

## ZL-690, ZL-691, ZL-692 Cabinet AC controller

### V3.5

### Introduction

ZL-690, ZL-691 and ZL-692 controller are for cabinet air conditioner control.

### Function

Temperature sense, display, calibration and control	High and low temperature alarm
One digital input	Sensor(s) failure alarm
Compressor delay protection	Beeping alarm
Lack of freon protection	RS485 modbus
Heater control	

### Model






Model	Cooling Heating	Compressor output	Heater control	Evaporator fan control	Alarm output	Max sensor qty.	Digital input	RS485 Modbus	Power supply
ZL-690AR+	Cool only	16A			Y	1	1	Y	12Vac, external transformer provided
ZL-691AR+	Cool only	16A		Y	Y	2	1	Y	12Vac, external transformer provided
ZL-692AR+	Cool heat	16A	Y		Y	2	1	Y	12Vac, external transformer provided
ZL-690ALR+	Cool only	16A			Y	1	1	Y	48Vdc
ZL-691ALR+	Cool only	16A		Y	Y	2	1	Y	48Vdc
ZL-692ALR+	Cool heat	16A	Y		Y	2	1	Y	48Vdc
ZL-690AR	Cool only	5A			Y	1	1	Y	12Vac, external transformer provided
ZL-691AR	Cool only	5A		Y	Y	2	1	Y	12Vac, external transformer provided
ZL-692AR	Cool heat	5A	Y		Y	2	1	Y	12Vac, external transformer provided
ZL-690ALR	Cool only	5A			Y	1	1	Y	48Vdc
ZL-691ALR	Cool only	5A		Y	Y	2	1	Y	48Vdc
ZL-692ALR	Cool heat	5A	Y		Y	2	1	Y	48Vdc

### Specification

Sensor: NTC 3470/10K, sensor length 1 meter	Working environment: -10 ~ 45°C
Power supply: 220Vac±20% 50Hz (with external transformer) for ZL-69xAR(+)	Deposit environment: -30 ~ 70°C, 5 ~ 85%RH without dew
12 ~ 60Vdc for ZL-69xALR(+)	Protection level: IP65 (front only)
Output: 5A/250Vac, 16A/250Vac, resistance load	Case materials: PC + ABS, fireproof
Terminal wires: 2 * 1.5mm <sup>2</sup> , 1 * 2.5mm <sup>2</sup>	Dimension: W78 x H34.5 x D71 mm
Setting range: 15 ~ 50°C	Front size: W78 x H34.5 mm
Display range: -40 ~ 130°C	Drilling size: W71 x H29 mm

### Display

#### Icon

Icon	Function	On	Off	Blink
	Compressor output	Energized	Deenergized	Within delay protection time, deenergized
<b>AUX</b>	Heater output	Energized	Deenergized	----
	Evaporator fan output	Energized	Deenergized	----
	Maintenance	Has failure	----	----
	Alarm	Alarming	----	----
	Communication	----	----	Communicating
<b>HACCP</b>	Compressor forced energized	Energized	----	----

**Text**

Display	Remark
E01	Room sensor failure (short or open)
E02	Evaporator sensor failure (short or open)
E03	Lack of freon protection
Hi	High temperature alarm
Lo	Low temperature alarm
EE	Data saving error
Err	Password error
iA	Digital input DI effective alarm (compressor high pressure)
UnL	Restore to factory set password "1111"
FrE	Evaporator frozen

**Operation**
**Fast set setpoint**

Keep [S] key depressed for 3 seconds, enter into fast setting setpoint status, display "Cool":

Press [▲] or [▼] key to switch between setting cooling setpoint and heating setpoint (display "HEAT").

Press [S] key to display the setpoint value:

Press [▲] or [▼] key to set the value.

( [Cooling setpoint U00] or [Heating setpoint U01] , see **parameter code table**).

Press [S] key to return to cool/heat setpoint selection.

Display	Remark	Setting range	Factory set
Cool	Set cooling setpoint [Cooling setpoint U00]	0 ~ 50°C	25
HEAT	Set heating setpoint [Heating setpoint U01]	0 ~ 50°C	5

Keep [S] key depressed for 3 seconds to exit the setting status, and **save the settings**.

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

**Parameter set**

Keep [P] key depressed for 3 seconds, display "---0", waiting for password to enter.

Press [▼] key to select the digit of the password. Press [▲] key to set the value of the digit. Press [S] to confirm:

If the password is not correct, display "Err", beep 3 times, exit setting status.

If the password is correct, beep once, display the 1<sup>st</sup> parameter code "U00".

Press [▲] or [▼] key to select parameter code. Press [S] key to display the value of the code.

Press [▲] or [▼] key to set the value of the code. Press [S] key to return.

Keep [P] key depressed for 3 seconds to exit the setting status, and save the settings.

The status will exit if there is no key operation for 30 seconds. And the settings will not be saved.

**ZL-690 parameter code table**

Code	Function	Range	Remark	Factory set
U00	Cooling setpoint	15 ~ 50°C		30
U02	Hysteresis	1.0 ~ 20.0°C		5
U03	High alarm temperature	-5.0 ~ 60°C	U03 ≥ U04 + 1°C	50
U04	Low alarm temperature			5
U10	Room sensor calibration	-3.0 ~ 3.0°C		0
U12	High temperature alarm	0/1	0: disable, 1: enable	1
U13	Low temperature alarm	0/1	0: disable, 1: enable	1
U22	Compressor works	0/1	0: enable, 1: disable	0
U26	External alarm input DI mode	0/1	0: normal close, 1: normal open	1
U28	Buzzer alarming	0/1	0: disable, 1: enable	1
U29	Delay protection time for compressor	0 ~ 5 min		3
U30	Minium running time for compressor	0 ~ 5 min		3
U33	On/off line	On/off	ON, OFF	ON
U34	RS485 baud rate (bps)	0 ~ 3	0: 2400, 1: 4800, 2: 9600, 3: 19200	3
U35	Device address	1 ~ 99		1
U99	Password	0000 ~ 9999	----	1111

**ZL-691 parameter code table**

Code	Function	Range	Remark	Factory set
U00	Cooling setpoint	15 ~ 50°C		30
U02	Hysteresis	1.0 ~ 20.0°C		5
U03	High alarm temperature	-5.0 ~ 60°C	U03 ≥ U04 + 1°C	50
U04	Low alarm temperature			5
U05	Evaporator fan setpoint	0 ~ 40°C		26
U06	Evaporator fan hysteresis	1.0 ~ 5.0°C		2
U07	Evaporator frozen protect point	-5.0 ~ 20.0°C		-1.0
U10	Room sensor calibration	-3.0 ~ 3.0°C		0
U11	Evaporator sensor calibration	-3.0 ~ 3.0°C		0
U12	High temperature alarm	0/1	0: disable, 1: enable	1
U13	Low temperature alarm	0/1	0: disable, 1: enable	1
U14	Lack of freon	0/1	0: disable, 1: enable	1
U21	Evaporator sensor works	0/1	0: disable, 1: enable	1
U22	Compressor works	0/1	0: enable, 1: disable	0
U24	Evaporator fan working mode	0/1	0: temperature control, 1: keep energized	0
U26	External alarm input DI mode	0/1	0: normal close, 1: normal open	0
U28	Buzzer alarming	0/1	0: disable, 1: enable	1
U29	Delay protection time for compressor	0 ~ 10 min		3
U30	Minium running time for compressor	0 ~ 10 min		3
U33	On/off line	On/off	ON, OFF	ON
U34	RS485 baud rate (bps)	0 ~ 3	0: 2400, 1: 4800, 2: 9600, 3: 19200	3
U35	Device address	1 ~ 99		1
U99	Password	0000 ~ 9999	----	1111

**ZL-692 parameter code table**

Code	Function	Range	Remark	Factory set
U00	Cooling setpoint	15 ~ 50°C		30
U01	Heating setpoint	0 ~ 20°C		5
U02	Hysteresis	1.0 ~ 20.0°C		5
U03	High alarm temperature	-5.0 ~ 60°C	U03 ≥ U04 + 1°C	50
U04	Low alarm temperature			5
U07	Evaporator frozen protect point	-5.0 ~ 20.0°C		-1.0
U10	Room sensor calibration	-3.0 ~ 3.0°C		0
U11	Evaporator sensor calibration	-3.0 ~ 3.0°C		0
U12	High temperature alarm	0/1	0: disable, 1: enable	1
U13	Low temperature alarm	0/1	0: disable, 1: enable	1
U14	Lack of freon	0/1	0: disable, 1: enable	1
U21	Evaporator sensor works	0/1	0: disable, 1: enable	1
U22	Compressor works	0/1	0: enable, 1: disable	0
U23	Heater works	0/1	0: enable, 1: disable	0
U26	External alarm input DI mode	0/1	0: normal close, 1: normal open	0
U28	Buzzer alarming	0/1	0: disable, 1: enable	1
U29	Delay protection time for compressor	0 ~ 5 min		3
U30	Minium running time for compressor	0 ~ 5 min		3
U34	RS485 baud rate (bps)	0 ~ 3	0: 2400, 1: 4800, 2: 9600, 3: 19200	3
U35	Device address	1 ~ 99		1
U99	Password	0000 ~ 9999	----	1111

**Check evaporator temperature**

Keep [▲] key depressed, the evaporator temperature for ZL-691/ZL-692 displays.

**On/off set on panel**

ZL-690/691 have this function. ZL-692 does not have this function. Keep [P] key depressed for 3 seconds to set U33.

## Control

### Cooling control

If room temp.  $\geq$  【Cooling setpoint U00】 + 【Hysteresis U02】 , and R1 has been off for 【Delay protection time for compressor U29】 , R1 on.

If room temp.  $\leq$  【Cooling setpoint U00】 , and R1 has been on for 【Minium running time for compressor U30】 , R1 off.

Example: 【Cooling setpoint U00】 = 25°C, 【Hysteresis U02】 = 2°C, control temperature between 25 ~ 27°C.

### Compressor forced running

When compressor is off, keep [▼] key depressed for 5 seconds to force compressor on.

When compressor is forced on, keep [▼] key depressed for 5 seconds to stop compressor forced running.

When compressor is forced on for 10 minutes, compressor stops the forced running automatically.

### Compressor delay protection

After compressor is off, it needs 【Delay protection time for compressor U29】 to be on again.

Afte compressor is on, it needs 【Minium running time for compressor U30】 to be off.

### ZL-692 heater control

If room temp.  $\leq$  【Heating setpoint U01】 - 【Hysteresis U02】 , heater on.

If room temp.  $\geq$  【Heating setpoint U01】 , heater off.

Example: 【Heating setpoint U01】 = 10°C, 【Hysteresis U02】 = 2°C, control temperature between 8 ~ 10°C.

**⚠ Heater and compressor will not be energized at the same moment.**

### ZL-691 evaporator fan control

When 【Evaporator fan working mode U24】 = 0:

If room temp.  $\geq$  【Evaporator fan setpoint U05】 + 【Evaporator fan hysteresis U06】 , and the fan has been off for 1 minute, the fan on.

If room temp.  $\leq$  【Evaporator fan setpoint U05】 , and the fan has been on for 1 minute, the fan off.

Example: 【Evaporator fan setpoint U05】 = 23°C, 【Evaporator fan hysteresis U06】 = 2°C, control temperature between 23~25°C.

### Buzzer beeping

Every key pressing, one beep. Every confirmation pressing, one long beep. Every wrong pressing, 3 short beeps.

If 【Buzzer alarming U28】 = 1, when there is failure, or effective external input to DI, keep alarming beeping, until no failure and effective input to DI.

### High low temperature alarm

If room temp.  $\geq$  【High alarm temperature U03】 for 5 seconds, high temperature alarm.

If room temp.  $\leq$  【High alarm temperature U03】 -2°C, stop alarming.

If room temp.  $\leq$  【Low alarm temperature U04】 for 5 seconds, low temperature alarm.

If room temp.  $\geq$  【Low alarm temperature U04】 +2°C, stop alarming.

### External input DI alarm (compressor high pressure)

【External alarm input DI mode U26】 = 1, normal open: If DI is short, alarm.

【External alarm input DI mode U26】 = 0, normal close: If DI is open, alarm.

**⚠ Compressor high pressure alarm:** If there are 3 times this alarm within one hour, it will not disappear, even the high pressure disappears, the compressor will keep off permanently. Only stop power supply, and supply power again, can stop the alarm, and make compressor works again.

### Temperature calibration

Room and evaporator sensor can be calibrated by setting 【sensor calibration U10, U11】 .

### ZL-691, ZL-692 lack of freon protection

After compressor has been running for 5 minutes, if evaporator temp.  $\geq$  (room temp. - 5°C), lack of freon protection: display "E03", compressor (R1) off.

**⚠ Lack of freon protection:** If there are 3 times the protection within one hour, it will not disappear, even evaporator temp. < (room temp. - 5°C) later, the compressor will keep off permanently. Only stop power supply, and supply power again, can stop the protection, and make compressor works again.

### ZL-691, ZL-692 evaporator frozen protection

After compressor has been energized for 1 minute, audit T2. If it is lower than 【U07】 for 5 seconds, start protect, display "FrE", compressor is de-energized, start fanning if ZL-691. When T2 reaches 【U07】 + 5 degree, stop protecting.

## Alarm output

Problems which will alarm:

Problem	Moment	Delay	Duration	Reset	Action
Room sensor fails	Any time	0 sec.	2 sec.	Auto	Compressor on, heater off, evaporator fan on, no lack of freon protection
Evaporator sensor fails	Any time	0 sec.	2 sec.	Auto	no lack of freon protection
High pressure alarm	Any time	0 sec.	5 sec.	Manual	Compressor off
Lack of freon protection	After compressor on	5 min.	5 sec.	Manual	Compressor off
High temp. alarm	Any time	0 sec.	5 sec.	Auto	No action for all outputs
Low temp. alarm	Any time	0 sec.	5 sec.	Auto	No action for all outputs
<b>Frozen protect</b>	<b>Compressor runs</b>	<b>1 min</b>	<b>5 sec.</b>	<b>Auto</b>	<b>Compressor off, fan on if ZL-691</b>

Alarm output terminals:

Name	Remark
NO	Open when there is alarm. Close when there is no alarm
NC	Close when there is alarm. Open when there is no alarm
C	Common

## Restore to factory set

Keep [P] and [▲] keys depressed simultaneously for 5 seconds, display "UnL".

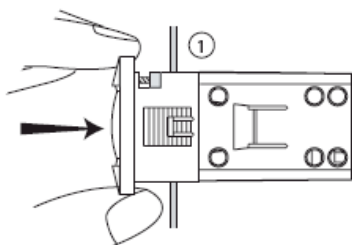
Press [▼] key twice. There will be a tone beep. All settings will be restored to factory set (see **parameter code table**), including the password.

## Check product information

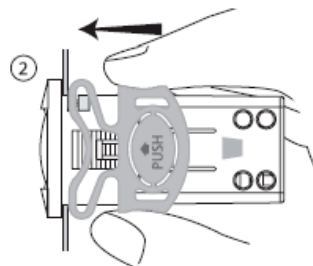
Keep [S] and [▲] keys depressed simultaneously for 3 seconds, display product model and version alternatively.

## Installation

1. Insert the controller in the hole



2. Slide the bracket to fix the controller



## Attention

Do not wire when power is supplied.

The specification for loads is for pure resistance loads. When drive capacitive or inductive loads, the drive ability should reduce to 1/5<sup>th</sup> of the spec. We could use intermediate relay, 220Vac input SSR, or magnetic contactor. Overload damage is not within warranty.

Electrical wiring must be manipulated by certified electrician.

Supply correct voltage and type power according to printing on the top of the controller.

Wire according to printing on the top of the controller.

Do not layout the sensor bundle together with power supply bundle.

Do not touch inside PCB by hand.

Avoid working in erosive, wet and strong electrical-magnetic field, vibrating 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

