AT02B

PID
TEMPERATURE CONTROLLER
User's Manual

RESTRICTIONS ON USE

When using this product in applications that require particular safety or when using this product in important facilities, please pay attention to the safety of the overall system and equipment. Install fail-safe mechanisms, perform redundancy checks and periodic inspections and adopt other appropriate safety measures when it is necessary. This product is rated at Class Ⅱ ▣ .Serviced by trained and skilled personnel only.

SAFETY PRECAUTION

This manual uses the following symbols to ensure safe operation of this timer.

⚠ **WARNING** Warnings are indicated when mishandling this product might result in death or serious injury to user.

⚠ **CAUTION** Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to the timer.

⚠ WARNING

- Note this incorrect wiring of this product can damage it and lead to other hazards. Make sure the product has been correctly wired before turning the power ON.
- Before wiring, or removing / mounting the product, be sure to turn the power OFF. Failure to do so might cause electric shock.
- Do not touch electrically charged parts such as the power terminals. Doing so might cause electric shock.
- Do not disassemble the product. Doing so might cause electric shock or faulty operation.

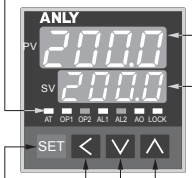
⚠ CAUTION

- Use the product within the operating ranges recommended in the specification (temperature, humidity, voltage, shock, mounting direction, atmosphere etc.). Failure to do so might cause fire or faulty operation.
- Firmly tighten the wires to the terminal. Insufficient tightening of the wires to the terminal might cause fire.

NAMES AND FUNCTIONS OF FACEPLATE

LEDs
AT: Lit when the auto tuning is ON.
OP1,OP2: Lit when the control output is ON.
AL1,AL2: Lit when the alarm output is ON.
AO: Lit when the linear output is ON.
LOCK: Lit when the key is locked.

SET: Switches the display. Hold down for 1 seconds to switch modes.



※ Different models may vay.

Upper Display: Displays PV values (current temperature, etc.) or setup items.

Lower Display: Displays SV values (set temperature, etc.) and other parameter values.

∨ ∧: Used to change numeric values.

∨ press for 1 seconds to lock & unlock the SV value.

<: Used to shift setup items or parameter digits.

INITIALIZATION

1.Make sure the key lock code value is (1122), as shown below.

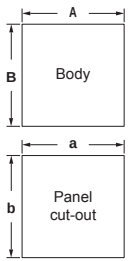
2.Turn off the power.

3.Press and hold both SET & ∧ key at the same time. Turn on the power till the Display is shown, then release key, as shown below.

SPECIFICATIONS

Operating voltage		AC/DC: 100-240V	
Allowable operating voltage range		85 ~ 110% of rated operating voltage	
Rated frequency		50/60Hz	
Input	-□02B-0□	Thermocouple	K, J, R
		RTD	Pt100
	-□02B-1□	Analog	Current(4~20mA)
Output1	SW5 OFF	Relay	240VAC 3A (Resistive load)
	SW5 ON	SSR	DC 24V
Output2	-□02B-□1	Relay(OP2)	240VAC 3A (Resistive load)
	-□02B-□2	Alarm 2(Relay)	240VAC 3A (Resistive load)
	-□02B-□3	Communication	RS-485
	-□02B-□4	Linear	Current(4~20mA)
	-□02B-□5	SSR(OP2)	DC 24V
Alarm		240VAC 3A (Resistive load)	
Control method		PID, PI, P, ON/OFF, Dead Band	
Power consumption		Approx. 3.5VA	
Life		Mechanical : 5,000,000 times Electrical : 100,000 times	
Ambient temperature		-10～+50℃ (without condensation & freezing)	
Ambient humidity		35 ~ 80%RH (without condensation)	
Altitude		MAX 2000m	
Weight		AT-402B ～ 195g , AT-502B ～ 150g AT-702B ～ 210g , AT-902B ～ 255g	

DIMENSION(mm)



AT02B	Body A	Body B	Panel cut-out a	Panel cut-out b
AT-402B	48	96	45.5 +0.5 -0	91 +0.5 -0
AT-502B	48	48	45.5 +0.5 -0	45.5 +0.5 -0
AT-702B	72	72	67.5 +0.5 -0	67.5 +0.5 -0
AT-902B	96	96	91 +0.5 -0	91 +0.5 -0

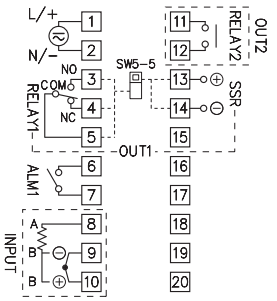
Unit=mm

FEATURES

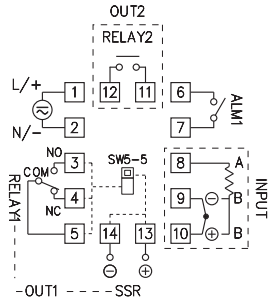
Measuring accuracy	Within ±0.3% of present value or ± 2°C whichever is greater
Proportional band(P)	0.1 ~ 3000 (0.1 units)
Integral time(I)	0 ~ 7200sec (1-second units)
Derivative time(D)	0 ~ 1800sec (1-second units)
Control period	1 ~ 65sec (1-second units)
Sampling period	250ms
Memory protection	EEPROM (write cycles : Approx. 100,000)

CONNECTION

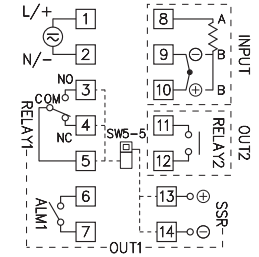
AT-402B / 902B



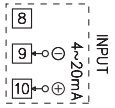
AT-502B



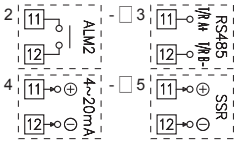
AT-702B



AT-□02B-1□ INPUT



AT-□02B-1□ OUT2



【Table 1】Key Lock Mode

○Can display and can be set ×Can't display nor can't be set

LoCY	uSEr	CntL	SEt	HidE
	○	×	×	×
22	○	○	×	×
111	○	○	○	×
1122	○	○	○	○

【Table 4】Input Mode

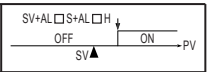
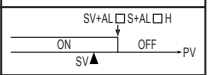
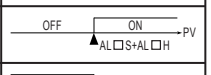
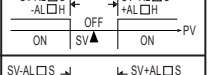
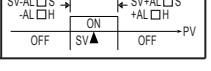
0	K, J, R, Pt100 Sensor input AT-□02B-0□
1	4~20mA Linear Output AT-□02B-1□

【Table 5】Output 2 Mode

0	None	AT-□02B-□0
1	Output 2 (RELAY)	AT-□02B-□1
2	Alarm 2 (RELAY)	AT-□02B-□2
3	RS485 Communication	AT-□02B-□3
4	4~20mA Linear Output	AT-□02B-□4
5	SSR	AT-□02B-□5

【Table 2】Alarm Function

AL1F	AL2F	AL1S	AL2S
1	Deviation High Alarm	-200.0~200.0	
2	Deviation Low Alarm	-200.0~200.0	
3	Process High Alarm	Input type see (Table 3)	
4	Process Low Alarm		
5	Deviation High / Low Alarm	0.0~200.0	
6	Band Alarm	0.0~200.0	
7	Deviation High Alarm (Standby)	-200.0~200.0	
8	Deviation Low Alarm (Standby)	-200.0~200.0	
9	Process High Alarm (Standby)	Input type see (Table 3)	
10	Process Low Alarm (Standby)		
11	Deviation High/Low Alarm (Standby)	0.0~200.0	
12	Band Alarm (Standby)	0.0~200.0	

Deviation High Alarm	
Deviation Low Alarm	
Process High Alarm	
Process Low Alarm	
Deviation High / Low Alarm	
Band Alarm	

【Table 3】SW5 - DIP Switch setting ⚠Warning! Please make sure the power is off, before making any changes

SW5 - DIP Switch			1	2	3	4	5	6
Input type	K	0~1200OC	ON	OFF	OFF			
	J	0~500OC	ON	ON	OFF			
	R	0~1700OC	ON	OFF	ON			
	Pt100	-50~400OC	OFF	ON	ON			
	Linear	-999~3200	N/A	N/A	N/A			
Control Mode	ON/OFF control					OFF		
	PID control					ON		
Control Mode	RELAY						OFF	
	SSR(DC 24V)						ON	
Control Mode	Key protect off							OFF
	Key protect on							ON

【Table 6】Communication Parameters and Addresses

		19	Act
01	LoCY	1A	dP
02	SV	1B	unit
03	AL1S	1C	LoSP
04	AL2S	1D	HiSP
05	Alt	1E	FiLt
06	PYoF	1F	AiLP
07	SYoF	20	AiHP
08	OutL	21	AiLS
09	HSt1	22	AiHS
0A	HSt2	23	AO
0B	P1	24	AOLS
0C	i1	25	AOHS
0D	d1	26	bAud
0E	Ct1	27	Addr
0F	P2	28	1-2
10	i2	29	1-3
11	d2	2A	1-4
12	Ct2	2B	1-5
13	db	2C	1-6
14	FUEY	2D	1-7
15	AL1F	2E	PYHS
16	AL1H	100	PV
17	AL2F		
18	AL2H		

Product is subject to change without notice.

操作流程說明

All displays are lit for 6 seconds, when the power is ON.

Operation Mode set value

SET 1sec → Level setting (LEVL uSEr) ▽ 1sec → Lock Code (Table 1) (LoCK 1122) SET 1sec → Change Code

SET → User submenu

User submenu

① AL 1S 10.0 — Alarm 1 Set Value
-200.0~200.0

② AL2S 10.0 — Alarm 2 Set Value (Note 1)
-200.0~200.0

③ At no — Auto Tuning (Note 4)
YES/no

④ PvoF 0.0 — PV Offset
-200.0~200.0

⑤ SvoF 0.0 — SV Offset
-200.0~200.0

⑥ OutL 0.0 — Output level percentage
0.0~100.0%

Back to **Operation Mode**

Control submenu (LEVL CntL)

① LEVL CntL — Control submenu

② HSt1 0.1 — Output 1 Hysteresis (Note 2)
0.0~200.0

③ HSt2 0.1 — Output 1 Hysteresis (Note 2,3)
0.0~200.0

④ P1 12.0 — Output 1 Propotional Band (Note 4)
0.1~3000

⑤ I1 240 — Output 1 Integral Time (Note 4)
0~7200 sec

⑥ d1 60 — Output 1 Derivative Time (Note 4)
0~1800 sec

⑦ Ct1 15 — Output 1 Cycle Time (Note 4,5)
1~65 sec

⑧ P2 12.0 — Output 2 Propotional Band (Note 3,4)
0.1~3000

⑨ I2 240 — Output 2 Integral Time (Note 3,4)
0~7200 sec

⑩ d2 60 — Output 2 Derivative Time (Note 3,4)
0~1800 sec

⑪ Ct2 15 — Output 2 Cycle Time (Note 3,4)
1~65 sec

⑫ db 0.0 — Dead Band / Overlap (Note 3)
-200.0~200.0

⑬ FUZY On — Fuzzy (Note 3)
On/OFF

Back to **Output 1 Hysteresis**

Setting submenu (LEVL SEt)

① LEVL SEt — Setting submenu

② AL 1F 1 — Alarm 1 Action Function (Table 2)
1~12

③ AL 1H 0.0 — Alarm 1 Hysteresis
-200.0~200.0

④ AL2F 1 — Alarm 2 Action Function (Table 2,Note 1)
1~12

⑤ AL2H 0.0 — Alarm 2 Hysteresis
-200.0~200.0

⑥ Act Ht — Control Action Selection(Note 6)
Ht/CL

⑦ dP 0.0 — Decimal Point
0/0.0

⑧ un it °C — Unit Selection
°C/°F

⑨ LoSP 0.0 — Low Set Point (Table 3)
LoSP~HiSP

⑩ HiSP 1200 — High Set Point (Table 3)
LoSP~HiSP

⑪ PvHS 0 — PV Hysteresis
0~200

⑫ FiLt 1 — Digiial Filter
0~120sec

⑬ AiLP 0.0 — Analog Input Low point (Note 7)
-999~3200

⑭ AiHP 100.0 — Analog Input High point (Note 7)
-999~3200

⑮ AiLS 3E28 — Analog Input Low scale (Note 7)
▽ 1sec to save

⑯ AiHS AA4F — Analog Input High scale (Note 7)
▽ 1sec to save

Hide submenu (LEVL HidE)

① LEVL HidE — Hide submenu

② 1-2 AL 1S — Parameter 2
non/AL1S/ AL2S/At/PvoF/ SvoF/OutL

③ 1-3 AL2S — Parameter 3
non/AL1S/ AL2S/At/PvoF/ SvoF/OutL

④ 1-4 At — Parameter 4
non/AL1S/ AL2S/At/PvoF/ SvoF/OutL

⑤ 1-5 PvoF — Parameter 5
non/AL1S/ AL2S/At/PvoF/ SvoF/OutL

⑥ 1-6 SvoF — Parameter 6
non/AL1S/ AL2S/At/PvoF/ SvoF/OutL

⑦ 1-7 OutL — Parameter 7
non/AL1S/ AL2S/At/PvoF/ SvoF/OutL

Back to **Parameter 2**

⑰ AO Pv — Analog Output Selection (Note 8)
Pv/Sv/dEv/mv

⑱ AOLS 15.8 — Analog Output Low Scale (Note 8)
0.0~100.0%

⑲ AOHS 92.0 — Analog Output High Scale (Note 8)
0.0~100.0%

⑳ bAud 9.6E — Baud Rate (Note 9)
2.4K/4.8K/9.6K
19.2K/38.4K

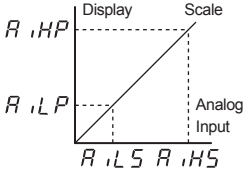
㉑ Addr 1 — Address (Note 9)
0~31

Back to **Alarm 1 Action Function**

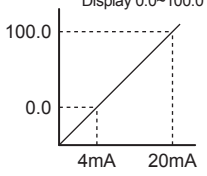
【Note 1】For AT-□02B-□2 only
【Note 2】For ON/OFF control mode only (see Table3)
【Note 3】For AT-□02B-□1 & AT-□02B-□5 only
【Note 4】For PID control mode only (see Table3)
【Note 5】Cycle Time for Output1:
Adjustable from 1~65 sec for RELAY output,
fixed 1 sec for DC24V output (see Table3)
【Note 6】Out1 action. Select "Ht" for heating or "CL"cooling. If Out2 is available, its action is opposite from Out1.

【Note 7】For AT-□02B-1□ only

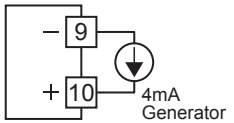
● Analog Input Scale



● Example: Input 4~20mA, Display 0.0~100.0

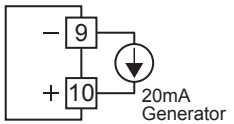


● Analog Input Low Scale calibration
1. Wire according to the diagram
2. Select【Analog Input Low Scale】
3. Press-and-hold ▽ key to save parameter



AT-□02B-1□

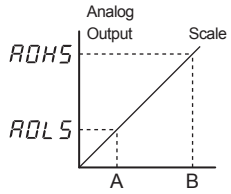
● Analog Input High Scale calibration
1. Wire according to the diagram
2. Select【Analog Input High Scale】
3. Press-and-hold ▽ key to save parameter



AT-□02B-1□

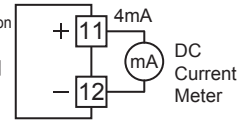
【Note 8】For AT-□02B-□4 only

● Analog Output Scale



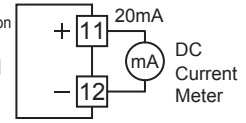
Mode	AO	A	B
PV	Pv	LoSP	HiSP
SV	Sv	LoSP	HiSP
PV-SV	dEv	LoSP	HiSP
Output1	nv	0.0	100.0

● Analog Output Low Scale calibration
1. Wire according to the diagram
2. Select【Analog Output Low Scale】
3. Press-and-hold ◁ ▽ △ key to adjust output to 4mA



AT-□02B-□4

● Analog Output High Scale calibration
1. Wire according to the diagram
2. Select【Analog Output High Scale】
3. Press-and-hold ◁ ▽ △ key to adjust output to 20mA



AT-□02B-□4

【Note 9】For AT-□02B-□3 only
● Interface : RS485
● Baud Rate : 2400, 4800, 9600, 19200, 38400
● Data Format : ModBus protocol RTU mode (Table 6)
● Data Frame:

0	B0	B1	B2	B3	B4	B5	B6	B7	1

1 start bit — 8 data bit — 1 stop bit

● RTU Request : Read command

0	1	2	3	4	5	6	7
Station Number	0x03	Address		0x0001		CRC-16	

● RTU Response : Read command

0	1	2	3	4	5	6
Station Number	0x03	0x02	Address		CRC-16	

● RTU Request : Write command

0	1	2	3	4	5	6	7
Station Number	0x06	Address		Data		CRC-16	

● RTU Response : Write command

0	1	2	3	4	5	6	7
Station Number	0x06	Address		Data		CRC-16	