CR-series SCR Operation Manual

(3Ø3W & 3Ø4W)

Notice of Safety

	*			
	 Please connect lines acco prevent hazard to human 	rding to Nation and equipment	al Electrical Code to t.	6
!	• To prevent electric shock, turned off before replacing	please make si g the fuse.	ure that power is	
Attention	 Please do not use beyond unsteady, please retain su 	the rated curre ufficient curren	ent. If the power is t safety reservation	2
	• Please lock terminal screw from being burned due to the form	/s tightly to pre the surge or ov	vent components erheat of contacts	
Danger	 The internal parts of the d voltage and high temper prevent hazard if it is ele 	evice are com ature. Do not t ctrified.	ponents with high touch any terminal to	
Model Expla	nation CR	23-	• A	2
		Output	Function	Voltage spec.
Specficia	tions	1:1φ 2:3φ2W 1φ2W 3:3φ3W	D: Standard A: Full function Current detection V: Full function(deve Voltage detection W: Full function (dev Power detector	2:220V 4:440V (380V) eloping)
Main power	220, 380, 440V±15% 50/60H	Z		Optional information:
Control power	200~240VAC(fan included) • 90~24	40V AC/DC(fans n	ion-included)	1. If the optional mod control, the controlle
Rated current	35A,50A,75A,100A,125A,150A,225	5A,300A,450A		power) control mode
Control mode	Phase trigger control or Zero cross	2. The full function n support ModBus p		
Control signal Vcmd	0~5V,1~5V (impedance 20K) 0~ 0~20mA,4~20mA (impedance 2500	10V, 1~10V (imped hm)	dance 100K)	3. Current has a wide
Output control range	0.0~100.0%			4 CRx-xxxxP can be
Resolution/Linear	0.1% / 1%	5.3 ω phase control		
E. ADJ control signal	Analog control: 0~5V(impedance on/off control: Hi=3.4V,Lo=2.2V	20K) to 0.0~10	0.0% °	P-type(standard): Using 6sets SCR to
Serial communication	RS-485 interface, support Mo	dBus protocol i	n RTU or ASCII format	controlled". Its cha (average = 0). It's s
Cooling Method	natural air circulation or fan	cooling		and so on. The con
Ambient temperature/humidity	-10~+50°C/under 90%RH			C-type Using 3sets SCR & This's called "2 a ba
Hi-pot test	AC2000V/1min. (between the	degree), It's suitabl		

over $20M\Omega/500V$ (between the power, signal terminal & heat sinks)



(5) Current spec. Control Mode P: Phase trigger control 035:35A Z: Zero cross control C: 3φ Half-wave (Blank): 1φ self-setup 450.450A lel is with full function (A,V,W) and the control mode is with phase r can be planned as a constant current (or constant voltage < constant Please refer to the parameter settings nodel is included the serials communication (RS-485) which can rotocal in RTU or ASCII format. Please refer to the communication pe is not included RS-485 and it's only for display.) range of specifications. Please refer to the product specifications planned to phase / zero control. control mode] with P-type and C-type two options. o control each phase' +/- phase voltage. This is called "3 φ full-wave racteristics is to control the output line current without DC component suitable for inductive (or resistive) load. Such as motors, transformers trollable phase angle only have 0~150 degrees control range.

0

3sets diodes to control each phase' half-circumference phase voltage If-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 (3 φ)I(AMP) = P(watt) ÷ V(voltage) ÷ $\sqrt{3}$ ÷ 0.85 (15% safety reservation) (1 φ)I(AMP) = P(watt) ÷ V(voltage) ÷ $\sqrt{3}$ ÷ 0.85 (15% safety reservation)

Fuse Spec.

2KV 5KHZ

ABS (UL94V)

Noise susceptibility

Isolation resistor

Housing Material

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

Current	Fuse model# 240V (l²t) /415V (l²t)	Current	Fuse model# 240V (I²t) /415V (I²t)	Current	Fuse model# 240V (l²t) /415V (l²t)	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				\boxtimes	0~20mA				
0~10V				\boxtimes	4~20mA				\boxtimes

CRx-xxxxP phase/zero cross control settings Note: Change control mode must be rebooted

			_	
Output Control	S4	S3	S2	S1
Phase trigger control	X			
Zero cross trigger control	\boxtimes			

3 2 **1** DIP switches SW1I on the main control panel

4

ON

Phase / zero control output waveform





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
d ,5P	$\begin{array}{c} disp: when select the normal condition, what types of value will be displayed performed by the performance of the pere$	PErE
SEUP	stup:1st time to start or standby over 5 minutes, soft start time (See [control signal modulation]) Range: 1~100 secs.	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 Valu
HLEd	HItd: maxi. output limit setting (constant current mode, maxi. output current). range:50~100%	100%
LLEd	LLtd:Vcmd=0 (see Vcut parameter), mini. output limit setting (constant current mode, mini. output current). range:0~50%	0%
RLEr	Altr: alarm output delay time when Abnormal. range:0~20 seconds	1Sec
Eool	CooL: Fan start temperature. range:5-60°C	50°
ERdJ	Eadj: Select external control to control Vcmd	nULL
uEUE	Vcut: when Vcmd(Ccmd)=0, select Lltd output or close output. Stop: close output Lltd: output by mini. of output value	SEoP
НЕШг	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
LEUr	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
68Ln	bALn:(optional)3 φ current no-balance setting, when 3 φ current is unbalance, the value between maxi, current & mini, current bigger than set value, error occurred. see [F bL] parameter. (phase: above 30%, zerp cross 50% start detect. set 0 as close function) range:0-500A	0A
FP	Kp: (optional) constant current (voltage/power) control deviation magnification settings. the greater the value the more sensitive response. range: 10~100%	100%
PLEd	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 st	tart
Display	Description	Default Value
บโก้ฮ	Vcmd: setup Vcmd display value to response the control signal. See [inout/output setting]	4-20
ם יר ב	Wire: set up CR3-xxxP wiring method 3P3L: 3 Phase 3 Line 3P4L: 3 Phase 4 Line	3P3L
	Main:Main power anomaly occurs disposal. 3 options.	Stop
חו חח	null ignore this ALAM: alarm output. Stop: alarm output. keep working shutdown the machine	
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 as NULL.	RLAA
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.	RLAN
F HE	F HC: high current anomaly occurred disposal. option is same as above.	RLAR
FLE	F LC: low current anomaly occurred disposal. option is same as above.	RLAR
FЬL	F bL: 3 phase unbalance anomaly disposal. option is same as above.	RLRĀ
FSEr	FSCR: SCR breakdown anomaly occurred disposal. option is same as above.	Stop
Ebrl	Ctrl: (optional) control options, phase/constant current/constant voltage/constant power controlled PHRS I CILE PLANE PALLE Phas: phase control iout: constant current vout: constant voltage Pout: constant power	PHRS
ı d	id:(optional) communication station settingrange:1~99	1
680d	baud: (optional) communication speed range:2.4 · 4.8 · 9.6 · 19.2 · 38.4。kbit/sec	9.6
dRER	data: (optional) communications serial format. range:8n1 + 8n2 + 8e1 + 8o1 =	8n1
ñodE	mode: (optional) ModBus communications format range:RTU - ASCii。	RTU
LoUL	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.
[Other	-]	
LoEF	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 step 1,2, 3: all open	3
EESE	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
οC	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	
กิ่มี เก	Main: the main power anomaly. check the input switch or the controller fuse if it is normal.	2	
HEUr	Hcur: (optional) high current	3	
5 int	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	
LoRd	Load: Load Break	6	
LEUr	LCur: (optional) low current.	7	
EHEr	Ther: temperature sensor anomaly. check the pin plug of temperature sensor whether is bad connection, (impedance is about 3K ~ 10K ohm)	8	
5Er	SCR: (optional) SCR breakdown. please return for repairing.	9	
Unbl	Unbl: (optional) 3 phase unbalance	10)

Modulation for control signals





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=2sOutput 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. Parameter Kp limited the maxi. current value.

Ex: model #CR3-A4075P (440V/75A), when Vcmd = 100% Kp = 30%, current target value = 75A x 30% = 22.5A Kp = 50%, current target value = 75A x 50% = 37.5A Kp = 100%, current target value = 75A x 100% = 75A

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=100% different KP output effects

Comm. control output Ccmd (optional function)

The controller can use the communication to control the SCR output value to replace $\ensuremath{\mathsf{Vcmd}}$.

Method:

 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

R-phase Ahnormal signal00005bitR1: on 0:off00006bitR7-phase Ahnormal signal00007bitR0ver current (OC) abnormal status00008bitR1: Ahnormal 0: normal00009bitR1: Ahnormal 0: normal00010bitR1: Ahnormal 0: normal00011bitR1: Ahnormal 0: normal00013bitR1: Ahnormal 0: normal00014bitR1: Ahnormal 0: normal00015bitR1: Ahnormal 0: normal00016bitR1: Abnormal 0: normal00016bitR1: Abnormal 0: normal00016bitR1: Abnormal 0: normal00016bitR <td< th=""><th>Explanation</th><th>Modbus Address</th><th>Data Length</th><th>R/W</th></td<>	Explanation	Modbus Address	Data Length	R/W
S-phase Abnormal signal00006bitR1: on 0: off00007bitRCver current (CC) abnormal status00008bitR1: Abnormal 0: normal00009bitRCver current (CC) abnormal status00010bitR1: Abnormal 0: normal00011bitRCver current (CCIR) abnormal status00011bitR1: Abnormal 0: normal00011bitR1: Abnormal 0: normal00011bitR2 phase unbalance (UNBL) abnormal status00012bitR1: Abnormal 0: normal00013bitR1: Abnormal 0: normal00014bitR1: Abnormal 0: normal00015bitR1: Abnormal 0: normal00016bitRScr (SCR) abnormal status00016bitR1: Abnormal 0: normal00016bitRScr (SCR) abnormal status00016bitRScr (SCR) abnormal status00016bitRScr (SCR) abnormal status00016wordR/WRange: 1-90 second40002wordR/WMaximum of output value (LItd)40003wordR/WRange: 0-600A40005wordR/WManimu of output value (LItd)40006wordR/WRange: 0-600A40007wordR/WRange: 0-600A40007wordR/WRange: 0-600A40001wordR/WRange: 0	R-phase Abnormal signal 1: on 0: off	00005	bit	R
T-phase Abnormal signal 1: on 0: off00007bitROver current (OC) abnormal status 1: Abnormal 0: normal00008bitROver temperature (SIKK) abnormal status 1: Abnormal 0: normal00010bitRHigh current (HCUR) abnormal status 	S-phase Abnormal signal 1: on 0: off	00006	bit	R
Over current (OC) abnormal status00008bitR1: Abnormal 0: normal00009bitRHigh current (HCUR) abnormal status00010bitRI: Abnormal 0: normal00011bitRLow current (LCUR) abnormal status00012bitR1: Abnormal 0: normal00012bitRMain power (MAIN) abnormal status00013bitR1: Abnormal 0: normal00014bitRLow current (LCUR) abnormal status00015bitR1: Abnormal 0: normal00015bitRLoad (LOAD) abnormal status00016bitRSch start time (STUP)40001wordR/WRange: 1-99 second40002wordR/WMaximum of output value (HItd)40003wordR/WMange: 0-600A40005wordR/WMange: 0-600A40006wordR/WAnge: 0-600A40007wordR/WAnge: 0-600A40008wordR/WAnge: 0-600A40009wordR/WAnge: 0-600A40011wordR/WAnge: 0-600A40011wordR/WAnge: 0-600A40011wordR/WAnge: 0-600A40011wordR/WAnge: 0-600A40011wordR/WAnge: 0-600A40011wordR/WAnge: 0-600A40011wordR/WAnge: 0-100%time setting (PLD)40010wor	T-phase Abnormal signal 1: on 0: off	00007	bit	R
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Low current setting (LC) Range: 0~600A40006wordR/W3 phase unbalance current setting (BALN) Range: 0~600A40007wordR/W9 proportional gain value setting (Kp) Range: 10~100%40008wordR/WProportional gain value setting (Kp) 	High current setting (HC) Range:0~600A	40005	word	R/W
3 phase unbalance current setting (BALN) Range: 0~600A40007wordR/WProportional gain value setting (Kp) Range: 10~100%40008wordR/Wthe maximum phase angle limited setting (PLTD) Range: 50~100%40009wordR/WAlarm output delay time setting (ALTR) 	Low current setting (LC) Range:0~600A	40006	word	R/W
Proportional gain value setting (Kp) Range: 10~100%40008wordR/WIte maximum phase angle limited setting (PLTD) Range: 50~100%40009wordR/WAlarm output delay time setting (ALTR) Range: 0~20 second40010wordR/WFan start temperature setting (COOL) 	3 phase unbalance current setting (BALN) Range : 0~600A	40007	word	R/W
the maximum phase angle limited setting (PLTD)40009wordR/WRange: 50~100%Alarm output delay time setting (ALTR) Range: 0~20 second40010wordR/WFan start temperature setting (COOL) Range: 5~60 degree40011wordR/WCommunication control signal (Ccmd) Range: 0~1000 (unit 0.1%)40016wordR/WAnalog control signal (Vcmd) 	Proportional gain value setting (Kp) Range:10~100%	40008	word	R/W
Alarm output delay time setting (ALTR) Range: 0~20 second40010wordR/WFan start temperature setting (COOL) Range: 5~60 degree40011wordR/WCommunication control signal (Ccmd) Range: 0~1000 (unit 0.1%)40016wordR/WAnalog control signal (Vcmd) 	the maximum phase angle limited setting (PLTD) Range : 50~100%	40009	word	R/W
Fan start temperature setting (COOL) Range: 5~60 degree40011wordR/WCommunication control signal (Ccmd) Range: 0~1000 (unit 0.1%)40016wordR/WAnalog control signal (Vcmd) Range: 0~input spec. (unit0.1 mA or V)40017wordRSCR present output 	Alarm output delay time setting (ALTR) Range:0~20 second	40010	word	R/W
Communication control signal (Ccmd) Range: 0~1000 (unit 0.1%)40016wordR/WAnalog control signal (Vcmd) Range: 0~input spec. (unit0.1 mA or V)40017wordRSCR present output Range: 0~1000 (unit:0.1%)40018wordRHeat sink temperature 	Fan start temperature setting (COOL) Range:5~60 degree	40011	word	R/W
Analog control signal (Vcmd) Range: 0~input spec. (unit0.1 mA or V)40017wordRSCR present output Range: 0~1000 (unit:0.1%)40018wordRHeat sink temperature Range: 0~100 degree C40019wordRR-phase current 	Communication control signal (Ccmd) Range:0~1000 (unit 0.1%)	40016	word	R/W
SCR present output Range: 0~1000 (unit:0.1%)40018wordRHeat sink temperature Range: 0~100 degree C40019wordRR-phase current Range: 0-see spec. (unit: 0. 1A)40020wordRS-phase current 	Analog control signal (Vcmd) Range:0~input spec. (unit0.1 mA or V)	40017	word	R
Heat sink temperature Range: 0~100 degree C40019wordRR-phase current Range: 0-see spec. (unit: 0. 1A)40020wordRS-phase current Range: 0-see spec. (unit: 0. 1A)40021wordRT-phase current 	SCR present output Range:0~1000 (unit:0.1%)	40018	word	R
R-phase current Range: 0-see spec. (unit: 0. 1A)40020wordRS-phase current Range: 0-see spec. (unit: 0. 1A)40021wordRT-phase current Range: 0-see spec. (unit: 0. 1A)40022wordR3 phase average current 	Heat sink temperature Range:0~100 degree C	40019	word	R
S-phase current Range: 0- see spec. (unit: 0. 1A) 40021 word R T-phase current Range: 0- see spec. (unit: 0. 1A) 40022 word R 3 phase average current Range: 0- see spec. (unit: 0. 1A) 40023 word R 0 utput voltage 40024 word R	R-phase current Range:0~see spec. (unit:0.1A)	40020	word	R
T-phase current Range: 0- see spec. (unit: 0. 1A) 40022 word R 3 phase average current Range: 0- see spec. (unit: 0. 1A) 40023 word R	S-phase current Range : 0~see spec. (unit : 0, 1A)	40021	word	R
3 phase average current Range:0-see spec. (unit:0, 1A) 40023 word R	T-phase current Range:0~see spec. (unit:0.1A)	40022	word	R
Output voltage	3 phase average current Range:0~see spec. (unit:0.1A)	40023	word	R
Range: 0~see spec. (unit:0.1V)	Output voltage Range:0~see spec. (unit:0.1V)	40024	word	R
Output power Range: 0~see spec. (unit:0.1kW) 40025 word R	Output power Range:0~see spec. (unit:0.1kW)	40025	word	R
Unexpected condition Unusual code: 0-10 (0: usual)	Unexpected condition Unusual code: 0~10 (0: usual)	40026	word	R
1: Over Gurrent (OC) 2: Main power (MAIN) 3: High current (HC) 4: Over heat (SINK) 5: Fuse (FUSE) 6: Overload break (LOAD) 7: Low curreNt (LO) 8: Sensor (SENS) 9: SCR short circuit (SCR)	2: Main power (MAIN) 3: High current (HC) 4: Over heat (SINK) 5: Fuse (FUSE) 6: Overload break (LOAD) 7: Low curreNt (LO) 8: Sensor (SENS) 9: SCR short circuit (SCR)			
10: 3 phase non-balance (UNBL) Contacts (coil) Status string pattern LSB(0x01)~MSB(0x16) accordingly 40027 word R	10: 3 phase non-balance (UNBL) 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

Туре	Current	Length L(mm)	Width W(mm)	Height H(mm)	A &B(mm)	Cooling Way	Р
	75A	203	80	180	215,50	Nature cooling	1
Cr1	100A 125A 150A	241	80	180	215,50		1
φιν	180A 225A	306	80	180	280,50	Fan cooling	2
	300A 380A	306	120	220	280,80		5
	35A	203	80	180	215,50	Nature cooling	1
Cr2	50A 75A	241	80	180	215,50		1
3φ2W	100A 125A 150A	241	120	220	215,80	Fan cooling	4
	180A 225A	306	120	220	280,80	1 an cooling	5
	300A 380A	310	245	220	295,160		
	35A	203	120	153	215,80	Nature cooling	3
Cr3	50A	228	120	153	215,80		3
3φ3W	75A 100A	241	120	220	215,80		4
	125A 150A	306	120	220	280,80	Fan cooling	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
- of rated current

Input signal wiring diagram



GND MAX 3 М ≥ C+ (5K~20K) C-RT+ RT-





4~20mA GND GND GND

Auto/Manual external switch





Manual adjustment









Communication control

Muti-unit link in control

TIC	MAX	MAX	MAX
- +	М	М	Μ
	- C+	C+	- C+
	C-	- C-	- C-
	RT+	RT+	RT+
	RT-	RT+	RT+
	4~20mA	1~5V	1~5V



