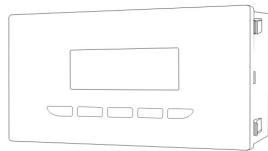Temperature Controller of Dry Transformer

BWDK-326 Series ︱ Manual ︱

Company Profile

Fujian LEAD Automatic Equipment Co., Ltd., founded in 1993, with the registered capital of RMB 120 million, is a high-tech enterprise integrated with the research, development, production, marketing and service of sensors, intelligent instrument, intelligent transformer components and industrial automation & intelligent control equipment, and it has developed to be the brand-name enterprise producing power transformers and transmission and distribution switchgear components in China, Standing Director Unit of National Special Transformer Industrial Technology Innovation Strategic Alliance, Top 100 enterprise of "Innovation 100" of Entrepreneurs & Scientists Innovation Forum in China. The market share of LD-series dry-type transformer thermostats has ranked No.1 for years in China. Weici Company took the lead to apply microcomputer excitation technology to mid-small sized hydropower stations in China in 1990, and it has been awarded with the third award of Fujian science and technology progress. The company employs over 300 employees which above 70% are from university and secondary school. It has passed the certification of ISO9001 Quality Management System and ISO14001 Environmental Management System, and has established the long-term cooperative relationship with Fuzhou University, Fujian Agriculture and Forestry University and multiple colleges and universities and scientific research institutes, thus forming the combination of production, education and scientific research, improving the R&D and innovation capacity and being awarded with multiple national patents.

After years of market development and operation, Fujian LEAD has formed complete production line of power transformers and transmission and distribution switchgear components. The main products of Fujian LEAD include integrated controllers of dry-type/ oil-immersed/ underground-type transformers, special controllers for rail transit transformers, intelligent distribution monitoring instrument, multi-function power meters, var compensators, negative control terminal & distribution and substation terminal, oil-water transmission controllers, thermal conductivity flowmeters, shaft current sensors, special intelligent instrument for hydropower stations, intelligent control screens of hydroelectric generating sets and all kinds of power equipment components, sensors, intelligent instrument and industrial automation control equipment. Fujian LEAD products have been widely applied Yangtze Three Gorges, Bird's Nest stadium, National Center for the Performing Arts, Shanghai World Expo, Shenzhen Metro, Shanghai Metro, Guangzhou Asian Games stadium and other national key projects. After years of development, Fujian LEAD has developed to be the best kit factory for transmission and distribution equipment enterprises in China. Till now, ten offices have been set for market exploration, maintenance and pre-sale and post-sale service, which have significantly enhanced the trust of users on LEAD products.

Fujian LEAD has established a sound and comprehensive long-term cooperation relationship with Jiangsu Huapeng Transformer Co., Ltd., XUJI ELECTRIC CO., LTD., Shandong Luneng Group Co., Ltd., Chongqing Water Turbine Works Co., Ltd., Hainan Jinpan Enterprise Co., Ltd., Tebian Electric Apparatus Stock Co., Ltd. (TBEA), CHINA XD GROUP CO., LTD., Sunte Electric Equipment Co., Ltd., Pearl Electric Co., Ltd. and other 300 transmission and distribution equipment manufacturing enterprises.

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<u>Safety Guidance</u>

Please read the instructions carefully before installing and operating the controller, and proper keeping.

⚠️ ⚠️ Warning

- ◆ Please read the instructions and wiring diagram carefully before using the controller.
- ◆ The controller monitors dangerous power transformers. If users do not obey a prescribed procedure to operate, that will lead to property damage or serious injury or even death.
- ◆ Only qualified technical personnel are allowed to operate the controller, and all safety instructions, installation, operation and maintenance procedures in the manual should be known before operating.
- ◆ Make sure that all electrical connections are correct and secure. The controller must be grounded reliably.
- ◆ After the controller is powered on, some terminals are energized, please be careful.
- ◆ **The sensor cable plug and the power cord should be separated from the controller before the transformer voltage test, so as not to damage the controller!**

⚠️ Attention

- ◆ The controller may only be used for the purpose specified by our company, and unauthorized modifications may cause the controller to malfunction or even fail.
- ◆ Please note the use conditions of the controller, especially the humid environment.
- ◆ The controller is avoided to be used in the atmosphere contains sulfur dioxide, hydrogen sulfide and other corrosive gases using, otherwise it will be damaged
- ◆ Do not apply a voltage or current that is greater than the rated value on the output terminals.
- ◆ Do not use a lighter to grill the sensor, otherwise the sensor will fail.
- ◆ Undefined terminals are not allowed to use.
- ◆ Please put the instructions in an easy place and give it to all users.

Special Product Description:

If the contents of the instruction do not conform to the product, the wiring diagram of the actual

product shall prevail.

Contents

01 General function description
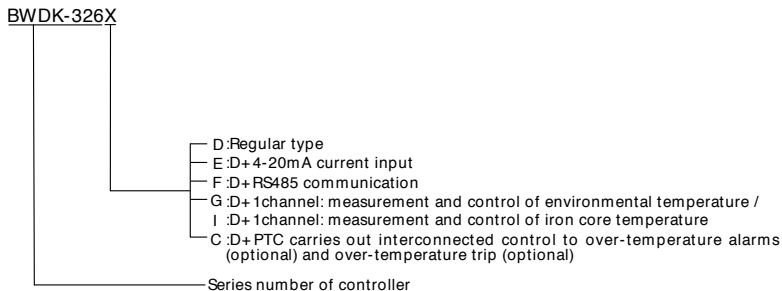
Product overview

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.

BWD-326 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.

Functional features

Temperature monitoring of dry-type transformer: three-phase circuit measurements and display; the maximum display; input open circuit and failure self-inspection display and output; cooling fan manual/automatic start-stop display and output; over-temperature alarms, over-temperature trip display and output; displayed value compensation of all channels; "black box"; control for timing start-stop of the fan; Temperature simulation;Door point alarm function.

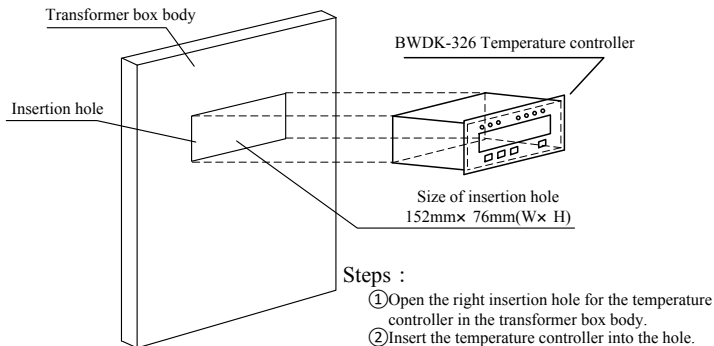## Type selection (any combination between E, F, G, I and C)

BWDK-326X

```
┌─ D:Regular type
├─ E:D+ 4-20mA current input
├─ F :D+ RS485 communication
├─ G :D+ 1channel: measurement and control of environmental temperature /
│  I :D+ 1channel: measurement and control of iron core temperature
└─ C :D+ PTC carries out interconnected control to over-temperature alarms
   (optional) and over-temperature trip (optional)

─ Series number of controller
```

Note: BWDK-326 series are not applicable to the same utilization of G-type and I-type.

02 Technical Parameters

Basic technical parameters

Ambient temperature (℃)	Relative humidity (%RH)	Measurement range (℃)	Sensor type
-20 ~ 55	< 95 (25℃)	-30.0 ~ 240.0	Pt100 (Three-wire)
Power frequency (Hz)	Power voltage (V)	Power consumption of controller (W)	Resolution (℃)
50/60(±2)	AC220 (-15% ,+10%)	≤8	0.1
Contact capacity		Accuracy grade	
Fan: 6A 250VAC (cosφ=0.4) Other: 5A 250VAC/5A 30VDC (resistive)		Grade 1 (controller: grade 0.5; sensor: grade B)	
Conforming to the relevant standards		Dimension (mm)	
JB/T7631-2016，ISO9001:2008，IEC61000-4:2002，GB/T17626-2008		Opening $76^{+1}×152^{+1}$ Appearance 82×158×106	

03 Installation Instructions

Transformer box body

BWDK-326 Temperature controller

Insertion hole

Size of insertion hole
152mm× 76mm(W× H)

Steps：
①Open the right insertion hole for the temperature
controller in the transformer box body.
②Insert the temperature controller into the hole.

04 Wiring Diagram Example and Instructions

Fan
1
220VAC
2
Door
Contact
3
Buzzer
4
Power
Alarm
5
6
Faulting
25 Pin Sensor Cable
Interface

Tripping
7
J
Trip
Power
8
Warning
9
Alarm
Power
10
11
12
L
220VAC
13
N
9 Pin signal
Interface
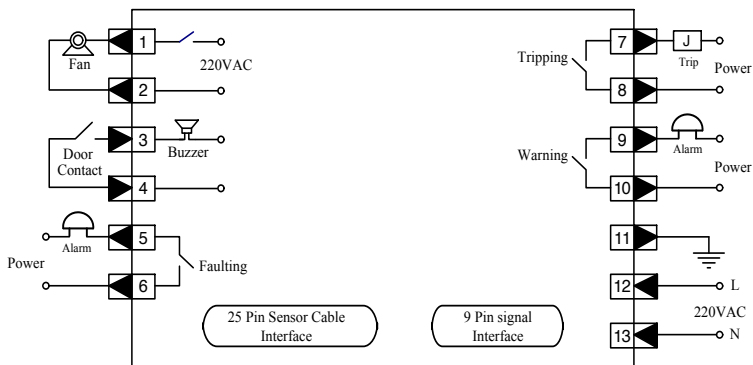
Note 1: Fan control output is active output, and users shall never connect it with external
power sources.

Note 2: For BWDK-326D/326G/326I type thermostats, there is no interface for 9-core signal cables;
For BWDK-326G type thermostats, terminal 5 &6 are fan control output in machine room;
For BWDK-326I type thermostats, terminal 5 &6 are iron-core over-temperature
alarm output.

Note 3: When there is door alarm, fault alarm or over-temperature alarm, users can press "ESC"
button on the thermostat panel to cancel the buzzer alarm, and such buzzer alarm function
of thermostats can be restored 10 minutes later.

The foregoing diagrams are only for reference, which shall be subject to the wiring diagram of
thermostat rear panels for specific wiring.

05 Human Machine Interface

Key Instructions

Buttons	Functions	Instructions
SET	Setup key	Make sure and enter into the next step.
▲	Increasing key/Manual key	Function 1: Add 1 to the parameter. If the key is held on, the number will be increased quickly. Function 2: Manual start and stop fan (In the temperature display state and the fan are not started automatically).
▼	Decreasing key/Maximum key	Function 1: Decrease 1 to the parameter, If the key is held on, the number will be decreased quickly. Function 2: Fixed display maximum value of each phase.
Fn + ESC	Reset	Press the key over 1S to reset the controller.
ESC	Exit/Silencer	Function 1: In setting state, press the key to exit setting(Parameter is not saved) Function 2: In normal displaying state, press the key to silencing.

Common Function Codes Diagram
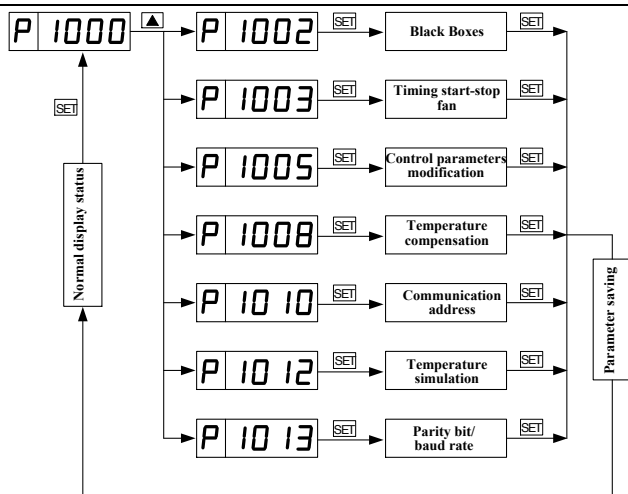
Note 1: When the meter is displaying the function prompts, press key SET to enter into the corresponding data display window. If there are multiple function parameters, each parameter is set by pressing the key SET in turn.

Note 2: The following parameters are conventional default values. Details are subject to the controller certification or the wiring figure.

Black Box (P1002)

No.	Display	Instructions	Remarks
1	P-EE-	Power failure records	Display the temperature when power is off, and press the key ▲ to check the temperature of all phases.

Timing Start-Stop Fan (P1003)

No.	Display	Instructions	Default (h)	Range (h)
1	P-00-	Timing start-stop fan setting	0	0-150

Control Parameters Modification (P1005)

● Setting of Conventional Control Parameters

No.	Display	Instructions	Default (℃)	Range (℃)
1	P-Ob-	Start-stop target values of the fan	90.0	-30.0-240.0

	2	P-dF-	Start-stop return differences of the fan	10.0	0.0-15.0
	3	P-AH-	Over-temperature trip target values	150.0	-30.0-240.0
	4	P-AL-	Over-temperature alarm target values	130.0	-30.0-240.0

- type-G control parameter setting (following the conventional control parameter setting serial number 4)

No.	Display	Instructions	Default (℃)	Range (℃)
5	P-ObJ	Start-stop target values of room fans	35.0	-30.0-240.0
6	P-dFJ	Start-stop return differences of room fans	2.5	0.0-15.0
7	P-AHJ	Target values of machine room trip	70.0	-30.0-240.0

- type-I control parameter setting (following the conventional control parameter setting serial number 4)

No.	Display	Instructions	Default (℃)	Range (℃)
8	P-ALJ	Target values of iron core alarm	130.0	-30.0-240.0

Note: The default return difference is 0.3℃ unless otherwise indicated. If the corresponding temperature is higher than the target value plus the return difference, its corresponding function outputs.

Temperature Compensation (P1008)

No.	Display	Instructions	Default (℃)	Range (℃)
1	A-Ad-	Temperature compensation of phase A		
2	b-Ad-	Temperature compensation of phase b	0.0	-19.9-19.9
3	C-Ad-	Temperature compensation of phase C		
4	d-Ad-	Temperature compensation of phase d		

Communication Address Setting (P1010)

No.	Display	Instructions	Default	Range
1	P-dd-	Communication address setting	1	1-247

Temperature Simulation (P1012)

No.	Display	Instructions	Simulation Range (℃)
1	A-AA-	Temperature simulation	-30.5-240.5

Note: The over-temp trip is not involved in the temperature simulation.

Setting of Parity Bit and Baud Rate (P1013)

| No.	Display	Instructions	Default	Range
1	P-PC-	Parity bit setting	0 (No parity)	0-2
2	P-bL-	Baud rate setting	3 (9600)	0-3

Note 1: Parity bit: 0: No parity (N)   1: Even parity (E)   2: Odd parity (O)
Note 2: Baud rate: 0:1200   1:2400   2:4800   3:9600

06 4-20mA Current Output (Type E)

Technical requirements for current output

● Load resistance: R≤500Ω; Output accuracy: ±1%
● The corresponding curve and relation expression between measured temperature and output current of the controller:
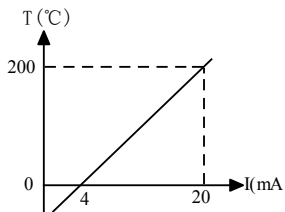
Relation expression of temperature and current:

$I = (16.00T/200.0) + 4.00$

Where: T is One phase temperature value (℃)

I refers to the current value corresponding to the temperature of this phase (mA)

Function features

There is linear relation between 4-20mA current signals and the detected temperature values (0.0-200.0℃), one temperature corresponds to one current. If users have special requirements for current signals, please explain when ordering.

07 RS485 Communication protocol specification (Type F)

Data Frame Format

Start Bit	Data Length	Parity Bit	Stop Bits
1 bit	8 bits	0 or 1 bit (settable)	1 bit

The Upper Computer Message Format (Example)

Message Format	Meter Address	Function Code	Reading Register Start Address	Number of Reading Data	CRC Check
Telemetry (three-way)	0x01	0x03	0x0000	0x0003	0x05CB
Telemetry (four -way)	0x01	0x03	0x0000	0x0004	0x4409
Remote signal	0x01	0x04	0x0000	0x0001	0x31CA

Note: The number of start address and data can be changed according to actual conditions.

Controller Return Message Format (Example)

Message Format	Meter Address	Function Code	Number of Bytes	Data Reading	CRC Check
Telemetry (three-way)	0x01	0x03	0x06	Phase temperature data	####
Telemetry (four -way)	0x01	0x03	0x08	Phase temperature data	####
Remote signal	0x01	0x04	0x02	Relay status data	####

Register address definition and data analysis

● Register address of data and description

Attribute Description	Register Address	Data Type	Proportion Factor	Data Range
Temperature data of phase A	0x0000	int16	0.1	-300~2400
Temperature data of phase b	0x0001	int16	0.1	-300~2400
Temperature data of phase C	0x0002	int16	0.1	-300~2400
Temperature data of d-way	0x0003	int16	0.1	-300~2400

- Data description

Temperature Data	Failure Status	Instructions
0x7000	-OP-	Open circuit
0x8000	-OL-	Exceeds the lower limit
0x6000	-OH-	Exceeds the upper limit

- Register address of signal and data description

Attribute Description	Register Address	Data Type	Remarks
Relay status data	0x0000	uint16	1 bit stands for the status of 1 relay.

Definition of low 8-bit of relay status data (0 stands for no actions, 1 stands for actions)

No.	bit7	bit6	bit5	bit4
Functions	Door contact status	Heating and dehumidification	Fan faults	
No.	bit3	bit2	bit1	bit0
Functions	Fault alarm	Over-temperature alarm	Over-temperature trip	Fan running

Three-circuit Temperature Measurement (D/E/F)

No.	bit7	bit6	bit5	bit4
Functions	Door contact status	Heating and dehumidification	Fan faults	Fault alarm
No.	bit3	bit2	bit1	bit0
Functions	Core alarm or room fan running	Over-temperature alarm	Over-temperature trip	Fan running

Note: Door contact status, heating and dehumidification and fan faults are used in case of the special function requirement.

08 Service

- Any entity and individual that purchases or uses our products may enjoy our after-sale services.
- We guarantee quality and free repair or replacement if product 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 change 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.