DELTA DVP04TC-H2 Temperature Measurement Module Instruction Manual

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DELTA DVP04TC-H2 Temperature Measurement Module

Product Information

The DVP04TC-H2 is an open-type temperature measurement module. It is designed to be installed in a control cabinet that is free of airborne dust, humidity, electric shock, and vibration. The module should be protected with a safeguard to prevent unauthorized access or accidents that may damage the module. It is important to ensure that AC power is not connected to any of the I/O terminals to avoid serious damage. The module should be properly grounded to prevent electromagnetic interference. Additionally, the correct setting of the thermocouple temperature sensor is crucial to avoid errors.

The product profile and dimensions are as follows:

- DIN rail (35mm)
- Connection port for extension module
- Model name
- POWER, ERROR, A/D indicator
- DIN rail clip
- Terminals
- Mounting hole
- I/O terminals
- Mounting port for extension module

The I/O terminal layout is as follows:

```
24 V   0V     D+     SL D     D-     L+     L-
RS-485 CH1
SL D
L+
L-
CH2
SL D     L+     L-
CH3
-1-
SL D
L+
L-
CH4
The external wiring instructions are as follows:
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1. For thermocouple wiring, use shielded cable and connect it to the appropriate terminals based on the thermocouple type.
2. Ensure proper grounding by connecting the system ground terminal to the system earth point and grounding the system contact or connecting it to the cover of the power distribution cabinet.
3. Separate the analog input wiring from other power cables or wirings that may cause interference.

The electrical specifications of the temperature measurement module are:

- Power supply voltage: 24VDC (20.4VDC ~ 28.8VDC) (-15% ~ +20%)
- Analog output channel: 4 channels/module

Product Usage Instructions

1. Ensure that the control cabinet where the DVP04TC-H2 module is installed is free of airborne dust, humidity, electric shock, and vibration.
2. Install a safeguard on the control cabinet to prevent unauthorized access and accidents that may damage the module.
3. Do not connect AC power to any of the I/O terminals to avoid serious damage.
4. Double-check all wiring before powering up the DVP04TC-H2 module.
5. After disconnecting the module, avoid touching any terminals for at least a minute.
6. Properly ground the ground terminal on the DVP04TC-H2 module to prevent electromagnetic interference.
7. Keep the wire as short as possible when wiring a platinum resistance thermometer (RTD) to the controller.
8. Route power wires as far as possible from load wires to prevent interference and induced noise.
9. Ensure that the setting of the thermocouple temperature sensor in CR#1 is correct to avoid serious errors.

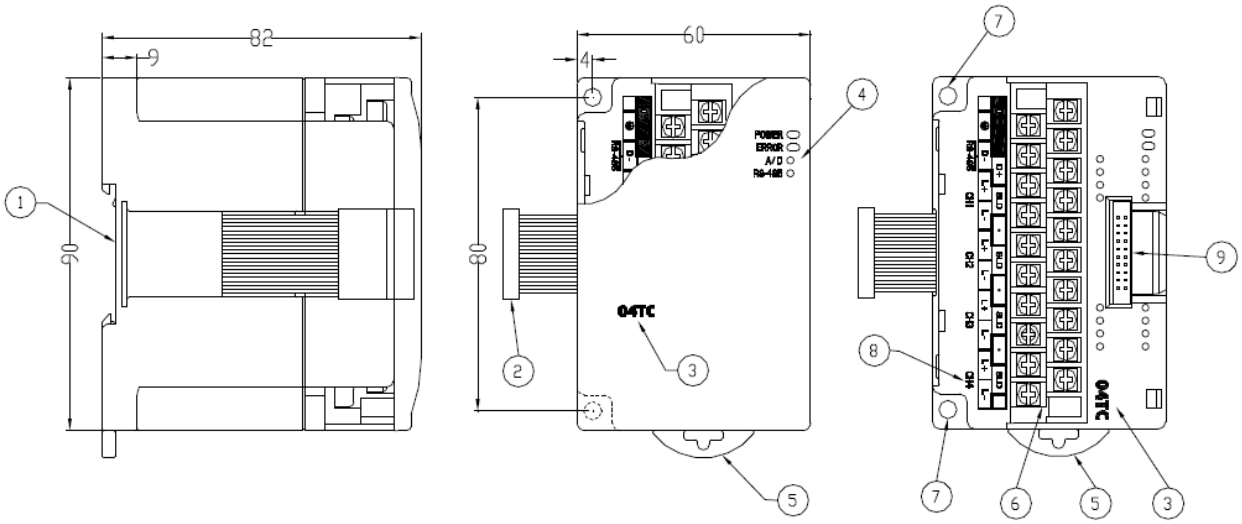
DVP04TC-H2 is able to receive 4 points 0~150mV voltage input of thermocouple temperature sensors (J-type, K-type, R-type, S-type, T-type, E-type, N-type) and convert them into 24-bit digital signals. Besides, through FROM/TO instructions in DVP-EH2 MPU program, the data in DVP04TC-H2 can be read or written. There are 49 16-bit control registers (CR) in it. DVP04TC-H2 displays temperatures in Celsius (resolution: 0.1°C) and Fahrenheit (resolution: 0.18°F).

- This Instruction Sheet only provides descriptions for electrical specifications, general specifications, installation & wiring. Other detail information about programming and instruction’s, please see “DVP-PLC Application Manual: Programming”. For more information about the optional peripherals, please see individual product

instruction sheet or “DVP-PLC Application Manual Special Modules”.

- DVP04TC-H2 is an OPEN-TYPE device. It should be installed in a control cabinet free of airborne dust, humidity, electric shock and vibration. To prevent non-maintenance staff from operating DVP04TC-H2, or to prevent an accident from damaging DVP04TC-H2, the control cabinet in which DVP04TC-H2 is installed should be equipped with a safeguard. For example, the control cabinet in which DVP04TC-H2 is installed can be unlocked with a special tool or key.
- DO NOT connect AC power to any of I/O terminals, otherwise serious damage EN DO NOT connect AC power to any of I/O terminals, otherwise serious damage may occur. Please check all wiring again before DVP04TC-H2 is powered up. After DVP04TC-H2 is disconnected, Do NOT touch any terminals in a minute. Make sure that the ground terminal on DVP04TC-H2 is correctly grounded in order to prevent electromagnetic interference.
- Please keep the wire as short as possible when wiring a platinum resistance thermometer (RTD) to the controller and please route power wires as far as possible from load wires to prevent interference and induced noise.
- Please make sure the setting of thermocouple temperature sensor in CR#1 is correct, or it will cause serious errors.

Product Profile & Dimension

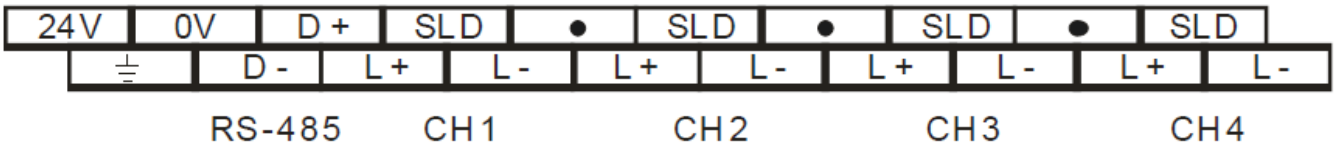


[Figure 1]

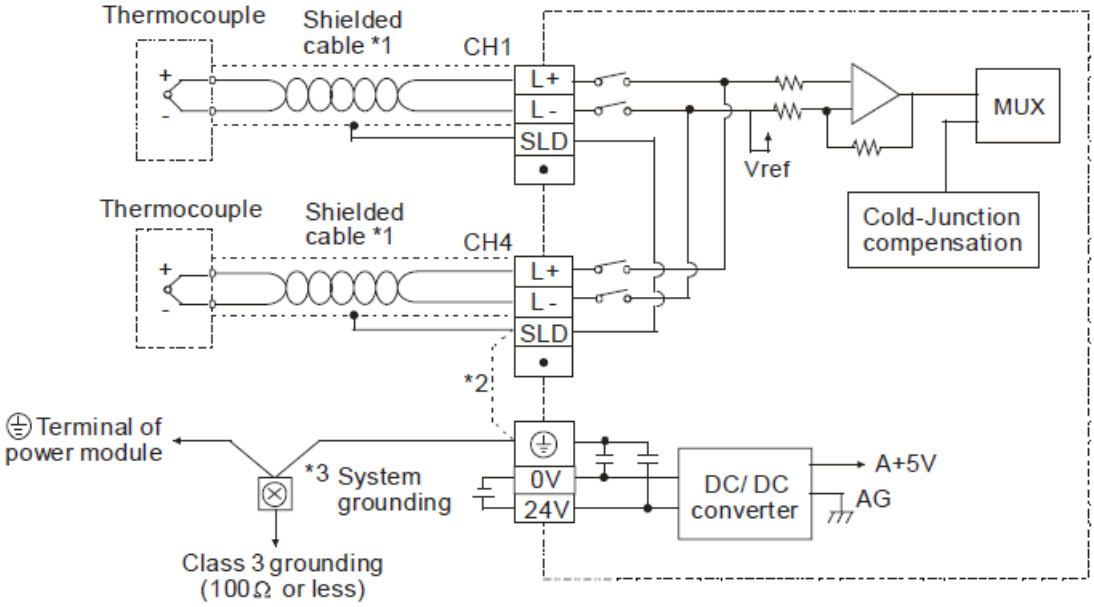
Unit: mm

1. DIN rail (35mm)
2. Connection port for extension module
3. Model name
4. POWER, ERROR, A/D indicator
5. DIN rail clip
6. Terminals
7. Mounting hole
8. I/O terminals
9. Mounting port for extension module

I/O Terminal Layout



External Wiring



1. The wiring used for analog input should adopts the connection cable or shielding cable of thermocouple temperature sensor J-type / K-type / R-type / S-type / T-type / E-type / N-type and should be separated from other power cable or wirings that may cause interference. The screw torque of the terminal should be 1.95 kg-cm (1.7 in-lbs).
2. Terminal SLD is the ground location for noise suppression.
3. Please connect the terminal on both the power module and DVP04TC-H2 to the system earth point and ground the system contact or connect it to the cover of power distribution cabinet.

   Note: DO NOT wire empty terminal. Use 60/75°C copper conductor only.

Electrical Specifications

Temperature measurement module	Explanation
Power supply voltage	24VDC (20.4VDC ~ 28.8VDC) (-15% ~ +20%)
Analog output channel	4 channels/module
Applicable sensor types	J-type, K-type, R-type, S-type, T-type, E-type, N-type Floating thermocouple sensor, 0~150mV voltage input.
Range of input temp.	See the table in section Temperature / Digital Curve
Range of digital conversio n	See the table in section Temperature / Digital Curve
Resolution	0.1°C/0.18°F*1
Overall accuracy	±0.6% when in full scale within the range of 0 ~ 55°C, 32 ~ 131°F
Response time	200ms × the number of channels
Isolation	Isolation between digital circuits and analog circuits. Isolation between channels. 5 00VDC between digital circuits and Ground 500VDC between analog circuits and Ground 500VDC between analog circuits and digital circuits 500VDC between 24V DC and Ground
Digital data format	15 significant bits out of 16 bits are available; in 2's complement
Average function	Yes; available for setting up in CR#2 ~ CR#5; range: K1 ~ K100
Self-diagnosis	Upper and lower bound detection/channel
Communication mode (R S-485)	Supported, including ASCII/RTU mode. Default communication format: 9600, 7, E, 1, ASCII; refer to CR#32 for details on the communication format. Note1: RS-485 cannot be used when connected to CPU series PLCs. Note2: Use extension module wizard in ISPSoft to search or modify the control regi ster (CR) in the modules.
When connected to DVP-PLC MPU in	The modules are numbered from 0 to 7 automatically by their distance from MPU. No. 0 is the closest to MPU and No. 7 is the furthest.
series	Maximum 8 modules are allowed to connect to MPU and will not occupy any digital I/O points.

The unit of temperature would be displayed as 0.1°C/0.1°F. If the temperature unit is set to be Fahrenheit, the second decimal place would not be shown.

Other Specifications

Power supply	
Max. rated power consum ption	24VDC (20.4VDC ~ 28.8VDC) (-15% ~ +20%), 2.5W supplied by external power.

Environment	
Operation/storage	1. Operation: 0°C~ 55°C (Temperature), 5 ~ 95% (Humidity), pollution degree 2 2. Storage: -25°C~ 70°C (Temperature), 5 ~ 95% Humidity
Vibration/shock immunity	Standard: IEC61131-2, IEC 68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST E a)

Control Register

CR#1: The working mode of the 4 channels in the sensors selected by the temperature measurement module. There are 8 modes (J-type, K-type, R-type, S-type, T-type, E-type, N-type, 0~150mV) for each channel which can be set up separately. For example, if the user needs to set up CH1: mode 0 (b2 ~ b0 = 100); CH2: mode 1 (b5 ~ b3 = 001); CH3: mode 0 (b8 ~ b6 = 000) and CH4: mode 1 (b11 ~ b9 = 001), CR#1 has to be set as H0208 and the higher bits (b12 ~ b15) is CH1~CH4 Disable/Enable. The default value = H'0000.

CR#	Attrib.		Register name	Explanation
#0	O	R	Model name	Set up by the system. DVP04TC-H2 model code = H'6403. You can read the model name from the program and s ee if the extension module exists.
#1	O	R/W	Thermocouple type	CH1 Disable/Enable bit12 CH2 Disable/Enable bit13 CH3 Disable/Enable bit14 CH4 Disable/Enable bit15 1 =Disable 0 =Enable Take the setting of CH1 for example: 1. When (b2, b1, b0) is set as (0,0,0), choose J-type 2. When (b2, b1, b0) is set as (0,0,1), choose K-type 3. When (b2, b1, b0) is set as (0,1,0), choose R-type 4. When (b2, b1, b0) is set as (0,1,1), choose S-type 5. When (b2, b1, b0) is set as (1,0,0), choose T-type 6. When (b2, b1, b0) is set as (1,0,1), choose E-type 7. When (b2, b1, b0) is set as (1,1,0), choose N-type 8. When (b2, b1, b0) is set as (1,1,1), choose 0 ~ 150 mV
CR#1: The working mode of the 4 channels in the sensors selected by the temperature measurement module. There are 8 modes (J-type, K-type, R-type, S-type, T-type, E-type, N-type, 0~150mV) for each channel which can be set up separately. For example, if the user needs to set up C H1: mode 0 (b2 ~ b0 = 100); CH2: mode 1 (b5 ~ b3 = 001); CH3: mode 0 (b8 ~ b6 = 000) and CH4: mode 1 (b11 ~ b9 = 001), CR#1 has to be set as H0208 and the higher bits (b12 ~ b15) is CH1~CH4 Disable/Enable. The default value = H'0000.				
#2	O	R/W	CH1 average time	Range of settings in CH1 ~ CH4: K1 ~ K100. Default
#3	O	R/W	CH2 average time	

#4	O	R/W	CH3 average time	=K10.
#5	O	R/W	CH4 average time	
#6	X	R	Average °C temp. measured at CH1	Average Celsius temperature measured at CH1 ~ CH4. Unit: 0.1°C
#7	X	R	Average °C temp. measured at CH2	
#8	X	R	Average °C temp. measured at CH3	
#9	X	R	Average °C temp. measured at CH4	
CR#6 ~ CR#9: The average Celsius temperature measured at CH1 ~ CH4 obtained from the average time settings in CR#2 ~ CR#5.				
#10	X	R	Average °F temp. measured at CH1	Average Fahrenheit temperature measured at CH1 ~ CH2. Unit: 0.1°F
#11	X	R	Average °F temp. measured at CH2	
#12	X	R	Average °F temp. measured at CH3	Average Fahrenheit temperature measured at CH3 ~ CH4. Unit: 0.1°F
#13	X	R	Average °F temp. measured at CH4	
CR#10 ~ CR#13: The average Fahrenheit temperature measured at CH1 ~ CH4 obtained from the average time settings in CR#2 ~ CR#5.				
#14	X	R	Present °C temp. measured at CH1	Present Celsius temperature measured at CH1 ~ CH4. Unit: 0.1°C
#15	X	R	Present °C temp. measured at CH2	
#16	X	R	Present °C temp. measured at CH3	
#17	X	R	Present °C temp. measured at CH4	
#19	X	R	Present °F temp. measured at CH1	Present Fahrenheit temperature measured at CH1 ~ CH4. Unit: 0.1°F
#20	X	R	Present °F temp. measured at CH2	
#21	X	R	Present °F temp. measured at CH3	
#22	X	R	Present °F temp. measured at CH4	
#24	O	R/W	OFFSET value of CH1	Adjustable OFFSET settings at CH1 ~ CH4. Range: -1,000 ~ +1,000 Default = K0 Unit: 0.1°C
#25	O	R/W	OFFSET value of CH2	
#26	O	R/W	OFFSET value of CH3	

#27	O	R/W	OFFSET value of CH4	
#30	X	R	Error status	Register for storing all error status. See the table of err or status for more information.
#31	O	R/W	Communication address setting	For setting RS-485 communication address. Range: 01 ~ 254, Default = K1.
#32	O	R/W	Communication format s etting	6 communication speeds: 4,800 bps /9,600 bps /19,20 0 bps / 38,400 bps /57,600 bps /115,200 bps. Data for mats include: ASCII: 7, E, 1/ 7,O,1 / 8,E,1 / 8,O,1 / 8,N,1 / 7,E,2 / 7,O ,2 / 7,N,2 / 8,E,2 / 8,O,2 / 8,N,2 RTU: 8, E, 1 / 8,O,1 / 8,N,1 / 8,E,2 / 8,O,2 / 8,N,2 Default: ASCII,9600,7,E,1 CR#32=H‘0002 Please refer to✽CR#32 at the bottom of the page for m ore details.
#33	O	R/W	Returning to default setti ng	Take the setting of CH1 for example: b0 is reserved. b1 is reserved. When b2 is set as 1, all the settings will return to defaul t settings. ERR LED definition: default of b12 ~ b15 = 1111 1. When b12 = 1, CH1 wiring to empty external contact, ERR LED will flash. 2. When b13 = 1, CH2 wiring to empty external contact, ERR LED will flash. 3. When b14 = 1, CH3 wiring to empty external contact, ERR LED will flash. 4. When b15 = 1 CH2 wiring to empty external contact, ERR LED will flash.
#34	O	R	Firmware version	Displaying the current firmware version in hex; e.g.
				version 1.0A is indicated as H’010A
#35 ~ #48				For system use
Symbols: ○: Latched. ╳: Non-latched. R: Able to read data by FROM instruction or RS-485 communication. W: Able to write data by TO instruction or RS-485 communication.				

- Reset Module (Firmware V4.08 or above): Having connected the external power 24V, write the reset code H’4352 in CR#0, then disconnect and reboot to complete the setup.
- CR#32 Communication Format Setting:
  - Firmware V4.06 (and lower): Data format (b11~b8) is not available, ASCII format is 7, E, 1 (code H’00xx), RTU format is 8, E, 1 (code H’C0xx/H’80xx).
  - Firmware V4.07 (and higher): Refer to the following table for setup. For new communication format, please take note that modules in the original code H’C0xx/H’80xx is changed to 8E1 for RTU.

b15 ~ b12		b11 ~ b8				b7 ~ b0	
ASCII/RTU & High/Low Bit Exchange of CRC		Data Format				Communication Speed	
Description							
H’0	ASCII	H’0	7,E,1*1	H’6	7,E,2*1	H’01	4800 bps
H’8	RTU, No High/Low Bit Exchange of CRC	H’1	8,E,1	H’7	8,E,2	H’02	9600 bps
		H’2	–	H’8	7,N,2*1	H’04	19200 bps
H’C	RTU, High/Low Bit Exchange of CRC	H’3	8,N,1	H’9	8,N,2	H’08	38400 bps
		H’4	7,O,1*1	H’A	7,O,2*1	H’10	57600 bps
		H’5	8.O,1	H’B	8,O,2	H’20	115200 bps

ex: To setup 8N1 for RTU (High/Low Bit Exchange of CRC), communication speed is 57600 bps, write H’C310 in CR #32.
Note *1. Supports ASCII mode ONLY.

- CR#0 ~ CR#34: The corresponding parameter address H’4096 ~ H’40B8 are for users to read/write data by RS-485 communication. When using RS-485, the user has to separate the module with MPU first.
- Function: H’03 (read register data); H’06 (write 1 word datum into register); H’10 (write many word data into register).
- Latched CR should be written by RS-485 communication to stay latched. CR will not be latched if written by MPU through TO/DTO instruction; ; however, when using TO/DTO instruction to modify the PID control registers, all latched CR will stay latched.

CR#30: Error status (see the table below)

Error status	Value	b15 ~ b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Abnormal power supply	K1 (H'1)		0	0	0	0	0	0	0	0	0	0	0	1
Wiring to empty external contact	K2 (H'2)		0	0	0	0	0	0	0	0	0	0	1	0
Memory self-test Fail	K16 (H'10)		0	0	0	0	0	0	0	1	0	0	0	0
CH1 wiring to empty external contact	K256 (H'100)	Reserved	0	0	0	1	0	0	0	0	0	0	0	0
CH2 wiring to empty external contact	K512 (H'200)		0	0	1	0	0	0	0	0	0	0	0	0
CH3 wiring to empty external contact	K1024 (H'400)		0	1	0	0	0	0	0	0	0	0	0	0
CH4 wiring to empty external contact	K2048 (H'800)		1	0	0	0	0	0	0	0	0	0	0	0
Note: *Each error status is determined by the corresponding bit (b0 ~ b11) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error.*														

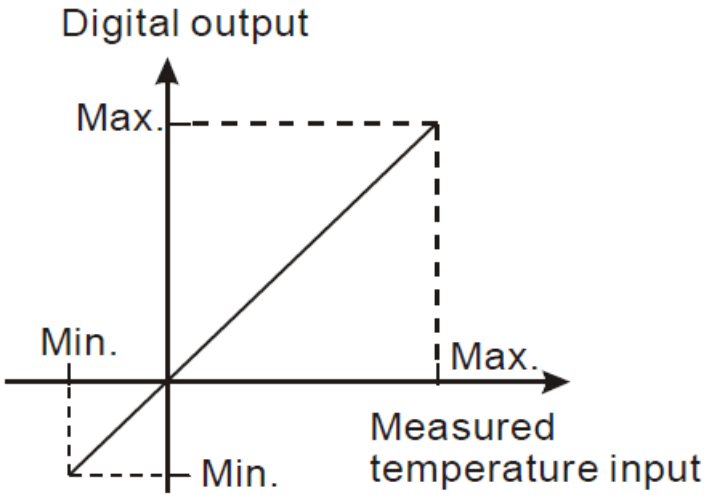
PID Control Registers

CR#				Latched		Register content	Explanation
CH1	CH2	CH3	CH4				
#51	#71	#91	#111	O	R/W	Temperature SV	Default = K0.
#52	#72	#92	#112	O	R/W	Sampling time (s)	Range: K1 ~ K30 (s). Default = K2.
#53	#73	#93	#113	O	R/W	KP	Default = K121.
#54	#74	#94	#114	O	R/W	KI	Integral constant, Default = K2,098.
#55	#75	#95	#115	O	R/W	KD	Derivative constant, Default = K-29.
#56	#76	#96	#116	O	R/W	Upper limit of I valu e	Range: K-32,760 ~ K32,760. Default = K0.
#57	#77	#97	#117	O	R/W	Lower limit of I valu e	Range: K-32,760 ~ K32,760. Default = K0.
#58	#78	#98	#118	X	R	I value	Current accumulated offset value. D efault = K0.
#59	#79	#99	#119	O	R/W	Heating/cooling control	0: Heater, 1: Cooler. Default = K0.
#60	#80	#100	#120	O	R/W	Upper limit of outpu t	Range: K-32,760 ~ K32,760. Default = K4,000.
#61	#81	#101	#121	O	R/W	Lower limit of outpu t	Range: K-32,760 ~ K32,760. Default = K0.
#62	#82	#102	#122	X	R	Output percentage (%)	Range: K0 ~ K1,000 (Unit: 0.1%). Default = K0.
#63	#83	#103	#123	X	R	Output width (ms)	Width of control output, Unit: ms. De fault = K0.
#64	#84	#104	#124	X	R	Output cycle (ms)	Cycle of control output, Unit: ms. De fault = K0.
#65	#85	#105	#125	X	R	Output volume	Default = K0.
#66	#86	#106	#126	X	R/W	PID_Run/Stop	0: Stop, 1: Run. Default = K0.
#67	#87	#107	#127	X	R/W	Auto Tune	0: Disabled, 1: Auto-tuning. Default = K0.

- The CR#51 ~ CR#127 listed above do not support RS-485 read/write.
- When using TO/DTO instruction to modify PID control registers, latched CR and PID control registers will stay latched.

Temperature / Digital Curve

Temperature Measurement Mode (°C/°F):



Documents / Resources

	DELTA DVP04TC-H2 Temperature Measurement Module [pdf] Instruction Manual DVP-0070630-03, DVP04TC-H2, DVP04TC-H2 Temperature Measurement Module, Temperature Measurement Module, Measurement Module