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DVP04TC-S

Instruction Sheet

安　裝　說　明

安　装　说　明

Temperature Measurement Module

溫度量測模組

温度量测模块

DVP-0010630-03
20220112

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Thank you for choosing Delta DVP series PLC. DVP04TC-S is able to receive 4 points of external thermocouple temperature sensors and convert them into 14-point digital signals. Besides, through FROM/TO instructions in DVP Slim series MPU program, the data in the module can be read and written. There are many 16-bit control registers (CR) in DVP04TC-S. The power unit is separate from it and is small in size and easy to install.

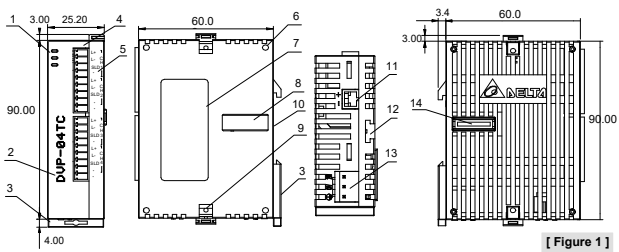
EN ✓ DVP04TC-S is an OPEN-TYPE device. It should be installed in a control cabinet free of airborne dust, humidity, electric shock and vibration. To prevent non-maintenance staff from operating DVP04TC-S, or to prevent an accident from damaging DVP04TC-S, the control cabinet in which DVP04TC-S is installed should be equipped with a safeguard. For example, the control cabinet in which DVP04TC-S is installed can be unlocked with a special tool or key.

EN ✓ DO NOT connect AC power to any of I/O terminals, otherwise serious damage may occur. Please check all wiring again before DVP04TC-S is powered up. After DVP04TC-S is disconnected, Do NOT touch any terminals in a minute. Make sure that the ground terminal ⏚ on DVP04TC-S is correctly grounded in order to prevent electromagnetic interference.

FR ✓ DVP04TC-S est un module OUVERT. Il doit être installé que dans une enceinte protectrice (boitier, armoire, etc.) saine, dépourvue de poussière, d'humidité, de vibrations et hors d'atteinte des chocs électriques. La protection doit éviter que les personnes non habilitées à la maintenance puissent accéder à l'appareil (par exemple, une clé ou un outil doivent être nécessaire pour ouvrir a protection).

FR ✓ Ne pas appliquer la tension secteur sur les bornes d'entrées/Sorties, ou l'appareil DVP04TC-S pourra être endommagé. Merci de vérifier encore une fois le câblage avant la mise sous tension du DVP04TC-S. Lors de la déconnection de l'appareil, ne pas toucher les connecteurs dans la minute suivante. Vérifier que la terre est bien reliée au connecteur de terre ⏚ afin d'éviter toute interférence électromagnétique.

■ Product Profile & Dimension

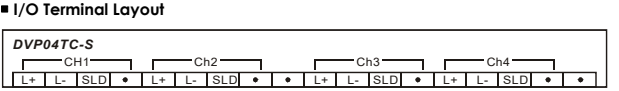


[Figure 1]

Unit: mm

1. Status indicator (POWER, RUN and ERROR)		2. Model name
3. DIN rail clip	4. I/O terminals	5. I/O point indicator
6. Mounting holes	7. Specification label	8. I/O module connection port
9. I/O module clip	10. DIN rail (35mm)	11. RS-485 communication port
12. I/O module clip	13. DC power input	14. I/O module connection port

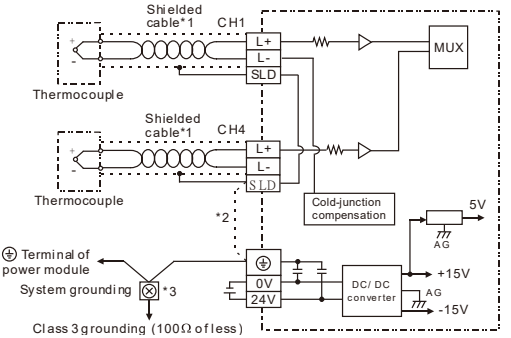
■ I/O Terminal Layout



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■ External Wiring

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[Figure 2]

Note1: Use only the wires that are supplied with your thermocouple sensor. Tighten PLC terminal screws to a torque of 1.95 kg-cm (1.7 in-lbs).

Note2: Terminal SLD is a grounding location for noise suppression.

Note3: Please connect ⏚ power supply module terminal and ⏚ DVP04TC-S temperature measurement module terminal to system earth ground.

Warning1: Do NOT wire empty terminals.

Warning2: Only use copper conducting wires with a temperature rating of 60/75°C and the length must be less than 50 m.

Warning3: TC modules must run for 30 minutes before they start to take any temperature measurement.

■ Electrical Specifications

Power supply voltage	24VDC (20.4VDC ~ 28.8VDC) (-15% ~ +20%)
Max. rated power consumption	2W, supplied by external power.
Operation/storage	Operation: 0°C~55°C (temperature), 5~95% (humidity), pollution degree 2 Storage: -25°C~70°C (temperature), 5~95% (humidity)
Vibration/shock resistance	International standards: IEC61131-2, IEC 68-2-6 (TEST Fc)/ IEC61131-2 & IEC 68-2-27 (TEST Ea)
Series connection to DVP-PLC MPU	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. Maximum 8 modules are allowed to connect to MPU and will not occupy any digital I/O points.

■ Functional Specifications

DVP04TC-S	Celsius (°C)	Fahrenheit (°F)
Analog input channel	4 channels per module	
Sensors type	J-type, K-type, R-type, S-type, and T-type thermocouple	
Temperature input range	J-type: -100°C ~ 700°C K-type: -100°C ~ 1,000°C R & S type: -10°C ~ 1,700°C T-type: -100°C ~ 350°C	J-type: -148°F ~ 1,292°F K-type: -148°F ~ 1,832°F R & S type: -14°F ~ 3,092°F T-type: -148°F ~ 662°F
Digital conversion range	J-type: K-1,000 ~ K7,000 K-type: K-1,000 ~ K10,000 R & S type: K-100 ~ K17,000 T-type: K-1,000 ~ K3,500	J-type: K-3,280 ~ K12,920 K-type: K-1,480 ~ K18,320 R & S type: K-140 ~ K30,920 T-type: K-1,480 ~ K6,620
Resolution	0.1°C	0.18°F*1
Overall accuracy	±0.5% of full scale of 25°C (77°F), ±1% of full scale during 0 ~ 55°C (32 ~ 131°F).	
Response time	200ms × channels	

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Isolation method (between digital and analog circuits)	Digital circuits and analog circuits 500VDC between digital / analog circuits and Ground 500VDC between analog circuits and digital circuits 500VDC between 24VDC and Ground
Digital data format	2's complement of 16-bit
Average function	Yes (CR#2 ~ CR#5)
Self diagnostic function	Yes
Communication mode (RS-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: Refer to Slim Type Special Module Communications in the appendix E of the DVP programming manual for more details on RS-485 communication setups.

*1: 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.

■ Control Register

CR#	Address	Save		Register content	Description
#0	H'4096	O	R	Model name	Set up by the system: DVP04TC-S model code=H'8B
#1	H'4097	O	R/W	Thermocouple type	b15~b12: Reserved; b11~b9: CH4; b8~b6: CH3; b5~b3: CH2; b2~b0: CH1 Example: Setting of CH1 1. (b2, b1, b0) set to (0, 0, 0), use J-type. 2. (b2, b1, b0) set to (0, 0, 1), use K-type. 3. (b2, b1, b0) set to (0, 1, 0), use R-type. 4. (b2, b1, b0) set to (0, 1, 1), use S-type. 5. (b2, b1, b0) set to (1, 0, 0), use T-type. Note: With version V4.20 and above, you can close a certain channel. For example, set (b2, b1, b0) to (1, 1, 0) and CH1 would be closed.
CR#1: Used to set the working mode of four channels. There are 5 modes (J-type, K-type, R-type, S-type, and T-type) for each channel and can be set individually. For example, If you want to set CH1~CH4 as following: CH1: J-type (b2 ~ b0=000), CH2: K-type (b5 ~ b3=001), CH3: J-type (b8 ~ b6=000) and CH4: K-type (b11 ~ b9=001), you should set CR#1 to H'0208. The higher bits (b12 ~ b15) will be reserved and the default setting is H'0000.					
#2	H'4098	O	R/W	CH1 average number	Number piece of readings used for the calculation of "average" temperature on channels CH1 ~ CH4. Setting range: For versions prior to V3.04: K1 ~ K4,095. For versions after V3.05: K1 ~ K20. Default setting is K10.
#3	H'4099	O	R/W	CH2 average number	
#4	H'409A	O	R/W	CH3 average number	
#5	H'409B	O	R/W	CH4 average number	
CR#2 ~ CR#5: Please be noticed that when PLC sets average times via TO/DTO instructions, please use rising-edge/falling-edge detection instruction (such as LDP and LDF) to get correct average times.					
#6	H'409C	X	R	CH1 average degrees	Average degrees for channels CH1 ~ CH4. (Unit: 0.1°C).
#7	H'409D	X	R	CH2 average degrees	
#8	H'409E	X	R	CH3 average degrees	
#9	H'409F	X	R	CH4 average degrees	
#10	H'40A0	X	R	CH1 average degrees	Average degrees for channels CH1 ~ CH4. (Unit: 0.1°F).
#11	H'40A1	X	R	CH2 average degrees	
#12	H'40A2	X	R	CH3 average degrees	
#13	H'40A3	X	R	CH4 average degrees	
#14	H'40A4	X	R	Present temp. of CH1	Present temperature of channels CH1 ~ CH4. (Unit: 0.1°C).
#15	H'40A5	X	R	Present temp. of CH2	
#16	H'40A6	X	R	Present temp. of CH3	
#17	H'40A7	X	R	Present temp. of CH4	
#19	H'40A9	X	R	Present temp. of CH1	Present temperature of channels CH1 ~ CH2. (Unit: 0.1°F).
#20	H'40AA	X	R	Present temp. of CH2	
#21	H'40AB	X	R	Present temp. of CH3	Present temperature of channels CH3 ~ CH4. (Unit: 0.1°F).
#22	H'40AC	X	R	Present temp. of CH4	

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#24	H'40AE	O	R/W	CH1 OFFSET Value	Adjust offset value of channels CH1 ~ CH4. The range is -1,000 ~ +1,000 and default setting is K0. (Unit: 0.1°C).
#25	H'40AF	O	R/W	CH2 OFFSET Value	
#26	H'40B0	O	R/W	CH3 OFFSET Value	
#27	H'40B1	O	R/W	CH4 OFFSET Value	
#29	H'40B3	X	R/W	PID mode setting	Set H'5678 to enable PID mode, other set values are invalid. Default: H'0000.
#30	H'40B4	X	R	Error status	Data register stores the error status. Refer to the error code chart for details.
#31	H'40B5	O	R/W	Communication address setting	RS-485 communication address. Setting range is 1 ~ 254 and default setting is K1.
#32	H'40B6	O	R/W	Communication format setting	It is used to set communication format. For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps. Communication format: ASCII：7,E,1 / 7,O,1 / 8,E,1 / 8,O,1 / 8,N,1 RTU ：8,E,1 / 8,O,1 / 8,N,1 Factory default : ASCII,9600,7,E,1 (CR#32=H'0002) Refer to ※CR#32 communication format settings at the end of this table for more information.
#33	H'40B7	O	R/W	Reset to default setting	b15~b12 | b11~ b9 | b8~b6 | b5~b3 | b2~b0 ERR LED | CH4 | CH3 | CH2 | CH1 Example: Setting of CH1 1. b0 ~ b1: Reserved. 2. b2: Set to 1 and PLC will be reset to default settings. Definition of ERR LED: b12~b15=1111 (default settings) 1. b12 corresponds to CH1: when b12=1, scale exceeds the range, ERR LED flashes. 2. b13 corresponds to CH2: when b13=1, scale exceeds the range, ERR LED flashes. 3. b14 corresponds to CH3: when b14=1, scale exceeds the range, ERR LED flashes. 4. b15 corresponds to CH4: when b15=1, scale exceeds the range, ERR LED flashes
#34	H'40B8	O	R	Software version	Display the software version in hexadecimal. Example: H'010A = version 1.0A
#35 ~ #48				System used	

Symbols: O: means latched. (Support when using RS-485 communication, not support when connecting with MPU)
X: means not latched. R: able to read data by using FROM instruction or RS-485.
W: able to write data by using TO instruction or RS-485.

1. Added the RESET function for modules with firmware V4.14 or later. Connect the module power input to 24 VDC and write H'4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.
2. If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example transferring the address "H'4096" of CR#0 in hexadecimal format to decimal format, to have the result 16534 and then adding one to it, you have 16535, the Modbus address in decimal format.
3. CR#32 communication format settings: for modules with firmware V4.12 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H'00XX) and for RTU mode, the format is fixed to 8, E, 1 (H'C0xx/H'80xx). For modules with firmware V4.13 or later, refer to the following table for setups. Note that the original code H'C0XX/H'80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.13 or later.

b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU, exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps

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H'8	RS-485 do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	reserved	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
		H'5	8.O,1	H'20	115200 bps

Note *1: This is only available for ASCII format.
Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

4. Function codes: 03'H is for reading data from registers. 06'H is for writing a word data into registers. 10'H is for writing multiple word data into registers.
5. CR#30 is the error code register. Refer to the chart below:

Error description	Content	b15 ~ b8	b7	b6	b5	b4	b3	b2	b1	b0
Power source abnormal	K1 (H'1)	Reserved	0	0	0	0	0	0	0	1
Wiring to empty external contact	K2 (H'2)		0	0	0	0	0	0	1	0
Setting mode error	K4 (H'4)		0	0	0	0	0	1	0	0
Offset/Gain error	K8 (H'8)		0	0	0	0	1	0	0	0
Temperature sensor error	K16 (H'10)		0	0	0	1	0	0	0	0
Digital range error	K32 (H'20)		0	0	1	0	0	0	0	0
Average times setting error	K64 (H'40)		0	1	0	0	0	0	0	0
Instruction error	K128 (H'80)		1	0	0	0	0	0	0	0
Note: Each error code will have corresponding bit (b0 ~ b7). Two or more errors may happen at the same time. 0 means normal and 1 means having error.										

6. When CR#29 is set to H'5678, CR#0 ~ CR#34 can be used for PID settings in DVP04TC-S V3.08 and versions above.

PID Mode description							
CR#	Keep	R/W		CR#	Keep	R/W	
#0	O	R	Model name	#24	O	R/W	CH1 K_D
#1	X	R/W	Thermocouple type	#25	O	R/W	CH2 K_D
#2	X	R	PID Output % at CH1	#26	O	R/W	CH3 K_D
#3	X	R	PID Output % at CH2	#27	O	R/W	CH4 K_D
#4	X	R	PID Output % at CH3	#28	X	R/W	Run/Stop & Auto tuning Bit0：CH1 PID Run/Stop Bit1：CH2 PID Run/Stop Bit2：CH3 PID Run/Stop Bit3：CH4 PID Run/Stop 0=PID Stop，1=PID Run Bit4：CH1 Auto tuning Bit5：CH2 Auto tuning Bit6：CH3 Auto tuning Bit7：CH4 Auto tuning 1: The auto tuning function is enabled. After the auto tuning is complete, the value becomes 0.
#5	X	R	PID Output % at CH4				
CR#2~CR#5: 0~1000; Unit: 0.1%							
#6	X	R	Average temperature (°C) at CH1				
#7	X	R	Average temperature (°C) at CH2				
#8	X	R	Average temperature (°C) at CH3				
#9	X	R	Average temperature (°C) at CH4				
CR#6~CR#9：Unit: 0.1%							
#10	O	R/W	Set temperature at CH1				
#11	O	R/W	Set temperature at CH2				
#12	O	R/W	Set temperature at CH3				
#13	O	R/W	Set temperature at CH4				
CR#10~CR#13: Set the PID target value (SV)							
#14	O	R/W	CH1 K_P	#29	X	R/W	Enter PID mode(H'5678) K0: Exit the PID mode
#15	O	R/W	CH2 K_P				
#16	O	R/W	CH3 K_P	#30	X	R	Error code
#17	O	R/W	CH4 K_P	#31	O	R/W	CH1 Sampling time
#19	O	R/W	CH1 K_I	#32	O	R/W	CH2 Sampling time
#20	O	R/W	CH2 K_I	#33	O	R/W	CH3 Sampling time
#21	O	R/W	CH3 K_I	#34	O	R/W	CH4 Sampling time
#22	O	R/W	CH4 K_I	CR#31~CR#34: 1~30; Unit: 1s			
Note: Users have to enter the PID mode (CR#29=H'5678) before setting other control registers.							

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