LD-B32 Series
New Energy Temperature and Humidity Controller

Operating Manual

Fujian Lead Automatic Equipment Co., Ltd.

1. Function Introduction

As an intelligent instrument designed for modern new energy technology field, LD-B32 new energy temperature and humidity controller can be used to measure oil temperature of the transformer and the temperature and humidity inside the box transformer, indicating visualized and clear temperature and humidity values with Nixie tube. Excessive high ambient temperature will cause the automatic start of the drought fan; Overdue oil temperature calls for the functions of warning output and tripping output; Overdue ambient humidity inside the box transformer will cause automatic start of ambient fan or start of heaters for dehumidification to keep favorable operating environment.

Oil surface temperature sensor adopts armor PT100 oil temperature liquid sensor with three-wire system mode of a connection whose lead wire amounts to 20 meters and temperature shows no distortion.

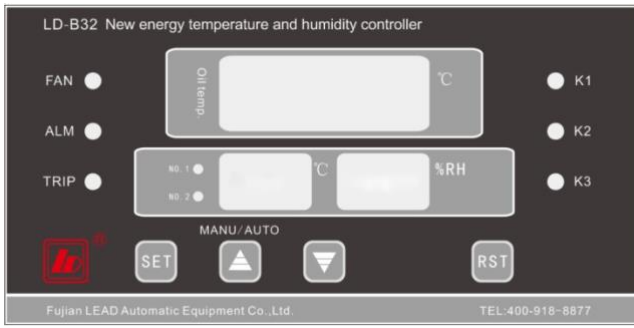
The imported, highly reliable and integrate ambient temperature and humidity sensor enjoys the features of high accuracy, excellent stability and remarkable anti-interference. This controller supports the inquiry of temperature tripping records and RS485 communication or analog quantity output can be selected (4 to 20mA current output or 1 to 5V voltage output).

2. Application area

- Photovoltaic power system
- High-tension switch board
- Wind power electrical system
- Box-type substation

3. Description of panel layout

3.1 Schematic drawing of panel



3.2 Display area descriptions

- Three rows of red LED indicators are used for display. In normal case, four-digit large indicator D3 the upper row gives the oil surface temperature, the three-digit small indicator D1 at the left bottom gives the ambient temperature and the three-digit small indicator D2 gives the ambient temperature at the right bottom.
- K1 and K2 indicator: They indicate the contact performance of heater 1 and heater 2; light on indicates corresponding contact is closed and the heater starts.
- K3 indicator: It indicates the contact performance of indicator K3; light on indicates the contact is closed and K3 contact is output (free disposition if necessary)
- Indicator of fan 2: It indicates the contact performance of control drought fan; light on indicates the contact is closed and the fan is turned on.
- Over-temperature indicator: It indicates the contact performance of overheat warning; light on indicates the contact is closed and overheat warning signal is output.

- Tripping indicator It indicates the contact performance of overheat tripping; light on indicates the contact is closed and overheat warning signal is output.

3.3 Description of the Buttons

There lies the setup key, Increasing button, decreasing button and reset key from left to right in the panel.

- Set key: In normal operation mode, parameters can be set by pressing the setup button which should be pressed to set up parameters to check the value modification and enter into the parameter setup of the next class.
- Increasing button ▲: Manual and automatic control switching of the fans. As for normal indication, press the Increasing button and the fan will start manually, namely the start of fans cannot be controlled by the temperature. Automatic mode means the start of fans proves to be under the control of temperature. When the measured temperature reaches the target value of fan start-up, the fan will begin to operate automatically. When modifying parameters press the Increasing button and the value increases by 1; press and hold and the value increases continuously and 10 consecutive value increase will be followed with rapid continuous increases.
- Decreasing button ▼ In normal indication, pressing this key brings no effect. When modifying parameters press the decreasing button and the value decreases by 1; press and hold and the value increases continuously and 10 consecutive value decreases will be followed with a rapid continuous decrease.
- Reset key: To reset the control by pressing this key.

4. Technical parameters

Working voltage		AC220V (-15%~+15%)
Contact output capacity		Other contacts 2A/250VAC Fan contact 5A/250VAC
Storage environment		-50℃~80℃, <95%RH
Measurement scope of environmental temperature:		-40℃~160℃
Measurement scope of oil temperature		-50.0℃~160.0℃
Measurement scope of humidity:		1.0%~99.9%
Applicable environment		-45℃~85℃, <95%RH (no condensation)
Operating altitude		﹤4km
Resolution/precision	Ambient humidity	0.1%/±5.0%
	Oil surface temperature	0.1℃/±1.0℃
	Ambient humidity	1℃/±1℃
Communication	Port form	RS485
	Communication protocol	Modbus RTU
	Communication rate	1200bps~19200bps
Appearance and weight	Opening size	76^{+1}mm× 152^{+1}mm
	Overall dimension	80mm (height)× 160mm (width)× 100mm (depth)
	Weight	Approximately 450g

5. Parameter setting

5.1 power failure records

Procedures	Indication / key	D1	D2	D3	Instruction	Remark
1	SET	--P	-Cd	1000	Enter into function operation	
2	▲	--P	-Cd	1002	Input password to **record inquiry**	Correct passwords should be input.
3	SET	--P	dyt	-0.1	The oil temperature is -0.1℃ when the power is off.	Press the ▲ button for loop checking of power failure records. Press SET button in the record web for record high temperature of each power failure (note: dt2 and dH2
4	▲	--P	dt1	-1	The ambient temperature of the first route is -1℃ when the power is off.	
5	▲	--P	dH1	-0.1	The ambient humidity of the first route is -0.1% when the power is off.	

6	▲	--P	dt2	-1	The ambient temperature of the second route is -1℃ when the power is off.	parameters are unavailable with only one route temperature and humidity in operation)
7	▲	--P	dH 2	-0.1	The ambient humidity of the second route is -0.1% when the power is off.	
8	SET	--P	Hyt	91.1	Record high of oil temperature is 91.1℃	
9	SET	Return to normal operation				

5.2 Trip record

Procedures	Indication key	D1	D2	D3	Instruction	Remark
1	SET	--P	-Cd	1000	Enter into function operation	
2	▲	--P	-Cd	1015	Input password to record inquiry	Correct passwords should be input.
3	SET	--P	tAH	100.0	Oil temperature was 100.0℃ in the last tripping.	

4	Any key	Return to normal operation

5.3 Basic parameter setup (the following data are normal values and special demands should be subject to the agreements between customers and manufacturers).

Procedures	Indication key	D1	D2	D3	Instruction	Remark
1	SET	--P	-Cd	1000	Enter into function operation	
2	▲	--P	-Cd	1005	Input parameter password	Correct passwords should be input.
3	SET	--P	-AL	80.0	Overtemperature alarm value	Alarm operating temperature>AL+0.3℃
4	▲ or ▼	--P	-AL	###	Setting range: -50.0℃～160.0℃	Alarm releasing temperature <AL-0.3℃
5	SET	--P	-AH	95.0	Overtemperature tripping temperature	Trip operating temperature> AH+0.3℃
6	▲ or ▼	--P	-AH	###	Setting range: -50.0℃～160.0℃	Trip releasing temperature <AH-0.3℃
7	SET	--P	-tb	50	Set the start-up temperature target value ofthe ambient fan	Start-up temperature of the fan >tb+tdF℃ Releasing temperature of the fan <tb-tdF℃
8	▲ or ▼	--P	-tb	###	Setting range: -40℃～160℃	

9	SET	--P	tdF	5	Set the start-up temperature difference value of the ambient fan	
10	▲ or ▼	--P	tdF	###	Setting range: 0℃～15℃	
11	SET	--P	-Hb	80.0	Set the start-up humidity target value of the ambient heating	Heating start-up humidity >Hb+HdF %RH Heating releasing humidity <Hb-HdF %RH
12	▲ or ▼	--P	-Hb	###	Setting range: 20.0%RH～99.9%RH	
13	SET	--P	HdF	5.0	Set start-up temperature difference value of the ambient heating	
14	▲ or ▼	--P	HdF	###	Setting range: 0.0%RH～15.0%RH	
15	SET	--P	-tL	-5	Set the start-up temperature value of the ambient heating	Heating start-up temperature<tL℃ Heating releasing temperature>tH℃
16	▲ or ▼	--P	-tL	###	Setting range: -30℃～30℃	
17	SET	--P	-tH	10	Set temperature range closing the ambient heating	
18	▲ or ▼	--P	-tH	###	Setting range: -30℃～30℃	

19	SET	Confirm modified parameter values and the controller exit the parameter setting condition and back into normal working condition.

5.4 Compensation settings for measurement

Procedures	Indication key	D1	D2	D3	Instruction	Remark
1	SET	--P	-Cd	1000		
2	▲	--P	-Cd	1008	Input the passport for indication compensation	Correct passwords should be input.
3	SET	--P	-yt	0.0	Enter oil temperature value compensation, the original compensation value is 0.0℃	Oil compensation can be positive or negative: Temperature setting ranges from 19℃ to 19℃; Oil temperature setting ranges from 19.9℃ to 19.9℃; Ambient humidity setting ranges from 19.9% to 19.9% (Remarks: In case there's
4	▲ or ▼	--P	-yt	###	Set oil surface temperature compensation value	
5	SET	--P	-t1	0	Access to the first route ambient temperature compensation, with the origin compensation value of 0℃	

6	▲ or ▼	--P	-t1	###	Set the first route of ambient temperature compensation value	only one route temperature and humidity function, no t2 or H2 parameters is set)
7	SET	--P	-H1	0.0	Access to the first route ambient humidity compensation, with the origin compensation value of 0℃	
8	▲ or ▼	--P	-H1	###	Set the first route of ambient humidity compensation value	
9	SET	--P	-t2	0	Access to the second route ambient temperature compensation, with the origin compensation value of 0℃	
10	▲ or ▼	--P	-t2	###	Set the second route of ambient temperature compensation value	

11	SET	--P	-H2	0.0	Access to the second route ambient humidity compensation, with the origin compensation value of 0℃	
12	▲ or ▼	--P	-H2	###	Set the second route of ambient humidity compensation value	
13	SET	Confirm modified parameter values and the controller exit the parameter setting condition and back into normal working condition.				

5.5 Communication parameter setting

Procedures	Indication key	D1	D2	D3	Instruction	Remark
1	SET	--P	-Cd	1000		
2	▲	--P	-Cd	1010	1010 Input parameter password 1010	Correct passwords should be input.
3	SET	--P	-dd	1	Default communication address	Setting range: 1～247
4	▲ or ▼	--P	-dd	###	Communication address setting	

5	SET	--P	-bL	3	Default baud rate	Setting range: 0~4
6	▲ or ▼	--P	-bL	###	Communication baud rate setting	
7	SET	--P	-PC	0	Default communication parity method	Setting range: 0~2
8	▲ or ▼	--P	-PC	###	Communication parity method setting	
9	SET	Confirm modified parameter values and the controller exit the parameter setting condition and back into normal working condition.				

Note 1: 1. Set communication baud rates 0-4 are corresponding to 1200, 2400, 4800, 9600, and 19200bps respectively.

Set communication parity methods 0-2 are corresponding to no parity, ODD parity, and ECC parity respectively.

Note 2: The data above are all examples or default numbers. Different specifications are for different models. In use, take the site observed value.

6. RS485/232 communication protocol (F model)

6.1 Frame definition

Start bit	Data length	Check bit	Stop bit
1 bit	8 bit	0 or 1 bit (settable)	1 bit

6.2 communication protocol content (message format)

6.2.1 Upper computer giving command (command contents as in the chart below):

Domicile	0x##(1~247)
Function code	0x03
Initial address 8 high bits	0x00
Initial address 8 low bits	0x##
Data size word 8 high bits	0x00
Data size word 8 low bits	0x##
CRC16 parity 8 low bits	
CRC16 parity 8 high bits	

6.2.2 Lower computer returning data:

When upper computer reads all the data, upper computer data word =0001~0006.

(For initial address of upper computer, see Note 3 below)

Domicile	0x##(1~247)
Function code	0x03
Data byte size	Data word size *2
Oil temperature data 8 high bits	Observed temperature=temperature data/10
Oil temperature data 8 high bits	
1st route environment temperature data 8 high bits	
1st route environment temperature data 8 low bits	

1st route environment temperature data 8 high bits	Observed humidity=humidity data/10
1st route environment temperature data 8 low bits	
2nd route environment temperature data 8 high bits	
2nd route environment temperature data 8 low bits	
2nd route environment temperature data 8 high bits	Observed humidity=humidity data/10
2nd route environment temperature data 8 low bits	
Relay status 8 high bits	Relay bit definition seen in **Note 5**.
Relay status 8 low bits	
CRC16 parity 8 low bits	
CRC16 parity 8 high bits	

Note 3: Upper computer initial address explanation

Start address	Instruction	Register definition
0x0000	Oil temperature data	40001
0x0001	1st route environment temperature data	40002
0x0002	1st route environment temperature data	40003
0x0003	2nd route environment temperature data	40004
0x0004	2nd route environment temperature data	40005
0x0005	Relay status data	40006

Note 4: Temperature/humidity data 8 high bits definition

Upper computer sends function code 03. After controller returns temperature/humidity data, find data 8 high bits and 8 low bits. If the 8 high bits and 8 low bits are as stated in the chart below, it means the meter operation is in error. Do not calculate temperature data or humidity date but rely on the operating status of temperature controller corresponding to the following chart. If temperature/humidity data 8 high bits are not the same with the chart below, it means the meter operation is normal. The observed data can be calculated according to data high 8 bits and low 8 bits.

Temperature/humidity data 8 high bits	data 8 low bits	Temperature controller status	Instruction
0x70	0x00	—OP—	Open circuit
0x60	0x00	—OH—	Beyond the upper limit
0x80	0x00	—OL—	Beyond the lower limit

Note 5: Relay status bit definition

Data 8 low bits definition

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0

Wherein: Bit5 stands for K3 carryout bit. Bit4 stands for K2 carryout bit. Bit3 stands for K1 carryout bit. Bit2 stands for overtemperature alarm carryout bit. Bit1 stands for carryout bit of tripping beyond temperature limit. Bit0 stands for blower control carryout bit.

Varied carryout bit status: 0 stands for output contact open. 1 stands for output contact close.

7. Current transformation supply output type (type E)

7.1 Performance characteristics

On the basis of general functions, 4-20mA current signals with output value and measured temperature value in linear corresponding relation can be connected directly with remote A/D chips to assemble distributed control system (DCS system).

7.2 Current output technical requirements

7.2.1 Load resistance R≤500 Ohm

Output precision: ±1%

7.2.2 Corresponding curve and relation for measured temperature by temperature controller and output current.

Relation of temperature and current

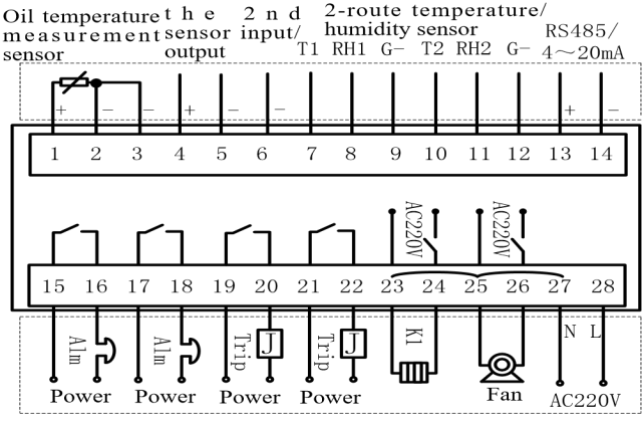
$$I=16*(T+50)/210+4$$

Wherein: T is a route temperature value, and I is corresponding current value of this route temperature.

7.3 Output transformation

If the user's acquisition system requires receiving voltage analog signals, directly connect 250Ω high-precision resistor in parallel at the existing current output end, to achieve 1-5V voltage signal with connected load resistance R≥20kΩ.

8. Definition of terminal



Terminals 1-6 are 2-route PT100 sensor connecting terminals. 1 and 4 are positive terminals. And 4, 5 and 6 (connected in parallel) are output.

Terminals 7-12 are 2-route temperature/humidity sensor connecting terminals. 8 and 10 are for temperature. 9 and 11 are for humidity.

Terminals 13 and 14 are RS485 communication terminals or 4-20mA analog quantity output.

Terminals 15,16 and 17,18 are relay dripping output contact (no source), whose output is controlled by oil temperature.

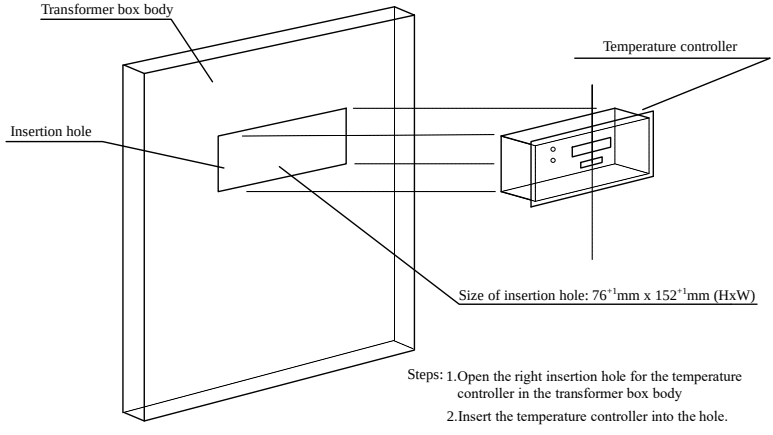
Terminals19,20and 21,22 are output contacts for spare output and can be set specifically according to the user's need.

Terminals 23 and 24 are 2 sets of relay output contacts (with source), whose output is controlled by humidity or environment temperature with heater connected.

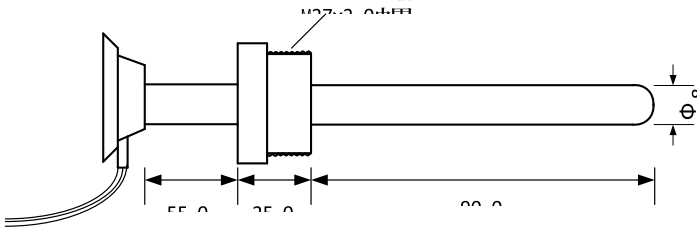
Terminals 25 and 26 are blower output contacts (with source), whose output is controlled by environment temperature.

Terminals 27 and 28 are operational power of controller.

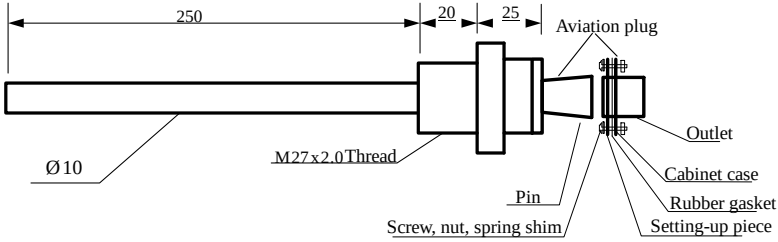
Notes: The above terminals are defined in corresponding definitions of LD-B32-12X-1112. Definitions can vary for different controller terminal models. For details, refer to the connection diagram on the controller. 9. Controller installation diagram

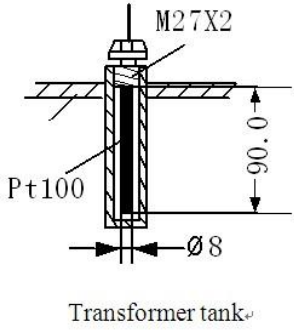


10. Armored PT100 sensor dimension diagram and installation diagram is as follows: (Unit: mm)



Aviation plug-in sensor dimension diagram





nstallation diagram is as left

Notes:

The above diagrams are only examples. If users have specific requirements for armored Pt100 cable length or detector size, the requirements can be put in the orders.

11. Order and model selection

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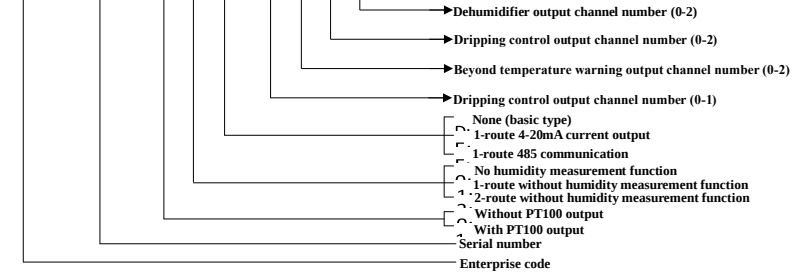

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