

DEESYS[®]

Digital Over Current Relay with Reclosing



DIPR-K210 / DIPR-K211



Digital Intelligent Protective Relay
- Over Current Relay with Reclosing

- ◆ DIGITAL fully calculated 3-phase overcurrent, ground fault overcurrent, load unbalance, OLTC Includes BLOCKING, and reclosing elements.
- ◆ It is possible to select and use each necessary relay element by 'ENABLE'.
- ◆ Logic can be configured with a simple PLC program for input/output contacts, so it can be applied to various sequences and easily configured according to the user's specific use.
- ◆ Various monitoring and measurement functions are supported, and 512 events, 12 X 60 cycles of fault and maximum waveform data can be saved, making accident analysis easier. Also, the self-diagnosis function is performed during operation, and an alarm is output when an error occurs.
- ◆ Through the operating program for the PC interface, you can set and monitor all protection elements and set and check various functions supported by the product.

Ratings

Input Current	Rating	AC 5A
	Overload capacity	Continuous 10A, 20times Current 2sec, 40times current 1sec
Frequency	Input Burden	Less than 0.3 VA / PHASE
	Input Frequency	60Hz
Control Power	Rated Input	AC/DC 110~220V (Free Voltage)
	Output Burden	50VA
Contact Capacity	Output contact	TRIP#1 ~ ALARM#D (1a x 11ea, 1b x 2ea)
	Rated Voltage	AC 250V, DC 125V
	Continuous current capacity	16A / AC 250V
	0.5 second closing capacity	30A / DC 125V
	Opening capacity	DC 125V, 30W, time constant 25ms, 1A
Comm.	Material	AgCdO
	Protocol	MODBUS
	RS-485	1 port
Applicable Standard	RS-232C	38,400bps, univ. RS-232C CROSS CABLE
	KEPCO standard	OC Relay : ES-5945-0001 Reclosing OC Relay : ES-5945-0002
Use Environment	Normal Use Status	Ambient Temp. : -10°C ~ +55°C Relative humidity : daily 30% ~ 80% Sea level : Lower than 1,000m
Size (W × H × D : mm)	-	161.5×223×204.9mm
Weight	-	5.3 kg

Relay Specification Overview

- ▶ 50/51 x 3, 50N/51N, 46, 50B, 79 configurations
- ▶ Real-time storage of information such as accident time in case of line failure by 512 events
- ▶ Built-in Fault Record function to save the accident waveform in case of an accident (max 12)
- ▶ Built-in two time curve functions of current type instantaneous and fixed time, KEPCO purchase standard (definite time limit, long & very inverse time, inverse time limit, very inverse time, early inverse time)
- ▶ The set value and logic configuration of the relay are permanently stored regardless of the presence or absence of control power.

Environment of use

Storing Temp. Range	-10°C ~ 55 °C
Working Temp. Range	-25 °C ~ 70 °C
Working RH Range	Daily average 30 ~ 80%
Elevation	Less than sea level 1000m
etc	A place without vibration and shock
Applicable Standard	ES-5943-0001/ES-5945-0002 IEC 60255

Case

Structure	Rectangular Recessed Drawout Type
Color	Munsell No. N1.5(Black)
Material	Steel

Instantaneous Overcurrent Element [50]

Operation	Operating current correction	1.0 ~ 80.0A (0.1A STEP)
	Operating Current Accuracy	Less than ±5% of correction value
	Operation time correction	Instantaneous (40 ~ 50ms), Definite time (0.04 ~ 10s/0.01 STEP)
	Operation time precision	Definite time (±35ms), 또는 ±5%
Return	Return value	More than 95% of correction value
	Return time	Less than 40ms
	Delay time (RET-TIME)	0.00 ~ 30.00S (0.01 STEP)



DIPR-K211

This product is a digital fully operational relay manufactured according to KEPCO standard, and has built-in fault protection of 3-phase line, unbalance detection of load line (UBOCR), and re-closing element. Depending on each characteristic, KEPCO MAIN TR or 23KV It is a product with high reliability that has the function of recording, storing, and analyzing accidents as a product suitable for protection against faults in three-phase lines such as D/L.

Instantaneous Overcurrent Element [51]

Operation	Operating current correction	0.1 ~ 12.0A (0.1A STEP)
	Operating Current Accuracy	Less than ±5% of correction value
	Operating time characteristics	KNI, KVI, NI, VI, EI, LI, DT
	Operating time correction	0.1 ~ 10.0S (0.1 STEP)
	Operating Time Accuracy	Less than ±5% of correction value or ±35ms
Return	Return value	More than 95% of correction value
	Return time	Less than 100mS
	Delay time (RET-TIME)	0.00 ~ 30.00S (0.01 STEP)

Instantaneous Earth Fault Overcurrent Element [50N]

Operation	Operating current correction	1.0 ~ 40.0A (0.1A STEP)
	Operating Current Accuracy	Less than ±5% of correction value
	Operating time characteristics	Instantaneous (40 ~ 50ms), Definite time (0.04 ~ 10s/0.01 STEP)
	Operating time correction	Definite time (±35ms)
Return	Return value	More than 95% of correction value
	Return time	Less than 40ms
	Delay time (RET-TIME)	0.00 ~ 30.00S (0.01 STEP)

Instantaneous Earth Fault Overcurrent Element [51N]

Operation	Operating current correction	0.1 ~ 12.0A (0.1A STEP)
	Operating Current Accuracy	Less than ±5% of correction value
	Operating time characteristics	KNI, KVI, NI, VI, EI, LI, DT
	Operating time correction	0.1 ~ 10.0S (0.1 STEP)
	Operating Time Accuracy	Less than ±5% of correction value or ±35ms
Return	Return value	More than 95% of correction value
	Return time	Less than 100ms
	Delay time (RET-TIME)	0.00 ~ 30.00S (0.01 STEP)

Load unbalance Element [46]

Operation	Operating current correction	0.1 ~ 4.0A (0.1A STEP)
	Operating Current Accuracy	Less than ±5% of correction value
	Operating time characteristics	Instantaneous time
	Operating time correction	0.1 ~ 10.0S (0.1 STEP)
	Operating Time Accuracy	Less than ±5% of correction value or ±35ms
Return	Return value	More than 95% of correction value
	Return time	Less than 100ms
	Delay time (RET-TIME)	0.00 ~ 30.00S (0.01 STEP)

OLTC BLOCKING 요소 [50B]

Operation	Operating current correction	5.0 ~ 80.0A (0.1A STEP)
	Operating Current Accuracy	Less than ±5% of correction value
	Operating time characteristics	Instantaneous time
	Operating time correction	0.04 ~ 30.00s (0.01 STEP)
	Operating Time Accuracy	Less than ±5% of correction value or ±35ms
Return	Return value	More than 95% of correction value
	Return time	Less than 100ms
	Delay time (RET-TIME)	0.00 ~ 30.00S (0.01 STEP)

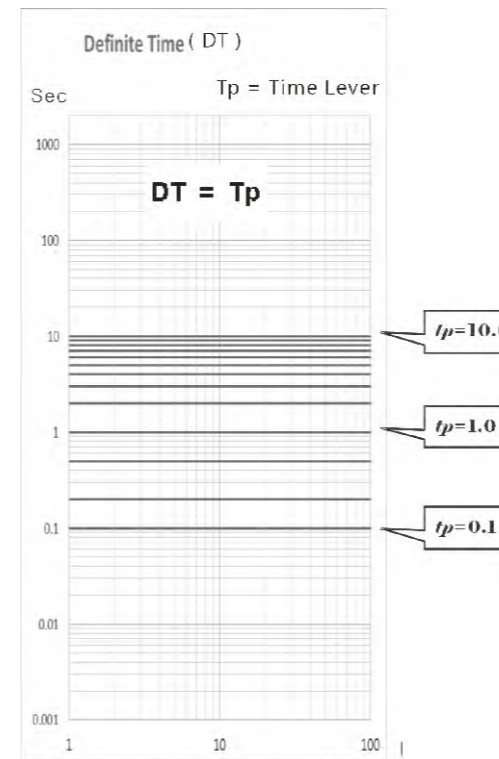
Overcurrent and Ground Fault Overcurrent Elements

Reclosing element [79]

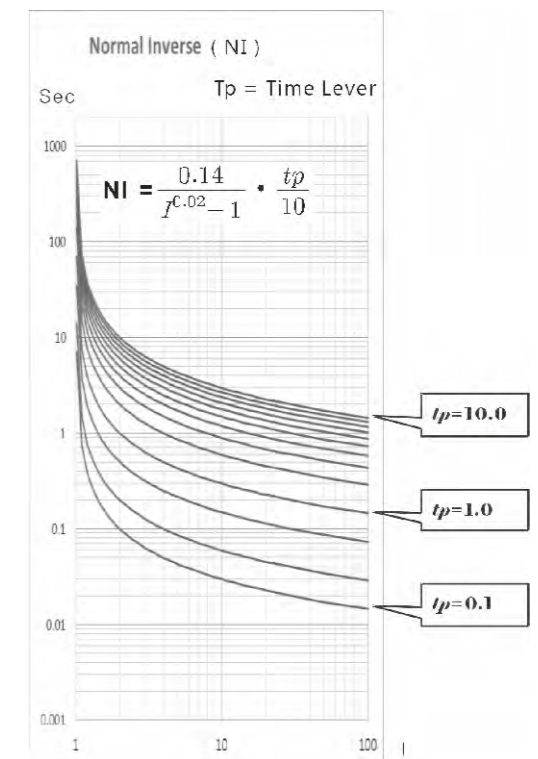
Count of reclosing element		1 ~ 3 time selectable
Instantaneous time BLOCKING		YES / NO selectable
PREPARE TIME	OP time	1 ~ 180S (1 STEP)
	Accuracy	Less than ±5% of correction value
RECLAIM TIME	OP time	1 ~ 180S (1 STEP)
	Accuracy	Less than ±5% of correction value
CLOSE PULSE SIGNAL TIME		0.1 ~ 2.0S (0.1 STEP)
DISCRIMINATION TIME		0.1 ~ 30.0 (0.1 STEP)
1 time reclosing	OP time	0.2 ~ 2.0S (0.1 STEP)
	Accuracy	Less than ±5% of correction value
2 time reclosing	OP time	0.1 ~ 30.0S (0.1 STEP)
	Accuracy	Less than ±5% of correction value
3 time reclosing	OP time	0.1 ~ 60.0S (0.1 STEP)
	Accuracy	Less than ±5% of correction value
FAIL PULSE SIGNAL TIME		1 ~ 600S (1 STEP)

Characteristic curve

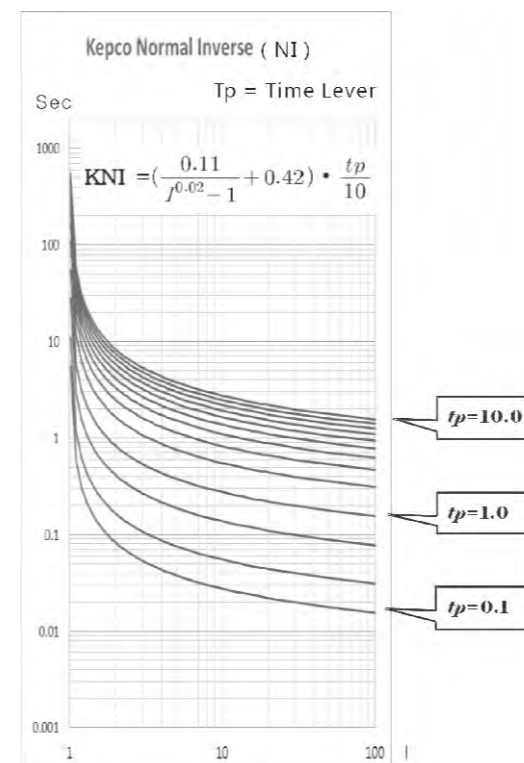
DT Curve



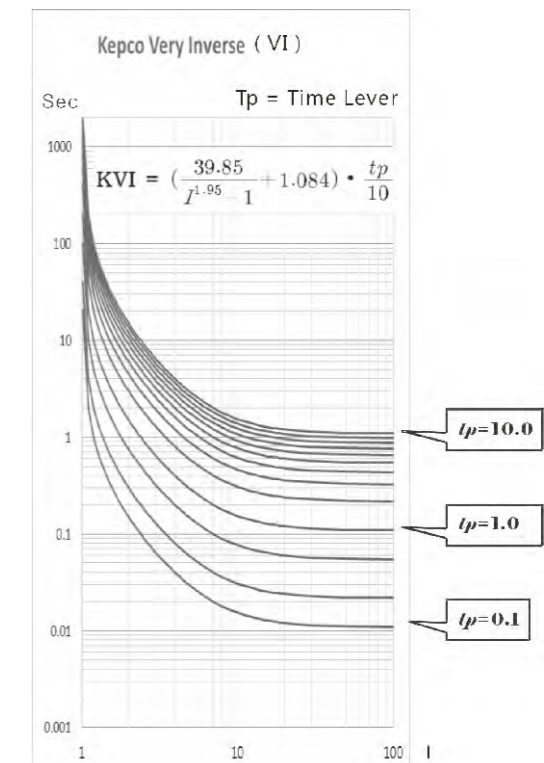
IEC NI Curve



KEPCO NI Curve



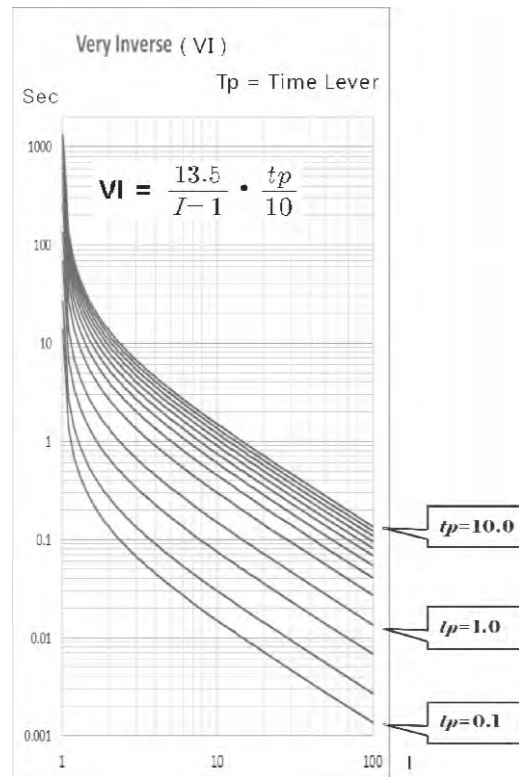
KEPCO VI Curve



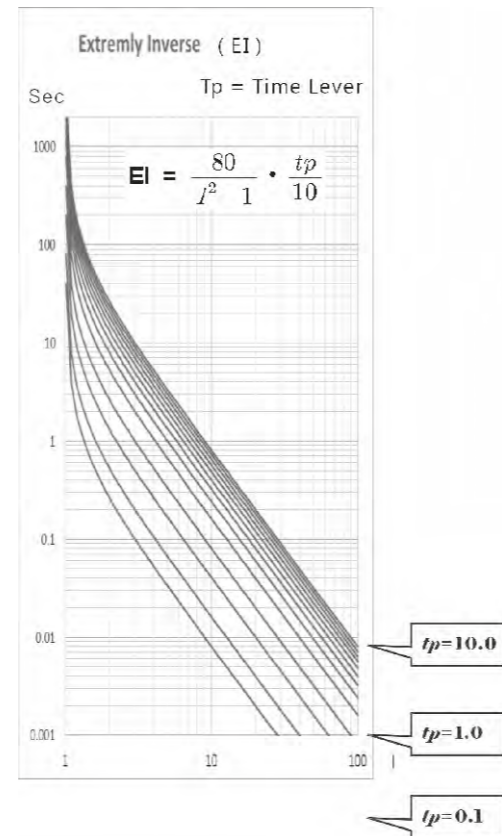
Overcurrent and Ground Fault Overcurrent Elements

Characteristic curve

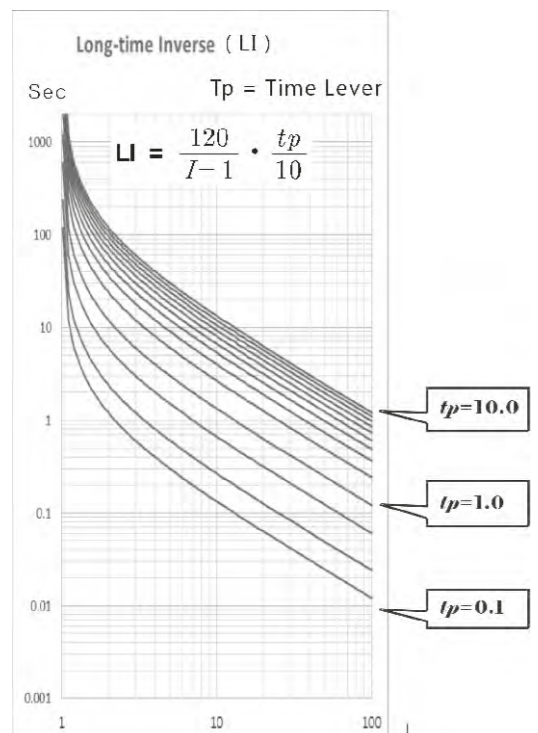
IEC VI Curve



IEC EI Curve



IEC LI Curve



24/7 Monitoring function [Self-diagnosis]

Add-on Function

DC POWER FAIL Monitoring	Without DC input
	DC input is low voltage of 83V or less
CPU & MEMORY FAIL Monitoring	CPU/ROM/RAM operation is abnormal
	CLOCK is abnormal
A/D CONVERTER FAIL Monitoring	signal line or control line is cut
	A/D CONTROL signal is abnormal
DI / DO CIRCUIT FAIL Monitoring	A/D control power is dropped over 1V
	Loss of control power
CORRECTION SETTING FAIL Monitoring	signal line or control line is cut
	set value is abnormally changed
	set value is out of the setting range

EVENT RECORDING FUNCTION

Add-on Function

EVENT Count	Up to 512 (first-in, first-out recording method)
Operation time resolution	1ms
DISPLAY	EVENT TYPE : Date and time of occurrence
EVENT TYPE	SYSTEM REBOOT
	SYSTEM FAIL EVENT
	- DI / DO CIRCUIT FAIL
	- MEMORY FAIL
	- AD CONVERTER FAIL
	- DC POWER FAIL
	- SETTING FAIL
	- SYSTEM OK
Relay Element EVENT	Reclosing Element SUCCESS / FAIL
STORAGE / DECODE	Permanent data storage even if control power is lost
	Can be read using communication operation program
	Save as COMTRADE FILE using communication operation program

FAULT Function [FAULT RECORDING]

Add-on Function	
FAULT RECORD COUNT	Up to 12 by setting (first-in, first-out recording method)
	◆ 12 Count / 1sec (12 X 60CYCLE)
	◆ 6 Count / 2sec (6 X 120CYCLE)
	◆ 3Count / 4sec (3 X 240CYCLE)
SAMPLING	36 SAMPLING / 1 CYCLE
STORE WAVEFORM DISPLAY	FAULT TYPE and occurrence status indication for each relay element
	Display fault current and operating time
	Display the current value of the remaining phases other than the accident phase at the time of the accident
	MANAGEMENT PROGRAM
	Phase shift status and harmonics, VECTOR indication
STORAGE / DECODE	Permanent data storage even if control power is lost
	Can be read using communication operation program
	Save as COMTRADE FILE using communication operation program

METERING DISPLAY FUNCTION

Add-on Function	
Phase A, B, C Current (I _a , I _b , I _c)	Display of fundamental wave current rms value for each phase
	Phase A current reference phase measurement
	Simultaneous Display of 1st and 2nd current values through CT ratio setting
	Input Current (CT) Guaranteed Range: AC 0 ~ 250A
Phase N Current (I _n)	Expression of fundamental wave current rms
	Simultaneous display of primary and secondary current values through CT ratio setting
	Input Current (CT) Guaranteed Range: AC 0 ~ 250A
Symmetrical current (I _{ps} / I _{ns})	Normal, reversed-phase, zero-phase current magnitude and phase measurement
	Primary current value displayed by converting input current into CT ratio
	Input Current (CT) Guaranteed Range: AC 0 ~ 250A
D/I (DIGITAL INPUT)	Display the item being used out of 5 D/I
Reclosing count	Reclosing operation cumulative display up to 65535
Metering accuracy	0.1CLASS

COMMUNICATION FUNCTION

Add-on Function		
RS-232C	Mounting position	1 PORT (Front of Relay)
	Purpose of use	LOCAL SETTING, EVENT and FAULT Waveform Analysis
	Transmission method	HALF - DUPLEX
	Communication speed	RS-232C
	Communication line	Universal RS-232C CROSS CABLE
RS-485	Back	1port

DIGITAL INPUT CONTACT SETTING [D/I]

Add-on Function	
D/I 1	REMOTE RESET
D/I 2	INSTANTANEOUS TRIP BLOCKING
D/I 3	CIRCUIT BREAKER STATUS (52-b)
D/I 4	Reclosing ON / OFF SWITCH (43RC)
D/I 5	GAS PRESSURE STATUS (63P)

Overcurrent/Ground Fault Overcurrent Protection (50/51, 50N/51N)

The overcurrent/ground fault overcurrent protection element can be obtained independently from two instantaneous/definite-time elements and one inverse-time element.

The instantaneous/definite-time element has a minimum operating time of 40mS or less and is configured to be supported by the inverse-time element, so three-step protection characteristics can be implemented.

The input current of the earth fault overcurrent protection element is the residual circuit connection of the earth fault protection CT or 3-phase CT, and the characteristic curve is IEC 4 types, IEEE/ANSI 7 types, and KEPCO 3 types.

Load unbalance protection (46)

The load unbalance function is 154kV MAIN TR. This is a zero-phase current detection method in which the load of 23kV D/L on the secondary side of the

In order to detect current imbalance, it is an alarm function to notify when the current waveform entering the N-phase CT of the relay is formed.

OLTC BLOCKING (50B)

OLTC BLOCKING function is a function to block OLTC (ON LOAD TAP CHANGER) to prevent damage caused by ARC occurring during the transformer tap changer process when the secondary side 23kV D/L of the 154kV main TR fails.

This relay has a current setting value of 5~80A, and the operating time characteristic basically has an instantaneous characteristic (=30mS). Also, it is possible to change the TRIP blocking signal transmission time of 0.03~20.s by setting the time limit function.

Reclosing Characteristics (79)

The reclosing element operates based on three phases, and has a built-in function to block the secondary side OLDC (ON LOAD TAP CHANGER) of the MAIN TR, and the function can be turned OFF if necessary. In addition, even if the reclosing element FAIL operates, it maintains the normal operation as it does not have any effect on the overcurrent and ground fault overcurrent elements.

[DIPR-K210] Terminal Configuration

CT _INPUT	1	14	A	TRIP#1	27	40	TOC + TOCG
CT -INPUT	2	15	B	TRIP#2	28	41	IOC + IOCG
CT -INPUT	3	16	C	TRIP#3	29	42	PROTO_OR
CT -INPUT	4	17	N	TRIP#4	30	43	PROTO_OR
DI#1	5	18	Remote Reset	ALARM#1	31	44	PROTO_OR
DI#2	6	19	Inst Blocking	ALARM#2	32	45	PROTO_OR
	7	20		ALARM#3	33	46	IOC_OR
	8	21		ALARM#4	34	47	TOC_OR
	9	22		ALARM#5	35	48	IOCG
	10	23		ALARM#6	36	49	TOCG
ALARM#8	11	24	50B_OR (b)	ALARM#7	37	50	UBOC
ALARM#9	12	25	Sys Error (b)	FG	38	51	DC (+)
통신 (+)	13	26	통신 (-)	FG	39	52	DC (-)

[DIPR-K211] Terminal Configuration

CT-INPUT	1	14	A	TRIP#1	27	40	TOC + TOCG
CT-INPUT	2	15	B	TRIP#2	28	41	IOC + IOCG
CT-INPUT	3	16	C	TRIP#3	29	42	PROTO_OR
CT-INPUT	4	17	N	TRIP#4	30	43	CB_CLOSE
DI#1	5	18	Remote Reset	ALARM#1	31	44	50B_OR (a)
DI#2	6	19	Inst Blocking	ALARM#2	32	45	79F
DI#3	7	20	52-b	ALARM#3	33	46	IOC_OR
DI#4	8	21	43RC	ALARM#4	34	47	TOC_OR
DI#5	9	22	63P	ALARM#5	35	48	IOCG
	10	23		ALARM#6	36	49	TOCG
ALARM#8	11	24	50B_OR (b)	ALARM#7	37	50	UBOC
ALARM#9	12	25	Sys Error (b)	FG	38	51	DC (+)
통신 (+)	13	26	통신 (-)	FG	39	52	DC (-)

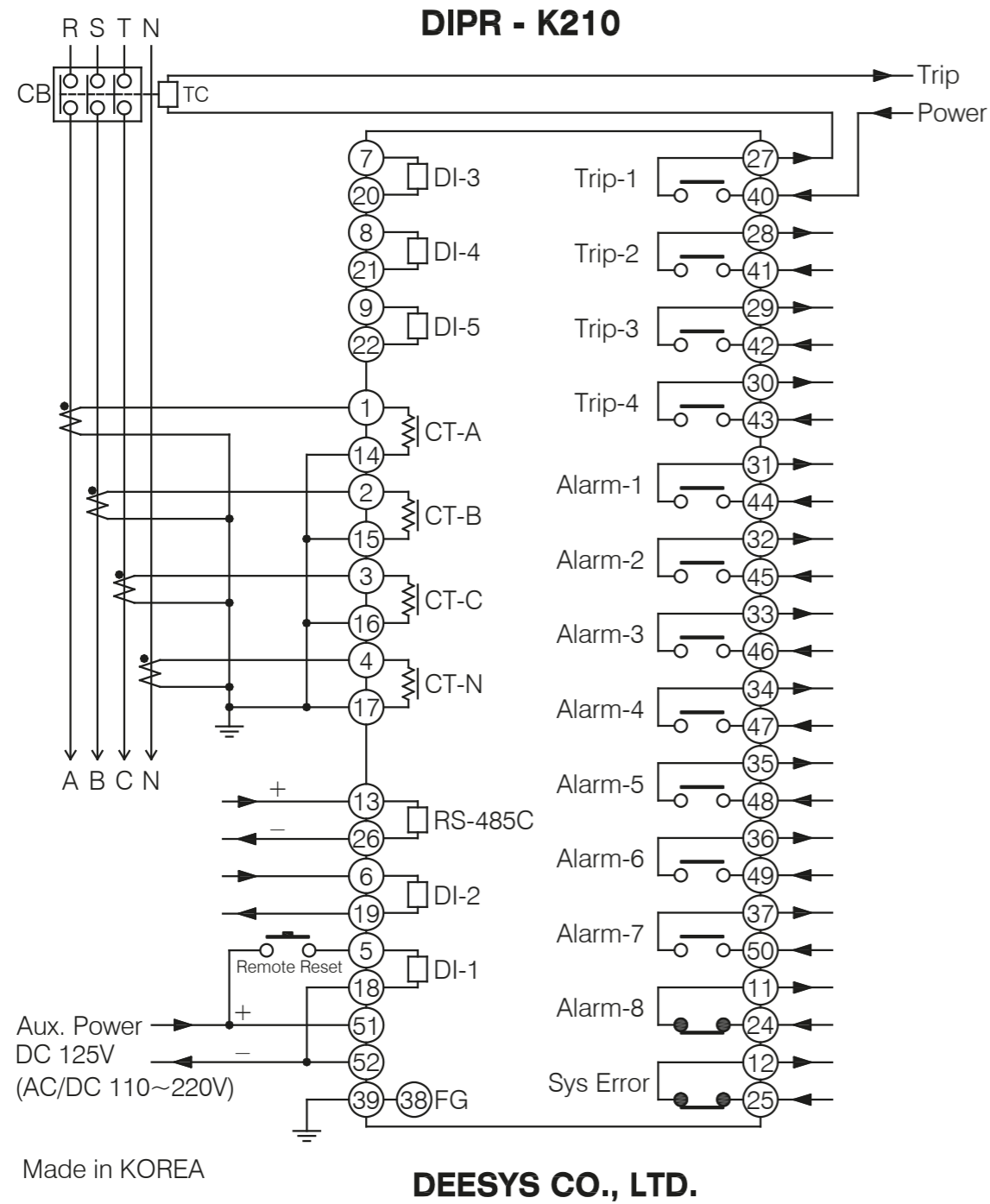
Digital Input Setting (D/I)

Input Contact				Condition of Input	Description of Setting Condition
DI#1	5	18	REMOTE RESET	7	DI (1) Input : Return Relay- REMOTE RESET SWITCH
DI#2	6	19	TRIP BLOCKING	Trip Blocking	DI (2) Input : Block Reclosing instantaneous operation
D#3	7	20	52-b	52-b	DI (3) Input : 52 b contact of CB status CHECK
DI#4	8	21	43RC	43RC	DI (4) Input : Reclosing ON / OFF SWITCH
DI#5	9	22	63P	43RC	DI (5) Input : 63 P contact of CB GAS pressure CHECK

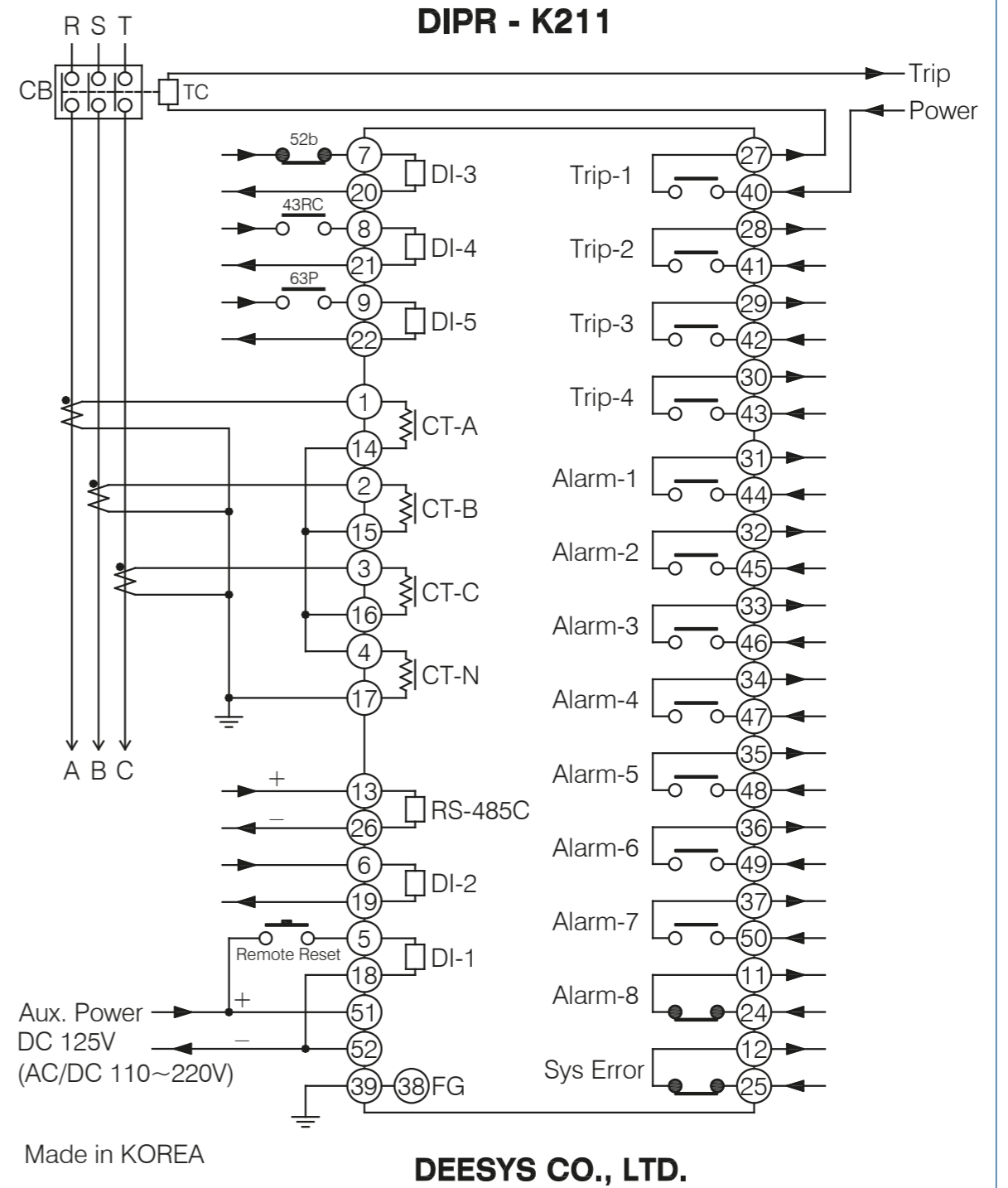
Terminal Descriptions

			OFF	Not Available
TRIP#1	2 7	4 0	TOC+TOCG	PROTO_OR SYSTEM ERROR OUTPUT OUTPUT If any one of all relay operations operates
TRIP#2	2 8	4 1	IOC+IOCG	IOC_OR OUTPUT If any one of all over-current instantaneous operates
TRIP#3	2 9	4 2	PROTO_OR	IOC_A OUTPUT If over-current instantaneous time in A phase operates
TRIP#4	3 0	4 3	CB_CLOSE	IOC_B OUTPUT If over-current instantaneous time in B phase operates
ALARM #1	3 1	4 4	50B_OR(a)	IOC_C OUTPUT If over-current instantaneous time in C phase operates
ALARM #2	3 2	4 5	79F	TOC_OR OUTPUT If any one of all over-current inverse time operates
ALARM #3	3 3	4 6	IOC_OR	TOC_A OUTPUT If over-current inverse time in A phase operates
ALARM #4	3 4	4 7	TOC_OR	TOC_B OUTPUT If over-current inverse time in B phase operates
ALARM #5	3 5	4 8	IOCG	TOC_C OUTPUT If over-current inverse time in C phase operates
ALARM #6	3 6	4 9	TOCG	IOCG OUTPUT If ground fault over-current instantaneous time operates
ALARM #7	3 7	4 0	UBOC	TOCG OUTPUT If ground fault over-current inverse time operates
ALARM #8	1 1	2 4	50B_OR (b)	IT_OC_A_OR OUTPUT If A phase of over-current instantaneous or inverse time operates
ALARM #9	1 2	2 5	SYS ERROR	IT_OC_B_OR OUTPUT If B phase of over-current instantaneous or inverse time operates
				IT_OC_C_OR OUTPUT If C phase of over-current instantaneous or inverse time operates
				IOC+TOC OUTPUT If any over-current instantaneous or inverse time operates
				IOC+IOCG OUTPUT If any over-current or Ground instantaneous operates
				IOC+TOCG OUTPUT If any over-current instantaneous or Ground inverse operates
				TOC+IOCG OUTPUT If any over-current inverse or Ground instantaneous operates
				TOC+TOCG OUTPUT If any over-current inverse or Ground inverse operates
				IOCG+TOCG OUTPUT If any over-current or Ground instantaneous operates
				50B_OR OUTPUT If 50B operates
				50B_A OUTPUT If 50B A phase operates
				50B_B OUTPUT If 50B B phase operates
				50B_C OUTPUT If 50B C phase operates
				UBOC OUTPUT If UBOCR operates
				79_RDY OUTPUT After Reclosing prepare time, operation ready
				79_START OUTPUT during started Reclosing and reclaim time
				79_FAIL OUTPUT when reclosing fail, during the FAIL PULSE
				CB_CLOSE OUTPUT every Reclosing operations during CB CLOSE PULSE

[DIPR-K210] External wiring diagram



[DIPR-K211] External wiring diagram



OUTPUT Configuration

Condition of Output	Relay elements Output	
1	PROTO_OR	50 + 51 + 50N + 51N (All relay element)
2	SYS_ERR	SYSTEM FAIL
3	OFF	NONE
4	UBOC	UBOCR
5	50B_C	50B (OLTC BLOCKING C Phase)
6	50B_B	50B (OLTC BLOCKING B Phase)
7	50B_A	50B (OLTC BLOCKING A Phase)
8	50B_OR	50B (OLTC BLOCKING A, B, C Phase)
9	IOCG + TOCG	50N + 51N (Ground OC N Phase instantaneous + Ground OC inverse)
10	TOC + TOCG	51 + 51N (OC A,B,C Phase Inverse + Ground OC inverse)
11	TOC + IOCG	51 + 50N (OC A,B,C Phase Inverse + Ground OC inverse)
12	IOC + TOCG	50 + 50N (OC A,B,C Phase instantaneous + Ground OC inverse)
13	IOC + IOCG	50 + 50N (OC A,B,C Phase instantaneous + Ground OC instantaneous)
14	IOC + TOC	50 + 50 (OC A,B,C Phase instantaneous + OC inverse)
15	IT_OC_C_OR	50-C + 51-C (OC C Phase instantaneous, inverse)
16	IT_OC_B_OR	50-B + 51-B (OC B Phase instantaneous, inverse)
17	IT_OC_A_OR	50-A + 51-A (OC A Phase instantaneous, inverse)
18	TOCG	51N (Ground OC N Phase inverse)
19	IOCG	50N (Ground OC N Phase instantaneous)
20	TOC_C	51- C (OC C Phase inverse)
21	TOC_B	51- B (OC B Phase inverse)
22	TOC_A	51- A (OC A Phase inverse)
23	TOC_OR	51 (OC A,B,C Phase inverse)
24	IOC_C	51- C (OC C Phase instantaneous)
25	IOC_B	51- B (OC B Phase instantaneous)
26	IOC_A	51- A (OC A Phase instantaneous)
27	IOC_OR	50 (OC A,B,C Phase instantaneous)
28	79_RDY	RECLOSING READY
29	79_START	RECLOSING START
30	79_FAIL	RECLOSING FAIL
31	79_CB_CLOSE	CB - CLOSE

Dimensions

