DPR

Digital Protection Relay

- Compact design
- easy to operate and set
- Back-lit LCD display
- Adjustable current and operation time
- The use of the output contacts are programmable
- Fault recording function
- Sequence of event function(S.O.E/Optional)
- Various communication network configurations
- EMC/EMI test certified

N2

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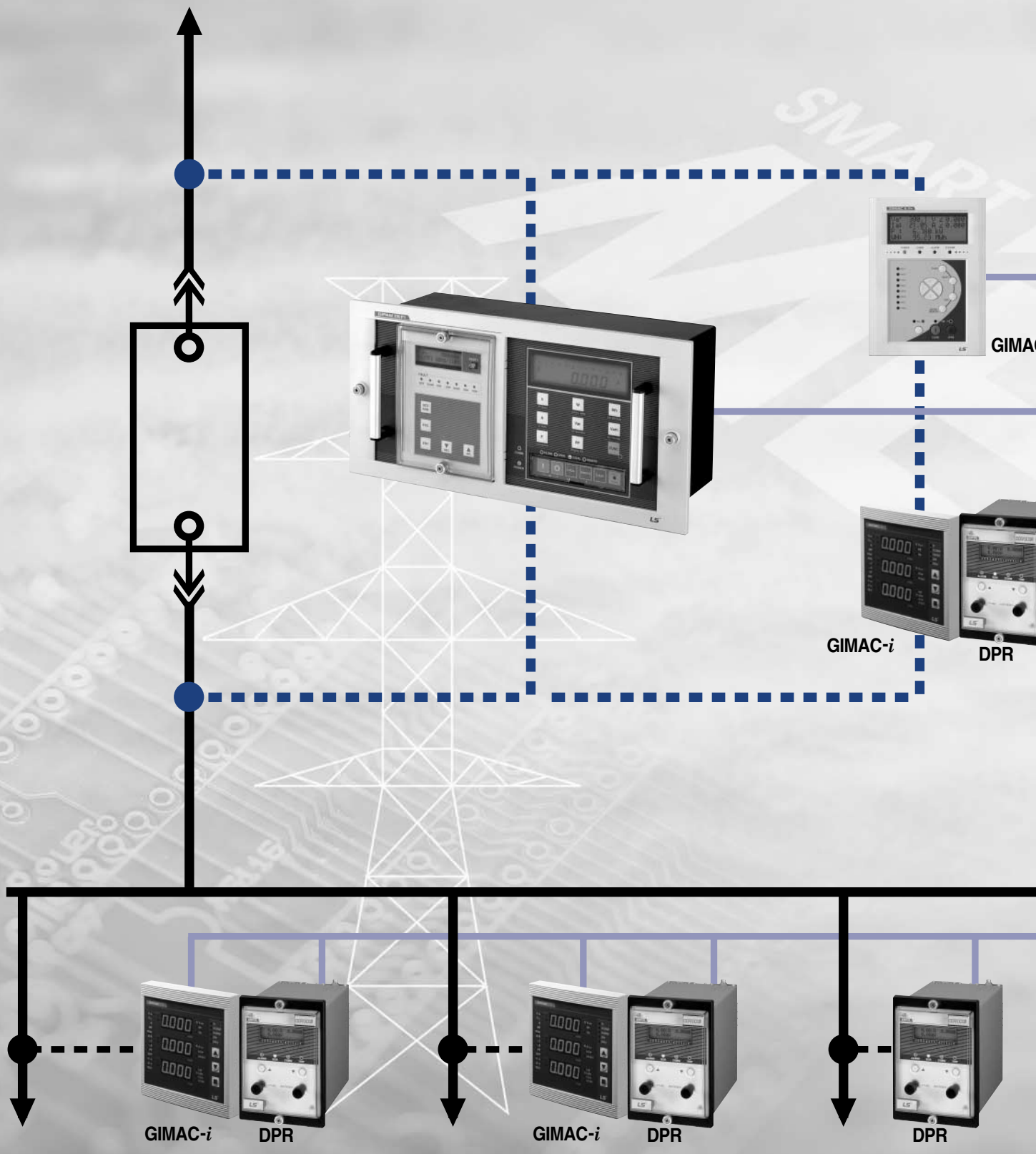
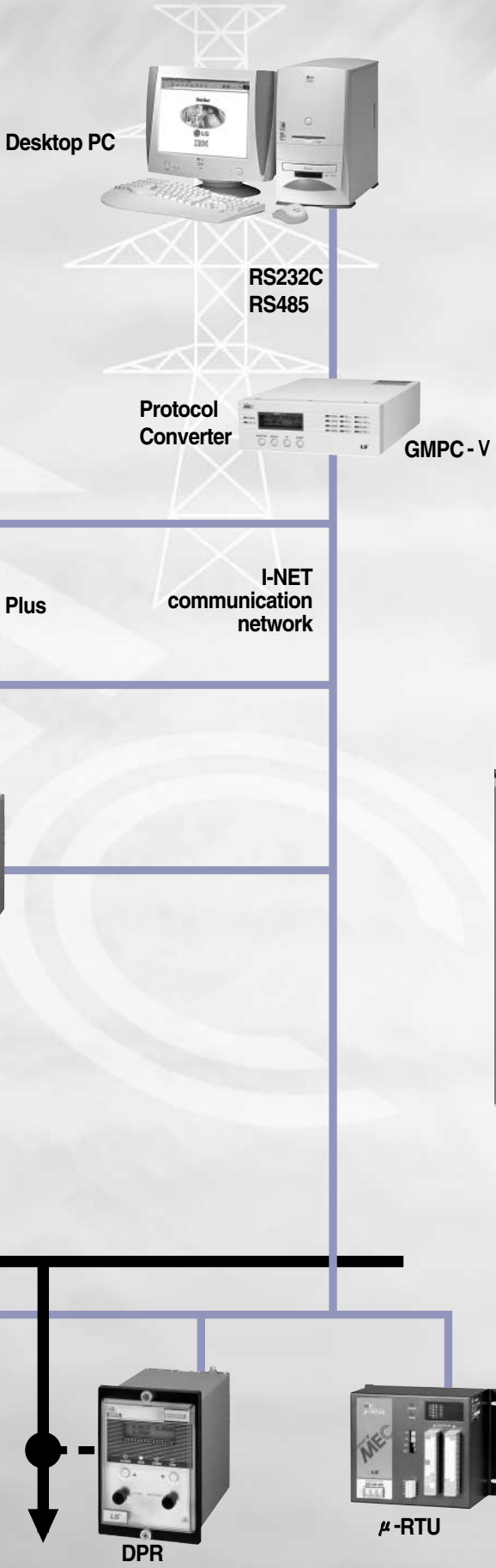
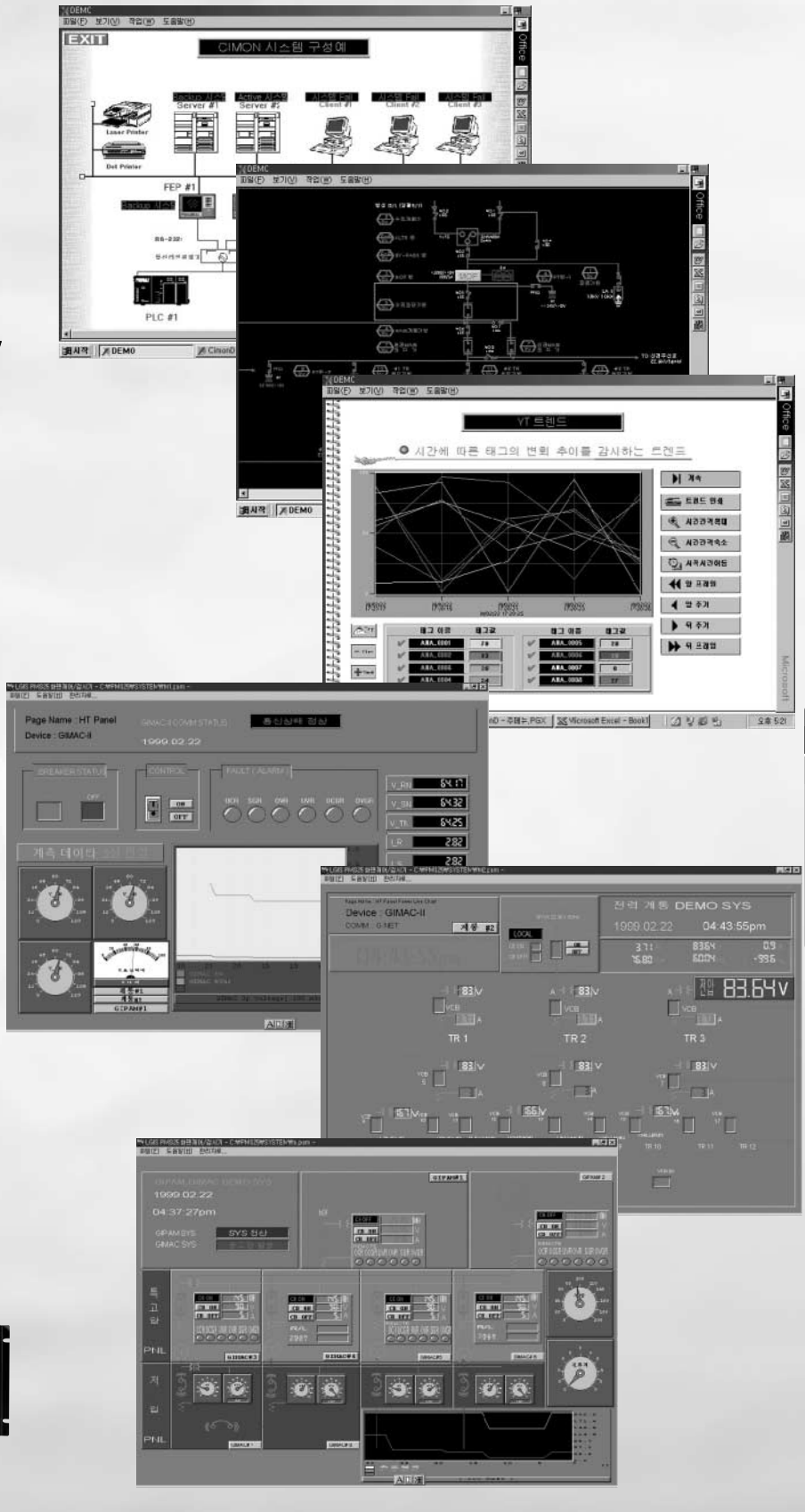
LS's advanced technology realized the digitalization of the measuring, monitoring and protecting equipment in the power transmission and distribution system.

Get a chance to use the reliable Digital Protection Relay and Digital Integrated Meter.



It is applicable to various programs for power monitoring & control system.





Digital Protection Relay (DPR)

Features

■ **Compact design**
- 124mm(Width) × 177mm(Height) × 243mm(Depth)

■ **Easy to operate and set**
- Set and check all the values by operating the ket button in the front.

■ **Back-lit LCD display**
- Back-lit LCD diaplay provide increased visibility
- Easy to check the cause of a fault and setting status by the abundant indication functions
- LCD flickers when all trips happens

■ **Adjustable current and operation time**
- Minute setting steps for the current and time are appropriate for network protection.

■ **The use of the output contacts are programmable**
- Various settings for output contacts(Trip or Alarm) are available
- For details, refer to the table in page N2-15, 19

■ **Fault recording function**
- When there is a fault in the power line, it records the fault wave forms for 10 cycles to the EEPROM.

■ **Sequence of event function(S.O.E/Optional)**
- It provides the sequence of the event (relay operation and cause of the fault and data adjustment, etc) to the higher system by the mili second intervals and it helps to analyze the cause of the fault easily.

■ **Various communication network configurations**
- -NET exclusive communication and Modbus communication(optional)

■ **EMC/EMI test certified**

Environmental characteristics

Dielectric withstand	IEC 60255-5 KEMC 1120	2kV rms. for 1 minute between all case terminals connected together and the case earth. 2kV rms. for 1 between all terminals of independent circuits with terminals and each independent circuit connected together 1kV rms. for I minute between each all terminals of open contact circuits
High voltage impulse	IEC 60255-5 KEMC 1120	5kV peak, 1.2×50㎲, between all terminals connected together and case earth 5kV peak, 1.2×50㎲, between mutual PT/CT circuits 5kV peak, 1.2×50㎲, between PT/CT circuits and control circuits 3kV peak, 1.2×50㎲, between mutual control circuits 3kV peak, 1.2×50㎲, between all terminals of PT/CT circuits 3kV peak, 1.2×50㎲, between all terminals of control power supply circuits
Insulation resistance	IEC 60255-5 KEMC 1120	DC 500V 10㏁ and over between all case terminals connected together and the case earth. DC 500V 5㏁ and over between all terminals of independent circuits with terminals and each independent circuits connected together DC 500V 5㏁ and over between each terminals of open contact circuits
Overload capacity	KEMC 1120 JEC-2500 KEMC 1120	Current circuit : In×2 for 3 hours(2 times by 1 minute interval) In×20 for 2 seconds In×40 for 1 second Voltage circuit : Vn×1.15 for 3 hours (1 time)
High frequency disturbance	IEC 60255-22-1 Class Ⅲ	2.5kv peak between independent circuits and case 1.0kv peak across terminals of the same circuit
Fast transient disturbance	IEC 60255-22-4 Class Ⅳ	4kv applied directly to power input 2kv applied to other inputs
Electrostatic discharge (ESD)	IEC 60255-22-2 Class Ⅲ	8kv discharge in air with cover in place 6kv point contact discharge with cover removed
RFI	KEMC 1120	Making a wave by accessing to the edge of relay with 5W transceiver(150MHz, 400MHz)
EMI	EN 50081-2 Class Ⅱ	AC power:0.15~0.50MHz, standard 79dB, average 66dB 0.50~30MHz, standard 73dB, average 60dB
Operating temperature	IEC 60068-2-1	-10~55℃
Storage temperature	IEC 60068-2-2	-20~70℃
Humidity	IEC 60068-2-3	56 days at 93% RH and +40℃
Shock	IEC 60255-21-2 Class Ⅲ KEMC 1120	30g, 3times/dir.
Vibration	KEMC 1120	30Hz, 0.4mm vibration applied for 600 seconds
Enclosure protection	IEC 529	IP 50(dust protected)

Digital Protection Relay (DPR)

Constitution

DISPLAY

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

UP key

- Increasing setting value
- Shifting to each menu

FUNC key

Shifting to each menu

Indicators

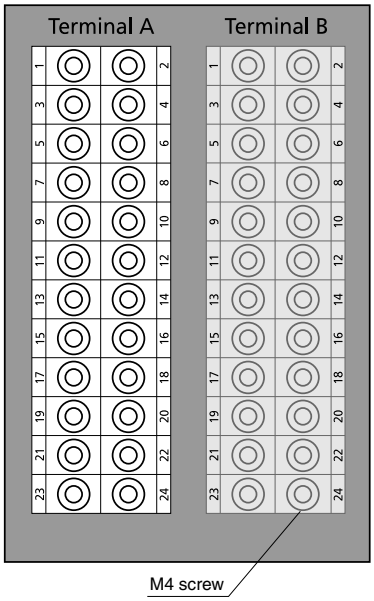
- Alarm: Alarm status LED
- Run: Normal operation status LED
- Comm: Communication status LED
- Trip: Trip status LED

Down key

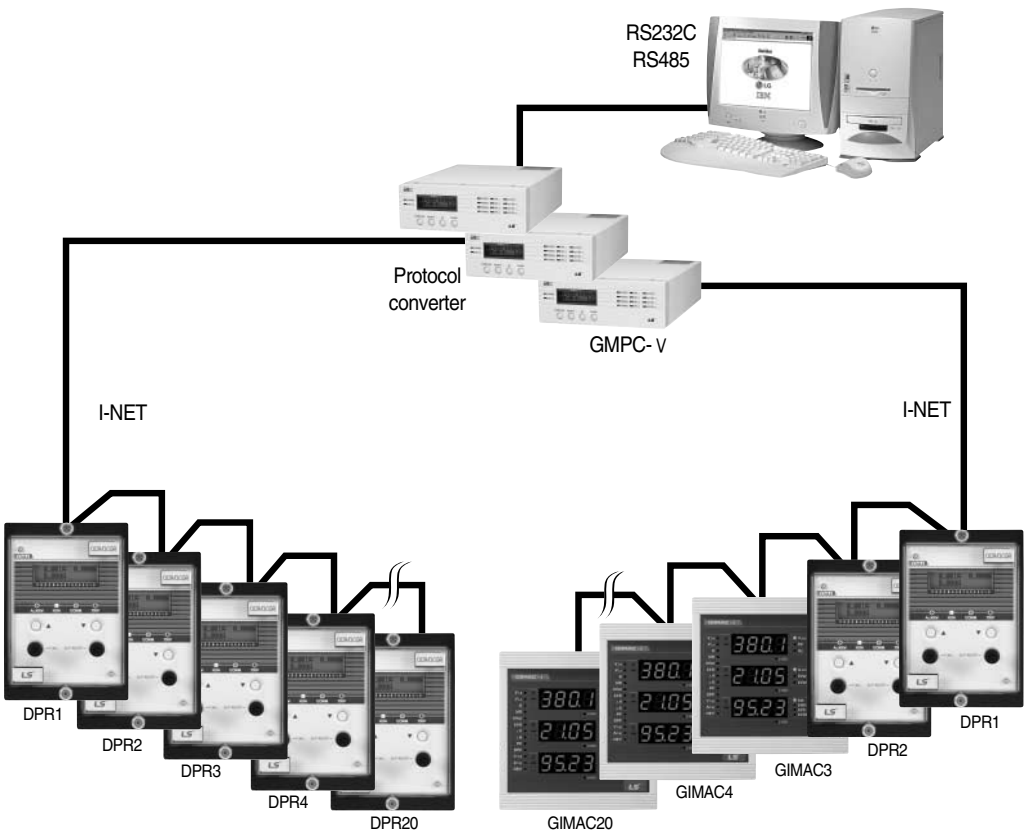
- Decreasing setting value
- Shifting to each menu

ENT/RESET key

- ENT : Selecting menu or data
- Reset: Resetting after relay operation



System constitution



Constant-supervision with self-diagnostics

High reliability of relay will be provided by various self-diagnostics function. When errors occurs it will be displayed "Error No." at LCD display window, then the front ALARM LED lights on and LCD display window flickers on also.
At the same time ALARM relay(Sys fail) will be output.

1. internal ROM check: "Error 1"
2. internal RAM check: "Error 2"
3. A/D converter check: "Error 3"
4. CPU watchdog check: "Error 4"
5. Power supply check: "Error 5"
6. EEPROM(Backup memory) check: "Error 6"
7. Calibration check: "Error 7"

When the self-diagnostics error happens, the relay is not operated until the cause of that fault is cleared.

Fault records

1. The fault curves are recorded into EEPROM when line fault happens, which will provide fast and correct grasping for the cause of a fault.
2. Storage the sample value of each phase for 10 cycles before and after the fault
   - 5 cycles before the fault
   - 5 cycles after the fault
   - 8 samples for a cycle
3. A fault recording information is available for ascertaining them via communications.

Sequence of event (S.O.E)

Many events (including relay operation, cause of fault, data adjustment) can be provided to the higher system

1. Kinds of event
   - The cause of a relay operation(trip)
   - The data adjustment of a relay
   - Error occurrence of auto-diagnostics
   - Relay resetting
2. Twenty events are stored in a buffer (maximum)

Communication specification

1. I-NET communication
   High speed, high reliability of serial communication by use of the custom LSI(GC829016) developed by LSIS
   1) Data rate : 250kbps
   2) Cable length : 1000m(max.)
   3) Insulation : Pulse Transformer
   4) Connection : 4 Wires multi-drop
   5) Signal modulation : Bipolar modulation
   6) Connectable quantity : max. 20units per a GMPC(a protocol converter)
   7) Address : Parameter setting from 1 to 255
   8) Communication cable : Low capacitance LAN interface cable
      - Spec : LIREV AMESB 22AWG 2-pair (1/0.643)
      - Impedance : 10MHz, 120(Ω)
      - Termination : Please use it by connecting 2 resistors with each end of cable
2. MODBUS communication (Optional)
   - FIELD BUS open protocol applied
   - Please contact us before applying this communication method

Digital Protection Relay (DPR)

Overcurrent relay for phase and ground faults (OCR & OCGR)

DPR-111

Features

- Self-diagnostics
- Fault recording
- Sequence of event(S.O.E)
- High speed serial data communication
- International standard applied
  - IEC 60255, IEC 61000-4, KEMC 1120

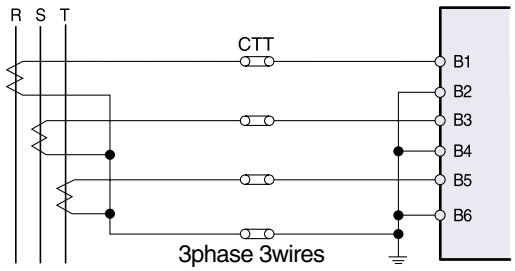
Operation characteristic curves (Refer to page N2-18)

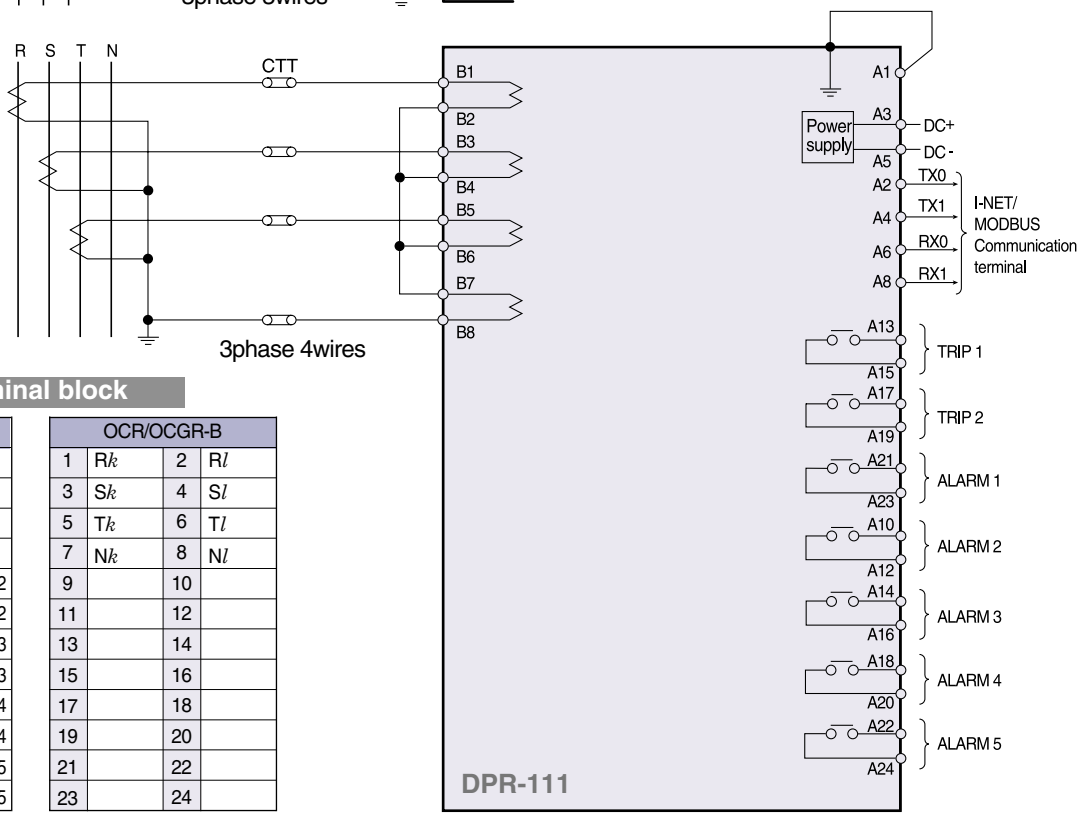
- Standard inverse time
- Very inverse time
- Extremely inverse time
- Long inverse time
- Definite time

Type designation			DPR-011	DPR-111
ANSI code			50/51 × 3	50/51×3 50/51N×1
Ratings	Current(In)		5A	
	Frequency(fn)		50/60Hz	
	Control power(Vx)		DC 110/125/220V (DC 85~220V)	
	Input burdens		0.5VA and below	
Relay elements			3 phase overcurrent protection(OCR)	3 phase overcurrent protection(OCR) Ground fault overcurrent protection(OCGR)
Setting range	Time delayed setting	Phase	1~16A/0.5A (20~200%)	1~16A/0.5A (20~200%)
		Earth		0.2~2.5A/0.1A (4~50%)
	Instantaneous setting	Phase	10~160A/5A (200~3200%), Lock	10~160A/5A (200~3200%), Lock
		Earth		2.5~40A/2.5A (50~800%), Lock
Operating time	Time delayed element	Inverse	Standard inverse, Very inverse, Extremely inverse, Long inverse 0.05~1seconds in a 0.2 step	
		Definite	0.1~10seconds in a 0.2 step	
	Instantaneous	Definite	Within 35msec	
Additional function			Self-diagnostics Fault recording Sequence of event(S.O.E)	
Communication mode			I-NET	
Display			Back-lit LCD(Dot matrix)	
Output contacts	Switching capacity		Make 10A/250Vac, 0.5sec, resistive Break 1A/250Vac 0.1PF	
	Constitution (7EA) Note)		Trip relay 2a, 1250VA and over Alarm relay 4a System fail relay 1a	
	Type	At trip operation	Trip relay+Trip LED+Alarm relay	
		Seif-diagnostics error	System fail relay+Alarm relay	
		At normal	RUN LED	
Insulation resistance			DC 500V 100㏁ and over	
Dielectric withstand			2kV(1kV) rms. and over for 1 minute	
High voltage impulse			5kV(3kv) peak and over applied for 1.2 × 50㎲	
Overload capacity		Current circuit	Rated current(In)×2 for 3 hours Rated current(In)×20 for 3 seconds Rated current(In)×40 for 3 seconds	
		Voltage circuit	Rated Voltage(Vn)×1.15 for 3 hours	
Temperature		Operating	-10~55℃	
		Storage	-20~70℃	
Humidity			80% RH (Non-condensing)	
Applied standard			IEC 60255, IEC 61000-4, KEMC 1120	
Weight			3.2kg	
Dimension			124(W)×177(H)×243(D)mm	

Note) The output contacts are programmable.

Connection methods





Terminal block

OCR/OCGR-A			
1	F.G	2	TX0
3	DC+	4	TX1
5	DC-	6	RX0
7		8	RX1
9		10	ALARM2
11		12	ALARM2
13	TRIP 1	14	ALARM3
15	TRIP 1	16	ALARM3
17	TRIP 2	18	ALARM4
19	TRIP 2	20	ALARM4
21	ALARM1	22	ALARM5
23	ALARM1	24	ALARM5

OCR/OCGR-B			
1	R*k*	2	R*l*
3	S*k*	4	S*l*
5	T*k*	6	T*l*
7	N*k*	8	N*l*
9		10	
11		12	
13		14	
15		16	
17		18	
19		20	
21		22	
23		24	

Output contacts OCR, OCGR

●:Default(when shipment) ○:Programmable ×:Not available

Unit	Kinds of contacts / Output contacts		TRIP RELAY			ALARM RELAY									
			TRIP	Trip-INST	Trip-TD	ALM-Trip	ALM-INST	ALM-TD	ALM- I1	ALM-I2	ALM-I3	ALM-I4	ALM-Sys Fail	PICK-Up	No use
OCR / OCGR	TRIP 1	for Trip	●	×	×	×	×	×	×	×	×	×	×	×	×
	TRIP 2		●	×	×	×	×	×	×	×	×	×	×	×	×
	ALARM 1	for Alarm	×	×	×	○	○	○	●	○	○	○	×	○	○
	ALARM 2		×	×	×	○	○	○	○	●	○	○	×	○	○
	ALARM 3		×	×	×	○	○	○	○	○	●	○	×	○	○
	ALARM 4		×	×	×	○	○	○	○	○	○	●	×	○	○
	ALARM 5		×	×	×	×	×	×	×	×	×	×	●	×	×
Purpose of contacts			Trip	Instantaneous Trip	Time delayed Trip	Trip Alarm	Instantaneous Trip	Time delayed Trip	"R" phase Trip	"S" phase Trip	"T" phase Trip	"N" phase Trip	Self-diagnotics Error	Overload Pre alarm	No use

Note 1) Alarm relay can not be used for Trip (CB control) contacts.
Note 2) Alarm-I4 is not available for DPR-011(OCR)
Note 3) In case of Trip1, Trip2, the contacts, status are stored as an EVENT, if they were changed during operation

Digital Protection Relay (DPR)

Selective Ground Relay (SGR)

DPR-211

Features

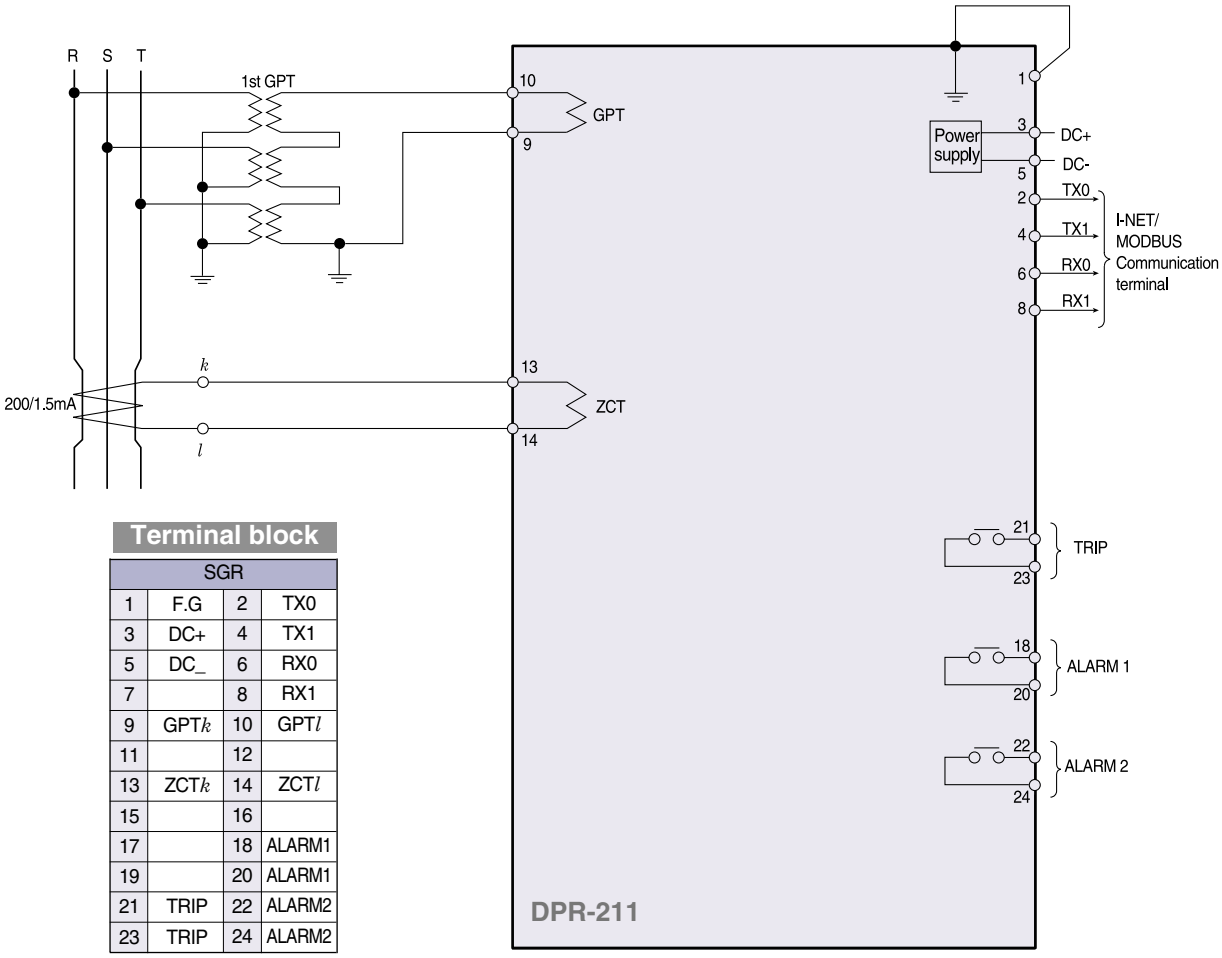
- Self-diagnostics
- Fault recording
- Sequence of event(S.O.E)
- High speed serial data communication
- International standard applied
  - IEC 60255, IEC 61000-4, KEMC 1120

Operation characteristic curves (Refer to page N2-18)

- Definite time

Type designation			DPR-211
ANSI code			67G
Ratings	Zero phase current(Ion)		1.5mA
	Frequency(fn)		50/60Hz
	Zero sequence voltage(Von)		190V
	Control power(Vx)		DC 110/125/220V(DC 85~220V)
	Input burdens		0.5VA and below
Relay elements			Selective earth fault protection(SGR)
Setting range	Operating current(Io)		0.9~5.4mA/0.3mA
	Operating voltage(Vo)		4~76V/4V
	Operating phase angle		0°, 30°, 45°, 60°, 90°
Operating time	Definite time		0.1~10seconds in a 0.1초 step
Additional function			Self-diagnostics Fault recording Sequence of event(S.O.E)
Communication mode			I-NET
Display			Back-lit LCD(Dot matrix)
Output contacts	Switching capacity		Make 10A/250Vac, 0.5sec, resistive Break 1A/250Vac 0.1PF
	Constitution (3EA)		Trip relay 1a, 1250VA and over Alarm relay 1a System fail relay 1a
	Type	At trip operation	Trip relay+Trip LED+Alarm relay
		Self-diagnostics error	System fail relay+Alarm LED
		At normal	RUN LED
Insulation resistance			DC 500V 100㏁ and over
Dielectric withstand			2kV(1kV) rms. and over for 1 minute
High voltage impulse			5kV(3kv) peak and over applied for 1.2×50㎲
Overload capacity	Voltage circuit		Vn×1.15 for 3 hours
Temperature	Operating		-10~55℃
	Storage		-20~70℃
Humidity			80% RH
Applied standard			IEC 60255, IEC 61000-4, KEMC 1120
Weight			2.8kg
Dimension			124(W)×177(H)×243(D)mm

Connection methods



Terminal block

SGR			
1	F.G	2	TX0
3	DC+	4	TX1
5	DC_	6	RX0
7		8	RX1
9	GPTk	10	GPTl
11		12	
13	ZCTk	14	ZCTl
15		16	
17		18	ALARM1
19		20	ALARM1
21	TRIP	22	ALARM2
23	TRIP	24	ALARM2

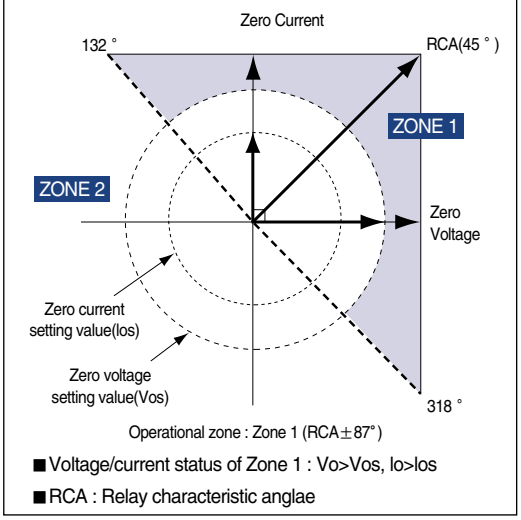
Output contacts of SGR

●:Default(when shipment) ○:Programmable ×:Not available

Unit	Kinds of contacts / Output contacts		Trip relay	Alarm relay	
			TRIP	ALM-Trip	ALM-Sys fail
SGR	Trip	for Trip	●	×	×
	Alarm 1	for Alarm	×	●	×
	Alarm 2		×	×	●
Purpose of contacts			Trip	Trip Alarm	Self-Diagnostics Error

Note) Alarm relay can not be used for Trip(CB control) contacts.

Operating phase characteristics



Operational zone : Zone 1 (RCA±87°)

■ Voltage/current status of Zone 1 : Vo>Vos, Io>Ios

■ RCA : Relay characteristic anglae

Digital Protection Relay (DPR)

Under and Overvoltage Relay (UVR & OVR)

DPR-411

Features

- Self-diagnostics
- Fault recording
- Sequence of event(S.O.E)
- High speed serial data communication
- International standard applied
  - IEC 60255, IEC 61000-4, KEMC 1120

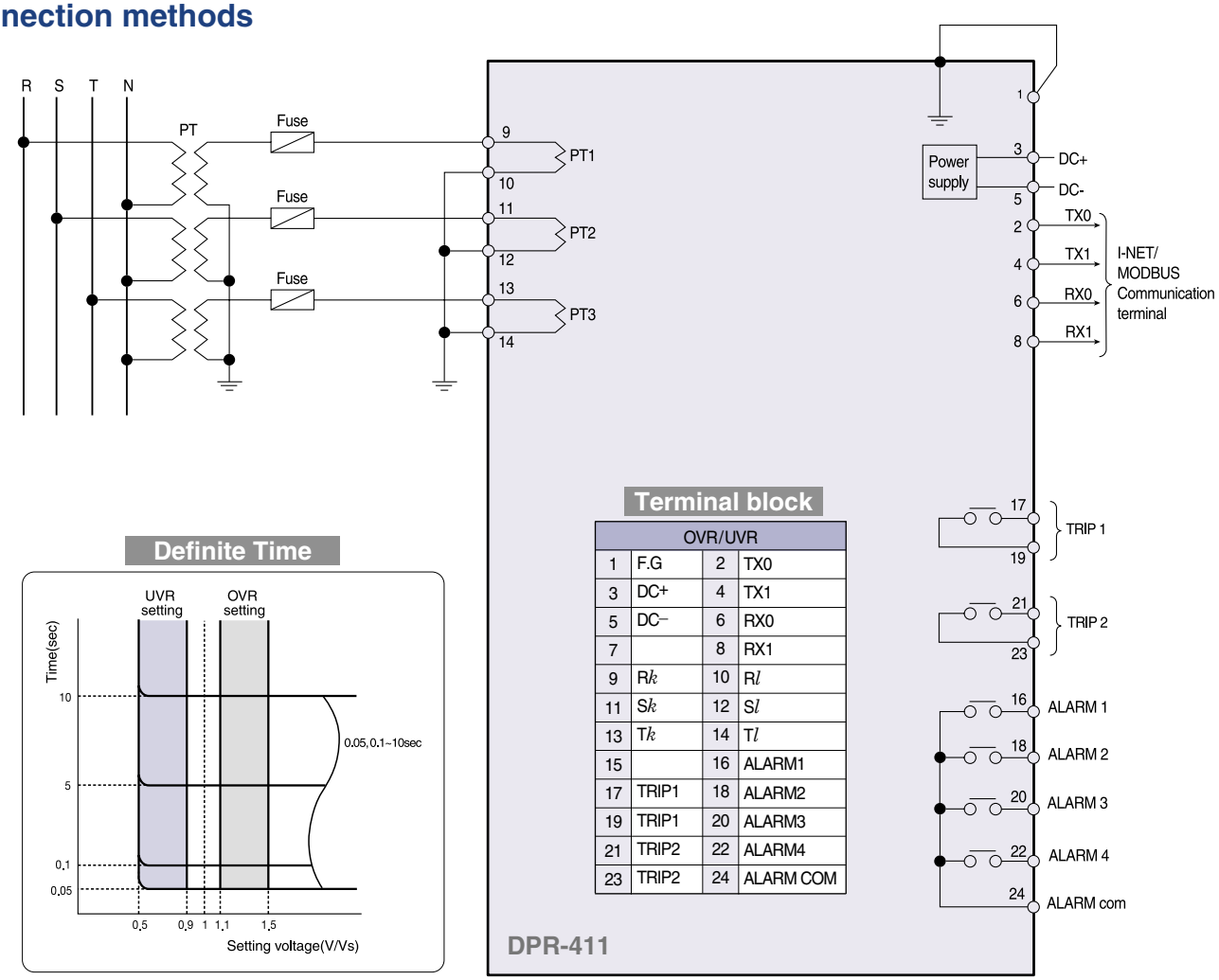
Operation characteristic curves (Refer to page N2-18)

- Definite time

Type designation			DPR-311	DPR-411
ANSI code			59(27)	59/27
Ratings	Volltage(Vn)		110V	
	Frequency(fn)		50/60Hz	
	Control power(Vx)		DC 110/125/220V (DC 85~220V)	
	Input burdens		0.5VA and below	
Relay elements			3phase overvoltage protection(undervoltage protection)	3phase overvoltage protection(OVR)
			-Selecting UVR or OVR	3phase overvoltage protection(UVR)
Setting range	Time delayed	OVR	121~165V/2V (110~150%)	
		UVR	55~99V/2V (50~90%), No-voltagge locking Note1)	
Operating time	Time delayed definite element		0.05, 0.1~10seconds in a 0.1 step	
Additional function			Self-diagnostics	
			Fault records	
			Sequence of event(S.O.E)	
Communication mode			I-NET	
Display			Back-lit LCD (Dot matrix)	
Output contacts	Switching capacity		Make 10A/250Vac, 0.5sec, resistive	
			Break 1A/250Vac 0.1PF	
	Constitution(6EA) Note2)		Trip relay 2a, 1250VA and over	
			Alarm relay 3a	
			System fail relay 1a	
	Type	At Trip operation	Trip relay+Trip LED+Alarm relay	
		Self-diagnostics error	System fail relay+Alarm relay	
		At Normal	RUN LED	
Insulation resistance			DC 500V 100㏁ and over	
Dielectric withstand			2kV(1kV) rms, and over for 1minute	
High voltage impulse			5kv(3kV) peak and over applied for 1.2×50㎲	
Overload capacity	Voltage circuit		Vn×1.15 for 2 hours	
Temperature	Operating		-10~55℃	
	Storage		-20~70℃	
Humidity			80% RH (Non- condensing)	
Applied standard			IEC 60255, IEC 61000-4, KEMC 1120	
Weight			3.1kg	
Dimension			124(W)×177(H)×243(D) mm	

Note 1) No-voltage lock : The lock function can be selected not to be tripped when no input voltage appeared (20% and under of rated voltage)
Note 2) The output contacts are programmable.

Connection methods



Terminal block

OVR/UVR			
1	F.G	2	TX0
3	DC+	4	TX1
5	DC–	6	RX0
7		8	RX1
9	R*k*	10	R*l*
11	S*k*	12	S*l*
13	T*k*	14	T*l*
15		16	ALARM1
17	TRIP1	18	ALARM2
19	TRIP1	20	ALARM3
21	TRIP2	22	ALARM4
23	TRIP2	24	ALARM COM

Definite Time

Output contacts of OVR/UVR

●:Default(When shipment) ○:Programmable ×:Not available

Unit	Output contacts \ Kinds of contacts		Trip relay		Alarm relay							
			Trip	Trip-3phase	Alm-Trip	Alm-3phase	Alm-V1	Alm-V2	Alm-V3	Alm-Sys fail	Pick-Up	No use
OVR / UVR	Trip 1	Note 3) for Trip	●	×	×	×	×	×	×	×	×	×
	Trip 2		×	●	×	×	×	×	×	×	×	×
	Alarm 1	for Alarm	×	×	○	○	●	○	○	×	○	○
	Alarm 2		×	×	○	○	○	●	○	×	○	○
	Alarm 3		×	×	○	○	○	○	●	×	○	○
	Alarm 4		×	×	×	×	×	×	×	●	×	×
Purpose of contacts			1phase and over fault among of R,S,T	R,S,T all phase fault	1phase and over trip	3phase Trip	"R" phase Trip	"S" phase Trip	"T" phase Trip	Self-diagnostics Error	Overload Pre alarm	No use

Note 1) Alarm relay can not be used for Trip(CB control) contacts.
Note 2) DPR-311 is available for selectable use as OVR or UVR, and it will be set on UVR when shipment.
Note 3) DPR-411 is used as OVR, UVR multiple relay. The Trip 1 is OVR and Trip 2 is for UVR as Trip contacts and it can be selected by Trip or Trip- 3phase.

Digital Protection Relay (DPR)

Over Voltage Ground Relay (OVGR)

DPR-511

Features

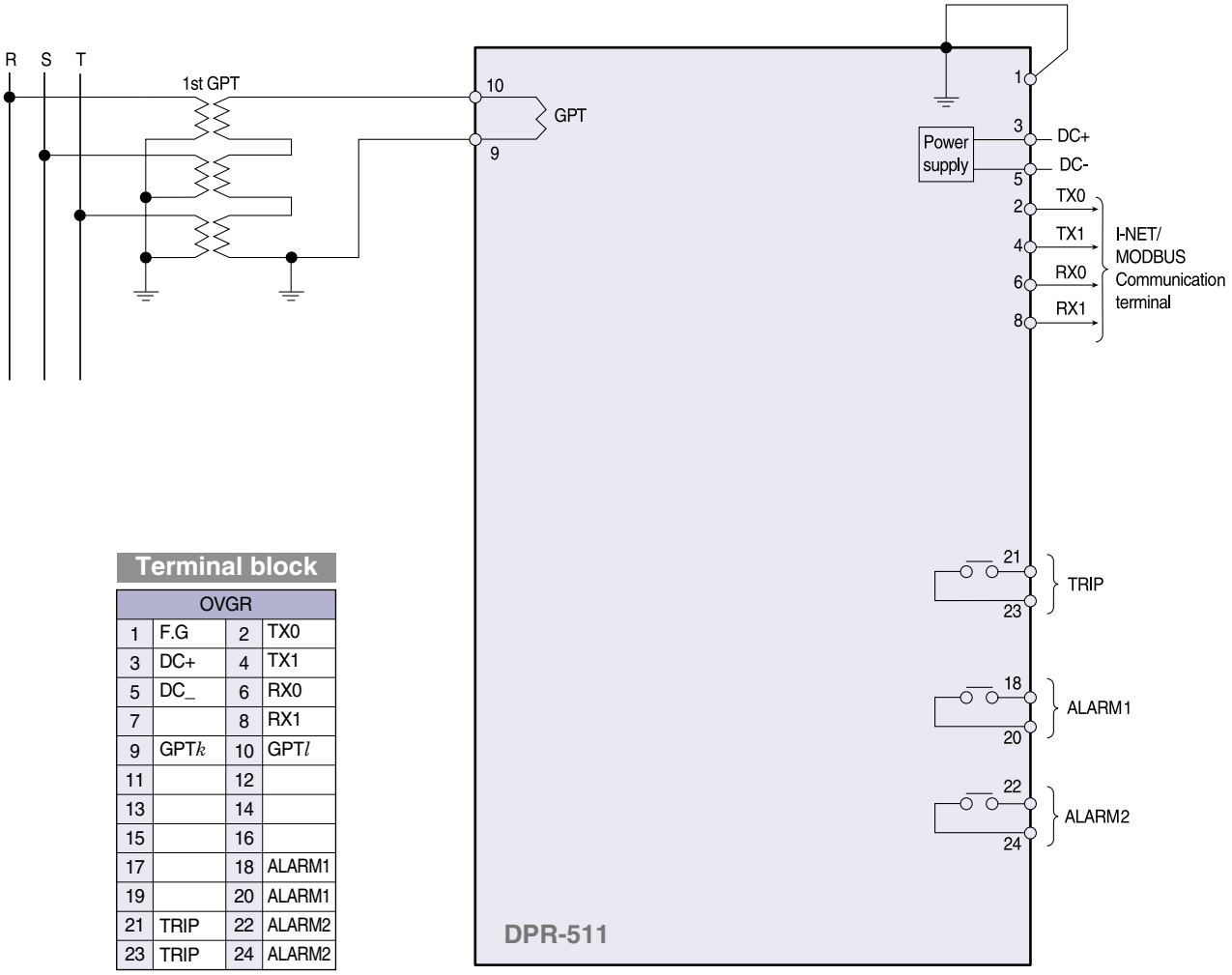
- Self-diagnostics
- Fault recording
- sequence of event(S.O.E)
- High speed serial data communication
- International standard applied
  -IEC 60255, IEC 61000-4, KEMC 1120

Operation characteristic curves (Refer to page N2-18)

- Standard inverse time
- very inverse time
- extremely inverse time
- long inverse time
- definite time

Type designation			DPR-511
ANSI code			64
Ratings	Voltage(Von)		190V or 190/ √3V
	Frequency(fn)		50/60Hz
	Control power(Vx)		DC 110/125/220V (DC 85~220V)
	Input burdens		0.5VA and below
Relay elements			Over Voltage Ground Protection (OVGR)
Setting range	Time delayed setting		20~76V/2V (10.5~40%)
	Instantaneous setting		20~76V/2V (10.5~40%), Lock
Operating time	Time delayed element	Inverse	Standard inverse, Very inverse, Extremely inverse
			0.05~1.00sec in a 0.01sec step
		Definite time	0.1~10sec in a 0.1sec step
	Instantaneous element	Definite time	Within 35 msec
Additional function			Self-diagnostics
			Fault records
			Sequence of event(S.O.E)
Communication mode			I-NET
Display			Back-lit LCD (Dot matrix)
Output contacts	Switching capacity		Make 10A/250Vac, 0.5sec, resistive
			Back 1A/250Vac, 0.1PF
	Constitution (3EA)		Trip relay 1a, 1250VA and over
			Alarm relay 1a
			System fail relay 1a
	Type	At Trip operation	Trip relay+Trip LED+Alarm relay
		Self-diagnostics error	System fail relay+Alarm relay
		At Normal	RUN LED
Insulation resistance			DC 500V 100㏁ and over
Dielectric withstand			2kV(1kV) rms. and over for 1 minute
High voltage impulse			5kV(3kV) peak and over applied 1.2×50㎲
Overload capacity	Voltage circuit		Vn×1.15 for 3 hours
Temperature	Operating		-10~55℃
	Storage		-20~70℃
Humidity			80% RH
Applied standard			IEC 60255, IEC 61000-4, KEMC 1120
Weight			2.8kg
Dimension			124(W)×177(H)×243(D) mm

Connection methods



Terminal block

OVGR			
1	F.G	2	TX0
3	DC+	4	TX1
5	DC_	6	RX0
7		8	RX1
9	GPTk	10	GPTl
11		12	
13		14	
15		16	
17		18	ALARM1
19		20	ALARM1
21	TRIP	22	ALARM2
23	TRIP	24	ALARM2

Output contacts of OVGR

●:Default(When shipment) ○:Programmable ×:Not available

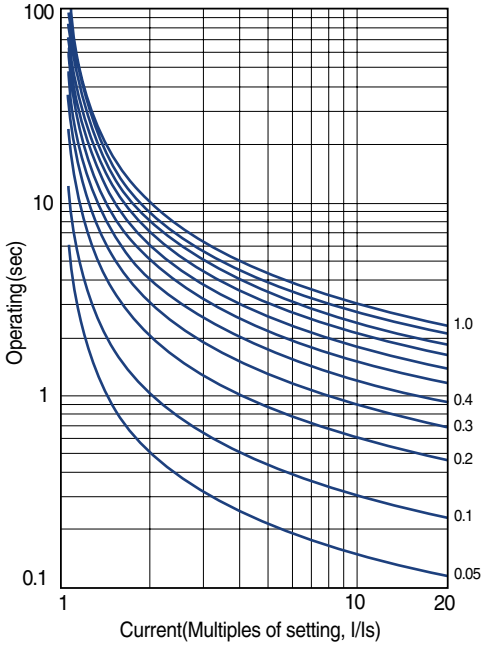
Unit	Output contacts / Kinds of contacts		Trip relay	Alarm relay	
			Trip	Alm-Trip	Alm-Sysfail
OVGR	Trip	for Trip	●	×	×
	Alarm1	for Alarm	×	●	×
	Alarm2		×	×	●
Purpose of contacts			Trip	Trip alarm	Self-diagnostics error

Note) Alarm relay can not be used for Trip(CB control) contacts.

Characteristics curve

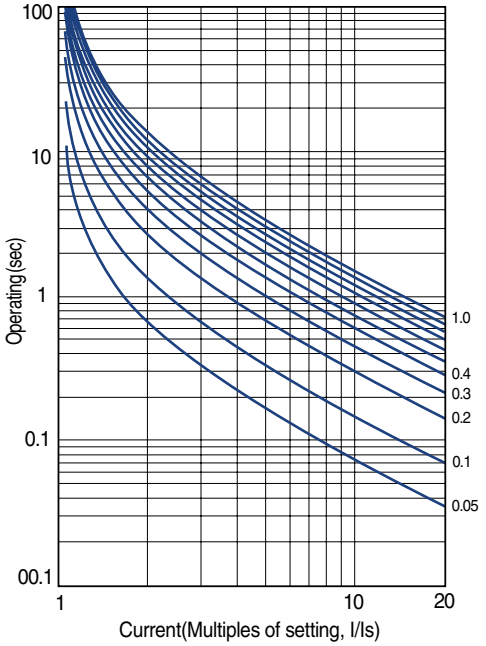
Standard inverse - (OCR, OCGR, OVGR)

Standard inverse time (SI)



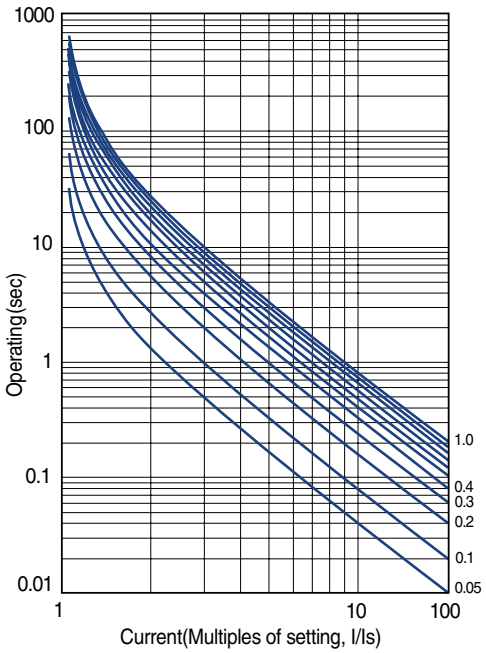
Very inverse - (OCR, OCGR, OVGR)

Very inverse time (VI)



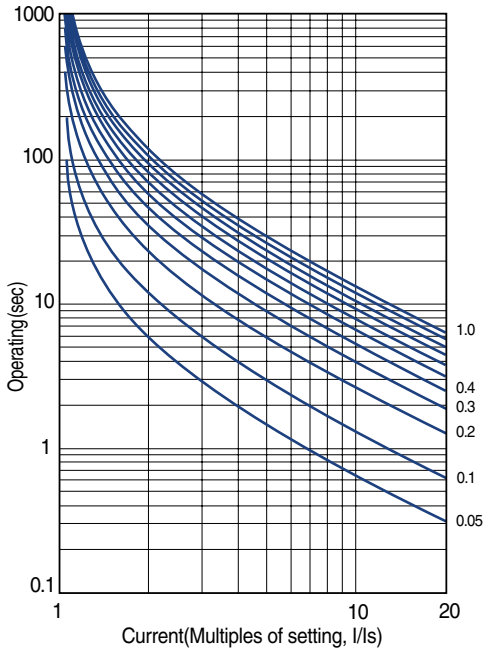
Extremely inverse - (OCR, OCGR, OVGR)

Extremely inverse time (EI)



Long inverse - (OCR, OCGR, OVGR)

Long inverse time (LI)

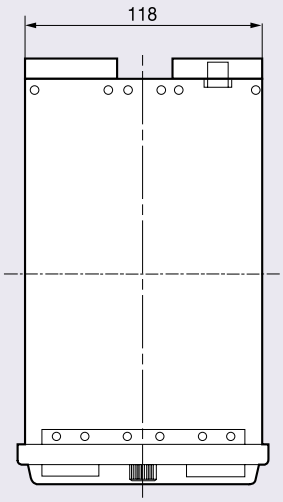


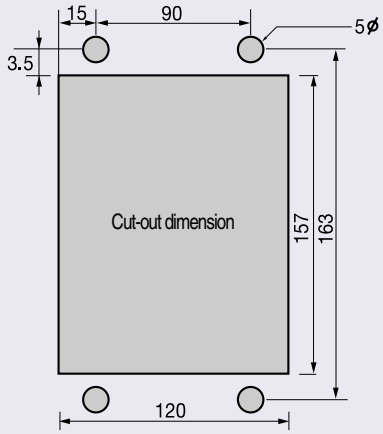
■ Operating time : $t(sec) = \frac{\beta}{\left(\frac{I}{Is}\right)^{\alpha}-1} \times Tap$

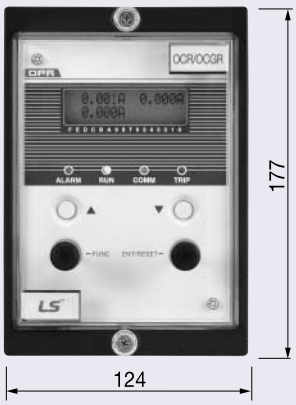
(Tap : 0.05~1.0)

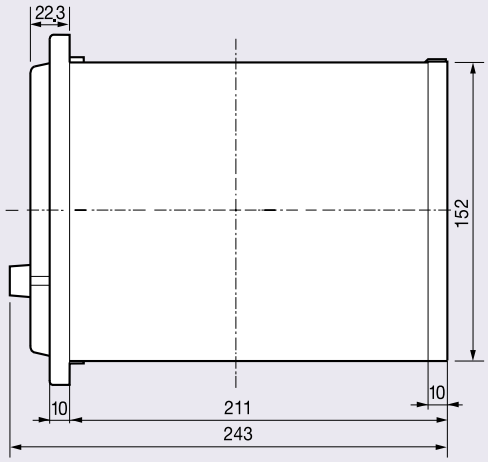
- SI : $\alpha = 0.02$ $\beta = 0.14$
- VI : $\alpha = 1$ $\beta = 13.5$
- EI : $\alpha = 2$ $\beta = 80$
- LI : $\alpha = 1$ $\beta = 120$

Dimensions









Ordering

DPR - **0** **1** **1**

Protection element	
0	OCR
1	OCG/OCGR
2	SGR
3	OVR(UVR) Note 1)
4	OVR/UVR
5	OVGR

Control voltage	
1	DC 110/125/220V

Communication	
1	I-NET

Note) DPR-311 is available for selectable use for OVR or UVR and DPR-411 is multi-relay with OVR and UVR