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DELTA DVP04PT-H2 Temperature Measurement Module Instruction Manual

**Temperature Measurement Module
DVP04PT-H2
Instruction Manual**

Contents

DVP04PT-H2 Temperature Measurement Module

DVP04PT-H2 is able to receive 4 points of resistance temperature detectors (PT100, PT1000, NI100, and NI1000) and convert them into 16-bit digital signals. Besides, through the user of FROM/TO instructions in DVP-EH2 MPU program, the data in DVP04PT-H2 can be read or written. There are 49 16-bit control registers (CR) in it. DVP04PT-H2 displays temperatures in Celsius (resolution: 0.1°C) and Fahrenheit (resolution: 0.18°F).

This sheet only provides instructions that include electrical and other specifications as well as wiring. For more details of program design and instructions, please refer to "DVP-PLC Application Manual: Programming". For any further information of peripherals, refer to "DVP-PLC Application Manual Special Modules"

✎ DVP04PT-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 DVP04PT-H2, or to prevent an accident from damaging DVP04PT-H2, the control cabinet in which DVP04PT-H2 is installed should be equipped with a safeguard. For example, the control cabinet in which DVP04PT-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 may occur. Please check all wiring again before DVP04PT-H2 is powered up.
After DVP04PT-H2 is disconnected, Do NOT touch any terminals in a minute. Make sure that the ground terminal

⏚ on DVP04PT-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.

✎ Make sure settings of resistance temperature detectors in CR#1 are correct, or serious error may occur in measurements.
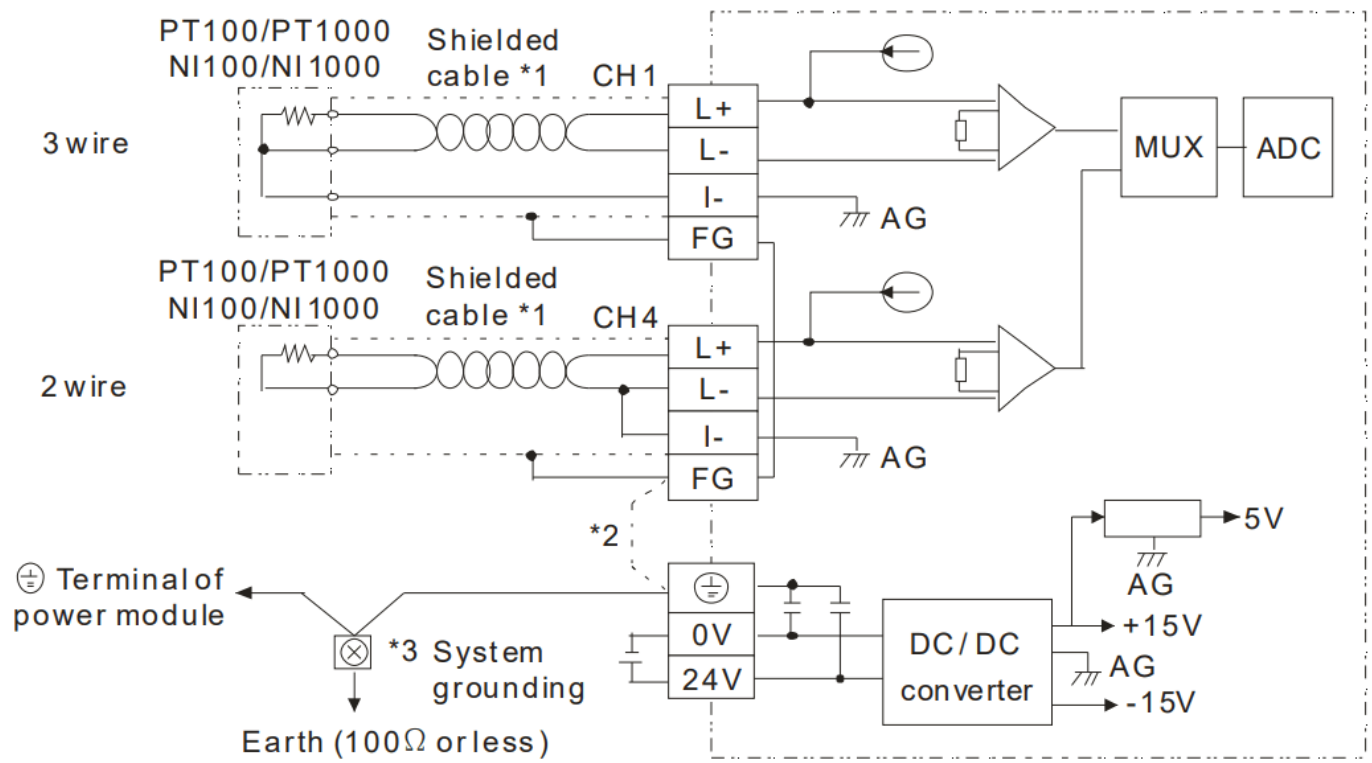

Product Profile & Dimensions
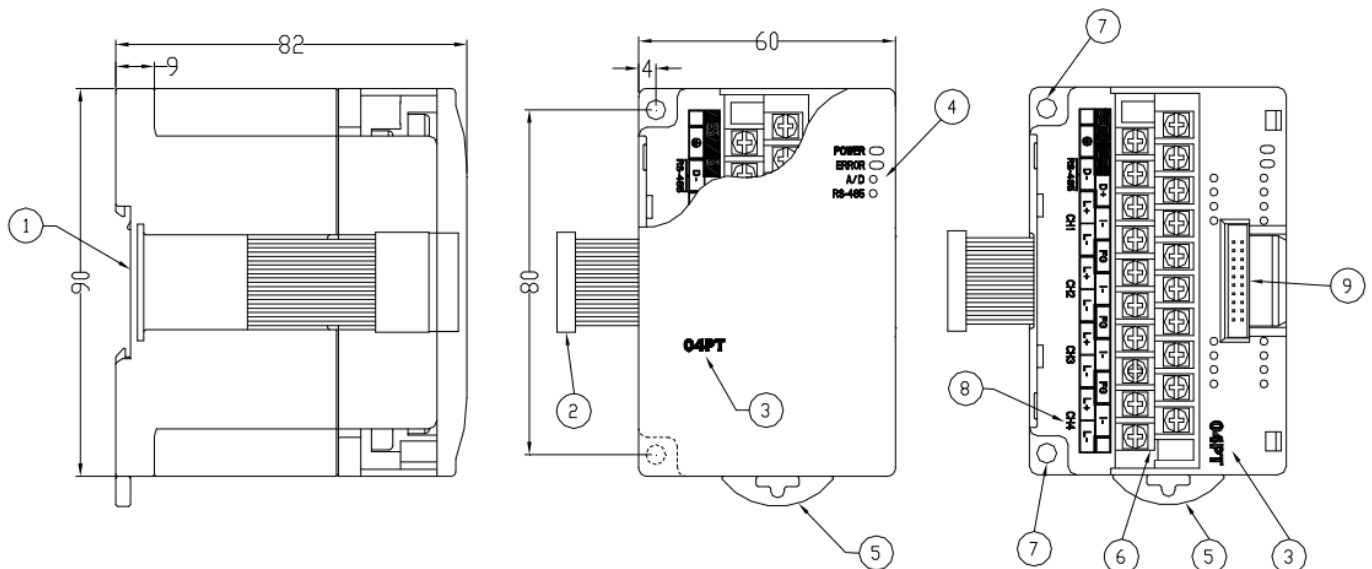
[Figure 1]
Unit: mm

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

24V	0V	D +	I -	FG	I -	FG	I -	FG	I -
⏚	D -	L +	L -	L +	L -	L +	L -	L +	L -
	RS-485	CH1		CH2		CH3		CH4	

External Wiring

*1: Wiring for analog inputs should use cables of resistive temperature sensors or double shielding cables and should be separated from other power cables that may cause interferences. To prevent the measuring results from being affected by the line resistance, use 3-wire temperature sensor. The terminals should be screwed at torque 1.95 kg-cm (1.7 in-lbs).

*2: Terminal FG is the ground location for noise suppression.

*3: Connect ⏚ terminal on both the power supply module and DVP04PT-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 terminals. Use 60/75°C copper conductors only.

Electrical Specifications

Power supply voltage	24 VDC (20.4 to 28.8 VDC) (-15 to +20%)
Analog output channel	4 channels/module
Applicable sensors	3-WIRE PT100 / NI100 / PT1000 / NI1000 3850 PPM/°C (DIN 43760 JIS C1604-1989)
Current excitation	1.53 mA/200 µA
Range of input temp.	See the table in "Temperature/Digital Value Curve" section.
Range of digital conversion	See the table in "Temperature/Digital Value Curve" section.
Resolution	0.1°C/0.18°F[*1]
Output impedance	0.5Ω or less
Overall accuracy	±0.6% when in full scale within the range of 0 to 55°C, 32 to 131°F
Response time	400 ms × number of channels
Isolation	Isolation between digital circuits and analog circuits. 500 VDC between digital circuits and ground 500 VDC between analog circuits and ground 500 VDC between analog circuits and digital circuits 500 VDC between 24 VDC and ground
Format of digital data	15 significant bits out of 16 bits are available; in 2's complement
Average function	Provided; available for setup in CR#2 to CR#5; Range: K1 to K100
Self-diagnosis	Upper and lower bound detection/channel
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 PLC CPUs. Note2: Use extension module wizard in ISPSoft to search or modify the control register (CR) in the modules.
Serial connection with DVP-PLC MPU	The modules are numbered from "0 to 7" automatically by their distance from MPU. 0 is the closest to MPU and 7 is the furthest. Maximum 8 modules are allowed to connect to the PLC and will not occupy any digital I/O points.

*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.

Other Specifications

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

Environment		
Operation/storage	1. Operation: 0 to 55°C (temperature), 5 to 95% (humidity), pollution degree 2 2. Storage: -25 to 70°C (temperature), 5 to 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#	Attrib.		Content	Explanation
#0	O	R	Model name	Set up by the system. DVP04PT-H2 = H'6402. You can read the model name from the program and see if the module exists.
#1	O	R/W	Modes of CH1 ~ CH4	CH1 mode: b0 ~ b3 CH2 mode: b4 ~ b7 CH3 mode: b8 ~ b11 CH4 mode: b12 ~ b15 Take setting up (b3, b2, b1, b0) of CH1 for example (Default = H'0000): 1. (0, 0, 0, 0): PT100 2. (0, 0, 0, 1): NI100 3. (0, 0, 1, 0): PT1000 4. (0, 0, 1, 1): NI1000 5. (0, 1, 0, 0): 0 to 300Ω 6. (0, 1, 0, 1): 0 to 3,000Ω 7. (1, 1, 1, 1): Disabled
#2	O	R/W	CH1 average time	Range of settings in CH1 to CH4: K1 to K100. Default = K10. Please note that the average times set in CR#2 to CR#5 can only be written in once.
#3	O	R/W	CH2 average time	
#4	O	R/W	CH3 average time	
#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 to CR#9 are the average Celsius temperatures measured at CH1 to CH4 obtained from the average time settings in CR#2 ~ CR#5.				

#12	X	R	Average °F temp. measured at CH1	Average Fahrenheit temperature measured at CH1 ~ CH4. Unit: 0.1°F
#13	X	R	Average °F temp. measured at CH2	
#14	X	R	Average °F temp. measured at CH3	
#15	X	R	Average °F temp. measured at CH4	

CR#12 to CR#15 are the average Fahrenheit temperatures measured at CH1 to CH4 obtained from the average time settings in CR#2 to CR#5.

CR#	Attrib.		Content	Explanation
#18	X	R	Present °C temp. measured at CH1	Present Celsius temperature measured at CH1 ~ CH4. Unit: 0.1°C
#19	X	R	Present °C temp. measured at CH2	
#20	X	R	Present °C temp. measured at CH3	
#21	X	R	Present °C temp. measured at CH4	
#24	X	R	Present °F temp. measured at CH1	Present Fahrenheit temperature measured at CH1 ~ CH4. Unit: 0.1°F
#25	X	R	Present °F temp. measured at CH2	
#26	X	R	Present °F temp. measured at CH3	
#27	X	R	Present °F temp. measured at CH4	
#30	X	R	Error status	Register for storing all error statuses. See the table of error status for more information.
#31	O	R/W	Communication address	The RS-485 communication addresses. Range: 01 to 254, Default = K1.

#32	O	R/W	Communication format	6 communication speeds: 4,800 bps /9,600 bps /19,200 bps / 38,400 bps /57,600 bps /115,200 bps. Data formats 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 more details.
#33	O	R/W	Returning to default setting	Take the setting of CH1 for example: b0: Reserved, b1: Reserved When b2 is set to 1, all settings will return to default ones. Definitions of ERR LED: (Default of b12 to b15 = 1111) 1. When b12 = 1 and CH1 wired to empty external contact, ERR LED will flash. 2. When b13 = 1 and CH2 wired to empty external contact, ERR LED will flash. 3. When b14 = 1 and CH3 wired to empty external contact, ERR LED will flash. 4. When b15 = 1 and CH2 wired 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: O: Latched, X: Non-latched R: Able to read data by using FROM instruction or RS-485 communication. W: Able to write data by using TO instruction or RS-485 communication.				

❀Reset Module (Firmware V4.06 or above): Having connected the external power 24V, write the reset code H'4352 for CR#0, then disconnect and reboot to complete the setup.

❀CR#32 Communication Format Setting:

– Firmware V4.04 (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 V4.05 (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 Ex change 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 addresses H'4064 ~ H'4086 are for users to read/write data by RS-485 communication. When using RS-485, you have to first separate the module from the PLC MPU.

1. Function: H'03 (read register data); H'06 (write 1 word datum into register); H'10 (write many word data into register).
2. The latched CR should be written by RS-485 communication to stay latched. The 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

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
Wired to empty external contact	K2 (H'2)		0	0	0	0	0	0	0	0	0	0	1	0
Incorrect mode setting	K4 (H'4)		0	0	0	0	0	0	0	0	0	1	0	0
OFFSET/GAIN error	K8 (H'8)		0	0	0	0	0	0	0	0	1	0	0	0
Memory self-test fail	K16 (H'10)		0	0	0	0	0	0	0	1	0	0	0	0
Abnormal digital range	K32 (H'20)		0	0	0	0	0	0	1	0	0	0	0	0
Incorrect average times setting	K64 (H'40)	Reserved	0	0	0	0	0	1	0	0	0	0	0	0
Instruction error	K128 (H'80)		0	0	0	0	1	0	0	0	0	0	0	0
CH1 wired to empty external contact	K256 (H'100)		0	0	0	1	0	0	0	0	0	0	0	0
CH2 wired to empty external contact	K512 (H'200)		0	0	1	0	0	0	0	0	0	0	0	0
CH3 wired to empty external contact	K1024 (H'400)		0	1	0	0	0	0	0	0	0	0	0	0
CH4 wired 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		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	Range: K1 to K30, Unit: 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 value	Range: K-32,760 to K32,760 Default = K0.
#57	#77	#97	#117	O	R/W	Lower limit of I value	Range: K-32,760 to K32,760 Default = K0.
#58	#78	#98	#118	X	R	I value	Current accumulated offset value. Default = 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 output	Range: K-32,760 to K32,760 Default = K4,000.
#61	#81	#101	#121	O	R/W	Lower limit of output	Range: K-32,760 to K32,760 Default = K0. .
#62	#82	#102	#122	X	R	Output percentage	Range: K0 to K1,000, Unit: 0.1%. Default = K0.
#63	#83	#103	#123	X	R	Output width	Width of control output, Unit: ms. Default = K0.
#64	#84	#104	#124	X	R	Output cycle	Cycle of control output, Unit: ms. Default = 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 Value Curve

Temperature Measurement Mode (°C/°F):

Digital output
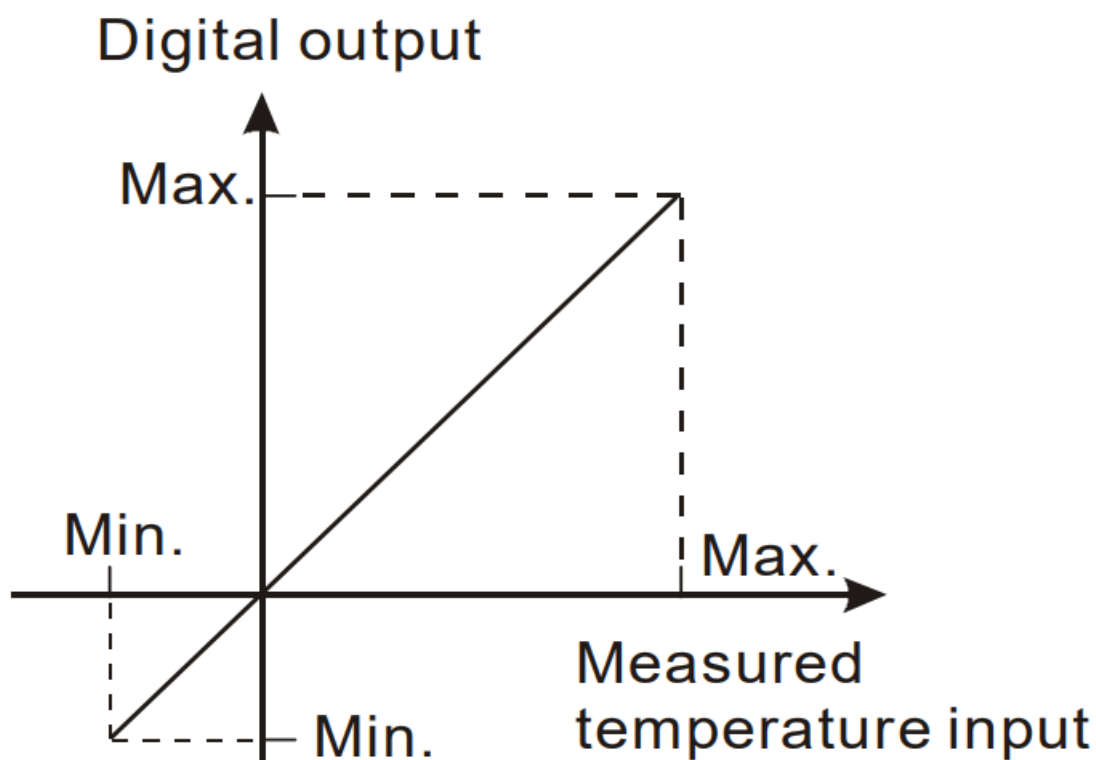
Thermo co uple	Range of input temperature		Range of digital conversion	
	°C (Min. / Max.)	°F (Min. / Max.)	°C (Min. / Max.)	°F (Min. / Max.)
PT100	-180 to 800°C	-292 to 1,472°F	K-1,800 to K8,000	K-2,920 to K14,720
NI100	-80 to 170°C	-112 to 338°F	K-800 to K1,700	K-1,120 to K3,380
PT1000	-180 to 800°C	-292 to 1,472°F	K-1,800 to K8,000	K-2,920 to K14,720
NI1000	-80 to 170°C	-112 to 338°F	K-800 to K1,700	K-1,120 to K3,380
300 Ω	0 to 300 Ω		K0 to K30,000	
3k Ω	0 to 3,000 Ω		K0 to K30,000	

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Documents / Resources

DELTA DVP04PT-H2 Temperature Measurement Module [pdf] Instruction Manual
DVP04PT-H2 Temperature Measurement Module, DVP04PT-H2, Temperature Measurement Module, Measurement Module, Module