Digital Over Load Motor Protection Relay

<DSP-/POM , PTM>

<Operation Factor:V1-V2-V3, L1-L2-L3>

<New Display Meter : DM II>

Samwha DSP Ltd.

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2. Main Feature

◯ One Model is able to meet three kind of independent function :
Voltage relay/Current relay/Power[Load/KW,Current]relay

Independent Function	Selection in "USAgE" Mode	Preset mode	Protection
Over/Under Voltage Relay	“V”	All of Mode except "PL",RP","Ov","Uv", "OUvt", “out", "UsAgE", "LinE", and "trAnS" become disable naturally	·Over voltage ·Under voltage ·Phase loss ·Reverse phase
Over/Under Current Relay	“A”	"PL",RP","Ov","Uv", "OUvt","LinE", "trAnS"and “hP-c" become disable naturally	·Over current ·Under current ·Locked rotor ·Phase loss ·Reverse phase ·Shock/Stall ·Ground fault ·Current unbalance
Power Type [Over/Under Load,Current] Relay	"VA"	All of mode is available	·Over voltage ·Under voltage ·Over Load [current] ·Under Load[current] ·Locked rotor ·Phase loss ·Reverse Phase ·Shock/Stall ·Ground fault ·Current unbalance

◯ MCU based digital protection : reliable correct operation
◯ Access restricted to authorized operator: Password
◯ To replace easily existing model which is not applied for Logic Input
:Main trip/1c(95-96-98), Aux trip/1c(05-06-08)
◯ Compact size, Multi-function

*Protection : Over/Under voltage, Over/Under Load[Current],Phase loss, Reverse phase,Locked rotor,Shock(stall),Current unbalance, Ground fault
*Indication : Voltage, Load[KW]/Current,KWH, Earth current, AWT [Accumulated Working Time], Power Factor, Bar Graph[operating/preset "oc"] ,Alarm ,Trip

◯ To show a trip cause and an operational information in character and/or number : 5 Digit Window

◯ To cover a wide current range for the protection
*10 Type
:0.5～10A/external CT : 0.5～6A
:0.37[KW] ～7.4[KW]/3P 480V
:0.1[KW]～2.2[KW]/1P 220V
*70 Type
:5A ～ 70A
:3.7[KW] ～ 52[KW]/3P 480V
:1[kw]～15[KW]/1P 220V

◯ Exclusive operation as voltage relay by direct voltage detection
*110V : 40~180V
*220V : 150V～290V *380V : 310V～450V
*440V : 370V～510V *480V : 410V～550V

◯ "Shock" protection : useful for the protection for instant mechanical shock while crasher, roller, conveyer,etc are working

◯ Rotated indication for operating factor in every 3 sec during motor is working:V,KW/Curr,KWH,Ec,AWT,Pf,Lf(Load factor)

◯ High sensitive level and wide zero phase current range for ground fault protection : 30mA ～ 2A
*Basic type : External ZCT[200mA/1.5mA]
*Optional type : Embedded ZCT

◯ Various way for the reset to trip : Manual,Electrical or Automatic/to response for wide application in applied sequence system

◯ To keep a stable operation under frequency variation from Inverter : 30Hz ～ 400Hz

◯ Self-diagnostic test by one touch for "SET" key

◯ To call easily factory preset value : not worried about forgetting the number of password

◯ Alarm before making trip by over load/current

◯ To memorize latest 8 trip among trip events

◯ To have stable state under the noise environment :line noise filter attached connection cable between indication meter and converter in panel flush mounting type

◯ Convenient installation for existed hole :65Φ hole or rectangular hole /display meter of panel flush mounting type

3. Function

▸Protection

Division	Time	Description
Over voltage[Ov]	ouvt:1～30sec	*to protect over voltage
Under voltage [Uv]	ouvt:1～30sec	*to protect under voltage
Over Load [Current]	*d-time :1~300sec *Definite T-I o-time:1～60sec *Inverse T-I o-time:5～30Class	*to protect over load [current] of each phase
Under Load [Current]	U-time:1～30sec/def	*to protect under load [current] of each phase
Phase Loss	*0.5sec:by incoming voltage *1~5sec:by load current	*to protect phase loss based on incoming voltage or load current
Current Unbalance	8 sec	*preset range :30%~90% / [(max-min)/max]*100[%]
Reverse Phase	*0.5sec:by incoming voltage *0.5sec:by load current	*to ptotect reverse phase based on incoming line or load current
Locked Rotor	dt + 0.1sec	*to protect locked rotor in starting state
Shock/Stall	0.5～3sec/def.	*to make a trip if preset value is sensed during working : preset range to “OL'["OC"]/180%～700%
Ground Fault	Edt:1～25sec, Eot:0.5～30sec/def.	* to ptotect GF by zero phase sequence current sensed through ZCT

▸Indication

Indication	Description
Rotated indication during the operation/ preset in “rotA" mode	*Selection for "V" in "USAgE" Mode(used for only voltage relay) :Average[Line] voltage is indicated orderly in every 3 sec :v-oFF is indicated in case of no voltage *Selection for "A" in "USAgE" Mode(used for only current relay)" -OFF:Stop state[operation mode :"Auto"] ,Working state [each phase cyrrent, Load factor, earth current] -ON:each phase current, earth current + AWT (accumulated working time)

	*Selection for "VA" in "USAgE" Mode[used for only power(load) relay : possible for preset a current according to preset " disable" in "OL" mode -OFF:Stop state[operation mode "Power", Avg(line) voltage], Working state[KW/current, Line/Avg Voltage,Earth current -ON:[KW/current, Line/Avg Voltage,Earth current + KWH, AWT,power factor *KWH:accumulated in every 0.1hr(6min) *AWT[accumulated working time] :time to alarm if the actual working time has elapsed over AWT *Load factor[operating/preset OL"("oc")] : displayed in bar graph *Possible to fix one of rotated factor or to release:repeated one touch with "CLR" key
to check and/ or to change preset value of each mode during the operation	* Possible to check a value and a mode as pressing "SET" key once during the operation ▸preset value and mode are appeared alternatively ▸next mode as pressing “CLR” Key or previous mode as pressing “SET” key * Possible to change a preset value after entering into working state if the preset value of “OPSET” mode belonged to “CAB” mode group is “ON”/ factory default value is “OFF” * Return to operating mode as pressing both “SET” and "CLR" key in the same time or waiting for 15sec in stopping state or 60sec in running state as storing adjusted value
Alarm	* Able to make alarm before tripping if actual current is kept over preset alarm rate to "OC" preset value over 3 sec * "AL" is flickeing in the rotation order of alarmed phase as showing alarmed value(%)

4. Technical Specification

DIV		Description
Line Voltage	*Under 600V *V1,V2,V3	*110/220/380/440/480
Load [Current] Range	10 Type	0.5～10A/0.5~6A with external CT :0.37[KW]～7.4[KW]/3P 480V :0.1[KW]～2.2[KW]/1P 220V
	70 Type	5～70A :3.7[KW]～52[KW]/3P 480V :1[kw]～15[KW]/1P 220V
	External CT	1～3000A
Earth current range	Zero phase current	*30mA～2A *Sensed through external ZCT or embeded ZCT *External CT type must be combined with external ZCT

Time preset	Starting delay time (dt)		1～300 sec/Def.
	over load[current] trip delay time(ot)		1～60 sec/Def. , 5~30 Class/Inv.
	under Load[current] trip delay time(ut)		1～30 sec/Def.
	Ground fault starting delay time(Edt)		OFF,1～25 sec/Def.
	Ground fault trip delay time(Eot)		0.5～30 sec/Def.
	Shock/stall trip delay time(st)		0.5～3 sec/Def.
	Over/Under voltage (oupt)		1~30sec
	Phase loss trip delay time by load current(PLc)		1~5sec
Allowable tollerance	Voltage		±5%
	Current		C<=2A:0.2A, C>2A:±5%
	Time		t<=2sec:± 0.2sec, t>2sec:±10%
	Power factor		< ±5%
	KW/KWH		Cos Phi>0.6 : ±3%
Control power			*AC 85V～AC260V,50/60Hz (DC90V～DC370V)
			*DC24V(Optional)
Trip output relay	Main : 95-96-98		1c(1-SPDT),3A/Resistive
	Aux : 05-06-08		1c(1-SPDT),3A/Resistive:(possible to output one of alarm/GF/OL[UC]/shock/OP/UP/RP
Application environment	temperature	Operation	-25^{O}C～+70^{O}C
	temperature	Storage	-40^{O}C～+80^{O}C
	Humidity		30～85%/relative , non-condensing
Current tollerance against changeable frequency from inverter			Average ±5% under 30Hz～400Hz
Max Main Conductor Size			25SQ
Screw Torque			Max0.6N.m
Insulation Resistence/IEC-60255-5			100Mohm or more/500VDC,circuit-case
High Voltage Withstand Test/ IEC-60255-5			*circuit-case:AC2000V,60Hz, 1 min *contact-contact:AC1000V,60Hz,1min

Lightning Impulse Voltage Withstand Test)/ IEC-60255-5	*Circuit-Ground,Circuit-Circuit:1.2/50uS,5KV *Control Circuits:1.2/50uS, 5KV
1 MHz Burst Immunity Test:IEC 61000-4-18	2.5KV,Positive/Negative under 2sec
Electrostatic Discharge: IEC-61000-4-2	Air:Level 3, 8KV,Contact:Level 3,6KV
Radiated Electromagnetic Field Disturbance:IEC-61000-4-3	Level 3, 10V/m
Electric Fast Transient Burst :IEC-61000-4-4	Power,Realy output:Level 4, 4KV
Surge Immunity test:IEC-61000-4-5	Relay output:1.2X50uS,2KV (0^O,90^O,180^O,270°)
Conducted Disturbence Test: IEC-61000-4-6	10V,Level 3
Current Loop Communication/	*Max current value in 3 phase is transformed into 20mA *only for PTM Type *The receiver for 4-20 signal does not need loop voltage
Consuming power	4W Max

5.Preset Mode

- Main Mode

Press "SET" key to enter into setting mode , then enter password. The more detail is described in "Operation of Control key "

Mode	Function/ range	Description	Factory Setting value
P****	Password	*need to input "0000"(factory default value) to enter setting mode *need to move a cursor from first digit(1000unit) to last unit(1unit) 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 forgets a pssword, manufacturer can support it *To call factory preset value, make power-off and pressed state for both “UP" & "DN" key, then power-on under pressed state of both button for	0000

		3sec or more	
out/a/b	to decide initial state of main trip output	In case the control power is powered,: initial state of 1c(main trip) output is changed to oposite state (95-96-98/95-96→open,95-98→close) b:initial state of 1c is not changed (95-96-98/95-96 →close,95-98→open) *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
USAgE /V/A/ VA	to select a independent operating function	*V :to use for voltage relay :All of Mode except “LInE”,”out”,”PhASE”, "trAnS","Auo",PL",RP","Ov","Uv","OUvt",,”trip”,”rESEt” become disable naturally *A :to use for current relay :"LInE","oL",”trAnS”,"LoAd", “PL","RP","Ov", "Uv" ,"OUvt" become disable naturally *VA : to use for power type relay *v-OFF is appered if line voltage is not loaded in initial state,also this means the motor is not possible to run	VA
LInE/ setting Value	to select line voltage	*to define the value of incoming line voltage to use for voltage relay or power type relay:220/ 380/440/480	440
PhASE/ 1P/3P	to select phase of power line	*1P:single phase motor/disable for phase loss & reverse phase/voltage must be loaded between V1 and V2 *3P:3 phase motor protection	3P
trAnS/L/A	to select a base to display incomming voltage	*L:line voltage *A:average voltage *"L--" is displayed naturally in case "A" is selected in "USagE" mode.This means this mode is disable	A
LoAd/ Pa/va	to select a kind of indicated load power	*Pa:effective power[KW]/adopted actual power factor *va:apparent power(not adopted actual power factor ,but Pf=1)/useful for inverter system *This mode is displayed alternatively like "LoAd" & "--" as selecting "A"(use for current	va

		relay) or "V"(use for voltage relay) in "USagE" mode	
ct/setting value	to preset a ratio of external CT	*This mode is available for 10 Type *to preset CT ratio of external CT with 5A secondary rating *CT ratio :2t,4t, 1~600[preset value = primary value of CT/5] *2t:twice winding through CT hole/0.3~3A *4t:4 times winding through CT hole/0.2~ 2A *1:to sense a current through its own CT or external CT with 5/5 ratio *This mode is displayed like "ct--" as selecting "V"(for use voltage relay) in "USAgE" mode	1
oL/OFF/ setting value	to preset a range to protect over load	*Available as selecting "VA" in USAgE" mode *OFF:this mode is disable and :“OC" mode become available *10Type :0.5~10A/external CT:0.5～6A .3P 110V//0.09[KW]~1.7[KW] :3P 220V/0.17[KW]～3.4[KW] :3P 380V/0.29[KW]～5.9[KW] :3P 440V/0.34[KW]～6.8[KW] :3P 480V/0.37[KW]～7.4[KW] :1P 220V/0.11[KW]～2.2[KW] :1P 440V/0.22[KW]～4.4[KW] *70 Type:5~70A .3P 110V/0.9[KW]~12[KW] :3P 220V/1.7[KW]～24[KW] :3P 380V/2.9[KW]～41.46[KW] :3P 440V/3.4[KW]～48[KW] :3P480V/3.7[KW]～ 52[KW] :1P 220V/1.1[KW]～15.[KW] :1P 440V/2.2[KW]～30[KW] *This mode is displayed like "oL--" as selecting "V"(for use voltage relay) in "USAgE" mode	oFF
oc/ setting value	to preset a range to protect over current	*this mode is disable and is displayed like "--" as presetting [KW] value in "OL" mode -10 Type:0.5A～10A -70 Type:5A ～70A *This mode is displayed like "oL--" as selecting "V" (use for voltage relay) in "USAgE" mode	*10:10A *70:70A

dt/OFF/ setting value	to preset starting delay time	*Trip delay time to prevent unwanted trip caused by starting current *OFF:dt is zero *1~300sec *available for sensing current over 0.3A(10 Type) or 3A(70 type)	5sec
Otc/deF/ Inv	to select time – current chracteristics for over current protection	*If "Usage" mode is preset "V", this is disable *to decide T-I characteristics: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 multiple value in each type to use 800% for inverse curve -10Type:0.5~6A -70Type:5~40A	deF
Ot/setting value	to preset trip delay time	*to preset time to make a trip when a current exceeds preset value *definite:1sec~60sec *inverse:0.2~30class *This mode is displayed like "ot--" as selecting "V"(for use voltage relay) in "USAgE" mode	5sec
Lc/oFF /on	to protect Locked Rotor	*OFF:disable for this mode in starting state *ON:Lc is shown in trip after dt+0.1sec if starting current exceeds 300% to oc *This mode is displayed like "Lc--" as selecting "V"(for use voltage relay) in "USAgE" mode	oFF
Shoc/ oFF/ setting value	Shock protection during working	*OFF:disable for this function *preset to "OC": max is 700% as followed calculation. -10Type:180%～[30/"OC"preset value] % -70Type:180%～[200/"OC" preset value]% *protection case of “OL” is same as “OC” *This mode is disable like "Shoc" & "--" as selecting "V"(use for voltage relay) in "USAgE" mode	oFF
st/setting value	to preset a time for shock protection	*0.5～3sec/def. *this mode is shown as "st--" if shock mode is disable	"st--"

PL/oFF/ ON	to protect phase loss by incoming line voltage	*OFF : disable *ON:to make a trip to protect initial phase loss based on incoming 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.	OFF
PLc /oFF/ setting value	to protect phase loss by load current	*OFF:disable *1~5 sec/adjustable:to make a trip to protect phase loss based on load current *This mode is displayed like "PLc--" as selecting "V"(for use voltage relay) in "USAgE" mode *Auto reset is not possible	OFF
RP/oFF/ on	to protect reverse phase by incoming line voltage	*OFF:disable *ON:to make a trip to protect initial reverse phase based on incoming line voltage within 0.5sec *Auto reset is not possible	OFF
RPc /oFF /on	to protect reverse phase by load current	*OFF:disable *ON:to make a trip to protect reverse phase based on load current within 0.5 sec	OFF
Ov/OFF/ setting value	to protect over voltage	*to preset a value to protect over voltage concerned with "USAgE" mode *110V:110~180V *220V:220～290V *380:380～450V *440:440～510V *480:480～550V *this protection is done in waiting state before starting a motor in case normal voltage is powered on *a trip caused by over voltage is reset automatically in case actual voltage is reached under preset voltage and the line voltage is not powered(zero voltage)	OFF
Uv/ OFF/ setting value	to protect under voltage	*to preset a value to protect under voltage concerned with "USAgE" mode *110V:40~110V *220V:150～220V *380V:310～380V *440V:370～440V *480V:410～480V *this protection is done in waiting state before starting a motor in case normal voltage is powered on	OFF

		*The start for motor operation is not possible if sensed voltage is under preset value *a trip by under voltage is reset automatically in case actual voltage is reached over preset value	
OUvt/ setting value	to preset trip delay time to protect over & under voltage	*trip delay time:1～30sec/adjustable *If Ov/Uv is "OFF", this mode is disable	2sec
Ec/oFF/set ting value	to preset zero phase current to protect ground fault	*OFF:to make this mode disable *preset range:30mA～2A *external ZCT must be used for external ct adoption *This mode is displayed like "Ec--" as selecting "V"(for use voltage relay) in "USAgE" mode	OFF
Edt/ oFF/ setting value	to preset starting trip delay time to protect ground fault	*if ”Ec” mode is preset OFF, "Edt" & "- -“ are shown alternatively *1～25sec/def.	2 sec
Eot /setting value	to preset trip delay time to protect ground fault	*0.5～30sec/def. *if ”Ec” mode is preset OFF, "Eot" & "- -“ are shown alternatively	0.5sec
uL[uc]/ oFF/ setting value	to preset a range to protect under load[current]	*"OL" is matched with this "UL" *In case "OFF" is selected in "USAgE" mode to use for current type relay, "OC" is matched with "Uc" *Preset range • 10 Type: : 0.4A～under "OC" preset value • 70 Type: : 4.9A～under "OC" preset value *This mode is displayed like "- -" as selecting "V"(for use voltage relay) in "USAgE" mode *This mode is able only 3 phase load	OFF
ut/ setting value	to prset trip delay time to protect under load[current]	*1～30sec/def. *This mode is displayed like "- -" as selecting "OFF" in "uL[uc]" mode	2sec

ub / oFF/ value	to define current unbalance rate	*to protect current unbalance among each phase *calculation : [(max-min)/max]*100[%] *preset range : 30%～90%	OFF
Au-o/ oFF/Ec/ Ec-tb/AL/ uc/Shoc/ Ov/Uv/ V-oN	to preset a kind of AUX trip output (05-06-08)	*oFF:to make same output as main trip *AL/Uc/Shoc/Ec is independent output from main trip during normal operation *AL:only for alarm to oc before trip *Uc:only for under current protection *Ec,Ec-tb :only for ground fault protection, but reset is not happened in Ec-tb even though trip cause is clear • Ec-tb is stored in “trip” mode as a one of 8 latest trip *shoc: only for mechnical shock protection *v-oN:AUX output(05-06-08) is energized as the incoming voltage is loaded *Ov:only for over voltage protection *Uv:only for under voltage protection *independent output from main trip except "OFF' and Ec-tb is excluded in main trip output naturally *All trip except Ec-tb,OFF is automatically reset if a trip condition is clear/need to press "CLR" key to make reset in case of OFF, Ec-tb *oFF/Ov/Uv is only available in case "V" is selected in "USAgE" Mode *Ec,Ec-tb, Shock,Uc,OP/UP are trip after operation trip time has passed *Previous preset factor is changed into “oFF” if “Usage” mode is changed after applying.	AL
AL/ setting value	to preset alarm level rate(%) to OL[OC]	*if other factor except "AL" in ”Auo” mode is preset, this mode is shown like “- -“ *preset range to "OL"["OC"] : 15%～100% *the alarm is come out as the condition of preset alarm % is keeping for 3 sec or more → “95”% point LED in bar graph and “AL” are flickering together *This mode is displayed like "AL--" as selecting "V"(for use voltage relay) in "USAgE" mode	90
ALt/ setting value & Clear	to preset a limit of accumulated working	*possible to preset a value between 0.1 hr～6553.5 hr by 0.1 hr unit *able to accumulate time in case available current assumed normal operation is sensed at least	6500

	time necessary to give alarm & clear	*indicated value is flickering as preset value is elapsed *To clear and to preset new value: enter into “ALT” mode in motor stop state, then put new required value by using "UP","DN" and come out the operation mode by pressing both "SET" & "CLR", at last the clearance for existed value and new value preset is done in the same time	
hP-c /Indication & CLR	to select indication for accumulated KWH or clear	*to show accumulated KWH untill latest term. *KWH is accumulated in every 0.1hr(6 min) and max value is 99999KWH *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 *This mode is displayed like "hpc--" as selecting "V", "A"(for use voltage,current relay) in "USAgE" mode	0
dC/ setting value	to decide max current to change into 20mA	*Available only for PTM Type *to transfer maximum current among 3phase current into 20mA and 4mA means zero ampere output *Primary current is transformed in case external CT is used. *The receiver for 4-20 signal does not need loop voltage	5
rota/ oFF/on	to decide additional factor besides basic factor to indicate value in the order	*Selection "V" in "USAgE" mode(usage for voltage relay) : to indicate “voLt" & 3 phase voltage orderly in every 3 sec *Selection "A" in "USAgE" mode(usage for current relay) -OFF:basic factor/current, GF current,load Factor [operating/preset “oc”]/Bar Graph -ON:accumulated working time is added to basic factor *Selection "VA" in "USAgE" mode (usage for power load relay) -OFF/basic factor : line voltage/average voltage,GF current,3 phase current to indicate orderly in every 3 sec.,kW/ load factor [operating value/preset “oc”]: Bar Graph -ON :KWH, accumulated working time and power factor is added to basic factor *possible to fix one of rotated factor or to release as pressing "CLR" key repeatedly, also power-off makes clear	OFF

rESEt/Hr/ Er/AuL-#	to decide how to reset trip state	*Hr:manual reset/Password input : main trip,AUX trip(Ec-tb) *Er:electrical reset :"Reset" key :"CLR" Key :Control power-off *AuL-#(n times):Auto reset by followed condition:max n=9 : n=1→possible to do only by entering password : n>1 ▸1st～(n-1) times: reset automatically according to preset reset time without entering password ▸n(last times) :possible to do only by entering password :reset is done if control power is off,but trip state (password lock state) is kept on again if the control power is on *Password reset:reset is done by comming out operating mode after input password *Auto:only available for "OC" trip	Hr
Aut/ 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 timed 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 or preset number of trip times is initialized to previous preset value *If Hr is preset in " rESEt " mode, this mode becomes disable	30
trIP /8~1 /trip cause trip value	to show latest number of 8 trip cause	*to show the number of 8 trip cause in the order *press "UP" or "DN" in the "trip" mode state, then trip cause and value is shown alternatively *press "CLR" or ""SET" to check next event or previous event *In order to enter setup state on the way of trip	

		condition check, press "DN" under pressing "UP" firstly and release "DN" firstly under pressing "UP", finally release "UP"	
Test	*to check if this relay is ready to work normally or not. *"tESt" is appeared in case the operator press test sw on the converter or "CLR" key for 3 sec or more, then release pressed test sw or "CLR" key *main(95-96-98) & aux trip(05-06-08) output will be trip after counting down preset o-time(definite T-I)[oupt in voltage relay]		

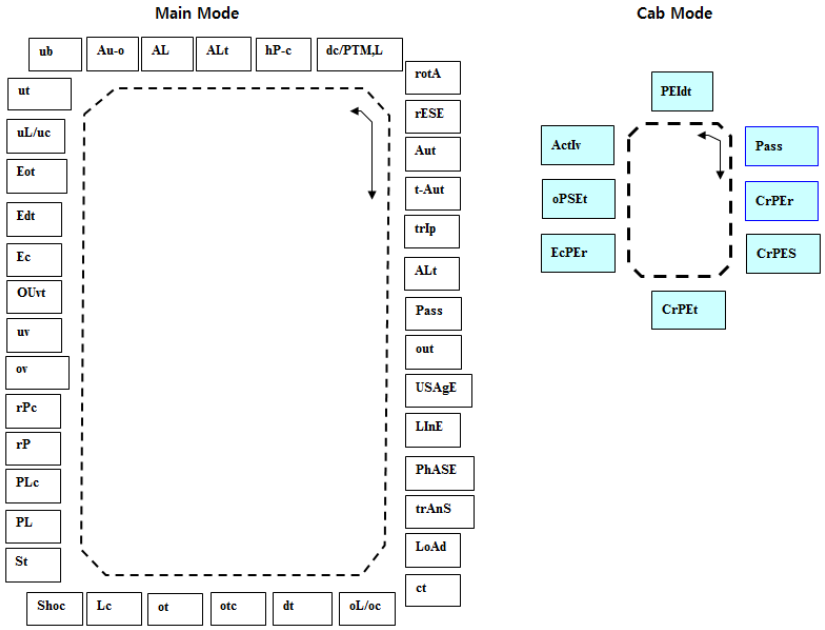
▶ Cab(calibration) Mode

This mode is appeared as pressing "SET" key for 3 sec or more ,and is disappeared as "SET'key once more

Mode	Function/ range	Description	Factory Setting value
P****	Password Input	*need to input password to adjust this mode group so that authorized person may be able to adjust. *How to input is same as it of main mode	0000
CrPEr	to have a calibration for phase "R"current	*Possible to adjust within +,- 0.1A~10A by using "UP"."DN" key.	0
CsPEr	to have a calibration for phase "S"current	*Possible to adjust within +,- 0.1A~10A by using "UP"."DN" key.	0
CtPEr	to have a calibration for phase "T"current	*Possible to adjust within +,- 0.1A~10A by using "UP"."DN" key.	0
vrPEr	to have a calibration for phase "R"voltage	*Possible to adjust within +,- 1V~100V by using "UP"."DN" key.	0
vsPEr	to have a calibration for phase "S"voltage	*Possible to adjust within +,- 1V~100V by using "UP"."DN" key.	0
vtPEr	to have a calibration for phase "T"voltage	*Possible to adjust within +,- 1V~100V by using "UP"."DN" key.	0
EcPEr	to have a calibration for GF current	*Possible to adjust within +,- 50% by using "UP"."DN" key..	0
OPSET/ON/ OFF	to decide if a preset value can be changed or not during normal operation	*ON:possible to change a preset value during normal operation *OFF:not possible to change a preset value during normal operation *This mode can not interfere “out” mode in any case	OFF

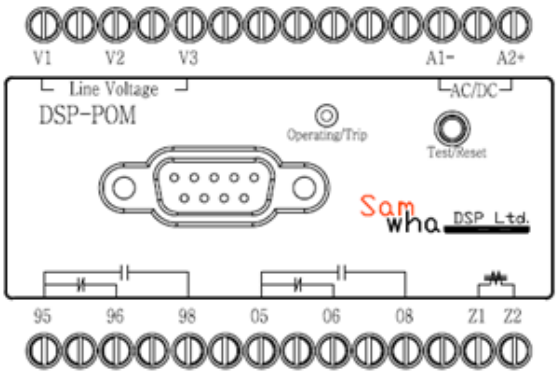
ActIv/ 50/60	to decide for power system frequency	*to decide a power system frequency for active filter (LPF) to be activated inside ZCT input to reduce induced current from next device *50 : 50Hz power system *60 : 60Hz power system	60
PedIt	to change Password	*Possible to enter new digit by using "UP" or DN" key after positioning a cursor on the equired digit as using "SET" & "CLR" key with directional job *How to complete password change: firstly press "CLR" key to come out "setting mode" ,then press both "SET" & "CLR" key	0000

6. The order of Rotated Mode

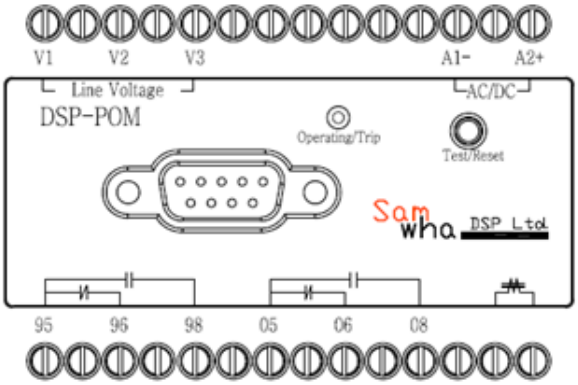


7.Input/Output

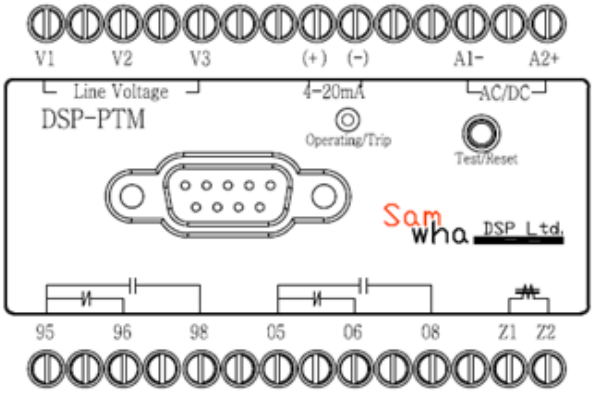
‣POM/External ZCT/Basic Type



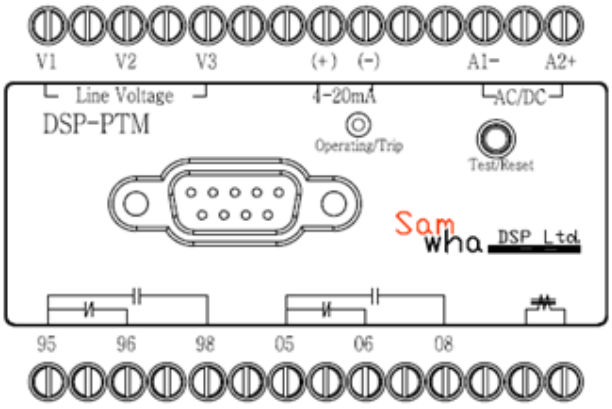
‣POM/Embeded ZCT



‣PTM/External ZCT/Basic Type



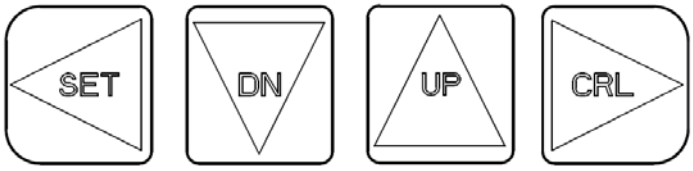
‣PTM/Embeded ZCT



※ Input and output for POL Type is same as POM Type

DIV	Feature	Terminal	Description	
Input	A1(+),A2(-)	Control Power	85～260VAC, 50/60Hz(90～370VDC)	
Input	Z1,Z2	ZCT	*Basic Type :applied for external ZCT/ 200mA/1.5mA, *Optional Type:Embeded ZCT	
State Indication	RED		Operating	Available for the converter of display meter type
State Indication	Green		Power/Stop	Available for the converter Of display meter type
State Indication	Yellow		Trip	Available for the converter of display meter type
Output	Main Trip	1c: 95-96-98	*Over Load[Current] *Under Load[Current] *Locked Rotor *Phase Loss *Reverse Phase *Ground Fault *Shock/Stall *Ov(over voltage)/Uv(under voltage):this output is only available for "V" mode operation	
Output	Aux	1c: 05-06-08	*Au-o/oFF/Ec/Ec-tb/AL/uL(uc)/Shoc/OP/UP/v-oN *the detailed description is described in "Auo" mode *oFF:to make same output as main trip *AL:only for alarm to oc before trip *Ec,Ec-tb:only for ground fault protection *Uc:only for under current protection *shoc:only for shock protection before trip *v-oN:AUX output(05-06-08) is energized as the incoming voltage is loaded *Uc:only for current unbalance protection *This selected protection factor is excluded in main trip output naturally *All of the trip except Ec-tb,OFF is automatically reset if a trip condition is clear *In case of Ec-tb, the trip output comes out by AUX and main trip output/need to press "CLR" key to make reset *oFF/Ov/Uv is only available in case "V", "VA" is selected in "USAgE" Mode	
Output	4～20mA	(+),(-)	*only for PTM/PTL Type *current communication : 4～20mA	

8. Control key operation



1."SET" key	*Press "SET" Key to enter into setting mode, then "P0000" (factory default password) is shown *Move cursor from first digit to right end digit by pressing "CLR" key ,finally press once more, if password is not changed from factory default value, but if password is changed, then make required digit by using "UP","DN" key untill operator meets changed password. *If there is no input for 15sec or pressing both "SET" and "CLR" key, it can be entered into operating condition.
2.Changed feature of Setting Key	*After entering into possible state for preset , each key acts its job as follows :SET--->backward direction ,CLR--->foward direction, UP.DN--->able to select number or character in preset mode. *The previous mode based on setting mode is come out as pressing "SET" key during doing a prest job
3."SET" Key & "CLR" Key/to select MODE	*Possible to select Mode by using "SET" or "CLR" key
4."UP" key & "DN" Key/Adjust	*Possible to preset required value as selection a character or number by using UP/DOWN
5."SET" & "CLR" Key/Store	*The storage for preset data is completed by pressing both SET and CLR key in the same time or after 15sec is elapsed
6."CLR" key	*While each factor is rotated, one of rotated factor is fixed by pressing "CLR" key and released as pressing once more *After fixing a operating factor, the operator is able to rotate manually one by one as pressing "UP"(forwardly), "DN" (reversely)
to check and/or to change preset value of each mode during the operation	* Possible to check a value and a mode as pressing "SET" key once during the operation ▸preset value and mode are appeared alternatively ▸next mode as pressing “CLR” Key or previous mode as pressing “SET” key * Possible to change a preset value after entering into checking state if the preset value of “OPSET” mode belonged to “CAB” mode group is “ON”/factory default value is “OFF” * Return to operating mode as pressing both “SET” and "CLR" key in the same time or waiting for 15sec as storing adjusted value

Test/Reset:"CLR" Key	*to check if this relay is ready to work normally or not. *"tESt" is appeared in case the operator presses test sw on the converter or "CLR" key for 3 sec or more, then release pressed test sw or "CLR" key *main(95-96-98) & aux trip(05-06-08) output will be trip after counting down preset o-time(definite T-I) *In case of display meter type, LED on the converter is turned on after a trip *After making trip, press "CLR" key for the reset action

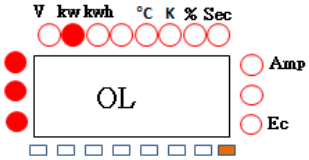
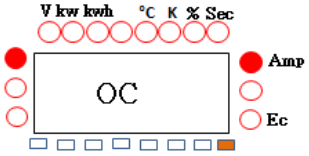
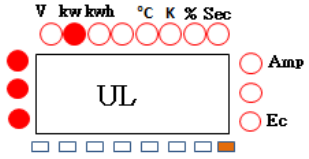
Note

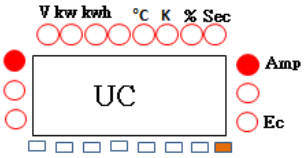
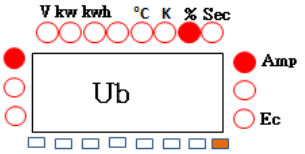
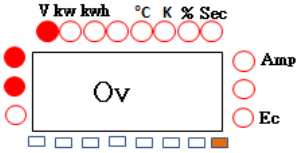
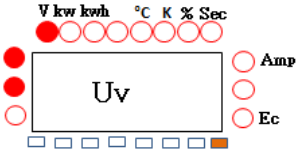
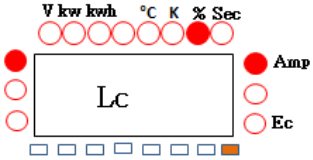
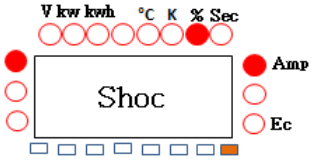
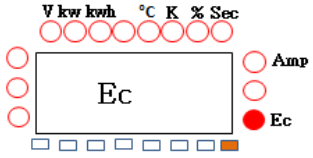
1.The operator will has to give an attention in order to apply for the function of preset "OPSET" mode which the operator is possible to change preset value of each mode while normal the operation is executed normally because the unwanted trip may be happend

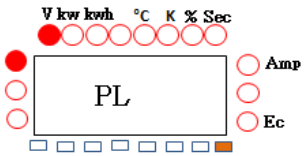
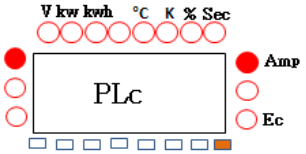
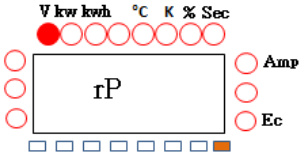
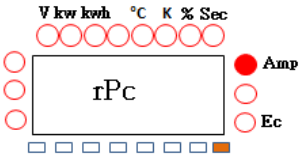
2.The operator can not preset "out" mode in any case concerned with "OPSET" mode

9. Trip Indication

Trip cause and caused value is appeared alternatively

Trip	Display	Cause
Over load		*trip caused by over load
Over current		*trip caused by over current
Under load		*trip caused by under load

Under current		*trip caused by under current
Current unbalance		*trip caused by unbalanced current in phase each other
Over voltage		*trip caused by over voltage
		*trip caused by under voltage
Locked Rotor		*trip caused by locked rotor load in phase L2 during motor starts
Shock		*trip caused by instant shocking load in load part
Ground fault		*trip caused by ground fault current

Phase loss		*trip caused by phase loss of incoming power line, phase L2
		*trip caused by phase loss of phase L1 in load part
Reverse phase		*trip caused by reverse phase of incoming power line
		*trip caused by reverse phase of load part line

10. Rotated indication

◯ Common Note

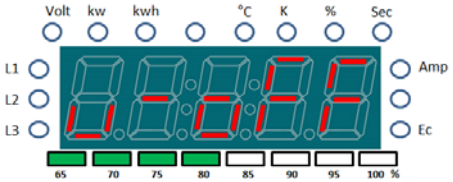
▸The one of "Volt" and "Auto" in order to show a kind of an operating mode to be preset is displayed in the motor stop state, not in the working state

▸While each factor is rotated, one of rotated factor is fixed by pressing “CLR” key and released as pressing once more

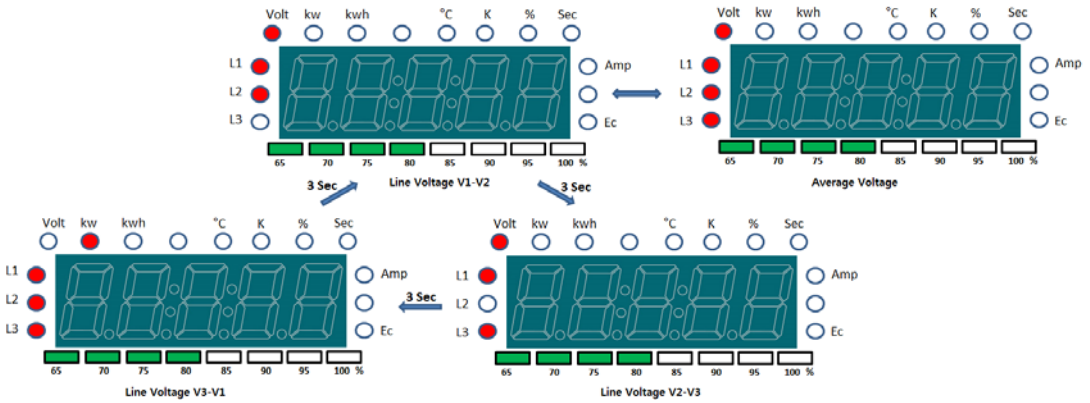
◯ Voltage Relay **:** select "V" in "USAgE" mode

V-oFF is displayed in the initial state in case the line voltage is not loaded, but voltage value is shown if the voltage is loaded.

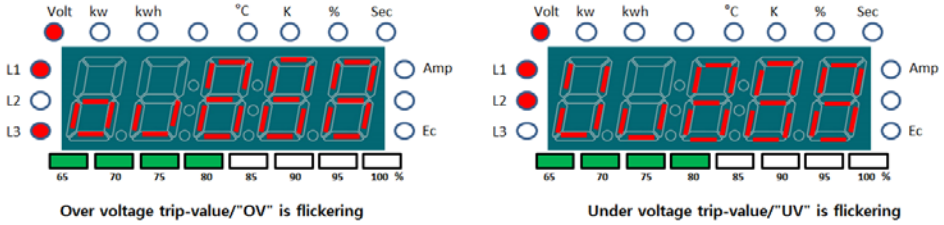
♦The line voltage is not loaded



♦The line voltage is loaded : line voltage ↔average voltage



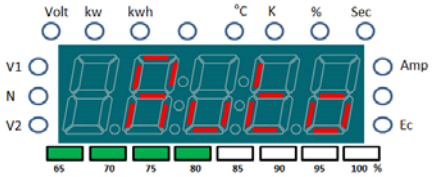
♦If the value is preset in "Ov and/or "Uv mode , a trip will be happened in the initial loaded voltage after the preset time of "ouvt" mode is elapsed



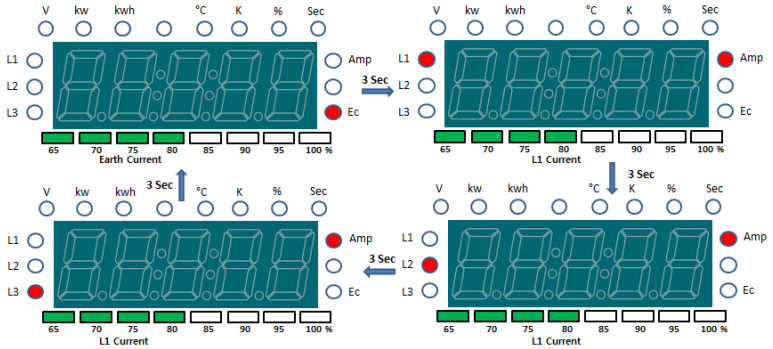
◯ Current Relay : select "A" in "USAgE" mode

▸ preset "OFF" in "rotA" Mode

♦Motor stop state :“Auto" "(the indication for usage of current relay)



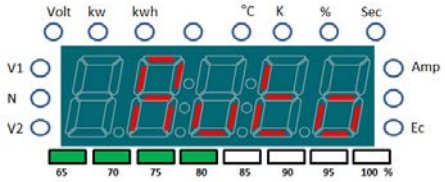
♦Motor working state : 3 phase line current , Earth current



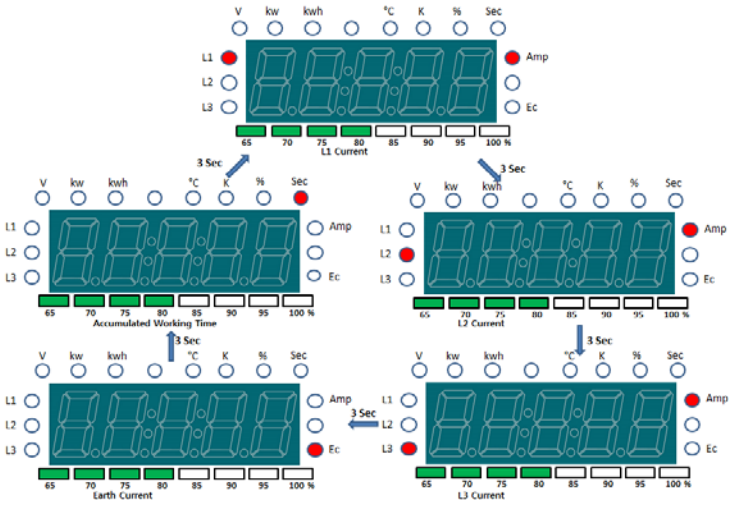
♦Load factor(operating current/”OC” preset value) is indicated in bar graph

▸ preset "ON" in "rotA" Mode : basic factor +AWT

♦Motor stop state



♦ Motor working state



◯ Power [voltage-current] Relay : select "VA" in "USAgE" mode

▸Motor stop state

♦v-oFF is shown if voltage is not loaded",but 3 phase line/average voltage is displayed if voltage is loaded.

♦If the value is preset in "Ov and/or "Uv mode , a trip will be happened in the initial loaded voltage as the preset time of "ouvt" mode is elapsed

♦The displayed content is just same as “V” selected operation in “USAgE” Mode

♦Load factor(operating current/”OC” preset value) is indicated in bar graph

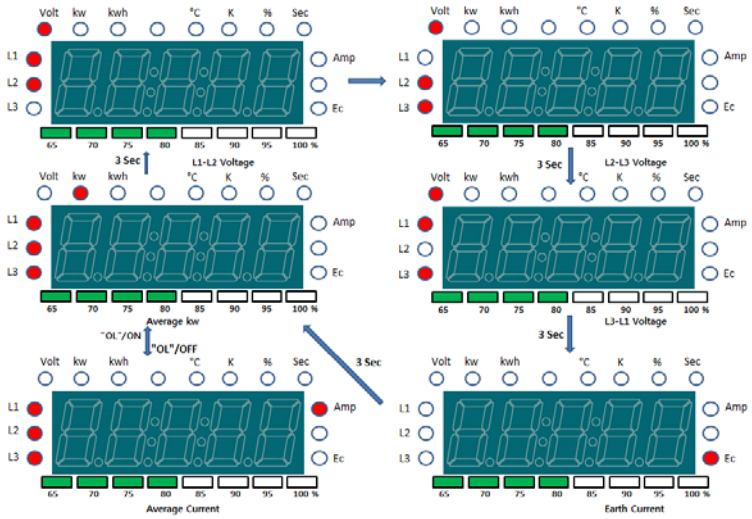
▸Motor working state

♦preset "OFF" in "rotA" Mode

→”L”(line voltage) is preset in “trAnS” mode

: preset “ON” in ”OL” mode/Line Voltage, Earth Current, Average KW

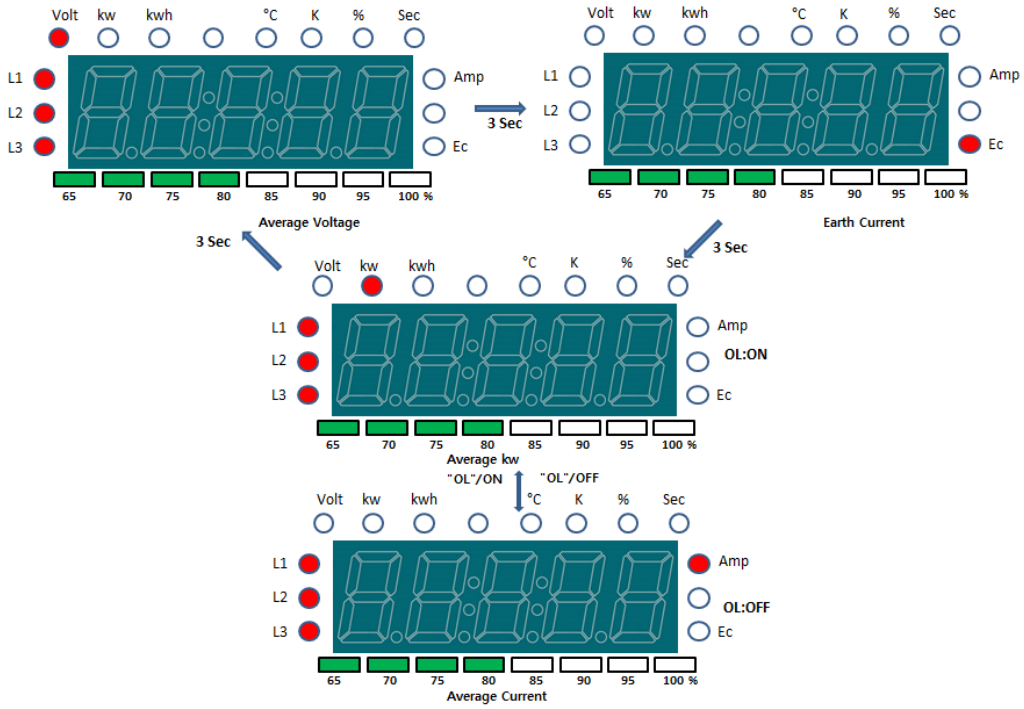
: preset “OFF” in ”OL” mode/Line Voltage, Earth Current, Average Current



→"A"(average voltage) is preset in "trAnS" mode

: preset "ON" in "OL" mode/Average Voltage, Earth Current, Average KW

: preset "OFF" in "OL" mode/Average Voltage, Earth Current, Average Current



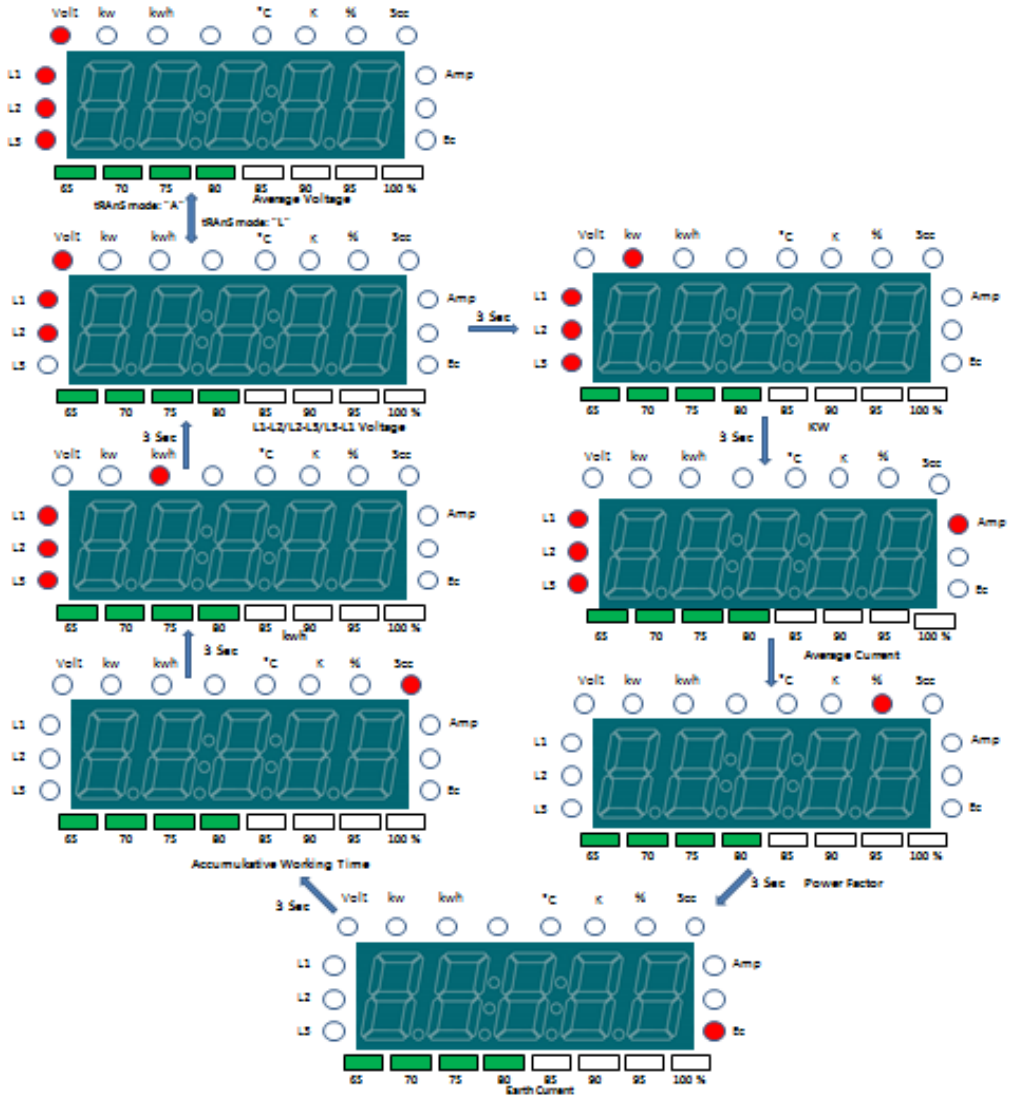
♦preset "ON" in "rotA" Mode

→"L"(line voltage) is preset in "trAnS" mode

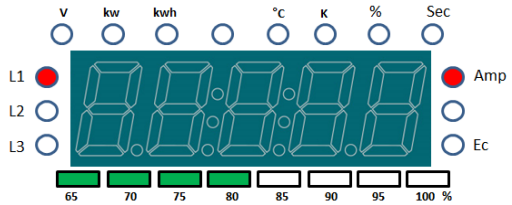
:Basic Factor[Line Voltage, Earth Current, KW/Average Current] + PF + Accumulative Working Time + KWH

→"A"(Average voltage) is preset in "trAnS" mode

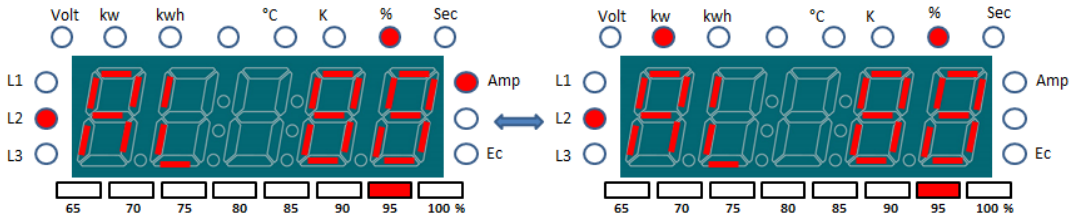
: Basic Factor[Average Voltage, Earth Current, KW/Average Current] + PF + Accumulative Working Time + KWH



◯Bar Graph : the % value with 5% point unit is shown based on the formular,[(actual current value/“OC” preset value)*100], under the range of 65~100% while a motor is working

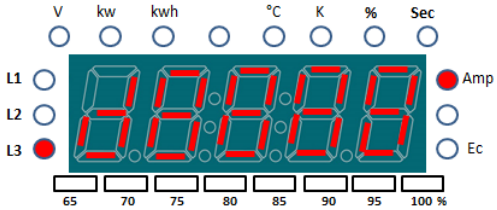


◯Alarm : “95%” point LED and “AL” are flickering without turning on bar graph LED if the preset alarmed level to “oc”/”oL” is happened



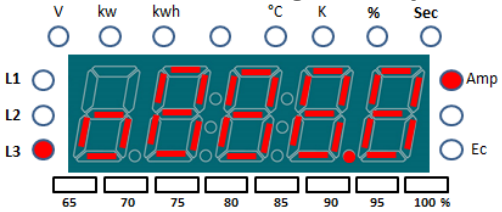
◯Indication for starting,operationa time before trip and trip

- “d & Current value” is indicated if “d-time” is executed for mortor starting as “d” is flickering in every 1sec



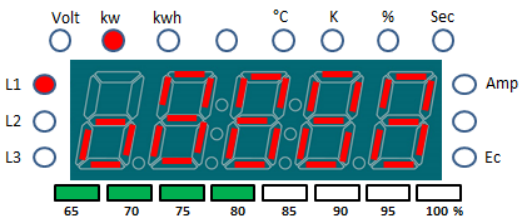
- preset operating time indication before trip in followed each case
  - “OC” trip

    “o” & Current value” is indicated if “o-time” is executed for over current protection ,but “o” is flickering in every 1 sec



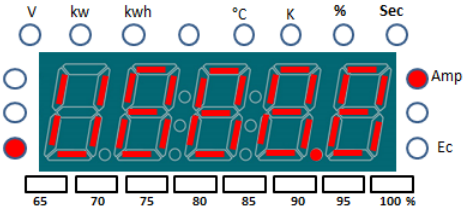
  - “OL” trip

    “o” & KW value” is indicated if “o-time” is executed for over load protection ,but “o” is flickering in every 1 sec



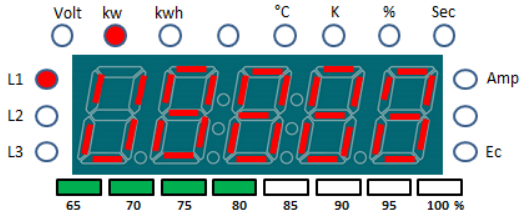
● “UC” trip

“u & Current value” is indicated if “u-time” is executed for under current protection, but “u” is flickering in every 1 sec



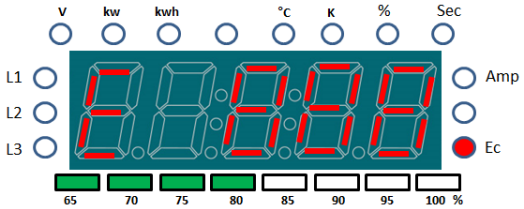
● “UL” trip

“u & KW value” is indicated if “u-time” is executed for under load protection ,but “u” is flickering in every 1 sec



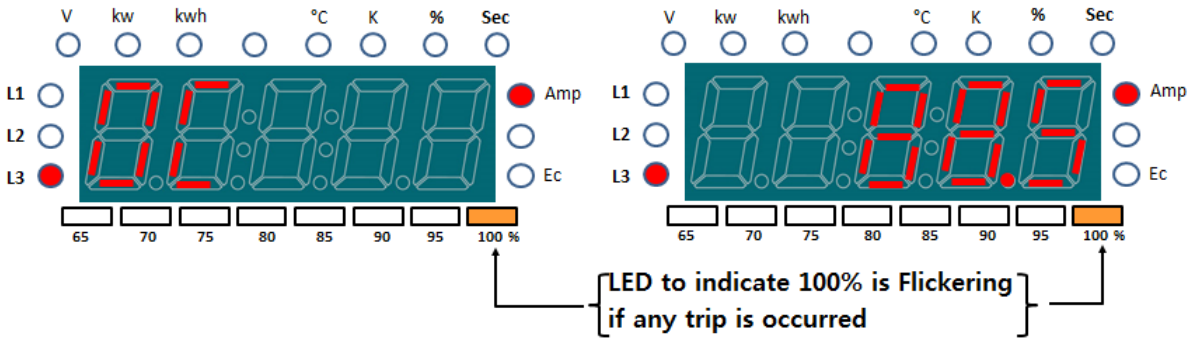
● “Ec” trip

“E & Ec Current value” is indicated if “u-time” is executed for earth current protection,but “E” is flickering in every 1 sec



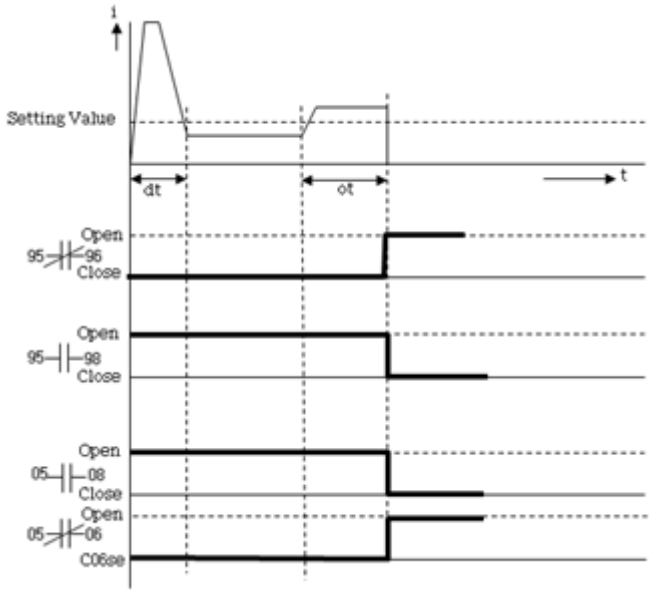
☞ "Ec-ct" is flickering if ZCT is not connected with a terminal of Z1-Z2 in motor stop state while the condition of "Ec" is available and also,the preset is not ahead anymore

▸ Indication after trip in every each case is that “trip cause” and “trip value” are shown alternatively as “100%” point LED in bar graph is flickering

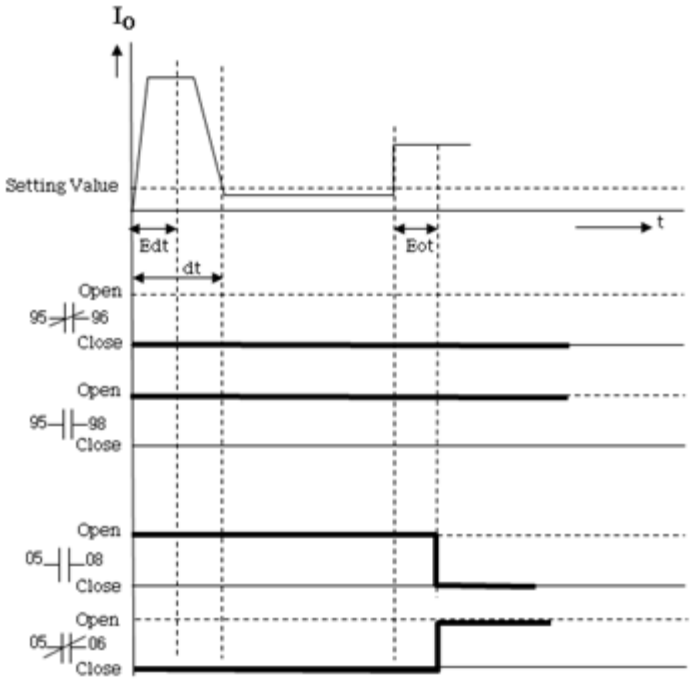


11. Time Based Trip Relay Output

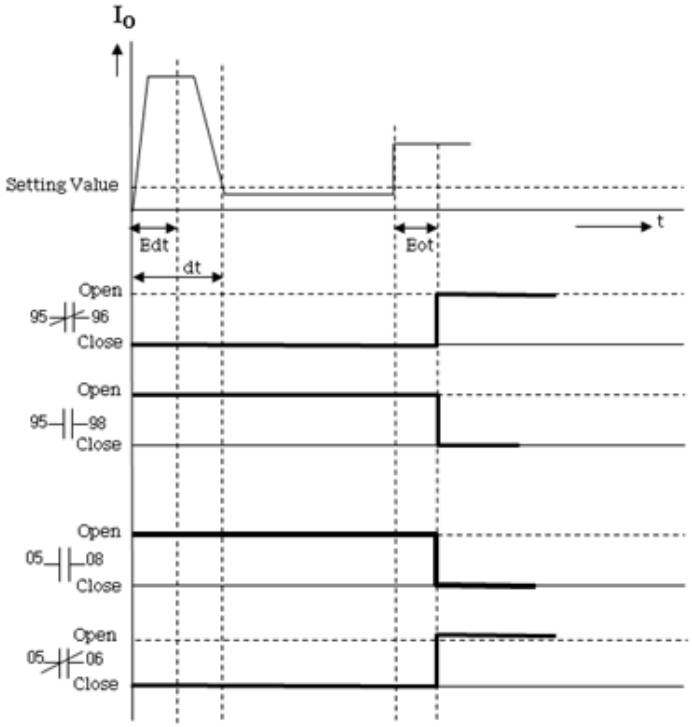
- Over load[current] protection/Au-o" mode:OFF/AUX(05-06-08)



- Ground fault protection/"Au-o" mode:Ec(05-06-08)

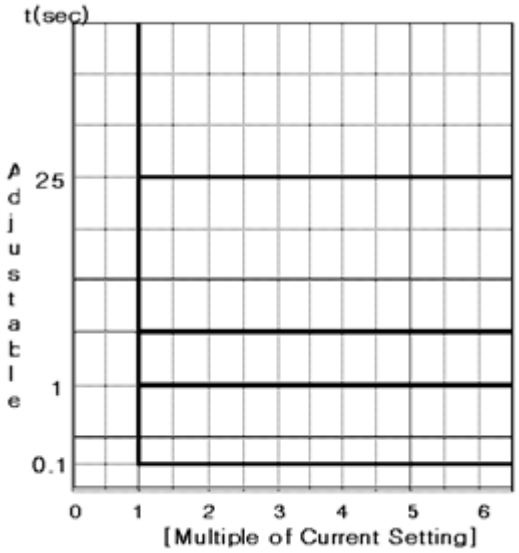


▸ Ground fault protection/"Au-o" mode:OFF(05-06-08)

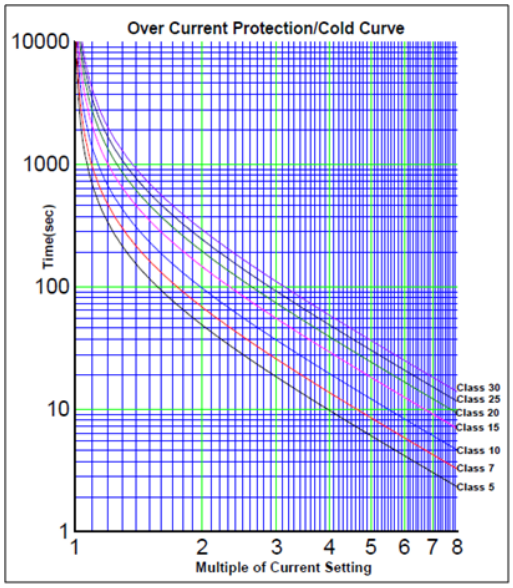


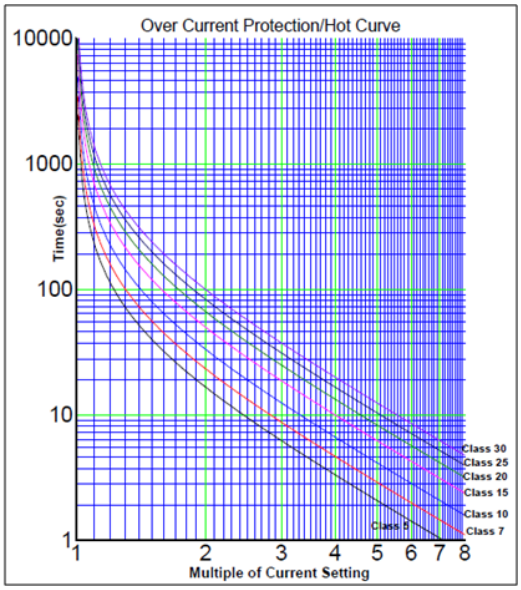
12.T-I Characteristic

▸Definite[over/under current,GR protection]

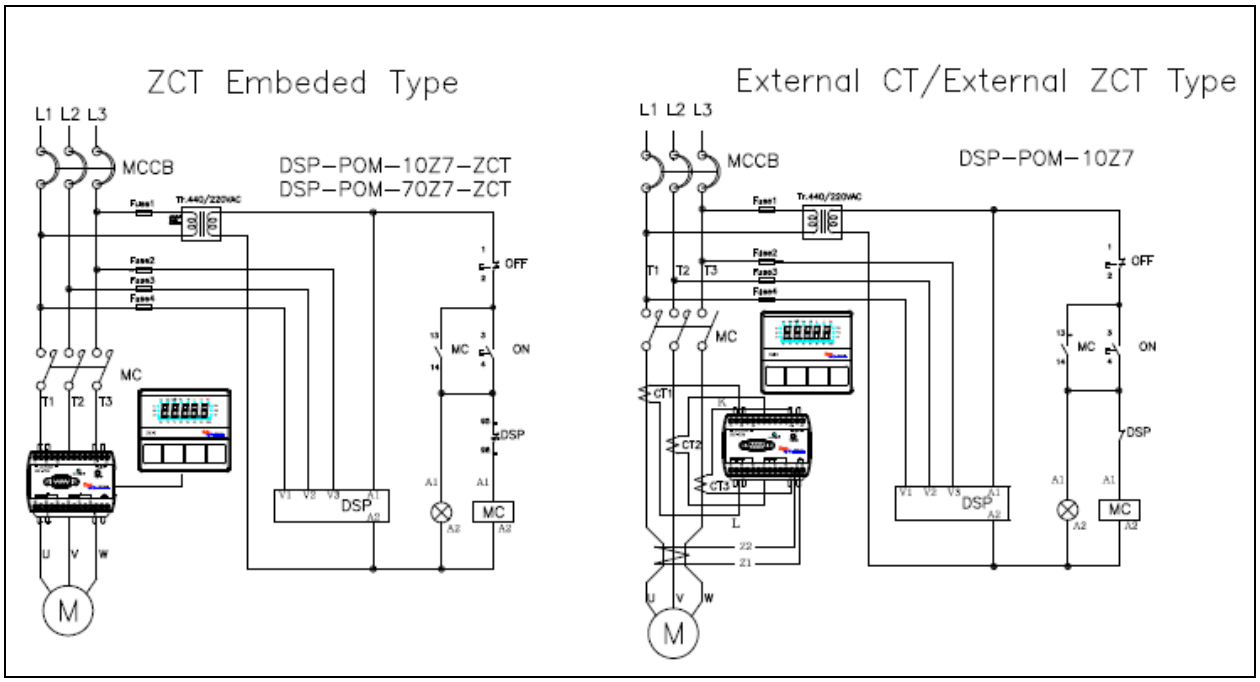


▸Inverse[over/under current protection]





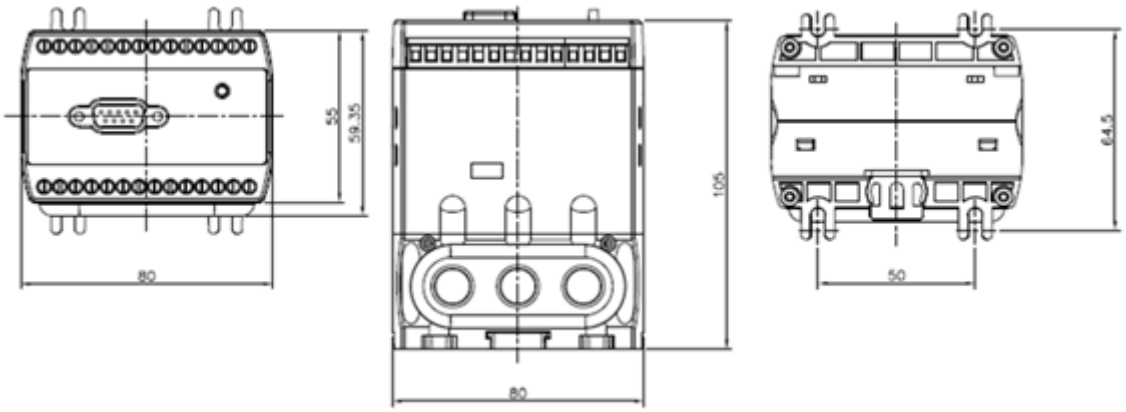
13. Application Sequence Diagram



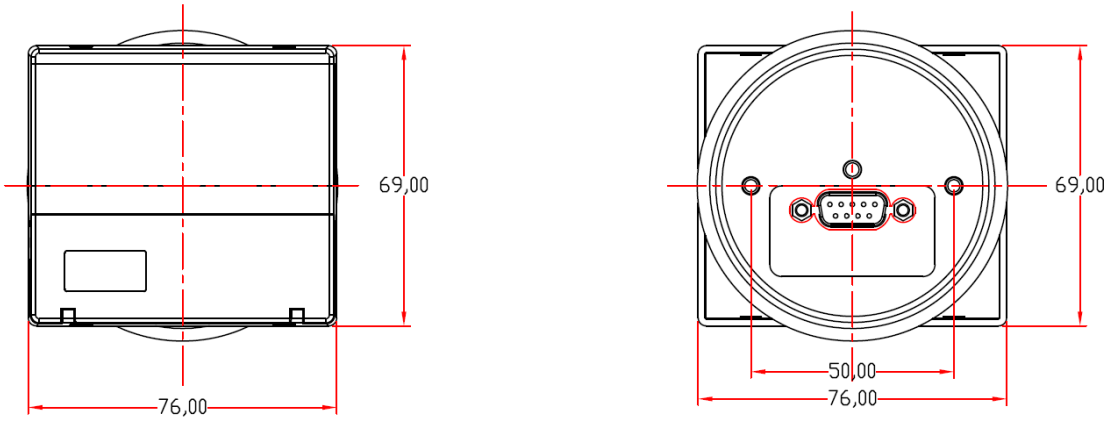
※V1,V2,V3 must be connected with a secondary terminal of MCCB

13. Dimension

- **Converter**



- **Display Meter**



14. Order form

DSP-1(Type)-2(Rating current)-3(Control Power)-4(ZCT Embeded)

Item	Reference code	Description
DSP-POM	DSP-POM-10Z7	Panel Flush MontingType :0.5～10A [0.37 KW～7.5KW/3P 480V,0.1KW～2.2KW/ 1P], 85～260VAC,50/60Hz (90～370 VDC) ,0.5~6A with external CT
	DSP-POM-10Z7ZCT	Panel Flush MontingType:0.5～ 10A [0.37 KW～7.5KW/3P 480V,0.1KW ～2.2KW/1P],85～260VAC, 50/60Hz (90～370VDC),ZCT embedded /not possible to use external CT
	DSP-POM-70Z	Panel Flush MontingType, 5A～70A [3.7KW ～52 KW/3P, 480V],85～ 260VAC, 50/60Hz (90～370VDC)

	DSP-POM-70Z7ZCT	Panel Flush MontingType, 5A～70A [3.7KW～52 KW/3P, 480V],85～260VAC, 50/60Hz (90～370VDC) ,ZCT embedded /not possible to use external CT
DSP-PTM	DSP-PTM-10Z7	Panel Flush MontingType :0.5～10A [0.37 KW～7.5KW/3P 480V,0.1KW～2.2KW/1P] 85～260VAC,50/60Hz (90～370VDC),0.5~6A with external CT,4~20mA
	DSP-PTM-10Z7ZCT	Panel Flush MontingType: 0.5～10A [0.3 KW～7.5KW/3P 480V,0.1KW ～2.2KW /1P],85～260 VAC, 50/60Hz (90～370VDC),ZCT embedded /not possible to use external CT,4~20mA
	DSP-PTM-70Z	Panel Flush MontingType, 5A～70A [Panel Flush MontingType, 5A～70A [3.7KW～52 KW/3P, 480V],85～260 VAC, 50/60Hz (90～370VDC)] ,4~20mA
	DSP-PTM-70Z7ZCT	Panel Flush MontingType:0.5 ～10A[0.37 KW～7.5KW/3P 480V, 0.1KW～2.2KW/1P],85～260VAC, 50/60Hz (90～370VDC),ZCT embedded /not possible to use external CT, 4~20mA
DSP-XXX	DSP-VIP-XXX-XX XXXXP	Custome made product
Terminal Type	Basic reference code +T	Three terminal through CT hole of each phase is composed with one body

*Accessory

Item	Refeence	Description	Remarks
Cable	DSP -CABLE-12	1.2m	
Cable	DSP -CABLE-18	1.8m	
Cable	DSP -CABLE-30	3m	
Cable	DSP -CABLE-50	5m	
ZCT	DSP -ZCT--XX	200mA/1.5mA	XX:Inner diameter of ZCT
Display Meter	DSP -ID-DM II	Input device/Display Meter	