Din Rail mount Dual loop four output PID Process Controller

DR04C-653

User manual

DR04C-653-C1

Read this manual carefully before operating and keep this manual for future reference

Main features

1. Standard DIN rail mount, controller attached to each other with a quick connector the RS-485 and power supply connection can be done together at once
2. Controller with LED display and indicators, with 4 buttons for setting purpose all configurations can be done even without master devices
3. Modbus-RTU communication, support 03H(read multiple address), 06H write single address, and 10H(write multiple address) command, support 03H read maximum 36 addresses and 10H command write 20 addresses
4. Support input TC/RTD, 0.3%F.S accuracy
5. Optional output, Relay, SSR Drive, mA or VDC analog signal, some of critical functions like heating/cooling control mode, ON/OFF control mode, auto/manual control mode, run/stop function, auto-tuning, high/low output limits all of these functions are configurable for each loop.
   Two auxiliary outputs AU1 and AU2 can be configured for different functions
   (1) AU1 and AU2 can be assigned as the high/low output for OP1 and OP2
   (2) AU1 and AU2 can be assigned as the cooling output of OP1 and OP2
   (3) AU1 and AU2 can be assigned as the I/O port of the digital outputs
6. Each loop has a output elimination function
7. Quick guide, please refer to "DR04C-653 quick guide at the last page"

1. Ordering Code

Please make sure you order the products based on your need

Model number and function code

DR04C－653 － □－□－□－□－□

Item number　software version　　① ② ③ ④ ⑤

①. Factory default input, refer to input sensor table, such as "K"(same input for 2 loops)

Input code	Type of input and range								
K	K	−30	to	1300	℃	/ −20	to	2372	℉
E	E	−30	to	600	℃	/ −20	to	1112	℉
J	J	−30	to	800	℃	/ −20	to	1472	℉
N	N	−30	to	1300	℃	/ −20	to	2372	℉
W	Wu3_Re25	600	to	2000	℃	/ 1000	to	3632	℉
S	S	0	to	1600	℃	/ 0	to	2912	℉
T	T	−30	to	400	℃	/ −20	to	752	℉
R	R	0	to	1700	℃	/ 0	to	3092	℉
B	B	200	to	1800	℃	/ 400	to	3272	℉
D	Pt100	-199	to	800	℃	/ −199	to	1472	℉

Remark: the accuracy of type S and R is not guaranteed when the process value is less than 200℃

②. OP1 and OP2, AU1 and AU2 output type, OP1 and OP2 output has to be the same, AU1 and AU2 output has to be the same

code	Main output OP1/OP2	Auxiliary output AU1/AU2
1	Relay NO 3A/250V	Relay NO 3A/250V
2	Voltage pulse 12VDC(SSR)	Voltage pulse 12VDC(SSR)
3	Voltage pulse 12VDC(SSR)	Relay NO 3A/250V
4	Relay NO 3A/250V	Voltage pulse 12VDC(SSR)
5	Analog mV/mA	Relay NO 3A/250V
6	Analog mV/mA	Voltage pulse 12VDC(SSR)
7	Relay NO 3A/250V	Analog mV/mA
8	Voltage pulse 12VDC(SSR)	Analog mV/mA
9	Analog mV/mA	Analog mV/mA

Remark: The OP1 and OP2 has to be the same, AU1 and AU2 output will be the same as way, for example, if you choose relay output for OP1, then OP2 will be relay as well, and if you choose 4-20mA for AU1, then the output for AU2 will be 4-20mA as well AU1 and AU2 can be configured as alarm output for OP1 and OP2 or cooling output for OP1 and OP2 and also can be assigned as the I/O port for digital outputs

③. Specify the analog output type for OP1/OP2

N: OP1/OP2 is not analog output
2: DC 0~20mA
8: DC 4~20mA
5: DC 0~5Vdc
6: DC 0~10Vdc
7: DC 1~5Vdc

④. Assign a factory default output function to AU1(the physical output type is the same as AU2)

A1: AU1 assigned as deviation high alarm for #1 channel(Relay)
B1: AU1 assigned as deviation low alarm for #1 channel(Relay)
H1: AU1 assigned as the process value high alarm for #1 channel(Relay)
J1: AU1 assigned as the process value low alarm for #1 channel(Relay)
O: AU1 used as I/O port(Relay)
WM: AU1 used as cooling output for #1 channel(Relay)
WV: AU1 assigned as cooling output for #1 channel(Voltage pulse)
W2: AU1 assigned as cooling output for #1 channel(0~20mA)
W8: AU1 assigned as cooling output for #1 channel(4~20mA)
W5: AU1 assigned as cooling output for #1 channel(0~5VDC)
W6: AU1 assigned as cooling output for #1 channel(0~10VDC)
W7: AU1 assigned as cooling output for #1 channel(1~5VDC)

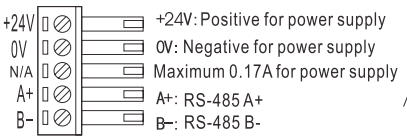
⑤. Assign a factory default output function to AU2(the physical output type is the same as AU1)

A2: AU2 assigned as deviation high alarm for #2 channel(Relay)
B2: AU2 assigned as deviation low alarm for #2 channel(Relay)
H2: AU2 assigned as the process value high alarm for #2 channel(Relay)
J2: AU2 assigned as the process value low alarm for #2 channel(Relay)
A1: AU2 assigned as deviation high alarm for #1 channel(Relay)
B1: AU2 assigned as deviation low alarm for #1 channel(Relay)
H1: AU2 assigned as the process value high alarm for #1 channel(Relay)
J1: AU2 assigned as the process value low alarm for #1 channel(Relay)
O: AU2 used as I/O port(Relay)
WM: AU2 used as cooling output for #2 channel(Relay)
WV: AU1 assigned as cooling output for #2 channel(Voltage pulse)
W2: AU1 assigned as cooling output for #2 channel(0~20mA)
W8: AU1 assigned as cooling output for #2 channel(4~20mA)
W5: AU1 assigned as cooling output for #2 channel(0~5VDC)
W6: AU1 assigned as cooling output for #2 channel(0~10VDC)
W7: AU1 assigned as cooling output for #2 channel(1~5VDC)

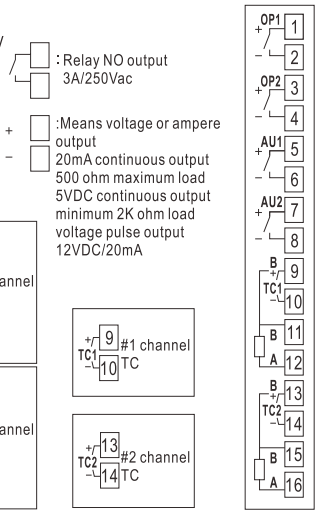
Example: DR04C-653-K-5-8-A1-A2, Dual loop Din rail mount controller, type K input for both channel, 4-20mA for OP1 and OP2, Relay for AU1 and AU2, AU1 and AU2 can be assigned as cooling output or alarm output for #1 and #2 channel

2. Wiring diagram

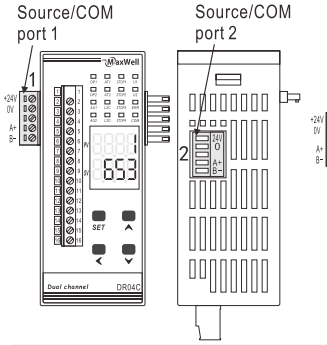
Power supply and RS-485 connection



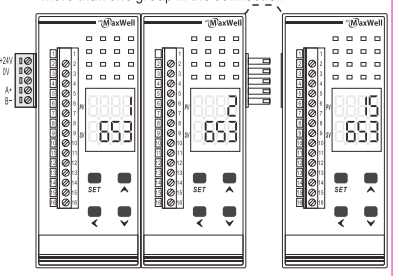
Please check the wiring diagram before setup wires



Please choose the connection port according to your Field application

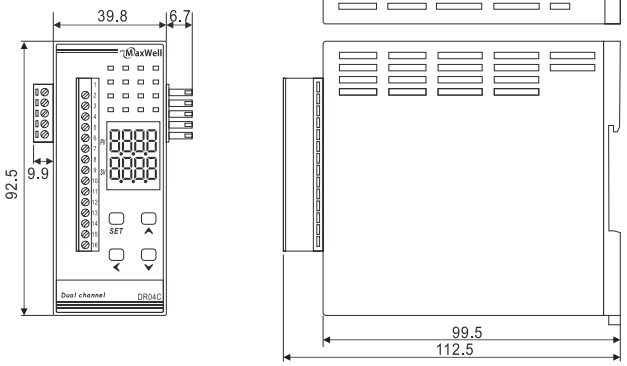


Controller connected to each via quick connection ports, source and RS-485 connection can be done at once
maximum 15 controllers allowed in a serial connection if the system has more than 15 controllers, use more than one group in the connection

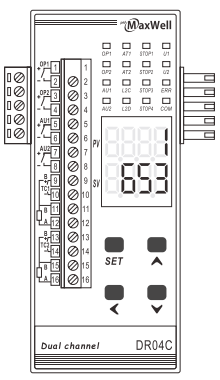


3. Size and mounting

Unit:mm



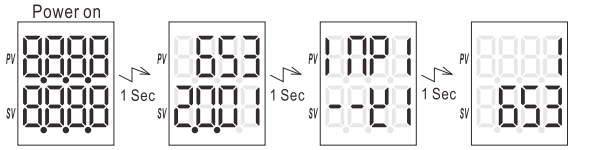
4. Panel description



1 PV display, address\parameter notation
2 SV setting, software version\parameter value
3 OP1: output 1 indication
OP2: output 2 indication
AU1: auxiliary output 1 indication
AU2: auxiliary output 2 indication
AT1: #1 channel auto-tuning indication
AT2: #2 channel auto-tuning indication
ST0P1: #1 channel output stop indication
ST0P2: #2 channel output stop indication
ST0P3: auxiliary output 1 stop indication
ST0P4: auxiliary output 2 stop indication
U1: auxiliary output 1 assigned as I/O output
U2: auxiliary output 2 assigned as I/O output
ERR: temperature sensor break or over range indication
COM: communication indication
4 SET : function key
5 ❮ : Digits shift key
6 ❯ : Increase digits
7 ❯ : Decrease digits

5. Parameter setting and communication address registry

5.1 Power up self-check, input and software version display



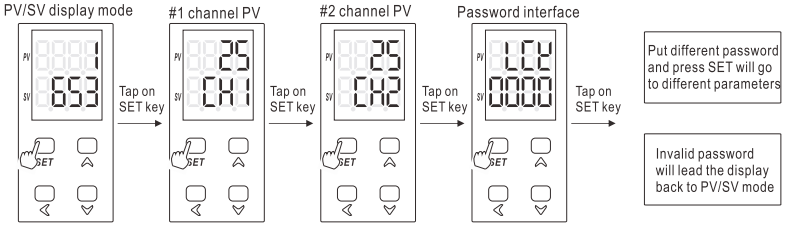
Symbol									
Input type	K	J	T	S	R	E	B	N	Wu3_Re25	Pt100

5.1.1 Communication protocol

(1) Modbus-RTU protocol, support 03 read, 06&10 write command
(2) Communication format: half-duplex multi-drop connection RS-485
Baud rate: 2400,4800,9600,19200(selectable)
Data format: 1 start bit, 8 data bit, None parity bit, 1 stop bit
(3) Maximum one time allowable write 20 address, maximum one time allowable read 37 address
(4) DR04 factory default address is "1" , baud rate is 9600
(5) Please refer to manual for detailed information on the address

5.2 Parameter lists and communication address for each parameters(Hex or Decimalism)

5.2.1 PV display and access to password interface, AU1/AU2 function configuration

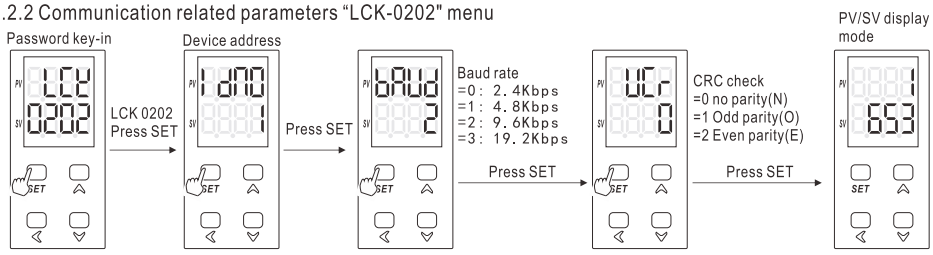


No	Parameter type	HEX	10 HEX	Data format	Read/ Write	Remark
1	#1 channel PV1	0000H	0	16 bit positive integer 10 hex	R	Reading gain 0.1
2	#2 channel PV2	0001H	1	16 bit positive integer 10 hex	R	Reading gain 0.1

For example, reading=1000, means 100.0 degree, only display as 100

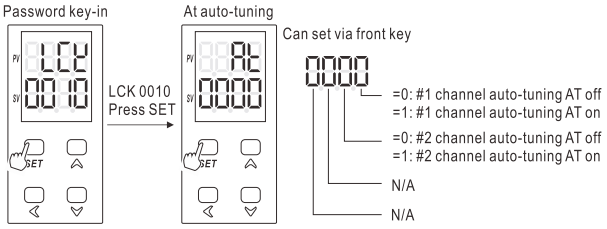
No	Parameter type	HEX	10 Hex	Data format	R/W	Remarks
3	AU1/AU2 assigned as I/O port address	0002H	2	16 bit integer binary	R/W (RAM)	Goes to U1 parameter under LCK-0101, Set U1=0, AU1 will be assigned as the I/O port, when U2=0, AU2 will be assigned as I/O port Bit0=0 AU1 off, Bit0=1. AU1 on, Bit1=0 AU2 off, Bit1=1, AU2 on
4	N/A	0003H	3			
5	#1 channel output%	0004H	4	16 bit integer 10 hex	R	reading gain 0.1, 0-1000 means 0.0%-100.0%, #1 channel output value, % is the unit
6	#2 channel output%	0005H	5	16 bit integer 10 hex	R	reading gain 0.1, 0-1000 means 0.0%-100.0%, #2 channel output value, % is the unit
7	AU1 output %	0006H	6	16 bit integer 10 hex	R	reading gain 0.1, 0-1000 means 0.0%-100.0%, AU1 auxiliary output value % is the unit
8	AU2 output %	0007H	7	16 bit integer 10 hex	R	reading gain 0.1, 0-1000 means 0.0%-100.0%, AU2 auxiliary output value % is the unit
9	LED indicators on panel	0008H	8	16 bit integer binary	R	bit0:COM , bit1:ERR , bit2:U2 , bit3:U1 , bit4:AU2 , bit5:AU1 , bit6:OP2 , bit7:OP1 , bit8:STOP4 , bit9:STOP3, bit10:STOP2 , bit11:STOP1 , bit12:N/A, bit13:N/A, bit14:AT2 , bit15:AT1 bitx=0 indicator off bitx=1 indicator on ERR indicators on means the temperature sensor break off, or the PV cross over the high/low range
10	LCK password	0009H	9	16 bit integer 10 hex	R/W (RAM)	LCK password 0-9999

5.2.2 Communication related parameters "LCK-0202" menu



Parameter type	Hex	Hex 10	Data format	R/W
Device address IDNO	0047H	71	16 bit positive integer 10 hex	R
Baud rate BAUD	0048H	72	16 bit positive integer 10 hex	R
Error check Field UCR	0049H	73	16 bit positive integer 10 hex	R

5.2.3 Auto-tuning AT/ Run stop RS parameter "LCK-0010" parameter



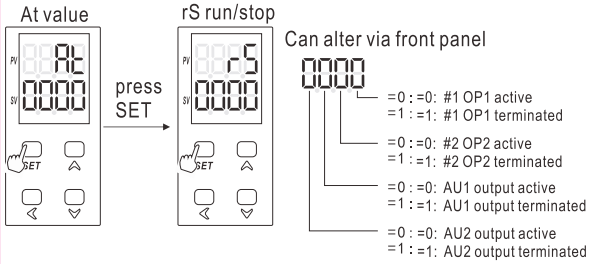
No	Parameter type	HEX	10 Hex	Data format	R/W	Remarks
11	Auto-tuning AT	000AH	10	16 bit positive integer Binary	R/W (RAM)	Bit0=0 #1 channel auto-tuning off Bit0=1 #1 channel auto-tuning on Bit1=0 #2 channel auto-tuning off Bit1=1 #2 channel auto-tuning on write 10 hex value "0" will turn off AT1 and AT2 at the same time, write 10 hex value "3" will turn on AT1 and AT2 at the same time.

Address for AT1/AT2 indicator is 0008H, Bit15 for AT1 indicator, Bit14 for AT2 indicator bit=0 indicator on, bit=1, indicator off

Remark: run/stop function will over write auto/manual and auto-tuning function, you can not initiated the auto-tuning and auto/manual under STOP status, auto-tuning can not be activated under manual control mode

Remark

1. AT1 and AT2 indicator on after auto-tuning activated, indicator off when auto-tuning finished 2. The control mode will be ON/OFF mode, large temperature fluctuation is expected during the auto-tuning process, the time duration for auto-tuning various for different process. 3. The value for P,I,d, rSt will be calculated by the auto-tuning process, and controller goes back to PV/SV mode and continue to work with the updated P,I,d, rSt value

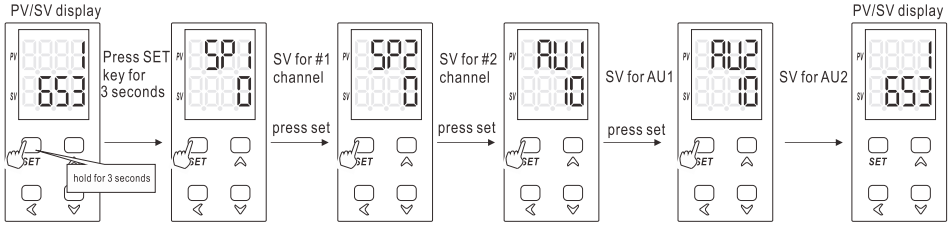


Remark: rS parameter is stored in EEPROM, the value will inherit during the power interruption, value will be the same after power resume

No	Parameter type	HEX	10 Hex	Data format	R/W	Remarks
12	Run/Stop R/S	000BH	11	16 bit positive integer Binary	R/W Eeprom	Bit0=0 #1 channel output on =1 #1 channel output stop Bit1=0 #2 channel output on =1 #2 channel output stop Bit2=0 AU1 output on =1 AU1 output off Bit3=0 AU2 output on =1 AU2 output off if you write 10 hex value "0" to this address, all output will be activated if you write 10 hex value "15" to this address, all output will be terminated

LED indicators on the panel: STOP1 : OP1, STOP2 : OP2, STOP3 : AU1, STOP4 : AU2, indicators on means "stop" correspondent address 0008H, bit8 : STOP4 , bit9 : STOP3, bit10 : STOP2 , bit11 : STOP1
bit=0 indicators on bit=1 indicators off
Remark: Can not initiate the auto/manual and auto-tuning features under "STOP" status

5.2.4 Setting value for #1, #2 channel SP1/SP2 and AU1/AU2 parameter menu

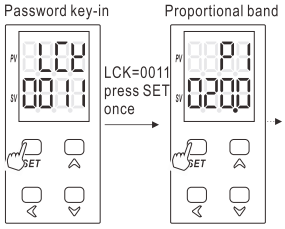


Important Notice

Factory default data storage method is EEPROM, the data stays at where the power was cutoff, the data will be the same after power on, the limitation of EEPROM is 100,000 times, so this mode is not suitable for application where data needs to be write and erased frequently. under this circumstance please go to LCK-0101 and change the RAM to RAM=1111,refer to LCK-0101 and NO.66 for explanation on the parameter "RAM"

No	Parameter type	Hex	10 Hex	Data format	R/W	Remarks
13	#1 channel SP1	000CH	12	16 bit integer 10 hex	R/W(Ram/EEPROM)	reading gain 0.1, read 1000 means 100.0 degree, write 2000, means write 200.0 degree
14	#2 channel SP2	000DH	13	16 bit integer 10 hex	R/W(Ram/EEPROM)	reading gain 0.1, read 1000 means 100.0 degree, write 2000, means write 200.0 degree
15	AU1 value	000EH	14	16 bit integer 10 hex	R/W(Ram/EEPROM)	reading gain 0.1, read 1000 means 100.0 degree, write 2000, means write 200.0 degree
16	AU2 value	000FH	15	16 bit integer 10 hex	R/W(Ram/EEPROM)	reading gain 0.1, read 1000 means 100.0 degree, write 2000, means write 200.0 degree

5.2.5 #1 channel P.I.D parameters "LCK-0011" menu

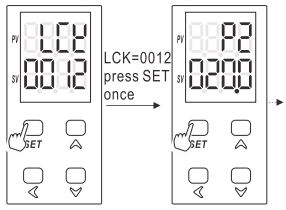


The data storage method for below parameters are "EEPROM"

No	Notation	Parameter type	Hex	10 Hex	Data format	R/W	Remarks
17	P1	Proportional band for #1 channel	0010H	16	16 bit integer 10 hex	R/W	reading gain 0.1, unit is degree, read 200 for 20.0 degree, write 300 for 30.0 degree factory default 20.0, range 0.0 ~800.0, when P1=0, OP1 switch to ON/OFF control mode, HYS1 is hysteresis
18	I1	Integral for #1 channel	0011H	17	16 bit integer 10 hex	R/W	Unit "second", 0-3600 second, factory default=210
19	d1	Derivative for #1 channel	0012H	18	16 bit integer 10 hex	R/W	Unit "second", 0-200 second, factory default=30
20	CYt1	Cycle time for #1 channel	0013H	19	16 bit integer 10 hex	R/W	Unit "second", 1-200 second, factory default= 20 seconds for relay, 2 seconds for voltage pulse analog output is 1 seconds as factory default

No	Notation	Parameter type	Hex	10 Hex	Data format	R/W	Remarks
21	HYS1	#1 channel hysteresis HYS1	0014H	20	16 bit integer 10 hex	R/W	reading gain 0.1, unit" degree" reading 4=0.4, write 10=1.0 degree factory default: 0.4 degree, range 0.0-800.0, opposite hysteresis for direct control, forward hysteresis for reverse control
22	rSt1	#1 channel proportional reset rst1	0015H	21	16 bit integer 10 hex	R/W	reading gain 0.1, unit "degree", read -50=-5.0 degree, write -100=-10.0 degree, the display on the controller can not display decimal points, range:-199.0~199.0 degree, this parameter used to counter balance the overshoot during heating process, factory default is -5.0, recommended to obtain the value via auto-tuning process
23	OPL1	#1 channel output lower limit OPL1	0016H	22	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the lower limit output for the #1 channel
24	OPH1	#1 channel output higher limit OPH1	0017H	23	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the higher limit output for the #1 channel
25	bUF1	#1 channel output restriction for analog output only	0018H	24	16 bit integer 10 hex	R/W	Reading gain 0.1, unit %, read=0 means 0.0%, write=200 means 20.0% factory default is 100.0, range 0.0~100.0%, this parameters used to define the change rate of the output, for example, if you put bUF1=5.0 means the output for #1 channel change rate can't be larger than 5.0%/second, this is very useful for analog output in protection the heater from being damaged

5.2.6 #2 channel P.I.D parameters "LCK-0012" menu

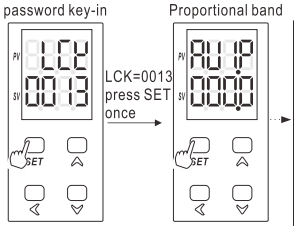


The data storage method for below parameters are "EEPROM"

No	Notation	Parameter type	Hex	10 Hex	Data format	R/W	Remarks
26	P2	Proportional band for #2 channel	0019H	25	16 bit integer 10 hex	R/W	reading gain 0.1, unit is degree, read 200 for 20.0 degree, write 300 for 30.0 degree factory default 20.0, range 0.0 ~800.0, when P2=0, OP2 switch to ON/OFF control mode, HYS2 is hysteresis
27	I2	Integral for #2 channel	001AH	26	16 bit integer 10 hex	R/W	Unit "second", 0-3600 second, factory default=210
28	d2	Derivative for #2 channel	001BH	27	16 bit integer 10 hex	R/W	Unit "second", 0-200 second, factory default=30
29	CYt2	Cycle time for #2 channel	001CH	28	16 bit integer 10 hex	R/W	Unit "second", 1-200 second, factory default= 20 seconds for relay, 2 seconds for voltage pulse analog output is 1 seconds as factory default

No	Notation	Parameter type	Hex	10 Hex	Data format	R/W	Remarks
30	HYS2	#2 channel hysteresis HYS2	001DH	29	16 bit integer 10 hex	R/W	reading gain 0.1, unit" degree" reading 4=0.4, write 10=1.0 degree factory default: 0.4 degree, range 0.0-800.0, opposite hysteresis for direct control, forward hysteresis for reverse control
31	rSt2	#2 channel proportional reset rst2	001EH	30	16 bit integer 10 hex	R/W	reading gain 0.1, unit "degree", read -50=-5.0 degree, write -100=-10.0 degree, the display on the controller can not display decimal points, range:-199.0~199.0 degree, this parameter used to counter balance the overshoot during heating process, factory default is -5.0, recommended to obtain the value via auto-tuning process
32	OPL2	#2 channel output lower limit OPL2	001FH	31	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the lower limit output for the #2 channel
33	OPH2	#2 channel output higher limit OPH2	0020H	32	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the higher limit output for the #2 channel
34	bUF2	#2 channel output restriction for analog output only	0021H	33	16 bit integer 10 hex	R/W	Reading gain 0.1, unit %, read=0 means 0.0%, write=200 means 20.0% factory default is 100.0, range 0.0~100.0%, this parameters used to define the change rate of the output, for example, if you put bUF2=5.0 means the output change rate for #2 channel can't be larger than 5.0%/second, this is very useful for analog output in protection the heater from being damaged

5.2.7 AU1 auxiliary output PID parameters setting, "LCK-0013" menu



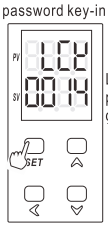
Data storage method "EEPROM"

No	Notation	Parameter type	Hex	Hex 10	Data format	R/W	Remark
35	AU1P	AU1 output proportional AU1.P	0022H	34	16 bit integer 10 hex	R/W	Reading gain 0.1, unit "degree", read 200= 20.0 degree, write 300=30.0 range: 0.0-800.0 When AU1.P=0.0, AU1 assigned as the alarm output for #1 or #2 channel, AU1.Y is the hysteresis 1. Goes to LCK-0101, set OUd=x0xx, AU1 assigned as deviation low or process low alarm OUd=x1xx, AU1 assigned as high deviation alarm or process high alarm 2. Goes to LCK-0101, U1=1, AU1 assigned as deviation alarm for #1 channel, alarm value=SP1+AU1 U1=2, AU1 assigned as process alarm for #1 channel, alarm value=AU1 U1=3, AU1 assigned as deviation alarm for #2 channel, alarm value=SP2+AU1 U1=4, AU1 assigned as process alarm for #2 channel, alarm value=AU1 if you set AU1.P to any value other than "0", AU1 can be used as the cooling output for #1 channel 1. Goes to LCK-0101, set OUd=x1xx, AU1 will be configured as direct control mode(PID cooling) 2. Goes to LCK-0101, set U1=1, AU1 will be configured as the cooling output target value, cooling SV= SP1+AU1
36	AU1I	AU1 integral time	0023H	35	16 bit integer 10 hex	R/W	Unit "second", 0-3600 seconds, factory default=210
37	AU1d	AU1 derivative time	0024H	36	16 bit integer 10 hex	R/W	Unit "second", 0-200 seconds, factory default=30

No	Notation	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
38	AU1t	cycle time for AU1 PID AU1.t	0025H	37	16 bit integer 10 hex	R/W	Unit "second", range 1-200, factory default: 20 seconds for relay, 2 seconds for voltage Recommendation: set cycle time≧20 seconds, voltage output= 2 seconds and analog will be 1 second
39	AU1Y	AU1 ON/OFF control mode AU1.Y	0026H	38	16 bit integer 10 hex	R/W	reading gain 0.1, unit" degree" reading 4=0.4, write 10=1.0 degree factory default: 0.4 degree, range 0.0-800.0, opposite hysteresis for direct control, forward hysteresis for reverse control
40	AU1r	proportional reset AU1.r	0027H	39	16 bit integer 10 hex	R/W	reading gain 0.1, unit "degree", read 10=1.0 degree, write 100=10.0 degree, the display on the controller can not display decimal points, range:-199.0~199.0 degree, this parameter used to counter balance the rapid outputs after at the first round for cooling output, the value goes further to the positive side will have bigger impact and restrain more on the output factory default=0.0
41	AU1L	AU1 lower limit output AU1.L	0028H	40	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the lower limit output for the AU1 output
42	AU1H	AU1 higher limit output AU1.H	0029H	41	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the higher limit output for the AU1 output
43	AU1F	AU1 output restriction AU1.F	002AH	42	16 bit integer 10 hex	R/W	Reading gain 0.1, unit %, read=0 means 0.0%, write=200 means 20.0% factory default is 100.0, range 0.0~100.0%, this parameters used to define the change rate of the output, for example, if you put AU1.F=5.0 means the output change rate for AU1 output can't be larger than 5.0% per second, this is very useful especially for analog output

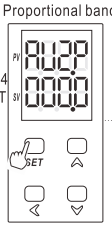
5.2.8 AU2 auxiliary output PID parameters setting, "LCK-0014" menu

password key-in



LCK=0014
press SET
once

Proportional band



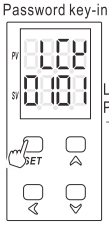
Data storage method "EEPROM"

No	Notation	Parameter type	Hex	Hex 10	Data format	R/W	Remark
44	AU2P	AU2 output proportional AU2.P	002BH	43	16 bit integer 10 hex	R/W	Reading gain 0.1, unit "degree", read 200= 20.0 degree, write 300=30.0 range: 0.0-800.0 When AU2.P=0.0, AU2 assigned as the alarm output for #1 or #2 channel, AU2.Y is the hysteresis 1. Goes to LCK-0101, set OUd=0xxx, AU2 assigned as deviation low or process low alarm OUd=1xxx, AU2 assigned as high deviation alarm or process high alarm 2. Goes to LCK-0101, U2=1, AU2 assigned as deviation alarm for #1 channel, alarm value=SP1+AU2 U2=2, AU2 assigned as process alarm for #1 channel, alarm value=AU2 U2=3, AU2 assigned as deviation alarm for #2 channel, alarm value=SP2+AU2 U2=4, AU2 assigned as process alarm for #2 channel, alarm value=AU2 if you set AU2.P to any value other than "0", AU2 can be used as the cooling output for #2 channel 1. Goes to LCK-0101, set OUd=1xxx, AU2 will be configured as direct control mode(PID cooling) 2. Goes to LCK-0101, set U2=3, AU2 will be configured as the cooling output target value, target SV=SP2+AU2
45	AU2.I	AU2 integral time	002CH	44	16 bit integer 10 hex	R/W	Unit "second", 0-3600 seconds, factory default=210
46	AU2d	AU2 derivative time	002DH	45	16 bit integer 10 hex	R/W	Unit "second", 0-200 seconds, factory default=30

No	Notation	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
47	AU2t	cycle time for AU2 PID AU2.t	002EH	46	16 bit integer 10 hex	R/W	Unit "second", range 1-200, factory default: 20 seconds for relay, 2 seconds for voltage Recommendation: set cycle time≧20 seconds, voltage output= 2 seconds and analog will be 1 second
48	AU2Y	AU2 ON/OFF control mode AU2.Y	002FH	47	16 bit integer 10 hex	R/W	reading gain 0.1, unit" degree" reading 4=0.4, write 10=1.0 degree factory default: 0.4 degree, range 0.0-800.0, opposite hysteresis for direct control, forward hysteresis for reverse control
49	AU2r	proportional reset AU2.r	0030H	48	16 bit integer 10 hex	R/W	reading gain 0.1, unit "degree", read 10=1.0 degree, write 100=10.0 degree, the display on the controller can not display decimal points, range:-199.0~199.0 degree, this parameter used to counter balance the rapid outputs after at the first round for cooling output, the value goes further to the positive side will have bigger impact and restrain more on the output factory default=0.0
50	AU2L	AU2 lower limit output AU2.L	0031H	49	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the lower limit output for the AU2 output
51	AU2H	AU2 higher limit output AU2.H	0032H	50	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, read 0=0.0%, write 200=20.0% factory=0.0, range 0.0-100.0%, this parameter used to define the higher limit output for the AU2 output
52	AU2F	AU2 output restriction AU2.F	0033H	51	16 bit integer 10 hex	R/W	Reading gain 0.1, unit %, read=0 means 0.0%, write=200 means 20.0% factory default is 100.0, range 0.0~100.0%, this parameters used to define the change rate of the output, for example, if you put AU2.F=5.0 means the output change rate for AU2 output can't be larger than 5.0% per second, this is very useful especially for analog output

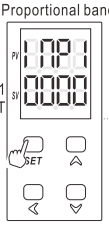
5.2.9 Field parameters "LCK-0101" menu

Password key-in



LCK=0101
Press SET

Proportional band



Data storage method "EEPROM"

No	Notation	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
53	INP1	Input type for both channels	0034H	52	16 bit integer 10 hex	R/W	

INP=	Input type and range
0 or 1	K type TC −30 to 1300 °C / −20 to 2372 °F
2 or 3	E type TC −30 to 600 °C / −20 to 1112 °F
4 or 5	J type TC −30 to 800 °C / −20 to 1472 °F
6	N type TC −30 to 1300 °C / −20 to 2372 °F
7	Wu3_Re25 600 to 2000 °C / 1000 to 3632 °F
8	S type TC 0 to 1600 °C / 0 to 2912 °F
9	T type TC −30 to 400 °C / −20 to 752 °F
10	R type TC 0 to 1700 °C / 0 to 3092 °F
11	B type TC 200 to 1800 °C / 400 to 3272 °F
16 or 17	PT100 -199 to 800 °C / −199 to 1472 °F

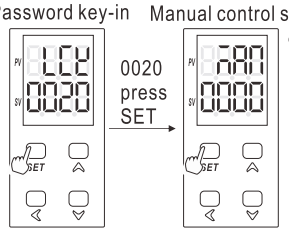
Write 0-17 to address 0034H or 52

No	Notation	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
54	UNIt	Display unit	0035H	53	16 bit integer 10 hex	R/W	=0 celcius °C =1 Fahrenheit °F factory default=0
55	SC1	Sensor offset for #1 channel	0036H	54	16 bit integer 10 hex	R/W	Reading gain 0.1, unit "degree" read -50=-5.0 degree, write 20=2.0 degree (the LED only shows integer) factory default=0.0 Range:-199.9 to 999.9, the display of the PV for #1 channel= actual measuring value+SC1
56	SC2	Sensor offset for #2 channel	0037H	55	16 bit integer 10 hex	R/W	Reading gain 0.1, unit "degree" read -50=-5.0 degree, write 20=2.0 degree (the LED only shows integer) factory default=0.0 Range:-199.9 to 999.9, the display of the PV for #2 channel= actual measuring value+SC2
57	OU1	AU1 auxiliary output configuration	0038H	56	16 bit integer 10 hex	R/W	=0: AU1 assigned as I/O output port, refer to address 002H under "5.2.1" No.3 for details =1: AU1 assigned as the deviation alarm or auxiliary PID output for #1 channel, setting value is SP1+AU1 =2: AU1 assigned as the process value alarm or auxiliary PID output for # 1 channel, setting value is AU1 =3: AU1 assigned as the deviation alarm or auxiliary PID output for #2 channel, setting value is SP2+AU1 =4: AU1 assigned as the process value alarm or auxiliary PID output for #2 channel, setting value is AU1 Remark 1: Goes to LCK-0013 and set AU1.P=0.0(PID function turn off), AU1 assigned as alarm output OUd parameter under LCK-0101 defines the alarm mode, if OUd=x0xx means low alarm, OUd=x1xx means high alarm Remark 2: Goes to LCK-0013 and set AU1.P to another value other than 0.0, AU1 assigned as auxiliary PID output for #1 channel for example set AU1.P=20.0(PID function on), OUd parameter from LCK-0101 defines the output mode, OUd=x1xx means AU1 for cooling control

No	Notation	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
58	AU2	AU2 auxiliary output configuration	0039H	57	16 bit integer 10 hex	R/W	=0: AU2 assigned as I/O output port, refer to address 002H under "5.2.1" No.3 for details =1: AU2 assigned as the deviation alarm or auxiliary PID output for #1 channel, setting value is SP1+AU2 =2: AU2 assigned as the process value alarm or auxiliary PID output for # 1 channel, setting value is AU2 =3: AU2 assigned as the deviation alarm or auxiliary PID output for #2 channel, setting value is SP2+AU2 =4: AU2 assigned as the process value alarm or auxiliary PID output for #2 channel, setting value is AU2 Remark 1: Goes to LCK-0013 and set AU2.P=0.0(PID function turn off), AU2 assigned as alarm output OUd parameter under LCK-0101 defines the alarm mode, if OUd=0xxx means low alarm, OUd=1xxx means high alarm Remark 2: Goes to LCK-0013 and set AU2.P to another value other than 0.0, AU2 assigned as auxiliary PID output for #2 channel for example set AU2.P=20.0(PID function on), OUd parameter from LCK-0101 defines the output mode, OUd=1xxx means AU2 for cooling control
59	PVFt	PV input filter strength PVFt	003AH	58	16 bit integer 10 hex	R/W	Range 0-30, the filter strength gets stronger when value is larger, factory default=15
60	LdE	SV deviation for temporarily extra output LdE	003BH	59	16 bit integer 10 hex	R/W	Reading gain 0.1, read 50 means 5.0 degree, write 100 means 10.0 degree(LED display shows 0-200 means 0.0~20.0 degree),This function is used to counter balance the sudden heat loss after the SV is reached, sometimes the SV drops too fast and it takes too long for the temperature to go back to the setting value, this function will kick-in when this happens, an extra output will be generated from the controller to the system so that the PV will be dragged back to SV as quickly as possible, SV1 deviation value for this function is LdE, active points=SP1-LdE for #1 channel, for #2 channel=SP2-LdE
61	SUP	Temporarily extra output value SUP	003CH	60	16 bit integer 10 hex	R/W	Reading gain 0.1, 0-1000 means 0.0-100.0% SUP=0, to turn off this function, if SUP=20, means the temporarily extra output is 20.0% Factory default=0.0(function off) please be care when using this function, large temperature fluctuation might happen if this function is not being executed correctly
62	OFF	SV deviation for temporarily extra output decrease OFF	003DH	61	16 bit integer 10 hex	R/W	Reading gain 0.1, read 50 means 5.0 degree, write 100 means 10.0 degree(LED display shows 0-200 means 0.0~20.0 degree),This function is used to counter balance the sudden heat increase after the SV is reached, sometimes the SV shoots up too much and it takes too long for the temperature to drop back to the setting value, this function will kick-in when this happens, an extra output decrease will be generated from the controller to the system so that the PV will be dragged back to SV as quickly as possible, OFF is the deviation value for this function to kick in, active points=SP1+PFF for #1 channel, for #2 channel=SP2+OFF
63	LP	Temporarily extra output decrease value LP	003EH	62	16 bit integer 10 hex	R/W	Reading gain 0.1, 0-1000 means 0.0-100.0% LP=0, to turn off this function, if LP=20, means the temporarily extra output decrease is 20.0% Factory default=0.0(function off) please be care when using this function, large temperature fluctuation might happen if this function is not being executed correctly
64	Err	Over range response Err	003FH	63	16 bit integer 10 hex	R/W	=0, Output will be terminated if the PV cross the higher limit range or lower limit range =1, Output will work normally if the PV cross the higher limit range or lower limit range, the higher limit or lower limit range is the same as the range of the sensor ranged defined in this controller, for example, the lower limit range for thermocouple is -30.0 and -199.9 for PT100
65	OUd	heating/cooling control configuration OUd	0040H	64	16 bit integer 10 hex	R/W	0000 Input respective bit value to configure bit0 =0 : OP1 output set as reverse control(heating) =1 : OP1 output set as direct control(cooling) bit1 =0 : OP2 output set as reverse control(heating) =1 : OP2 output set as direct control(cooling) bit2 =0 : AU1 set as low alarm, or reverse control(heating) =1 : AU1 set as high alarm, or direct control(cooling) bit3 =0 : AU2 set as low alarm, or reverse control(heating) =1 : AU2 set as high alarm, or direct control(cooling)
66	rAM	SV store method configuration rAM	0041H	65	16 bit integer 10 hex	R/W	0000 Input respective bit value to configure bit0 =0:SP1 stored in EEPROM =1:SP1 stored in RAM, the value restored is the value registered in EEPROM before power cut bit1 =0:SP2 stored in EEPROM =1:SP2 stored in RAM, the value restored is the value registered in EEPROM before power 据t bit2 =0:AU1 stored in EEPROM =1:AU1 stored in RAM, the value restored is the value registered in EEPROM before power cut bit3 =0:AU2 stored in EEPROM =1:AU2 stored in RAM, the value restored is the value registered in EEPROM before power cut EEPROM: 100,000 times write and erase limits RAM: no limits on the write and erase

5.2.10 Auto/manual control MAN "LCK-0020"

Password key-in Manual control setting



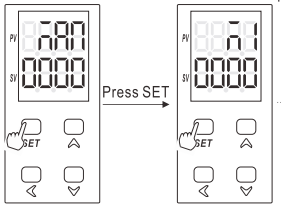
configurable via keys on panel

0000
=0 : OP1 output auto control
=1 : OP1 output manual control, output value M1
=0 : OP1 output auto control
=1 : OP1 output manual control, output value M2
=0 : AU1 output auto control
=1 : AU1 output manual control, output value MAU1
=0 : AU2 output auto control
=1 : AU2 output manual control, output value MAU2

Below parameter stored as RAM mode, the controller will be at auto control mode after power resume if the controller was at manual control mode before power failure

No	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
67	Auto/manaul control mode	0042H	66	16 bit integer 10 hex	R/W RAM	Bit0=0 OP1 output auto control =1 OP1 output manual control, output value M1 Bit1=0 OP2 output auto control =1 OP2 output manual control, output value M2 Bit2=0 AU1 output auto control =1 AU1 output manual control, output value MAU1 Bit3=0 AU2 output auto control =1 AU2 output manual control, output value MAU2

MAN control mode #1 channel manual output%

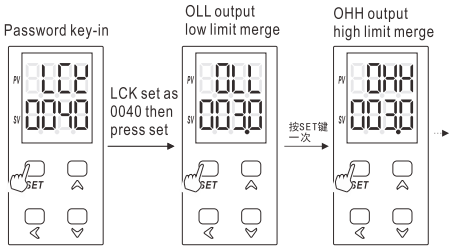


Below parameter stored on RAM mode

No	Notation	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
68	M1	#1 manual output% M1	0043H	67	16 bit integer 10 hex	R/W RAM	Reading gain 0.1, unit is %, read 0 means 0.0%, write 200, means 20.0%
69	M2	#2 manual output% M2	0044H	68	16 bit integer 10 hex	R/W RAM	Reading gain 0.1, unit is %, read 0 means 0.0%, write 200, means 20.0%
70	MAU1	#1 auxiliary manual output% MAU1	0045H	69	16 bit integer 10 hex	R/W RAM	Reading gain 0.1, unit is %, read 0 means 0.0%, write 200, means 20.0%
71	MAU2	#2 auxiliary manual output% MAU2	0046H	70	16 bit integer 10 hex	R/W RAM	Reading gain 0.1, unit is %, read 0 means 0.0%, write 200, means 20.0%

Remark: you can't active the manual control mode if the controller are under stop mode

5.2.11 OLL/OHH output merge "LCK-0040"



Parameters stored in EEPROM

No	Notation	Parameter type	HEX	Hex 10	Data format	R/W	Remarks
76	OLL	output low limit merge	004BH	75	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, factory default=3.0 read 0 means 0.0%, write 30 means 3.0% when the output is less than <oLL%, the output will be 0%
77	OHH	output high limit merge	004CH	76	16 bit integer 10 hex	R/W	Reading gain 0.1, unit is %, factory default=3.0 read 0 means 0.0%, write 30 means 3.0% when the output is larger than >(100%-oHH%) the output will be 100%

6. DR04C-653 quick start guide

6.1 Communication , baud rate, CRC check, please refer to 5.2.2 under "LCK-0202" for more details
6.2 RUN/STOP function, refer to 5.2.3, section 12 under "LCK-0010" for more details
6.3 Auto-tuning AT, refer to 5.2.3, section 11 under "LCK-0010" for more details
6.4 Auto/manual control, refer to 5.2.10 section 67 under "LCK-0020" and M1, M2, MAU1,MAU2 for more details
6.5 SV setting
Refer to 5.2.4 under section 13-section 16 for details on how to set SP1/SP2 and AU1/AU2, the SP1 and SP2 stored in the EEPROM, the SP1 and SP2 value will be restored to the value right before the power off, but the EEPROM can only be written and erased at maximum 100,000 times, this is not an ideal choice if you have a project where you need to write and erase the data on a high frequency, please go to LCK-0101 menu and change the setting from EEPROM to RAM=1111, refer to section 66 under LCK-0101 for more details
6.6 Output OP1/OP2 setting
The physical nature of the output was fixed once you order with us, but the way you use the output is configurable, the OP1/OP2 can be configured as reverse/direct control
(1) Set OP1 or OP2 as reverse/direct(heating/cooling) control, refer to 5.2.9 section 65 under LCK-0101, locate OUd.
oUd=xxx0: OP1 will be set as reverse control mode/heating control mode OUd=xxx1: OP1 will be set as direct control mode/cooling control mode
oUd=xx0x: OP2 will be set as reverse control mode/heating control mode OUd=xx1x: OP2 will be set as direct control mode/cooling control mode
(2) Refer to 5.2.5 under LCK-0011 menu to change the control mode from PID mode to ON/OFF mode for #1 channel, proceed the same configuration for #2 channel under 5.2.6 under LCK-0012
6.7 AU1/AU2 relay configured as alarm output relay
(1) AU1 assigned as the deviation high/process high alarm for #1 channel
Step 1: goes to LCK-0101, section 57, set parameter U1=1/2/3/4(AU1 can be assigned as the alarm output for #1 or #2 channel depends on the setting)
U1=1, AU1 assigned as the deviation alarm for #1 channel or auxiliary PID output, alarm target value=SP1+AU1
U1=2, AU1 assigned as the absolute alarm for #1 channel or auxiliary PID output, alarm target value is AU1
U1=3, AU1 assigned as the deviation alarm for #2 channel or auxiliary PID output, alarm target value=SP2+AU1
U1=4, AU1 assigned as the absolute alarm for #2 channel or auxiliary PID output, alarm target value is AU1
Step 2: refer to menu section 65 under LCK-0101 and locate parameter OUd, put OUd=x0xx, AU1 will be assigned as low alarm, oUd=x1xx, AU1 will be used as high alarm.
Step 3: refer to menu section 35 under LCK-0013, and locate parameter AU1.P=0.0, turn off the auxiliary PID output function, AU1 will be used as alarm
Step 4: refer to menu section 39 under LCK-0013, and locate parameter AU1.y to set the alarm hysteresis.

(1) AU2 assigned as the process low alarm for #2 channel
Step 1: goes to LCK-0101, section 58, set parameter U2=1/2/3/4(AU2 can be assigned as the alarm output for #1 or #2 channel depends on the setting)
U2=1, AU2 assigned as the deviation alarm for #1 channel or auxiliary PID output, alarm target value=SP1+AU2
U2=2, AU2 assigned as the absolute alarm for #1 channel or auxiliary PID output, alarm target value is AU2
U2=3, AU2 assigned as the deviation alarm for #2 channel or auxiliary PID output, alarm target value=SP2+AU2
U2=4, AU2 assigned as the absolute alarm for #2 channel or auxiliary PID output, alarm target value is AU2
Step 2: refer to menu section 65 under LCK-0101 and locate parameter OUd, put OUd=1xxx, AU2 will be assigned as high alarm, oUd=0xxx, AU2 will be used as low alarm.
Step 3: refer to menu section 44 under LCK-0013, and locate parameter AU2.Pas set as 0.0, turn off the auxiliary PID output function, AU2 will be used as alarm
Step 4: refer to menu section 48 under LCK-0013, and locate parameter AU2.y to set the alarm hysteresis.
6.8 AU1/AU2 relay assigned as digital I/O ports
(1) AU1 assigned as the digital I/O ports
Step 1: refer to menu at section 57, under parameter LCK-0101 and set U1=0
Step 2: refer to menu at section 3, if you write BIT0=0 under address 0002H, no output on AU1, if you write BIT=1, AU1 output energized
(2) AU2 assigned as the digital I/O ports
Step 1: refer to menu at section 58, under parameter LCK-0101 and set U2=0
Step 2: refer to menu at section 3, if you write BIT1=0, no output on AU2, if you write BIT1=1, AU2 output energized
6.9 AU1/AU2 output assigned as cooling output for #1 or #2 channel
(1)Assigned AU1 as cooling output for #1 channel
Step 1, refer to section 57 on menu under LCK-0101 and set U1=1, U1=1 means AU1 assigned as deviation alarm or PID auxiliary output for #1 channel, alarm value or auxiliary output target value is SP1+AU1
Step 2, refer to section 65 on menu under LCK-0101 and set OUd=x1xx, put AU1 as cooling PID or high alarm
Step 3, refer to section 35 on menu under LCK-0013 and set AU1.P as any value other than 0.0 to turn on the PID function
(2)Assigned AU2 as cooling output for #2 channel
Step 1, refer to section 58 on menu under LCK-0101 and set U2=2, U2=3 means AU2 assigned as deviation alarm or PID auxiliary output for #2 channel, alarm value or auxiliary output target value is SP2+AU2
Step 2, refer to section 65 on menu under LCK-0101 and set OUd=1xxx, put AU2 as cooling PID or high alarm
Step 3, refer to section 44 on menu under LCK-0014 and set AU2.P as any value other than 0.0 to turn on the PID function