ELCON

Notice of Safety

Attention

Danger

- Please connect lines according to National Electrical Code to prevent hazard to human and equipment.
- To prevent electric shock, please make sure that power is turned off before replacing the fuse.
- Please do not use beyond the rated current. If the power is unsteady, please retain sufficient current safety reservation
- Please lock terminal screws tightly to prevent components from being burned due to the surge or overheat of contacts

• The internal parts of the device are components with high voltage and high temperature. Do not touch any terminal to prevent hazard if it is electrified.

APPEARANCE

Model Explanation

CR 3- A 2 035 P

Output	Function	Voltage spec.	Current spec.	Control Mode
1:1φ 2: 3φ2W 1φ2W 3: 3φ3W	D:Standard A: Full function Current detection V: Full function Voltage detection W: Full function Power detector	2:220V 4: 440V (380V)	035:35A : : 450:450A	P:Phase trigger control Z: Zero cross control C: 3φHalf-wave (Blank): 1φself-setup

Specfiications

Main power	220, 380, 440V±15% 50/60HZ
Control power	200~240VAC(fan included)。90~240V AC/DC(f ans non-included)
Rated current	35A,50A,75A,100A,125A,150A,225A,300A,450A
Control mode	Phase trigger control or Zero cross control (only 1φ1 W type)
Control signal Vcmd	0~5V,1~5V (impedance 20K) 0~10V, 1~10V (impedance 100K) 0~20mA,4~20mA (impedance 250Ohm)
O utput control range	0.0~100.0%
Resolution/Linear	0.1% / 1%
E.ADJ control signal	Analog control:0~5V(impedance 20K) to 0.0~100.0%。 on/off control : Hi=3.4V,Lo=2.2V
Serial communication	RS-485 interface, support ModBus protocol in RTU or ASCII format
Cooling Method	natural air circulation or fan cooling
Ambient temperature/humidity	-10~+ 50°C / under 90%RH
Hi- pot test	AC2000V/1min.(between the power, signal terminal & heat sinks)
Noise susceptibility	2KV 5KHZ
Isolation resistor	over 20MΩ/500V(between the power, signal terminal & heat sinks)
Housing Material	ABS (UL94V)

Optional information:

1. If the optional model is with full function (A,V,W) and the control mode is with phase control, the controller can be planned as a constant current (or constant voltage、constant power) control mode. Please refer to the parameter settings

2.The full function model is included the serials communication (RS-485) which can support ModBus protocal in RTU or ASCII format. Please refer to the communication spec. (Standard type is not included RS-485 and it's only for display.)

3. Current has a wide range of specifications. Please refer to the product specifications

4. Single-phase control can be planned to phase / zero control.

5. 3φ phase control [control mode] with P-type and C-type two options.
P-type(standard):
Using 6sets SCR to control each phase' +/- phase voltage. This is called "3φfull-wave controlled". Its characteristics is to control the output line current without DC component (average = 0). It's suitable for inductive (or resistive) load. Such as motors, transformers and so on. The controllable phase angle only have 0~150 degrees control range.

C-type
Using 3sets SCR & 3sets diodes to control each phase' half-circumference phase voltage. This's called "3φhalf-wave controlled". It has a wide phase angle control range (0~120 degree). It's suitable for micro voltage adjustment. Due to line current has DC component, therefore, it's only suitable for resistive load.

5.Current calculation and specifications used
(3φ)I(AMP) = P(watt) ÷ V(voltage) ÷ √3 ÷ 0.85 (15% safety reservation)
(1φ)I(AMP) = P(watt) ÷ V(voltage) ÷ √3 ÷ 0.85 (15% safety reservation)
:

Fuse Spec .

Pls use the available fuses, the below is model# for Bussmann & (I²t)

Current	Fuse model# 240V (I²t) /415V (I²t)	Current	Fuse model# 240V (I²t) /415V (I²t)	Current	Fuse model# 240V (I²t) /415V (I²t)	Current	Fuse model# 240V (I²t) /415V (I²t)
35A	50LET(1400)/50FE(380)	100A	125LET(7500)/110EET(4000)	180A	200LMT(20000)/200FM(10500)	380A	------/Nidec 660GH400(112000)
50A	63LET(2200)/63FE(480)	125A	160LET(16000)/100FE(1800)2pcs	225A	250LMT(40000)/280FM(10500)	450A	-----/280FM(30500)2pcs
75A	80LET(3800)/100FE(1800)	150A	180LET(29000)/100FE(1800)2pcs	300A	355LMT(100000)/350FM(60000)		

Input/Output setting

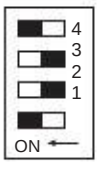
Make sure the control signals based on the input type and then adjust by the below table accordingly to avoid control errors.

■ :ON □ :OFF ☒ :Don't Care

Input signal	S4	S3	S2	S1	Input signal	S4	S3	S2	S1
0~5V	□	□	■	☒	2~10V	□	■	□	☒
1~5V	□	□	□	☒	0~20mA	■	□	■	☒
0~10V	□	■	■	☒	4~20mA	■	□	□	☒

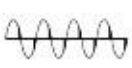
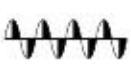
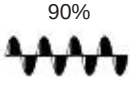
1φ(CR1)phase/zero cross control settings
Note: Change control mode must be rebooted

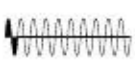
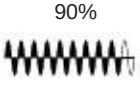
Output Control	S4	S3	S2	S1
Phase trigger control	☒	☒	☒	■
Zero cross trigger control	☒	☒	☒	□



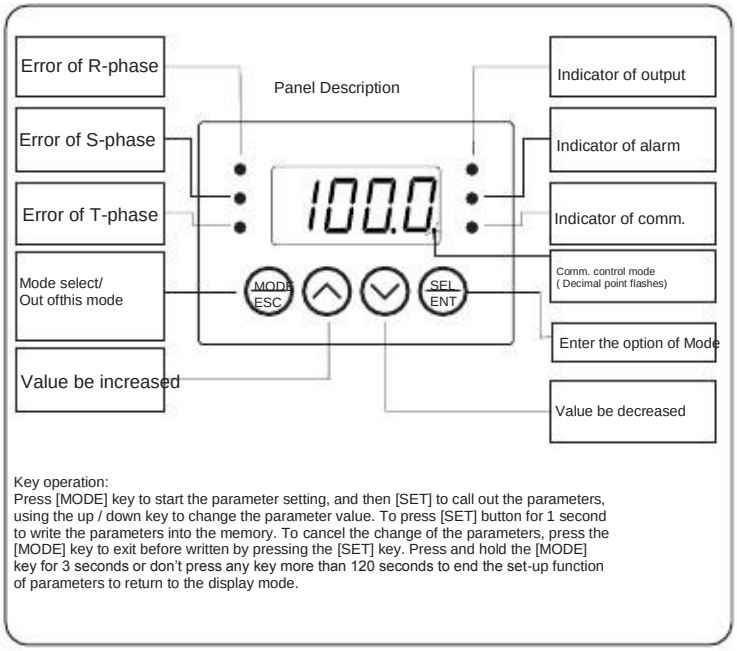
DIP switches SW1l
on the main control panel

Phase / zero control output waveform

	10%	50%	90%
Phase Trigger Control			

	10%	50%	90%
Zero Cross Trigger Control			

■Parameter setting / operating



Key operation:
Press [MODE] key to start the parameter setting, and then [SET] to call out the parameters, using the up / down key to change the parameter value. To press [SET] button for 1 second to write the parameters into the memory. To cancel the change of the parameters, press the [MODE] key to exit before written by pressing the [SET] key. Press and hold the [MODE] key for 3 seconds or don't press any key more than 120 seconds to end the set-up function of parameters to return to the display mode.

[Step 1] Parameter, press [MODE] to start

Display	Description	Default Value
diSP	disp: when select the normal condition, what types of value will be displayed PErt → uCmd → HEAt → i r → i S pert: output percentag e r:R (1φ) I S:S phaseV Cmd: control Heat: heat sink I temperaturesignalphase current current i t → i A T-phase current average current	PErt
StUP	stup:1st time to start or standby over 5 minutes, soft start time (See [control signal modulation])	10Sec.
rESP	resp:control signal(Vcmd,Ccmd)response time (See [control signal modulation]) range:1~60 seconds	2Sec.

[Step 2] Press the [MODE] key for 3 seconds to start

Display	Description	Default Value
HLtd	Hltd: maxi. output limit setting (constant current mode, maxi. output current) . range:50~100%	100%
LLtd	LLtd:Vcmd=0 (see Vcut parameter), mini. output limit setting (constant current mode, mini. output current) . range:0~50%	0%
ALtr	Altr: alarm output delay time when Abnormal. range:0~20 seconds	1Sec
CooL	CooL: Fan start temperature. range:5~60 degree C	45度
EAdJ	Eadj: Select external control to control Vcmd nULL → MuL → Add → Sub nuLL: no effect MuL: Vcmd x Eadj Add: Vcmd+Eadj Sub: Vcmd - Eadj AvG → Strt Avg: (Vcmd+Eadj)/2 Strt: On/Off control	nULL
uCUt	Vcut: when Vcmd(Ccmd)=0, select Lltd output or close output . StoP → LLtd Stop: close output LLtd: output by mini. of output value	StoP
HCUr	Hcur: (optional) high current. when current value bigger than set value, error occurred. see [F HC] parameter. (phase: above 30%, zero cross 50% above start detect. set 0 as close function) range:0~500A	0A
LCUr	Lcur: (optional) low current. when current value lower set value, error occurred. see [F LC] parameter. (phase: above 30%, zero cross 50% above start detect. set 0 as close function) range:0~500A	0A
bALn	bALn:(optional) 3φcurrent no-balance setting. when 3φcurrent is unbalance, the value between maxi. current & mini. current bigger than set value, error occurred . see [F bL] parameter. (p h a s e : above 30%, zerp cross 50% start detect. set 0 as close function) range:0~500A	0A
tP	Kp: (optional) constant current (voltage/ power) control deviation magnification settings. the greater the value the more sensitive response. range: 10~100%	100%
PLtd	Pltd: (optional) constant current control, limit the maximum phase angle. inductive load due to voltage phase is ahead current phase, this feature can prevent failure of SCR trigger. range: 50~100%	100%

[Step 3] Press [MODE]+[UP] key for 3 seconds to start

Display	Description	Default Value
uCnd	Vcmd: setup Vcmd display value to response the control signal. See [inout/ output setting] 4-20 → 0-20 → 0-5 → 1-5 → 0-10 4~20mA 0~20mA 0~5V 1~5V 0~10V 2-10 2~10V	4-20
nA in	Main:Main power anomaly occurs disposal. 3 options. nULL → ALAn → StoP null: ignore this anomaly ALAM: alarm output. Stop: alarm output. shutdown the machinekeep working	StoP
FUSE	Fuse: The fuse blown anomaly occurred disposal. option is same.	StoP
F Ld	F Ld: (LOAD) disconnection occurred disposal. option is same as above. standard type under 75A (non-included) has not this feature, please must set	ALAn
SEnS	SENS: temperature switch failure occurred disposal. option is same as above. when output 10 minutes continusally, temperature value is still on 0 degree C.	ALAn
F HC	F HC: high current anomaly occurred disposal. option is same as above.	ALAn
F LC	F LC: low current anomaly occurred disposal. option is same as above.	ALAn
F bL	F bL: 3 phase unbalance anomaly disposal. option is same as above.	ALAn
FSCr	FSCR: SCR breakdown anomaly occurred disposal. option is same as above.	StoP
CtrL	Ctrl: (optional) control options, phase/constant current/ constant voltage/constant power controlled PHAS → iout → vout → Pout Phas: phase control iout: constant current vout: constant vlotage Pout: constant power	PHAS
id	id:(optional) communication station settingrange:1~99	1
bAUd	baud: (optional) communication speed range:2.4, 4.8, 9.6, 19.2, 38.4。kbit/sec	9.6
dAtA	data: (optional) c ommunications serial format. range:8n1, 8n2, 8e1, 8o1。	8n1
nodE	mode: (optional) ModBus communications format range:RTU, ASCii。	RTU
toUt	tout: (optional) communication timeout setting. when the communication disconnection time exceeds, then the remove communication output control will transfer to the vcmd to control. range: 2~99S	5Sec.
[Ot h er]		
LoCt	Press [MODE]+[DOWN] key for 3 seconds to start Lock: parameter protection setting. range: 0~3 0: all cannot setup 1: open step 1, 2: open step1,2, 3: all open	3
tESt	Press [SET key for 3 seconds to start test: manual output testing. range:0~100%	0%

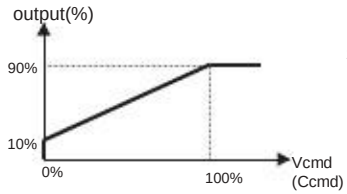
Anomaly display (press [SET]+[UP] key to clear)

Display	Description	Comm. code
oC	OC: (optional) over-current, when the current value exceeds rated value more than 1.2 times, the controller will stop output. please check the load whether short-circuit.	1
nA in	Main: the main power anomaly. check the input switch or the controller fuse if it is normal.	2
HCUr	Hcur: (optional) high current	3
S inK	Sink: heat sink temperature exceeds 80 degrees, the controller will stop output. check the fan spins and environmental ventilation.	4
FUSE	Fuse: fuse breakdown. please confirm fuse spec.、 load power or if the connection screws has locked tight (heat fuse)	5
LoAd	Load: Load Break	6
LCUr	LCur: (optional) low current.	7
tHEr	Ther: temperature sensor anomaly. check the pig plug of temperature sensor whether bad connection, (impedance is about 3K ~ 10K ohm) range:8n1, 8n2, 8e1, 8o1。	8
SCr	SCR: (optional) SCR breakdown. please return for repairing.	9
UnbL	Unbl: (optional) 3 phase unbalance	10

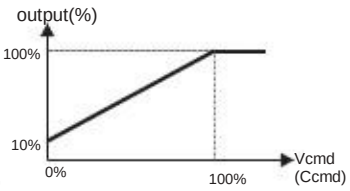
Modulation for control signals

- The relations between mini./maxi. output and Vcmd (Ccmd)

  Remarks: Ccmd is the communication signal. See [comm. control]

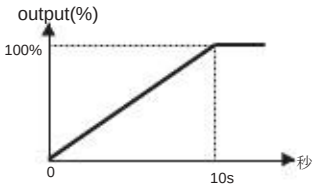


Vcut="0V",HLtd=90%,
LLtd=10% control result



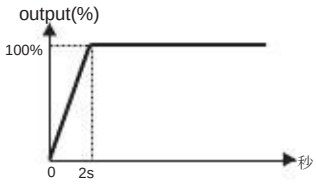
Vcut="LLtd",HLtd=100%,
LLtd=10% control result

- Soft start time (STUP) , the relations between response time (RESP) & output



STUP=10s的Output delay effects

(power on or standby over 5 minutes)



RESP=2s Output delay effects

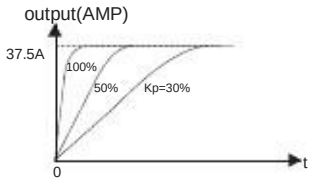
Constant current/voltage/power (optional functions)

If parameter"CTRL"setup as iOUT current control/vOUT voltage control or pOUT power control (below is the current example), the controller will enter the constant current control mode and Vcmd (Ccmd) will also convert to current target value (SV) automatically.

Ex: model #CR3-A4075P (3φphase trigger control 440V/75A)
when Vcmd=50%, current target value= 75x50%=37.5A. and so on
if HLtd=90%, LLtd=10%, which means the maxi. SV value is limited in 67.5A, the mini. SV start from 7.5A.

The controller adopted a proportional - integral (PI) as a constant current control operation. Parameters "Kp" is for the proportional gain. the greater output response sensitive the more value setting. please see the load characteristics adjusted to the best value.

Below is the diagram shows:



Vcmd=50% different KP output effects

Note:
Current measurement value is on controller sampling basicaly,it's average value not rms value. Error value is about 3%。

Comm. control output Ccmd (optional function)

The controller can use the communication to control the SCR output value to replace Vcmd.

Method:
1. Set the contacts (coil) IP 0x01 to 1(comm. control).
The first decimal point on the display start flashes.

2. Change the register (reg. Ip4x016) value, SCR output immediate change.

Note:
Under the communication control mode, even if no change the output, which must keep the communicate status with the controller, for example, keep reading the register or contacts address value. Otherwise, the controller will determine the communication disconnection. If the disconnection time longer than Tout, the controller will automatically remove the communication control function to avoid danger.

Description for communication address

Explanation	Modbus address	Data length	R/W
Unexpected condition cleared 1: Lift the unusual alarm (Automatic recovery to 0)	00001	bit	R/W
Select control mode 1: communication 0: external	00002	bit	R/W
Output mode 1: start 0: stop	00003	bit	R
Fan spinning mode 1: start 0: stop	00004	bit	R

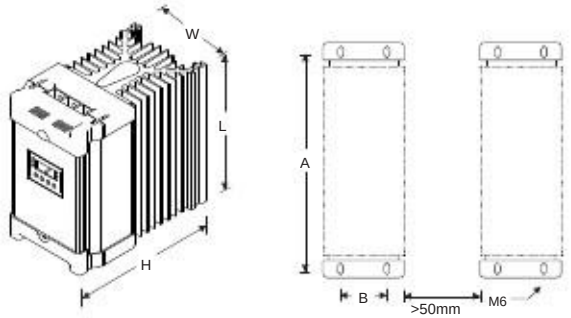
Explanation	Modbus Address	Data Length	R/W
R-phase Abnormal signal 1: on 0: off	00005	bit	R
S-phase Abnormal signal 1: on 0: off	00006	bit	R
T-phase Abnormal signal 1: on 0: off	00007	bit	R
Over current (OC) a bnormal status 1: Abnormal 0: normal	00008	bit	R
Over temperature (SINK) abnormal status 1: Abnormal 0: normal	00009	bit	R
High current (HCUR) abnormal status 1: Abnormal 0: normal	00010	bit	R
Low current (LCUR) abnormal status 1: Abnormal 0: normal	00011	bit	R
3 phase unbalance (UNBL) abnormal status 1: Abnormal 0: normal	00012	bit	R
Main power (MAIN) abnormal status 1: Abnormal 0: normal	00013	bit	R
Fuse (FUSE) abnormal status 1: Abnormal 0: normal	00014	bit	R
Load (LOAD) abnormal status 1: Abnormal 0: normal	00015	bit	R
SCR (SCR) abnormal status 1: Abnormal 0: normal	00016	bit	R
Soft start time (STUP) Range: 1~99 second	40001	word	R/W
Response speed time (RESP) Range: 1~30 second	40002	word	R/W
M aximum of output value (Hl td) Range : 50~100%	40003	word	R/W
Manimun of output value (Lltd) Range: 0~50%	40004	word	R/W
High current setting (HC) Range: 0~600A	40005	word	R/W
Low current setting (LC) Range: 0~600A	40006	word	R/W
3 phase unbalance current setting (BALN) Range: 0~600A	40007	word	R/W
Proportional gain value setting (Kp) Range: 10~100%	40008	word	R/W
the maximum phase angle limited setting (PLTD) Range: 50~100%	40009	word	R/W
Alarm output delay time setting (ALTR) Range: 0~20 second	40010	word	R/W
Fan start temperature setting (COOL) Range: 5~60 degree	40011	word	R/W
Communication control signal (Ccmd) Range: 0~1000 (unit 0.1%)	40016	word	R/W
Analog control signal (Vcmd) R ange : 0~input spec. (unit0.1 mA or V)	40017	word	R
SCR present output Range: 0~1000 (unit:0.1%)	40018	word	R
Heat sink temperature Range: 0~100 degree C	40019	word	R
R-phase current R ange : 0~ see spec. (unit: 0. 1A)	40020	word	R
S -phase current R ange : 0~ see spec. (unit: 0. 1A)	40021	word	R
T-phase current R ange : 0~ see spec. (unit: 0. 1A)	40022	word	R
3 phase average current Range : 0 ~ see spec . (unit : 0 . 1A)	40023	word	R
Output voltage Range: 0~see spec. (unit:0.1V)	40024	word	R
Output power Range: 0~see spec. (unit:0.1kW)	40025	word	R
Unexpected condition Unusual code: 0~10 (0: usual)	40026	word	R
Contacts (coil) Status string pattern LSB(0x01)~MSB(0x16) accordingly	40027	word	R

Communication can support RTF or ASCII format, allows up to continuously 8 data for reading/writing. the above address is 10 hex.

Read and write please refer to the ModBus protocal.。

Dimension

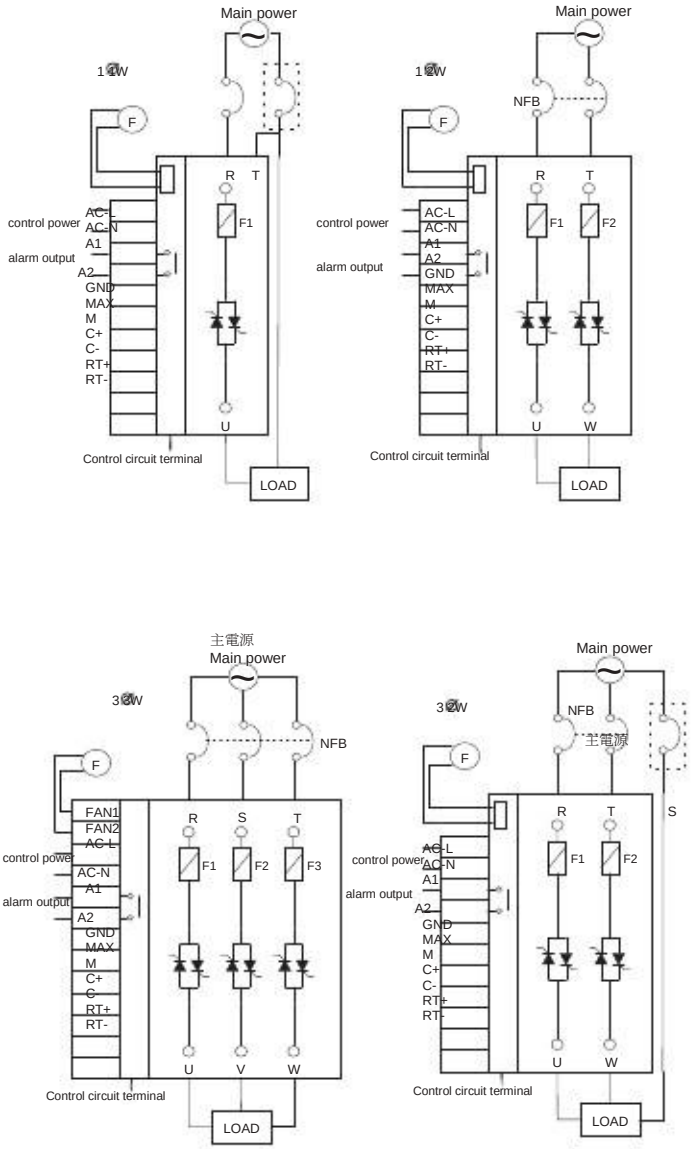
Type	Length W(mm)	Height H(mm)	A &B(mm)	Current L(mm)	Cooling Way	P
Cr1 1φ1W	75A	203	80	180	215,50	Nature cooling	1
	100A 125A 150A	241	80	180	215,50	Fan cooling	1
	180A 225A	306	80	180	280,50		2
	300A 380A	306	120	220	280,80		5
Cr2 3φ2W	35A	203	80	180	215,50	Nature cooling	1
	50A 75A	241	80	180	215,50	Fan cooling	1
	100A 125A 150A	241	120	220	215,80		4
	180A 225A	306	120	220	280,80		5
	300A 380A	310	245	220	295,160		
Cr3 3φ3W	35A	203	120	153	215,80	Nature cooling	3
	50A	228	120	153	215,80	Fan cooling	3
	75A 100A	241	120	220	215,80		4
	125A 150A	306	120	220	280,80		5
	180A 225A	310	245	220	295,160		
	300A 380A	395	245	220	380,160		
	450A	395	365	220	380,280		



Installation instruction

- Adopts vertical installing so as to achieve the best radiation effect
- Notice the width of the interspace between two heat sinks to ensure the best radiation ability (>50mm)
- Keep the sufficient space for ventilation at the upper and lower side (>50mm)
- Control cabinet should have vent holes and mounted with fans so as to make ventilation better
- If the internal temperature is too high, please use the current lower than 70% of rated current

Wiring diagram



Input signal wiring diagram