

TWSK-G Dry-Type Transformer Temperature Controller

User Manual



Version: 1.10

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Read me

When you use TWSK-G Dry-Type Transformer Temperature Controller, be sure to carefully read this user manual, and be able to fully understand the implications, the correct guidance of operations in accordance with user manual, which will help you make better use TWSK-G Dry-Type Transformer, and help to solve the various problems at the scene.

1. Before the meter turning on the power supply, be sure that the power supply within the provisions of the instrument;
2. When installation, the current input terminal must non-open, voltage input terminals must Non-short circuit;
3. Communication terminal (RS232 or RS485) is strictly prohibited to impose high pressure;
4. Be sure the instrument wiring consistent with the internal system settings;
5. When communicating with the PC, instrument communication parameters must be consistent with the PC.



- **Please read carefully before using this user manual**
- **Please save this document**

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1.- SUMMARIZE

The TWSK-G Intelligent Temperature Controller is specially designed for air-cooled dry-type transformers. Powered by a high-performance 32-bit microprocessor with integrated DSP and FPU units, it enables fast and accurate three-phase winding temperature monitoring and display. It supports manual/automatic fan control, over temperature alarm and trip protection, self-diagnostics, highest temperature recording, and temperature logging at power loss, enhancing transformer safety and reliability.

The controller supports RS485 communication and door-opening output, with parameter retention and operating data memory functions. Optional features include 4–20mA analog output and core temperature monitoring, providing a flexible solution for transformer temperature monitoring and remote management.

FEATURES

- Three-phase winding temperature monitoring;
- Manual / automatic fan control;
- Over temperature alarm and trip protection;
- Intelligent temperature management;
- Power loss temperature logging;
- Sensor open-circuit and malfunction detection;
- Optional core temperature monitoring;
- RS485/ Modbus RTU communication;

APPLICATION

- Cast resin transformers;
- Dry-type transformer insulation systems;
- Air-cooled dry-type transformers;
- Dry-type transformer winding protection;
- Industrial dry-type power transformers;

2.- SPECIFICATIONS

Working power	
Power supply	AC220V(±10%,50Hz)
Consumption	≤5VA
Measurement	
Oil temp. measure range	-30 ~ 200°C
Accuracy	±0.5%FS
Resolution	0.1°C
Interface	
Digital output	Load capacity: 10A@AC250V Passive NO contact for fault, alarm, trip, door open, Active output 220Vac for fan control
Digital Inputs	Passive NO contact for door open signal input
Analog output (optional)	DC 4~20mA
Communication	RS485/ Modbus RTU
Safety	
Withstand voltage	2kV AC RMS 1 minute, between input / output / case / power supply; 1kV AC RMS 1 minute, between output and power supply.
Insulation	Input, output and power supply to the chassis ≥5 MΩ
Environment	
Protection (TH)	Anti-containing acid, alkali, salt gas
Work environment	-30~60°C; Noncondensing
Storage environment	-40~85°C; Noncondensing
Others	
Display method	Programmable 2-rows LED switching display
Dimension	160W*80H*123Dmm; Hole size: 154×77mm
Weight	Approx. 1KG

3.- INSTALLATION AND START-UP



The manual you hold contains information and warnings that -users should follow in order to guarantee a proper operation of all the instrument functions and keep it in safety conditions. The instrument must not be powered on and used until its definitive assembly is on the cabinet's door.

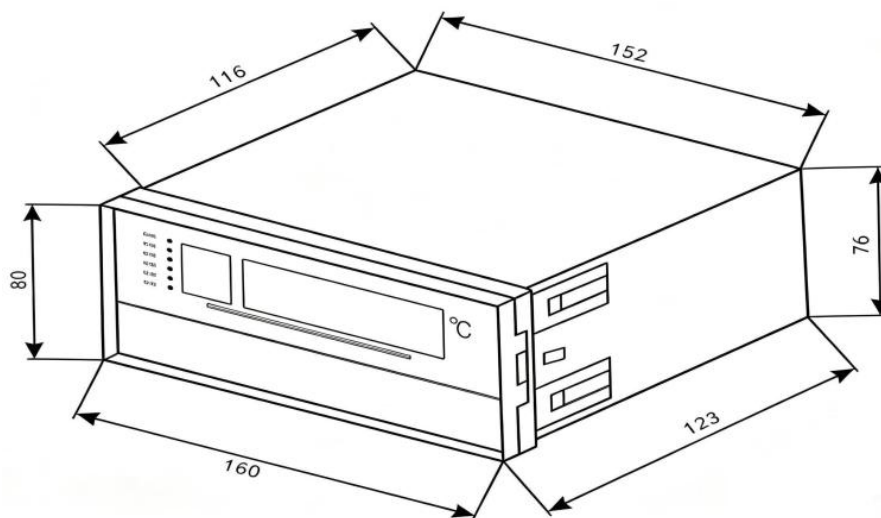
If the instrument is not used as manufacturer's specifications, the protection of the instrument will be damaged.

When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified service representative.

3.1.- Installation

Dimension: 160W*80H*123Dmm; Hole size: 154×77mm

Controller is to be mounted on panel. All connections keep inside the cabinet.



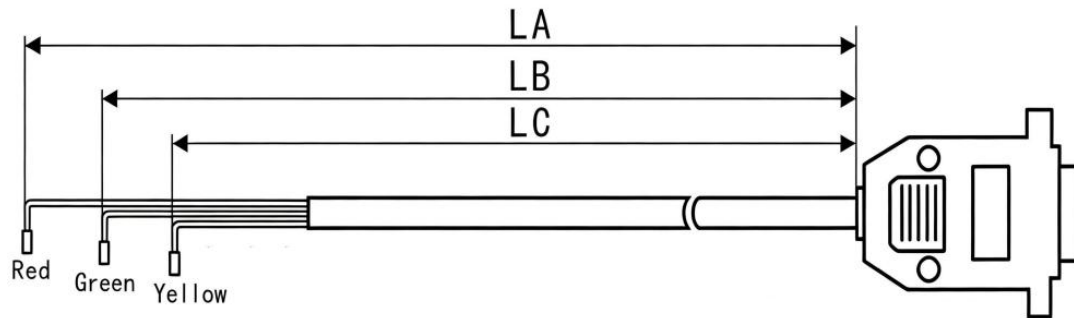
1. Insert the controller through the panel cutout.
2. Insert the mounting bracket into the mounting groove at the top and bottom of the controller and push the mounting bracket forward until the bracket stops at panel wall.
3. Completion status

Warning: The controller must not be power on until this is completely installed!

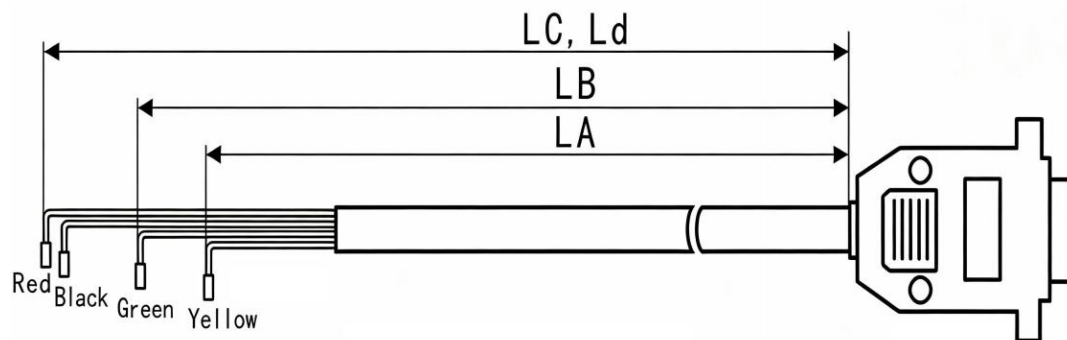
Temperature sensor installation

The sensor is supplied with a 15-pin plug. The standard cable lengths are LA= 4m, LB= 4.3m, LC= 4.6m, and Ld= 4.6m. Please specify any special length requirements when placing an order.

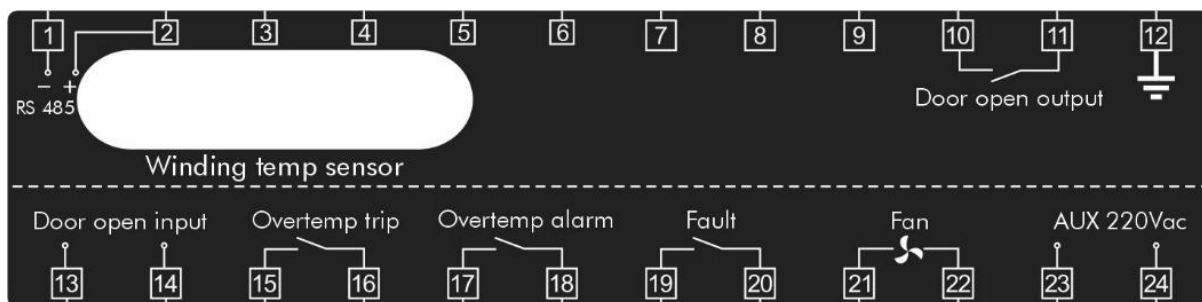
Three-wire winding temperature sensor (default)



Four-wire Winding temperature sensor (optional)



3.2.-Terminal connection



Upper terminal

No.	Marked	Notes
1-2	RS485	RS485 communication interface
3-5	Winding temp sensor	Winding temperature sensor input
6-9	Reserved	
10-11	Door open output	Door open signal output
12		Grounding

Lower terminal

No.	Marked	Notes
13-14	Door open input	Door open signal input
15-16	Over temp trip	Over temperature trip output
17-18	Over temp alarm	Over temperature alarm output
19-20	Fault	Sensor fault output (open-circuit, malfunction)
21-22	Fan	Fan control output, active output 220Vac
23-24	AUX	Power supply 220Vac

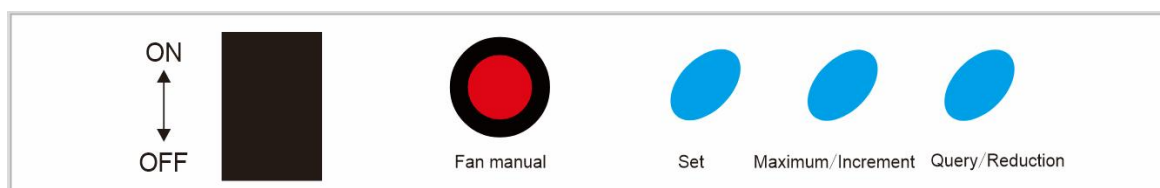
Note:

The terminal pin definition may change depends on customer order; please refer to the label on the meter!

3.3.- LED indicators description

	Lights up when the fan is turned on.
	Lights up when the fan is in manual mode.
	Lights up when the highest/ Increment button is pressed to display the highest temperature, and turns off when pressed again.
	Lights up when the over temperature alarm threshold is reached.
	Lights up when the over temperature trip threshold is reached.
	Lights up when any phase sensor fault.
	Lights up when the limit switch or push switch on the transformer enclosure door.

3.4.- Button description



ON/OFF	Press to power- on / power- off.
Fan manual	Press to manually control the fan start or stop.
Set	Press to enter the query and parameter settings page.
Maximum/ Increment	Press to switch between the highest temperature display and three phase temperature cycling display.
Query/ Reduction	Press to display the A, B, and C phase winding temperatures at the last power failure.

4.- FUNCTIONS INTRODUCTION

4.1.- Temperature Cycling Display

Supports cyclic display of three-phase winding temperatures or core temperatures (optional), with a switchable highest temperature display.

4.2.- Over Temperature Alarm

When the highest temperature among the three phases reaches the over temperature alarm threshold, the controller activates the buzzer and alarm indicator, and outputs a switch signal through the alarm output terminal to an external alarm controller.

4.3.- Over Temperature Trip

When the highest temperature among the three phases reaches the over temperature trip threshold, the controller activates the buzzer and trip indicator, and outputs a switch signal through the trip output terminal to an external trip controller to disconnect the power supply.

4.4.- Fan Control

Automatic Control: automatically controls fan operation according to the preset fan start and stop temperatures to ensure safe operation of the dry-type transformer. When the highest temperature among the three phases reaches the fan start temperature, the fan starts and the fan indicator lights up.

Manual Control: press the fan manual button to manually start or stop the fan. this function can also be used for fan testing.

Timed Fan Operation: allows a timer of 0–255 hours to be set on the panel. (set 000 to disable this function), when the set time is reached, the fan automatically runs for 1 minute and then stops.

4.5.- Sensor Fault Alarm

When a temperature sensor on any phase fails, the fault indicator lights up, the buzzer sounds, and a switch signal is output through the fault output terminal to an external fault alarm.

On the screen display **[H]** indicates sensor open circuit, while **[L]** indicates sensor short circuit. and when a sensor fault is detected, the fan will start immediately

4.6.- Power-Off Memory

Records the three-phase winding temperatures and core temperature (optional) at the time of the most recent power failure for later review.

4.7.- Door Status Detection

Supports connection to a limit switch or push switch on the transformer enclosure door. when the door open input terminals are closed, the buzzer sounds and a switch signal is output through the door output terminal.

4.8.- Parameter Query and Settings

Allows users to query and set the fan stop temperature, fan start temperature, over temperature alarm and trip, timed fan operation period, communication address, and baud rate. all settings are retained after power loss. (Details see chapter 5.)

5.- Parameter Query and Settings

After power-on, the controller cyclically displays the winding temperatures of phases A, B, and C. Press the **SET** button to query/ set the operating parameters and threshold in sequence. each press of the **SET** button displays the next parameter. After the last parameter is displayed, the controller returns to the temperature cycling display.

Parameter Query:

Step	Button	Display	Description	Note
1	Press SET	1=080	Fan stop temperature: 80°C	Default: 80°C
2	Press SET	E=080	Ambient/core alarm temperature: 80°C (optional)	Default: 80°C
3	Press SET	2=100	Fan start temperature: 100°C	Default: 100°C
4	Press SET	3=130	Over temperature alarm: 130°C	Default: 130°C
5	Press SET	4=150	Over temperature trip: 150°C	Default: 150°C
6	Press SET	H=000	Timed fan operation: 000 (means disable this function)	Default: 000; range: 0–255 hours
7	Press SET	P=001	Communication address: 001	Default: 001; range: 1-247
8	Press SET	8=096	Communication baud rate: 9600	Default: 9600 range: 012-1200, 024-2400, 048-4800, 096-9600
9	Press SET	/	Returns to temperature cycling display	/

Parameter Settings:

Step	Button	Display	Description	Note
1	Press SET	1.=080	Fan stop temperature	
2	Press three times Fan Manual	1.=080	Fan stop temperature	When the first digit's decimal point lights up, press "Max/Increase" or "Query/Decrease" to set the fan stop temperature.
3	Press SET	E.=080	Ambient/core alarm temperature (optional)	Press "Max/Increase" or "Query/Decrease" to set the core alarm temperature.
4	Press SET	2.=100	Fan start temperature	Press "Max/Increase" or "Query/Decrease" to set the fan start temperature.
5	Press SET	3.=130	Over alarm temperature	Press "Max/Increase" or "Query/Decrease" to set the alarm temperature.
6	Press SET	4.=150	Over temperature trip	Press "Max/Increase" or "Query/Decrease" to set the trip temperature.
7	Press SET	H.=000	Fan timer start time	Press "Max/Increase" or "Query/Decrease" to set the fan timer start time in hours. 000 disables this function.
8	Press SET	P.=001	Communication address	Press "Max/Increase" or "Query/Decrease" to set the communication address.
9	Press SET	8.=096	Communication baud rate	Press "Max/Increase" or "Query/Decrease" to set the communication baud rate.

Step	Button	Display	Description	Note
10	Press SET	=.000	Simulate operating status of temperature controller	Press “Max/Increase” or “Query/Decrease” to adjust the simulated temperature, or press “Fan Manual” to increase it by 10°C. The controller responds accordingly. For example, at 130°C, it immediately triggers audible and visual alarms and closes the alarm terminals.
11	Press SET	/	Returns to temperature cycling display	/

Note:

The controller automatically saves the settings in the order: Trip > Alarm > Fan start > Fan stop, with a minimum interval of 5°C.

6.- COMMUNICATION INTERFACE

6.1.- Connection for RS485 BUS

The composition of the RS-485 cabling must be carried out with a meshed screen cable (minimum 3 wire), diameter of not less than 0.5mm², with a maximum distance of 1,200 m between the controller and the master unit.

6.2.- MODBUS © protocol

Modbus RTU Frame Format:

Address code	1 BYTE	<i>Slave device address 1-247</i>
Function code	1 BYTE	<i>Indicates the function codes like read coils / inputs</i>
Data code	4 BYTE	<i>Starting address, high byte Starting address, low byte Number of registers, high byte Number of registers, low byte</i>
Error Check code	2 BYTE	<i>Cyclical Redundancy Check (CRC)</i>

MODBUS FUNCTIONS:

Code	Meaning	Description
FUNCTION 03	Read holding registers	<i>Read the binary contents of holding registers in the slave.</i>
FUNCTION 10	Write multiple registers	<i>Writes values into a sequence of holding registers</i>

Note: Float data follow **IEEE754**, float low bit first, high bit next. (**CD AB**)

6.3.- Register map

6.3.1.- Read A B C phase temperature data, function 03 to read.

Register	Data	Byte mode		Instruction
0x00	Device status	INT	2	Detail see table blow
0x01	A phase temperature	INT	2	Range: -30-200°C
0x02	B phase temperature	INT	2	
0x03	C phase temperature	INT	2	

Note: Above temperature data is in hexadecimal format. Actual data need convert to decimal and multiply by 0.1, Unit: °C.

Register 0x00 bit definition

Byte	Bit	Data	Description
High byte	bit0	Over temperature alarm	0: Not alarm; 1: alarmed
	bit1	Over temperature trip	0: Not trip; 1: tripped
	bit3	Alarm muted	0: Not mute; 1: muted
Low byte	bit0	Maximum temperature display	0: Not display; 1: displayed
	bit1	Manual start the fan	0: Auto; 1: manual
	bit2	Door Open Input	0: No Signal; 1: signal present
	bit3	Fan starting	0: Stopped; 1: starting
	bit4	A phase sensor fault	0: Normal; 1: fault
	bit5	B phase sensor fault	0: Normal; 1: fault
	bit6	C phase sensor fault	0: Normal; 1: fault

6.3.2.- Read and write communication and other parameters. function 03 to read / function to write.

Register	Data	Byte mode		Instruction
0x05	Fan timed start time	INT	2	Range: 0-255hour, set 0 means disable this function
0x06	Communication address	INT	2	Range: 1-247,default 1
0x07	Baud rate	INT	2	Range: 9600 (default), 4800, 2400, 1200
0x08	Fan stop threshold	INT	2	Range: -30-200°C, default 80
0x09	Fan start threshold	INT	2	Range: -30-200°C, default 100
0x0A	Reserved	INT	2	
0x0B	Alarm threshold	INT	2	Range: -30-200°C, default 130
0x0C	Trip threshold	INT	2	Range: -30-200°C, default 150

6.3.3.- Command example

Read Command (Function x 03)

Read all register data

Host inquiry:

01 03 00 00 00 0D 84 0F

Slave response:

01 03 1A 00 00 00 DC 00 ED 00 E4 00 00 00 18 00 01 25 80 00 50 00 64 00 00 00
82 00 96 BC 22

Definition:

01: Device address
03: Function code
1A: Number of data bytes
00 00: Device status
00 DC: A phase temperature = 22.0°C
00 ED: B phase temperature = 23.7°C
00 E4: C phase temperature = 22.8°C
00 00: Reserved
00 18: Fan timer = 24 hours
00 01: Device address = 1
25 80: Baud rate = 9600 bps
00 50: Fan stop temperature threshold = 80°C
00 64: Fan start temperature threshold = 100°C
00 00: Reserved
00 82: Over temperature alarm threshold = 130°C
00 96: Over temperature trip threshold = 150°C
BC 22: CRC check

Write Command (Function x 10)

Modify the device's communication address from 01H to 16H.

Host inquiry:

01 10 00 06 00 01 02 00 16 27 F8

Slave response:

16 10 00 06 00 01 E2 EF

7.- TECHNICAL SERVICE

FAQ's

Fault Description	Cause Analysis	Corrective Action
No display after power-on	Power supply wiring not connected properly	Check the power supply wiring.
	Power supply failure	Return the unit to the factory for repair.
Unbalanced temperature readings	Inconsistent sensor installation depth	Adjust the sensor installation depth.
	Unbalanced three-phase transformer load	Normal operation.
Unable to modify control parameters	Not properly entered setup mode	In normal temperature display mode, press "SET", then press "fan manual" three times. when the decimal point of the first digit lights up, the settings can be modified.
Fan starts below the set temperature	Fan is in manual on mode	Press "fan manual" to turn off manual mode.
	Fan is in timed start mode	Normal operation. the fan will automatically stop after 1 minute.
"L" or "H" displayed and fault indicator on	Sensor not properly connected, loose, or damaged	Reconnect the db15 sensor connector securely and tighten the screws, or replace the sensor.
Fan cannot be manually stop	Fan is in timed start mode, or the winding temperature has reached the set value	Normal operation.
Fan does not start	Fan wiring loose	Check the fan wiring and connections.
Fan fuse blows on startup	The fan's output contact is an active output type, yet it has been connected to an external power supply.	Connect the fan to the thermostat fan output terminals as a dry-contact output.

8.- SAFETY CONSIDERATIONS



All installation specification described at the previous chapters named:
INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.

Please note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

- ◆ The device must have a professional installation and maintenance.
- ◆ Any operation of the device, you must cut off the input signal and power.

9.- MAINTENANCE

The TWSK series controller does not require any special maintenance. No adjustment, maintenance or repairing action should be done when the instrument is open and powered on, should those actions are essential, high-qualified operators must perform them.

Before any adjustment, replacement, maintenance or repairing operation is carried out, the controller must be disconnected from any power supply source.

When any protection failure is suspected to exist, the controller must be immediately put out of service. The controller's design allows a quick replacement in case of any failure.

For any inquiry about the instrument performance or whether any failure happens, contact to Blue Jay's technical service.

Blue Jay - After-sales service

For any inquiry about the instrument performance or any failure, contact to Blue Jay's technical service.

Blue Jay - After-sales service

E-mail: tech@cqbluejay.com