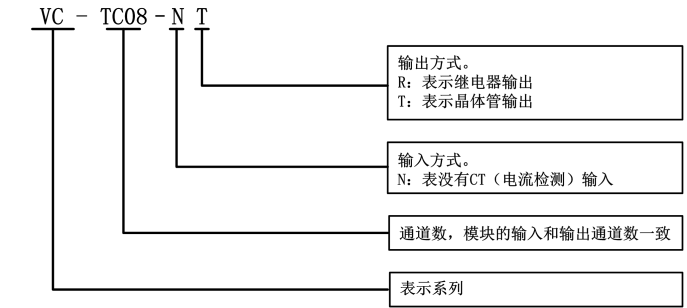


VC-TC08-NT 温控器速查手册

提示：

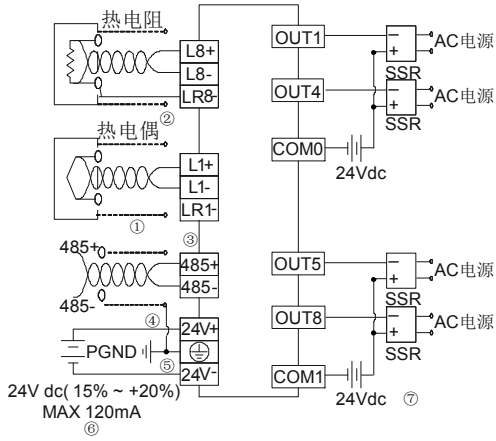
在开始使用之前，请仔细阅读操作指示、注意事项，以减少意外的发生。负责产品安装、操作的人员必须经严格培训，遵守相关行业的安全规范，严格遵守本手册提供的相关设备注意事项和特殊安全指示，按正确的操作方法进行设备的各项操作。

型号说明如下图所示。



1 布线说明

用户端子输入布线示意图如下图所示。



图中的①~⑦表示布线时必须注意的7个方面：

- ①热电偶（热电阻）信号建议通过屏蔽补偿电缆（连接电缆）接入。电缆应远离电源线或其他可能产生电气干扰的电线。使用长的补偿电缆（连接电缆）容易受到噪声的干扰，建议使用长度小于100米的补偿电缆（连接电缆）。补偿电缆（连接电缆）存在阻抗，会引入测量误差，特性调整可解决此问题。
- ②热电阻（类型为Pt100、JPt100、Cu100、Cu50）必需采用三线制接法。
- ③建议将不使用的通道的正负端子L+、L-之间短接，以防止在这个通道上会检测出错误的数据。
- ④如果存在过多的电气干扰，请将屏蔽线（热电偶的补偿电缆屏蔽端，热电阻的连接电缆屏蔽端，485通讯线的屏蔽端）与温控器接地端PG相连接。
- ⑤将温控器的接地端PG良好接地。
- ⑥24V供电电源可以使用PLC主模块的辅助输出24Vdc电源，也可以使用其它满足要求的电源。
- ⑦用户需按2.2 性能指标中输出方式的指标选择合适的电源和固态继电器。

2 使用说明

2.1 电源指标

项目	说明
电源	24Vdc (-15%~20%)，最大允许纹波电压5%，VC08NTZ最大功耗120mA

2.2 性能指标

项目	指标	
输入信号	热电偶类型 热电阻类型	K、J、E、N、T、R、S（适用各个通道） Pt100、Cu100、JPt100、Cu50（适用各个通道）
	输出方式	门极开路的晶体管输出 回路电源电压：5~24V 最大回路电源电压：30V 回路电流：0.3A/24Vdc 开路时漏电流：<0.1mA/30Vdc 最小负载：5mA（5~24Vdc）
采样周期	8通道最大执行时间500ms（不使用的通道不进行转换，每关闭一组对应通道(1和5、2和6、3和7、4和8)，循环时间减少125ms)	
控制周期	1~100秒，默认值为30秒	
控制方法	ON/OFF控制，PI控制，PID控制	
额定温度范围	类型K	-100℃~1200℃（-148℉~2192℉）
	类型J	-100℃~600℃（-148℉~1112℉）
	类型E	-100℃~850℃（-148℉~1562℉）
	类型N	-100℃~1200℃（-148℉~2192℉）
	类型T	-200℃~300℃（-328℉~572℉）
	类型R	0℃~1600℃（32℉~2912℉）
	类型S	0℃~1600℃（32℉~2912℉）
	Pt100	-150℃~600℃（-238℉~1112℉）
	JPt100	-150℃~500℃（-238℉~932℉）
	Cu100	-30℃~120℃（-22℉~248℉）
	Cu50	-30℃~120℃（-22℉~248℉）
	Ni120	-80.0℃~280.0℃（-112.0℉~536.0℉）
最低分辨率	类型K	0.8℃（1.44℉）
	类型J	0.7℃（1.26℉）
	类型E	0.5℃（0.9℉）
	类型N	1℃（1.8℉）
	类型T	0.2℃（0.36℉）
	类型R	1℃（1.8℉）
	类型S	1℃（1.8℉）
	Pt100	0.2℃（0.36℉）
	JPt100	0.2℃（0.36℉）
	Cu100	0.2℃（0.36℉）
	Cu50	0.2℃（0.36℉）
	Ni120	0.2℃（0.36℉）
精度	（±0.7%输入范围）±1位	
隔离	采样通道与电源间隔离，采样通道与输出隔离，通道与通道之间不隔离	

2.3 缓冲区（BFM）

VC-TC08采用Modbus或ECbus通过BFM与主模块交换温度数据和其他信息。读写属性的寄存器可使用MODBUS或ECBUS指令进行读写。若读取保留单元，将会获得0值。保存标记为Y代表使用参数保存功能时，能够被写入闪存，标记为N表示不能被写入闪存。采用MODBUS协议，最多一次可读写50个BFM单元。

BFM单元部分内容如下：

- 通道运行监测；
- 通道特性设定；
- 控制功能设定；
- BFM参数保存设定；

2.3.1 通道运行监测

BFM				内容	备注	属性	保存
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#100 #112	#103 #115	#106 #118	#109 #121	测量值(PV)*1	单位: 0.1℃或0.1℉	R	N
#101 #113	#104 #116	#107 #119	#110 #122	控制输出(MV)*2	缺省值: 0.0% (百分比表示)	R	N
#102 #114	#105 #117	#108 #120	#111 #123	多段控制的当前执行段*3	缺省值: 0 范围: 0~8	R	N
#124				错误状态字*4	缺省值: H0000	R	N
#125				设置值范围错误地址*5	0: 正常 其它数值: 设置错误的BFM地址	R	N
#126				冷端温度*6	缺省值: 0	R	N
#127 #131	#128 #132	#129 #133	#130 #134	工作状态字*7	缺省值: H0000	R	N

*1: BFM#100、BFM#103、BFM#106、BFM#109、BFM#112、BFM#115、BFM#118、BFM#121：第1至第8通道测量值。单位依据输入类型选择单元（BFM#300、BFM#306、BFM#312、BFM#318、BFM#324、BFM#330、BFM#336、BFM#342）确定，当模式是摄氏度时，其单位是0.1℃，当模式为华氏度时，其单位为0.1℉。

*2: BFM#101、BFM#104、BFM#107、BFM#110、BFM#113、BFM#116、BFM#119、BFM#122：控制输出值MV。各通道经过控制算法运算得到的输出值。

*3: BFM#102、BFM#105、BFM#108、BFM#111、BFM#114、BFM#117、BFM#120、BFM#123：各通道多段设定执行当前段。显示多段设定时，正在执行的段号。

0: 表示现在未在多段设定执行状态或多段执行完成。

*4: BFM#124的故障状态信息见下表。

BFM#124的位状态	开(1)	关(0)
b0: 错误	当b1~b15任何一个错误发生时，此标志位为1（b1-b2中任何一个为1，所有通道AD转换停止）	无错误
b1: 保留	—	—
b2: 硬件故障	AD转换器或其它硬件故障	硬件正常
b3: 设定值备份错误	当因干扰和VC-TC08内部出现错误时，该标志位将变为1。如果电源切断后再接通，错误仍不能被清除，请与销售代理商或我公司联系	数据备份正常
b4: 冷端温度补偿错误	AD转换数字输出值小于-1或大于4096时，标志位为1	数字输出值正常
b5: AD转换数字范围错误	当因干扰和VC-TC08内部出现错误时，如果读取备份数据错误，该标志位为1	—
b6: 设定值恢复错误	—	—
b7: 保留	—	—
b8~b15 断偶检测（只支持热电偶）	第1~8通道热电偶断偶时，该标志位为1	通道无断偶错误

*5: BFM#125：设置值错误的BFM地址。显示写入错误数据的BFM区地址。

*6: BFM#126：反映当前的冷端温度。

*7: BFM#127~BFM#134：通道状态字。显示了各通道的错误状态和控制状态，具体信息下表。

位	定义	开(1)	关(0)
b0~b3	告警1~4的状态	有告警	无告警
b4	初始化完成标志	初始化完成	初始化未完成
b5	自整定状态	自整定状态	非自整定状态
b6	控制状态	控制状态	非控制状态
b7	控制完成状态	温度达到设定值并处于稳定状态	未完成控制
b8~b15	保留	—	—

2.3.2 通道特性设定

BFM				内容	备注	属性	保存
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#200				恢复出厂设置*1	缺省值: 0	R/W	N
#201				更改设置允许*2	缺省值: 1 1, 允许更改 0: 不允许更改	R/W	N
#202 #222	#207 #227	#212 #232	#217 #237	一阶延迟数字滤波设置	缺省值: 0 范围: 0~100 (秒)	R/W	Y
#203 #223	#208 #228	#213 #233	#218 #238	D0*3	缺省值: 0	R/W	Y
#204 #224	#209 #229	#214 #234	#219 #239	D1*3	缺省值: 12000 (随输入类型变化)	R/W	Y
#205 #225	#210 #230	#215 #235	#220 #240	A0*3	缺省值: 0	R	N
#206 #226	#211 #231	#216 #236	#221 #241	A1*3	缺省值: 12000 (随输入类型变化)	R	N
#242				通道特性确认命令*4	缺省值: B0000	R/W	N

*1: 将BFM#200设为1后，温控器的所有BFM单元将复位成缺省值。当使用参数保存功能时，保存在flash中的数据不受该位的影响。

*2: BFM#201为BFM更改设置允许。当设置BFM#201为0，将会禁止用户对BFM的疏忽性调整。一旦设置了禁止更改设置功能，该功能将一直有效，直到设置了允许命令（BFM#201=1）。

*3: BFM#203~BFM#241：通道特性设置数据寄存器，使用两点法设置通道特性，D0、D1表示通道输出的数字量，A0、A1表示通道实际输入温度值，每通道占用4个字。考虑到方便用户的设置，同时并不影响功能的实现，将A0固定为0℃，将A1固定为当前模式下测量范围的最大值，D0、D1、A0、A1数据的单位依据输入类型选择单元确定。

若更改通道的D0、D1数值，即可更改通道特性。D0、D1允许在出厂设定基础上调整±1000，若当前模式使用摄氏度，则调整范围为±100.0℃，若当前模式使用华氏度，则调整范围为±100.0℉，若设定值超出此范围，VC-TC08不会接收，并保持原有有效设置。

*4: 通道特性设置确认命令，表示为二进制数B×8×7×6×5×4×3×2×1。×1为通道1的设置命令，×2为通道2的设置命令，依此类推，即用最低八位表示通道设置命令。当通道特性数据设置后，在相应的十六进制数据位中写入1，当前通道特性设置值才会有效，相应通道的输出特性即可改变，该命令正确执行后，会自动清除。

2.3.3 控制功能设定

BFM				内容	备注	属性	保存
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#300 #324	#306 #330	#312 #336	#318 #342	输入类型选择*1	缺省值: 0	R/W	Y
#301 #325	#307 #331	#313 #337	#319 #343	设定值(SV)*2	缺省值: 0.0 单位: 0.1℃/℉	R/W	Y
#302 #326	#308 #332	#314 #338	#320 #344	控制输出周期设定*3	缺省值: 30 范围: 1~100 (秒)	R/W	Y
#303 #327	#309 #333	#315 #339	#321 #345	比例带	缺省值: 30 单位: 0.1% 范围: 0.1%~1000.0%	R/W	Y
#304 #328	#310 #334	#316 #340	#322 #346	积分时间	缺省值: 240 范围: 1~3600 (秒)	R/W	Y
#305 #329	#311 #335	#317 #341	#323 #347	微分时间*4	缺省值: 60 范围: 0~3600(秒)	R/W	Y

BFM				内容	备注	属性	保存
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#348				CH1～CH4 控制开始/停止设置*5	缺省值：B0000 0：停止 1：开始	R/W	Y
#349				CH5～CH8 控制开始/停止设置	缺省值：B0000 0：停止 1：开始	R/W	Y
#350				CH1～CH8 自整定设置值*6	缺省值：B0000 0：不自整定或自整定已经完成 1：自整定	R/W	Y
#351 #355	#352 #356	#353 #357	#354 #358	控制方式设置	缺省值：2 0：手动 1：ON/OFF 2：PID	R/W	Y
#359 #363	#360 #364	#361 #365	#362 #366	加热/冷却操作选择值	缺省值：1 0：冷却 1：加热	R/W	Y
#367 #371	#368 #372	#369 #373	#370 #374	手动输出设定值*7	缺省值：0 范围：0.0～100.0(%)	R/W	Y
#375 #379	#376 #380	#377 #381	#378 #382	调节灵敏度设置 (ON/OFF 控制方式有效)	缺省值：100 单位：0.1℃/°F 范围：0～999	R/W	Y
#383 #387	#384 #388	#385 #389	#386 #390	自整定偏差设置	缺省值：－300 单位：0.1℃/°F 范围：±输入范围	R/W	Y

*1：BFM#300、BFM#306、BFM#312、BFM#318、BFM#324、BFM#330、BFM#336、BFM#342：输入类型选择。选择各通道的输入类型和温度模式。当通道设置为0时，该通道关闭，对应的通道不执行 A/D 转换，因此总的转换时间减少。模式字的意义见下表。

模式字	意义
1	K 型热电偶，输入范围：－100.0～200.0℃
2	K 型热电偶，输入范围：－100.0～400.0℃
3	K 型热电偶，输入范围：－100.0～1200.0℃
4	K 型热电偶，输入范围：－148.0～800.0°F
5	K 型热电偶，输入范围：－148.0～2192.0°F
6	J 型热电偶，输入范围：－100.0～200.0℃
7	J 型热电偶，输入范围：－100.0～400.0℃
8	J 型热电偶，输入范围：－100.0～600.0℃
9	J 型热电偶，输入范围：－148.0～752.0°F
10	J 型热电偶，输入范围：－148.0～1112.0°F
11	E 型热电偶，输入范围：－100.0～200.0℃
12	E 型热电偶，输入范围：0.0～850.0℃
13	E 型热电偶，输入范围：－148.0～1562.0°F
14	N 型热电偶，输入范围：－100.0～1200.0℃
15	N 型热电偶，输入范围：－148.0～2192.0°F
16	T 型热电偶，输入范围：－200.0～200.0℃
17	T 型热电偶，输入范围：－200.0～300.0℃
18	T 型热电偶，输入范围：0.0～300.0℃
19	T 型热电偶，输入范围：－328.0～400.0°F
20	T 型热电偶，输入范围：－328.0～572.0°F
21	T 型热电偶，输入范围：0.0～572.0 °F
22	R 型热电偶，输入范围：0.0～1600.0℃
23	R 型热电偶，输入范围：32.0～2912.0°F
24	S 型热电偶，输入范围：0.0～1600.0℃
25	S 型热电偶，输入范围：32.0～2912.0°F
26	Pt100，输入范围：－50.0～150.0℃

模式字	意义
27	Pt100，输入范围：－150.0～600.0℃
28	Pt100，输入范围：－238.0～300.0°F
29	Pt100，输入范围：－238.0～1112.0°F
30	JPt100，输入范围：－50.0～150.0℃
31	JPt100，输入范围：－150.0～500.0℃
32	JPt100，输入范围：－238.0～300.0°F
33	JPt100，输入范围：－238.0～932.0°F
34	Cu100，输入范围：－30.0～120.0℃
35	Cu100，输入范围：－22.0～248.0°F
36	Cu50，输入范围：－30.0～120.0℃
37	Cu50，输入范围：－22.0～248.0°F
38	Ni120，输入范围：－80.0℃～280.0℃
39	Ni120，输入范围：－112.0°F～536.0°F
注：摄氏℃＝5/9×（华氏°F－32）	

*2：BFM#301、BFM#307、BFM#313、BFM#319、BFM#325、BFM#331、BFM#337、BFM#343：温度设定值。设定各通道温度控制的目标值。

*3：BFM#302、BFM#308、BFM#314、BFM#320、BFM#326、BFM#332、BFM#338、BFM#344：控制输出周期设定值。设定各通道的控制输出周期，设定范围为：1～100 秒，缺省值为 30 秒。每控制周期输出的最大误差为 20 毫秒。

*4：BFM#305、BFM#311、BFM#317、BFM#323、BFM#329、BFM#335、BFM#341、BFM#347：微分时间设定值。设定各通道的微分时间，设定范围为：0～3600 秒，缺省值为 60。当设定值为 0 时，进行 PI 控制。

*5：BFM#348、BFM#349：控制开始/停止设置。表示为二进制数 B×4×3×2×1。即分别用最低四位表示通道，当相应位设置为 0 时，不进行控制，输出为 OFF；当相应位设置为 1 时，进行温度控制。

*6：BFM#350：自整定使能。表示为二进制数 B×8×7×6×5×4×3×2×1。缺省值 B0000 的含义为通道 1～8 都不进行自整定或自整定都已经完成。

*7：BFM#367～BFM#374：手动输出设定值。设定各通道的恒定输出的占空比，设定范围为：0～1000（单位为 0.1%），缺省值为 0。

2.3.4 BFM参数保存设定

BFM				内容	备注	属性	保存
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#700				温控器参数保存	缺省值：0 0：不保存参数 1：参数保存启动	R/W	N

2.3.5 其它

BFM				内容	备注	属性	保存
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#4094				温控器软件版本信息	H1000(BCD 码格式)	R	N
#4095				温控器的识别码*1	HB882	R	N

*1：BFM#4095：温控器识别码。VC-TC08-NT 的识别码是 HB882。可编程控制器中的用户程序可以在程序中使用这个识别码，以在传输/接收数据之前确认此温控器。

3 运行检查

3.1 例行检查

- 检查模拟输入布线是否满足要求（参考 *I 布线说明*）。
- 检查 24V 电源是否过载。
- 检查应用程序，确保应用中选择的是正确的操作方法及参数范围，特别注意对于有特殊操作时序的 BFM 区需按规定时序操作。

3.2 故障检查

如果 VC-TC08 运行不正常，请检查下列项目。

检查“24V”指示灯状态

点亮：24Vdc 电源正常；

熄灭：24Vdc 电源可能故障；若 24Vdc 电源正常，则 VC-TC08 故障。

检查 RUN 指示灯状态

高速闪烁：VC-TC08 运行正常；

慢速闪烁：检查 BFM#124、BFM#125 中的信息。

常亮或熄灭：VC-TC08 死机。

用户须知

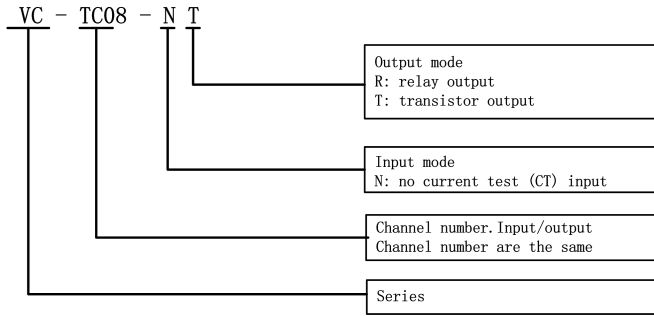
- 保修范围指温控器本体。
- 保修期为十八个月**，保修期内正常使用情况下，产品发生故障或损坏，我公司免费维修。
- 保修期起始时间为产品制造出厂日期**，机器编码是判断保修期的唯一依据，无机器编码的设备按过保处理。
- 即使在保修期内，如发生以下情况，将收取一定的维修费用：
 - 不按用户手册操作导致的机器故障；
 - 由于火灾、水灾、电压异常等造成的机器损坏；
 - 将温控器用于非正常功能时造成的损坏。
- 服务费按实际费用计算，如另有合同，以合同优先的原则处理。
- 请您务必保留此卡，并在保修时出示给维修单位。
- 如您有问题可与代理商联系，也可直接与我公司联系。

VC-TC08-NT Temperature Controller Quick Start Manual

Note:

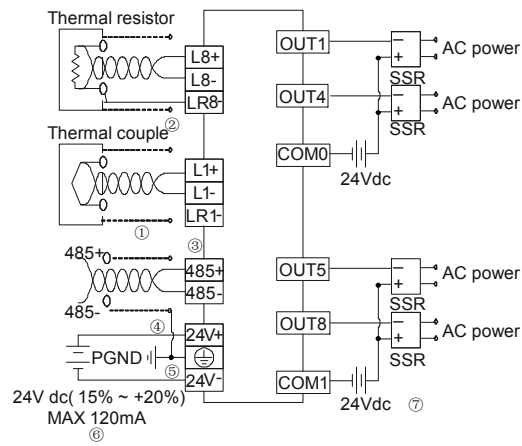
To reduce the chance of accident, please carefully read the operating instructions and safety precautions prior to use. Only adequately trained personnel shall install or operate this product. In operation, strict compliance with applicable safety rules in the industry, the operating instructions and safety precautions in this book is required.

See the following figure for the model explanation.



1 Wiring

The wiring of the user ports is shown in the following figure.



The circled 1 ~ 7 stand for the following 7 points to note during the wiring:

- It is recommended to input the thermocouple (resistor) signal through the shielded compensation cable (connection cable). The cable should be away from the power cable or any cable that could be the EMI source. For long cables are more susceptible to noise, the cable should be shorter than 100m. Besides, the cable impedance may cause measurement error. To handle that, modify the channel characteristics.
- Use three-wire connection for the thermal resistors (types: Pt100, JPt100, Cu100, Cu50).
- Short connect the terminals (L+, L-) of unused channels to avoid reading false data through the channel.
- If strong EMI exists, connect the shielding (of the compensation cable for thermocouple, of the connection cable for thermal resistor, or of the RS485 communication cable) to the PG terminal.
- Properly ground controller PG terminal.
- The basic module's 24Vdc auxiliary output power or other qualified power supplies can be used as the power source of VC-TC08.
- Select power supply and solid-state relay according to 2.2 Performance.

2 Indices

2.1 Power Supply

Item	Description
Power supply	24Vdc (-15% ~ 20%). Max. allowable ripple voltage: 5%; Max. power: 120mA

2.2 Performance

See the following table for the performance description.

Item	Indices
Input signal	Thermocouple K, J, E, N, T, R, S (applicable to all channels)
	Thermal resistor Pt100, Cu100, JPt100, Cu50 (applicable to all channels)
Output mode	Open gate
	transistor output
Sampling cycle	Loop power-supply voltage: 5 ~ 24V Max. loop power-supply voltage: 30V Loop current: 0.3A/24Vdc Open-circuit leakage current: <0.1mA/30Vdc Min. load: 5mA (5 ~ 24Vdc)
	Max. time for 8 channels: 500ms. Unused channels requires no conversion. The cycle is reduced 125ms whenever a channel-pair (CH1 & CH5, CH2 & CH6, CH3 & CH7, CH8 & CH8) is closed
Control cycle	1 ~ 100s (default: 30s)
Control method	ON/OFF control, PI control and PID control
Rated temperature range	Type K -100°C ~ 1200°C (-148°F ~ 2192°F)
	Type J -100°C ~ 600°C (-148°F ~ 1112°F)
	Type E -100°C ~ 850°C (-148°F ~ 1562°F)
	Type N -100°C ~ 1200°C (-148°F ~ 2192°F)
	Type T -200°C ~ 300°C (-328°F ~ 572°F)
	Type R 0°C ~ 1600°C (32°F ~ 2912°F)
	Type S 0°C ~ 1600°C (32°F ~ 2912°F)
	Pt100 -150°C ~ 600°C (-238°F ~ 1112°F)
	JPt100 -150°C ~ 500°C (-238°F ~ 932°F)
	Cu100 -30°C ~ 120°C (-22°F ~ 248°F)
	Cu50 -30°C ~ 120°C (-22°F ~ 248°F)
	Ni120 -80.0°C ~ 280.0°C (-112.0°F ~ 536.0°F)
	Lowest resolution
Type J 0.7°C (1.26°F)	
Type E 0.5°C (0.9°F)	
Type N 1°C (1.8°F)	
Type T 0.2°C (0.36°F)	
Type R 1°C (1.8°F)	
Type S 1°C (1.8°F)	
Pt100 0.2°C (0.36°F)	
JPt100 0.2°C (0.36°F)	
Cu100 0.2°C (0.36°F)	
Cu50 0.2°C (0.36°F)	
Ni120 0.2°C (0.36°F)	
Accuracy	
Isolation	isolation between sampling channels and power supply; between sampling channels and outputs. No isolation between channels

2.3 Buffer Memory

VC-TC08 exchanges data with the basic module through Buffer Memory (BFM) by using Modbus or EcBus. You can use Modbus or EcBus instructions to write and read a BFM unit whose property is R/W. Reading a reserved unit will get zero. The BFM units that are marked Y in the column of "Save" can be saved in the flash memory, while those marked N cannot. When using the Modbus protocol, up to 50 BFM units can be read or written at the same time.

The BFM units are mainly classified into the following five kinds:

- Channel operation monitoring
- Channel characteristic setting
- Control function setting
- BFM parameter saving

2.3.1 Channel operation monitoring

BFM				Content	Remark	P*	S*
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#100/ #112	#103/ #115	#106/ #118	#109/ #121	Process value (PV) *1	Unit: 0.1°C/°F	R	N
#101/ #113	#104/ #116	#107/ #119	#110/ #122	Manipulated variable (MV)*2	Default: 0.0%	R	N
#102/ #114	#105/ #117	#108/ #120	#111/ #123	Current section in multisection	Default: 0 Range: 0 ~ 8	R	N

BFM				Content	Remark	P*	S*
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#124				setting*3			
#124				Error state*4	Default: H0000	R	N
#125				Address of incorrectly set BFM*5	0: normal Others: address of incorrectly-set BFM	R	N
#126				Cold junction temperature*6	Default: 0	R	N
#127/ #131	#128/ #132	#129/ #133	#130/ #134	Work state*7	Default: H0000	R	N
Note: P: property. R: readable. W: Writable. S: save. Y: the parameter can be saved. N: the parameter cannot be saved							

*1: BFM#100, BFM#103, BFM#106, BFM#109, BFM#112, BFM#115, BFM#118, BFM#121: PVs of channels 1 ~ 8. The unit of the PV is dependent on the settings of the input type selection (BFM#300, BFM#306, BFM#312, BFM#318, BFM#324, BFM#330, BFM#336, BFM#342).

*2: BFM#101, BFM#104, BFM#107, BFM#110, BFM#113, BFM#116, BFM#119, BFM#122: MV, or the control outputs of various channels calculated through control algorithms.

*3: BFM#102, BFM#105, BFM#108, BFM#111, BFM#114, BFM#117, BFM#120, BFM#123: the current section in the multi-section setting of CH1 ~ CH8. Zero means no multi-section setting or multi-section setting has been executed.

*4: See the following table for the error state message of BFM#124.

Bit	ON (1)	OFF (0)
b0: faulty	When fault occurs to anyone of b1 ~ b15 (AD conversion of all channels will stop if b1 or b2 is 1)	Normal
b1: reserved	-	-
b2: hardware fault	AD converter or other hardware is faulty	Normal
b3: Setting backup faulty	This flag is 1 upon EMI or controller internal error. If the fault is not removed after power off reset, please contact your distributor or our local office	Normal
b4: cold junction temperature compensation error	When the digital output of AD conversion exceeds the range of -1 ~ 4096	Normal
b5: AD conversion fault	When reading of backup data is faulty due to EMI or controller internal error	-
b6: setting restoration fault	-	-
b7: reserved	-	-
b8~ b15: decouple detection (only for thermocouple)	When the thermocouple of CH1 ~ CH8 decouples	Normal

*5: BFM#125: it displays the addresses of the BFM units that are set incorrectly.

*6: BFM#126: the current cold junction temperature.

*7: BFM#127 ~ BFM#134: state words of CH1 ~ CH8, including the error state and control state. For details, see the following table.

Bit	Definition	ON (1)	OFF (0)
b0 ~ b3	States of alarms 1 ~ 4	Alarm	No alarm
b4	Initialization complete flag	Initialization completed	Initialization uncompleted
b5	Self-tuning state	Self-tuning state	Non-self-tuning state
b6	Control state	Control state	Non-control state
b7	Control complete state	Temperature reached set point and is in stable state	Control incomplete
b8 ~ b15	Reserved		

2.3.2 Channel characteristic setting

BFM				Content	Remark	P*	S*
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#200				Restore defaults*1	Default: 0	R/W	N
#201				Setting change enabling *2	1: change enabled (default) 0: change disabled	R/W	N
#202/ #222	#207/ #227	#212/ #232	#217/ #237	Primary delay digital filter setting	Default: 0 Range: 0 ~ 100s	R/W	Y
#203/ #223	#208/ #228	#213/ #233	#218/ #238	DO *3	Default: 0	R/W	Y

BFM				Content	Remark	P*	S*
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#204/ #224	#209/ #229	#214/ #234	#219/ #239	D1 *3	Default: 12,000 (dependent on the channel mode)	R/W	Y
#205/ #225	#210/ #230	#215/ #235	#220/ #240	A0 *3	Default: 0	R	N
#206/ #226	#211/ #231	#216/ #236	#221/ #241	A1 *3	Default: 12000 (dependent on the channel mode)	R	N
#242				Characteristic setting confirming command *4	Default: B0000	R/W	N
Note: P: property. R: readable. W: Writable. S: save. Y: the parameter can be saved. N: the parameter cannot be saved							

*1: Set BFM#200 to 1 and all BFM units will be reset to defaults. The data saved in the flash are not subject to the influence of this setting.

*2: BFM#201: enabling the change of BFM setting. Setting BFM#201 to 0 will disable inadvertent change of BFM. This setting will be valid until you change BFM#201 to 1.

*3: BFM#203 ~ BFM#241: channel characteristics setting data registers. The linear channel characteristics can be defined by just two points. D0 and D1 are the digital outputs and A0 and A1 are the actual temperature inputs. Each channel occupies four words. To simplify the operation process without affecting functions, A0 and A1 are fixedly set to 0°C and the maximum value in the present mode respectively. The units of D0, D1, A0 and A1, are determined by the setting of input type selection.

You can change the channel characteristic by changing D0 or D1, which is allowed to be set within ±1000 of their defaults. For example, in Celsius unit, the adjustable range is ±100.0°C; in Fahrenheit unit, the adjustable range is ±100.0°F. If they are set outside this range, the settings will be invalid, and VC-TC08 will remain the original settings.

*4: channel-characteristic setting confirming instruction, displayed as binary BX8X7X6X5X4X3X2X1, where X1 is the setting for CH1; X2, CH2, and so on. After setting the channel characteristic, set the corresponding digit in BX8X7X6X5X4X3X2X1 to 1 to validate the setting of the channel immediately. This instruction will be cleared after it is executed successfully.

2.3.3 Control function setting

BFM				Content	Remark	P*	S*
CH1/CH5	CH2/CH6	CH3/CH7	CH4/CH8				
#300/ #324	#306/ #330	#312/ #336	#318/ #342	Input type selection *1	Default: 0	R/W	Y
#301/ #325	#307/ #331	#313/ #337	#319/ #343	Set point value (SV) *2	Default: 0.0 Unit: 0.1°C/°F	R/W	Y
#302/ #326	#308/ #332	#314/ #338	#320/ #344	Control output cycle *3	Default: 30 Range: 1s ~ 100s	R/W	Y
#303/ #327	#309/ #333	#315/ #339	#321/ #345	Proportional band	Default: 30 Unit: 0.1% Range: 0.1% ~ 1000.0%	R/W	Y
#304/ #328	#310/ #334	#316/ #340	#322/ #346	Integral time	Default: 240 Range: 1s ~ 3600s	R/W	Y
#305/ #329	#311/ #335	#317/ #341	#323/ #347	Differential time *4	Default: 60 Range: 0s ~ 3600s	R/W	Y
#348				CH1 ~ CH4 Control start/stop selection *5	Default: B0000. 0: stop 1: start	R/W	Y
#349				CH5 ~ CH8 Control start/stop selection	Default: B0000. 0: stop 1: start	R/W	Y
#350				CH1 ~ CH8 self-tuning selection *6	Default: B0000 0: no self-tuning or self-tuning completed 1: self-tuning	R/W	Y

BFM				Content	Remark	P*	S*
CH1/ CH5	CH2/ CH6	CH3/ CH7	CH4/ CH8				
#351 #355	#352 #356	#353 #357	#354 #358	Control mode selection	Default: 2 0: manual. 1: ON/OFF. 2: PID	R/W	Y
#359 #363	#360 #364	#361 #365	#362 #366	Heating/cooling selection	Default: 1 0: cooling. 1: heating	R/W	Y
#367 #371	#368 #372	#369 #373	#370 #374	Manual output setting *7	Default: 0 Range: 0.0 ~ 100.0%	R/W	Y
#375 #379	#376 #380	#377 #381	#378 #382	Dead band (only when ON/OFF control is valid)	Default: 100 Unit: 0.1°C/°F Range: 0 ~ 999	R/W	Y
#383 #387	#384 #388	#385 #389	#386 #390	Self-tuning offset	Default: -300 Unit: 0.1°C/°F Range: ± input range	R/W	Y

Note:
P: property. R: readable. W: Writable.
S: save. Y: the parameter can be saved. N: the parameter cannot be saved

*1: BFM#300, BFM#306, BFM#312, BFM#318, BFM#324, BFM#330, BFM#336, BFM#342: set the input type and temperature mode for all channels. When a channel is set to zero (0), the channel is closed, there will be no A/D conversion for the channel, and the total conversion time is reduced. See the following table for the setting description.

X (decimal)	Description
1	K type thermocouple. Input range: -100.0 ~ 200.0°C
2	K type thermocouple. Input range: -100.0 ~ 400.0°C
3	K type thermocouple. Input range: -100.0 ~ 1200.0°C
4	K type thermocouple. Input range: -148.0 ~ 800.0°F
5	K type thermocouple. Input range: -148.0 ~ 2192.0°F
6	J type thermocouple. Input range: -100.0 ~ 200.0°C
7	J type thermocouple. Input range: -100.0 ~ 400.0°C
8	J type thermocouple. Input range: -100.0 ~ 600.0°C
9	J type thermocouple. Input range: -148.0 ~ 752.0°F
10	J type thermocouple. Input range: -148.0 ~ 1112.0°F
11	E type thermocouple. Input range: -100.0 ~ 200.0°C
12	E type thermocouple. Input range: 0.0 ~ 850.0°C
13	E type thermocouple. Input range: -148.0 ~ 1562.0°F
14	N type thermocouple. Input range: -100.0 ~ 1200.0°C
15	N type thermocouple. Input range: -148.0 ~ 2192.0°F
16	T type thermocouple. Input range: -200.0 ~ 200.0°C
17	T type thermocouple. Input range: -200.0 ~ 300.0°C
18	T type thermocouple. Input range: 0.0 ~ 300.0°C
19	T type thermocouple. Input range: -328.0 ~ 400.0°F
20	T type thermocouple. Input range: -328.0 ~ 572.0°F
21	T type thermocouple. Input range: 0.0 ~ 572.0°F
22	R type thermocouple. Input range: 0.0 ~ 1600.0°C
23	R type thermocouple. Input range: 32.0 ~ 2912.0°F
24	S type thermocouple. Input range: 0.0 ~ 1600.0°C
25	S type thermocouple. Input range: 32.0 ~ 2912.0°F
26	Pt100. Input range: -50.0 ~ 150.0°C
27	Pt100. Input range: -150.0 ~ 600.0°C
28	Pt100. Input range: -238.0 ~ 300.0°F
29	Pt100. Input range: -238.0 ~ 1112.0°F
30	JPt100. Input range: -50.0 ~ 150.0°C
31	JPt100. Input range: -150.0 ~ 500.0°C
32	JPt100. Input range: -238.0 ~ 300.0°F
33	JPt100. Input range: -238.0 ~ 932.0°F
34	Cu100. Input range: -30.0 ~ 120.0°C
35	Cu100. Input range: -22.0 ~ 248.0°F
36	Cu50. Input range: -30.0 ~ 120.0°C
37	Cu50. Input range: -22.0 ~ 248.0°F
38	Ni120. Input range: -80.0 ~ 280.0°C
39	Ni120. Input range: -112.0 ~ 536.0°F

Note: °C = 5/9 × (°F-32)

*2: BFM#301, BFM#307, BFM#313, BFM#319, BFM#325, BFM#331, BFM#337, BFM#343: temperature set point value (SV), used to set the target

temperature for the temperature control of various channels.

*3: BFM#302, BFM#308, BFM#314, BFM#320, BFM#326, BFM#332, BFM#338, BFM#344: set the control output cycle of various channels. Range: 1 ~ 100s. Default: 30s. The maximum error of each cycle is 20ms.

*4: BFM#305, BFM#311, BFM#317, BFM#323, BFM#329, BFM#335, BFM#341, BFM#347: channel differential time. Range: 0 ~ 3600s. Default: 60. When set as zero (0), the corresponding channel will be under PI control.

*5: BFM#348, BFM#349: control start/stop, expressed in binary BX4X3X2X1. The four LSBs stand for the channel. 0: no control, output OFF. 1: temperature control.

*6: BFM#350: self-tuning enabling, expressed in binary BX8X7X6X5X4X3X2X1. The default B0000 means self-tuning of all channels are disabled or the self-tuning has been completed.

*7: BFM#367 ~ BFM#374: manual output setting, used to set the duty cycle of various outputs. Range: 0 ~ 1000 (unit: 0.1%). Default: 0.

2.3.4 BFM parameter saving

BFM				Content	Remark	P*	S*
CH1/ CH5	CH2/ CH6	CH3/ CH7	CH4/ CH8				
#700				Parameter save ON/OFF	0: parameter save OFF (default) 1: parameter save ON	R/W	N

Note:
P: property. R: readable. W: Writable.
S: save. Y: the parameter can be saved. N: the parameter cannot be saved

2.3.5 Others

BFM				Content	Remark	P*	S*
CH1/ CH5	CH2/ CH6	CH3/ CH7	CH4/ CH8				
#4094				Controller software version	H1000 (BCD code)	R	N
#4095				Controller ID *1	HB882	R	N

Note:
P: property. R: readable. W: Writable.
S: save. Y: the parameter can be saved. N: the parameter cannot be saved

*1: BFM#4095: controller ID. For VC-TC08-NT, the ID is HB882. You can use this ID in the PLC user program, so that the PLC can recognize this controller before transceiving data.

3 Operation Inspection

3.1 Routine Inspection

- Check that the wiring of analog input meets requirements (refer to 1 *Wiring*).
- Check that the 24V power supply is not overloaded.
- Check the application, make sure that the correct operation method and parameter setting range are selected. In particular, note that the BFM units with special time sequence requirements must be operated according to the requirements.

3.2 Inspection Upon Faults

In case of abnormality, check the following items:

- The status of '24V' indicator

ON: 24Vdc power supply normal.

OFF: 24Vdc power supply possibly faulty, or VC-TC08 faulty.

- The status of the RUN indicator

Flash quickly: VC-TC08 in normal operation.

Flash slowly: Check the information in BFM#124 and BFM#125.

On or OFF: VC-TC08 faulty.

Notice

- The warranty range is confined to the controller only.
- Warranty period is 18 months**, within which period Emerson Network Power conducts free maintenance and repairing to the controller that has any fault or damage under the normal operation conditions.
- The start time of warranty period is the delivery date of the product**, of which the product SN is the sole basis of judgment. Controller without a product SN shall be regarded as out of warranty.
- Even within 18 months, maintenance will also be charged in the following situations:
 - Damages incurred to the controller due to mis-operations, which are not in compliance with the User Manual;
 - Damages incurred to the controller due to fire, flood, abnormal voltage, etc;
 - Damages incurred to the controller due to the improper use of controller functions.
- The service fee will be charged according to the actual costs. If there is any contract, the contract prevails.
- Please keep this paper and show this paper to the maintenance unit when the product needs to be repaired.
- If you have any question, please contact the distributor or our company directly.