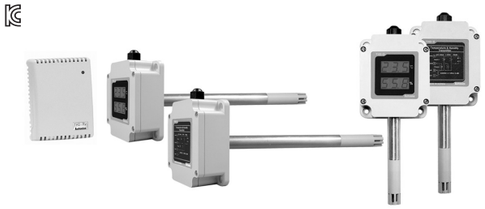
Autonics

Temperature/Humidity Transducer

THD SERIES

INSTRUCTION MANUAL



Thank you for choosing our Autonics product.

Please read the following safety considerations before use.

▣ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ **Warning** Failure to follow these instructions may result in serious injury or death.

⚠ **Caution** Failure to follow these instructions may result in personal injury or product damage.

⚠ Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
   Failure to follow this instruction may result in fire, personal injury, or economic loss.
2. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
3. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
4. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire.

⚠ Caution

1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
   Failure to follow this instruction may result in fire.
3. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in fire or explosion.
4. **Keep metal chip, dust, and wire residue from flowing into the unit.**
   Failure to follow this instruction may result in fire or product damage.

▣ Ordering Information

THD — D D 1 — C

Output	**PT**※	DPt100Ω resistance value (Temp.)
	PT/C※	DPt100Ω resistance value (Temp.) / Current output (Humidity)
	C	Current output (Temp./Humidity)
	V	Voltage output (Temp./Humidity)
	T	RS485 com. output (Temp /Humidity)
Length of sensor pole	**No-mark**※	Built in type
	1	100mm
	2	200mm
Display	**No-mark**	Non-display type
	D	Display type
Mounting	**R**	Room type (for indoor)
	D	Duct mounting type
	W	Wall mounting type
Item	**THD**	Temperaure Humidity Double

※It is only for THD-R.

▣ Specifications

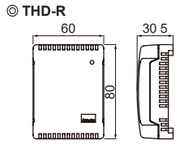
Model		THD-R-PT	THD-R-PT/C	THD-R-C THD-R-V THD-R-T	THD-D□-□ THD-W□-□	THD-DD□-□ THD-WD□-□
Power supply		—	24VDC⎓			
Permissible voltage range		—	90 to 110% of rated voltage			
Power consumption		—	Max. 2.4W			
Sensor type		Temperature sensor	Temperature/Humidity sensor			
Display type		Non-display				7Segment LED Display
Display digit		—				Each 3 digits for temp./humi.
Character size		—				W6.2×H10 0mm
Measuring range	Temp.	-19.9 to 60.0℃				
	Humidity	—	0 0 to 99 9%RH (THD-R is required to attend for using over 90%RH)			
Accuracy※1	Temp.	Max. ±0 8℃	±1℃ (at room temp.)			
	Humidity	—	±3%RH (30 to 70%RH, at room temp.), ±4%RH (10 to 90%RH)		Typ. ±2%RH (10 to 90%RH, at room temp.) ※Max. ±2.5%RH	
Output	Temp.	DPt100Ω resistance value (TCR: 3850ppm/℃)		DC4-20mA (allowable impedance: max. 600Ω), 1-5VDC⎓, RS485 communication (Modbus RTU)		
	Humidity	—	DC4-20mA (allowable impedance: max. 600Ω)			
Resolution		—	1/1000			
Sampling period		—	0 5 sec			
Insulation resistance		—	Min. 100MΩ (at 500VDC megger)			
Dielectric strength		—	500VAC 50/60Hz for 1 minute			
Noise resistance		—	±0.3kV the square wave noise (pulse width: 1μs) by the noise simulator			
Vibration	Mechanical	—	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour			
	Malfunction	—	0 5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 minutes			
Shock	Mechanical	—	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times			
	Malfunction	—	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times			
Protection		IP10			IP65 (except sensor part)	
Environment	Ambient temperature	-20 to 60℃, storage: -20 to 60℃				
Cable		—			Ø4mm, 4-wire, length: 2m (AWG22, Core diameter: 0.08mm, number of cores: 60, insulation out diameter: Ø1.25mm)	
Approval		CE (only for THD-□-T model)				
Weight※2		Approx. 98g (approx. 55g)			Approx. 415g (approx. 160g)	

※1: •Room temperature is 23℃±5℃.
• t may cause degree of degradation when the unit is exposed to organic chemicals such as alcohol gas or sulfuric acid.
•It may cause degree of degradation for humidity when using the unit at high temperature/humidity environment for a long time.
•It may cause error of humidity value when the unit is used at high humidity environment (over 80%RH) for a long time.
※2: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.

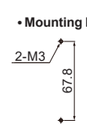
▣ Dimensions

(unit: mm)

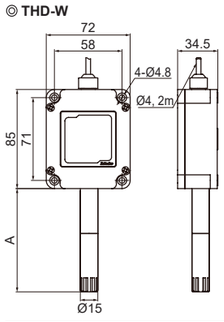
◎ **THD-R**



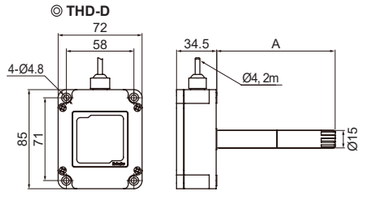
• **Mounting hole**



◎ **THD-W**

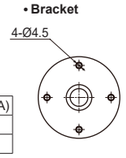


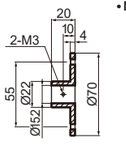
◎ **THD-D**



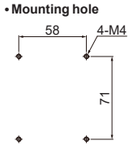
Model	Length of sensor pole (A)
THD-□1-□	100mm
THD-□2-□	200mm

• **Bracket**





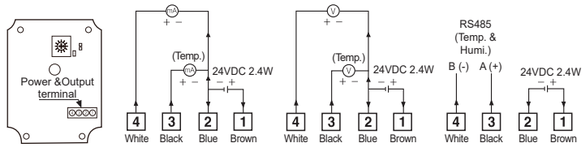
• **Mounting hole**



▣ Terminal Connection

◎ **THD-D/THD-W**

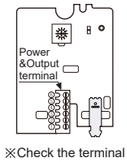
●**THD-D-C/ THD-W-C** DC4-20mA (Humi.)



●**THD-D-V/ THD-W-V** 1-5VDC (Humi.)

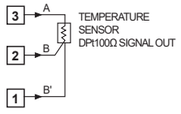
●**THD-D-T/ THD-W-T**

◎ **THD-R**

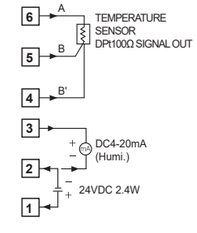


※Check the terminal connection diagram and be sure that when connecting the power.

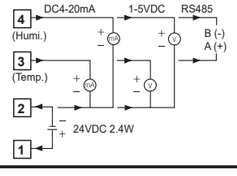
●**THD-R-PT**



●**THD-R-PT/C**



●**THD-R-C, V, T**

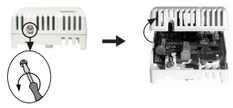


※**The above specifications are subject to change and some models may be discontinued without notice.**
※**Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).**

▣ Case Detachment

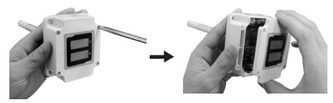
◎ **THD-R**

Unfasten the bolt on the bottom of the product, separate the case from it.



◎ **THD-D/THD-W**

Unfasten 4 bolts on the top of the product, separate the case cover from it.



▣ Current Output

It transmits current temperature/humidity to other devices (PC, recorder, etc.) and outputs DC4-20mA.
It outputs DC4mA at -19.9℃ of temperature and 0%RH of humidity, DC20mA at 60℃ of temperature and 99.9%RH of humidity. The temperature and humidity output are separated and the resolution is divisible by 1,000.

▣ Voltage Output

It transmits current temperature/humidity to other devices (PC, recorder, etc.) and outputs 1-5VDC.
It outputs 1VDC at -19.9℃ of temperature and 0%RH of humidity, 5VDC at 60℃ of temperature and 99.9%RH of humidity. The temperature and humidity output are separated and the resolution is divisible by 1,000.

▣ DPt 100Ω Resistance Value Output

It transmits current temperature to other devices (recorder, thermometer, etc.). t outputs 100Ω at 0℃ and 119.40Ω at 50℃. (Temperature coefficient (TCR)=3850ppm/℃)

▣ RS485 Communication Output

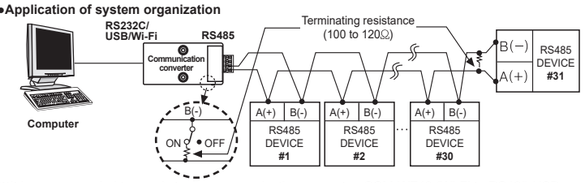
It is output transmit current temperature and humidity to other devices (PC, recorder, etc.) by communication.

●**Interface**

Comm. protocol	Modbus RTU
Connection type	RS485
Application standard	Compliance with EIA RS485
Max. connection	31 units (address: 01 to 31)
Synchronous method	Asynchronous
Comm. method	Two-wire half duplex
Comm. distance	Max. 800m
Comm. speed	1200 to 115200bps (selectable)
Start bit	1-bit (fixed)
Data bit	8-bit (fixed)
Parity bit	None (fixed)
Stop bit	1-bit (fixed)

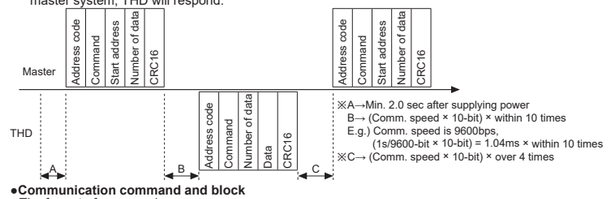
※It is not possible to change parameter related to communication of THD under the communication wth high order system.
(At communication status, THD and upper system are available to change the address.)
※Match the parameter of THD communication to be same as the high order system.
※It is not allowed to set overlapping communication address at the same communication line.

●**Application of system organization**



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485 USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

●**Ordering of communication control**
1. The communication method is Modbus RTU.
2. After 2.0 sec being supplied the power into master system, it is able to start communication.
3. The initial communication is started by master system. When a command comes out from the master system, THD will respond.



●**Communication command and block**
The format of query and response.
Query

Address code	Command	Start address	Number of data	CRC16

Calculation range of CRC16

①Address code: This address code is for identifying THD by master system and able to set within range of 01 to 31.
②Command: Read command for input register
③Start address: The start address of input register to read (start address). It is available to select 0000 and 0001 for start address. 16-bit data in the address 0000 indicates temperature value, 16-bit data in the address 0001 indicates humidity value. (refer to Modbus Mapping table.)
④Number of data: The number of 16-bit data from start address (no. of Points). When start address is 0000, it is available to read 2 of 16-bit data, or when start address is 0001, it is available to read 1 of 16-bit data.
⑤CRC16: Checksum for checking the whole frame and it is used for more reliable transmit/receive to check the error between transmitter and receiver.

Response

Address code	Command	Number of data	Temperature data	Humidity data	CRC16

Calculation range of CRC16

①Address code: This address code is for identifying THD by master system and able to set within range of 01 to 31.
②Command: A response for read command of input register
③Number of data: The number of 8-bit data to send from start address (no. of bytes). When start address is 0000, it is available to read 4 of 8-bit data, or when start address is 0001, it is available to read 2 of 8-bit data.
④Temperature data: This is the value of 16-bit. To get a current temperature value, divide read value by 100.
E g.)When read data is 0×09B0, decimal value is 2480, the current value is 2480/100=24.80℃.
⑤Humidity data: This is the value of 16-bit. To get a current humidity value, divide read value by 100.
E g.)When read data is 0×0B68, decimal value is 2920, the current value is 2920/100=29.20%RH.
⑥CRC16: Checksum for checking the whole frame.

●**Application for communication command**
(Query): Address code (01), Start address (0000), The number of 16-bit data to read (2), CRC16 (0×71CB)

01	04	00	00	00	02	71	CB
Address code	Command	Start address		Amount of data		CRC16	
		High	Low	High	Low	High	Low

(Response): Address code (01), The number of 8-bit data to read (4), Temperature (0×09B0), Humidity (0×0B68), CRC16 (0×94DE)

01	04	04	09	B0	0B	68	94	DE
Address code	Reponse command	Number of data	Temperature data		Humidity data		CRC16	
			High	Low	High	Low	High	Low

●**Error processing (Slave → Master)**
1. Not supported command

01	8X	01	XX	XX
Address code	Response command	Exception code	CRC16	

※Set a received the highest bit and send it to response command and exception code 01.
2. The start address of queried data is inconsistent with the transmittable address or the requested number of data is bigger than the transmittable address.

01	84	02	C2	C1
Address code	Response command	Exception code	CRC16	

※Set a received the highest bit and send it to response command and exception code 02.

●**Modbus Mapping Table**

Address	Item	Remark
30001 (0000)	Temperature value	Temperature value×0 01
30002 (0001)	Humidity value	Humidity value×0.01

●**Setting communication speed**
1. Turn off the power of the unit.
2. Set SW1 to 0 and supply the power.
3. Operation indicator LED is flashing.
4. Set a communication speed after choosing SW1 within the range 1 to 8, and hold it for 3 sec.
5. After setting a communication speed, the LED will be ON. At the moment turn OFF the power.

※Factory default communication speed is 9600bps.

<Setting table for communication speed>

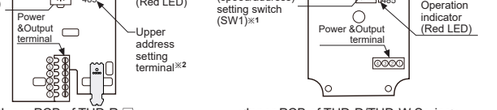
SW1	Comm. speed (bps)	SW1	Comm. speed (bps)
1	1200	5	19200
2	2400	6	38400
3	4800	7	57600
4	9600	8	115200

●**Setting communication address**
1. Set upper address setting terminal and setting switch (SW1) to the desired address and supply the power.
2. The communication address is changed automatically.

※Factory default communication address is 01.
(SW1: 1, Upper address setting terminal: OPEN)

<Setting table for address>

Upper address setting terminal	SW1	Address	Upper address setting terminal	SW1	Address	Upper address setting terminal	SW1	Address
OPEN	1	01	OPEN	D	13	SHORT	9	25
OPEN	2	02	OPEN	E	14	SHORT	A	26
OPEN	3	03	OPEN	F	15	SHORT	B	27
OPEN	4	04	SHORT	0	16	SHORT	C	28
OPEN	5	05	SHORT	1	17	SHORT	D	29
OPEN	6	06	SHORT	2	18	SHORT	E	30
OPEN	7	07	SHORT	3	19	SHORT	F	31
OPEN	8	08	SHORT	4	20			
OPEN	9	09	SHORT	5	21			
OPEN	A	10	SHORT	6	22			
OPEN	B	11	SHORT	7	23			
OPEN	C	12	SHORT	8	24			



<Inner PCB of THD-R-□> <Inner PCB of THD-D/THD-W Series>

※**1** Only when communication setting, remove the case cover and adjust communication setting switch to set address and communication speed.
※**2** Short terminal as upper address setting terminal, the lower address setting is available.

▣ Comprehensive Device Management Program [DAQMaster]

DAQMaster is comprehensive device management program. t is available for temperature and humidity monitoring.
For more information, please refer to the DAQMater user manual.

Item	Minimum specifications
System	IBM PC compatible computer with Pentium III or above
Operations	Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS232C serial port (9-pin), USB port

▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, t may cause unexpected accidents.
2. Keep away from high voltage lines or power lines to prevent inductive noise.
   In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
   Do not use near the equipment which generates strong magnetic force or high frequency noise.
3. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
4. 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
5. Do not overlapping communication line and power line.
   Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
6. Do not touch TDH-W/D sensor part at the bottom of the sensor pole by hands.
   It may cause malfunction.
7. THD-R must be installed on the wall.
   It may cause malfunction.
8. Make a required space around the unit for radiation of heat.
   For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
9. Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
10. Do not wire to terminals which are not used.
11. This unit may be used in the following environments.
    ①Indoors (in the environment condition rated in 'Specifications') ②Altitude max. 2,000m
    ③Pollution degree 2 ④Installation category II

▣ Major Products

■ Photoelectric Sensors
■ Fiber Optic Sensors
■ Door Sensors
■ Door Side Sensors
■ Area Sensors
■ Proximity Sensors
■ Pressure Sensors
■ Rotary Encoders
■ Connector/Sockets
■ Switching Mode Power Supplies
■ Control Switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper Motors/Drivers/Motion Controllers
■ Graphic/Logic Panels
■ Field Network Devices
■ Laser Marking System (Fiber, Co_2, Nd: yag)
■ Laser Welding/Cutting System
■ Temperature Controllers
■ Temperature/Humidity Transducers
■ SSRs/Power Controllers
■ Counters
■ Timers
■ Panel Meters
■ Tachometer/Pulse (Rate) Meters
■ Display Units
■ Sensor Controllers