

**Multi-function Motor Protection Relay with
Insulation Resistance/PI Measurement
< DSP-VIP-RTM-FASCIO/RTMZ-PT3 >
<Modified FASCIO/2015>
<Polarized Index>**



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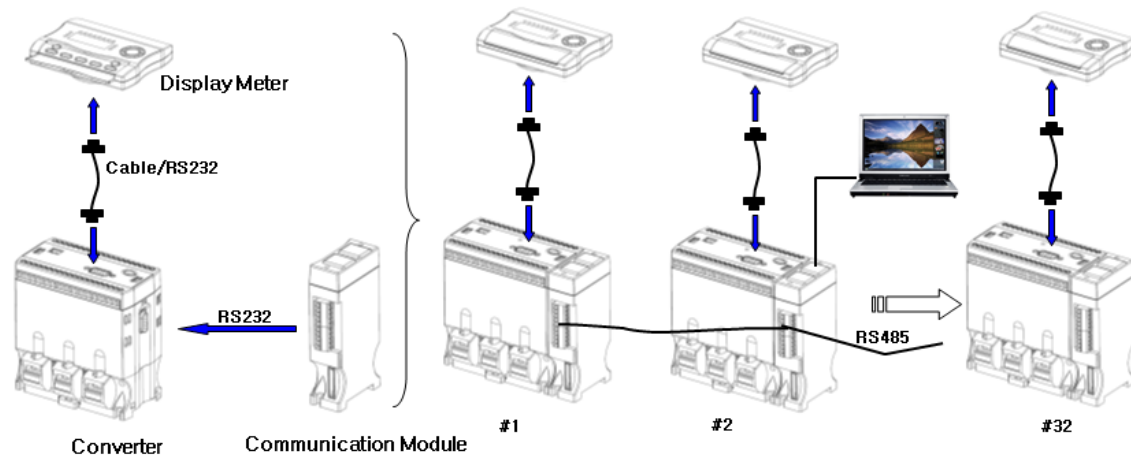
Content

- 1. System Construction**
- 2 Main Feature**
- 3. Specialized Point**
- 4. Function List**
- 5. Technical Specification**
- 6. Self-diagnosis Display Indication**
- 7. Input-Output Terminal**
- 8. Presetting Description**
- 9. Order of MODE**
- 10. Display Window Image**
- 11. Control Key Operation**
- 1. Trip Indication**
- 13. Current range table matched with external CT**
- 14. Time-Current Characteristics**
- 15. Rotated Indication**
- 16. Time based Trip Relay Output**
- 17. Application Sequence Diagram**
- 18. Example for Applied Communication**
- 19. PC Operation Program/”Samdsp^R”**
- 20. Dimension**
- 21. Order Form**
- 22. Guide for user**

Multifunction Motor Protection Relay with Insulation Resistance/PI Measurement

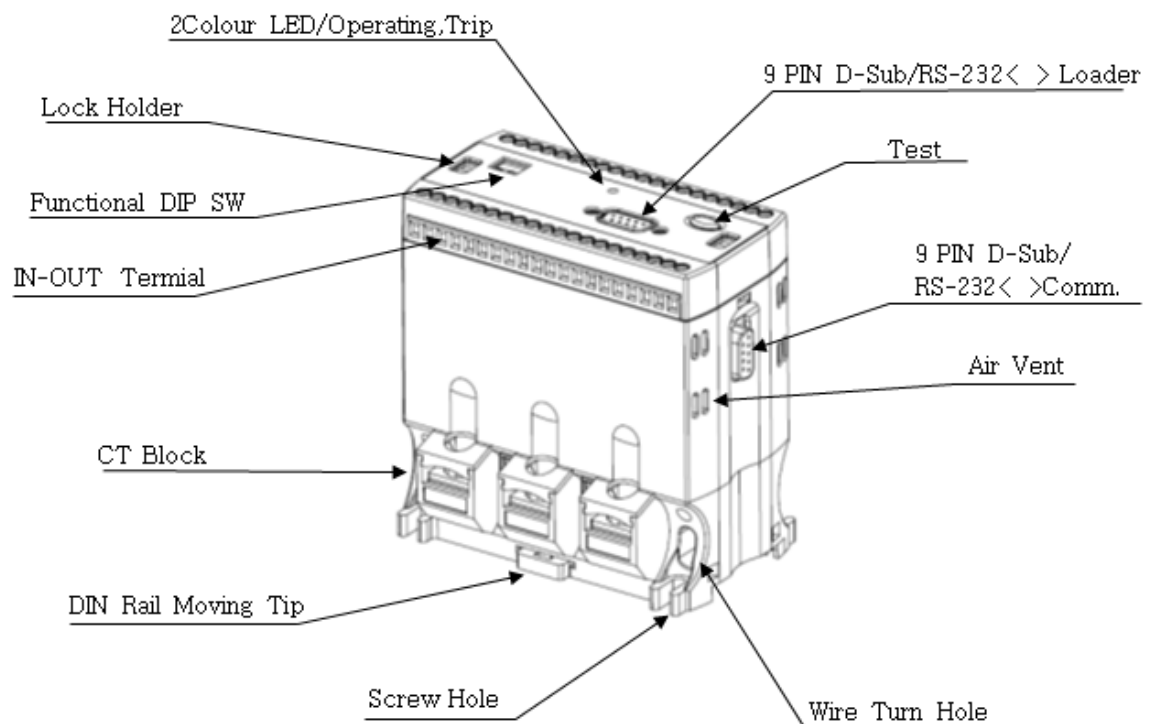
During Working:Protection Relay ,During Stopping:Resistance Measurement

1.System Construction

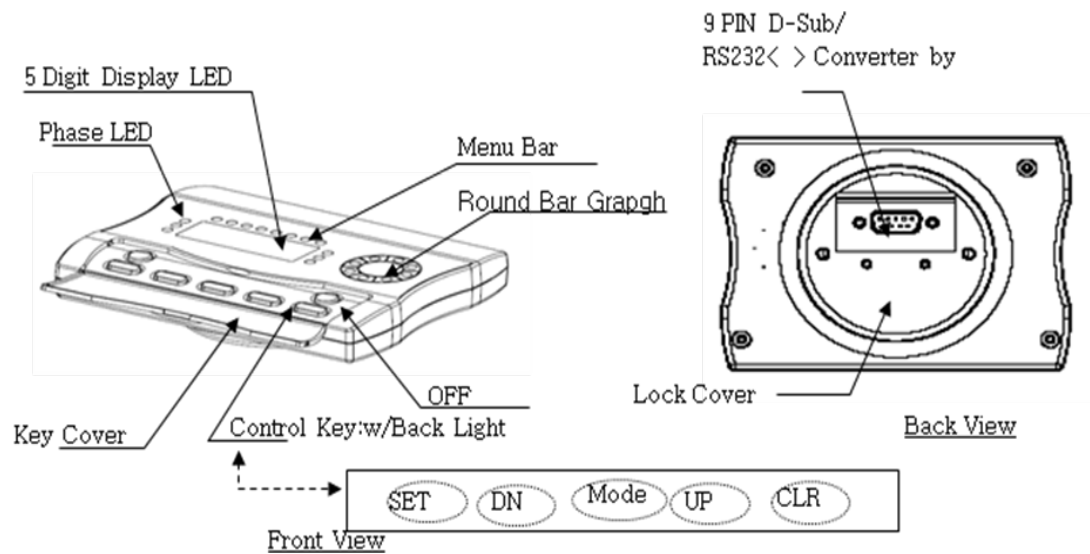


Detailed Structure

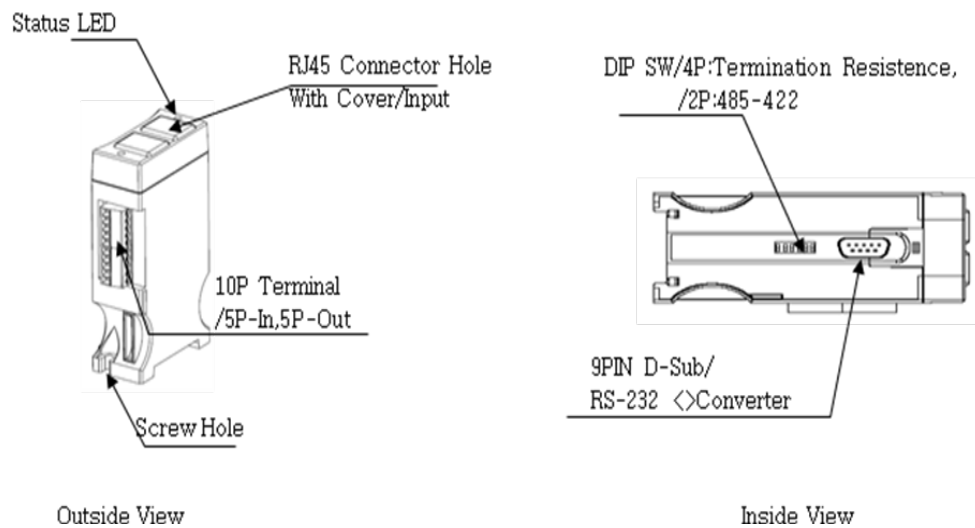
○ Converter



○ Display Meter



○ Communication Module



2. Main Feature

❑ Easy Handling

- ▶ To give a guarantee to exclusive operator : Password Input
- ▶ To realize convenient and various data input
 - Display Meter
- ▶ Main/Sub/Cab Menu: three divided menu groups according to usage and the frequency of data input
 - Main menu: Data input frequency is rather higher
 - Sub menu: Ratherly common application for all kind rating of motor
 - Cab menu (calibration menu): adjustable for indicating value within narrow range (+/- 12.7%) / This menu is appeared when "SET" key is pressed for 5 sec or more and disappeared right after pressing again.
- ▶ Alarm before trip : adjustable for 65~100% to "OC"
- ▶ ON-OFF switch in display meter to save a wiring, a space and a labor cost inside panel
- ▶ Convenient installation : possible to match with both 65 Phi a round hole and a rectangular hole.
- ▶ To indicate a number of main contactor ON-OFF : to contribute to check a replacing term and an effective maintenance schedule.
- ▶ To keep a stable operation under the frequency variation of Inverter: 1Hz ~ 400Hz
- ▶ To call a preset default value in the factory : firstly make a press "RESET" button on the converter before power-on, then keeping a pressing state for 3 sec after power-on. ,

❑ Line Insulation Resistance Measurement Function : Motor Stopping State

- ▶ Not available for this Line insulation resistance measurement in case "PI" is preset in "Usage" mode of "CAB" mode group
- ▶ How to check motor stop state : followed condition must be satisfied at same time
 - To keep close state of P1-P2 from Aux output for open state(b) of Contactor : **this is critical safety condition** for this product to have a normal measurement function
 - To keep close state of M1-M2 from output for open state(b) of MCCB
 - Any current greater than 0.2A is not sensed by converter
 - Logic input #1 keeps low state (zero voltage)
- ▶ Initial indication state after the control power is ON

Prior to do the first measurement by the preset time in "1st" mode (minimum time : 6 sec), the initial indication state is appeared as followed :

1) In case ZCT and/or PT-100 is not connected

LOP → t1-no (temperature sensor PT100 is not connected : hence next procedure can not be done forwardly if there is preset value in "pt" mode, otherwise it can go on if "pt" mode is preset by "OFF" or making short for input) → Ec-ct (ZCT is not connected: hence, next procedure can not be done forwardly if there is preset value in "Ec" mode, otherwise it can go on if "Ec" mode is preset by "OFF" or making short for input) → Firmware Version → the latest measured insulation resistance value → Stnby (this means first measurement is done) → position to command ON-OFF (one of LOP/MCC/rcs) → Stanby → alternatively shown [the latest measured resistance value - present measured temperature (in case "temP" is preset by "rota" mode) - control command position] → actually entering into measurement action

- 2) In case ZCT and/or is connected(included embeded zct type)
 LOP→t1-no(if temperature sensor PT100 is not connected, hence next procedure can not go on forwardly if there is preset value in “pt” mode, otherwise it can go on if “pt” mode is preset by “OFF” or making short for input) → Firmware Version → the the latest measured insulation resistance value → Stanby(first measurement is done)→position to command ON- OFF (one of LOP/MCC/rcs)→Stanby→ alternatively shown [the latest measured resistance value-present measured temperature (in case “tEmP” is preset by "rota" mode)-control command position] → actually entering into measurement action

❑ PI(Polarization Index) Measurement Function : Motor Stopping State

- ▶ Not available for calculating PI value in case “LINE” is preset in “Usage” mode of “CAB” mode group
- ▶ This measurement is possible only in case “PI” is preset in “USAGE” mode
- ▶ PI : the ratio of the 10 minitue insulation resistance value(IR10) to the 1 minitue resistance value(IR1) : IR_{10} / IR_1
- ▶ The measuring action is done as pressing “MODE” for 3sec under keeping pressed “DN” at first and PI value is shown after the measurement job is finished
- ▶ Indicated PI value is cooperated with the round bar LED. The first LED(65) is turned on related with PI value,then second LED(70) for IR_1 and third LED(75) for IR_{10} according to press “DN” key
- ▶ The measured resistance value for calculating PI value is understood as followed → the result is not meaningful if the measured value for insulation resistance is under 1 MOhm, consequently “no-PI” is shown after the measurement is completed
- ▶ The measured value is shown as flickering in every 5 sec interval during a measurement
- ▶ The maximum value is 5 even though the actual calculation is greater than 5
- ▶ The operator is able to stop PI measurement process as pressing both “mode” & “UP” in the same time or make control power off while the process is going on.

❑ Critical Preset Mode to have measurement function : 1st measurement time, interval time , a number of the measurement, alarm level,manual/auto and Usage for the measurement.

Preset		Description
Mode	Mode group	
IrAL	Sub	*to preset alarm level for “Ir”
rECOd		*to preset the measuring interval time after 1 st measurement is done → to measure line : 0.1 min~3000 min → to mesure PI value : this mode is not available / only by manual process *This mode is available in case Auto is preset in “Class” mode *If the motor is running after the preset time is elapsed, the 1 st measurement is done with 6sec to the followed motor stop.
rE-nb		*to preset the number of allowable measurement in case Auto is preset in “Class” mode. *the reset by power-off or “pressing SET key” must be done if

		the operator wants to renew this number of allowable measurement , otherwise the measurement is not done until the reset is done after the measuring action by preset time has done
rota		*to decide if the latest measured insulation resistance value is displayed in the orderly rotated indication or not.
Auo		*to decide if alarm output comes through AUX output in case the measured value is under the preset value or not as preseting “Ir” in “Auo” mode
USAGE/ LINE/PI	CAB	*to measure line insulance resistance(IR) or PI (Polarization Index) * ”LINE” →possible to measure line insulance resistance →not possible to calculate PI value * “PI” → to calculate PI value → not possible to measure line insulance resistance
CLASS/ OFF/MAN/ AUTO		*to decide a method how to execute the actual measurement : OFF/MAN/AUTO :available only for “LINE” of “USAGE” mode *OFF : not use the measurement function *MAN →the measurement is done whenever “Mode” key is pressed for 1sec under pressed state for “DN” key at first *AUTO →the measurement is done according to a conditions for first measuring time and next measuring interval time which is preset in each mode
1ST		*to preset the first measurement time from the instant that the control power is loaded. *0.1 min(6sec)~3000 min *this mode is available only for AUTO in “Class” mode

► Useful management for “Class” mode & “1st” mode

1)In case it is entered into "Auto" mode, "Stnby" is appeared and start to measure a resistance for 2 sec → shown measured value → continuously, next measurement is done by the number of allowable measurement and the measurement interval time
→shown a measured value of every meaurement (on the way of the measurement, the command position for ON-OFF is shown between first “Stnby” and next second “Stanby”// “Stanby” means “just to start to measure”) → the measured value and the control command position is shown alternatively after next second measurement

2)In case the motor has been kept the stopping state as the control power is ON : the latest measured value and the control command position for ON-OFF(one of LOP/mCC /PC/rcs) is shown alternatively before showing “Stnby” to do the first measurement action → first measuring action for 2 sec after showing “Stnby” → the measurement is done and shown a measured value according to measurement interval time and the number of allowable measurement(the command position for ON-OFF , measured value and the present temperature are shown between previous “Stnby” and next “Stnby”

3)The reset by power-off or “pressing SET key” must be done if the operator wants to

renew this number of allowable measurement , otherwise the measurement is not executed until the reset is done after the measuring action by preset times has finished.

- ▶ How to make a command for the measurement in motor stop state whenever the operator wants.
 - 1)It is possible by pressing “Mode” key for 1 sec under pressed state for “DN” key as preset “MAN” in “Class” mode
- ▶ In case the control power is ON newly
 - 1)If temperature sensor PT100 or ZCT is not connected , "t1-no"or "Ec-ct" is appeared and the managing action can not go on forwardly
 - 2)To go on next procedure, the operator has to preset “OFF” in each mode(“pt” mode, “Ec” mode) or to make a short circuit between input terminal of each part.
- ▶ How to indicate a measured line insulation resistance or PI Value
 - 1)Line insulation resistance
 - The latest measured value among 8 events is indicated while a motor stops ,also the rest of 7 events can be checked by pressing "UP,"DN" key as matched with the number of turned-on LED in round bar graph position ,finally "None" is appeared if there is no more measurement result.
 - "Ir-Ps" is appeared in case the value greater than 3000MOhm is measured, it means a line state is normal / nevertheless, need to check the disconnection of line to input, "L-E ", and/or the opening between M1-M2
 - "Ir-0.0" is flickering in case the measured value is zero or under 50 KOhm
 - 2)PI Value
 - Possible to check latest value as entering into “PI” of “USAGE” mode
 - The latest measured value among 8 events is indicated while a motor stops ,also the rest of 7 events can be checked by pressing "UP,"DN" key
- ▶ Execution for motor not to start in the followed case :
 - 1)The latest measured value is lower than preset value
 - the measured value is flickeing
 - enter into "IrAL" mode in order to start motor as pressing "SET" key,then preset "OFF" or lower level than the latest value
 - 2) the opening state between P1-P2(to be connected with Aux output "b" from main contactor)
 - "OPEn" is flickering / operator needs to make a proper connection
 - **This is strongly a critical condition to operate this product safely**
 - 3)Opening state between M1 and M2(to be connected by MCCB)
 - "Ir-Ps" is appeared , but Motor start is possible
 - to clear this indication, the operator needs to connect "b" output from MCCB with M1-M2 each or make short state intentionally between M1 and M2
- ▶ Alarm for a measured resistance value

This alarm output is possible to do through aux output(07-08-10) in case “Ir” is preset in “Au-o” mode

❑ Multi-complexed Protection Function

- ▶ Multi-complexed protection relay based on current, temperature and insulation resistance
- ▶ To indicate RMS value for current : RMS chip adopted in every input to contribute to check an exact condition of the motor
- ▶ To provide actual meter function : current, temperature, insulation tester, PI checker
 - Current Meter : high precision
 - Insulation resistance meter → "LINE" is preset in "Usage" mode of "CAB" mode group : 0.1 MOhm~500 MOhm/500VDC
 - PI Checker → "PI" is preset in "Usage" mode of "CAB" mode group : 1 MOhm~2000 MOhm/500VDC
 - Temperature Meter (Pt100): 3 input channel / 0°C ~ 150°C
 - Auto Range: to indicate decimal point in conjunction with "K" LED in Display Meter
- ▶ To cover a wide current range
 - 70 Type: 0.2A ~ 70A or 0.2A~6A with an external CT ("5t" must be selected in "cto" mode)
 - With external CT : 1A~3600A
- ▶ To Indicate a necessary information in every 3 sec
 - Rotating indication for basic factor : 3 phase current, GR current / "OFF" must be preset in "rota" mode
 - Additional indication above basic factor : Basic Factor + Temp, AWT (Accumulated Working Time) / "ON" must be preset in "rota" mode
 - Possible to fix one of circulated factor or to release: one touch for CLR Key
 - To show load factor (actual/preset) / 65% ~ 100%
- ▶ Wide range with high sensitivity for ground fault protection: 30mA ~ 10A
 - Need to use shield wire for connection between ZCT and Z1, Z2 terminal of the converter
 - Alarm for disconnection with ZCT : the preset process is not ahead anymore as flickering "Ec-ct" in case ZCT is not connected with Z1, Z2 of the converter in motor stopping state after the control power is on → preset "Off" in "Ec" mode to clear alarm.
- ▶ To realize Ground fault protection in any necessary time: 0.05sec/instant, 0.1~30sec/Def T-I, inv T-I
- ▶ To be acceptable for various rating of ZCT
 - 200/1.5mA or 200/100mV : selectable in DIP SW
 - Optional type: ZCT embed internally
- ▶ To protect an arised temperature of the case, winding of motor : sensed by PT100

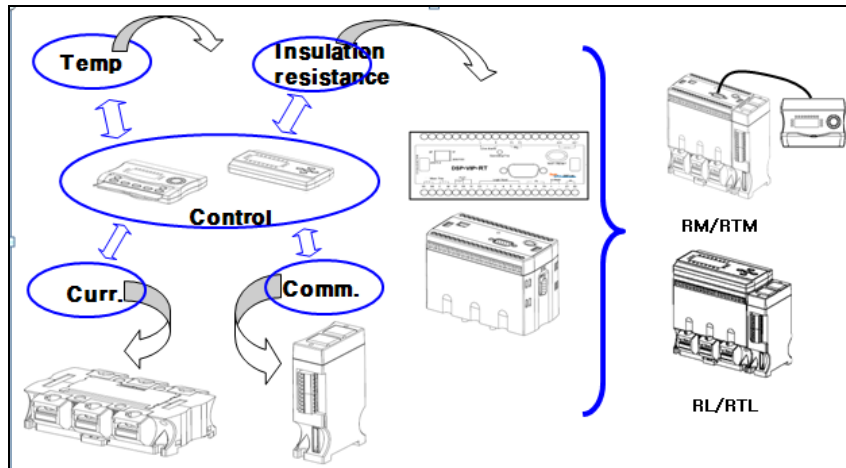
- ▶ Various and multiple output : Main and Aux trip output
 - C1-M(1a) : close/co-worked with logic input,open/trip with main trip
 - Main trip(1a) : 97-98
 - AUX(1a)/07-08:acts same as main trip or one of Ec/Uc/Shoc/AL/tEMP1/tEMP2/tEMP3/Ir/Ec-ta/Ec-tb/Ec-tE/allPt selected in "Au-o" mode
- ▶ To memorize the latest trip cause of 8 trip event : to contribute for analyzing a trouble cause and motor working condition in conjunction with a number of lighted LED in bar graph to show an order of trip event.
- ▶ Main contactor Auto Close:in case a line power is "on" again within a preset time(SDDT) after a line power is "OFF" during a normal operation,main contactor is closed automatically after another preset time(DOMT)
 - This function is not available for RCS operation
 - Shut Down Delay Time:1~5sec/Adjustable
 - Delay On Make Time:0(instant)~25sec/Adjustable by 5 sec unit
 - Expression in mode:eg/2-3:in case power is on within 2sec after power-off, motor starts after 15sec(3 is matched with 15sec) from the instant of power-on
- ▶ Self-diagnostics
 In case an operator press "test" button of the converter once or "CLR" button for 3 sec, the main trip output is energized(trip) after counting down the preset o-time of definite T-I characteristics or a time matched with 550% of the preset "OC" value in selected class of Inverse T-I Curve , hence % of bar graph LED shows how much time is counted down

□ Remote Control through RS-485/422,232 digital communication

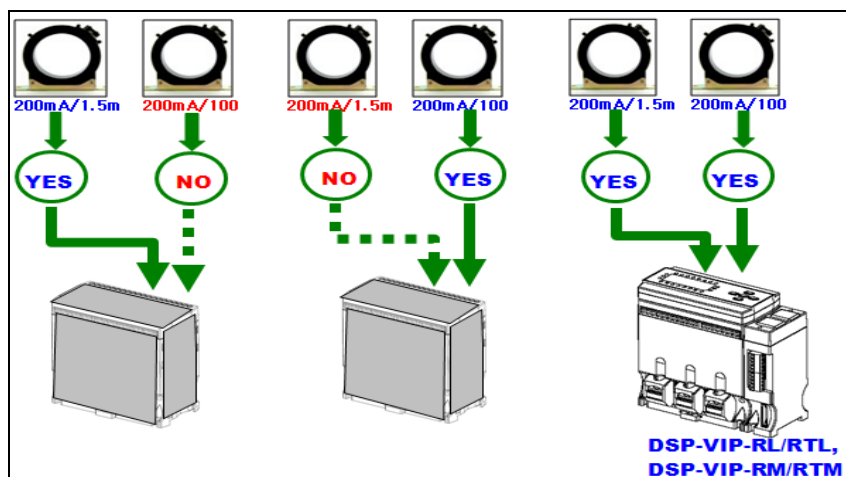
- ▶ 4~20mA output:20mA for maximum current of 3 phase
- ▶ To realize effective control for digital communication : possible with simply combining a communication module
 - CM44 : 485/422,Modbus/RTU , RS232 cooperated with converter
- ▶ To select one of RS 485 and 422 : simply selectable in DIP SW inside communication Module :CM44
- ▶ To put easily termination resistance in extreme end unit: simply selectable in DIP SW inside communication Module
- ▶ To monitor and to input a data by using "samdsp"
 - "samdsp" : PC < > Converter of DSP ,for monitoring and controlling
 - possible to communicate with converter through the communication module by PC or a converter directly by PC without communication module

3.Specialized Point

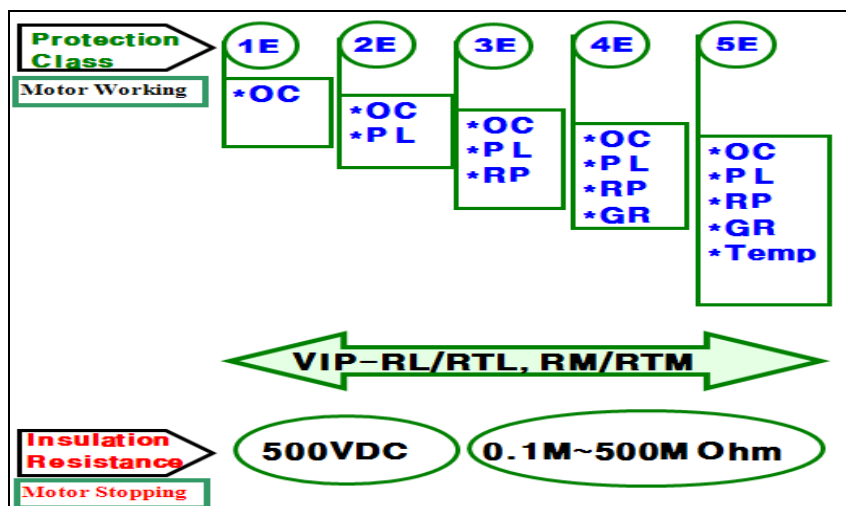
- ❑ Current based protection(operating state) & Insulation resistance measurement (stopping state)



- ❑ To be acceptable both rating of ZCT



- ❑ High Level Protection Class

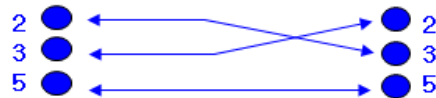


❑ Convenient Communication Module with CM-44
VIP/converter < 232 > PC

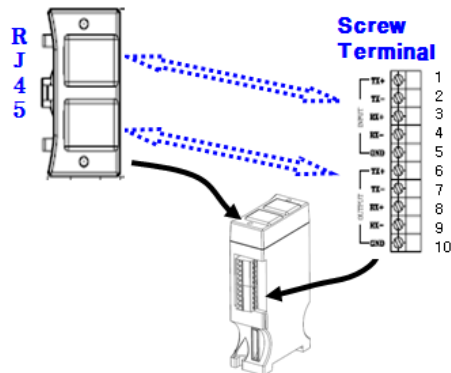


Monitoring and Data input through Note PC

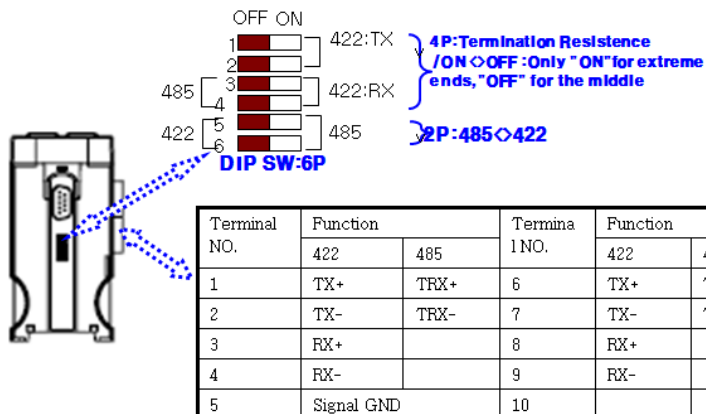
Note: If DSP is connected through a 9 pin port in PC, the wiring must be changed as follows:



VIP with communication module < 485/422:Fieldbus > PC/Master



Communication Module/Serial connection through RJ45 or Terminal

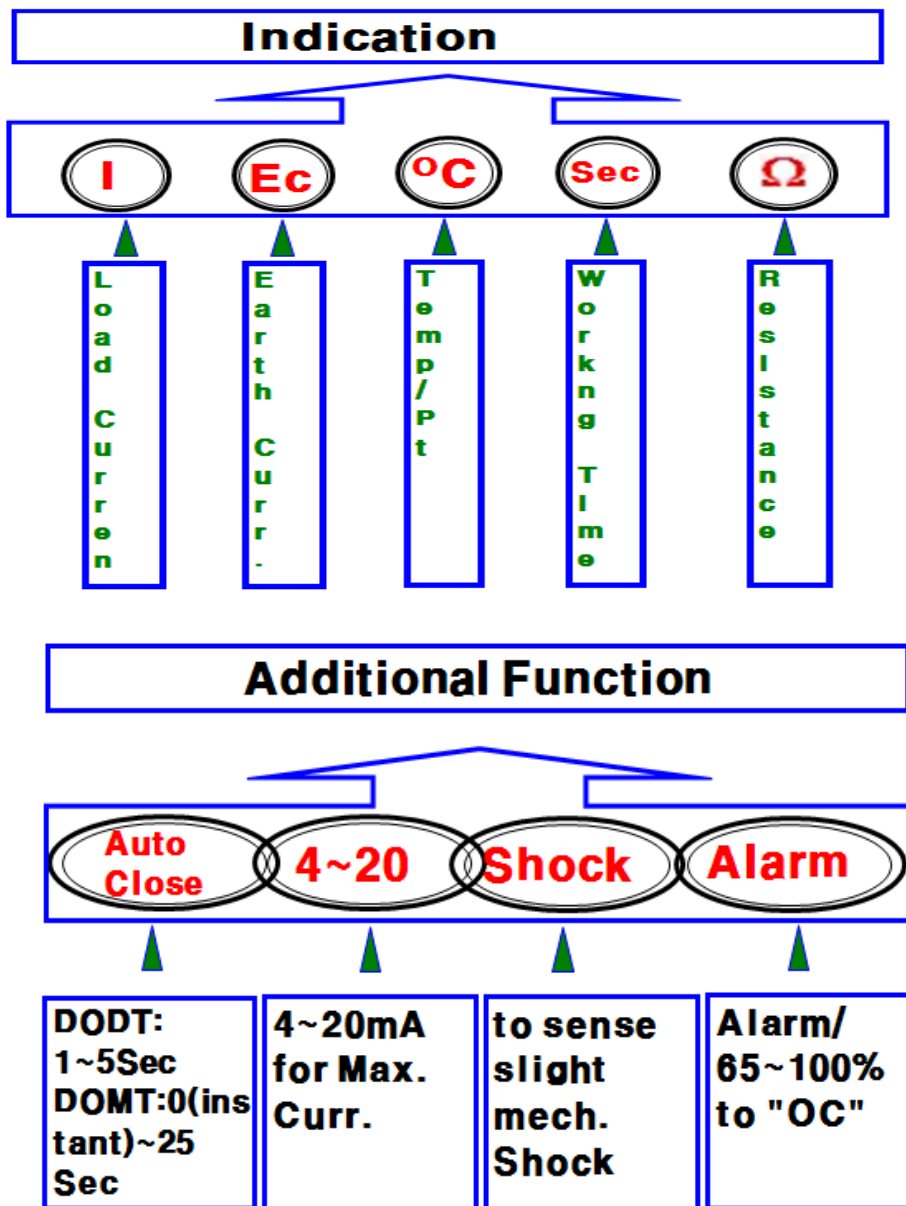


Movable Terminal:10P

DIP SW Selection:484/422, Termination Resistance

※DIP SW for MWR-S is described in the manual for MWR-S
:not available

❑ Various and Multiple Indication



4. Function List

Function		Converter+Dis. Meter	Comm. Module	Remarks
Protection	Over Current	O		
	Under Current	O		
	Phase Loss	O		
	Reverse Phase	O		
	Unbalance	O		
	Locked Rotor	O		
	Shock/Stall	O		
	Ground Fault	O		
	Over temperature	O		
Indication	Load Current	O		
	Earth Current	O		
	Line Insulation resistance/PI	O		
	Accumulated working time	O		
	Load factor /Bar graph	O		
Auxiliary	Alarm	O		
	ON-OFF	O		RUN/STOP
	Main contactor Auto Close	O		
Communication	4~20mA	O		
	RS 485/422- Modbus,RTU	X	O	
	RS232	O		
	Interface with Note PC	O		

► Protection

Item	Description	Remarks
Over Current	Trip is done if the load current greater than preset value is kept over preset o-time	
Under Current	Trip is done if the load current greater than preset value is kept over preset o-time	
Unbalance	*Trip is done if the preset current unbalance rate is kept over 8 sec. *rate=[(max curr.-min curr.)/max curr.]*100[%]	
Locked Rotor	Trip is done if 300% current greater than preset oc is kept for d-time plus 0.1 sec.	
Shock/Stall (instant over current)	*Trip is done if a current greater than preset value during working is happened for presetting time. *Presetting range:180%~700% *0.05sec, 0.1~3sec	*upper limit for type 70 is based on [(240/OC setting value) *100(%)]

Ground Fault	Trip is done if a current greater than preset zero phase current is kept for Eot(earth operating time)	According to selection of DIP SW *ZCT rating is used for 200mA/1.5mA or 200mA/100mV
Over temperature	Trip is done if the temperature sensed by PT100 greater than preset temperature is kept over 8 sec	If measured temperature from a motor is greater than presetting value in initial state ,motor starting is not possible
Phase Loss by load current	*This protection is identified by load current within preset Time : 1~5sec/definite,adjustable *"OFF" is possible in this mode	*If phase loss is happened,this is not allowed to have auto reset, but manual reset.
Reverse phase by load current	*This protection is identified by load current within 0.5 sec. *"OFF" is possible in this mode	

► **Indication**

Item	Description	Remarks
Load Current	L1,L2,L3	
Insulation Resistance/PI (Polarization Index)	*to measure line insulation resistance between connected line to motor and the earth during stopping state of the motor →the latest measured value is shown in first stopping state *to make PI value as measuring between connected line to motor and earth during stopping state of the motor →the measuring action is executed as pressing "MODE" for 3sec under keeping pressed "DN" at first →possible to check latest value as entering into "PI" of "USAGE" mode	
Temperature/case,winding	Temp1,Temp2,Temp3:1 ⁰ C ~ 150 ⁰ C/scale 1 ⁰ C	sensed by PT100
Accumulated working time (AWT)	*if 0.2A is loaded, working time is accumulated in every 6min *range:0~6553.5 hr,next to zero *to clear existing accumulated time:press "DN" or "UP"	

preset time to make alarm for working time	*making alarm if preset working time is passed over. *range:0~6553.5 hr,next to zero *to clear stored time:refer AWT	
Trip number /main contactor	*indicating tripped number of main contactor *range:1~65535, next to zero *to clear existing accumulated number:press "DN" under pressing "UP" at first ,then finally make both pressing state,consequently release "DN" at first ,after then release "UP" in "Cn" mode	
Load factor by bar graph	*calculating % as followed. [actual load curr./preset curr.]*100[%] or [actual load kw/preset load kw]*100[%] *indicating for 65~100%	
Alarm	*preset "AL" in "Au-o" mode *1a is closed(energized) if actual level exceeds preset level %/Available even when a condition is keeping for 3 sec	

► Auxiliary Function

Item	Description	Remarks
DC 4~20mA	*To change max current among 3 phase into 20mA *The receiver for 4-20 signal does not loop voltage	
Password	*The presetting in a mode is possible as inputing password to have a gurantee with a exclusive operator	
Self-diagnostics	*Main trip relay will be tripped(energized) after count down a preset o-time(dt or time of 550% in inverse) as pressing "CLR" key to check if a self-function is normal or not.	
Main contactor auto close	*In case a line power is "on" again within a presetting time after a line power is "OFF" during a normal operation,main contactor is closed automatically after another presetting time(DOMT) *Shut Down Delay Time:1~5sec /Adjustable *Delay On Make Time:0(instant)~25sec/Adjustable by 5sec unit *Expression in mode:eg/2-3:in case power is "on" within 2sec after power-off,motor starts after 15sec((3 is matched with 15sec) from the instant of power-on *This function is not available for RCS operation	

5. Technical Specification

Division		Description	
Current setting range	70 Type	0.2A ~ 70A or 0.2A~6A with external CT	
	External CT	Refer Table	
Ground protection	Zero Sequence Current	30mA~10A	
Time setting	Starting delay time(dt)	OFF,0.1 ~300 sec/def, "OFF" selection means inverse curve	
	Over current trip delay time(ot)	0.1~60 sec/def,5~30class/inv:refer curve	
	Under current trip delay time(ut)	0.1~30 sec/def	
	Shock/stall trip delay time(st)	0.05sec, 0.1 ~ 3 sec/def	
	Ground fault starting delay time(Edt)	OFF,1 ~ 25 sec/def	
	Ground fault trip delay time(Eot)	*0.05sec(instant),0.1~ 30 sec/def,Inv	
	Main contactor Auto Close	*Shut down delay Time:1 sec~5 sec *Delay On Make Time:0(instant)~25 sec	
	Phase loss trip delay time(PLc)	1~5sec/definite,adjustable	
Allowable tollerance	Current	C<=2A:0.1A,C>2A:+, - 5%	
	Time	t<=2sec:+,-,0.1sec, t>2sec:+,-,5%	
	Insulation resistance	*Line insulation resistance measurement R<=1M:±0.05M, 1M<R<=50M:±5%(avg), 50M<R<=200M: ±10%(avg), 200M<R<500M:available range *PI(Polarization Index) 1M<R<=500M:±5%(avg), 500M<R<=2000M: ±10%(avg),	
Control power		*85VAC~260VAC,50/60Hz(90VDC~370 VDC)	
		*24VAC/DC(optional)	
Trip Output Relay	Main trip(97-98)	1a(1-SPST)	
	Aux(07-08)	1a(1-SPST),3A/Resistive	
	RUN(C1-M)	1a,3A/Resistive(coworked with Logic Input)	
Application environment	Temperature	Operation	-25 °C ~ +70 °C
		Storage	-40 °C ~ +80 °C
	Relative humidity	30 ~ 85%,non-condensing	
Current tollerance against changeable frequency in Inverter		Avg +,- 3% in 1Hz ~ 400Hz	

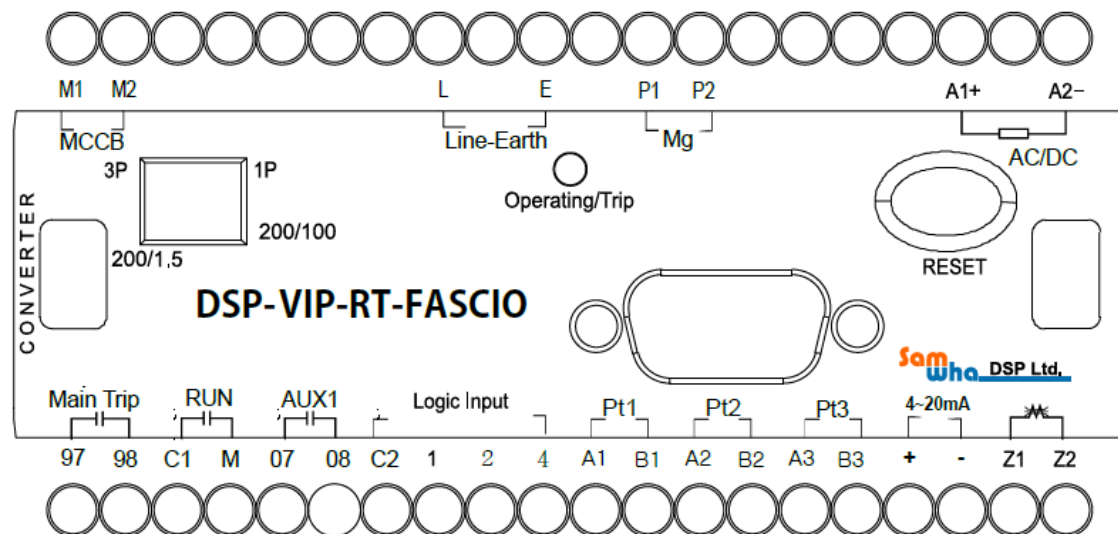
Logic Input		*220VAC:150 ~ 260VAC,50/60Hz(220 ~ 370VDC)/Standard *110VAC:75 ~ 150VAC,50/60Hz(110 ~ 220VDC)/Optional
Max Conductor Size		25sq
Screw Torque		Max 0.6 N.m
Insulation Resistance/IEC-60255-5		10Mohm or more/500VDC,circuit-case
High Voltage Withstand Test/ IEC-60255-5		*circuit-case:AC 2000V,60Hz, 1 min *contact-contact:AC 1500V,60Hz,1 min
Lightning Impulse Voltage Withstand Test)/ IEC-60255-5		*Circuit-Ground,Circuit-Circuit: 1.2/50uS,5KV *Control Circuits:1.2/50uS, 3KV
1 MHz Burst Immunity Test: IEC 60255 – 22-1		2.5KV,Positive/Negative under 2sec
Electrostatic Discharge) :IEC-60255-22-2		Air:Level 3, 8KV,Contact:Level 3,6KV
Radiated Electromagnetic Field Disturbance:IEC-60255-22-3		Level 3, 10V/m
Electric Fast Transient Burst:IEC-60255-22-4		Power,Realy output:Level 4,4KV
Surge Immunity test:IEC/EN 60255-22-5		Relay output:1.2X50uS,2KV (0°,90°,180°,270°)
Conducted Disturbance Test: IEC-60255-22-6		10V,Level 3
Digital Communication with communication module/recorder	Physical feature	*RS 485/ RS 422 : CM-44
	Address	1 ~ 250
	Speed	*CM44: 9.6/19.2/38.4/57.6/76.8/115.2kbps
	wiring connection	*Input/Output:RJ 45 and/or Screw Terminal *RJ45 and Screw Terminal(5P) is commoned physically *RJ45 is recommended for the test by "Samdsp"
	Termination resistance	*DIP S/W selection/200 Ohm
	Cable	Sheathed cable,2 Pair/4 pair
Current Loop Communication/4 ~ 20mA		20mA for maximum value in 3 phase current
Consuming power		10W max

6. Self-diagnostics Display Indication

Discription	Display Indication
485 communication error	LED on the communication module is not turned on or not flickering
Fault for internal current board	cu-no
Fault for internal main board	ec-no
ZCT disconnection	ec-ct:not possible to start unless preset "OFF" in "Ec" mode
PT100 disconnection	t1-no;not possible to run if a value is preset in"temp" mode
Latest measured temp > preset value	“temP” & value is shown alternatively,not possible to run
P1-P2 disconnection	"oPEn".not possible to operate unless making connection from main contactor ,also this is strongly critical condition to operate this product safely
Open of M1-M2	*"Ir-pS".not possible to start unless making connection from MCCB or making short state for M1-M2 *Unless M1-M2 is opened, it means resistance value is good
Test by “CLR” SW in display meter	Main trip(97-98) is trip after counting down preset o-time in definite T-I or 550% time in inverse T-I/the number of lighted LED is matched with counted time

7. Input-Output Terminal

Standard type/possible with external CT & external ZCT



Division			Description			
Feature		Terminal				
Input	3P/1P	3P-1P	3 phase/Single phase			
	External ZCT	Z1,Z2	200/1.5mA-200/100mV			
	Control Power	A1+,A2-	85~260VAC,50/60Hz(90~370VDC)			
	LOGIC	C2	COMMON			
		1	LOP	ON(RUN)		
		2		OFF(STOP)		
		4		LOW		
		1	RCS	*High: ON(RUN) *Low: OFF(STOP)		*RCS shall be selected in “ctroL” mode
		2		*Low		
		4		*High		
		1	MCC/ PC	Logic input is not used		*MCC or PC shall be selected in “ctroL” mode
		2				
		4		*High		
		Temperature 1	A1,B1	*PT100		
		Temperature 2	A2,B2	*PT100		
	Temperature 3	A3,B3	*PT100			
	Insulation resistance measurement	L-E	Line-Earth			
		P1-P2	From Contactor			
		M1-M2	From MCCB			
State	RED	Operating	3 Tone Colour LED			
	Green	Power/stop				
	Yellow	Trip				
Output	MAIN TRIP	97-98	1a			
	AUX1	07-08	1a			
	RUN	C1-M	1a			
	4~20mA	+ , -	Running current→4~20mA/DC			

► Relay Output

Trip	Relay	Output	Remark
Main	1a-1b/95-96, 97-98	*OverCurrent	
		*Under Current	
		*Locked Rotor	
		*Phase Loss	
		*Reverse Phase	
		*Ground Fault	
		*Over Temperature	
		*Current Unbalance	
		*Shock	
Aux1,	1a,Normal de-energized(07-08,)	*Selected in Au-o mode : one of OFF, Ec/Uc/Shoc/ AL/tEmpP1/Ir/Ec-tE/Ec-ta/Ec-tb/tEmpP2 /tEmp3/ allPt *OFF:same as Main trip *Ec-ta,Ec-tb:Main trip action caused by Ec	

		/independent from main trip/initial aux output state in normal running as followed: . Ec-ta:normal energized state(open→close) . Ec-tb:normal de-energized state(open→open) *AL:Alarm level to OC,65~100%/Contact is closed after 3 sec from reaching preset alarm level *Ir:Insulation resistance *Ec:Earth current *Ec-tE: Earth current or Temperature *Uc:Under current *Shoc:Instant overcurrent during operation *temp1;Temperature by PT1 *temp2 ; Temperature by PT2 *temp3 : Temperature by PT3 *allPt : anyone of temp1,temp2 and temp3 *Flickering in stopping state if measured insulation resistance value is lower than preset value in "IrAL"mode	
--	--	---	--

8. Preset Description

□ Main Mode

Mode	Function/range	Description	Factory Setting value
P0000	Password	*need to input a number of 4 digit,"0000" to enter into setting mode *need to move a cursor from first digit(1000 unit) to last unit(1 unit) to pass over next mode as pushing CLR key(Enter function) 4 times. *possible to change password in "PEdIt" mode in "CAB" mode group *If the operator forget a pssword,manufacturer can support it or use factory initialized setting value *To call factory seting value,make pressed state for "Test" button of converter at first under power-off condition, then power-on under pressed state of test button for 3 sec or more	"0000"
oc/ setting value]	to preset a range to protect over current	*Current range :70 Type :0.2 ~ 70A /possible to match with external CT (0.2A ~6A) : naturally changed as presetting 5A in next "Cto" mode	10
Cto/1t/ 5A	*to sense a current through DSP in itself or combined with external CT	*1t : current is sensed through its own CT : next "ct" mode is not appeared automatically *5A:available for external CT/a secondary current rating of external CT is 5A	1t
ct /setting	to preset a ratio of	*if 1t is selected in "cto" mode , this mode is displayed like "ct--", it means that any preset is not	"- -"

value	external CT	available anymore.so need to enter to next mode. *to preset the value of CT ratio[primary value/5] *setting value :1~600 *1 for its own CT or 5:5 external CT	
dt/off/setting value	to preset starting delay time	*Trip delay time to prevent unwanted trip caused by starting current *0.1~300 sec	5 sec
Otc/deF/Inv	to select time-current characteristics for over current	*to decide t-i characteristics to protect over current : deF/Inv *deF(definite):trip based on preset value for “OC” and “ot” *inverse ▶dt=0 : trip based on cold curve ▶dt>0 :trip based on hot curve after dt is elapsed (actually dt+calculated time in inverse curve)	deF
Ot/oFF/setting value	to preset trip delay time	to make a time for a trip when a current exceeds preset value *definite:0.1sec ~ 60sec *inverse:0.2 ~ 30 Class	5
Lc/oFF/on	to protect Locked Rotor	OFF:disable for this mode *ON -Otc=Def:dt+0.1sec if starting current exceeds 300% to oc during dt, Lc is shown in trip -Otc=Inv: →dt=0: a trip by “OC” according to inverse curve,but Lc is shown in trip →dt>0: dt+0.1sec same case as Otc=Def, but Lc is shown in trip	oFF
Shoc/oFF/Setting Value	Shock protection during working	*to preset a value in each current range *Preset range is 180% ~700% to OC setting value *In case of 70 type ,maximum % is decided by a formular [(200/OC setting value)*100(%)],but if it is over 700%, possible maximum setting % is 700%.	oFF
st/setting value	to preset a time for shock protection	*0.05sec,0.1~3 sec/definite *If "Shoc" mode is oFF, this mode is displayed like a image of "st --",it means that user is not able to input a value anymore	“__“
PLc/oFF/setting value	to protect phase loss by load current	*OFF:to make this mode disable *1~5sec/adjustable,definite *Auto reset is not possible,only for manual reset.	3
rPc/oFF/on	to protect reverse phase by load current	*OFF:not to protect reverse phase *ON:to make a trip to protect reverse phase based on load current within 0.5 sec *Auto reset is not possible,only for manual reset.	oFF
Ec/oFF/setting value	to preset zero phase current to protect ground fault	*based on zero phase current through ZCT *range:20mA~10A	oFF

Edt/oFF /setting value	to preset trip delay time to protect ground fault	*OFF:to make this mode disable *trip delay time:1 ~ 25 sec/def *Sensitive range:30mA~10A *If "Ec" mode is off,this mode is displayed like an image of "Ec --",it means that user is not able to input a value anymore	2
Etc/deF /Inv	to select time-current characteristics to protect ground fault	*deF or inv *If "Ec" mode is off,this mode is displayed like an image of "--",it means that user is not able to input a value anymore	deF
Eot /setting value	to preset trip delay time to protect ground fault	*deF:0.05 sec, 0.1 ~ 30 sec/1sec step *Inv:1 ~ 10 Class/refer curve *If "Ec" mode is off,this mode is displayed like an image of "Eot --",it means that user is not able to input a value anymore	05sec
Test	This is done by pressing by pressing "CLR" key in display meter *to check if this relay is ready to work normally or not. *main trip output will be tripped after counting down preset o-time (definite T-I;o-time,inverse T-I:550% time of its class) *need to make a reset to enter into operational condition *”End” is shown as pressing “Reset button” or “CLR” key for 3sec in order to make reset after trip, then release pressed state		

□Sub Mode

Mode	Function/ range	Description	Factory setting value
P*****	Password	*same as a case of "main Mode"	0000
Out /a / b	to decide initial state of main trip relay	*to make initial state(a or b) of main trip output(97-98) when control power is powered *a:normal energized type(open→close) *b: normal deenergized type(open→open)	b
uc/oFF/ setting value	to preset a range to protect under current/load	*under current setting range - 70 Type:0.1A~ under preset OC value *OFF:disable	oFF
ut/oFF/ setting value	to preset trip delay time to protect under load/current	*to preset trip delay time to protect under current *def:0.1~30sec *in case "uc" mode is OFF ,this mode is displayed an image like "uc--", which means this mode is disable *OFF:disable	“- -“
ub / oFF / value	to preset current unbalance rate(%) among 3 phase	*formular:[(max-min)/max]*100 [%] *range:30% ~ 90% *minimum available current:0.3A *OFF:disable	50%

Au-o/ OFF /Ec/ Uc/Sho c/AL /temp1/ Temp2/ temp3/ Ir/ Ec-tE/ Ec-ta /Ec-tb/ allPt	to preset a kind of AUX trip output	*oFF:to make same output as main trip *Ec:only for ground fault protection *Uc:only for under current protection *shoc:only for shock protection *AL:only for alarm to oc before trip *temp1:only for over temperature/pt1 *temp2:only for over temperature/pt2 *temp3: only for over temperature/pt3 *allPt : anyone of pt1,pt2 and pt3 *Ir:only for indication for insulation resistance *Ec-tE: only for one of Ec or temperature *Ec-ta:the state of 07-08 before trip is "b"(close) , then takes trip action caused by GR like same manner of the main trip *Ec-tb:the state of 07-08 before trip is not changed as "a"(open) , then takes trip action caused by GR like same manner of the main trip *independent output from main trip except presetting "OFF', Ec-ta & Ec-tb *This selected protection factor is naturally excluded in main trip *This trip is naturally reset if a trip condition is clear except Ec-ta,Ec-tb	oFF
AL/oFF /setting value	to preset alarm level rate(%) to OC	*oFF:if other factor except AL in "Au-o" mode is preset,this mode is displayed an image like "AL- -" *% range:65% ~100% of preset value to OC	“—“
ALt/ setting value	to preset a limit of accumulated working time necessary to give alarm.	*if 0.2A is loaded, working time is accumulated in every 6 min *setting range:0.1 hr ~6553.5 hr in 0.1 hr of a step *"Sec" LED of front menu LED will be flickered to give alarm after passing a presetted value of hour *To clear:press "UP" or “DN”, but “- - will be flickerd until 6 min has passed after starting a motor	6500
dc	to dedide max current to change into 20mA	*to transfer maximum current of 3 phase current into 20mA *4mA means zero ampere output *Primary current is transferred in case external CT is used. *The receiver for 4-20 signal does not loop voltage	5
temp1/ oFF/ Setting Value	to preset temperature value to protect temperature rising	*based on PT100 sensor of PT1 temperature input *range: 1°C ~150°C/ 1 °C in a step *If measured temperature from a motor is greater than presetting value in initial state,a motor starting is not possible	OFF
temp2/ oFF/ Setting Value	to preset temperature value to protect temperature	*based on PT100 sensor of PT2 temperature input *range: 1°C ~150°C/ 1 °C in a step *If measured temperature from a motor is greater than presetting value in initial state,a motor starting is not possible	OFF

	rising		
temp3 /oFF/ Setting Value	to preset temperature value to protect temperature rising	*based on PT100 sensor of PT3 temperature input *range: 1°C ~150°C/ 1 °C in a step *If measured temperature from a motor is greater than presetting value in initial state,a motor starting is not possible	OFF
Cn/ fixed value	to count tripped number of main contactor	*Fixed Value:to show accumulated number of actual trip * max value is 65535 * need to press both "UP" and "DN" key *ON-OFF must be done by logic input and actual current greater than 0.2A must be loaded.	OFF
rota /oFF / on/temp	to decide additional factor besides basic to indicate value in order	►Motor Running State *OFF:to indicate basic factor/3 phase current,GR current in every 3 sec *ON:to indicate additional factor such as Ir(latest measured line insulation resistance value), temp1 ,temp2,temp3, AWT (Accumulated Working Time) including basic factor together ►Motor Stopping State *ON,OFF : to indicate control command position (LOP, rcs,mcc) ,latest Ir *temp: to indicate control command position (LOP, rcs,mcc) ,latest Ir,latest temperature(temp1, Temp2,temp3) ► Possible to fix one of circulated factor or to release:one touch button(CLR Key:enter function)	OFF
rESet/ Hr/Aut- #	to decide how to reset tripped state	*Hr:password input *Er : "CLR" Key :Control power : OFF :Reset switch on the converter *Aut-# :to preset auto reset and allowable number for auto reset, possible number is 1 to 9. *Manual reset by "CLR" key in the meter is not available if Auto reset is preset *if trip is acted by phase loss,auto reset is not able,only for manual reset	Hr
Aut-t/ setting value	to preset automatic reset time	*to preset time from trip to reset in auto reset mode *time range:1sec~3600sec(60min) .1~59 sec:actual digit, .1min~30min:actual digit + -m(bar m/time unit) in display. *if Hr is preset in "rESet" mode,this mode is like a "Aut--"	6500
t-Aut/ setting value	to preset total possible time available for executing	*possible total allowable time to have the preset number of auto reset *time range:30min~60min *only possible for over current trip	"--"

	defined times of auto reset	*the preset time is counted from the instant of first trip and return to the preset condition for auto reset after the allowable time is elapsed *Password lock in Auto Reset :able in case the preset number of auto trip is done within preset total reset time :otherwise, the counted number of trip time is initialized to previous preset value *If Hr is preset in "rESet" mode, this mode becomes disable	
trIP /8 ~1/trip cause / trip value	to show latest number of 8 trip cause	*To show latest number of 8 trip cause in the order *8th trip cause and caused value are appeared firstly, next 7th and finally 1st trip cause as every pressing "up" button *to support an operator how many order of 8 tripped event is appeared in conjunction with a number of lighted LED in bar graph. *need to press "Mode" key to return to main mode *trip information in order: faulty phase and faulty value is appeared alternatively *more detailed information can be retrieved by note PC directly or remote center	trip
Addr /Setting value	to put self-address to communicate with pc	*to preset an address for 485/422 communication *range of number: #1 ~ #250	1
bPS / setting value	to decide communication speed	*to select communication speed * 9.6/19.2/38.4/57.6/76.8/115.2kbps	115.2
Tover/ OFF/ Setting value(SDDT-DODT)	Main contactor Auto Close	*This function is not available for RCS operation *In case a line power is "on" again within a presetting time(SDDT) after a line power is "OFF" during a normal operation, main contactor(M) is closed automatically after another presetting time(DOMT) *Shut Down Delay Time: 1~5sec/Adjustable *Delay On Make Time: 0(instant)~25sec /Adjustable by 5sec unit *Expression in mode: eg/2-3: in case power is on within 2sec after power-off, motor starts after 15 sec((3 is matched with 15sec) from the instant of power-on *This is not available for "RCS" operation	OFF
IrAL/ OFF/Setting value	to preset alarm level for insulation resistance	*OFF: Disable *preset range →IR: 0.1Mohm~500Mohm/"LINE" in "USAGE" mode →PI : not available *If measured insulation resistance is lower than preset value in initial state, a motor starting is not	1

		possible/Aux output(07-08) is energized(tripped) in case "Ir" is selected in "auo" mode	
rEcOd/ Setting value(m in)	to preset measurement interval time for insulation resistance	*to preset the measuring interval time after 1 st measurement is done →0.1 min~3000 min for to measure line insurance resistance → PI value : this mode is not available *This mode is available in case Auto is preset in "Class" mode *If the motor is running after the preset time is elapsed, the 1 st measurement is done 6sec from the followed motor stop. *First measument is done after preset time of "1 st mode from motor stop *If such interval time is placed on the mid of motor operation,a measurement is neglected	60
rE-nb /oFF/ Setting Value	to preset possible number to continue a measument by interval time	*OFF:a measurement is done in every interval time during motor stopping state *This mode is available in case "Auto" is preset in "Class" mode *Adjustable range:1~10 times *the reset by power-off or "pressing SET key" must be done if the operator wants to renew the number of allowable measurement , otherwise the measurement is not done until the reset is done after the measuring action by preset times has done	oFF

❑ Cab Mode

This mode is appeared as pressing "SET" key for 5 sec or more and is disappeared as pressing "M/OFF" key

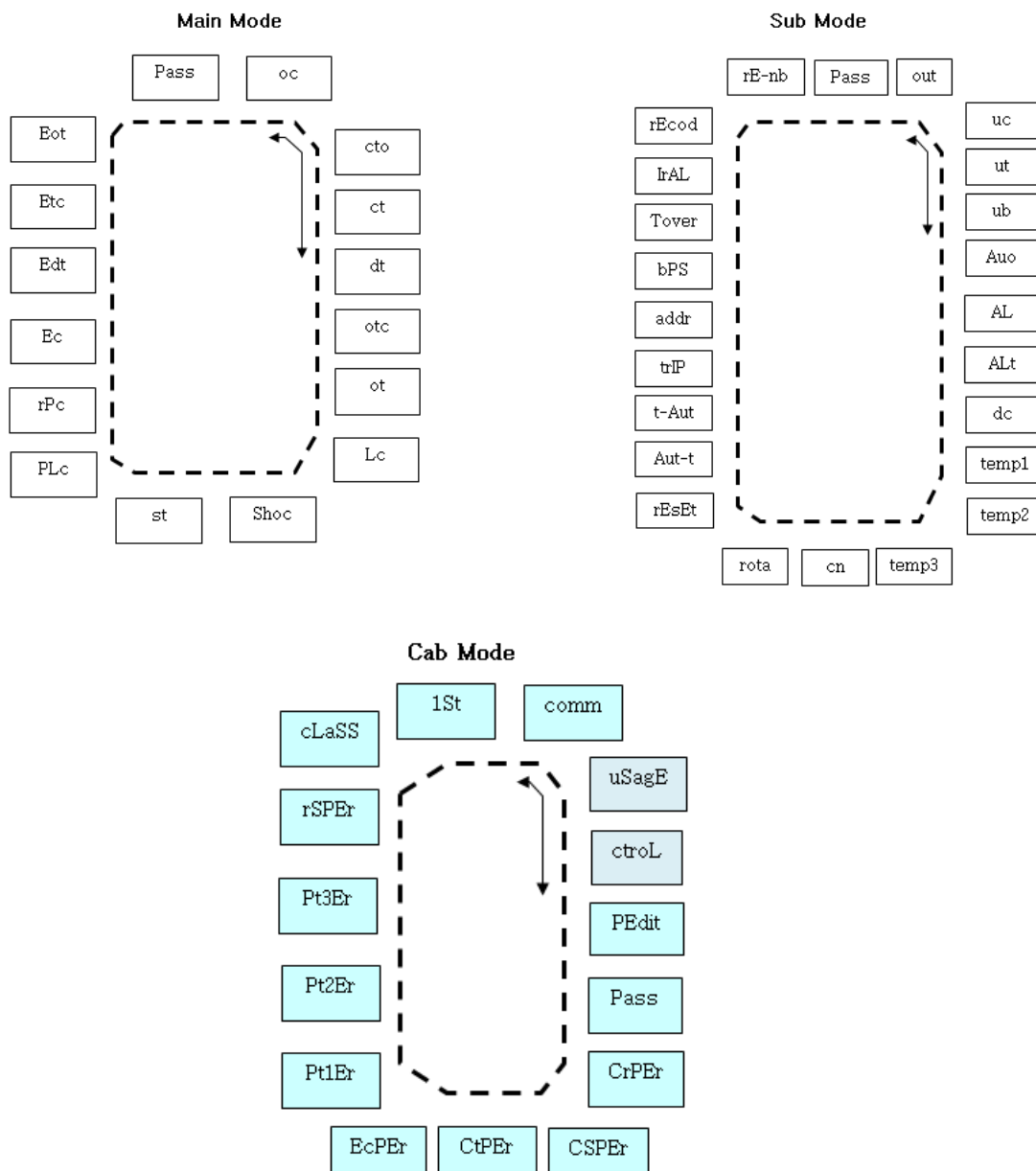
Mode	Function/ range	Description	Factory setting value
P0000	Password Input	*need to input factory value "0000" to enter into this mode group *to calibrate slight difference between indication and actual value within +,-12.7% *possible to come next mode by pressing right direction key "CLR"	0000
CrPEr	to have a caribration for phase "R" current		0
CsPEr	to have a caribration for phase "S" current		0
CtPEr	to have a caribration for phase		0

	"T" current		
EcPEr	to have a caribration for ground fault current	*possible to adjust within +,- 12.7% from indicated value by using "UP" or "DN" key	0
t1PEr	to have a caribration for a temperatute from Pt1		0
t2PEr	to have a caribration for a temperatute from Pt2		0
t3PEr	to have a caribration for a temperatute from Pt3		0
rSPEr	to have a caribration for measured resistance		
CLASS /oFF/ Man/ AUTO	to determine a method to measure a resistance	*oFF:not available for resistane measurement function *MAN(displayed:bar-nan):a measurement is executed whenever "Mode"key is pressed for 1 sec under pressing state for "DN" key at first *Auto:resistance is measured automatically according to first measuring time and next measuring interval time which is preset in each mode/pressing "SET" twice is able to measure a resistance once manually *the starting point to measure a resistance is the time control power is on *the measured resistance is lower than preset value in MAN and AUTO , the mortor is not possible to start	AUTO

1st/oFF /Setting Value (min)	to preset a first measuring time	*OFF: not available for this function after the control power is on *available only in case "Class" mode is preset by "Auto" *adjustable value: 0.1 min(6 sec) ~ 3000min *the measurement starts in the point of motor stop and next measurement is done by the preset time of "Recod" mode *if the preset time is positioned in the mid of running state, the actual measuring action is not executed *if the motor is restarted according to the "Tover" mode, this function is not executed *this is reset by power OFF or the pressing "SET" button	0.1
Comm/ auto /slave	To decide a qualification of VIP in communicat ion	*auto: VIP always dispatches a data *Slave: VIP dispatches a data only in case the master requires	
USAG E/LINE /PI	To select IR or PI for the usage of measured resistance value	*to measure Line insulance resistance(IR) or PI (Polarization Index) *LINE → possible to measure by manual or auto → possible to measure line insulance resistance → not possible to calculate PI value → possible to make an alarm and a trip *PI → possible to measure only by manual process, not by auto → to calculate PI value → not possible to measure line insulance resistance → only possible to calculate PI and to show the result → The measuring action is done as pressing "MODE" for 3sec under keeping pressed "DN" at first	LINE
ctroL/ mcc/ rCS/PC	to decide motor control command position	*motor control command(ON-OFF) is executed by followed position : LOP → it is executed by logic input #1-#2 : rCS → it is executed as taking a cooperation with logic #1, #4 : mcc → it is executed by ON-OFF key in display meter : PC → it is executed by PC in 485 network *The RCS, mcc and PC operation is defined with Logic table *LOP operation by Logic #2 takes a priority in any case	RCS

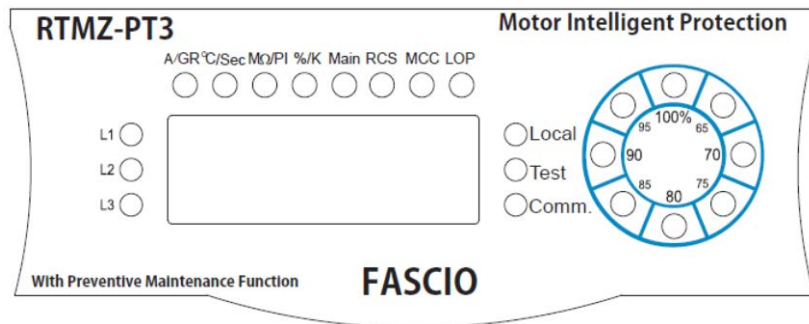
PEdit/ Setting Value (P****)	to change password	*possible to enter new digit by using "UP" or "DN" key after positioning a cursor on the required digit *possible to enter into main mode or sub mode as pressing "mode" key	

9.Operational Order of MODE



10. Display Window Image

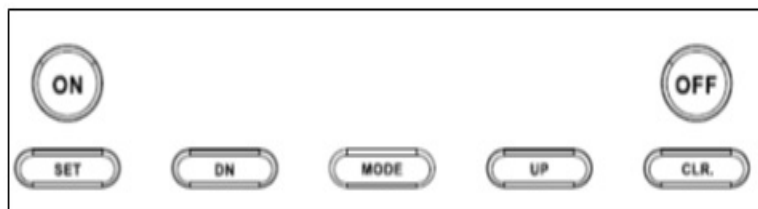
- Panel Flush Mounting Type : Display meter



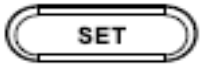
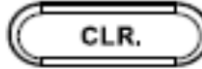
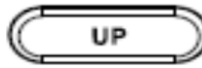
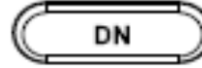
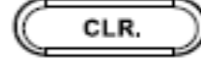
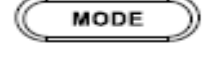
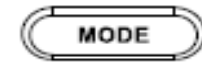
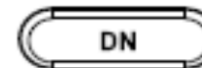
*Local : turned on LOP/rCS, but turned off in PC operation

*Comm : communication between Converter and Meter

11. Control Key Operation



Function	Key	Description
1.Mode Group Selection		*Initial state to indicate one of controlled position(ON-OFF control:LOP/bar-nCC/rcs) is appeared. *Main Mode or Sub Mode in conjunction with "Main" LED/"main mode":LED is turned on. *Press "SET" Key to enter into setting mode,then "P0000"(factory default password) is shown *In case of using this default number, move cursor from first digit to right end digit by pressing "CLR" key and finally operator meets possible state for setting as pressing "CLR" key one more after a cursor is positioning right end digit *If there is no input for 15 sec or pressing "Mode" key, VIP is entered into operating condition.
2.Setting Key Function		*After entering into possible state for setting , each key acts its job as follows : SET→ backward direction, : CLR→ forward direction, : UP.DN→ able to select number or character in preset mode. *if operator wants to stop setting,it is possible to return as "Mode" key ,in result selected data untill previous mode is stored

3.MODE selection	 	* a Mode selection to preset data is done by pressing "SET" or "CLR" under the job of directional key.
4.Adjust	 	*To select number or character in the each mode *Return to next mode as pressing "CLR" key
5.Mode (Store)		*As pressing "Mode" Key once again ,preset procedure is completed and is ready to operate in its duty. *it needs 3 sec to store a preset data,so if operator makes "power-off" without waiting a storing precess for this time,ratherly this could returns to initial factory state
Possible to check preset value of each mode during operation	  	*possible to check value and mode as pressing "SET" key once during operation *preset vale and mode are appeared alternatively *possible to check next mode as pressing "CLR" Key *return to operating mode as waiting for 15 sec *not possible to preset a value *possible to check both mode "main and sub" as pressing "CLR" key continuously
Possible to check PI value	 	*possible to check latest value as entering "PI" of "USAGE" mode *possible to enter operation state after checking the latest value as pressing "DN" under keeping pressed "MODE" at first
Motor Start/Stop,	 	*Possible to make motor start/stop in case "MCC" is selected in "ctrol" mode of "cab" mode group

12. Trip Indication

Trip	Display	Trip cause
Over Current	L1 ☒ L2 ☐ L3 ☐ -OC- ☒ Local ☐ Test ☒ Comm.	Trip caused by over current in phase L1 was happened
Under Current	L1 ☒ L2 ☐ L3 ☐ -UC- ☒ Local ☐ Test ☒ Comm.	Trip caused by under current in phase L1 was happened
Current unbalance	L1 ☐ L2 ☐ L3 ☒ -Ub- ☒ Local ☐ Test ☒ Comm.	Trip caused by unbalanced current in phase L3
Ground Fault	L1 ☒ L2 ☒ L3 ☒ -EC- ☒ Local ☐ Test ☒ Comm.	Trip caused by ground fault current
Phase loss	L1 ☐ L2 ☒ L3 ☐ -PLc- ☒ Local ☐ Test ☒ Comm.	Trip caused by phase loss in phase L2
Reverse phase	L1 ☐ L2 ☒ L3 ☐ -rPc- ☒ Local ☐ Test ☒ Comm.	Trip caused by reverse phase in phase L2
Locked Rotor	L1 ☐ L2 ☒ L3 ☐ -Lc- ☒ Local ☐ Test ☒ Comm.	Trip caused by locked rotor current in phase L2 during motor start
Shock/Stall	L1 ☐ L2 ☒ L3 ☐ Shoc- ☒ Local ☐ Test ☒ Comm.	Trip caused by shocking current in phase L2 during working
Over Temperature	L1 ☒ L2 ☐ L3 ☐ -Pt1- ☐ Local ☐ Test ☐ Comm.	Trip caused by over temperature of PT1 in conjunction with "L1" LED
	L1 ☐ L2 ☒ L3 ☐ -Pt2- ☐ Local ☐ Test ☐ Comm.	Trip caused by over temperature of PT2 in conjunction with "L2" LED
	L1 ☐ L2 ☐ L3 ☒ -Pt3- ☐ Local ☐ Test ☐ Comm.	Trip caused by over temperature of PT3 in conjunction with "L3" LED

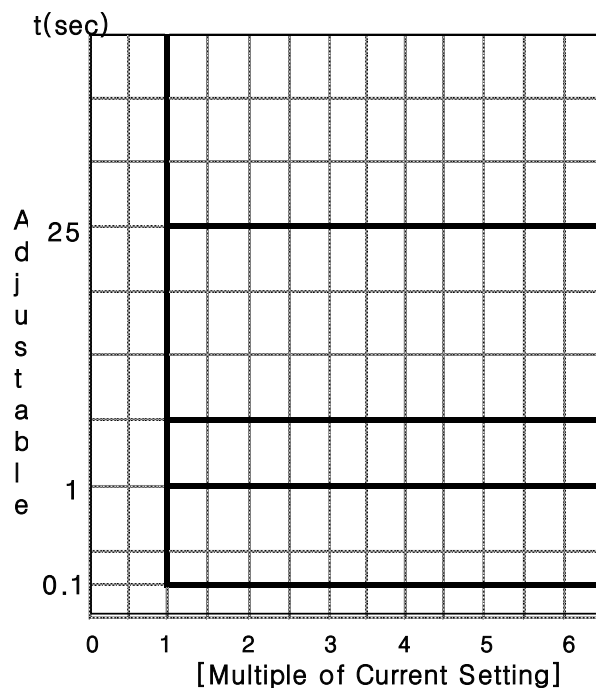
13. Current range table matched with external CT

Range	Number of CT turn in itself	Preset in "ct" mode	Preset in "cto" mode	Remarks
		(ct ratio)		
0.2A~70A	1	*Without external CT	1t	70 Type, Wide Range
	1	*With external CT: 0.2~6A	5t	
0.4A~10A	1	2(10:5)	5A	*With external CT, Secondary rating of CT is 5A *CT ratio to preset is 1~600
0.6A~15A	1	3(15:5)		
0.8A~20A	1	4 (20:5)		
1.2A~30A	1	6 (30:5)		
1.6A~40A	1	8 (40:5)		
2A~50A	1	10(50:5)		
2.4A~60A	1	12 (60:5)		
3A~75A	1	15 (75:5)		
4A~100A	1	20(100:5)		
4.8A~120A	1	24(120:5)		
3.6A~150A	1	30(150:5)		
8A~200A	1	40(200:5)		
10A~250A	1	50(250:5)		
12A~300A	1	60(300:5)		
16A~400A	1	80(400:5)		
20A~500A	1	100(500:5)		
24A~600A	1	120(600:5)		
30A~750A	1	150 (750:5)		
32A~800A	1	160(800:5)		
40A~1000A	1	200(1000:5)		
48A~1200A	1	240(1200:5)		
60A~1500A	1	300(1500:5)		
80A~2000A	1	400(2000:5)		
100A~2500A	1	500(2500:5)		
120A~3000A	1	600(3000:5)		

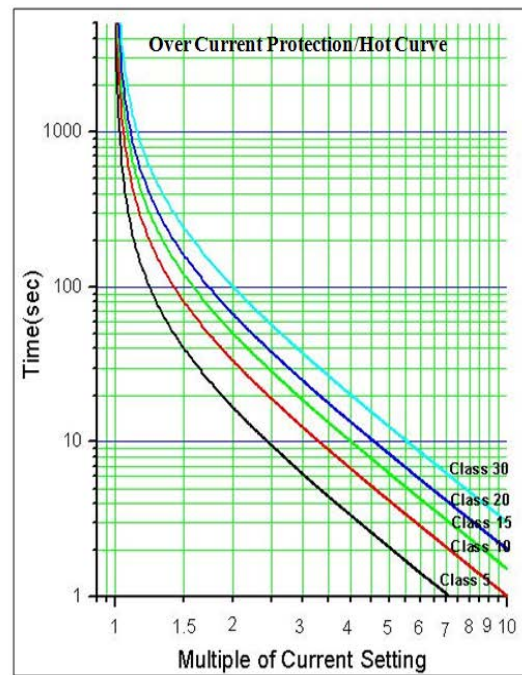
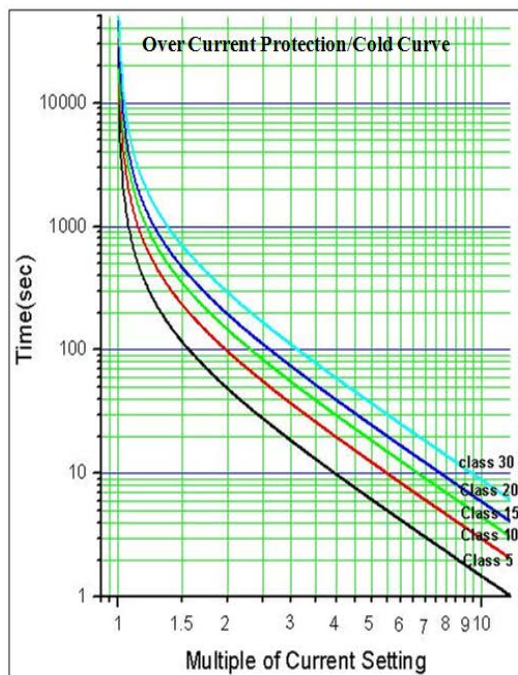
14. Time-Current Characteristics

❑ Over Current Protection

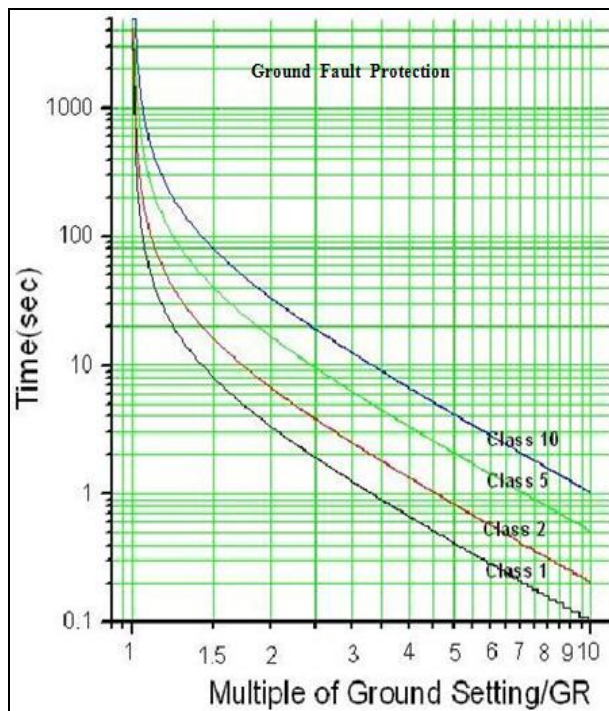
► Definite



► Inverse

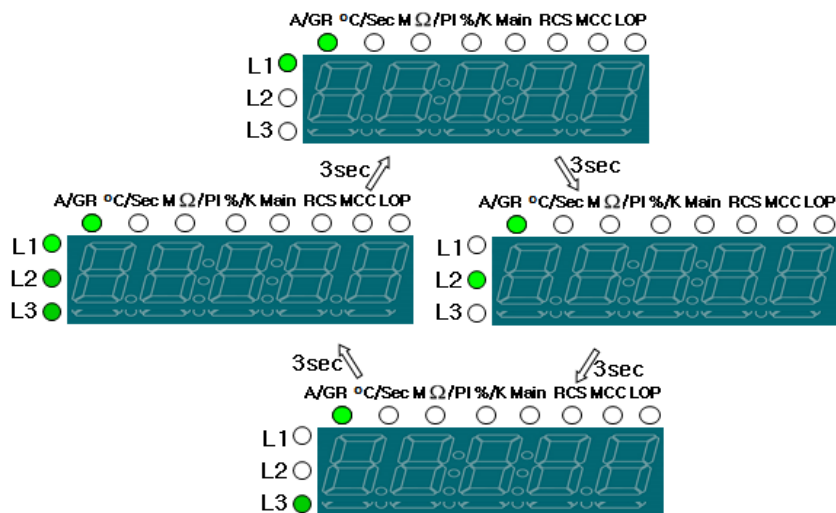


❑ Ground Fault Protection

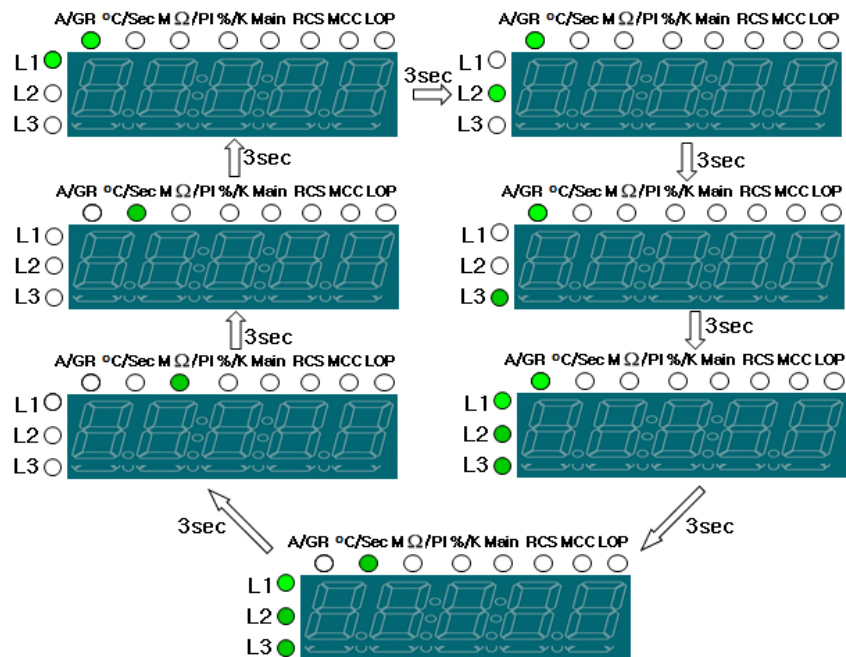


15. Rotated Indication

❑ Basic factor: 3 phase current, GR



□ Basic factor + Pt , Ir/PI , AWT

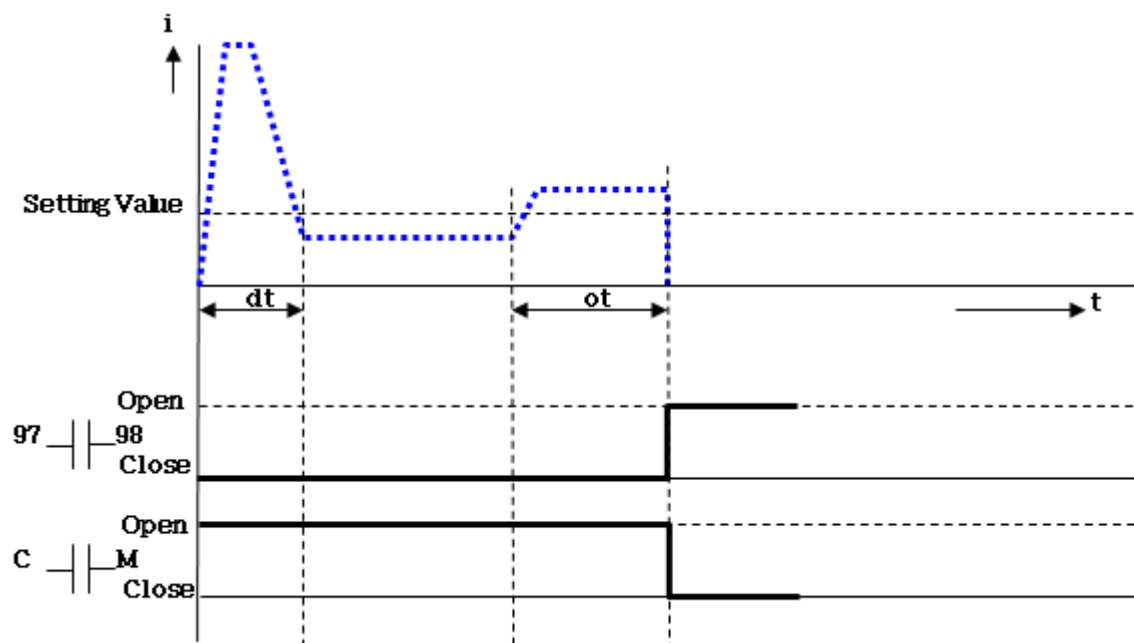


※ Temp1, Temp2 and Temp3 can be recognized based on LED for L1,L2,L3 when the such order of temp indication is coming

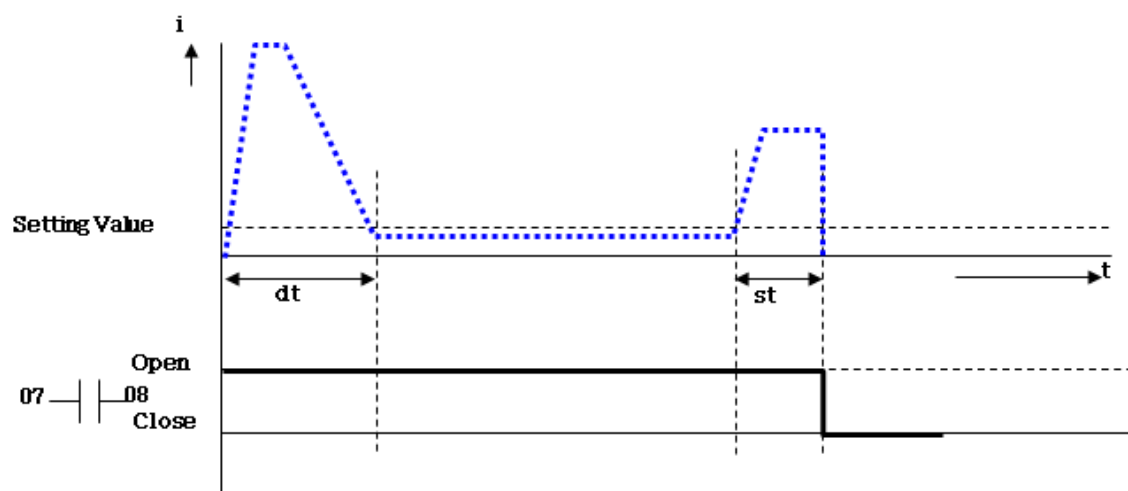
※ the indicated value greater than 270 in temperature means that PT100 temperature sensor is not connected.

16. Time based Trip Relay Output

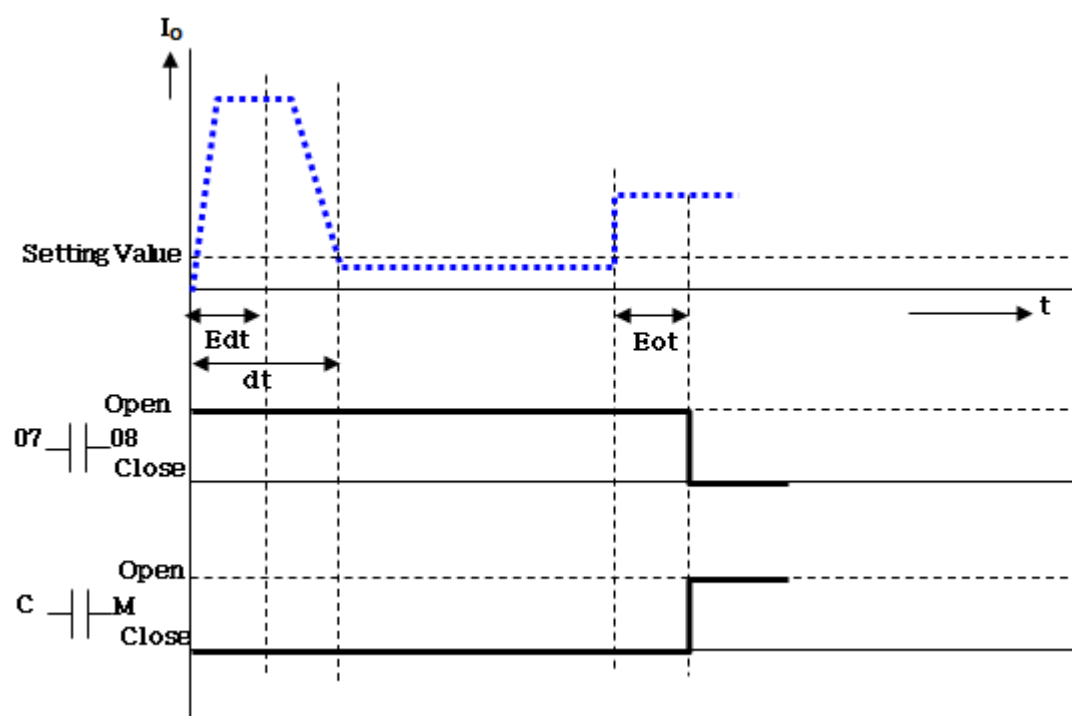
□ Over Current Protection/ "out" mode :a



❑ Shock/Stall Protection:AUX is selected for exclusive output for shock in "Au-o" mode



❑ Ground Fault Protection
"Auo" mode:Ec-tb



17. Application Sequence Diagram

LOP Duty:

Logic Input	High	Low	State	Output relay operation by Logic input : C1-M
1	Low→High		Motor Start	*C1-M→Close
2	O	-		
4		O		
1		O	Motor Stop	*C1-M→Open
2	High→Low			
4		O		

rscs(Remote Control Sensor) Duty

Logic Input	High	Low	State	Output relay operation by Logic input : C1-M
1	High		Motor Start	*C1-M→Close *continuously logic high(“ON”) by remote control sensor *”RCS” must be selected in “ctrol” mode
2		O		
4	O			
1	Low		Motor Stop	*C1-M→Open *continuously logic low(“OFF”) by remote control sensor *”RCS” must be selected in “ctrol” mode
2		O		
4	O			

PC Duty

Inut	High	Low	State	Output relay operation by Logic input : C1-M
1	-	-	Motor start/stop in PC	*”PC” is selected in “ctrol” mode *Logic #1,#2 is not available
2	-	-		
4	O			

Display Meter Duty(MCC)

Input	High	Low	State	Output relay operation by Logic input : C1-M
1	-	-	Motor start/stop in Meter	*”mCC” is selected in “ctrol” mode *Logic #1,#2 is not available
2	-	-		
4	O			

※ In case selected operation mode is changed by Selector SW, the motor will be continued to work according to new selected mode after the motor is stopped shortly

※ LOP operation will have a priority if logic input, #2 and #4 are high in the same time

※ “LoErr” will be shown if logic input, #1,#2 and #4 are low in the same time and can not run a motor

※ LoErr” will be shown in short transient time and return to LOP indication if Logic input #2 is changed in very short time in order to stop a working motor

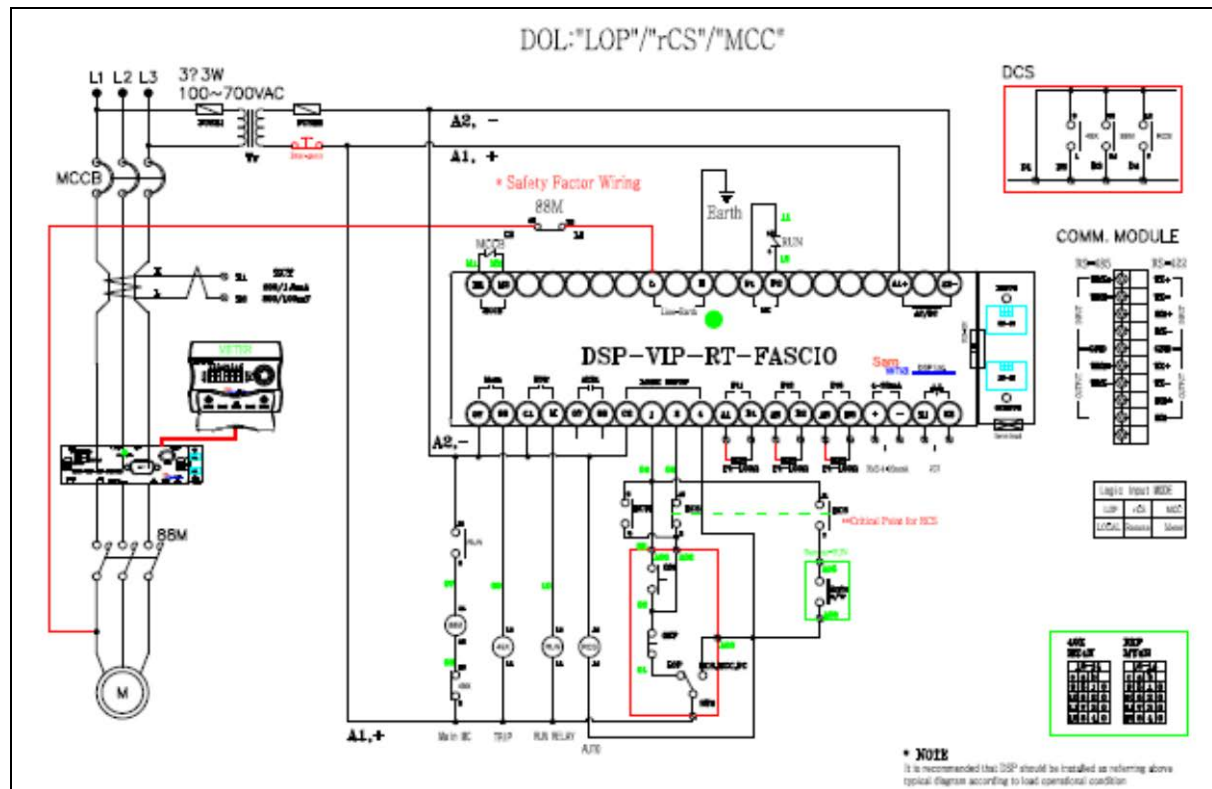
※ It would be easy to understand as referring the application sequence diagram

※ It is required that logic input from long distance sensor must be connected through the output of external aux relay because input line could keep unwanted voltage by induced current

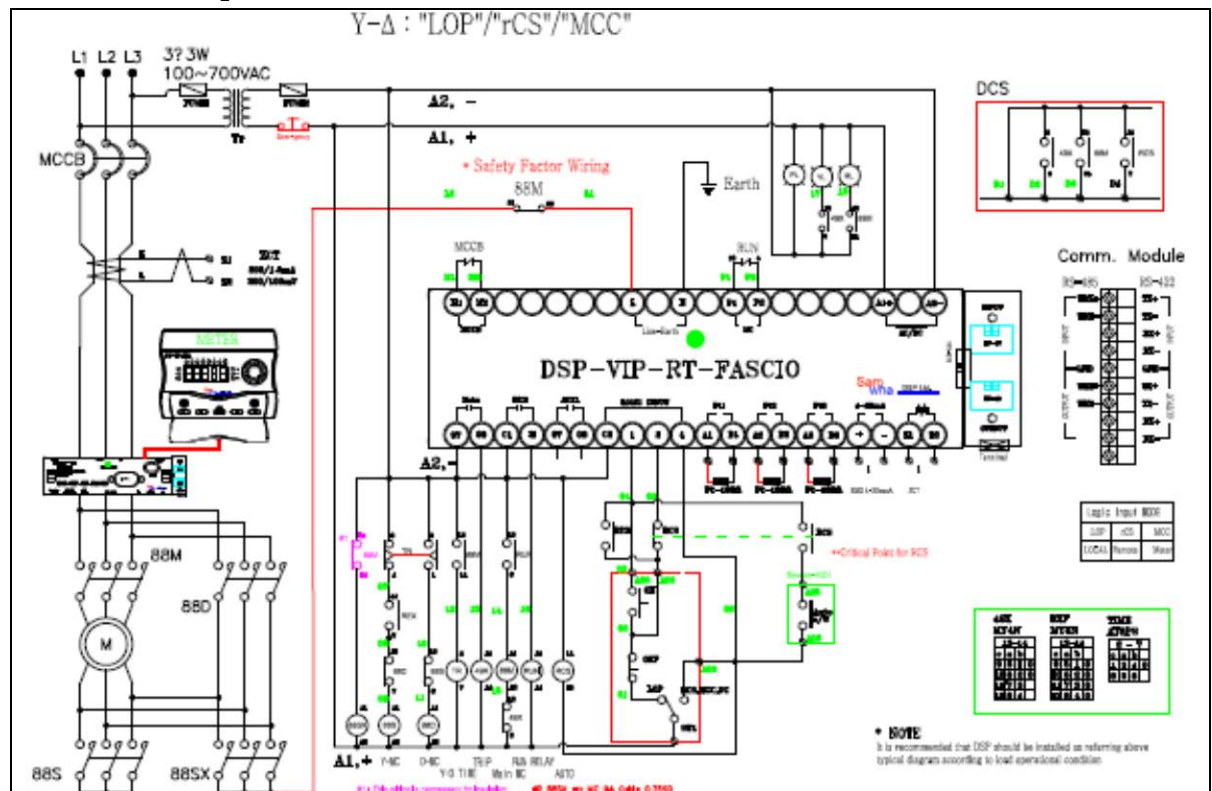
※ In case motor is stopped , the command position is appeared in the front window to indicate originated command source

※”Tover” is not available for both “RCS” operation and “LoErr” state

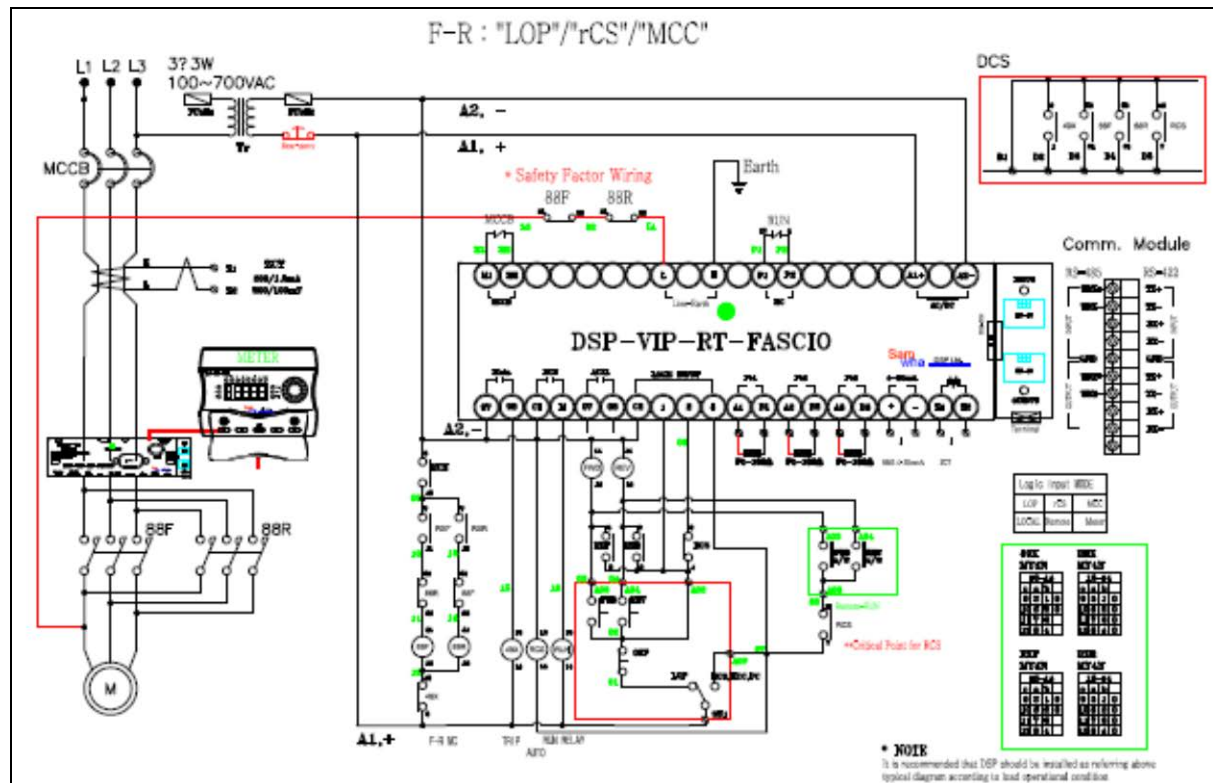
○ DOL(Direct on Line)



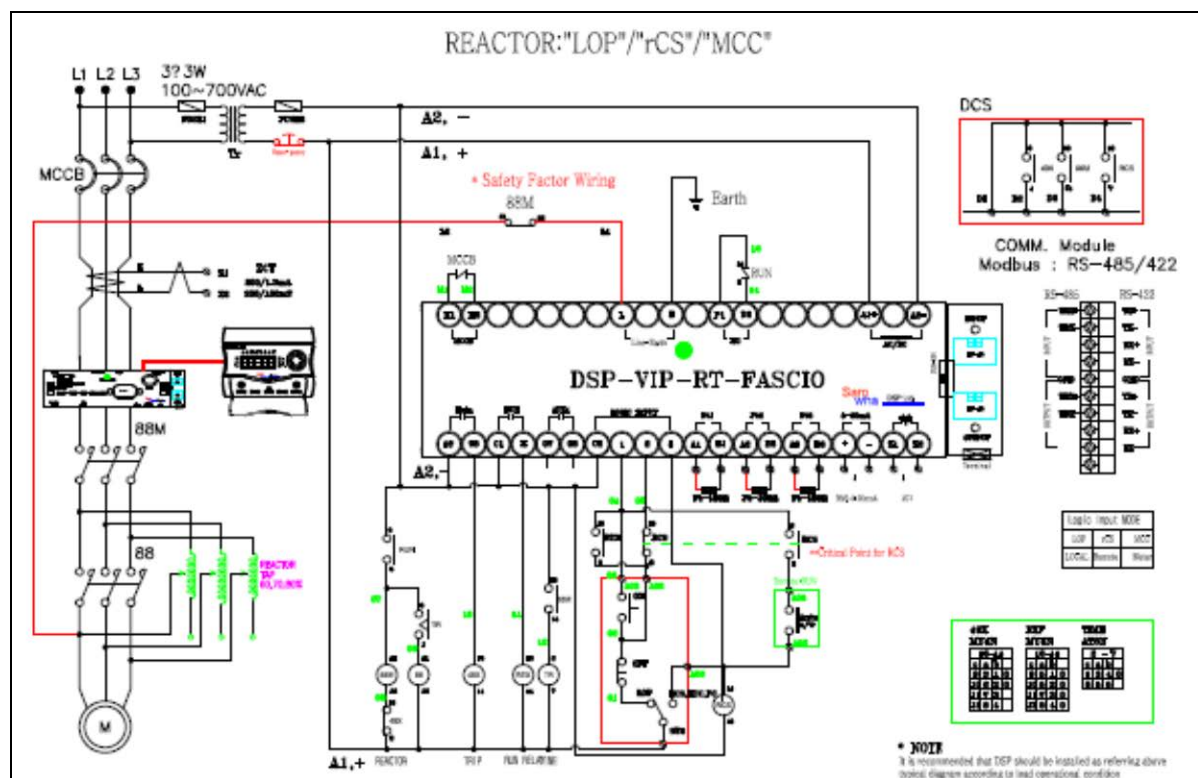
○ Y-D Start Operation



○ Forward-Reverse Operation

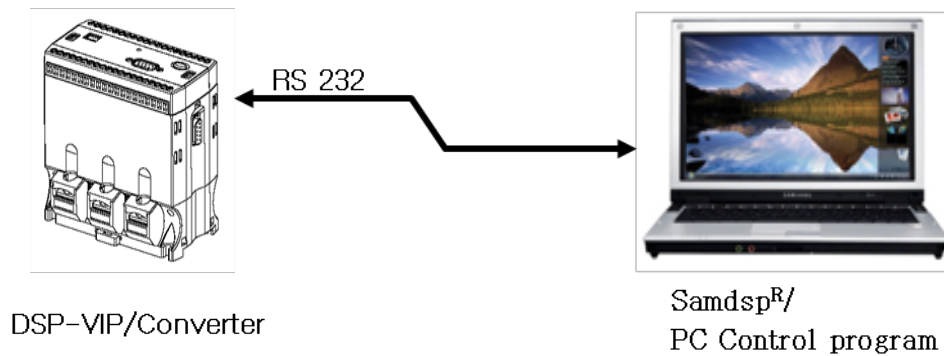


○ Reactor Start Operation

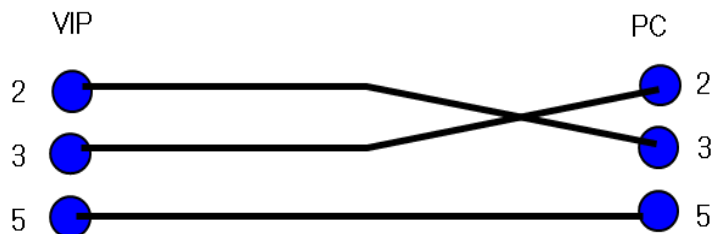


18. Example for Applied Communication:

18-1.PC <Directly > DSP by RS-232/Data Input & Monitoring

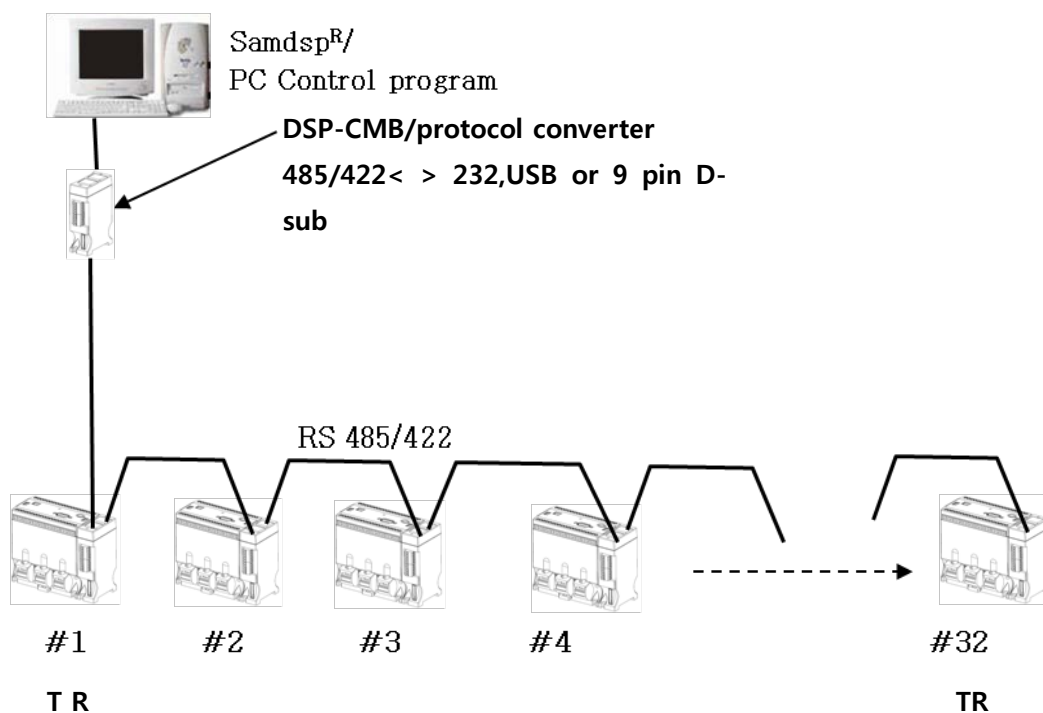


***In case VIP is connected with PC through 9 pin connector in PC, a connection is changed as follows: ,but if USB port of PC is used, it is not changed**



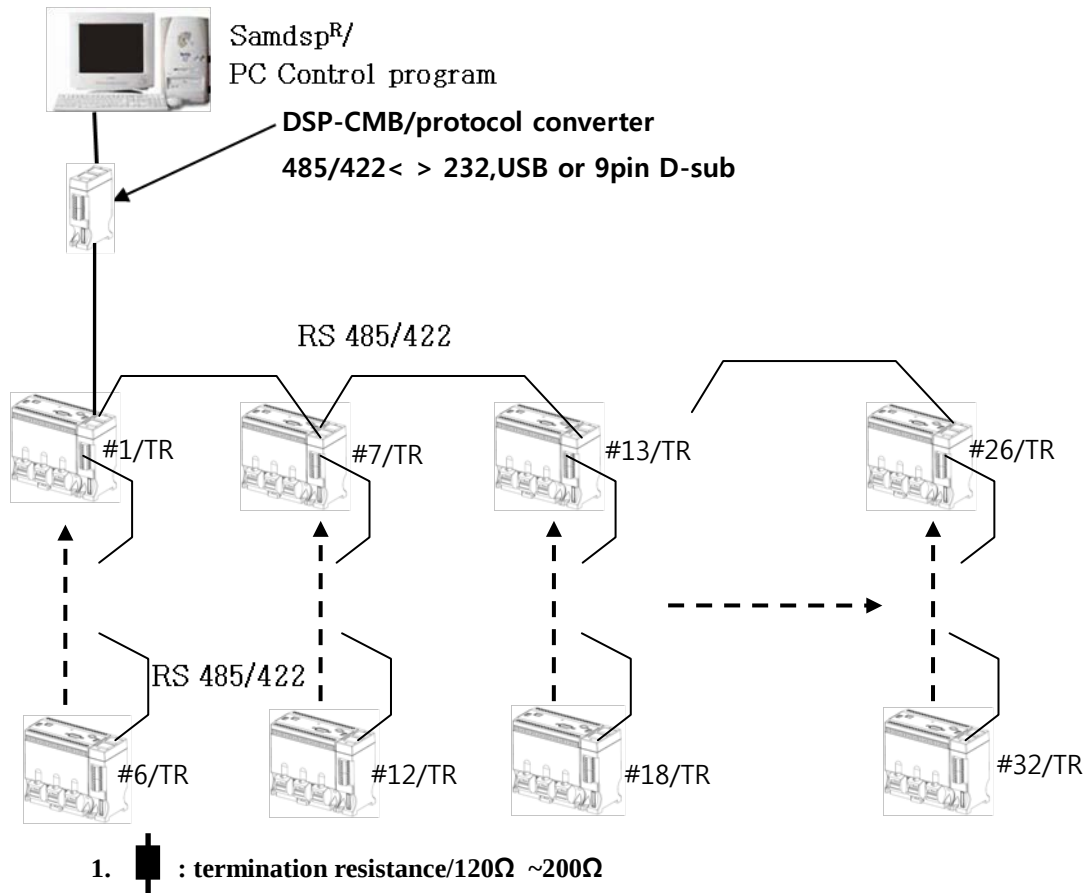
18-2.Center(PC),PLC < > DSP by RS-485/422

a.Serial Line Connection



※TR : termination resistance

b.Serial Line-Parallel Connection



2. Termination resistance for extreme end slave : possible to engage by the DIP SW inside

※ Note

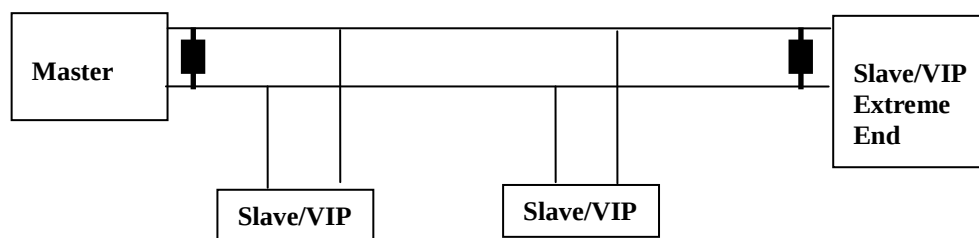
- The end connection device to connect with communication module is available for both RJ45 and/or screw terminal.
But it is mainly recommended to use RJ45 for the test of communication state one by one or a serial group, on the other hand Screw terminal for actual field connection wiring to secure from the vibration, noise, humidity, etc.
The example picture for RJ45 is as follows:



Also the actual connection through screw terminal between Master and Slave(DSP-VIP) in field bus system is as follows:



- In the connection on the concept with Master and Slave, a matching converter (protocol converter) to match 485 of VIP with Master, which is manufactured by other manufacturer, is required to have isolated power from a PC (Master)
- The position of termination resistance in serial communication between Master and Slave (VIP) is basically referred as follows, but it could be changed according to a field condition:



b. How to handle

- 1) It is not possible that an operator presets an address in VIP while a motor is working, so if user wants to do so, motor must be stopped.
- 2) The operator needs to check carefully additional selection by DIP SW for 485/422 or termination resistance before combining. not to make a separation again to preset DIP SW or termination resistance
- 3) As possible as you can, do not separate this module once after combining in order not to give a damage caused by an unwanted force while the separation job is doing
- 4) The operator needs to give a very attention to combine this module with VIP converter through 9 pin D-sub which is located in inside of this module, because a connection pin could be damaged by unwanted enforcement during a combining job.
To prevent a pin damage during a combination, follow a next procedure
 - 1) check a pin condition if there is any defect, corroded state or not.
 - 2) put a hook into the hole in the bottom of VIP converter
 - 3) align correctly both D-sub connector each other
 - 4) press a top side of module slightly toward a converter until a cricking sound is sensed
- 5) As like a same manner, a separation for this module from the converter must be done carefully.
If a separation is needed inevitably, give a force slightly to expand a clearance between a converter and a module on the center part of top side as using something like a thin driver.
- 6) Operator needs to use RS 422/485 < > RS232 (USB) protocol converter to make a communication between a converter of VIP and Note PC through a this module to operate VIP by using "Samdsp" operation program.

“Samdsp” is provided by a manufacturer in free of charge,also ”Samdsp” is loaded in our web site([www://samwhadsp.com](http://www.samwhadsp.com))

7)The model name of protocol converter mentioned in above is DSP-CMB(Multi-1U/USB Combo @ Cross Cable) and is not included in standard product of DSP-VIP

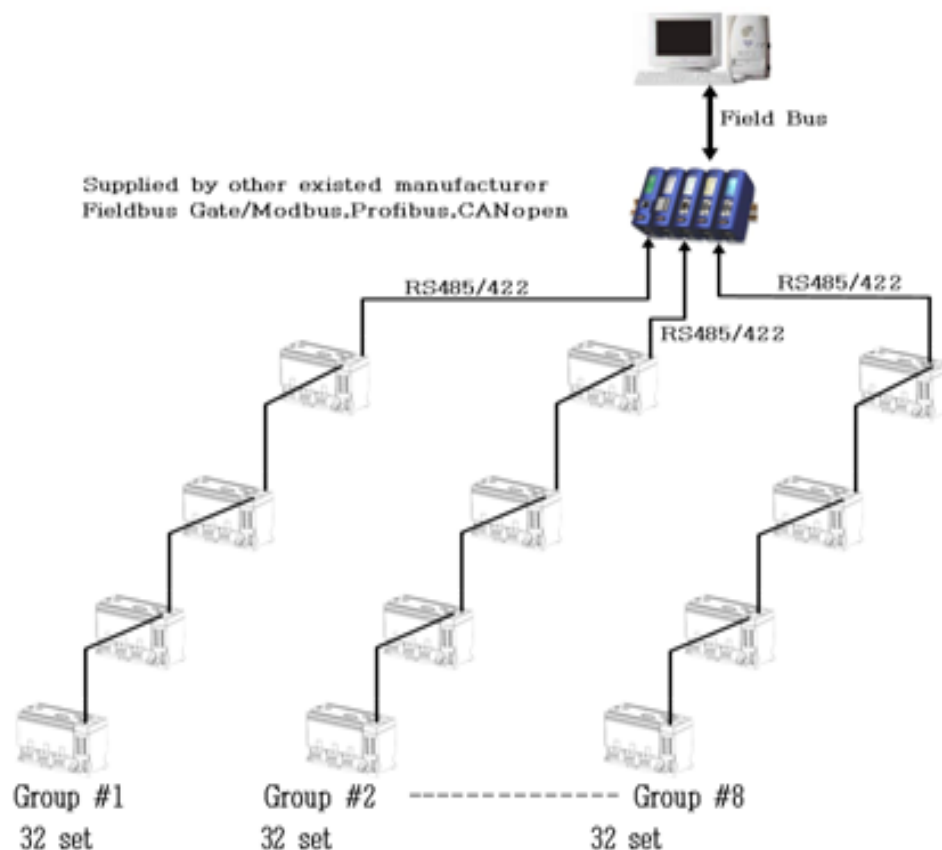
So if this is necessary , a purchaser of DSP-VIP needs to order this protocol converter seperately because this item is very common in the commercial market.

It is mainly recommended that DSP-CMB is useful to test VIP by using “Samdsp”

8)In actual serial communication, the proper protocol converter is desireably required to have with two of 485 port at least

Also one end of cross cable is terminated with RJ45,hence if operator wants to connect this one end with 10P screw terminal of a communication module, please do to cut a RJ45,then connect a wire into screw terminal as follows:

18-3.Center(PC),PLC < > DSP by RS-485/422 through Gateway

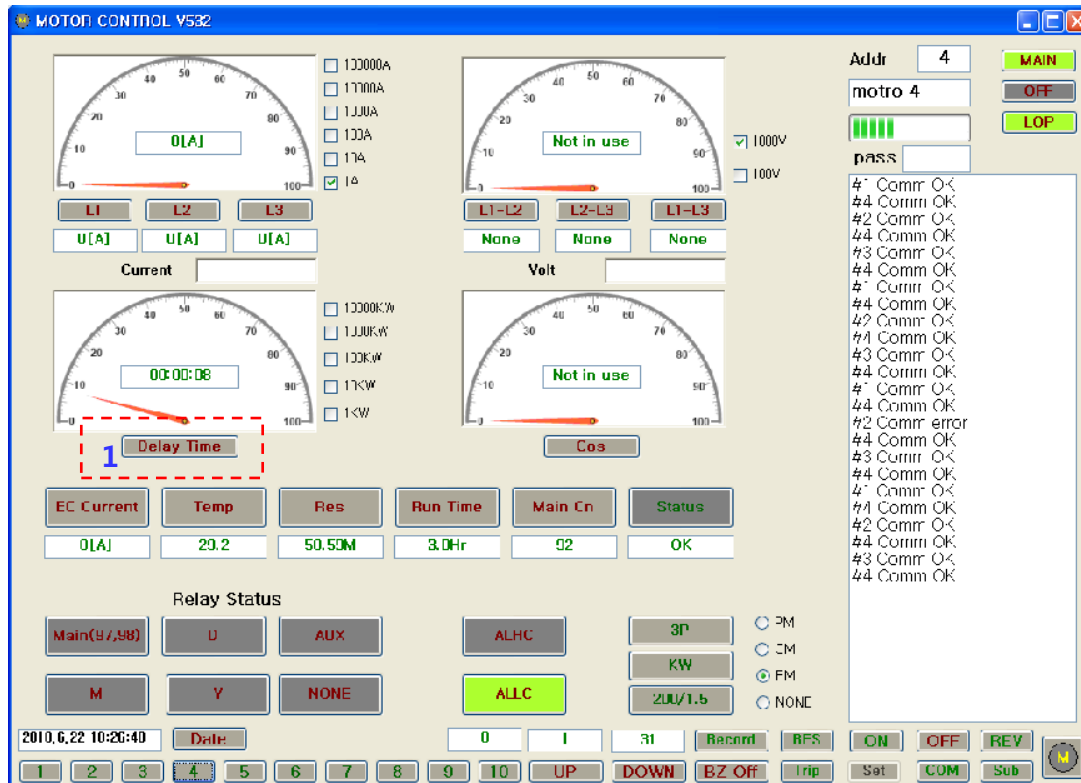


19. PC Operation Program/”Samdsp^R”

Followed description can not be perfectly matched with DSP-VIP-RTM-FASCIO ,but can be matched partially

- “MAIN”, ”SET” and “TRIP” window is as bellow

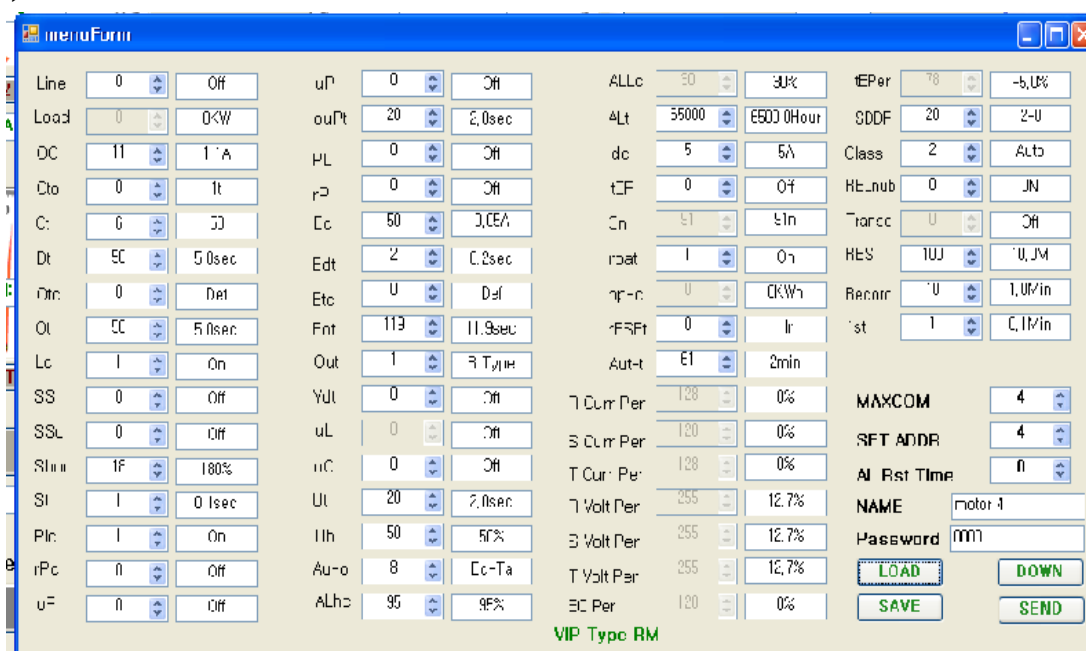
► “MAIN” Window



All information except “Delay time” is a same manner like VIP-PM/PL

- 1 : Delay time : the value of this indication is not a starting delay time which is normally adopted in all of motor protection relay.
The value in here means the remaining time to have next comming resistance measurement

► “SET” Window



► “TRIP” Window

MOTOR CONTROL V532

Addr: 4

motor 4

MAIN RUN LOP

10000A 17000A

0[A] 29.4 50.63M 3.0Hr 98 OK

Relay Status

Main(97,98) D AUX ALHC 3P 3M

M Y NONE ALLC KW 200/1.5 2M

2010.6.22 11:20:40 Date 0 5 30 Record BPS ON OFF REV

1 2 3 4 5 6 7 8 9 10 UP DOWN BZ Off Trip Set COM Sub M

CODE Phase Data1 Ctu L1-L2 L2-L3 L1-L3 L1 FA1 L2 FA1 L3 FA1

Power EC Curr Cos Temp Main Cn Run Time ADDN

TRIP2

SAVE

#4 Comm OK
#3 Comm OK

○ How to operate

► General

- (1) This program is written by C# language and a basic bps is ranged in 9.6K to 38.4K, but MWR-S is 9.6K~115.2Kbps)
- (2) The user needs additional USB/232<>485/422 protocol converter like DSP-CMB to make PC to communicate with VIP
- (3) The user's PC basically based on Window XP and Window 7 should be embedded by following file
*.net framework 4.0(dotnetfx40_full_setup.exe) for MS Window :able to down load from MS or
"www://samwhadsp.com"
* This is opened software with a free of charge

► How to install "samdsp" program

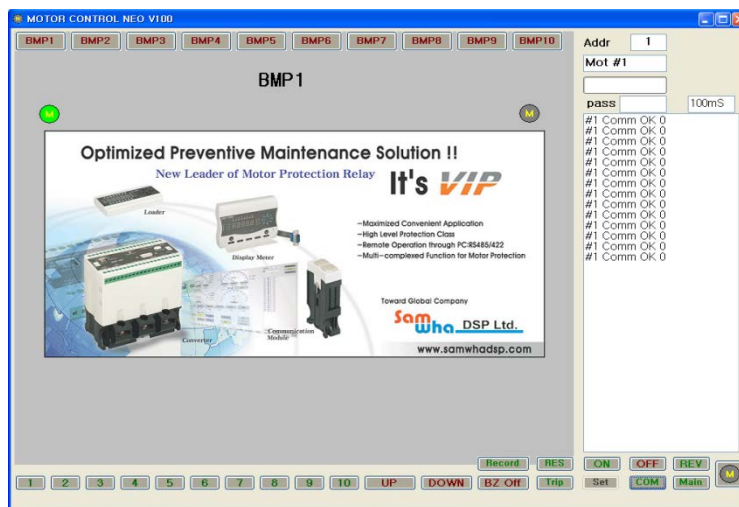
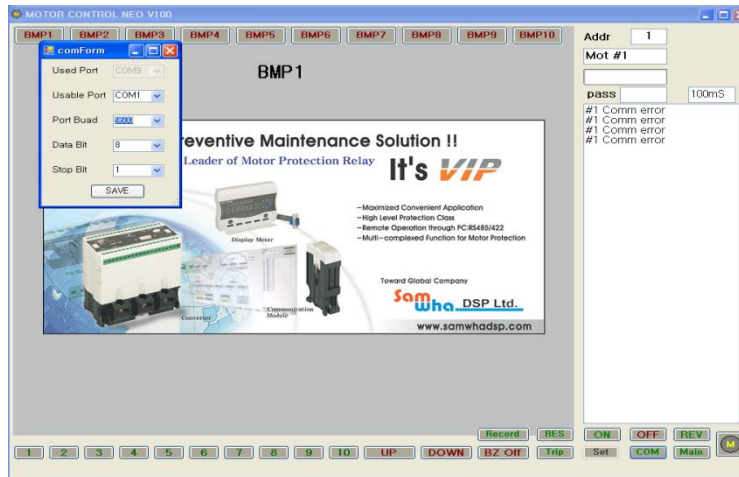
- (1) Down load latest "samdsp-v**(version number)" file provided by SamWha DSP.Co.(web page or CD) in C:// of your PC and run into the execution for this file
- (2) Check if c:"samdsp" folder is created naturally or not
- (3) If you find "Samdsp" folder ,enter into c:"samdsp",then user will meet "samdsp" file with circled "M" symbol , hereafter this "samdsp" is execution file to open main window.



4)Execute "samdsp" with image of motor symbol "M" in circle,then main window is shown.



5) In this stage,if communication port to be run in "samdsp" is not matched with it in your PC, errored message in right column is shown, then user can preset right port number and bps in pop-up window that is shown by pressing "COM" button
After preset port number and bps, make a press "SAVE" button in pop-up window.



► How to monitor a data in your PC

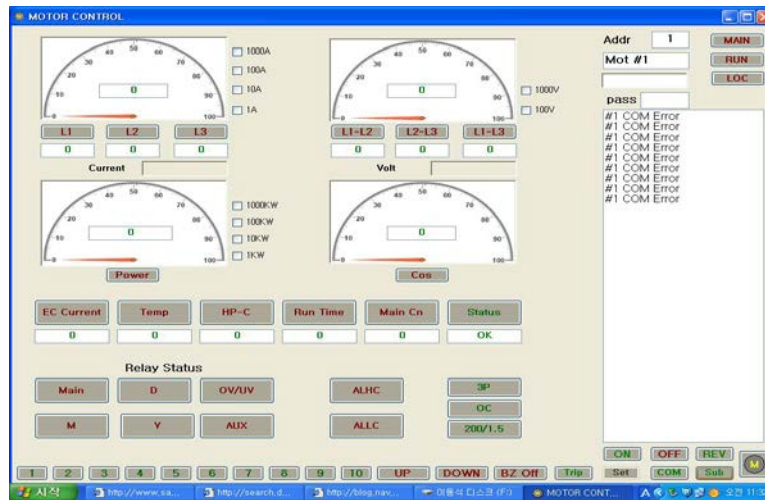
- 1) Unless you make other picture to be expressed by "main.bmp" file, you meet a window with Samwha DSP company image below . It means everything is OK.



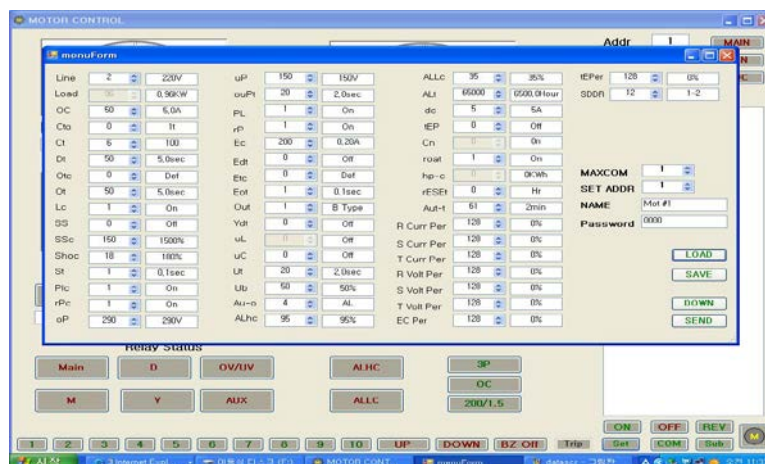
- 2) if you want to change this main window with image of samwha dsp company into your own layout, then you need to save a file named by "main.bmp" for new layout in "samdsp" folder
- 3) If you create a motor symbol matched with address of VIP in the position what you want to put, click a number matched in a bottom , then you can put a motor symbol in proper position by operating a mouse. Like this manner, same process should be done for remained motor.

4)After this action,an operator is able to control a data by clicking a button in screen on the right bottom side.

5)In case you click "Main" button,a following screen has come



6) In case you click "Set" button under the condition with password input,a following screen is come



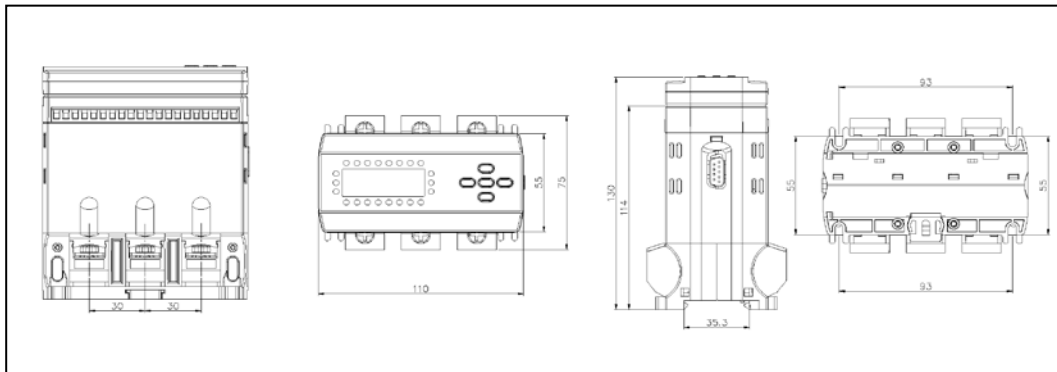
7) In case you click "Trip" button,a following screen is come



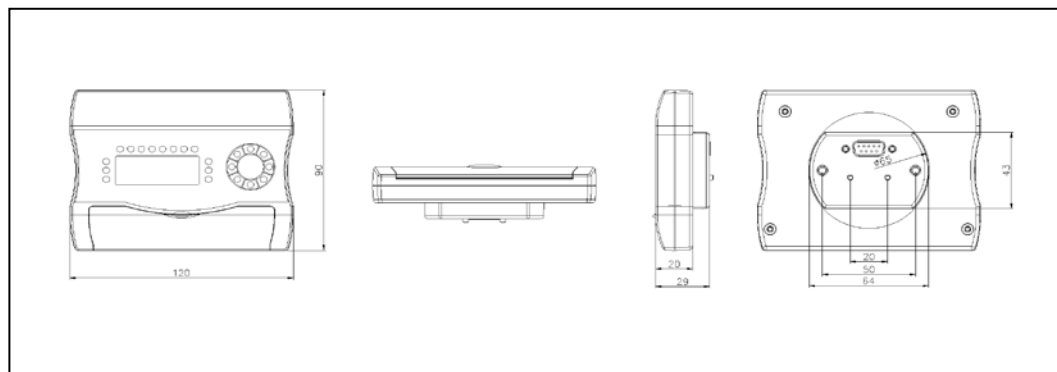
8)Then,you could operate this protection relay as controllng and/or monitoring in every screen

20. Dimension

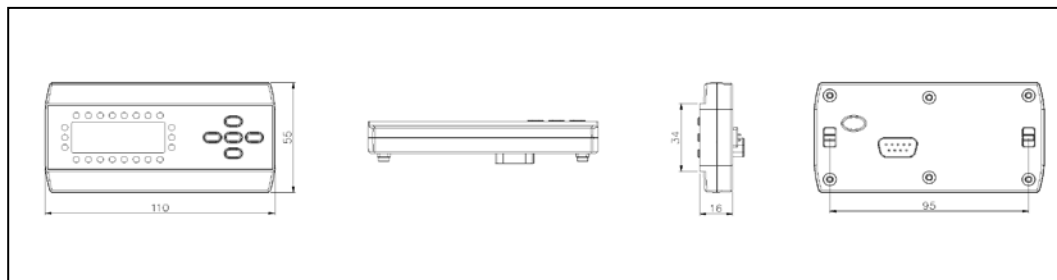
❑ Converter/Loader



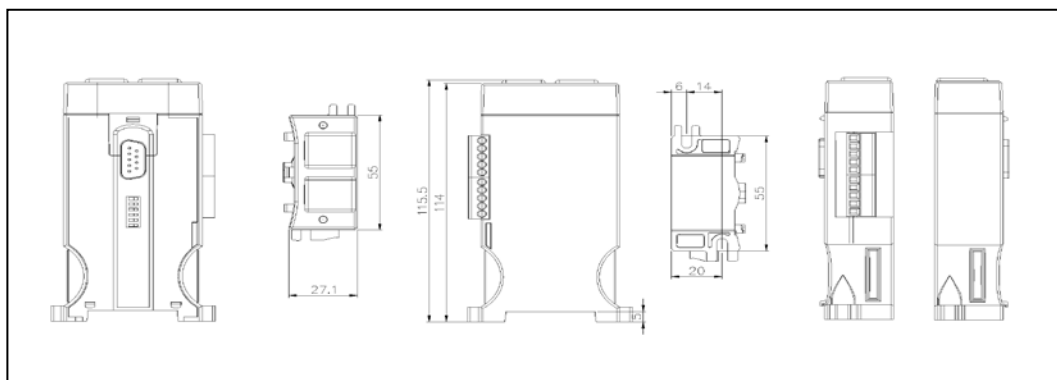
❑ Display Meter



❑ Loader



❑ Communication Module



21. Order Form

* DSP-VIP-RTM-FASCIO -1-2-3-4-XX

DIV		Description	Remark
DSP-VIP-RTM-FASCIO			Panel Flush Mounting Type /4~20mA/Motor Protection/Line Insulation Resistance or PI Measurement
1	70	0.2A ~ 70A	Possible with external CT[0.2A ~ 6A]
2	B	24VAC/DC(Optional)	Control Power
	Z	85VAC~260VAC(120VDC~ 370VDC)	
3	7	50/60Hz	Frequency/Control Power
4	ZCT	ZCT Embedded	Not possible to use with external CT
5	PI	Polarization Index	
XX	Option	Exclusive Customer Order	*Available for Package type 1)None:Standard Software 2)P:Optional Software 3)PC:Optional Software with Communication Module 4)Others except above: Customer Order Made
	A	Logic Input Voltage	220VAC(150~260 VAC)/220~370 VDC
	B		110VAC(75~150VAC)/110~220VVDC

□ Reference Code

Reference Code		Description
DSP- VIP- RTM- FASCIO	DSP-VIP -RTM- FASCIO -70Z7- PI	85VAC ~ 260VAC,50/60Hz,(120VDC ~ 370VDC), 4 ~ 20mA, Display meter
	DSP-VIP -RTM- FASCIO -70Z7- ZCT-PI	85VAC ~ 260VAC,50/60Hz(120VDC ~ 370VDC), 4 ~ 20mA, ZCT Embedded, Display meter

※Note

Logic input voltage is 220VAC(150~260 VAC)/220~370VDC without suffix code “A”
unless “B” is suffixed in completed reference code.

❑ Accessory

Item	Reference	Description	Remarks
Cable	DSP-CABLE-12	1.2m	
	DSP-CABLE-18	1.8m	
	DSP -CABLE-30	3m	
	DSP -CABLE-XX	Over 3m	
ZCT	DSP -ZCT-I-XX	100mA/1.5mA	XX:inside diameter of ZCT
	DSP -ZCT-V-XX	100mA/100mV	XX::inside diameter of ZCT
Display Meter	DSP-ID-FASCIO -RTM	Input Device/Display Meter, matched with converter,VIP-RTM-FASCIO	
CT Terminal	DSP -TB-3T	Terminal through CT Hole	
Communication Module	DSP -CM-44	*Module:RS 485/422< >RS 485/422	RS485/422 Serial communication
Matching (Protocol) Converter	DSP -CMB	*Module:RS 485/422 < > RS 232:USB	*Existed product by other manufacturer * only for test, Input ,retrieval for VIP-CM44 combined with VIP by using “Samdsp”
External CT	DSP-C1	3CT/Rectangular, 100/5	
	DSP-CC	3CT/Rectangular, 150/5	
	DSP-C2	3CT/Rectangular, 200/5	
	DSP-C3	3CT/Rectangular, 300/5	
	DSP-C4	3CT/Rectangular, 400/5	

21. Guide for user

- ❑ This product should be maintained by qualified engineer according to manufacturer's guide, so a damage or something wrong of this product which comes from violating this guide may cost to user
- ❑ Using environment is as follows:
 - 1)Temperature:-25 °C ~+70 °C
 - 2)Storage :-40 °C ~ +80 °C
 - 3)Humidity:30 ~ 80%/RH,Non-condensing
 - 4)Voltage
- ❑ The control voltage is AC 85V~260V ,220V, 50/60Hz(DC 120V~370V) or AC/DC 24V and allowable deviation for this voltage is +.-10% .
 - 1)a supplied voltage greater than rating value may be given a damage to incoming part of DSP,so customer must keep allowable deviation of input voltage.
Also this control voltage must be supplied through a transformer insulated between primary and secondary,also proper fuse(not use Line-Neutral Voltage in 3P4W)
 - 2)in case of the interface between Note PC and DSP directly by RS232 to monitor and to preset data ,power source for Note PC also must be provided through an insulated transformer and a proper fuse above mentioned,otherwise RS 232 communication could be interfered
 - 3)fastening screw:a connection between a terminal of DSP and a wire must be done clearly and surely, but user should be care of distortion caused by extra fastening torque
 - 4)It is not possible that an operator presets a data directly through PC while DSP and a motor are working ,so if user wants to do so,please stop to operate a motor.
- ❑ An operator should not combine a converter with a loader and a display meter while the motor is working,so if necessary to do so, a motor should be stopped.
- ❑ An operator should not control DIP SW while a motor is working. If necessary to do so, a motor should be stopped and be done in waiting mode state
- ❑ Operator need to use RS 422/485<>RS232(USB) converter(eg:DSP-CMB),so USB must have isolated power to connect communication module of DSP-VIP to PC in serial connection . This converter is one of common accessory provided by other manufacturer.