VEICHI

VH-4TC Temperature Detection Module

Manual

Preface

■ Brief

VH-4TC is a 4-channel input thermocouple temperature detection module, which can be used with VH series master stations and coupling units such as VH-RTU-ECT or VH-RTU-PN. This manual covers mechanical and electrical installation, troubleshooting, module programming examples, and version compatibility for the product.

■ Additional Materials

Name	Content
VH-RTU-ECT	Detailed instructions on installation, wiring, and operation.
VH-RTU-PN	Detailed instructions on installation, wiring, and operation.
VH-4AD/4DA/4PT/4TC	Detailed instructions on installation, wiring, and operation.

■ Version Change Log

Date	Version	Content
2025-01	V1.0	First release

■ Manual Acquisition

● This manual is not shipped with products. If you need it, please log on to the official website of VEICHI (www.veichi.com), "Services and Support-Data Download", search for keywords and download the PDF file.

● Scan the QR code on the product body to obtain it.

■ Warranty Description

Under normal use, VEICHI provides an 18-month warranty for product malfunctions or damage (starting from the factory date, based on the barcode on the product body, and following contract terms if applicable). After 18 months, repair costs will be charged. Within the first 18 months, repair costs will be incurred for:

● Improper operation of the product without following the manual.

● Damage caused by fire, flood, or abnormal voltage.

● Damage caused by using the product for non-intended purposes.

● Damage caused by exceeding the product's specified usage range.

● Secondary damage caused by force majeure (natural disasters, earthquakes, lightning strikes).

● The relevant service fee shall be calculated by the unified standard of the manufacturer. If there is a contract, terms in it will be of the highest priority.

● Please refer to "Product Warranty Card" for details.

Precautions

■ Safety Statement

1. Read and follow these safety precautions before installing, operating, and maintaining the product.

2. Ensure personal and equipment safety by adhering to marks on the product and safety precautions described in the manual during installation, operation, and maintenance.

3. The "Caution," "Warning," and "Danger" notices in the manual do not cover all of the safety precautions to be observed, but only supplement to safety precautions.

4. Please use the product in an environment that meets the requirements of design specifications, otherwise it may cause failure, abnormal function or component damage, which is not within the scope of product quality assurance.

5. VEICHI will not take on any legal responsibility for personal safety accidents and property damage caused by unauthorized operation of the product.

■ Safety Level

⚠ DANGER : Failure to observe the precautions will cause serious personal injuries or deaths.

⚠ WARNING : Failure to observe the precautions may cause serious personal injuries or deaths.

⚠ CAUTION : Failure to observe the precautions may cause slight personal injuries or product damage.

Please keep this manual safe for reference and ensure it is delivered to the end user.

Control System Design
⚠ DANGER :
➢ Ensure safety circuit design to maintain secure operation during power outages or controller failures;   ➢ Install external safety devices like fuses or circuit breakers to prevent smoking or fire from overcurrent caused by overloads or short circuits.
⚠ WARNING :
➢ Design emergency stop, protection, interlock circuits for forward/reverse operations, and limit switches to prevent product damage in the PLC external circuits;   ➢ Design external protective circuits and safety mechanisms for major accident-related output signals to ensure equipment safety;   ➢ The programmable controller's CPU may shut down all outputs upon detecting system anomalies; design appropriate external control circuits to ensure normal operation in case of partial circuit failure;   ➢ Damage to the PLC relays, transistors, or other output units may render their outputs uncontrollable in switching between ON and OFF states;   ➢ The PLC is designed for indoor use in an overvoltage category II electrical environment; its power system should include lightning protection to prevent damage from overvoltage due to lightning strikes on power/signal input terminals, or control output terminals.

Installation
⚠ WARNING :
➢ Only professionals with relevant maintenance training in electrical equipment and electrical knowledge can install this product;

> Disconnect all external power supplies before disassembling or assembling modules. Failure to do so may result in electric shock, module failure, or malfunction;
> Do not use the PLC in environments with dust, fumes, conductive dust, corrosive gases, flammable gases; exposed to high temperatures, condensation, wind, or rain; or in areas with vibration or impact. Electrical shock, fire, and misoperation can damage and deteriorate the product;
> As the PLC is an open type device, install it in a control cabinet (enclosure protection > IP20) with a lock, accessible only to operators trained in electrical equipment with sufficient electrical knowledge.

⚠ CAUTION :

> Avoid metal debris and wire ends falling into the PLC's ventilation openings during installation to prevent fire, malfunction, or misoperation;
> Ensure no obstructions on the ventilation surface after installation to avoid impaired heat dissipation, which could cause fire, malfunction, or misoperation;
> Securely connect the module to its connector and lock the hooks during installation to prevent misoperation, failure, or detachment due to improper installation.

Wiring

⚠ DANGER :

> Only professionals with relevant training in electrical equipment and electrical knowledge can carry out wiring on this product;
> Disconnect all external power supplies before wiring. Failure to do so may result in electric shock, equipment failure, or malfunction;
> After wiring, install the provided terminal cover before powering up and operating the product to prevent electric shock;
> Ensure proper insulation on cable terminals and maintain the required spacing between cables after installation to avoid electric shock or equipment damage.

⚠ CAUTION :

> Disconnect the power supply before connection to avoid electric shock;
> The input voltage for this product is DC 24V; supplying power outside the DC24V±20% range can severely damage the product. Regularly check the stability of the DC power provided by the switching power supply.

Operation & Maintenance

⚠ CAUTION :

> Only professionals with relevant training in electrical equipment and electrical knowledge can operate and maintain this product;
> Disconnect all external power supplies before cleaning modules or adjusting terminal and connector bolts to prevent electric shock;
> Disconnect all external power supplies before removing/installing modules or connecting/disconnecting communication cables. Incomplete disconnection may cause electric shock or misoperation.

Safety Recommendations
> Carefully consider the functionality of field manual devices or other alternatives at locations where operators directly contact mechanical parts, such as loading/unloading stations or automated mechanical operation areas. These should be independent of the PLC and capable of initiating or interrupting the system's automatic operation.

➢ When modifying programs while the system is running, consider implementing locking or other protective measures to ensure that only authorized personnel can make necessary changes.

Disposal

⚠ CAUTION :

➢ Dispose of them according to industrial waste treatment standards. Waste batteries should be disposed of separately in accordance with local laws;

➢ Treat and recycle scrapped equipment and products according to industrial waste treatment standards to avoid environmental pollution.

1. Product Information

1.1 Naming Rules

$$\underline{VH} - \underline{4}\ \underline{TC}$$
$$\text{\textcircled{0}} \qquad \text{\textcircled{1}} \quad \text{\textcircled{2}}$$

⓪Product information VH: VEICHI slim series module
①Input channels 4: 4 channels 8: 8 channels
②Module type AD: Analog input DA: Analog output PT: Thermal resistance temperature detection TC: Thermocouple temperature detection

Based on the naming rules and nameplate information, the relevant ordering data for this product is shown in the table below:

Model	Description	Code	Product
VH-4TC	A 4-channel thermocouple temperature detection module	9120380027	VH series PLC, VH series coupler

1.2 Component

Here are the module terminal descriptions:
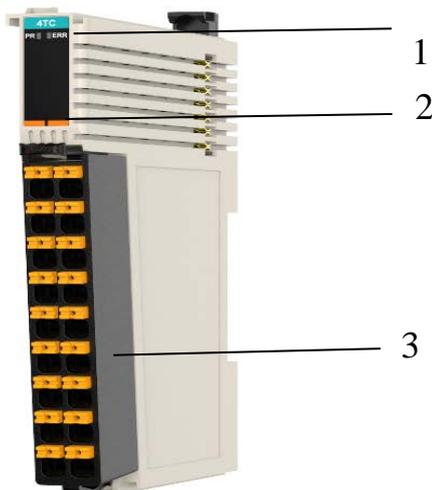
No.	Interface	Description			
1	Signal indicator	PR (POWER+RUN)	Power/Run indicator	On (Green)	Normal
				Off	Module abnormal
				Flash (Green)	Module ready or stopped
		ERR	Error indicator	On (Red)	Module error
2	Color identification	Yellow: IO input		Red: IO output	
		Green: Analog input		Blue: Analog output	
		Orange: Temperature input		-	
3	User terminal	Refer to the terminal definition section for details.		-	

1.3 Technical Specification

1.3.1 Power Specification

Item	Specification
Terminal input power rated voltage	24VDC (20.4VDC~28.8VDC)
Terminal input power rated current	100mA (typical at 24V)
Bus input power rated voltage	5VDC (4.75VDC~5.25VDC)
Bus input power rated current	85mA (typical at 5V)
Power isolation	24V and 5V isolated
Terminal output power rated voltage	None
Terminal output power rated current	None
Module hot swap	N/A

1.3.2 Input Specification

Item	Description
Input channel	4 channels
Digital resolution	24 bits
Sensitivity	0.1℃, 0.1℉
Input terminal	Thermocouple input, types: B, E, N, J, K, R, S, T
Compensation method	Internal cold junction compensation
Precision (normal temperature 25℃)	(±0.1%)[1] (±100mV full-scale) + cold junction compensation error [2]
Precision (environmental temperature -20℃~55℃)	(±0.3%)[1] (±100mV full-scale) + cold junction compensation error [2]
Sampling cycle	250ms, 500ms, 1000ms/4 channels (configurable via software)
Filter time	0s~100s (configurable via software, default 5s)
Isolation	Isolated between I/O terminals and power supply, channels are not isolated

[1]: Indicates the ADC sampling precision, which needs to be determined based on the sensor type and thermocouple temperature measurement range. For details, refer to "Table 1-1" in 1.3.3.

[2]: The cold junction compensation error needs to be determined based on the installation orientation, adjacent module types, and operating temperature range. For details, refer to "Table 1-2" in 1.3.3.

1.3.3 Range and Precision

Table 1-1 Thermocouple Measurement Range and ADC Sampling Precision

Sensor Type	Range	ADC Sampling Precision
B	200.0℃～1800.0℃, 392.0℉~3272.0℉	≥±5℃@200℃≤T≤400℃ ＜±5℃@400℃≤T≤750℃ ＜±3℃@750℃≤T≤1200℃ ＜±3.5℃@1200℃≤T≤1800℃
E	-100.0℃～+1000.0℃ -148.0℉~+1832.0℉	≥±1℃@-100℃≤T≤0℃ ＜±1℃@ 0℃≤T≤400℃ ＜±1.5℃@400℃≤T≤1000℃
N	-100.0℃～+1200.0℃ -148.0℉～+2192.0℉	＜±2℃@-100℃≤T≤0℃ ＜±1.5℃@ 0℃≤T≤750℃ ＜±0.2% display @750℃≤T≤1200℃
J	-100.0℃～+1000.0℃ -148.0℉~+1832.0℉	≥±1℃@-100℃≤T≤0℃ ＜±1℃@ 0℃≤T≤500℃ ＜±0.2% display @500℃≤T≤1000℃
K	-100.0℃～+1200.0℃ -148.0℉～+2192.0℉	≥±1.5℃@-100℃≤T≤ 0℃ ＜±1.5℃@0℃≤T≤100℃ ＜±1℃@100℃≤T≤500℃ ＜±0.2% display @500℃≤T≤1100℃ ≥±2.6℃@1100℃≤T≤1200℃
R	0.0℃～+1600.0℃ 32.0℉~+2912.0℉	≥±4℃@ 0℃≤T≤50℃ ＜±4℃@50℃≤T≤250℃ ＜±2℃@250℃≤T≤500℃ ＜±3.5℃@500℃≤T≤1500℃ ≥±3.5℃@1500℃≤T≤1600℃

| S | 0.0°C～+1600.0°C
32.0°F～+2912.0°F | ≥±4°C@0°C≤T≤50°C
＜±4°C@50°C≤T≤300°C
＜±2°C@300°C≤T≤600°C
＜±3.5°C@600°C≤T≤1500°C
≥±3.5°C@1500°C≤T≤1600°C |
| T | -200.0°C～+400.0°C
-328.0°F～+752.0°F | ≥±1°C@-200°C≤T≤-100°C
＜±1°C@-100°C≤T≤400°C |

Table 1-2 Cold Junction Compensation Error

Direction	Adjacent Module	Error (-20°C~0°C)	Error (0°C~55°C)
Horizontal and upright	Temperature module	±3.5°C	±2°C
	Non-temperature module	±6.5°C	±4.5°C
Not horizontal and upright	Temperature module	±5.5°C	±4°C
	Non-temperature module	±5.5°C	±4.5°C

1.3.4 Software Specification

Item	Description
Break or overlimit	Output max. value, no refresh
System diagnosis	System power error
Channel diagnosis	Over-limit alarm, under-limit alarm, break alarm, overflow error
Software diagnosis	N/A
Configuration diagnosis	Error identification, channel parameter error diagnosis
Input PDO data size	16 Byte
Diagnostic reporting	YES
Diagnostic detection	Supports limit and break detection
Limit detection	YES
Independent channel enable	YES
Temperature offset enable	YES
Temperature setting range	-204.8~+204.7 (°C/°F)
Sampling cycle	250ms, 500ms, 1000ms/4 channels
Display mode	Celsius (°C), Fahrenheit (°F)
Sensitivity	0.1°C, 0.1°F
Sampling refresh	Asynchronous refresh based on sampling time, not required to sync with bus cycle
Stop mode	Continue refresh according to sampling time

1.3.5 Environment

Item	Specification
Operating temperature	-20°C~55°C
Operating humidity	10%~90%RH, no condensation

Use environment	Non-corrosive and combustible gas, slight conductive dust
Storage temperature	-40℃~70℃ (Relative humidity < 90%RH, no condensation)
Altitude	≤2000m
Pollution degree	2
Immunity	Power line 2kV (IEC61000-4-4)
Overvoltage category	I
EMC	Zone B, IEC61131-2
Vibration resistance	IEC 60068-2-6 5Hz~8.4Hz, 3.5mmp, 8.4Hz~150Hz, 1g, X/Y/Z three directions, 10 cycles/direction
Shock resistance	IEC 60068-2-27 150m/s², 11ms, ±X/Y/Z six directions, 3 times/direction, total 18 times

2. Mechanical Installation

2.1 Installation Dimension

2.1.1 Module

The installation dimensions are shown in the following figure, in millimeters (mm):
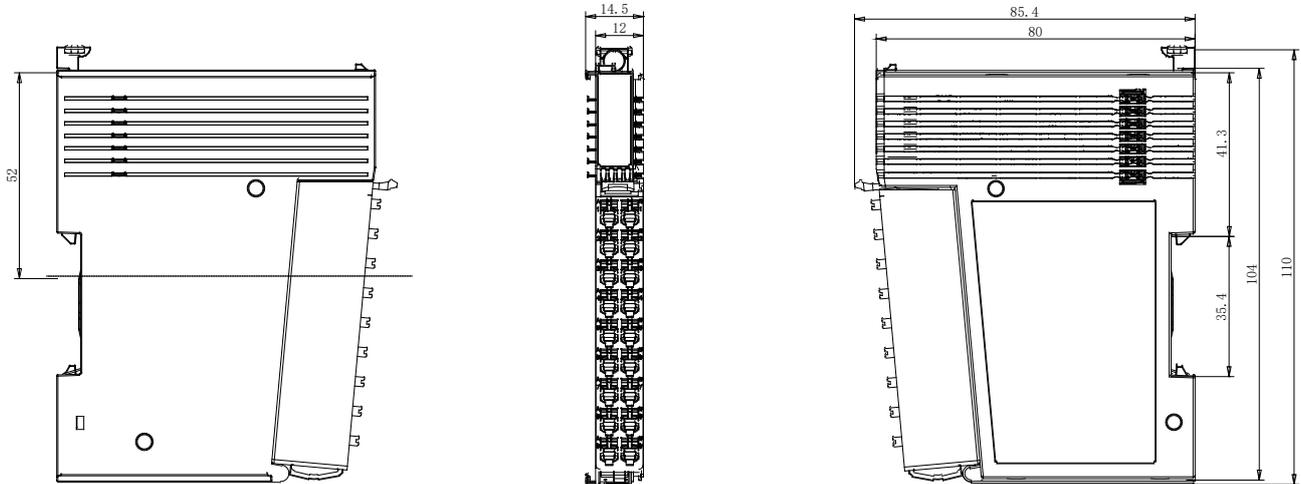
Ensure at least 10mm of clearance above the product to accommodate the latch's movement.

2.1.2 Connection Cable
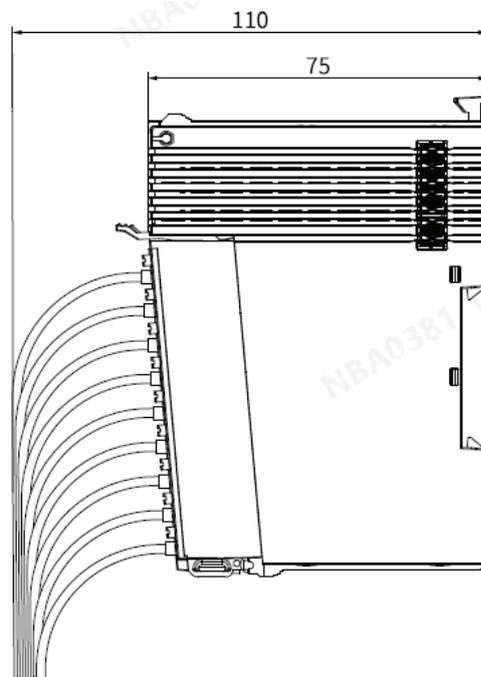
2.2 Installation Method

2.2.1 Module Installation

Modules are assembled by sliding to the correct positions from the top and bottom lead rails.
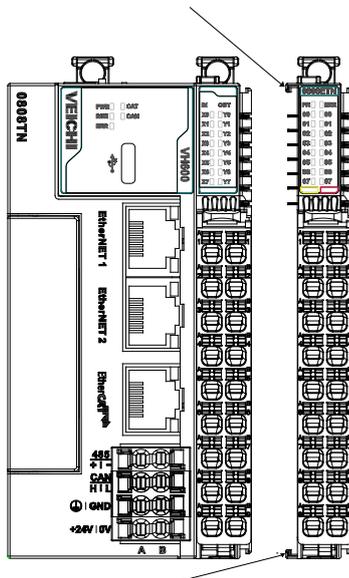
2.2.2 Module Installation on Rail

When installing, align the module to the DIN lead rail, press the latch, and there will be an obvious clipping sound if it is in place, as shown in the figure below.
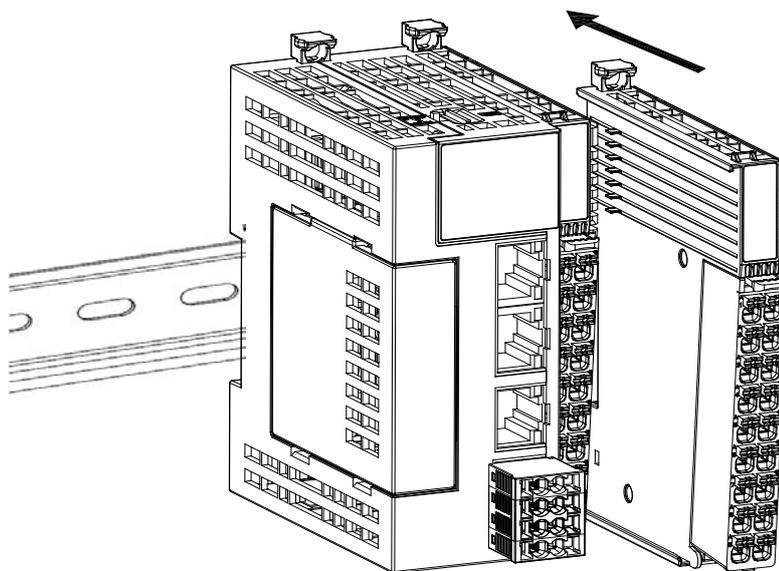
Note: Depress the rail latch to open it, then place the module on the DIN lead rail and press down on the latch to secure it. Install a DIN snap at both ends of the main unit or module. When installing the rail snap, hook the bottom of it to the bottom of the rail and then rotate the snap so that the top end of it is hooked to the top end of the rail, and finally tighten the screws to lock the rail snap.

2.2.3 Disassembly

Use a straight screwdriver or similar tool to pry up the rail latch, then pull the module forward by the handle (raised part).
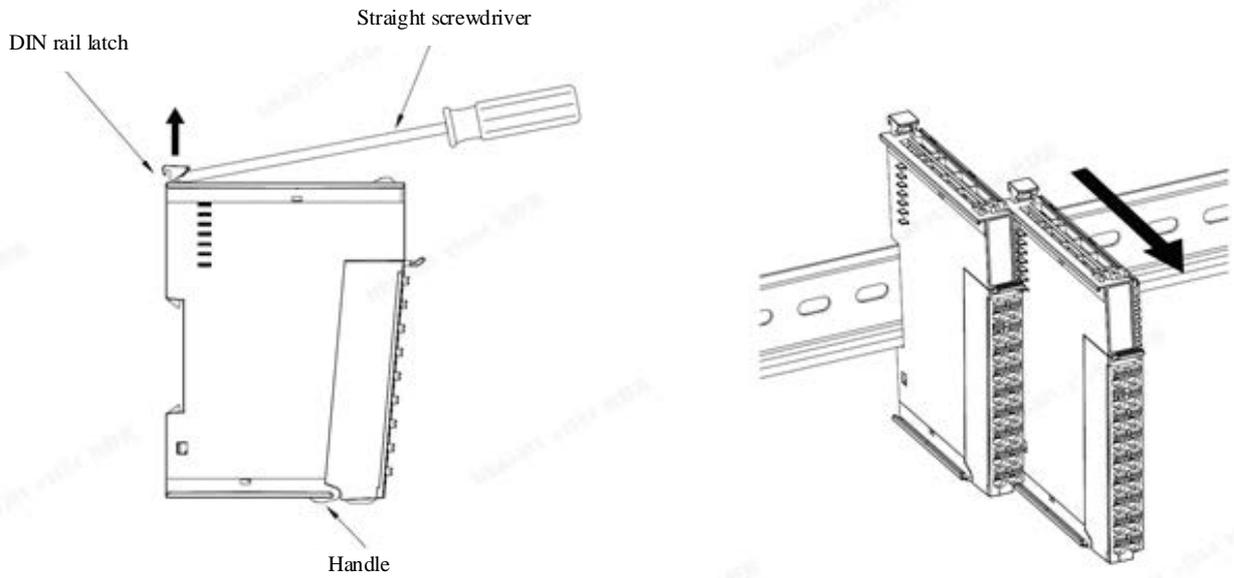
Depress the rail latch with your finger and then pull the module away from the DIN lead rail.
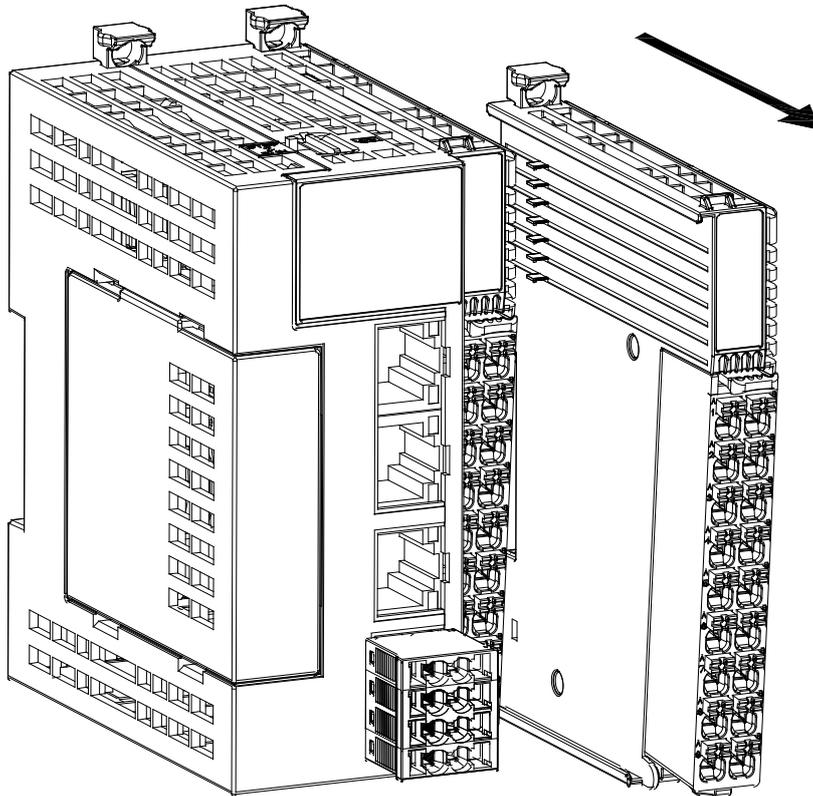
3. Electrical Installation

3.1 Cable Selection

In the following table, the lug diameter is for reference only, which can be calculated reasonably according to actual use and adjusted separately.

Name of Accessories	Diameter	
	GB/mm^2	ANSI/AWG
	0.3	22
	0.5	20
Tubular lug	0.75	18
	1.0	18
	1.5	16

If other tubular lugs are used, press them to the twisted cables. The shape and size requirements are shown in the following figure.
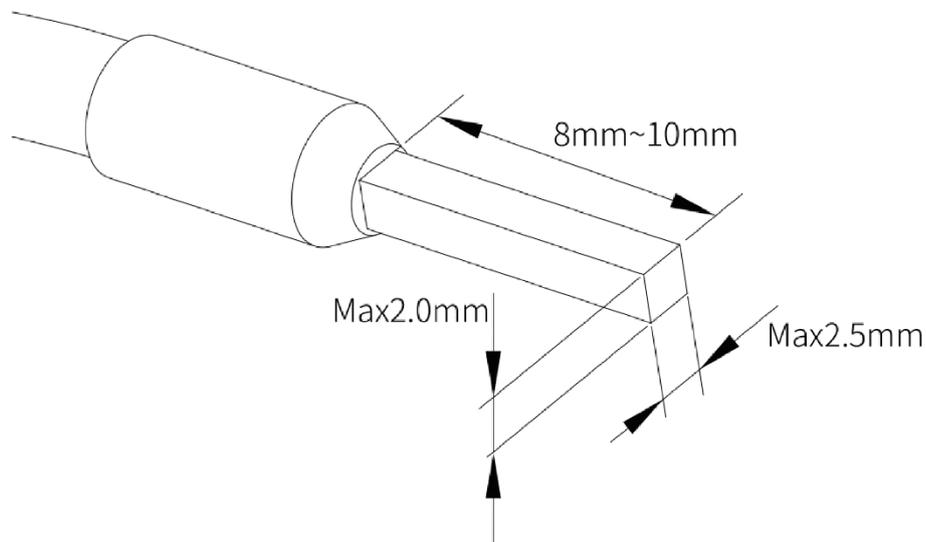
3.2 Definition

Left Signal	Left Terminal	Right Terminal	Right Signal
L0+	A1	B1	L0–
L1+	A2	B2	L1–
L2+	A3	B3	L2–
L3+	A4	B4	L3–
•	A5	B5	•
•	A6	B6	•
•	A7	B7	•
PE	A8	B8	PE
+24V	A9	B9	COM

3.3 User Terminal Wiring

3.3.1 Wiring Precautions

● Avoid bundling extension cables with power lines (high voltage, high current) that transmit strong interference signals, as this may increase noise, surges, and induction effects. Cables should be separated and not paralleled.

● Use recommended cables and interface boards for connections. It is advised to use shielded cables for extension to enhance interference resistance.

● Ensure single-point grounding for the shields of shielded cables and welded cables.

3.3.2 Input Terminal Wiring
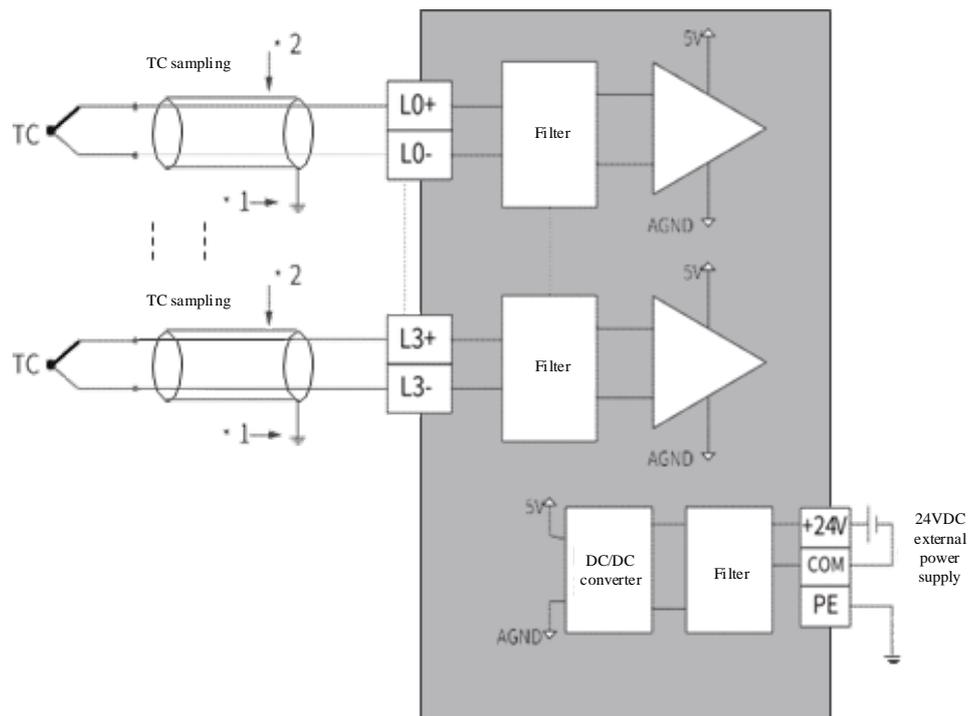
Note: *1 Cables must be shielded, with the shield connected to PE.

　　　*2 Please use specialized thermocouple extension cables for thermocouple sensors that are far from the module.

　　　Avoid using regular cables as extensions, as it may affect temperature measurement precision and data stability.

4. Troubleshooting

When the ERR indicator light is on, it indicates a module error with an error code reported. Double-click the 4TC module to access the "Extension Module Configuration" interface, where the error code can be obtained from the configured component address. Here is the "Extension Module Configuration" interface (Autostudio):
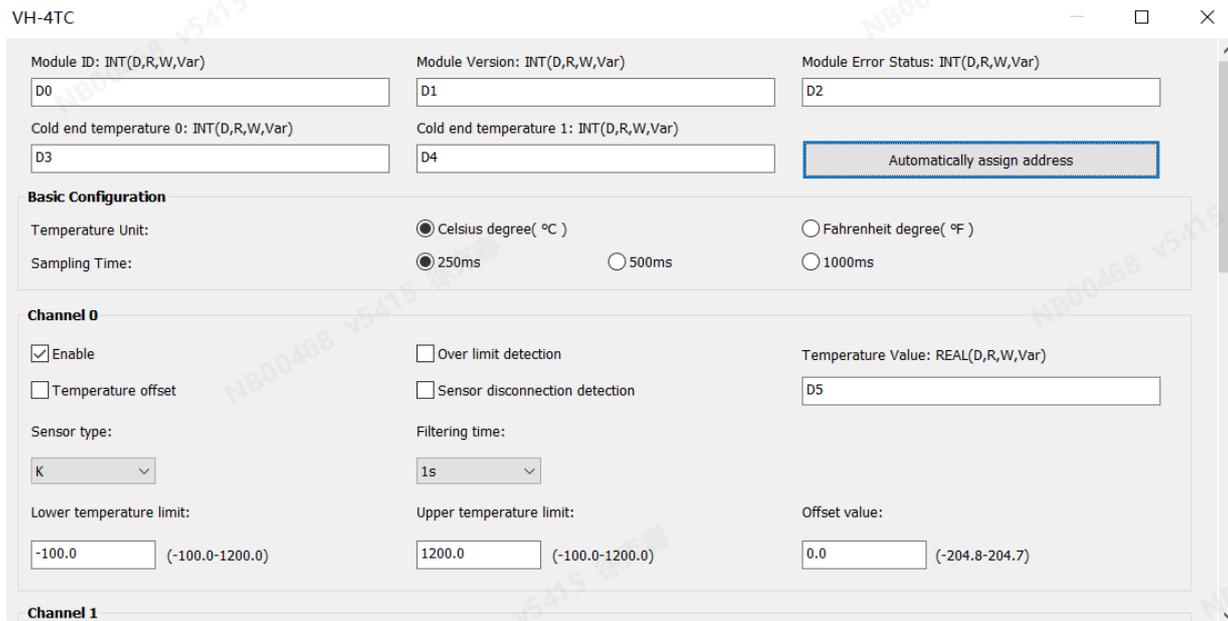
1.1 Module ID

ID	Description
12	4TC module

1.2 Module Version

Version	Description
10000	Ver. 1.0
10001	Ver. 1.1

1.3 Error Code

Code	Description	Solutions
Bit 0	Module disconnection	Check the wiring for each input channel with disconnection detection enabled.
Bit 1	Module beyond limit	Verify the upper and lower limit settings for each input channel with limit detection enabled.
Bit 8	External 24V power error	Check the module's isolated power supply
Bit 9	ADC error	Power up and restart

16

5. Module Programming

5.1 CODESYS Programming (with VH600)

Here are the instructions for using the input channels 0, 1, 2, 3 of the VH-4TC module with the VH600 series as the control main module:

1. Open CODESYS software, click [File]→click [New Project]→select [Standard project]→rename and choose the location→click [OK]. See the figure below for specific steps.
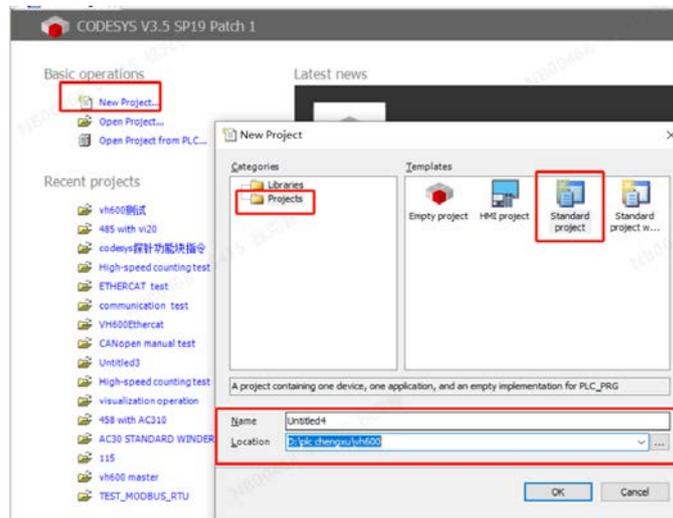
2. After creating a new project, select the appropriate model.
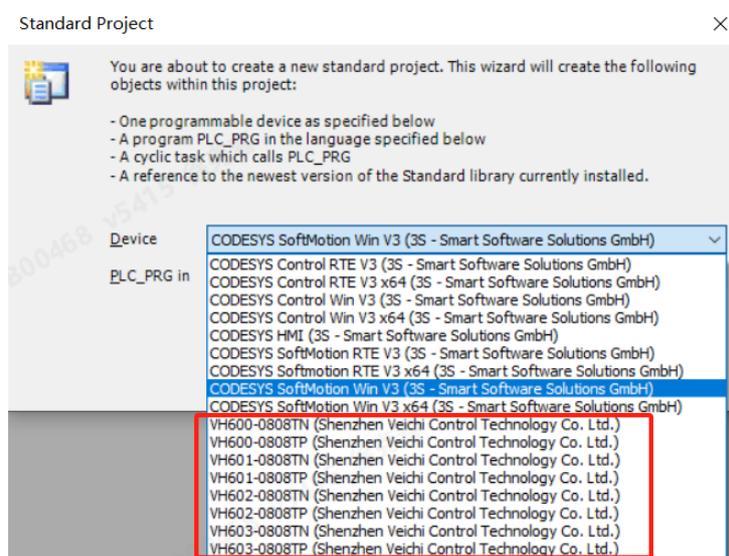
3. Choose the programming language.
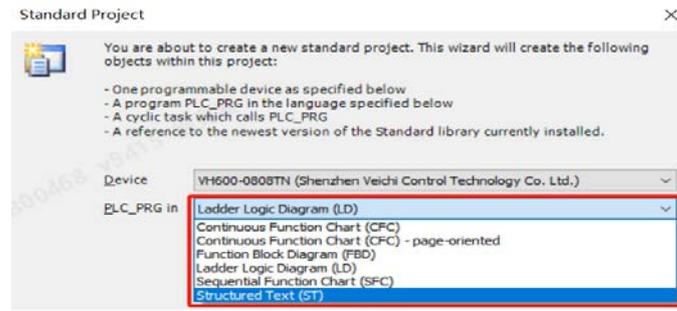
4. Double-click [Device]→click [Scan Network]→select the detected device model→click [OK], as shown in the figure below:
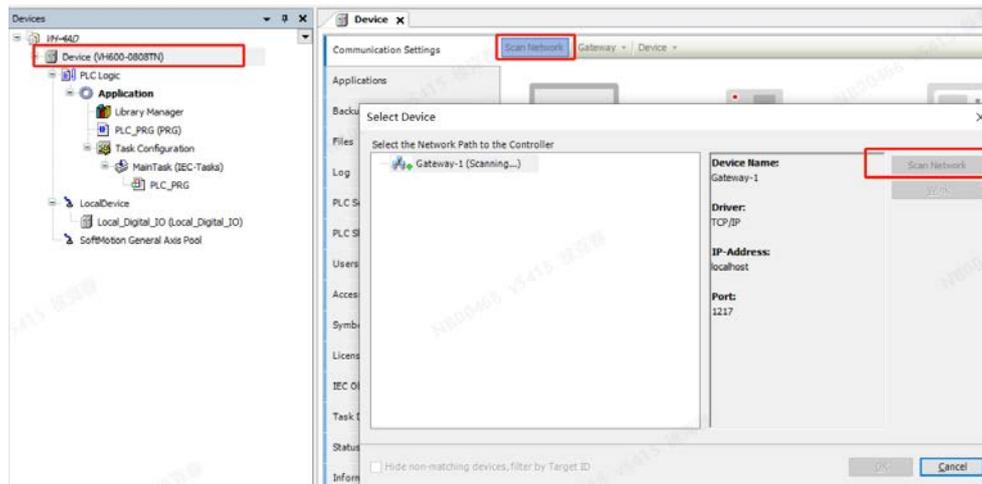
5.1.1 Add Device

1. In the [Devices] window, right-click [Device] and select [Add Device].
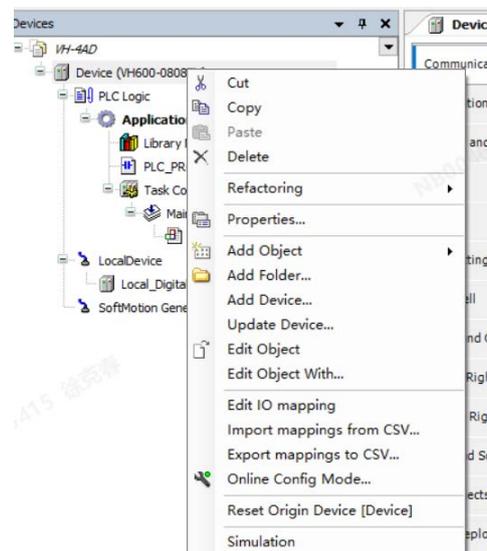
2. Choose Shenzhen Veichi Control Technology Co., Ltd. in [Vendor] column→unfold [Miscellaneous]→double-click [VH_ExtensionDevice] to add it.
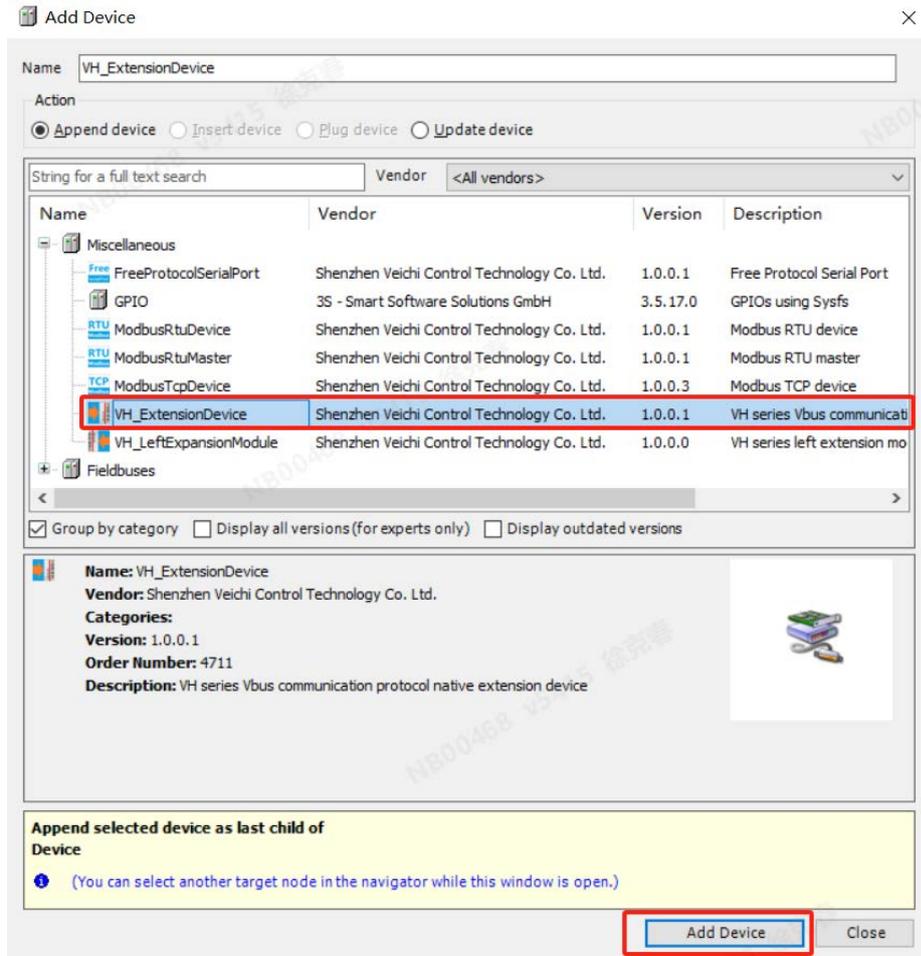
5.1.2 Scan for Module

Currently, VH600 supports automatic device scanning. Right-click [VH_ExtensionDevice]→select [Scan for Devices]→check [Show Project Differences]→Copy→and click [OK]. The scanned modules order matches the physical devices. Or add the device via [Add Devices].
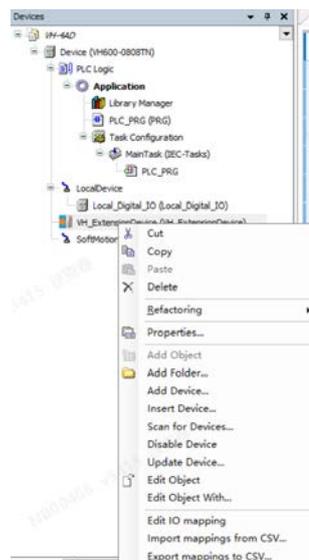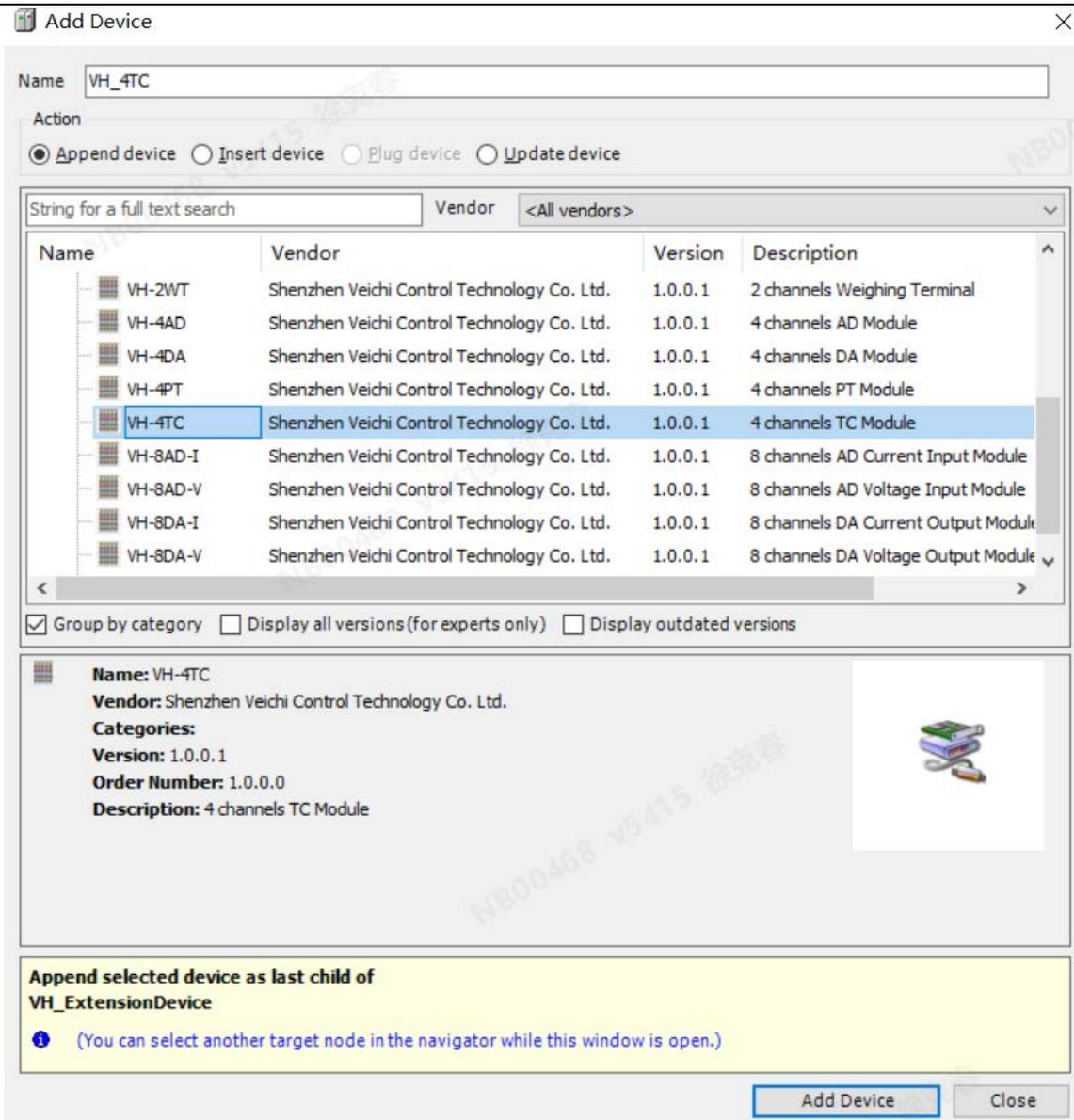
5.1.3 IO Mapping

1. Add custom input variables VH_4TC_CHI0, VH_4TC_CHI1, VH_4TC_CHI2, and VH_4TC_CHI3 in the variables.

2. Map the input variables VH_4TC_CHI0, VH_4TC_CHI1, VH_4TC_CHI2, and VH_4TC_CHI3 defined in the program to the input channels of the configured module to complete variable mapping.
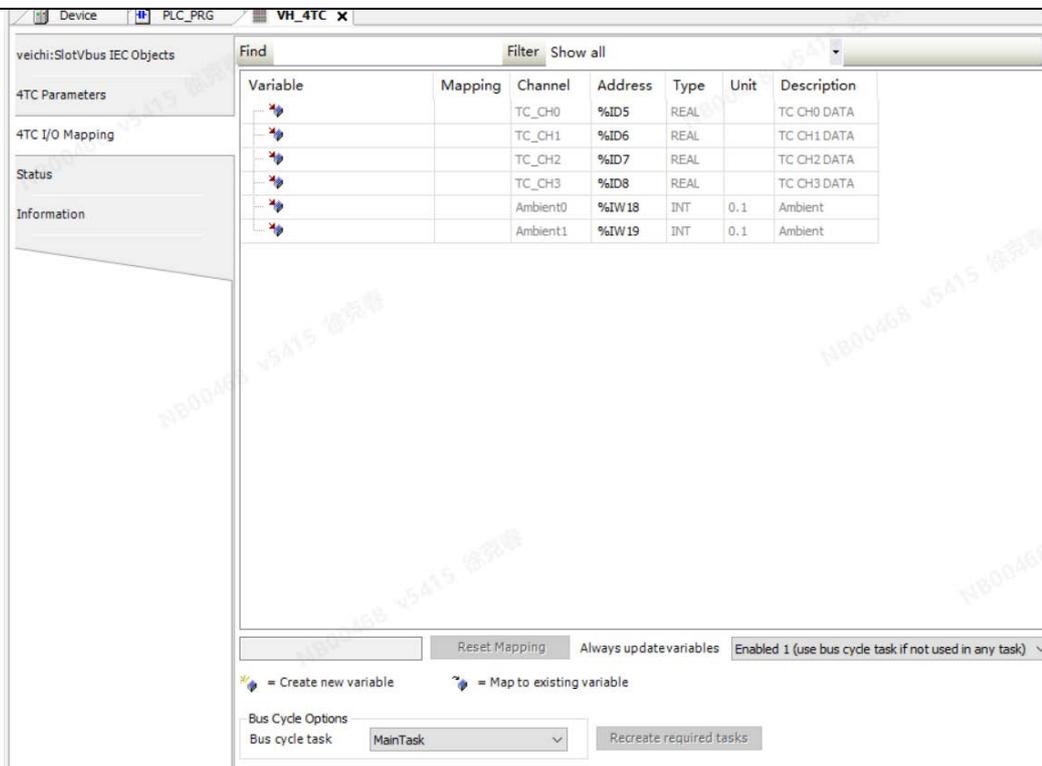
5.1.4 Set Parameters

1. Double-click the VH-4TC module to pop up parameter configuration, enable channels, modify channels and switch modes as needed, and set sampling time and filtering parameters.
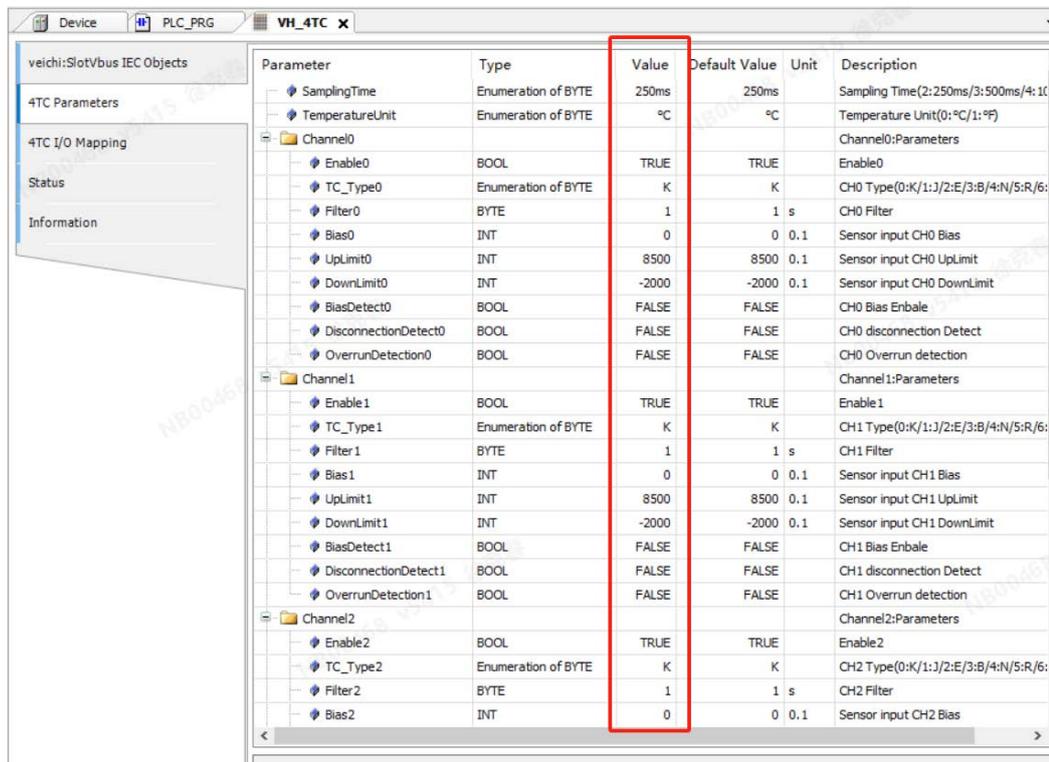
2. After logging on online, double-click the VH-4TC module to pop up 4TC parameter configuration, modify channels and switch modes as needed, and set sampling time and filtering parameters
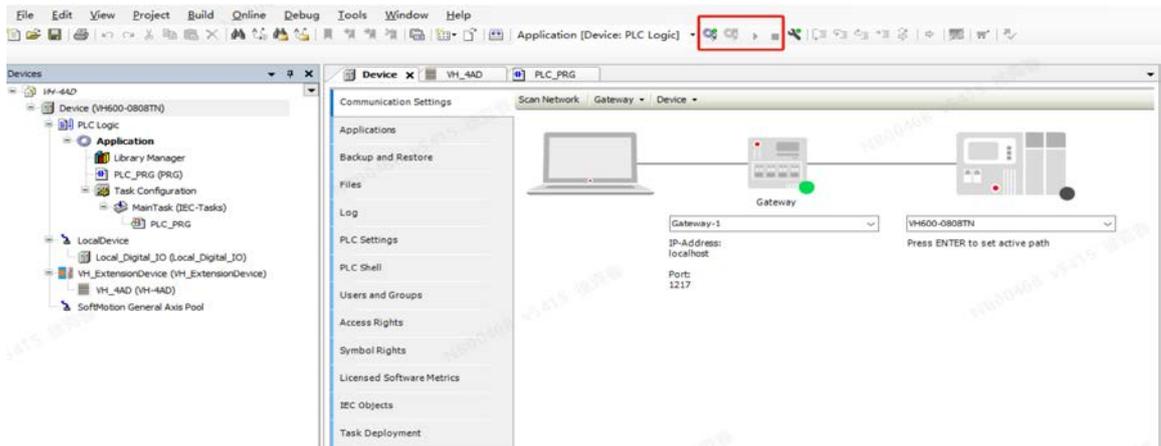
5.1.5 Write User Program

Use LD programming or ST programming.
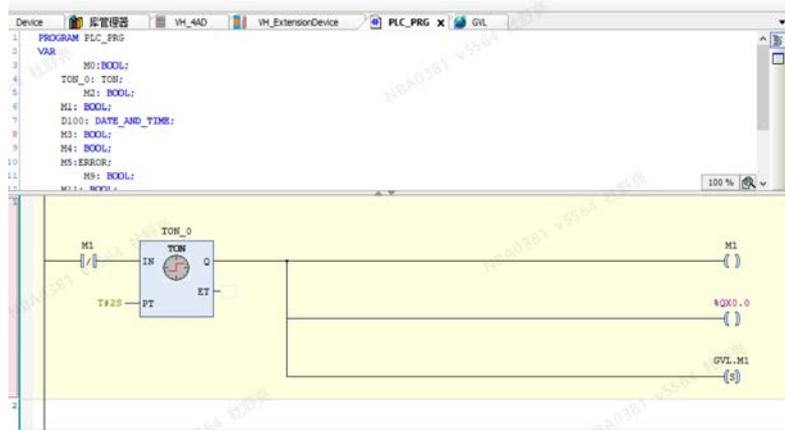
5.1.6 Compilation, Download, and Running

If compilation is without errors, download and run the program.

5.2 CODESYS Programming (with VH523)

Here are the instructions for using the input channels 0, 1, 2, 3 of the VH-4TC module with the VH500 series as the control main module:

5.2.1 New Project

Open AutoStudio software, click [File]→click [New Project]→select [PLC Type]→name the project and choose the location→click [OK]. In the [Project Manager] interface, double-click [Extension Modules] in the left navigation→double-click [VH-4TC] to complete the addition of the VH-4TC extension module, as shown in the figure below.
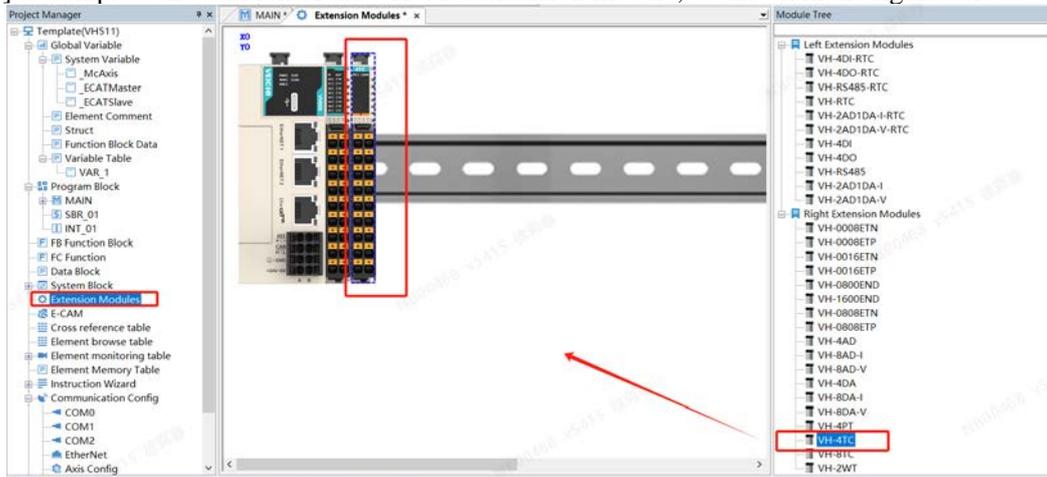
5.2.2 Scan for Module

Or right-click [Extension Modules] on the left navigation, select [Auto Scan] (new projects should be downloaded first to ensure successful scan).
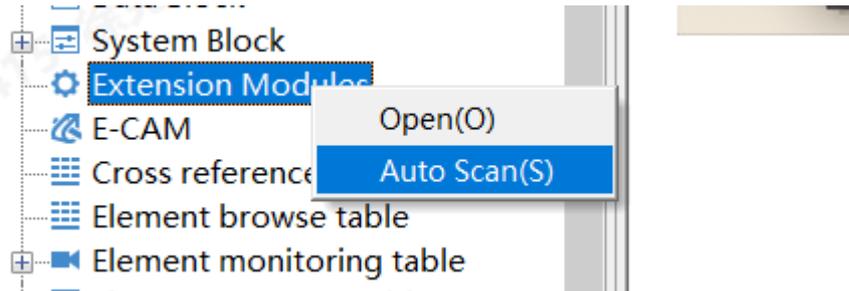

5.2.3 IO Mapping

In the [Extension Module] interface, double-click [VH-4TC]; or right-click [VH-4TC] module and select [Configuration] to enter the window for channel address and parameter settings, and complete the configuration of the VH-4TC extension module, as shown in the figure below.
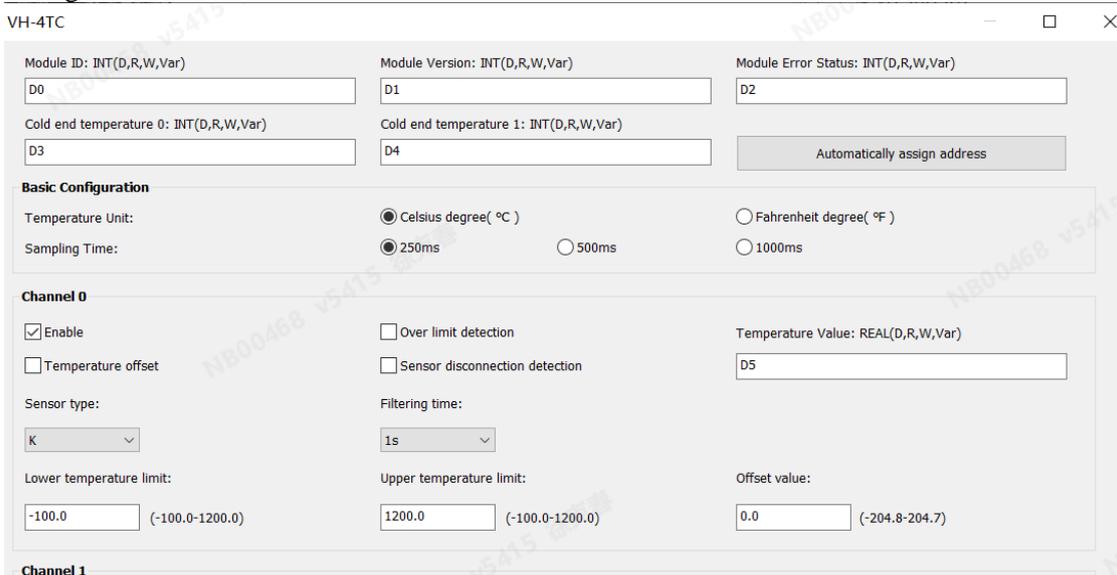
5.2.4 Compilation and Download

After writing the program and compiling it successfully, download it. Monitor the 4TC channel addresses D5~D11 and the cold junction temperatures D3/D4. With a sensor connected to Channel 1, D5 reads the current temperature of the first channel.
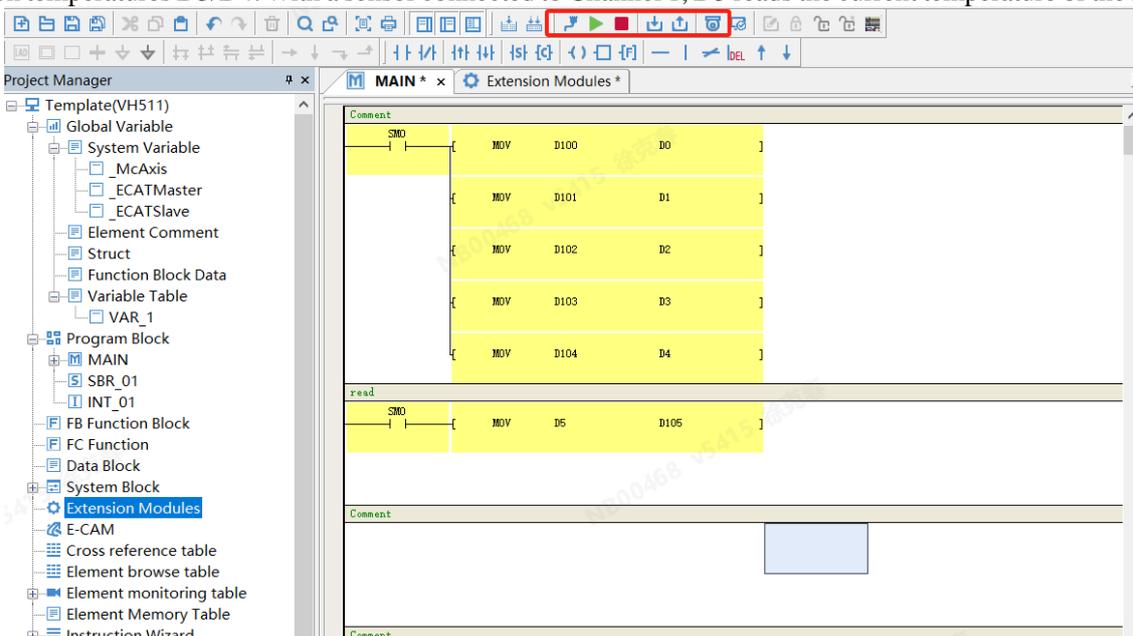
VEICHI

Suzhou Veichi Electric Co., Ltd.

Address: No.1000 Songjia Road, Wuzhong Economic and Technological Development Zone, Suzhou, Jiangsu Province, China.

Tel.: 0512-6617 1988

Fax: 0512-6617 3610

Hotline: 400-600-0303   Website:www.veichi.com   Ver.: 1.0, 2024