fault voltage and fault current. It is also able to record up to 64 cycles of fault details of thewaveforms, and the number of recordings can be adjusted according to the frequency division.
Accident waveform can be saved as a Comtrade (IEEE) file format for subsequent waveform analysis or can be used in Fault Simulation.

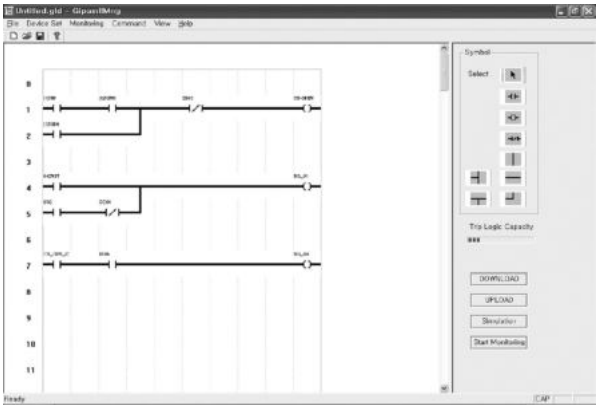






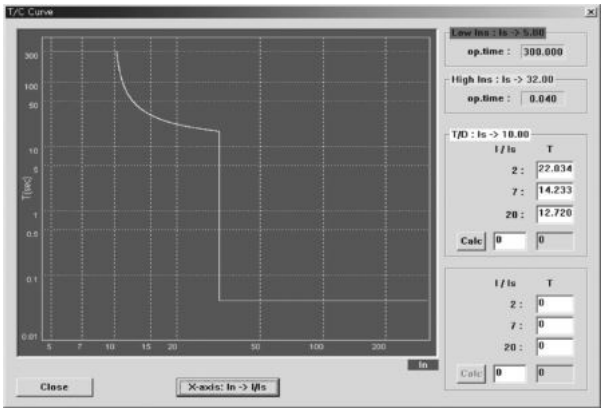
TRIP LOGIC & SEQUENCE

Operation signals of all I/O contacts and relay elements of GIPAM2200 series, including the trip relay, can be operated according to a user-created logic. Logic can be configured easily through the PC operation program included allowing it to be used in various sequences.



Time Characteristic Curve

GIPAM2200 uses the operation program for PC interface to correct individual relay elements and generate a time characteristic curve of the setting values. As it displays the graph immediately, it is easier to configure protection relay elements and configure protection collaboration between systems.

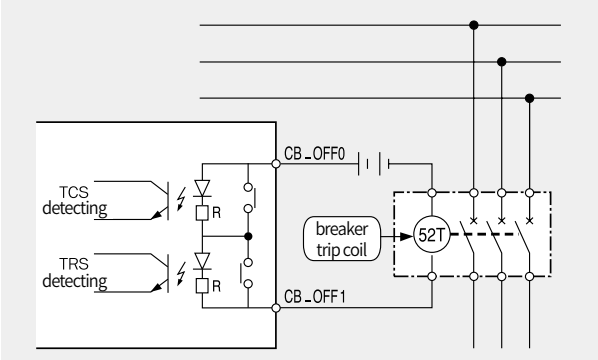


Select Before Operating (SBO) & Check Before Operating (CBO) functions

This function executes control commands only after selecting a control point and confirming a normal response from the selected point for greater control reliability and security. GIPAM2200 applies SBO/CBO functions on the power contact for CB control. The selected control point will wait for a control execution command for 5 seconds after responding, and if an execution command is not delivered within 5 seconds, it returns to its previous state, and if an execution command is delivered properly within 5 seconds, only then it will execute the control operation.

TRIP CIRCUIT SUPERVISION (TCS) & TRIP RELAY SUPERVISION (TRS)

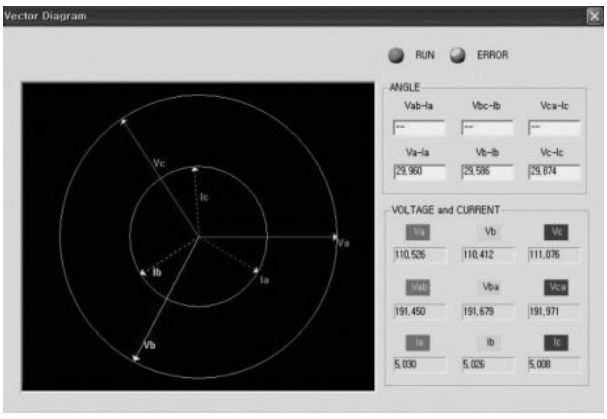
GIPAM2200 supplies fine currents to the trip circuit, which consists of circuit breaker trip coil, control power and trip relay, and checks it every 1 hour to determine faults in the trip circuit. In addition, by configuring the trip relay as 2 pole serial connection rather than a 1 pole independent structure to operate fixed cycle or contact when necessary for auto inspection of the trip relay without operating the circuit breaker. Results of the auto inspection are then recorded as Events, and it is able to prevent accidents in advance as a contact is outputted when and where a fault occurs.



* During normal conditions, each end of the CBOFF generates approximately 40KΩ, so connecting it with an external device may cause voltage to be distributed resulting the external device to not operate properly.

VECTOR DIAGRAM

GIPAM2200 displays a Vector Diagram of the system voltage, current and phase through the operation program for PC interface. With this information, the user can visually identify the electric energy allowing easy identification of the system status.



Features

Sequence of Event (SOE) Function

When an event, such as an alarm due to internal relay operation, circuit breaker operation, self-diagnosis result, occurs, GIPAM2200 records the event every 1ms in sequential order to enable troubleshooting and checking of operation. The SOE function can save up to 800 events, including recently recorded events, and details of each event can be viewed from the “EVENT LIST” of the “EVENT/FAULT REC” menu. The records can also be saved as a file in GIPAM Manager (more than 800 items can be managed).

PT (VT) FAILURE

As the system is capable of generating alarm message and outputting logic by detecting opening (melt down) of secondary PT fuse, it is possible to prevent the blocking caused by the operation of relay elements such as UVR and NSOVR. It does not operate at low voltage or interruption conditions, and it determines PT fuse opening by comparing the current, voltage and circuit breaker status. The user can set up a trip block to prevent tripping and can generate alarm signals with DO output. This system restores itself once the PT fuse is replaced.

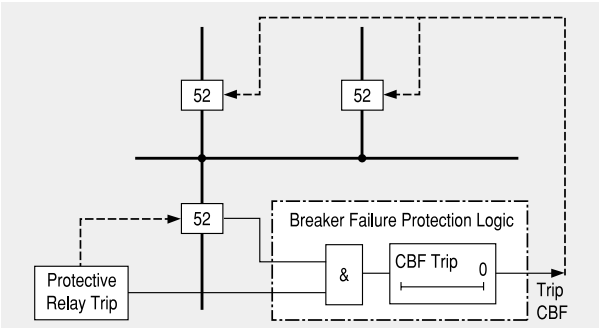
ANALOG INPUT (Option)

GIPAM2200 allows 4-point analog contact input which allows it to measure a variety of analog data including internal temperature of receiving/distributing panels, transformer temperature, motor interior stator and bearing temperature, rectification-based AC/DC voltage and current measurement.

- AI Input Range: DC 4~20mA
- Number of Contacts: 4 Point
- Display Method: User Define
- Accuracy: 0.2% at Full scale

CIRCUIT BREAKER FAILURE(CBF)

When the circuit breaker or trip circuit fault occurs causing the circuit breaker not operate despite a trip signal output, GIPAM2200 uses a breaker failure function to trip the upper circuit breaker and protect the system. In addition to the trip signal if a fault occurs during CB close/open control, an alarm can be generated.

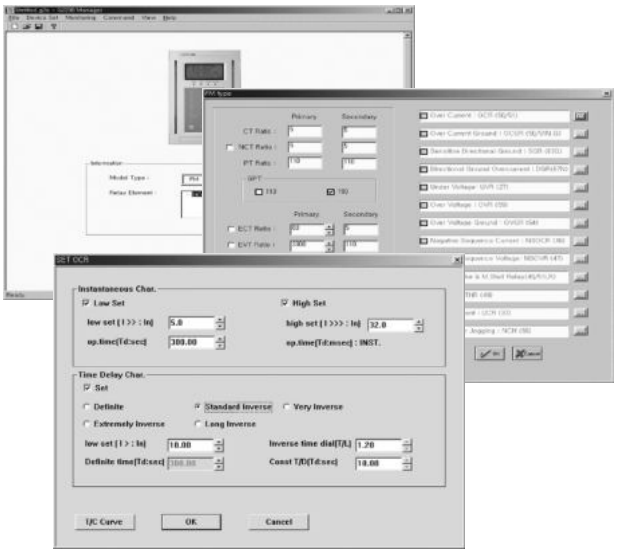


Wide Range of Communication Compatibilities

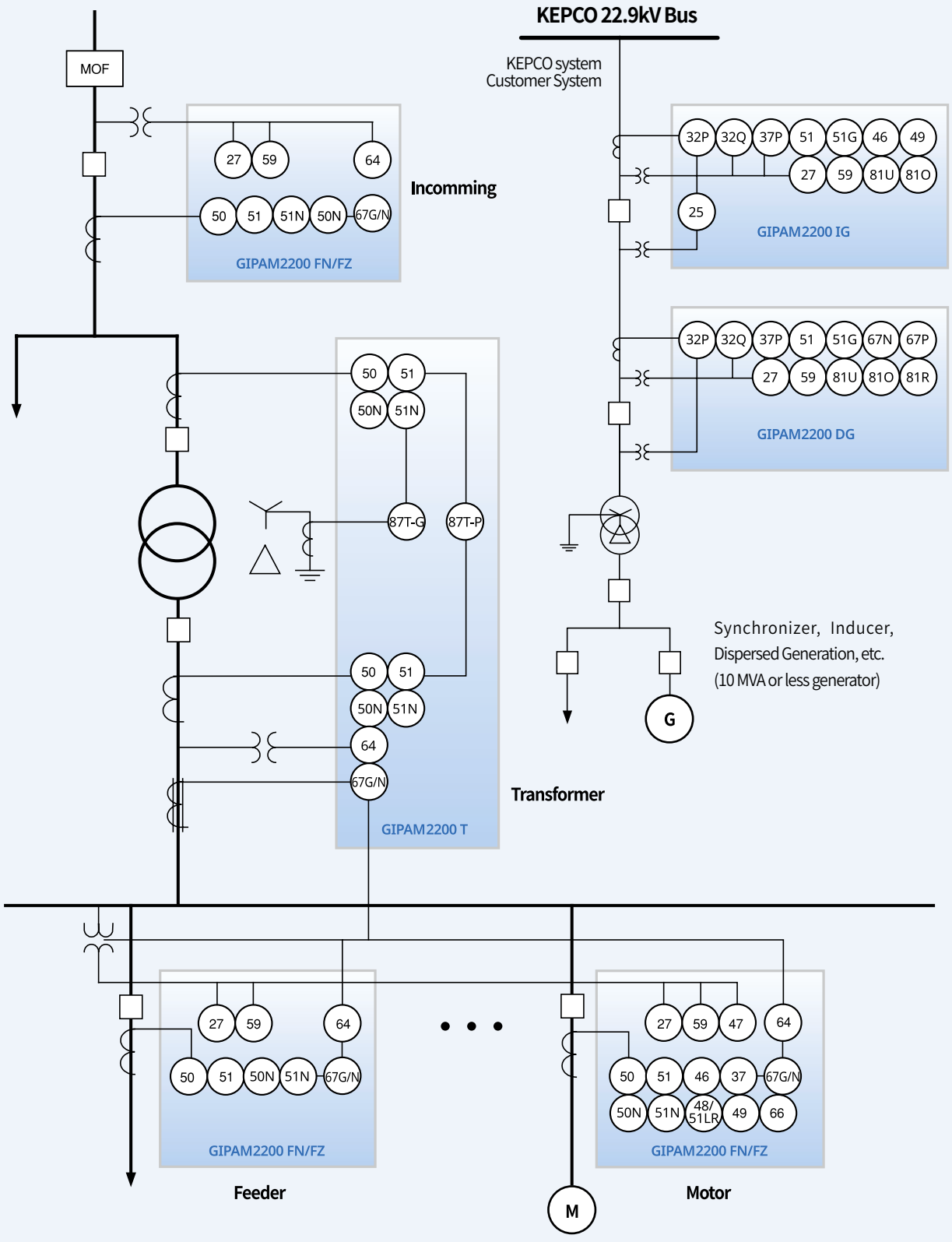
GIPAM2200 supports RS485/422 and Fiber Optic communications and supports DNP3.0 and MODBUS protocols that allow easy application in various systems in the industrial field. It also supports Ethernet based communication with the use of a protocol converter, which enable high-speed data transfer as well as duplex communication for a differentiated system establishment. The system also features an IrDA (infrared) port that enables easy upload/download with a PC.

Convenient GIPAM2200 Setting

The operation program for PC interface that is provided for GIPAM2200 setting (GIPAM Manager) allows the user to easily check and setup functions of GIPAM2200 including all relay settings. After configuring individual parameters from a PC, user needs to download the setting to GIPAM 2000 series through the front communication port (IrDA) to apply. As it is capable of downloading/uploading data, it is very easy to perform maintenance as well.



Functional Block Diagram



Function & Rating

Protection Function

Protection Use	Type	Protection Element		
Incoming Feeder Motor	GIPAM2200 FN	·OCR (50/51) ·UVR (27) ·NSOVR (47) ·48/51LR	·OCGR (50/51N) ·OVR (59) ·NSOCR (46) ·UCR (37)	·DGR (67N) Note 4) ·OVGR (64) Note 3) ·THR (49) ·NCH (66)
	GIPAM2200 FZ	·OCR (50/51) ·UVR (27) ·NSOVR (47) ·48/51LR	·SGR (67G) ·OVR (59) ·NSOCR (46) ·UCR (37)	·OVGR (64G) Note 3) ·THR (49) ·NCH (66)
Distributed Generation	GIPAM2200 DG	·OCR (50/51) ·OVR (59) ·DPR (32P) ·UFR (81U)	·OCGR (50/51N) ·UPR (37P) ·OFR (81O) ·DOCR (67P)	·UVR (27) ·DQR (32Q) ·DOCGR (67N) ·ROCOF (df/dt, 81R)
Interconnection Generator	GIPAM2200 IG	·OCR (50/51) ·OVR (59) ·DPR (32P) ·UFR (81U)	·OCGR (50/51N) ·NSOCR (46) ·UPR (37P) ·OFR (81O)	·UVR (27) ·THR (49) ·DQR (32Q) ·SYNC Check (25)
Transformer	GIPAM2200 T1	·DFR (87T-P) ·OCR-2 (50/51) ·OVGR (64) Note 3)	·DFR (87T-G) ·OCGR-1 (50/51N) ·DGR-1 (67N) Note 4)	·OCR-1 (50/51) ·OCGR-2 (50/51N) ·DGR-2 (67N) Note 4)
	GIPAM2200 T2	·DFR (87T-P) ·OCR-2 (50/51) ·OVGR (64) Note 3)	·DFR (87T-G) ·OCGR-1 (50/51N) ·SGR-2 (67G)	·OCR-1 (50/51) ·DGR-1 (67N) Note 4)
	GIPAM2200 T3	·DFR (87T-P) ·OCR-2 (50/51) ·OVGR (64) Note 3)	·DFR (87T-G) ·OCGR-2 (50/51N) ·SGR-1 (67G)	·OCR-1 (50/51) ·DGR-2 (67N) Note 4)

Note) 1. Models are differentiated according to ground fault system. Please take caution when selecting a model (refer to the Designation System).
2. Lock-out (86) element can be configured with logic.
3. OVGR is not connected to CB_OFF (Trip Circuit) (edit logic, if necessary)
4. DGR is identical to DOCGR

Measurement

Type	Item		Range	Accuracy(%)	Remarks
GIPAM 2200FN/FZ GIPAM 2200 IG GIPAM 2200DG	Voltage	Voltage (V)	0.0V ~ 999.99kV	±0.5%	Line voltage , Phase voltage
		Reverse phase voltage (V2)	0.0V ~ 999.99kV		
		Zero phase voltage (Vo)	0.0V ~ 999.99V		Vo, Vo_max
	Current	Current (A)	0.0A ~ 999.99kA	±0.5%	Each phase current
		Reverse phase current (I2)	0.0A ~ 999.99kA		
		Zero phase current (Io)	0.0A ~ 999.9A		Io(In), Io(In)_max
	Power	Active power (W)	0.00W ~ 999.99MW	±1.0%	Forward, Reverse
		Reactive power (Var)	0.00Var ~ 999.99MVar	±1.0%	
	Energy	Active energy (WH)	0.00Wh ~ 9999.999MWh	±1.0%	Forward, Reverse
		Reactive energy (VARH)	0.00Varh ~ 9999.999MVarh	±1.0%	
	Frequency		45 ~ 65Hz	±0.5%	
	Power Factor (PF)		-1.000 ~ 1.000	±1.0%	cosθ, Lead (-) / Lag (+)
GIPAM 2200T	Current	Current (A)	0.0A ~ 999.99kA	±0.5%	Each phase current
		Reverse phase current (I2)	0.0A ~ 999.99kA		
		Zero phase current (Io)	0.0A ~ 999.9A		Io(In), Io(In)_max
	Zero phase voltage (Vo)		0.0V ~ 999.99V		o, Vo_max
	Differential Current (Id)				
	Inhibitory Current (Ir)				
	Zero phase Differential Current (Iod)				
	Zero phase Inhibitory Current (Ior)				

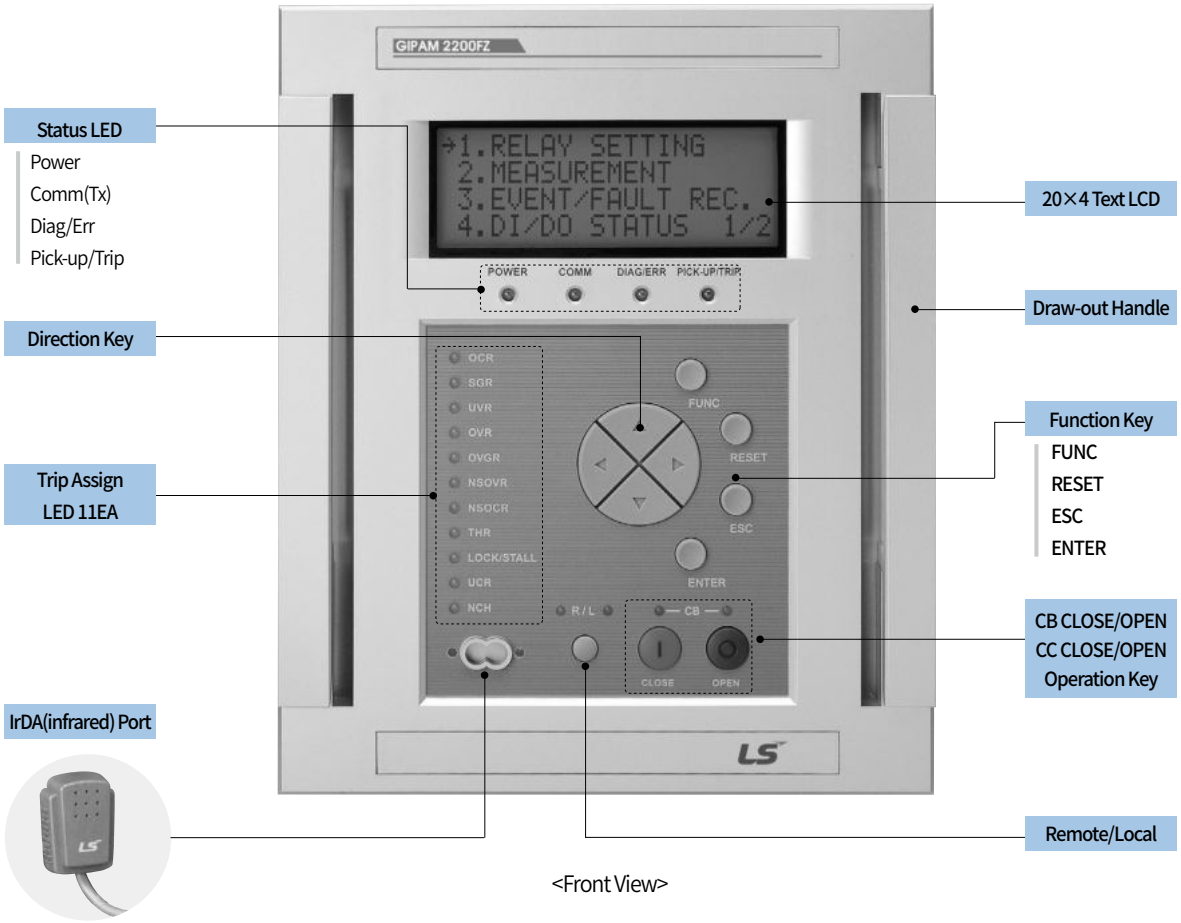
Note) The minimum measured voltage input is 2% (2.2V) and the minimum measured current input is 1% (0.05A).

C

Ratings

Type			Specification
Wiring			1P3W, 3P3W, 3P4W
Rating	Frequency		60Hz
	Voltage	PT	110V
		GPT	190V, 190 / √3V
	Current	CT	5A
		ZCT	200 / 1.5mA
	Power		AC/DC 110V, 125V
	Power consumption		30W or less : Stanby 70W or less : Operation
	Burden		0.5VA or less : PT 1.0VA or less : CT
Input contact	for general		Digital Input AC/DC 110V, 125V
Output contact	for trip		Rated Capacity: AC 250V 16A/DC 30V 16A, Resistive Load Opening Capacity: AC 4000VA, DC 480W
	for alarm		Closed Capacity: AC 250V 5A/DC 30V 5A, Resistive Load Opening Capacity: AC 1250VA, DC 150W
Insulation Resistance			DC 500V 10MΩ or more
Insulation Voltage			AC 2kV(1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 2 times of rated current for 3 hours. Withstand 20 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV : power input 2kV : other input 1kV : analog input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Altitude			1,000m or less
Environment			A place not subject to abnormal vibration and shock. A place where the surrounding air pollution is not remarkable.
Applied Standards			IEC 60255, IEC 61000-4, KEMC 1120
Dimension (W×H×D)			237×285×223mm
Weight			7.8kg
Communication			RS485 : Modbus, DNP3.0 Ethernet FE(Fiber Optic) : Modbus, DNP3.0

Appearance



<Front View>

FUNC — **FUNCTION**
Select DGR or OCGR from ground system options

RESET — **Return Trip**
LED display after accident, Restore LCD message

ESC — **ESC**
Cancel selected item, cancel setting change
Move to upper menu

ENTER — **ENTER**
Select item, confirm setting

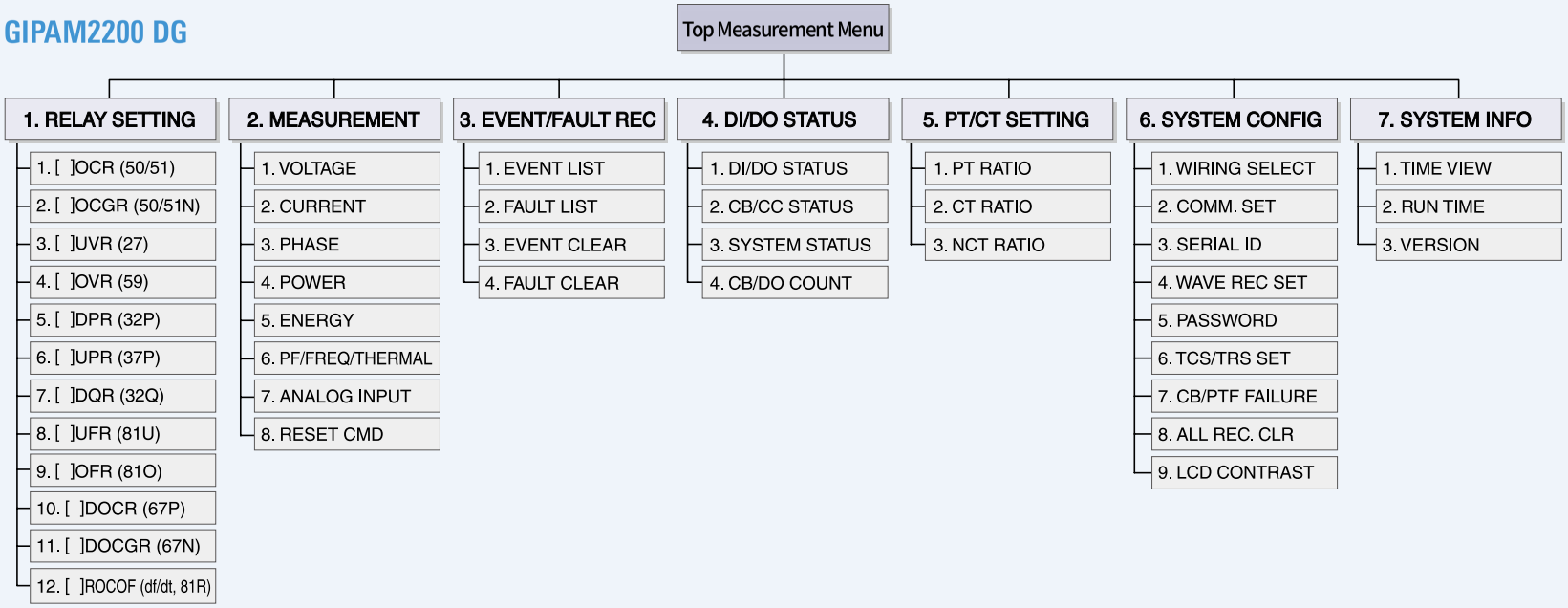
R / L — **Remote / Local**
Green LED-Remote/Red LED-Local

< Draw-out Type >

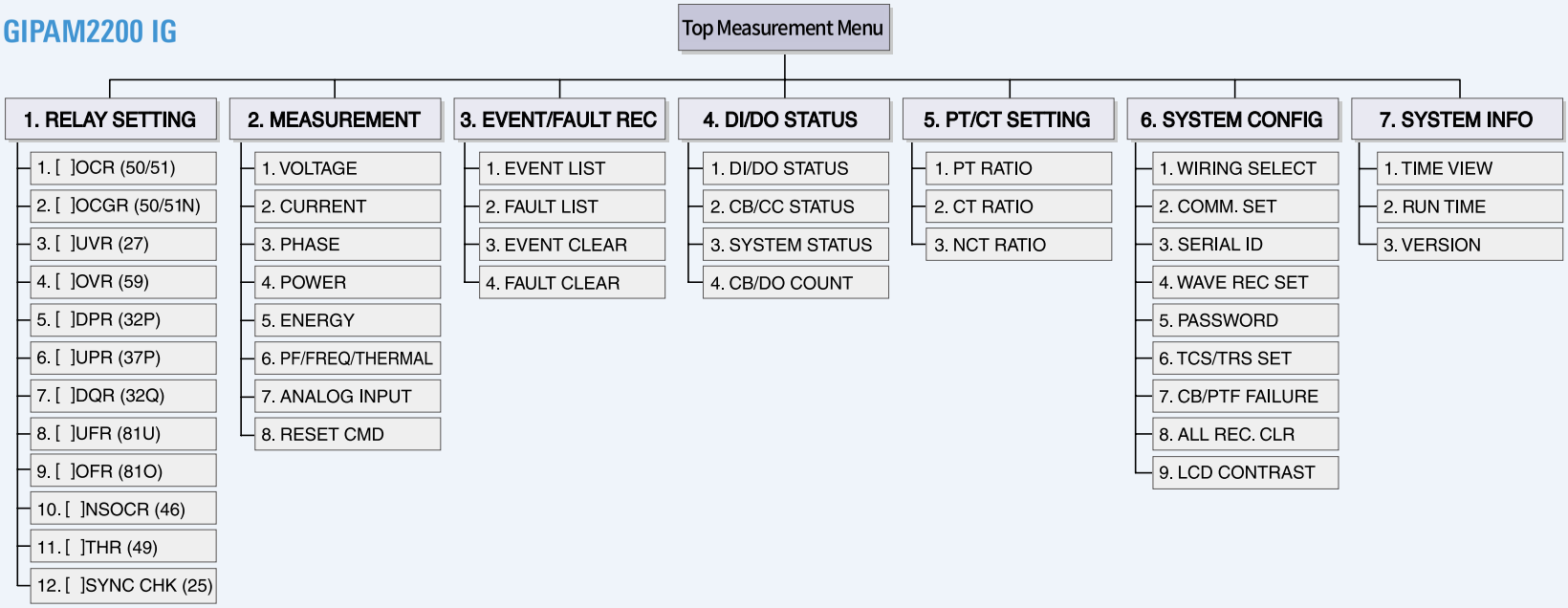
Note) 1. OCGR, SGR and DGR are displayed individually for each model according to the ground fault system.
2. In the "RELAY SETTING" menu of the GIPAM2200T model, w1 means primary winding and w2 means secondary winding.

C

GIPAM2200 DG



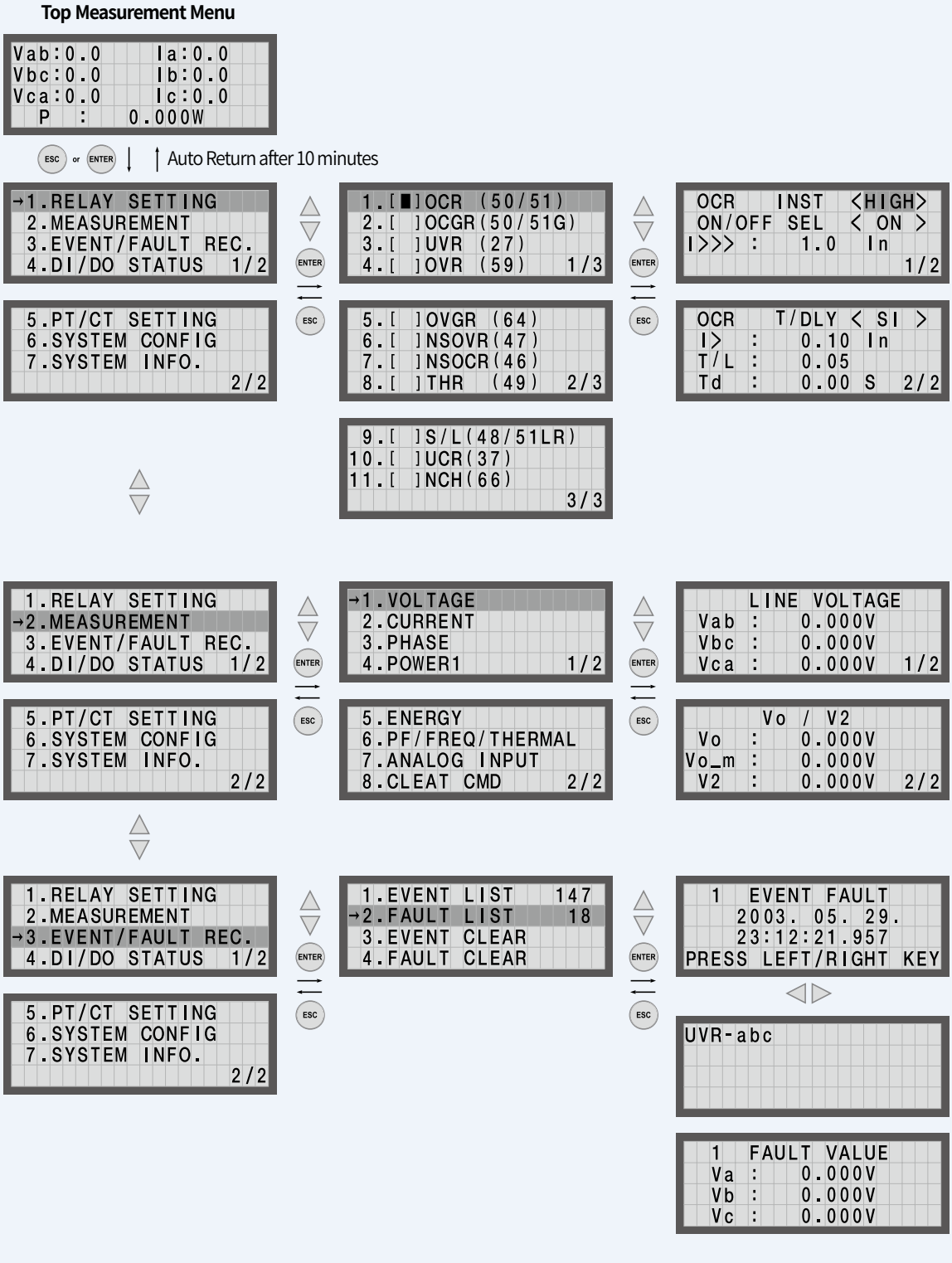
GIPAM2200 IG



C

MMI Interface

GIPAM2200 series is able to setup various relay elements using the text LCD and control key on the front panel, and it features menus such as SYSTEM Configuration and SYSTEM Information which is capable of measurement display, fault and event data logging, DI/DO monitoring, PT/CT ratio setup, wiring method and communication setting, and other product information display.



Communication

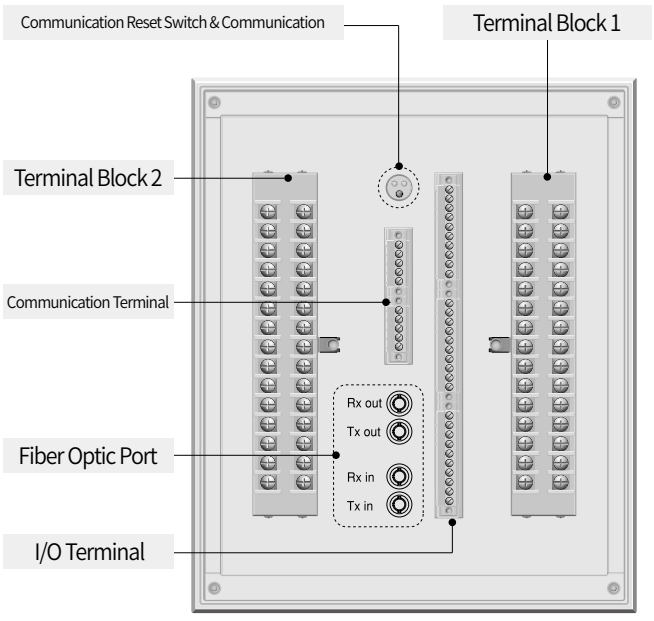
GIPAM2200 uses universal RS485 communication which is capable of transferring data at 38.4kbps, with the features like RS-485 and fiber optic ports and supports DNP3.0 and MODBUS protocols.

1) **Supported Protocol**
DNP3.0, MODBUS

2) RS-485 **Communication**
- Operation Mode: Differential
- Communication Range: max. 1.2Km
- Communication Cable: Universal RS-485 Shielded twist 2-Pair cable
- Communication Speed: 9600bps ~ 38.4kbps
- Transfer Method: Half-Duplex
- +Max. I/O Voltage: -7V ~ +12V

3) **Fiber/Optic Communication (Optical Transceiver specification)**
- Wave Length: 820nm
- Fiber Size: 50/125, 62.5/125, 100/140μm
- Optic Connector Type: ST Type
- Optic Link Distance : 4km (may vary according to data rate)
  (Data bit rate of GIPAM 2000: 9600bps-230.4kbps)
- Transceiver Specification: 500m (175Mbps) ~ 2.7km (20Mbps)
- Fiber : Multi Mode Cable

Note) For more information about communication protocols, please contact the manufacturer.



<Rear View>

C

GIPAM2200 F

Protection	Operating part		Setting Range		Operating time Characteristics		Note
					Setting	Curves	
OCR (50/51)	Instantaneous	Low set	OFF, 1.0 ~ 32.0In/0.1In		Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set					
	*Time delay		OFF, 0.10 ~ 10.00In/0.01In		0.05 ~ 1.20/0.01 0.05 ~ 300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
OCGR (50/51N)	Instantaneous	Low set	OFF, 0.1 ~ 8.0In/0.02In		Low: 0.05 ~ 300.00s/0.01s High: 40ms or less BLOCK: OFF, 0.0~60.0s/0.1s	Definite	Block: OCGR pause to prevent malfunctioning due to inrush current up on circuit breaker operation
		High set					
	*Time delay		OFF, 0.02 ~ 2.00In/0.01In		0.05 ~ 1.20/0.01 0.05 ~ 300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
NSOVR(47)	Time delay	Low set	OFF, 0.1 ~ 1.0Vn/0.1Vn		0.05 ~ 10.00s/0.01s	Definite	V2=1/3 (VR + a2VS + aVT) a=1∠120°, a2=1∠240°
		High set					
UVR(27)	Time delay		OFF, 0.02 ~ 1.00Vn/0.01Vn		0, 0.05 ~ 10.00s/0.01s	Definite	
OVR(59)	Time delay	Low set	OFF, 0.8 ~ 1.6Vn/0.01Vn		0.05 ~ 10.00s/0.01s	Definite	
		High set					
OVGR(64) Note3)	Instantaneous		OFF, 11 ~ 80V/1V		Inst, 50 ~ 250ms/5ms	Definite	DT, SI Von=190V or 190/√3V
	Time delay		OFF, 11 ~ 80V/1V		0.05 ~ 10.00s/0.01s 0.05 ~ 300.00s/0.01s	Inverse Definite	
NSOCR(46)	Instantaneous		OFF, 0.1 ~ 1.0In/0.02In		Inst, 50 ~ 250ms/5ms	Definite	DT, SI, VI, EI, LI Inst. (Instant): 50ms or less
	Time delay		OFF, 0.1 ~ 1.0In/0.01In		0.05 ~ 1.00/0.01 0.05 ~ 10.00s/0.01s	Inverse Definite	
SGR(67G) DGR(67N)	Time delay	Zero phase current	Grounded	OFF, 0.9 ~ 6mA/0.1mA (Ion=1.5mA)	0.05 ~ 10.00s/0.01s	Definite	Vo > Vos Io > Ios Ø(Vo) -Ø(Io) ≤ RCA + 87。 Ø(Vo) -Ø(Io) ≥ RCA - 87
			Non-grounded	OFF, 0.02 ~ 2.00Ion/ 0.01Ion(Ion=5A)			
		Zero phase voltage	11 ~ 80V/1V (Von=190V,190/√3V)				
		Reference sensitivity Phase angle	0° ~ 90°/5°				
THR(49)	Hot		0.2 ~ 1.2In/0.01In		τh: 2.0 ~ 60.0min/0.5min	$t = \tau h \cdot \ln\left[\frac{I_2 - I_{P2}}{I^2 - (k \cdot I_B)^2}\right]$	t: Operating time k: multiple factor (0.8~1.2/0.05) τ: Thermal time constant
	Cold				τc: 2.0 ~ 60.0min/0.5min	$t = \tau c \cdot \ln\left[\frac{I_2}{I^2 - (k \cdot I_B)^2}\right]$	
Stall/Lock (48/51LR)	Time delay	Stall Current	OFF, 0.2 ~ 10.00In/0.01In		0.05 ~ 300.00s/0.01s	Definite	Starting time set 1.0~300s/0.1s
		Lock Current	OFF, 0.2 ~ 10.00In/0.01In		0.05 ~ 1.00/0.01 0.05~300.00s/0.01s	Inverse(VI,EI) Definite	
UCR(37)	Time delay		OFF,0.1 ~ 0.9In/0.02In		0.1 ~ 10.0s/0.01s	Definite	
NCH(66)	Starts Number Base Time Time between starts Block Restart Block Residual Thermal				1 ~ 5 times / 1 time 10 ~ 60min/1min 0 ~ 60min/1min 0 ~ 60min/1min 10 ~ 80%/1%		

Note) 1. *Operating Delay Time Setting: 0.00~10.00s/0.01s (only applied on inverse time)
2. If nominal operation time is less than 40ms during inverse time, it receives definite time properties (IDMT)
3. OVGR is not connected to CB_OFF (Trip Circuit) (use edit logic, if necessary)

Operation Characteristics

GIPAM2200 T

Protection	Setting Range		Operating time Characteristics	Note
DFR (87T-P)	Low set	Id (Pick up): 0.2 ~ 1.0In/0.1In Slope 1: 15 ~ 100%/1% Slope 2: 15 ~ 100%/1% Knee Point: 1.0 ~ 20.0In/0.1 In	Inst, 0.05 ~ 10.00s/0.01s	Normal mode Inst: 40ms or less Inrush mode Inst: 40ms or less
		Inrush Inhibit: ON (10 ~ 50%/1%) OFF		
	HIgh set	Id (Pick up): 2.0 ~ 32.0 In/0.1In	40ms or less	2Harmonic/A fundamental wave
	Io Elimination: ON, OFF			
DFR (87T-G)	Zero phase Differential Current	Iod (Pick up): 0.05 ~ 1.00In/0.01In Slope: 15 ~ 100%/1%	Inst, 0.05 ~ 10.00s/0.01s	Inst: 40ms or less

Protection	Operating part		Setting Range	Operating time Characteristics		Note
				Setting	Curves	
OCR-1 (50/51)	Instantaneous	Low set	OFF, 1.0 ~ 32.0In/0.1In	Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set				
	* Time delay		OFF, 0.10 ~ 10.00In/0.01In	0.05 ~ 1.20/0.01 0.05~300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
OCR-2 (50/51)	Instantaneous	Low set	OFF, 1.0 ~ 32.0In/0.1In	Low: 0.05 ~ 300.00s/0.01s High:40ms or less	Definite	
		High set				
	* Time delay		OFF, 0.10 ~ 10.00In/0.01In	0.05 ~ 1.20/0.01 0.05~300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
OCGR-1 (50/51N)	Instantaneous	Low set	OFF, 0.1 ~ 8.0In/0.02In	Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set				
	* Time delay		OFF, 0.02 ~ 2.00In/0.01In	0.05 ~ 1.20/0.01 0.05~300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
OCGR-2 (50/51N)	Instantaneous	Low set	OFF, 0.1 ~ 8.0In/0.02In	Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set				
	* Time delay		OFF, 0.02 ~ 2.00In/0.01In	0.05 ~ 1.20/0.01 0.05~300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
OVGR(64) Note3)	Instantaneous		OFF, 11 ~ 80V/1V	Inst, 50 ~ 250ms/5ms	Definite	DT, SI Von=190V or 190/√3V
	Time delay		OFF, 11 ~ 80V/1V	0.05~10.00s/0.01s 0.05~300.00s/0.01s	Inverse Definite	
SGR(67G) DGR(67N)	Time delay	Zero phase current	Grounded: OFF, 0.9 ~ 6mA/0.1mA (Ion=1.5mA)	0.05 ~ 10.00s/0.01s	Definite	Vo > Vos Io > Ios Ø(Vo) -Ø(Io) ≤ RCA + 87。 Ø(Vo) -Ø(Io) ≥ RCA - 87
			Non-grounded: OFF, 0.02 ~ 2.00Ion/0.01Ion(Ion=5A)			
		Zero phase voltage	11 ~ 80V/1V (Von=190V,190/√3V)			
		Reference sensitivity Phase angle	0° ~ 90°/5°			

Note) 1. *Operating Delay Time Setting: 0.00~10.00s/0.01s (only applied on inverse time)
2. If nominal operation time is less than 40ms during inverse time, it receives definite time properties (IDMT)
3. OVGR is not connected to CB_OFF (Trip Circuit) (use edit logic, if necessary)

GIPAM2200 IG

Protection	Operating part		Setting Range	Operating time Characteristics		Note
				Setting	Curves	
OCR (50/51)	Instantaneous	Low set	OFF, 1.0 ~ 32.0In/0.1In	Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set				
	*Time delay		OFF, 0.10 ~ 10.00In/0.01In	0.05 ~ 1.20/0.01 0.05 ~ 300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
OCGR (50/51N)	Instantaneous	Low set	OFF, 0.1 ~ 8.0In/0.02In	Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set				
	*Time delay		OFF, 0.02 ~ 2.00In/0.01In	0.05 ~ 1.20/0.01 0.05 ~ 300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
UVR(27)	Time delay	Low set	0.2 ~ 1.0Vn/0.01Vn	0.05 ~ 10.00s/0.01s	Definite	
		High set				
	UVR Auto Reset		Auto reset if voltage returns beyond set value			
OVR(59)	Time delay	Low set	OFF, 0.8 ~ 1.6Vn/0.01Vn	0.05 ~ 10.00s/0.01s	Definite	
		High set				
NSOCR(46)	Instantaneous		OFF, 0.1 ~ 1.0In/0.02In	Inst, 50 ~ 250ms/5ms	Definite	DT, SI, VI, EI, LI Inst. (Instant): 50ms or less
	*Time delay		OFF, 0.1 ~ 1.0In/0.01In	0.05 ~ 1.00/0.01 0.05 ~ 10.00s/0.01s	Inverse Definite	
THR(49)	Hot		0.2 ~ 1.2In/0.01In	τh: 2.0 ~ 60.0min/0.5min	Inverse	
	Cold			τc: 2.0 ~ 60.0min/0.5min		
DPR(32P)	Time delay	Forward overpower	OFF, 0.80 ~ 1.50Pn/0.01Pn	0.10 ~ 120.00/0.10s	Definite	
		Reverse overpower	OFF, 0.01 ~ 0.50Pn/0.005Pn	0.10 ~ 120.00/0.10s	Definite	
DQR(32Q)	Time delay		OFF, 0.02 ~ 1.20Qn/0.01Qn	0.10 ~ 120.00/0.10s	Definite	
UPR(37P)	Time delay		OFF, 0.01 ~ 0.80Pn/0.005Pn	0.10 ~ 120.00/0.10s	Definite	
UFR(81U)	Time delay		OFF, fn-10 ~ fn/0.01Hz	0.10 ~ 300.00/0.10s	Definite	Fn=60Hz
	Low voltage Block		0.50 ~ 0.90Vn/0.01Vn			
OFR(81O)	Time delay		OFF, fn ~ fn+10/0.01Hz	0.10 ~ 300.00/0.10s	Definite	Fn=60Hz
	Low voltage Block		0.50 ~ 0.90Vn/0.01Vn			
SYNC_CHK (25)	Voltage Difference		2 ~ 50V/1V			Synchronous Allowed Voltage 0.5Vn ~ 1.20Vn
	Phase Difference		5 ° ~ 45 ° /1 °			
	Slip Frequency		0.01 ~ 0.5Hz/0.01Hz			
	Circuit breaker activation time		0 ~ 1000ms/1ms			
	Dead Voltage		OFF, 0.20 ~ 0.40Vn/0.01Vn			

Note) 1. *Operating Delay Time Setting: 0.00~10.00s/0.01s (only applied on inverse time)
2. If nominal operation time is less than 40ms during inverse time, it receives definite time properties (IDMT)

Operation Characteristics

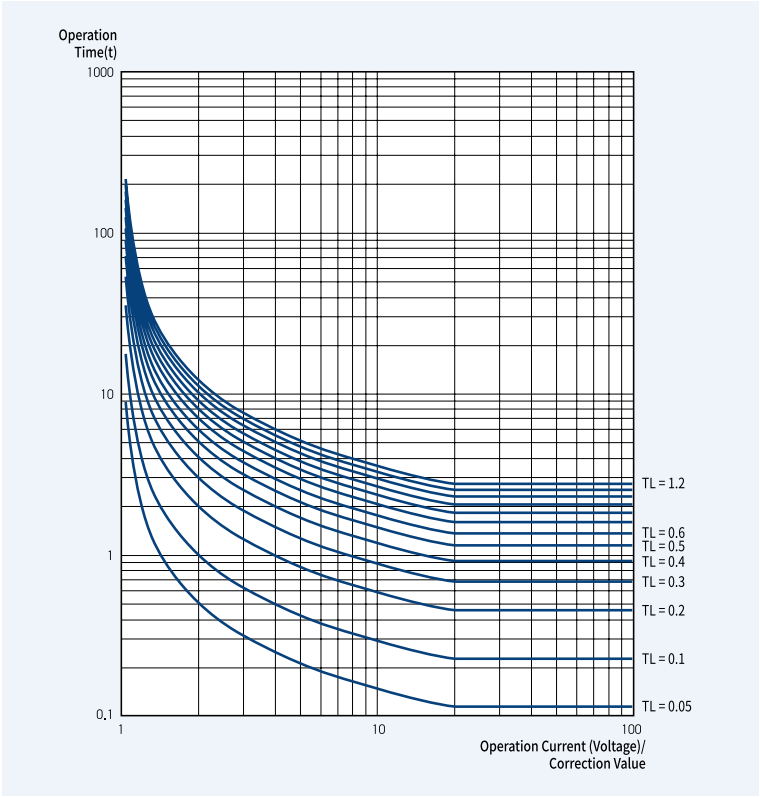
GIPAM2200 DG

Protection	Operating part		Setting Range	Operating time Characteristics		Note
				Setting	Curves	
OCR (50/51)	Instantaneous	Low set	OFF, 1.0 ~ 32.0In/0.1In	Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set				
	*Time delay		OFF, 0.10 ~ 10.00In/0.01In	0.05 ~ 1.20/0.01 0.05 ~ 300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
OCGR (50/51N)	Instantaneous	Low set	OFF, 0.1 ~ 8.0In/0.02In	Low: 0.05 ~ 300.00s/0.01s High: 40ms or less	Definite	
		High set				
	Time delay		OFF, 0.02 ~ 2.00In/0.01In	0.05 ~ 1.20/0.01 0.05 ~ 300.00s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
UVR(27)	Time delay	Low set	OFF, 0.02 ~ 1.00Vn/0.01Vn	0.05 ~ 10.00s/0.01s	Definite	
		High set				
	UVR Auto Reset		Auto reset if voltage returns beyond set value			
OVR(59)	Time delay	Low set	OFF, 0.8 ~ 1.6Vn/0.01Vn	0.05 ~ 10.00s/0.01s	Definite	
		High set				
DPR(32P)	Time delay	Forward overpower	OFF, 0.80 ~ 1.50Pn/0.01Pn	0.10 ~ 120.00/0.10s	Definite	
		Reverse overpower	OFF, 0.01 ~ 0.50Pn/0.005Pn	0.10 ~ 120.00/0.10s	Definite	
UPR(37P)	Time delay		OFF, 0.01 ~ 0.80Pn/0.005Pn	0.10 ~ 120.00/0.10s	Definite	
DQR(32Q)	Time delay		OFF, 0.02 ~ 1.20Qn/0.01Qn	0.10 ~ 120.00/0.10s	Definite	
UFR(81U)	Definite		OFF, fn-10 ~ fn/0.01Hz	0.10 ~ 300.00/0.10s		Fn=60Hz
	Low voltage Block		0.50 ~ 0.90Vn/0.01Vn			
OFR(81O)	Time delay		OFF, fn ~ fn+10/0.01Hz	0.10 ~ 300.00/0.10s	Definite	Fn=60Hz
	Low voltage Block		0.50 ~ 0.90Vn/0.01Vn			
DOCR (67P)	Instantaneous		OFF, 1.0 ~ 32.0/0.1In	0.05 ~ 300.0/0.01s	Definite	
	*Time delay		OFF, 0.1 ~ 10.0/0.01In	0.05 ~ 1.20/0.01s 0.05 ~ 300.0/0.01s Operation Delay Time: 0.0 ~ 10.0s/0.01s	Inverse Definite	DT, SI, VI, EI, LI
	Directional Characteristic		Characteristic Angle Setting: 0 ~ 359°/1°, Op Range: 50 ~ 90°/5°			
	DOCR BLOCK		If all voltage drops below 11V when a 3-phase short circuit accident occurs, the voltage memorized during normal condition (1sec) is used to determine the direction. If the DOCR BLOCK is set to ON, the directional element becomes blocked.			
DOCGR (67N)	Instantaneous		OFF, 0.1 ~ 8.0/0.02In		Definite	
	*Time delay		OFF, 0.02 ~ 2.0/0.01In	0.05 ~ 1.20/0.01s 0.05 ~ 300.0/0.01s Operation Delay Time: 0.0 ~ 10.0s/0.01s	Inverse Definite	DT, SI, VI, EI, LI 1. GPT 3Vo: Vo due to GPT input 2. Calc 3Vo: Vo due to 3-phase voltage calculation
	Directional Characteristic		Characteristic Angle Setting: 0 ~ 359°/1°, Op Range: 50 ~ 90°/5°			
ROCOF (df/dt, 81R)	Definite		OFF, 0.1 ~ 2.0/0.1 (Hz/s)	0.20 ~ 60.00/0.1s	Definite	
	Low voltage Block		0.50 ~ 0.90Vn / 0.01Vn			

Note) 1. *Operating Delay Time Setting: 0.00~10.00s/0.01s (only applied on inverse time)
2. If nominal operation time is less than 40ms during inverse time, it receives definite time properties (IDMT)
3. There are two methods of detecting Vo. One is receiving GPT input and the other is the calculate PT value. The method can be selected from the menu

C

Standard Inverse Time - SI



• Apply: Over-current (50/51)
Ground Fault and Current (50/51N)
Ground Fault and Voltage (64)
Reverse Phase and Current (46)

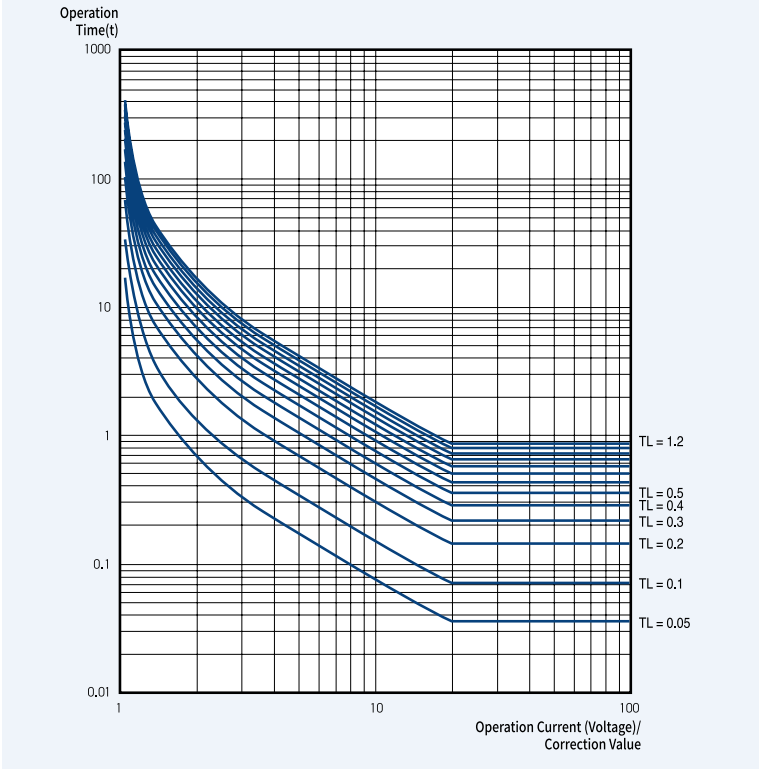
$$t = \frac{0.14}{(I/Is)^{0.02}-1} \times TL + C$$

·Time Correction Lever TL: 0.05~1.2
(Ground Fault and Voltage / Reverse Phase and Current } TL: 0.05~1.0)

· Relay Characteristic Value C: 0

· Operation Delay Time: 0.00~10.00s/0.01s
(applied only during inverse time of Overcurrent, Ground Fault Overcurrent, Reverse Phase Overcurrent)

Very Inverse Time -VI



• Apply: Over-current (50/51)
Ground Fault and Current (50/51N)
Ground Fault and Voltage (64)
Reverse Phase and Current (46)
Locked Rotor (51LR)

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

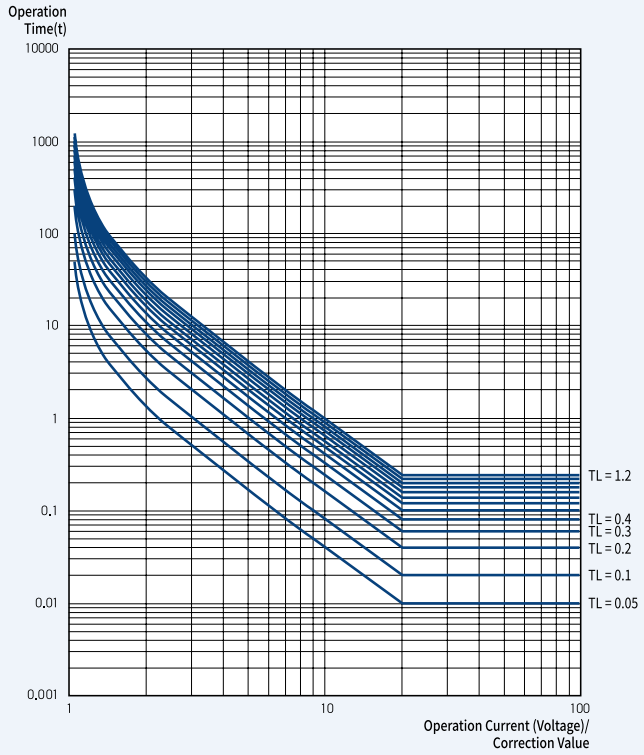
·Time Correction Lever TL: 0.05~1.2
(Ground Fault and Voltage / Reverse Phase and Current / Locked Rotor } TL: 0.05~1.0)

· Relay Characteristic Value C : 0

· Operation Delay Time: 0.00~10.00s/0.01s
(applied only during inverse time of Overcurrent, Ground Fault Overcurrent, Reverse Phase Overcurrent)

Characteristic Curve

Extremely Inverse Time - EI



• Apply: Over-current (50/51)
Ground Fault and Current (50/51N)
Ground Fault and Voltage (64)
Reverse Phase and Current (46)
Locked Rotor (51LR)

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

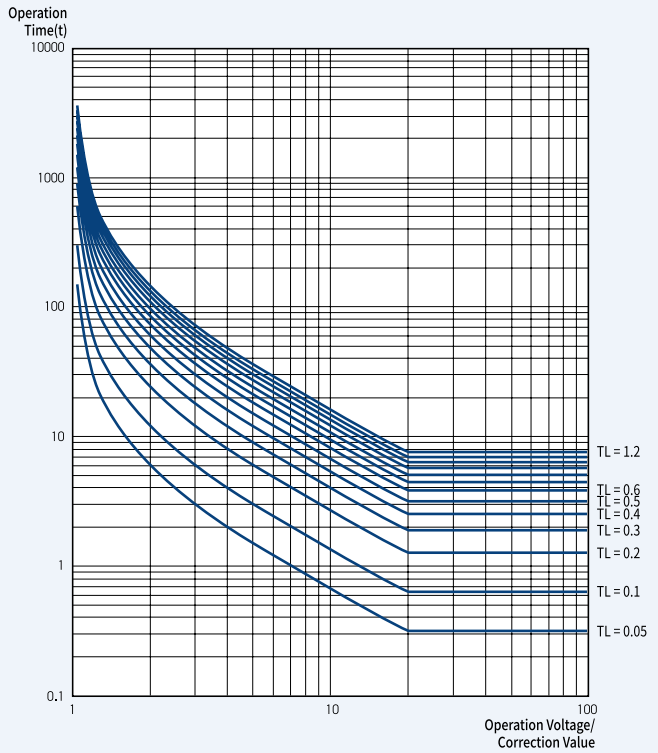
· Time Correction Lever TL: 0.05~1.2

(Ground Fault and Voltage / Reverse Phase and Current / Locked Rotor } TL: 0.05~1.0)

· Relay Characteristic Value C: 0

· Operation Delay Time: 0.00~10.00s/0.01s
(applied only during inverse time of Overcurrent, Ground Fault Overcurrent, Reverse Phase Overcurrent)

Long Inverse Time - LI



• Apply: Over-current(50/51)
Ground Fault and Current (50/51N)
Reverse Phase and Current (46)

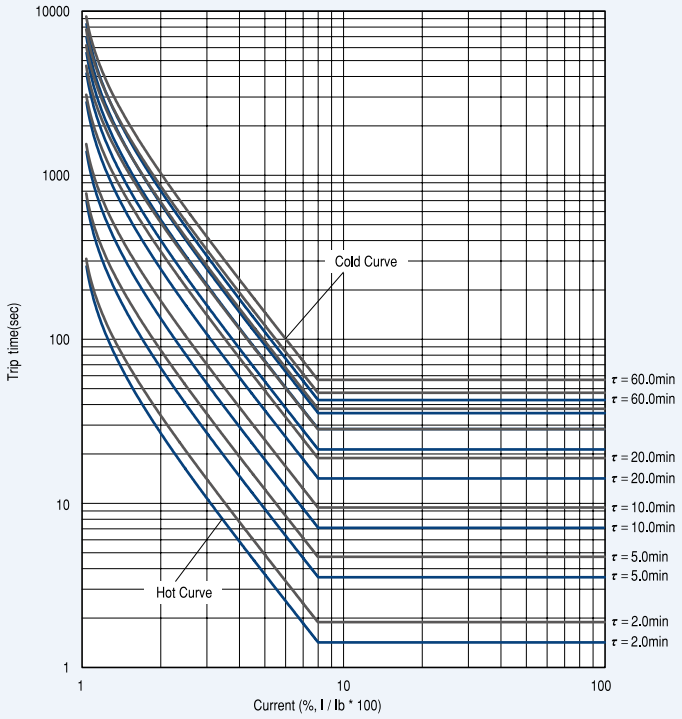
$$t = \frac{120}{(I/Is)-1} \times TL + C$$

· Time Correction Leve TL: 0.05~1.2
(Reverse Phase and Current TL: 0.05~1.0)

· Relay Characteristic Value C: 0

· Operation Delay Time: 0.00~10.00s/0.01s
(applied only during inverse time)

Thermal Curve



• **Apply : Thermal Overload Relay ((49)**

HOT $t = \tau_h \cdot \ln \frac{I^2 - I_P^2}{I_2 - (k \cdot I_B)_2}$

$\tau_h = 2.0 \sim 60.0\text{min}$

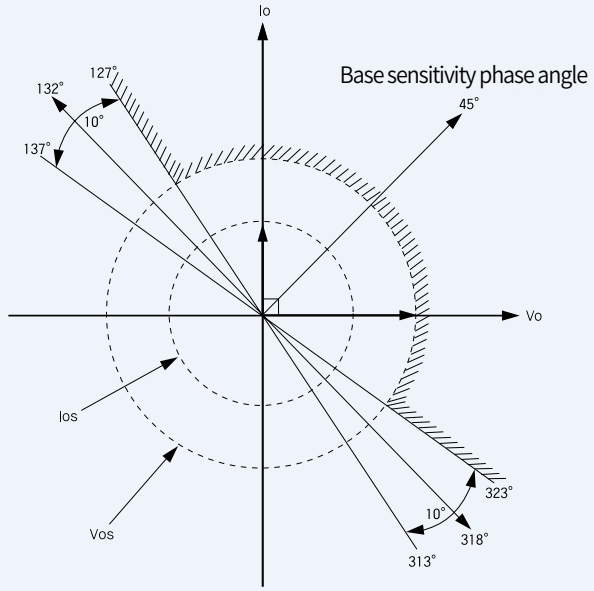
COLD $t = \tau_c \cdot \ln \frac{I^2}{I_2 - (k \cdot I_B)_2}$

$\tau_c = 2.0 \sim 60.0\text{min}$

In case of $\begin{cases} I_P = 0.5 \\ k = 1 \\ I_B = 1 \end{cases}$

I_P: Load current before fault
I_B: Rated load current
k: Overload constant
I: Fault current
τh (τheating): Thermal time constant during operation
τc (τcooling): Thermal time constant during cooling

Cold state is $I_P = 0$



• **Apply : Select ground Fault (67G)**
Directional ground Fault (67N)

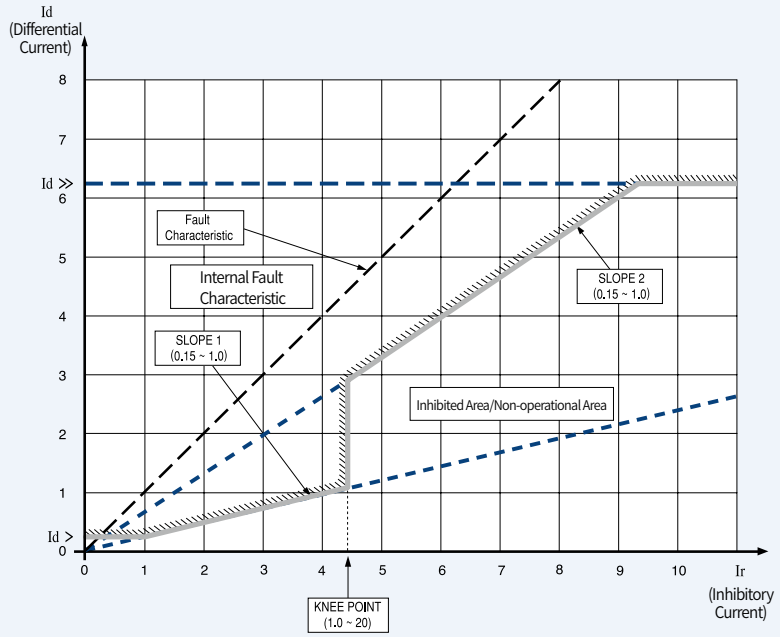
(a) I/O range where pick-up actually occurs:
323° ~ 127°
(b) I/O range where drop-out occurs after pick-up:
137° ~ 313°

Vo > Vos
Io > Ios
RCA-87。 ≤ Ø(Vo)-Ø(Io) ≤ RCA+87。

※ RCA(Relay Characteristic Angel) :
Relay Characteristic Angles

Characteristic Curve

Ratio Differential Curve



• **Apply: Transformer protection differential ratio relay**

$Id = I_{differtial} = |\bar{I}_1 - \bar{I}_2|$ (Vector sum.)

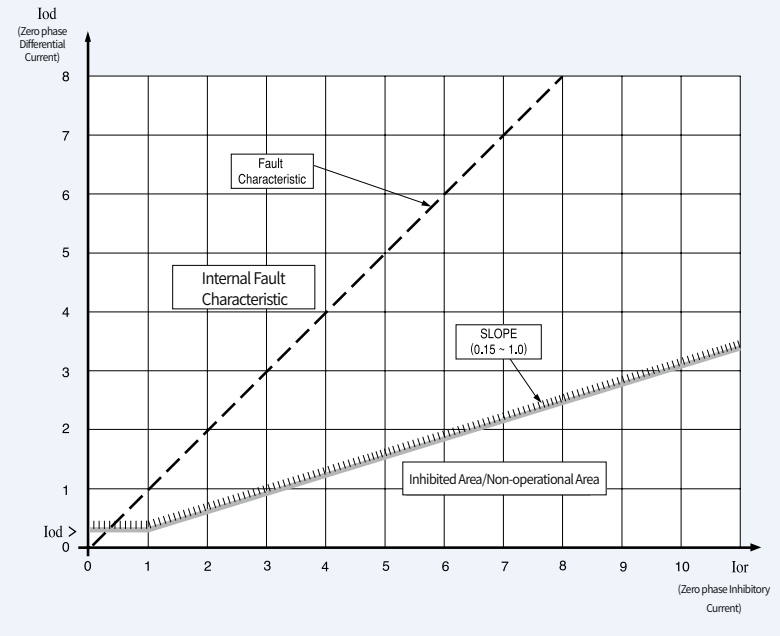
$Ir = I_{restraint} = |I_1| + |I_2|$ (Scalar sum.)

$SLOPE = \left[\frac{Id}{Ir}\right]$

Fault Characteristic: Transformer interior complete fault characteristics
($I1st = If$, $I2nd = 0$)

Id: Differential current
Ir: Inhibitory current
Id>: Time differential current (Low set: 0.2~1.0)
Id>>: Instantaneous differential current (High set: 2.0~32.0)
Knee Point: Inflection point
SLOPE 1: Characteristic gradient 1
SLOPE 2: Characteristic gradien2

Ground Ratio Differential Curve



• **Apply: Ground Fault in a Differential Relay (87T-G)**

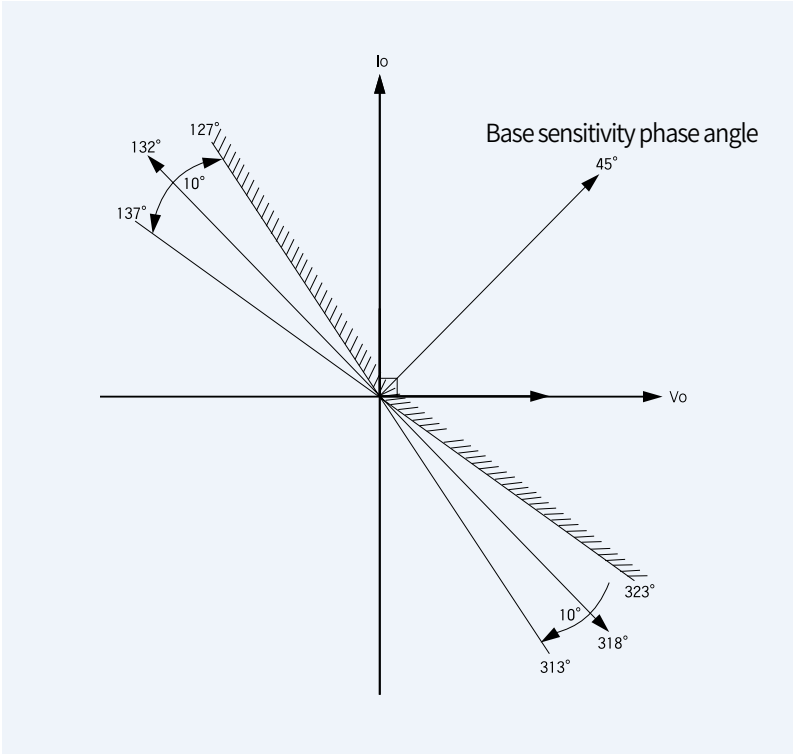
$Iod = |3\bar{I}o - \bar{I}g|$ (Vector sum.)

$Ior = |3\bar{I}o| + |\bar{I}g|$ (Scalar sum.)

$SLOPE = \left[\frac{Iod}{Ior}\right]$

Fault Characteristic: Transformer interior complete fault characteristics
($I1st = If$, $I2nd = 0$)
Iod : Zero phase Differential Current
Ior : Zero phase Inhibitory Current
Iod> : Zero phase Time Differential Current (0.05 ~ 1.00)
SLOPE : Characteristic gradient

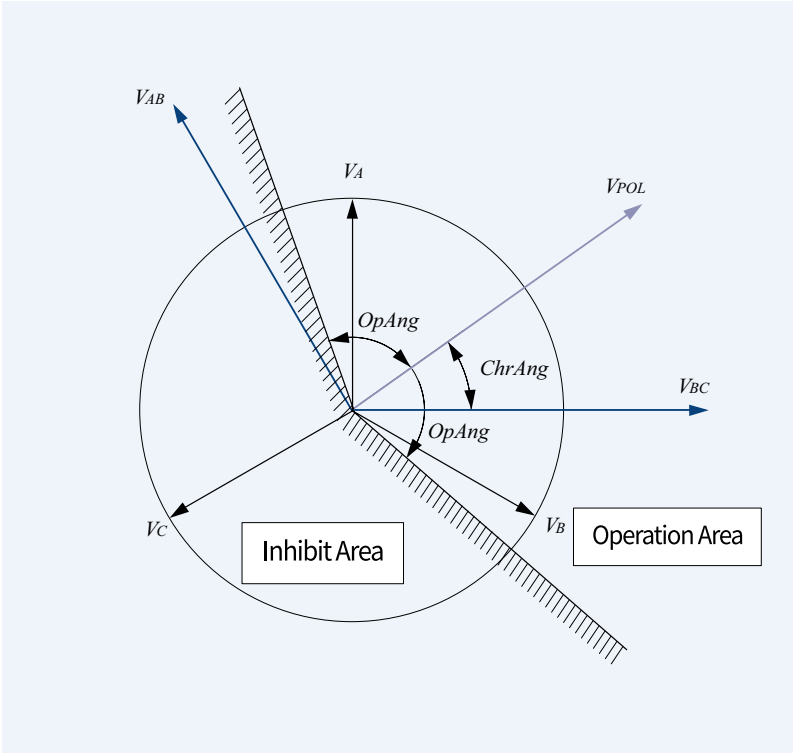
Directional Element Operation Range



• **SGR, DGR, DOCGR**

※Range where SGR and DGR relays pick-up occurs
RCA-87° ≤ ∠Vo-∠Io ≤ RCA+87°
(RCA (Operation Characteristi cangle) = 0~90/5°)

※Range where DOCGR relays winner pick-up occurs
RCA - Op Ang ≤ ∠Vo-∠Io ≤ RCA + Op Ang
(RCA = 0~359/1°, Op Ang = 50~90/5°)



• **DOCR**

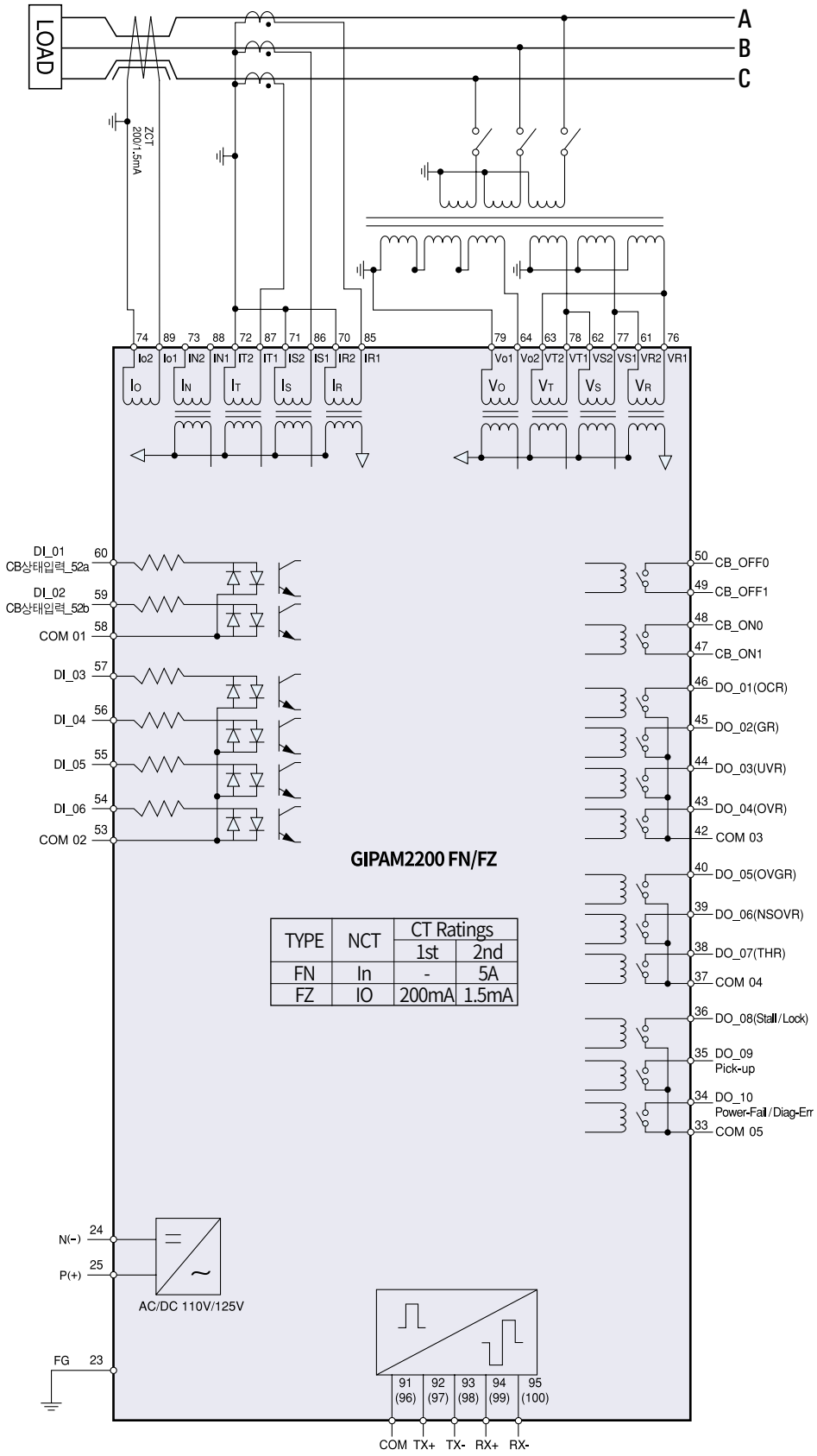
※ Range where DOCR relays winner pick-up occurs
RCA - Op Ang ≤ ∠Vo-∠Io ≤ RCA + Op Ang
(RCA = 0~359/1°, Op Ang = 50~90/5°)

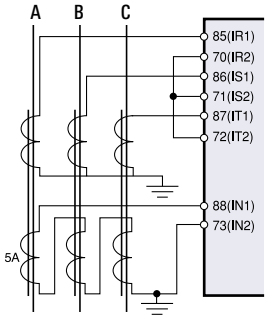
- DOCR Polarity Based

phase	Operation Current	Polarity Voltage
A	I_a	$V_{bc} = V_b - V_c$
B	I_b	$V_{ca} = V_c - V_a$
C	I_c	$V_{ab} = V_a - V_b$

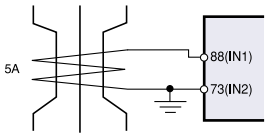
Wiring

3P3W





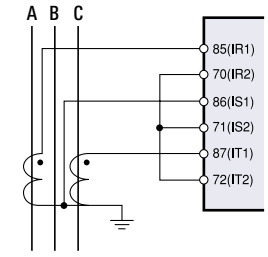
*In case of using three winding CT as 3CT Y wiring in the 3-phase 3- wire resistance grounding system



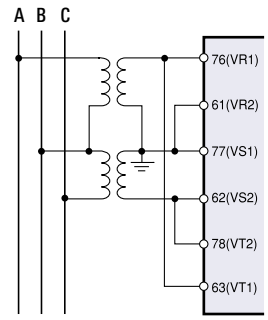
*Ground fault detection in case of using ground CT in the 3-phase 3-wire resistance grounding system

GIPAM2200 FN

Apply two CTs

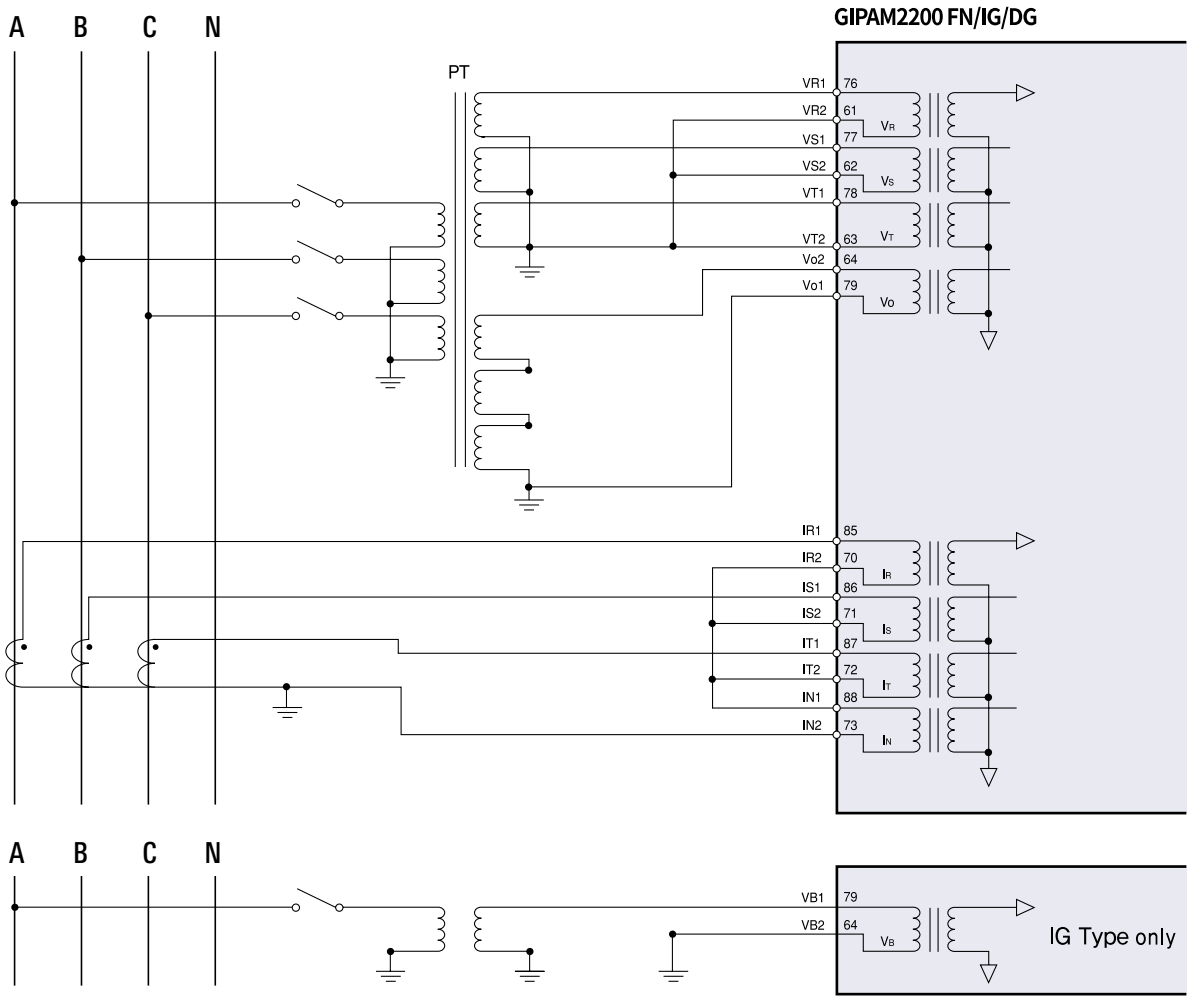


Apply two CTs (open delta wiring)

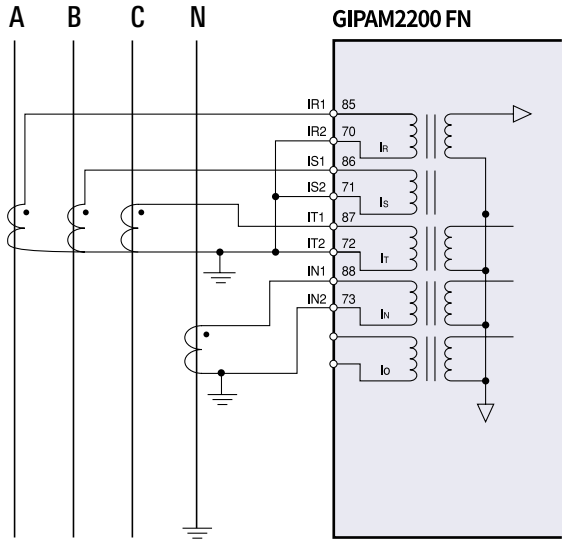


C

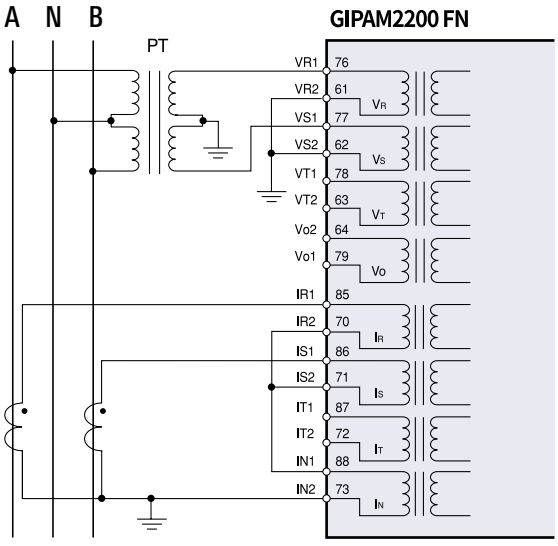
3P4W



1P3W



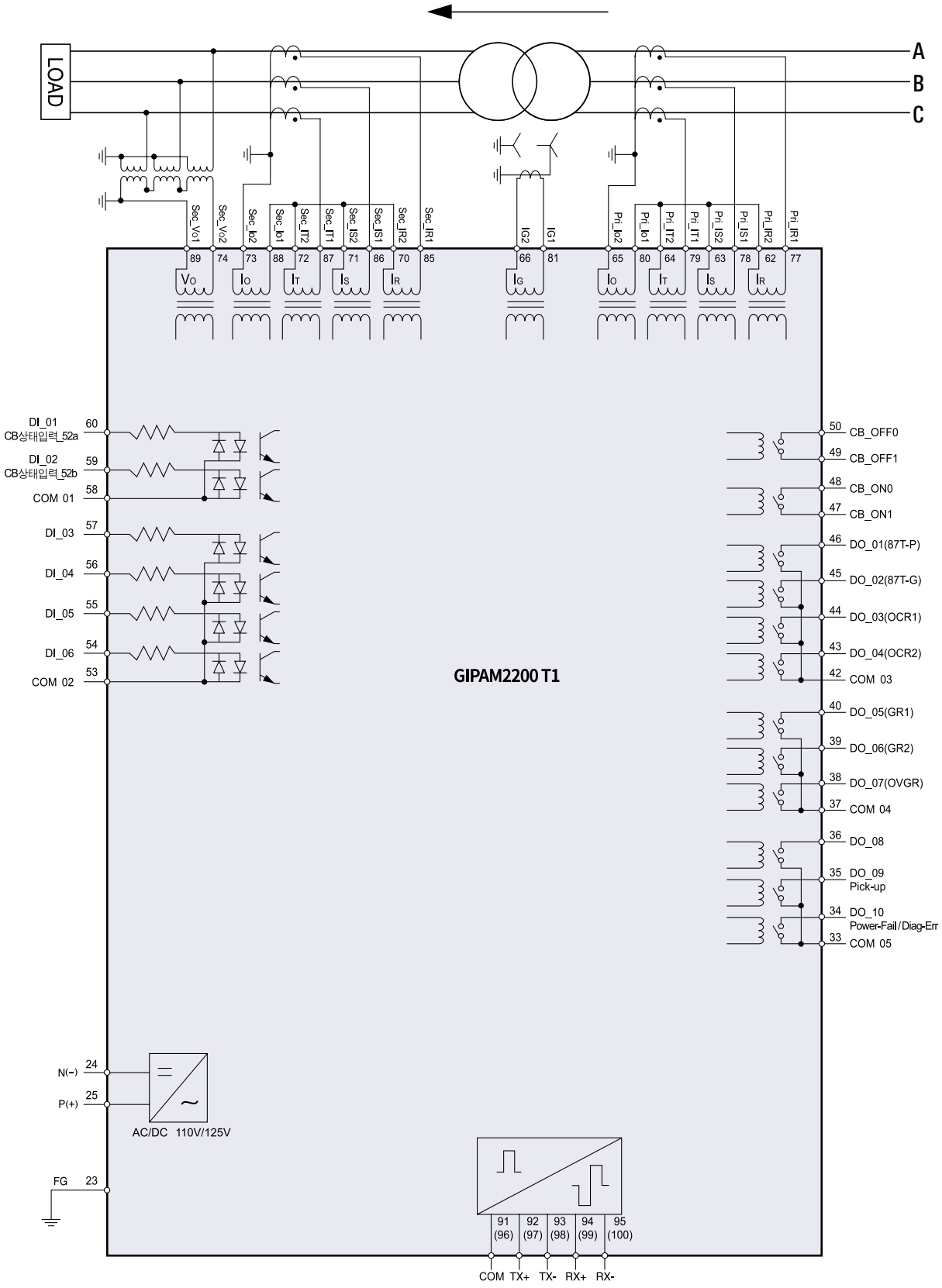
*If a separate CT is used at the transformer neutral point



*Only FN model can use 1P3W.

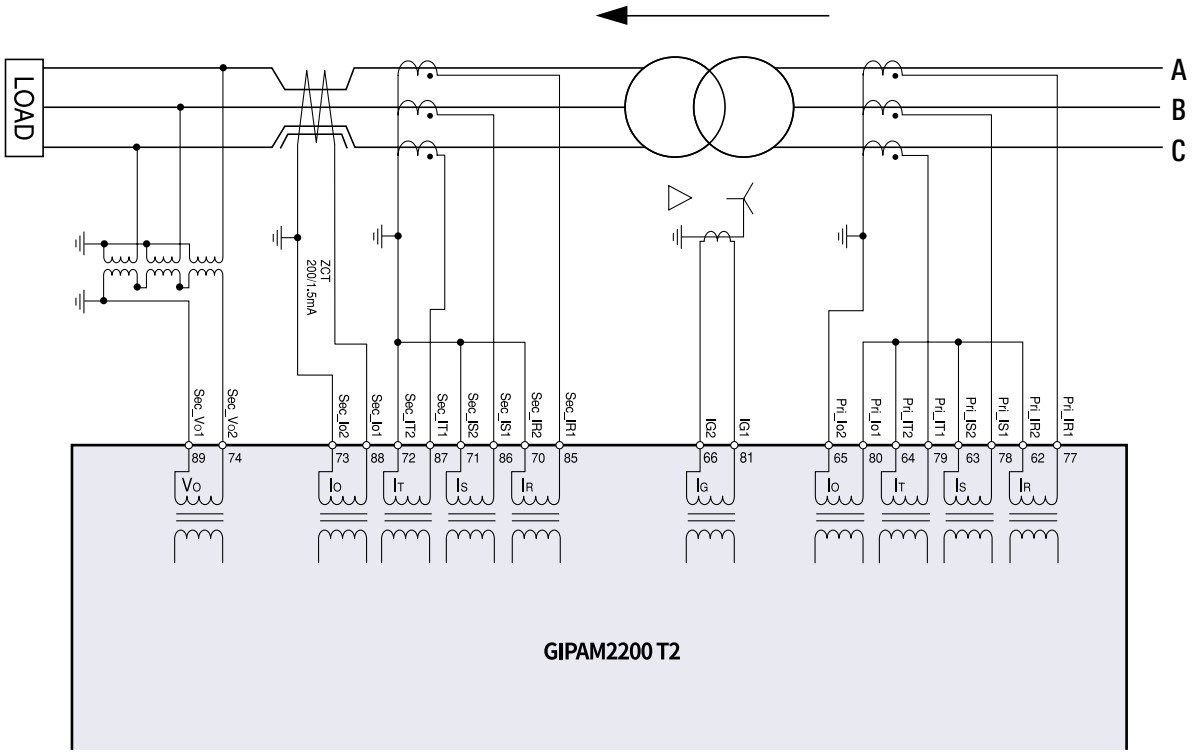
Wiring

GIPAM2200 T1

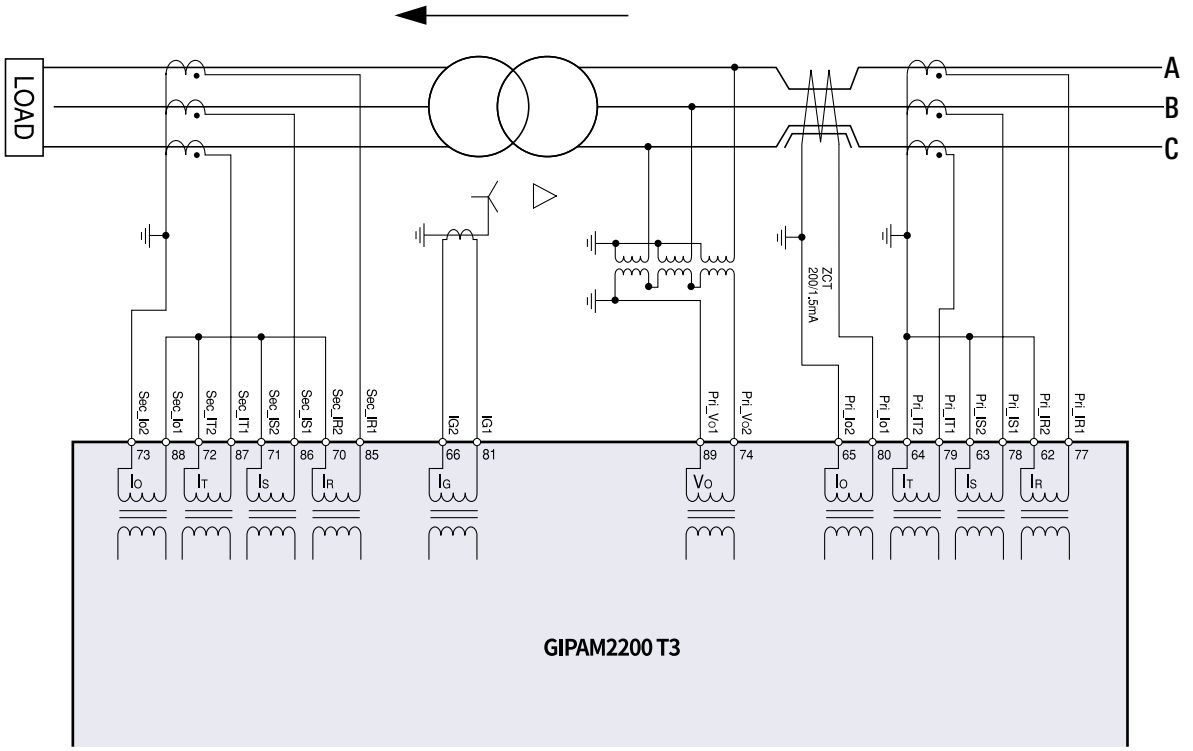


C

GIPAM2200 T2

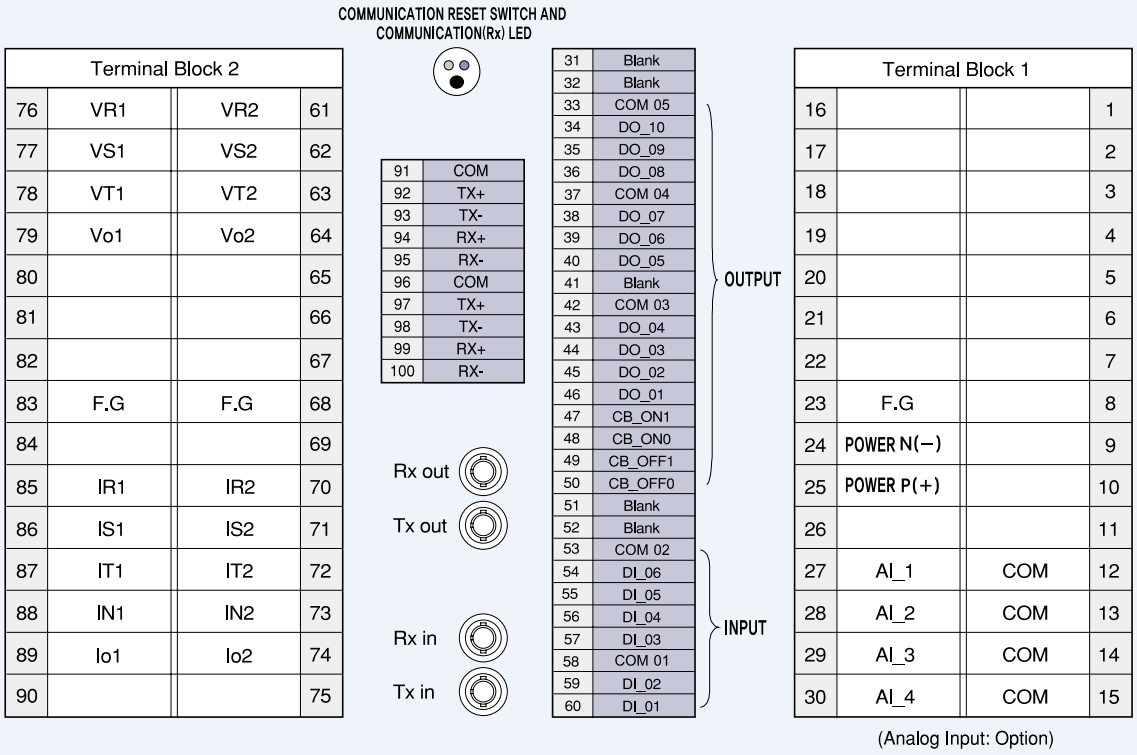


GIPAM2200 T3



Contact Configuration

GIPAM2200 FN/FZ

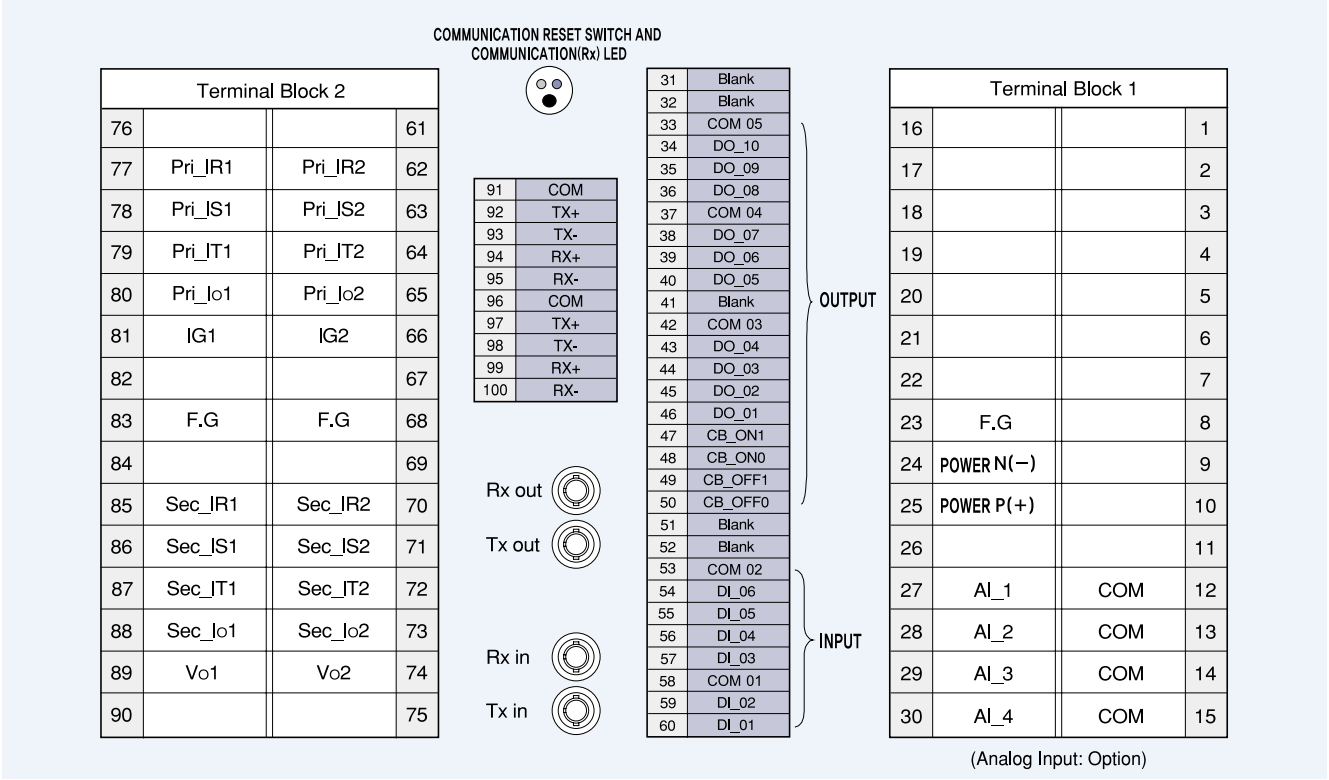


FN/FZ Model I/O Contact Configuration

Terminal Number	Terminal Details	Default Use	Updated Use
60	DI_01	CB Status input_52a	Unchangeable
59	DI_02	CB Status input_52b	
57	DI_03	General DI	General DI
56	DI_04	General DI	General DI
55	DI_05	General DI	General DI
54	DI_06	General DI	General DI
50	CB_OFF0	CB_OPEN OUTPUT	Unchangeable Note3)
49	CB_OFF1		
48	CB_ON0	CB_CLOSE OUTPUT	
47	CB_ON1		
46	DO_01	50/51 (OCR)	General DO (Normal/Pulse)
45	DO_02	50/51N, 67G/N (OCGR/SGR/DGR)	General DO (Normal/Pulse)
44	DO_03	27 (UVR) Note3)	General DO (Normal/Pulse)
43	DO_04	59 (OVR)	General DO (Normal/Pulse)
40	DO_05	64 (OVGR) Note3)	General DO (Normal/Pulse)
39	DO_06	47 (NSOVR)	General DO (Normal/Pulse)
38	DO_07	49 (THR)	General DO (Normal/Pulse)
36	DO_08	48/51LR (Stall/Lock)	General DO (Normal/Pulse)
35	DO_09	Pick-up (Relay element Pick-up)	Unchangeable
34	DO_10	Power_Fail/Diag_Err (Power failure and self diagnosis)	

Note) 1. In case of General DO, Normal (Holding) or Pulse (0.1~10s) output can be selected.
2. Relay element output is latched on with a self-maintaining circuit configured.
3. OVGR is not connected to CB_OFF (Trip Circuit) (use edit logic, if necessary)
4. When setting up the UVR Auto Reset, the DO self-maintaining circuit must be released at Logic Diagram.

GIPAM2200 T



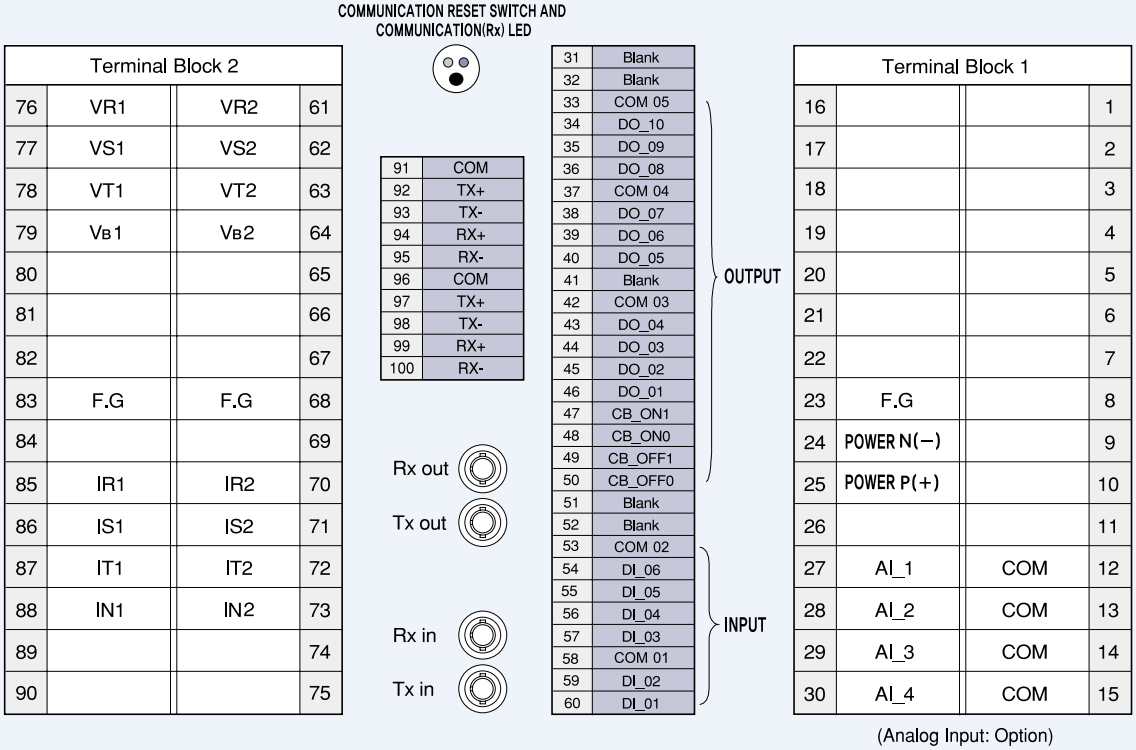
T Model I/O Contact Configuration

Terminal Number	Terminal Details	Default Use	Updated Use
60	DI_01	CB Status input_52a	Unchangeable
59	DI_02	CB Status input_52b	
57	DI_03	General DI	General DI
56	DI_04	General DI	General DI
55	DI_05	General DI	General DI
54	DI_06	General DI	General DI
50	CB_OFF0	CB_OPEN OUTPUT	Unchangeable Note3)
49	CB_OFF1		
48	CB_ON0	CB_CLOSE OUTPUT	
47	CB_ON1		
46	DO_01	87T-P (DFR)	General DO (Normal/Pulse)
45	DO_02	87T-G (DFR)	General DO (Normal/Pulse)
44	DO_03	50/51 (OCR 1)	General DO (Normal/Pulse)
43	DO_04	50/51 (OCR 2)	General DO (Normal/Pulse)
40	DO_05	50/51N, 67G/N (OCGR/SGR/DGR 1)	General DO (Normal/Pulse)
39	DO_06	50/51N, 67G/N (OCGR/SGR/DGR 2)	General DO (Normal/Pulse)
38	DO_07	64 (OVGR) Note3)	General DO (Normal/Pulse)
36	DO_08	General DO (Normal)	General DO (Normal/Pulse)
35	DO_09	Pick-up (Relay element Pick-up)	Unchangeable
34	DO_10	Power_Fail/Diag_Err (Power failure and self diagnosis)	

Note) 1. In case of General DO, Normal (Holding) or Pulse (0.1~10s) output can be selected.
2. Relay element output is latched on with a self-maintaining circuit configured.
3. OVGR is not connected to CB_OFF (Trip Circuit) (use edit logic, if necessary)

Contact Configuration

GIPAM2200 IG

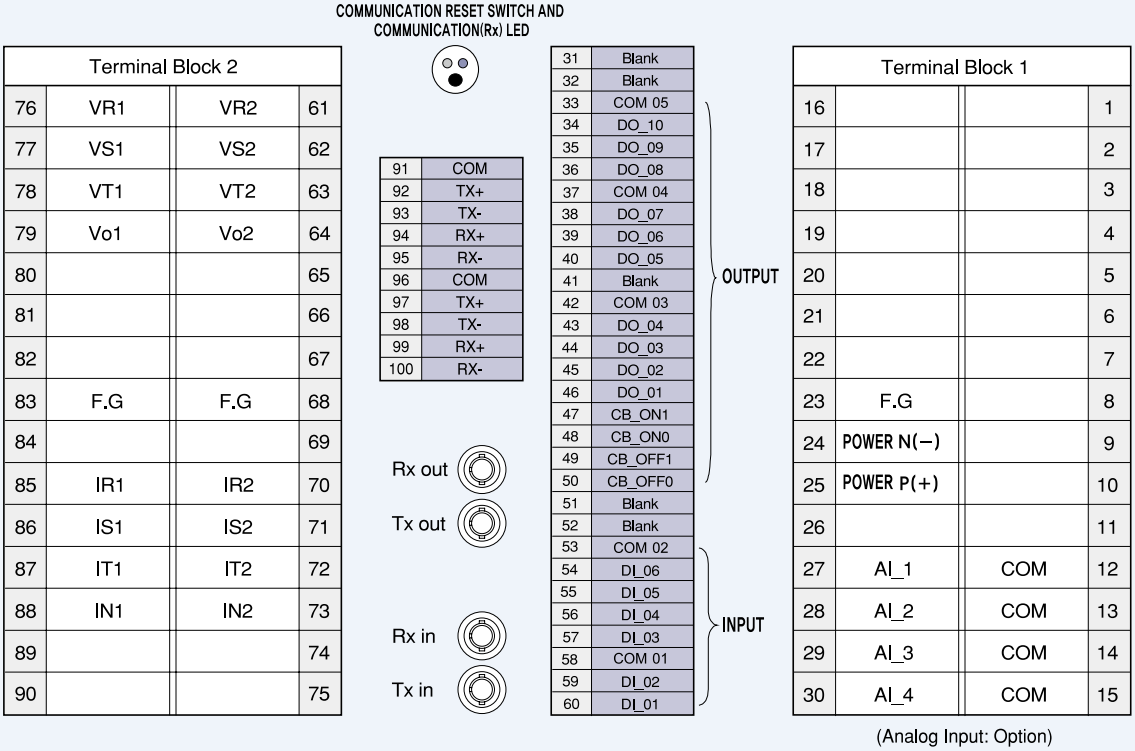


IG Model I/O Contact Configuration

Terminal Number	Terminal Details	Default Use	Updated Use
60	DI_01	CB Status input_52a	Unchangeable
59	DI_02	CB Status input_52b	
57	DI_03	General DI	General DI
56	DI_04	General DI	General DI
55	DI_05	General DI	General DI
54	DI_06	General DI	General DI
50	CB_OFFO	CB_OPEN OUTPUT	Unchangeable
49	CB_OFF1		
48	CB_ON0	CB_CLOSE OUTPUT	
47	CB_ON1		
46	DO_01	50/51 (OCR)	General DO (Normal/Pulse)
45	DO_02	50/51N(OCGR)	General DO (Normal/Pulse)
44	DO_03	27 (UVR) Note3)	General DO (Normal/Pulse)
43	DO_04	59 (OVR)	General DO (Normal/Pulse)
40	DO_05	32P(DPR), 37P(UPR)	General DO (Normal/Pulse)
39	DO_06	81O(OFR), 81U(UFR)	General DO (Normal/Pulse)
38	DO_07	32Q(DRPR), 46(NSOCR), 49(THR)	General DO (Normal/Pulse)
36	DO_08	25(SYNC)	Unchangeable
35	DO_09	Pick-up (Relay elemen Pick-up)	
34	DO_10	Power_Fail/Diag_Err (Power failure and self diagnosis)	

Note) 1. In case of General DO, Normal (Holding) or Pulse (0.1~10s) output can be selected.
2. Relay element output is latched on with a self-maintaining circuit configured.
3. When setting up the UVR Auto Reset, the DO self-maintaining circuit must be released at Logic Diagram.

GIPAM2200 DG

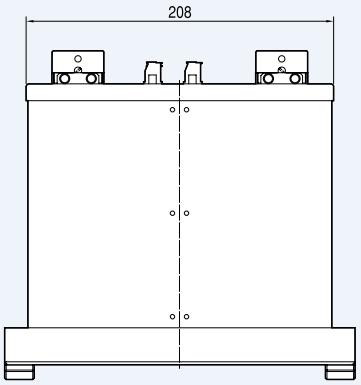


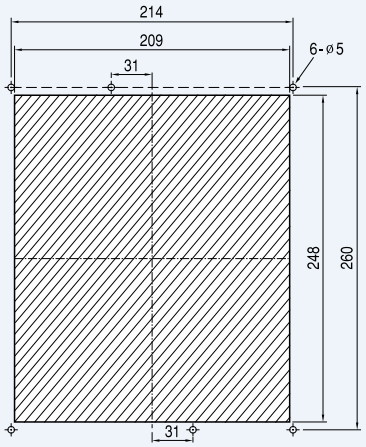
DG Model I/O Contact Configuration

Terminal Number	Terminal Details	Default Use	Updated Use
60	DI_01	CB Status input_52a	Unchangeable
59	DI_02	CB Status input_52b	
57	DI_03	General DI	General DI
56	DI_04	General DI	General DI
55	DI_05	General DI	General DI
54	DI_06	General DI	General DI
50	CB_OFFO	CB_OPEN output	Unchangeable
49	CB_OFF1		
48	CB_ON0	CB_CLOSE output	
47	CB_ON1		
46	DO_01	50/51, 67P (OCR, DOCR)	General DO (Normal/Pulse)
45	DO_02	50/51N, 67N(OCGR, DOCGR)	General DO (Normal/Pulse)
44	DO_03	27 (UVR) Note3)	General DO (Normal/Pulse)
43	DO_04	59 (OVR)	General DO (Normal/Pulse)
40	DO_05	81O(OFR), 81U(UFR), 81R(ROCOF,df/dt)`	General DO (Normal/Pulse)
39	DO_06	86X	General DO (Normal/Pulse)
38	DO_07	32P, 32rP Note4)	General DO (Normal/Pulse)
36	DO_08	Reserved(Not available)	-
35	DO_09	Pick-up (Relay elemen Pick-up)	Unchangeable
34	DO_10	Power_Fail/Diag_Err (Power failure and self diagnosis)	

Note) 1. In case of General DO, Normal (Holding) or Pulse (0.1~10s) output can be selected.
2. Relay element output is latched on with a self-maintaining circuit configured.
3. When setting up the UVR Auto Reset, the DO self-maintaining circuit must be released at Logic Diagram.
4. There is no 32P, 32rP in CB OPEN output, so you need to modify LOGIC if necessary.

Dimensions





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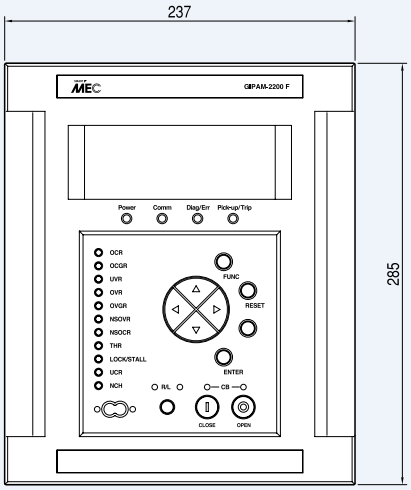
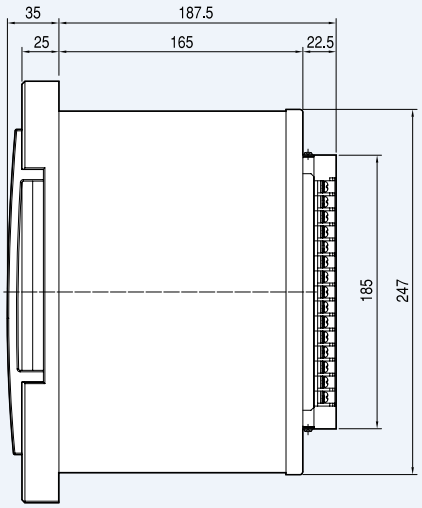
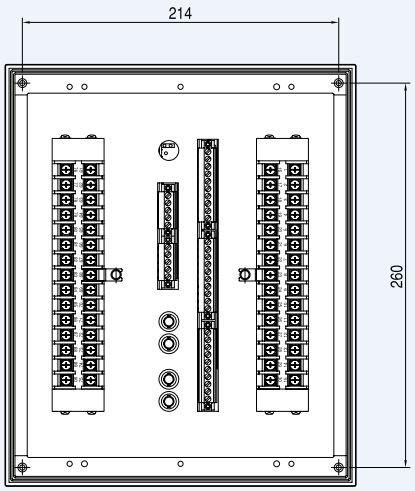






C

GIPAM2200

FN

Protection Use & Transformer Input	
FN	Feeder, Incoming, Motor / NCT
FZ	Feeder, Incoming, Motor / ZCT
T1	Transformer / Pri_NCT, Sec_NCT
T2	Transformer / Pri_NCT, Sec_ZCT
T3	Transformer / Pri_ZCT, Sec_NCT
DG	Linked cable protection
IG	Linked cable protection

RS

Communication	
RS	RS-485, 422
OP	Fiber Optic

D

Protocols	
D	DNP 3.0
M	MODBUS

110V

PT Rating
110V
100V

5A

CT Rating
5A

60Hz

Frequency
60Hz

AC/DC 110V

Control Power
AC/DC 110V

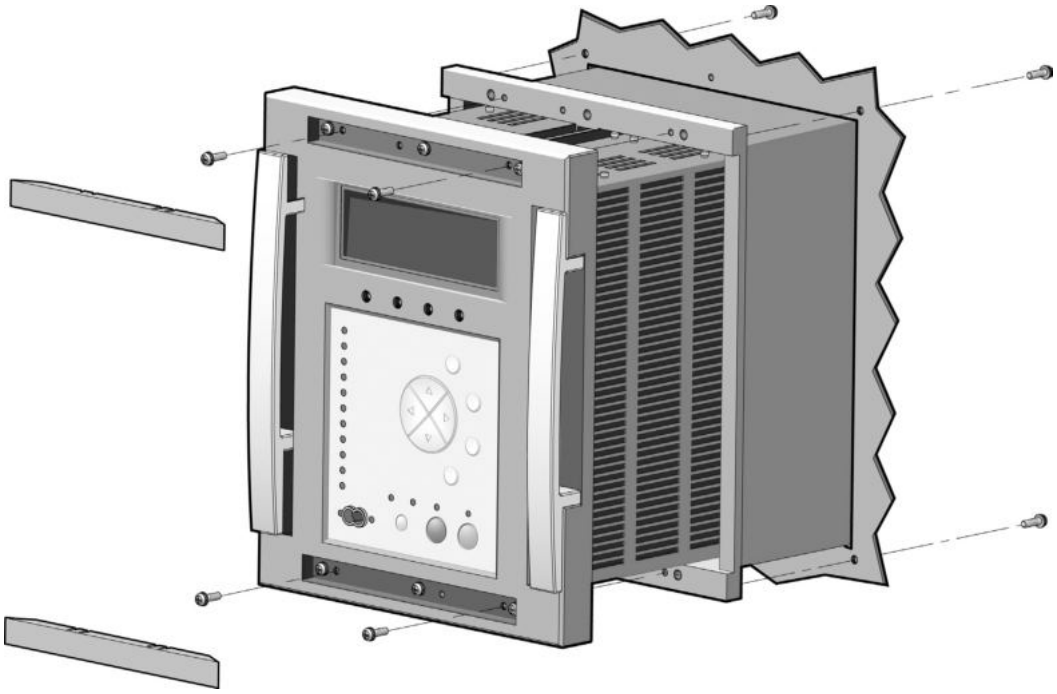
DI_AC/DC 110V

Digital Input Power
AC/DC 110V

AI

Analog Input	
AI	4 ~ 20mA
-	None

GIPAM - OPTO MASTER — IrDA(infrared) Serial Port(Option)



A complex power protection monitoring device with 7 protection elements and various measurement elements used for receiving and distributing panel fault monitoring, protection and monitoring

GIPAM115 FI

D

GIPAM115 FI

Digital Integrated Protection & Monitoring Equipment

It is a complex power protection monitoring device with 7 protection elements and various measurement elements for receiving and distributing panel fault monitoring, protection and monitoring service. It also achieves high reliability with self-diagnosis function through μ-Processor, and it reinforced user convenience by displaying various measurements, event/fault and operation status of individual elements of the relay.

- Various protection functions and fault cause analysis
- Display of various measurements
- Improved Reliability through Self-Diagnosis
- Data communication function
- Simplified structure and easy maintenance

Contents

Features

Various Protection Function & Easy Fault Analysis

7 protection functions of OCR, OCGR, OVR, UVR, OVGR, SGR and POR are integrated in one as digital calculations which will improve protection collaboration system reliability through protection function combinations and accurate operation time, and it records the voltage and current at the time of fault thereby allowing for easy fault analysis.

EVENT & FAULT RECORDING Function

For easy fault analysis, the Event/Fault recording function has undergone significant upgrades.

1. EVENT: 128EA, FAULT: 32EA
2. Event Recording Items: Relay element Pick-up/Operate,
   DI/DO COS[Note)], Setting Change, CB ON/OFF,
   Event Record Time

Note) COS: Change of Status

Display of Various Measurements

Various electric measurements (V, A, W, VAR, WH, VARH, PF, F, Vo) along with circuit breaker operation time and open/close count are displayed as digital and analog bar graphs on the LCD, and symbols indicating the ON/OFF status of the circuit breaker and individual protection relays improve user convenience.

High-Precision Measurement

Single quantity precision such as voltage and current is 0.5%, and complex quantity precision such as power is 1.0%.

Improved Reliability through Self-Diagnosis

Self-diagnosis function enabled by μ-Processor which helps it achieves higher reliability.

Communication Function

Universal MODBUS communication

- Communication Method: RS485
- Address: 1~247
- Baud Rate: 9600, 19200, 38400bps
- SWAP function

Simplified Structure & Easy Maintenance

Various instruments of receiving/distribution panels, control and switches, status lamps and protection relay functions are integrated into a single device, thereby significantly reducing the amount of wiring and creating a simplified structure, and then it can be applied on various power systems by configuring the PT ratio, CT ratio and wiring method.

D

Ratings

Type			Specification
Wiring			1P2W, 1P3W, 3P3W, 3P4W
Rating	Frequency		60Hz, 50Hz
	Voltage	PT	110V or 100V (Select)
		GPT	190V
	Current	CT	5A
		ZCT	1.5mA
	Power		AC 110V, DC 110/125V
	Power consumption		15W or less : Stanby 70W or less : Operation
	Burden		0.5VA or less : PT 1.0VA or less : CT
Input contact	for general		Digital Input AC/DC 110V
Output contact	for trip		Contact switching capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: AC 4000VA, DC 480W
	for alarm		Contact switching capacity: AC 250V 5A/DC 30V 5A, Resistive Load Max. switching capacity: AC 1250VA, DC 150W
Insulation Resistance			DC 500V 10MΩ or more
Insulation Voltage			AC 2kV(1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 2 times of rated current for 3 hours. Withstand 20 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Altitude			1,000m or less
Environment			A place not subject to abnormal vibration and shock. A place where the surrounding air pollution is not remarkable.
Applied Standards			IEC60255, KEMC 1120, IEC61000
Dimension(mm)			444 x 216 x 207
Weight			10.5kg
Communication			RS485 : Modbus

Note) I/O contacts are fixed (user configuration not available)

Measurement Specification

Type		Range	Remarks
Voltage	Voltage (V)	5~414,000V	PT SETTING : 110 ~ 345,000V/1V (1st), 110V or 100V (2nd)
	Zero-phase voltage (V_O)	5~190V	-
Current	Current (A)	0.05~7,200A	CT SETTING : 5 ~ 6000A/1A (1st), 5A Fixed (2nd)
	Zero-phase current (I_O)	0.5~40A	Displayed only during OCGR use and displayed as secondary NCT current
power	Active power(W)	0~9,999MW	Effective Power = 0 (Min. Measurement Voltage or Current or less) or (PF<0: Reverse Effective Power is displayed as 0)
	Reactive power(var)	0~9,999MVar	Reactive Power = 0 (Min. Measurement Voltage or Current or less)
Energy	Active energy (Wh)	0~9,999MWh	LCD Graphic bar 5EA increase during Roll_over
	Reactive energy (varh)	0~9,999MVarh	
Frequency (F)		45~65Hz	Frequency = 0 (45[Hz] or less or 65[Hz] or more) or (Secondary PT Voltage 50[V] or less)
Power Factor (PF)		Lead/Lag 0~100%	Lead , Lag

Function & Rating

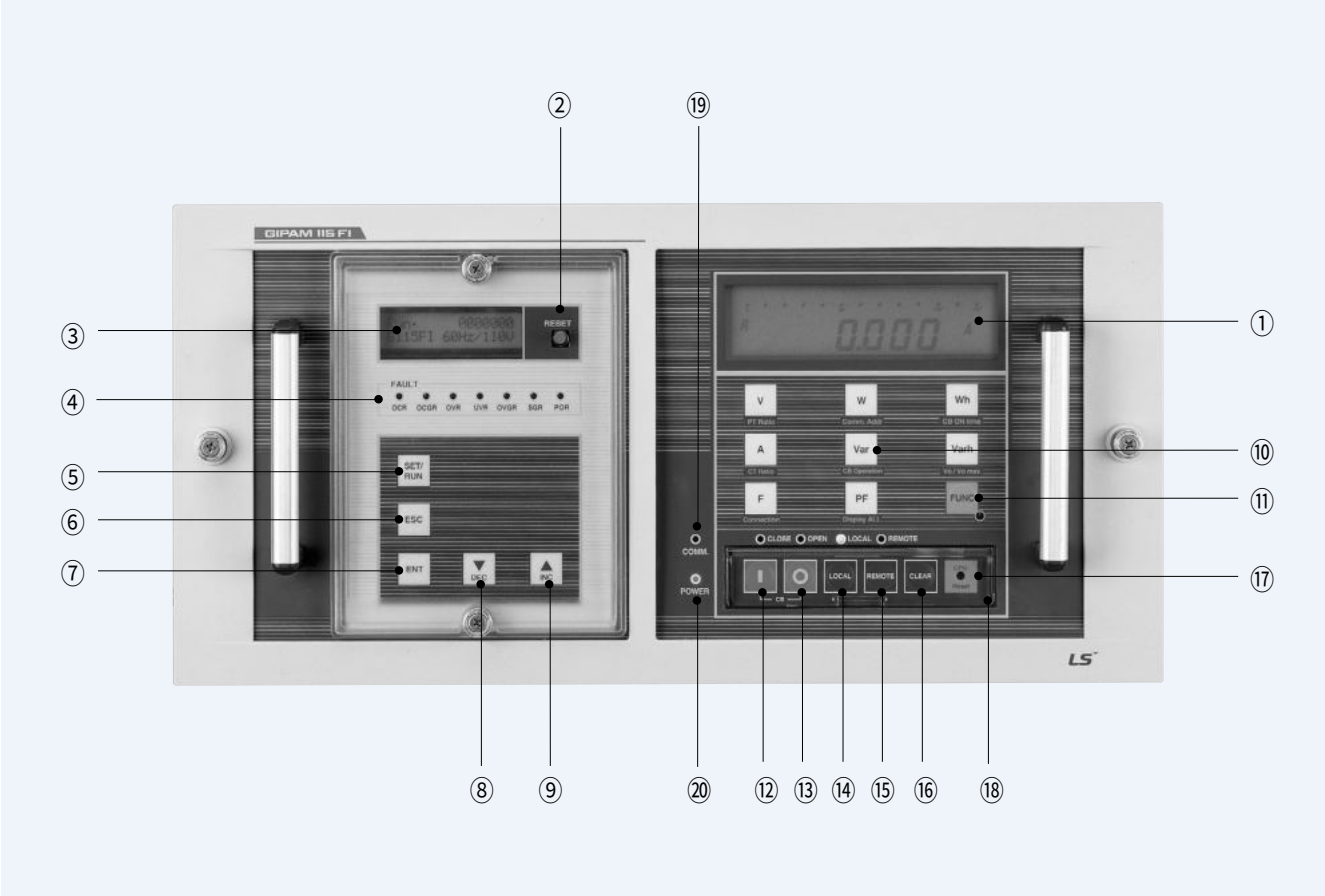
Protection characteristic (Refer to the operating characteristics for details)

Protection		Setting Range	Operating time		Note
			Setting	Curves	
OCR	Instantaneous (High)	OFF, 2 ~ 24In/1In	0.04 ~ 60.0s/0.01s	Instantaneous Definite	
	Time delay (Low)	OFF, 0.2 ~ 10.0In/0.1In	0.05 ~ 1.2/0.01	Inverse Definite	D2, D4, D8, SI, VI, EI, LI Note1)
OCGR	Instantaneous (High)	OFF, 0.5 ~ 8.0In/0.5In	0.04 ~ 60.0s/0.01s	Instantaneous Definite	Block Time: Note2) 0.1~60.0s/0.1s
	Time delay (Low)	OFF, 0.1 ~ 0.5In/0.02In	0.05 ~ 1.2/0.01	Inverse Definite	
OVR	1st setting (High)	OFF, 0.80 ~ 1.60Vn/0.02Vn	0.1 ~ 60.0s/0.01s	Definite	
	2nd stting (Low)	OFF, 0.80 ~ 1.60Vn/0.02Vn	0.1 ~ 60.0s/0.01s	Definite	
UVR	1st setting (High)	OFF, 0.20 ~ 0.90Vn/0.02Vn	0.1 ~ 60.0s/0.01s	Definite	Low voltage Lock Note3) (Less than 15V)
	2nd stting (Low)	OFF, 0.20 ~ 0.90Vn/0.02Vn	0.1 ~ 60.0s/0.01s	Definite	
OVGR	1st setting (High)	OFF, 0.10 ~ 0.40Von/ 0.02Von (Von=190V)	0.1 ~ 60.0s/0.01s	Definite	
	2nd stting (Low)	OFF, 0.10 ~ 0.40Von/ 0.02Von (Von=190V)	0.1 ~ 60.0s/0.01s	Definite	
SGR	Zero-phase current (I_o)	OFF, 0.6 ~ 3.6Ion/0.2Ion (Ion=1.5mA)	0.1 ~ 60.0s/0.01s	Definite	Ungrounded Type GR Mode ON/OFF Select
	Zero-phase voltage (V_o)	0.1 ~ 0.40Von/0.02Von (Von=190V)			
	Base sensitivity phase angle(RCA)				
POR	1st setting (High)	OFF, 5 ~ 100%/1%	0.1 ~ 60.0s/0.01s	Definite	
	2nd stting (Low)	OFF, 5 ~ 100%/1%	0.1 ~ 60.0s/0.01s	Definite	

Note) 1. Definite Time Calculation: t=T×Step (sec)
Definite(D2) T = 2
Definite(D4) T = 4
Definite(D8) T = 8
2. Refer to chapter remarks for protection function OCGR
3. Refer to remarks for protection function UVR

Measurement

Measurement element		Range	Accuracy(%)	Remarks
Voltage	Voltage (V)	5~414,000V (Bar Graph 0 ~ 120%)	±0.5%	V_r, V_s, V_t, V_{rs}, V_{st}, V_{tr}
	Zero-phase voltage (V_o)	5~190V (Bar Graph 0 ~ 120%)	-	V_o, V_o_max (Peak)
Current	Current (A)	0.05~7,200A (Bar Graph 0 ~ 120%)	±0.5%	I_r, I_s, I_t
	Zero-phase current (I_o)	0.5~40A	-	Displayed only when using OCGR
power	Active power(W)	0~9,999MW (Bar Graph 0 ~ 120%)	±1.0%	-
	Reactive power(var)	0~9,999MVar	±1.0%	-
Energy	Active energy (Wh)	0~9,999MWh (Bar Graph 0 ~ 120%)	±1.0%	-
	Reactive energy (varh)	0~9,999MVarh (Bar Graph 0 ~ 120%)	±1.0%	-
Frequency (F)		45~65Hz	±0.5%	
Power Factor (PF)		Lead/Lag 0~100%	±1.0%	



① LCD Display

② Fault Indicator Reset Switch

③ 16 × 2 LCD

④ Fault Indicator LED

⑤ SET/RUN key
- Shift to Setup Mode located at Top Menu

⑥ ESC key
- Cancel, move to top menu

⑦ ENT key
- Save edited data or Clear

⑧ ▼ key
- Data decrease, move Cursor

⑨ ▲ key
- Data increase, move Cursor

⑩ Measurement select key

⑪ Function key (Red LED)

⑫ CB ON key (Red LED)

⑬ CB OFF key (Green LED)

⑭ Local key (Red LED)
- Operate local output contact
- Setting local control of CB

⑮ Remote (Green LED)
- Operate Remote output contact
- Setting remote control of CB

⑯ Clear Key
- Effective/Reactive electric energy, CB open/close count, CB current supply time, Max zero-phase voltage clear

⑰ Device Reset key

⑱ Protection Cover

⑲ COMM LED (Red)
- Blinks during communication

⑳ POWER LED (Red)

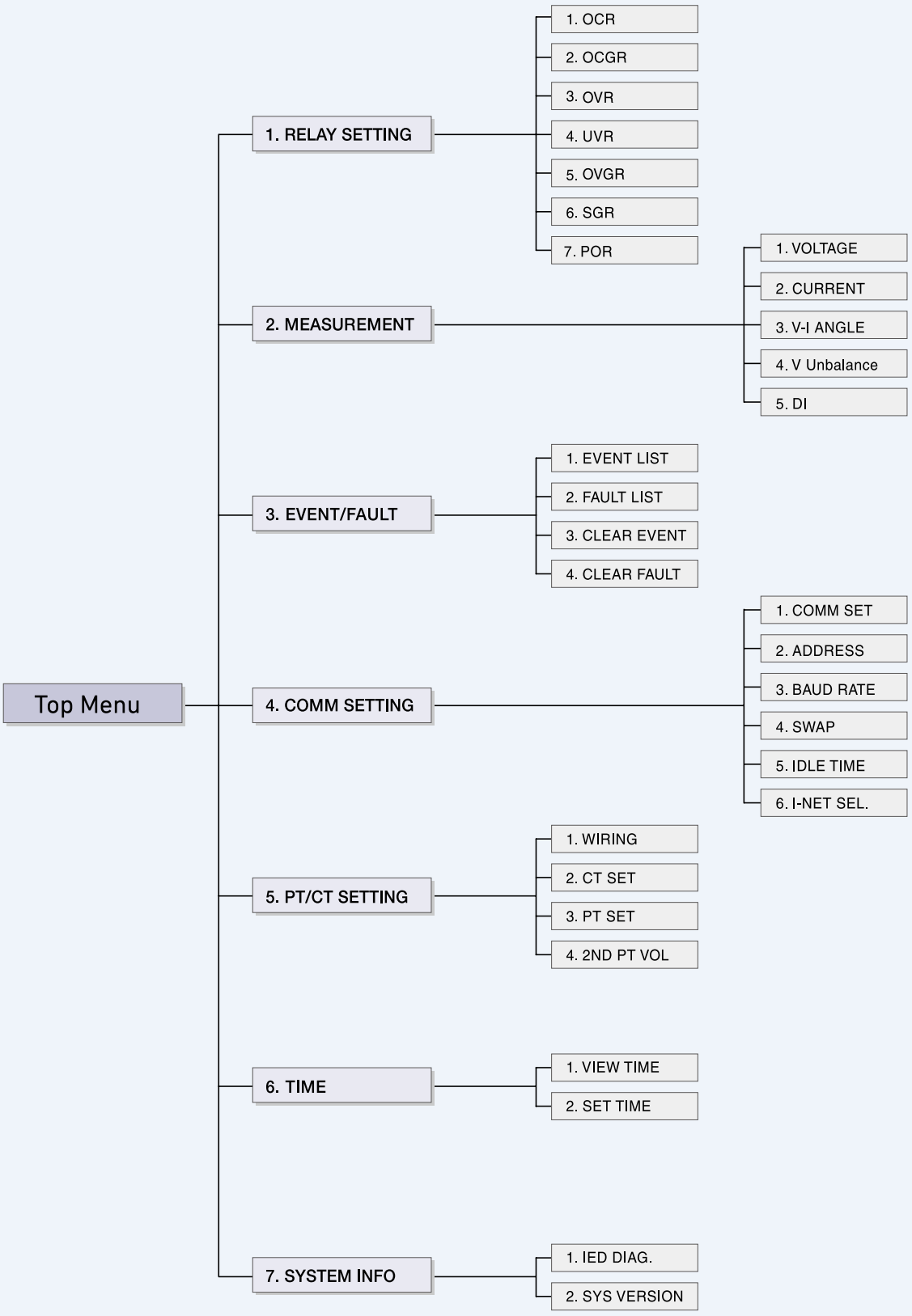
Operation & Setting

Basic Function & Operation

LED Type	Description
POWER LED 	Display power status (red). Remains ON if normal operation continues.
COMM LED 	Displays remote communication status (red). Blinks if the communication card communicates properly, or the card is receiving/sending data.
PICK-UP/TRIP LED 	Display relay status (red). If relay is at pick-up status due to detecting a system accident, it blinks once/second. Remains ON if the relay is operating (trop) due to system accident. This LED can only be released by pressing the RESET key of the relay or Reset Relay from remote communication.
LOCAL/REMOTE 	Local: Red, Remote: Green, and is located on top of the L/R key. It displays the current Local/Remote status.
CB CLOSE/OPEN 	Lights up red/green and is located on top of the CLOSE/OPEN key. It displays the current status of the CG connected to the relay. If CB is at CLOSE status, LED = red, and if CB is at OPEN status, LED = green.

Basic Key Function & Operation

Key Types	Corresponding Menu	Description
Direction Keys (Up/Down) /(DEC, INC) 	Menu Tree	Move the Cursor between menus
	Correct & Setting of Menu	Move Cursor to data to configure
ENT Key	Correct & Setting of Menu	Save changed data or Clear
	Menu Tree	Move to menu using the Cursor
ESC Key	Correct & Setting of Menu	Cancel changed data
	Menu Tree	Move to upper menu
SET/RUN Key 	Relay Element Setting Menu	Select relay element to use, Move to Setting Menu
CLOSE Key OPEN Key 	All Menus	Used when controlling CB Close key is used to close CB Open key is used to open CB
LOCAL/ REMOTE Key 	All Menus	Used to shift device control from Remote to Local or from Local to Remote.
CLEAR Key 	All Menus	Used to reset accumulated value (Reactive/Effective Electric Energy, Open/Close Count, etc.).


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

Operation Characteristics

Protection element Characteristics

Type	setting mode		Screen	Range / Step (Converted Value)	Remarks
OCR (50/51)	Instantaneous current (High)	Operating current	I>>	OFF, 2 ~ 24In/1step (10 ~ 120A)	In = 5A
		Operating time	t	0.04 ~ 60.0s/0.01step	0.04: Instantaneous, 0.05 or more: Definite
	Time current (Low)	Operating current	I>	OFF, 0.2 ~ 10.0In/0.1step (1 ~ 50A)	In=5A
		Operating time	t	0.05 ~ 1.20/0.01step	
		Operation Characteristics	Cv	Definite(D2, D4, D8), Inverse (SI, VI, EI, LI)	
	Operating Mode		MD	-, AL, TP	
Note1) OCGR (50/51N)	Instantaneous current (High)	Operating current	In>>	OFF, 0.5 ~ 8.0In/0.5step (2.5 ~ 40A)	In = 5A
		Operating time	t	0.04 ~ 60.0s/0.01step	0.04: Instantaneous, 0.05 or more: Definite
	Time current (Low)	Operating current	In>	OFF, 0.10 ~ 0.50In/0.02step (0.5 ~ 2.5A)	In = 5A
		Operating time	t	0.05 ~ 1.20/0.01step	
		Operation Characteristics	Cv	Definite(D2, D4, D8), Inverse (SI, VI, EI, LI)	
	Block Time		t	0.1 ~ 60.0s/0.1step	OCGR function block for a specified time when the motor starts (applied more than 1A of phase current)
	Operating Mode		MD	-, AL, TP	
OVR (59)	1st setting (High)	Operating Voltage	V>>	OFF, 0.80 ~ 1.60Vn/0.02step (80 ~ 176V)	Definite, Vn=100 or 110V
		Operating time	t	0.1 ~ 60.0s/0.01step	
	2nd setting (Low)	Operating Voltage	V>	OFF, 0.80 ~ 1.60Vn/0.02step (80 ~ 176V)	
		Operating time	t	0.1 ~ 60.0s/0.01step	
	Operating Mode		MD	-, AL, TP	
UVR (27)	1st setting (High)	Operating Voltage	V<<	OFF, 0.20 ~ 0.90Vn/0.02Vn (20 ~ 99V)	
		Operating time	t	0.1 ~ 60.0s/0.01step	
	2nd setting (Low)	Operating Voltage	V<	OFF, 0.20 ~ 0.90Vn/0.02Vn (20 ~ 99V)	Note2) Definite (UVR Look: Does not work under 3 phase voltage 15V.)
		Operating time	t	0.1 ~ 60.0s/0.01step	
	Operating Mode		MD	-, AL, TP, TA	
OVGR (64)	1st setting (High)	Operating Voltage	Vo>>	OFF, 0.10 ~ 0.40Von/0.02step (19 ~ 76V)	Definite, Von=190V
		Operating time	t	0.1 ~ 60.0s/0.01s	
	2nd setting (Low)	Operating Voltage	Vo>	OFF, 0.10 ~ 0.40Von/0.02step (19 ~ 76V)	
		Operating time	t	0.1 ~ 60.0s/0.01s	
	Operating Mode		MD	-, AL, TP	
Note1) SGR (67G)	Zero phase Current		Io	OFF, 0.6 ~ 3.6/0.2step (0.9 ~ 5.4mA)	Definite, Ion=1.5mA, Von=190V
	Zero phase voltage		Vo	0.1 ~ 0.4/0.02step (19 ~ 76V)	
	Operating time		t	0.1 ~ 60.00s/0.01s	
	GR Mode		-	ON/OFF (If ON is selected, it operates only with Io value.)	
	Operating Mode		MD	-, AL, TP	
POR (47)	1st setting (High)	Operating Voltage	Vu>>	OFF, 5 ~ 100%/1%	Definite
		Operating time	t	0.1 ~ 60.0s/0.01s	
	2nd setting (Low)	Operating Voltage	Vu>	OFF, 5 ~ 100%/1%	
		Operating time	t	0.1 ~ 60.0s/0.01s	
	Operating Mode		MD	-, AL, TP	

Note 1) OCGR and SGR cannot be used simultaneously.
Note 2) Used to prevent UVR operation in relay element test and generator shutdown
※ Mode of operation description
1) -- : Front LED lights up
2) AL : Front LED ON + Alarm DO + Relay Element DO Operation
3) TP : Front LED ON + Alarm DO + Relay element DO + CB OFF
4) TA : Front LED ON + Alarm DO + Relay element DO + CB OFF Contact operation + Auto Reset

Measurement Display

Press each key on the measurement part of the front panel to check the measurement of choice..

- [V] : Voltage
  [$V_{RS} \rightarrow V_{ST} \rightarrow V_{TR} \rightarrow V_{RN} \rightarrow V_{SN} \rightarrow V_{TN}$]
- [A] : Current
  [$I_R \rightarrow I_S \rightarrow I_T \rightarrow I_N$]
- [W] : Active power
- [Var] : Reactive power
- [Wh] : Active power amount
- [Varh] : Reactive power amount
- [F] : Frequency
- [PF] : Power Factor

[FUNC] Displays special function mode is dependent on the key combination.

- [FUNC] + [V] : PT ratio setting display
- [FUNC] + [A] : CT ratio setting display
- [FUNC] + [F] : Display set wiring method
- [FUNC] + [W] : Display communication address set in Main Board Communication Part
- [FUNC] + [Var] : Display circuit breaker open/close count
- [FUNC] + [PF] : Display all measurements in a sequential order (V→A→W→Var→ Wh→Varh→F→PF, All phases with voltage and current measurements)
- [FUNC] + [Wh] : Display circuit breaker current supply time (operation time)
- [FUNC] + [Varh] : N1–Display image voltage(Vo)
  N2–Display max. image voltage(Vo-max)

Self-Diagnosis Function

Screen layout during Auto Diagnosis (LCD on the right)

In case of internal faults, an error code is displayed on the measurement LCD, and details of each error code is as follows:

-ERROR 101: CT/PT Calibration Execution Error
-ERROR 102: Interrupt Error
-ERROR 103: S/W Run Error
-ERROR 104: Setting Error
-ERROR 301: Error in Internal Communication with Relay CPU

Fault Classification & Operation (LCD on the left)

Fault Classification	Operation
Diagnosis Error P-F (POWER FAIL)	If power module voltage drops below a certain level after self-voltage monitoring, “P-F” is displayed on the LCD. Once the power fail status is removed, the system resumes normal operation. ※Take caution that both WH and VARH are plausible cases to be cleared using Clear Key during POWER FAIL operation.
No Calib	If no valid data is collected during CT/PT calibration execution monitoring or if calibration is not performed, “No Calib” is displayed. System resumes once calibration is performed
Diagnosis Error NV	If an internal memory fault occurs, “NV” is displayed.
Diagnosis Error SET	If a relay element operation related setting fault occurs, “SET” is displayed.
Diagnosis Error ADC	If an internal analog conversion circuit fault occurs during operation, “ADC” is displayed.

Various Fault/Event Recording

Saves events and other fault related information such as relay operation status, monitoring I/O output status, control status and setting change

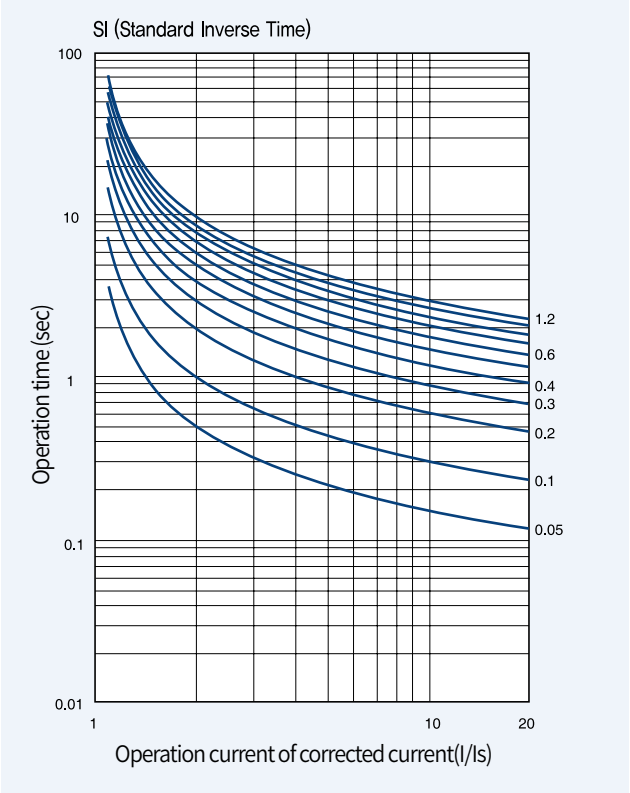
Function Details

Items	Configuration	Contents
Relay Pick Up	Picked-up Relay, Time Tag	Display operated relay element/time
Relay Operation	Operated Relay, Time Tag	Display trip causing relay element/time
Relay Trip (Fault)	Operated Relay, Time Tag	Display DI status change/time
DI COS	Change of DI Status, Time Tag	Display DO status change/time
DO COS	Change of DO Status, Time Tag	Display CB ON/OFF, power ON time
Control	CB, Control Contact, Power ON	Display CB ON/OFF, power ON time
Relay Setting	Change of Relay Setting Parameter	Display relay element setting change/time
System Configuration	Change of System Configuration	Display user environment change/time

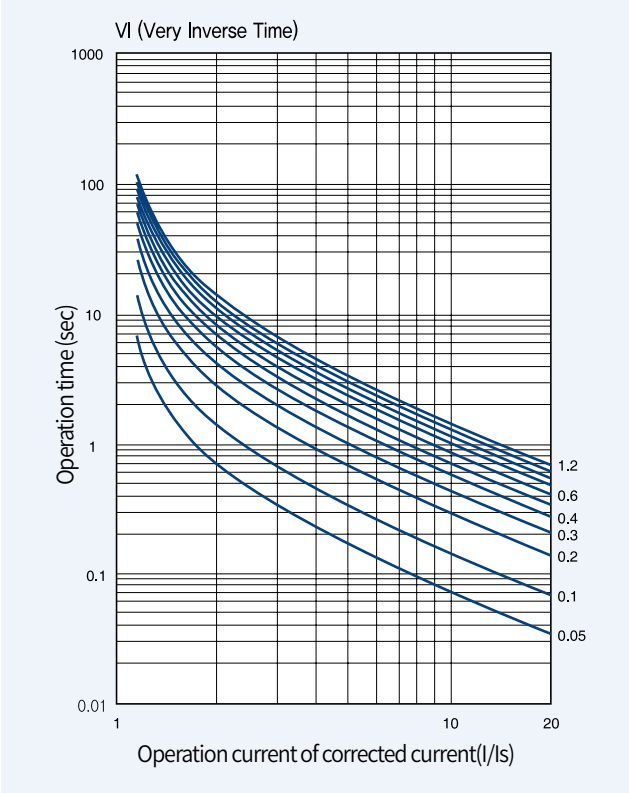
*Fault information recording is recorded along with 32 other items including current and voltage stored at the time of fault occurrence
-Recorded Information: VR, VS, VT, VO, IR, IS, IT, IO, IN, Vunbal

Characteristic Curve

Long Inverse Time
- OCR, OCGR, OVGR



Very Inverse Time
- OCR, OCGR



Operation time characteristic

- Long Inverse Time(SI) $t = \frac{0.14}{(I/IS)^{0.02} - 1} \times TL$
- Very Inverse Time(VI) $t = \frac{13.5}{(I/Is) - 1} \times TL$
- ExtremelyInverse Time(EI) $t = \frac{80}{(I/Is)^{2} - 1} \times TL$
- Long Inverse Time(LI) $t = \frac{120}{(I/Is) - 1} \times TL$

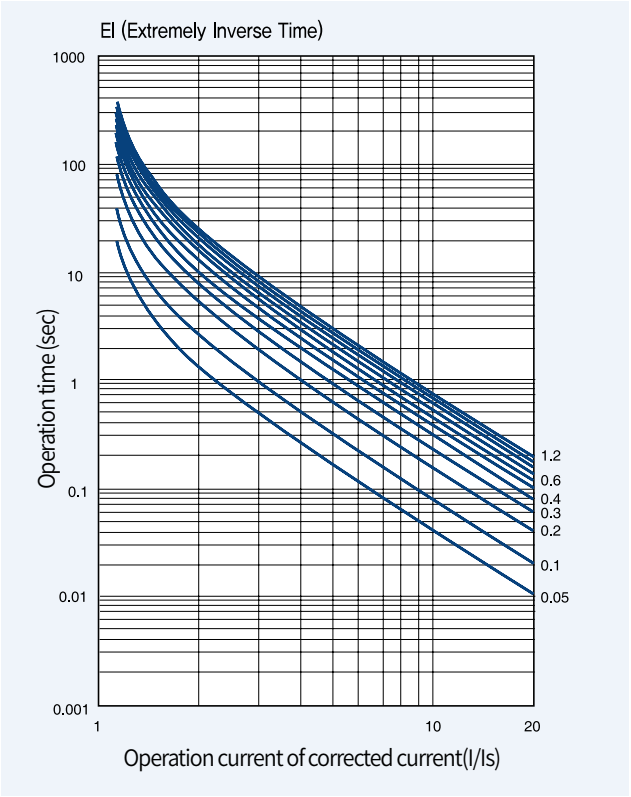
(※ OVGR is based on V / VS.)

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

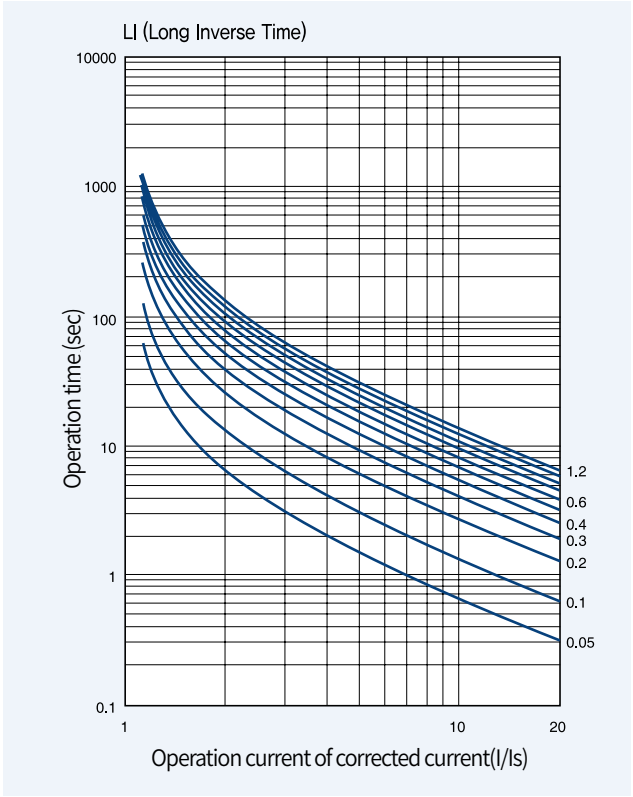
Note) Definite time calculation method: t = T x step (seconds)

t = Operation time
I = Operation Value
Is = Correction Value
α = Characteristic curve dimension
TL = 0.05 ~ 1.20 (Time Correction Lever)

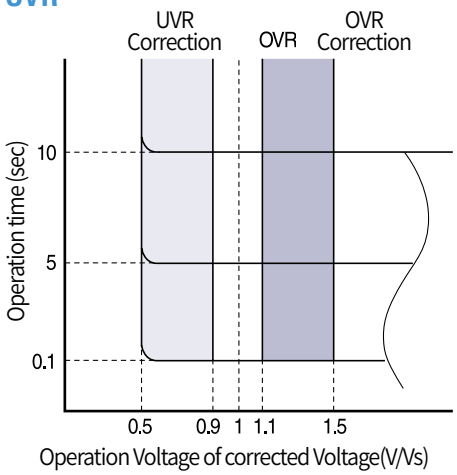
Extremely Inverse Time
- OCR, OCGR



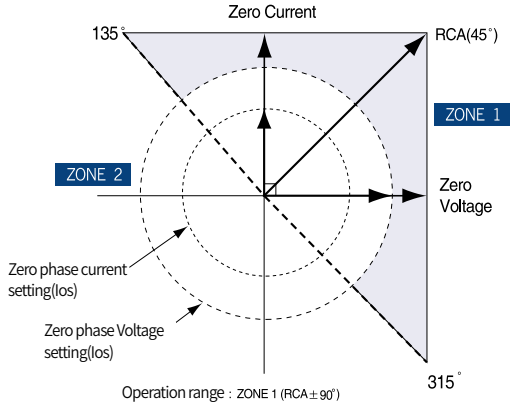
Long Inverse Time
- OCR, OCGR



Definite Time
- UVR, OVR



SGR operation phase characteristic



■ ZONE 1 voltage status: Vo > Vos, Io > Ios
■ RCA (Relay Characteristic Angle)

• **POR (Open phase relay element)**

Imbalance voltage calculation equation $V_{unbal} = \frac{V_{max} - V_{min}}{V_{avg}} \times 100\%$ (5-100% of Operation Value/1% Unit Setting)

$V_{max} = \max(|Va|, |Vb|, |Vc|)$

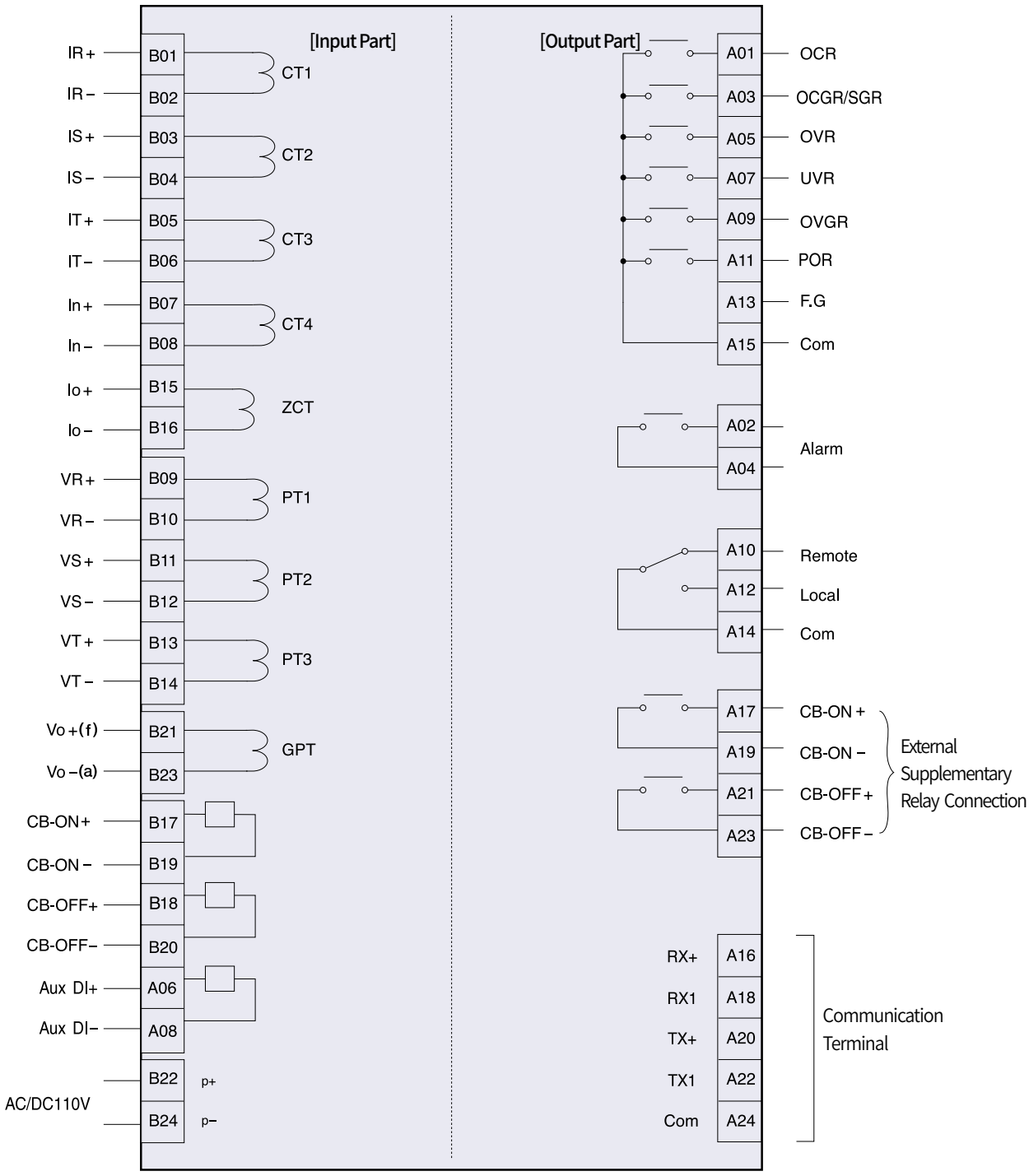
$V_{min} = \min(|Va|, |Vb|, |Vc|)$

$V_{avg} = (|Va| + |Vb| + |Vc|) \times \frac{1}{3}$

Wiring

⚠ Caution

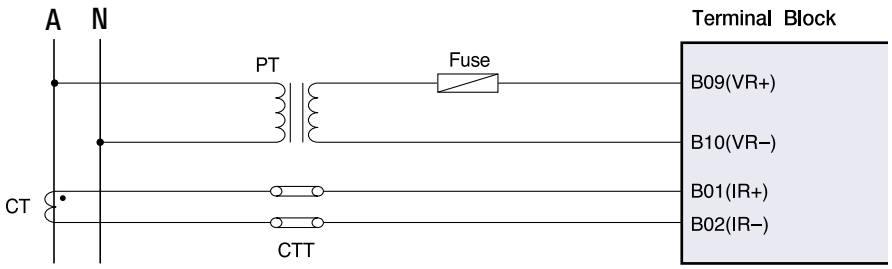
System power must not be connected in parallel with a device that generates noise.
After installing the device, press the Clear Switch to reset all existing data.



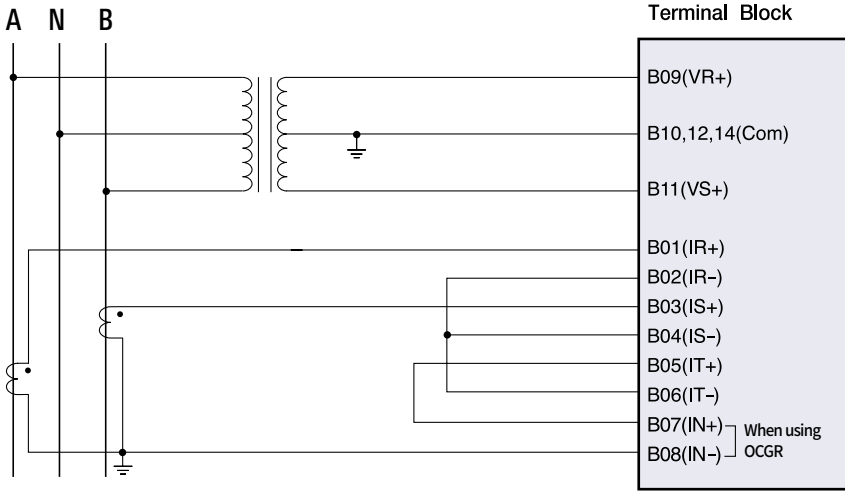
* Terminal Block : Draw-Out Type
*CT Terminal is automatically shorted upon Draw-Out

D

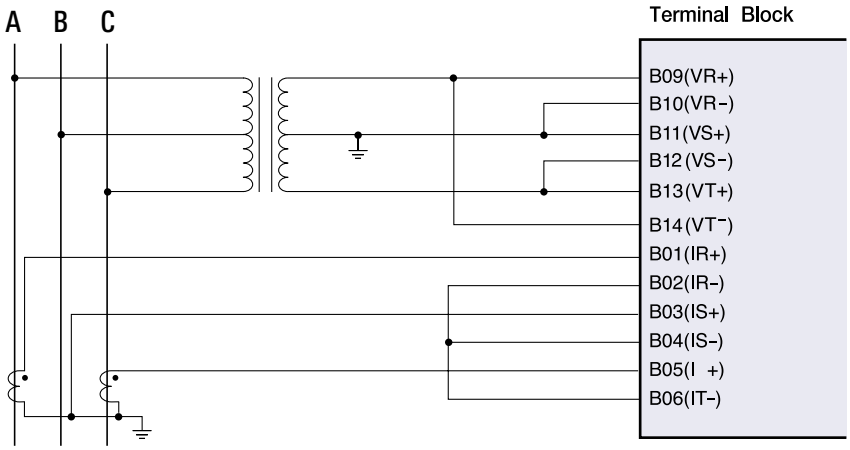
Single Phase 2 Wire System



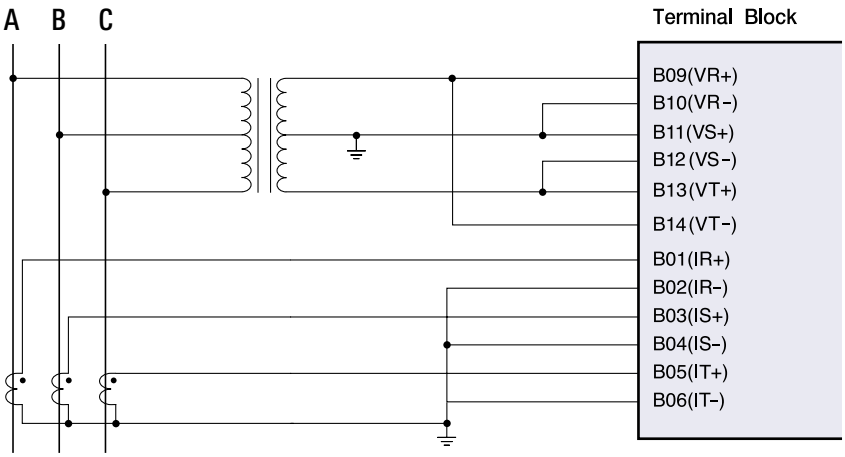
Single Phase 3 Wire System



3-phase 3-wire (2CT, 2PT) system

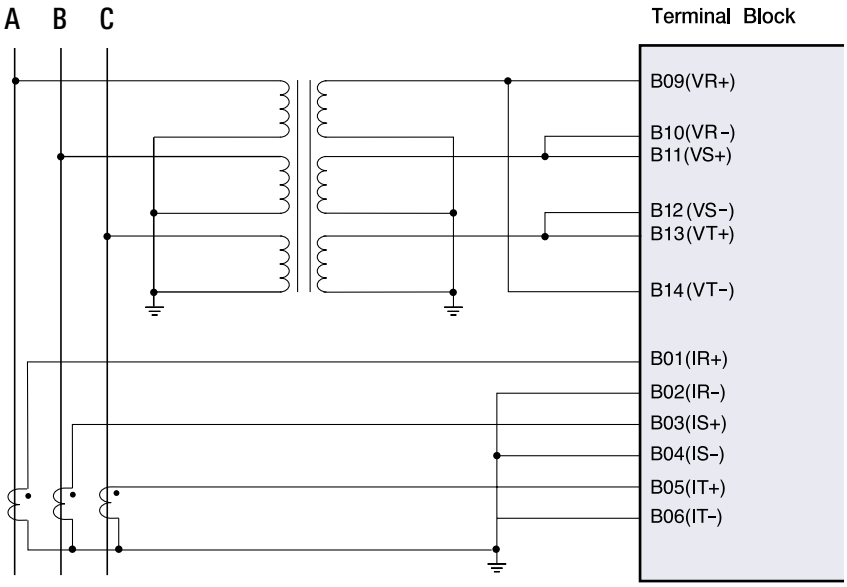


3-phase 3-wire (3CT, 2PT) system



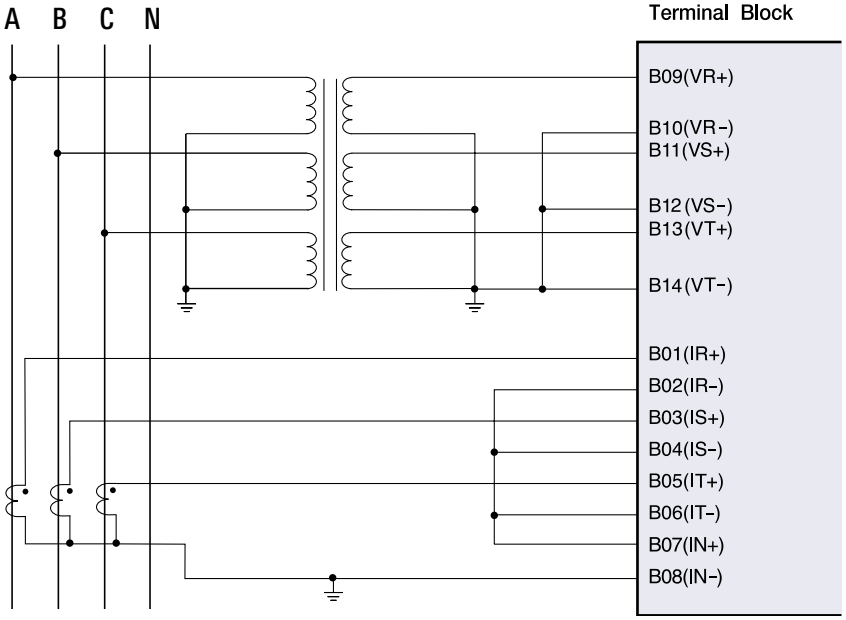
Wiring

3-phase 3-wire system

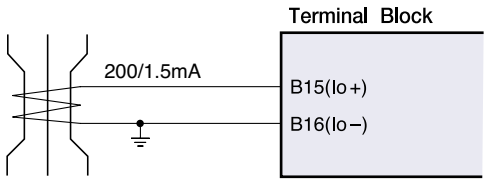


3-phase 4-wire system

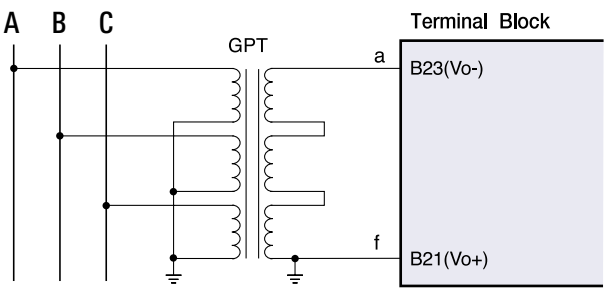
※ Neutral point CT (NCT) can be used



ZCT Connection



GPT Connection



Terminal Block

	[OUTPUT Terminal Positioning]		
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	RX+	A16
A17	CB ON+	RX-	A18
A19	CB ON-	TX+	A20
A21	CB OFF+	TX-	A22
A23	CB OFF-	COMM GND	A24

	[INPUT Terminal Positioning]		
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

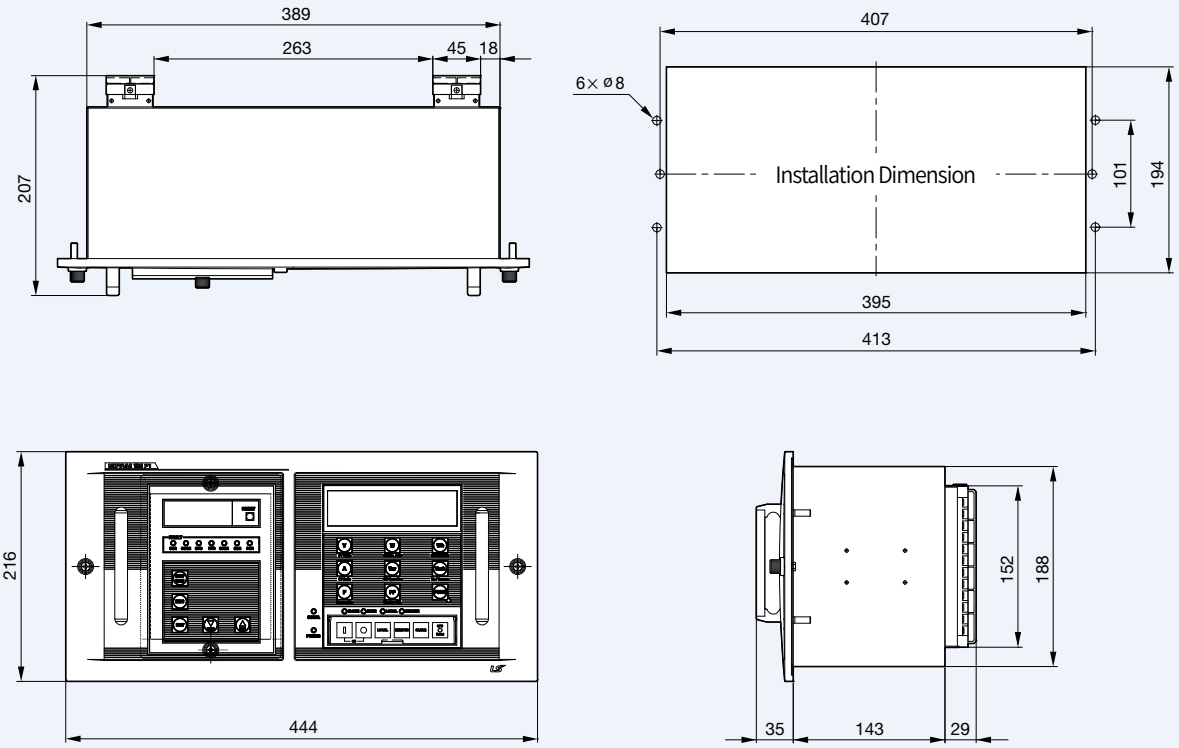
I/O Contact Configuration

Terminal Details	Terminal Number	Base setting use	Remarks
OCR	A01	General DO	OCR Output contact
OCGR/SGR	A03	General DO	OCGR Output contact or SGR Output contact
OVR	A05	General DO	OVR Output contact
UVR	A07	General DO	UVR Output contact
OVGR	A09	General DO	OVGR Output contact
POR	A11	General DO	POR Output contact
F.G	A13	F.G Terminal	
ALARM COM	A15	General DO COM	Relay element output contact and use
CB ON+	A17	CB ON status input	External supplementary relay(CX) connection recommended
CB ON-	A19		
CB OFF+	A21	CB ON status input	External supplementary relay(TX) connection recommended
CB OFF-	A23		
ALARM+	A02	General DO	Operation set upon an accident (Alarm Trip Mode output upon relay operation)
ALARM-	A04		
Aux DI+	A06	General DI	Used as general digital input such as Circuit breaker interlock, D/S status, E/S status, etc.
Aux DI-	A08		
REMOTE	A10	General DO	REMOTE status Output contact
LOCAL	A12	General DO	LOCAL status Output contact
L/R COM	A14	General DO COM	L/R status Output contact and use
CB ON+	B17	CB ON status input(52a)	
CB ON-	B19		
CB OFF+	B18	CB OFF status input(52b)	
CB OFF-	B20		

*General DO cannot be used for circuit breaker control

Dimensions & Ordering

Dimensions



Ordering

GIPAM115

FI	RS	M	110V	5A
Protection Use	Communication	Protocols	PT Rating	CT Rating
FI Feeder, Incoming	RS RS485	M MODBUS	110V	5A

60Hz	AC/DC 110V	DI_AC/DC 110V
Frequency	Control Power	Digital Input
50Hz	AC/DC 110V	AC/DC 110V
60Hz		

Digital protection relay with various protection elements for high-voltage motor fault monitoring, protection and monitoring

DPR1000

E

DPR1000

Digital Protection Relay

It Is a digital protection relay with various protection elements for fault monitoring, protection and monitoring of receiving/distribution system feeders, in particular for high-voltage motor.

- 11 protection elements are integrated for high-voltage motor protection
- Saving of 128 Events, 32 Faults and Fault Waves (up to 32 accident records)
- Used for the protection, monitoring and control systems for high/low voltage medium capacity motors
- MODBUS and RS485 communications
- Compact protection relay with various additional functions

Contents

Features

Characteristics of Digital Protection Relay DPR1000

Protection and Control Function

Overcurrent(50/51) and Earth-fault Overcurrent(50/51N)
Thermal(49) and Reverse-Phase current(46)
Ground Directional Overcurrent(67G) and Neutral Directional Overcurrent(67N)
Undercurrent(37) and Locked / Stalled(48/51LR)
Notching Device(66) and Bearing Protective Device(38)
Lock-out(86)
5 output contacts(DO) including Circuit Breaker Control, etc.
3 input contacts(DI) including Circuit Breaker Status, etc.

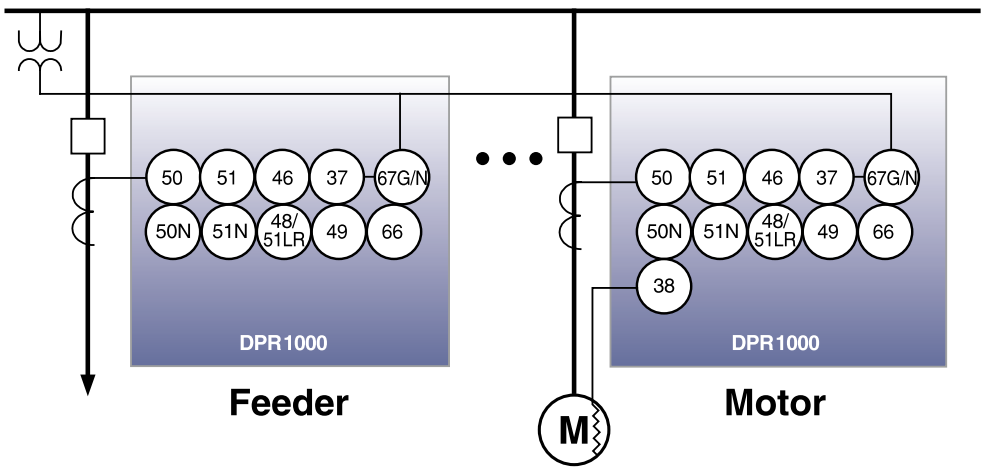
Monitoring and Measuring Function

Cable/Load current, zero phase current, zero phase voltage, reverse phase current, Analog Input DC4 ~ 20mA (2ch.)
Motor start history management event triggered the wave recording including operation current, start time, FLC, thermal, etc.
15 traces including (Ry PU/OP, COS): Ir, Is, It, Io, Vo, Al1, Al2, DI/DO, etc.
CBF, CB/DO operation count, CB/MOTOR operation time recording available

User Interface

20×4 Character LCD
Various communication protocol support (MODBUS)
PC software (GIPAM Manager) available through front panel IrDA (infrared) port

Function Block Diagram



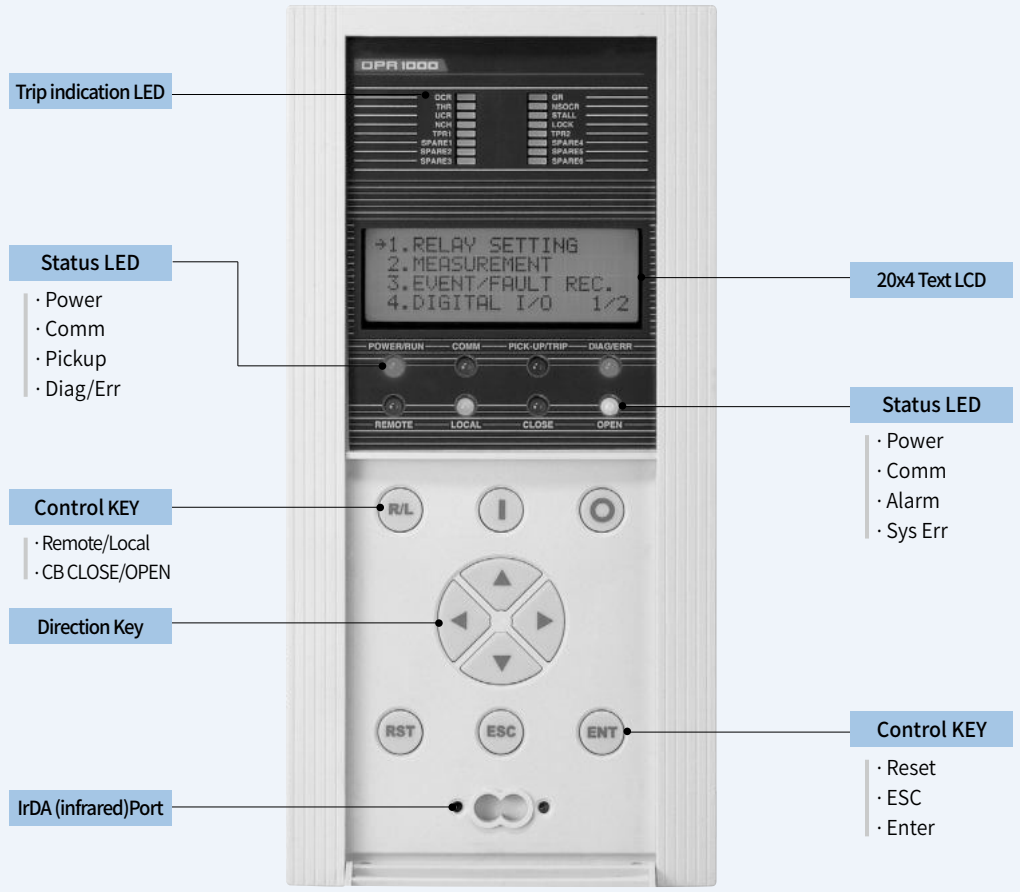
Rating

Type			Specification
Wiring			3P3W, 3P4W
Input	Frequency		60Hz, 50Hz
	Voltage	PT	-
		GPT	190, 190/√3
	Current	CT	5A
		ZCT	1.5mA
	Power		AC/DC 110, DC 125V
	Power consumption		30W or less : Stanby 70W or less : Operation
	Burden		0.5VA or less : PT 0.5VA or less : CT
Input contacts	for general		Digital Input AC/DC 110V
Output contact	for trip		Rated Capacity: AC 250V 16A/DC 30V 16A, Resistive Load Opening Capacity: AC 4000VA, DC 480W
	for alarm		Closed Capacity: AC 250V 5A/DC 30V 5A, Resistive Load Opening Capacity: AC 1250VA, DC 150W
Insulation Resistance			DC 500V 10MΩ or more
Insulation Voltage			AC 2kV(1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 2 times of rated current for 3 hours. Withstand 20 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV : power input 2kV : other input 1kV : analog input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Altitude			1,000m or less
Environment			A place not subject to abnormal vibration and shock. A place where the surrounding air pollution is not remarkable.
Applied Standards			IEC 60255, IEC 61000-4, KEMC 1120
Dimension (W×H×D)			120×245×185 (mm)
Weight			3.4kg
Communication			RS485 : Modbus

Protection element

Model	Protection element
DPR1000 FN	50/51, 50/51N, 46, 67N, 49, 48/51LR, 37, 66, 38
DPR1000 FZ	50/51, 46, 67G, 49, 48/51LR, 37, 66, 38

Appearance



Product front

Key Type	Corresponding Menu	Base Function
▲ ▼	Menu Tree	Move Cursor between menus
	Correct and Setting menu	Move Cursor to data to set up
	Password Setting	Change input password data
◀ ▶	Correct and Setting menu	Change data with Cursor
	Password Setting	Move Cursor
ENT	Correct and Setting menu	Save changed data
	Menu Tree	Move to menu with Cursor
	Confirm Save menu	Save changed data
ESC	Correct and Setting menu	Cancel changed data
	Menu Tree	Move to upper menu
	Confirm Save menu	Cancel save changed data
RST	When relay trip operation	Reset Relay Trip
I O	All menus	Used to control CB. Close key is used to close CB. Open key is used to open CB.
R/L	All menus	Used to shift device control from Remote to Local or from Local to Remote.

Operation Characteristics

Protection element characteristics

Protection element	Operating part	Setting & Operating time	Remarks
OCR (50/51)	Instantaneous High	Setting: OFF. 0.5 ~ 20.0/0.1In	Operates below fixed 40ms
	Instantaneous Low	Setting: OFF. 0.5 ~ 20.0/0.1In Operating time: 0.05 ~ 60.0/0.01s	Definite
	Time delay Low	Setting: OFF. 0.1 ~ 4.0/0.02In Operating time: 0.05 ~ 1.20/0.01 (Inverse)	Time curve SI, VI, EI, LI
OCGR (50/51N)	Instantaneous	Setting: OFF. 0.1 ~ 8.0/0.02In Operating time: Inst, 0.05 ~ 60.00/0.01s	Definite
	Time delay	Setting: OFF. 0.02 ~ 2.0/0.01In Operating time: 0.05 ~ 1.20/0.01 (Inverse) 0.05 ~ 60.0/0.01s (Definite)	Time curve DT, SI, VI, EI, LI
NSOCR (46)	Time delay High	Setting: OFF. 0.1 ~ 1.0/0.02In Operating time: 0.08 ~ 60.0/0.01s	Definite
	Time delay Low	Setting: OFF. 0.1 ~ 1.0/0.01In Operating time: 0.05 ~ 1.00/0.01(Inverse) 0.08 ~ 60.0/0.01s(Definite)	Time curve DT, SI, VI, EI, LI
DGR (67N)	Time delay	Io Setting: 0.02 ~ 2.0/0.01Ion Vo Setting: 11 ~ 80/1V RCA Setting: 0 ~ 90/1° Operating time: 0.05 ~ 10.00/0.01s	Ground type Definite
SGR (67G)	Time delay	Io Setting: 0.9 ~ 6.0/0.1mA Vo Setting: 11 ~ 80/1V RCA Setting: 0 ~ 90/1° Operating time: 0.05 ~ 10.00/0.01s	Ungrounded Type Definite
THERMAL (49)	Time delay	Setting: OFF. 50 ~ 100/1% (τh, τc) ※ Effective correction: FLC×SVC×O/L	Motor Config. Reference
STALL/ LOCK (48/51LR)	Stall Time delay	Setting: 0.50 ~ 10.00/0.01 FLC Operating time: 0.05 ~ 300.0/0.01s(Definite)	Motor Config. Reference
	Lock Time delay	Setting: 0.50 ~ 10.00/0.01 FLC Operating time: 0.05 ~ 300.0/0.01s(Definite) 0.05 ~ 1.20/0.01 (Inverse)	Motor Config. Reference Time curve: DT, VI, EI
UCR (37)	Time delay	Setting: 0.1 ~ 0.9/0.02In Operating time: 0.05 ~ 300.0/0.01s	Definite
NCH (66)	-	Starts number: OFF. 1 ~ 5/1회 Setting Time: 10 ~ 60/1분 Time between starts block: 1 ~ 60/1분 Current calorie: 10 ~ 80/1%	Maneuver restriction
TPR (38)	Time delay	Setting: OFF. 20 ~ 180/1°C Operating time: 50ms 이하	Definite

E

Operation Characteristics

Motor protection setting

Operating part	Setting & Operating time	Remarks
STALL/START TIME	Tss (Stall Operating time): 0.05 ~ 300.00/0.01s Ts (Motor Starting time): 1.0 ~ 300.0/0.1s	-
FLC/LRC	FLC: 0.20 ~ 2.00/0.01In LRC: 0.50 ~ 10.00/0.01FLC	FLC: STALL Setting LRC : LOCK Setting
SERVICE FACTOR	SVC: 1.00 ~ 1.20/0.05	-
THR CONST	Thermal constant (Heat): 2.0 ~ 60.0/0.5min Thermal constant (Cool): 2.0 ~ 60.0/0.5min Overload Constant (O/L): 0.80 ~ 1.20/0.05	THR (49) Setting
OCGR BLOCK TIME	B/T: 0.00 ~ 60.00/0.01s	OCGR instantaneous operation delay Applied only with INST at 50N

* THR depends on the h-factor, but the amount of heat reaches 100% when FLC is continuously introduced.

Measurement

Item		Range	Accuracy(%)	Remarks
Voltage	Zero-phase voltage	0, 2.2 ~ 200V	5%	V_o, V_o max
Current	Line / Load current	0, 0.05 ~ 200A	±0.5% (0.2 ~ 1.2 In)	I_a, I_b, I_c
	Reversed phase current	0, 0.05 ~ 200A	±5%	I_2
	Zero-phase current (I_o)	0, 0.05 ~ 40A (NCT) 0, 0.15 ~ 30mA (ZCT)	±5%	I_o, I_o max
	starting current	0, 0.05 ~ 200A	±5%	Is_avg, Is_peak
starting time		Average start time of last 5 operations, Max. start time	±5%	Ts_avg, Ts_peak
% Load factor		0, 5 ~ 999.99%	±1%	%FLC, %FLCavg, %FLCpeak
% Heat utilization		0, 5 ~ 150.0%	±5%	%Q, %Qavg, %Qpeak
Analog Input (AI) 1, 2		4 ~ 20mA DC	±0.5%	

*Voltage/current values above are based on secondary PT/CT

LED Operation Explanation

DPR1000 LED is different according to each model. In case of an AI model, there are additional LEDs TPR 1 and 2 compared to the base model.

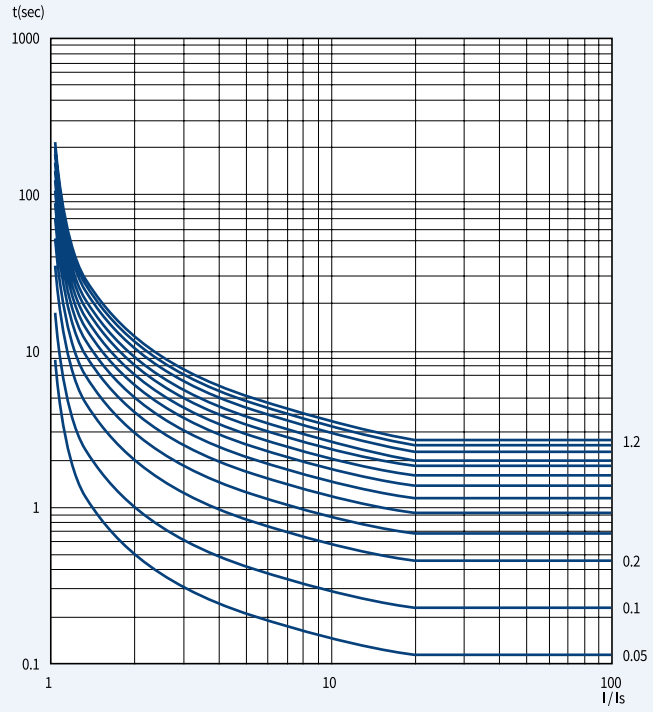
LED Types	Description
Power LED 	Displays the power status of DPR1000 (blue). If the system operates properly, it maintains blue. If a fault has occurred, it blinks once/second.
Communication LED 	Displays the remote communication status of DPR1000 (orange). If data is sent/received in normal communication condition, it blinks.
DIAG/ERR 	If hardware or program faults are detected during self-diagnosis of DPR100, it blinks (yellow). It is turned off during normal condition. If this LED is blinking, please contact a designated service center.
PICK-UP/TRIP 	Displays the relay operation of DPR1000 (red). If relay is at pick-up status due to a system accident occurring, it blinks once/second. If relay operates due to a system accident or during trip, it maintains ON. This relay LED can only be released by reset.
LED for TRIP indication 	If DPR100 executed trip operation due to a system accident, it displays the accident relay element (red). Trip display LED. In case of enforcement element, it only switches ON if the motor cannot start. Relay LED can only be released with a reset operation like pick-up/trip LED.
REMOTE/LOCAL 	They are blue and red LEDs located on top of the R/L keys. They display the current control status of DPR1000. If the control is REMOTE/LOCAL REMOTE, the blue LED lights up, and if the control is LOCAL, the red LED lights up These 2 LEDs cannot be turned ON/OFF at the same time.
CB CLOSE/OPEN 	It is a blue and red LED located on top of CLOSE/OPEN keys. It displays the current CB status connected to DPR1000. If CB is closed, red LED lights up, and if CB is opened, blue LED lights up

Self-Diagnosis

Fault Item	Cause	Description
AUX BAT	Occurs when internal backup capacitor is discharged	Leaving the power ON for a while will charge the capacitor and automatically resumes If the system does not resume automatically, Please contact the service department
F/S	Happens when front IrDA (infrared) communication fault has occurred	Please contact the service department
R/S	Occurs when an internal communication board fault occurred	Please contact the service department
NO CT	Occurs when CT/PT calibration was not performed	Please contact the service department
NO T/S	Occurs when device time is abnormal	Resumes if the time is set using the Manager program or through communication.
NO AI	Occurs when AI calibration was not performed	Please contact the service department
NO W/T	Occurs when Wave Trigger was not saved	Resumes if Wave Trigger condition is set using the Manager program
WATCH DOG	Occurs when the device does not boot properly	Please contact the service department

Characteristic Curve

Standard inverse time

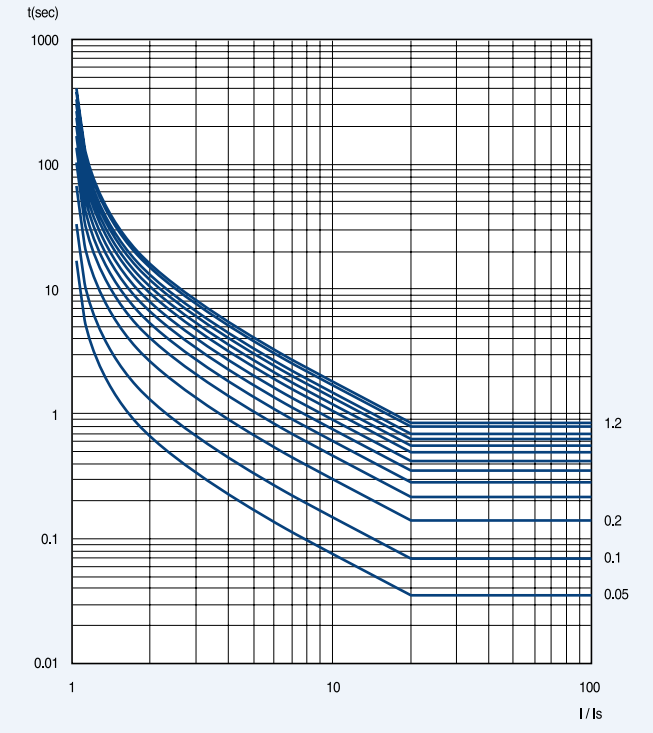


• Apply: Over-current (50/51)
Ground Fault and Current (50/51N)
Reverse Phase and Current (46)

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

I: Accident Current
Is: Correction value
TD: Time Setting tab
C: Relay characteristic value

Very Inverse Time

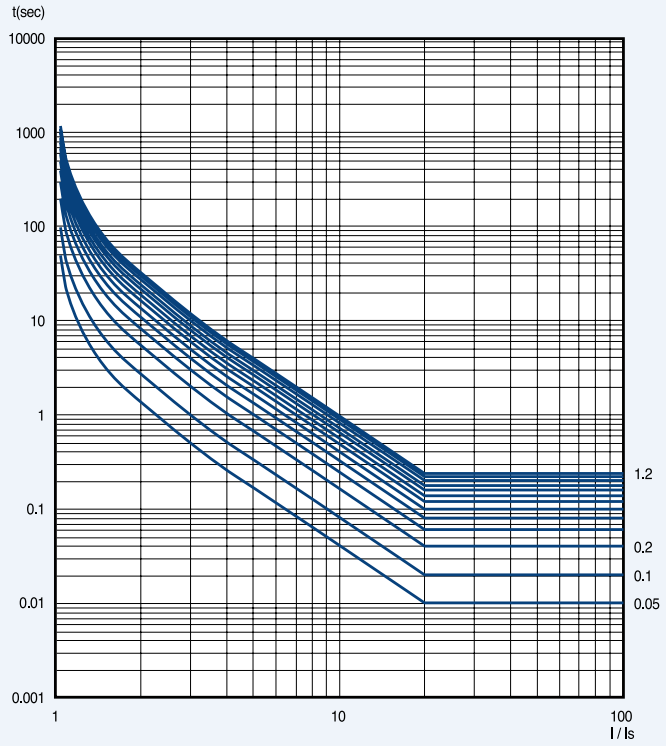


• Apply: Over-current (50/51)
Ground Fault and Current (50/51N)
Reverse Phase and Current
(46)Locked Rotor (51LR)

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

I: Accident Current
Is: Correction value
TD: Time Setting tab
C: Relay characteristic value

Extremely Inverse Time

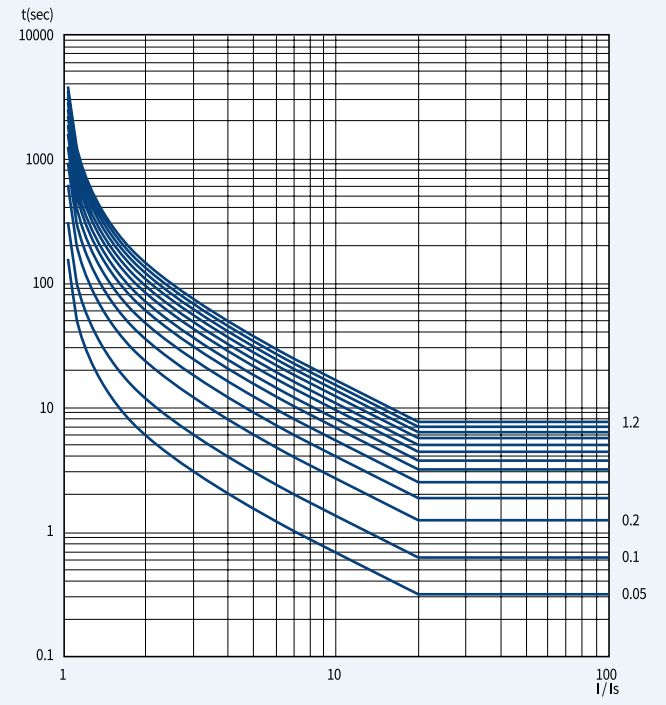


• Apply: Over-current (50/51)
Ground Fault and Current (50/51N)
Reverse Phase and Current
(46)Locked Rotor (51LR)

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

I: Accident Current
Is: Correction value
TD: Time Setting tab
C: Relay characteristic value

Long Inverse Time



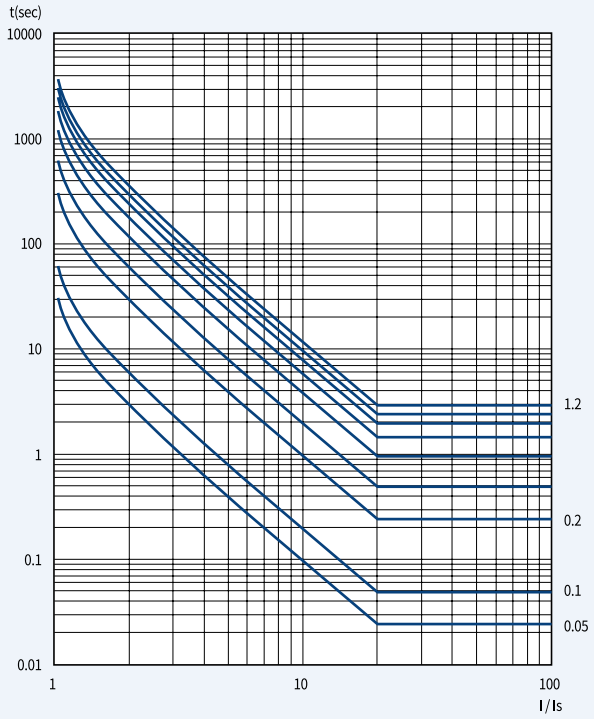
• Apply: Over-current (50/51)
Ground Fault and Current (50/51N)
Reverse Phase and Current (46)

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

I: Accident Current
Is: Correction value
TD: Time Setting tab
C: Relay characteristic value

Characteristic Curve

Thermal Element Characteristic (Thermal Curve Cold, Hot status)



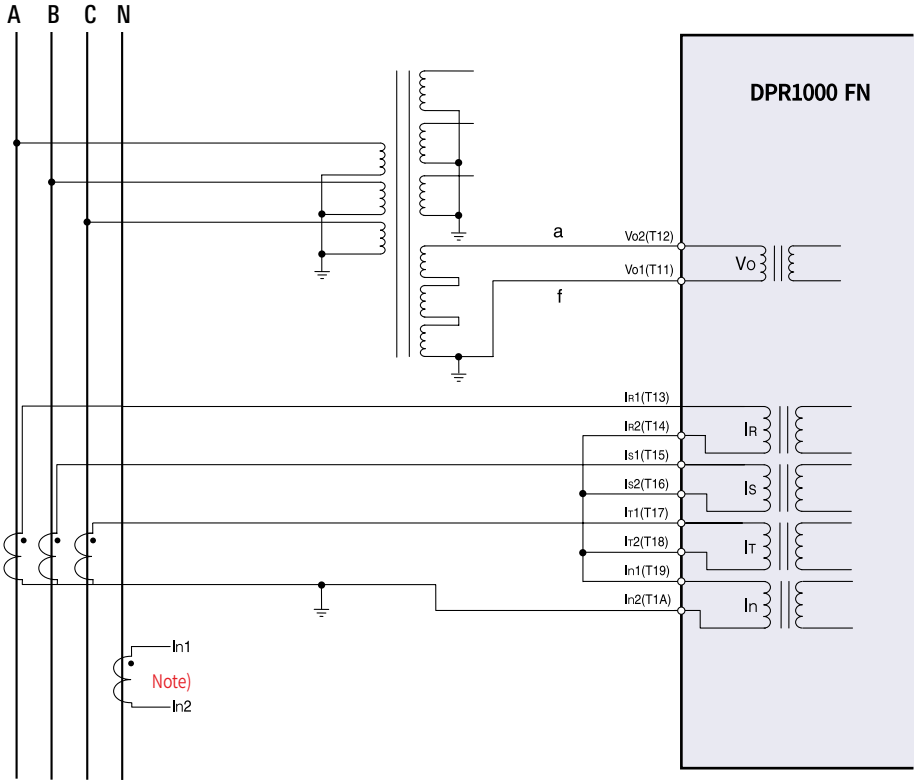
• **Apply: Thermal Overload Relay (49)**

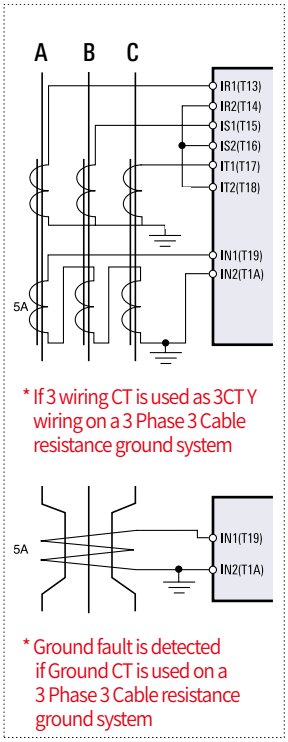
$$\text{triptime} = \tau.\text{In}\ \frac{I^2 - IP^2}{I^2 - (OL \cdot SF \cdot Ib)^2}\ [\text{min}]$$

τ(Thermal Time Constant)
= 2, 10, 20, 30, 40, 50, 60min

I: Fault Current
IP: (Load Current before Memory Fault)=0.5
Ib: (Rated Current or FLC)=1
OL: (Overload Constant)=1
SF: (Service Faclor)=1

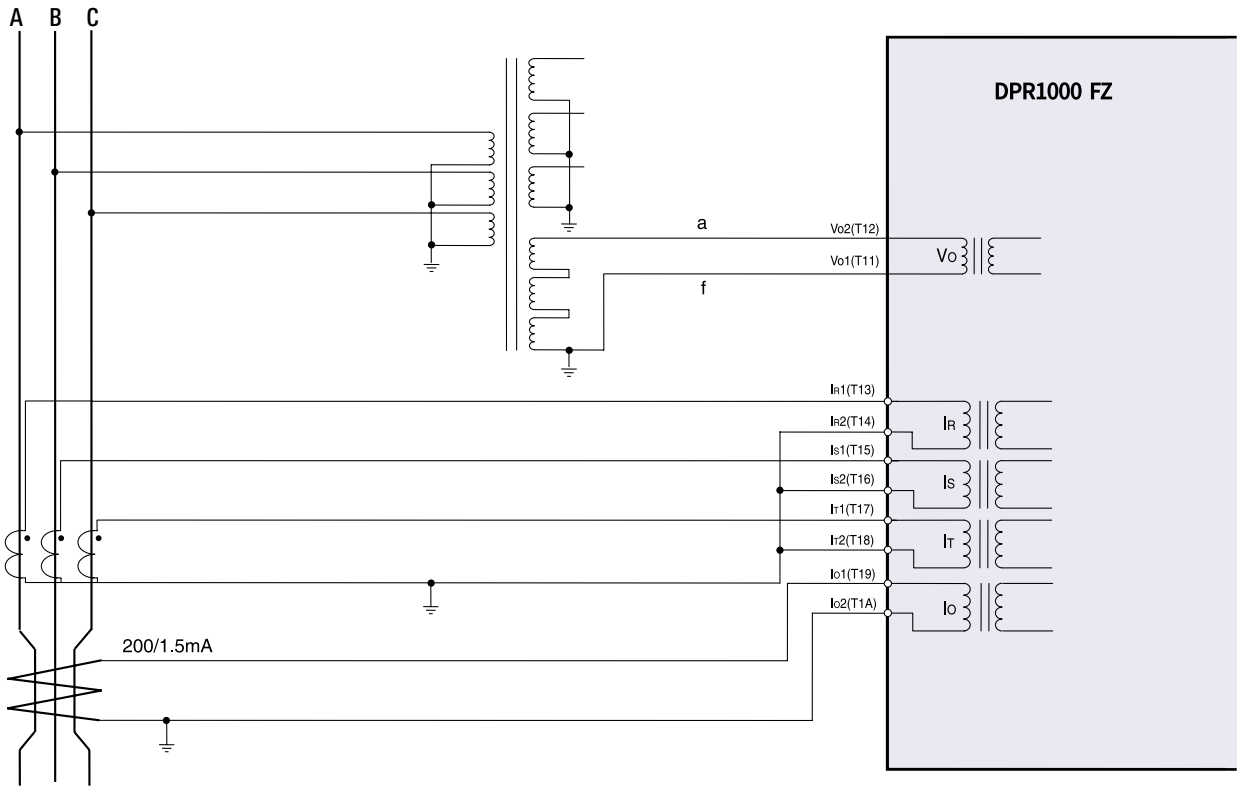
DPR1000 FN





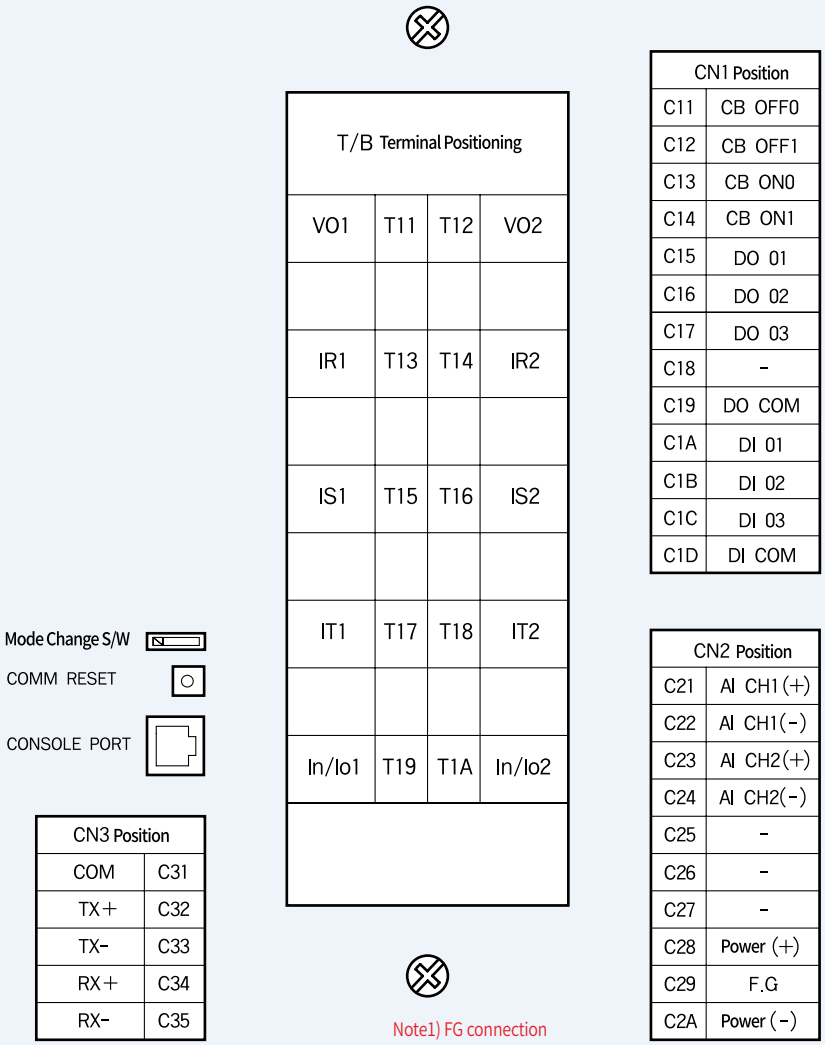
Note) When detecting ground fault using CT on the transformer neutral point ground wire, wire it with the ground wire

DPR1000 FZ



*Take caution that in order to properly measure the phase, the polarity of zero phase voltage (Vo2, Vo1) and zero phase current must be set in the opposite direction

Contact Configuration



CN1 Position	
C11	CB OFF0
C12	CB OFF1
C13	CB ON0
C14	CB ON1
C15	DO 01
C16	DO 02
C17	DO 03
C18	-
C19	DO COM
C1A	DI 01
C1B	DI 02
C1C	DI 03
C1D	DI COM

CN2 Position	
C21	AI CH1(+)
C22	AI CH1(-)
C23	AI CH2(+)
C24	AI CH2(-)
C25	-
C26	-
C27	-
C28	Power (+)
C29	F.G
C2A	Power (-)

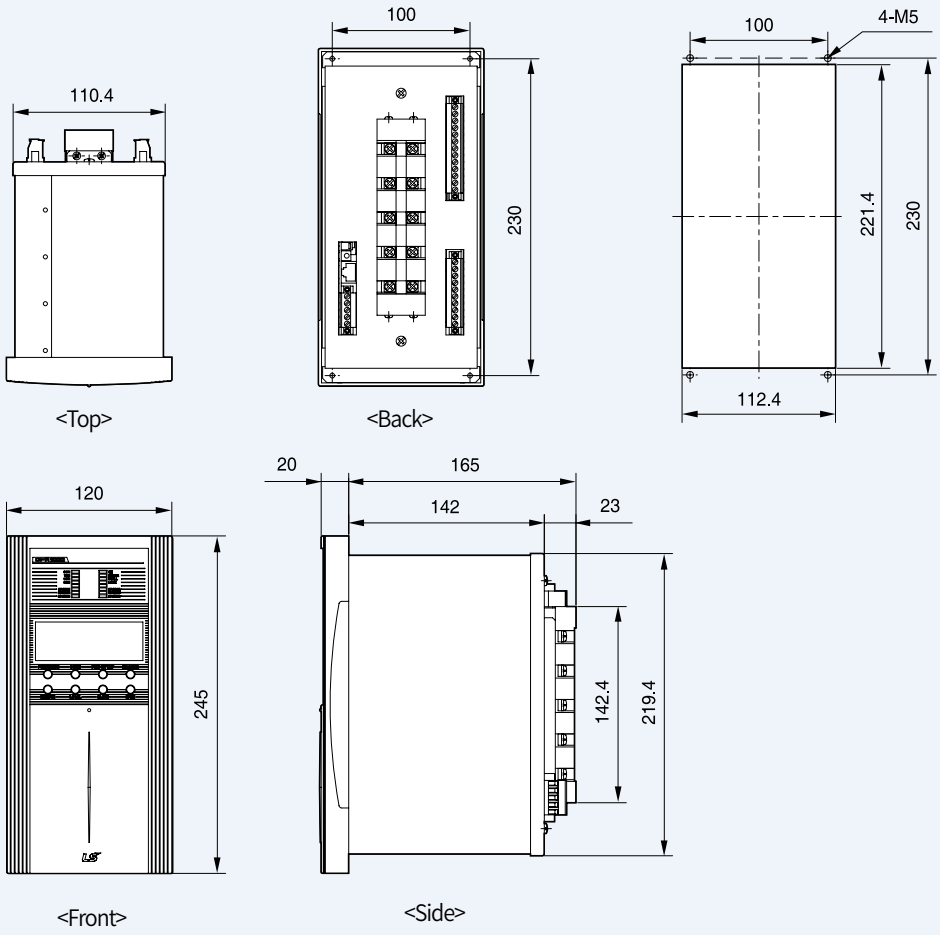
CN3 Position	
COM	C31
TX+	C32
TX-	C33
RX+	C34
RX-	C35

Contact Configuratione

Terminal Number	Terminal Details	Default Use	Changeable Use
C11	CB OFF0	CB Open Output	Unchangeable
C12	CB OFF1		
C13	CB ON0	CB Close Output	
C14	CB ON1		
C15	DO 01	50/51	General DO
C16	DO 02	50/51N, 67N, 67G	General DO
C17	DO 03	Relay elements except for DO 01, 02	General DO
C1A	DI 01	CB status input	Unchangeable
C1B	DI 02	General DI	General DI
C1C	DI 03	General DI	General DI

*DI 01 is CB OPEN/CLOSE status input contact, and if DI 01 does not receive input, it sets OPEN, and if it receives input, it sets CLOSE.
*DO 01-03 are CB OPEN/CLOSE control contacts, which cannot be used.

Dimensions



Ordering

DPR1000

FI	RS	M	5A	60Hz
Protection Use & Transformer Input	Communication	Protocol	CT Rating	Frequency
FN Feeder, Motor/NCT	RS RS485	M MODBUS	5A	50Hz
FZ Feeder, Motor/ZCT				60Hz

AC/DC 110V	DI_AC/DC 110V	AI
Control Power	Digital Input	Analog Input
AC/DC 110V	AC/DC 110V	AI 4 ~ 20mA
		- None

Sold separately

DPR - OPTO MASTER — IrDA(infrared) Serial Port(Option)

Unit-type Digital Relay

GIPAM10

F

GIPAM10

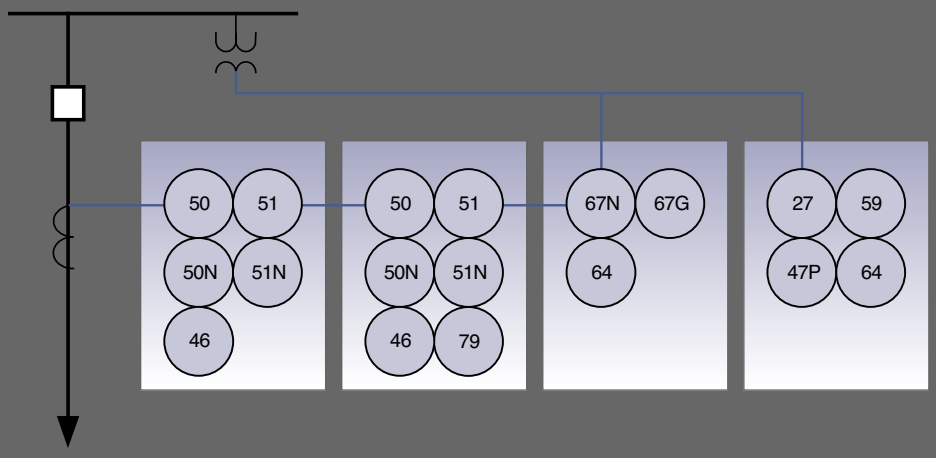
Digital Protection Relay

It is a unit-type digital relay with protection functions for each relay element for cable fault monitoring and protection, and with various additional functions and parameters used for cable protection, it is capable of effectively responding to accidents through prompt accident analysis.

Contents

Features

4 Unit-type Relays with up to 4 Analog Channels



GIPAM10 is a unit - type digital relay with protection functions for each relay element for cable fault monitoring and protection, and it is capable of effectively responding to accidents through prompt accident analysis made with various additional functions and parameters implemented for cable protection.

F

Wave Recording

Convenient analyzing by storing DI/DO Status simultaneously when faults happen

Event Recording

Analyzing operations conveniently by storing before and after factors to Event Record

DO Latch function

Available to set DO operation (DO 4ea independently)

Convenient DO setting

Available to set Trip DO and Alarm DO to each protection element

Setting Group

Up to 3 setting groups can be set only for GIPAM 10 CU / CR model, and can be changed through KEY and DI.

Easy PC program connection

Convenient connecting by adopting common USB mini B Type

Device Settings and Data Analysis Using GIPAM10 Manager

By sending information (Event Recording, Fault Recording, Wave Recording) to PC, available to set and verify all the functions that GIPAM10 supports.

Function & Rating

Functional summary

Type	Function	Device No.	GIPAM10 CU	GIPAM10 CR	GIPAM10 VO	GIPAM10 NZ
Element	OCR	50/51	●	●	-	-
	OCGR	50/51N	●	●	-	-
	NSOCR	46	●	●	-	-
	Reclosing	79	-	●	-	-
	OVR	59	-	-	●	-
	UVR	27	-	-	●	-
	POR	47P	-	-	●	-
	OVGR	64	-	-	●	●
	SGR	67G	-	-	-	●
	DGR	67N	-	-	-	●
Monitoring	Latching	86	●	●	●	●
	Trip Indication		●	●	●	●
	Event Recording		32 EA			
	Fault Recording		32 EA			
	Wave Recording		4 EA (32 Samples/Cycle×30 Cycle)			
Communication	Modbus		●	●	●	●
Inputs/Outputs	Digital Input		5 EA			
	Digital Output		4 EA (32 Samples/Cycle×30 Cycle)			
PC Interface	USB mini B		●	●	●	●

Note) Details of event/fault and wave can be checked through GIPAM10 Manager.

Measurement

Item		Range	Accuracy(%)	Applicable models
Voltage	Phase voltage (V)	0.000V ~ 999.999kV	±0.5%	GIPAM10 VO
	Line voltage (V)	0.000V ~ 999.999kV	±0.5% or ±1V	GIPAM10 VO
	zero-phase voltage (V_o)	0.000V ~ 999.999V	±0.5% or ± 1V	GIPAM10 VO/NZ
	Unbalanced voltage rate	0.00 ~ 200.00%	±5% or ±2.5% (Constant)	GIPAM10 VO
Current	Phase current (A)	0.000A ~ 999.999kA	± 0.5% at In, ±0.5% or ±0.05A (Rating 5A), ±0.01A (Rating 1A) at Other Current range	GIPAM10 CU/CR
	Reverse phase current(I_2)	0.000A ~ 999.999kA	±0.5% or ±0.05A (Rating 5A), ±0.01A (Rating 1A)	GIPAM10 CU/CR
	Zero-phase Current (I_n)	0.000A ~ 999.999A	±0.5% or ±0.05A (Rating 5A), ±0.01A (Rating 1A)	GIPAM10 NZ
	Zero-phase Current (I_o)	0.000mA ~ 99.999mA	±0.5%	GIPAM10 NZ
Phase		0.00° ~ 360.00°	±5°	GIPAM10 NZ

Rating

Type			Specification
Ratings	Wiring		3P3W, 3P4W
	Frequency		60Hz, 50Hz
	Voltage	PT	110V
		GPT	190V
	Current	CT	5A, 1A
		ZCT	1.5mA
	Power		AC/DC 110V, 220V
	Power consumption		20W or less : Stanby 25W or less : Operation
	Burden		0.5VA or less : PT 1.0VA or less : CT
Input contacts	for general		Digital Input AC/DC 110V, 220V
Output contact	for trip		Rated capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: 380VAC, 125VDC/16A
	for alarm		Closed capacity: AC 240V 3A/DC 30V 3A, Resistive Load Max. switching capacity: 240VAC, 30VDC/5A
Insulation Resistance			10MΩ : All electric circuits 5MΩ : Between Electrical circuits 5MΩ : Between contact circuit terminals
Insulation Voltage			AC 2kV/1min : Between Electric circuit and earth AC 2kV/1min : Between Electrical circuits AC 1kV/1min : Between contact circuit terminals
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 2 times of rated current for 3 hours. Withstand 20 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV : power input 2kV : other input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-25°C ~ +55°C
	Storage		-30°C ~ +70°C
Humidity			RH 80% or less (non-condensing)
Altitude			1000m or less
Environment			A place not subject to abnormal vibration and shock. A place where the surrounding air pollution is not remarkable.
Applied Standards			KEMC 1120, IEC60255
Dimension (W×H×D)			100 × 240 × 217 (mm)
Weight			3kg
Communication			RS485 : Modbus

F

Function & Rating

Additional Function

- **Setting Group (applicable to GIPAM10 CU/CR)**

1. 3 relay element setting group is supported allowing for different combinations according to circumstances
2. Setting group can be modified using key control or DI port

- **Circuit Breaker Failure Protection Function (CBF)**

When the circuit breaker or trip circuit fault occurs causing the circuit breaker to not operate despite a trip signal output, a breaker failure function trips the upper circuit breaker to protect the system and to prevent spreading influence of the accident.

1. Correction Range: OFF, 0.5 ~ 5.0 A/0.1 A
2. Operation Time: 0.10 ~ 60.00/0.01s
3. Contact Output: None, DO01, DO02, DO03, DO04

- **Self-Diagnosis**

1. Power Fail
   If the voltage drops below a certain level (78V - 85V) due to control power monitoring, the LCD displays “Power Fail” through the monitoring port and the DIAG_ERR LED blinks. Once Power fail status is released, the system resumes normal operation.
2. Watch Dog
   If the DSP determines normal operation and discovers DSP is not operating properly, an external monitoring IC forces DSP and neighboring devices to reset, and boots them up in the same order and standard booting sequence (not displayed separately).
3. CT/PT Calibration Execution
   If CT/PT calibration execution monitoring detects invalid data or no calibration performed, DIAG_ERR LED blinks.
4. Memory & Correction Value Fault Monitoring
   It is an external memory fault monitoring. If the external memory fails to operate properly, “CRC ERROR” is displayed on the LCD and the DIAG_ERR LED blinks.

Recording available

System Event	
Number of Saved Items	32
Trigger	Power ON, Setting Change, DI/DO Status Change

Fault Event	
Number of Saved Items	32
Trigger	Pickup, Operation
Main Information	Voltage or Current at Fault
SupplementaryInformation	DI/DO Status

*The “Record” items of the device display the total number of Events (Roll Over Count and Current Event Index), and if a trip occurred, it displays the last single operation event type on HMI.
*Detailed values can be checked with the help of PC Manager program

Wave Recording	
Wave Recording	4
Trigger	Relay Element Operation
Sample/Cycle	32 sample/1 cycle
Save Cycle	30 Cycle (50/60Hz Common)
Can be checked using PC Manager program	

Appearance

DISPLAY

2 lines' Back-lit LCD for fault indication and setting

UP/DOWN Key

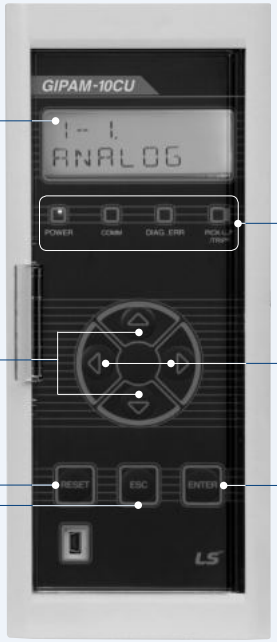
- Increasing/Decreasing setting value
- Setting change mode is used to increase or decrease the number.

[RESET] Key

Fault window and TRIP LED initialization when the [RESET] Key is input after the fault is cleared after the fault occurs.

[ESC] Key

Move up one step when [ESC] Key is input to the menu other than setting value.
The previous value is maintained when the [ESC] key is input while changing the set value.



Front View

INDICATORS

- POWER: Power status LED
- COMM: Communication LED
- DIAG_ERR: indicating Power fail / Calibration
- PICK-UP/TRIP: Flicker in pick-up situation due to relay operation, lights up in trip situation

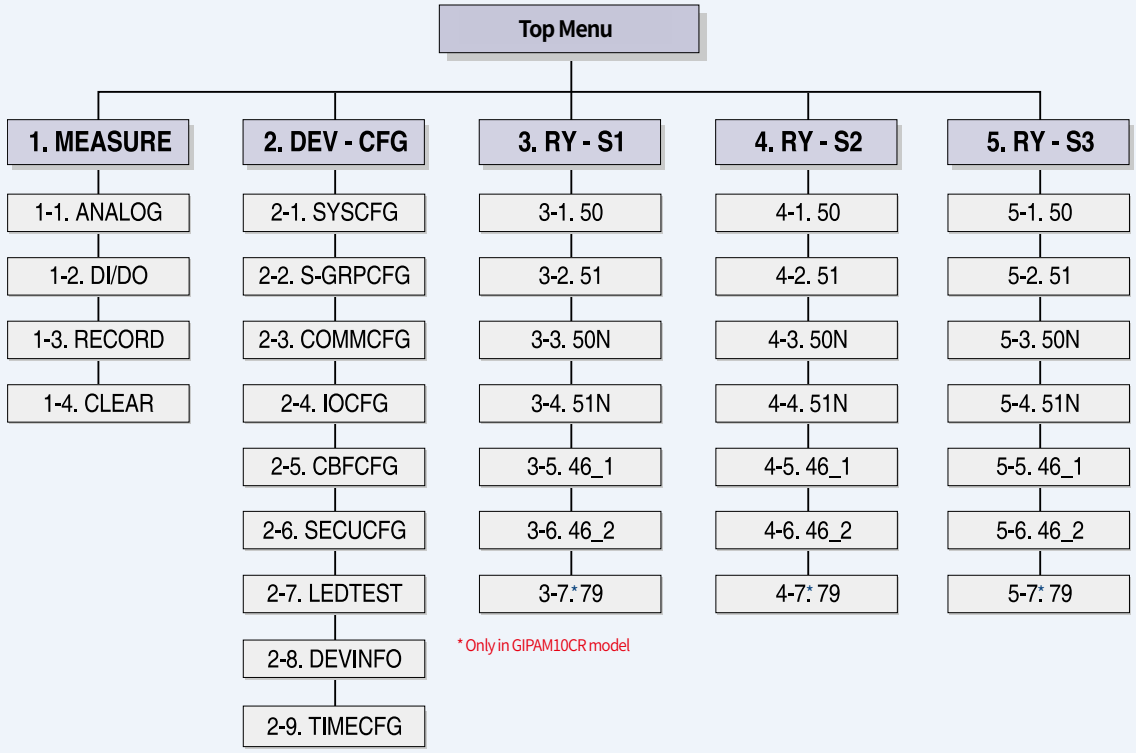
Right / Left Key

Validate only in mode of changing the setting value

[ENTER] Key

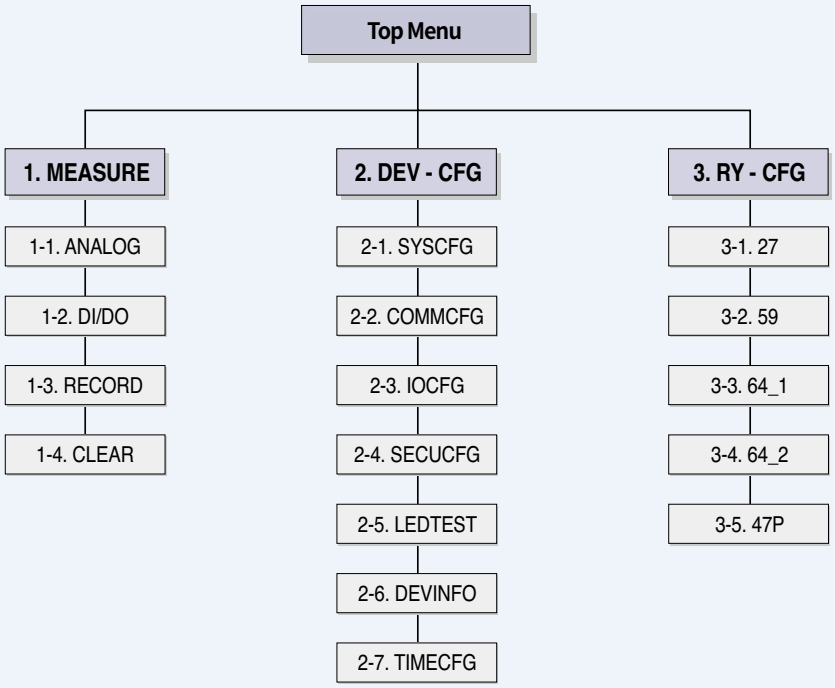
- Moves one step down when inputting the [ENTER] key in a menu other than setting.
- Enters the mode to change the set value when the [ENTER] key is input where the set value can be changed and Save the set value when you input the [ENTER] key after changing the set value.

Setting MMI (GIPAM10 CU/CR)

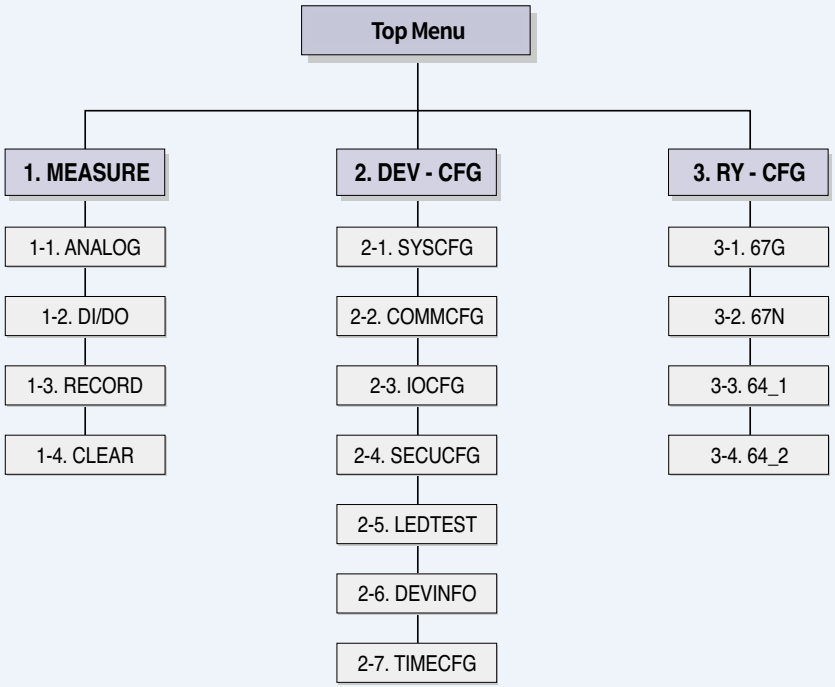


* Only in GIPAM10CR model

Setting MMI (GIPAM10 VO)



Setting MMI (GIPAM10 NZ)



Operation Characteristics

OCR (Over Current Relay - 50)

Type		Details	Remarks
Operating value	5A	5 ~ 100A/1A	-
Setting range	1A	1 ~ 20A/1A	
Operating time setting		0.04 ~ 60.00s/0.01s	0.04s: instantaneous 0.05 ~ 60.00s: definite
Trip/Alarm contact		One in DO01 ~ DO04	Available to not use or multi-use

OCR (Over Current Relay - 51)

Type		Details	Remarks
Operating value	5A	1.0 ~ 12.0A/0.1A	-
Setting range	1A	0.2 ~ 2.4A/0.1A	
TC (Time Characteristics)		DT, SI, VI, EI, LI	-
TD (Time Delay)		0.10 ~ 60.00s/0.01s	Applied when selecting Definite
TL (Time Lever)		0.05 ~ 1.20s/0.01s	Applied when selecting Definite SI, VI, EI, LI
RTC (Reclaim time characteristics)		DT, SI, VI, EI, LI	available only to characteristics the same as TC
Trip/Alarm contact		One in DO01 ~ DO04	Available to not use or multi-use

OCGR (Over Current Ground Relay - 50N)

Type		Details	Remarks
Block		0.1 ~ 60.0s/0.1s	Standard current: 1A
Operating value	5A	2.5 ~ 40.0A/0.1A	-
Setting range	1A	0.5 ~ 8.0A/0.1A	
Operating time setting		0.04 ~ 60.00s/0.01s	0.04s: instantaneous 0.05~60.00s: definite
Trip/Alarm contact		One in DO01 ~ DO04	Available to not use or multi-use

OCGR (Over Current Ground Relay - 51N)

Type		Details	Remarks
Motor Block Time		0.1 ~ 60.0s/0.1s	Standard current: 1A
Operating value	5A	0.5 ~ 5.0A/0.1A	-
Setting range	1A	0.1 ~ 1.0A/0.1A	
TC (Time Characteristics)		DT, SI, VI, EI, LI	-
TD (Time Delay)		0.10 ~ 60.00s/0.01s	Applied when selecting Definite
TL (Time Lever)		0.05 ~ 1.20s/0.01s	Applied when selecting Definite SI, VI, EI, LI
RTC (Reclaim time characteristics)		DT, SI, VI, EI, LI	available only to characteristics the same as TC
Trip/Alarm contact		One in DO01 ~ DO04	Available to not use or multi-use

NSOCR (Negative Sequence Over Current Relay - 46)

Type		Details	Remarks
Operating value	5A	0.5 ~ 5.0A/0.1A	-
Setting range	1A	0.1 ~ 1.0A/0. 1A	
Operating time setting		0.10 ~ 60.00s/0.01s	definite
Trip/Alarm contact		One in DO01 ~ DO04	Available to not use or multi-use

Auto Reclosing - 79

Type	Details	Remarks
Times of reclosing	1 ~ 4times	-
Reclaim Time	0.10 ~ 200.00sec/0.01sec	-
Prepare Time	0.10 ~ 200.00sec/0.01sec	-
1st Shot Delay	0.10 ~ 200.00sec/0.01sec	-
2nd Shot Delay	0.10 ~ 200.00sec/0.01sec	-
3rd Shot Delay	0.10 ~ 200.00sec/0.01sec	-
4th Shot Delay	0.10 ~ 200.00sec/0.01sec	-

* SHOT signal output is fixed at DO02.(Unchangeable)

F

Operation Characteristics

SGR (Selective Ground Relay - 67G)

Type	Details	Remarks
Zero phase current(Io)	0.9 ~ 6.0mA/0.1mA	-
Zero phase voltage (Vo)	10~80V/1V	-
Time characteristics angle	0° ~ 90°/1°	-
TD (Time Delay)	0.10 ~ 60.00s/0.01s	Definite
Trip/Alarm contact	One in DO01 ~ DO04	Available to not use or multi-use

DGR (Directional Ground Relay - 67N)

Type		Details	Remarks
Zero phase current(Io)	5A	0.5 ~ 5.0A/0.1A	-
	1A	0.1 ~ 1.0A/0.1A	
Zero phase voltage (Vo)		10 ~ 80V/1V	-
Time characteristics angle		0° ~ 90°/1°	-
TD (Time Delay)		0.10 ~ 60.00s/0.01s	Definite
Trip/Alarm contact		One in DO01 ~ DO04	Available to not use or multi-use

OVGR (Over Voltage Ground Relay - 64)

Type	Details	Remarks
Operating value Setting range	10 ~ 110V/1V	-
TD (Time Delay)	0.10 ~ 60.00s/0.01s	Definite
Trip/Alarm contact	One in DO01 ~ DO04	Available to not use or multi-use

UVR (Under Voltage Relay - 27)

Type	Details	Remarks
Operating value Setting range	10 ~ 110V/1V	-
TD (Time Delay)	0.10 ~ 60.00s/0.01s	Definite
UVR Block	ON/OFF available	Standard voltage: 15V
Trip/Alarm contact	One in DO01 ~ DO04	Available to not use or multi-use

OVR (Over Voltage Relay - 59)

Type	Details	Remarks
Operating value Setting range	60 ~ 160V/1V	-
TD (Time Delay)	0.10 ~ 60.00s/0.01s	Definite
Trip/Alarm contact	One in DO01 ~ DO04	Available to not use or multi-use

POR (Phase Open Relay - 47P)

Type	Details	Remarks
Operating value Setting range	5 ~ 100%/1%	-
TD (Time Delay)	0.10 ~ 60.00s/0.01s	Definite
Trip/Alarm contact	One in DO01 ~ DO04	Available to not use or multi-use

$$\text{Unbalance} = \frac{\text{MAX}[\text{“Vphase - Vavg”}]}{\text{Vavg}} \times 100[\%]$$

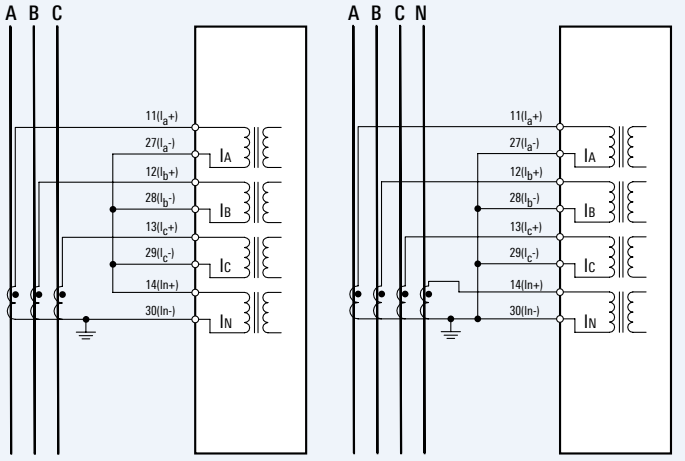
GIPAM10 CU/CR

- Protection Relay Function : 50/51, 50/51N, 46, 79(10CR)
- 3 Setting Groups
- Domestic & Overseas Standards
  - KEC 1120, IEC60255

Wiring Method

Current Type (GIPAM10 CU/CR)

POWER-	17		1	POWER+
DO 01-	18		2	DO 01+
DO 02-	19		3	DO 02+
DO 03-	20		4	DO 03+
DO 04-	21		5	DO 04+
DI 01-	22		6	DI 01+
DI 02-	23		7	DI 02+
DI 03-	24		8	DI 03+
DI 04-	25		9	DI 04+
DI 05-	26		10	DI 05+
I_a-	27		11	I_a+
I_b-	28		12	I_b+
I_c-	29		13	I_c+
IN-	30		14	IN+
NC	31		15	NC
TRX-	32		16	TRX+



3P3W

3P4W
(If a separate NCT is used at the neutral point)

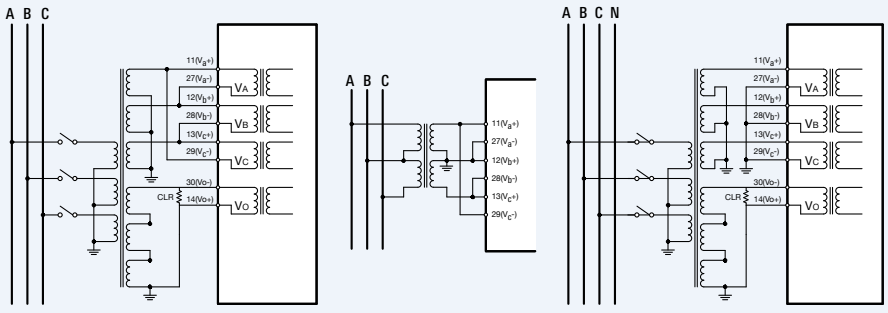
GIPAM10 VO

- Protection Relay Function: 27, 59, 47P, 64
- Apply voltage related protection elements
- Domestic & Overseas Standards
  - KEC 1120, IEC60255

Wiring Method

Voltage type (GIPAM10 VO)

POWER-	17		1	POWER+
DO 01-	18		2	DO 01+
DO 02-	19		3	DO 02+
DO 03-	20		4	DO 03+
DO 04-	21		5	DO 04+
DI 01-	22		6	DI 01+
DI 02-	23		7	DI 02+
DI 03-	24		8	DI 03+
DI 04-	25		9	DI 04+
DI 05-	26		10	DI 05+
V_a-	27		11	V_a+
V_b-	28		12	V_b+
V_c-	29		13	V_c+
Vo-	30		14	Vo+
NC	31		15	NC
TRX-	32		16	TRX+



3P3W

If 2PT is used
(OPEN DELTA(△) wiring)

3P4W

*Take caution of Zero phase voltage wiring

Wiring

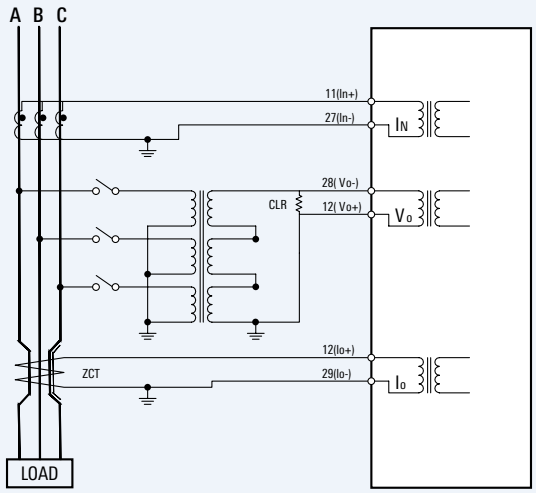
GIPAM10 NZ

- Protection Relay Function: 67G, 67N, 64
- Resistance Ground & Un-ground System Ground Fault Protection
- Domestic & Overseas Standards
  - KEC 1120, IEC60255

Wiring Method

Ground Fault (GIPAM10 NZ)

POWER-	17	1	POWER+
DO 01-	18	2	DO 01+
DO 02-	19	3	DO 02+
DO 03-	20	4	DO 03+
DO 04-	21	5	DO 04+
DI 01-	22	6	DI 01+
DI 02-	23	7	DI 02+
DI 03-	24	8	DI 03+
DI 04-	25	9	DI 04+
DI 05-	26	10	DI 05+
IN-	27	11	IN+
Vo-	28	12	Vo+
IO-	29	13	IO+
NC	30	14	NC
NC	31	15	NC
TRX-	32	16	TRX+



*Take caution of Zero phase voltage wiring *In case of 3P4W, a separate NCT can be used at the neutral point

I/O Contact Structure

Trip and alarm outputs of all relay elements can be set on DO 01 ~ DO 04

Terminal Details	Terminal Number	Default	Updated Use	Remark
DI01	22 - 6	CB_OFF	DO01 ~ DO04, SG1 ~ SG3 (GIPAM10 CU, 10CR), General DI	
DI02	23 - 7	CB ON	DO01 ~ DO04, SG1 ~ SG3 (GIPAM10 CU, 10CR), General DI	
DI03	24 - 8	GI	DO01 ~ DO04, SG1 ~ SG3 (GIPAM10 CU, 10CR), General DI	
DI04	25 - 9	GI	DO01 ~ DO04, SG1 ~ SG3 (GIPAM10 CU, 10CR), General DI	
DI05	26 - 10	GI	DO01 ~ DO04, SG1 ~ SG3 (GIPAM10 CU, 10CR), General DI	
DO01	18 - 2	TPIP	TRIP, ALARM, General DO	Latch ON/OFF
DO02	19 - 3	ALARM	TRIP ALARM DO Reclose Input Signal	Latch ON/OFF
DO03	20 - 4	-	TRIP, ALARM, General DO	Latch ON/OFF
DO04	21 - 5	-	TRIP, ALARM, General DO	Latch ON/OFF

*SG1-SG3 only applies to GIPAM10 CU/CR models which support Setting Group
*If DI is allocated as DO, DI input generates DO output

DO Default Setting

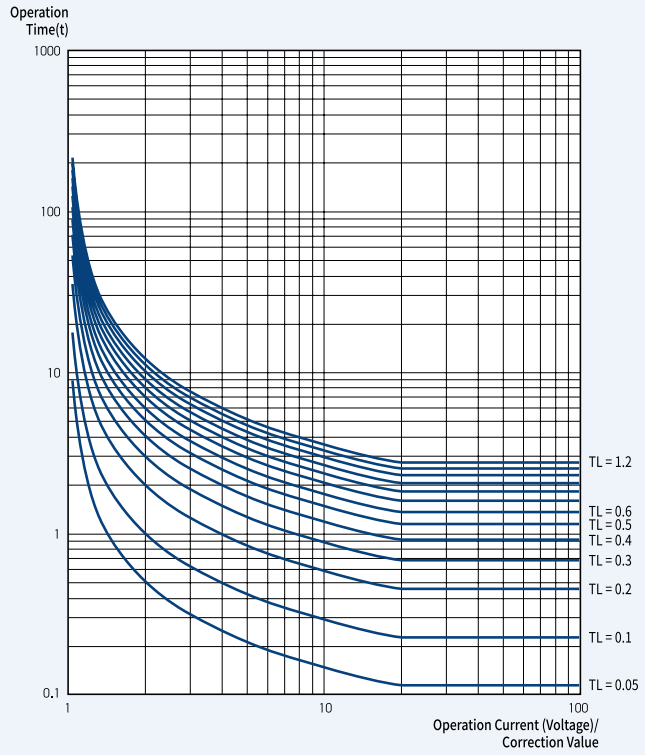
Model	Terminal	Setting
GIPAM10 CU/CR	DO 01	TRIP(OCR, OCGR, NSOCR)
	DO 02	OCR ALARM
	DO 03	OCGR ALARM
	DO 04	NSOCR ALARM
GIPAM10 VO	DO 01	TRIP(OVR, POR)
	DO 02	OVR ALARM
	DO 03	OVGR ALARM
	DO 04	UVR, POR ALARM

Model	Terminal	setting
GIPAM10 NZ	DO 01	TRIP(SGR, DGR)
	DO 02	SGR ALARM
	DO 03	DGR ALARM
	DO 04	OVGR ALARM

*In case of GIPAM10 CR, reclose signal is generated at DO 02.
If reclose is used, DO setting must be modified as the following.

GIPAM10 CR	DO 01	TRIP(OCR, OCGR, NSOCR)
	DO 02	XX(NONE)
	DO 03	OCR, OCGR ALARM
	DO 04	NSOCR ALARM

Standard Inverse Time - SI



• Apply : Over-current (50/51)
Ground Fault and Current (50/51N)

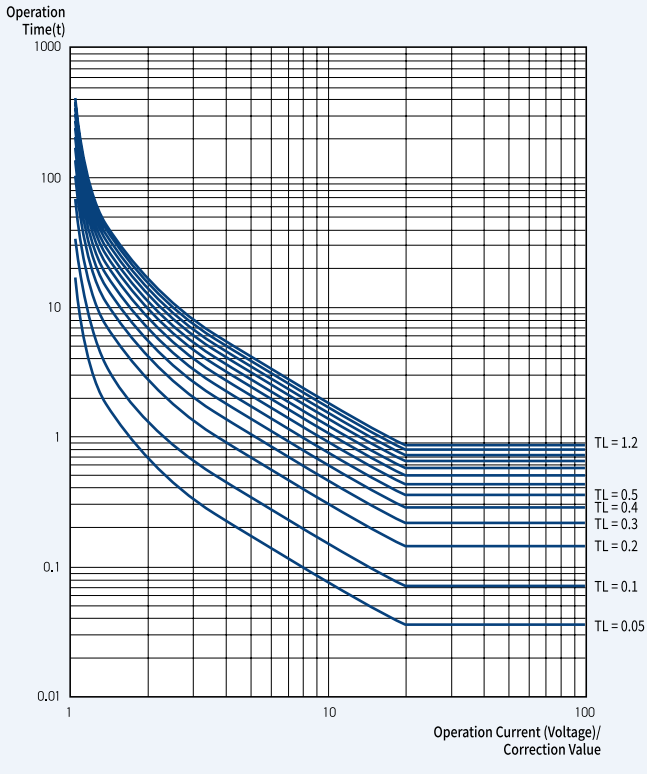
$$t = \frac{0.14}{(I/Is)^{0.02}-1} \times TL + C$$

· t: Operation Time
· I: Operation Value
· Is: Correction value
· TL: Time Correction Lever (0.05 ~ 1.20)
· C: Relay Characteristic Value (0)

※ Return Characteristic (RTC)

$$t = \frac{9.7}{1-(I/Is)^2} \times TL$$

Very Inverse Time - VI



• Apply : Over-current (50/51)
Ground Fault and Current (50/51N)

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

· t: Operation Time
· I: Operation Value
· Is: Correction value
· TL: Time Correction Lever (0.05 ~ 1.20)
· C: Relay Characteristic Value (0)

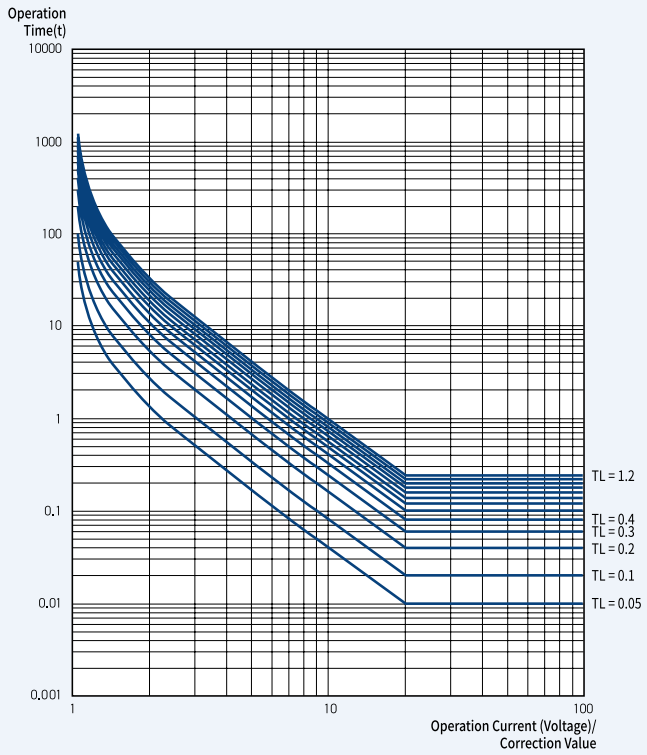
※ Return Characteristic (RTC)

$$t = \frac{58.2}{1-(I/Is)^2} \times TL$$

F

Characteristic Curve

Extremely Inverse Time - EI



• Apply : Over-current (50/51)
Ground Fault and Current (50/51N)

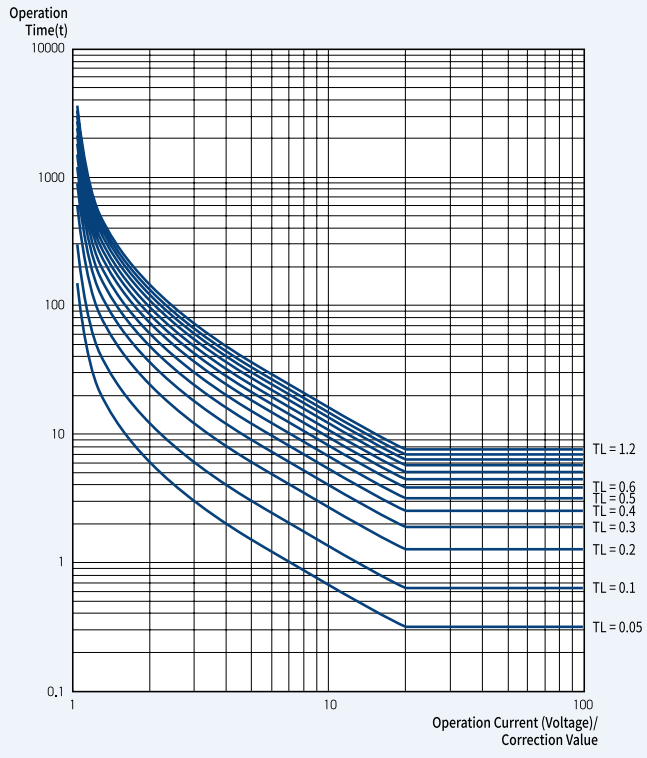
$$t = \frac{80}{(I/Is)^2-1} \times TL + C$$

· t: Operation Time
· I: Operation Value
· Is: Correction value
· TL: Time Correction Lever (0.05 ~ 1.20)
· C: Relay Characteristic Value (0)

※ Return Characteristic (RTC)

$$t = \frac{43.2}{1-(I/Is)^2} \times TL$$

Long Inverse Time - LI



• Apply : Over-current (50/51)
Ground Fault and Current (50/51N)

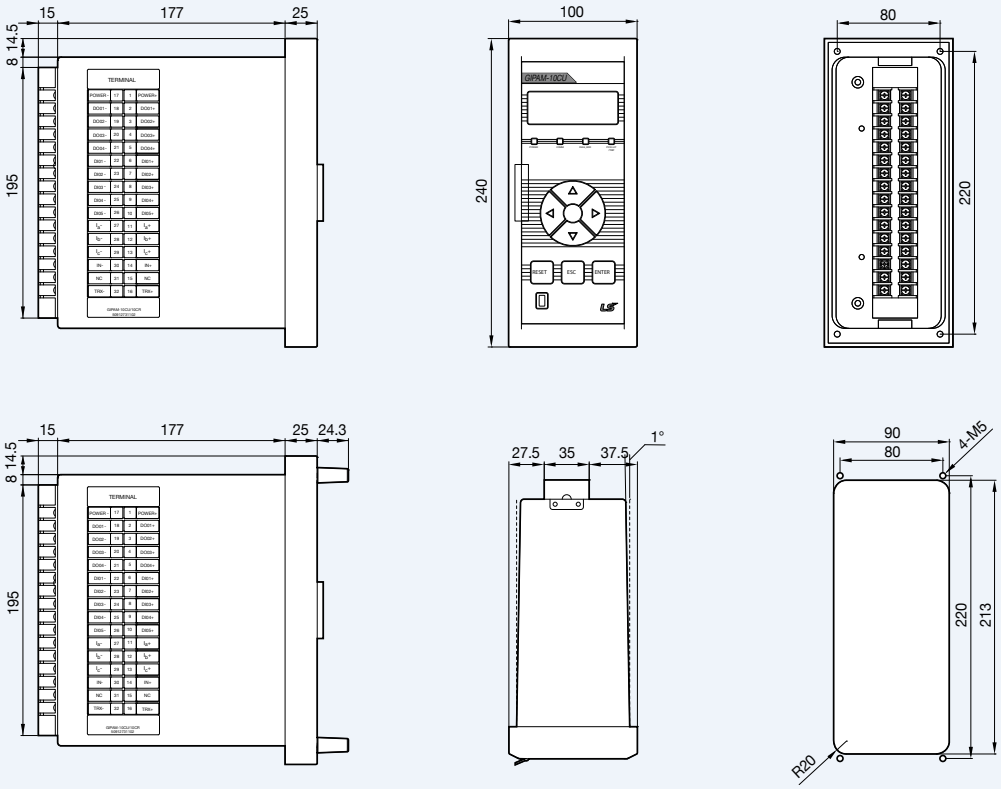
$$t = \frac{120}{(I/Is)-1} \times TL + C$$

· t: Operation Time
· I: Operation Value
· Is: Correction value
· TL: Time Correction Lever (0.05 ~ 1.20)
· C: Relay Characteristic Value (0)

※ Return Characteristic (RTC)

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

Dimensions



(Draw-out Type)

(Installation Dimension)

* For the draw-out type, the CT input terminal is automatically shorted when the product is taken out.

F

Ordering

GIPAM10

CU

Protection Use	
CU	50/51, 50N/51N, 46
CR	50/51, 50N/51N, 46, 79
VO	27, 59, 47P, 64
NZ	67N, 67G, 64

RS

Communication	
RS	RS485

M

Protocols	
M	MODBUS

5A

CT Rating
1A
5A

* CU, CR, NZ type Only

60Hz

Frequency
50Hz
60Hz

AC/DC 110/220V

Control Power
AC/DC 110/220V

DI_AC/DC 110V

Digital Input
AC/DC 110V
AC/DC 220V

OPTION

OPTION
Draw-out

*Drawout Product

We provide total solutions for system failure,
monitoring and protection of power facilities

Measurement Device

Measurement Device

GIMAC-V

Capable of high-precision measurement of various electricity, power quality and harmonic analysis, circuit breaker control, DI monitoring, and event recording of power distribution systems, and includes an automatic power factor control device (APFC)

GIMAC-V

Digital Integrated Metering & Control Device
Power Quality Meter
Automatic Power Factor Controller

Due to use of non-linear loads which are sensitive to the power quality, the amount of harmonic wave generation increased and resulted in various malfunctioning and damages to the industry. GIMAC-V is a measuring device designed to measure power quality by measuring phase voltage, current, phase, frequency and harmonic wave, and collecting power quality elements such as Sag, Swell, Interruption and Transient to minimize the economic losses caused by unexpected circumstances of equipment malfunctioning, production delays and process confusion as a result of harmonic wave generation and electromagnetic phenomenon.

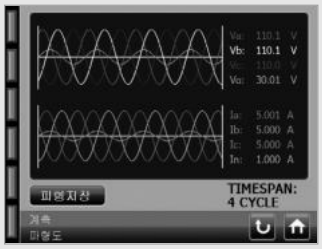
GIMAC-V series is a Integrated Metering and Control Device capable of high-precision measurement of various electricity, power quality and harmonic analysis, circuit breaker control, DI monitoring, and event recording of power distribution systems, and includes an automatic power factor control device (APFC)

Contents

Features

A variety of measurement items and monitoring

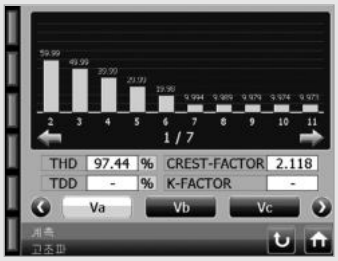
- Wide voltage input range (AC 10 ~ 452V, 40 ~ 70Hz)
- Voltage/current 0.2% and power/energy 0.5 Class accuracy achieved
- 105 kinds of measurement elements provided including voltage and current harmonics upto 63ch., THD, K-Factor and Crest Factor
  - Wave capture of voltage and current waveforms
  - Check the wiring via VECTOR with color LCD
  - Color display of DIO operation status



<Oscillograph view>

Enhanced power quality (PQ) measurement function

- Measure, analyze and store up to 512 Sag, Swell and Interruption events.
- Analysis up to 63rd harmonic spectrum.
- Power measurements with accuracy Class 0.5 (IEC 62053-21, 22)
- Waveform data storage for up to 250 PQ events

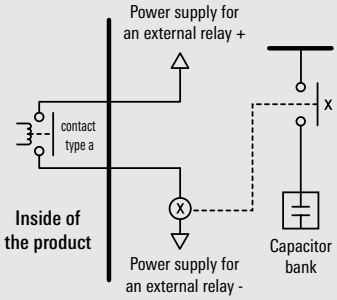


<Harmonics view>

Automatic Power Factor Control (APFC), Optional function

Automatic power factor control for upto 8 capacitor banks by setting capacitor capacity and control condition

- Combination control: In case the capacitance is set, it calculates the required reactive power at current factor and controls the capacitors to comply with the set capacity
- Circulation control: If the capacitance is not set, it opens closed capacitors and then closes those from lately opened one.



Transient Wave/Event storage/Inquiry

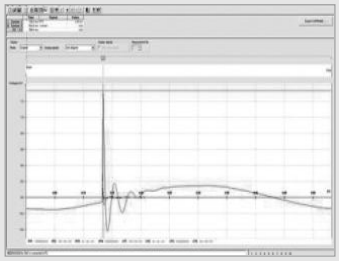
- Up to 20 Transient Waves stored at 1,024 Sampling (60Hz 16.28μsec) per cycle
- Power Quality, Transient waveform and DI input display
- Analyze files saved as Comtrade format files

<Transient Event Records view>

Power Quality/Transient function

Item	Range	Remarks
Sag	40 ~ 90%	- PQ Event: Saving max. 512 events of Time of occurrence, Voltage of pickup, max and min. - PQ Wave: Saving max. 250 waveforms of voltage/current of at least 60 cycles - When PQ event occurs, DO output, Alarm LED blinks
Swell	110 ~ 200%	
Interruption	10 ~ 30%	
Transient Voltage	60 ~ 150V	- Event: Saving max. 512 events of Time of occurrence, dV/dt, Voltage of max and min. - Wave: Saving max. 20 waveforms of voltage/current of 1 cycle(1,024 sampling) - When event occurs, DO output, Alarm LED blinks - Transient recognition time : 16.276 μs (when frequency is 60Hz)

Note) The setting range is a percentage of the secondary rated voltage (%).
Note) Wave stored as Comtrade files can be analyzed in detailed.


<Transient waveform analysis>

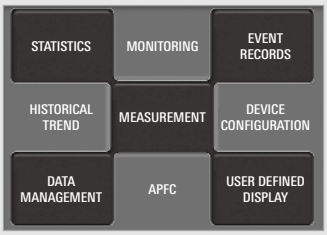
Color graphic LCD & Touch screen

Increased visibility of measuring of the power system
and real-time waveform through graphic processing
by using a color touch graphic LCD

- Comprehensive measurements display with high visibility
- Real-time waveform display and capture
- harmonic analysis display

Language selection and User Defined Display

Korean / English language is supported for all menus,
and the user-defined screen display function makes it easy to find
the menu and screen.



GIMAC-V Manager

It is possible to download and upload the settings of the device using
USB, making maintenance and data inquiry very convenient.

■ Function

- PC connection via USB port
- Managing of demand trends, events inquiry and Database
- Device settings and status inquiry
- Monitoring of measurement, electricity demand and harmonic
- Displays of electricity by vector or trend graph
- Circuit Breaker and Digital Output control by Remote/Local/Auto/Manual
- All events such as general, PQ, and transient can be queried, and waveform data is saved as a file with Comtrade format.

■ System Requirements

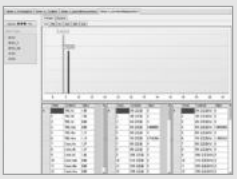
- Intel Pentium 3 or more IBM-PC compatible PC
- 512MB or more memory
- 1024× 768 or higher resolution VGA card
- MS Windows 7/2000/XP
- 1G byte or more hard disk space
- USB 1.0 or higher port
- USB Mini-B type cable

■ Software download

- https://www.lsis.com/support/download-center

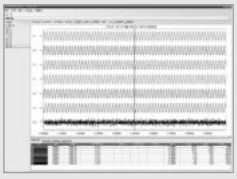
<Main>

<Measuring>



<Harmonics>

<Setting>



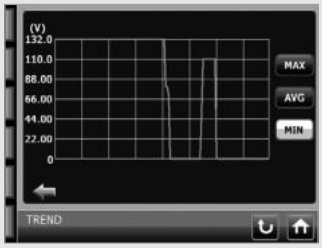
<Waveform data>

A

Features

Statistics and Trend

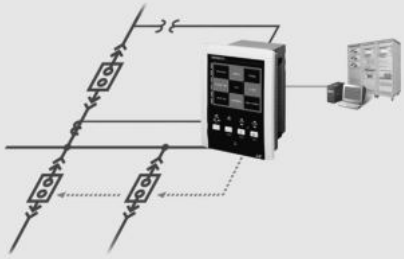
- S aving max. values of the 43 measurement elements, min. values of the 19 measurement elements, preceding demand, the max/min/avg value of the instantaneous value out of the preceding demand time, and max/min demand value.
- For the selected 10 measurements elements Trend data for 110days (15min basis)can be stored and displayed in Graph for trend analysis
- Demand time: 1, 2, 5, 10, 15, 20, 30, 60 min



< Voltage Trend view>

Other functions

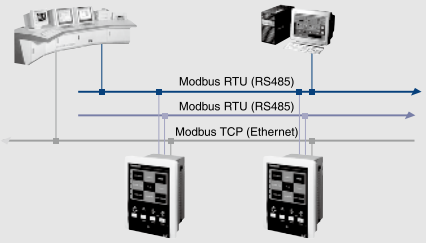
- Breaker status monitoring and Select Before Operation control
- 512 events storable including equipment status changes, reset, clear and etc
- Self-test function on system incorrect wiring, frequency error and internal memory
- Analog 4 ~ 20mA input option



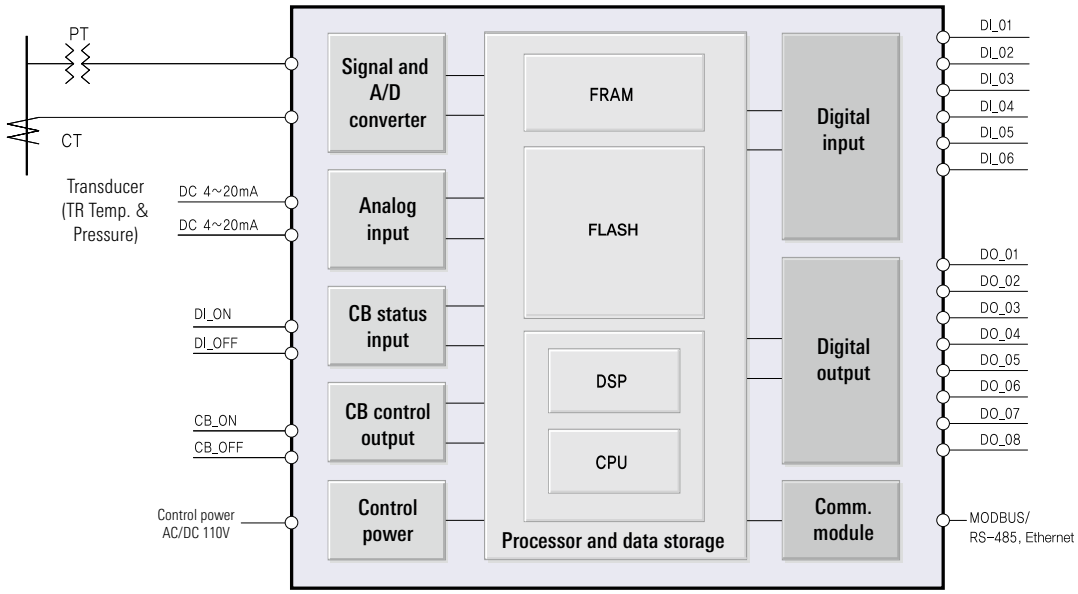
Support 3 independent communication

2 RS485 ports and 1 Ethernet port Independent communication is possible

- 2 ports for MODBUS RTU (RS-485)
- 1 ports for MODBUS TCP (Ethernet 10/100 Base-Tx)



Functional Block Diagram



Rating

Item			Specification
Wiring			1P2W, 1P3W, 3P3W(Y), 3P3W(OPEN-DELTA), 3P4W
Rating	frequency		60Hz, 50Hz
	Voltage	PT GPT	10~452V : Phase voltage
	Current	CT ZCT	0.05~6A
	Power		AC/DC 110V ±20%
	Power Consumption		20W or less : Stanby 30W or less : Operation
	Burden		0.2VA or less : PT 0.2VA or less : CT
input contact	for general		Digital Input AC/DC 110V
Output contact	for trip		AC 250V 16A, DC 30V 16A
	for general		AC 250V 5A, DC 30V 5A
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 75°C
Humidity			RH 80% or less (non-condensing)
Altitude			2,000m or less
Applied Standards			IEC60255, IEC61326, IEC61000-4, KEMC 1110
Dimension(mm)			190×255×116
Weight			3.6kg
Communication	MODBUS-TCP		• MODBUS TCP(10/100 Base-Tx): 1Port • Communication speed: 10/100 MBps, Star Type, UTP (CAT.3, CAT.5) • Communication distance, max.100m (HUB to terminal)
	MODBUS-RTU		• MODBUS RTU(RS485): 2Ports • Operation mode Differential, Communication speed 9,600/19,200/38,400bps • Communication distance, max 1.2km, Universal RS485 Shielded twisted pair cable • Transmission system, max Half-Duplex, output voltage -7V ~ +12V

Note) Avoid places with vibration, shock, dust, moisture, corrosive, gas, etc.

Automatic Power Factor Controller (APFC)

Type		Specification
BANK setting	BANK	0 ~ 8
	Alarm	0 ~ 1
Capacitor capacity setting		None ~ 999MVA
Alarm contact setting		DO_01~DO_08
Capacitor closing delay time		10~300sec/1sec
Dead time (for charge or discharge)		10~300sec/1sec
Maximum power factor setting		0.95 ~ -0.90 (+ lag, - lead)
Minimum power factor setting		0.80 ~ 0.95
Alarm power factor setting (Alarm occurred)		0.00 ~ 0.90
Event & Alarm Setting	Low Current	Set whether to get EVENT occurred and set the control in case the average current of 3 phase is 1A
	Under Voltage	Set whether to get EVENT occurred and set the control in case the phase voltage (line voltage for 3-phase 3-wire open delta) is 80 V or less
	Over PF	Set whether to get EVENT occurred when exceed the Maximum PF
	Under PF	Under PF : Set whether to get EVENT occurred when less than the Minimum PF
	Over Volt THD	Set whether to get EVENT occurred and BANK control when the voltage THD is above the set value
Power Factor control	Automatic control	Auto
	Manual control	Manual
	Combination control Note)	In case all capacitances are set
	Circulation control	In case the capacity of the capacitor is not set - The first input capacitor is opened first, and the last opened capacitor is input first.

Note) Circulation control is recommended when the capacitor capacity is the same

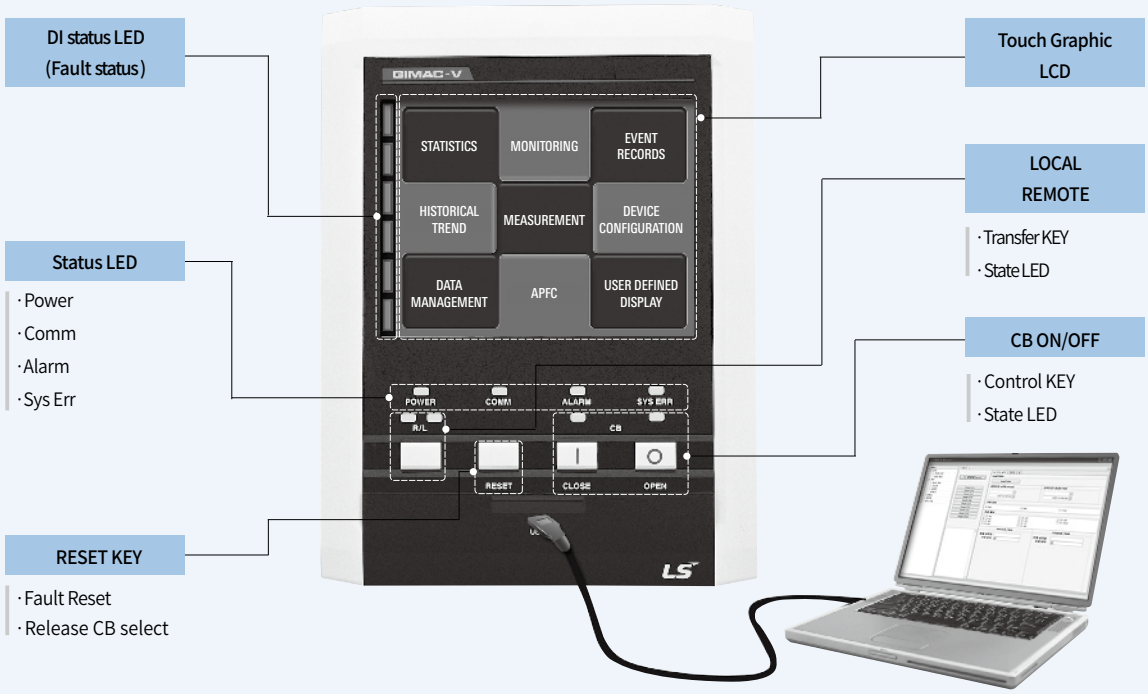
Function & Rating

Measurement

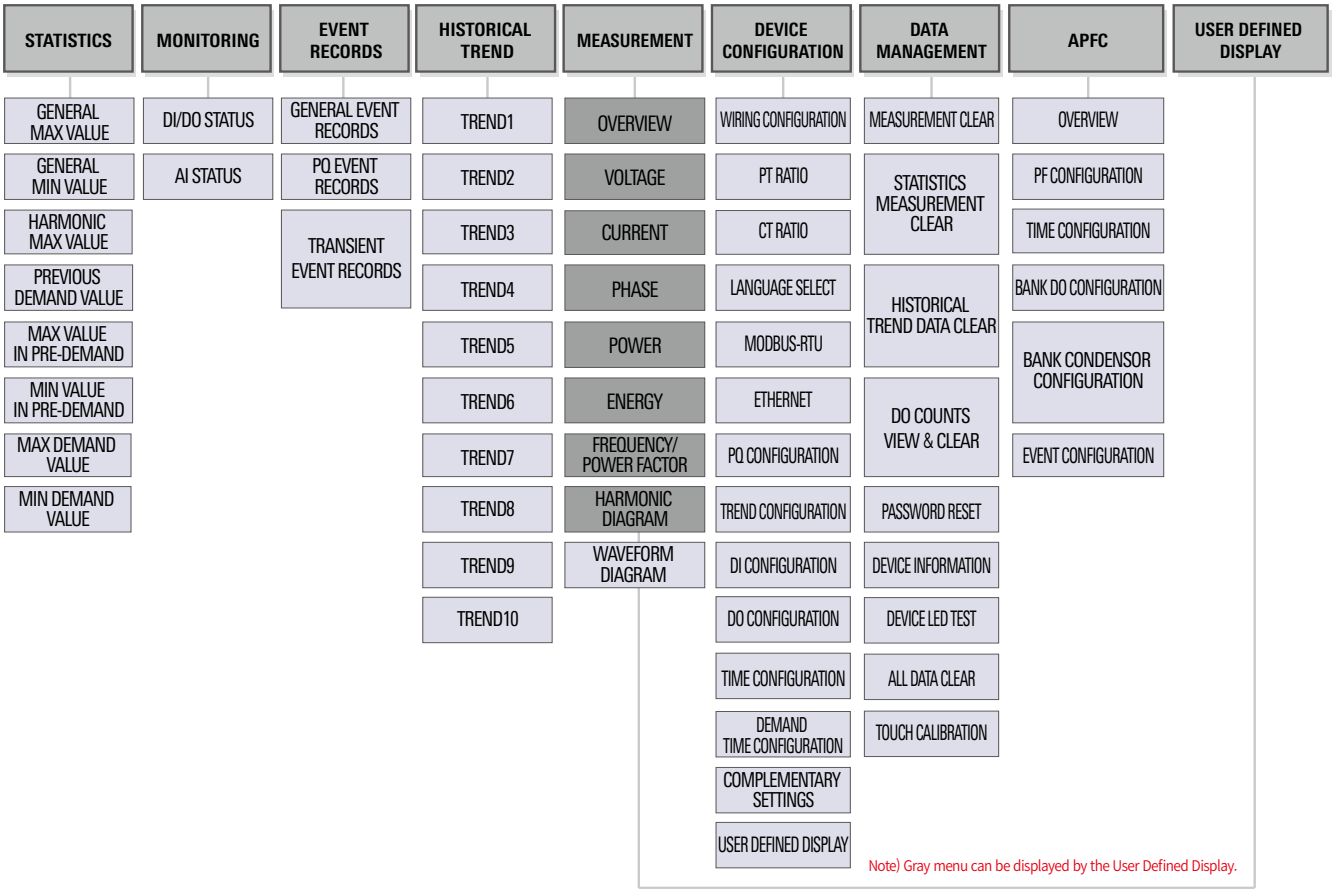
Item		Description	Measurement range	Accuracy
Voltage	Phase voltage	V_a, V_b, V_c, V_{navg}	0.000V~999.9kV	0.20%
	Line voltage	$V_{ab}, V_{bc}, V_{ca}, V_{lavg}$ Note)	0.000V~999.9kV	0.20%
	Normal phase voltage	V_1	0.000V~999.9kV	-
	Reversed-phase voltage	V_2	0.000V~999.9kV	-
	Crest Factor	$V_a, V_b, V_c, V_{ab}, V_{bc}, V_{ca}$	0.000~999.9	-
Current	Phase current	I_a, I_b, I_c, I_{avg}	0.000A~999.9kA	0.20%
	X phase current	I_x	0.000A~999.9kA	0.20%
	Normal phase current	I_1	0.000A~999.9kA	-
	Reversed phase current	I_2	0.000A~999.9kA	-
	Crest Factor	I_a, I_b, I_c	0.000~999.9	-
Phase	Line voltage	$\angle V_{ab}, \angle V_{bc}, \angle V_{ca}$	0.0~359.9°	0.5°
	Phase voltage	$\angle V_a, \angle V_b, \angle V_c$		
	Phase current	$\angle I_a, \angle I_b, \angle I_c, \angle I_x$		
Power	Active power	$P_a, P_b, P_c, \Sigma P$	0.000~999.9GW	Class0.5
	Reactive power	$Q_a, Q_b, Q_c, \Sigma Q$	0.000~999.9GVar	Class0.5
	Apparent power	$S_a, S_b, S_c, \Sigma S$	0.000~999.9GVA	Class0.5
Energy	Active energy	$WH_a, WH_b, WH_c, \Sigma WH$	0.000~999,999.999MWh	Class0.5
	Reactive energy	$VARH_a, VARH_b, VARH_c, \Sigma VARH$	0.000~999,999.999MVarh	Class0.5
	Reverse active energy	$rWH_a, rWH_b, rWH_c, \Sigma rWH$	0.000~999,999.999MWh	Class0.5
	Reverse reactive energy	$rVARH_a, rVARH_b, rVARH_c, \Sigma rVARH$	0.000~999,999.999MVarh	Class0.5
	Apparent energy	$VAH_a, VAH_b, VAH_c, \Sigma VAH$	0.000~999,999.999MVAh	Class0.5
Frequency		F(Hz)	40.000~70.000Hz	0.1%
Power Factor	Power Factor(PF)	$PF_a, PF_b, PF_c, \Sigma PF$	-1.0000~1.0000	phase accuracy
	1st harmonic power factor (DPF)	$DPF_a, DPF_b, DPF_c, \Sigma DPF$		
Harmonics	Line voltage	V_{ab}, V_{bc}, V_{ca} 2~63th Harmonics	0.000~999.9	-
	Phase voltage	V_a, V_b, V_c 2~63th Harmonics	0.000~999.9	
	Phase current	I_a, I_b, I_c 2~63th Harmonics	0.000~999.9	-
	THD	$V_{ab}, V_{bc}, V_{ca}, V_a, V_b, V_c, I_a, I_b, I_c$	0.000~999.9%	-
	TDD	I_a, I_b, I_c	0.000~999.9%	-
	K-FACTOR	I_a, I_b, I_c	0.000~999.9	-
Analog Input		AI01, AI02	4.000-20.00mA	0.5%

Note) Average of line voltage

Appearance & Setting

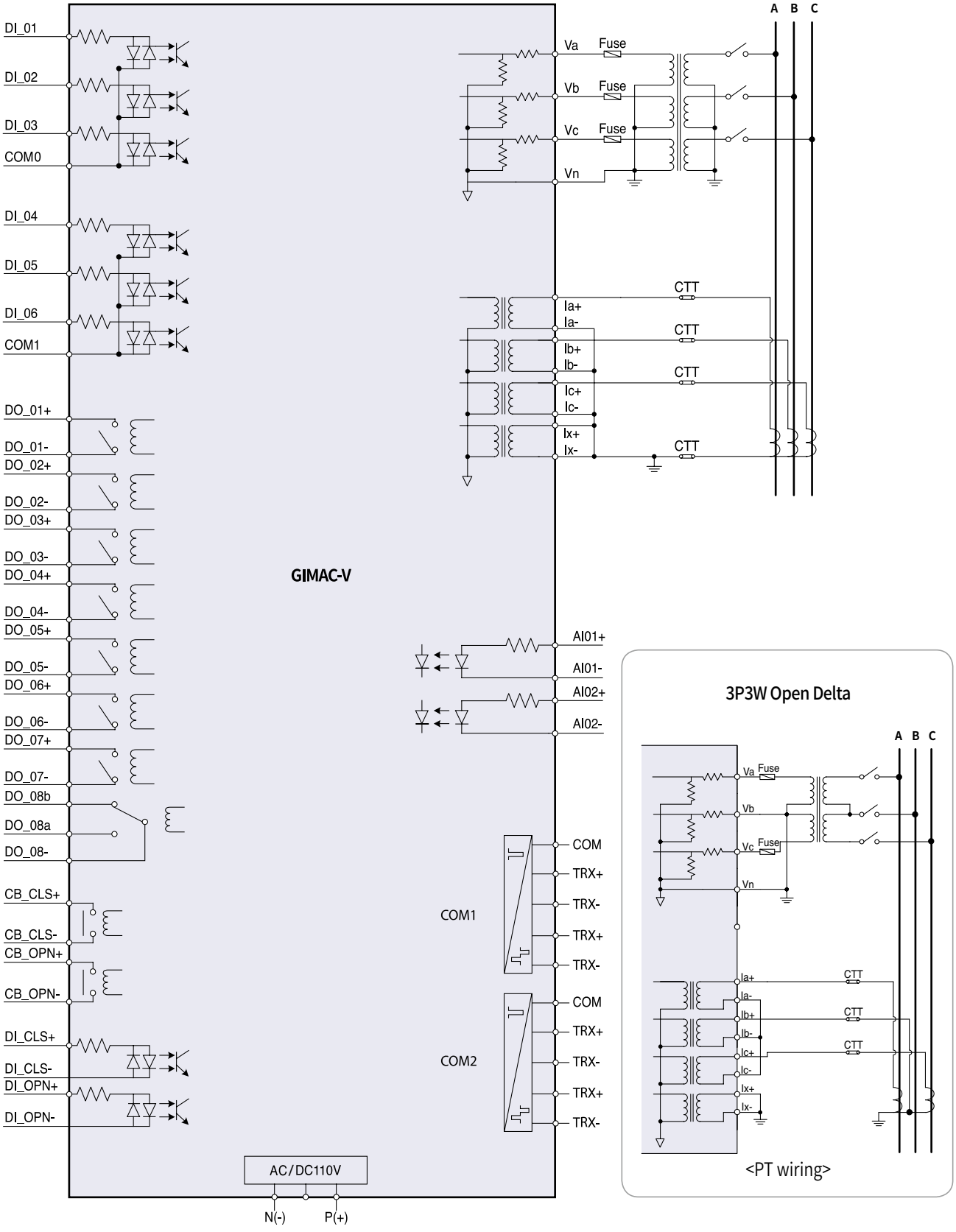


MMI control

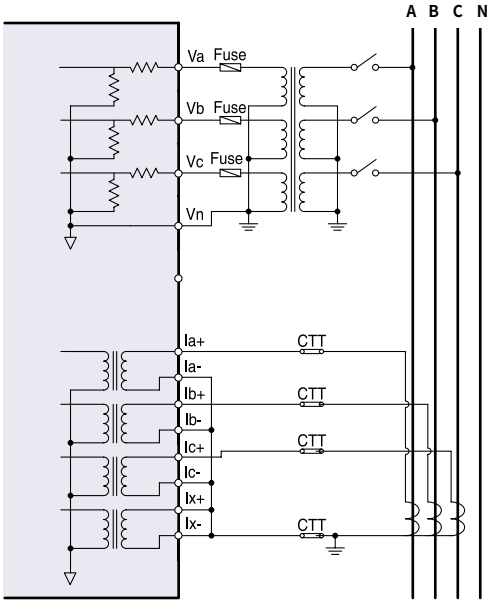


Wiring

3P3W


DI_01
DI_02
DI_03
COM0
DI_04
DI_05
DI_06
COM1
DO_01+
DO_01-
DO_02+
DO_02-
DO_03+
DO_03-
DO_04+
DO_04-
DO_05+
DO_05-
DO_06+
DO_06-
DO_07+
DO_07-
DO_08b
DO_08a
DO_08-
CB_CLS+
CB_CLS-
CB_OPN+
CB_OPN-
DI_CLS+
DI_CLS-
DI_OPN+
DI_OPN-
GIMAC-V
AC/DC110V
N(-)
P(+)
Va
Vb
Vc
Vn
Fuse
A B C
CTT
Ia+
Ia-
Ib+
Ib-
Ic+
Ic-
Ix+
Ix-
AI01+
AI01-
AI02+
AI02-
COM1
COM2
COM
TRX+
TRX-
3P3W Open Delta
<PT wiring>

3P4W



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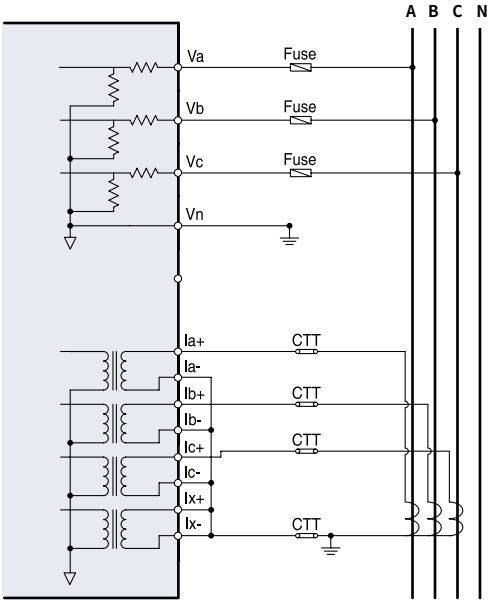
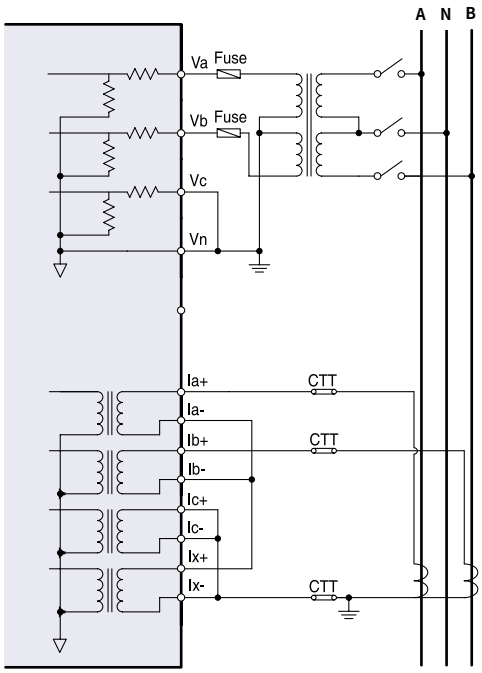


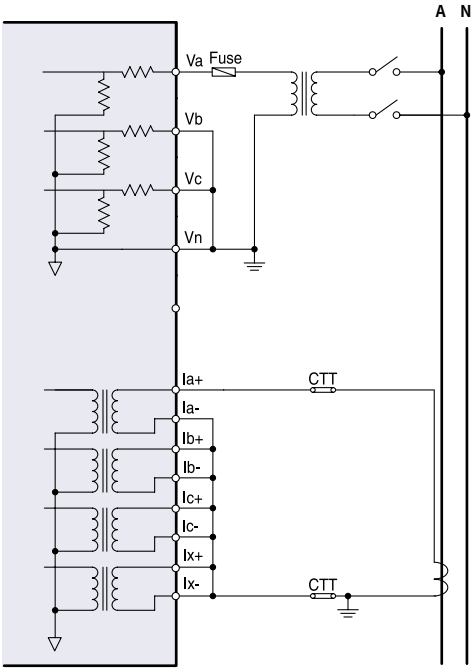
<Direct Wiring>

A

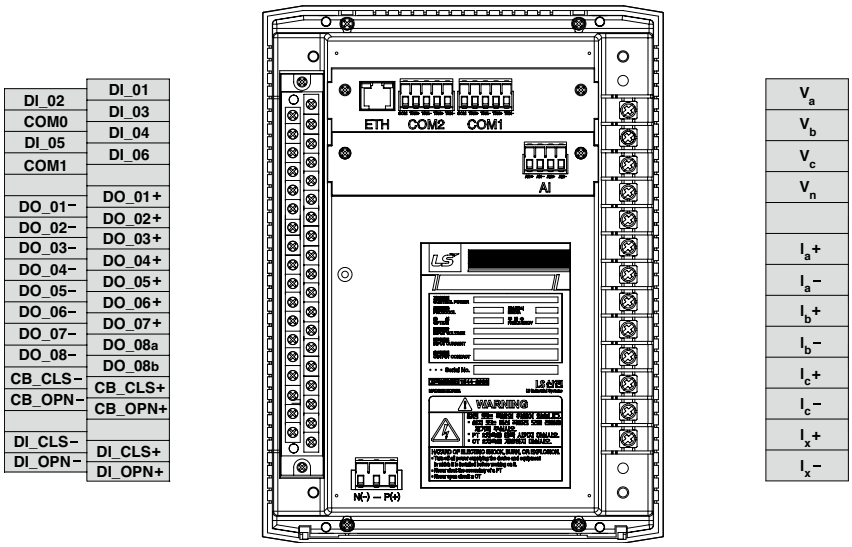
1P3W



1P2W



Contact Configuration



Input and output contact configuration

Contact name	Setting by model(Example)		Remark
	GIMAC-V NO	GIMAC-V AP	
DI_CLS+, DI_CLS-	CB CLOSE State input_52a		User defined using N/A
DI OPN+ DI OPN-	CB OPEN State input_52b		
DI_01 ~ 06	FAULT-CAPTURE	DI-NONE	
CB_CLS+, CB_CLS-	CB CLOSE Output		User defined using N/A
CB_OPN+, CB_OPN-	CB OPEN Output		
DO_01+, DO_01-	SAG	For BANK control	Factory setting is NONE
DO_02+, DO_02-	SWELL	For BANK control	
DO_03+, DO_03-	INTERRUPTION	For BANK control	
DO_04+, DO_04-	TRANSIENT	For BANK control	
DO_05+, DO_05-	DI	For BANK control	
DO_06+, DO_06-	LATCH	For BANK control	
DO_07+, DO_07-	NONE	For BANK control	
DO_08a, DO_08-, DO_08b	LOCAL/REMOTE	ALARM	

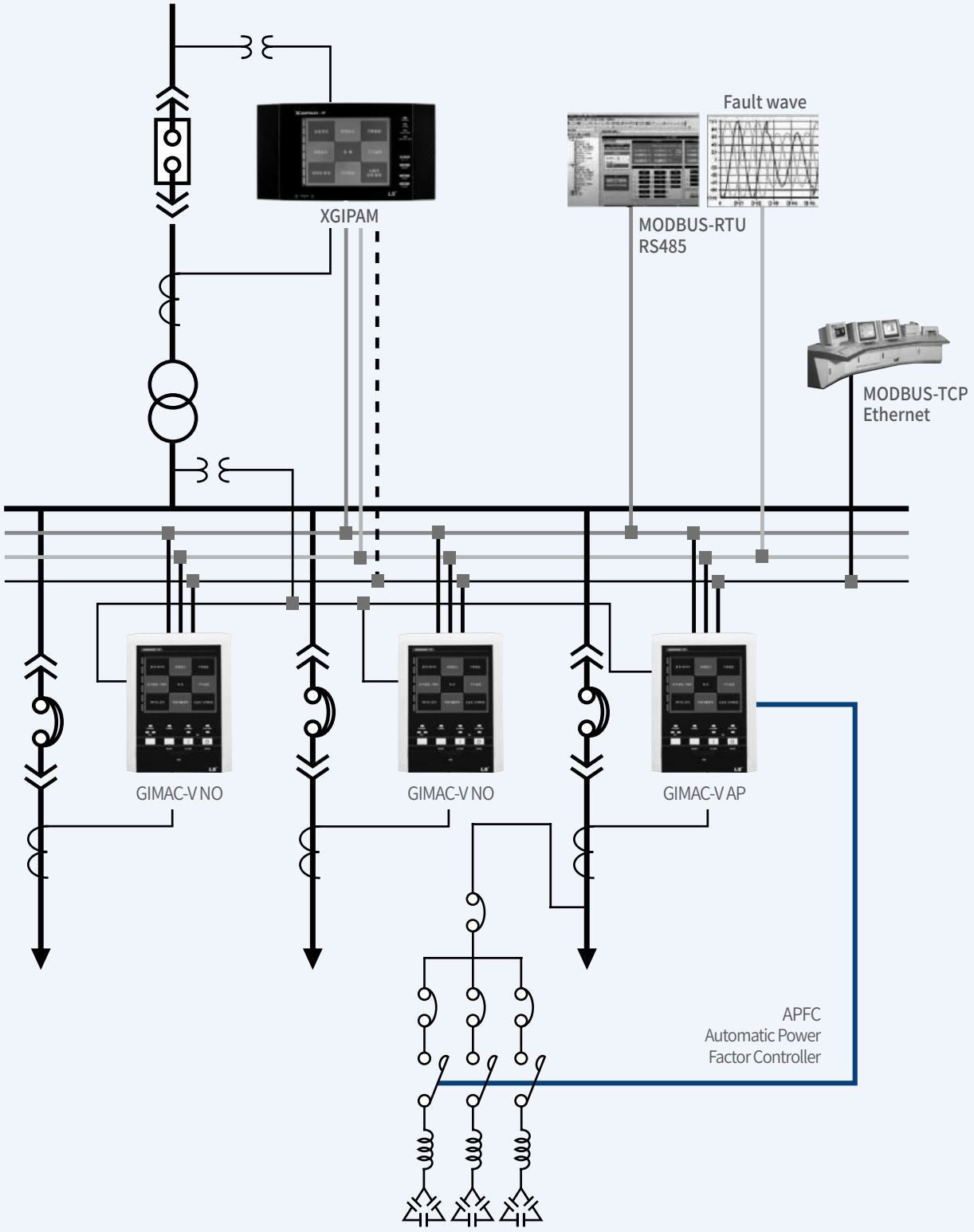
Operations by DI setting

Contact name	Setting Value		RESET after		Removal of fault after RESET		Waveform storage (at the point of DI)
	At normal	At Fault	Operation (Fault elimination first)	RESET	RESET	Operation (RESET first)	
FAULT-CAPTURE	Off	Flickering (red)	Flickering (red)	Off	On (red)	Off	○
FAULT-NONE							×
DI-CAPTURE	Off	On (yellow)	Off	-	-	Off	○
DI-NONE							×

Operations by DO setting

Contact name	Setting Value	Operation	Return condition
DO_01 ~ DO_07	NONE	-	-
	SAG	Output in the event of SAG EVENT of PQ	Return by FAULT RESET
	SWELL	Output in the event of SWELL EVENT of PQ	Return by FAULT RESET
	INTERRUPTION	Output in the event of INTERRUPTION EVENT of PQ	Return by FAULT RESET
	TRANSIENT	Output in the event of TRANSIENT EVENT of PQ	Return by FAULT RESET
	DI	If corresponding DI is in ON state	If DI is in OFF state
	LATCH	If corresponding DI is in ON state	If DI is in OFF state and FAULT is RESET
	APFC ALARM	Output in the event of Alarm of APFC	If FAULT is RESET or ALARM is relieved
	APFC BANK	Output in the event of APFC's closing condition is satisfied	If APFC's opening condition is satisfied or opening command is entered by communications/KEY
DO_08	LOCAL/REMOTE	Output in the state of REMOTE	Return at LOCAL state

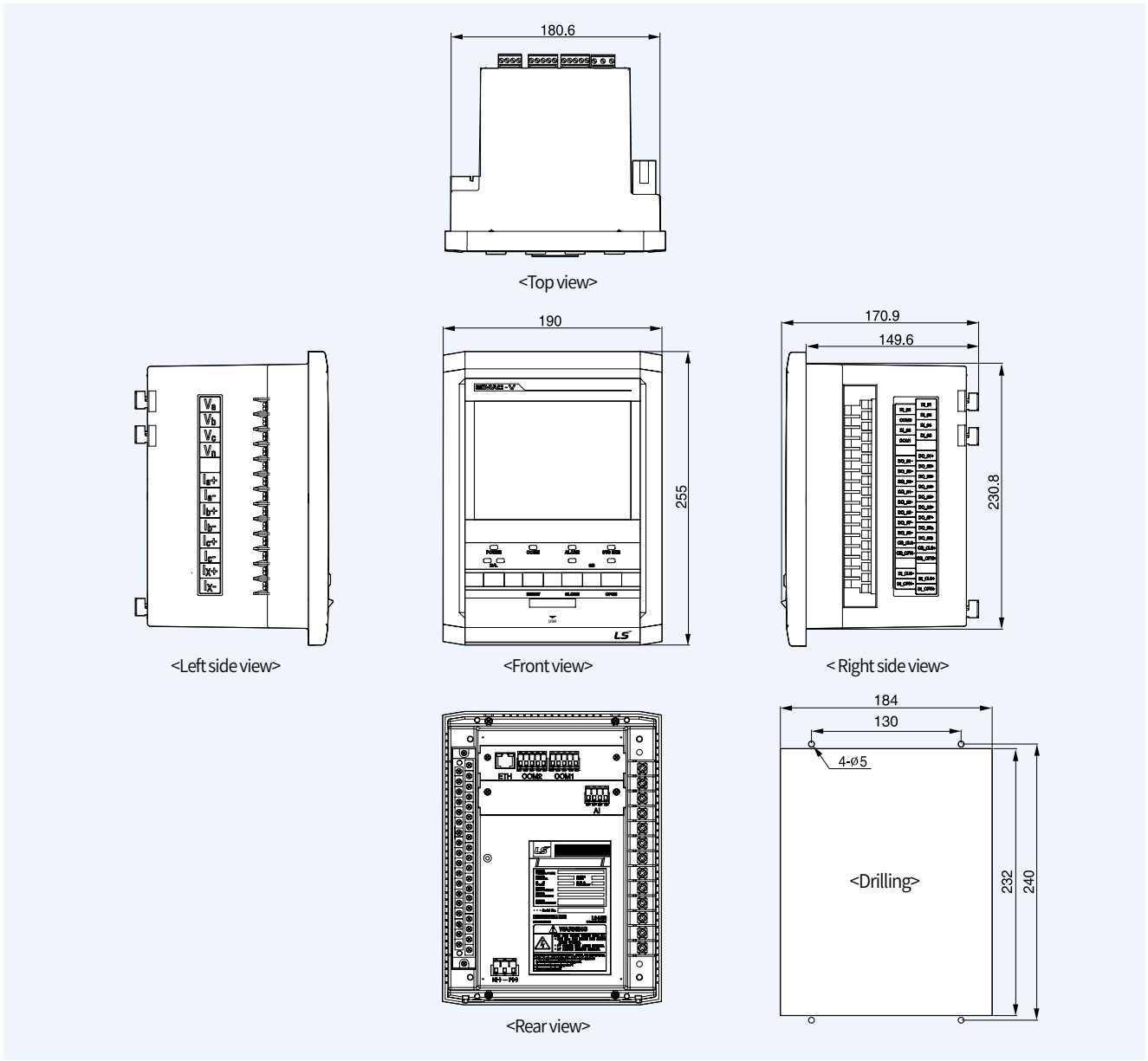
System Configuration



A

Dimensions & Ordering

Dimensions



Ordering

GIMAC - V

NO	RS	M	5A	60HZ	AC/DC 110V	DI_AC/DC 110V	AI

Model

NO	Normal
AP	APFC functions

Communication

RS	RS485 2Port
ET	Ethernet 1Port
RE	RS485 2Port, Ethernet 1Port

Protocol

M	MODBUS

CT Rating

5A

Frequency

50Hz

60Hz

Control Power

AC/DC 110V

Digital Input

AC/DC 110V

Option

AI	4~20mA (2P)
-	None

※ Manager program is downloaded from our website, USB Mini 5p cable is available commercially.

MEMO

GIMAC-IV

Capable of high-precision measurement of various electricity, power quality and harmonic analysis, circuit breaker control, DI monitoring, and event recording of power distribution systems, and includes an automatic power factor control device (APFC)

GIMAC-IV

Digital Integrated Metering & Control Device
Automatic Power Factor Controller
Demand Controller

GIMAC-IV series performs 128 samplings per cycle with the integrated high-performance DSP for various measurements and calculations to enable high measurements accuracy, and it also added a digital filter to prevent inaccurate measurements by effectively blocking various noises and abnormal waveforms such as Sag and Swell that cause measurement errors.

It features Event Recording function which is capable of saving up to 300 events ranging from setting changes, DI/DO status change, APFC event and demand controller event, and it also features various self-diagnosis functions which not only diagnose external issues such as inappropriate wiring, shorted wiring and abnormal frequencies, but also internal memory and CPU faults as well.

B

Contents

고효율기자재

Use of High Energy Efficiency Materials

LS auto power factor controller GIMAC-IV AP is a critical product comprising of complex receiving/distribution panels certified with high energy efficiency materials certified by the Korea Energy Agency. GIMAC-IV AP is a high energy efficiency material product capable of automatically controlling the power factor to improve upon the product's energy efficiency, and it acquired KERI certification which verifies its performance and reliability.

GIMAC-IV NO DPR1000

GIMAC-IV DC

- Various measurement functions and High accuracy (0.2%)
- Maximum 8 Capacitor Banks or load control
- Optimized power factor control with automatic/manual control, circulation control and combined control (GIMAC-IV AP)
- Efficient maximum demand power management with automatic/manual control and priority control
- Event Recording (Max. 300)
- Acquired KERI certificate for high-efficiency energy equipment (APFC)

B

Features

Multi function, High Measurement accuracy

Various measurement functions and High accuracy (0.2%)

In addition to basic relay elements such as voltage, current, power, electric energy, power factor and frequency, it is able to perform measurement on phase, harmonic wave and demand. It also incorporates a high performance DSP which performs 128 samplings per cycle, as a result achieving 0.2% or greater measurement accuracy.

Harmonic Wave Measurement & THD

Along with basic waves such as voltage and current, it is capable of measuring and displaying the 63th harmonic wave, and it is also capable of displaying THD (Total Harmonics Distortion) thereby enabling an easy power quality analysis.

Event Recording

Up to 300 events ranging from relay fault occurrence, circuit breaker operation, Digital Output contact operation, status change, setting change, self-diagnosis error, APFC event and demand event are recorded.

- APFC Evnet: Zero Voltage, Under Voltage, Zero Current, Reverse Currnet
  Low Current, Over Switching, Alarm PF, Over PF, Under PF
- Demand Event : Alarm1, Alarm2
- Daily/Monthly/Yearly data recording available

Incorporation of Digital Filter

High-performance digital filter is installed to prevent incorrect frequency measurements that are caused by noise waves within the voltage or abnormal waveforms such as Sag and Swell.

Analog Input (Option)

GIMAC-IV is capable of 2-point analog contact input, and it is capable of measuring analog data such as interior temperature of the switchgear or rectified AC/DC voltage.

- AI Input Range: DC 4 ~ 20mA
- Number of Contact Points: 2
- Accuracy: ±0.5% at Full scale

Reliability & Convenience

Select Before Operating (SBO) & Check Before Operating (CBO) functions

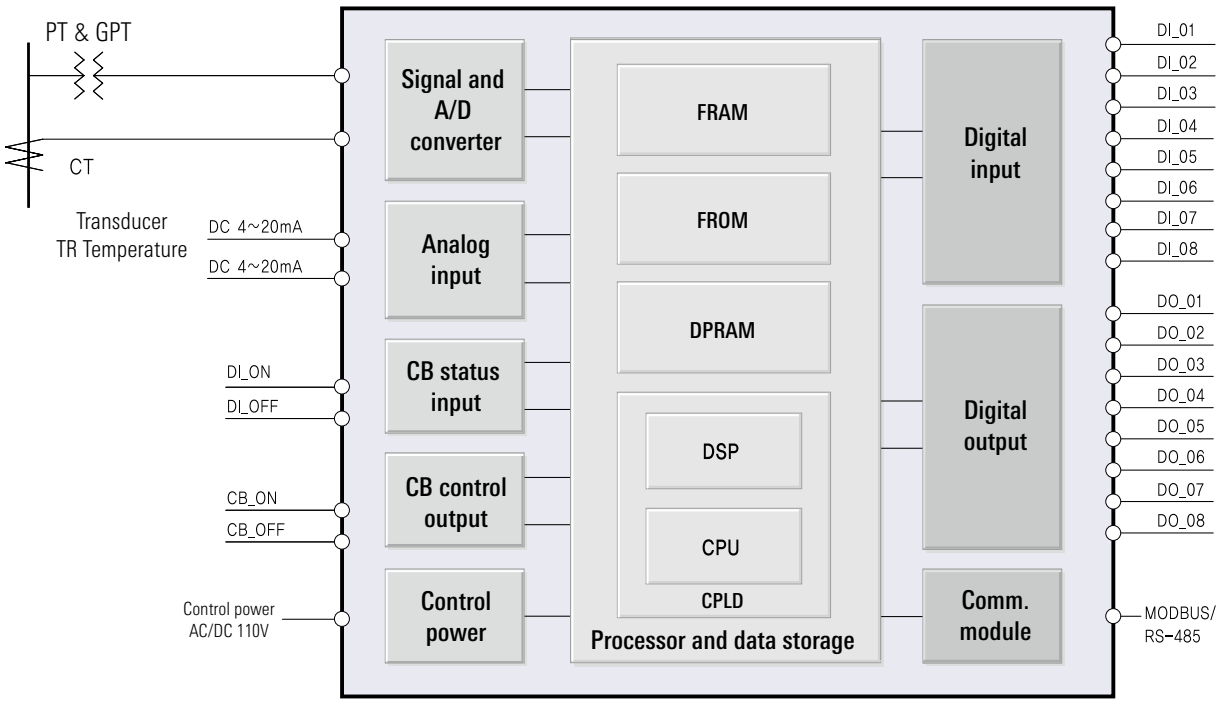
This function executes control commands only after selecting a control point and confirming a normal response from the selected point for greater control reliability and security. GIMAC-IV applies SBO/CBO functions on the power contact for CB control. The selected control point will wait for a control execution command for 5 seconds after responding, and if an execution command is not delivered within 5 seconds, it returns to its previous state, and if an execution command is delivered properly within 5 seconds, only then it will execute the control operation.

Variety of Self-Diagnosis Features

Frequency issue, wiring issue, voltage issue, circuit breaker control error, DO control error, DPRAM error are detected and saved as events, and displaying on the LCD screen and the blinking of system error LED is also a part of the wide range of self-diagnosis functions of the system.

Wide Range of Communication Compatibilities

GIMAC-IV supports MODBUS/RS485 communications. With the use of a protocol converter, it can also support DNP3.0, Glofa PLC protocol and Ethernet compatibility that enables high-speed data transfer as well as duplex communication for greater application.

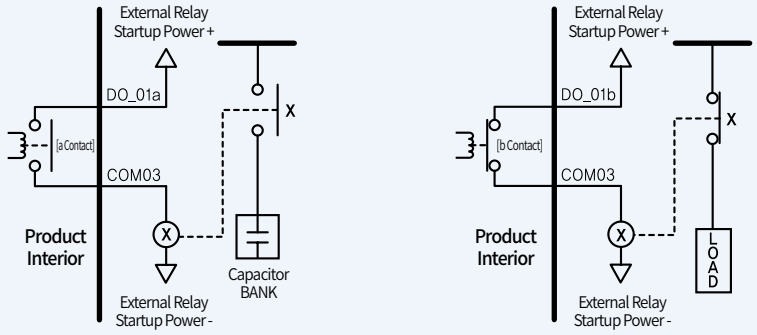


Block Diagram

Automatic Power Factor Controller, Demand Controller(OPTION)

Maximum 8 Capacitor Banks or load control

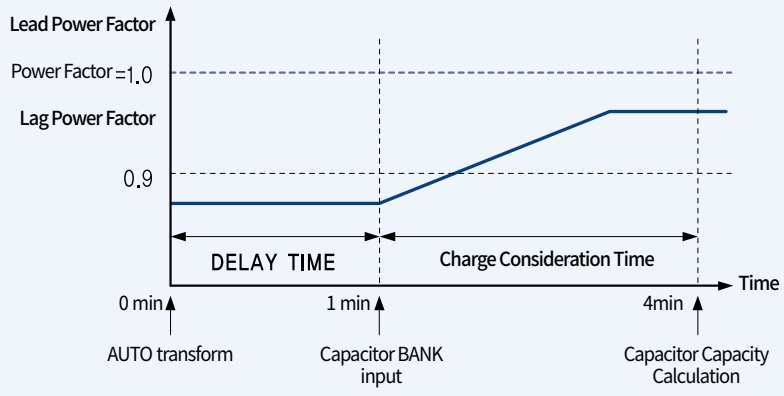
With c type 8 contacts, a/b type contact can be used independently. also by setting 1 bank as 2a, it's possible to control CB on/off independently with a type 2 contacts.



[a Contact] [b Contact]

Optimized power factor control with automatic/manual control, circulation control and combined control (GIMAC-IV AP)

Capacitor capacity can be set automatically or manually, and by circulating the Capacitor control order, it can prevent control concentrating on a single bank. It also can achieve optimum power factor control by implementing combination control which automatically combines Capacitor capacities and automatically calculates the target power factor.

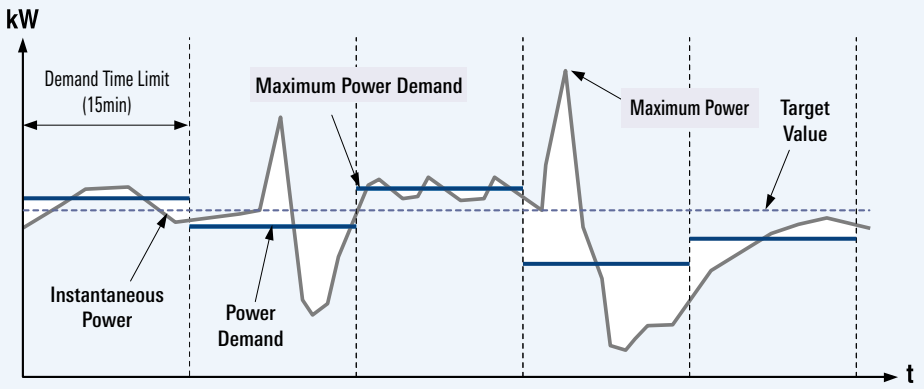


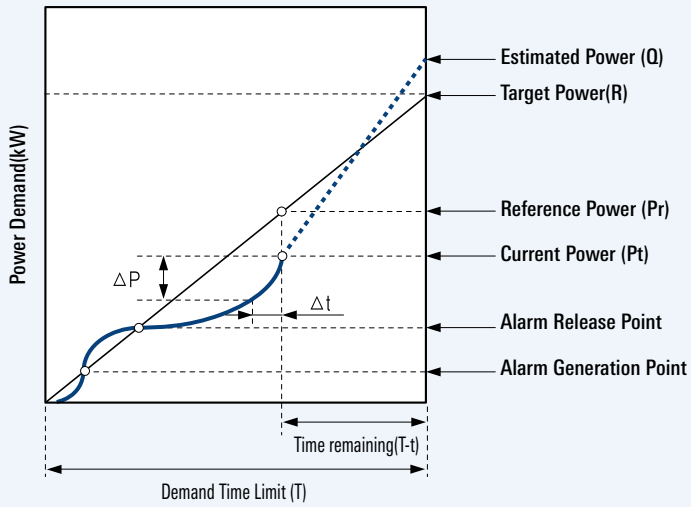
Acquired KERI certificate for high-efficiency energy equipment (APFC)

GIMAC-IVAP is an automatic power factor controller (APFC), which is an essential product of a complex switchgear system that is a high-efficiency energy equipment implemented by the Korea Energy Agency.

Efficient maximum demand power management with automatic/manual control and priority control

The power consumption is constantly monitored to automatically calculate the predicted power so that it does not exceed the preset target power value, and cut off the load to manage the maximum demand power.





B

Function & Rating

Rating

Type			Specification
Ratings	Wiring		1P2W, 1P3W, 3P3W, 3P4W
	Frequency		60Hz, 50Hz
	Voltage	PT	10 ~ 230V
		GPT	2.2 ~ 230V
	Current	CT	0.05 ~ 6A
	Power		AC/DC 110V, 220V
	Power consumption		10W or less : Stanby 30W or less : Operation
	Burden		1.0VA or less : PT 1.0VA or less : CT
Input contact	for general		Digital Input AC/DC 110V, 220V
Output contact	for trip[Note1]		Contact switching capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: AC 3840VA, DC 480W
	for alarm		Contact switching capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: AC 3840VA, DC 480W
Insulation Resistance			DC 500V 10MΩ or more
Insulation Voltage			AC 2kV (1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 1.2 times of rated current for 3 hours. Withstand 8 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV : power input 2kV : other input 1kV : analog input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Altitude			2,000m or less
Applied Standards			IEC60255, IEC61000-4, KEMC 1110
Dimension(mm)			190×255×116
Weight			3.6kg
Communication			RS485 : Modbus, DNP3.0

Note 1) When the circuit breaker relay open circuit occurs, it must be an unloaded open circuit.

Measurement

Item		Measurement range	Accuracy(%)	Remarks
Voltage	Voltage (V)	0.000V~999.99kV	±0.2%	Phase voltage, Line voltage
		0.000V~999.99kV	±0.2%	
	Normal voltage (V_1)	0.000V~999.99kV	-	
	Reversed phase voltage (V_2)	0.000V~999.99kV	-	
	Zero phase voltage (V_0)	0.000V~999.99kV	±0.5%	V_0
	Unbalanced voltage rate	0.000~100.00%	-	
Current	Current (I)	0.000A~999.99kA	±0.2%	Each Phase Current
	Normal current (I_1)	0.000A~999.99kA	-	
	Reversed phase current (I_2)	0.000A~999.99kA	-	
Phase	Line voltage	0.000~360.00°	±0.5°	Voltage 30V, Current 0.5A or higher
	Line voltage-current			
	Phase voltage			
	Phase voltage-current			
	Phase current			
Power	Active power	0.000W~99999.9MW	±0.5%	+ Forward, - Reverse
	Reactive power	0.000Var~99999.9MVar	±0.5%	+ Forward, - Reverse
	Apparent power	0.000VA~99999.9MVA	±0.5%	
Energy	Active energy	0.000Wh~99999.9MWh	±0.5%	+ Forward, - Reverse
	Reactive energy	0.000Varh~99999.9MVarh	±0.5%	+ Forward, - Reverse
	Reverse active energy	0.000Wh~99999.9MWh	±0.5%	
Frequency		45~70Hz	±0.05Hz	
Power Factor	Power Factor(PF)	-1.000~1.000	±0.5%	cosθ (+: Lag, -: Lead)
Harmonics	Line voltage	0.000V~999.99kV	-	Basic Wave~63th Harmonic Wave and THD
	Phase voltage			
	Phase current	0.000A~999.99kA	-	Basic Wave~63th Harmonic Wave and THD
Demand	Active power demand	0.000W~99999.9MW	-	Peak demand
	Current demand	0.000A~999.99kA	-	Peak demand
Analog Input	Analog Input	DC 4.000 ~ 20.00mA	±0.5%	4mA or less not measured

Communication

Type	Item	Specification	Remarks
MODBUS/RS485	Operation Mode	Differential	-
	Communication Speed	9,600 / 19,200 / 38,400bps	
	Communication Distance	Max. 1.2km	
	Communication Cable	Universal RS485 Shielded twisted pair cable	
	Transfer Method	Half-Duplex	
	Max. I/O Voltage	-7V ~ +12V	

B

Function & Rating

Automatic Power Factor Controller (APFC)

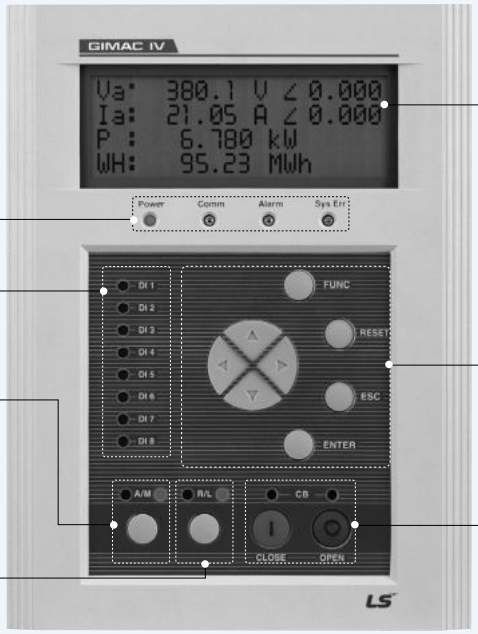
Type		Specification (GIMAC-IV AP only)
BANK setting	BANK	0 ~ 8
	Alarm	0 ~ 1
BANK Control Contact Setting	1BANK 1a contact	DO_01a ~ DO_08a (Latch)
	1BANK 1b contact	DO_01b ~ DO_08b (Latch)
	1BANK 2a contact	DO_01a ~ DO_08a (ON/OFF contact independently controlled, 500ms Pulse)
Capacitor capacity setting		None ~ 9,999MVA(Automatic / manual)
Alarm contact setting		DO_01~DO_08
Capacitor closing delay time		3 ~ 300sec / 1sec
Dead time (for charge or discharge)		3 ~ 300sec / 1sec
Maximum power factor setting		0.95 ~ -0.90 (+ lag, - lead)
Minimum power factor setting		0.50 ~ 0.95
Alarm power factor setting (Alarm occurred)		0.00 ~ 0.90
Event & Alarm Setting	Reverse Current	Set whether to get EVENT occurred and set the control in case the reverse power is maintained for delay time
	Low Current	Set whether to get EVENT occurred and set the control in case the average current of 3 phase is 1A
	Under Voltage	Set whether to get EVENT occurred and set the control in case the phase voltage (line voltage for 3-phase 3-wire open delta) is 80V or less
	Over Switching	Set whether to get EVENT occurred when capacitor control relay On count is 500 or more
	Over PF	Set whether to get EVENT occurred when exceed the Maximum PF
	Under PF	Set whether to get EVENT occurred when less than the Minimum PF
Power Factor control	Automatic control	Auto
	Manual control	Manual
	Combination control Note)	In case all capacity of capacitors are set
	Circulation control	In case the capacity of the capacitor is not set - The first input capacitor is opened first, and the last opened capacitor is input first.

Note) It is recommended to control the circulation when the capacitor capacity is the same.

Demand Controller

Type		Specification (GIMAC-IV DC only)	
Monitoring Function		Target Power Wt, Estimated Power We(t), Reference Power Wt(t), Current Power Wc(t)	
		Load Control Status	
		Event	
		DC Time & Status Display	
Load Setting	Number of Loads	0 ~ 8	
	Number of Alarms	0 ~ 2	
Load Control Contact Setting	1LOAD 1a contact	DO_01a ~ DO_08a (Latch)	
	1LOAD 1b contact	DO_01b ~ DO_08b (Latch)	
	1LOAD 2a contact	DO_01a ~ DO_08a (ON/OFF contact independently controlled, 500ms Pulse)	
Alarm Contact Setting	Alarm 1	Estimated Power > Target Power	2 or less contacts set among DO_01 ~ DO_08
	Alarm 2	Current Power > Reference Power	
Demand time		5 ~ 60min / 5min	
Start time		0 ~ Demand time / 1min	
Period time		10 ~ 60sec / 1sec	
Delay time		1 ~ (Period time-1)sec / 1sec	
Target Power (Wt)		100W ~ 99,999MW	
Alarm		Primary, Secondary Alarm	
Demand Control Sequence	Auto Control	Auto	
	Manual Control	Manual	
	Priority Control	All load inputs made simultaneously after Demand Time blocked according to priority is expired	

Appearance



Status LED
- Power
- Comm
- Alarm
- Sys Err

DI Status LED (Fault Status)

AUTO/MANUAL
- Display LED
- Function Switching KEY

REMOTE/LOCAL
- Display LED
- Function Switching KEY

20x4 Text LCD

Function KEY
- FUNC
- RESET
- ESC
- ENTER
- DIRECTION

CB ON/OFF
- Status display LED (RED, GREEN)
- CB Control KEY

Front View

FUNC — **FUNCTION**
Setting Menu and Measurement Menu Change

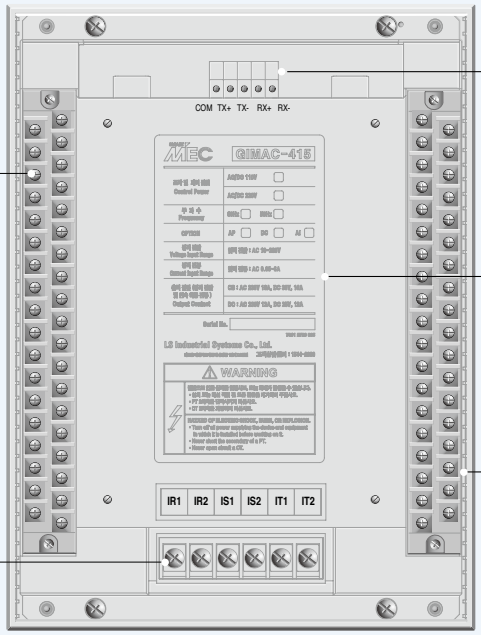
RESET — **FAULT, ALARM RESET**
ALARM DO Return, SYS ERR Return

ESC — Cancellation of selected item, cancel setting change, move to upper menu

ENTER — Select item and check setting, save changed data, Enter password

R/L — **Remote/Local change**

A/M — **Auto/Manual change**



Communication Terminal

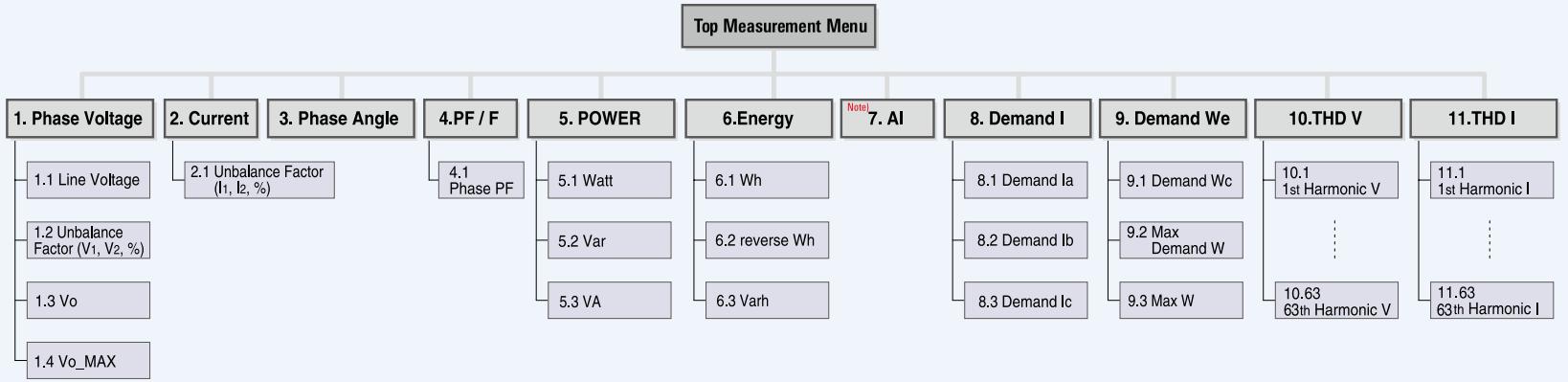
- PT Input Terminal
- CB Control I/O Terminal
- AI Input Terminal

Product Specification

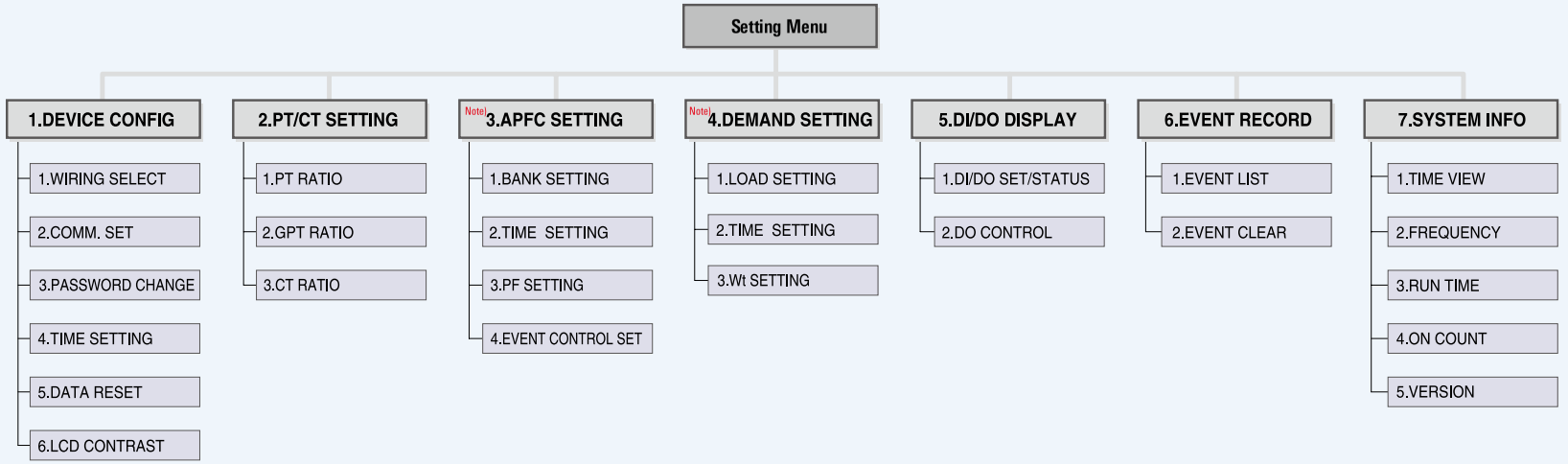
DI/DO I/O Terminal

CT Input Terminal

Rear View



※Press the ▼ button at the top Measurement Menu to move to the lower measuring item.

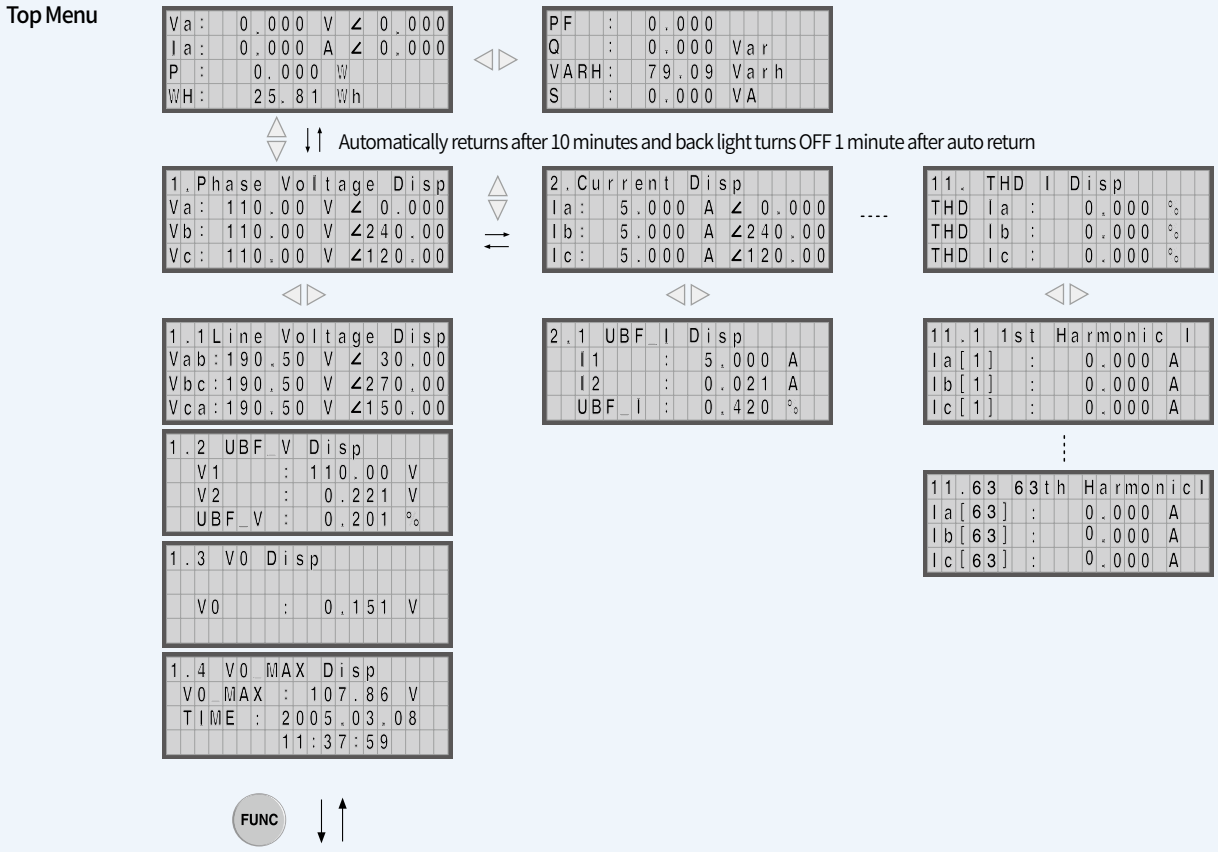


Note) AI measurement, APFC Setting and Demand Setting can only measure and be set with corresponding models.

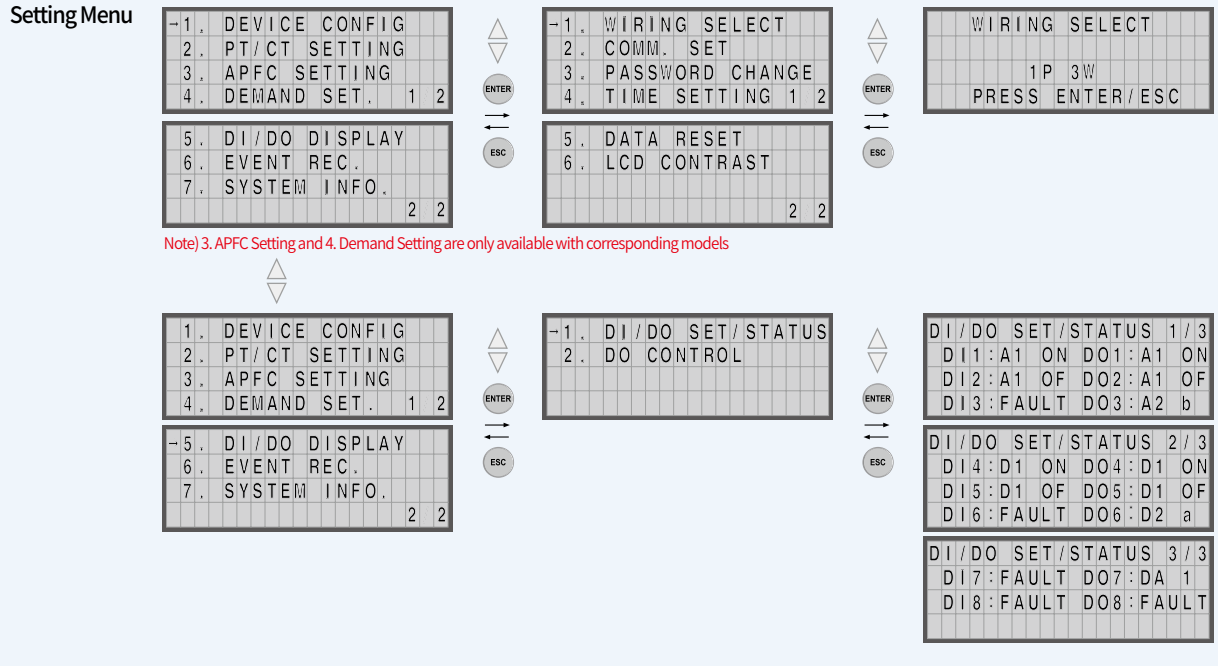
MMI Interface

GIMAC-IV series features a Text LCD and movement keys (▲▼◀▶) on the front panel, allowing the user to check various measurement values, and with the help of FUNC and control buttons, Event Recording, DI/DO Monitoring and PT/CT ratio setting as well as wiring method and communication can be set.
In addition, the auto power factor controller (APFC) and maximum power demand controller setting and data can be checked.

Top Menu

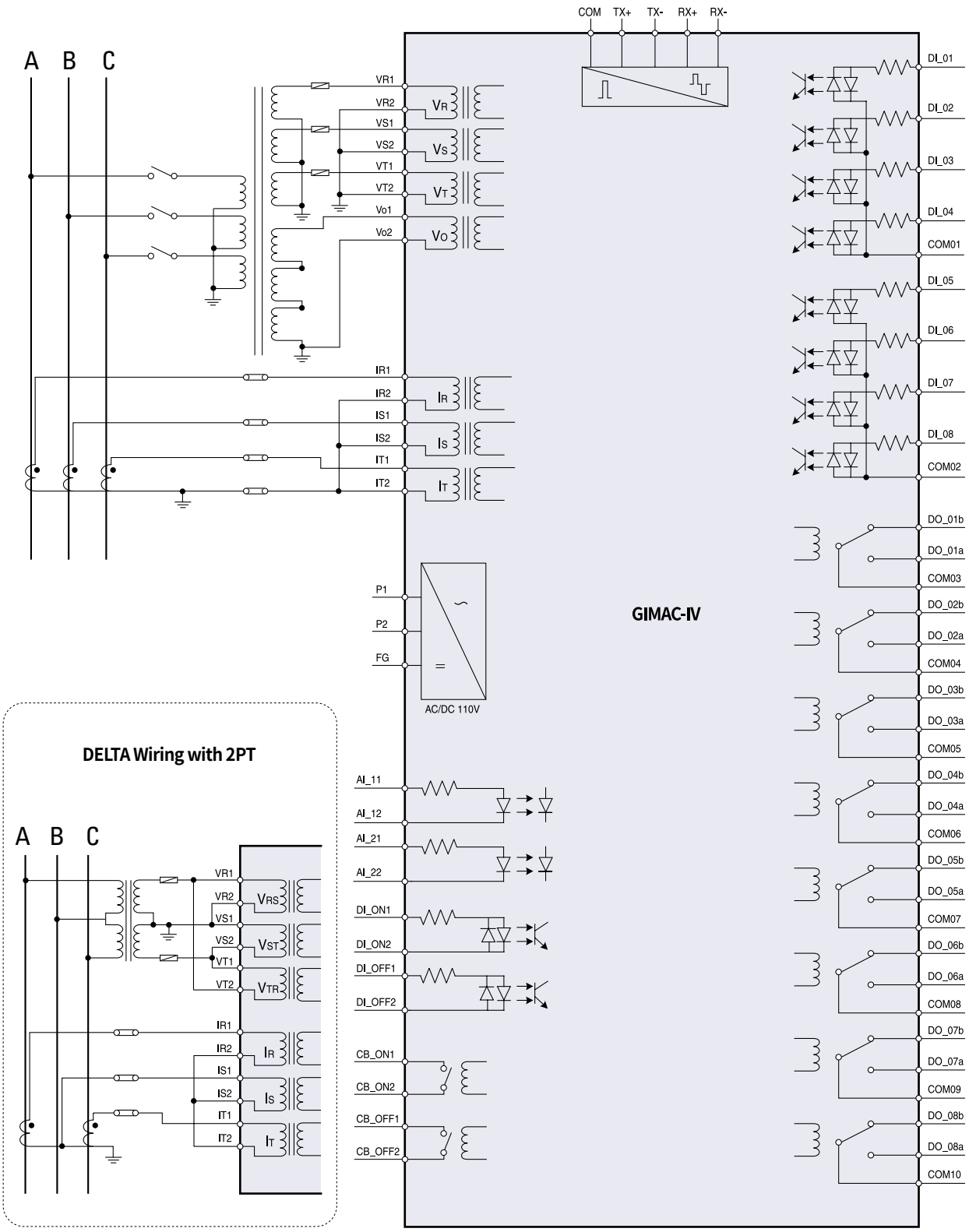


Setting Menu



Wiring

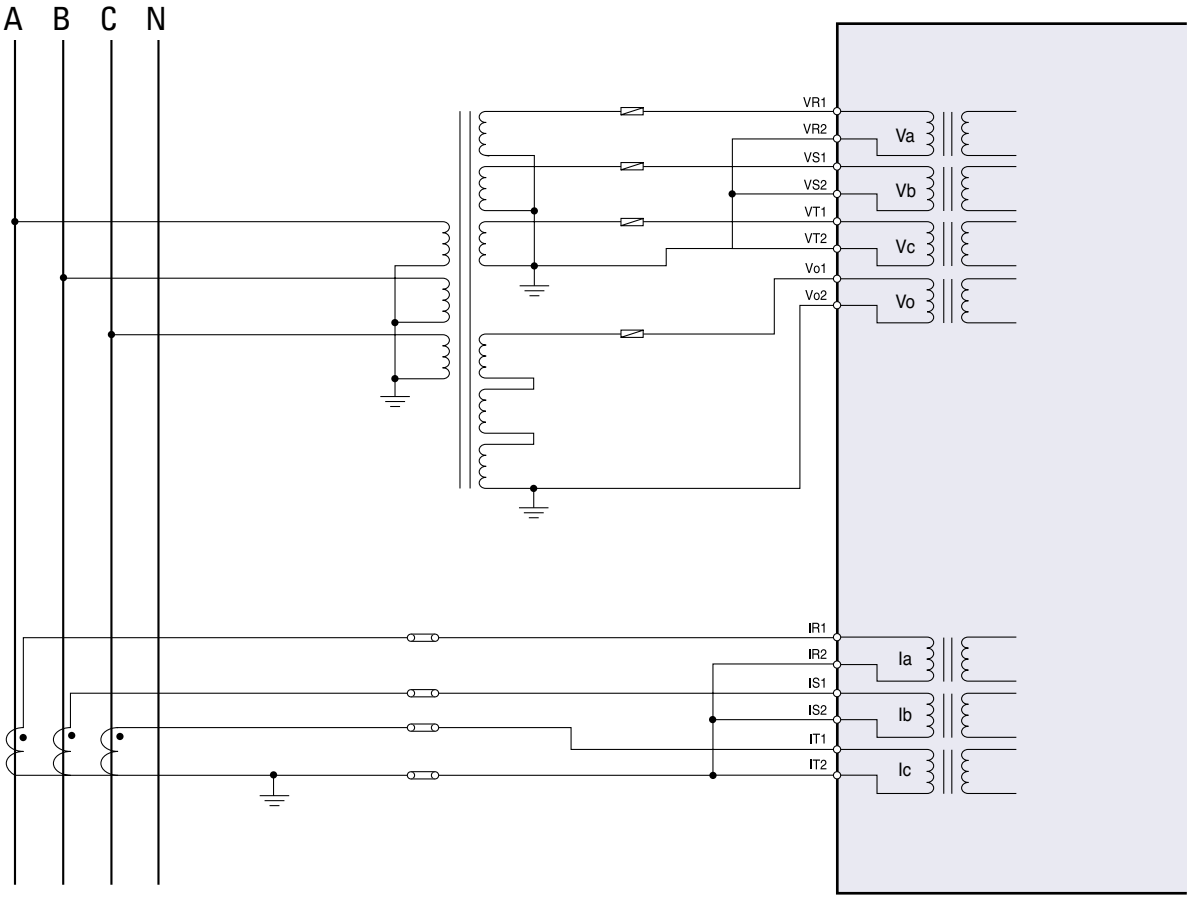
3P3W



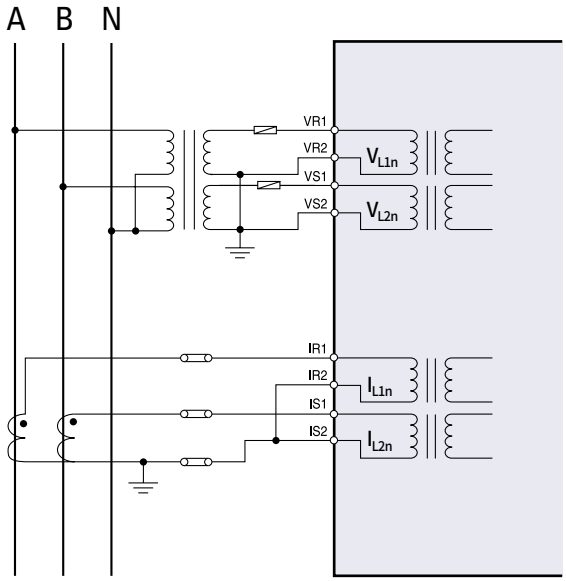
DELTA Wiring with 2PT

Note) If Delta wiring is used, it is possible for errors to occur in case an unbalanced load is used, so we have to then implement 3PT wiring (Y wiring) for unbalanced loads.

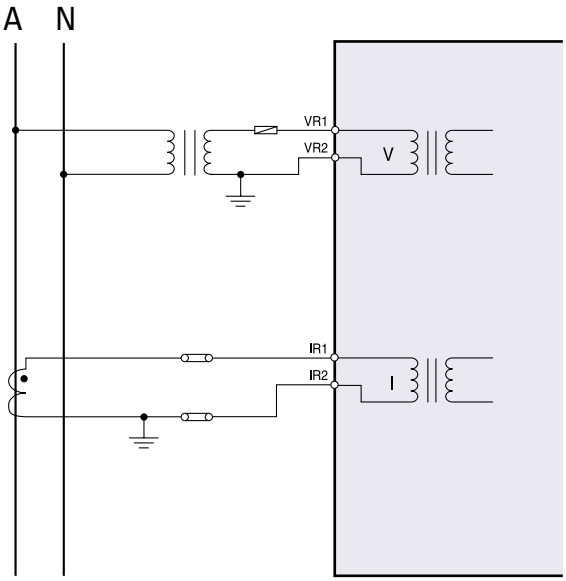
3P4W



1P3W

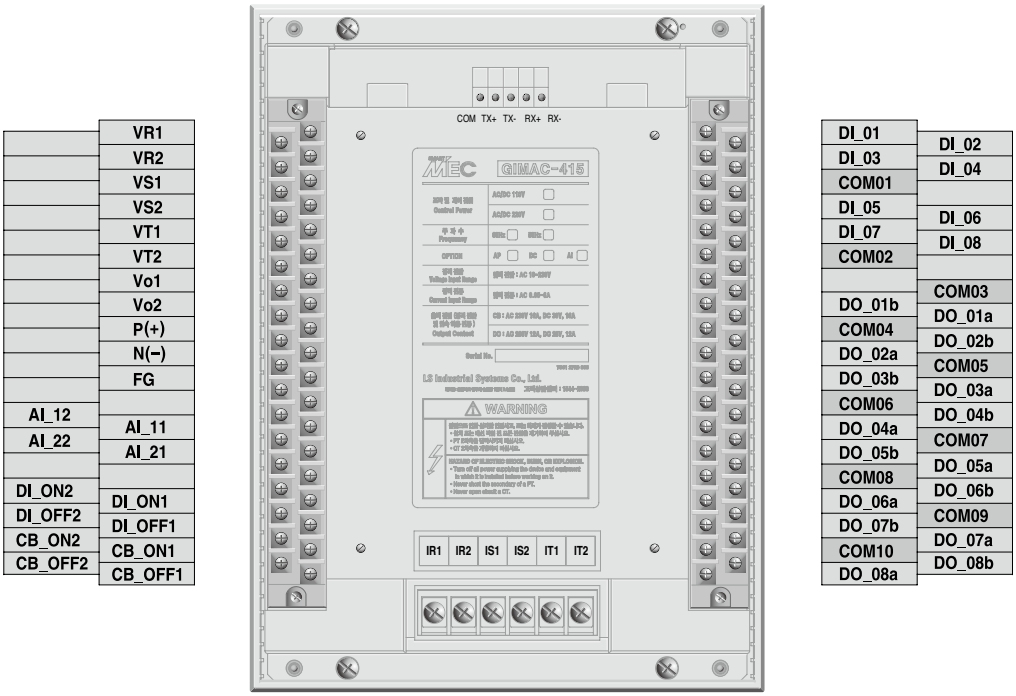


1P2W



B

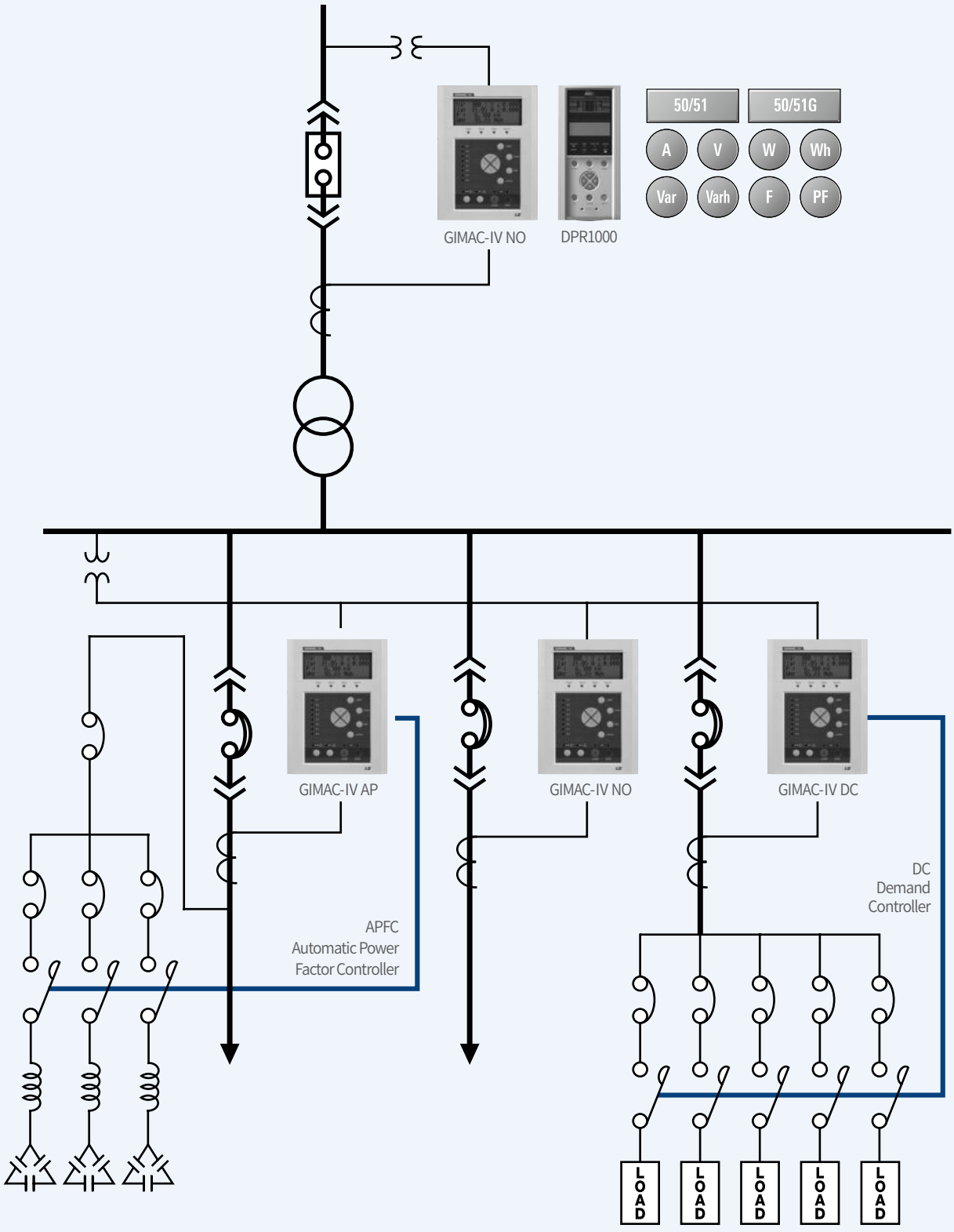
Contact Configuration



I/O Contact Configuration

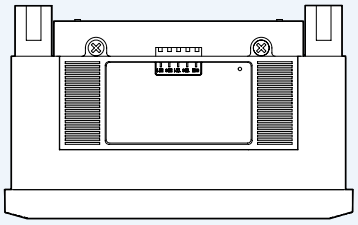
Contact name	Setting per Model (example)				Remark
	GIMAC-IV NO	GIMAC-IV AP	GIMAC-IV DC	GIMAC-IV PD	
DI_ON1	CB CLOSE Status Input_52a				Unchangeable
DI_ON2					
DI_OFF1	CB OPEN Status Input_52b				
DI_OFF2					
DI_01~08	Fault DI	Fault DI	Fault DI	Fault DI	Bank/Load Control 2a Contact Used as CB input upon setting
CB_ON1	CB_CLOSE output				Unchangeable
CB_ON2					
CB_OFF1	CB_OPEN output				
CB_OFF2					
DO_01a	Latch	Remote	Remote	Remote	Can be set as Fault DO, Bank/ Load control or Alarm DO according to the model (However, Fault DO can only be set once) ※Default setting upon delivery is No Type, so in case of AP, DC or PD Type, it is necessary to execute the set up process accordingly.
DO_01b		Local	Local	Local	
DO_02a		Fault DO	Fault DO	Fault DO	
DO_02b		Fault DO	Fault DO	Fault DO	
DO_03a		for Bank Control	for Load Control	for Bank Control	
DO_03b		for Bank Control	for Load Control	for Bank Control	
DO_04a		for Bank Control	for Load Control	for Bank Control	
DO_04b		for Bank Control	for Load Control	for Bank Control	
DO_05a		for Bank Control	for Load Control	for Bank Control	
DO_05b		for Bank Control	for Load Control	for Bank Control	
DO_06a		for Bank Control	for Load Control	for Bank Control	
DO_06b		for Bank Control	for Load Control	for Bank Control	
DO_07a	Fault DO	for Bank Control	ALARM 1	for Bank Control	
DO_07b	Fault DO	for Bank Control	ALARM 1	for Bank Control	
DO_08a	Remote	ALARM	ALARM 2	for Bank Control	
DO_08b	Local	ALARM	ALARM 2	for Bank Control	
Remark	Bank/Load Control unavailable	Load Control unavailable	Bank Control unavailable	All Available	

System Configuration

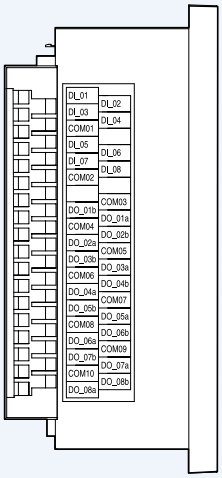


B

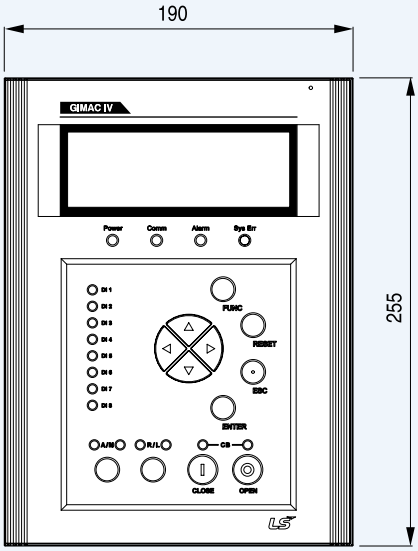
Dimensions



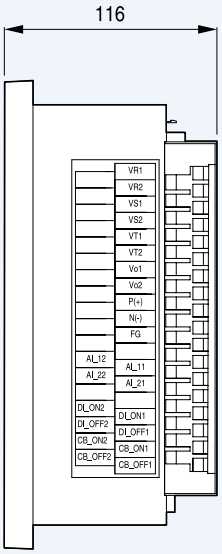
<Top view>



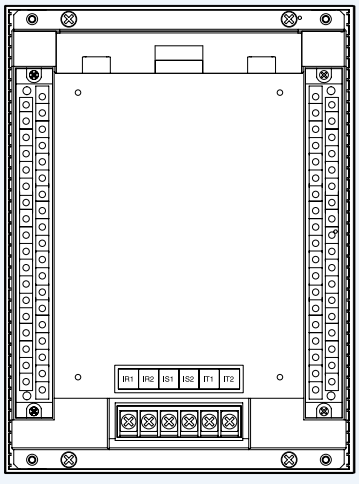
<Left side view>



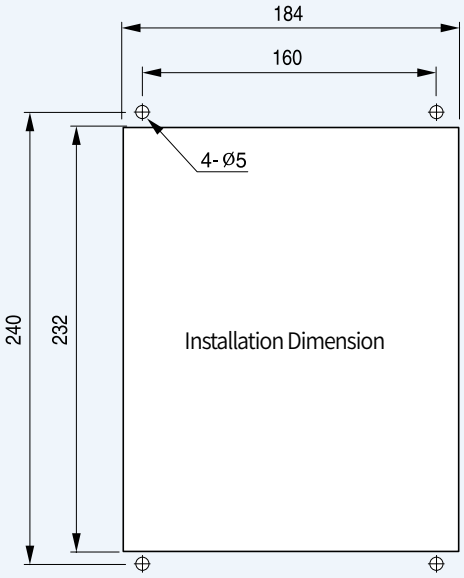
<Front view>



< Right side view>



<Rear view>



Ordering

GIMAC - IV

Note) When ordering GIMAC-IV, the model name is GIMAC-415, which is the same product name.

NO	RS	M	5A	60HZ	AC/DC 110V	DI_AC/DC 110V	AI

Model

NO	Normal
AP	APFC functions
DC	Demand Control functions
PD	APFC & D/C functions

Communication

RS	RS485

Protocol

M	MODBUS
D	DNP

CT Rating

5A

Frequency

50Hz
60Hz

Control Power

AC/DC 110V
AC/DC 220V

Digital Input

AC/DC 110V
AC/DC 220V

Option

AI	4~20mA (2P)
-	None

Digital Integrated Metering & Control Device

Automatic Power Factor Controller

Demand Controller

B

GIMAC-PQ

Through the measurement and analysis of power quality, accurate diagnoses prevent accidents from losses caused by harmonic generation or malfunction of the equipment, such damage and repair, and perform the operation.

GIMAC-PQ

Digital Integrated Metering & Control Device
Power Quality Meter

Due to use of non-linear loads which are sensitive to the power quality, the amount of harmonic wave generation has increased resulting in various malfunctioning and damages in the industry. GIMAC-PQ is a measuring device designed to measure power quality by measuring phase voltage, current size, phase, frequency and harmonic wave, and collecting power quality elements to minimize the economic losses caused by unexpected circumstances of equipment malfunctioning, production delays and process confusion as a result of harmonic wave generation and electromagnetic phenomenon.

- Various measurement functions and High accuracy (0.2%)
- Harmonic Wave Measurement, THD, TDD and K-Factor
- Event Recording
- Fault Wave Recording
- Analog Input (Option)
- Communication redundancy
- Block Diagram

C

Contents

Features

Multi function, High Measurement accuracy

Various measurement functions and High accuracy (0.2%)

In addition to basic relay elements such as voltage, current, power, electric energy, power factor and frequency, it is able to perform measurement on phase, harmonic wave and demand. It also incorporates a high performance DSP achieving 0.2% or greater values in measurement accuracy.

Harmonic Wave Measurement, THD, TDD and K-Factor

It is capable of measuring and displaying basic waveforms up to the 15th harmonic wave for voltage and current, and it is also able to display THD (Total Harmonics Distortion), TDD (Total Demand Distortion) and K-Factor, the transformer thermal capacity relationship index enabling an easy power quality analysis.

Event Recording

Up to 256 events ranging from relay fault occurrence, circuit breaker operation, digital output contact operation , status change, setting change, self-diagnosis error and PQ event.
- PQ Event : Sag, Swell, Interruption, Under voltage, Over voltage

Fault Wave Recording

When a power quality fault occurs, it can save up to 60 cycles of waveform data.

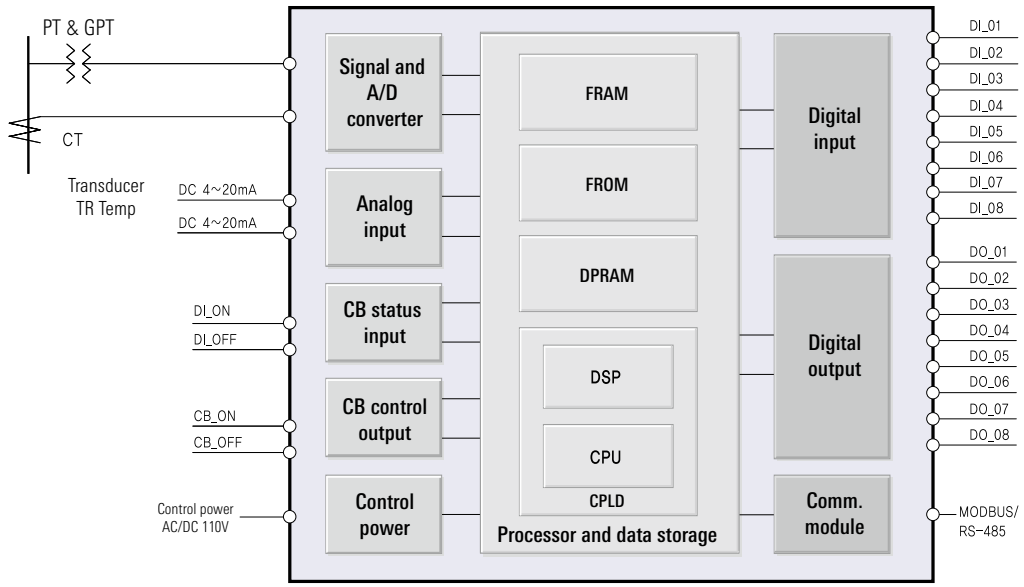
Analog Input (Option)

GIMAC-PQ is capable of taking 2-point analog contact input, and it is capable of measuring analog data such as the interior temperature of a receiving/distributing panel or rectified AC/DC voltage.
-AI Input Range: DC 4~20mA, ±0.5% at Full scale

Communication redundancy

GIMAC-PQ supports communication redundancy of MODBUS/RS485 which enables Fault waveform data transfer even during normal communication conditions.

Block Diagram

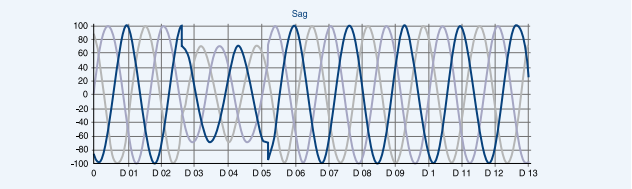


Short Duration Variation

The most common issue of instantaneous voltage changes (interruption, sag, swell) is equipment fault. In many fields, which utilize multiple critical loads, companies have to invest a considerable amount of time to resume normal operation after their processes seize due to instantaneous voltage changes. This, in the end, these can cause significant problems to the industry just the way long duration variation cause them.

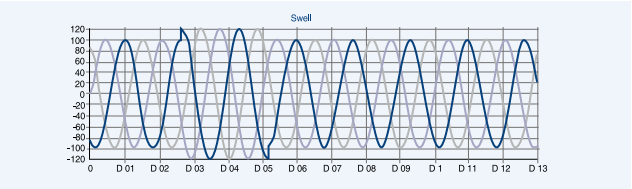
● **SAG (voltage drop)**

The phenomenon when the effective value is at 0.1-0.9pu of the rated voltage for 0.5-30 cycles is called Instantaneous Sag, and one that lasts for 30 cycles-3 seconds is called a Temporary Sag. The Sag phenomenon cannot be prevented by measures such as Battery Backup, and transformers, cables, switch gears and CT & PT are not influenced by Sag.



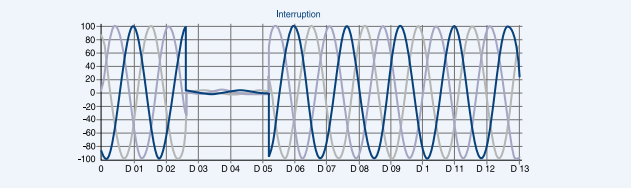
● **SWELL (voltage increase)**

The phenomenon when the effective value is at 1.1-1.8pu of the rated voltage for 0.5 ~ 30cycles is called Instantaneous Swell, and one that lasts for 3seconds ~ 1minute is called a Temporary Swell. Devices sensitive to frequency are influenced by Swell. Devices requiring accurate device speed, as well as computer and electronic control devices are instantly disturbed by Swell.



● **Interruption (blackout)**

The phenomenon when the effective value is less than 0.1pu for 0.5 ~ 3 seconds is called Momentary Interruption, and one that lasts for 3 seconds-1 minute is called Temporary Interruption. An Interruption can cause malfunctions in electronic control, computer and rotating device control. It also hinders the inductivity of electric motor contacts and can influence soft-starter devices.



Long Duration Variation

If voltage variation in the supply voltage continues for more than 1 minute, it can cause issues in equipment operation. As most power suppliers have to maintain voltage fluctuation within ±5%, so overvoltage or undervoltage issues do not occur frequently on the feeder. However, if loads are connected overwhelmingly to a feeder or if the transformer tab is set up inappropriately, issues can arise when the capacitor bank fuse shorts. Reasons that cause interruption to continue include circuit breaker tripping, shorted fuse, feeder closing by power supplier, power system equipment failure and more.

● **Continuation of Interruption**

The main influence of continued interruption is equipment issues. However, systems that are protected by UPS (Uninterruptible Power Supply) or by other energy storage devices are not influenced by such continued interruptions.

● **Undervoltage**

It is the condition where effective voltage value is 0.8-0.9pu of the rated voltage and is continuing for more than 1 minute. Undervoltage continuing for more than 1 minute can cause malfunctioning. In particular, induced motors in undervoltage conditions experience motor current increase which results in a greater thermal loss. It also reduces the effect of capacitor banks.

● **Overvoltage**

It is the condition where effective voltage value is 1.1-1.2pu of the rated voltage continuing for more than 1 minute. Transformer, cable, Bus, switchgear, CT & PT and rotational devices do not suffer any immediate influences, but overvoltage does reduce product life. In case of electronic products, it is the direct cause of issues cropping up in the machine.

● **Voltage Unbalance**

When an imbalance occurs in 3-phase voltage, the condition is referred to as Voltage Unbalance.

$$\text{Voltage Unbalance Ratio} = \frac{\text{Reverse Phase Voltage Size}}{\text{Phase Voltage Size}} \times 100(\%)$$

● **Frequency Variation**

Power suppliers have to delicately manage the frequency of power systems. Even the slightest change in frequency of a power system can cause significant influence on the generator and turbine, which in turn generate larger torque. Frequency variation occurs frequently in self-generation systems, and it is measured based on the frequency reference phase (R, S, T phase) that is already set by the user.

Note) pu is an abbreviation of per unit, and it means the value based on 1. The unit used is [pu].

C

Function & Rating

Rating

Type			Specification
Ratings	Wiring		1P2W, 1P3W, 3P3W Delta, 3P3W Y, 3P4W
	Frequency		60Hz, 50Hz
	Voltage	PT	10 ~ 230V
		GPT	2.2 ~ 230V
	Current	CT	0.05 ~ 6A
	Power		AC/DC 110V, 220V
	Power consumption		10W or less : Stanby 30W or less : Operation
	Burden		1.0VA or less : PT 1.0VA or less : CT
input power	for general		Digital Input AC/DC 110V, 220V
Output contact	for trip Note1)		Contact switching capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: AC 3840VA, DC 480W
	for alarm		Contact switching capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: AC 3840VA, DC 480W
Insulation Resistance			DC 500V 10MΩ or more
Insulation Voltage			AC 2kV(1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Fast Transient Disturbance			4kV: power input 2kV: other input 1kV: analog input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Altitude			2000m or less
Environment			A place not subject to abnormal vibration and shock. A place where the surrounding air pollution is not remarkable.
Applied Standards			IEC60255, IEC61000-4, KEMC 1110
Dimension(mm)			190×255×116
Weight			3.6kg
Communication			RS485 : Modbus Note2)

Note) 1. When circuit breaker relay open circuit occurs, it must be an unloaded open circuit.
2. Duplex communication means communications capable of simultaneously responding to 2 upper communication masters (duplex port).

Power quality

PQ type	Effective voltage	Fault type	Continuous time	Remarks
Sag	0.1 ~ 0.9pu	Instantaneous sag	0.5 ~ 30cycle	• Fault wave : Store up to 60 cycles of three-phase voltage / current waveforms • Event : Occurrence time (year to ms) and Max / Min Record, Up to 256 • Blinking alarm LED • Output Event DO
		Momentary sag	30cycle ~ 3sec	
		Temporary sag	3sec ~ 1min	
Swell	1.1 ~ 1.8pu	Instantaneous swell	0.5 ~30cycle	
		Momentary swell	30cycle ~ 3sec	
		Temporary swell	3sec ~ 1min	
Interruption	0.1pu or less	Momentary interruption	0.5cycle ~ 3sec	
		Temporary interruption	3sec ~ 1min	
Undervoltage	0.8 ~ 0.9pu		over 1min	
Overvoltage	1.1 ~ 1.2pu		over 1min	

Measurement

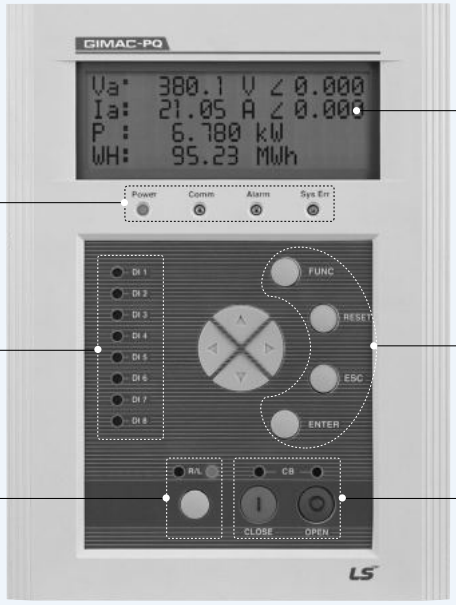
Item		Measurement range	Accuracy(%)	Remarks
Voltage	Voltage (V)	0.000V~999.99kV	±0.2%	Phase voltage, Line voltage
		0.000V~999.99kV	±0.2%	
	Normal voltage (V_1)	0.000V~999.99kV	-	
	Reversed phase voltage (V_2)	0.000V~999.99kV	-	
	Zero phase voltage (V_0)	0.000V~999.99kV	±0.5%	V_0
	Unbalanced voltage rate	0.000~100.00%	-	
Current	Current (I)	0.000A~999.99kA	±0.2%	Each Phase Current
	Normal current (I_1)	0.000A~999.99kA	-	
	Reversed phase current (I_2)	0.000A~999.99kA	-	
Phase	Line voltage	0.000~360.00°	±0.5°	
	Line voltage-current			
	Phase voltage			
	Phase voltage-current			
	Phase current			
Power	Active power	0.000W~99999.9MW	±0.5%	+ Forward, - Reverse
	Reactive power	0.000Var~99999.9MVar	±0.5%	+ Forward, - Reverse
	Apparent power	0.000VA~99999.9MVA	±0.5%	
Energy	Active energy	0.000Wh~99999.9MWh	±0.5%	+ Forward, - Reverse
	Reactive energy	0.000Varh~99999.9MVarh	±0.5%	+ Forward, - Reverse
	Reverse active energy	0.000Wh~99999.9MWh	±0.5%	
Frequency	Frequency(V_a)	45~70Hz	±0.05Hz	
	Frequency(V_b)			
Power Factor	Power Factor(PF)	-1.000~1.000	±0.5%	cosθ (+: Lag, -: Lead)
Harmonics	Line voltage	0.000V~999.99kV	-	2^{nd}~15^{th} Harmonic
	Phase voltage			
	Phase current	0.000A~999.99kA	-	Basic Wave~15^{th} Harmonic Wave
	Voltage THD	-	-	
	Current THD			
	TDD	-	-	
	K-FACTOR	-	-	
Demand	Active power demand	0.000W~99999.9MW	-	Total peak demand
	Current demand	0.000A~999.99kA	-	Each phase and total peak demand
Analog Input	Analog Input	DC4.000~20.00mA	±0.5%	4mA or less not measured

Data Base function

item		Measurement element	Save Cycle
Measurement Data Statistics	Max. Value/Time Min. Value/Time Average Value	3-phase Voltage/Current, Effective/Reactive/Apparent Power, Image Voltage, Frequency, Power Factor Unbalance Rate (V, A), THD, TDD, K-Factor	1 ~ 60min cycle

Note) TDD (Total Demand Distortion) : Harmonic Wave [$TDD(I)\% = \frac{\sqrt{\sum_{K=2}^{\infty} I_K^2}}{I_L} \times 100(\%)$]

Appearance



Status LED
- Power
- Comm
- Alarm
- Sys Err

DI Status LED (Fault Status)

REMOTE/LOCAL
- Change KEY
- Display LED

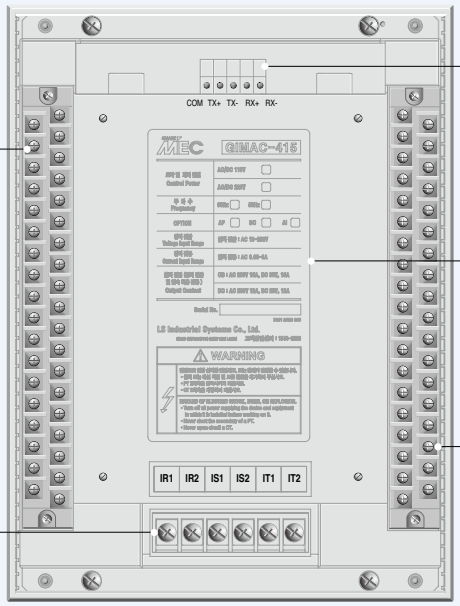
20×4 Text LCD

Function KEY
- FUNC
- RESET
- ESC
- ENTER

CB ON/OFF
- Control KEY
- Status Display LED

Front view

FUNC	**FUNCTION** Setting Menu and Measurement Menu Change	RESET	**FAULT, ALARM RESET** SYS ERR Return, Fault DO Return, DI/DO Return	ESC	Cancellation of selected item, cancel setting change, move to upper menu
ENTER	Select item and check setting, save changed data, Enter password	R/L	Remote/Local change		



Communication Terminal(RS485 Dual)

- PT Input Terminal
- CB Control I/O Terminal
- AI Input Terminal

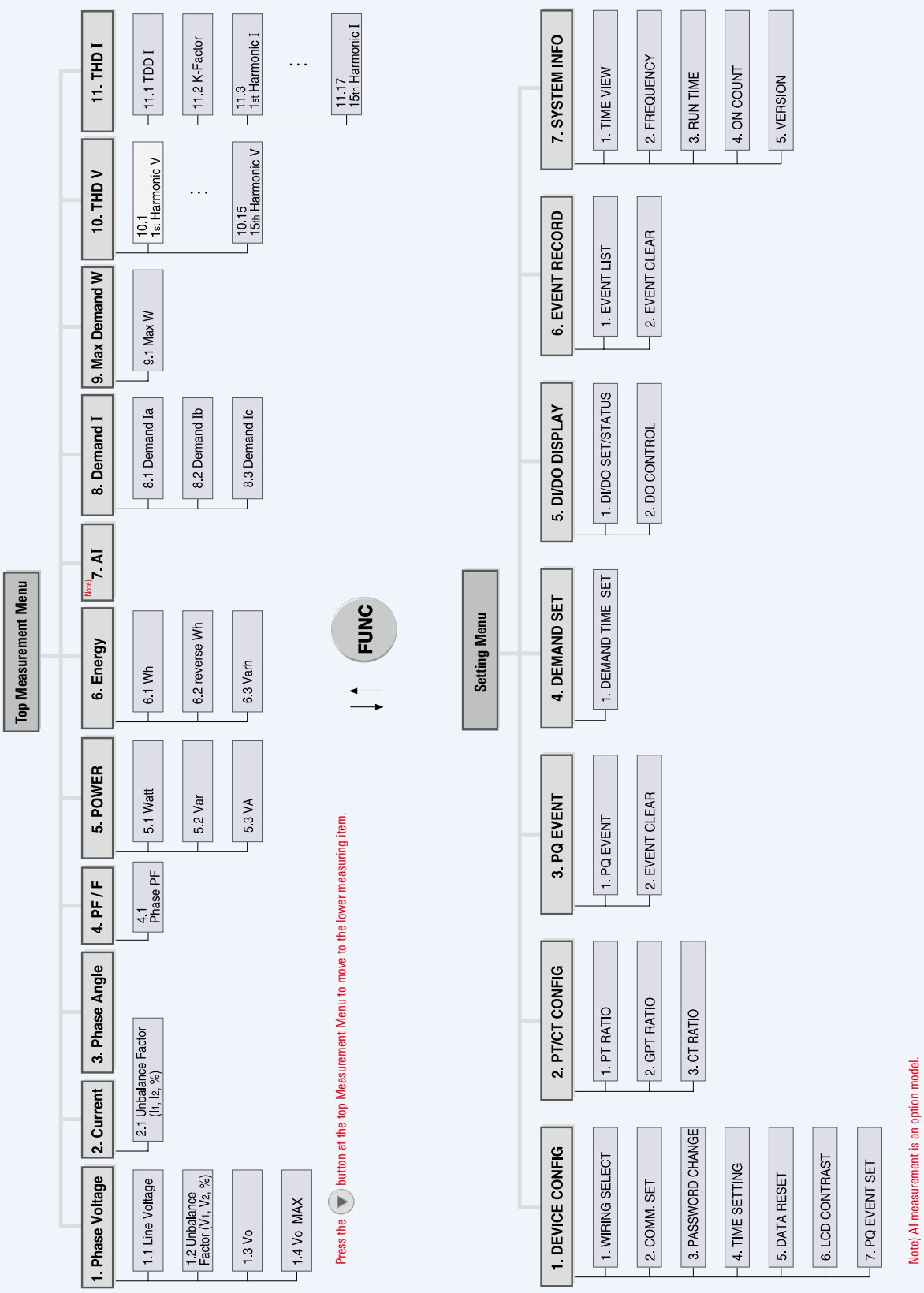
Product Specification

DI/DO I/O Terminal

CT Input Terminal

Rear view

DI Status LED (Fault Status)	Normal	Fault (DI input)	RESET after		Removal of fault after RESET	
			Fault elimination	RESET	RESET	Fault elimination
	Off	Flickering	Flickering	On	Off	On

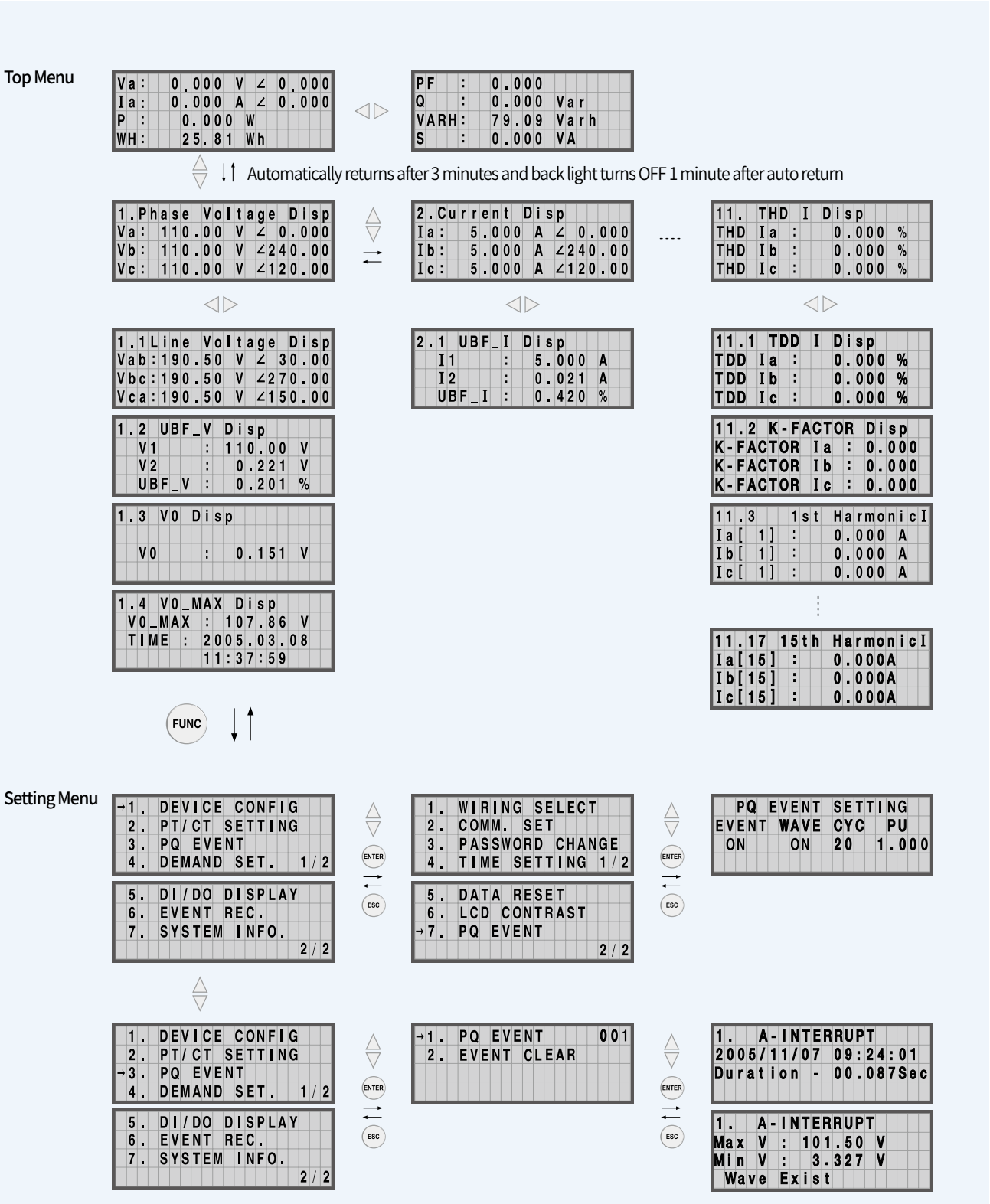

Top Measurement Menu
1. Phase Voltage
1.1 Line Voltage
1.2 Unbalance Factor (V1, V2, %)
1.3 Vo
1.4 Vo_MAX
2. Current
2.1 Unbalance Factor (I1, I2, %)
3. Phase Angle
4. PF / F
4.1 Phase PF
5. POWER
5.1 Watt
5.2 Var
5.3 VA
6. Energy
6.1 Wh
6.2 reverse Wh
6.3 Varh
Note) 7. AI
8. Demand I
8.1 Demand Ia
8.2 Demand Ib
8.3 Demand Ic
9. Max Demand W
9.1 Max W
10. THD V
10.1 1st Harmonic V
10.15 15th Harmonic V
11. THD I
11.1 TDD I
11.2 K-Factor
11.3 1st Harmonic I
11.17 15th Harmonic I
FUNC
Press the button at the top Measurement Menu to move to the lower measuring item.
Setting Menu
1. DEVICE CONFIG
1. WIRING SELECT
2. COMM. SET
3. PASSWORD CHANGE
4. TIME SETTING
5. DATA RESET
6. LCD CONTRAST
7. PQ EVENT SET
2. PT/CT CONFIG
1. PT RATIO
2. GPT RATIO
3. CT RATIO
3. PQ EVENT
1. PQ EVENT
2. EVENT CLEAR
4. DEMAND SET
1. DEMAND TIME SET
5. DI/DO DISPLAY
1. DI/DO SET/STATUS
2. DO CONTROL
6. EVENT RECORD
1. EVENT LIST
2. EVENT CLEAR
7. SYSTEM INFO
1. TIME VIEW
2. FREQUENCY
3. RUN TIME
4. ON COUNT
5. VERSION
Note) AI measurement is an option model.

C

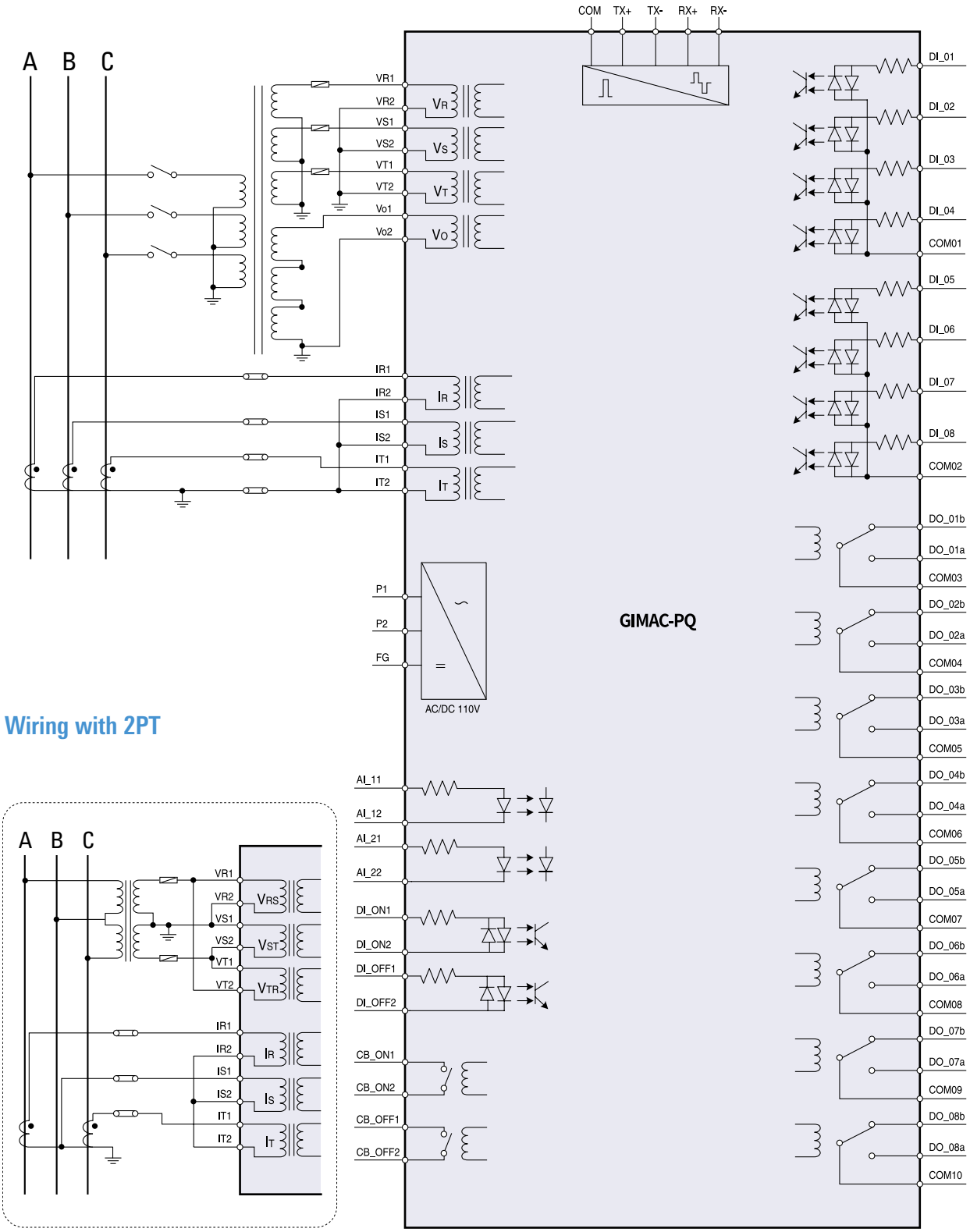
Operation & Setting

MMI Interface

GIMAC-PQ features a Text LCD and movement keys (▲▼◀▶) on the front panel, allowing the user to check for various measurement values, and using FUNC and control buttons, Event Recording, DI/DO Monitoring and PT/CT ratio setting as well as wiring method and communication mode can be set.



3P3W



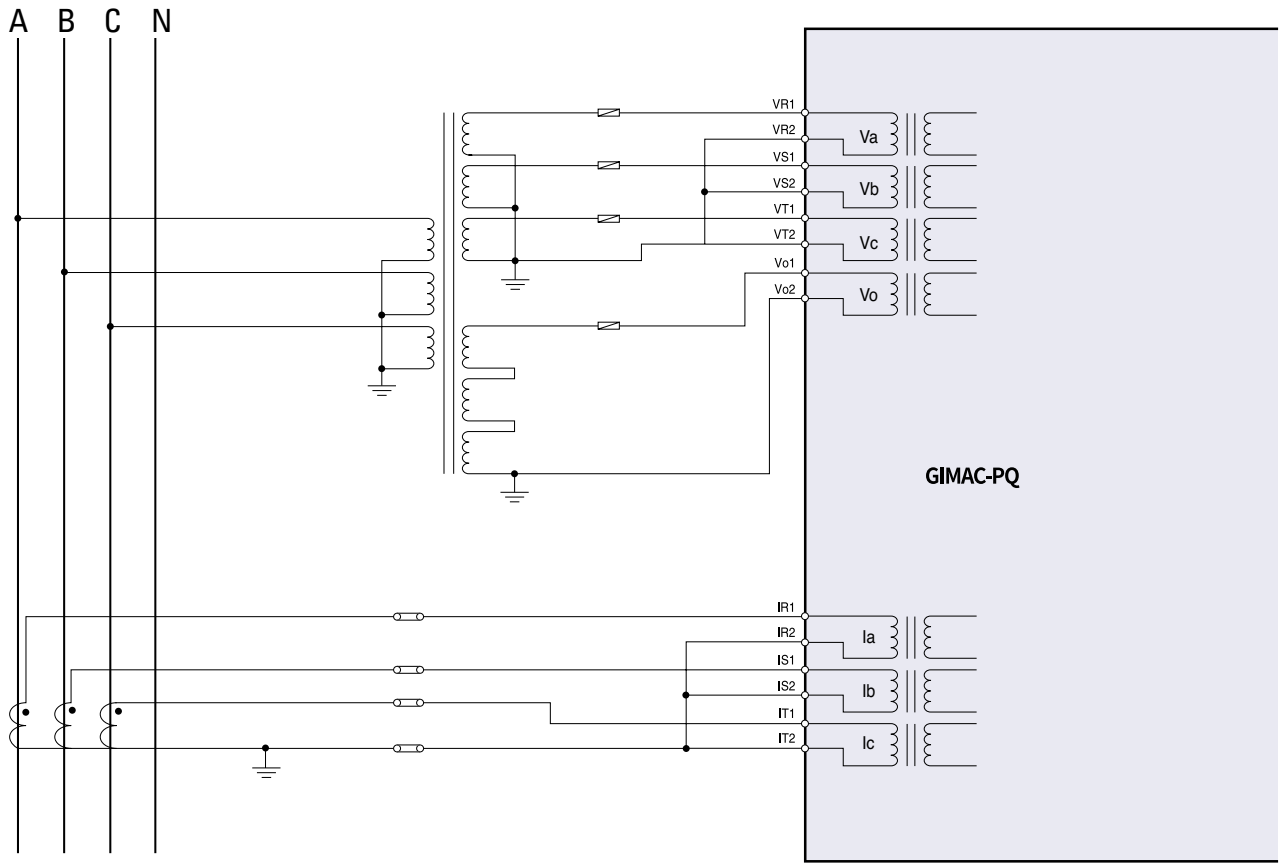
DELTA Wiring with 2PT

Note) If Delta wiring is used, it is possible for errors to occur in case an unbalanced load is used, so we have to then implement 3PT wiring (Y wiring) for unbalanced loads.

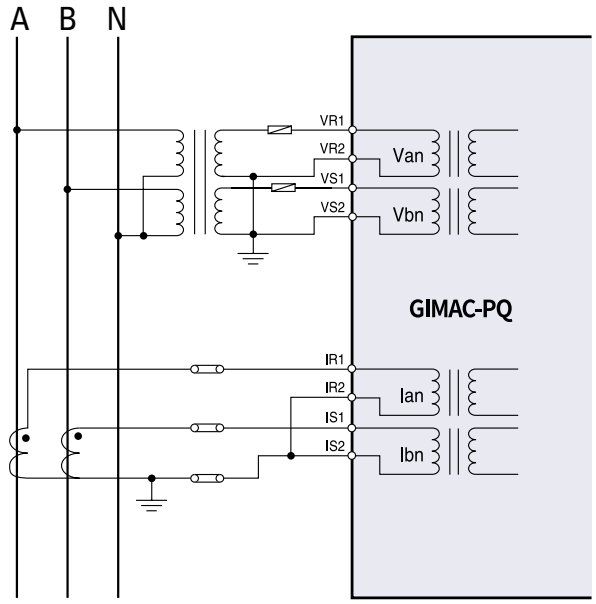
C

Wiring

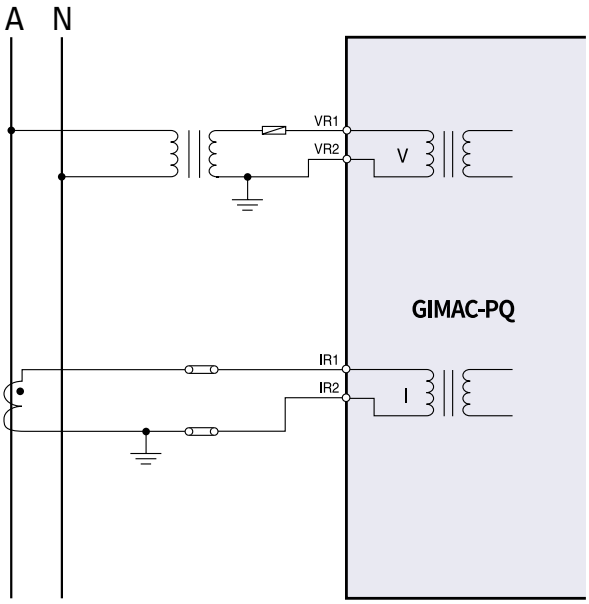
3P4W



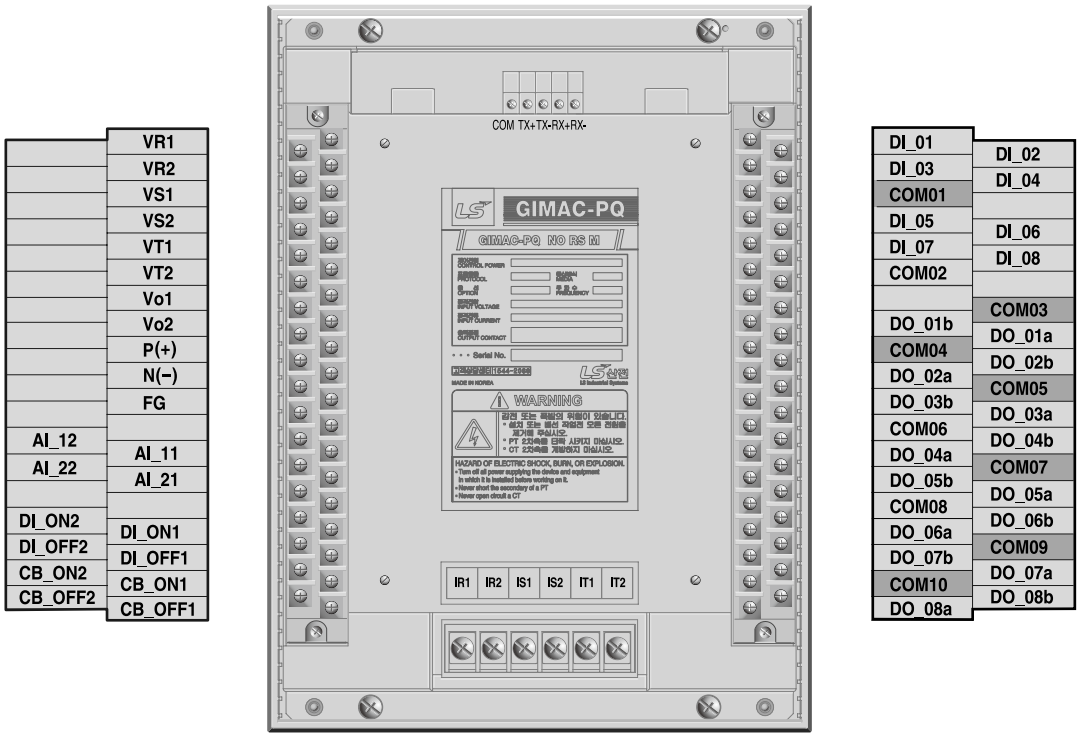
1P3W



1P2W



Contact Configuration

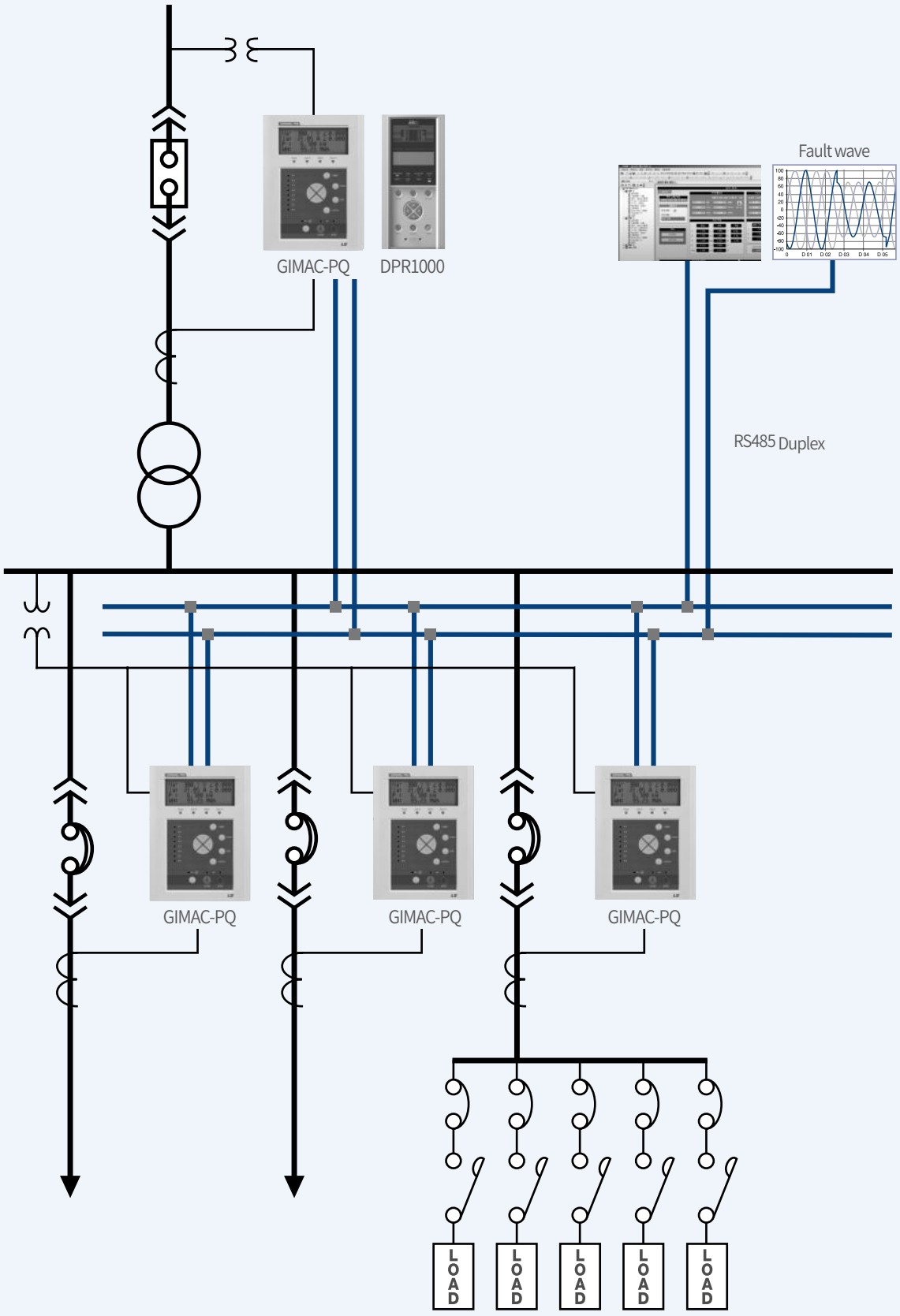


I/O contact

Terminal Details	Setting mode	Description	Remarks
DI_ON1	CB CLOSE Status Input_52a	CB ON Input	Unchangeable
DI_ON2			
DI_OFF1	CB OPEN Status Input_52b	CB ON Input	
DI_OFF2			
DI_01~08	Fault DI	Fault Status Input	Unchangeable
CB_ON1	CB_CLOSE output	CB ON Input	Unchangeable
CB_ON2			
CB_OFF1	CB_OPEN output	CB OFF Input	
CB_OFF2			
DO_01a	Latch	When DI is set, Operates when the same number of Fault DI is input.	Remote/Local, Fault DO and Alarm DO can only be set 1 each
DO_01b	Latch		
DO_02a	Latch		
DO_02b	Latch		
DO_03a	Latch		
DO_03b	Latch		
DO_04a	Latch		
DO_04b	Latch		
DO_05a	Latch		
DO_05b	Latch		
DO_06a	Latch		
DO_06b	Latch		
DO_07a	Fault DO	When Fault DO is set, Operates when any fault DI is input.	
DO_07b	Fault DO		
DO_08a	Remote	When Remote/Local is set, device status is output.	
DO_08b	Local		

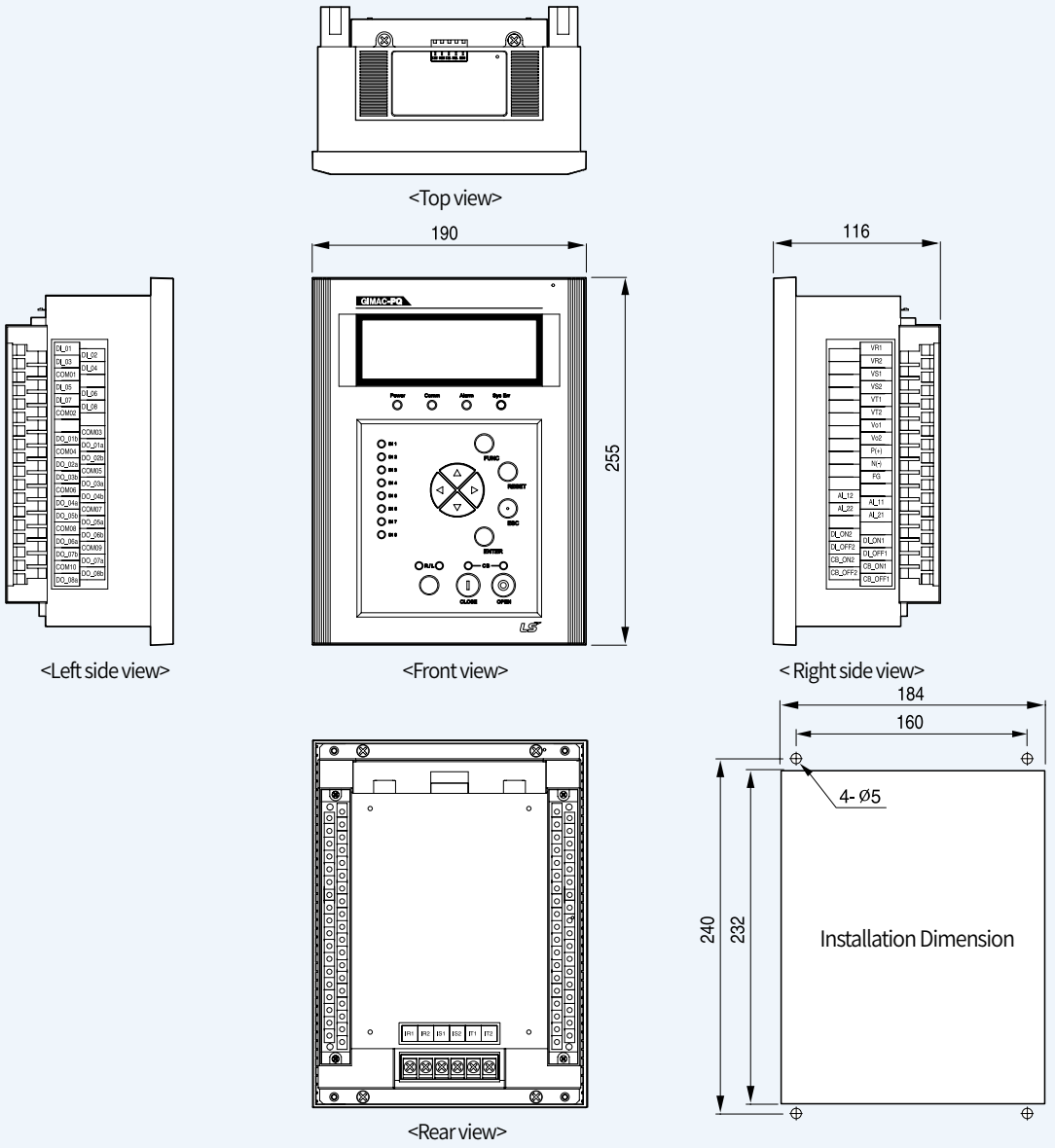
C

System Configuration



Dimensions & Ordering

Dimensions



Ordering

GIMAC - PQ

NO	RS	M	5A	60HZ	AC/DC 110V	DI_AC/DC 110V	AI
Model	**Communication**	**Protocol**	**CT Rating**	**Frequency**	**Control Power**	**Digital Input**	**Option**
NO Normal	RS RS485/Dual	M MODBUS	1A	50Hz	AC/DC 110V	AC/DC 110V	AI 4 ~ 20mA (2P)
			5A	60Hz	AC/DC 220V	AC/DC 220V	- None

C

GIMAC-II Plus

It is a Digital Integrated Metering & Control Equipment with various measurement elements of the power system, harmonic analysis, circuit breaker control, and fault monitoring functions.

GIMAC-II Plus

Digital Integrated Metering & Control Equipment

GIMAC-II Plus is a Digital Integrated Metering & Control Equipment that has various measurement elements and harmonic analysis, breaker control, and fault monitoring functions of the power system, and improves measurement accuracy compared to the existing GIMAC-II, measurement elements/self-diagnosis function/communication protocol, etc. With this addition, it is a new product that enhances the function and performance to a new level.

- Measurement accuracy(High-Performance DSP)
  Current/Voltage ±0.3%, Power ±0.5%
- Event Recording(256EA)
- Measurement elements and phase data display on LCD screen
- Select Before Operation (SBO)
- 20x4 Character LCD
- Self-diagnosis
  Inappropriate wiring, shorted cable and frequency issues of system exterior inspection/ warning functions

D

Contents

Features

Characteristics of GIMAC-II Plus

Various Measurement Elements & High Measurement accuracy

GIMAC-II Plus is installed with a high-performance, high-speed DSP for calculating various measurements which enable high measurement accuracy at a 0.3% error rate on basic measurement elements (voltage, current phase).

History

GIMAC-II Plus saves the last 256 events to provide recent history data to the user.

Reliability of Control & Setting Change

GIMAC-II Plus features user password and SBO (Select Before Operation) function ensuring its outstanding reliability in control and setting changes.

20x4 Character LCD

GIMAC-II Plus features a large 20x4 character LCD with large fonts which greatly improves user convenience with various measurement data and event information summarily displayed on the device.

Self-Diagnosis Function

GIMAC-II Plus features self-diagnosis functions which enable detection of external system issues (inappropriate wiring, shorted cable, frequency issues) and Power Fail detection function, and warns the user in case a fault has been detected.

Outstanding Reliability

GIMAC-II Plus improves measurement precision, harmonics analysis, and self-diagnosis function, and has excellent reliability.

User Convenience

GIMAC-II Plus displays phase data in addition to basic measurement elements (voltage, current, power, etc.) allowing the user to easily identify inappropriate wiring and load status physically.

Various Communication Methods

GIMAC-II Plus allows the user to select a preferred communication method (RS485/Ethernet) and protocol(MODBUS/DNP3.0/IEC61850) by replacing the Respective modules.

RSTP support

GIMAC-II Plus offers a duplex port for Ethernet, and it ensures quick switchover speeds by supporting RSTP (Rapid Spanning Tree Protocol).

Rating

Type			Specification
Wiring			1P2W, 1P3W, 3P3W(Y), 3P3W(Delta), 3P4W
Ratings	Frequency		60Hz, 50Hz
	Voltage	PT	20 ~ 230V (110V)
		GPT	2.2 ~ 230V
	Current	CT	0.05 ~ 6A (5A) or 0.01 ~ 1.2A (1A)
	Power		AC/DC 110V, 220V
	Power consumption		10W or less: Stanby 30W or less: Operation
	Burden		1.0VA or less: PT 1.0VA or less: CT
Input contacts	for general		10EA (2EA for Circu it Breaker, for Signal 8EA)
Output contact	for trip Note1)		Contact switching capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: AC 3840VA, DC 480W
	for alarm		Contact switching capacity: AC 250V 16A/DC 30V 16A, Resistive Load Max. switching capacity: AC 3840VA, DC 480W
Insulation Resistance			DC 500V 10MΩ or more
Insulation Voltage			AC 2kV(1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 1.2 times of rated voltage for 3 hours.
			Withstand 8 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV: power input
Electrostatic Discharge(ESD)			8kV: Air, 6kV: Contact
Temperature	Operation		-10°C ~ 55°C
	Storage		-25°C ~ 70°C
Humidity			RH 80% or less (non-condensing)
Applied Standards			IEC60255, IEC61000-4
Communication			Modbus/RS485, Ethernet
			DNP3.0/Ethernet
			IEC61850 MMS/Ethernet

Note 1) When circuit breaker relay open circuit occurs, it must be an unloaded open circuit.

D

Function & Rating

Measurement

Type	Measurement	Measuring range	Accuracy(%)	Remarks
Voltage	Voltage (V)	0.000V~999.99kV	±0.3%	Phase voltage, Line voltage
		0.000V~999.99kV	±0.3%	
	Normal voltage (V_1)	0.000V~999.99kV	-	
	Reversed phase voltage (V_2)	0.000V~999.99kV	-	
	Zero phase voltage (V_0)	0.000V~999.99kV	±0.5%	V_0, V_0_max
	Unbalanced voltage rate	0.000~100.00%	-	Unbalanced factor
Current	Current (I)	0.000A~999.99kA	±0.3%	Each Phase Current
	Normal current (I_1)	0.000A~999.99kA	-	
	Reversed phase current (I_2)	0.000A~999.99kA	-	
Phase	Line voltage	0.000~360.00°	±0.5°	
	Line voltage-current	0.000~360.00°	±0.5°	
	Phase voltage	0.000~360.00°	±0.5°	
	Phase voltage-current	0.000~360.00°	±0.5°	
Power	Active power	0.000W~99999.9MW	±0.5%	+: Forward , -: Reverse
	Reactive power	0.000Var~99999.9MVar	±0.5%	
	Apparent power	0.000VA~99999.9MVA	±0.5%	
Energy	Active energy	0.000Wh~99999.9MWh	±0.5%	
	Reactive energy	0.000Varh~99999.9MVarh	±0.5%	
	Reverse active energy	0.000Wh~99999.9MWh	±0.5%	
Frequency		45~70Hz	±0.05Hz	
Power Factor	Power Factor(PF)	-1.000~1.000	±0.5%	cosθ (+: Lag, -: Lead)
Harmonics	Line voltage	0.000V~999.99kV	-	Basic Wave of $V_{a(ab)}$, $V_{b(bc)}$ and $V_{c(ca)}$의 to 15th Harmonic Wave, THD
	Phase voltage			
	Phase current	0.000A~999.99kA	-	Basic Wave of I_a, I_b and I_c to 15th Harmonic Wave, THD, TDD and K-FACTOR
Demand	Active power demand	0.000W~99999.9MW	-	Peak demand
	Current demand	0.000A~999.99kA	-	
Analog Input	Analog Input	DC4.000~20.00mA	±0.5%	4mA or less are displayed as 0mA

Fault Status Display

DI Status LED	Normal status	Fault status	RESET after Fault elimination		Fault elimination after RESET	
			Fault elimination	RESET	RESET	Fault elimination
Fault DI	Off	Flickering	Flickering	On	Off	On
DI DI	Off	On	Off	Off	On	Off

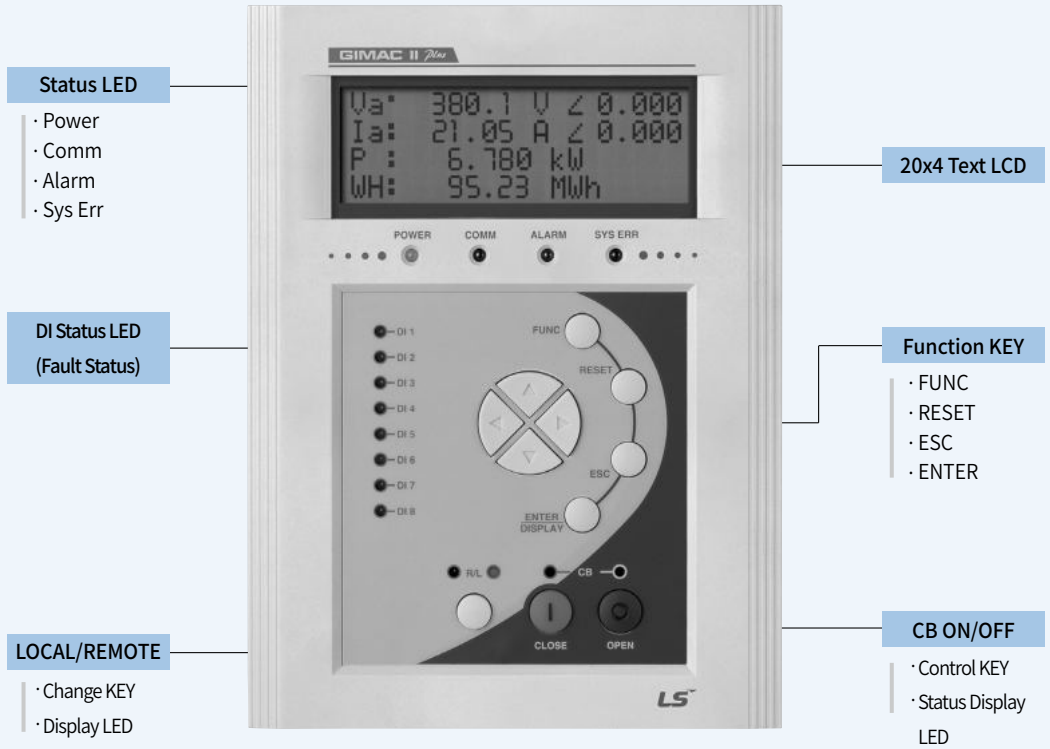
System Error Status Display

Type	Normal status	Event status	Reset pressed		Eliminate Event Cause
			Before Fault eliminate	After Fault eliminate	
Sys Err LED	Off	Flickering	Flickering/On	off	Off

Note) Alarm Status Display LED: This LED does not operate in GIMAC-II Plus and Neo models.

COMM LED Status Display

Type	Normal status	Abnormal status	Abnormal (Communication Module Fault)
COMM LED	Flickering/off	ON	ON



Front View

Key Type	Corresponding Menu	Base Function
Direction Keys (Up/Down)	Normal Display Tree	Move between Items (Voltage → Current, etc.)
	Settings Menu Tree	Move between Items or Change Setting
Direction Keys (Right/Left)	Normal Display Tree	Move to Lower Display (Phase Voltage → Between Cable Voltage, etc.)
	Settings Menu Tree	Move between Items or Change Setting
FUNC Key	Normal Display Tree	Change to Settings Menu
	Settings Menu Tree	Change to Normal Display Menu
ENTER Key	Confirm Save menu	Save Changed Data
	Enter Password Menu	Enter Password
ESC Key	Settings Menu Tree	Move to upper menu
	Confirm Save menu	Cancel Save Changed Data
RESET Key	SYS ERR	Return to Menu Screen
	Other than the above	Return to FAULT, ALARM RESET and ALARM DO
R/L	All menu	Change LOCAL/REMOTE
CLOSE/OPEN Key	All menu	Circuit Breaker Manual Control

D

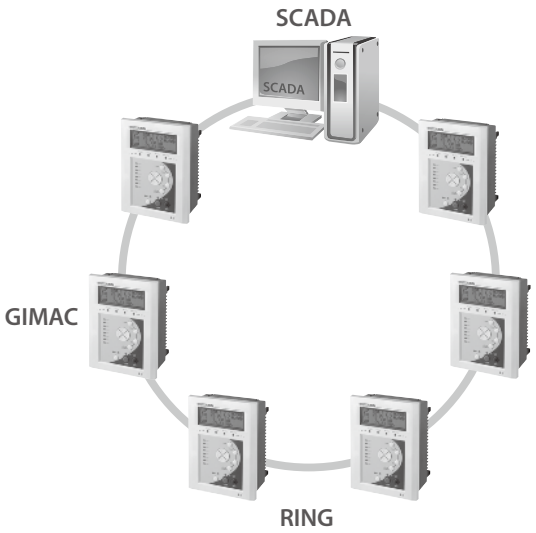
Communication

1) Supported Protocol

MODBUS-RTU, MODBUS-TCP, DNP3.0-TCP, IEC61850-TCP

2) MODBUS/RS485 Communication

- Operation Mode: Differential
- Communication Range: max. 1.2km
- Communication Cable: Universal RS485 Shielded twisted pair cable
- Communication Speed: 19.2kbps~38.4kbps
- Transfer Method: Half-Duplex
- Max. I/O Voltage: -7V ~ +12V



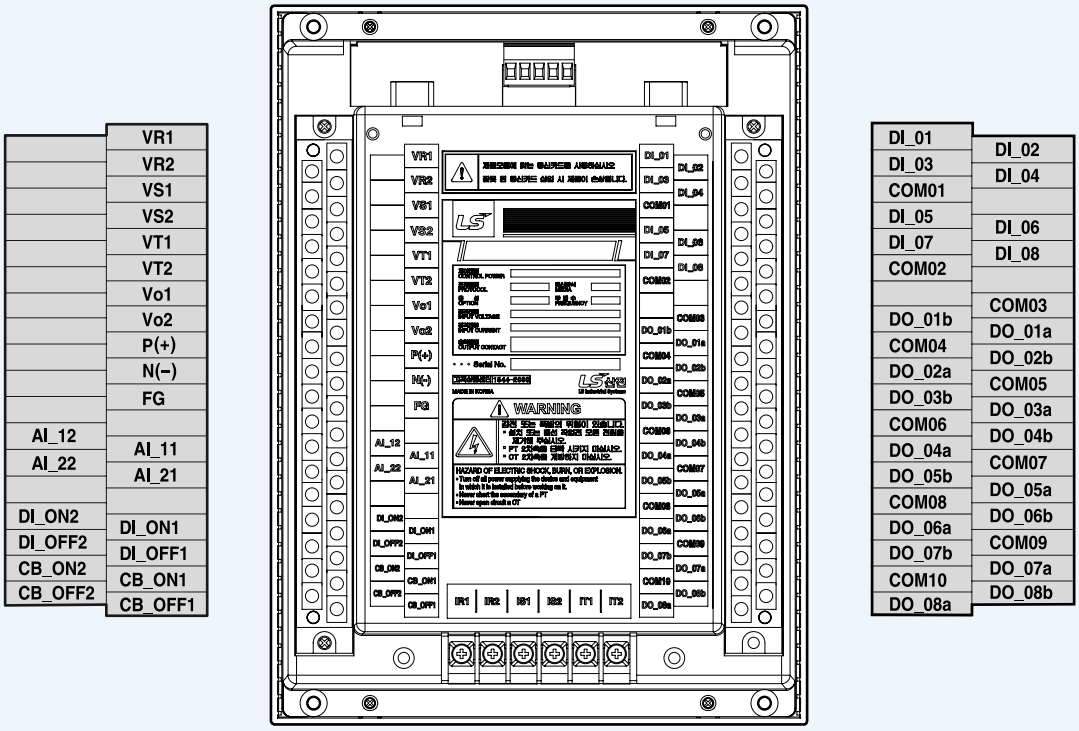
3) 10/100 Base-T Ethernet (MODBUS, DNP3.0, IEC61850)

- TCP(10/100 Base-T): 2Ports
- Communication Speed: 10/100Mbps
- Topology: Star, Daisy-Chain, Ring
- Duplex: RSTP (switchover time of 10 seconds or less)
- Transfer Medium: UTP(CAT.3, CAT.5)
- Max. Transfer Distance: Max. 100m(Solid Core Cable), Max. 50m(Stranded Cable)

Self-Diagnosis Functions

ERROR	Operation Condition	Display		Return condition	Remarks
		LCD	LED		
Err. Frequency	When the rated frequency exceeds ±5%	FREQUENCY ERROR	Sys Err Flickering	Reset press or Auto Elimination	Ignore the value exceeding the frequency measurement range.
Err. Wiring	When T voltage phase > S voltage phase	WIRING ERROR			3-phase 3-wire / 3-phase 4-wire support
Err. CB control	No operation for 0.5seconds after CB close/open command	CB CTRL ERROR			-
Err. Power	When control power error occurs		Sys Err Flickering & Power Flickering		Fail display, key recognition, control function not working

Note) 1. In the case of Wiring Error, inspect and correct PT and CT wirings.
2. Recognition voltage varies according to control power specification (110V: DC 60~80V or less, 220V: DC 140~16V0 or less)

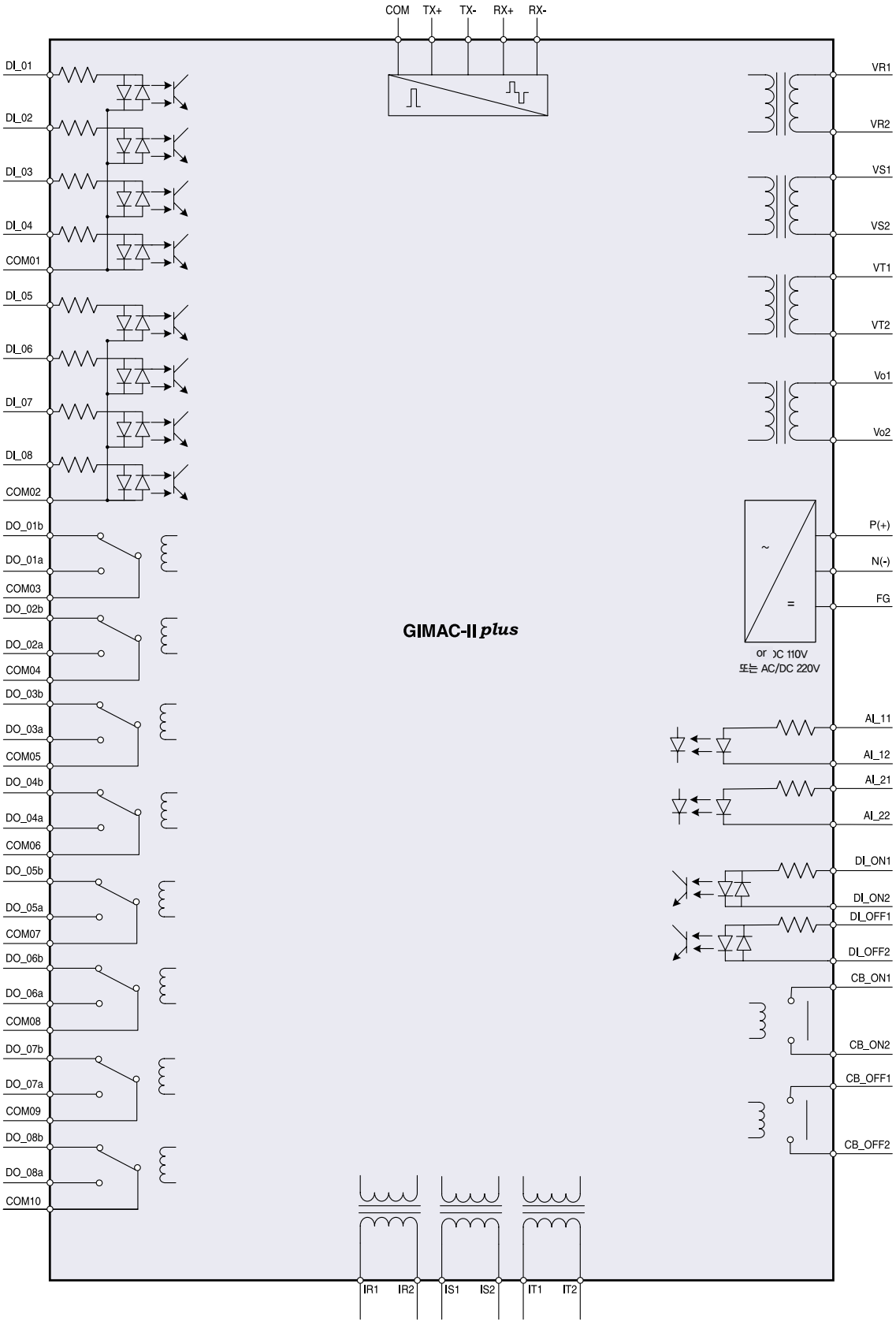


Rear View & Contact Structure

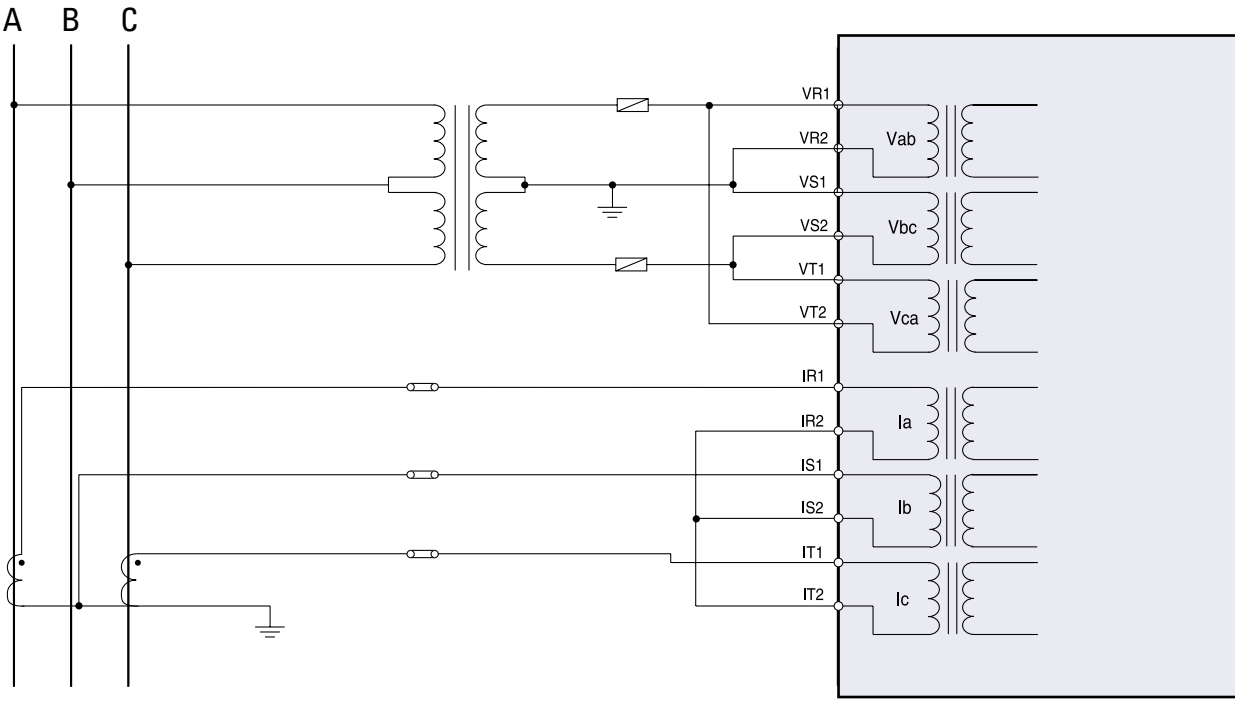
Terminal Details	Usage	Remarks
Vx1~Vx2	Voltage Input	
Ix1~Ix2	Current Input	
P(+), N(-)	Control Power Input	
FG	Ground	Grounding Must Be Done
AI_11, AI_21	AI (DC4~20 mA) + Polarity Input	
AI_12, AI_22	AI (DC4~20 mA) -Polarity Input	
DI_ON1, DI_ON2	Circuit Breaker ON Status Input	
DI_OFF1, DI_OFF2	Circuit Breaker OFF Status Input	
CB_ON1, CB_ON2	Circuit Breaker ON Output	External Secondary Relay (CX) Connection Recommended
CB_OFF1, CB_OFF2	Circuit Breaker OFF Output	External Secondary Relay (TX) Connection Recommended
DI_01,DI_02,DI_03,DI_04	Input Terminal of DI1-4	
COM01	Common Terminal of DI1-4 Input	
DI_05,DI_06,DI_07,DI_08	Input Terminal of DI5-8	
COM02	Common Terminal of DI5-8 Input	
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 DO1-8	

D

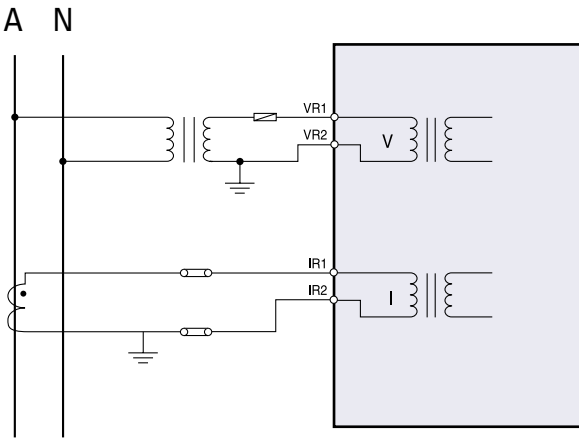
Wiring


COM
TX+
TX-
RX+
RX-
DI_01
DI_02
DI_03
DI_04
COM01
DI_05
DI_06
DI_07
DI_08
COM02
DO_01b
DO_01a
COM03
DO_02b
DO_02a
COM04
DO_03b
DO_03a
COM05
DO_04b
DO_04a
COM06
DO_05b
DO_05a
COM07
DO_06b
DO_06a
COM08
DO_07b
DO_07a
COM09
DO_08b
DO_08a
COM10
GIMAC-II plus
VR1
VR2
VS1
VS2
VT1
VT2
Vo1
Vo2
P(+)
N(-)
FG
or)C 110V
또는 AC/DC 220V
AI_11
AI_12
AI_21
AI_22
DI_ON1
DI_ON2
DI_OFF1
DI_OFF2
CB_ON1
CB_ON2
CB_OFF1
CB_OFF2
IR1
IR2
IS1
IS2
IT1
IT2

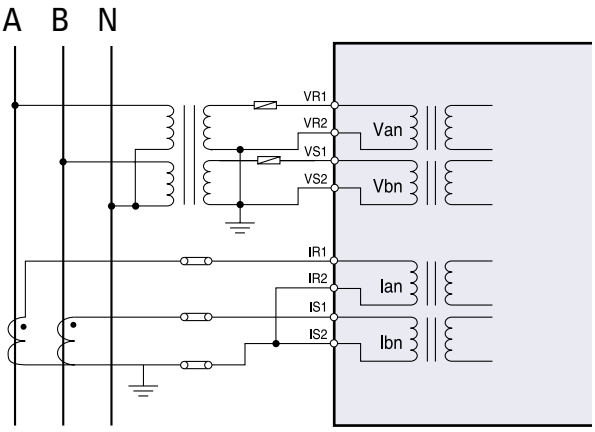
3P 3W (2PT DELTA Wiring)



1P 2W



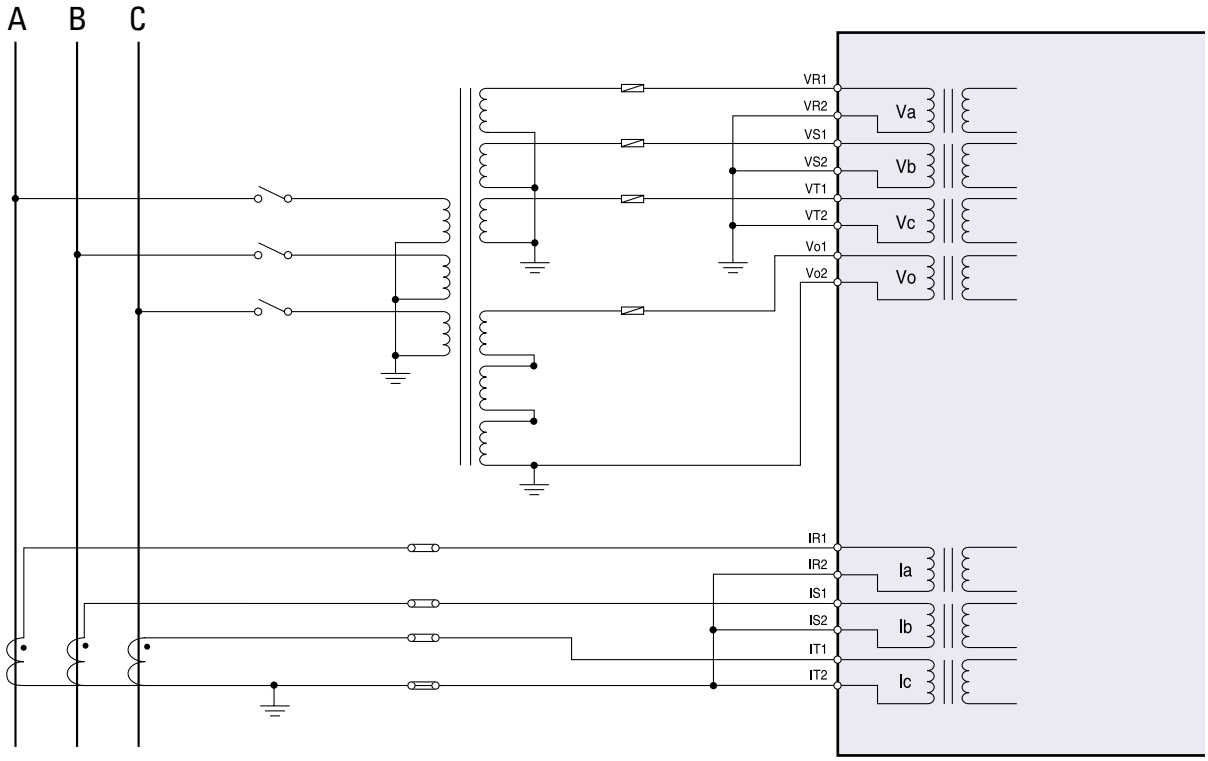
1P 3W



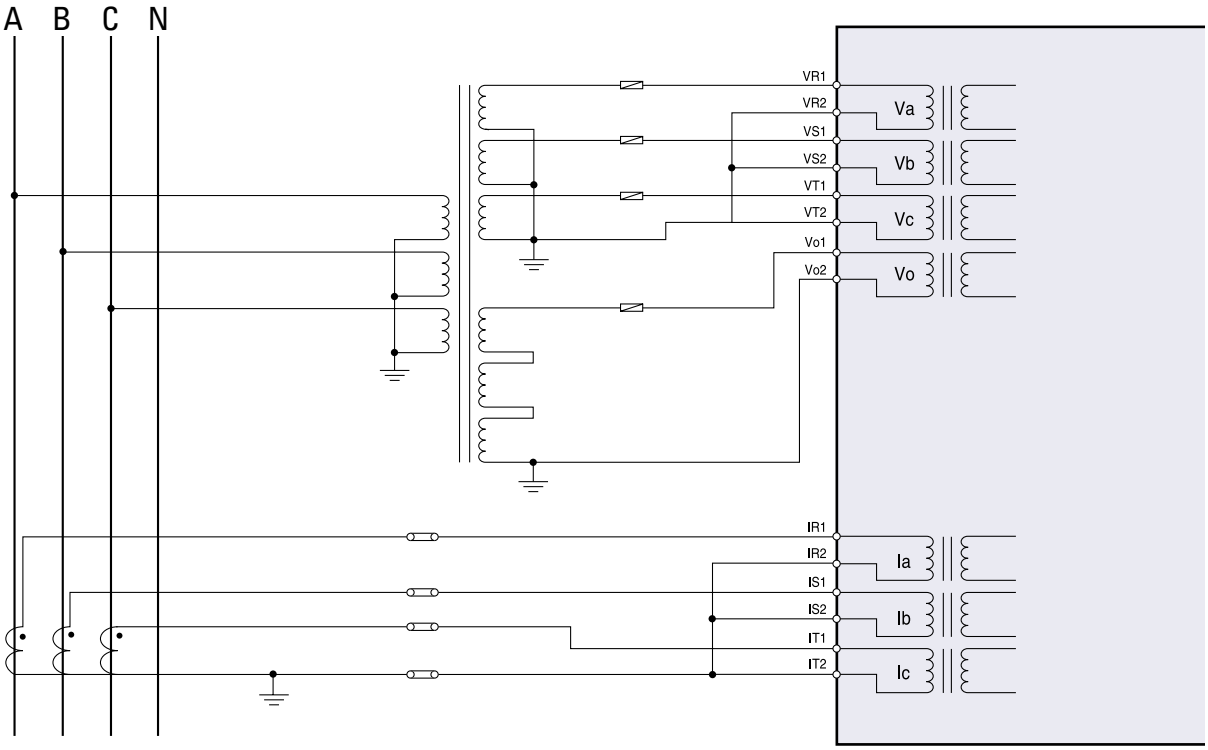
D

Wiring

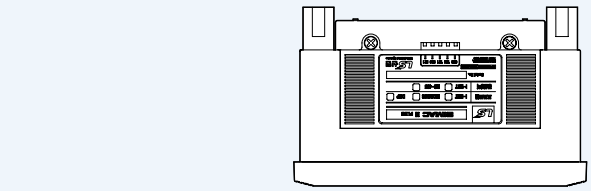
3P 3W (Y Wiring)



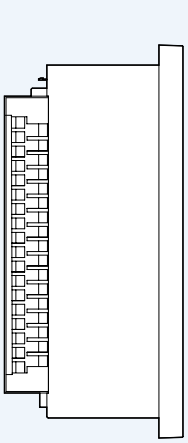
3P 4W



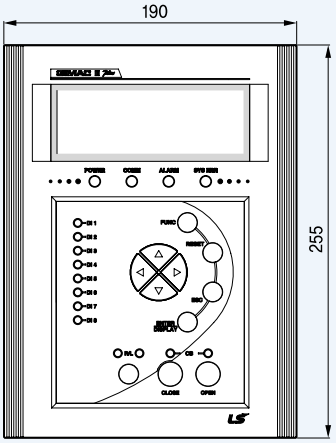
Dimensions



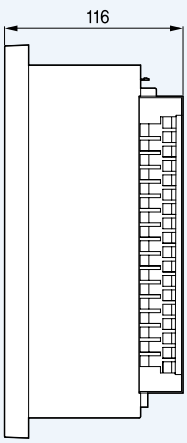
<Top view>



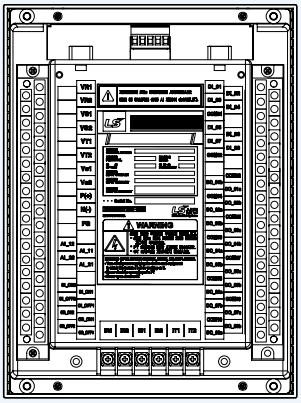
<Left side view>



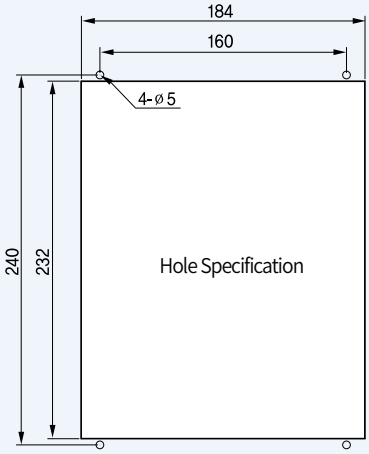
<Front view>



< Right side view>



<Rear view>



Ordering

GIMAC-II Plus

Note) When ordering GIMAC-II Plus, the model name is GIMAC-115P, which is the same product name.

NO	RS	M	5A	60HZ	AC/DC 110V	DI_AC/DC 110V	AI
Model	Communication	Protoco	CT Rating	Frequency	Control Power	Digital Input	Option
NO Normal	RS RS485	M MODBUS	1A	50Hz	AC/DC 110V	AC/DC 110V	AI 4~20mA (2P)
	TE Ethernet	C IEC61850 MMS	5A	60Hz	AC/DC 220V	AC/DC 220V	- None
		D DNP3.0 Note) 2					

Note) 2. DNP3.0 is only supported by communication method TE.

D

GIMAC1000

It is an advanced digital Power Measuring Device that enables power quality analysis such as high-precision measurement, harmonics, and THD measurement of various electric quantities of power distribution system.

GIMAC1000

Digital Power Measuring Device

- Various measurement elements and high precision measurement
  - Voltage, current : ±0.3%
  - Power : Class0.5
- **Extended harmonic measurement range (31th harmonic)**
- Wide range of PT inputs (AC 10~452V)
- Incorrect wiring check function
- **Compact appearance design**
- Free Voltage Control Power
- Automatic Scroll Display of Measured Items
- RS-485, **Ethernet communication support**
- **Provide rapid spaning tree protocol function**

E

Contents

Features

Various measurement elements and high precision measurement

The NO models can measure 14 measurement elements, while the EX models can measure 38 elements. The voltage satisfies ± 0.3% (real scale) at rated voltage 10 ~ 452V, current is ± 0.3% (full scale) at 0.05 ~ 6A, and power is class0.5. In particular, it ensures high reliability by maintaining precision even in the frequency fluctuating site.

Extended harmonic measurement range (31th harmonic)

Basic power quality measurement such as fundamental wave, harmonic and THD of electricity quantity is possible

Wide range of PT inputs (AC 10~452V)

It is economical and easy to wire because you can input AC10 ~ 452V directly without any PT.

Incorrect wiring check function

By detecting the direction of voltage rotation and judging whether there is an error in the wiring, the user can be notified of the PT wiring by notifying the user. Only three-phase four-wire and three-phase three-wire connections.

Compact appearance design

The basic model has an outline of 110 (W) x 110 (H) x 84.6 (D) mm and the panel cutting size is suitable for DIN 96 and ANSI 4.

Free Voltage Control Power

Control power can be used in various power environments.

Automatic Scroll Display of Measured Items

When you press the [DOWN] KEY (∨) and [ENTER] KEY (↵) at the same time, the displayed item will automatically scroll every 10 seconds.

RS-485, Ethernet communication support

It supports MODBUS and TCP / IP protocol of RS-485 and Ethernet communication method.

Provide rapid spaning tree protocol function

Ethernet supports port redundancy and Rapid Spanning Tree Protocol for fast switching performance.

Rated specifications

Ratings

Type			Specification
Wiring			1P2W, 1P3W, 3P3W(Y), 3P3W(Delta), 3P4W
Voltage	Frequancy		60Hz, 50Hz
	Voltage	PT	AC 10~452V
	Current	CT	0.05~6A(5A), 0.01~1.2A(1A)
	Power		AC/DC 100~240V, Free Voltage
	Power consumption		4.5W or less : Stanby
	Burden		0.1VA or less : PT 0.5VA or less : CT
Insulation Resistance			DC 500V 10MΩ or more
Insulation Voltage			AC 2kV(1kV)/1min
Lightning impulse voltage			AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload withstand	Current circuit		Withstand 1.2 times of rated voltage for 3 hours. Withstand 8 times of rated current for 2 seconds.
	Voltage circuit		Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient Disturbance			4kV : power input
Electrostatic Discharge(ESD)			8kV : Air, 6kV : Contact
Temperature	Operation		-20°C ~ +60°C
	Storage		-25°C ~ +70°C
Humidity			RH 80% or less (non-condensing)
Applied Standards			IEC60255, IEC61000-4
Dimension(mm)			110×110×84.6, 110×110×106.6(Ethernet)
Weignt			0.5kg
Communication			RS485 : Modbus Ethernet : Modbus

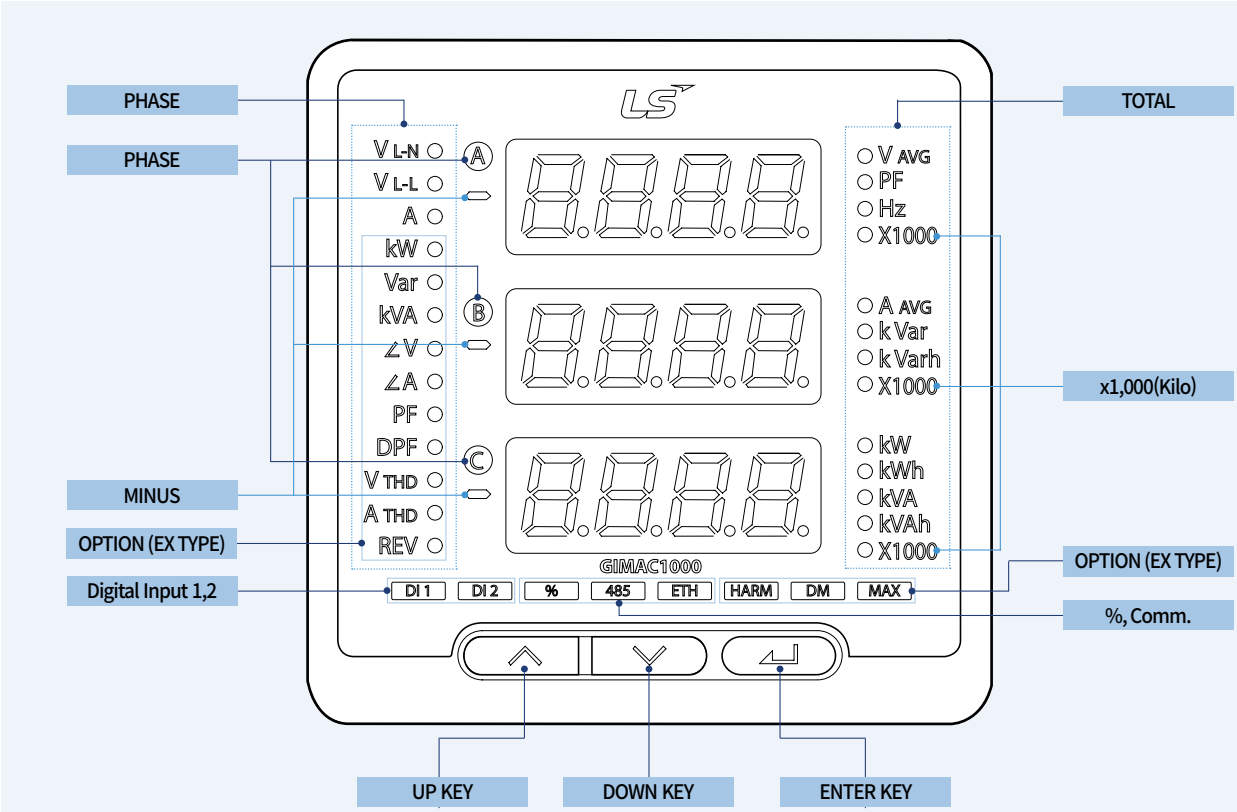
E

Rated specifications

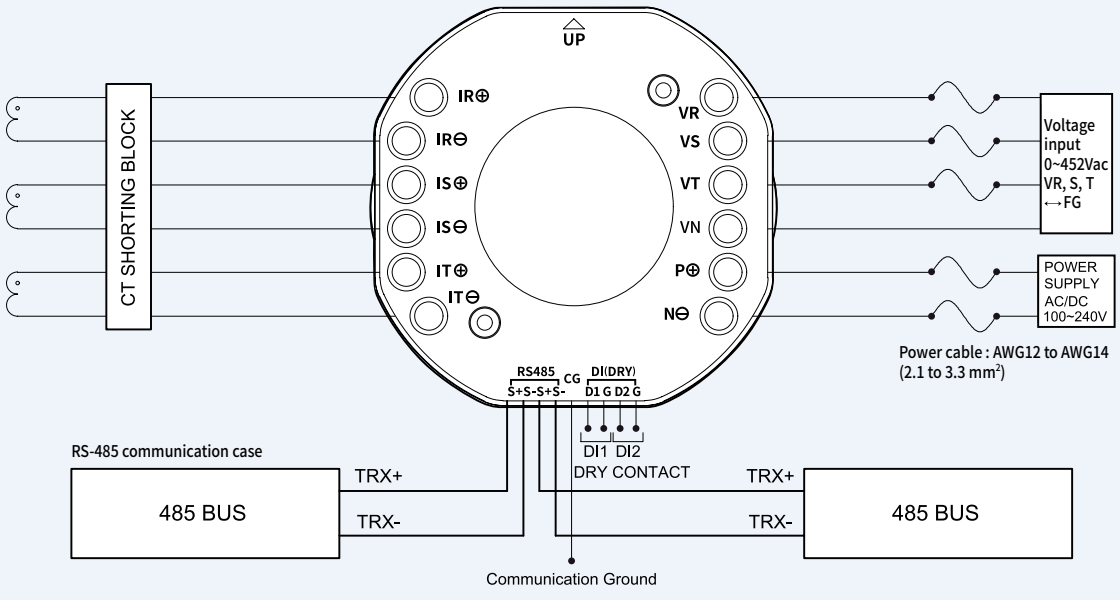
Measurement

Item		Description	Range	NO	EX	Accuracy (%)	Remarks
Voltage	Phase voltage	V_a, V_b, V_c	0.000V ~ 999.9kV	■	■	±0.3%	-
	Line voltage	V_{ab}, V_{bc}, V_{ca}	0.000V ~ 999.9kV	■	■	±0.3%	-
	Average voltage	V_{avg}	0.000V ~ 999.9kV	■	■	±0.3%	-
Current	Current	I_a, I_b, I_c	0.000A ~ 99.99kA	■	■	±0.3%	-
	Average current	I_{avg}	0.000A ~ 99.99kA	■	■	±0.3%	-
Phase	Line voltage	$\angle V_{ab}V_{bc}, \angle V_{ab}V_{ca}$	0.000 ~ 359.9°	-	■	±0.5°	3P 3W
	Line voltage-current	$\angle V_{ab}I_a, \angle V_{ab}I_b, \angle V_{ab}I_c$	0.000 ~ 359.9°	-	■	±0.5°	3P 3W
	Phase voltage	$\angle V_aV_b, \angle V_aV_c$	0.000 ~ 359.9°	-	■	±0.5°	3P 4W
	Phase voltage-current	$\angle V_aI_a, \angle V_bI_b, \angle V_cI_c$	0.000~360.00°	-	■	±0.5°	3P 4W
Power	Total Active power(Reverse)	P	0.000W ~ 999.9GW	■	■	Class0.5	IEC1036
	Phase Active power(Reverse)	P_a, P_b, P_c	0.000W ~ 999.9GW	-	■	Class0.5	IEC1036
	Total Reactive power(Reverse)	Q	0.000Var ~ 999.9GVar	■	■	Class0.5	IEC1036
	Phase Reactive power(Reverse)	Q_a, Q_b, Q_c	0.000Var ~ 999.9GVar	-	■	Class0.5	IEC1036
	Total Apparent power	S	0.000VA ~ 999.9GVA	■	■	Class0.5	IEC1036
	Phase Apparent power	S_a, S_b, S_c	0.000VA ~ 999.9GVA	-	■	Class0.5	IEC1036
Energy	Active energy	Wh	0.000Wh ~ 999.9GWh	■	■	Class0.5	IEC1036
	Reactive energy	Varh	0.000Varh ~ 999.9GVarh	■	■	Class0.5	IEC1036
	Reverse active energy	rWh	0.000Wh ~ 999.9GWh	-	■	Class0.5	IEC1036
	Reverse reactive energy	rVarh	0.000Varh ~ 999.9GVarh	-	■	Class0.5	IEC1036
	Apparent energy	VAh	0.000VAh ~ 999.9GVAh	■	■	Class0.5	IEC1036
Frequency		F	45.00 ~ 70.00Hz	■	■	±0.05Hz	-
Power Factor	Power Factor(PF)	PF	-1.000~1.000	■	■	Based on phase error	+ : Lag - : Lead
	Phase Power Factor	PF_a, PF_b, PF_c	-1.000~1.000	-	■	Based on phase error	
	1st harmonic power factor (DPF)	DPF_a, DPF_b, DPF_c	-1.000~1.000	-	■	Based on phase error	
Harmonics	Voltage	$V_{a(ac)}, V_{b(bc)}, V_{c(ca)}$ ~31th Harmonics	0.000~999.9kV	-	■	-	-
	Current	I_a, I_b, I_c ~31th Harmonics	0.000A ~ 99.99kA	-	■	-	-
	Voltage THD	$V_{a(ac)}, V_{b(bc)}, V_{c(ca)}$ THD	0.000 ~ 100.0%	-	■	-	-
	Current THD	I_a, I_b, I_c THD	0.000 ~ 100.0%	-	■	-	-
DEMAND	Active power demand	Demand W	0.000Wh ~ 999.9GWh	-	■	-	
	Current demand	Demand I_a, I_b, I_c, Iavg	0.000A ~ 99.99kA	-	■	-	
Load factor		Load factor I_a, I_b, I_c	0.000 ~ 120.0%	■	■	-	-
MAX	Max. current	max I_a, max I_b, max I_c, max I_{avg}	-	-	■	-	-
	Max. voltage THD	max $V_{a(ab)}$ THD, max $V_{b(bc)}$ THD max $V_{c(ca)}$ THD	-	-	■	-	-
	Max. current THD	max I_a THD, max I_b THD, max I_c THD	-	-	■	-	-
	Max. active power	max W	-	-	■	-	-
	Max. reactive power	max VAR	-	-	■	-	-
	Max. apparent power	max VA	-	-	■	-	-
	DEMAND	max Demand I_{avg}, I_a, I_b, I_c	-	-	■	-	-
		max Demand W	-	-	■	-	-

Front configuration



Rear configuration



E

Operation & Settings

The GIMAC1000 have a display mode and a setting mode.

Display Mode

- Move between pages is (↵) key, Move between factor is (∧ | ∨) key
- See the measurement table on page 7 for details on pages and measurement items.

[Page]
1page total measurement factor : voltage, current, phase, power, frequency, power factor
2page THD : voltage, current 1st~31th
3page DEMAND : active power, current
4page MAX : current, voltage/current THD, active/reactive power, DEMAND

Setup Mode

- If you press (∧ | ∨) keys at the same time in the 'display mode', you will move to the 'setup mode'.
- The initial screen of 'setup mode' displays 'CONN' which indicates the wiring method.
- Move between setting items using (∧ | ∨) key.
- Change the value using (∧ | ∨) key and press (↵) to save.
- When all settings are completed, press the (∧ | ∨) keys at the same time to return to the 'display mode'.

* If there is no operation for more than 3 minutes in 'setup mode', it automatically returns to 'display mode'.

Setup parameter

Order of display	Setup menu	Display	Value	Default	Remarks
1	Wiring	'CONN'	1 : 1P 2W 2 : 1P 3W 3 : 3P 3W-D 4 : 3P 3W-Y 5 : 3P 4W	5	
2	PT Ratio	'Pt'	1.0000~1400.0000	1	1st / 2nd Magnification Input 1 input for direct connection
3	CT Ratio	'Ct'	1~2000(5A) or 1~9999(1A)		
4	DEMAND time	'dE.t'	1~60	15	Step 5(1~5 Step 1)
5	Communication Address	'Addr'	1~247	1	
6	Communication speed	'bPS'	1 : 9600 bps 2 : 19200 bps 3 : 38400 bps	3	
	Float variable & swap	'S'	On : Yes Off : No	On	
7	Tx delay time	'tX.t'	10~200 msec	20	
8	IP Address	'tCP' 'Adr.'	1.0.0.0~233.255.255.255	192.168.0.100	
9	Subnet Mask	'tCP' 'SUb.'	0.0.0.0~255.255.255.255	255.255.255.0	
10	Gateway	'tCP' 'GAt.'	1.0.0.0~223.255.255.255	192.168.0.1	
11	Mac Address	'C-Ad'	00-00-00~FF-FF-FF	-	Not Available
12	TCP Idle Time	'id.t'	10~60 sec	10	
13	TCP SWAP	'tCP' 'S'	On : Yes Off : No	On	
14	DI1 Debounce time	'dEb' '1'	10~200	10	
15	DI2 Debounce time	'dEb' '2'	10~200	10	
16	RS485 Termination Switch	'tEr'	On : Yes Off : No	Off	
17	Data Reset	'rSt.'	0 : All Data Reset 1 : Wh Reset 2 : Varh Reset 3 : VAh Reset 4 : rWh Reset 5 : rVarh Reset 6 : Demand A Reset 7 : Demand W Reset 8 : Max A Reset 9 : Max W Reset 10 : Max Var Reset 11 : Max VA Reset 12 : Max V THD Reset 13 : Max A THD Reset 14 : Max Demand A Reset 15 : Max Demand W Reset 16 : DI1 Counter Reset 17 : DI2 Counter Reset	-	4~15: EX type only
18	LED TEST	'LEd' 'tESt'	On : Yes Off : No	Off	When setting value 'On', then all LEDs light for 2 seconds
19	Version display	'vEr.'	XX.XX / X.X	-	Not Available

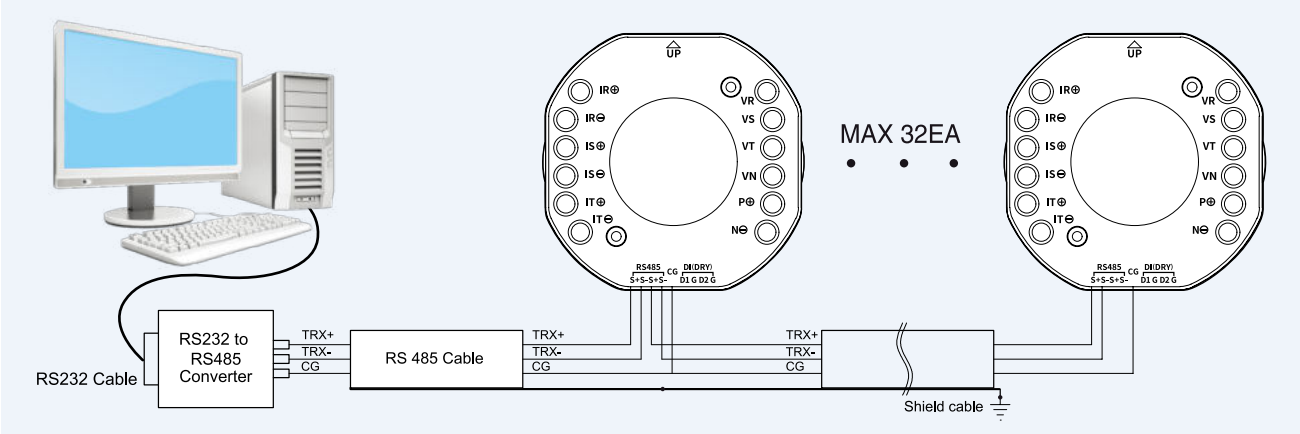
E

Communication

1) Protocol

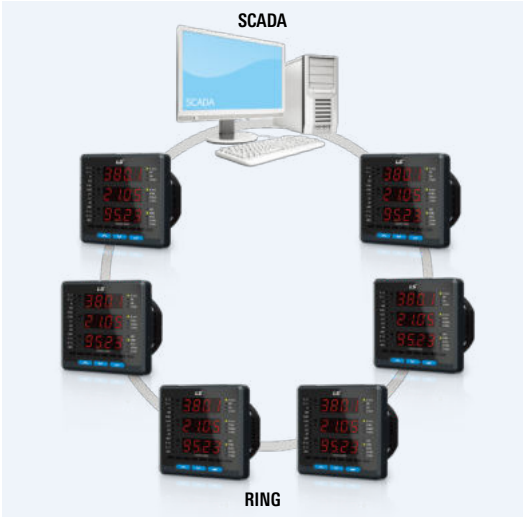
Type	Item	Specifications	Remarks
MODBUS/RS485	Operation mode	Differential	
	Baud rate	9600, 19200, 38400bps	
	Distance	Max. 1.2km	
	Cable spec.	Standard RS485 Shielded twisted pair cable	
	Transmission	Half-Duplex	
	Max. number of connections	Max. 32ea	
MODBUS/Ethernet	Topology	RSTP (Star, Daisy-Chain, Ring)	
	Communication speed	10/100Mbps	
	Distance	Max. 100m (between HUB to Terminal)	
	Cable spec.	UTP(CAT.3, CAT.5)	

2) MODBUS/RS485



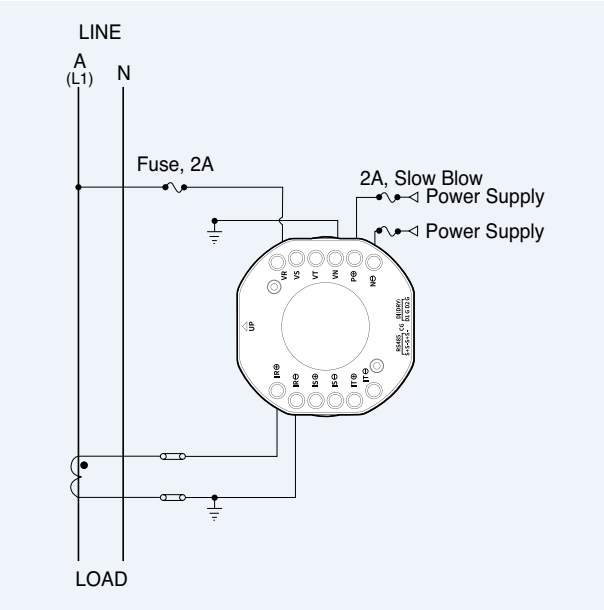
- VN terminal of the product must be grounded.
  ※ CAUTION) If the VN terminal is not grounded, the internal communication driver may be damaged.
- Shield of communication cable must be connected to each other and grounded.
- The CG terminals of the products must be connected to each other for the same potential and never connect the CG terminal to earth ground.
  ※ CAUTION) if the CG of communication cable be grounded, Internal components may be damaged.
- For the product connected at the end of communication, turn on the RS485 termination switch setting.
- 485 LED blinks in response to communication.

3) MODBUS/Ethernet

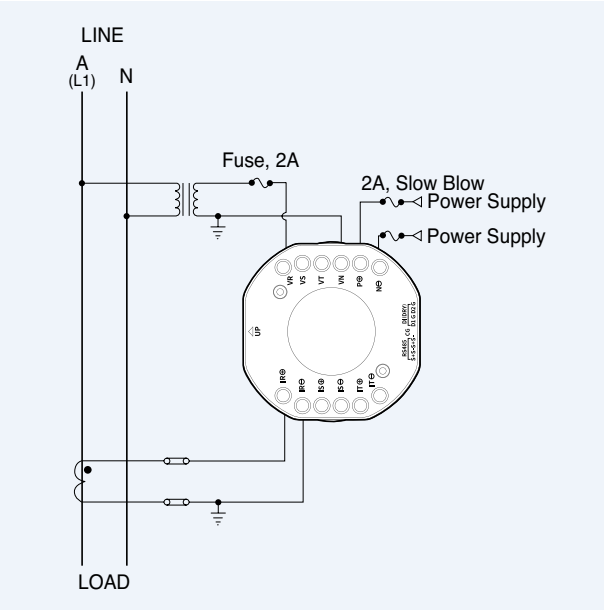


1P 2W

The range of voltage that can be directly connected without PT is 10 ~ 380V (+ 120%) based on phase voltage.
The value of 1-phase 2-wire setting value in the wiring setting mode is “1”.



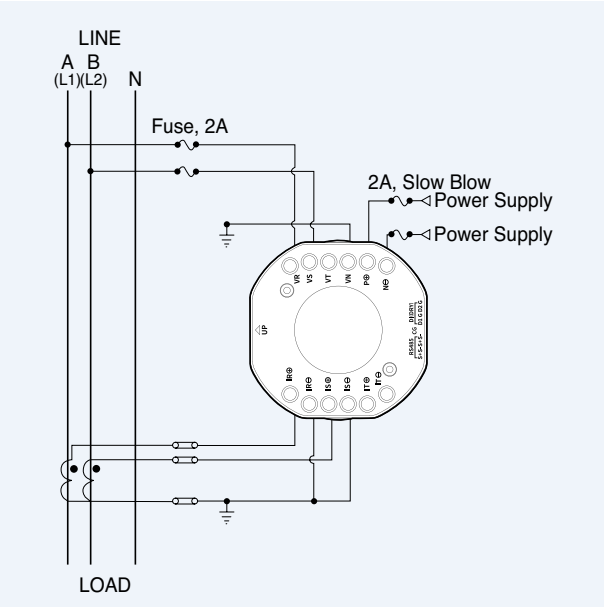
1-phase 2-wire direct connection



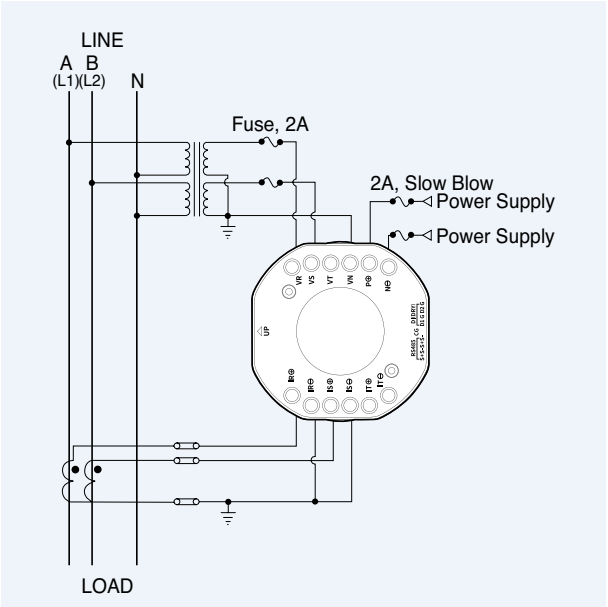
1-phase 2-wire connection with PT

1P 3W

The range of voltage that can be directly connected without PT is 10 ~ 380V (+ 120%) based on phase voltage.
The value of 1-phase 3-wire setting value in the wiring setting mode is “2”.



1-phase 3-wire direct connection



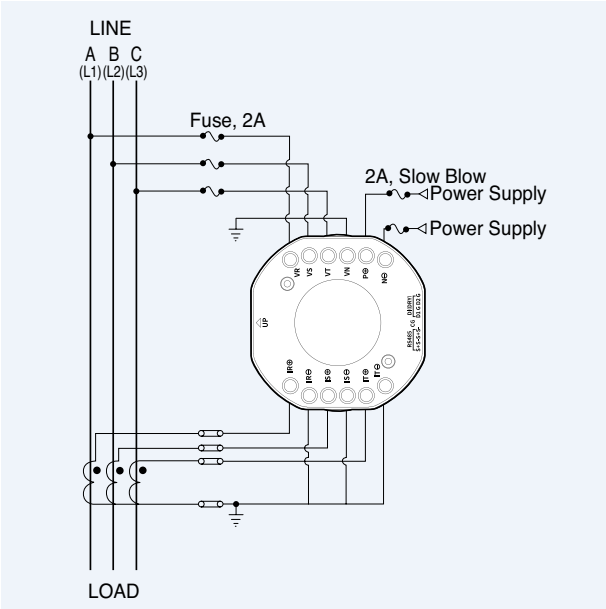
1-phase 3-wire connection with PT

E

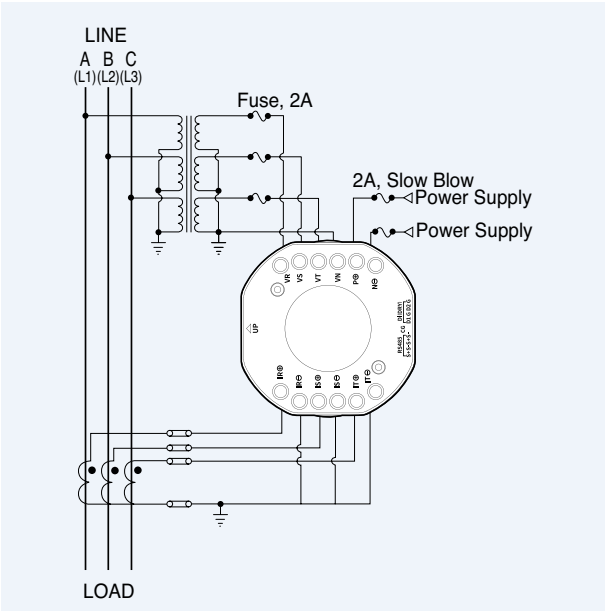
Wiring

3P 3W–Y

The range of voltage that can be directly connected without PT is 17.3 ~ 658.2V based on line voltage.
The value of 3-phase 3-wire Y type setting value in the wiring setting mode is “4”.



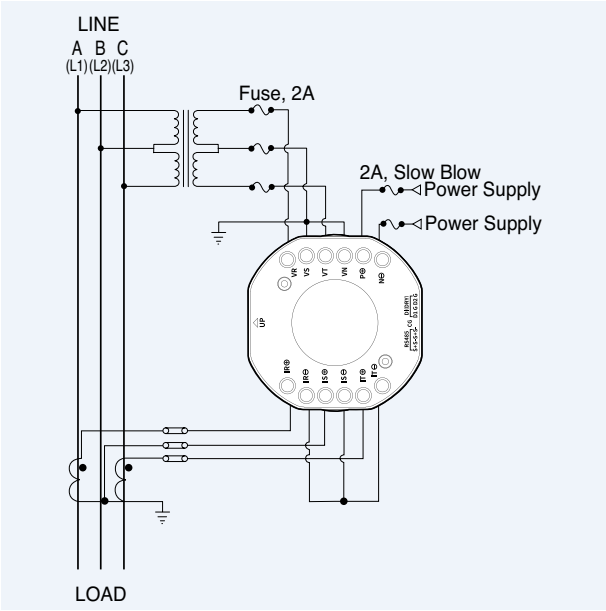
3-phase 3-wire direct connection



3-phase 3-wire Y connection with 3PT

3P 3W–Open Delta

The value of 3-phase 3-wire Delta type setting value in the wiring setting mode is “3”.

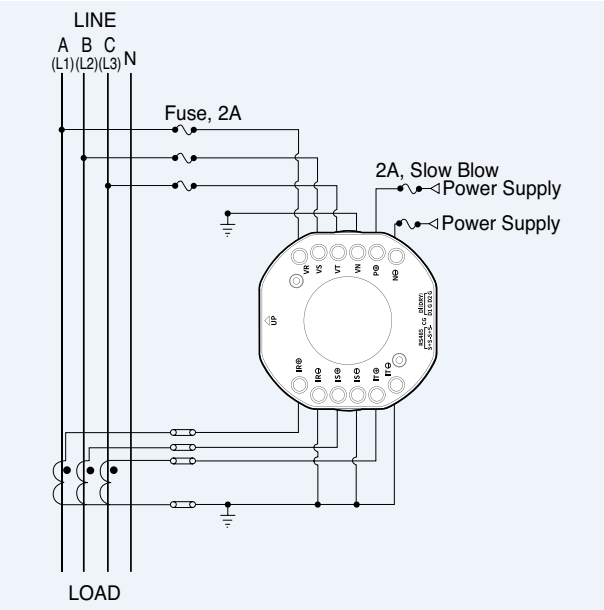


3-phase 3-wire Delta connection with 2PT and 2CT

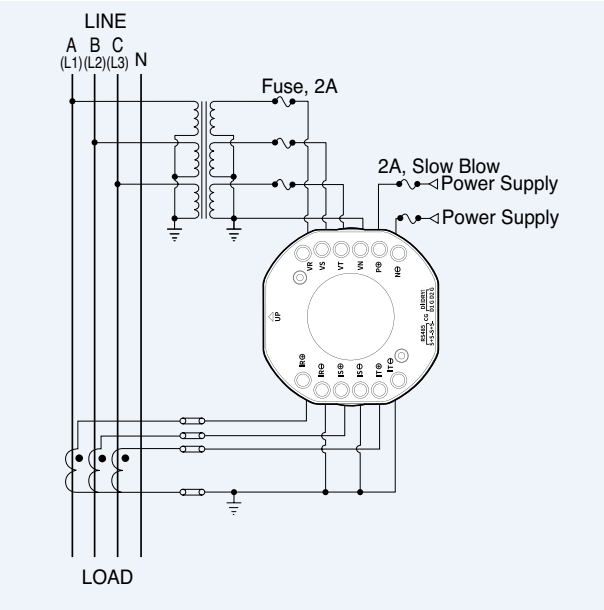
- When 2PT is used, the V_{ca} voltage is obtained by the combination of V_{ab} and V_{bc}.
  Therefore, if the voltage is unbalanced, the voltage of V_{ca} causes an error.
- When 2CT is used, the IS current is obtained by the combination of I_a and I_c.
  Therefore, if the current is unbalanced, the current of I_b causes an error.
- In case of unbalanced load, error occurs in power, so use it in case of balanced load.
- Each phase power (active, reactive, apparent), voltage/current phase, each phase power factor, and each phase fundamental power factor cannot be measured or displayed.

3P 4W Wiring

The range of voltage that can be directly connected without PT is 10 ~ 380V(+120%) based on phase voltage.
The value of 3-phase 4-wire setting value in the wiring setting mode is “5”.

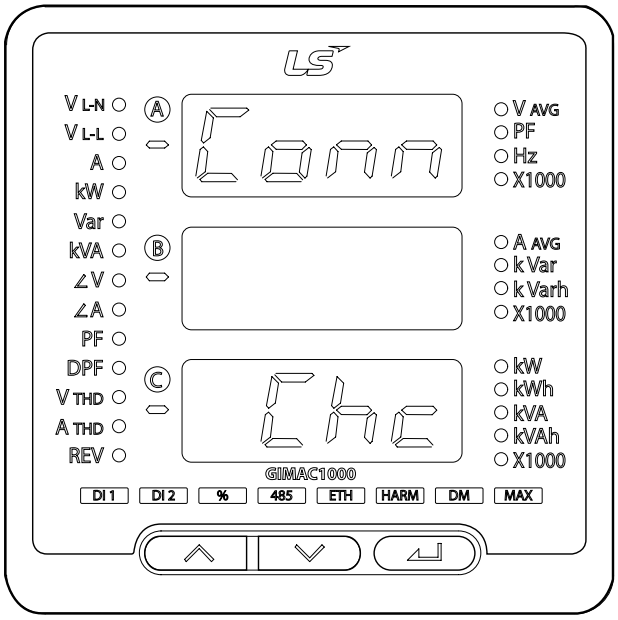


3-phase 4-wire direct connection



3-phase 4-wire connection with 3PT

Incorrect wiring



<Wiring Check>

The following message occurs in 3-phase 4-wire and 3-phase 3-wire-Y.
Press the [ENTER] key to return to the measurement display mode.
In case of [Conn Chc] message, check the wiring status.

Self diagnosis function & LCD display

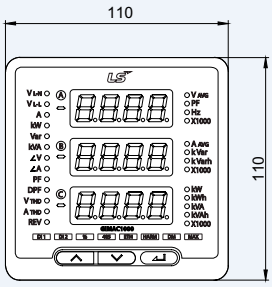
ERROR	FND display
MEMORY	ERROR 1
OPTION	ERROR 3
Setting Data	ERROR 4

E

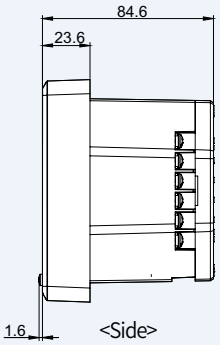
Dimensions & Ordering

Dimensions

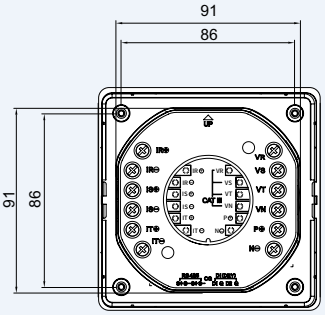
▸ NOCOMM/M485 TYPE



<Front>

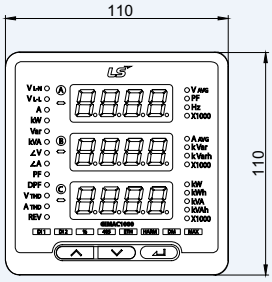


<Side>

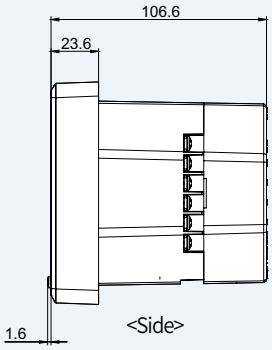


<Rear>

▸ ETHERNET TYPE



<Front>



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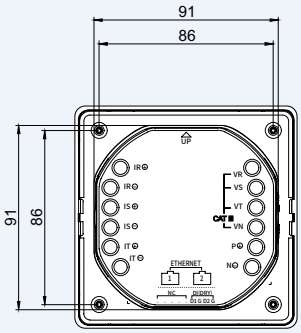
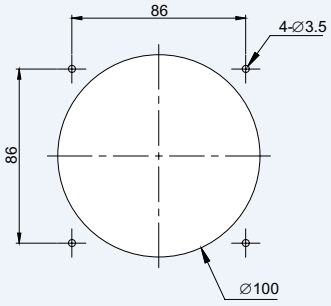
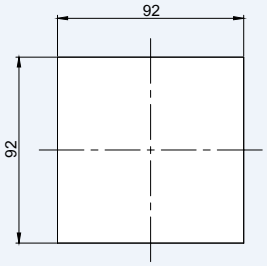


<Rear>



ANSI 4 Cutting Size



DIN 96 Cutting Size

• Panel cutting shape can be processed by selecting round or square.

Ordering

GIMAC1000

NO	M485	5A	60HZ	AC/DC 100~240V
Model	Communication	CT Rating	Frequency	Control Power
NO Basic	- N/A	5A	60Hz	AC/DC 100~240V
EX Expansion	M485 MOD/RS485	1A	50Hz	
	ETH MOD TCP/ Ethernet			

GIMAC-B

The Metasol Energy Measuring Device by LS is a segment power surveillance meter for low-voltage switchgears and distribution boards in buildings and factories

GIMAC-B

Energy Measuring Device GIMAC-B

The Metasol Energy Measuring Device by LS is a segment power surveillance meter for low-voltage switchgears and distribution boards in buildings and factories, which offers stable and efficient power management capabilities to the user by integrating surveillance through high-speed Ethernet communication and power quality surveillance all into a single device.

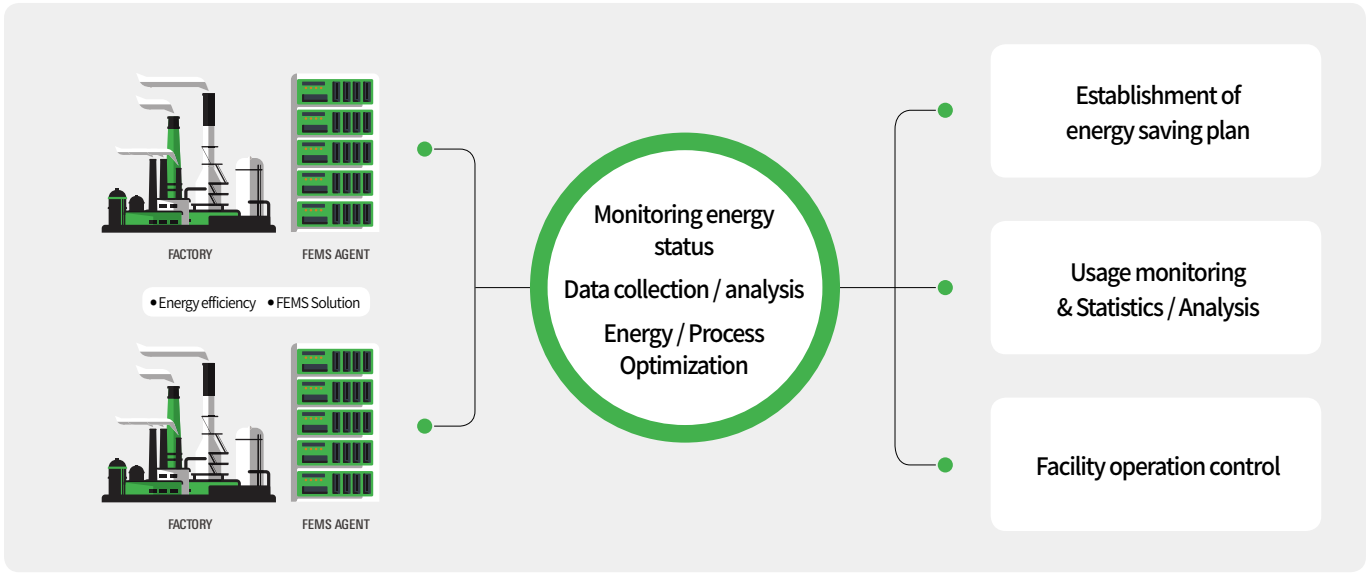
Contents

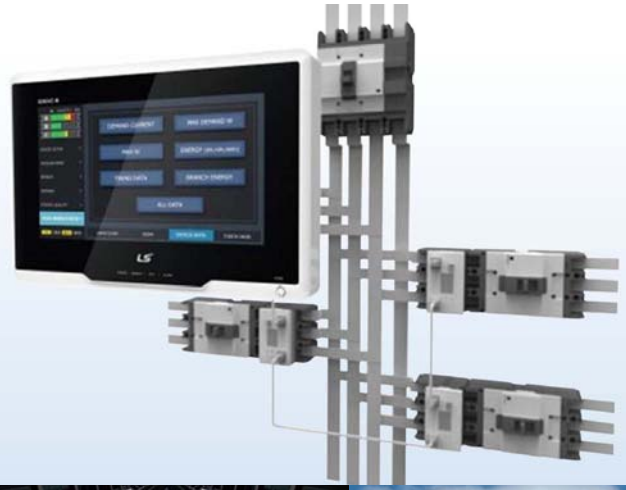
F

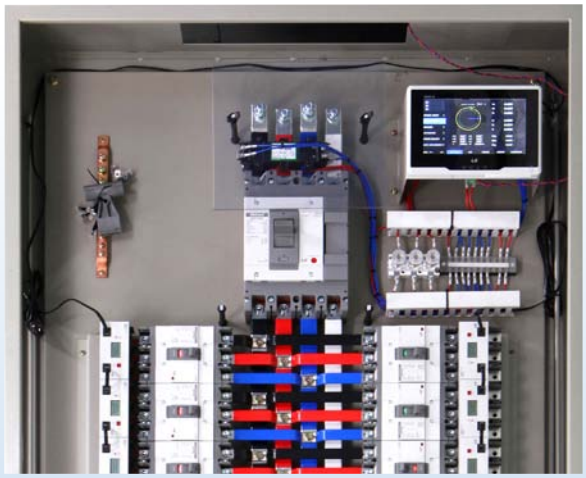
Energy Measuring Device
GIMAC-B

LS's Metasol Energy Meter is a meter for power monitoring of each branch circuit in low-voltage switchgears and distribution boards in buildings and factoriess. By integrated monitoring the load abnormality and the power quality through the high-speed Ethernet communication, it is possible to provide users with stable and efficient power operation management.

- Construction of FEMS and BEMS through power measurement by load
- Association with Building management system
- Association with Power monitoring unit

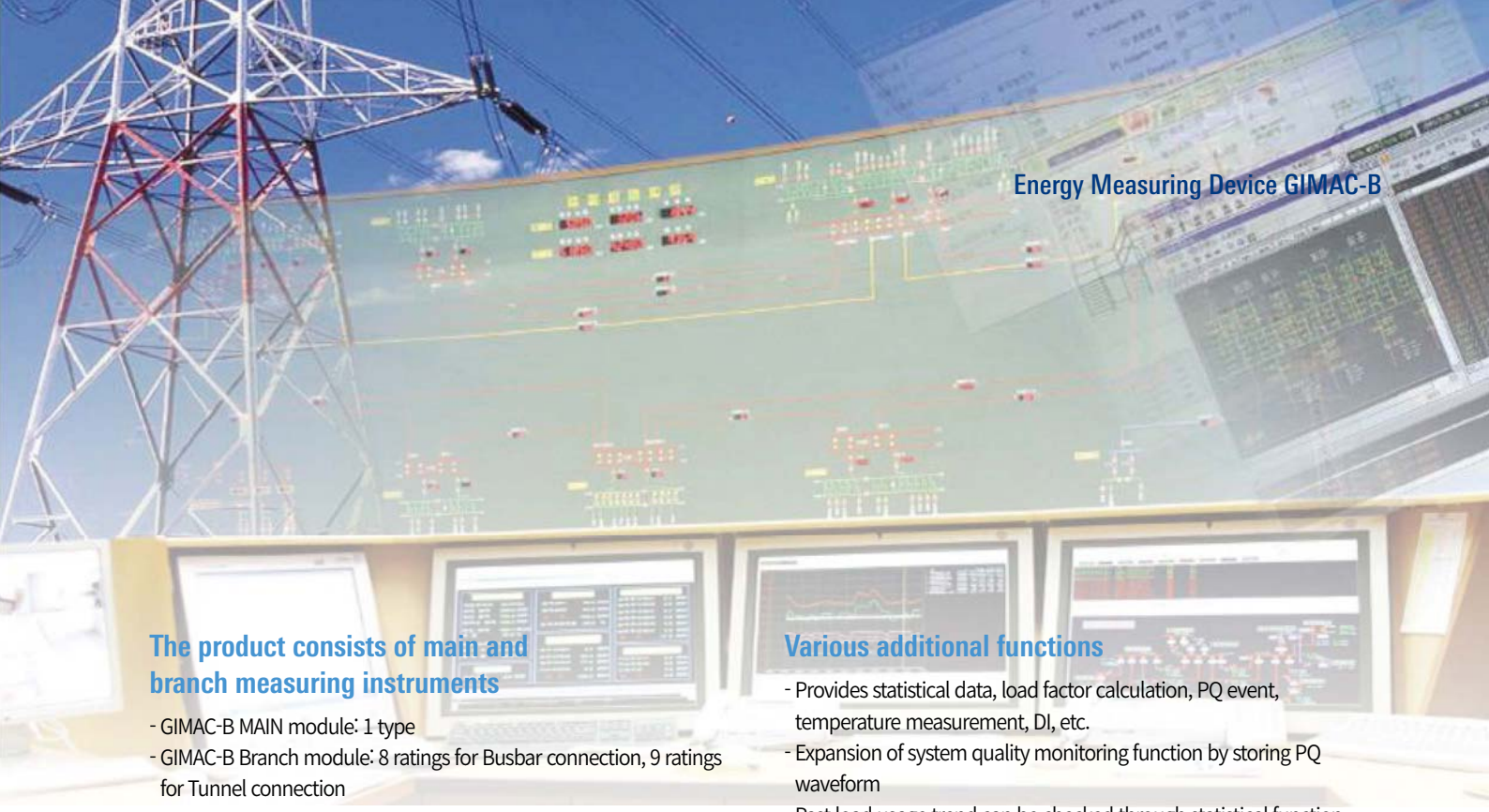






Building
Office, Commercial, Residential, School, Hospital

Industrial facilities
Petrochemical, Electronics, Glass, Steel, Semiconductor, Chemical, Pharmaceutical, Cement, Paint



The product consists of main and branch measuring instruments

- GIMAC-B MAIN module: 1 type
- GIMAC-B Branch module: 8 ratings for Busbar connection, 9 ratings for Tunnel connection

1. Single phase (4 ratings for each busbar/tunnel connection style: 30A, 100A, 125A, 250A)
2. Three phases [(4 ratings for busbar, 5 for tunnel style): 5A(tunnel only), 30A, 100A, 125A, 250A]
3. Leakage current measurement function as an option
4. Temperature measurement function (available when installing separate temperature module)

Providing standard communication function

- High-speed Ethernet provides load monitoring and power quality monitoring in real time
- Main module: Standard Ethernet, MODBUS RS-485
- Branch module: MODBUS RS-485
- Automatic ID allocation function for constructing a simple communication system
- Up to 50 branch modules can be connected per main module

Various measurement functions

- Phase (line) current, Phase (line) voltage, phase, unbalance rate, power factor, frequency, power, energy, THD, TDD, K-FACTOR, Harmonics, Demand, Load-ratio
- Provides useful information such as PQ (Sag, Swell, Interruption), demand power / current measurement

Various additional functions

- Provides statistical data, load factor calculation, PQ event, temperature measurement, DI, etc.
- Expansion of system quality monitoring function by storing PQ waveform
- Past load usage trend can be checked through statistical function
- Adopted an 8-inch Graphic LCD with touch screen as the main instrument ensuring visibility and convenience
- Ensures system scalability by connecting up to 50 branch instruments
- Branch module abnormality data is stored as event and provides transferring of each branch module information to main module through communication and storing and DO output function.
- Leakage current measurement using ZCT built in breaker by branch module (Option)
- It is possible to monitor the ON, OFF, and Trip status of the breaker by receiving the AX and AL contacts of the MCCB to the branch module (Optional)

Busbar or Tunnel connection (module)

- Types of connection with MCCB can be selectable - Busbar or Tunnel

Provide high accuracy error

- Provides voltage / current accuracy error (0.2%) and provides various rated products according to customer's demand.
(The range of current measurement is different for each product rating)

Public facilities
Gas, Water and sewerage, Airport, Railway, Harbor

Features

GIMAC-B MAIN

Various measurement / Power quality monitoring function

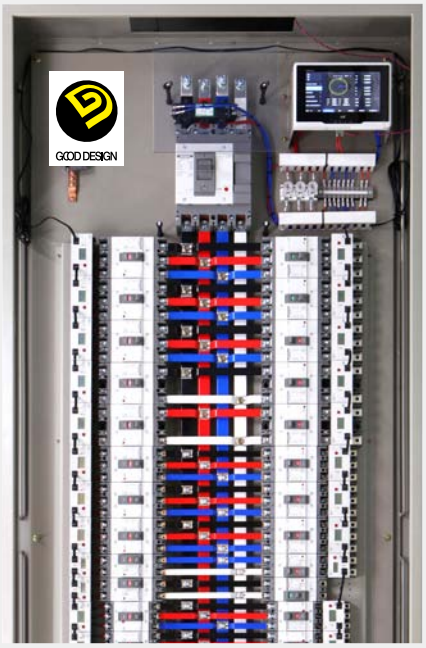
- Voltage, current, power, energy, frequency, power factor, phase
- Provides convenience of on-site maintenance by providing Various Vector screens
- THD, Sag, Swell, Interruption function
- Suitable for high quality power system operation by providing power quality monitoring event

Provides optimal deployment of the system

- Easy wiring through direct connection of external CT (5A)
- Convenient system design with wide measurement voltage range
- D/I and D/O provide easy configuration of switchgear system
- Supports up to 50 branch monitoring
- Easy installation and commissioning through dedicated branch communication/power integrated supply cable
- Temperature monitoring in the inside of a panel by temperature measurement module

Supports various communication networks

- Support for redundancy via RS-485 and Ethernet
- Easy installation and commissioning through branch auto address support



8" TFT LCD touch screen

- Large touch screen provides ease of operation and use
- Diversification of display through graphic application (PQ waveform, Trend, Vector)
- Provides ease of analysis and maintenance
- Set the language in the GIMAC-B screen menu
  - Korean and English supported

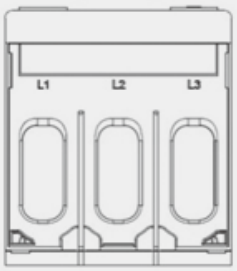
Good Design

- Awarded Good Design in 2015

GIMAC-B Branch Measurement Module

User-friendly structure

- Display of branch-specific measurement value by applying Customized LCD 4 Segment
- Convenient on-site installation through tunnel style long-hole structure



Various additional functions of branch circuit

- Displaying the status of the branch circuit (breaker) on the LED and signaling it to the main monitoring module
- Providing leakage current measurement when connected to MCCB with ZCT(Optional)

System / Operational reliability

- Short-circuit tested with MCCB
- Provides branch power stabilization solutions in harsh environments
- Various branch cables are provided

Breaker status monitoring function

- Monitoring AX, AL state using DI 2CH (Optional)
  - MCCB status(ON, OFF, Trip) monitoring function

Good Design

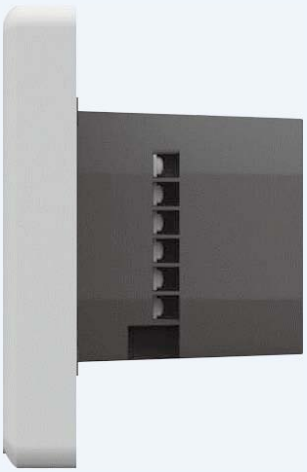
- Awarded Good Design in 2015

GOOD DESIGN

F

GIMAC-B Main Module

GIMAC-B MAIN

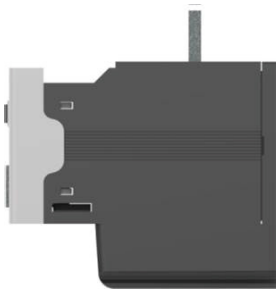


GIMAC-B Branch Module

100AF 2P

125AF 2P

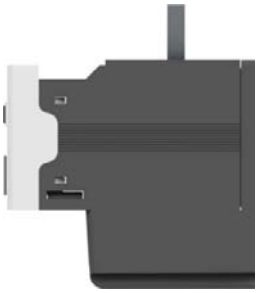
250AF 2P



100AF 3P

125AF 3P

250AF 3P



Standard Operating Environment

This product should be used under the following standard usage conditions.

1) Temperature
- Normal operating: -20 to 60°C
- Storage: -30 to 70°C

2) Humidity: 80% or less (no condensation)

3) Location
- Altitude: Below 2,000 meters above sea level.
- CT to abnormal vibration or shock.
- Where the ambient air pollution is not significant.

Note) Caution: In the environment exposed to chemicals and gas, it may cause measurement hunting due to metal corrosion and control power failure. Therefore, product performance in the environment is not guaranteed.

Product rating

Item		Rating		Remarks
Rated frequency		50 or 60Hz (Input range: 50 or 60 ± 5Hz)		
Control Power	Power input range	Normal	~ 220VAC/DC	
		Min ~ Max	88 ~ 264VAC/DC	
	Power Consumption	Single use	MAX. 19 W	
		Branch connection	MAX. 40 W	With 50 branch connection
Measurement	Voltage input range	3 ch	9~452V (9 ~ 782V)	Phase voltage(between line voltage) basis
	Current input range	3 ch	0.05 ~ 6A	
	Input burden	Each phase	1VA or less	
Input contact		DI: 2CH (Dry Contact)		
Output contact		DO: 1CH (250VAC 5A, 30VDC 5A)		For resistive load
Temperature measurement range		-20°C ~ 70°C (°C/°F change)		Separate temperature module is required

F

Function & Rating

Measurement

item		Description	Instant value	Peak Demand	3P4W	3P3W Y	3P3W OD	1P2W	Display range (Warranty range)	Accuracy
Voltage	Phase voltage	V_a, V_b, V_c	○	○	○	×	×	○	9 ~ 452V (30 ~ 452V)	0.20%
	Line voltage	V_{ab}, V_{bc}, V_{ca}	○	○	○	○	○	×	9 ~ 782V (30 ~ 452V)	0.20%
	Normal phase voltage	V_1	○	○	○	○	×	×	0 ~ 452V	N/A
	Reverse phase voltage	V_2	○	○	○	○	×	×	0 ~ 452V	N/A
	Zero phase voltage	V_0	○	○					0 ~ 452V	N/A
	Unbalance	UBV	○	○	○	○	○	×	0 ~ 100%	N/A
Current	Current	I_a, I_b, I_c	○	○	○	○	○	○	0.050 ~ 6.000A	0.20%
	Normal phase current	I_1	○	○	○	○	×	×	0 ~ 6.000A	N/A
	Reverse phase current	I_2	○	○	○	○	×	×	0 ~ 6.000A	N/A
	Zero phase current	I_0	○	○					0 ~ 6.000A	N/A
	Unbalance	UBA	○	○	○	○	○	×	0 ~ 100%	N/A
Phase	phase voltage	V_a, V_b, V_c angle	○		○	×	×	○	0 ~ 359.9°	0.5°
	Line voltage	V_{ab}, V_{bc}, V_{ca} angle	○		○	○	○	×	0 ~ 395.9°	0.5°
	current	I_a, I_b, I_c angle	○		○	○	○	○	0 ~ 359.9°	0.5°
Power	Active power	P_a, P_b, P_c	○	○	○	○	○	○	0 ~ ±999.9M	IEC 62053-22 Class 0.5S
	Reactive power	Q_a, Q_b, Q_c	○	○	○	○	○	○		
	Apparent power	S_a, S_b, S_c	○	○	○	○	○	○		
Energy	Active energy	PE3Ø, PE_a, PE_b, PE_c	○		○	○	○	○	0~999,999.9M	IEC 62053-22 Class 0.5S
	Reactive energy	$Varh_a, Varh_b, Varh_c$	○		○	○	○	○		
	Reverse active energy	rPE3Ø, rPE_a, rPE_b, rPE_c	○		○	○	○	○		
Frequency		Freq	○	○	○	○	○	○	45 ~ 65Hz	0.05Hz
Power factor		PF, PF_a, PF_b, PF_c	○	○	○	○	○	○	0 ~ ±1.000	Subject to phase error
Harmonics	Phase voltage	V_a 1~15	○		○	×	×	○	6.6V ~ 452V (Within 30% THD)	N/A
		V_b 1~15	○		○	×	×	×		
		V_c 1~15	○		○	×	×	×		
	Line voltage	V_{ab}, V_{bc}, V_{ca} 1~15	○		×	○	○	×		N/A
	Current harmonic	I_a, I_b, I_c 1~15	○		○	○	○	○	0.06 ~ 6A (Within 60% THD)	N/A
	Phase voltage THD	THD V_a, V_b, V_c	○	○	○	×	×	○	0 ~ 100%	N/A
	Line voltage THD	THD V_{ab}, V_{bc}, V_{ca}	○	(○)	×	○	○	×		
	Current THD	THD I_a, I_b, I_c	○	○	○	○	○	○		
	Current TDD	TDD I_a, I_b, I_c	○	○	○	○	○	○		
	Current K-factor	K-Factor I_a, I_b, I_c	○	○	○	○	○	○		

Note 1: Previous value of Demand MAX / MIN / AVERAGE
Note 2: Line voltage THD is supported only in 3P3W.

1) PQ function

- Non-volatile memory storage for PQ events over ½ cycle
- Sag, Interruption, Swell PQ Event Detection
- PQ Event storage, waveform storage and LCD display up to 32 events

2) Statistics and trend graph function

- Statistical functions for measuring and updating the maximum, minimum and average values during the demand cycle for the 32 measurement elements of the main instrument(phase voltage, line voltage, power factor, power, reactive power, apparent power, frequency, zero phase, normal, reverse voltage/current, voltage/current THD, TDD, K-factor)
- Trend graphs using power statistics of the main and branch instruments

3) Connection up to 50 branch modules and measurement display

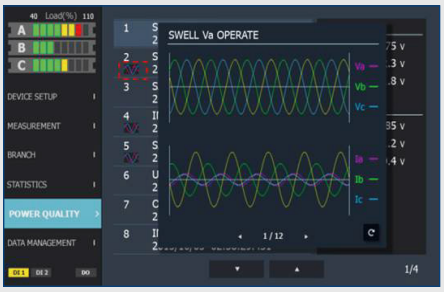
- Ability to configure the screen freely by designating branch instrument name and display position
- Convenient check through detailed display of branch measurement elements
- Improved intuitive awareness by displaying branch status
- Temperature measurement in the inside of a panel by temperature module

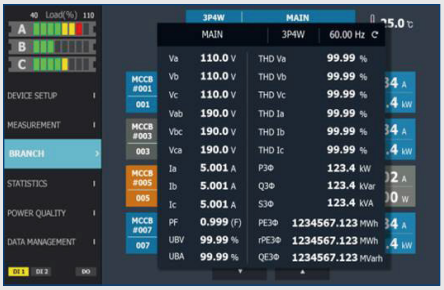
4) Various alarm function and alarm event storage

- Various alarm function and DO output such as PQ Event, overcurrent, PTF, open phase, POR, temperature over, Demand power over, current THD over of the main instrument
- Alarm indication and DO output for overcurrent, demand power over, current THD over, leakage current over of the branch instrument
- By applying DI input of branch instrument, the status of each breaker (On/Off/Trip) is monitored

5) Improved intuitiveness through load factor display

6) Free network configuration through implementation of Ethernet Switch function





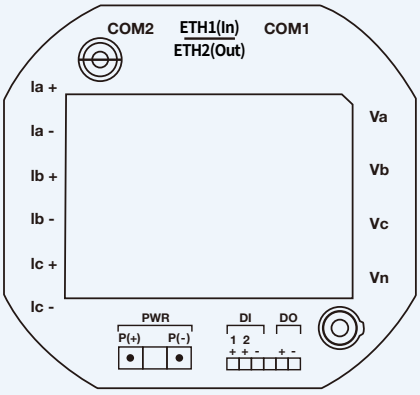
F

Appearance

Appearance and Configuration

Name	Description	Remarks
POWER	The corresponding LED lights when the control power is normal	GREEN
BRANCH	When communication data is requested to branch instrument connected to COM1 or COM2 by RS-485, or when resonding to the upstream monitoring unit the corresponding LED blinks	GREEN
ETH	LED blinks when communication data is transmitted via Ethernet	GREEN
ALARM	When the alarm condition is satisfied and the DO becomes output status , the corresponding LED lights	GREEN
HOME	Press HOME key to move to main measurement screen	

I/O Terminal configuration



Terminal	Description	Remarks
P(+), P(-)	Control power input terminal	
V_a, V_b, V_c, V_n	AC voltage input terminal	
I_a+, I_a-, I_b+, I_b-, I_c+, I_c-	AC current input terminal	
DI_1(+), DI_2(+), DI(-)	DI input terminal	2 port
DO(+), DO(-)	DO output terminal	1 port
ETH1, ETH2	Ethernet communication terminal (RJ-45)	
COM1, COM2	RS485 communication terminal (RJ-12)	

Accessories

Item	Cable	Quantity	Remarks
Connection between main and branch	RJ12 Cable, 3m	2ea	Basic Components of the Main Instrument
Connection between main and SCADA	RJ12-RS485 Cable, 1m	1ea	Basic Components of the Main Instrument (RS485)
Connection between main and SCADA	RJ45 Cable, Within 100m	-	Purchased separately (Ethernet)

Note) Please use only RJ12 cable provided by LS Industrial Systems.

Note) If 25 Branch modules are connected to one COM port, the total cable distance between the MAIN meter and the last connected Branch module is up to 8M. To extend the distance, a separate power boost module connection is required through distance simulation. (Only available in an environment without noise)

Note) All cables necessary for product configuration are consumable parts. Therefore, it is recommended to replace the cable if any abnormality occurs or corrosion occurs. (Can be ordered in cable units)

This product consists of a main body and a power module (SMPS) connected with connector and two screws.
When wiring unscrew the two screws fastened to the back of the product by a (+) screwdriver and remove the power module.

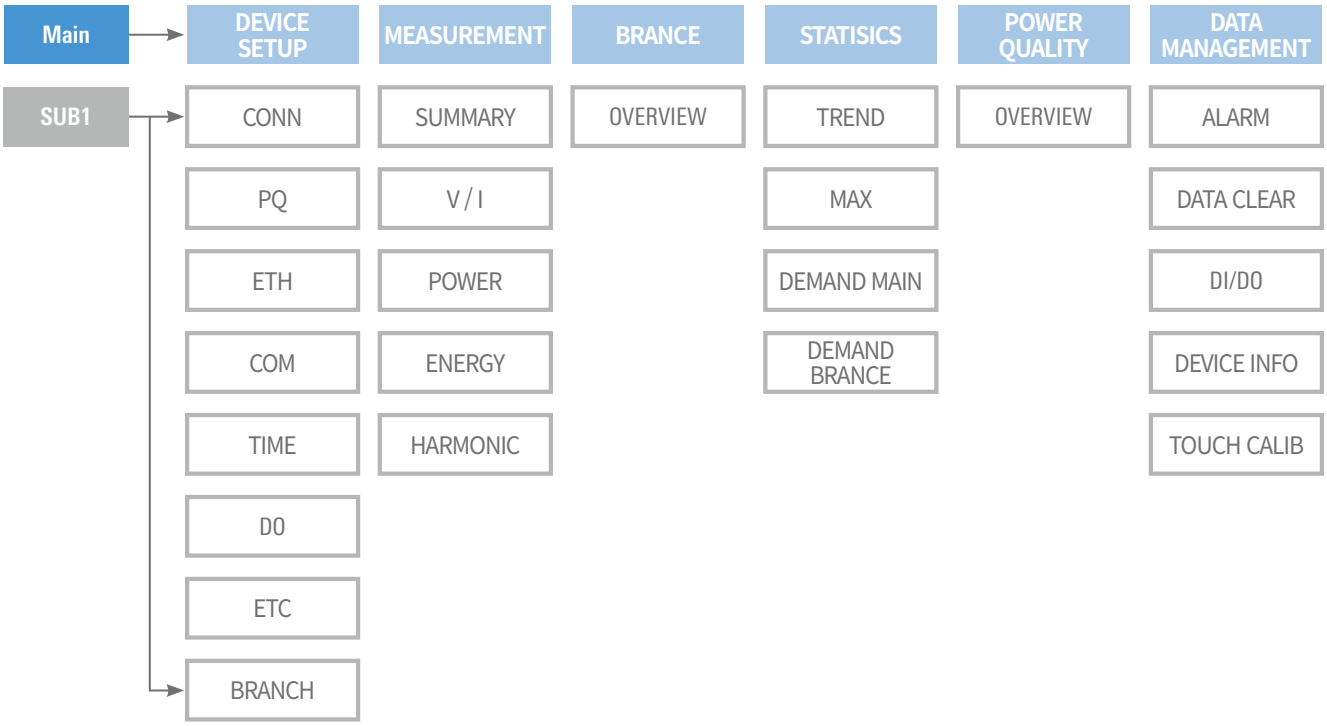
※ **This product**

1) Be careful not to let foreign substances such as dust get into the connector of the power module that has been disconnected for terminal wiring.
2) Do not apply the power to DI input terminal because it is dry contact (no voltage type).
3) When reassembling the power module after finishing the connection, take special care not to apply excessive force or to prevent warping or displacement of the connector between the main body and power module.

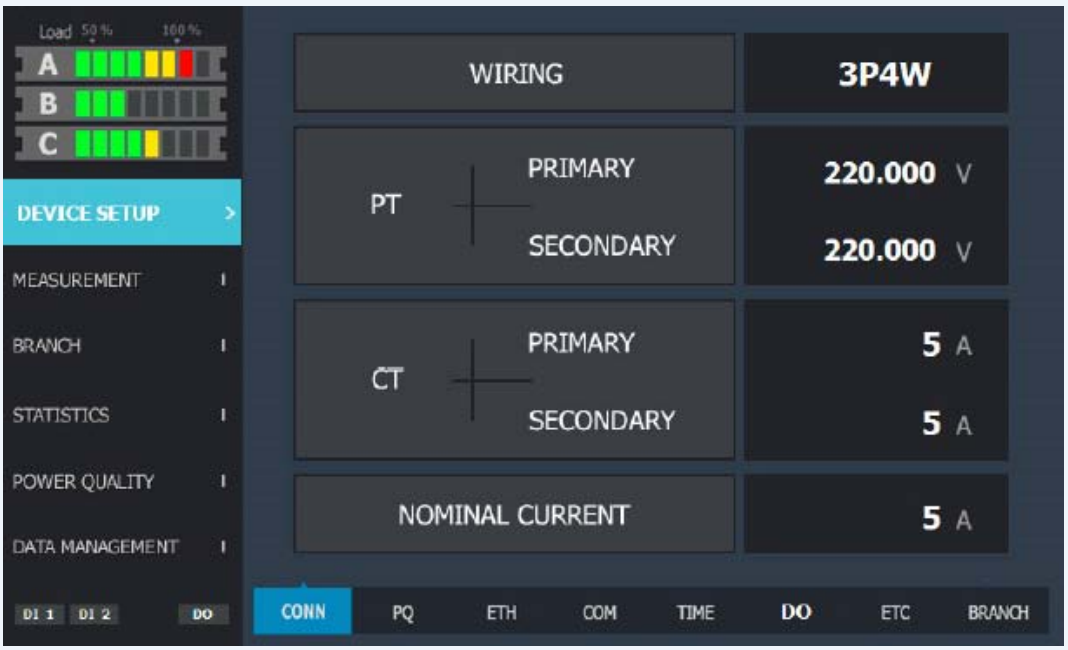
F

Operation & Setting

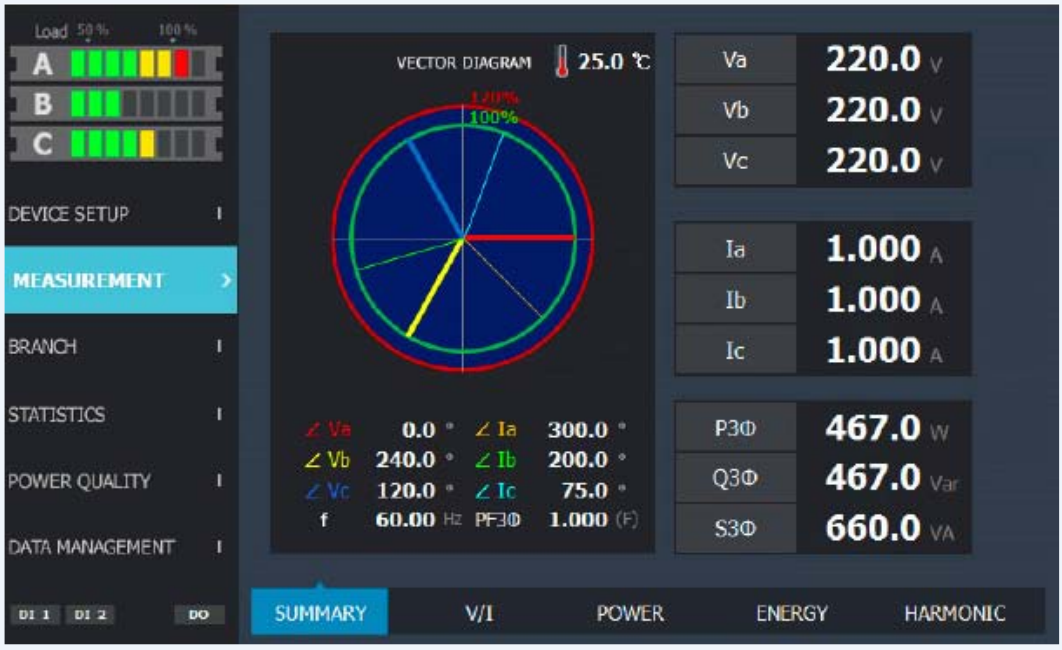
GMAC-B Main Menu Tree



DEVICE SETUP Screen



MEASUREMENT Screen



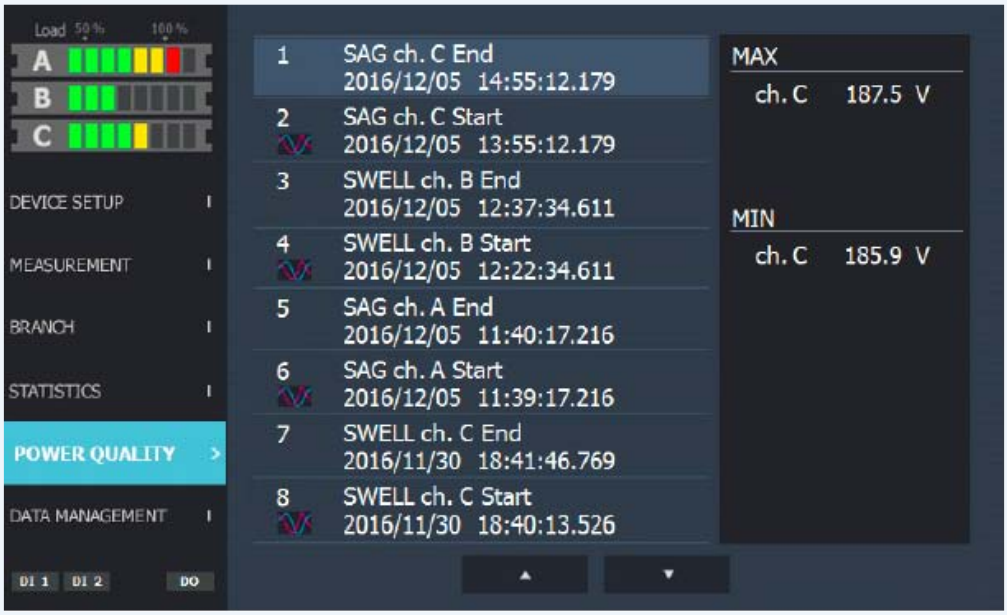
25.0 ℃ Temperature display is displayed only when there is a temperature module.

BRANCH Screen

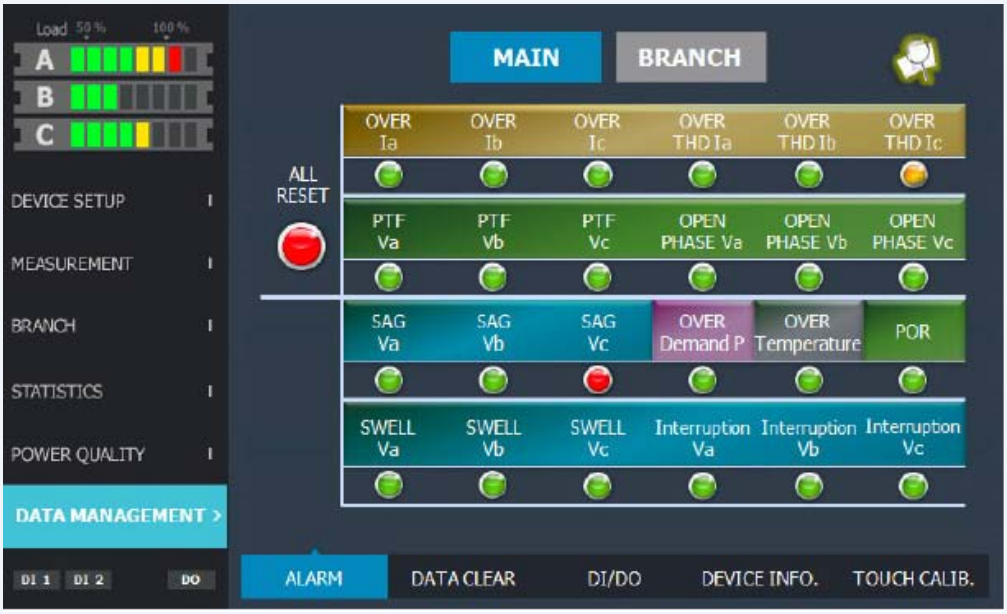
F

Operation & Setting

POWER QUALITY Screen



DATA MANAGEMENT Screen



Communication Specifications

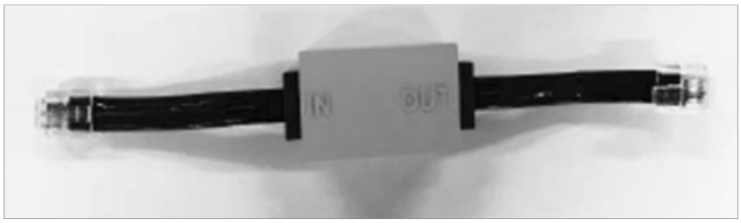
The GIMAC-B can be configured as an independent triple system using two built-in RS485 communication ports and two Ethernet communication ports.

1) RS485 communication specification

- Port specifications: RJ12, 2ea
- Communication speed: 9600, 19200, 38400 bps (Fixed to 38400 for Master)
- Topology: Multi-Drop (BUS)
- Maximum transmission distance: Upper communication (Slave) - Up to 1.2km (depending on transmission speed)
  Branch communication (Master) - Maximum 8m
- Protocol: MODBUS RTU
- Communication method: Master (branch module and communication mode) / Slave function
  Up to 25 branch modules can be connected per port when setting master

Note) If 25 Branch modules are connected to one COM port, the total cable distance between the MAIN meter and the last connected Branch module is up to 8M. To extend the distance, a separate power boost module connection is required through distance simulation. (Only available in an environment without noise)

* Power Boost Module (sold separately)



2) communication specification

- Port specifications: RJ45, 2ea
- Communication speed: 10 / 100Mbps
- Topology: STAR type, Daisy-chain type
- Maximum transmission distance: Up to 100m between the HUB and the main instrument (or between main modules)
- Protocol: MODBUS TCP
- Communication method: Server function (main and branch module information)

3) Branch communication function (RS485-Master-Branch value monitoring)

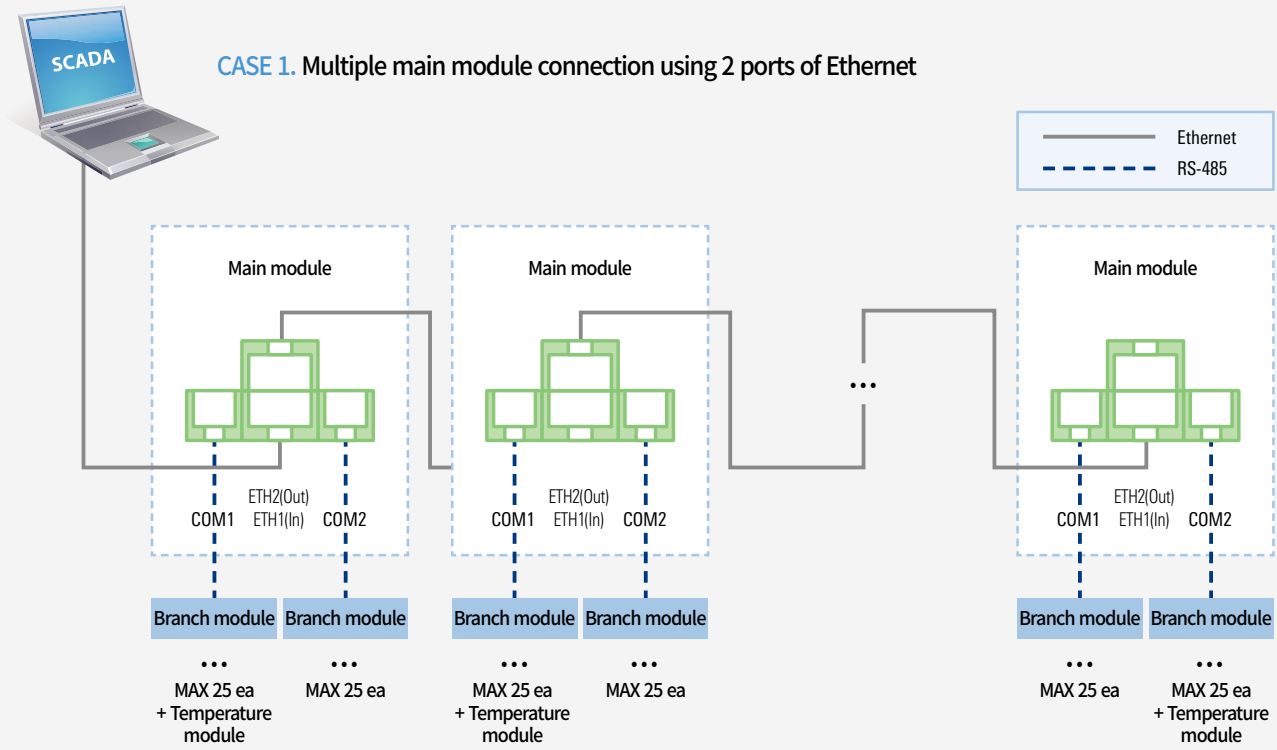
- Time delay for reflecting branch setting data: Within 1 sec.
- Main module time delay for branch measurement value: About 6 sec. when connecting 50 modules

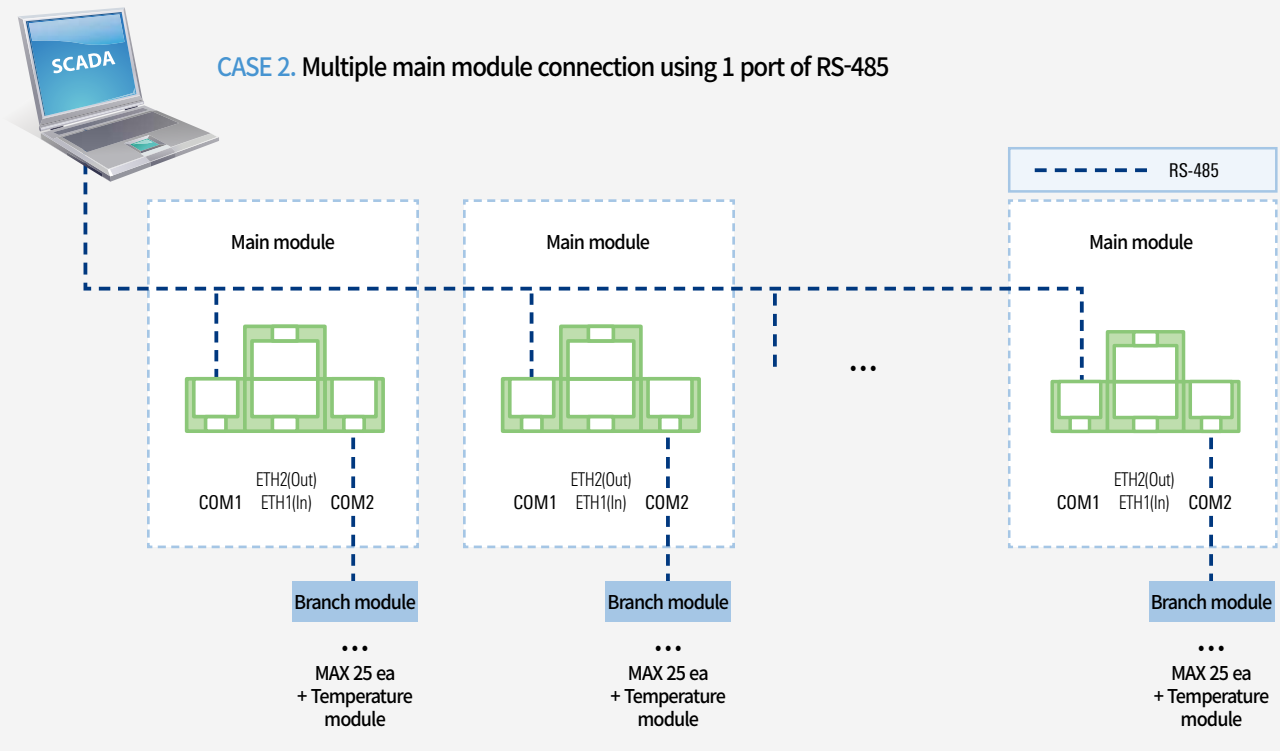
Note) When configuring the STAR topology network, the redundant network must not be connected.
Note) When configuring Daisy-Chain, it should not be composed of Ring.

F

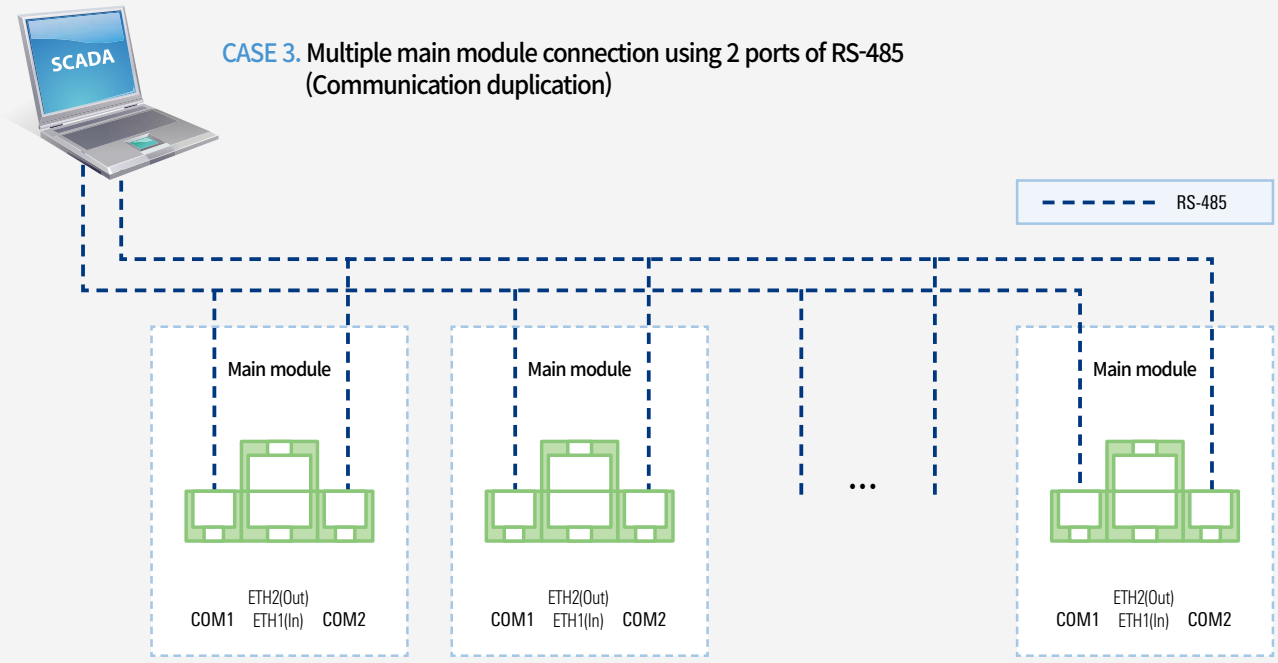
Communication

Communication configuration

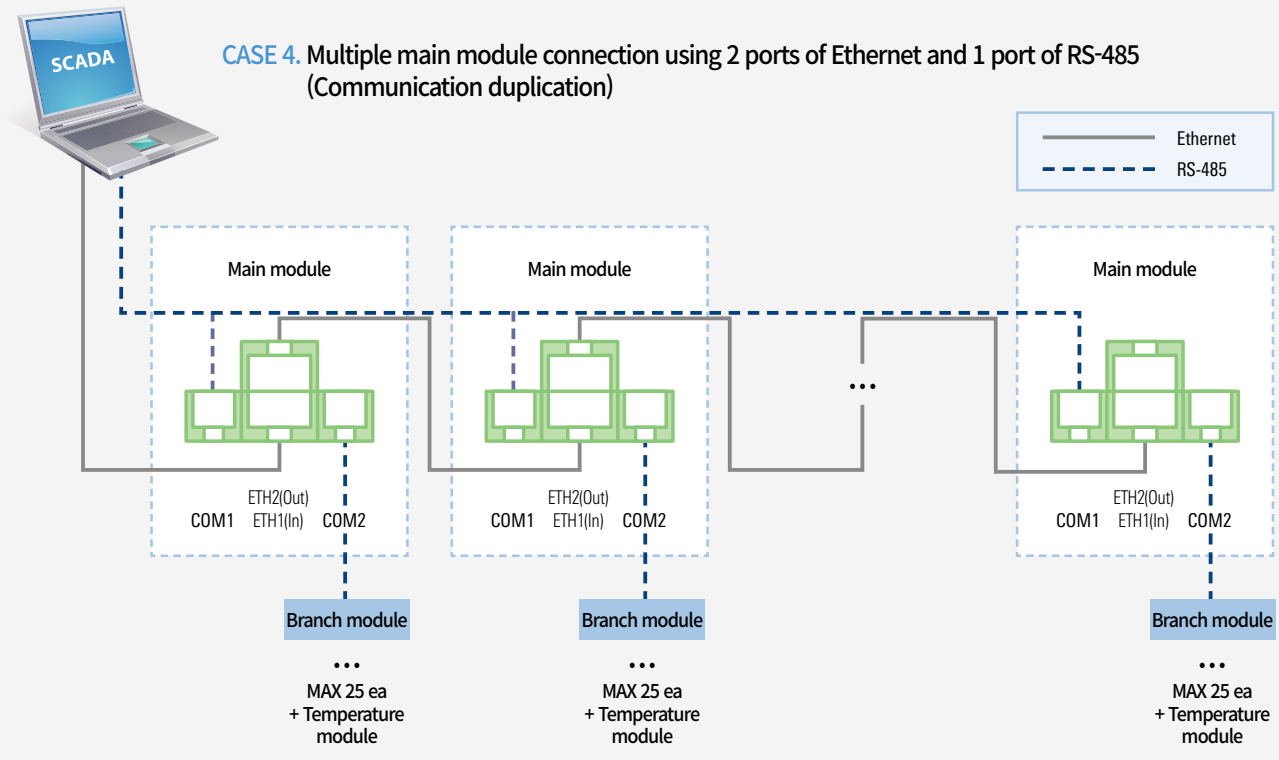




CASE 3. Multiple main module connection using 2 ports of RS-485 (Communication duplication)



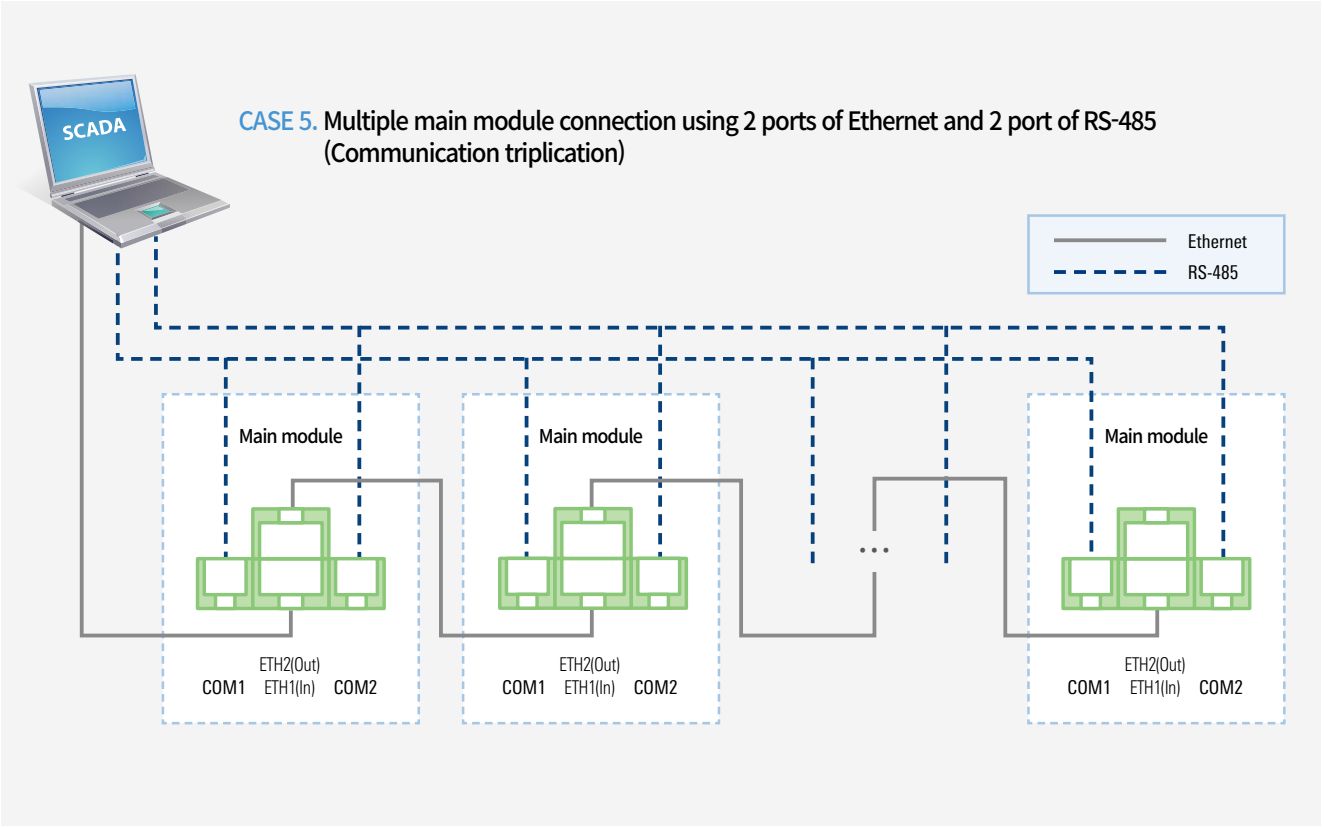
CASE 4. Multiple main module connection using 2 ports of Ethernet and 1 port of RS-485 (Communication duplication)



F

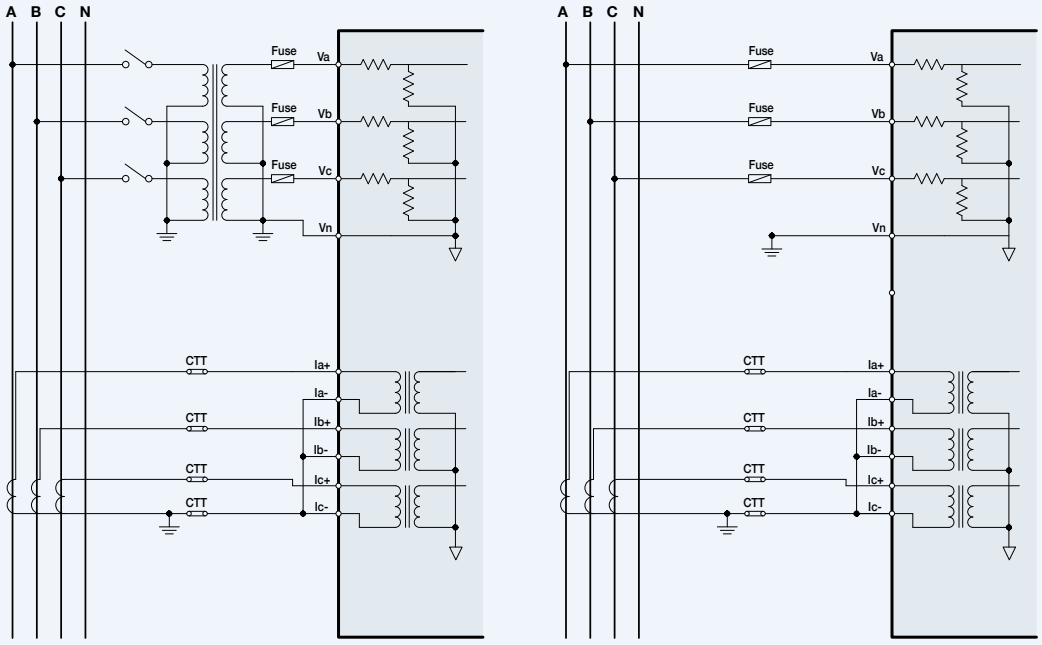
Communication

Communication configuration

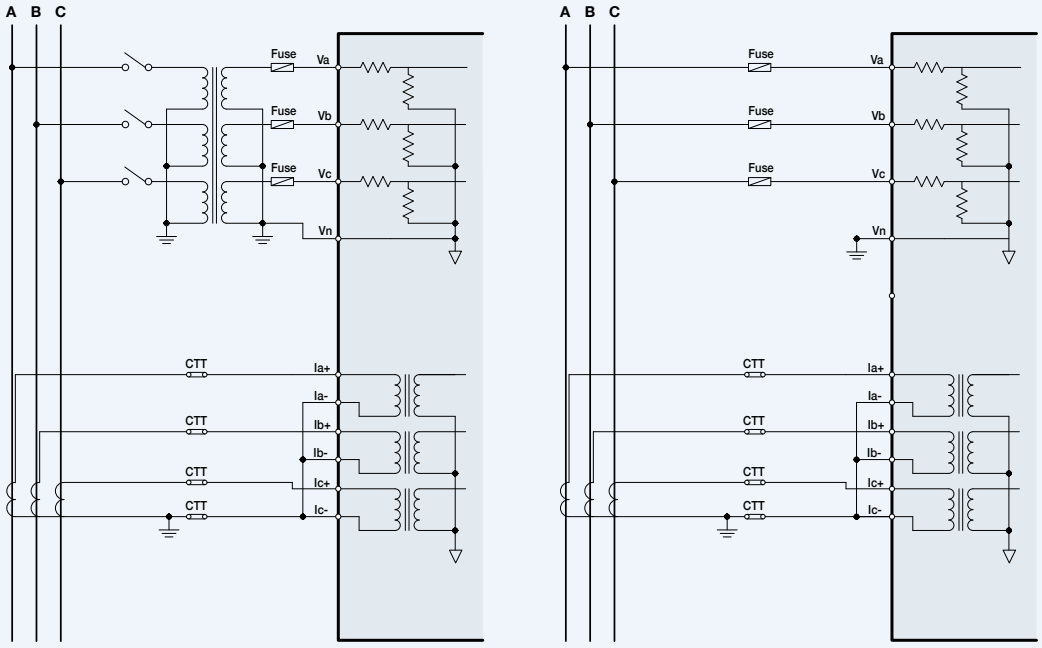


Note) Please use Shield Twisted Cable for communication for RS485 communication line.
Note) Please connect the shield line of RS485 communication line to the ground to prevent induction of communication line.
Note) The maximum distance of RS485 communication is 1.2km, the maximum number of connections is 32 units.
Note) The maximum distance of Ethernet communication is 100m, and the maximum number of connections is 20 units.
Note) Communication maximum distance means the maximum length of connection cable between products.
※ When connecting the Ethernet cable, pay attention to the IN(ETH1)/OUT(ETH2) direction.

3-phase 4-wire



3-phase 3-wire Y connection



Note) PT, CT secondary winding should be grounded. Note) Power Quality function monitors Va, Vb, Vc voltage. Note) Transformer should be used when Vn (phase voltage) is over 453V.
Note) Unused terminals should be grounded.

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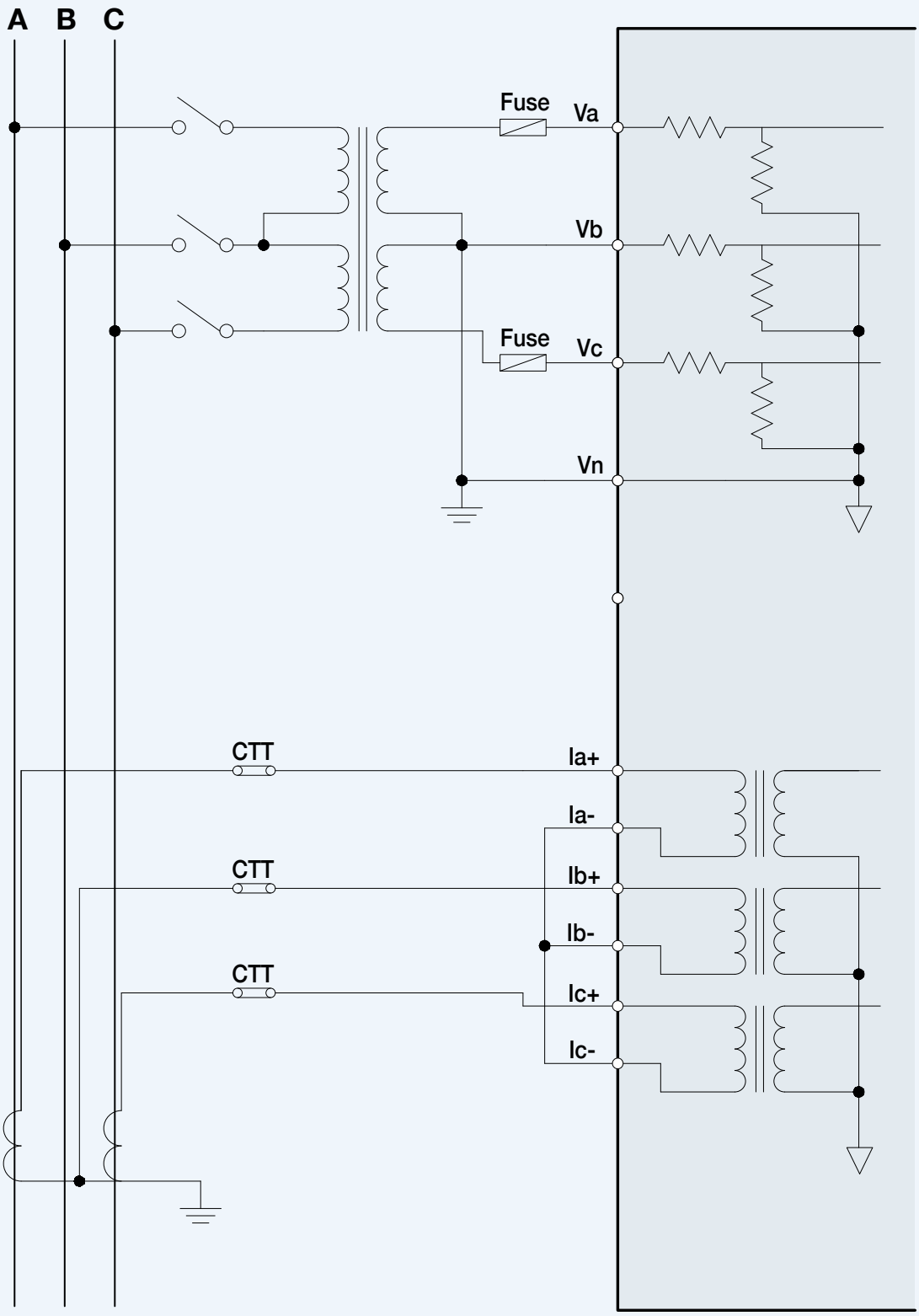
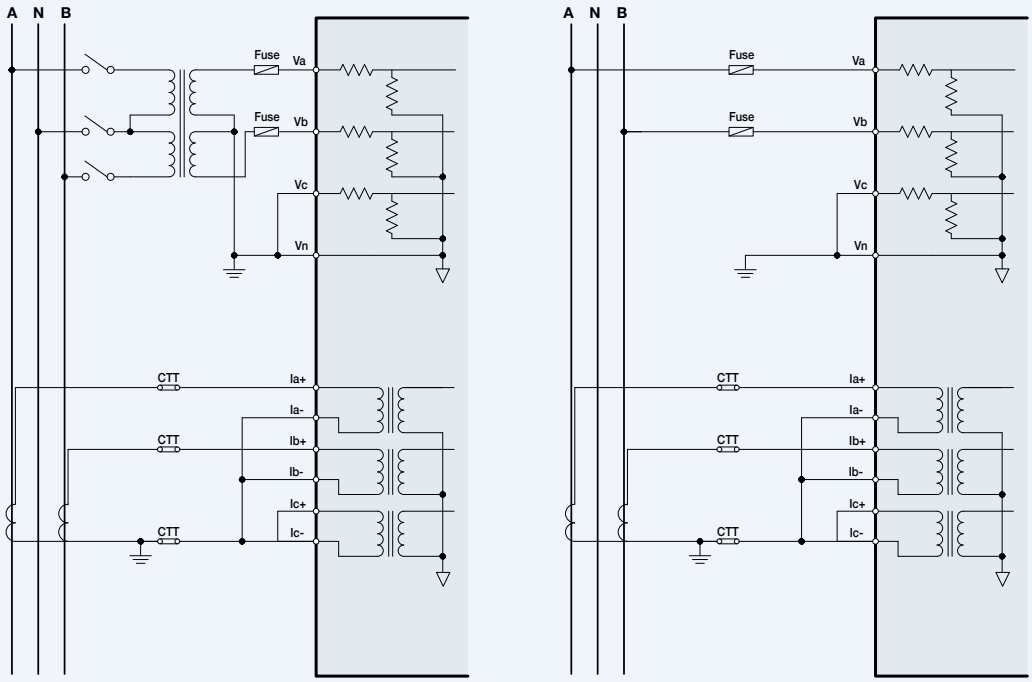
Wiring

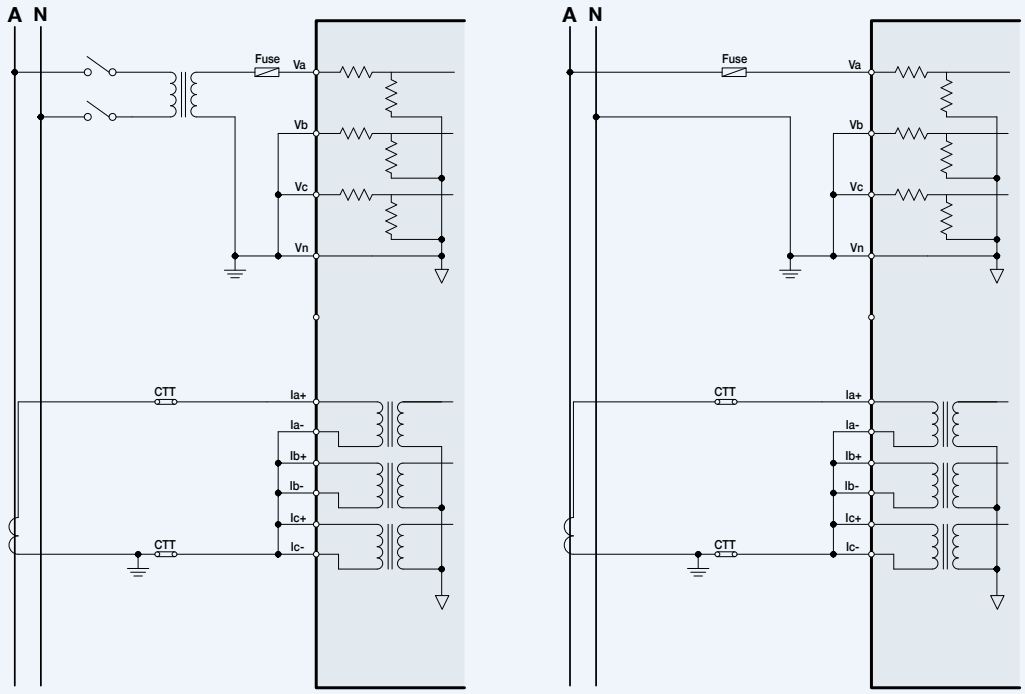
3-phase 3-wire Open Delta



1-phase 3-wire



1-phase 2-wire



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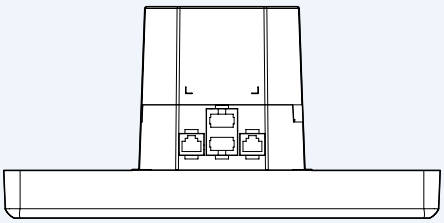
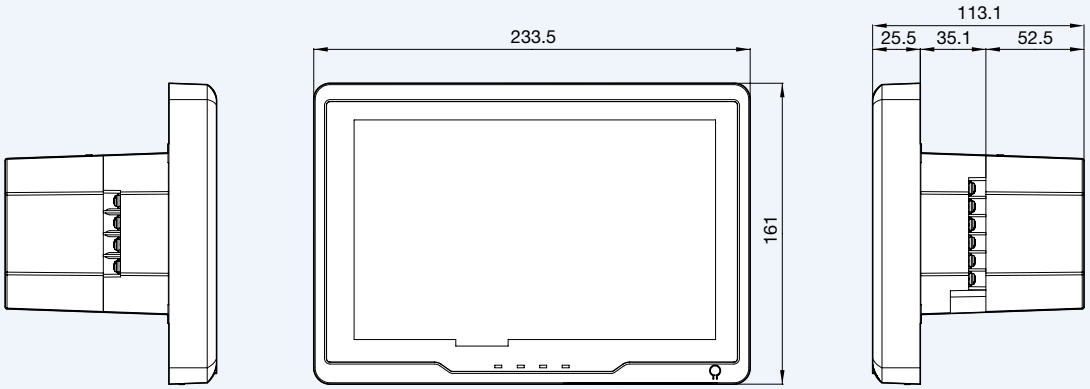
Dimensions

(Unit : mm)

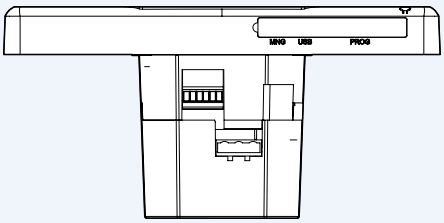


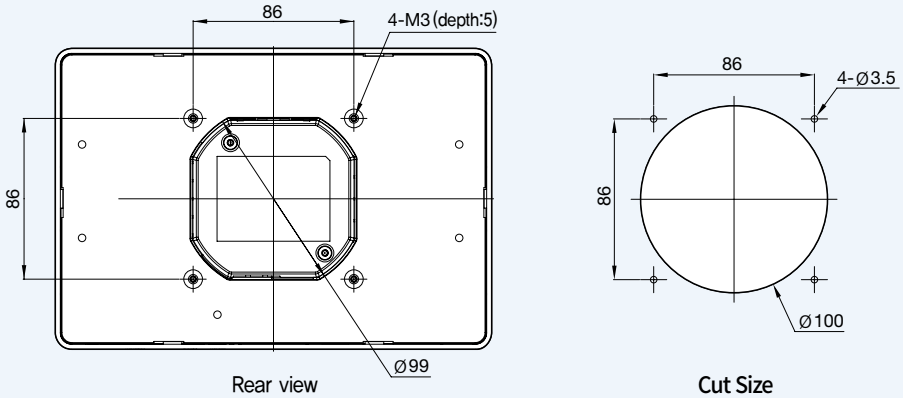
Top view



Front view

Side view





Rear view

Cut Size

Product type (Normal type)

3Phase Branch Module (Direct connection)	3Phase Branch Module (Through type)	2Phase Branch Module (Direct connection)	2Phase Branch Module (Through type)
 M250AF 3P 250A TeM	 M250AF 3P 250A	 M250AF 2P 250A TeM	 M250AF 2P 250A
 M125AF 3P 125A TeM	 M125AF 3P 125A	 M125AF 2P 125A TeM	 M125AF 2P 125A
 M100AF 3P 100A TeM	 M100AF 3P 100A	 M100AF 2P 100A TeM	 M100AF 2P 100A
 M100AF 3P 30A TeM	 M100AF 3P 30A	 M100AF 2P 30A TeM	 M100AF 2P 30A
	 M100AF 3P 5A		 Temperature

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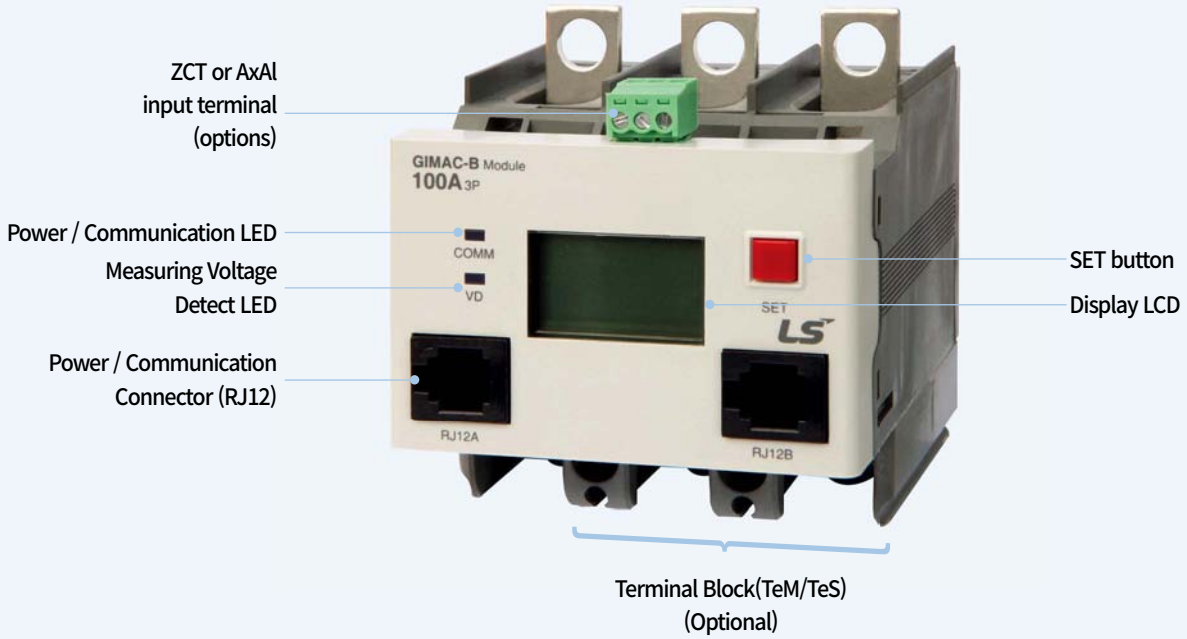
GIMAC-B Branch Module

Product type (ZCT(MZ) / AxAl(MD) type)

3Phase Branch Module (Direct connection)	3Phase Branch Module (Through type)	2Phase Branch Module (Direct connection)	2Phase Branch Module (Through type)
 MZ250AF 3P 250A TeM	 MZ250AF 3P 250A	 MZ250AF 2P 250A TeM	 MZ250AF 2P 250A
 MZ125AF 3P 125A TeM	 MZ125AF 3P 125A	 MZ125AF 2P 125A TeM	 MZ125AF 2P 125A
 MZ100AF 3P 100A TeM MD100AF 3P 100A TeM	 MZ100AF 3P 100A MD100AF 3P 100A	 MZ100AF 2P 100A TeM MD100AF 2P 100A TeM	 MZ100AF 2P 100A MD100AF 2P 100A
 MZ100AF 3P 30A TeM MD100AF 3P 30A TeM	 MZ100AF 3P 30A MD100AF 3P 30A	 MZ100AF 2P 30A TeM MD100AF 2P 30A TeM	 MZ100AF 2P 30A MD100AF 2P 30A
	 MZ100AF 3P 5A MD100AF 3P 5A		

Product configuration



Name	Description	Remarks
LCD	Display of setting and measurement value	
COMM LED	Lighting up when power is on, blinking when communicating with main module	Red
VD LED	Flashing when voltage is detected and blinking (when voltage is not detected in one or two phases in 3-phase type) (detection voltage: 9V)	Green
SET BUTTON	Button to change setting value or move the menu	
RJ12A / RJ12B	RJ12 type connector for device power and RS485 communication connection	
ZCT Input terminal	Input terminal for leakage current measurement, connectable with MCCB	Option
AxAl Input terminal	AxAl Connection Terminal to check the status of the MCCB	Option
BUSBAR T / B	For Busbar style only	Option

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Product Rating

Standard Operating Environment

This product, except as otherwise stated, should be used under the following standard usage conditions.

1) Temperature

- Normal operating: -20 to 60°C
- Storage: -30 to 70°C

2) Humidity: 80% or less (no condensation)

3) Location

- Altitude: Below 2,000 meters above sea level.
- Do not subject to abnormal vibration or shock.
- Where the ambient air pollution is not significant.

Note) Caution: In the environment exposed to chemicals and gas, it may cause measurement hunting due to metal corrosion and control power failure.
Therefore, product performance in the environment is not guaranteed.

Ratings

Item		Rating		Remarks
Rated frequency		50 or 60Hz (Input range: 50 or 60 ± 5Hz)		
Voltage input range	Power input range	9 ~ 452V (9 ~ 782V)		phase voltage(between line voltage) basis
Current input range		30A	300mA ~ 36A	0.01In ~1.2In
		100A	600mA ~ 120A	
		125A	1.25A ~ 150A	
		250A	2.5A ~ 300A	
		5A	0.05A ~ 6A	
Input burden of PT & CT		1VA or less		
Leakage current input range		30mA ~ 3A		Using 200mA/100mV ZCT
DI(AX/AL) Status input		Dry Contact		2ch

Measurement element and Accuracy

item			Description	Display range	Accuracy	Remarks
Voltage	Phase voltage		Va, Vb, Vc	0.000 ~ 999.9 V	±0.2 % F/S	100V or less
					±0.2 % R/S	Above 100V
	Line voltage		Vab, Vbc, Vca		±0.2 % F/S	380V or less
					±0.2 % R/S	Above 380V
Current	Phase current		Ia, Ib, Ic	0.000~99.99 kA	±0.2 % F/S	0.2In or less
					±0.2 % R/S	Above 0.2In
	Leakage current		Io	0.000~9.999 A	±15% F/S	30mA≤Io≤100mA
					±3% F/S	100mA<Io≤2.5A
					±10% R/S	2.5A<Io≤3A
Power	Active power		Pa(Pab), Pb(Pbc), Pc(Pca), P3Ø	0.000 ~ 9.999 MW/MVar	Class 0.5	
	Reactive power		Qa(Qab), Qb(Qbc), Qc(Qca), Q3Ø		Class 0.5	
	Demand power	Max. value	MAX Pa(Pab), Pb(Pbc), Pc(Pca), P3Ø	0.000 ~ 9.999 MW	Subject to active power error	
		Min. value	MIN Pa(Pab), Pb(Pbc), Pc(Pca), P3Ø			
		The average	AVG Pa(Pab), Pb(Pbc), Pc(Pca), P3Ø			
Energy	Active energy		PE3Ø	0.000 ~ 999.9 GWh/GVarh	Class 0.5	
	Reactive energy		QE3Ø		Class 0.5	
Frequency			F	45.00 ~ 65.00 Hz	±0.05 Hz	Value measured in MAIN
Power factor			PFa(PFab), PFb(PFbc), PFc(PFca), PF3Φ	0.00 ~ ±1.00	Subject to phase error	
Harmonic	THD		THDVa(THDVab), THDVb(THDVbc), THDVc(THDVca), THDIa, THDIb, THDIc	0.000 ~ 100.0 %	10 %	
	TDD		TDDIa, TDDIb, TDDIc	0.000 ~ 100.0 %	10 %	
Temperature			t		±5 °C	Convergence time 10 minutes

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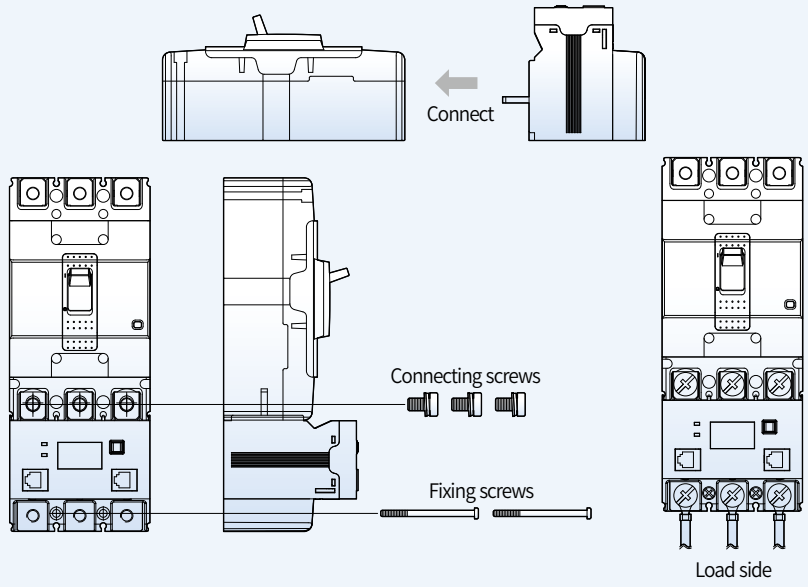
Spare Parts

Item	Power/Communication cable (10cm)	Fixing screws for Tunnel style	Fixing screws for Busbar style	Connecting bolt for 250A	Connecting screw
Appearance					
3P 250ATeM	1		2	3	
2P 250ATeM	1		2	2	
3P 125ATeM	1		2		3
2P 125ATeM	1		1		2
3P 100ATeM	1		2		3
2P 100ATeM	1		1		2
3P 30ATeM	1		2		3
2P 30ATeM	1		1		2
3P 250A	1	2			
2P 250A	1	2			
3P 125A	1	2			
2P 125A	1	2			
3P 100A	1	2			
2P 100A	1	2			
3P 30A	1	2			
2P 30A	1	2			
3P 5A	1	2			
Temperature	1	2			
Sub-Module Power-Booster (Option)			Application: 1. Providing long-term operation reliability against the voltage drop of the branch module due to environmental change. 2. When connecting a branch module in the distance		

Note) Please use only the bundled dedicated cable for power / communication cable.
Note) If you need a specific length of power / communication cable, please contact us.

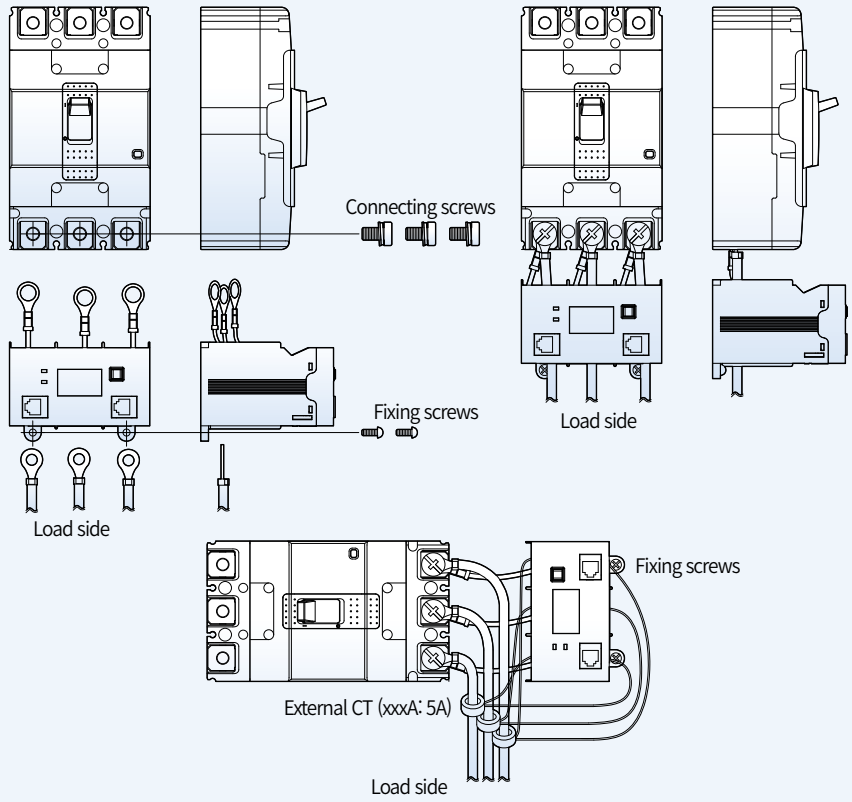
How to install

Installation of busbar style branch module



※ Be sure to assemble after removing foreign substances between the direct-connected branch module and the breaker terminal.

Installation of tunnel style branch module



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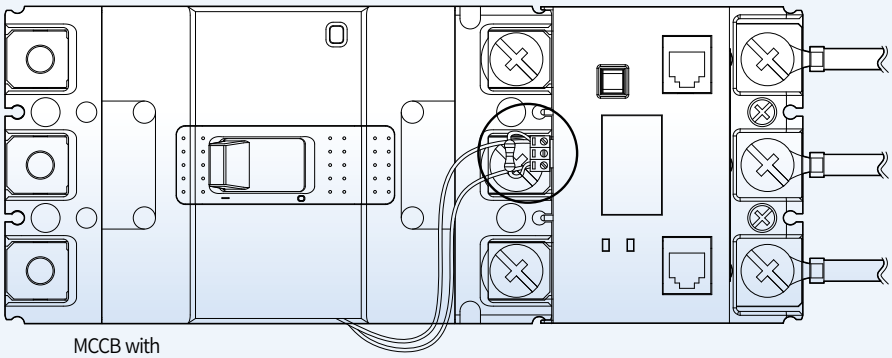
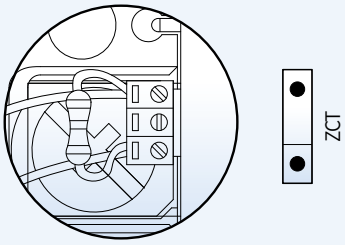
How to install

Connecting ZCT

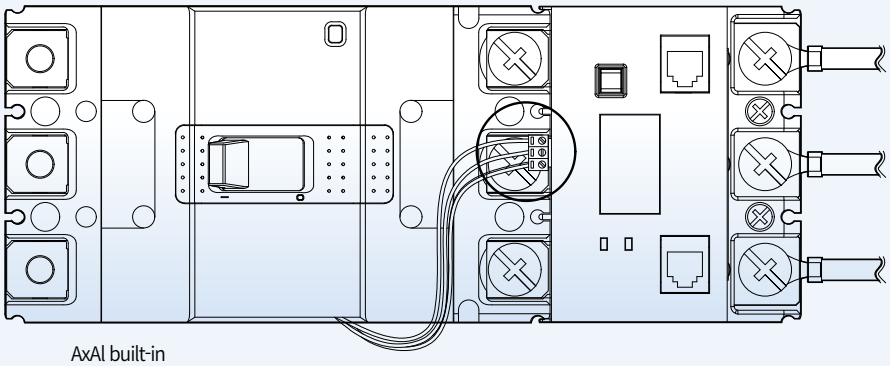


MCCB with
ZCT

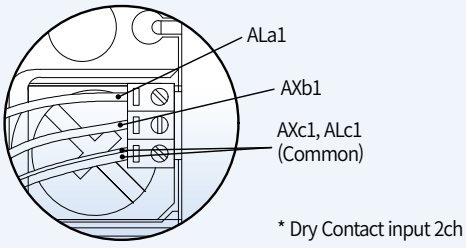


Connecting the resistor for ZCT

AxAl Wiring method

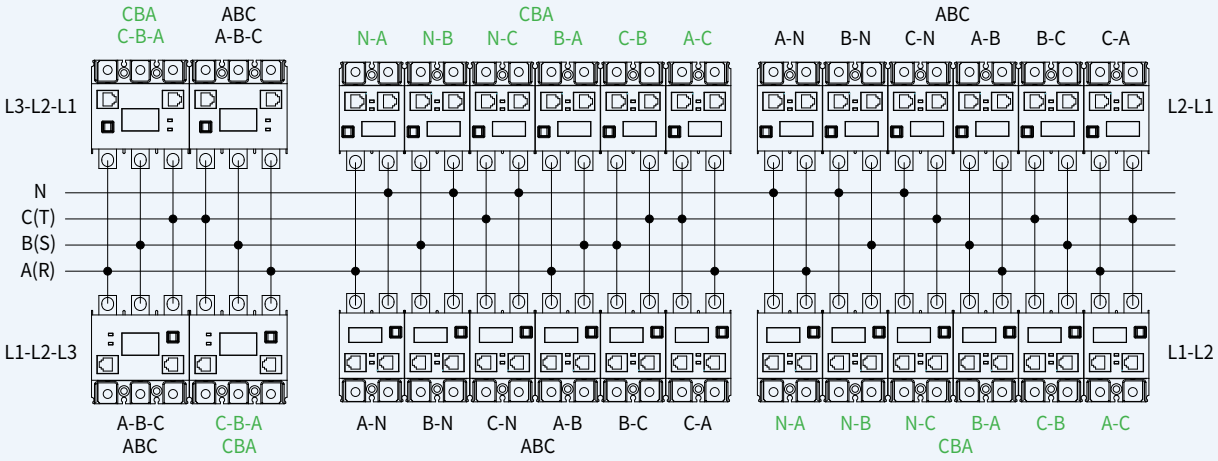


AxAl built-in
MCCB

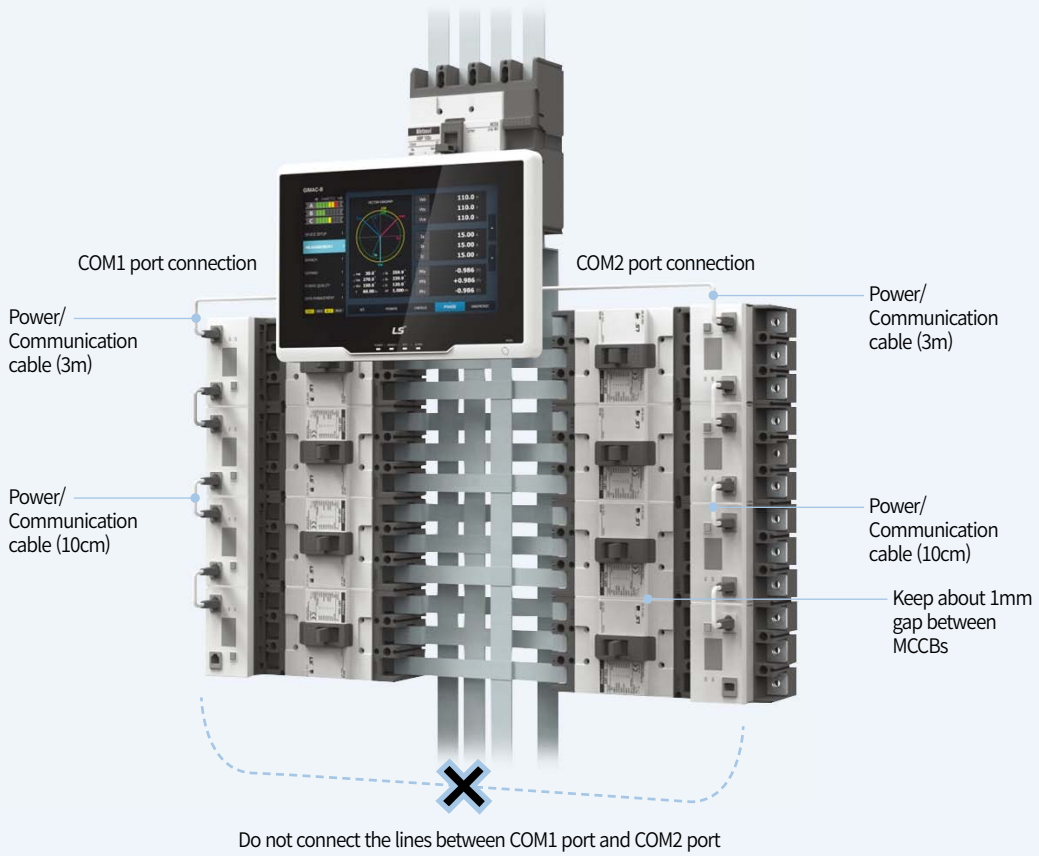


* Dry Contact input 2ch

Phase sequence



Connection and arrangement of communication cable



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Operation/Setting

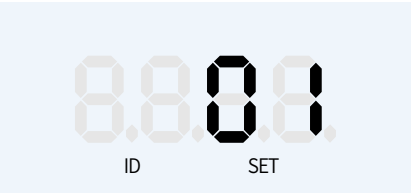
How to set up

Entering the setting display mode

• In automatic display mode, press SET key for more than 2 seconds (Long) to enter setting display mode.

< Automatic display mode status >

SET KEY Long operation



< Setting display mode status >

Note) Setting display mode: Mode that displays preset values of various setting values for operating the branch module and allows the setting values to be changed and stored

How to operate the KEY

- It operates as shown in the table below according to the operation mode at the time of pressing SET KEY and the time to press SET KEY. (Long is longer than 2 seconds and Short is shorter than 2 seconds.)

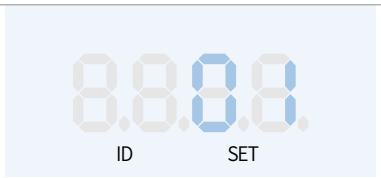
How to set details

Communication ID setting

Set the communication ID (station number) of the branch module for communication with the main module. It is possible to set communication ID between 1 ~ 50 and there should be no duplicate ID setting between connected branch instruments.

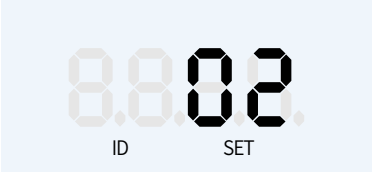
< Setting display mode status >

SET KEY Long operation



Communication ID number flashing

SET KEY Short operation

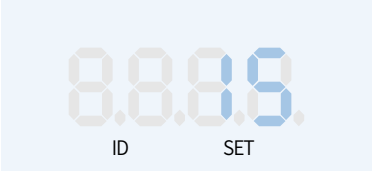


Communication ID number change (flashing)

SET KEY Short operation

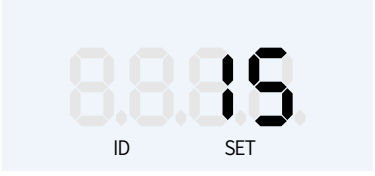
Short operation to set communication ID (flashing)

SET KEY Short operation



Communication ID display to set (flashing)

SET KEY Long operation



Communication ID setting completed

Phase sequence setting

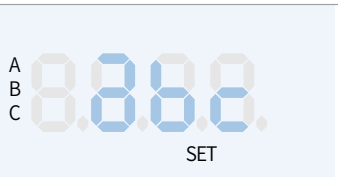
It is used to match the phase of the switch board bus bar with the phase (input channel) of the branch module according to the direction connected to R, S, T on the switch board. Set as one of ABC(A ➡ B ➡ C order) /CBA(C ➡ B ➡ A) order)

< Setting display mode status >

SET KEY Short operation

Move to Phase sequence setting screen

SET KEY Long operation



Connection method flashing

SET KEY Short operation

Changing Phase sequence (flashing)

SET KEY Long operation

Setting completed

Connection method setting (only for three-phase branch module)

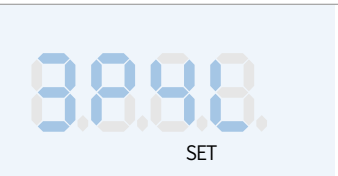
A function to set the wiring method of the busbar to which the three-phase branch module is connected. Set as one of 3P3L / 3P4L

< Setting display mode status >

SET KEY Short operation

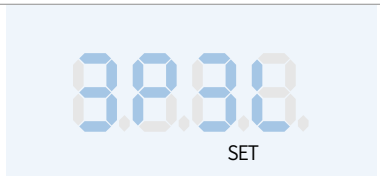
Move to the wiring method setting screen

SET KEY Long operation



Connection method flashing

SET KEY Short operation



Changing Wiring method (flashing)

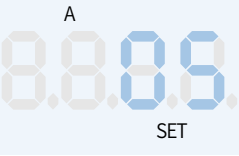
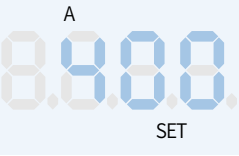
SET KEY Long operation

Setting completed

F

Operation/Setting

Rated current setting (only for 5A branch module)
It is the function to set the primary rated current when connecting the external CT to the 5A branch module.
(Set to one of 5/400/600/800. 30A/100A/125A/250A fixed)

			
< Setting display mode status >	SET KEY Short operation	Move to the rated current setting screen	SET KEY Long operation
			
Rated current flashing	SET KEY Short operation	Changing rated current (flashing)	SET KEY Long operation
	※ 50 Step : 5A,10A,15A,20A,25A,30A,40A,50A,60A,75A,80A,100A,120A,125A,130A,150A,180A,200A,220A,240A,250A,300A,350A,400A,450A,500A,600A,630A,700A,750A,800A,900A,1000A,1100A,1200A,1400A,1500A,1600A,2000A,2200A,2500A,3000A,3500A,4000A,4500A,5000A,6000A,7000A,8000A,10000A		
Setting completed			

Unit for energy setting
The function to set the unit of the active energy / reactive energy of the branch module to be displayed on the LCD of the HMI part.
It represents the cumulative amount of energy in 4 restricted digits and is used to match the display unit.
Set to one of (active energy / reactive energy) (K (Kilo) / M (Mega) / G (Giga)

			
< Setting display mode status >	SET KEY Short operation	Move to Energy unit setting screen	SET KEY Long operation
			
Energy unit flashing	SET KEY Short operation	Changing Energy unit (flashing)	SET KEY Long operation
			
Setting completed			

Leakage current setting (ZCT type module only)

Function to enable or disable the leakage current measurement function
by measuring the leakage current flowing to the branch module. Set to ON or OFF

< Setting display mode status >

SET KEY Short operation

Move to Leakage current setting screen

SET KEY Long operation

Leakage current flashing

SET KEY Short operation

Changing Leakage current (flashing)

SET KEY Long operation

Setting completed

Energy initialization

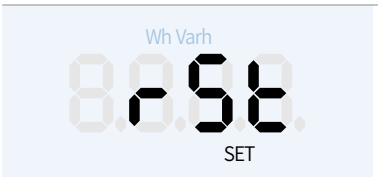
The function to initialize the accumulated active energy/reactive energy value to zero
The current value of active energy/reactive energy stored in branch module is initialized to 0

< Setting display mode status >

SET KEY Short operation

Move to Energy initialization setting screen

SET KEY Long operation



Energy flashing

SET KEY Short operation

Energy initialization flashing

SET KEY Long operation

Setting completed

F

Operation/Setting

Setting the temperature unit (Temperature Module only)
Function to set temperature display unit of temperature branch module
Set to one of CEL (Celsius C) / Fah (Fahrenheit)

< Setting display mode status >

SET KEY Short operation

Move to Temperature unit setting screen

SET KEY Long operation

Temperature unit flashing

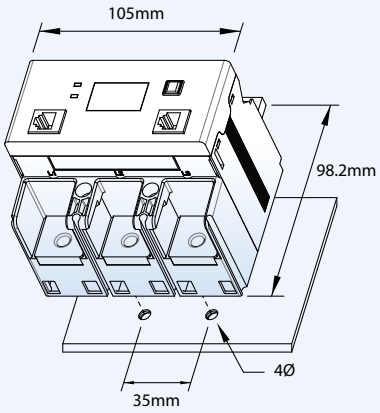
SET KEY Short operation

Changing Temperature unit (flashing)

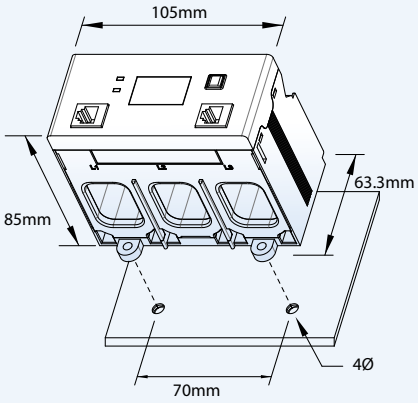
SET KEY Long operation

Setting completed

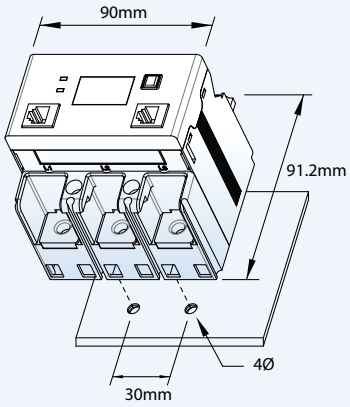
Dimensions and Installation Dimension



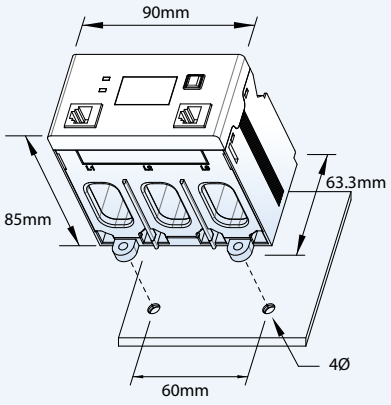
M(Z)250AF 3P 250A TeM



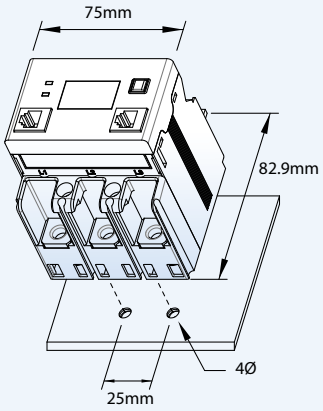
M(Z)250AF 3P 250A



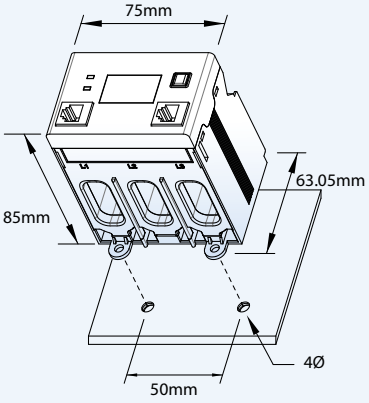
M(Z)125AF 3P 125A TeM



M(Z)125AF 3P 125A



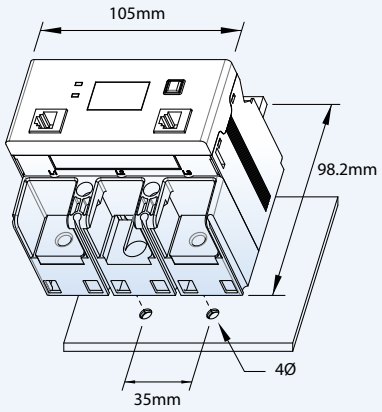
M(Z)100AF 3P 30A/100A TeM



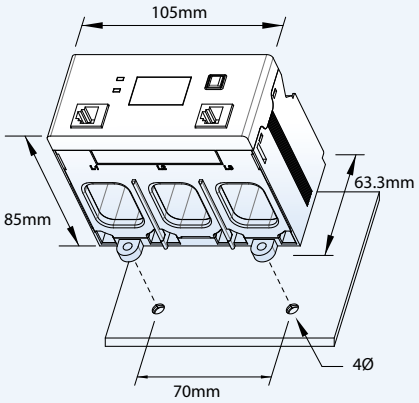
M(Z)100AF 3P 5A/30A/100A

F

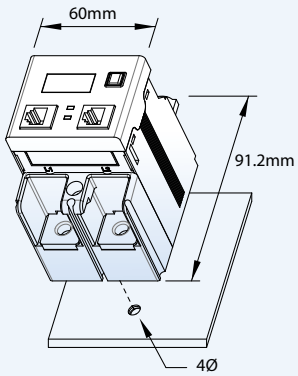
Dimensions and Installation Dimension



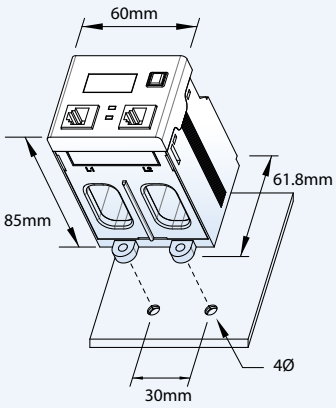
M(Z)250AF 2P 250A TeM



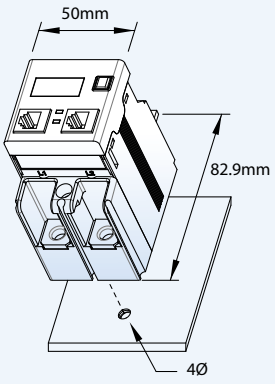
M(Z)250AF 2P 250A



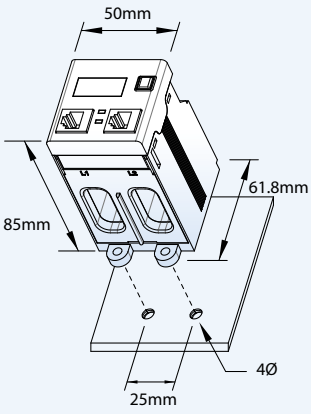
M(Z)125AF 2P 125A TeM



M(Z)125AF 2P 125A



M(Z)100AF 2P 30A/100A TeM



M(Z)100AF 2P 30A/100A / Temperature

Type Description

GIMAC-B Main

GIMAC - B | TE | M | 5A | 60Hz

Communication	
TE	Ethernet / RS485 1Port / 2Port

Modbus

Frequency	
60Hz	60Hz
50Hz	50Hz

GIMAC-B Branch module

GIMAC - B | MZ100AF | 3P | 100A | TeM | 60Hz

Model	
M (Meter)	100AF
	125AF
	250AF
MZ (Meter + ZCT)	100AF
	125AF
	250AF
MD (Meter + AxAl)	100AF

Number of poles	
2P	2 Pole
3P	3 Pole

Rated current	
100AF	5A*
	30A
	100A
125AF	125A
250AF	250A

Note) 5A model is 3P poles
There is only a model.

Terminal Block	
-	Penetration Standard length
TeM	Direct Coupling Type Metasol MCCB

Frequency	
60Hz	60Hz
50Hz	50Hz

GIMAC-B Accessories

GIMAC - B | Temperature

GIMAC-B Accessories

Item	Type	Remarks
GIMAC-B RJ12 Cable	3M Cable : Provide 2 basic when purchasing the main measuring Device 100M Cable : Provide 1 basic when purchasing the branch measuring Device 1M Cable(RS485) : Provide 1 basic when purchasing the main measuring Device	In addition to the basic offer you can purchase additional cables in various lengths. : 100/200/300/500mm, 1/1.3/1.5/2/2.5/ 3/5/7/10M
GIMAC-B Power Booster	Branch power boost module	
GIMAC-B 10/14PH Cable	Voltage measurement cable for through branch : Provide Standard 10cm cable when purchasing the branch measuring Device	Various lengths according to the site situation Voltage measurement cables available : 30/50cm, 1M

F

GIMAC-DC

It is a digital measuring device capable of measuring and displaying input AC voltage, output DC voltage, frequency, THD and battery charge/discharge current.

GIMAC-DC

Digital Power Meter
Digital DC Meter

GIMAC-DC is a digital measuring device specializing in rectification-based switchgear that are capable of measuring and displaying input AC voltage, output DC voltage, frequency, THD and battery charge/discharge current.

- High precision measurement
  - AC/DC Voltage ±0.3%
  - DC Current (Output/Battery) ±0.5%
- AC Voltage THD, Max AC Voltage, Max DC Voltage, Max DC Current, Max THD
- Wide Control Display and Easy Installation (DIN96/ANSI 4 support)
- Wide range of control power (AC/DC 88~264V)

Contents

G

Features

DC voltage/current measurement

DC voltage and current (output current and battery current) measurement and MAX DC voltage and current measurement are possible, and it is a product specialized in the switchboard rectification panel.

High measurement accuracy

This product satisfies the accuracy of AC/DC voltage ±0.3% and DC current ±0.5%. In particular, it ensures high reliability by maintaining precision even in the case of fluctuating frequencies.

Wide range of PT voltage inputs

Without a extra PT, it supports a wide voltage range of AC 20~452V and DC 20~264V which enables economical and easy wiring.

Compact appearance and panel cutting size

The external size is 144(W) x 144(H) x 85(D) mm, and the panel cutting size is suitable for DIN 96 and ANSI 4.

Wide range of control power (AC/DC 88~264V)

The control power range is AC/DC 88~264V, so it can be used in various power environments.

Auto Scroll

If the DOWN Key and Enter Key are pressed simultaneously, the displayed item is automatically scrolled every 10 seconds.

Communication

It supports RS485 type general-purpose MODBUS RTU Protocol.

Rating

Type		Specifications
Rating	Frequency	60Hz, 50Hz
	Voltage	AC 20 ~ 452V, DC 20 ~ 264V
	Shunt resistor	DC 3~180mV
	Power	AC/DC 88 ~ 264V, Free Voltage
	Power Consumption	10W or less: Stanby
	Burden	0.5VA or less: PT
Insulation Resistance		DC 500V 10MΩ or more
Insulation Voltage		AC 2kV (1.5kV)/min
Lightning impulse voltage		AC 5kV(3kV) or more, 1.2x50μs standard waveform supplied
Overload Capacity	Current Circuit's	Withstand 1.2 times of rated voltage for 3 hours. Withstand 8 times of rated current for 2 seconds.
	Voltage Circuit	Withstand 1.15 times of rated voltage for 3 hours.
Fast Transient/Burst Immunity		4kV: AC power input 2kV: DC power
Electrostatic Discharge(ESD)		8kV: Air 6kV: Contact
Temperature	Operation	-10°C ~ 55°C
	Storage	-25°C ~ 70°C
Humidity		RH 80% or less (non-condensing)
Applied Standards		IEC60255, IEC61000-4
Dimension (mm)		144×144×85
Weight		0.52kg
Communication		RS485: Modbus

Measurement

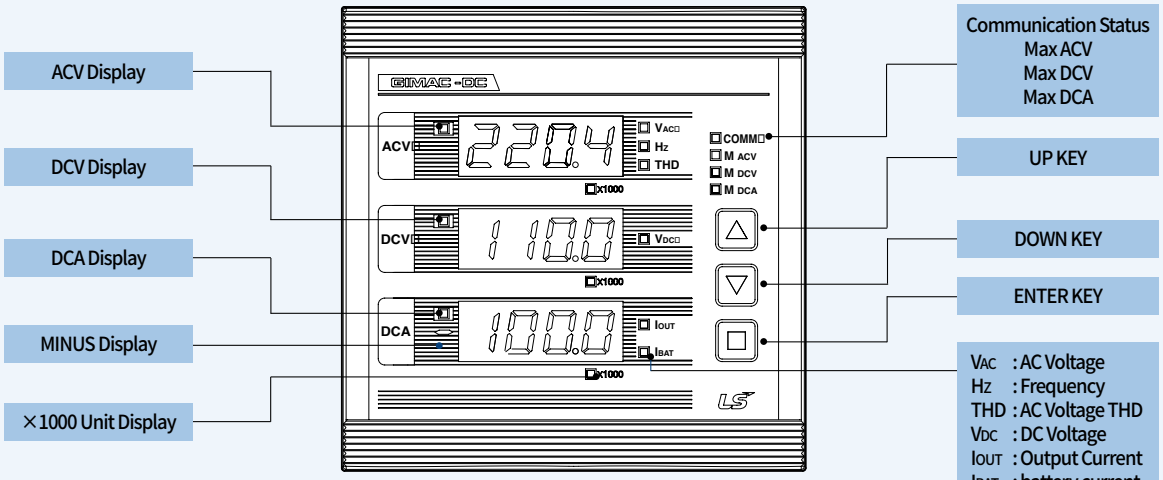
item		Description	Display range	Accuracy(%)
Voltage	AC Voltage	V_{ac}	0.000~999.9kV	±0.30%
	DC voltage	V_{dc}	0.000~999.9V	±0.30%
Current	Output Current	I_{out}	0.000~999.9kA	±0.50%
	Battery Current	I_{bat}	0.000~999.9kA	±0.50%
Frequency		Hz	45.00~70.00Hz	±0.05Hz
Harmonics	Harmonics Voltage	1~15th V harmonics	0.000~999.9kV	-
	Voltage THD	THD	0.000~999.9%	-
MAX	AC voltage	MAX V_{ac}	-	-
	DC voltage	MAX V_{dc}	-	-
	Output Current	MAX I_{out}	-	-
	Battery Current	MAX I_{bat}	-	-
	THD	MAX THD	-	-

Note) 1. Connecting VAC to GPT will allow the user to check Vo and Vo_MAX values.

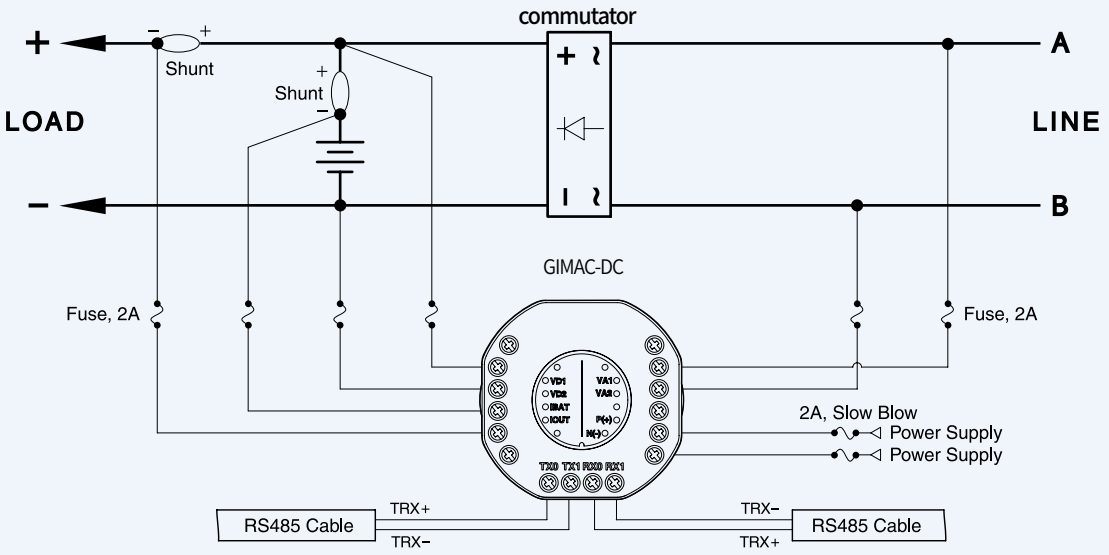
G

Appearance

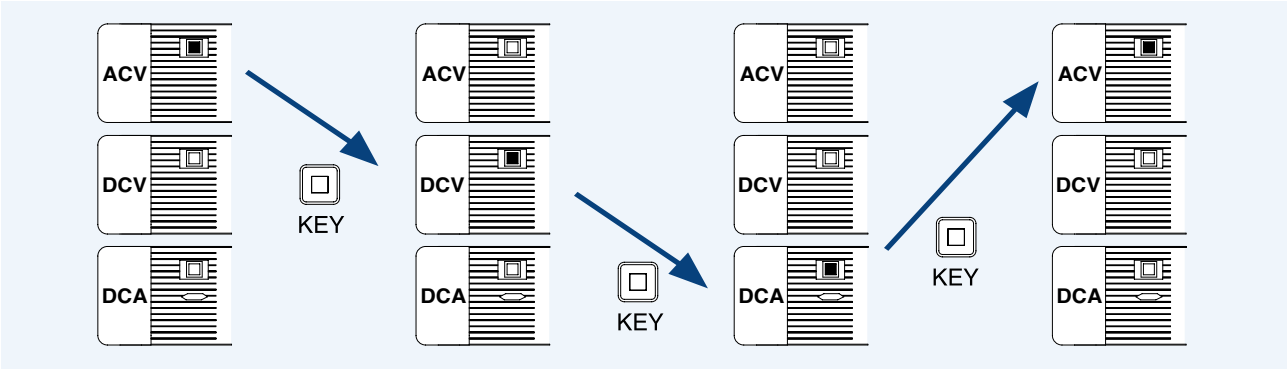
Characteristics of Digital DC Measuring Device GIMAC-DC



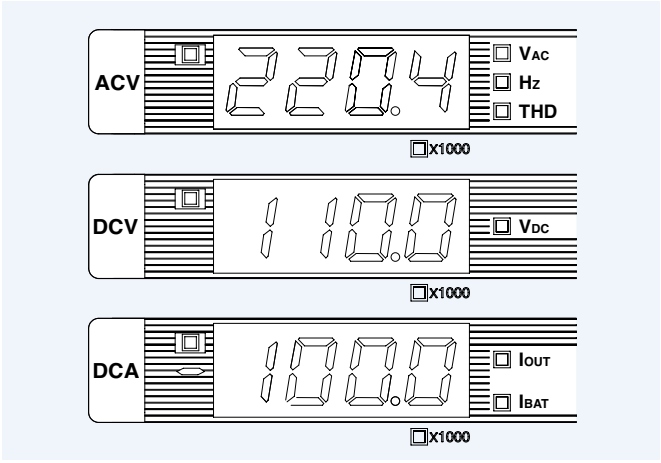
Back Terminal Section



Select Rated Item Measurement setting



Use the △ ▽ keys to select the necessary measurement display element



Measurement Element	LED	Measurement Display Element
ACV	VAC	AC Voltage
	Hz	AC Voltage Frequency
	THD	AC Voltage Total Harmonic Distortion
	MACV + VAC	MAX AC Voltage
	MACV + THD	MAX AC Voltage THD
Measurement Element	**LED**	**Measurement Display Element**
DCV	VDC	DC Voltage
	MDCV + VDC	Max DC Voltage
Measurement Element	**LED**	**Measurement Display Element**
DCA	IOUT	DC Output Current
	IBAT	Battery Charge/Discharge Current
	MDCA + IOUT	MAX DC Output Current
	MDCA + IBAT	MAX Battery Charge/Discharge Current

Setting Method

- Pressing (UP) and (DOWN) keys together will enter/exit the Setting Mode.
- Use the (UP) and (DOWN) keys to move and search between setting items.
- Pressing the (ENTER) key at Setting Display Mode will trigger the corresponding item to blink, and this is when the setting can be modified.
- Use the (UP) and (DOWN) keys to change the setting and then press the (ENTER) key to save the change, and the blinking will stop and become a highlight.
  - After completing all settings, pressing (UP) and (DOWN) keys together will return the menu to the Measurement Display Mode.

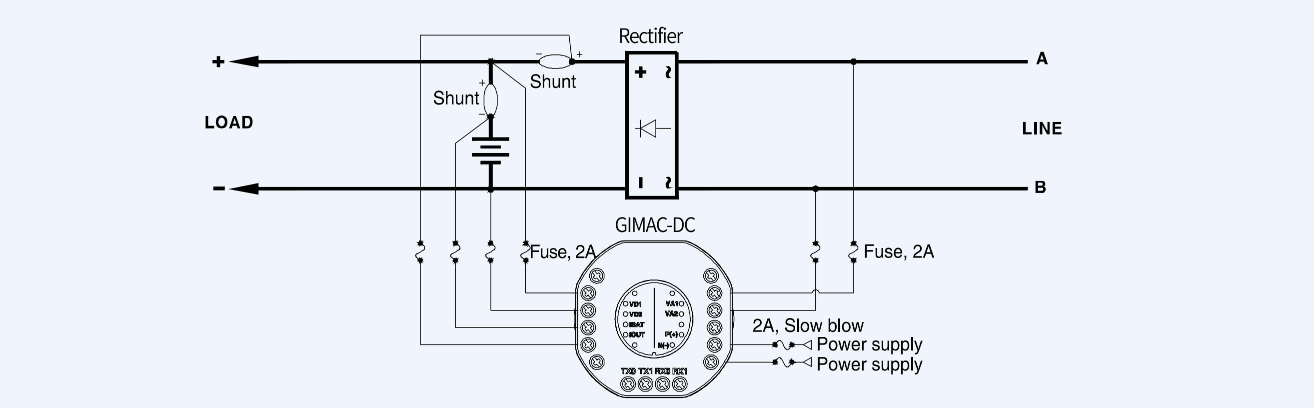
Setting Mode Procedure & Items

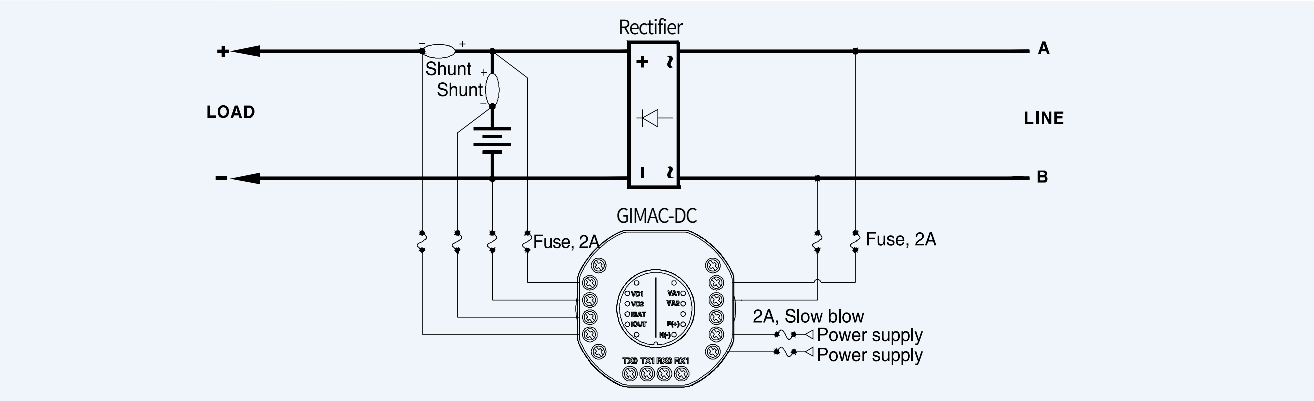
Order	Setting Menu	Display Details	Setting Value	Initial Value	Remark
1	PT Ratio Note)	'Pt'	1.0000 ~ 1400.0000	1.0000	
2	Output current, shunt resistance, rating current	'Ao_S'	1 ~ 9999 A	100	STEP 1
3	Output current, shunt resistance, rating voltage	'Vo_S'	100 ~ 150 mV	100	STEP 10
4	Battery charge/discharge current, shunt resistance,rating current	'Ab_S'	1 ~ 9999 A	100	STEP 1
5	Battery charge/discharge current, shunt resistance,rating voltage	'Vb_S'	100 ~ 150 mV	100	STEP 10
6	Communication Address	'Addr'	1 ~ 247	1	
7	Communication speed	'bPS'	1 : 9600 bps 2 : 19200 bps 3 : 38400 bps	3	
	Float variable Swap Yes/No	'S'	On : Yes Of : NO	on	
8	Tx delay time	'tH. t'	10 ~ 200 msec	20	
9	Data Reset	'rSt.'	0 : all Data Reset 1 : Max VAC Reset 2 : Max THD Reset 3 : Max VDC Reset 4 : Max IOUT Reset 5 : Max IBAT Reset	-	
10	Display version	'vEr.'	X.XXX	-	Not to be Set by user

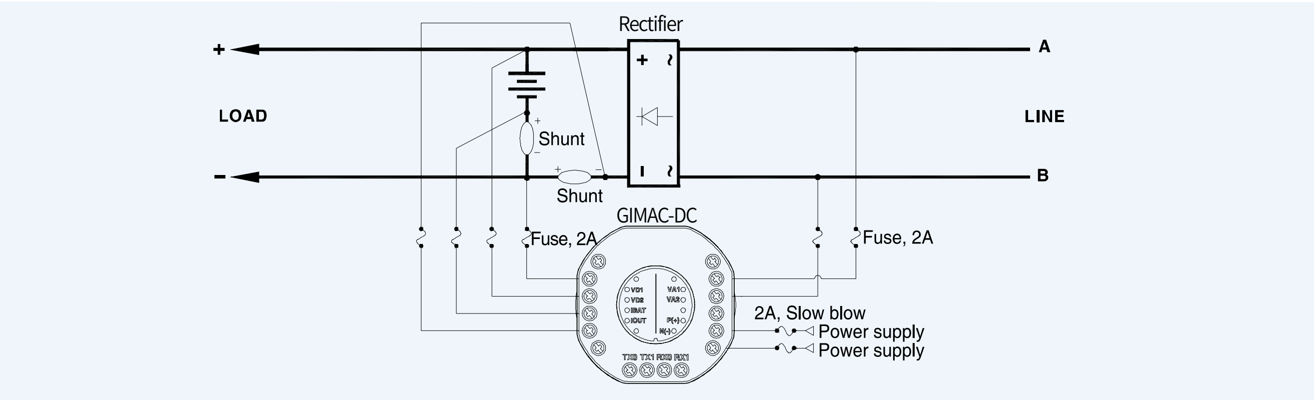
Note) PT ratio setting is unavailable (input value is displayed)

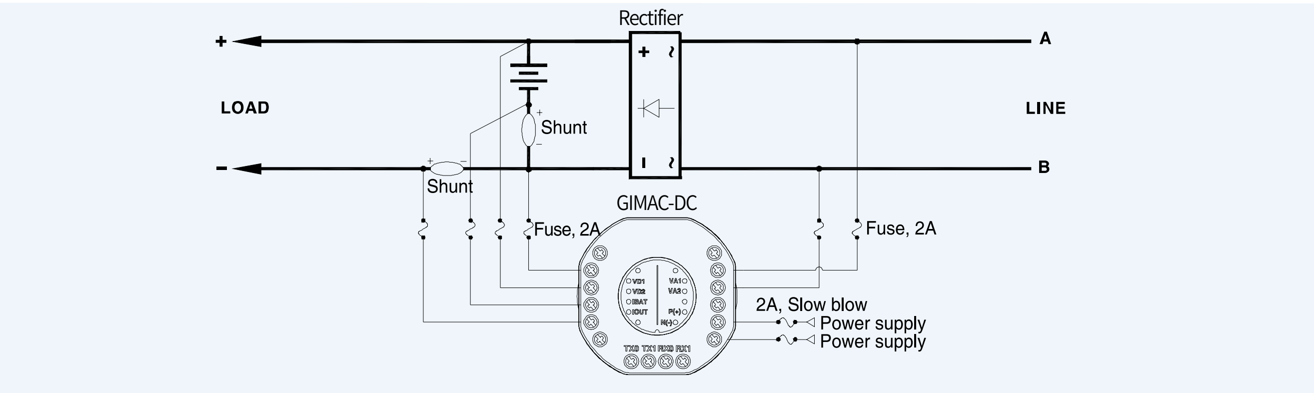
Wiring

Rectification-Based Wiring





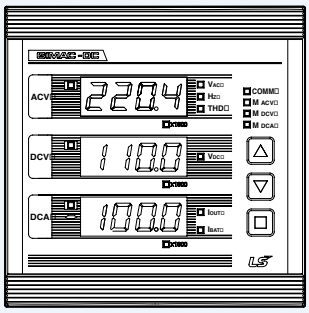




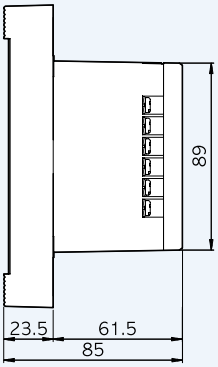
Note) Wiring must take place after duly disconnecting all power sources from the device.
Note) Suitable cable thickness is AWG14 to AWG1212.1-3.3m2.
Note) Terminal bolt tightening torque (kg-cm) is less than 10.
PNL cutting dimension can be selected between circular or rectangular.

Dimensions & Ordering

Exterior Dimensions



<Front>



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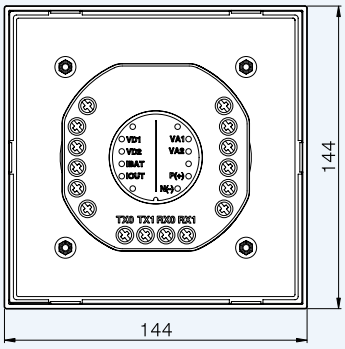

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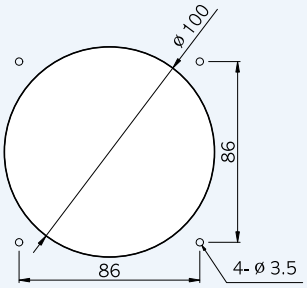
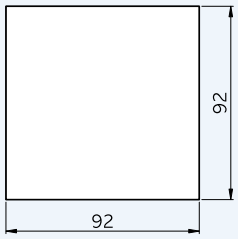


ANSI 4 Cutting Size



DIN 96 Cutting Size

Note) PNL cutting dimension can be selected between circular or rectangular.

Ordering

GIMAC - DC

M485	50/60Hz	AC/DC 88~264V

Communication		Frequency	Control & Control Power
M485	Modbus/RS485	50/60Hz	AC/DC 88~264V
-	None		

G

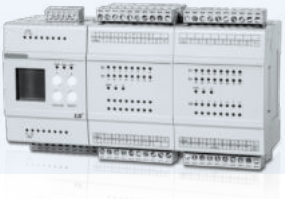
µ-RTU

Network Device

Micro Remote Terminal Unit (µ- RTU)

- Output contact Latch/Pulse type available
- Contact input/output status LED display
- Communication method RS485/Ethernet available

Contents



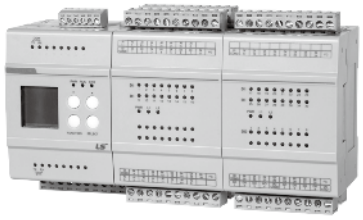
Micro Remote Terminal Unit (μ- RTU)

Features

μ-RTU III (Micro Remote Terminal Unit) is a communication relay device for monitoring the status of remote contacts, remote control, and measuring analog data in the field when establishing a switchgear monitoring and control system. RS485 or Ethernet It performs the function of transmitting to the upper system by communication method.
It is a device to connect digital and analog contact signals that are not accepted by devices such as relays and measuring instruments to the communication network.

Key Characteristics
- Output Contact Latch/Pulse Option Available
- Communication Method RS485/Ethernet Available
- Acquisition of KC Certification

[μ-RTU III-016/0320/8160]



[μ-RTU III-8328]

Rating

Type			Specification
Rating	Power		AC/DC 110V
	Power consumption		15W or less: Stanby
Input contact	Digital Input		Dry contact input
	Pulse Input		Dry ON/OFF input, Duration 30ms or more
	Analog Input		DC 4~20mA
Output contact	Output type	Latch	Latch ON, Latch OFF
		Pulse	Pulse (500ms, 1sec, 1.5sec, 2sec Duration)
	Output device		AC250V/3A, DC30V/3A cosθ=1.0
	Drive power		Internal power (DC 24V)
	Type		Dry "a" contact
Temperature	Operation		-10~55°C
	Storage		-26~70°C
Humidity			RH 80% or less (non-condensing)
Dimension(mm)			116×80×58 (mm) 174×80×58 (mm) (8328 model)
Weignt			0.5kg/0.7kg (8328 model)
Communication			RS485 : Modbus Ethernet : Modbus

Specification

Model	AI Contacts	DI Contacts	DO Contacts	Communication Method
μ-RTU III-0160	0	16 point	0	RS485, Ethernet
μ-RTU III-0320	0	32 point	0	
μ-RTU III-8160	8 point	16 point	0	
μ-RTU III-8328	8 point	32 point	8 point	

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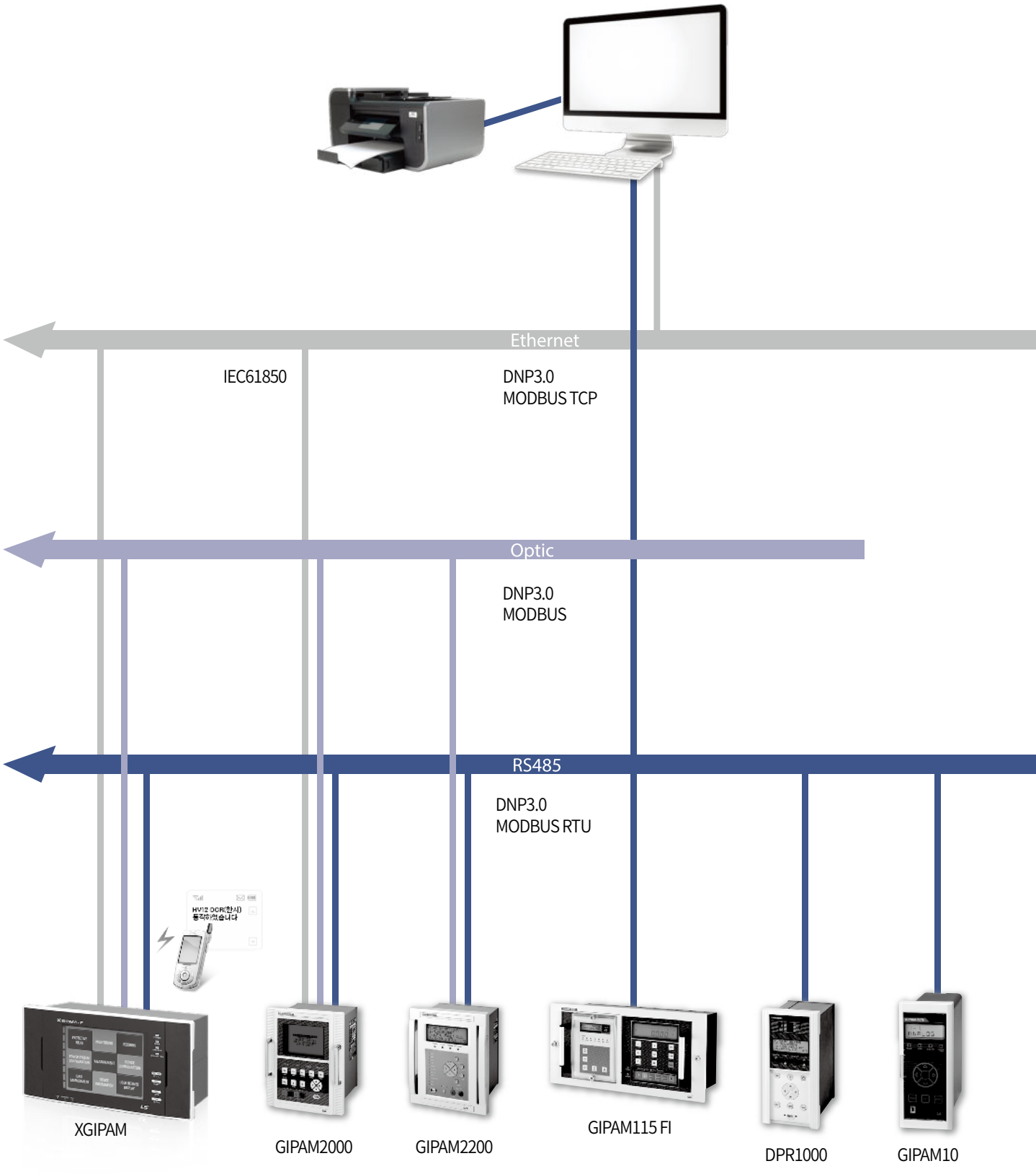
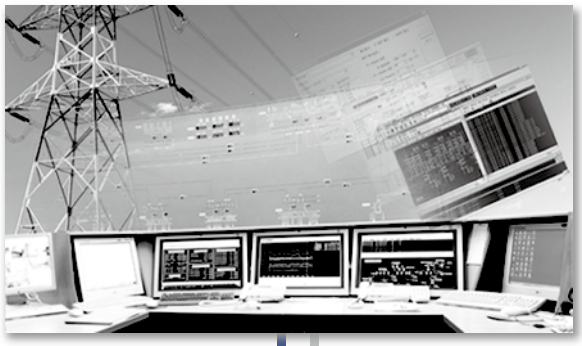
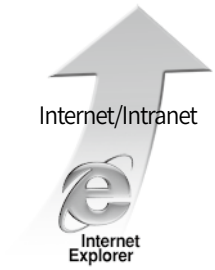
Control/Surveillance System Structure





TWS



Web-Server

PLC

GIMAC-IV/II Plus

micro-RTU

GIMAC-PQ

GIMAC1000

GIMAC-DC

IMP-C

IMC-III

μ-RTU III

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MEMO

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

- According to The WEEE Directive, please do not discard the device with your household waste.

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2021. 04

Specifications in this catalog are subject to change without notice due to continuous product development and improvement.