Voltage-Current based Digital Multi-function Motor Protection Relay DSP-VIP-PL/PM

<"oPSEt" mode: to preset during operation> <"Logic/on/oFF" mode>
<"FdbuS" mode : 485/422 serial or Ethernet communication>
<Version II,Year 2018>

Sam wha DSP Ltd.
Control Protection Maintenance

Content

DSP-VIP-PL/PM

Voltage-Current based Digital Multi-function Motor Protection Relay
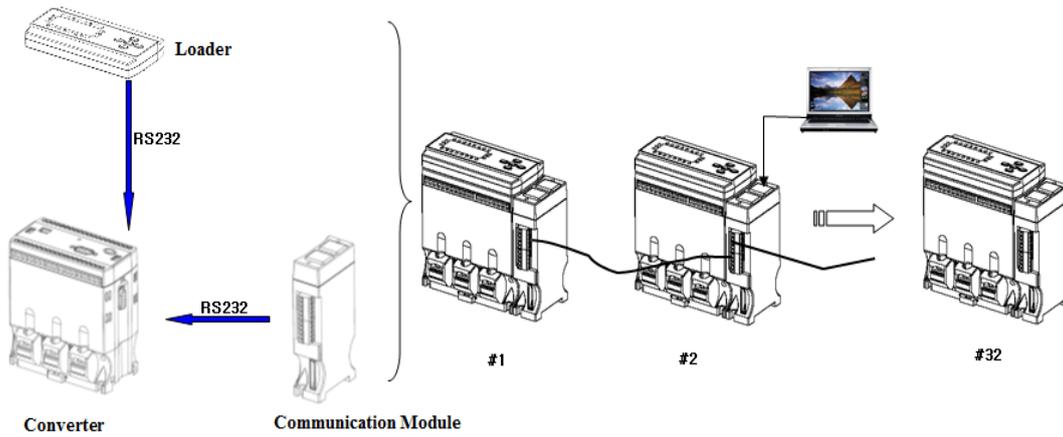
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<"FdbuS" mode : 485/422 serial or Ethernet communication> <Version II,Year 2018>

1.System Construction

○ **DSP-VIP-PL/Panel Mounting Type**

○ **DSP-VIP-PM/ Panel Flush Mounting Type**
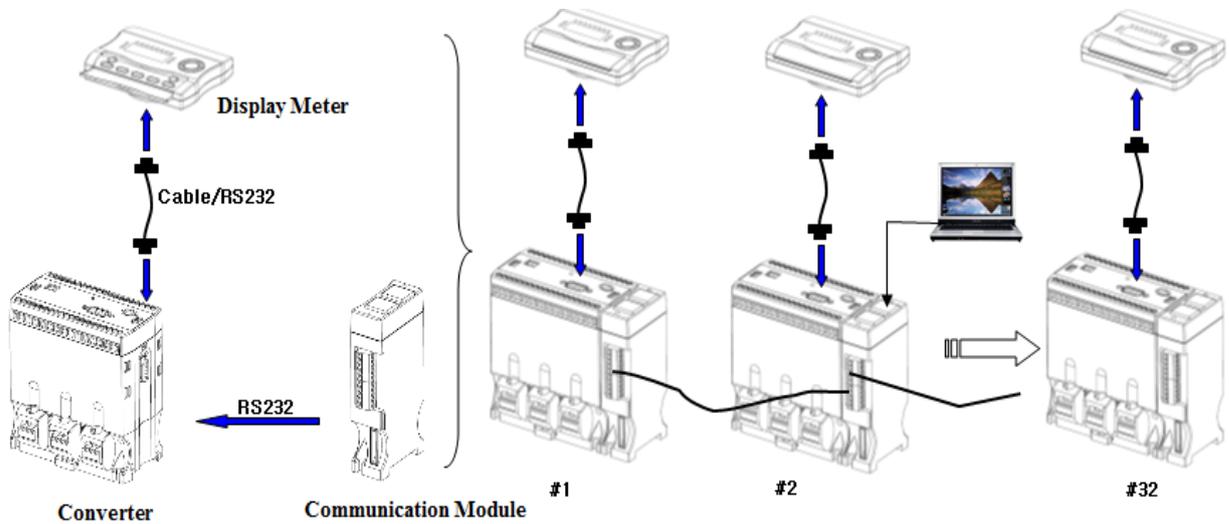
2.Detailed Structure

◯ **Converter**

Labels:
3 Colour LED/ Power(G),Operating(R),Trip(Y)
Lock Holder
Functional DIP SW
IN-OUT Termial
CT Block
DIN Rail Moving Tip
ScrewHole
9 PIN D-Sub/RS-232〈〉Loader
Reset
9 PIN D-Sub/ RS-232〈〉Comm. Module
Air Vent
Wire Turn Hole

◯ **Loader**

Labels:
Menu Bar
5 Digit Display LED
Status LED
Phase Line LED
Control Key
Line Bar Grapgh
Fronf View
Lock Holder
9 PIN D-SUB/RS-232
Back View
UP
SET Mode CLR
DN

○ Display Meter

5 Digit Display LED

Phase Line LED

Menu Bar

Round Bar Grapgh

FWD

REV

Key Cover

Control Key: W/Back Light

Front View

SET DN M/OFF UP CLR

Lock Cover

Back View

9 PIN D-Sub/
RS232〈 〉Converter
by Cable Connector

○ Communication Module

Status LED

RJ45 Connector Hole
With Cover/Input
/Test for each module
by Notr PC

DIP SW/4P:Terminal Resistence,
2P:485-422

10P Terminal
/5P-In,5P-Out
/Actual Field
serial connection

ScrewHole

9PIN D-Sub/
RS-232〈〉Converter

Outside View

Inside View

3.Main Feature

◆ **Easy Handling**

- ❑ **Incoming voltage is indicated orderly while a motor is stopped**
- ❑ **To give a guarantee to exclusive operator : Password Input**
- ❑ **To realize convenient and various data input**
  - ● **Loader: DSP-VIP-PL**
  - ● **Display Meter: DSP-VIP-PM**
  - ● **Note Book PC: DSP-VIP-PL,VIP-PM**
- ❑ **Main/Sub/Cab Menu:Three devided menu group 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 of motor**
  - ● **Cab (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.

- ❑ **To Indicate a necessasary information in every 3 sec**

  - ● **Basic Factor circulating indication:V,I,KW,GR(Ec)/ "OFF" must be set in "rota" mode**

  - ● **Basic Factor + PF,Temp,KWH,AWT(Accumulated Working Time)/"ON" must be set in "rota" mode/**
    Possible to fix one of circulated factor or to release:repeated one touch for CLR Key

  - ● **To show load factor(actual/setting)/65% ~ 100%:Line Type/DSP-VIP-PL, Round Type/DSP-VIP-PM**
  - ● **Possible to check and/or to change preset value of each mode during the operation**
    - ▶**to check preset value**
      *Press "SET" key during a motor run,then search mode neccessary to check , consequently name
      of mode & preset value is shown alternatively
      *not possible to change preset value,only to show presetting state.
    - ▶**to change preset value**
      * Firstly, preset "ON" in "oPSEt" mode
      *Press "SET" key during a motor run,then search mode neccessary to change , consequently name
      of mode & preset value is shown alternatively and make a change for preset value by "UP",DN" key
- ❑ **Higher Alarm to OC : useful for operator to recognize a trouble**

- ❑ **ON-OFF switch to control motor/DSP-VIP-PM:to save wiring and labor inside panel**

- ❑ **Convenient installation:65Phi circle or rectagular hole(48*96)/DSP-VIP-PM:Display Meter.**

- ❑ **To keep a stable operation under frequency variation of Inverter:1Hz ~ 400Hz**

- ❑ **Indication for a position of "FWD(ON)"-"REV(OFF') command to run a motor:in case motor is run or stopped during the action by "OFF" or "Auto sensor", a position message like LOP,MCC(Display meter),rcs(Remote control sensor),out-F(external fault input) and PC that such command was originated from is appeared in front message window.**

◆ **Multi-complexed Function**

- ❑ **Power type protection relay based on Voltage and Current**
- ❑ **To indicate RMS value/load current,earth current:RMS chip adopted in every input/to contribute to check an exact condition of motor**
- ❑ **To achieve high-resolution voltage measurement : isolation amplifier with an output seperated from the input circuitry**

- ❑ **To act as actual complexed meter:V,I,KW,PF,KWH,Temp**
    - ***Voltage Select:110V/220V/380V/440V/480V(110V is secondary voltage of PT)***
    - ***Current Meter with CT:0.5A~3600A(Auto Range for decimal point)***
    - ***KW Meter:0.1~60000KW(Auto Range)***
    - ***Power Factor Meter: ± 0%~100%***
    - ***KWH Meter:1KWH~99999999KWH(used "K" unit LED)***
    - ***Temperature Meter:$0^{O}C \sim 150^{O}C$***
    - ***Auto Range: to indicate decimal point in conjunction with "K/Test" LED in Loader and DM***
- ❑ **To cover a wide current range**
    - ***70 Type:0.2A ~70A/0.2A ~ 6A(0.2KW~4.4KW/AC480V) with external CT***
    - ***With external CT :0.5~3600A***

- ❑ **High sensitive Level and Wide range for ground fault protection:30mA~ 10A**
    - ***Standard type/with external ZCT : need to use shield wire for connection between ZCT and Z1,Z2 terminal of DSP***
    - ***Optional type : ZCT embeded***
    - ***Alarm to disconnection with ZCT:In case ZCT is disconnected with Z1,Z2 of the converter after the control power is on,not while operating,the preset process is not gone ahead anymore as flickering "Ec-ct"/"Off" in "Ec" mode to clear this alarm.***
- ❑ **To realize Short,Ground fault protection by instant trip time:0.05sec**
- ❑ **To be acceptable for two kind of ZCT rating : 200/1.5mA or 200/100mV,selectable in DIP SW**
- ❑ **Temperature arising protection of case,winding of motor:sensed by PT100:$^{0}C\sim150^{O}C$**
    - ***If sensed temperature is greater than preset value, motor can not start***
    - ***if PT100 is not connected and the value except "OFF" in "TEP" mode is preset ,alarm is shown and motor can not start. hence need to preset "OFF" in "TEP" mode to make a motor start***

- ❑ **Various and multiple trip output of Main and Aux relay**
    - ***Main/1a(97-98):energized(trip) with an output of C1-F-R(1a * 2) together***
    - ***AUX/1a(07-08):same job as main trip or one of Shoc/Uc/AL/Temp/OV-UV/V-Ub/V-oFF selected in "Au-o" mode***
    - ***03-04/1a : trip for short circuit***
    - ***57-58/1a : trip for ground fault***
- ❑ **To memorize 8 events of the latest trip : to contribute analyzing trouble cause and motor working condition in conjunction with a number of lighted LED in bar graph to show a order of tripped event.**

- ❑ **Main contactor Auto Close:In case a line power is "on" 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)**
    - ***"Logic" mode should be preset "ON"***
    - ***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-diagonostics:in case of pressing "CLR" key of display meter or loader for 3 sec or more,all kind of trip output is tripped after counting down o-time of definite T-I characteristic or a time of 550% to "OC" preset value in Inverse T-I Curve , hence % of bar graph LED shows how much time is counted down**
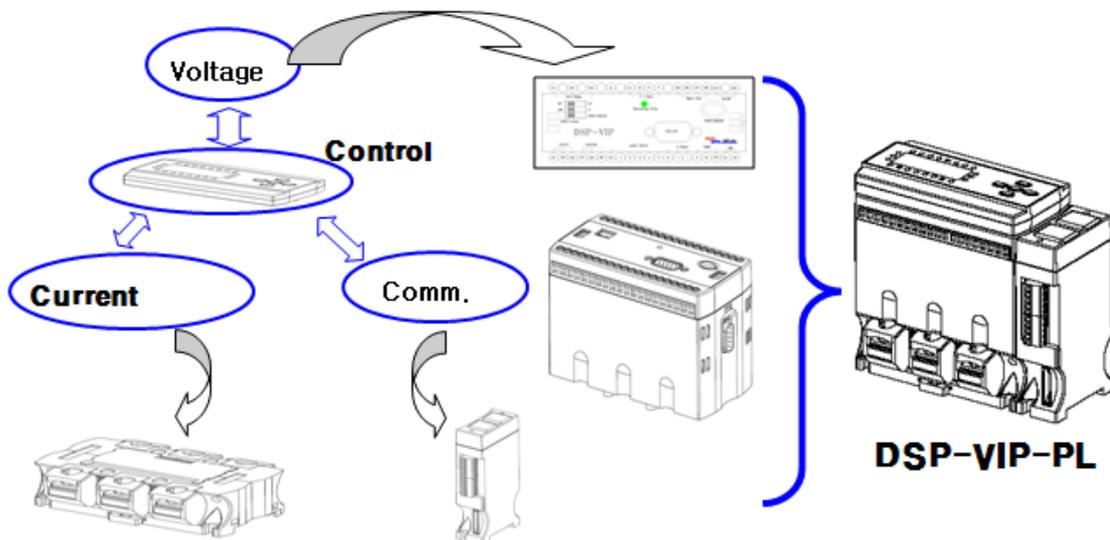
◆ **Remote Control through RS-485/422 digital communication**

- ❑ **Various communication module function**
  - *** CM44   : 485/422,Modbus/RTU**
  - *** CM-44E   : Ethernet Network,Modbus TCP**
  - *** MWR-S   : 485,Modbus/RTU, 1 month data record/recording interval:50msec/max**
- ❑ **4~20mA output for current loop communication : 20mA for maximum current value among 3 phase**
- ❑ **To realize effective system for digital communication : possible to combine a module simply if necessary**
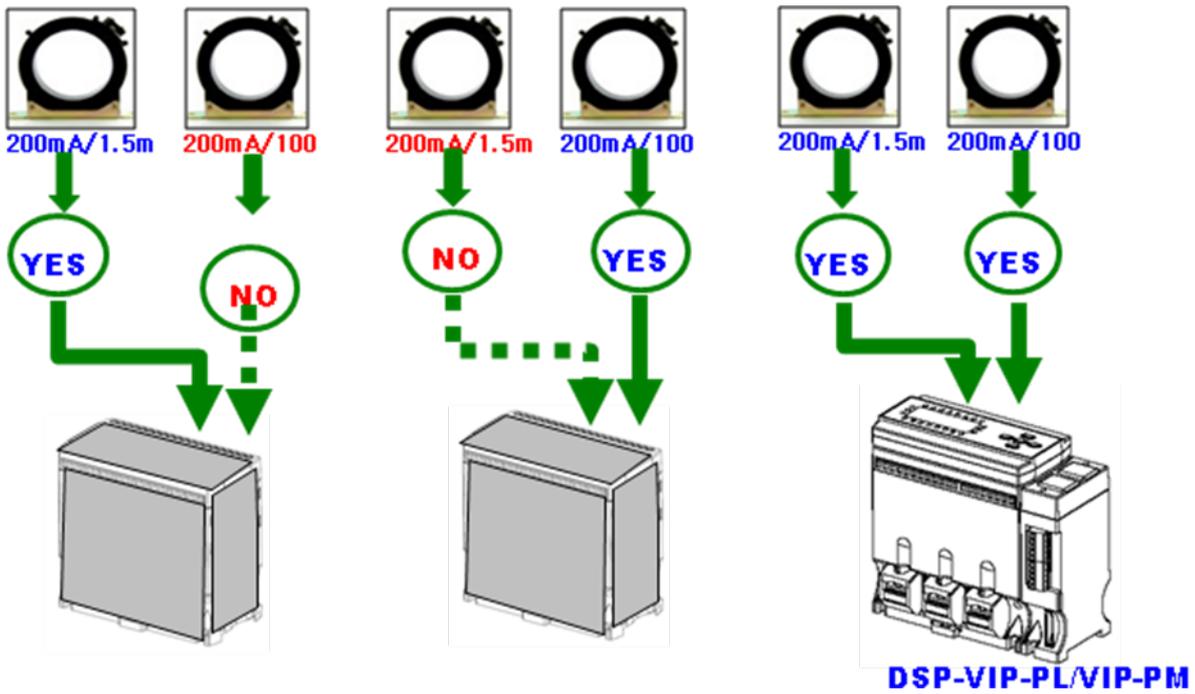
- ❑ **To response for RS-485/422, Modbus/RTU or Ethernet,Modbus TCP**
- ❑ **To select one of RS 485 and 422 : Simply selectable in DIP SW inside communication module:CM-44**
- ❑ **To put easily termination resistence in extreme end unit in serial network if neccessary: Simply selectable in DIP SW inside communication Module**
- ❑ **To monitor and input a data by using "samdsp" in the field:Note PC < > Converter of DSP**
  - ***PC<RS232>VIP converter:not to need a communication module**
  - ***PC<Comm. Module>VIP converter:need 485(Comm. Module)/USB(PC): Protocol Converter**
    - **/ DSP-CMB**
- ❑ **To realize a preventive maintenance : convenient and effective software**
  - ***management and control : "samdsp"**
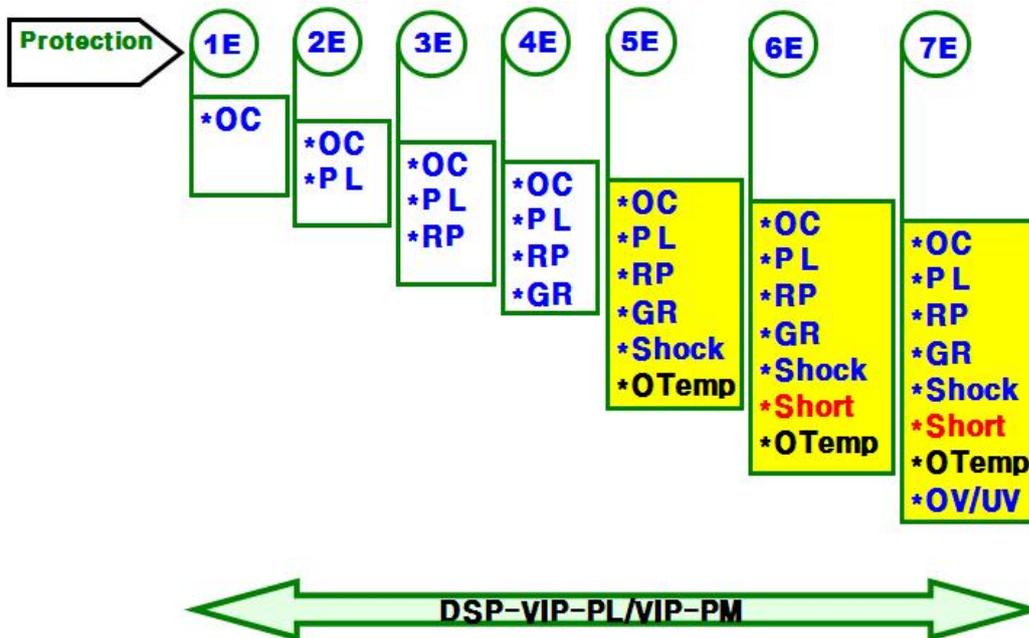 - ***data base construction : "samdspdb"**

4.Specialized Point
◆ Power Type = Incoming Line Voltage <==>Load Current

DSP-VIP-PL

◆ **Acceptable with both rating of ZCT**

200mA/1.5m	200mA/100	200mA/1.5m	200mA/100	200mA/1.5m	200mA/100
YES	NO	NO	YES	YES	YES

DSP-VIP-PL/VIP-PM

◆ **High Level　Protetion Class**

Protection

1E	2E	3E	4E	5E	6E	7E
*OC	*OC *PL	*OC *PL *RP	*OC *PL *RP *GR	*OC *PL *RP *GR *Shock *OTemp	*OC *PL *RP *GR *Shock *Short *OTemp	*OC *PL *RP *GR *Shock *Short *OTemp *OV/UV

DSP-VIP-PL/VIP-PM
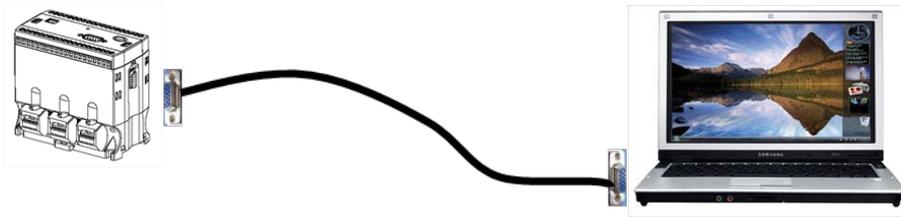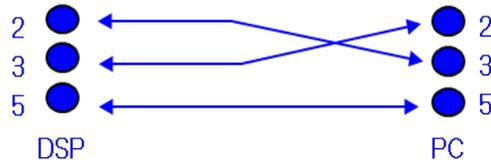
◆ Convenient Communication Module : DSP-CM-44, CM-44E,MWR-S

a. the interface between Note PC and DSP directly by RS232

Monitor and input through Note PC

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


```
2 ●  ←      ●  2
3 ●  ←      ●  3
5 ●  ←→     ●  5
   DSP         PC
```

b. VIP-PM/CM-44 < 485/422:Serial Network >PC/Master

R
J
4
5

**Screw
Terminal**

INPUT
┌ TX+
│ TX-
│ RX+
│ RX-
└ GND

OUTPUT
┌ TX+
│ TX-
│ RX+
│ RX-
└ GND
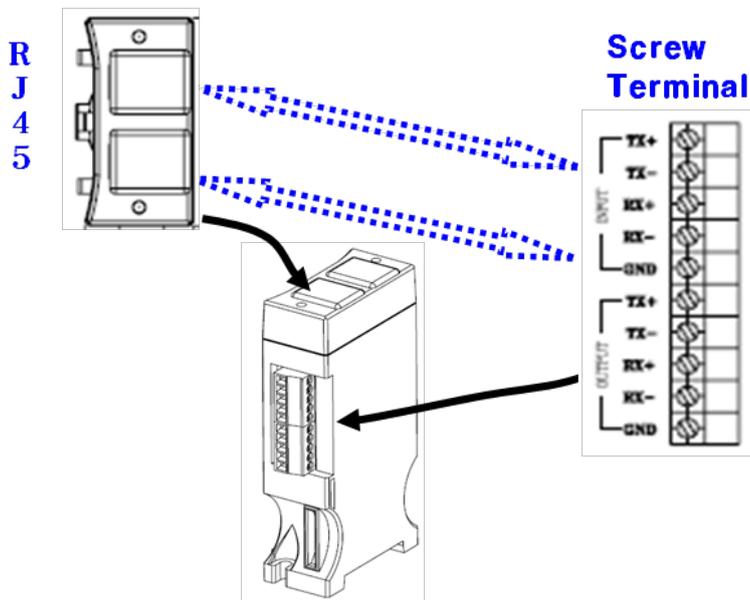
Serial connection through terminal/RJ45 for test of each module

OFF ON

1   422:TX
2   485:TRX
485 { 3
4   422:RX
422 { 5
6   485

4P:Termination Resistence /ON<>OFF:Only "ON"for extreme ends,"OFF" for the middle

2P:485<>422

DIP SW:6P
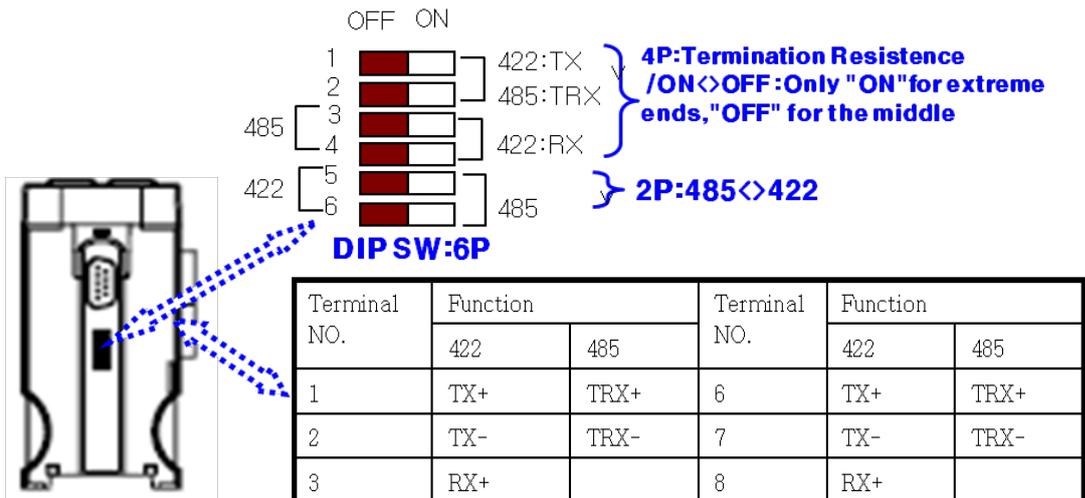
Terminal NO.	Function		Terminal NO.	Function	
	422	485		422	485
1	TX+	TRX+	6	TX+	TRX+
2	TX-	TRX-	7	TX-	TRX-
3	RX+		8	RX+	
4	RX-		9	RX-	
5	Signal GND		10		

Movable Terminal:10P

DIP SW Selection:484<>422 , Termination Resistence

※Note:The detail about MWR-S(485 & recorder) is described in the manual for MWR-S

c.VIP-PM/CM-44E < Ethernet Network > PC/Master

Switching Hub

Display Meter

Cable/RS232

Converter   Comm.Module

RS232

#1   #2   #N

Communication Signal LED

RJ45 Connector

9P-Sub DIN matched with Converter
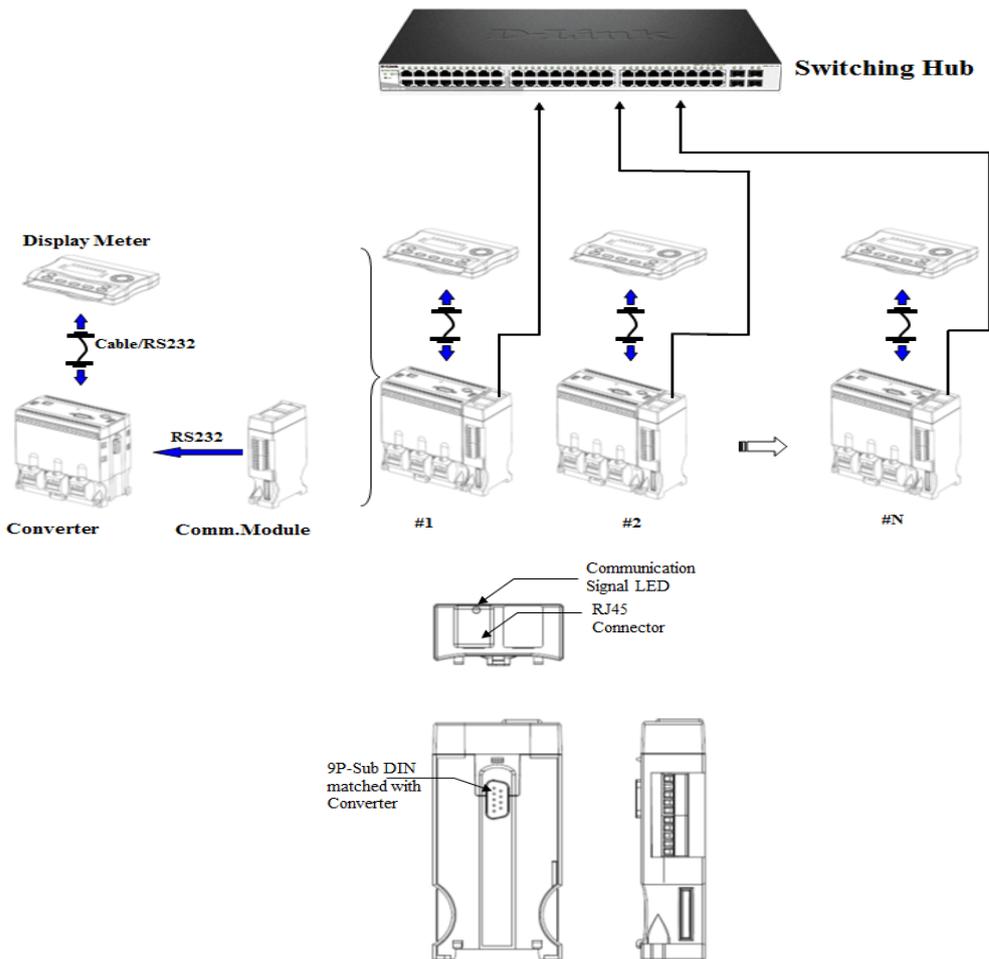
CM-44E /Ethernet Network Module

◆ **Various and Multiple Indication**

Indication

V	I	KW	PF	KWH	°C	Sec
Line Voltag	Load Curren	Load KW	Power Facto	Load KWH	Temperature	Accum-Time

Additional Function

Y-△	4~20	Shock	2 Alarm
Y-△ /Ractor /Fwd-Rev	4~20mA for Max. Curr	to sense slight mech. Shock	Duplex Alarm/ Higher/ Lower
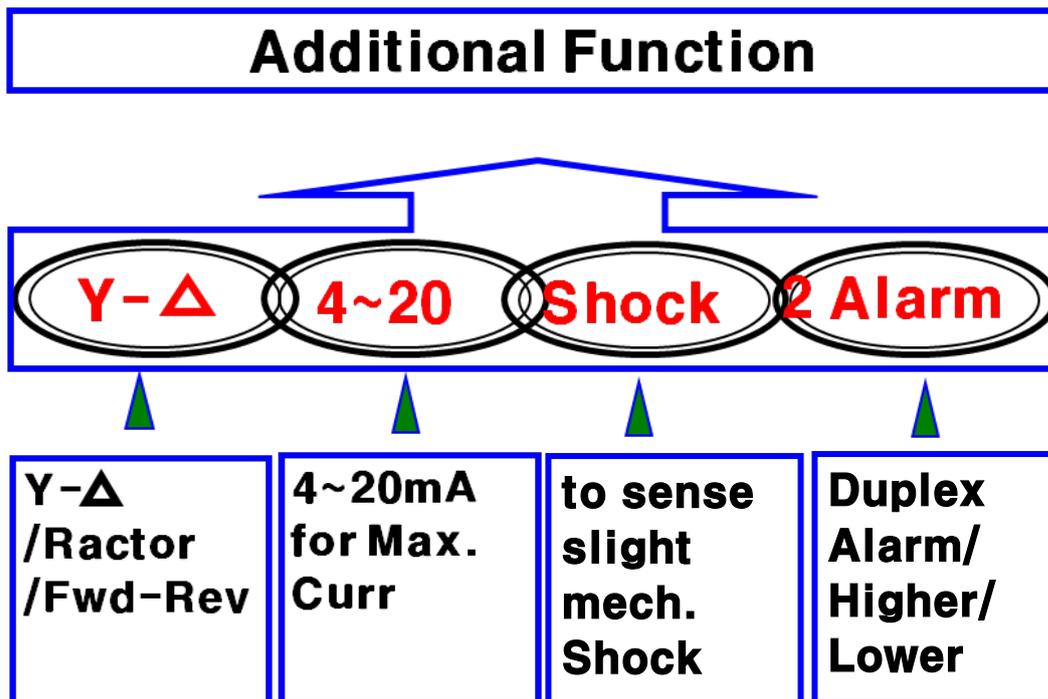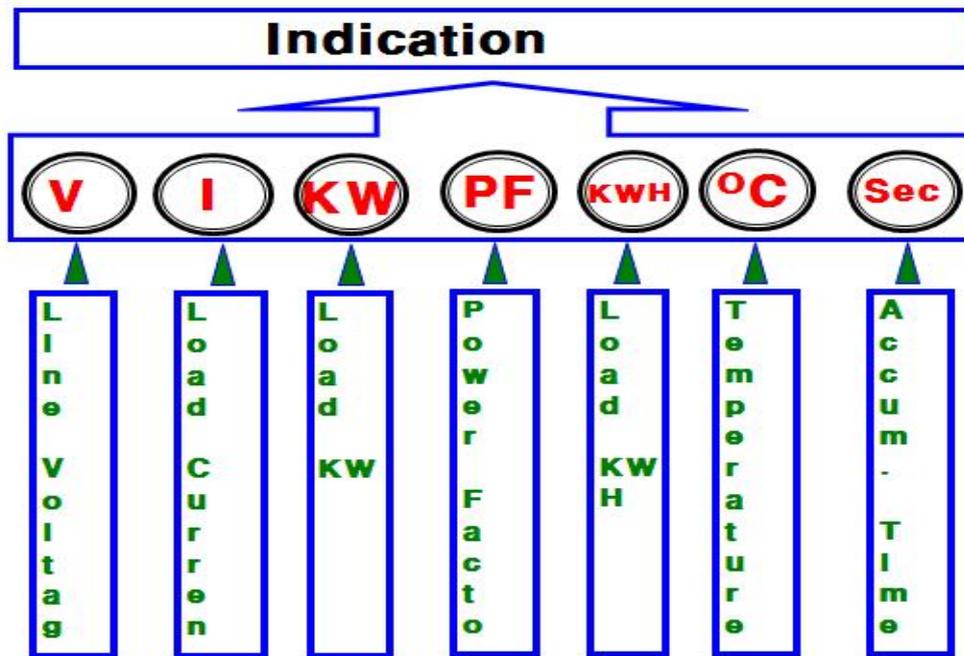
5.Function List

	Function	DSP-VIP-PL		DSP-VIP-PM	
		Converter + Loader	Comm. Module	Converter+ D. Meter	Comm. Module
Protection	Over Load/ Over Current	O		O	
	Under Load/□Under Current	O		O	
	Over Voltage	□		O	
	Under Voltage	O		O	
	Phase Loss by Line Voltage	O		O	
	Phase Loss by Load Current	O		O	
	Phase Reverse by Line Voltage	O		O	
	Phase Reverse by Load Current	O		O	
	Current Unbalance	□		O	
	Voltage Unbalance	O		O	
	Locked Rotor	O		O	
	Shock/Stall	O		O	
	Short	O		O	
	Ground Fault	O		O	
	Over temperature	O		O	
Indication	Line Voltage	O		O	
	Load□current			O	
	3 Phase power	O		O	
	Power factor	O		O	
	KWH	O		O	
	Accumulated working time	O		O	
	Load factor/Bar graph	O		O	
Auxiliary	Y-D Timer	O		O	
	2 Level Alarm	O		O	
	Forward-Reverse	O		O	
	ON-OFF	X		O	
	Main contactor□Auto Close	O		O	
Communi□ation	4~20mA	O		O	
	RS 485,M□dbus	□	O	X	O
	Ethernet/CM-44E		O		O
	RS 232	O		O	
	Interface with Note PC	O		O	

6.Technical Specification

Division		Description
Line Voltage		**3 phase ,AC 100V ~ 600V,50/60Hz**
Voltage setting range	**AC 110V**	**over:110V~150V　　　　,under:70~110V**
	AC 220V	**over:220V~290V　　　,under:150~220V**
	AC 380V	**over:380~450V　　　　,under:310~380V**
	AC 440V	**over:440V~510V　　　,under:370~440V**
	AC 480V	**over:480V~550V　　　,under:410~480V**
Current setting range	**70 Type**	**0.2 ~ 70A/0.2KW ~52.4KW(AC 480V) /0.2 ~ 6A(0.2KW~4.4KW/AC480V) 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/under voltage trip delay time (ouPt)	**0.1~30 sec/def**
	over load/current trip delay time(ot)	**0.1~60 sec/def,5~30class/inv:refer curve**
	under load/current trip delay time(ut)	**0.1~30 sec/def**
	Shock/stall trip delay time(st)	**0.05 sec/instant, 0.1 ~ 3 sec/def**
	Ground fault starting delay time(Edt)	**OFF,1 ~ 25 sec/def**
	Ground fault trip delay time(Eot)	***0.05(instant),0.1~ 30 sec/def *1~10 Class/Inverse,refer curve**
	Voltage Unbalance	**0.5~10sec/Adjustable**
	SC/F-MC/R starting transfer time(ydt)	**1 sec~5 min/def(Transit interval time/SC-end~MC-start:0.2 sec)**
	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	***based on load current *1~5sec/definite**
Allowable tollerance	**Voltage**	**+.- 3%**
	Current	**C<=2A:0.1A,C>2A:+,- 5%**
	Time	**t<=2 sec:+,-,0.1sec, t>2 sec:+,-,5%**
	Power factor	**+,- 5%**
	KW,KWH	**+.-5% , Cos Phi>0.6**
Control power		***85VAC~260VAC,50/60Hz(90VDC~370VDC)**
		*24VAC/DC(optional)
Trip Relay	**C1-F-R**	**1a*2(2-SPST), 3A/Resistive**

	Main	1a(1-SPST), 3A/Resistive	
	Aux	1a(1-SPST), 3A/Resistive	
	SS	1a(1-SPST), 3A/Resistiv	
	GR	1a(1-SPST), 3A/Resistive	
Application environment	**Temperature**	Operation	-25 ^{O}C ~ +70 ^{O}C
		Storage	-40 ^{O}C ~ +80 ^{O}C
	Relative humidity	30 ~ 85%,non-condensing	
Current tollerance against changeable frequency in inverter		Avg ± 5% in 20Hz ~ 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 Resistence/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- 60255-22-5		Relay output:1.2X50uS,2KV(0°,90°,180°,270O)	
Conducted Disturbence Test: IEC-60255-22-6		10V,Level 3	
Digital Communication/ Serial Network/CM-44, MWR-S	**Physical feature**	*RS 485/ RS 422 : CM-44 *RS485 : MWR-S	
	Address	1 ~ 250	
	Speed	*9.6/19.2/38.4/57.6/76.8/115.2kbps *matched with CM-44,MWR-S	
	wiring connection	*Input/Output:RJ 45 ot Screw Terminal *RJ45 and Screw Terminal(5P) is commoned Physically *RJ45 is recommended for the test by "Samdsp"	
	Termination resistence	*DIP S/W selection / 200 Ohm	
	Cable	Sheathed cable,2 Pair	
Digital	**Physical feature**	Modbus TCP	

Communication/Ethernet Network/CM-44E	IP Address	*RJ45 *http://www.sollae.co.kr/kr/download/utility .php : ezManager ,v3.2E/Software to preset an operation factor for Windows
Current Loop　Communication: 4 ~ 20mA		Maximum value in 3 phase current
Consuming power		10W max

7. Protection List

Item	Description	Remarks
Over Voltage	*110V:110~150 *220V:220~290 *380V:380~450 *440V:440~510 *480V:480~550	*The 3 phase voltage over upper level of each range makes trip by over voltage. *The trip caused by a voltage is reset automatically after reaching over preset value *Only 110V is based on a secondary voltage of PT *If line voltage is under preset value in initial starting state,motor can not start.
Under Voltage	*110V:70~110 *220V:150~220 *380V:310~380 *440V:370~440 *480V:410~480	*The 3 phase voltage under lower level of each range is not sensed,but assumed zero. *The trip caused by a voltage is reset automatically after recovering to level of preset value *If line voltage is under preset value in initial starting state,motor can not start.
Over Load(KW)	Trip is done if the load(KW) greater than preset value is kept over preset o-time	
Over Current	Trip is done if the load current greater than preset value is kept over preset o-time	
Under Load(KW)	Trip is done if the load(KW) smaller than preset value is kept over preset u-time	
Under Current	Trip is done if the load current　greater than preset value is kept over preset o-time	
Current Unbalance	*Trip is done if the preset current unbalance rate is kept over 8 sec. *rate=[(max curr.-min curr.)/max curr.]*100[%]	
Voltage Unbalance	*Trip is done if the preset voltage unbalance rate is kept over preset time. *rate=[(max voltage-min voltage)/max voltage] * 100 [%]	Preset time:0.5~10sec/adjustable
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/shock)	*Trip is done if a current greater than preset value during working is happened for preset time. *Preset range:180%~700% to "OC"	*upper limit for 70 type is based on [(240/OC setting value)*100(%)]
Short	*If load current is greater than preset value,output relay is trip within 0.05 sec *Preset range:800%~2000% to "OC" *Trip time : 0.05sec±20mS	*Available "OC" preset range ‣ 0.2A~70A without external CT: 0.2A~25A ‣ 0.2A~6A with external CT *Available short protection range based on OC" preset value is followed Calculation : 800%~[(250/"OC" preset value)]*100[%] *SS(03-04) output through intermediate auxiliary relay will operate MCCB with enough current capacity
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 sensed temperature is greater than preset value, motor can not start	
Phase Loss by line voltage	*This protection is identified by line voltage *Trip time is within 0.5 sec. *"OFF" is possible in this mode	*If each of 3 phase is a state of phase loss in the same time,which means normal "power off", this mode does not response to such state *If phase loss is happened, auto reset is not possible,but manual reset.
Phase Loss by load current	*This protection is identified by load current *Trip time:1~5 sec/definite. *"OFF" is possible in this mode	*If phase loss is happened,auto reset is not possible,but manual reset.
Reverse Phase by line voltage	*This protection is identified by line voltage *Trip time is within 0.5 sec. *"OFF" is possible in this mode	*If reverse phase is happened ,auto reset is not possible ,but manual reset.
Reverse Phase by load current	*This protection is identified by load current *Trip time is within 0.5 sec. *"OFF" is possible in this mode	*If reverse phase is happened, auto reset is not possible,but manual reset.

8. Indication List

Item	Description	Remarks
Line Voltage	Incoming Line/V1,V2,V3 or Average voltage(selected in "trans" mode of "cab" mode group)	*110V is based on a secondary voltage of PT *In case incoming voltage is zero in the same time:OFF is shown
Load Current	L1,L2,L3	
Temperature/case,winding	$1^{O}C \sim 150^{O}C$/scale $1^{O}C$	
Power factor	COS Phi	In case of 110V, it is based on secondary voltage of PT for correct calculation
Accumulated KWH	*if a current greater than 0.2A is loaded,KWH is accumulated every 6 min. *possible to record 99999999 KWH *to clear existing accumulated KWH: in "hp-c" mode ,press "DN" under pressing "UP" at first ,then finally make both pressing state ,and reversely release "UP" after releasing "DN" at first	
Accumulated working time	*if a current greater than 0.2A is loaded, working time is accumulated in every 6 min *range:0~6553.5 hr,next to zero *to clear an existed value , use the way to call initial factory default value	
preset time to make alarm for working time	*indicating a trip event number of main contactor *range:1~65535, next to zero *to clear existing accumulated number in "Alt" mode :refer a case of KWH	
Trip number/main contactor	*indicating trip number of main contactor *range:1~65535, next to zero *to clear existing accumulated KWH:refer a case of KWH	
Load factor by bar graph	*calculating % as followed. [actual load curr./preset curr.]*100[%] or [actual load kw/preset load kw]*100[%] *Line type/DSP-VIP-PL ,round type/DSP-VIP-PM *indicating only ALhc(higher level alarm)	
Alarm before trip	*preset "AL" in "Au-o" mode ,then make level % in "Alhc" mode *1a is closed(energized) if actual level % exceeds preset level %/Available even when a condition is keeping for 3 sec	

9.Auxiliary Function

Item	Description	Remarks
SC/F-MC/R transfer timer	***Providing transfer time from Y to Delta** ***Adjustable transfer time:1sec ~ 5 min** ***Transit interval time from Y-End to D-Start :0.2 sec** ***dt is available for each during Y and D contactor is "on" state**	
DC 4~20mA	***To change max current among 3 phase into 20mA** ***The receiver for 4-20 signal does not need loop voltage**	
Password	***The preset procedure in a mode is possible as inputing password for a exclusive operator to have gurantee for operation**	
Self-diagnostics	***All trip relay will be trip(energized) after count down a preset o-time(dt or time of 550% in inverse) in pressing "CLR" SW for 3 sec to check if a self-function is normal or not.**	
Main contactor Auto Close	***This mode is available for the condition under "Logic" mode is "on"** ***In case a line power is "on" again within a preset time after a line power is "OFF" during a normal operation,main contactor is closed automatically after another preset 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**	

10. Self-diagnostics table

| Discription	Message display
Initial state display	**When the control power is on,the disply is shown in the order as follows: LOP(default)→ tE-no(if PT-100 is not connected)→ version NO→ ON/OFF control command position(one of LOP, MCC/display meter , rcs and PC)**
485 communication error	**LED on the communication module is not turned on or not flickered**
Fault for internal current board	**cu-no**
Fault for internal voltage board	**vo-no**
Fault for GR protection function in internal main board	**Ec-no**
ZCT disconnection	**Ec-ct**
PT100 disconnection	**te-no;not possible to rum if a value is preset in"tep" mode**

Latest measured temperature greater than preset temperature	"tep" and "latest measured value" is appeared alternatively/not possible to run if preset value is not changed
Test:"CLR" key/Display meter or Loader	Main trip(97-98) is tripped after counting down preset o-time in definite T-I(550% time in inverse T-I)/the number of lighted LED is matched with counted time

11.Input-Output Terminal

▶ **External ZCT type/possible matched with external CT**
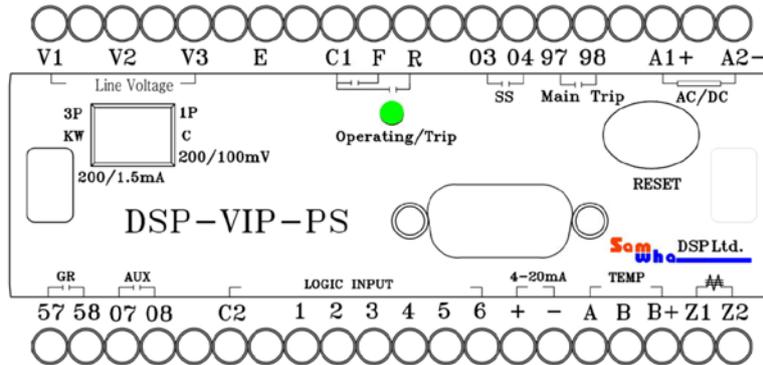
▶ **Embeded ZCT type/not possible matched with external CT**
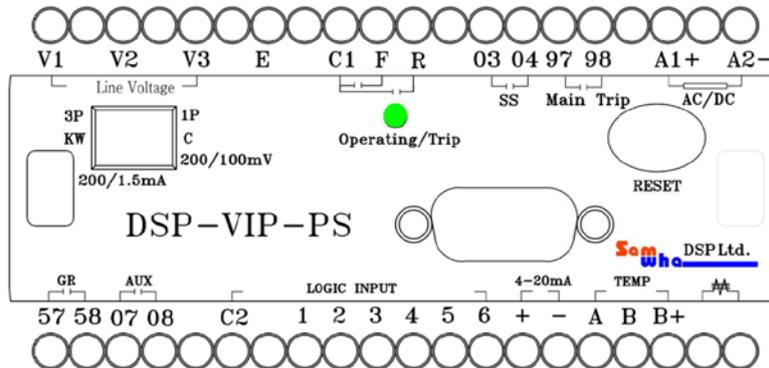
Division			Description	
Feature		**Terminal**		
Input	**3P/1P**	**3P-1P**	**3 phase/Single phase**	
	Load-current	**KW-C**		
	External ZCT	**Z1,Z2**	**200/1.5mA - 200/100mV**	
	Control Power	**A1+,A2-**	**85~260VAC,50/60Hz/90~370VDC**	
	Line Voltage	**V1,V2,V3**		
	Motor Earth	**E**		
	LOGIC/available for "ON" in "OPSET" mode	**C2**	**COMMON**	
		1	**ON**	**LOP**
		2	**OFF/Reset(high--> low)**	
		3	**REVERSE START**	

		4	Remote Control Sensor/must be matched logic #1 to start and stop a motor	PC
		5	Meter run(MCC)	
		6	External Fault Input	
	Temperature	A,B,B+	PT100	
State	RED	Operating	3 Tone Colour LED	
	Green	Power ON : stop state		
	Yellow	Trip		
Output	Motor Start by Logic Input	C1-F	Starting contactor/Forward contactor	
		C1-R	Reverse contactor	
	Main TRIP	97-98	OL/OC,UL/UC,Lc,PL/PLc,rP/rPc, Shock(Stall),Temp	
	GR	57-58	Ground fault	
	SS	03-04	Short Circuit/to trip a device like MCCB with sufficient VA capacity	
	AUX	07-08	AL,volt[ov/uv/v-ub/v-oFF],uc,temp	
	4~20mA	+ , -	Current loop communication/not allowed to be loaded a voltage from a receiving device	
C1-F , C1-R *Close(motor start) - Open (trip) * This is coworked with logic input *Trip output is operated together with main trip				

▶ **Display window image**
→ **Panel Flush Mounting Type : Display meter**
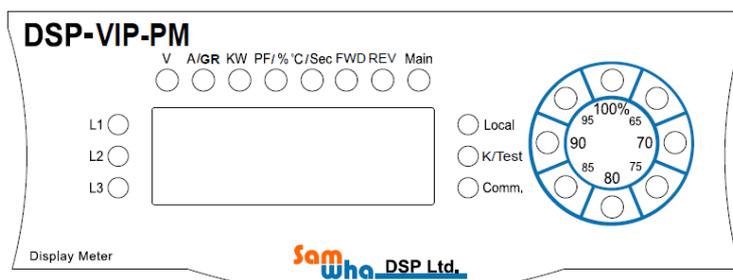
→ **Panel Mounting Type : Loader**
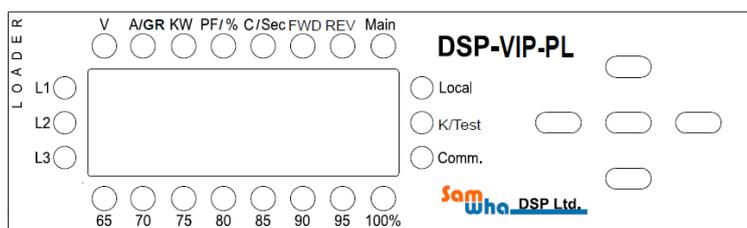
V	Voltage	KW	Power
A/GR	Load Current/Earth Current	PF/%	Power Factor/% Unit
^{O}C/Sec	Temperature/Time	FWD	Forward
REV	Reverse	L1-L2-l3	3 Phase/Each
K/Test	1000 unit/Self-diagnostic	Local	Local Operation Panel
Comm	Internal Communication between converter and meter		
Round Bar Graph:Load Factor/PM Line Bar Graph:Load Factor/PL		Main : Main mode/turned on,Sub mode/turned off	

12.Trip Relay Output

Trip	Relay	Output	Remark
Main	**97-98**	***Over Load/OverCurrent**	
		*Under Load/Under Current	
		*Locked Rotor	
		*Phase Loss	
		*Reverse Phase	
		*Ground Fault	
		*Over Temperature	
		*Current Unbalance	
		*Shock	
GR	**57-58**	***Ground Fault**	**This trip is not related with main trip**
SS	**03-04**	***Short Circuit**	
Aux	**07-08**	***Selected in Au-o mode(one of OFF, uc ,Shoc, Al, tEmP,volt)** ***OFF:same as Main Trip** ***Al: alarm to OC, 5~100%/ contact is closed after 3 sec from reaching setting alarm level** ***tEmP : alarm to temperature** ***Shoc : alarm to shock(instant over current)** ***volt** **▸ ov: alarm to over voltage** **▸ uv: alarm to under voltage** **▸ v-ub: alarm to voltage unbalance** **▸v-oFF : voltage value is not sensed** ***selected factor is excluded from main trip** ***all trip in this mode is naturally reset in case trip cause is clear**	

13.Preset Description
13-1.Main Mode

Mode	Function/range	Description	Factory Setting value
P0000	**Password**	*Press "SET" button to have a preset. *Input a factory setting number,"0000" to enter setting mode *Move a cursor from first digit(1000 unit) to last digit(1 unit) to pass over next mode as pushing CLR key(Enter function) 4 times. *possible to change password made by "PEdIt" mode in CAB mode group *If the operator forget a password, manufacturer can support it or use a procedure to call 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**
LInE/oFF/110/220/380/440/480	**to select a value of line voltage**	*to select voltage range of incoming line *OFF:to make disable a protection at a one time for phase loss ,reverse phase based on line voltage ,over(Ov) and under(Uv) voltage *this disable execution takes a priority from ON/OFF of each mode(Ov,Uv) about voltage , also consequently,output of OV/UV is changed into the output of lower level alarm(ALLc) *110V is the output of PT by D-Y connection between primary and secondary for the correct calculation of power factor ,but others are line voltage to operate a motor	**440V**
Load(DIP S/W→KW)/setting value	**to preset a range to protect over load**	*In case of selecting KW in DIP SW,this mode is available to preset value(Load)and it is default condition that previous "C" mode is not appeared *Imaginary preset value of "OC" to execute a protection for "Lock","Short" and "Shock" is calculated inside algorithm as followed formular:[KW=[root3 * V * I * K].here K=0.9. *Normal operation is done as sensing a current greater than 0.12KW/0.2A(380V)	

oc(DIP S/W→C) / setting value	**to preset a range to protect over current**	*In case of selecting C in DIP SW,this mode is available to preset value(current)and it is default condition that previous "KW" mode is not appeared
		*even though "C" is selected,the indication and the protection in conjunction with line voltage can be executed if line voltage is powered.
		*Current range
		--70 Type:0.2A ~ 70A/0.2A~6A with external CT
		*Over Load range with Voltage
		  --70 Type:0.2KW~52.4KW(AC480V)
		  /0.2KW~4.5KW(AC480V) with external CT
			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
		  :the preset in next "ct" mode is not able.
		*5A:a secondary current rating of external CT is 5A
			1t

ct /setting value	to preset a ratio for external CT	*if 1t is selected in "cto" mode , this mode is displayed like "ct--", it means that any preset is not 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	ct--
dt/off/setting value	to preset starting trip 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 chracteristics for over current protection	*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) ▸Available range:100~(240/"oc" value)*100[%]	deF
Ot/oFF/setting value	to preset operating trip delay time	to preset time to make a trip when Load(KW) or C exceeds preset value *definite:0.1sec ~ 60sec *inverse:5 ~ 30 Class	5 sec
Lc/oFF / on	to protect Locked Rotor	*OFF:disable for this mode *ON -Otc=Def/Inv:dt+0.1sec if starting current exceeds 300% to oc during dt, Lc is shown in trip *In case Load is selected ,this protection is done by imaginary oc value calculated internally by the relationship of V,I,PF,Effeciency.	oFF
SS/oFF/on	To protect Short circuit	*oFF:This function is disable only for starting time(dt), After dt is elapsed,this function is able *on:This function is able from starting point	Off
SSc/OFF/ Setting Value	To preset short protection % to OC	*Available "OC" preset range ▸0.2A~70A without external CT:0.2A~25A ▸0.2A~6A with external CT *Available short protection range based on OC" preset value is followed calculation : 800%~[(250/"OC" preset value)]*100[%] *SS(03-04) output will operate MCCB with enough current capacity through intermediate auxiliary relay *trip time:0.05sec ±20mS	OFF

Shoc/oFF /Setting Value	To protect mechanical shock during motor is working	*to preset a value in each current range *Preset range is 180% ~700% to OC setting value *In case of 70 type , this upper level % must be limited by this formular as {(240/OC preset value) *100[%] *OFF:This mode is disable *If KW is selected, OC value above formular is still applied for this protection.	oFF
st /setting value	To preset a time for shock protection	*0.05/instant,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	*ON:to make a trip to protect phase loss based on load current:1~5sec/adjustable *OFF:to make this mode disable *Auto reset is not possible,but manual reset.	on
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,but manual reset.	oFF
Ov/OFF/ setting value	to protect over voltage	*to preset a value to protect over voltage concerned with "LInE" mode *OFF:disable for this mode *preset range ‣ 110V:110~150 ‣ 220V:220 ~ 290V ‣ 380 : 380~450V ‣ 440: 440~510V, ‣ 480V:480~550V *a trip by over voltage is reset automatically in case actual voltage is reached under preset value *this function is activated during initial waiting state if voltage is loaded *motor can not run in initial start state if line voltage is over preset value	oFF
Uv/OFF/ setting value	to protect under voltage	*to preset a value to protect under voltage concerned with LInE mode *110V:70~110,220V:150~220, 380V: 310~380 , 440V:370~440 , 480V:410~480V *a trip by over voltage is reset automatically in case actual voltage is reached over preset value *this function is activated during initial waiting state if voltage is loaded *motor can not run in initial start state if line voltage is under preset value	oFF
OUvt/oFF/ setting value	to preset trip delay time to protect over/under voltage	*oFF:to make this mode disable,but this disable job is not available if any one of over and under voltage standard is preset *this mode can be "OFF" only in case all of Uv,Ov is oFF *trip delay time range:0.1 ~ 30sec/definite	1

Mode	Function/range	Description	
PL/oFF / on	to protect phase loss by line voltage	*OFF:to make this mode disable *Even if C is selected,this mode is available to protect phase loss of line *ON:to make a trip to protect phase loss based on line voltage within 0.5 sec *In case 3 phase is normal power-off state,this mode is not worked. *Auto reset is not possible,but manual reset.	on
rP /oFF / on	to protect reverse phase by line voltage	*OFF:to make this mode disable *Even if C is selected,this mode is available to protect reverse phase of line *ON:to make a trip to protect reverse phase based on line voltage within 0.5 sec *Auto reset is not possible,but manual reset.	oFF
Ec/oFF/ setting value	to preset a range of zero phase current to protect ground fault	*based on zero phase current through ZCT *range:20mA~10A	10
Edt/oFF/ setting value	to preset starting trip delay time	*OFF:to make this mode disable *starting trip delay time:1 ~ 25 sec/def *Sensitive range:20mA~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 chracteristics to protect ground fault	*deF or inv *If "Ec" mode is off,this mode is displayed like an image of "Etc --",it means that user is not able to input a value anymore	deF
Eot /setting value	to preset operating trip delay time to protect ground fault	*deF:0.05 sec(instant),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	0.5sec
Test	*This is done by test sw on the converter or by pressing "CLR" key for 3 sec or more *to check if this relay is ready to work normally or not. *all kind of trip output will be trip 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 as pressing "Reset SW in Converter or "CLR" key for 0.5sec more,then "End" is shown		

13-2. Sub Mode

Mode	Function/range	Description	Factory setting value
P0000	Password	*same as a job of password mode in "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(not changed) *Not possible to change the preset value of this mode in any case during operation even if "OPSET" mode of "CAB" mode group is "ON"	a

Fr-ty/a/b	to decide transferred pattern for F-R	*a:C1-R is closed after C1-F is opened after preset time of Frdt mode is elapsed *b: C1-R is closed after C1-F is kept close as preset time of Frdt mode is elapsed *Not possible to change the preset value of this mode in any case during operation even if "OPSET" mode of "CAB" mode group is "ON"	b
Frdt/oFF/ setting value	to preset transferred time for F-R	*Adjustable time : 1sec~5 min *SC-end~MC-start transit time : 0.2sec *dt is available for each contactor while the transaction is done *OFF : transaction for F-R is not done,also possible to have reverse operation in case Logic input #3 is used	b
uL/oFF/ setting value/ /[uc/oFF]	to preset a range to protect under current/load	*this mode shows "uL" or "uC" according to a selection(Load/KW) in DIP SW *under load setting range with voltage -110V:70W~Under OL preset value -220V:135W~Under OL preset value -380V:235W~Under OL preset value -440V:270W~Under OL preset value -480V:300W～ Under OL preset value *under current setting range:0.1A~ under preset value for "Oc"	OFF
ut/oFF/setting value	to preset trip delay time to protect under load/current	*to preset trip delay time to protect under load/current *def:0.1~30sec *in case "uL" mode is OFF ,this mode is displayed an image like "uL--", it means this mode is disable	"--"
ub / oFF / value	to preset current unbalance rate(%) among 3 phase	* even if Load is selected,this function is available by actual current *formular:[(max-min)/max]*100 [%] *range:30% ~ 90% *minimum available current:0.3A	50%
Au-o/ oFF/ uc/Shoc/AL/ tEMP/volt	to preset a factor of AUX trip output	*oFF:to make same output as main trip *uc:only for under load/under current *Shock:only for Shock/Stall *AL:only for higher level alarm to oc *tEMP:only for over temperature *volt : ov or uv or v-ub or v-OFF ▸ ov : over voltage ▸ uv:under voltage ▸ v-ub : voltage unbalance ▸ v-OFF : voltage value is not sensed *This selected protection factor is excluded in main trip naturally *This trip is automatically reset if a trip condition is clear	oFF
ALhc/oFF/ setting value	to preset higher alarm level rate(%) to OC(OL)	*oFF:if other factor except AL in this "Au-o" mode is preset,this mod is displayed an image like "ALhc-" *% range:65% ~100% of preset value to Load(KW)/OC	95

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 step** ***''Sec'' LED of front window will be flickered to give alarm after passing a preset value for hour** ***To clear:press ''UP'' or "DN" after entering "ALT" mode in motor stop state, but "—" will be flickerd until 6 min has passed after starting a motor**	**6500**
dc	**to decide max current to change into 20mA**	***to transfer maximum current of 3 phase current into 20mA ,and 4mA means zero ampere output** ***Primary current is transferred in case external CT is used.** ***The receiver for 4-20 signal does not need loop voltage**	**5**
tEMP/oFF/ Setting Value	**to preset temperature value to protect temperature rising**	***based on PT100 sensor** ***range: $1^{O}C \sim 150^{O}C/I\ ^{O}C$ a step** ***if sensed temperature is greater than preset value,restarting is not able**	**OFF**
Cn/fixed value	**to count tripped number of main contactor**	***Fixed Value:to show accumulated number of actual trip** *** max value is 65535** ***To clear:press ''UP'' firstly-->keeping pressed ''UP'' -->nextly,press ''DN'' key ,then keep 1 sec under pressed state of both key ,finally release ''DN'' key earlier than ''UP'' key** ***ON-OFF must be done by logic input and actual current greater than 0.2A must be loaded.**	**OFF**
rota /oFF / on	**to indicate additional factor besides basic factor to indicate running operation value in a order**	***OFF:to indicate basic factor orderly in every 3 sec:V,I,KW(V*I*t*cos phi),GR** ***ON:to indicate additional factor such as Temp,PF,KWH,AWT(Accumulated Working Time) including basic factor together** *** Possible to fix one of circulated factor or to release:one touch button(CLR Key:enter function)**	**OFF**
hP-c /clear	**to start to accumulate KWH or to clear accumulated KWH**	***to accumulate KWH from timed position in every 6 min** ***max accumulated KWH is 99999999** ***To clear:press ''UP'' firstly-->keeping pressed ''UP'' -->nextly,press ''DN'' key ,then keep 1 sec under pressed state of both key ,finally release ''DN'' key earlier than ''UP'' key**	**0**

rESEt/Hr/ AuL-#	to decide how to reset trip state	*Hr:password input *Er :"Reset" button of converter :"CLR" Key :Control power : OFF :Logic #2 input :OFF(High→Low) *AuL-#(n times):Auto reset by followed condition :n=1:possible to do only by entering password :n>1 ▶1(once)~(n-1) times: reset automatically according to preset reset time without entering password ▶n(last times) :possible to do only by entering password :trip state is kept on untill making password reset even though the control power is off(password lock) *Password reset:reset is done by comming into operating mode after input password	Hr
Aut-t/ setting value	to preset auto reset time	*time range :0(instant), 0.1sec,1~300sec *If Hr is preset in "rESEt" mode, this mode becomes disable	"--"
t-Aut/ setting value	to preset total possible time available for executing defined times of auto reset	*possible total allowable time to have the preset number of auto reset *time range:30min~60min *only possible for over current trip *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 tripped cause	*To show latest number of 8 trip cause in order *8th tripped cause and caused value are appeared firstly, next 7th and finally 1st trip ped cause as every pressing "up" button *to support an operator how many order of 8 trip event is appeared, a number of lighted LED in bar graph is in conjunction with it. *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 *This mode is naturally disable if "tcP" is slected in "FdbuS" mode	1
bPS / setting value	to decide communication speed	*to select communication speed :9.6/19.2/ 38.4/57.6/76.8/115.2kbps *This mode is naturally disable if "tcP" is slected in "FdbuS" mode	115.2
Tover/OFF/Setting value (SDDT-DODT)	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(M) is closed automatically after another preset 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 mode is naturally disable if "oFF" is slected in "LogIc" mode *"OFF" contact should be kept for 0.5sec more in case "ON" and "OFF" is done in order to test a sequence when this mode is able state	OFF

13-3.Cab Mode

This mode is appeared as pressing "SET" key for 5 sec or more and is disappeared as pressing "SET" key shortly once more, also it is not recommended that user makes a calibration without checking by accurate source

Div	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% *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 "T" current	*possible to adjust within +, - 12.7% from indicated value by using "UP" or "DN" key	0
vrPEr	to have a caribration for phase "R" voltage		0
vsPEr	to have a caribration for phase "S" voltage		0

vtPEr	to have a caribration for phase "T" voltage		0
EcPEr	to have a caribration for ground fault current		0
tEPEr	to have a caribration for temperature		0
tranS/OFF/ d-Ear	to select indication pattern of incomming voltage	*OFF: to indicate line voltage:v1,v2,v3 *d-Ear:to indicate average voltage	OFF
vUb/OFF/ setting value	to preset voltage unbalance protection rate(%)	*trip in case preset rate condition is kept on preset time or more *rate:[(Max V-Min V)/Max V]*100 [%] *adjustable range:2%~40%	OFF
v-uT/ setting value	to preset operating trip delay time for voltage unbalance	*to preset a operating trip time for voltage unbalance *Adjustable range: 0.5~10 sec	3
PF/Pa/va	To preset a condition for KW calculation	* Pa :to adopt actual power factor measured from running state *va : to fix to 1(100%) as power factor//useful for the operation under the inverter	Pa
v-num	To decide a qualification of VIP in case of the communication	*auto:VIP always dispatches a data *Slave:VIP dispatches a data only in case the master requires	auto
Comm/auto /slave	To decide a qualification of VIP in case of the communication	*auto:VIP always dispatches a data *Slave:VIP dispatches a data only in case the master requires	auto
FdbuS/ RTU/TCP	To decide network protocol	*RTU : Modbus/RTU,422/485 *TCP : Modbus TCP, Ethernet	RTU
oPSEt/ON/ OFF	to decide if it is possible to preset during the operation	*ON : it is possible for operator to change a preset value during motor normal operation except "out"mode *OFF : it is not possible for operator to change a preset value during motor normal operation	OFF
LogIc/oN/oFF	To decide if logic input state can be activated or not	*ON : to make logic input state be able ▸ C1-F : 1a/Forward ▸ C1-R : 1a/Reverse *OFF : to make logic input state be disable ▸ "Auto" is shown initially after the control power is loaded	ON
InIt	To make factory default condition	*It becomes the factory default value afer "EEPIn" is shown as pressing "UP" and "DN" key together for 2sec or more	-
PEdIt/setting Value(P****)	to change password	*possible to enter new digit by using "UP" or "DN" key after positioning a curser on the required digit *possible to enter into main mode or sub mode as pressing "mode" key	0000

13-4. Order of MODE

-

Cab Mode

	LogIc	InIt	PEdIt	
OPSET				
FdbuS				Pass
comm				CrPE
v-num				CSPEr
PF				CtPEr
v-ut				vrPEr
v-ub				vSPEr
tranS	tEPEr	EcPEr	vtPEr	

Main Mode

				oc
Eot	Test	P0000	LInE	LoAd
Etc				cto
Edt				ct
Ec				dt
rP				otc
PL				ot
OUvt				Lc
Uv				SS
Ov				SSc
	rPc	PLc	St	Shoc

Sub Mode

				uc
P0000	out	Fr-ty	Frdt	
Tover				uL
bPS				ut
addr				ub
trIP				Au-o
Aut-t				AL
rEsEt				ALt
	rota	cn	tEMP	dc
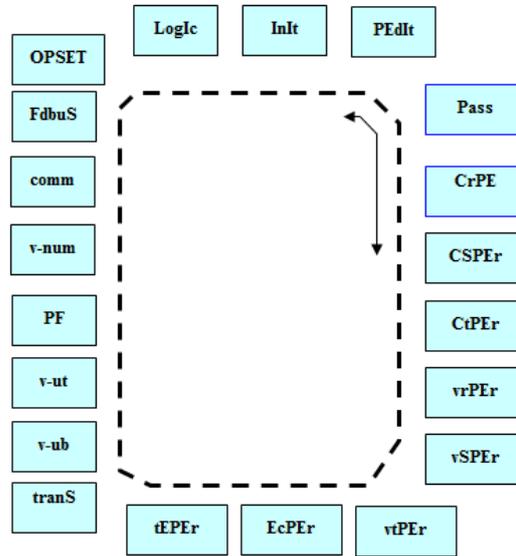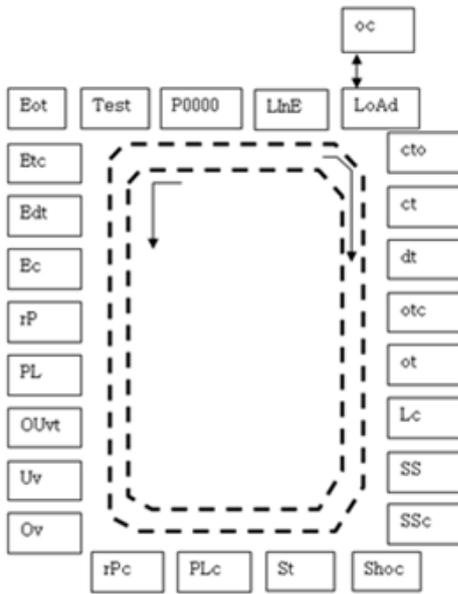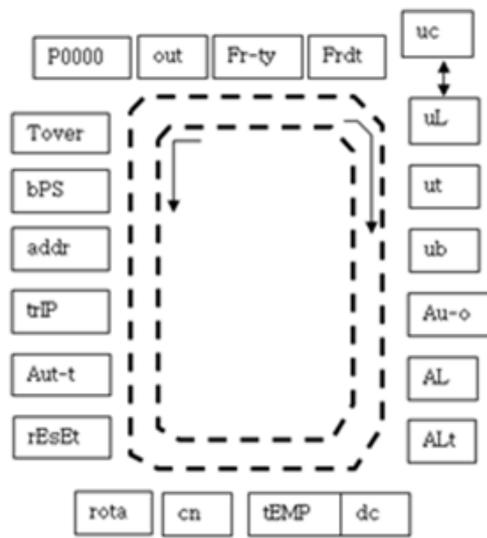
14.Control Key Operation
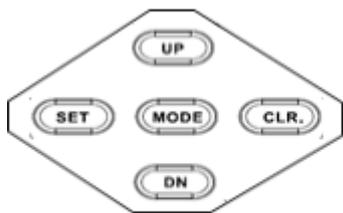
DSP-VIP-PL
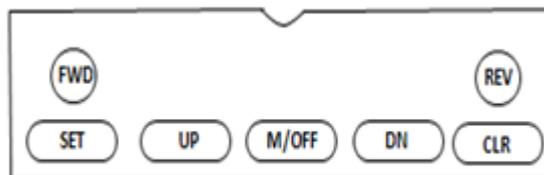
DSP-VIP-PM

Function	Key	Description
1.Mode Group Selection	M/OFF	*Initial state to indicate one of controlled position(ON-OFF control:LOP/over bar_ n CC (MCC)/rcs/PC) 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 ,finally press once more,then operator meets possible state for setting a number or character of mode . *If there is no input for 15 sec or pressing "Mode" key, VIP is entered into operating condition.
2.Set Key Function	SET	*After entering into posible state for setting , each key acts its job as follows : SET--->backward direction, CLR---> foward direction,UP.DN--->able to select number or character in preset mode. *if operator wants to stop setting,it is possible to return to next mode as pressing "Mode" key or setting nothing for 15 sec or more ,then all selected data untill previous action to cease a setting is stored automatically.
3. MODE selection	SET / CLR.	a Mode selection to preset data is done by pressing "SET" or "CLR" under the job of directional key.
4.Adjust	UP / DN	*To select number or character in the each mode *Return to next mode as pressing "CLR" key
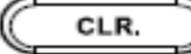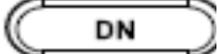
5.Mode (Store)	M/OFF		*As pressing "Mode" Key once again ,preset procedure is completed and is ready to operate in its duty. *it needs 3 sec to store a preset data,so if operator makes "power-off" without waiting a storing precess for this time,ratherly VIP could returns to initial factory state
DSP-VIP-PM	Motor Start	FWD REV	*To start a motor in conjuntion with logic input *Stop job is kept each other while the motor is operated by the command for the other *FWD :Forward operation *REV:Reverse operation
	Motor Stop	M/OFF	To stop a motor in any case
To check and/or change preset value of each mode during operation	SET M/OFF CLR.		*possible to check preset value during an operation ▸ press "SET" key once during operation ▸ preset vaue and mode are appeared alternatively ▸ "SET" and "CLR" key works same direction job above to check next mode or previous mode * possible to change preset value during an operation ▸ "oPSEt" mode will be "ON" before activating this condition ▸"UP" and "DN" key for changing a preset value , then SET" or "CLR" key for next mode or previous mode *press "Mode" key in order to return to normal operation state or wait 15 sec after completing its job *there is no interval between "Main" and "sub" for direction of "SET" or "CLR" key
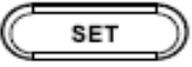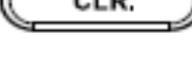
15.Time based Trip Relay Output

15-1. Over Load / Over Current Protection

(Normal energized condition:95-96/open,97-98/close after control power is oN)
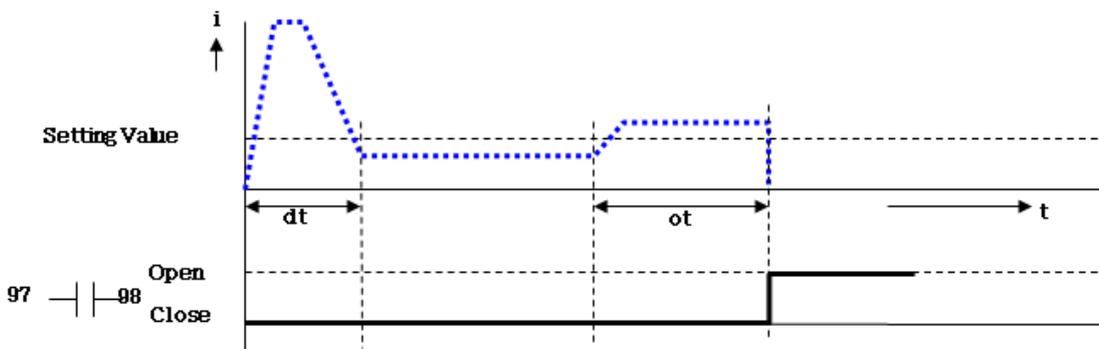
15-2. Over Voltage/Under Voltage Protection:"volt" will be selected in "Auo" mode
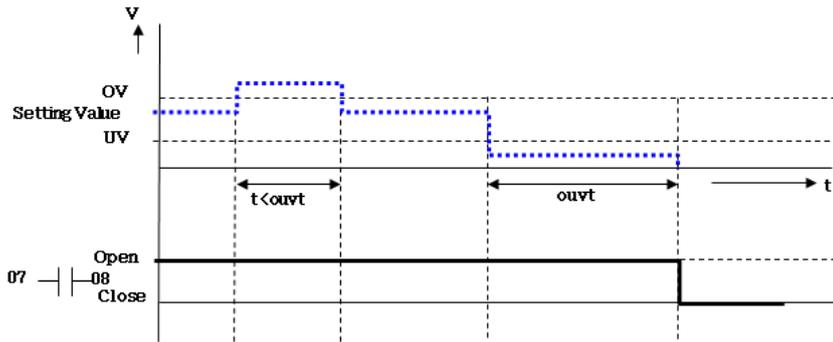
15-3. Shock/Stall   Protection/Normal energized condition
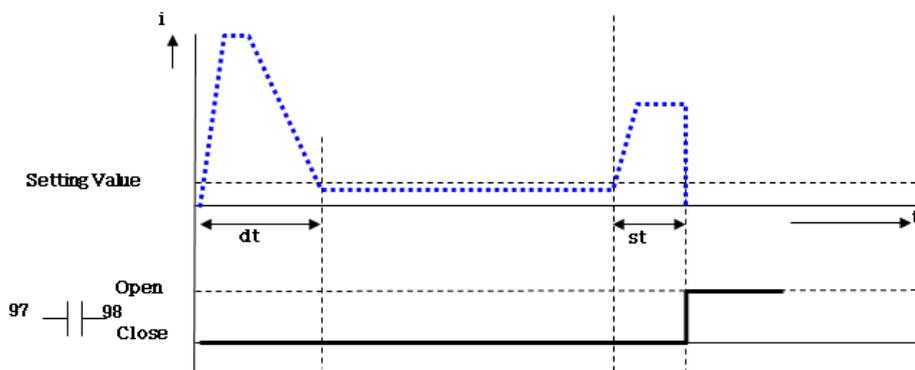
15-4. Ground fault Protection
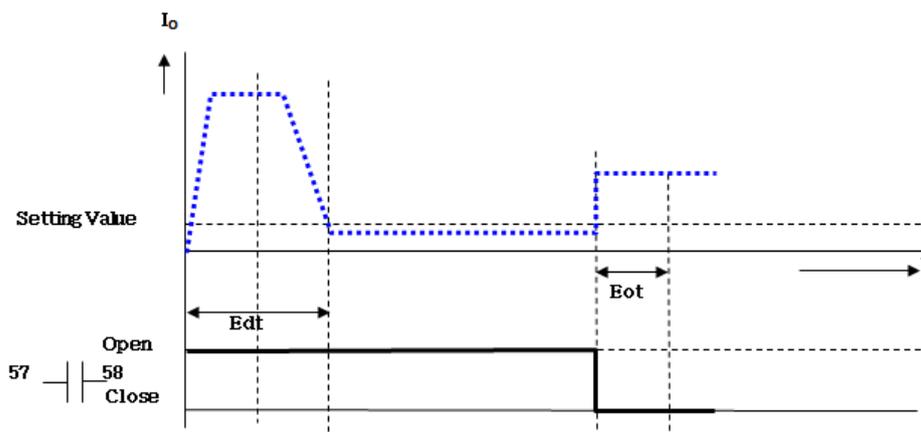
15-5.C1/F↔C1/R :Transit time/0.2 sec

Transit Interval Time:0.2 sec
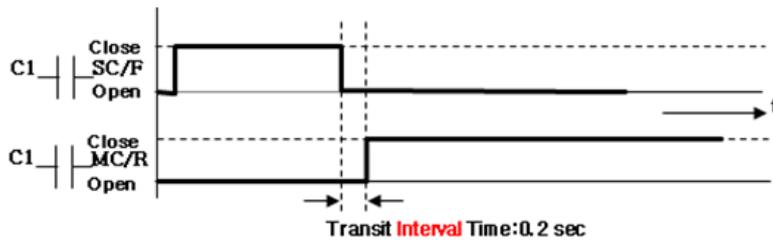
16.Trip Indication

Trip	Display	Cause
Over Load(KW)	L1 ● L2 ● L3 ● −LoAd− Local ○ Test ○ Comm. ○	trip caused by over load(KW)
Over current(oc)	L1 ● L2 ○ L3 ○ −OC− Local ○ Test ○ Comm. ○	trip caused by over current in phase L1
Under Load	L1 ● L2 ● L3 ● −UL Local ○ Test ○ Comm. ○	trip caused by under load(KW)
Under Current	L1 ● L2 ○ L3 ○ −UC− Local ○ Test ○ Comm. ○	trip caused by under current in phase L1
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 ○ −PL− Local ○ Test ○ Comm. ○	trip caused by phase loss of phase L2 in incomming voltage
	L1 ○ L2 ● L3 ○ −PLc− Local ○ Test ○ Comm. ○	trip caused by phase loss of phase L2 in load part
Reverse phase	L1 ● L2 ● L3 ● −rP− Local ○ Test ○ Comm. ○	trip caused by reverse phase of phase L2 in incomming voltage

	L1 ● L2 ● ● `-rPc-` ○ Local ○ Test ○ Comm.	**trip caused by reverse phase in load part**
Locked Rotor	L1 ○ L2 ● L3 ○ `-Lc-` ○ Local ○ Test ○ Comm.	**trip caused by locked rotor current in phase L2 during motor staet**
Shock/Stall	L1 ○ L2 ● L3 ○ `Shoc` ○ Local ○ Test ○ Comm.	**trip caused by shocking current in phase L2 during working**
Short	L1 ○ L2 ● L3 ○ `-SS-` ○ Local ○ Test ○ Comm.	**trip caused by short circuit current in phase L2**
Over Temp	L1 ● L2 ● L3 ● `-tEmP-` ○ Local ○ Test ○ Comm.	**trip caused by over temperature/3 LED of L1,L2,L3 is flickering together**

▶ **Trip indication caused by Voltage only:**
 *Target : Ov,Uv,vUb
 *Output feature:OV/UV(27-28-30) trip/Independent from Main trip/VIP takes normal protection job
 *Indication:Basically a trip caused by voltage is reset automaticaliy if trip cause is clear , so when trip
   is happened, LED indication for both voltage and trip cause is shown together as below while
   normal circulation for each factor is turned on,then move forward to next indication factor.

Trip	Display	Cause
Over voltage (OP)	L1 ● L2 ● L3 ○ `-ov-` ○ Local ○ Test ○ Comm.	**trip caused by over voltage with value of 250V in phase L1-L2 during running**
Under voltage (UP)	L1 ● L2 ● L3 ○ `-uv-` ○ Local ○ Test ○ Comm.	**trip caused by under voltage with value of 190V in phase L1-L2 during running**
Voltage unbalance(vUb)	L1 ● L2 ● L3 ○ `v-ub-` ○ Local ○ Test ○ Comm.	**trip caused by voltage unbalance with which the deviation between max and min is 190V**
Zero Voltage during running	L1 ● L2 ● L3 ○ `v-oFF` ○ Local ○ Test ○ Comm.	**trip caused by line voltage zero during running.**

17.Current Range Table for external CT

Range	Number of CT turn in itself	Preset in "ct" mode (ct ratio)	Preset in "cto" mode	Remarks
0.2A~70A	1	*Without external CT	1t	70 Type,Wide Range
0.2A~70A	1	*With external CT:0.2~6A	5t	70 Type,Wide Range
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	600(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)		

18.Time-Current Characteristics
18-1.Over Current/Over Load protection : Inverse Curve
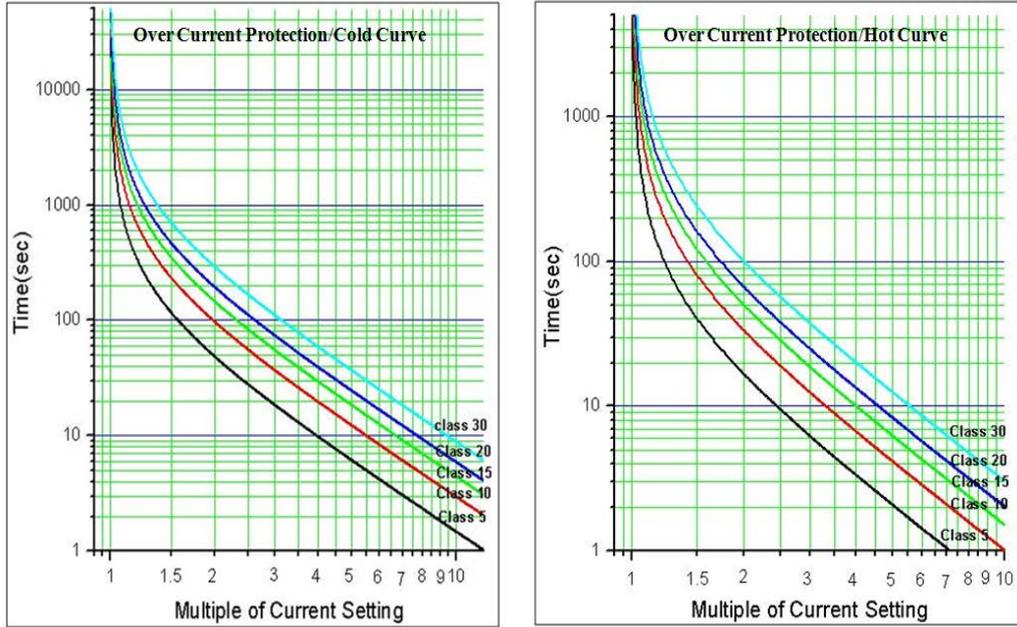
18-2.Ground Fault Protection : Inverse Curve
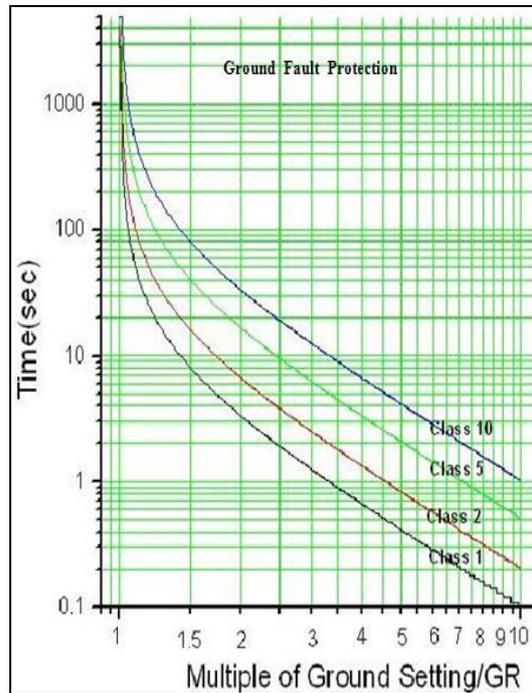
18-3.Over Current/Over Load ,GF protection : Definite Curve
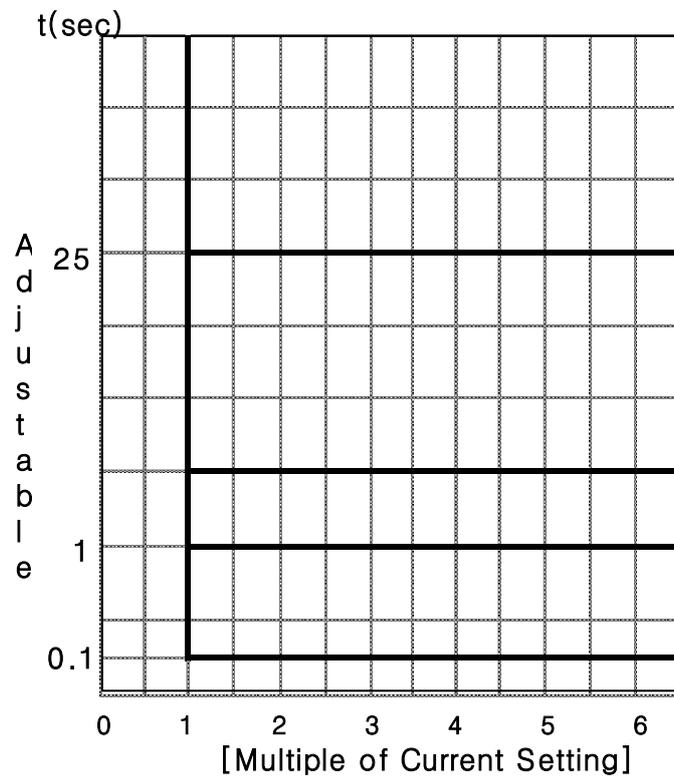
19.Application Sequence Diagram
19-1. Logic Input Operation Table : "Logic" mode will be "ON"

LOP Duty

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F-R/2a]
1	Low→High		Motor Start	C1-F → Close
2	O	-		
1	-	O	Motor Stop	C1-F→Open
2	High→Low			

rcs(Remote Control Sensor) Duty

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F-R/2a]
1	O		Motor Start	C1-F →Close
4	O	O		
1		O	Motor Stop	C1-F →Open
4	O			

PC Duty

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F-R/2a]
4	O	-	Motor start/stop in PC	C1-F→Close(start)
5	O	-		C1-F→Open(stop)

Display Meter Duty(MCC)

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F-R/2a]
5	O	-	Start/Stop in Display Meter	C1-F→Close(start C1-F→Open(stop)

LOP-FWD/REV (PM,CM / RM,RTM)

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F-R/2a]
1	Low→High		Forward Start	C1-F→close
2	O	-		
2	-	O	Forward Stop	C1-F→open
3	Low→High		Reverse Start	C1-R→close
2	O	-		
2	-	O	Reverse Stop	C1-R→open

rcs-FWD/REV (PM,CM / RM,RTM)

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F-R/2a]
1	Low→High		Forward Start	C1-F→close
4	O	-		
1	-	O	Forward Stop	C1-F→open
3	Low→High		Reverse Start	C1-R→close
4	O	-		
3	-	O	Reverse Stop	C1-R→open

EFI(External Fault Input) Duty(Available for VIP-PM,CM /RM,RTM,5E)

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F-R]

| 6 | O | - | *Motor stop *Displayed :OUT-F(auLt) | 97-98(Close,selected "b" on "out" mode),C1-F→Open
97-98(Open,selected "b" on "out" mode),C1-F→Open |

※ In case selected operation mode is changed by Selector SW, the motor will be continued to work according to new selected mode afte the motor is stopped shortly
※ It would be easy to understand as referring the application sequence diagram
※ In order to use Logic input #3 for FWD-REV operation, "Frdt" mode in sub menu group must be preset "OFF"
※ In case motor is stopped by the command of ON-OFF(Rmote sensor or external fault input ,not by the trip output signal) , LOP,MCC,rcS(remote control sensor) ,out-F(External fault Input) or PC is appeared in the front window to indicate originated command source
※ 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
※ The following table shows a mode list that becomes naturally disable in case "Logic" mode is preset "OFF"

Mode Group	Mode	Description
Sub	Fr-ty/a/b	To decide transfer pattern from Forward to Reverse
	Frdt/OFF/Setting	Forward-Reverse transfer time
	Tover/OFF/Setting	Main contactor Auto Close

19-2.Direct On Line Starting
▸ ”Logic” mode : “ON”
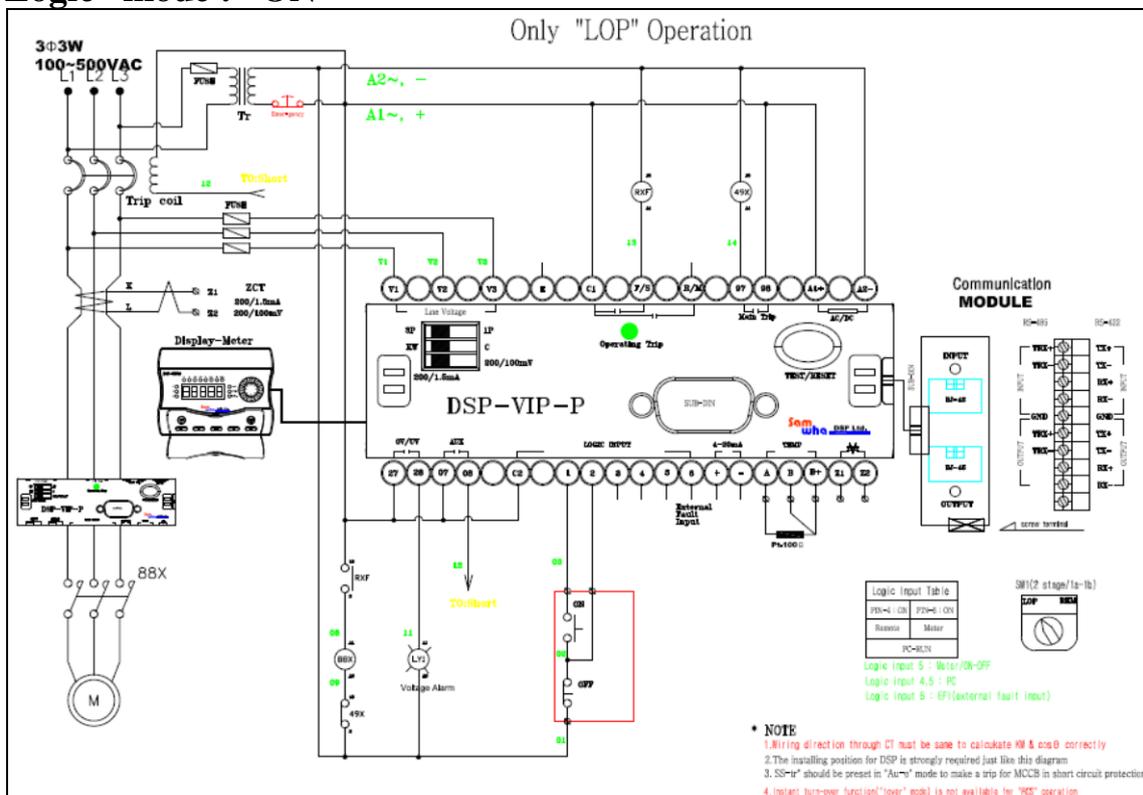
▸ **"Logic" mode : "OFF"**
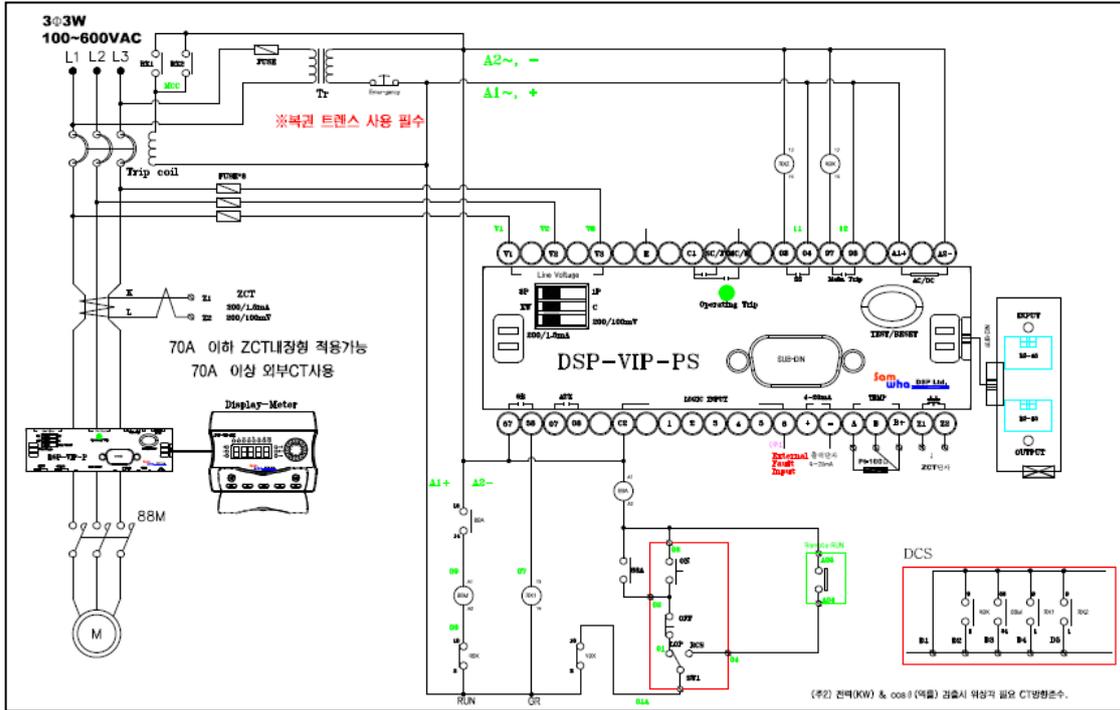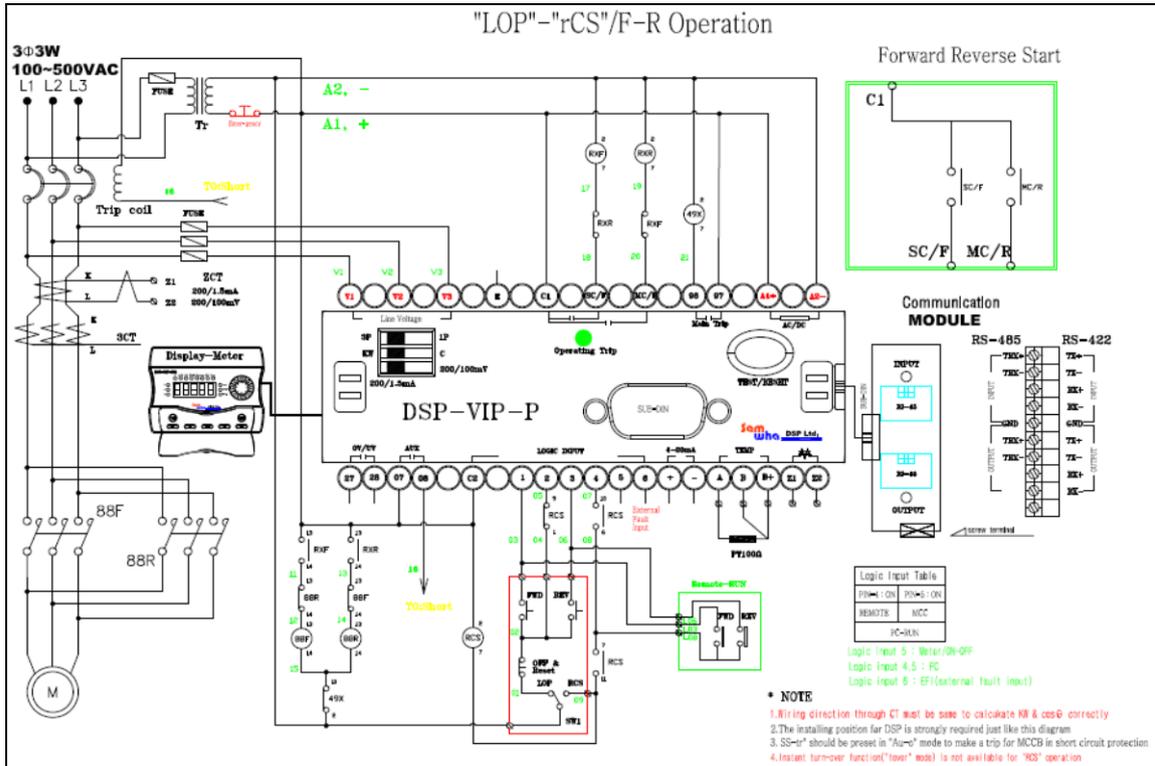

19-3.Y-Δ Start
▸ **"Logic" mode : "ON"**

▸ ”Logic” mode : “OFF”

19-4.Foward-Reverse Start

19-5.Reactor start

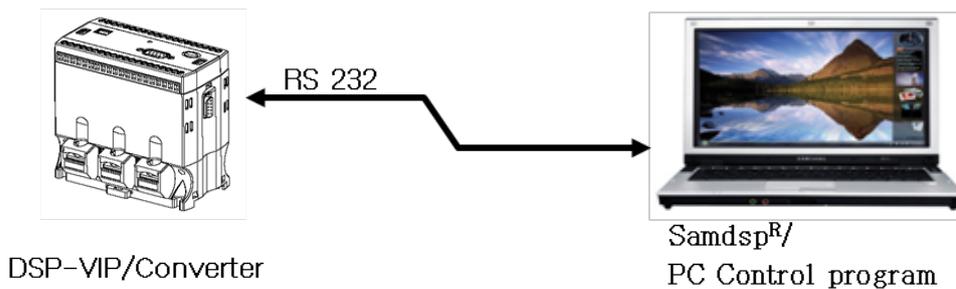# 20.Rotated Indication
20-1.Basic factor(V,I,KW,GR)
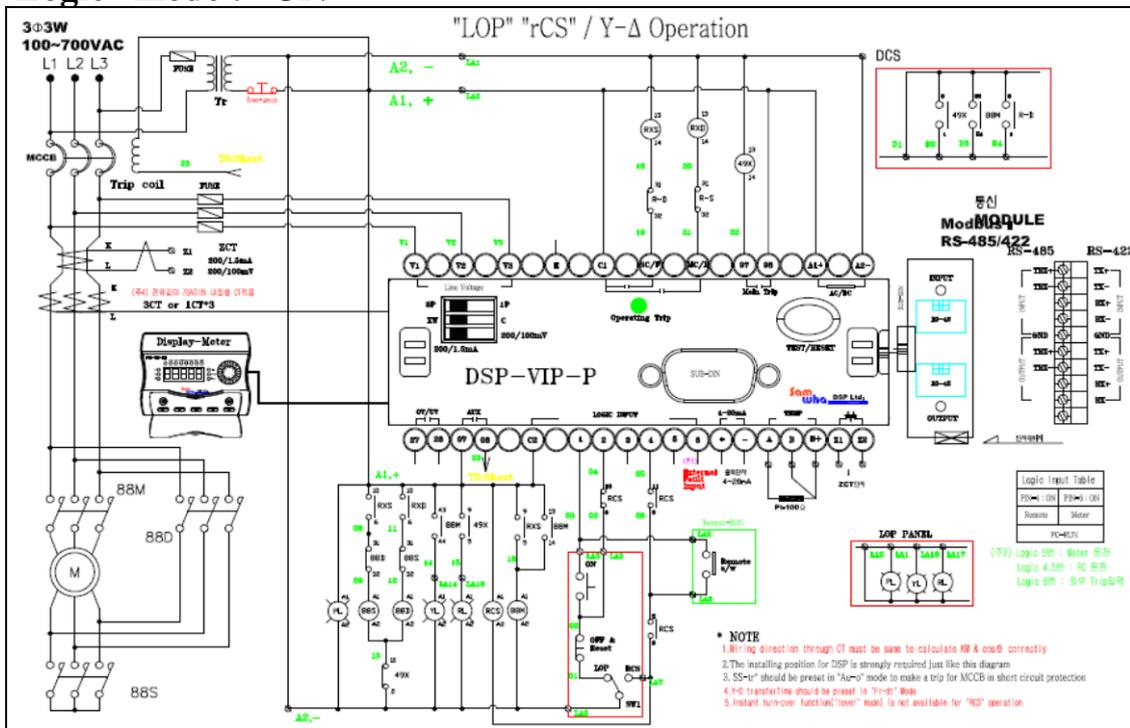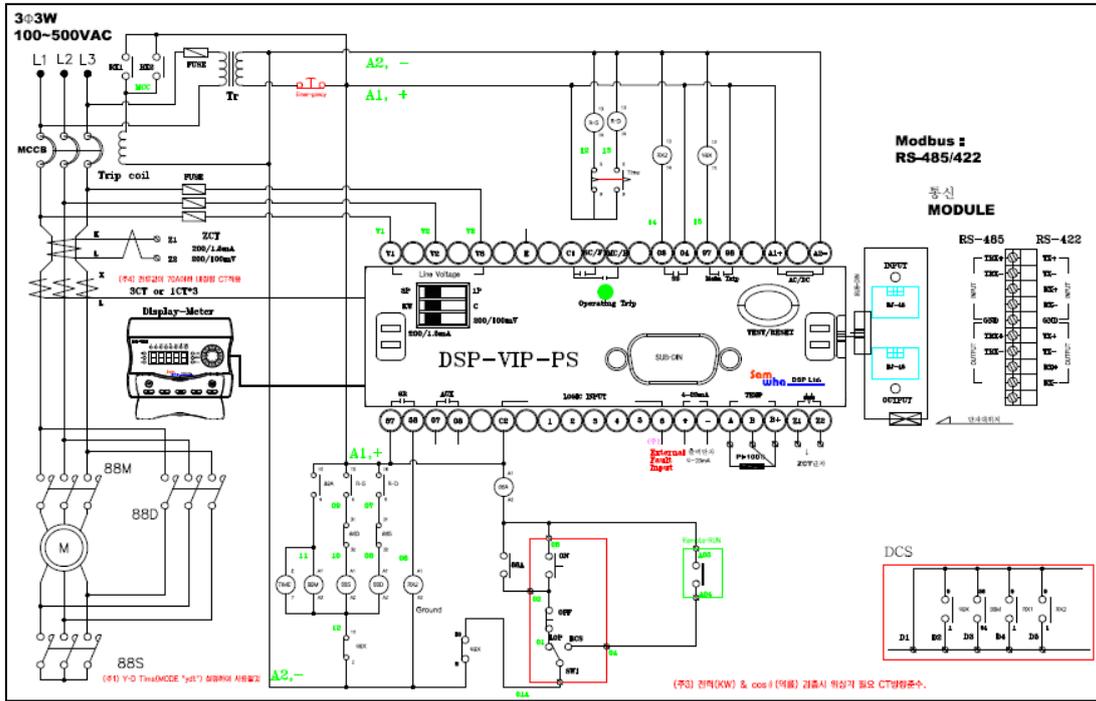
20-2.Basic factor + PF,Temp,AWT
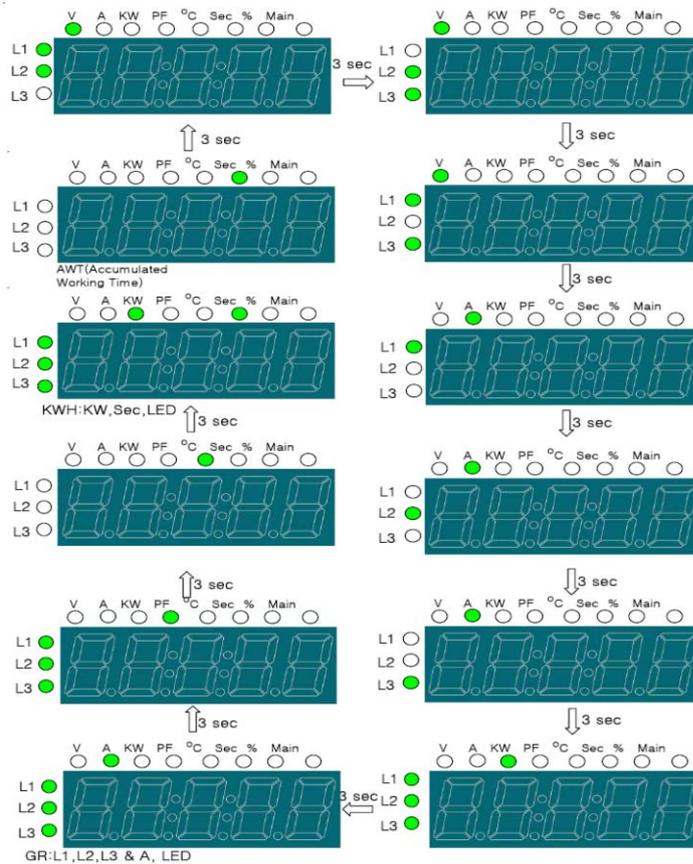
21.Example for Applied Communication
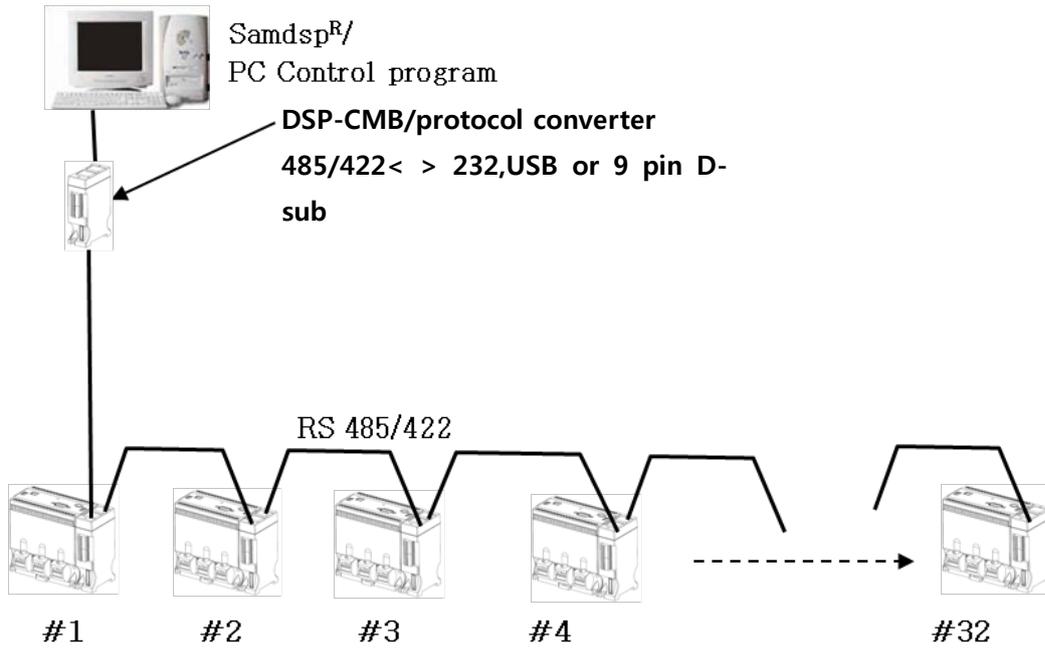## 21-1.PC <Directly > DSP by RS-232/Data Input & Monitoring

DSP-VIP/Converter

Samdsp^R/
PC Control program

*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
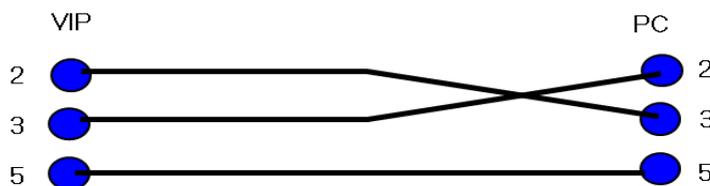
21-2.Center(PC),PLC < > DSP by RS-485/422
a.Serial Line Connection

Samdsp^R/
PC Control program

DSP-CMB/protocol converter

485/422< > 232,USB or 9 pin D-sub

RS 485/422

#1   #2   #3   #4   #32

✱**TR : termination resistance**

b.Serial Line-Parallel Connection

Samdsp^R/
PC Control program

DSP-CMB/protocol converter

485/422< > 232,USB or 9pin D-sub

RS 485/422

#1/TR   #7/TR   #13/TR   #26/TR

RS 485/422

#6/TR   #12/TR   #18/TR   #32/TR
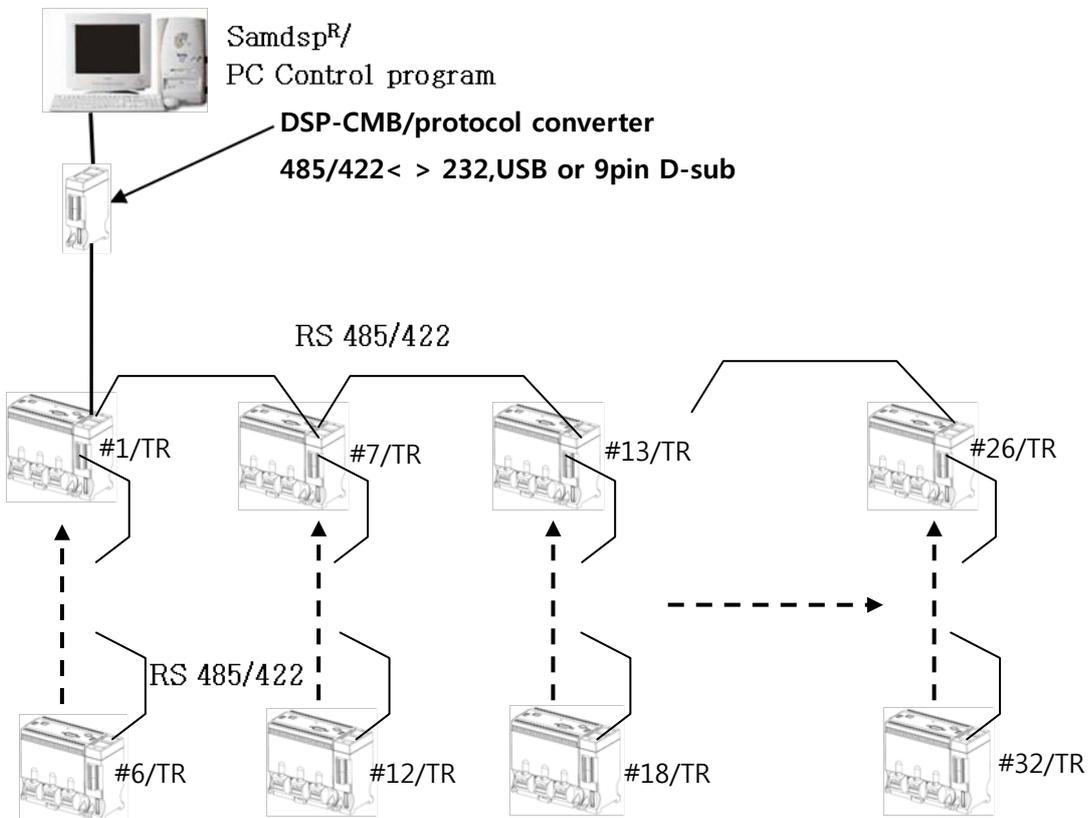
1. ▮ : termination resistance/120Ω ~200Ω

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.
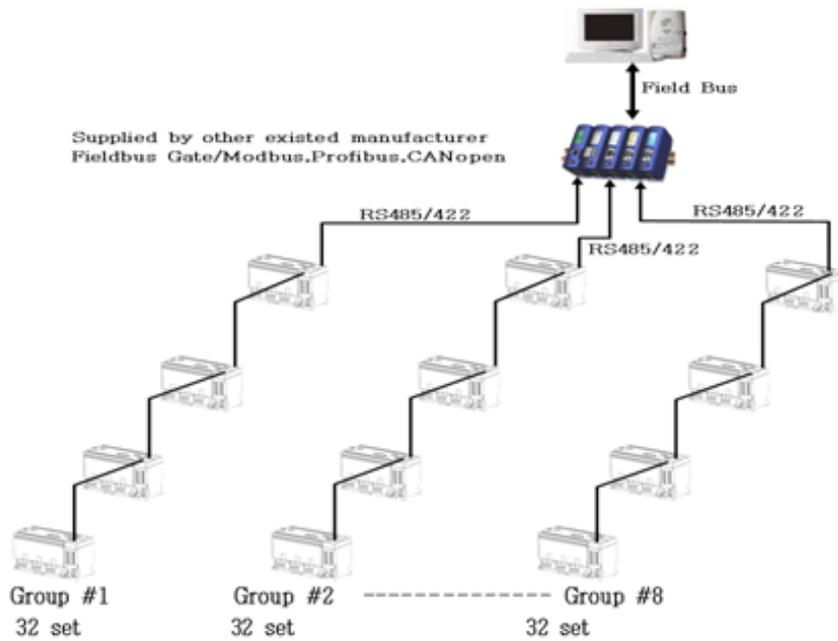The example picture for RJ45 is as follows:

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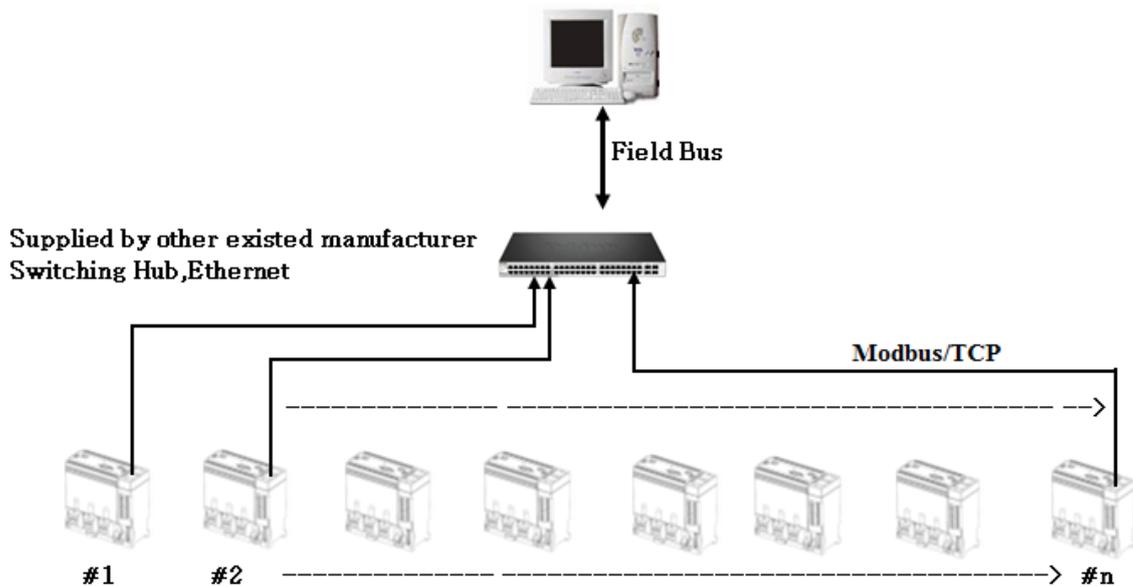

◯In the connection on the concept with Master and Slave, a matching converter (protocol converter) to match 485 of VIP with Master ,which is manufacured by other manufacturer, is required to have isolated power from a PC(Master)
◯The position of termination resistance in serial communication between Master and Slave(VIP) is basically referred as follows,but it could be changed according to a field condition:
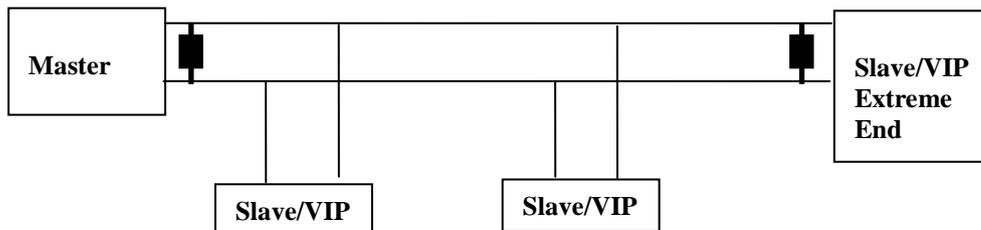
21-3.Center(PC),PLC < > DSP by RS-485/422 through Gateway

Supplied by other existed manufacturer
Fieldbus Gate/Modbus,Profibus,CANopen

Field Bus

RS485/422   RS485/422   RS485/422

Group #1   Group #2 ------------- Group #8
32 set   32 set   32 set

21-4.Center(PC),PLC < Switching Hub > DSP , Ethernet/Modbus,TCP

Field Bus

Supplied by other existed manufacturer
Switching Hub,Ethernet

Modbus/TCP

#1   #2 --> #n

21-5. 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 seperation again to preset DIP SW
or termination resistance

3)As possible as you can, do not seperate 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 ,corooked 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 untill a cricking sound is sensed

5) As like a same manner, a seperation for this module from the converter must be done
carefully.
If a seperation 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)

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:

22.PC Operation Program/"Samdsp^R"

▶ **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 embeded 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

(4) This program is to operate a serial communication by CM-44 and MWR-S

▶ **How to install "samdsp" program**

(1) Down load latest "samdsp-v**(version nmber)" 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 <u>"samdsp" file with circled "M" symbol</u> , hereafter this "samdsp" is execution file to open main window.


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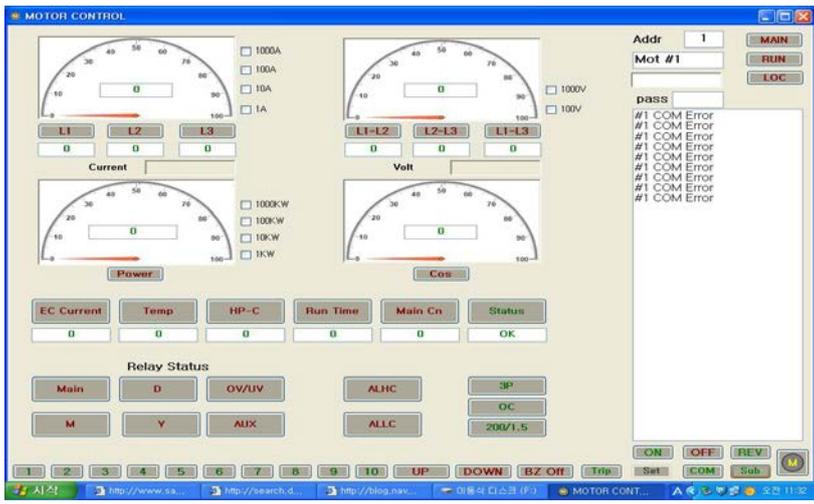
6) In case you click "Set" button under the condition with password input,a following screen is come
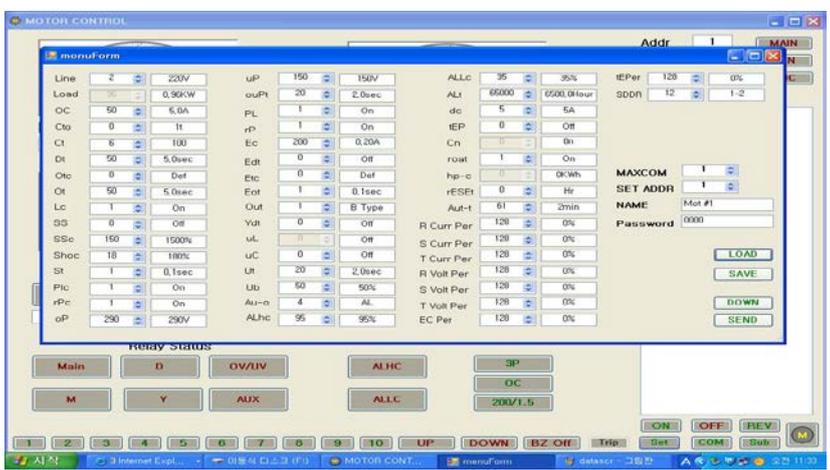
7) In case you click "Trip" button,a following screen is come

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

▶ **How to analize recorded data in your PC**

In case MWR/MWR-S is used with VIP-PM/PL, this is described in user manual for MWR-S (Motor Working Recorder)

23.Ethernet Network Operation

▶ **Ethernet network is based on Modbus TCP and the applied module for this job is CM-44E**
▶ **CM-44E is embeded system chip , CSE-M53E,which is made by "Sollae Systems(www.sollae.co.kr)"**
▶ **The user will follow to preset a necessary value in order to fix IP address according to manual of "ezManager"**

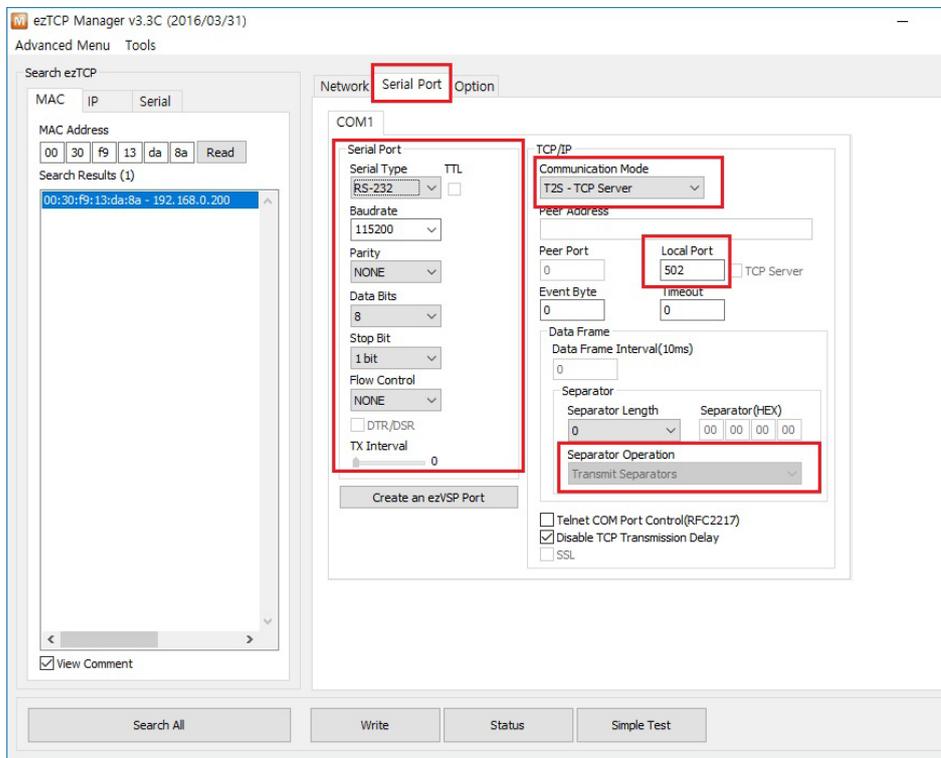**1.The followed window is shown firstly after completing "down load" for "ezManager"**
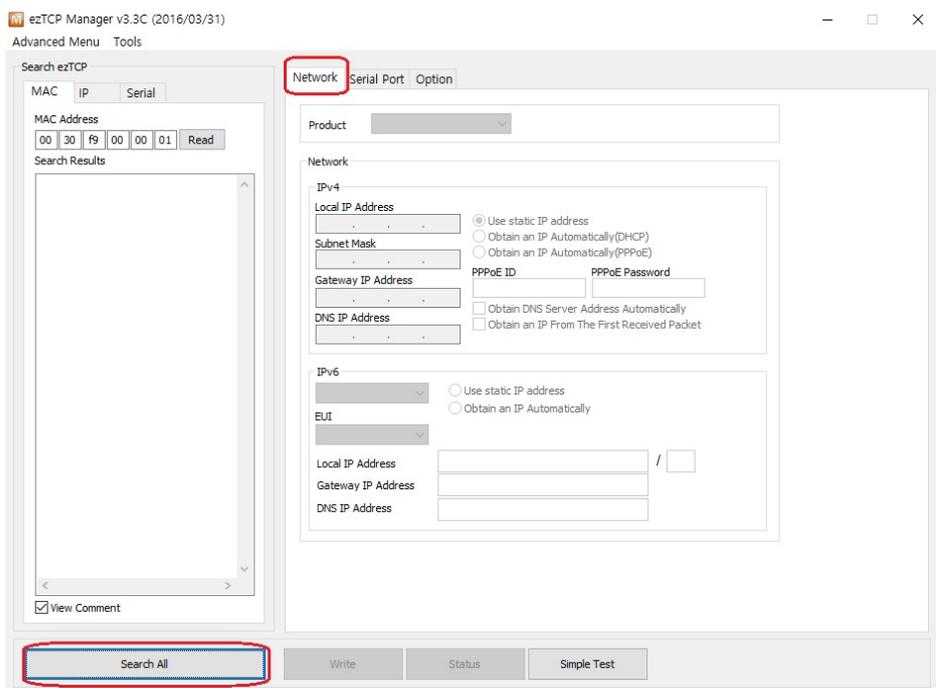
2.Select "Network" and click "Search All" ,then input product,CSE-53N which is embeded chip CM-44E will be rised with an information about IP as followed window
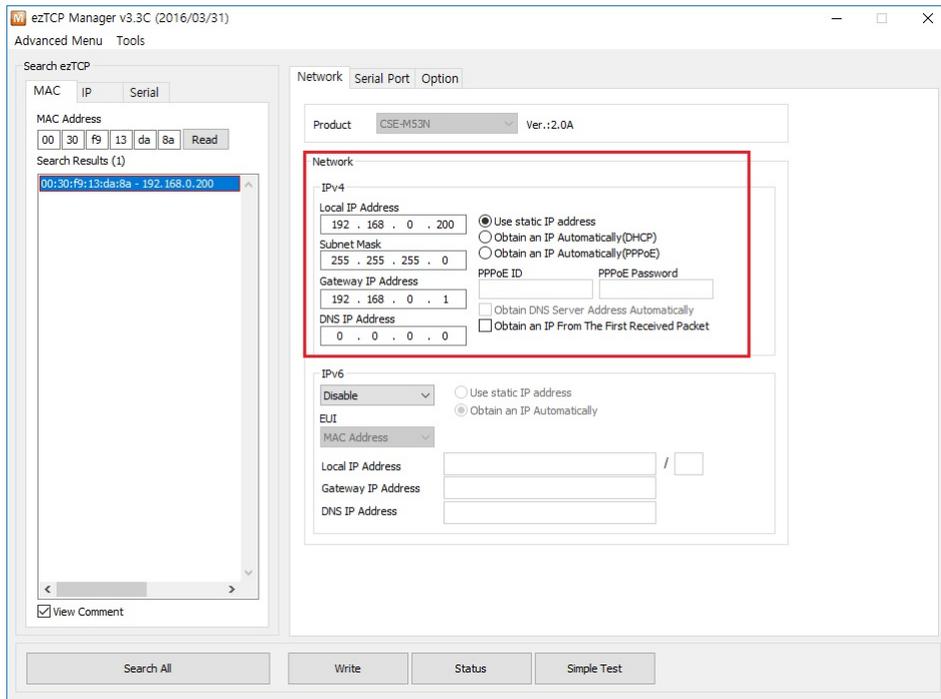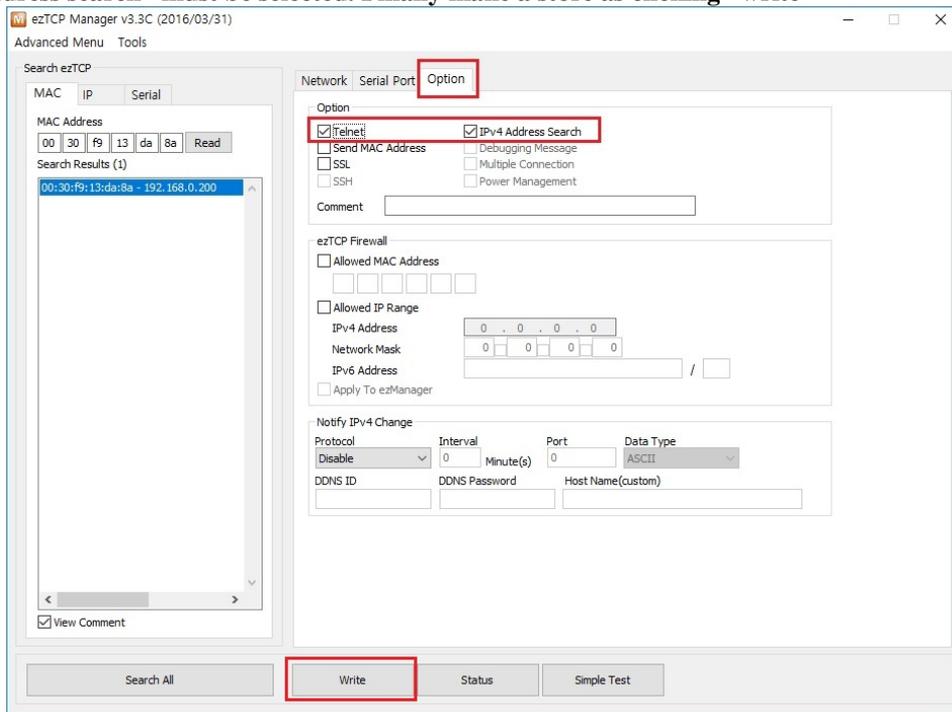

▸ **The user need to input an necessary information into above needs and make "write"**

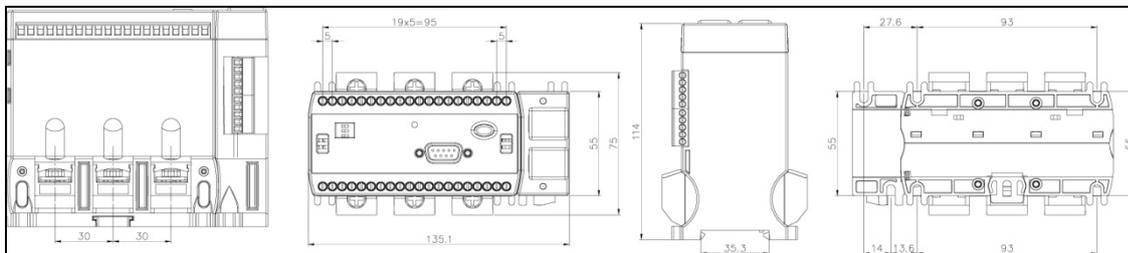**3.input a value for serial port**

4. make a store after input necessary information inside "option" menu, also "telnet" and "IPv address search" must be selected. Finally make a store as clicking "write"
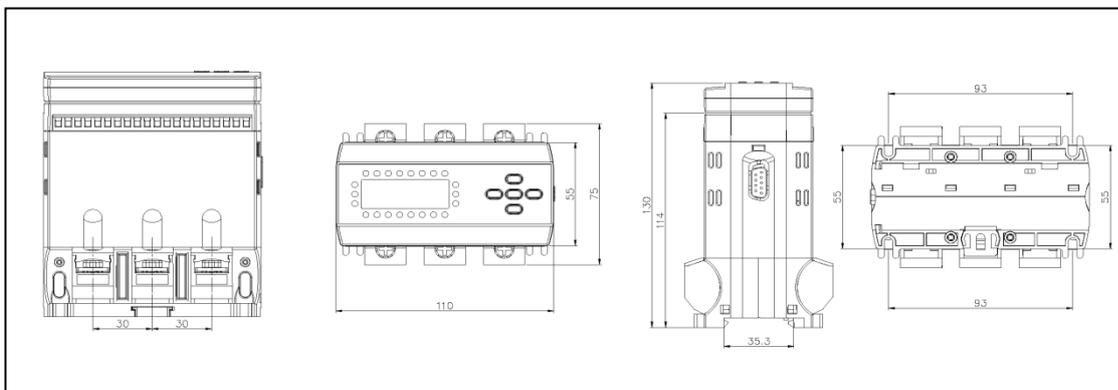

▶ **For the more detail. the user can make down load for "ezManager"/user's manual in "Sollae system Website"**
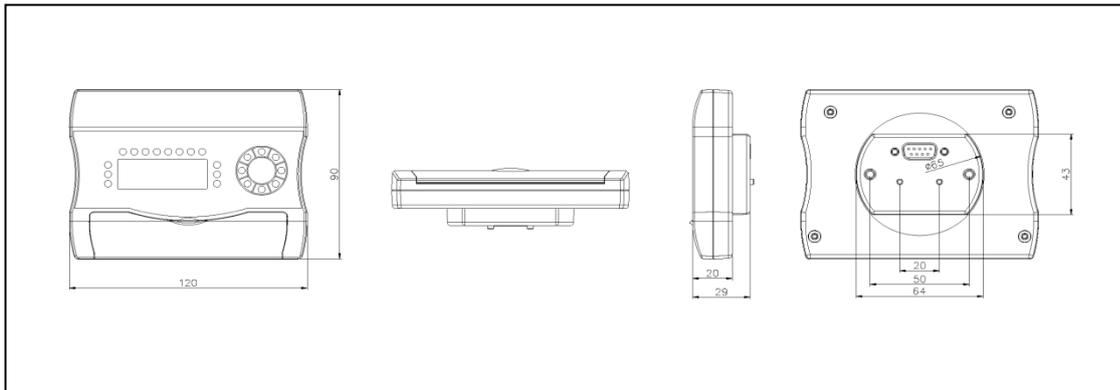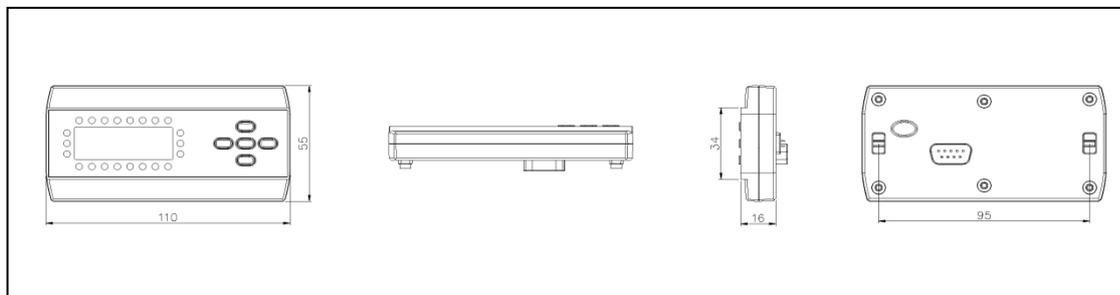
24.Dimension

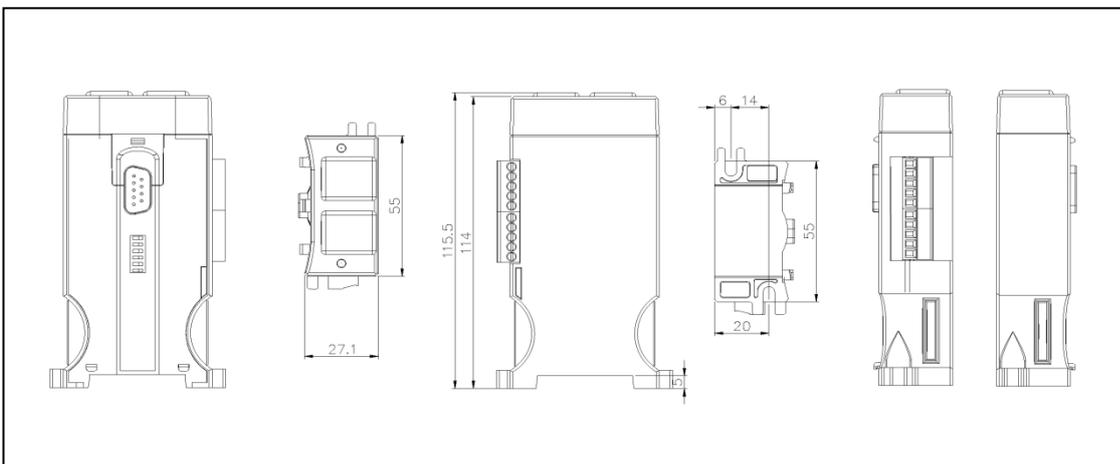▸ **Converter/Communication　Module**

▸ **Converter/Loader**

▸ **Display Meter**

▸ **Loader**

▸ **Communication Module**

25.Order Form
*DSP-VIP-1-2-3-4-5-XX

DIV		Description	Remark
1	PL	Loader	Data Input Device/Panel Mounting Type
	PM	Display Meter	Data Input Device/Panel Mouting Type
2	70	0.2A ~ 70A(0.2A~6A with external CT)	Current rating
3	B	24VAC/DC	Control Power
	Z	85VAC~260VAC(90VDC~370VDC)	
4	7	50/60Hz	Frequency/Control Power
5	ZCT	ZCT Embeded	Not possible to use with external CT
XX	Option	Exclusive Customer Order	*Available for Package type 1)None:Standard Software 2)P:Optional Software 3)PC:Optional Software with Comm. Module 4)Others except above:Customer Order Made
	A	Logic Input Voltage	220VAC(150~260 VAC)/220~370VDC
	B		110VAC(75~150VAC)/110~220VVDC

*Reference Code

IItem	Reference Code	Description	
DSP-VIP	-PL70B	Loader	0.2 70A /0.2 6A with external CT,24VAC/DC, with external ZCT
	-PL70Z7	Loader	0.2 70A/0.2 6A with external CT , 85VAC 260VAC, 50/60Hz(90VDC 370VDC),0.2~6A with external ZCT
	-PM70B	Display Meter	0.2~70A/0.2 6A with external CT ,24VAC/DC, with external ZCT
	-PM70Z7	Display Meter	0.2 70A/0.2 6A with external CT,85VAC 260VAC, 50/60Hz(90VDC 370VDC),with external ZCT
	-PL70BZCT	Loader	0.2 70A,24VAC/DC, ZCT Embedded
	-PL70Z7ZCT	Loader	0.2 70A,85VAC 260VAC,50/60Hz(90VDC 370VDC), ZCT Embedded
Converter Only	DSP-VIP-70B		0.2 70A/0.2 6A with external CT,24VAC/DC, with external ZCT
	DSP-VIP-70Z7		0.2 70A/0.2 6A with external CT,85VAC 260VAC, 50/60Hz(90VDC 370VDC), with external ZCT
	DSP-VIP-70BZCT		0.2 70A,24VAC/DC, ZCT Embedded

	DSP-VIP-70Z7ZCT	0.2 70A,85VAC 260VAC,50/60Hz(90VDC 370VDC), ZCT Embedded
Package Type	DSP-VIP-PM70Z7-P	0.2 70A,Converter+DisplayMeter/OptionalFunction program/85VAC 260VAC,50/60Hz,(90VDC 370VDC), with external ZCT, 0.2~6A with external CT
	DSP-VIP-PM70Z7-PC	0.2 70A,Converter+Display Meter+Comm.Module /Optional Function program/85VAC 260VAC, 50/60Hz (90VDC~370VDC), with external ZCT , 0.2~6A with external CT
	DSP-VIP-PM70B-C	0.2 70A,Converter+Display Meter+Comm. Module +Terminal/24VAC/DC, with external ZCT , 0.2~6A with external CT
	DSP-VIP-PM70Z7-TC	0.2 70A,Converter+ Display Meter +Comm. Module + Terminal/85VAC 260VAC,50/60Hz,(90VDC~370VDC), with external ZCT , 0.2~6A with external CT
	DSP-VIP-PM70Z7-ZCT-P	0.2 70A,Converter+DisplayMeter/OptionalFunction program/85VAC 260VAC,50/60Hz,(90VDC 370VDC),ZCT embedded
	DSP-VIP-PM70Z7-ZCT-PC	0.2 70A,Converter+Display Meter+Comm.Module /Optional Function program/85VAC 260VAC, 50/60Hz,(90VDC~370VDC),ZCT embedded
	DSP-VIP-PM70B-ZCT-C	0.2 70A,Converter+Display Meter+Comm. Module +Terminal/24VAC/DC,ZCT Embedded
	DSP-VIP-PM70Z7-ZCT-TC	0.2 70A,Converter+ Display Meter +Comm. Module + Terminal/85VAC 260VAC,50/60Hz,(90VDC~370VDC),ZCT Embedded
	DSP-VIP-PM70Z7-PCR	0.2～70A,Converter+Display Meter+MWR-S/Optional Function program/85VAC～260VAC, 50/60Hz (90VDC~370VDC), with external ZCT, 0.2~6A with external CT
	DSP-VIP-PM70B-CR	0.2～70A,Converter+Display Meter+ MWR-S +Terminal/24VAC/DC, with external ZCT , 0.2~6A with external CT
	DSP-VIP-PM70Z7-TCR	0.2～70A,Converter+ Display Meter + MWR-S + Terminal/85VAC～260VAC,50/60Hz,(90VDC~370VDC), with external ZCT , 0.2~6A with external CT
	DSP-VIP-PM70Z7-ZCT-PCR	0.2 70A,Converter+Display Meter+ MWR-S /Optional Function program/85VAC 260VAC, 50/60Hz, (90VDC~370VDC),ZCT embedded
	DSP-VIP-PM70B-ZCT-CR	0.2 70A,Converter+Display Meter+ MWR-S +Terminal/24VAC/DC,ZCT Embedded
	DSP-VIP-PM70Z7-ZCT-TCR	0.2 70A,Converter+ Display Meter + MWR-S + Terminal/85VAC 260VAC,50/60Hz,(90VDC~370VDC),ZCT Embeded

*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-□XX	□00mA/1.5mA	XX:Inner diamete□ of ZCT
	DSP -ZCT-V-XX	100mA/100mV	
Loader	DSP -ID-PL	Input Device/ Loader	

Display Meter	DSP -ID-PM	Input 〈device/ Display Meter	
Converter	DSP-VIP-PS	assembled with CT block	not included external CT block
CT Terminal	DSP -TB-3T	Terminal through CT Hole	
Communication Module	DSP -CM-44	*Module〈RS 485/422<>RS 485/422	RS485/422 Serial Comm.
	DSP-CM-44E	*Module,Ethernet <> Switching Hub	Ethernet
Communication & recorder Module	DSP-MWR-S	*Module:RS 485<> RS 485 *Recorder for 20 days in every second	RS485 Serial communication
Protocol converter	DSP-CMB	*Multi-1U/USB Combo @ Cross cable *485(CM-44)<>232 USB (Note PC)	
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	

※Note

1. Logic input voltage is 220VAC(150~260 VAC)/220~370VDC unless "B" is suffixed in completed reference code in case control voltage is 220VAC
2. Logic input voltage is 24VDC unless "C" or "D" is suffixed in completed reference code in case control voltage is 24VDC
   ● "C" : 220VAC:150～260VAC,50/60Hz(220～370VDC)
   ● "D" : 110VAC:75～150VAC,50/60Hz(110～220VDC)

26. 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 vioiolating this guide may cost to user

❑ Applied environment is as follows:

1)Temperature:-25 OC ~+70 OC

2)Storage :-40 OC ~ +80 OC

3)Humidity:30 ~ 80%/RH,Non-condensing

4)Voltage

The control voltage is AC 85V~260V , 50/60Hz(DC 90V~370V) or AC/DC 24V and allowable deviation for this voltage is +.-10% .

1)a supplied voltage greater than rating value many 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/do 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 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,s o 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) protocol converter,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.

❑The more detailed information about a communicatio between PC and VIP   is also described in the manual for a communication module