ANLY ELECTRONICS CO., LTD.

AT03 PID Temperature Controller
User's Manual

AT - 403 / AT - 503 / AT - 603 / AT - 703 / AT - 903

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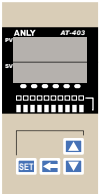
Chapter 0 : Overview

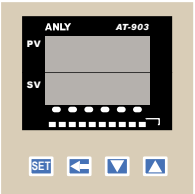
ANLY AT03 series is an 1 input, 2 output, 3 alarm, auto-tuning PID temperature controller designed to accommodate comprehensive needs in process automation and system integration.

Wide ranges of inputs are accepted, including thermocouple (T/C: type K, J, T, R, E, S, B, N), Resistive Temperature Device (RTD: Pt100, JPt100) and linear input (voltage, current). Up to 2 output controls include relay, SSR, linear voltage, linear current and signal retransmission. Servo motor control is also possible. Up to 3 alarms are available and each has different functions and modes for customizations. This controller can have up to 8 segments for a single process.

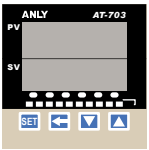
A separate optionsl channel allows Remote Set Point via linear voltage or linear current. The same channel can also be used for current transformer for heater break alarm. The users may chose between RS-232 and RS-485 communication modules for links up with computer for programming.



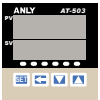
AT - 403



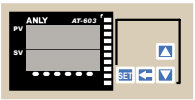
AT - 903



AT - 703



AT - 503



AT - 603

Chapter 1 : Specification

Detaile Information

Detail Specification	
Type	AT - 403 / AT - 503 / AT - 603 / AT - 703 / AT - 903
Operating voltage	100 ~ 240VAC
Rated Frequency	50 / 60 Hz
Power Consumption	Approximately 3.5VA
Sensor input	Thermocouple : K, J, T, R, E, S, B, N
	RTD : Pt100, JPt100
	Linear : Voltage, Current
Control output	Relay, Voltage, Linear, Motor Control
Alarm output	250VAC, 5A
Alarm fucntion	See Table on Page 49
Control method	PID, PI, P, On/OFF, Dead band
Setting	Digital setting with front keys
Communication	RS-232 or RS-485 (both optional)
Indicator	4-digit 7-segment-display
Ambient temperature	-10°C ~ +50°C
Storage temperature	-25°C ~ +65°C
Ambient humidity	34%~80% relative humidity with no icing or condensation
Storage humidity	35%~95% relative humidity with no condensation

Detail Specification (Continue)	
Weight (only approximation, actual figures varie depending on the options chosen)	AT-403: ~170g
	AT-503: ~125g
	AT-603: ~170g
	AT-703: ~200g
	AT-903: ~250g

Detail Features	
Measuring accuracy	Within 0.3% of present value or +-2OC, whichever is greater
Propotional Band	0.0 ~ 3000 sec (0.1 sec increment)
Integral Time	0 ~ 3600 sec (1 sec increment)
Derivative Time	0 ~ 900 sec (1 sec increment)
Control Period	0 ~ 150 sec (1 sec increment)
Sampling Period	300ms
Memory Protection	EEPROM non-volatile memory (at least 100,000 write cycle)

Ordering Information

ANLY AT03 can be customized to specific needs and requirements. The ordering code consists of a 10-digit numeral in 3-4-3 format :

A T - □ 0 3 - □ □ □ □ - □ □ □

“03” is the designation for AT03 series controllers. The following explains the representation of the remaining 8 numerals.

A T - ■ 0 3 - □ □ □ □ - □ □ □

Dimension
4 = 96x48mm (1/8 DIN)
5 = 48x48mm (1/16 DIN)
6 = 48x96mm (1/8 DIN)
7 = 72x72mm
9 = 96x96mm (1/4 DIN)

The dimension size is a measurement for the device face plate. Note that AT-402 is vertical while AT-603 is horizontal, although they have the same DIN size.

A T - □ 0 3 - ■ □ □ □ - □ □ □

Input
1 = T/C or RTD
2 = 0~100mV
3 = 0~20mA
4 = 4~20mA
5 = 0~5V
6 = 0~10V
7 = 1~5V
8 = 2~10V
9 = 0~1V

1 is for both thermocouple and RTD sensor inputs. However, the sensor type also needs to be specificied by users under Level menu. 2 through 9 are for linear inputs.

A T - □ 0 3 - □ ■ ■ □ - □ □ □

Output 1	Output 2
(1 is standard)	0 = None
1 = Relay	1 = Relay
2 = Pulsed	2 = Pulsed
3 = 0~20mA	3 = 0~20mA
4 = 4~20mA	4 = 4~20mA
5 = 0~5V	5 = 0~5V
6 = 0~10V	6 = 0~10V
7 = 1~5V	7 = 1~5V
8 = 2~10V	8 = 2~10V
9 = Motor Control	

A relay output on Ouput 1 is standard on all AT03. It can be changed to any of the 9 types. Note that motor control on Output 1 uses 3 terminals. Therefore, Motor Control option is not available with Output 2. Therefore, “90” is the code for motor controlo output.

A T - □ 0 3 - □ □ □ ■ - □ □ □

Alarm
1 = 1 alarm
2 = 2 alarms
3 = 3 alarms

1 alarm is standard on all AT03. There can be upt o 3 alarms on AT-403, AT-603, AT-703 and AT-903. However, AT-503 can only have up to 2 alarms.

AT- □ 0 3 - □ □ □ □ - ■ □ □

Other
0 = None
1 = DC 24V
2 = Current Transformer
A = Remote Set Point 0~20mA
B = Remote Set Point 4~20mA
C = Remote Set Point 0~5V
D = Remote Set Point 0~10V
E = Remote Set Point 1~5V
F = Remote Set Point 2~10V

In Other option, there can be inputs for DC24V, current transformer and Remote Set Point (R-SP). Current transformer is used as the heater break alarm. R-SP is used to change SV remotely with volatage or current. AT-403 is availiable with Other option but this will negate Ouput2.

AT- □ 0 3 - □ □ □ □ - □ ■ □

Communication
0 = None
1 = RS=232
2 = RS-485

Communication module, such as RS-232 and RS-485 module, is availiable for direct link up with PC for programming.

AT- □ 0 3 - □ □ □ □ - □ □ ■

Program
0 = None
1 = Program

Program is the option that gives the controller segment programming.

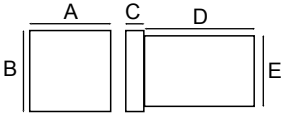
Some models, due to their limited terminals, cannot be ordered with all the features. Such limitations are:

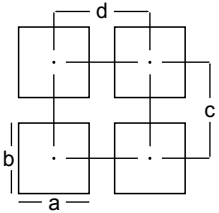
AT-503 is not available with the Other and the 3 alarms options. Also, AT503 only uses two terminals for its RS-485 communication while others use three terminals

Servo motor control option occupies one Output 2 terminal. Hence, the Motor Control and Output 2 are not available on the same device.

An example of order code is AT – 903 – 1111 – 000. It would have 1/4 DIN size, a sensor input, 2 relay outputs, 1 alarm, no Other option, no Communication option and no Program Control options

Chapter 2 : Installation





	Device Measurement					Panel Cutout Measurement			
Type	A	B	C	D	E	a	b	c	d
AT-403	48	96	10.5	83	90	$46^{+0.5}$	$91^{+0.5}$	120	70
AT-503	48	48	10.5	83	45	$46^{+0.5}$	$46^{+0.5}$	70	70
AT-603	96	48	10.5	83	43	$91^{+0.5}$	$46^{+0.5}$	70	120
AT-703	72	72	10.5	83	67	$68^{+0.5}$	$68^{+0.5}$	100	100
AT-903	96	96	10.5	83	90	$91^{+0.5}$	$91^{+0.5}$	120	120

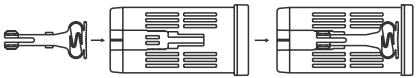
All measurements in millimeter (mm)

Mounting Procedure

1. Make sure the front panel is no more than 10mm thick. Also, each of the two brackets needs additional 6mm clearance outside of the shell casing on each side.

2. Make a panel cut-out precise to the measurement according to the type. (see the table on the previous page)

3. Insert the controller into the cutout from the front side of the panel



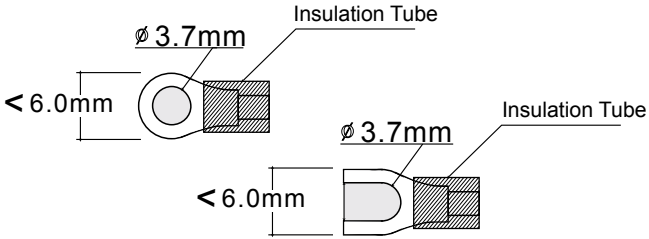
4. Align the bracket so the notches are in their slots and the wide side towards the front panel.

5. Pinch the prongs and slide the bracket forward till the bracket is firmly against the backside of the front panel.

6. Repeat step 3 through 5 with another bracket on the other side.

Terminals

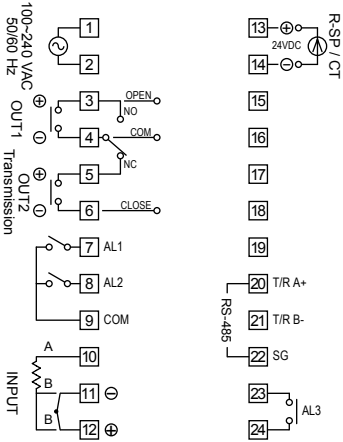
For wire terminations, the recommended terminals are fork or ring terminals with #6 stud size, narrow tongue, and with insulation. Wire gauge should be at least AWG 18.



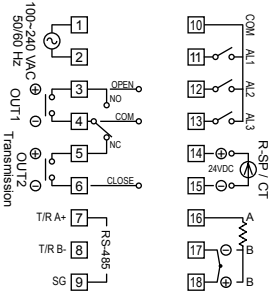
Of all 5 types of ANLY AT03, there are 3 styles of terminal arrangements. AT-503 has 14 usable terminals; AT-403/603/903 have 19 usable terminals; AT-703 has 18 usable terminals. Each terminal has numbering on the edge of the casing for easy identification.

The terminal layout for different models are as followed.

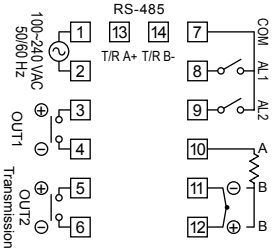
AT-403 / AT-603 / AT-903



AT-703

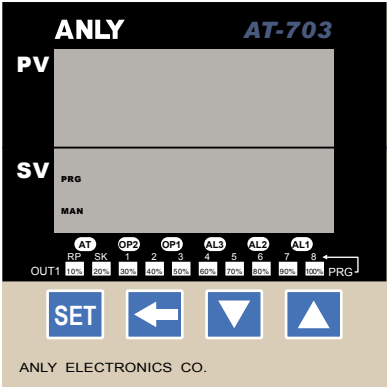


AT-503



Chapter 3 : Programming

Terminology



PV **Process value display**

SV **Set value display**

PRG **Programmable mode indicator**

MAN **Manual mode indicator**

AT **Auto tuning indicator**

OP2 **OP1** **Control output 2, 1 indicator**

AL3 **AL2** **AL1** **Alarm output 3, 2, 1 indicator**

10% ~ 100% **Manipulated output display**

1 ~ 8 **Segment-in-process display**

RP **Soaking mode indicator**

SK **Ramping mode indicator**

Set Key
used to navigate within the hierachal set-up menu

Shift Key
used to shift in and out of the adjust mode

Down Key
used to decrease a value or to scroll down. When not in programming mode, press-and-hold to call up lock or hold function.

Up Key
used to increase a value or to scroll up.
When not in programming mode, press-and-hold to go back to the standby display.

Press-and-Release
press a key and release it immediately

Press-and-Hold
press a key and hold it untill the display has changed

Menu mode
a heirarchal tree menu with the PV display showing the menu title and the SV display showing the submenu or the parameter.

Adjust mode
when the value at the SV diaply is flashing and ready to be adjusted with the down or up button.

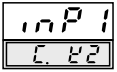
Standby mode
when the red PV display is sowing the temperature's present value and the SV display is showing the set value. At this mode, the controller can ne changed to Menu mode or Operation mode.

Operation mode
when the device is running

Power-up Sequence

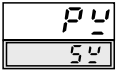
When the controller is powered up, it goes through 4 diagnostic stages.

1st stage: All displays light up. Users can verify that all display LEDs are functional.



2nd stage: The PV display shows Input1 and the SV display shows the temperature unit used, C. for Celsius and F. for Fahrenheit. Following the unit is the sensor type and range.

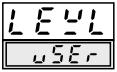
3rd stage: The displays show the range of temperature according to the chosen sensor type and range. PV display shows the minimum and the SV display shows the maximum



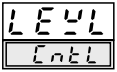
4th stage: The controller goes to the standby mode and the device is operational.

Hierarchal Tree Menu

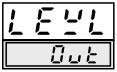
ANLY AT03 has a hierarchal tree menu to organize the parameters and functions. There are 7 Submenus under Level.
When not in the adjust mode, press-and-hold Set or Up will always bring the device to Standby mode.



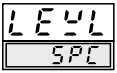
User (uSEr) submenu



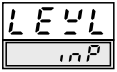
Control (CntL) submenu



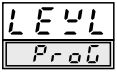
Output (Out) submenu



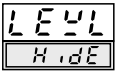
Special Control (SPC) submenu



Input (inP) submenu



Program (ProG) submenu



Hide (HidE) submenu

Device Hold

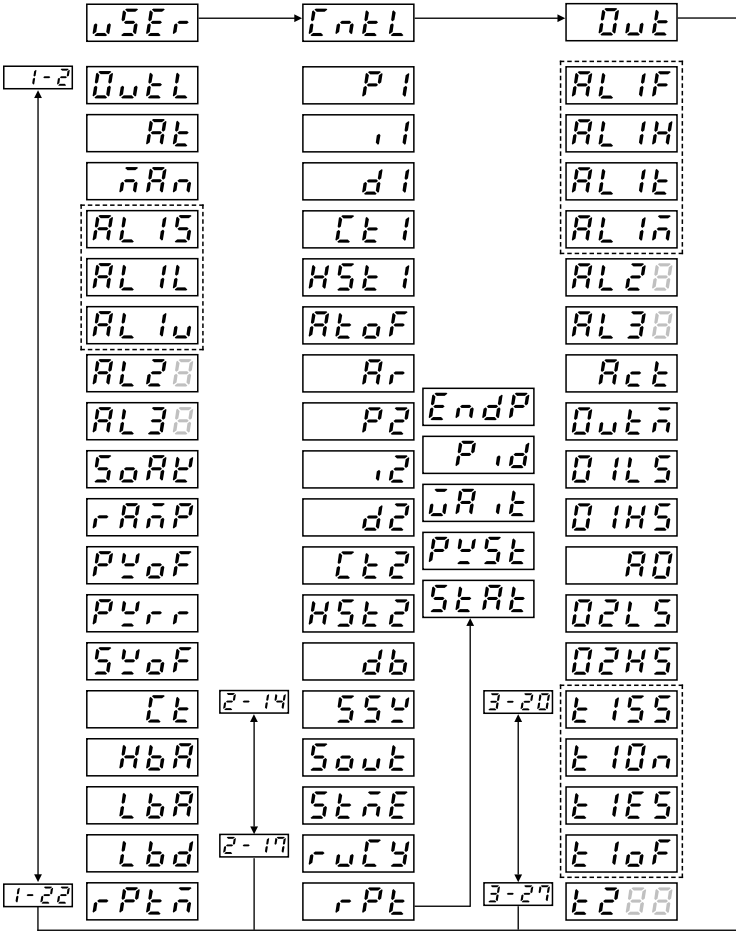
In Standby mode, press-and-hold Down to enter Hold mode. In the Hold mode, the SV display will be flashing HoLd, meaning all operation has been suspended.

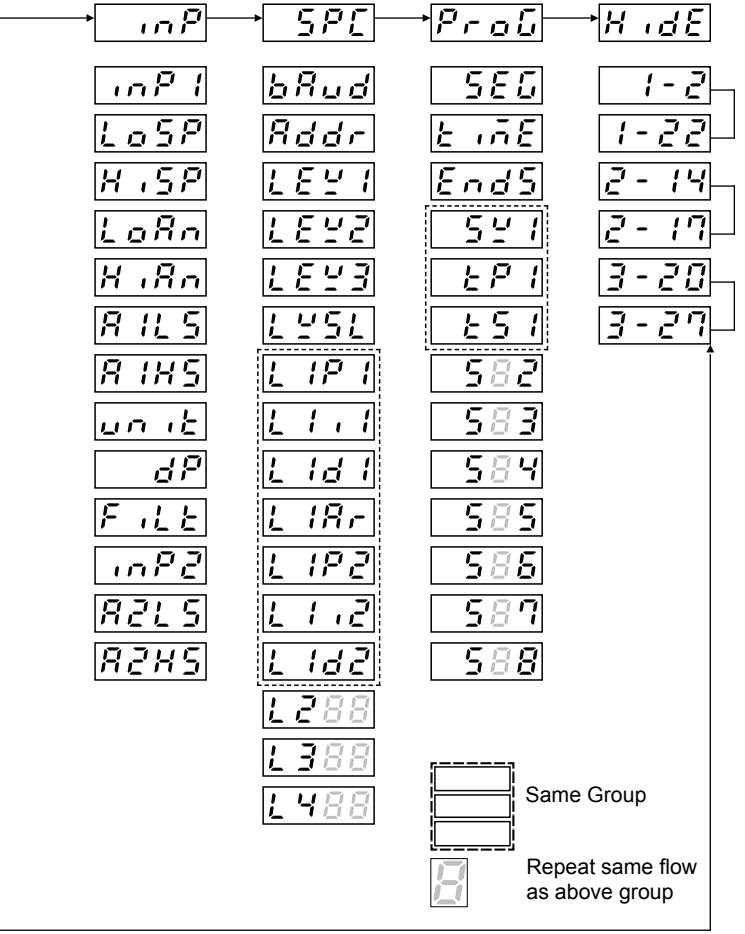
Device Lock

Under Level menu, press-and-hold Down to enter the lock parameter submenu. The parameter is freely adjustable from 0 to 9999. However, only 10 numbers will lock the device in specific ways. The following table details the number and the corresponding table function.

Device Lock Code And Function	
Lock Code	Function
0	all parameters are locked except PV
101	all parameters are locked except SV
11	open “USER” level and above
22	open “CNTL” level and above
111	open “OUT” level (except OUTM) and above
222	open “INP” level and above
1100	open “SPC” level and above
2200	open “PROG” level and above
1122	open “HIDE” level and above
1234	open “USER” and “PROG” level only

Parameter Flow Chart




inP
SPC
ProG
HidE
inP1
LoSP
HiSP
LoAn
HiAn
A1LS
A1HS
unit
dP
FiLt
inP2
A2LS
A2HS
bAud
Addr
LEY1
LEY2
LEY3
LYSL
L1P1
L1i1
L1d1
L1Ar
L1P2
L1i2
L1d2
L2
L3
L4
SEG
tiME
EndS
SY1
tP1
tS1
S2
S3
S4
S5
S6
S7
S8
1-2
1-22
2-14
2-17
3-20
3-27
Same Group
Repeat same flow
as above group

Parameter Description, Range, Initial Value

PV

Process Value	LoSP ~ HiSP	

SV

Set Value	LoSP ~ HiSP	0.0

USER submenu

(Parameter)	(Range)	(Initial Value)
OutL		
Output level percentage	0.0 ~ 100.0%	0.0
At		
Auto tuning	No / Yes	No
Man		
Manual Mode	Man1 = power failure memory Man2 = no memory No = non	No
AL1S		
Alarm 1 Set Value	AL1F = 1, 2: AL1S = -200 ~ 200 AL1F = 3, 4: AL1S = Losp ~ Hisp AL1F = 10: AL1S = 1 ~ 8 segment	10.0

uSEr USER submenu

(Parameter)	(Range)	(Initial Value)

AL1L AL1L

Alarm 1 Lower Set Value	0 ~ 200	10.0

AL1u AL1u

Alarm 1 Upper Set Value	0 ~ 200	10.0

AL2S AL2L AL2u AL3S AL2L AL2u

For AL2* and AL3* : please refer to the AL1* description above

SoAK SoAK

Soak Operation (only when AL1M= 8 or 9)	0.0 ~ 99.59 hr.min	0.00

“SoAK” only performs when AL1M is set at 8 or 9, and the controller is without program function. If AL1M is set at 8, AL1 will shift to soak function and the contact is normally open; if AL1M is set at 9, AL1 will shift to soak function and the contaact is normally closed.

rAmP rAmP

Ramp Operation	0.0 ~ 200.0 per minute	0.0

“rAmP” sets the rate of change for PV when the controller is without program function. For example, if ramp is set at 10, the PV will increase 10 degree per minute. However, if PV is higher than SV, the PV will decrease 10 degree per minute.

uSEr USER submenu

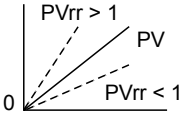
(Parameter)	(Range)	(Initial Value)
PVoF PV Offset	-200 ~ 200	0

If PV is not correct to SV, PV can be offset linearly with positive or negative pvof .

PVrr PV Ratio	0.001 ~ 9.999	1.000

If PV is not correct to SV, PV can be adjusted with “pvrr”. The formula is:

PV (now) - PV (pre) * pvrr + pvof



SVoF SV Offset	-200 ~ 200	0.0

If SV is not correct to PV, SV can be offset linearly with positive or negative “SVoF” .

Ct Current Transformer Monitor	0.0 ~ 100.0 A	0.0

“Ct” is used to detect if the heater is broken. The value ranges from 0.0A ~ 100.0A. (“Ct” is only availiabe if the option is ordered)

uSEr USER submenu

(Parameter)	(Range)	(Initial Value)

HbA HbA

Heater Break Alarm Value	0.1 ~ 100.0 A	0.1

“Hba” ranges from 0.1A ~ 100.0A. For example, when the control output is on and “Ct” <= “Hba”, the heater is broken. The alarm is triggered. Or when the control output is off and “Ct” >= “Hba”, the alarm is then triggered. (“Hba” is only availiabe if the option is ordered)

LbA LbA

Loop Break Alarm Value	0.1 ~ 200.0 min	8.0

Lbd Lbd

LBA Dead Band	0.0 ~ 200.0	0.0

Parameters for Loop break Alarm. For example, when out1 = 0.0% and “lba” has elapsed, PV should be below “lbd”. If PV is till within “lbd”, the alarm is triggered. When out1 = 100% and “lba” time has elapsed, PV should be higher than “lbd”. if PV is till within “lbd”, the alarm is triggered. (“lba” and “lbd” is implemented through firmware only)

rPtm rPtm

Repeat Times Monitor (only in Program function)	1 ~ 1000

“rptm” displays how many times the program has repeated thus far. This parameter only works whenthe controller has program function turned on.

CntL CONTROL submenu

(Parameter)	(Range)	(Initial Value)
P1		
Output 1 Propotional Band	0.0 ~ 3000	30.0
i1		
Output 1 Integral Time	0 ~ 3600 sec	240
d1		
Output 1 Derivative Time	0 ~ 900 sec	60
Ct1		
Output 1 Cycle Time	0 ~ 150 sec	15

"ct1" is the cycle time for output 1. Normally, it is set at 0 for 4~20mA output, 1 for SSR output and 15 for relay output.

HSt1		
Output 1 Hysteresis	0.0 ~ 200.0	0.0
AtoF		
Auto Tuning Offset	-200 ~ 200	0.0
Ar		
Anti-Reset Windup	0.0 ~ 100.0 % (SV-P1*Ar)	100.0

CntL CONTROL submenu

(Parameter)	(Range)	(Initial Value)

"Ar" is for preventing over-shooting. This parameter sets an integral delay. The setting ranges from 0 ~ 100%. At 100%, the integral will perform when PV reaches the propotional band. At 50%, the integral will perform when PV reaches 50% of the propotional band.

P2 P2

Output 2 Propotional Band	0.0 ~ 3000 sec	30.0

i2 i2

Output 2 Integral Time	0.0 ~ 3600 sec	240

d2 d2

Output 2 Derivative Time	0.0 ~ 900 sec	60

Ct2 Ct2

Output 2 Cyclic Time	0 ~ 150 sec	15

HSt2 HSt2

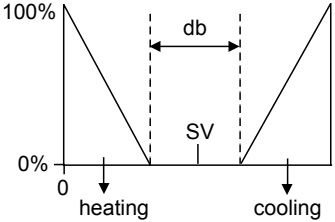
Output 2 Hysteresis	0.0 ~ 200.0	0.0

db

Dead Band / Overlap	-200.0 ~ 200.0	0.0

CntL CONTROL submenu

(Parameter)	(Range)	(Initial Value)



SSV SSV

Soft Start Set Value	0.0 ~ 200.0	120.0

“SSV” is used to prevent the heating system temperature rising too quickly at the start. For example, to achieve 120 degree slowly, “SSV” is set at 120.

Sout Sout

Soft Start Output Percentage	0.0% ~ 100.0 %	30.0

“Sout” sets the output percentage when PV is under “SSV”.

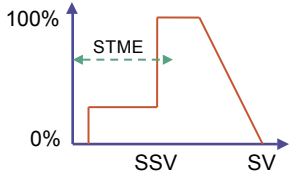
StmE Stme

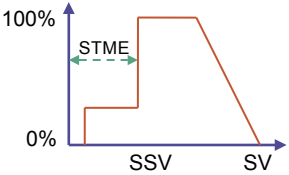
Soft Start Fail Time	0 ~ 10 min	10

“Stme” sets the time interval when the soft start is deemed failed. When the “Stme” time is reached and the PV has not reached “SSV”, the soft start has failed and the controller will revert to SV.

CntL CONTROL submenu

(Parameter) (Range) (Initial Value)

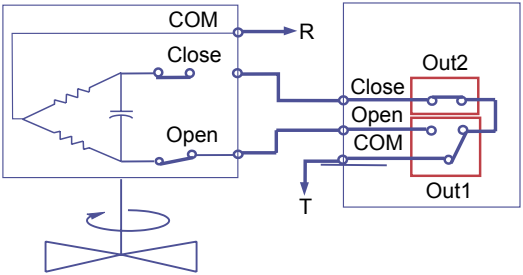




ruCy ruCy

Motor Valve Running Cycle	1 ~ 150sec	5

"ruCy" sets the running cycle time in motor valve control, the time from close to open or from opento close.



rPt rPt

Program Repeat Time	1 ~ 1000	1

"rPt" set the number of times the program will repeat execution.

CntL CONTROL submenu

(Parameter)	(Range)	(Initial Value)

StAt StAt

Start Mode Selection (only in Program function)	CoLd = Manual rSET = start after power ON Hot = start from memory after power failure	CoLd

“StAt” sets the start mode the program. “CoLd” requires manual start. “rSET” starts the program automatically after the power is turned on. “Hot” starts from memory after a power failure.

PVSt PVSt

Start Point Selection (only in Program mode)	rSEt = start from 0 PV = start from PV	rSEt

wAit wAit

Wait Value in Program	0.0 ~ 200.0	0.0

“wAit” sets the time the SV will wait for PV if PV chanes slower than SV.

Pid Pid

PID / Level PID Selection	Pid = PID LPid = Level PID	Pid

“Pid” selects between PID (Pid) and Level PID (LPid). Level PID allows upto 4 level of different PID.

CntL CONTROL submenu

(Parameter)	(Range)	(Initial Value)

EndP EndP

End of Program Control	Cont = Continuous StoP = 1 program only	StoP

"EndP" controls the the flow of the program to be continuous (Cont) or 1-program-only-and-stop (StoP).

Out OUTPUT submenu

(Parameter)	(Range)	(Initial Value)

AL1F AL1F

Alarm 1 Action Function	0 ~ 13	1

Please refer to Chapter 6 : Alarm for functio descriptions

AL1H AL1H

Out

Alarm 1 Hysteresis	0.0 ~ 200.0	0.0

AL1t AL1t

Alarm 1 in Program Mode on Time	0.00 ~ 99.59 hr.min	0.00

AL1M AL1M

Alarm 1 Special Mode Selection	1 ~ 11	0

Please refer to Chapter 6 : Alarm for mode descriptions

Out OUTPUT submenu

(Parameter)	(Range)	(Initial Value)

AL2F AL2H AL2t AL1M

AL3F AL3H AL3t AL3M

For AL2 and AL3, please refer to Al1 description above.

Act

Control Action Selection	CooL / HEAt	HEAt

Outm

Output Mode Selection (Please contact distributor for changes)

Please refer to Chapter 5 : Output for mode descriptions

O1LS

Output 1 Scale Low	0.0 ~ 100.0 %	17.6

O1HS

Output 1 Scale High	0.0 ~ 100.0 %	96.0

AO

Analog Output Selection	PV = transmit PV SV = transmit SV dEV = transmit (PV-SV) MV = transmit output percentage	PV

Out OUTPUT submenu

(Parameter)	(Range)	(Initial Value)
O2LS		
Output 2 Scale Low	0.0 ~ 100.0 %	17.6
O2HS		
Output 2 Scale High	0.0 ~ 100.0 %	96.0
t1SS		
Time Signal 1 Start Segment Setting (only in Program mode)	1 ~ 8	1

"t1SS" sets the segment the alarm will be activated. For example, if the alarm activation is desired in Segment 2, set "t1SS" at 2.

t1On		
Time Signal 1 On Time Setting (only in Program mode)	0.00 ~ 99.59 hr.min	0.01

"t1On" sets the time the alarm will be activated. For example, if the alarm activation is desired after 3 minute in Segment 2, set "t1On" at 3min and "t1SS" at 2. Note that the Program Time in Segment 2 (tP2) may be longer than 3 minute.

t1ES		
Time Signal 1 End Segment Setting (only in Program mode)	1 ~ 8	1

Out OUTPUT submenu

(Parameter)	(Range)	(Initial Value)

"t1es" sets the segment the alarm will be deactivaed. For example, if the alarm deactivation is dersired in Segment 6, set "t1ES" at 6.

t1oF t1oF

Time Signal 1 Off Time Setting (only in Program mode)	0.00 ~ 99.59 hr.min	0.01

"t1oF" sets the time the alarm will be deactivaed. For example, if the alarm deactivation is desired after 7 minute in Segment 6, set "t1oF" at 7min and "t1ES" at 6. Note that the Program Time in Segment 6 may be longer than 7 minute.

t2SS t2SS t2On t2ES t2oF

For t2 parameters descriptions, please refer to see t1 parameters (t1SS, t1On, t2ES, t2oF).

inP INPUT submenu

(Parameter)	(Range)	(Initial Value)

inP1 inP1

Input 1 Selection		K2

LoSP LoSP

Low Set Point	LoSP ~ HiSP	0.0

inP INPUT submenu

(Parameter)	(Range)	(Initial Value)
HiSP		
High Set Point	LoSP ~ HiSP	400.0
LoAn		
Analog Input Range Low	-1999 ~ 9999	0.0
HiAn		
Analog Input High	-1999 ~ 9999	100.0
A1LS		
Analog Inpput 1 Scal Low	0 ~ FFFF	
A1HS		
Analog Input 1 Scale High	0 ~ FFFF	
unit		
Unit Selection	^{O}C / ^{O}F / non	^{O}C
dP		
Decimal Point	0 / 0.0 / 0.00 / 0.000	0.0

inP INPUT submenu

(Parameter)	(Range)	(Initial Value)
FiLt		
Digital Filter	0.001 ~ 1.000	0.900
inP2		
Input 2 Selection	non = no function Ct = current transformer rmSV = remote SV	non
A2LS		
Analog Input 2 Scale Low	0 ~ FFFF	
A2HS		
Analog Input 2 Scale High	0 ~ FFFF	

SPC SPECIAL CONTROL submenu

(Parameter)	(Range)	(Initial Value)
bAud		
Baud Rate	2.4K / 4.8K / 9.6K / 19.2K / 38.4K	9.6K
Addr		
Address	0 ~ 31	0

SPC SPECIAL CONTROL submenu

(Parameter)	(Range)	(Initial Value)
LEV1		
Leve 1 PID Range	LoSP ~ HiSP	400
LEV2		
Level 2 PID Range	LoSP ~ HiSP	400
LEV3		
Level 3 PID Range	LoSP ~ HiSP	400
LVSL		
Level PID Selection Monitor	1 ~ 4	1

Level PID Selection Monitor selects whiche level of PID to be monitored. For example, if Level3 parameters (L3P1, L3P1, L3d1... etc.) are to be monitored, set “LVSL” to 3. Note that PID parameter under CONTROL submenu needs to set at Level PID (LPiD).

L1P1		
Level 1 Propotional Band for Output 1	0.0 ~ 3000	30.0
L1i1		
Level 1 Integral Time for Output 1	0 ~ 3600 sec	240

SPC SPECIAL CONTROL submenu

(Parameter)	(Range)	(Initial Value)
L1d1 L1d1		
Level 1 Derivative Time for Output 1	0 ~ 900 sec	60
L1Ar L1Ar		
Level 1 Anti-Reset Windup	0.0 ~ 100.0 %	100.0
L1P2 L1P2		
Level 1 Propotional Band for Output 2	0.0 ~ 3000 sec	30.0
L1i2 L1i2		
Level 1 Integral Time for Output 2	0 ~ 3600 sec	240
L1d2 L1d2		
Level 1 Derivative Time for Output 2	0 ~ 900	60

L2	L2P1	L2i1	L2d1	L2Ar	L2P2	L2i2	L2d2
L3	L3P1	L3i1	L3d1	L3Ar	L3P2	L3i2	L3d2
L4	L4P1	L4i1	L4d1	L4Ar	L4P2	L4i2	L4d2

For Level2, Level3 and Leve4 parameters description, please refer to Level1 parameters (L1P1, L1i1, L1Ar, L1P2, L1i2, L1d2).

ProG PROGRAM submenu

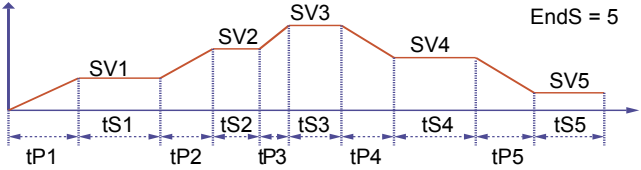
(Parameter)	(Range)	(Initial Value)
SEG SEG		
Program Segment Monitor	1 ~ 8	
tiME tiME		
Program Countdown Monitor		
EndS EndS		
Program Segment End Setting	1 ~ 8	1
SV1 SV1		
SV in Segment 1	LoSP ~ HiSP	100
tP1 tP1		
Program Time in Segment 1	0.00 ~ 99.59 hr.min	0.00
tS1 tS1		
Soak Time in Segment 1	0.00 ~ 99.59 hr.min	0.00

SV2	tP2	tS2		SV6	tP6	tS6	
SV3	tP3	tS3		SV7	tP7	tS7	
SV4	tP4	tS4		SV8	tP8	tS8	
SV5	tP5	tS5					

ProG PROGRAM submenu

(Parameter) (Range) (Initial Value)

For Segment2 to Segment8 parameters description, please refer to Segment1 parameters (SV1, tP1, tS1).



HidE PROGRAM submenu

(Parameter) (Range) (Initial Value)

1-2 ~ 1-22

Parameters under USER Submenu

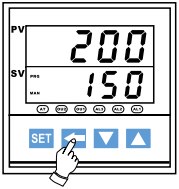
2-14 ~ 2-17

Parameters under CONTROL Submenu

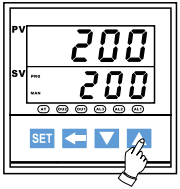
3-20 ~ 3-27

Parameters under OUTPUT Submenu

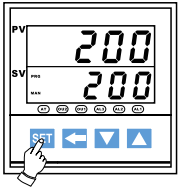
A. Example : How to set “SV” at 200°C



Press-and-hold till SV blinks. Press again to move the digit

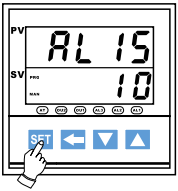


Press to increase or press to decreasae the value

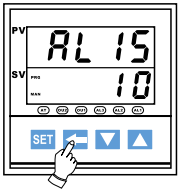


Press SET to set the SV value

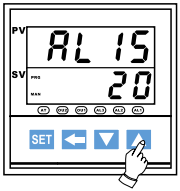
B. Example : How to set AL1S at 20°C



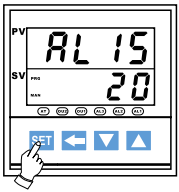
Press-and-hold SET till PV shows “AL1S”



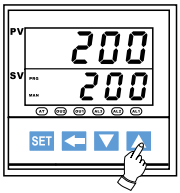
Press-and-hold till SV blinks, press again to move the digit



Press to increase or press to decrease the value

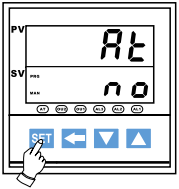


Press SET to enter AL1 setting

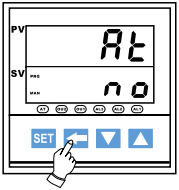


Press-and-hold to return to PV/SV windows

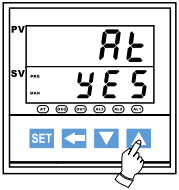
C. Example : How to set “AT” (auto tuning)



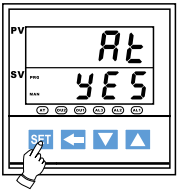
Press SET to show “AT” on PV windows



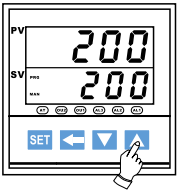
Press ◄ to show “no” flickering on SV windows



Press ▲ to show “yes” on SV window



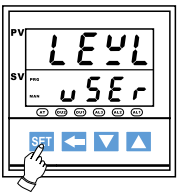
Press SET to enter AT setting



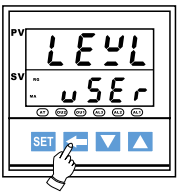
Press-and-hold ▲ to return to PV/SV window

D. Example : How to enter different “level” for setting parameter

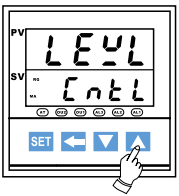
(1) Enter “CntL” level



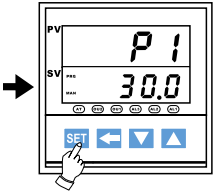
Press-and-hold SET till “LEVL” on PV window (under PV/SV initial window)



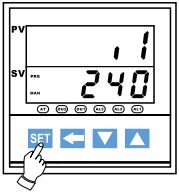
Press ◄ to show “user” flickering on SV window (under PV show “LEVL”



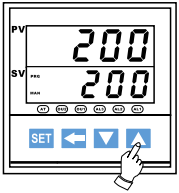
Press ▲ to show “cnt1” on SV window then press SET to enter this level



Press-and-hold SET to show “P1” on PV window

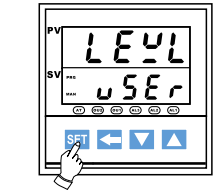


Press-and-hold SET to continue other parameters in this level

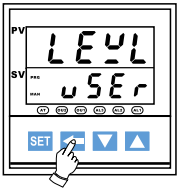


Press-and-hold ▲ to return to PV/SV initial window

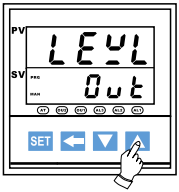
(2) Enter “Out” level



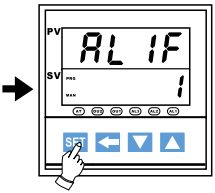
Press-and-hold SET to show “LEVL” on PV window (under PV/SV initial window)



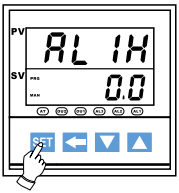
Press ◄ to show “user” flikering on SV window (under PV show “LEVL”



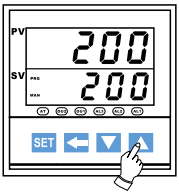
Press ▲ to show “out” on SV window then press SET to enter this level



Press SET to show “AL1F” on PV window

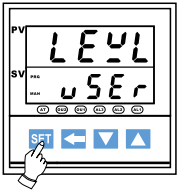


Press-and-hold SET to continue other parameters in this level

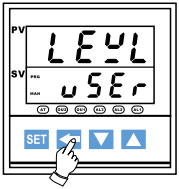


Press-and-hold ▲ to return PV/SV initial window

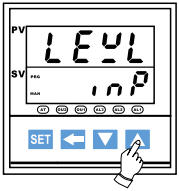
(3) Enter “inP” level



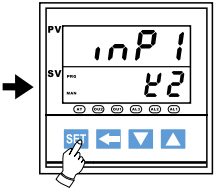
Press-and-hold SET to show “LEVL” on PV window (under PV/SV initial windows)



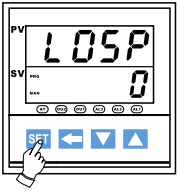
Press ◄ to show “user” flickering on SV window (under PV “LEVL”)



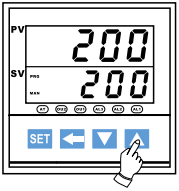
Press ▲ to show “inP” on SV window then press SET to enter this level



Press-and-hold SET to show “inP1” on PV window

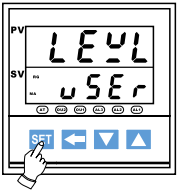


Press-and-hold SET to continue other parameters in this level

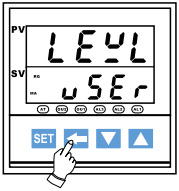


Press-and-hold ▲ to return PV/SV initial window

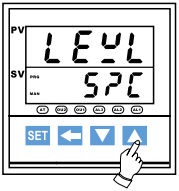
(4) Enter “Spc” level



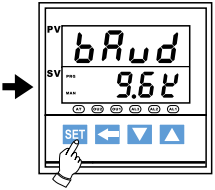
Press-and-hold SET to show “LEVL” on PV window (under PV/SV initial window)



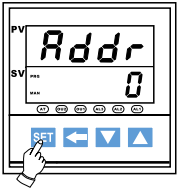
Press ◄ to show “user” flickering on SV window (under PV show “LEVL”)



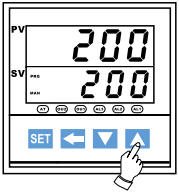
Press ▲ to show “SPC” on SV window then press SET to enter this level



Press-and-hold SET to show “baud” PV window



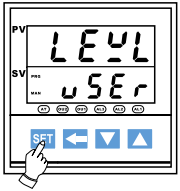
Press-and-hold SET to continue other parameters in this level



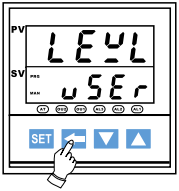
Press-and-hold ▲ to return to PV/SV initial window

(5) Enter program level

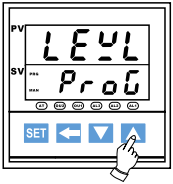
* “OUTM” in “out” level must be selected at “8” or “9”



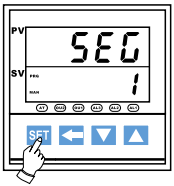
Press-and-hold SET to show “LEVL” on PV window (under PV/SV initial window)



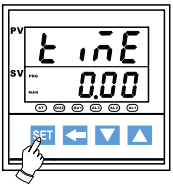
Press ⇐ to show “user” flickering on SV window (under PV show “LEVL”)



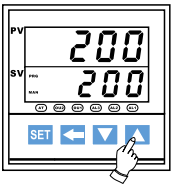
Press ▲ to show “PROG” on SV wndow then press SET to enter “PROG” level



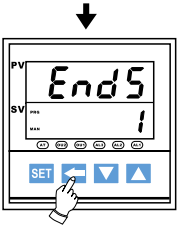
Press-and-hold SET to show “SEG” on PV window, this parameter only display executing segment



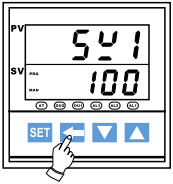
Press-and-hold SET to continue other parameters, this parameter only display time for ramp or soak steps



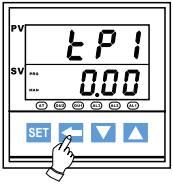
Press-and-hold ▲ to return to PV/SV initial window



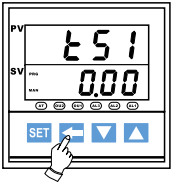
Press ro show SV flickering, the press key to set ending segment



Press to set SV for segment 1



Press to set time for ramp of segment 1



Press to set time for soak of segment 1

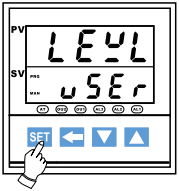
.....

The operation from SV2 to SV are the same as SV1

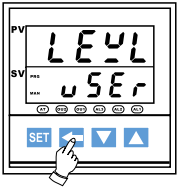
8

(6) Enter “Hide” level

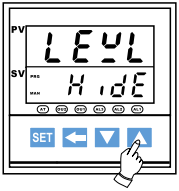
In this level, the user can arrange parameter order or hiding from No. 1-2 to 1-22, 2-14 to 2-17 and 3-20 to 3-27 (please refer to level parameter flow chart), but same parameter can not be arranged in 2 positions at the same time. For example, to arrange “OUTL” to 1-3 you need to cancel it in 1-2 first. When canceling or to hide, select “non” on the “SV”



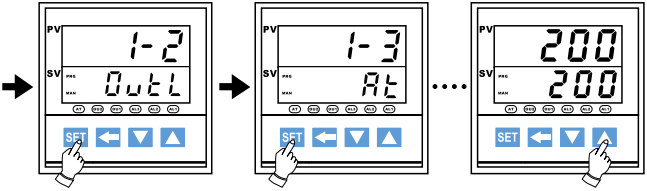
Press-and-hold SET to show “LEVL” on PV window (under PC/SV initial window)



Press to show “user” flickering on SV window (under PV show “LEVL”)



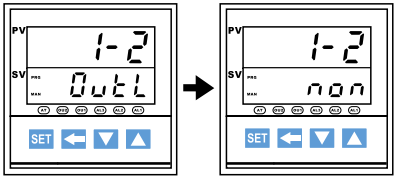
Press to show “Hide” on SV window then press SET to enter this level



Press-and-hold SET to show “1-2” on PV window

Press-and-hold SET to continue other parameters at this level

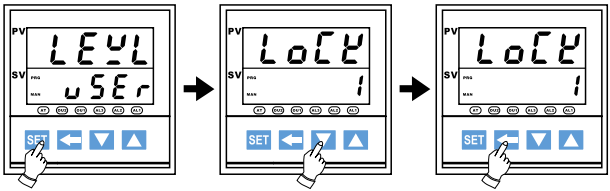
Press-and-hold ▲ to return to PV/SV initial window



Press-and-hold ⇐ to show “OUTL” flickering then press ▼ to “non” for hiding and cancelling or press ▲ to select other parameters

If “non” is selected in1-2 and SET is pressed, 1-2 will not display anything. If other parameter is selected in 1-2, it will display that parameter.
The operation in 1-2 to 1-22, 2-14 to 2-17 and 3-20 to 3-27 are all the same.

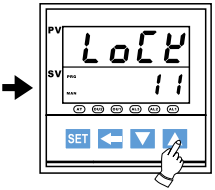
E. Example : How to set “LOCK” function



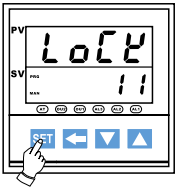
Press-and-hold SET to show “LEVL” on PV window (under PV/SV initial window)

Press-and-hold ▼ to show “LOCK” on PV window

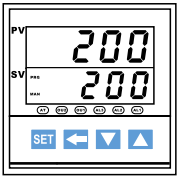
Press ⇐ till SV blinks



Press ▲ to increase or press ▼ to decrease code number



Press SET to enter “LOCK” setting



Press-and-hold ▲ to return to PV/SV initial window

Chapter 4 : Input

AT03 series is designed to accept thermocouples sensor, RTD sensors, linear voltage and linear current inputs. The input type is specified partly through hardware and needs to be specified at the time of ordering.

For sensor inputs (thermocouple and RTD), AT03 can accept K, J, T, R, E, S, B, N or N type thermocouple and Pt100 or JPt100 RTD sensors. There are different segments in firmware to optimize the sensing performance. The specific segment is specified through firmware and is specified through the parameter inP1 under inp submenu.

For linear input, all vairotions are soecified through hardware at the time of ordering.

Input Hardware ordering information

A T - □ 0 3 - ■ □ □ □ - □ □ □
Input
1 = T/C or RTD Sensor
2 = 0~100mV
3 = 0~20mA
4 = 4~20mA
5 = 0~5V
6 = 0~10V
7 = 1~5V
8 = 2~10V
9 = 0~1V

Parameter INP1 under INP submenu

Type	INP1	^{O}C	^{O}F
K	K1	0 ~ 200	32 ~ 392
	K2	0 ~ 400	32 ~ 752
	K3	0 ~ 800	32 ~ 1472
	K4	0 ~ 1000	32 ~ 1832
	K5	0 ~ 1200	32 ~ 2192
J	J1	0 ~ 200	32 ~ 392
	J2	0 ~ 400	32 ~ 752
	J3	0 ~ 800	32 ~ 1472
	J4	0 ~ 1000	32 ~ 1832
	J5	0 ~ 1200	32 ~ 2192
T	T1	-50 ~ 50	-58 ~ 122
	T2	-100 ~ 100	-148 ~ 212
	T3	-200 ~ 400	-328 ~ 752
R	R	0 ~ 1700	32 ~ 3092
E	E	0 ~ 1000	32 ~ 1832
S	S	0 ~ 1700	32 ~ 3092
B	B	0 ~ 1800	32 ~ 3272
N	N	-200 ~ 1300	-328 ~ 2372
Pt	Pt1	-50 ~ 50	-58 ~ 122
	Pt2	0 ~ 100	32 ~ 212
	Pt3	0 ~ 200	32 ~ 392
	Pt4	0 ~ 400	32 ~ 752
	Pt5	-200 ~ 600	-328 ~ 1112
	jPt	-200 ~ 500	-328 ~ 932
Linear	Lin	-1999 ~ 9999	

Chapter 5 : Output

AT03 series has highly customizable outputs for customers' specific needs. It may have upto 2 control outputs. The desired ouputs needs to be specified at the time of ordereing and set by the users under OUTPUT submenu according to the hardware.

Output hardware ordering information

A T - □ 0 3 - □ ■ ■ □ - □ □ □

Output 1	Output 2
(1 is standard)	0 = None
1 = Relay	1 = Relay
2 = Pulsed	2 = Pulsed
3 = 0~20mA	3 = 0~20mA
4 = 4~20mA	4 = 4~20mA
5 = 0~5V	5 = 0~5V
6 = 0~10V	6 = 0~10V
7 = 1~5V	7 = 1~5V
8 = 2~10V	8 = 2~10V
9 = Motor Control	

Parameter OUTM under OUT submenu

OUTM	Mode
1	Single Output
2	Dual Output
3	Motor Control, A contact
4	Motor Control, B contact
5	Single output with transmitter
6	Single output with soft start

7	Single output with transmitter and soft start
8	Program control
9	Program control with trsnamitter

Chapter 6 : Alarm

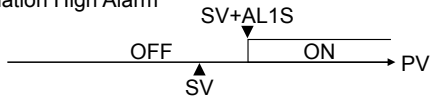
AT03 models can have upto 3 alarms. Each alarm can be programmed to different function and different mode.

Alarm Function

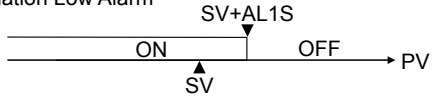
Parameter AL1F, AL2F and AL3F under OUT submenu

ALARM FUNCTION DESCRIPTION			
AL1F	AL2F	AL3F	Description
0	0	0	No Alarm
1	1	1	Deviation High Alarm
2	2	2	Deviation Low Alarm
3	3	3	Absolute High Alarm
4	4	4	Absolute Low Alarm
5	5	5	Deviation high/low Alarm
6	6	6	Band Alarm
7	7	7	System Failure Alarm
8	8	8	Loop break alarm
9	9	9	Heater Break Alarm
10	10	10	Segment Ending Alarm
11	11	11	Program Ending Alarm
12	12	Not Availiable	Time Signal Alarm
13	13		Program Mode Running alarm

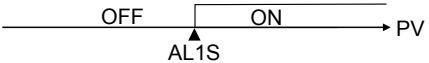
1. Deviation High Alarm



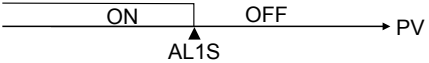
2. Deviation Low Alarm



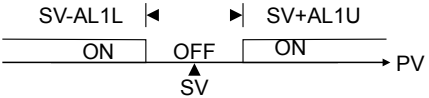
3. Absolute High Alarm



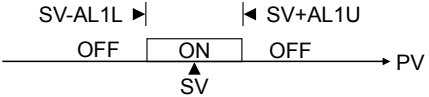
4. Absolute Low Alarm



5. Deviation High/Low Alarm



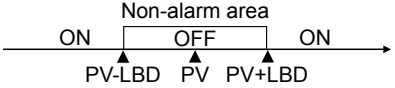
6. Band Alarm



7. System Failure Alarm

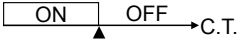
Alarm is triggered when the system has failed.

8. Loop break alarm



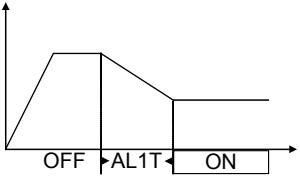
9. Heater Break Alarm

Low or no current flow
Control output is ON



Over current or short circuit
Control output is OFF

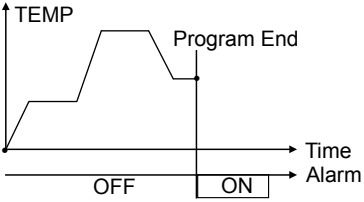
10. Segment Ending Alarm



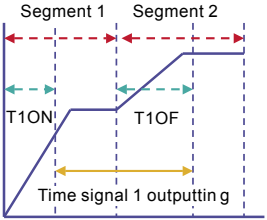
AL1S
1~8 segment
AL1T

0.00	Flicker alarm
(other)	ON delay time
99.59	Continuous alarm

11. Program Ending Alarm

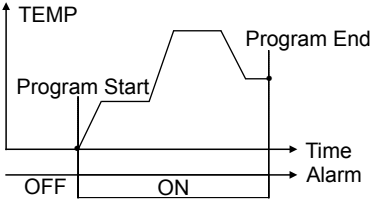


12. Time Signal Alarm



T1SS
Time signal 1 start segment setting
T1ON
Time signal 1 on time setting
T1ES
Time signal 1 end segment setting
T1OF
Time signal 1 off time setting

13. Program Mode Running alarm



Alarm Mode

Parameter AL1M, AL2M and AL3M under OUT submenu

ALARM MODE DESCRIPTION			
AL1M	AL2M	AL3M	Descrition
0	0	0	Normal
1	1	1	Alarm with nomally closed contact
2	2	2	Latch
3	3	3	Alarm with nomally closed contact and latch

ALARM MODE DESCRIPTION (continue)			
4	4	4	Alarm with inhibit
5	5	5	Alarm with inhibit and normally closed contact
6	6	6	Alarm with inhibit and latch
7	7	7	Alarm with inhibit, normally closed contact and latch
8	(Mode 8, 9, 10, 11 are not availiable on Alarm2 and Alarm3. Only Alarm1 has all 11 modes)		Alarm with on-delay timer
9			Alarm with on-delay timer but normally closed contact
10			Alarm with soaking timer
11			Alarm with soaking timer but normally cloased contact

Chapter 7 : Communication

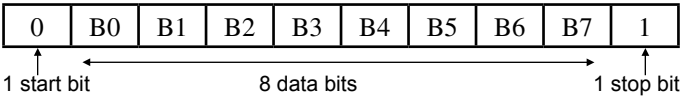
AT03 has optional RS-232 and RS-485 module, which enables the controller to be programmed and monitored remotely.

Interface RS-232, RS-485

Baud Rate 2400 bps, 4800 bps, 9600 bps, 19200bps, 38400 bps

Data Format ModBus protocol RTU mode

Data Frame



Sample Commands

RTU Request : Read command

0	1	2	3	4	5	6	7
Station Number	Function 0X03	Address (MSB~LSB)		Count (MSB~LSB)		CRC16 (LSB~MSB)	

Station number : 00H ~ 1FH

Adderss : 0000H ~ 0100H

Count : number of data

CRC16 : Cyclical Redundancy Check

RTU Response : Read command

0	1	2	3	4	5	6	7	8
Station Number	Function 0x03	Byte Count	Data 1 (MSB~LSB)		Data 2 (MSB~LSB)		CRC16 (LSB~MSB)	

Station number : 00H ~ 1FH

Adderss : 0000H ~ 0100H

Count : number of data bytes

CRC16 : Cyclical Redundancy Check

RTU Request : Write command

0	1	2	3	4	5	6	7
Station Number	Function 0X06	Address (MSB~LSB)		Count (MSB~LSB)		CRC16 (LSB~MSB)	

Station number : 00H ~ 1FH

Adderss : 0000H ~ 0100H

CRC16 : Cyclical Redundancy Check

RTU Request : Write command

0	1	2	3	4	5	6	7
Station Number	Function 0X06	Address (MSB~LSB)		Count (MSB~LSB)		CRC16 (LSB~MSB)	

Station number : 00H ~ 1FH

Adderss : 0000H ~ 0100H

CRC16 : Cyclical Redundancy Check

Parameters and Addresses

The following table on the next two pages lists all the parameters and their corresponding addresses under ModBus RTU.

PARAMETERS AND ADDRESSES							
LEvL	00	rPtm	18	AL1F	30	t2On	48
LoCK	01	P1	19	AL1H	31	t2ES	49
Sv	02	i1	1A	Al1t	32	t2oF	4A
OutL	03	d1	1B	AL1m	33	inP1	4B
At	04	Ct1	1C	AL2F	34	LoSP	4C
mAn	05	HSt1	1D	AL2H	35	HiSP	4D
AL1S	06	AotF	1E	AL2t	36	LoAn	4E
AL1L	07	Ar	1F	AL2m	37	HiAn	4F
AL1U	08	P2	20	AL3F	38	A1LS	50
AL2S	09	i2	21	AL3H	39	A1HS	51
AL2L	0A	d2	22	AL3t	3A	unit	52
AL2U	0B	Ct2	23	AL3m	3B	dp	53
AL3S	0C	HSt2	24	Act	3C	FiLt	54
AL3L	0D	db	25	Outm	3D	inP2	55
AL3U	0E	SSv	26	O1LS	3E	A2LS	56
SOAK	0F	Sout	27	O1HS	3F	A2HS	57
rAmP	10	Stme	28	AO	40		
PvoF	11	rUCy	29	O2LS	41	bAud	59
Pvrr	12	rPtm	2A	O2HS	42	Addr	5A
SvoF	13	StAt	2B	t1SS	43	LEv1	5B
Ct	14	PvSt	2C	t1On	44	LEv2	5C
HbA	15	wAit	2D	t1ES	45	Lev3	5D
LbA	16	Pid	2E	t1oF	46	LvSL	5E
Lbd	17	EndP	2F	t2SS	47	L1P1	5F

PARAMETERS AND ADDRESSES							
L1i1	60	L4P2	78	Sv7	90	1-20	A8
L1d1	61	L4i2	79	tP7	91	1-21	A9
L1Ar	62	L4d2	7A	tS7	92	1-22	AA
L1P2	63	SEG	7B	Sv8	93	2-14	AB
L1i2	64	TimE	7C	tP8	94	2-15	AC
L1d2	65	EndS	7D	tS8	95	2-16	AD
L2P1	66	Sv1	7E	1-2	96	2-17	AE
L2i1	67	tP1	7F	1-3	97	3-20	AF
L2d1	68	ts1	80	1-4	98	3-21	B0
L2Ar	69	Sv2	81	1-5	99	3-22	B1
L2P2	6A	tP2	82	1-6	9A	3-23	B2
L2i2	6B	tS2	83	1-7	9B	3-24	B3
L2d2	6C	Sv3	84	1-8	9C	3-25	B4
L3P1	6D	tP3	85	1-9	9D	3-26	B5
L3i1	6E	tS3	86	1-10	9E	3-27	B6
L3d1	6F	Sv4	87	1-11	9F		
L3Ar	70	tP4	88	1-12	A0		
L3p2	71	tS4	89	1-13	A1		
L3i2	72	Sv5	8A	1-14	A2		
L3d2	73	tP5	8B	1-15	A3		
L4P1	74	tS5	8C	1-16	A4		
L4i1	75	Sv6	8D	1-17	A5		
L4d1	76	tP6	8E	1-18	A6		
L4Ar	77	tS6	8F	1-19	A7	**Pv**	**100**

Appendix A Error Code

in1E	Input1 error
in2E	Input2 error
AdCF	A/D converter failed
CJCE	Cold junction compensation failed
PyPy	PV exceeds set ranges
rAmF	RAM failed
intF	Interface failed
AutF	Auto tuning failed

Note :

Note :

Note :

Note :

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