DITEK LD-B10 Series Temperature controller of Dry Transformer Instruction Manual

Contents

LD-B10 Series Temperature controller of Dry Transformer

Product Information

The LD-B10 Series Temperature Controller is designed for use with dry transformers. It is manufactured by Fujian LEAD Automatic Equipment Co., Ltd. The temperature controller is responsible for monitoring and controlling the temperature of the transformer winding to ensure safe operation and prevent damage to the insulation.

Technical Indicators:

- Measurement Range: -30.0°C to 240.0°C
- Measurement Accuracy: Grade 1 (Grade 0.5 for temperature controller, Grade B for sensor)
- Resolution: 0.1°C
- Operating Conditions: Room temperature: -20°C to 55°C
- Power Consumption of Temperature Controller: 8W
- Execution Standard: JB/T7631-2016 Electronic Thermo-controllers for Transformers
- Certifications: ISO9001:2008, IEC61000-4:2002, GB/T17626-2008
- Relay Contact Output:
  - Capacity of Fan Contact: 6A/250VAC (Cos=0.4) for single-phase fan, 9A/380VAC (Cos=0.4) for three-phase fan
  - Control of Output Capacity: 5A/250VAC, 5A/30VDC (Resistance)
- Protection Class: IP40 (IP54 for panel)

Product Usage Instructions

1. Before installing, operating, and running the temperature controller, carefully read the manual and keep it properly for future reference.
2. Disconnect the sensing cable plug and power line from the temperature controller before performing a high-voltage holding test on the transformer to avoid any damage to the temperature controller.
3. Handle and install the temperature controller with care to ensure its normal operation. Install it on the transformer case or on the wall for enhanced reliability.
4. Do not weld on the steel jacket of the temperature controller probe or conduct temperature control tests using open fire temperature measurement probes. Use the analog output function of the controller to detect the output state.
5. Refer to the wiring diagram on the back cover of the temperature controller or at the back of the box door for external wiring. Check if the terminal is active or passive and refer to the description of the capacity of relay contact in the directions or wiring diagram.
6. If you have any questions or find any errors when reading the directions or using the control, promptly contact Fujian LEAD Automatic Equipment Co., Ltd.
7. No further notice will be given for manual modifications or alterations. If any insert is annexed to the manual, the wiring diagram and description in such insert shall prevail.

Instructions for Use of LD-B10 Series Temperature controller of Dry Transformer
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Preface
Before installing, operating and running the temperature controller, please carefully read the manual. Keep the manual properly!
The manual shall be in kept where it is accessible to, and shall be reserved by the end user!
The sensing cable plug and power line should be disconnected from the temperature controller first before the transformer is put to the high-voltage holding test so as not to cause any damage to the temperature controller!!!
To ensure normal operation of temperature controller it should be handled and installed with as much care as possible.
Acute vibration will occur when you switch on the transformer, and much heat, low-frequency vibration and electromagnetic interference will be produced in normal operation. In order to enhance the reliability of the temperature controller, install the temperature controller on case of transformer or on the wall as far as possible.
Welding on steel jacket of probe of the temperature controller by electric soldering iron is not allowed. It is not allowed to conduct temperature control test by open fire temperature measurement probe. When it is required to detect the output state of the temperature controller, please apply the analog output function of the controller. (User password: 1012)
For external wiring, please refer to the wiring diagram on the back cover of the temperature controller / at the back

of the box door. Check if the terminal is active or passive and refer to the description of the capacity of relay contact in the directions or wiring diagram
Should you have any question or find any error when reading the directions or using the control, we shall be grateful if you could contact us promptly.
No further notice will be given where the manual is modified or altered. If any insert is annexed to the manual, the wiring diagram and description in such insert shall prevail.

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Introduction

Safe operation and working life of power transformers depends largely on the safety and reliability of transformer winding. If the temperature of transformer winding exceed the temperature which insulation withstand, it will damage the insulation. This is one of the most important reasons that transformers cannot operate normally.
LD-B10 series temperature controller of dry transformer (Referred to as temperature controller) is an intelligent controller designed especially for safe operation of dry transformer. The temperature controller features adoption of single chip computer technology and utilization of the platinum thermo-resistors embedded in the winding of the dry transformer for detection and display of temperature rise of the transformer windings. It can start or stop the cooling fan automatically for forced air cooling of windings and control over-temperature alarm and over-temperature tripping output so that the transformer will be operated safely.

Technical Indicators

1. Range of measurement: 30.0 240.0
2. Accuracy of measurement: Grade of accuracy: Grade 1(Grade 0.5 for temperature controller, Grade B for sensor)

   Resolution 0.1
3. Operating conditions: Room temperature: 20 55
   - Relative humidit y: < 95% (25 ℃℃)
   - Power frequency: 50Hz or 60Hz (±2Hz)
   - Power voltage: AC220V (+10%, 15%)
   - Or AC380V (3 phase 3 wire system) (+10%, 15%)

     (Power voltage should be indicated before placing order, oth erwise AC220V shall govern)
4. Power consumption of temperature controller: ≤8W
5. Execution standard: Production standard: JB/T7631 20 16 Electronic

   Thermo controllers for Transformers

   Certification passed: ISO9001:2008 Qu ality Management Systems requirements

   Test passed: IEC61000

   4:2002 International Standard and GB/T17626 2008

   Standard for Electromagnetic Compatibility Test and Measuring Technology

6. 2.6 Relay contact output:

   Capacity of contact of fan: 6A/250VAC (Cosφ=0.4) (Single phase fan)

   9A/380VAC (Cosφ=0.4) (Three phase fan)

   Control of output capacity: 5A/250VAC; 5A/30VDC (Resistance)

7. Protection class: IP40

   Protection class of panel: IP54

Type and Classification of Function

Note: Other special requirements for the temperature controller should be indicated when placing orders.

Sensing Cable Assembly
4.1 D25 sensing cable (3-wire system), cable length tolerances: ±2.5%
Note: Correspondence between line color and phase:
Yellow corresponds phase A; Green corresponds phase B;
Red corresponds phase C; Blue corresponds d-way

Types G/I 4-way cable connection schematic diagram

4.2.1 Pt100 platinum resistor is a thermo-resistor with better linearity in the range of -30.0 ℃ ~240.0 ℃ and meets the requirements for Grade B set forth in GB/T8622-97–Technical Specification and Reference Table for Industrial Platinum Resistance.
4.2.2 Overall dimension: Φ4mm×40mm
4.2.3 Corresponding curves to the resistance and temperature of Pt100 platinum resistor:
4.3 Humidity module (Selection function)
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4.3.1.2 Humidity range: 0.0%RH 100.0%RH (Can be condensed)
4.3.1.3 Detection range: 0.0%RH 99.0%RH
4.3.1.4 Save temperature range: -20.0℃ 85.0℃
4.3.1.5 Save humidity range: Below 95% RH (Can be condensed)
4.3.1.6 Humidity detection accuracy: ±5%RH (Conditions: at 25℃, 60%RH)
4.3.2 Corresponding curves to the input moisture percentage and output voltage:
4.4 Interlock control of Pt100 and PTC on over-temp alarm and over-temp trip signal
4.4.1 Explanation of PTC (Selection function)
PTC is an abbreviation for positive temperature coefficient thermistor, which is a semiconductor resistor having a typical temperature sensitivity. When the temperature exceeds a certain value (Fixed temperature point not be adjustable), its resistance value will increase impulsively with increasing temperature, i.e., resistance mutation.
4.4.2 Logical relation of interlock control of Pt100 and PTC
4.4.2.1 Interlock control of Pt100 and PTC on over-temp alarm
4.4.2.1.1 When the temperature measured by Pt100 exceeds over-temp alarm value, in addition, PTC reaches the point of over-temp alarm and the resistance has mutated. Over-temp alarm signal will output in 6 seconds.
4.4.2.1.2 When the temperature measured by Pt100 exceeds over-temp alarm value,

in addition, PTC has went wrong (Short circuit or open circuit, see table ‘PTC Status Inquiry’ below). Over-temp alarm signal will output in 6 seconds.
4.4.2.1.3 When PTC reaches the point of over-temp alarm and the resistance has mutated, in addition, all Pt100s have went wrong (Displaying ‘-OL-’ or ‘-OP-’ or ‘ -OH-’). Over-temp alarm signal will output in 6 seconds.
4.4.2.2 Interlock control of Pt100 and PTC on over-temp trip
4.4.2.2.1 When the temperature measured by Pt100 exceeds over temp trip value, in addition, PTC reaches the point of over temp trip and the resistance has mutated. Over temp trip signal will output in 10 seconds.
4.
4.2.2.2 When the temperature measured by Pt100 exceeds over temp trip value, in addition, PTC has went wrong (Short circuit or open circuit, see table ‘PTC Status Inquiry’ below). Over temp trip signal will output in 10 seconds.
4.4.2.2.3 When PTC reaches the point of over temp trip and the resistance has mutated, in addition, all Pt100s have went wrong (Displaying ‘ OL –’ or OP –’ or OH –’). Over temp trip signal will output in 10 seconds.
4.4.3 PTC Status Inquiry
4.4.4 About PTC ordering
4.4.4.1 Two options
4.4.4.1.1 PTCAL&PTCAH: Invol ved in controlling over temp alarm and over temp trip signal output
4.4.4.1.2 PTCAH: Only involved in controlling over-temp trip signal output.
4.4.4.2 We offer PTCAL and PTCAH whose temperature point is as same as the controller setting for over-temp alarm and over-temp trip. Over-temp alarm PTC is PTC130, over-temp trip PTC is PTC150. PTC temperature point of resistance mutation is fixed value could not be adjustable. If users need to change the PTC temperature point, please make a note when ordering.

Display and Key

Display of working mode of temperature controller (Exemplified by ordinary type D temperature controller)

D1: One-bit code display, showing the measurement phase and prompting characters.
D2: Four-bit code display, showing the measured value and parameters.
5.2 Function of key

Note: In key operation, if no key is pressed, the temperature controller will return to normal working status automatically in about 100 seconds while the setting will become invalid.

Parameter Setting
6.1 Function of “black box”
Under the function operation mode you can check the instantaneous temperature value of the winding in each phase before power failure. (D-way is available for types G/I only)
Excitation function of cooling fan (Timed start/stop of fan)
Note: The spacing interval is expressed in a unit of hour with a set range of 0~150. The auto operation time of the fan is set as 2 minutes by the software and user is unable to change it.
For example: If 0 is set, it indicates the fan has no timed start/stop function; If 24 is set, the fan will start or stop once at an interval of 24 hours. The user can set the

spacing interval in light of the actual conditions.
6.3 Parameter setting function
Prompting characters
for parameters have the following implications:
Ob:
target value for start/stop of fan
dF:
backlash of target value for start/stop of fan
AH:
target value for over temperature tripping
AL:
target value for over temperature alarm
ObJ:
targ et value for start/stop of transformer room fan
dFJ:
backlash of target value for start/stop of fan in transformer room
AHJ: target value for over
temperature tripping in transformer room
ALJ: target value for
transformer core over te mperature alarm
Hb:
target value for start/stop of d ehumidification heater
H
dF: backlash of target value for start/stop of d ehumidification heater
S
tarting temperature of fan > Ob+dF
S
topping temperature of fan < Ob dF
S
tarting temperature of fan i n transformer room> ObJ+dFJ
S
topping temperature of fan in transformer room < ObJ dFJ
S
tarting temperature of d ehumidification heater Hb +HdF
S
topping temperature of d ehumidification heater Hb HdF
Note:
①
The backlash of other target values than those for cooling fan , transformer
room fan and d ehumidification heater is all approved to be 0.3 tacitly.
②
The parameters shown above are all for reference and specific set value shall
be subject to the delivery label.
6.4 Procedures for setting digital compensation for measured value
When any error in the measured temperature value occurs owing to external
causes such as sensor accuracy, you can go into the mode of setting digital
compensation for measured value and calibrate the measured value. (Compensation
range: -19.9℃~+19.9℃)
6.5 Operating procedures for detection of output status
The change in measured temperature can be simulated by digital setting to detect
the output status of temperature controller and corresponding contact.
Note:
① To prevent the transformer from wrong tripping, the software doesn’t support
analogue function of over-temperature tripping!
② Type G/I temperature controller has no analogue function of failure output.
③ The actual operating temperature point shall be subject to the internal
parameter of temperature controller (1005 function setting).
6.6
Operating procedures for setting protecti ve value of fan

Note:
① When 0 is set for FC, there is no fan protection function;
When FC × 50 Fd, it is considered that fa n is in normal;
When FC × 50 Fd, it is considered that fan is in f ailure and it will output alarm.
② Please connect same amount and same specification fans to 2 sets of fan terminals.
③ Start fan manually, check Fd, and then set the FC valu e that is larger than Fd/50.
④ If the fan protection is not correct after setting FC, please check the fan and fan wiring and make reference of 3 parts above.

4~20mA Current Output (Type E)
7.1 Functional features
On the basis of the general-purpose function transmission of independent 3-way (4-way) 4~20mA current signals that are in linear correspondence with the measured temperature value (0.0℃~200.0℃) will link to the distant A/D card directly so as to set up a distributed control system(DCS).
Within the temperature controller A-, B-, C- and d- are connected mutually, namely, with common catho. If your collecting system is in conflict with it, please specify before placing order. We usually provide 3-phase winding temperature current output. If you need an additional d-way temperature current output, please indicate before placing order.
7.2 Technical specifications for current output
7.2.1 Load resistance: R≤500Ω
Output accuracy: ±1%
7.2.2 Corresponding curve and relationship formula between measured temperature and output current of temperature controller:

Relationship formula between temperature and current: I= (16T/200)+4
Where: T stands for temperature value of winding in X-phase
I stands for current value corresponding to the temperature in the phase.
7.2.3 Conversion of output

If the user’s collecting system calls for receipt of analogue voltage signals, 250Ω resistor with high accuracy may be connected in parallel directly at the existing current output end. Then 1V~5V voltage signals may be received immediately and connected to the load resistance R≥20KΩ.
8. RS485 Communications (Type F)
8.1 Functional features of temperature controller communications
Temperature controller has serial communication function and the operating status of the transformer and temperature controller can be monitored by the monitoring system.
It usually utilized RS485 interface. If you need additional communication interface as RS232, RS422, please specify before ordering.
8.2 Technical indicators for communications:
① Maximum communication distance: 1200m;
② Maximum number of temperature controller to be connected to: 28
③ Schematic communications connection diagram
8.3 Procedures for setting up communication address of temperature controller
8.4 Procedures for setting up transmission check bit and baud rate of temperature

controller
8.5 MODBUS RTU communication protocol
8.5.1 Definition of frame
8.5.2 Instructions on communications protocol
8.5.2.1 Function code in use:
① When function code is 0x03, temperature value readings in each phase of temperature controller should be taken.
② When function code is 0x04, output state readings of temperature controller relay should be taken.
8.5.2.2 Definition of register address:
8.5.2.2.1 Definition of register address for temperature value in each phase (0x03 function code):

Note 1: If temperature controller measures 3 way, the initial address 0x0003 is retention address .
Note 2: Actual temperature in each phase is equal to the temperature data in each phase divided by 10.
Note 3: Definition of temperature data high 8 bit:
After PC transmits function code 0x03 and temperature controller sends back data, PC has to ju dge first whether temperature data are high 8 bit or temperature data low 8 bit. If the values for temperature data high 8 bit and temperature data low 8 bit are just as those shown in the table below, it indicates temperature controller is faulty and temp erature value should not be calculated; Instead, corresponding working status of temperature controller should be shown based on the table below; If the value for temperature data high 8 bit is not shown in the table below, it indicates temperature control ler is in normal operation and temperature value can be calculated based on the temperature data high 8 bit and temperature data low 8 bit.
8.5.2.2.2 Definition of relay output register address (0x 04 function code):

Definition of data low 8 bit:

▲: When temperature controller measure s 3 way:
Where: Bit
5 stands for fan fault alarm output bit
Bit 3 stands for fault alarm output bit
Bit 2 stands for over temperature alarm output bit
Bit 1 stands for over temperature tripping output bit
Bit 0 stands for fan c ontrol output bit
▲: When temperature controller measures 4 way:
Where: Bit
5 stands for fan fault alarm output bit
Bit 4 stands for fault alarm output bit
Bit 3 stands for iron core over temperature alarm output bit (Gauge T ype I)
Bit 3 stands for transformer room fan control output bit (Gauge Type G)
Bit 2 stands for over temperature alarm output bit
Bit 1 stands for over temperature tripping output bit
Bit 0 stands for fan control output bit

Note:
Each output bit status: Bit 0 stands for no action contact
Bit 1 stands for action contact

8.6 Communication examples
Assumption: When communication address of temperature controller (To measure 3-way) is 1; Temperature in phase A is in opening status (-OP-), temperature in phase B is 30.0°C and temperature in phase C is 100.1°C; Fault alarm output and fan control output.
8.6.1.1 Computer issues order to send back data (Temperature readings in each phase are taken)
8.6.1.2 Data sent back by temperature controller (Temperature value in each phase)
8.6.2.1 Computer issues order to send back data (Relay output readings are taken)
8.6.2.2 Data sent back by temperature Controller (Relay output status)

Common Knowledge about Fault handling on the site

Fittings & Ordering

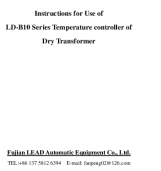
▲: Combined with Type G and Type I is 4-way sensing cable assembly.
◆: The mating shall be in line with the actual output mode of the temperature controller, e.g., if the communication signal is output from terminal, communication cable of lower computer will be not equipped.
Introduction to RS485 serial communication: You can directly download the testing software from official website of our company: **http://www.fjlead.com**.

Order Information
1. The user is requested to refer to the table of Function and Classification of Type in page 2 before placing orders for selection of applicable size and type.
2. Special technical requirements for temperatu
re controller should be indicated
when placing orders.

Service
◆
Any entity or individual that purchases or uses our products may enjoy our after sale services.
◆
We guarantee quality and free repair or replacement if pr oduct found unsatisfactory in its performance within two years as of the date of delivery or eighteen months from the date of operation.
◆
If any damage to the product is caused by improper use, test or installation, unauthorized dismantling, sudden chang e in external power source or unexpected lightning, we shall provide no such guarantee.
◆
The product beyond the warranty period or the damaged one referred to in Paragraph 3 may be returned to our company for maintenance, but the user shall bear a given repairs cost.

Warranty Card
Coupon kept by the user

Documents / Resources

	DITEK LD-B10 Series Temperature controller of Dry Transformer [pdf] Instruction Manual LD-B10 Series Temperature controller of Dry Transformer, LD-B10 Series, Temperature controller of Dry Transformer, controller of Dry Transformer, of Dry Transformer, Dry Transformer, Transformer