Instructions for Use of

BWDK-3206 Series

Temperature controller of Dry Transformer

Fujian LEAD Automatic Equipment Co., Ltd.

TEL:+86 137 5812 6394 E-mail: fanpeng02@126.com

Contents

1. Technical Indicators

1.1 Technical parameter

Room temperature: -20℃~+55℃

Relative humidity: < 95%(25℃)

Power voltage: 220VAC (+10%, -15%)

Power frequency: 50Hz or 60Hz (±2Hz)

The type of sensor: Pt100(Three-wire system)

Range of measurement: -30.0℃～240.0℃

Power consumption of temperature controller: ≤8W

Resolution: 0.1℃

Grade of accuracy: Grade 1(Grade 0.5 for temperature controller, Grade B for sensor)

Capacity of contact of fan: 6A/250VAC(cos Φ=0.4)

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

1.2 Standard

Production standard:

JB/T7631-2016 Electronic Thermo-controllers for Transformers

Certification passed: ISO9001: 2008 Quality Management Systems-requirements

Test passed: IEC61000-4: 2002 International Standard and GB/T17626-2008 Standard for Electromagnetic Compatibility Test and Measuring Technology

2. Classification of Function and Type

Type	Function
BWDK-3206D (Ordinary type)	**Three-phase circular measurement; Three-phase circular display/maximum value display and mutual switching between two functions; Input disconnection and trouble self-check display and output; Auto start and stop of cooling fan and output; Over-temperature alarm display and output; Over-temperature trip display and output; Display of manual/auto modes of fan, output and mutual switching; Digital compensation for value displayed in each channel; Function of black box; Timed start, stop and control function of fan; Detection of output status.**

BWDK-3206E	**The same as type BWDK-3206D, with addition of 4~20mA analogue current output.**
BWDK-3206F	**The same as type BWDK-3206D, with addition of RS485 serial communications function.**
BWDK-3206G	**The same as type BWDK-3206D, with addition of one-way transformer room temperature measurement and control.**
BWDK-3206I	**The same as type BWDK-3206D, with addition of one-way transformer core temperature measurement and alarm .**

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

3．Parameter Setting

3.1 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: Target 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-temperature alarm

Starting temperature of fan >Ob+dF

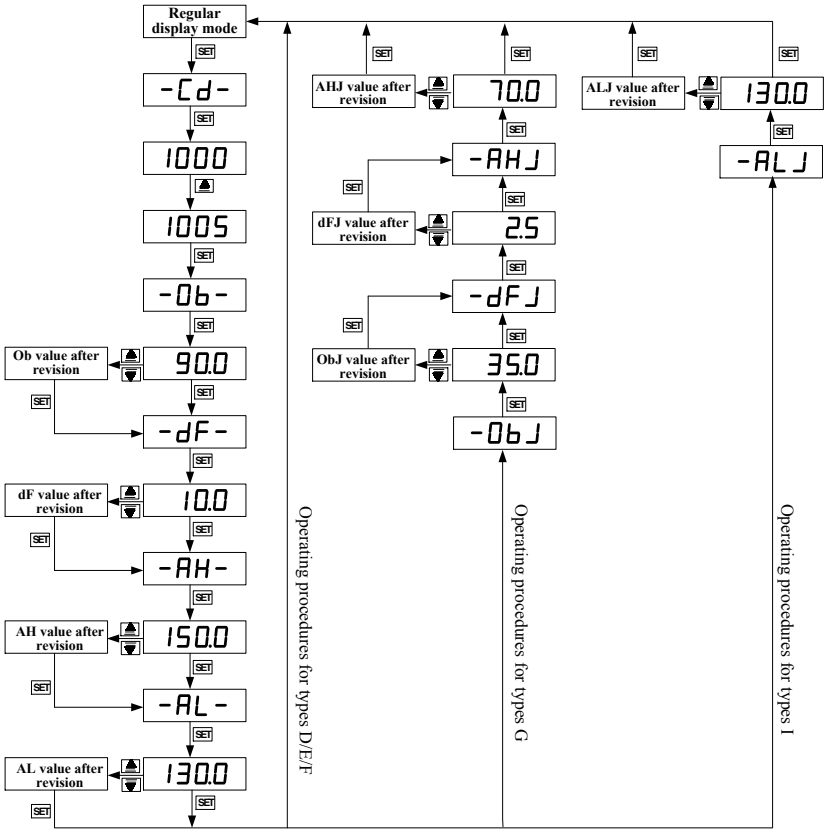
Stopping temperature of fan <Ob-dF

Starting temperature of fan in transformer room>ObJ+dFJ

Stopping temperature of fan in transformer room <ObJ-dFJ

Note: ① The backlash of other target values than those for cooling fan and transformer room fan is all approved to be 0.3℃ tacitly.

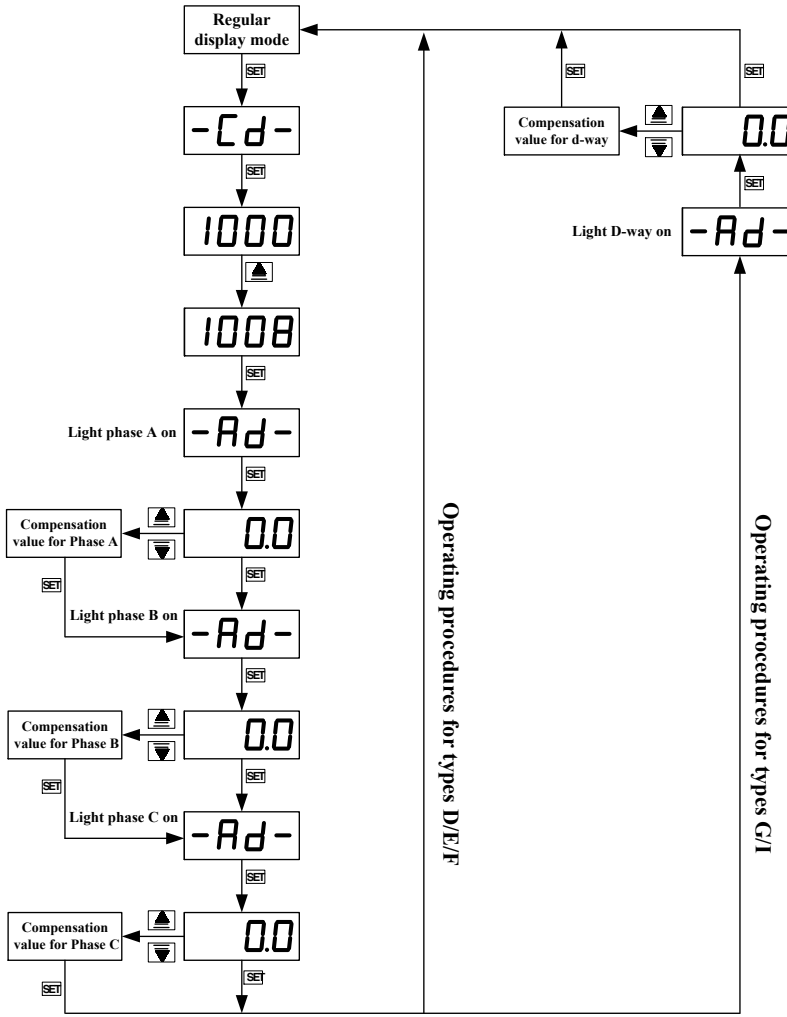
② The parameters shown below are all for reference and specific set value shall be subject to the delivery label.



3.2 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℃)



4. 4~20mA Current Output (Type E)

4.1 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).

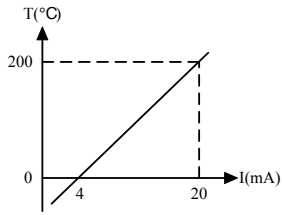
Within the temperature controller A+, B+, C+ and d+ are connected mutually, namely, with co-positive electrode. If your collecting system is in conflict with it, please specify before placing order. We usually provide 3-phase winding temperature current output. If you need an additional d-way temperature current output, please indicate before placing order.

4.2 Technical specifications for current output

4.2.1 Load resistance: R≤500Ω

Output accuracy: ±1%

4.2.2 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.

4.2.3 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 1~5V voltage signals may be received immediately and connected to the load resistance R≥20kΩ.

5. RS485 Communications (Type F)

5.1 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.

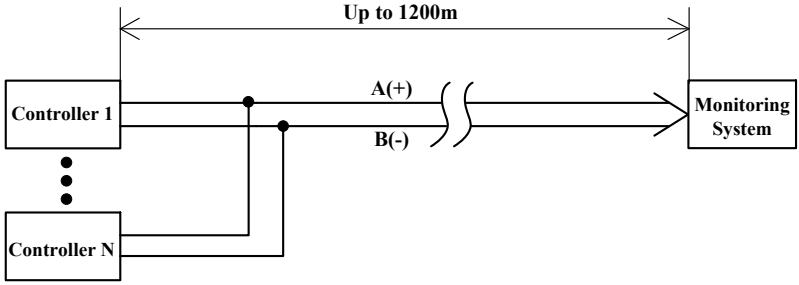
It usually utilized RS485 interface. If you need additional communication interface as RS232, RS422, please specify before ordering.

5.2 Technical indicators for communications:

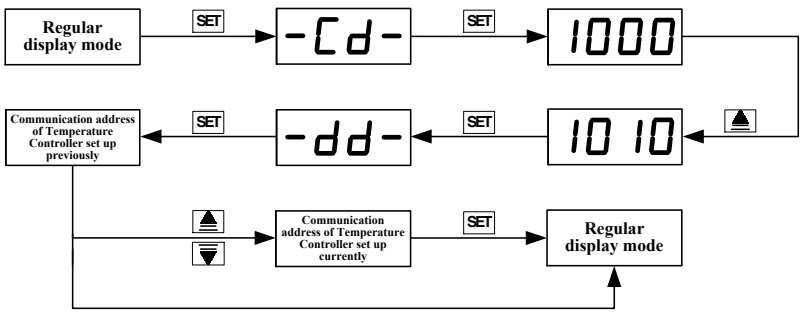
5.2.1 Maximum communication distance: 1200m;

5.2.2 Maximum number of temperature controller to be connected to: 28;

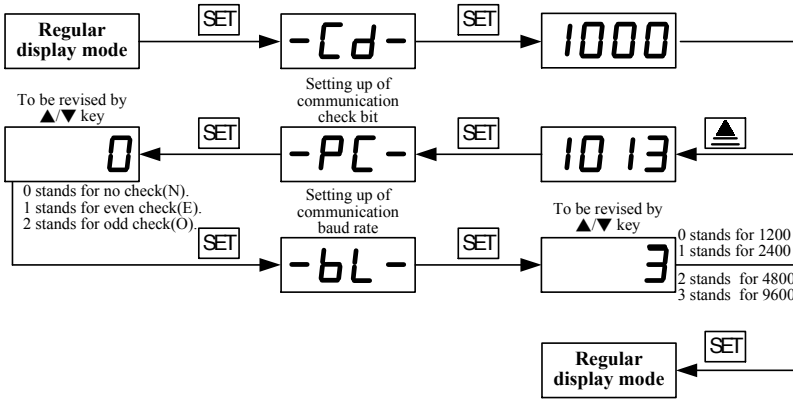
5.2.3 Schematic communications connection diagram



5.3 Procedures for setting up communication address of temperature controller



5.4 Procedures for setting up transmission check bit and baud rate of temperature controller



5.5 MODBUS RTU communication protocol

5.5.1 Definition of frame

Initial bit	Data length	Check bit	Stop bit
1 bit	8 bit	0 or 1 bit (To be set)	1 bit

5.5.2 Instructions on communications protocol

5.5.2.1 Function code in use:

5.5.2.1.1 When function code is 0x03, temperature value readings in each phase of temperature controller should be taken.

5.5.2.1.2 When function code is 0x04, output state readings of temperature controller relay should be taken.

5.5.2.2 Definition of register address:

5.5.2.2.1 Definition of register address for temperature value in each phase (0x03 function code):

Initial address	Description	Register address corresponding to some equipment

0x0000	Temperature data high 8-bit in phase A Temperature data low 8-bit in phase A	Temperature data in phase A	40001
0x0001	Temperature data high 8-bit in phase B Temperature data low 8-bit in phase B	Temperature data in phase B	40002
0x0002	Temperature data high 8-bit in phase C Temperature data low 8-bit in phase C	Temperature data in phase C	40003
0x0003	Temperature data high 8-bit for d-way Temperature data low 8-bit for d-way	Temperature data for d-way	40004

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 judge 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 temperature 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 controller is in normal operation and temperature value can be calculated based on the temperature

data high 8-bit and temperature data low 8-bit.

Temperature data high 8-bit	Temperature data low 8-bit	Status of temperature controller	Description
0x70	0x00	-OP-	Open-circuit
0x60	0x00	-OH-	Out of upper limit
0x80	0x00	-OL-	Out of lower limit
0x50	0x00	-Er-	Fault

5.5.2.2.2 Definition of relay output register address (0x04 function code):

Initial address	Description		Register address corresponding to some equipment
0x0000	Relay output data high 8-bit	For definition of data low 8-bit, refer to the following.	30001
	Relay output data low 8-bit		

Definition of data low 8-bit:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

a、When temperature controller measures 3-way:

Where: 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 control output bit

b、When temperature controller measures 4-way:

Where: bit 4 stands for fault alarm output bit

bit 3 stands for iron core over-temperature alarm output bit (Gauge Type 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

5.6 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℃ and temperature in phase C is 100.1℃; Fault alarm output and fan control output.

5.6.1.1 Computer issues order to send back data (Temperature readings in each phase are taken)

0x01	0x03	0x00	0x00	0x00	0x03	0x05	0xCB

5.6.1.2 Data sent back by temperature controller (Temperature value in each phase)

0x01	0x03	0x06	0x70	0x00	0x01	0x2C	0x03	0xE9	0x2B	0x0E

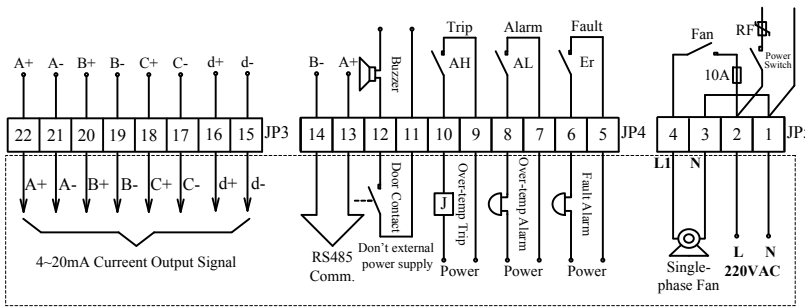
5.6.2.1 Computer issues order to send back data (Relay output readings are taken)

0x01	0x04	0x00	0x00	0x00	0x01	0x31	0xCA

5.6.2.2 Data sent back by temperature Controller (Relay output status)

0x01	0x04	0x02	0x00	0x09	0x79	0x36

6. Wiring diagram



① JP5 terminal 3 and 4 are for fan active output. Don't connect external power supply.

② JP3 terminal are for 4~20mA current output signal, for type E;
JP4 terminal 13 and 14 are for RS485 communication signal, for type F;

③ When the model is BWDK-3206G, JP4 terminal 5 and 6 output control signal for room fan, JP4 terminal 9 and 10 output over-temperature trip signal for both winding and room.

When the model is BWDK-3206I, JP4 terminal 5 and 6 output over-temperature alarm signal of iron core.

④ When there is cabinet alarm, failure alarm or over-temperature alarm, users can press the silencing key to cancel buzzer function. The controller will recover the buzzer function in 10 minutes.

⑤ The schematic above is only for reference. For detailed wiring, you shall refer to the wring diagram on the reverse side of the temperature controller.