

DVP04PT-S

DVP04PT-S

Platinum Temperature Sensors

Instruction Sheet

1 WARNING

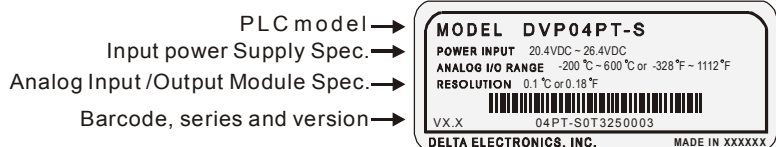
- Please carefully read this instruction thoroughly prior to use the DVP04PT-S.
- In order to prevent electric shock, do not touch the terminals or conduct any maintenance while PLC power is ON. DO NOT open the PLC. Only qualified personnel or Delta staff is allowed to conduct any internal electrical work on the PLC.
- This is an OPEN-TYPE device and certified to meet IEC 61131-2 (UL 508) safety requirements when installed in an enclosure.
- The DVP04PT-S must be kept under the environment away from high temperatures, high humidity, excessive vibration, corrosive gases, liquids, airborne dust, and metallic particles.
- Do not apply AC power to any of the input/output terminals, or it may damage the DVP04PT-S.
- Make sure that the DVP04PT-S is properly grounded (⊕), to prevent any electromagnetic noise.
- Use wires with resistance when connecting the platinum resistance thermister (RTD) to the PLC.
- Please keep the wires as short as possible when connecting RTD to PLC and keep power lead as far away as possible from I/O wires to prevent noise interference.

2 INTRODUCTION

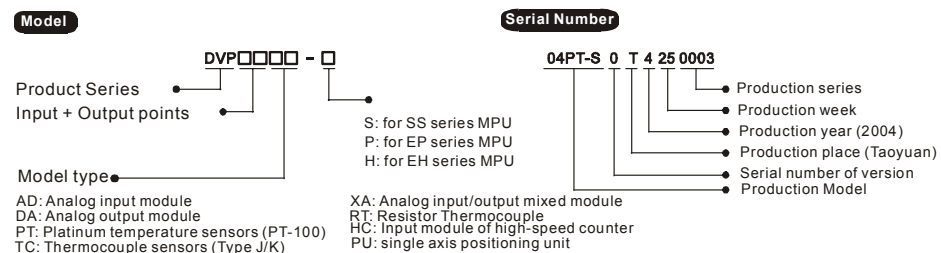
2.1 Model Explanation and Peripherals

- Thank you for choosing DELTA DVP Series PLC. The DVP04PT-S allows the connection of four platinum temperature sensors (PT100 3-WIRE 100Ω 3850 PPM/°C(DIN 43760 JIS C1604-1989)). The PLC converts the sensors input to a 14-bit digital signal, which then be manipulated using TO and FROM commands in the ladder logic program. There are 49 Controlled Registers (CR, each register has 16-bit) in each module.
- DVP04PT-S is able to share the information via RS-485 communication or by direct connect to DVP-SS main processing unit. Power supply and main processing units are sold separately.
- DVP04PT-S displays both Centigrade and Fahrenheit. The input resolution for Centigrade is 0.1 degrees and for Fahrenheit is 0.18 degrees.

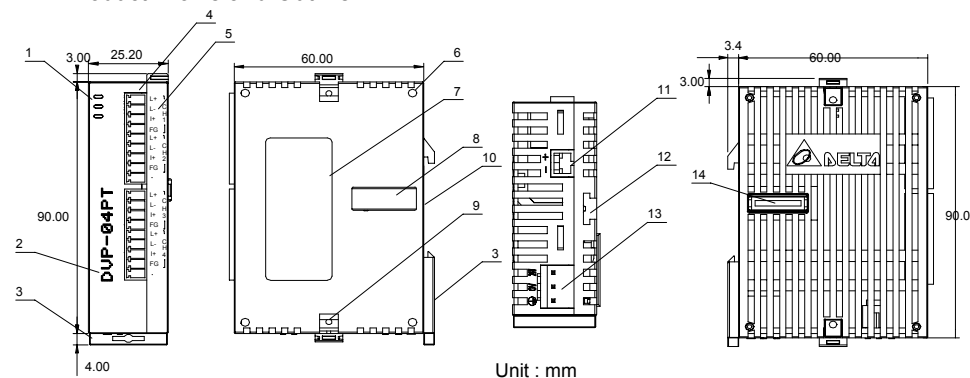
■ Nameplate Explanation



■ Model Explanation

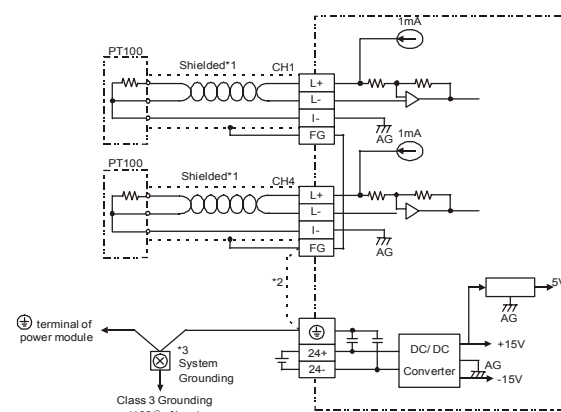


2.2 Product Profile and Outline



- | | |
|--|-------------------------------|
| 1. Status indicator (Power, RUN and ERROR) | 8. Extension port |
| 2. Model Number | 9. Extension Clip |
| 3. DIN rail clip | 10. DIN rail location (35mm) |
| 4. I/O terminals | 11. RS-485 Communication port |
| 5. I/O point indicator | 12. Extension Clip |
| 6. Mounting holes | 13. DC Power input |
| 7. Specification Label | 14. Extension port |

2.3 External wiring



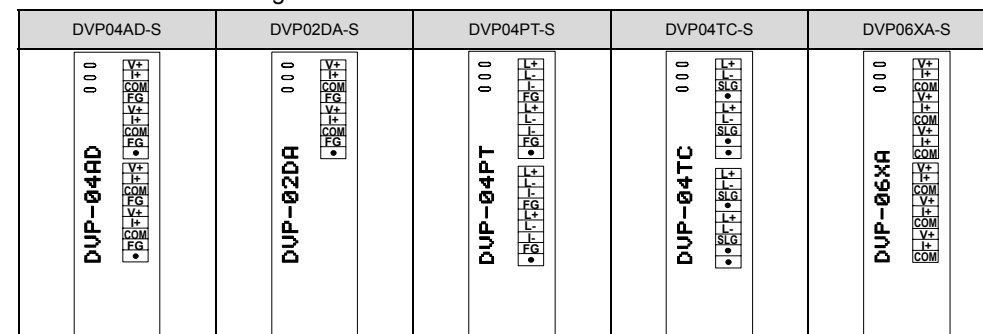
Note 1: Use only the wires that are packed with the temperature sensor (PT 100) for analog input and separate from other power line or any wire that may cause noise. Please use 3-wire for PT 100.

Note 2: Terminal FG is grounded for noise suppression.

Note 3: Please connect ⊕ power supply module terminal and ⊕ DVP-04PT-S platinum temperature sensors module terminal to system earth ground.

Warning: DO NOT connect wires to the No Connection (●) terminals.

2.4 Terminals of analog module



3 STANDARD SPECIFICATIONS

3.1 Function Specifications

Platinum Temperature Module (04PT)	Centigrade (°C)	Fahrenheit (°F)
Power supply voltage	24 VDC (20.4VDC~26.4VDC) (-15%~+10%)	
Analog input channel	4 channels per module	
Sensors type	3-WIRE PT100Ω 3850 PPM/°C(DIN 43760 JIS C1604-1989)	
Current excitation	1 mA	
Temperature input range	-200°C~600°C	-328°F~1112°F
Digital conversion range	K-2000~K6000	K-3280~K11120
Resolution	14 bits(0.1°C)	14 bits(0.18°F)
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	200 ms xchannels	
Isolation method	Isolation between digital and analog circuitry. There is no isolation between channels.	
Digital data format	2's complement of 16-bit, (13 Significant Bits)	
Average function	Yes (CR#2~CR#5 may be set and the range is K1~K4096)	
Self diagnostic function	Yes	

Platinum Temperature Module (04PT)	Centigrade (°C)	Fahrenheit (°F)
Communication mode (RS-485)	MODBUS ASCII or RTU Mode. Communication baud rate 4800 / 9600 / 19200 / 38400 / 57600 / 115200. For ASCII mode, date format is 7Bits, even, 1 stop bit (7 E 1), while RTU mode, date format is 8Bits, even, 1 stop bit (8 E 1). RS-485 is disabled when the DVP04AD-S is connected in series with an MPU.	
Connection to a DVP-PLC MPU in series	If DVP04PT-S modules are connected to MPU, the modules are numbered from 0 ~ 7. 0 is the closest and 7 is the furthest to the MPU. 8 modules is the max and they do not occupy any digital I/O points of the MPU.	

3.2 Other Specification

Maximum Power Consumption	2W at 24 VDC (20.4VDC~28.8VDC) (-15% ~ +20%)
Environment Condition and Wiring	Follow the DVP-PLC MPU.
Static Electricity Prevention	All places between terminals and ground comply with the spec.

4 CR (Controlled Register)

DVP04PT-S platinum temperature sensors			Explanation																
CR No.	RS-485 Parameter address	Latched	Register name	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
#0	H 4064	○ R	Model type	System used, data length is 8bits (b7~b0). DVP-04PT model code = H 8A															
#1			Reserved																
#2	H 4066	○ R/W	CH1 average number	Number piece of readings used for the calculation of "average" temperature on channels CH1~CH4. Setting range is K1~K4096 and factory setting is K10.															
#3	H 4067	○ R/W	CH2 average number																
#4	H 4068	○ R/W	CH3 average number																
#5	H 4069	○ R/W	CH4 average number																
#6	H 406A	○ R	CH1 average degrees(°C)	Average degrees for channels CH1~CH4. (unit: 0.1 degrees C)															
#7	H 406B	○ R	CH2 average degrees(°C)																
#8	H 406C	○ R	CH3 average degrees(°C)																
#9	H 406D	○ R	CH4 average degrees(°C)																
#10~#11			Reserved																
#12	H 4070	○ R	CH1 average degrees(°F)	Average degrees for channels CH1~CH4. (unit: 0.1 degrees F)															
#13	H 4071	○ R	CH2 average degrees(°F)																
#14	H 4072	○ R	CH3 average degrees(°F)																
#15	H 4073	○ R	CH4 average degrees(°F)																
#16~#17			Reserved																
#18	H 4076	○ R	Present temperature of CH1 (°C)	Present temperature of channels CH1~CH4. (unit: 0.1 degrees C)															
#19	H 4077	○ R	Present temperature of CH2 (°C)																
#20	H 4078	○ R	Present temperature of CH3 (°C)																
#21	H 4079	○ R	Present temperature of CH4 (°C)																
#22~#23			Reserved																
#24	H 407C	○ R	Present temperature of CH1 (°F)	Present temperature of channels CH1~CH4. (unit: 0.1degrees F)															
#25	H 407D	○ R	Present temperature of CH2 (°F)																
#26	H 407E	○ R	Present temperature of CH3 (°F)																
#27	H 407F	○ R	Present temperature of CH4 (°F)																
#28~#29			Reserved																
#30	H 4082	○ R	Error status	Data register stores the error status. Refer to the fault code chart for details.															
#31	H 4083	○ R/W	Communication address setting	RS-485 communication address. Setting range is 01~255 and factory setting is K1															
#32	H 4084	○ R/W	Communication baud rate setting	Communication baud rate (4800, 9600, 19200, 38400, 57600 and 115200 bps). b0: 4800 bps (bit/sec). b1: 9600 bps (bit/sec). (factory setting) b2: 19200 bps (bit/sec). b3: 38400 bps (bit/sec). b4: 57600 bps (bit/sec). b5: 115200 bps (bit/sec). b6~b13: Reserved. b14: switch between low bit and high bit of CRC code (RTU mode only) b15: RTU mode.															
#33	H 4085	○ R/W	Reset to factory setting	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
				Definition of ERR LED CH4 CH3 CH2 CH1 Example: Setting of CH1 1. b0 Reserved 2. b1 Reserved 3. b2: Set to 1 and PLC will be reset to factory settings. Definition of ERR LED: b12~b15=1111(factory settings) 1. b12 corresponds to CH1: when b12=1, scale exceeds the range or external contact has no connection, ERR LED flashes. 2. b13 corresponds to CH2: when b13=1, scale exceeds the range or external contact has no connection, ERR LED flashes. 3. b14 corresponds to CH3: when b14=1, scale exceeds the range or external contact has no connection, ERR LED flashes. 4. b15 corresponds to CH4: when b15=1, scale exceeds the range or external contact has no connection, ERR LED flashes.															
#34	H 4086	○ R	Software version	Display the software version in hexadecimal. Example: H 010A = version 1.0A.															
#35~#48			System used																

Explanation:

- CR#0: PLC model type.
- CR#1, CR#10, CR#11, CR#16, CR#17, CR#22, CR#23, CR#28, CR#29 are reserved.
- CR#2 ~ CR#5: Used to set the number piece of input readings used for the calculation of average temperature. The available range is K1~K4096 and factory setting is K10.

- CR#6 to CR#9: The average temperature (C). Temperature is calculated by averaging multiple pieces temperature readings. Example: If CR#2 is 10, the temperature in CR#6 will be the average of the last 10 readings on CH1.
- CR#12 to CR#15: The average temperature (F). Temperature is calculated by averaging multiple pieces temperature readings. Example: If CR#2 is 10, the temperature in CR#12 will be the average of the last 10 readings on CH1.
- CR#18 ~ CR#21: display the present temperature (C) of CH1~CH4 input signal.
- CR#24 ~ CR#27: display the present temperature (F) of CH1~CH4 input signal.
- CR#30 is the fault code register. Refer to the chart below.

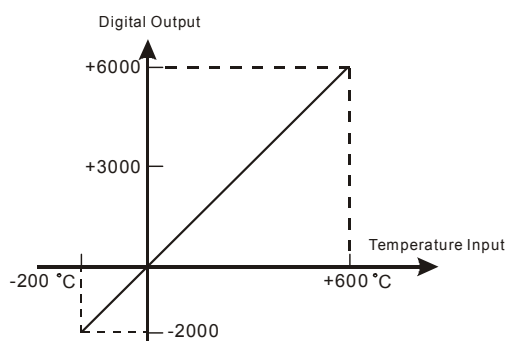
Fault description	Content	b15~b8	b7	b6	b5	b4	b3	b2	b1	b0
Power source abnormal	K1(H1)	Reserved	0	0	0	0	0	0	0	1
Analog input value error	K2(H2)		0	0	0	0	0	0	1	0
Setting mode error	K4(H4)		0	0	0	0	0	1	0	0
Offset/Gain error	K8(H8)		0	0	0	0	1	0	0	0
Hardware malfunction	K16(H10)		0	0	0	1	0	0	0	0
Digital range error	K32(H20)		0	0	1	0	0	0	0	0
Average times setting error	K64(H40)		0	1	0	0	0	0	0	0
Command error	K128(H80)		1	0	0	0	0	0	0	0

Note: Each fault code will have corresponding bit (b0~b7). Two or more faults may happen at the same time. 0 means normal and 1 means having fault.

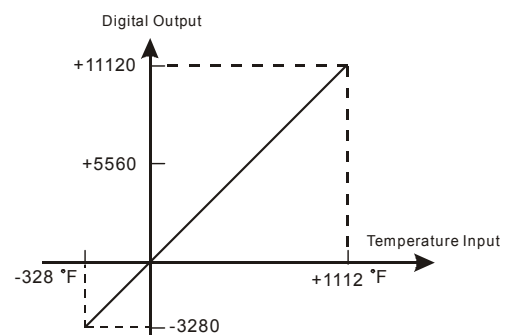
- CR#31: RS-485 communication address. Setting range is 01~255 and factory setting is K1.
- CR#32: RS-485 communication baud rate: 4800, 9600, 19200, 38400, 57600 and 115200. b0:4800bps, b1:9600bps (factory setting), b2:19200bps, b3:38400 bps, b4:57600 bps, b5:115200 bps, b6~b13: Reserved, b14: switch between low bit and high bit of CRC code (RTU mode only) b15: ASCII or RTU mode. Communication format for ASCII mode is 7Bit, even bit, 1 stop bit (7 E 1), while RTU mode is 8Bit, even bit, 1 stop bit (8 E 1).
- CR#33: b0~b11: Used to reset the settings of CH1~CH4 to factory defaults. b12~b15: definition of ERR LED, factory setting is b12~b15=1111.
- CR#34: software version.
- CR#35~ CR#48: Reserved for internal system use.
- The corresponding parameters address H4064~H4095 of CR#0~CR#48 are provided for users to read/write data via RS-485 communication.
 - Communication baud rate: 4800, 9600, 19200, 38400, 57600, 115200 bps.
 - Communication format: ASCII mode is 7Bit, even bit, 1 stop bit (7 E 1). Communication format of RTU mode is 8Bit, even bit, 1 stop bit (8 E 1).
 - Function code: 03H—read data from register. 06H—write one WORD to register. 10H—write multiple WORD to registers.

5 Temperature/Digital Characteristic Curve

Temperature mode: (Centigrade)



Temperature mode: (Fahrenheit)



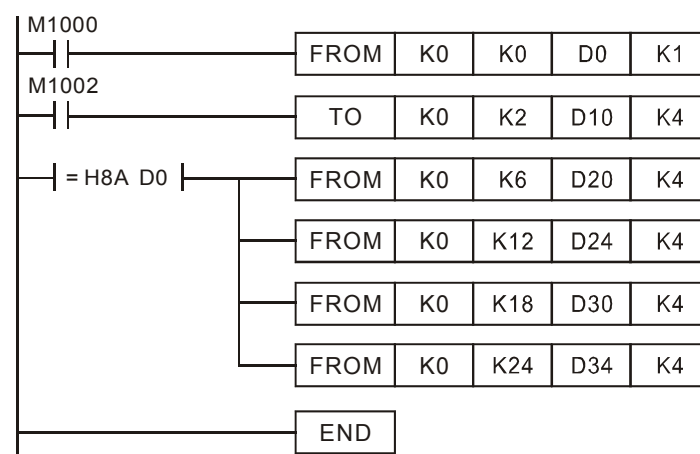
6 Initial PLC Start-up

LED display:

- Upon power-up, the ERROR LED will light for 0.5 seconds the POWER LED will light continuously.

- No errors: POWER LED on and ERROR LED off.
Low Voltage error (lower than 19.5V), ERROR LED will blink continuously till the power supply goes above 19.5V.
- DVP04-PT connected to PLC MPU in series = RUN LED on MPU will be lit and A/D LED or D/A LED should blink.
- After receiving the first RS-485 command, the A/D LED or D/A LED will blink.
- If the input or output exceeds the upper or lower bounds, the ERROR LED will blink.

Example:



Explanation:

- Read the model type of extension module K0 (should be H8A for DVP04PT-S model type).
- Number of piece, saved in D10~D13, used to calculate the average temperature reading (C) of CH1~CH4
- For DVP04PT-S model. Read the average temperature (C) of CH1~CH4 (4 data) from CR#6~CR#9 and save it to D20~D23.
- Read the average temperature (F) of CH1~CH4 from CR#12~CR#15 and save it to D24~D27.
- Read the present temperature (C) of CH1~CH4 from CR#18~CR#21 and save it to D30~D33.
- Read the present temperature (F) of CH1~CH4 from CR#24~CR#27 and save it to D34~D37.

7 Related Instructions Explanation

API	D	TO	P	(m1)	(m2)	(S)	(n)	Special module CR data read out	Adaptive model
78									ES EP EH

	Bit device				Word device											
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	E	F	
m1					*	*										
m2					*	*										
D					*	*	*	*	*	*	*	*	*	*	*	
n					*	*										

Note: The usage range of operand m1 is 0~7. The usage range of operand m2: ES/EP: 0-48, EH: 0-254. The usage range of operand n: ES/EP: n=1~(49-m2), EH: 1~(255-m2). ES series model doesn't support the pulse execution command (FROMP, DFROMP).

Flag: When M1083 On, it allows to enable interrupt during FROM/TO. Refer to the below for detail.

Command Explanation

- (m1): the module number you are probing. (m2): the number of Controlled Registers to be read. (D): the data register location for storing data. (n): the number of CRs to read at one time.
- DVP-series PLC uses this command to read CR data of each special module.
- (D): When assigning bit operand, K1~K4 are used for 16-bit and K5~K8 are used for 32-bit.
- Please refer the footnote below for the calculation of special module number.
- Read the content of CR#24 and CR#25 of module#0 and save it to D0 and D1 when n=2.
- Command will be executed when X0=ON. Nothing happen if X0=OFF, the stored data will have no change.

Program Example



API	D	TO	P	(m1)	(m2)	(S)	(n)	Special module CR data write	Adaptive model
79									ES EP EH

	Bit device				Word device											
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	E	F	
m1					*	*										
m2					*	*										
S					*	*	*	*	*	*	*	*	*	*	*	
n					*	*										

Note: The usage range of operand m1 is 0~7. The usage range of operand m2: ES/EP: 0-48, EH: 0-254. The usage range of operand n: ES/EP: n=1~(49-m2), EH: 1~(255-m2). For ES series, it doesn't support the pulse execution command (TOP, DTOP).

Flag: When M1083 On, it allows to enable interrupt during FROM/TO. Refer to the below for detail.

Command Explanation

- (m1): the module number you are probing. (m2): the number of Controlled Registers that will be written to. (S): the data to write. (n): the number of CR to write to one time.
- DVP-series PLC uses this command to write data to Controlled Registers of special modules.
- (S): When assign bit operand, K1~K4 are used for 16-bit and K5~K8 are used for 32-bit.
- Using 32-bit command DTO. The program will write D11 and D10 to CR#3 and CR#2 of special module#0. DTO allows only one group data to be written at one time when n=1.
- Command is executed when X0=ON. Nothing happen if X0=OFF, the stored data will have no change.

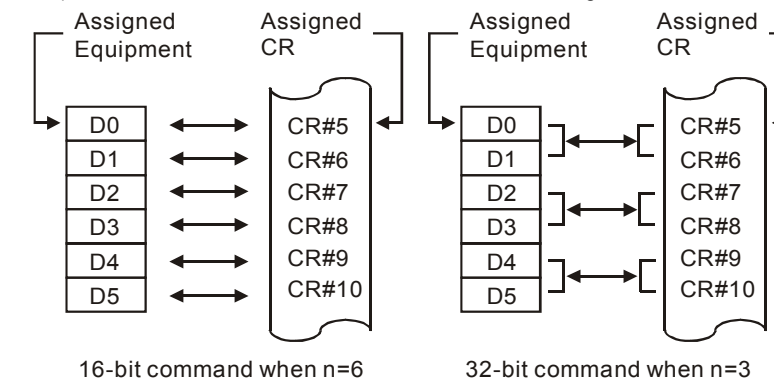


Program Example

- The rules for adding multiple special modules to a Main Processing Unit:
 - m1: The maximum number of special modules attached to an MPU is 8. The module closest to the MPU is 0 and the furthest module to the MPU is 7.
 - m2: The number of Controlled Registers (CR) built in is 49. (#0~#48).
 - FROM/TO command read/write one CR at a time, while DFROM/DTO command read/write two CR at a time. Example below:



(Access 16-bit if n=2, or 32-bit if n=1. Same controlled registers are accessed).



- In ES series models, flag M1083 is not provided. When FROM/TO command is executed, all interrupts (including external or internal interrupt subroutines) will be disabled. All interrupts will be executed after FROM/TO command is completed. Besides, FROM/TO command also can be executed in the interrupt subroutine.
- The function of the flag M1083 (FROM/TO mode exchange) provided in EP/EH series models:
 - When M1083=Off, all interrupts (including external or internal interrupt subroutines) will be disabled when FROM/TO command is executed. The Interrupts will resumed after FROM/TO command complete. Please be advised FROM/TO command can be executed in the interrupt subroutine.
 - When M1083=On, if an interrupt enable occurs while FROM/TO command are executing, the interrupt FROM/TO command will be blocked till the requested interrupt finish. Unlike M1080 off situation, FROM/TO command cannot be executed in the interrupt subroutine.