Mechanivis CWT-TM-16TC-T

Mechanivis CWT-TM-16TC-T 16-Channel K-Type Thermocouple Temperature Acquisition Module User Manual

Model: CWT-TM-16TC-T

1. INTRODUCTION

This manual provides detailed instructions for the installation, operation, and maintenance of the Mechanivis CWT-TM-16TC-T 16-Channel K-Type Thermocouple Temperature Acquisition Module. This module is designed for accurate temperature measurement and data acquisition in industrial environments, utilizing RS485 Modbus RTU communication.
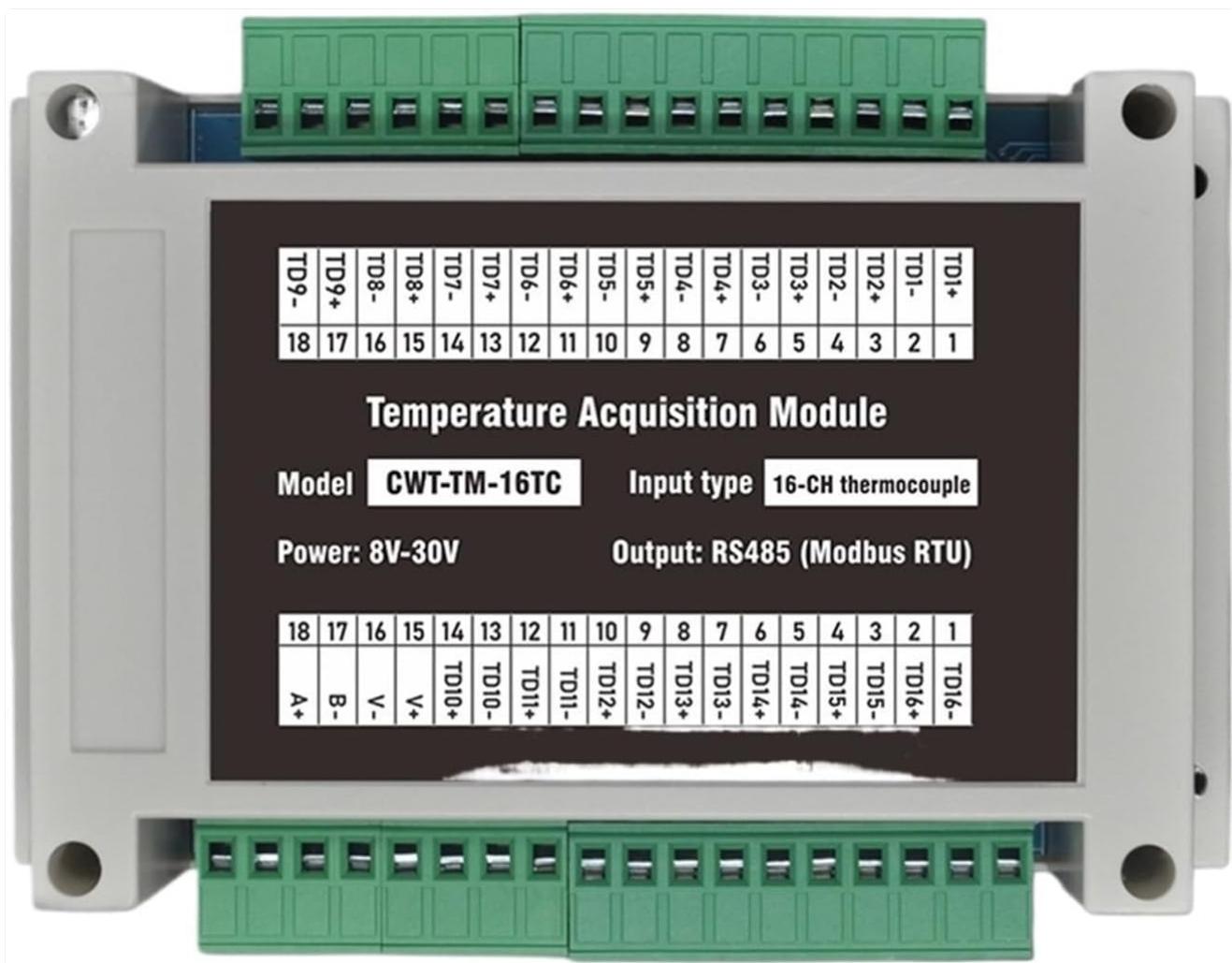
Figure 1.1: Front view of the Mechanivis CWT-TM-16TC-T module, showing terminal blocks and model information.

2. KEY FEATURES

- **Accurate Measurement:** High resolution and precision for reliable temperature readings.
- **High Compatibility:** Supports 16 channels of K-Type thermocouples.
- **Variety of Outputs:** Features RS485 Modbus RTU communication for data output.
- **Industrial Adaptability:** Designed for robust performance in harsh industrial environments.
- **Signal Conversion:** Converts analog thermocouple signals to digital for easy data acquisition and transmission.

3. SPECIFICATIONS

The following table details the technical specifications of the CWT-TM-16TC-T module.

Power supply	DC8~30V
Power consumption	19mA@30V, 22mA@24V, 45mA@12V, 41mA@8V
Input	• type: K-thermocouple • Measure range: -200℃ ~ +1350℃ • Resolution 0.25℃
Output	RS485 （Modbus RTU protocol）, isolation design
Working environment	-30~+55℃ / 0 -95%RH
Material	ABS
mounting type	35mm Din-rail
Dimensions	145*90*40mm

Figure 3.1: Detailed technical specifications including power supply, input type, measurement range, resolution, output, working environment, material, mounting type, and dimensions.

Parameter	Value
Power Supply	DC 8-30V
Power Consumption	19mA@30V, 22mA@24V, 45mA@12V, 41mA@8V
Input Type	K-Type Thermocouple
Measure Range	-200°C ~ +1350°C
Resolution	0.25°C
Output	RS485 (Modbus RTU protocol), isolation design
Working Environment	-30 ~ +55°C / 0 - 95%RH (non-condensing)
Material	ABS
Mounting Type	35mm DIN-rail
Dimensions	145*90*40mm
Item Weight	3000 Grams

4. SETUP AND INSTALLATION

4.1 Physical Installation

The CWT-TM-16TC-T module is designed for 35mm DIN-rail mounting. Secure the module onto a standard DIN-rail in your control cabinet or enclosure.
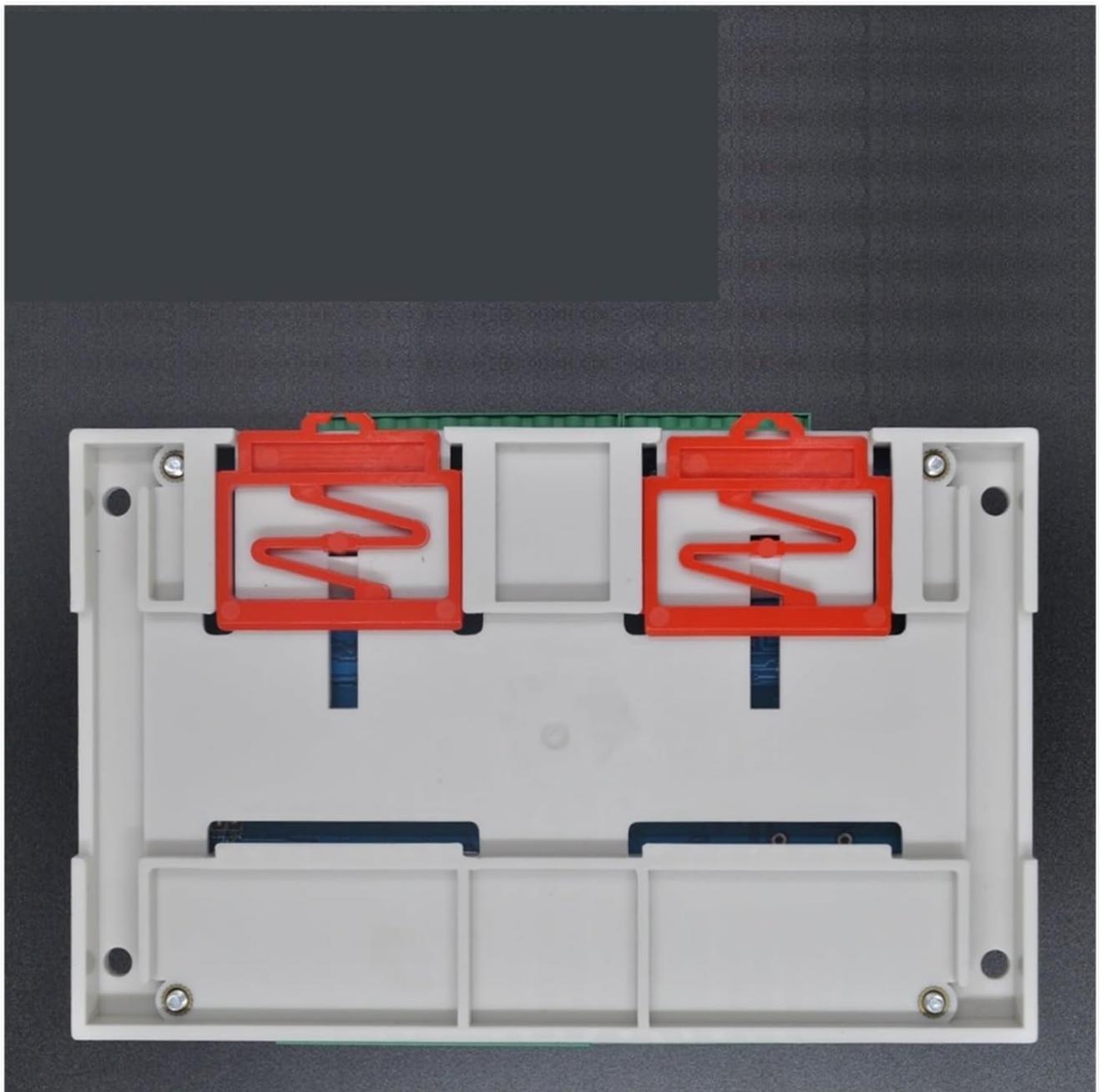
Figure 4.1: Rear view of the module, illustrating the integrated clips for 35mm DIN-rail mounting.

4.2 Wiring Connections

Ensure all power is disconnected before making any wiring connections. Refer to the terminal diagram below for correct wiring.

Terminals	description
+V	Power +
GND	Power -
TD(n)+	Sensor +
TD(n)-	Sensor -
A (D+)	RS485 +
B (D-)	RS485 -

Figure 4.2: Terminal connection diagram, detailing power, sensor, and RS485 wiring.

- **Power Supply:** Connect DC 8-30V to the +V (Power +) and GND (Power -) terminals.
- **Thermocouple Input:** Connect K-Type thermocouples to the TD(n)+ (Sensor +) and TD(n)- (Sensor -) terminals for each of the 16 channels. Ensure correct polarity.
- **RS485 Communication:** Connect the RS485 bus to the A (D+) and B (D-) terminals.

5. OPERATING INSTRUCTIONS

5.1 Modbus RTU Communication

The CWT-TM-16TC-T module communicates using the Modbus RTU protocol over an RS485 interface. A Modbus master device (e.g., PLC, HMI, PC with Modbus software) is required to read data from and write parameters to the module.

5.2 Reading Temperature Data

Temperature data for each of the 16 channels can be read from the specified Modbus holding registers. The data format is UINT (Unsigned Integer) with a scale factor of 0.1. This means the raw value read from the register should be divided by 10 to get the actual temperature in degrees Celsius.

Address (hex)	Description	Format	scale	Number of bytes	Property
20H	Channel 1	UINT	0.1	2	R
21H	Channel 2	UINT	0.1	2	R
22H	Channel 3	UINT	0.1	2	R
23H	Channel 4	UINT	0.1	2	R
24H	Channel 5	UINT	0.1	2	R
25H	Channel 6	UINT	0.1	2	R
26H	Channel 7	UINT	0.1	2	R
27H	Channel 8	UINT	0.1	2	R
28H	Channel 9	UINT	0.1	2	R
29H	Channel 10	UINT	0.1	2	R
2AH	Channel 11	UINT	0.1	2	R
2BH	Channel 12	UINT	0.1	2	R
2CH	Channel 13	UINT	0.1	2	R
2DH	Channel 14	UINT	0.1	2	R
2EH	Channel 15	UINT	0.1	2	R
2FH	Channel 16	UINT	0.1	2	R

Figure 5.1: Modbus register map for reading temperature values from Channel 1 to Channel 16.

Address (hex)	Description	Format	Scale	Number of bytes	Property
20H	Channel 1	UINT	0.1	2	R
21H	Channel 2	UINT	0.1	2	R
22H	Channel 3	UINT	0.1	2	R
23H	Channel 4	UINT	0.1	2	R
24H	Channel 5	UINT	0.1	2	R
25H	Channel 6	UINT	0.1	2	R
26H	Channel 7	UINT	0.1	2	R
27H	Channel 8	UINT	0.1	2	R
28H	Channel 9	UINT	0.1	2	R
29H	Channel 10	UINT	0.1	2	R
2AH	Channel 11	UINT	0.1	2	R
2BH	Channel 12	UINT	0.1	2	R
2CH	Channel 13	UINT	0.1	2	R

2DH	Channel 14	UINT	0.1	2	R
2EH	Channel 15	UINT	0.1	2	R
2FH	Channel 16	UINT	0.1	2	R

5.3 Configuring Communication Parameters

The module's communication parameters (baud rate, parity, and Modbus address) can be configured by writing to specific Modbus holding registers.

Address (hex)	Byte order	Meaning	Description	Property
10	LO	Communication parameters initial value: 00	BIT<7:5> reserve BIT<4:3> 00=none 01=even 10=odd （11= odd） BIT<2:0> 000=9600 001=1200 010=2400 011=4800 100=9600 101=14400 110=19200	RW
	Hi	address initial value: 01	1-250	RW

Figure 5.2: Modbus register map for configuring communication parameters and device address.

Address (hex)	Byte order	Meaning	Description	Property
10	LO	Communication parameters	BIT<7:5> reserve BIT<4:3> 00=none 01=even 10=odd (11=odd) BIT<2:0> 000=9600 001=1200 010=2400 011=4800 100=9600 101=14400 110=19200 *Initial value: 01*	RW
	Hi	address	1-250 *Initial value: 01*	RW

Note: The initial Modbus address is 01. The initial baud rate is 9600 bps with no parity. Refer to the table for specific bit configurations for baud rate and parity settings.

6. MAINTENANCE

The CWT-TM-16TC-T module is designed for minimal maintenance.

- **Cleaning:** Periodically clean the exterior of the module with a soft, dry cloth. Do not use abrasive cleaners or solvents.
- **Connections:** Regularly inspect all wiring connections to ensure they are secure and free from corrosion.
- **Environment:** Ensure the operating environment remains within the specified temperature and humidity ranges to prevent damage.

7. TROUBLESHOOTING

- **No Power Indication:**
  - Verify the power supply voltage is within the DC 8-30V range.
  - Check power wiring for correct polarity and secure connections.

- **No Communication via RS485:**
  - Ensure RS485 A (D+) and B (D-) connections are correct and secure.
  - Verify the Modbus address of the module matches the master device's configuration.
  - Check baud rate and parity settings on both the module and the master device. The initial settings are 9600 bps, no parity.
  - Confirm the RS485 network is properly terminated if necessary.

- **Incorrect Temperature Readings:**
  - Ensure K-Type thermocouples are used and connected with correct polarity to the respective channels.
  - Check thermocouple integrity and ensure they are not damaged.
  - Verify the scaling factor (0.1) is correctly applied when interpreting the raw Modbus data.
  - Ensure the ambient temperature of the module is stable, as internal cold junction compensation relies on it.

8. WARRANTY AND SUPPORT

For warranty information and technical support, please contact your vendor or the manufacturer, Mechanivis. Keep your purchase receipt for warranty claims.
Manufacturer: **Mechanivis**