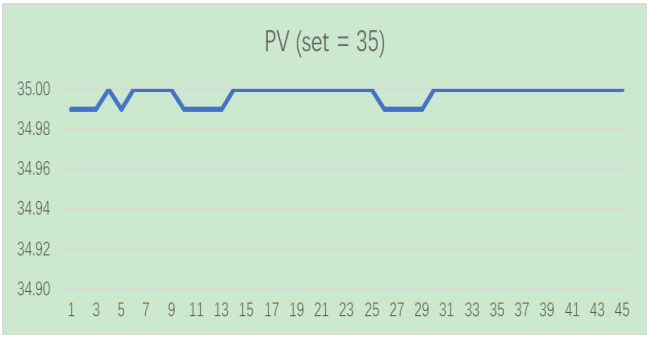
ZL-7802D Humidity and Temperature Controller

Version 1.0b

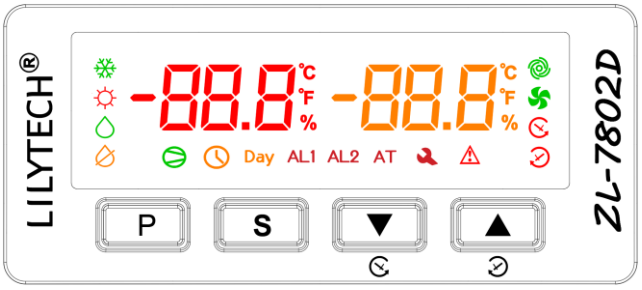
Introduction

Optional PID and on/off temperature control.
Internal control resolution is 0.01℃ to reach better control result.
Integrated SSR, with 5A rate power driving ability.
Optional external SSR-DA could drive heavier load.
With auxiliary outputs, the controller could control incubator, climate room, warehouse, and so on.



Specification

Temperature sensor:	NTC, $R_{25℃}$ =10K $B_{25/50℃}$ =3470K
Setting range:	-40.0 ~ 99.9℃, 10.0 ~ 90.0%RH
Power supply:	100 ~ 240Vac, 50/60Hz
Temperature output:	Integrated SSR, R5, 5A, 250Vac (resistance load) External SSR, (Y+, Y-), 4 ~ 2mA, 12Vdc
Humidity output R2:	10A, 250Vac (resistance load)
Output R1:	7A, 250Vac (resistance load)
Output R3/R4:	3A, 250Vac (resistance load)
Working environment:	-10 ~ 45℃, 5 ~ 85%RH without dew
Protection level:	IP65 (Front panel only)
Case dimension:	L78 x W34.5 x D71 (mm)
Drilling size:	L 71 x W29 (mm)



Display

Icon

Icon	Function	On	Blink	Off
☼	Heating	SSRs on	PID controlling (U73 = 0)	SSRs off
💧	Humidifying	R2 on	Delay protection, R2 off	R2 off
Day	Incubation days	----	Has incubated for set days	
⚠	Alarming	Alarming	Alarming	
AT	PID Auto Tune	Will start AT	Auto tuning	
🔧	Set parameter	----	Parameter setting	
🌀	R1 on/off	R1 timer on	R1 over limit on	R1 off
↺	Left turning R3	R3 on	Start left turning, R3 on, icon blinks for 30 sec.	R3 off
↻	Right turning R4	R4 on	Start right turning, R4 on, icon blinks for 30 sec.	R4 off

*. Both ↺ and ↻ blink: egg turning times has reached to set times.

Text

Display	Remark
E1	NTC sensor failure
E2	Humidity sensor failure
tHi	High temperature warning
tLo	Low temperature warning
HHi	High humidity warning
HLo	Low humidity warning
iA	External digital input alarming
At1	PID auto tuning fails (There is temperature interference during tuning)
At2	PID auto tuning fails (The amplitude of temperature oscillation is abnormal)
At3	PID auto tuning fails (The periods of temperature oscillation is abnormal)
At4	PID auto tuning fails (Time out)
SUc *	PID auto tuning success
UnL	Restore to factory settings

*. After auto tuned, display “SUc”, the controller does not control temperature now.
Press any key, the “SUc” disappears, start to PID control temperature.

Operation

Set setpoints

Keep〖S〗depressed for 3 seconds. Display , and temperature setpoint (“t” + “setpoint”).

Press〖S〗to switch between temperature set status and humidity set status (“H” + “setpoint”).

Press〖▲〗or〖▼〗to set the setpoint (keeping depressed could fast set).

Keep〖S〗depressed for 3 seconds to **save the settings**, and exit.

The setting status will exit if there is no key operation for 30 seconds, and the settings **will not be saved**.

Factory setpoints are 38.0℃ and 60.0%RH.

Parameter code table

Code	Function	Range	Remark	Factory set
U10	Temperature setpoint up limit	U11 ~ 99.9℃		99.9
U11	Temperature setpoint low limit	-40.0℃~ U10		-40.0
U12	High temp. protection start point	0.1 ~ 10.0℃	Relative value, real value = setpoint + U12	0.3
U13	High temp. protection stop point	0.1 ~ 10.0℃	Relative value, real value = setpoint + U13	0.1
U14	Low temperature alarm point	0.0 ~ 99.9℃	Relative value, real value = setpoint – U14	35.0
U15	High temperature alarm point	2.0 ~ 99.9℃	Relative value, real value = setpoint + U15	99.9
U16	Temperature hysteresis	0.0 ~ 20.0℃	Effective when U73 = 1	0.2
U30	Temperature calibration	-20.0 ~ 20.0℃		0.0
U40	Timer R1 on time unit	0 ~ 2	0: sec, 1: min., 2: hour	0
U41	Timer R1 on time	1 ~ 999		120
U42	Timer R1 off time unit	0 ~ 2	0: sec, 1: min., 2: hour	1
U43	Timer R1 off time	1 ~ 999		120
U46	Output R1 working mode	0 ~ 3	0: Timer output 1: High temperature/humidity protection 2: Timer output + High temp./humi. protection 3: Disable	2
U47	R1/R2 work during auto tuning	0 ~ 1	0: R1/R2 keep working during auto tuning 1: R1/R2 keep off during auto tuning	1
U50	Humidity hysteresis	0.1 ~ 20%RH		2.0
U51	R2 delay protection time	2 ~ 300 sec.		5
U52	Humidity calibration	-20.0 ~ 20.0%RH		0.0
U53	High humidity protection start point	1.0 ~ 20.0%RH	Relative value, real value = setpoint + U53	5.0
U54	High humidity protection stop point	0.0 ~ 20.0%RH	Relative value, real value = setpoint + U54	0.0
U55	Low humidity alarm point	0.0 ~ 99.9%RH	Relative value, real value = setpoint – U55 0.0: disable the alarm function	20.0
U56	High humidity alarm point	0.0 ~ 99.9%RH	Relative value, real value = setpoint + U56 0.0: disable the alarm function	30.0
U60	Egg turn times set	0 ~ 999	0: do not counter the times of egg turn	0
U61	Left turn R3 time unit	0 ~ 2	0: sec, 1: min., 2: hour	1
U62	Left turn R3 time	1 ~ 999		90
U63	Right turn R4 time unit	0 ~ 2	0: sec, 1: min., 2: hour	1
U64	Right turn R4 time	1 ~ 999		90
U66	Reset egg turn counter after power supplied	0 ~ 1	0: reset, 1: not reset (keeps)	0
U67	Egg turn period time saving	0 ~ 1	0: not save, 1: save	0
U68	Reset incubated days counter after power supplied	0 ~ 1	0: reset, 1: not reset (keeps)	1
U69	Max incubation days set	0 ~ 999 day	0: do not counter the days of incubation	30
U70	External digital input working mode	0 ~ 2	0: disable, 1: alarm if short 2: alarm if open	0
U71	Beep alarming	0 ~ 1	0: disable, 1: enable	1
U73	Temperature control mode	0 ~ 1	0: PID, 1: on/off control	0
U74	Heater power during PID auto tuning	10 ~ 100%	Percent of heater’s whole power rate	50
P	Proportion parameter: Kp	0.1 ~ 9999		2.6
I	Integration parameter: Ti	0 ~ 9999		500
d	Differential parameter: Td	0 ~ 9999		50
U99	Password	000 ~ 999	000: disable password	000

Set Parameters

Keep 〖P〗 depressed for 3 seconds. Display .

If the password is “000”, no password is needed to enter parameter setting status.

If the password is not “000”, it needs password to enter parameter setting status:

Display “PSd” + “password”.

Press 〖▲〗 or 〖▼〗 to set the “password” to the correct password.

Press 〖S〗 to confirm.

If the password is correct, enter parameter setting status, else exit.

After having entered parameter setting status, display the 1st parameter code + its value: “U10” + “value”.

In parameter setting status:

press 〖S〗 or 〖P〗 to select the parameter code (see **Parameter code table** in page 2).

Press 〖▲〗 or 〖▼〗 to set the value of the parameter.

Keep 〖P〗 depressed for 3 seconds to **save the settings**, and exit.

The setting status will exit if there is no key operation for 30 seconds, and the settings **will not be saved**.

Check *incubated days* and *egg turned times*

Press 〖S〗 and 〖▲〗 simultaneously, display incubated days: “day” + “valve” for 2 seconds.

Press 〖S〗 and 〖▼〗 simultaneously, display egg turned times: “cnt” + “value” for 2 seconds.

Control

Timer output R1

During【Timer R1 on time U41】, R1 energized.

During【Timer R1 off time U43】, R1 deenergized.

Temperature control

R5 and ex-SSR are the temperature control outputs.

PID control

When【Temperature control mode U73】= 0, PID control.

ON/OFF control

When【Temperature control mode U73】= 1, hysteresis control.

If ***Room temp.*** ≥ ***Temp. setpoint,*** R5 and ex-SSR deenergized.

If ***Room temp.*** ≤ ***Temp. setpoint*** –【Temperature hysteresis U16】, R5 and ex-SSR fully energized.

High temperature protection

When【Output R1 working mode U46】= 1 or 2:

If ***Room temp.*** ≥ ***Temp. setpoint*** +【High temp. protection start point U12】, R1 energized.

If ***Room temp.*** ≤ ***Temp. setpoint*** +【High temp. protection stop point U13】, R1 deenergized.

Note: after R1 is deenergized, it could be energized again after 3 seconds.

High/low temperature alarm

If ***Room temp.*** ≥ ***Temp. setpoint*** +【High temperature alarm point U15】, high temperature alarming: alternatively display ***room temp.*** and “tHi”, R5 and ex-SSR off, beeping alarming.

If ***Room temp.*** ≤ ***Temp. setpoint*** +【Low temperature alarm point U14】, low temperature alarming: alternatively display ***room temp.*** and “tLo”, beeping alarming.

If【Beep alarming U71】= 0, there is no beeping alarming.

Humidity control

If ***Room humidity*** ≥ ***Humidity setpoint***, R2 deenergized.

If ***Room humidity*** ≤ ***Humidity setpoint*** -【Humidity hysteresis U50】, and R2 has stopped for【R2 delay protection time U51】, R2 energized.

High humidity protection

When【Output R1 working mode U46】= 1 or 2:

If ***Room humidity*** ≥ ***Humidity setpoint*** +【High humidity protection start point U53】, R1 energized.

If ***Room humidity*** ≤ ***Humidity setpoint*** +【High humidity protection stop point U54】, R1 deenergized.

Note: after R1 is deenergized, it could be energized again after 3 seconds.

High/low humidity alarm

If ***Room humidity*** ≥ ***Humidity setpoint*** +【High humidity alarm point U56】, high humidity alarming: alternatively display ***Room humidity*** and “HHi”, beeping alarming.

If ***Room humidity*** ≤ ***Humidity setpoint*** +【Low humidity alarm point U55】, low humidity alarming: alternatively display ***Room humidity*** and “HLo”, beeping alarming.

If【Beep alarming U71】= 0, there is no beeping alarming.

Egg turning control

Output R3/R4 is universal timer output, although the function is designed for incubator egg turning.

Timer function for egg turning

During【Left turn R3 time U62】, display , R3 energized, R4 deenergized.

During【Right turn R4 time U64】, display , R3 deenergized, R4 energized.

One ***full egg turn*** = one left turn + one right turn. Egg turn counter counts the times of ***full egg turn.***

If【Egg turn times set U60】= 0, egg turning timer will never stop (**never stop egg turning**).
If【Egg turn times set U60】> 0, egg turning timer will stop (**stop egg turning**) after the counter value reaches U60, and , blink.

Egg turn period time (phase) saving

If【Egg turn period time saving U67】= 0, Egg turn period time is not saved.
If【Egg turn period time saving U67】= 1, Egg turn period time will be saved once every 30 minutes. When power supply loses and come back, the timer time continues from the saved time.

Check *egg turned times*

See: **Operation-> Check *incubated days* and *egg turned times***.

Egg turn counter reset manually

Keep〖S〗and〖▼〗depressed simultaneously for 5 seconds, display: “cnt” + “Clr”, the counter resets.

Egg turn counter reset after power supplied.

If【Reset egg turn counter after power supplied U66】= 0, the counter resets after power supplied.
If【Reset egg turn counter after power supplied U66】= 1, the counter does not reset after power supplied.

Stop egg turning

Keep〖P〗and〖S〗depressed simultaneously for 3 seconds, stop or start egg turn timer running.
When egg turn timer stops, and blink.

Egg turning manually

Keeping〖▲〗depressed for 3 sec. starts right egg turning, display , R4 energized, R3 deenergized.
Keeping〖▼〗depressed for 3 sec. starts left egg turning, display , R3 energized, R4 deenergized.

Incubation days

When ***incubated days*** has reached【Max incubation days set U69】, the day counter stops counting, Day blinks.
Note: after ***incubated days*** has reached the max incubation days, the controller will not stop control.

Check *incubated days*

See: **Operation-> Check *incubated days* and *egg turned times***.

***Incubated days* reset manually**

Keep〖S〗and〖▲〗depressed simultaneously for 5 seconds, display: “day” + “Clr”, the counter resets.

***Incubated days* reset after power supplied**

If【Reset incubated days counter after power supplied U68】= 0, the counter resets after power supplied.
If【Reset incubated days counter after power supplied U68】= 1, the counter does not reset after power supplied.

External digit input (DI)

If【External digital input working mode U70】= 0, disable DI function.
If【External digital input working mode U70】= 1, alarm when DI is short.
If【External digital input working mode U70】= 2, alarm when DI is open.
When alarming, beeping (when【Beep alarming U71】= 1) , R1 keeps working, all other outputs are deenergized.

Buzzer alarming

When【Beep alarming U71】= 1, if there is failure, or effective DI input, there is beeping alarming.
Then failure disappears, no input to DI, the alarming stops.
Press〖P〗can stop beeping.

Sensor

The sensors can be calibrated by setting【Temperature calibration U30】and【Humidity calibration U52】.
When temperature sensor fails, display blinking “E1”, beeping, heating output deenergized, other outputs keep working.
When humidity sensor fails, display blinking “E2”, beeping, humidity output deenergized, other outputs keep working.
When【Beep alarming U71】= 0, no beeping.

Restore to factory set

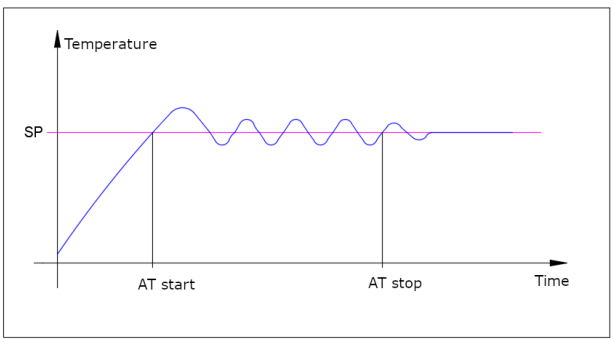
Keep〖P〗and〖▲〗depressed simultaneously for 3 seconds, “UnL” displays. Then press〖▼〗3 times, all parameters will restore to factory set, including the password (see the **Operation->Parameter code table** column “Factory set”).

PID parameters Auto Tuning (AT)

Auto tuning operation

By AT, we could find optimized parameters for most temperature control system. AT step:

1. Set【Heater power during PID auto tuning U74】1st, or set it in step 4. Factory set for it is 50%, which is considered a best percent.
2. Set temperature setpoint (SP) for AT.
3. keep〖▲〗and〖▼〗depressed for 5 seconds, U74 value will display, AT blinks.



4. Press 〖▲〗 and 〖▼〗 to set U74.
5. Press 〖P〗 to start AT.

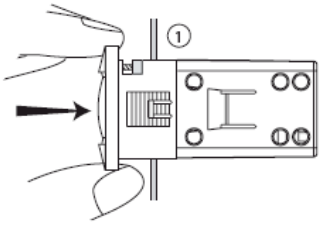
During AT, the room temperature (PV) will reach and vibrate around SP for several times. Then the PID parameters will be calculated, and AT display will be off.
If AT fails, it will show the reason of failure: “At1”, “At2”, “At3”, and “At4”, see: **Display->Text**.
If AT is successful, display “SUc”. New PID parameters will be get. Press any key, “SUc” disappears, start PID control.
If AT never be successful, and never fails, because the PV can not never reach SP, set big power rate, or with a bigger heater.
If AT has lasted 180 minutes, and has not finished, stop AT, display “At4”.

Note

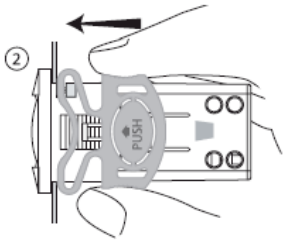
There are some notes for PID AT in ZL-7817A manual.

Installation

1. Insert the controller into hole



2. Slide the bracket to fix the device (step two)



Warning

If the temperature heater power rate is big, or has inductance such as coil wired heater, use external SSR-DA, instead of integrated SSR.
If other loads are big, or with capacitance or inductance, such as many humidifiers, we advise to use intermediate relay, SSR-AA, or magnetic contactor.
When wiring the controller, do not supply power.
Overload damage is not within warranty.

Attention

Electrical wiring must be manipulated by certified electrician.
Connect according to electrical wiring diagram. Wrong connection will damage the device.
Do not layout the sensor bundle together with power supply bundle.
Avoid working in erosive, wet and strong electrical-magnetic field environment.
This device has been checked fully before shipment. The warranty time is one year, damaged by wrong usage, such as wrong connection, is not warranted.

Wiring Diagram