2013/10/03

DTV Series Valve Temperature Controller

Instruction Sheet

Thank you very much for choosing Delta DTV series valve temperature controller. Please read this instruction sheet before using your DTV to ensure proper operation. Keep this instruction handy for quick reference.

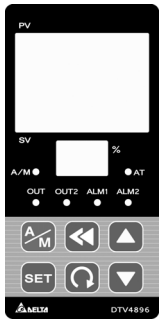
■ Warning

⚠ **DANGER! CAUTION! ELECTRIC SHOCK!** When the power is on, DO NOT touch the AC terminals in case an electric shock may occur. Make sure the power is disconnected when you check the input power.

⚠ DTV is an OPEN-TYPE device. If it will cause serious injury to workers or damage on other equipments when used in a dangerous environment, please make sure it is installed in an automatic safety protection device.

1. Always use recommended solder-less terminals: Fork terminal with isolation (M3 screw, Max. width 7.2mm). Please be sure to tighten them properly and make sure the wire is connected to the correct terminal.
2. Prevent dust or metallic debris from falling into the device and cause malfunction. DO NOT modify or uninstall DTV series without being permitted. DO NOT use empty terminals.
3. Keep away from high-voltage and high-frequency environment during installation in case of interference. Prevent using DTV in premises which contain: (a) dust or corrosive gas; (b) high humidity and high radiation; (c) shock and vibration
4. The power has to be switched off when wiring or changing temperature sensor.
5. Make sure to use compensation wire which matches the thermocouple when extending or connecting the thermocouple wire.
6. Use wires with resistance when extending or connecting the platinum resistance sensor.
7. Keep the wire as short as possible when wiring a sensor to the temperature controller. Separate the power cable and load wire in order to prevent interference and induced noise.
8. DTV is an open-type device. Make sure to install it in an enclosure which prevents dust and humidity in case of an electric shock.
9. Make sure the power cables and signal device are installed correctly before switching on the power; otherwise serious damage may occur.
10. DO NOT touch the terminals or repair the device when the power is on; otherwise an electric shock may occur.
11. Please wait for one minute after the power is switched off to allow the capacitor to discharge. DO NOT touch the internal wiring within this period.
12. DO use dry cloth and DONOT use acid or alkaline liquid to clean the device.

■ Display, LED & Pushbuttons



PV: Present value
SV: Set value
%: Output percentage
AT: Auto-tuning indicator
A/M: Manual control indicator
OUT1/OUT2: Output indicator
ALM1/ALM2: Alarm output indicator
A/M Manual/auto mode switch key
SET Selection/setup key
Switching page key
Left-shifting the digit
Adjusting numbers

■ Ordering Information

DTV 1 2 3 4 5

Series name	DTV: Delta V series valve temperature controller
1 2 3 4 Panel size (W × H)	4896: 1/8 DIN W48 × H96 mm 9696: 1/4 DIN W96 × H96 mm
5	R: Valve, relay output SPST (250VAC, 5A)

■ Specifications

Power input	AC100 ~ 240V, 50/60Hz
Input power range	85% ~ 110%, rated voltage
Power consumption	Less than 5VA
Display	2-line, 7-segment LED, 4bits and 2 bits of valve openness display PV in red, SV and valve openness in green.
Input temperature sensor	Thermocouple: K, J, T, E, N, R, S, B, L, U, TXK
	Platinum resistance: Pt100, JPt100
	Analog input: 0 ~ 5V, 0 ~ 10V, 0 ~ 20mA, 4 ~ 20mA, 0 ~ 50mA
Control method	PID, PID programmable control, manual, On/Off
Control output type	Relay output: SPST, Max. load 250V, 5A resistive load
Display scale	1 digit after the decimal point, or no decimal point
Sampling cycle	Analog input: 0.15 sec; thermocouple/platinum resistance: 0.4 sec
Vibration resistance	10 ~ 55Hz 10m/s^2 3 axes 10 min.
Shock resistance	Max. 300m/s^2 3 axes 6 directions, 3 times each
Ambient temperature	0°C ~ +50°C
Storage temperature	-20°C ~ +65°C
Operation altitude	Less than 2,000m
Ambient humidity	35% ~ 80% RH (non-condensing)

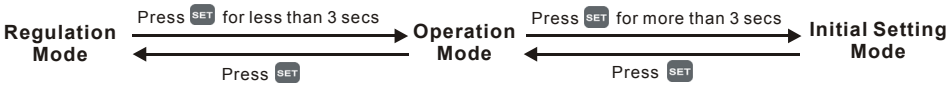
■ Setting up Parameters

Switching Modes: DTV is in the operation mode when the power is switched on, displaying PV and SV. Press SET for more than 3 seconds to enter the initial setting mode. Press SET for less than 3 seconds in the operation mode to enter the regulation mode. Press SET once in the regulation or initial setting mode to return to the operation mode.

Selecting parameters: In the operation, regulation or initial setting mode, press ↺ to select parameters for setup.

Setting up number parameters: Find the parameters to be set up or modified. Use ▲ ▼ to modify the settings. Press ◀ to move to the desired digit to be modified and the digit will flash. Press SET to complete and save the setting.

Setting up non-number parameters: Find the parameter to be set up or modified and use ▲ ▼ to modify the setting. The parameter will flash at this time. Press SET to complete and save the setting.



Regulation Mode	Operation Mode	Initial Setting Mode
AT Auto-tuning (Set up when in PID control and RUN) Press ↺ ▽	1234 Use ▲ ▼ to set up SV Press ↺ ▽	InPt Set up input type Press ↺ ▽
Pidn Select the PID group (0 ~ 4) (4 groups of PID are available in PID control. n = 4: PID is auto-selected. See the next table.) Press ↺ ▽	r-S Control loop RUN/STOP Press ↺ ▽	tPUn Set up temperature unit (Not displayed when in analog input mode) Press ↺ ▽
Pdof PD control offset Press ↺ ▽	PoUt Adjust valve openness (Displayed when control loop is set to STOP) Press ↺ ▽	tP-H Upper limit for the temperature range Press ↺ ▽
HtS Heating hysteresis setting (Set up when in On/Off control) Press ↺ ▽	Ptrn Start setting up patterns (Set up when in PID programmable control mode) Press ↺ ▽	tP-L Lower limit for the temperature range Press ↺ ▽
CtS Cooling hysteresis setting (Set up when in On/Off control) Press ↺ ▽	SP Set up the position of decimal point (Not for thermocouple B, R, S type) Press ↺ ▽	Ctrl Select control mode (Enter step editing when PID programmable control is selected. See the next table) Press ↺ ▽
HtPd/CtPd Heating/cooling control cycle Press ↺ ▽	AL1H Upper limit for alarm 1 (Adjustable when ALA1 is enabled) Press ↺ ▽	S-HC Select heating or cooling Press ↺ ▽
u-Fb Switch for valve feedback setting Press ↺ ▽	AL1L Lower limit for alarm 1 (Adjustable when ALA1 is enabled) Press ↺ ▽	ALA1 Set up alarm mode 1 Press ↺ ▽
u-At Auto adjusting feedback value (Displayed when in valve feedback mode and STOP) Press ↺ ▽	AL2H Upper limit for alarm 2 (Adjustable when ALA2 is enabled) Press ↺ ▽	ALA2 Set up alarm mode 2 Press ↺ ▽
uAtr Time from valve fully closed to fully open Press ↺ ▽	AL2L Lower limit for alarm 2 (Adjustable when ALA2 is enabled) Press ↺ ▽	SALA Set up system alarm Press ↺ ▽
u-dE Valve DeadBand Setting Press ↺ ▽	Loc Key-locked mode Press ↺ ▽	SLoP Set up rising/descending slope (Displayed when control mode is set in slope control) Press ↺ ▽
u-Hi Upper limit adjusting with feedback output (Displayed when in valve feedback mode) Press ↺ ▽	oUt Displaying and adjusting output percentage (Displayed when in PID mode and manual RUN) Press ↺ ▽	CoSH Enable/disable communication write-in Press ↺ ▽
u-Lo Lower limit adjusting with feedback output (Displayed when in valve feedback mode) Press ↺ ▽	FoUt Output percentage of valve feedback (Displayed when there is valve feedback) Press ↺ ▽	C-SL Select ASCII/RTU communication format Press ↺ ▽
tPoF Adjusting PV offset Press ↺ ▽	uP D/A value of valve feedback (Displayed when there is valve feedback) Press ↺ ▷ Back to top	C-no Set up communication address Press ↺ ▽
oHAy Upper limit for control output Press ↺ ▽		bPS Set up baud rate Press ↺ ▽
oLCn Lower limit for control output Press ↺ ▽		LEn Set up data length Press ↺ ▽
FLFt Filter factor input Press ↺ ▽		StoP Set up stop bit Press ↺ ▷ Back to top

FLrb Filter input range Press ↺ ▽		
uLFt Feedback filter factor input (Displayed when provided with valve feedback) Press ↺ ▷ Back to top		

Select the PID group: The user can select one of the 4 groups. When n = 4, the program will automatically select the PID group that is the closest to the SV.

Regulation Mode	Operation Mode	Initial Setting Mode
Pidn Select the PID group (n = 0~4) Press ↺ ▷ PID group 0 ~ 3	Sv0 Set up the temperature SV for PID group 0 Press ↺ ▽	Sv3 Set up the temperature SV for PID group 3 Press ↺ ▽
	P0 Set up the proportion band for PID group 0 Press ↺ ▽	P3 Set up the proportion band for PID group 3 Press ↺ ▽
	I0 Set up the Ti value for PID group 0 Press ↺ ▽	I3 Set up the Ti value for PID group 3 Press ↺ ▽
	d0 Set up the Td value for PID group 0 Press ↺ ▽	d3 Set up the Td value for PID group 3 Press ↺ ▽
	toF0 Set up the integration offset for PID group 0, AT auto-setting Pres ↺ ▷ PD control offset	toF3 Set up the integration offset for PID group 3, AT auto-setting Press ↺ ▷ PD control offset

Editing patterns and steps: In parameter CtrL, select Pro6 for editing. Take pattern 0 for example:

Regulation Mode	Operation Mode	Initial Setting Mode
PAtn Select the pattern No. to be edited Select No. ▷ Press ↺ ▽ Select OFF	SP00 Edit the temperature in step 0 Press ↺ ▽	PSt0 Select the actual number of steps in the program Press ↺ ▽
Leave pattern and step editing ▽ Continue the setup in S-Hd	tI00 Edit the time for step 0 (unit: hour/minute) Press ↺ ▽	CyC0 Set up the number of additional cycles (0 ~ 99) Press ↺ ▽
	Set up from step 0 ~ step 7 in order	tLn0 Set up the link pattern. OFF = end of program Press ↺ ▽
	SP07 Edit the temperature in step 7 Press ↺ ▽	Return to “select the pattern No. to be edited”
	tI07 Edit the time for step 7 (unit: hour/minute) Press ↺ ▽ Following the actual number of steps	

■ Output Control

DTV offers heating and cooling outputs.

In parameter S-Hd, you can select either to operate heating control or cooling control. Select HEAt for heating output and CooL for cooling output.

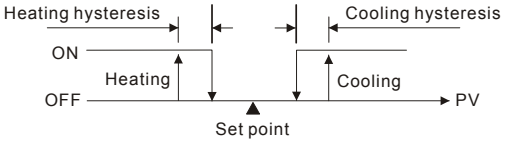


Figure 1: Output operation when in On/Off control

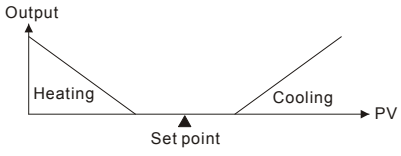


Figure 2: PID control

Key-locked Function LoC

LoC1: Lock all the keys on the panel.

LoC2: Only SV can be modified.

LoC3: Only SV and auto/manual mode can be modified (The control mode has to be PID control).

Press SET and ↺ at the same time to unlock the keys.

■ Types of Temperature Sensors & Temperature Range

Input Sensor Type	Register Value	Display	Range
0 ~ 50mV analog input	17	0u	-999 ~ 9,999
4 ~ 20mA analog input	16	4A4	-999 ~ 9,999
0 ~ 20mA analog input	15	0A0	-999 ~ 9,999
0V ~ 10V analog input	14	u10	-999 ~ 9,999
0V ~ 5V analog input	13	u5	-999 ~ 9,999

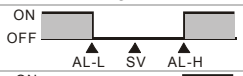
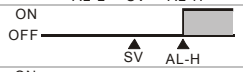
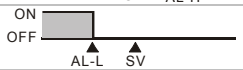
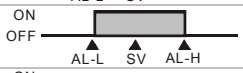
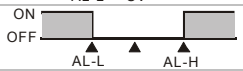
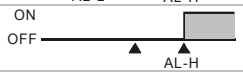
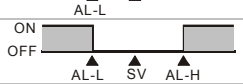
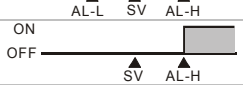
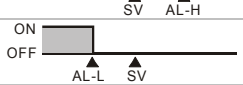
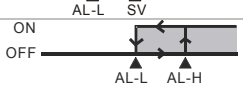
Platinum resistance (Pt100)	12	Pt	-200 ~ 600°C
Platinum resistance (JPt100)	11	JPt	-20 ~ 400°C
Thermocouple TXK type	10	txk	-200 ~ 800°C
Thermocouple U type	9	U	-200 ~ 500°C
Thermocouple L type	8	L	-200 ~ 850°C
Thermocouple B type	7	b	100 ~ 1,800°C
Thermocouple S type	6	S	0 ~ 1,700°C

Input Sensor Type	Register Value	Display	Range
Thermocouple R type	5	r	0 ~ 1,700°C
Thermocouple N type	4	n	-200 ~ 1,300°C
Thermocouple E type	3	E	0 ~ 600°C
Thermocouple T type	2	t	-200 ~ 400°C
Thermocouple J type	1	J	-100 ~ 1,200°C
Thermocouple K type	0	K	-200 ~ 1,300°C

Note 1: The current input is built-in with a 249Ω precision resistor. See “How to Set up Current Input” section.
Note 2: The default setting is Pt100 input.
Note 3: To display the decimal point, you have to set up the parameter SP (in the operation mode). The decimal point display is available for all modes except for thermocouple B, R, and S type.
Note 4: The range for analog input is -999 ~ 9,999. Take 0 ~ 20mA for example, -999 refers to 0mA input and 9,999 refers to 20mA input. If we change the range into 0 ~ 2,000, 0 will thus refer to 0mA input and 2,000 refers to 20mA input (1 display scale = 0.01mA).

■ Alarm Output

DTV offers 2 groups of alarm outputs and 17 modes for each group under the initial setting mode. When the PV exceeds or falls below SV, the alarm output will be enabled. See the table below for the 17 alarm output modes.

Mode	Alarm Type	Alarm Output Operation
0	No alarm	Off
1	Alarm output is enabled when the temperature reaches upper and lower limits. Alarm will be enabled when the PV exceeds SV + AL-H or falls below SV - AL-L.	
2	Alarm output will be enabled when the temperature reaches the upper limit. Alarm will be enabled when the PV exceeds SV + AL-H.	
3	Alarm output is enabled when the temperature reaches the lower limit. Alarm will be enabled when the PV falls below SV – AL-L.	
4	Alarm output will be enabled when the PV is between SV + AL-H and SV – AL-L.	
5	Alarm output is enabled when the temperature reaches the absolute value of the upper and lower limits. Alarm will be enabled when the PV exceeds AL-H or falls below AL-L.	
6	Alarm output is enabled when the temperature reaches the absolute value of the upper limit. Alarm will be enabled when the PV exceeds AL-H.	
7	Alarm output is enabled when the temperature reaches the absolute value of the lower limit. Alarm will be enabled when the PV falls below AL-L.	
8	Standby upper/lower limit alarm: Alarm will be enabled when the PV reaches SV and exceeds SV + AL-H or falls below SV – AL-L.	
9	Upper limit standby alarm: Alarm will be enabled when the PV reaches SV and exceeds SV + AL-H.	
10	Lower limit standby alarm: Alarm will be enabled when the PV reaches SV and falls below SV – AL-L.	
11	Upper limit hysteresis alarm: Alarm will be enabled when the PV exceeds SV + AL-H. Alarm will be disabled when the PV falls below SV + AL-L.	
12	Lower limit hysteresis alarm: Alarm will be enabled when the PV falls below SV – AL-H. Alarm will be disabled when the PV exceeds SV – AL-L.	
14	Programmable STOP: Alarm will be enabled when the program is in STOP status.	
15	Programmable RAMP UP: Alarm will be enabled when the program is in RAMP UP status.	
16	Programmable RAMP DOWN: Alarm will be enabled when the program is in RAMP DOWN status.	
17	Programmable SOAK: Alarm will be enabled when the program is in SOAK status.	
18	Programmable RUN: Alarm will be enabled when the program is in RUN status.	
19	Enabled when the feedback failed and any feedback signals are provided (displayed when feedback signals are set)	

Note: AL-H and AL-L include AL1H, AL2H and AL1L, AL2L. There is no mode 13 (reserved for CT function).

PID Programmable Control

Functions and Parameter Setting:
The PID programmable control includes 8 patterns (Pattern 0 ~ 7). Each pattern contains 8 steps (Step 0 ~ 7) and parameters: link pattern, cycle and the number of steps.

Start Pattern Ptrn**:** This parameter can be set in the operation mode. The user can set up which pattern is the start pattern for the programmable control. This function is only available when the program is in STOP status.

Step: Includes the settings of the two parameters, set point X and execution time T, indicating that the set point (SV) has to rise to temperature X after the period of execution time T. If the result of the set point X is the same as that of the previous setting, the process is called Soak; otherwise, it is called Ramp. Therefore, the programmable control is also known as Ramp/Soak control.
The default setting of the first step program is Soak control. The temperature will first rise to the set point X and remain at X. The total execution time is T.

Link Pattern: For example, if the parameter LinK is set as 2, it refers to the execution of pattern 2 will follow the execution of pattern 0. If the link pattern is set as oFF, it refers to the program will end after the execution of the pattern is completed and the temperature will remain at the SV for the last step.

Cycle: The additional number of cycles for a pattern. For example, if the parameter CyC4 is set as 2, it refers to pattern 4 has to execute twice additionally, totaling the executions to 3 times including the original one.

The Number of Steps: The number of steps in each pattern (range: 0 ~ 7). For example, if the parameter PSy7 is set as 2, it refers to pattern 7 will execute step 0 ~ step 2 and other steps will not be executed.

The Execution:

1. When the parameter r-S is set as run, the program will start its execution from step 0 of the start pattern.
2. When the parameter r-S is set as, CLoS the program will stop and the control output will be disabled.
3. When the parameter r-S is set as PStP, the program will stop and the temperature will stop at the SV before the program stops. When you select run again, the program will execute again from step 0 of the start pattern.
4. When the parameter r-S is set as PAod, the program will stop and the temperature will stop at the SV before the program stops. When you select run again, the program will resume the step before the program stops and execute by the remaining time.

Display:
In PID programmable control, some SVs are re-set as P-XX. P refers to the current pattern and XX refers to the current step. Press ▲ ▼ to modify the display.
Select SP and press A/M. SV will display the target temperature for the current step.
Select r-tI and press A/M. SV will display the remaining time of the current step.

PID Control

In PID control, you can select any one of the 4 groups of PID parameter (P, I, D, IOF). After auto-tuning, the PID value and the temperature SV will be stored into the selected PID parameter.
Pid0 ~ Pid4**:** PIDn, n = 0 ~ 4. 0 ~ 3 are the corresponding selected PID parameter. Pid4 refers to auto-selected PID and the program will automatically select a most useful PID parameter based on the current SV. SV displays will be Su0 ~ Su3 corresponding to n = 0 ~ 3.
Su0 ~ Su3**:** The SV for the selected PID parameter, can be set by the user or auto-generated by auto-tuning.

Valve Control

Heaters and coolers can be used to control the temperature and the openness of the valve in order to control the flow of the medium. Current and voltage can control the openness of the valve; however, the most direct and economic way to control the openness of the valve is the relay. To control the valve by voltage and current, you can use the DTB series analog output controller. If you tend to use relay for the control output, you have to choose the valve function in DTV series. The two control outputs are relay output for the forward/reverse running of the motor to drive the opening and closing of the valve. Control output1 controls the opening of the valve and control output 2 controls the closing of the valve in order to adjust the position of the valve. In order to detect the position of the valve, DTV is able to receive “feedback signal” and “no feedback signal”. When there is no feedback signal and the valve is fully open, control output 1 will output continuously. If at the moment the valve is fully closed, control output 2 will output continuously. If the valve you use is with feedback output, you can connect the output of the valve to the feedback part of DTV and set u-Fb to On to precisely control the openness of the valve. If there is no feedback signal or the feedback signal is incorrect, and the pre-set openness of the valve is not reached after twice as long as the time set in the parameter uAtr, the program will automatically switch back to the no feedback state. To ensure the correctness of the valve control, please make sure that you have set up the parameters below:

uAtr**:** Time required from the valve fully closed to fully open. This parameter has to be correct when the valve is without feedback signal; otherwise, the accuracy for the temperature control will be affected. The PID control will correspond to the openness of the valve according to the setting of this parameter.

u-dB**:** DeadBand value of the valve. The parameter is to prevent frequent movement of the valve. For example, assume the DeadBand is 4%, PID control will correspond to the openness of the valve within 4% and the valve will not move within the range unless the value is accumulated and exceeds 4%. If the DeadBand value is too small and the valve is set to have feedback signals, moving back and forth of the valve will shorten the life of the valve motor.

u-Fb**:** With or without feedback signals.

When u-Fb is set as “On”, it refers to “with feedback signals” and the following parameters will be displayed.

a) u-At**:** Automatically adjusting the upper/lower limit of the valve feedback. This parameter will only be displayed when r-S is set as StoP. When this parameter is set as On, the relay will enable the forward and reverse running of the motor in order to calculate the time needed from the valve fully closed to fully open and the feedback signal of fully closed and open. The feedback signal is the hardware D/A value of the valve control, which is for the calculation of the valve controller.

b) u-HC**:** Upper limit of the valve signal. Set u-At as “On”, can be set automatically or manually.

c) u-Lo**:** Lower limit of the valve signal. Set u-At as ”On”, can be set automatically or manually.

Auto/Manual Mode Switch

A/M indicator On refers to manual mode; A/M indicator Off refers to auto mode. Besides On/Off, PID, programmable and manual controls, the valve control is also able to forcibly switch to manual control (fixing the openness of the valve, unit: % from valve fully closed to fully open) when in PID control mode. You simply need to press A/M in PID control mode to switch to manual mode and A/M indicator will be On. Press A/M again to return to PID control and A/M indicator will be Off.

■ Slope Control

Set the rising slope of temperature (unit: degree/minute) to control the rise or descent of temperature to the set value following to the given slope.
Select control mode CtrL and set to slope control, then proceed to set the rising slope SLoP.

■ Input Signal Filter

Noise can be screened by the filter function. The setting procedures are listed below.

Filter factor FiFt: This parameter should be set under the regulation mode. The default value is 8. When the value is greater, the filtering effect will be better but the response time will take longer.

Filter range FirG: This parameter should be set under the regulation mode. The default value is 5.0 (unit: degree). When the value is set to 5.0, it means the filter function will be enabled when the temperature variation is within 5.0 degrees. If the variation exceeds the set range, a new value of temperature will be set.

Filter factor for valve feedback uFiL: This parameter should be set under the regulation mode. The default value is 8. It will be displayed when there is a valve feedback.

■ Control Loop r-S: Close/Run/Hold

There are three statuses of control valves, as listed below.

Close CLoS: Force valves to close.

Run rUn: Open valves in certain degree according to the output value given by a corresponding control mode.

Hold HoLd: Maintain the current valve openness. Users can set the parameter PoUt for simulated valve openness adjustment for reference purposes for control. The adjustment will not change the valve openness. This function is normally used when there is no feedback signal.

■ Upper/Lower Limits of Valve Openness

Assume we would like the maximum openness of the valve to be 80% and the minimum to be 20%, set the parameter oAHy as 80 and oALo as 20, and the valve openness of PID control, programmable control and manual control will fall within this range.

■ RS-485 Communication

1. Supports transmission speed 2,400bps, 4,800bps, 9,600bps, 19,200bps and 38,400bps; does not support communication format 7, N, 1/8, E, 2/8, O, 2. Communication protocol: Modbus (ASCII or RTU). Function: 03H (able to read max. 8 words in the register), 06H (able to write 1 word into the register), 01H (able to read max. 16 bits of data), 05H (able to write 1 bit into the register).
2. Address and content of the data register.

Address	Content	Explanation
1000H	Present temperature value (PV)	Unit: 0.1 degree, updated every 0.4 second. The read values below indicate the occurrence of errors: 8002H: temperature not acquired yet 8003H: temperature sensor not connected 8004H: wrong sensor type 8006H: unable to acquire temperature, ADC input error 8007H: unable to read/write the memory
1001H	Set point (SV)	Unit: 0.1 degree
1002H	Upper limit of temperature range	The content shall not be bigger than the range.
1003H	Lower limit of temperature range	The content shall not be smaller than the range.
1004H	Input sensor type	See “Types of Temperature Sensors and Temperature Range" table.
1005H	Control method	0: PID; 1: On/Off; 2: manual control; 3: PID programmable control; 4: Slope control
1006H	Selecting heating/cooling control	0: heating; 1: cooling
1009H	Proportion band value	0.1 ~ 999.9
100AH	Ti value	0 ~ 9,999
100BH	Td value	0 ~ 9,999
100CH	Default integration value	0 ~ 100%, unit: 0.1%
100DH	Offset compensation value for proportional control (when Ti = 0)	0 ~ 100%, unit: 0.1%
1010H	SV of output hysteresis	0 ~ 9,999
1012H	Read/write of output percentage	Unit: 0.1%, only applicable in manual control mode
1014H	Upper limit regulation for analog linear output	1 scale = 2.8μA = 1.3mV
1015H	Lower limit regulation for analog linear output	1 scale = 2.8μA = 1.3mV
1016H	Temperature offset regulation value	-99.9 ~ +99.9, unit: 0.1
1017H	Analog decimal point setting	0 ~ 3
1018H	Time from valve fully closed to fully open	0.1 ~ 999.9
1019H	DeadBand setting of valve	0 ~ 100%, unit: 0.1%
101AH	Upper limit for valve feedback signal	0 ~ 1,024
101BH	Lower limit for valve feedback signal	0 ~ 1,024
101CH	PID group setting	0 ~ 4
101DH	SV for the corresponding PID setting	In valid range. Unit: 0.1
101EH	Upper limit for control output	Lower limit for control output ~ 100%, unit: 0.1%
101FH	Lower limit for control output	0 ~ Upper limit for control output, unit: 0.1%
1020H	Output mode for alarm 1	See “Alarm Output” section.
1021H	Output mode for alarm 2	See “Alarm Output” section.
1023H	System alarm setting	0: None (default); 1 ~ 2: Set alarm 1 ~ alarm 2
1024H	Upper limit for alarm 1	See “Alarm Output” section.

Address	Content	Explanation
1025H	Lower limit for alarm 1	See “Alarm Output” section.
1026H	Upper limit for alarm 2	See “Alarm Output” section.
1027H	Lower limit for alarm 2	See “Alarm Output” section.
102AH	Read/write LED status	b0: °F; b1: °C; b2: ALM2; b3: x; b4: OUT1; b5: OUT2; b6: AT; b7: ALM1
102BH	Read/write key status	b0: Set; b1: Select; b2: Up; b3: Down; 0 refers to push.
102CH	Panel lock status	0: normal; 1: lock all; 11: SV adjustable; 111: SV adjustable, A/M available
102FH	Software version	V1.00 refers to 0x100
1030H	No. of start pattern	0 ~ 7
1040H ~ 1047H	Number of steps in a pattern	0 ~ 7 = N refers to the pattern will be executed from step 0 to step N.
1050H ~ 1057H	Additional number of cycles for a pattern	0 ~ 99 refers to the pattern will be executed for 1 ~ 100 times.
1060H ~ 1067H	No. of the link pattern for the current pattern	0 ~ 8. 8 refers to end of the program; 0 ~ 7 refers to the next pattern No. following the current pattern.
2000H ~ 203FH	SV temperature for pattern0 ~ 7 SV for pattern 0 is set in 2000H ~ 2007H	-999 ~ 9,999
2080H ~ 20BFH	Execution time for pattern 0 ~ 7 Time for pattern 0 is set in 2080H ~ 2087H	0 ~ 900 (Every scale = 1 minute)

3. Address and content of the bit register (read bits are stored starting from LAB and written data is FF00H, set the bit as 1. 0000H sets the bit data as 0.)

0810H	Selecting communication write-in	Communication write-in forbidden: 0 (default), allowed: 1
0811H	Selecting temperature unit	0: °F; 1: °C/linear input (default)
0812H	Position of the decimal point	0 or 1. Available for all modes except for thermocouple type B, S, R.
0813H	Read/write auto-tuning (AT)	0: AT stops (default); 1: AT starts
0814H	RUN/STOP of the control	0: stop; 1: run (default)
0815H	Programmable control RUN/STOP	0: run (default); 1: stop
0816H	Programmable control RUN/PAUSE	0: run (default); 1: pause
0817H	Read/write valve feedback	0: without feedback (default); 1: with feedback
0818H	Read/write AT of valve feedback	0: AT stops (default); 1: AT starts

4. Communication transmission format: command 01: read bit, 05: write bit, 03: read word, 06: write word.

ASCII Mode

Read Command			Read Response Message			Write Command			Write Response Message		
Start word	’ : ’	’ : ’	Start word	’ : ’	’ : ’	Start word	’ : ’	’ : ’	Start word	’ : ’	’ : ’
Machine address 1	‘0’	‘0’	Machine address 1	‘0’	‘0’	Machine address 1	‘0’	‘0’	Machine address 1	‘0’	‘0’
Machine address 0	‘1’	‘1’	Machine address 0	‘1’	‘1’	Machine address 0	‘1’	‘1’	Machine address 0	‘1’	‘1’
Command 1	‘0’	‘0’	Command 1	‘0’	‘0’	Command 1	‘0’	‘0’	Command 1	‘0’	‘0’
Command 0	‘3’	‘1’	Command 0	‘3’	‘1’	Command 0	‘6’	‘5’	Command 0	‘6’	‘5’
Read start address of data/bit	‘1’	‘0’	Length of response data (byte)	‘0’	‘0’	Write data address	‘1’	‘0’	Write data address	‘1’	‘0’
	‘0’	‘8’		‘4’	‘2’		‘0’	‘8’		‘0’	‘8’
	‘0’	‘1’	Data content in 1000H/081xH	‘0’	‘1’		‘0’	‘1’		‘0’	‘1’
	‘0’	‘0’		‘1’	‘7’		‘1’	‘0’		‘1’	‘0’

Read Command			Read Response Message			Write Command			Write Response Message		
Read length of data/bit (word/bit)	‘0’	‘0’	Data content in 1000H/081xH	‘F’	‘0’	Write data content	‘0’	‘F’	Write data content	‘0’	‘F’
	‘0’	‘0’		‘4’	‘1’		‘3’	‘F’		‘3’	‘F’
	‘0’	‘0’	Data content in 1001H	‘0’			‘E’	‘0’		‘E’	‘0’
	‘2’	‘9’		‘0’			‘8’	‘0’		‘8’	‘0’
LRC1 check	‘E’	‘D’		‘0’		LRC1	‘F’	‘E’	LRC1	‘F’	‘E’
LRC0 check	‘A’	‘C’		‘0’		LRC 0	‘D’	‘3’	LRC 0	‘D’	‘3’
End word 1	CR	CR	LRC1 check	‘0’	‘E’	End word 1	CR	CR	End word 1	CR	CR
End word 0	LF	LF	LRC0 check	‘3’	‘3’	End word 0	LF	LF	End word 0	LF	LF
			End word 1	CR	CR						
			End word 0	LF	LF						

LRC check: Sum up from “machine address” to “data content”, e.g. 01H + 03H + 10H + 00H + 00H + 02H = 16H. Obtain 2’s complement EA.

RTU Mode

Read Command			Read Response Message			Write Command			Write Response Message		
Machine address	01H	01H	Machine address	01H	01H	Machine address	01H	01H	Machine address	01H	01H
Command	03H	01H	Command	03H	01H	Command	06H	05H	Command	06H	05H
Read start address of data	10H	08H	Length of response data (byte)	04H	02H	Write data address	10H	08H	Write data address	10H	08H
	00H	10H					01H	10H		01H	10H
Read length of data (bit/word)	00H	00H	Data content 1	01H	17H	Write data content	03H	FFH	Write data content	03H	FFH
	02H	09H		F4H	01H		20H	00H		20H	00H
CRC low byte	C0H	BBH	Data content 2	03H		CRC low byte	DDH	8FH	CRC low byte	DDH	8FH
CRC high byte	CBH	A9H		20H		CRC high byte	E2H	9FH	CRC high byte	E2H	9FH
			CRC low byte	BBH	77H						
			CRC high byte	15H	88H						

CRC (Cyclical Redundancy Check) is obtained by the following steps.

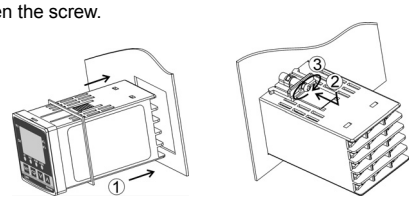
1. Load in a 16-bit register FFFFH as the CRC register.
2. Do an exclusive OR operation of the first byte of the data and low byte of CRC register, and place the operation result back to the CRC register.

3. Right shift the bits in the CRC register and fill the high bits with “0”. Check the removed lowest bit.
4. If the removed lowest bit is “0”, repeat step 3. Otherwise, do an exclusive OR operation of the CRC register and the value A001H and place the operation result back to the CRC register.
5. Repeat step 3 and 4 until the 8 bits (1 byte) are all right shifted.
6. Repeat step 2 and 5 and calcualte all the bits to obtain CRC check.

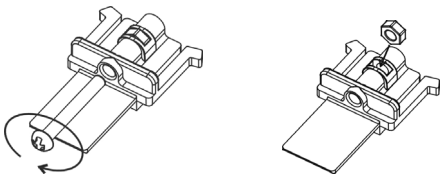
Please be aware of the high/low byte transmission order in the CRC register.

■ How to Mount

1. Insert DTV into the panel cutout
2. Insert the mounting bracket into the mounting groove at the top and bottom of DTV.
3. Push the mounting bracket forward until the bracket stops at the panel wall.
4. Tighten the screw.

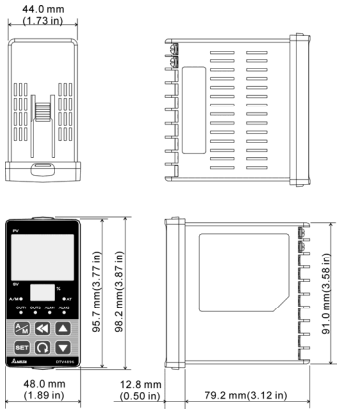


■ How to Install Mounting Bracket

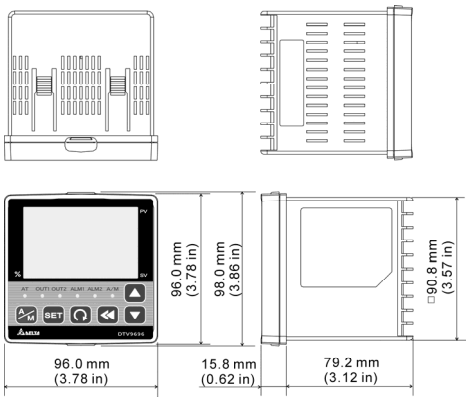


■ Dimensions

DTV4896

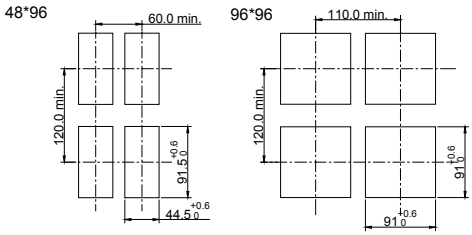


DTV9696



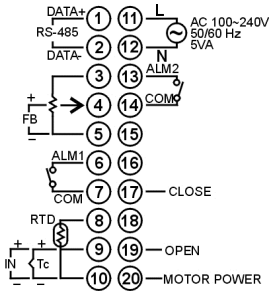
■ Panel Cutout

DTV4896/DTV9696



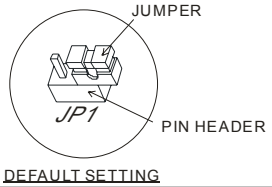
■ Terminals

DTV4896R/DTV9696R



■ How to Set up Current Input

For normal input (default)



DEFAULT SETTING

Current input (4 ~ 20mA, 0 ~ 20mA)