# Temperature/Humidity Transducer

Indoor, Duct & Wall mounting type Temperature/Humidity transducer
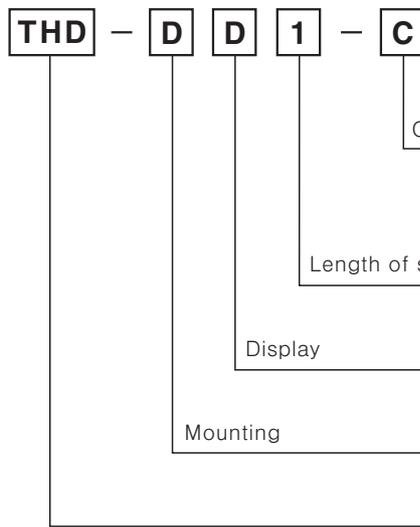
▣Features

- Compact design
- Built−in temp./humidity sensor
- 7 Segment LED Display (THD−DD/THD−WD)
- Various output modes
  DC4−20mA, 1−5VDC, RS485 (MODBUS RTU)
- Wide range of temp./humidity measurement
  −19.9 ~ 60.0℃ / 0.0 ~ 99.9%RH
- Communication speed : 115200bps

⚠ **Please read "Caution for your safety" in operation manual before using.**

THD-DD□

THD-WD□

THD-R

THD-D□

THD-W□

▣Ordering information

THD − D D 1 − C
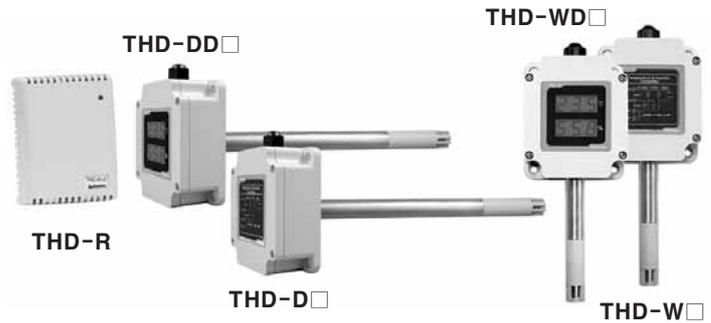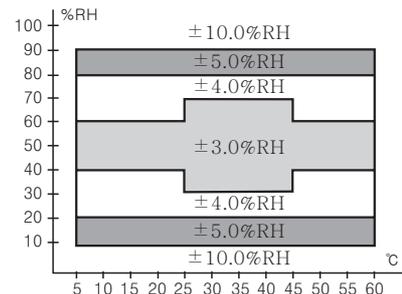
※	PT	Temperature sensor resistance value (PT100Ω)
※	PT/C	Temperature sensor resistance value (PT100Ω) / Current output (DC4−20mA)
Output	C	Current output (DC4−20mA)
	V	Voltage output (1−5VDC)
	T	RS485 communication output (MODBUS RTU)
	※	Built−in
Length of sensor pole	1	100mm
	2	200mm
Display		Non−Display
	D	Display
	R	Room (For indoor)
Mounting	D	Duct mounting
	W	Wall mounting
	THD	Temperature Humidity Double

※It is only for THD−R series.

▣Specifications

Model		THD−R−PT	THD−R−PT/C	THD−R−□	THD−D□−□ THD−W□−□	THD−DD□−□ THD−WD□−□
Display type		———	Non−indicating type			7Segment LED Display
Digit		———	———			3Digit for tempera−ture, humidity
Character size		———	———			10mm
Power supply		———	24VDC ±10%			
Power consumption		———	Max. 2.4W			
Measuring input		Temperature (Built−in sensor)	Temperature, Humidity (Built−in sensor)			
Output	Temp.	PT100Ω resistance value	●DC4−20mA ●1−5VDC ●RS485 (MODBUS RTU)			
	Humidity	———	DC4−20mA			
Measurement range	Temp.	−19.9~60.0℃				
	Humidity	———	0.0~99.9%RH (THD−R series is required to attend for using over 90%RH.)			
Accuracy	Temp.	Max. ±0.8℃	5.0~40.0℃ Max. ±0.5℃ (Max. ±1.0℃ for other term)			
	Humidity	———	Max. ±3%RH at 30~70%RH (at 25~45℃)			

%RH graph:
- ±10.0%RH
- ±5.0%RH
- ±4.0%RH
- ±3.0%RH
- ±4.0%RH
- ±5.0%RH
- ±10.0%RH

(vertical axis: 10 20 30 40 50 60 70 80 90 100 %RH; horizontal axis: 5 10 15 20 25 30 35 40 45 50 55 60 ℃)

THD Series

▣Specifications

Model	THD-R-PT	THD-R-PT/C	THD-R-☐	THD-D☐-☐ THD-W☐-☐	THD-DD☐-☐ THD-WD☐-☐
Sampling period	———				
Insulation resistance	———				
Dielectric strength	———				
Noise strength	———				

Model	THD-R-PT	THD-R-PT/C	THD-R-☐	THD-D☐-☐ / THD-W☐-☐	THD-DD☐-☐ / THD-WD☐-☐
Sampling period	———	Fixed 0.5sec			
Insulation resistance	———	Min. 100MΩ (500VDC mega)			
Dielectric strength	———	500VAC 50/60Hz for 1 minute			
Noise strength	———	±0.3kV the square wave noise (pulse width:1μs) by the noise simulator			
Vibration — Mechanical	———	0.75mm amplitude at frequency of 10~55Hz in each of X, Y, Z directions for 1hour			
Vibration — Malfunction	———	0.5mm amplitude at frequency of 10~55Hz in each of X, Y, Z directions for 10minutes			
Shock — Mechanical	———	300m/s² (30G) in X, Y, Z directions for 3 times			
Shock — Malfunction	———	100m/s² (10G) in X, Y, Z directions for 3 times			
Protection	IP10			IP65	
Ambient temperature	−20 ~ 50℃ (at non−freezing status)			0 ~ 60℃ (at non−freezing status)	
Storage temperature	−20 ~ 60℃ (at non−freezing status)				
Cable	Terminal type			4P, φ4mm, Length:2m	
Unit weight	Approx. 55g			Approx. 160g	

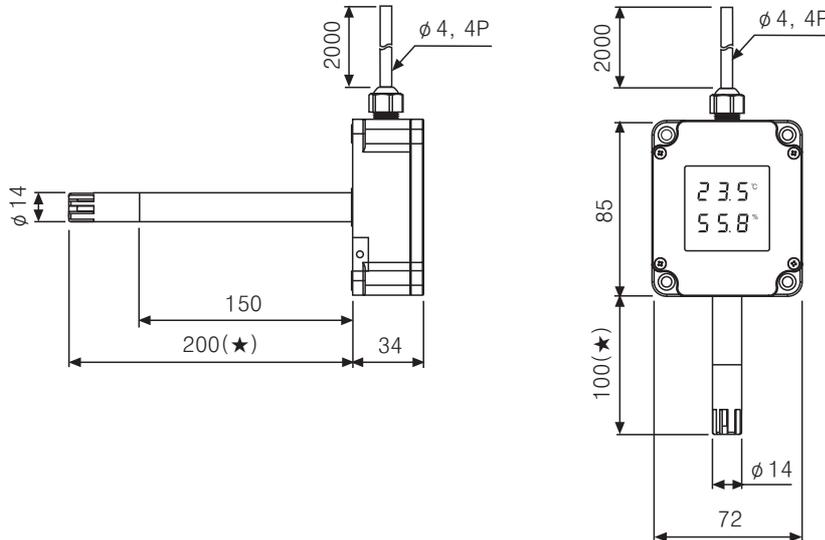※The allowable impedance of current output is max. 600Ω.

▣Dimensions

●THD-R-☐   ●THD-R-PT   ●THD-R-PT/C

(Unit:mm)
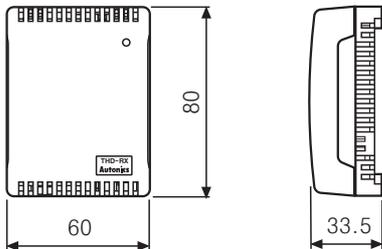
●THD-D☐-☐ / THD-DD☐-☐   ●THD-W☐-☐ / THD-WD☐-☐
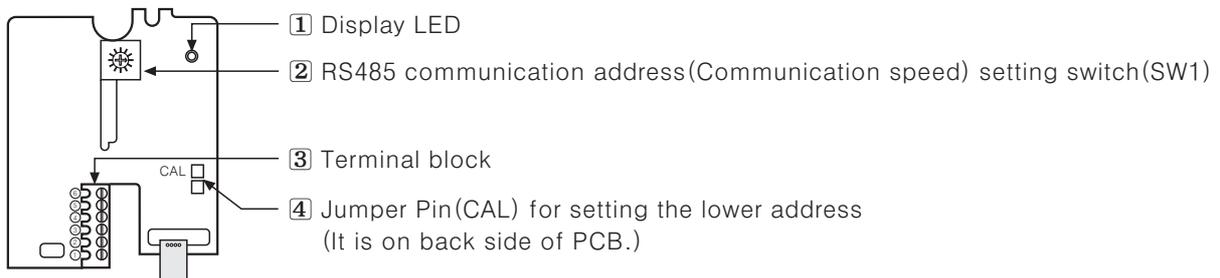

※(★) See the ordering information to select the one with 2 sensing poles.
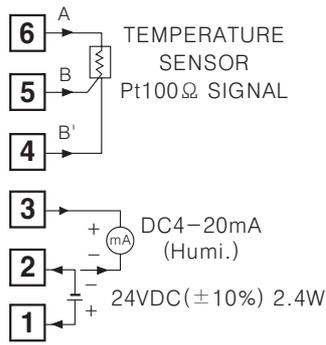※See the ordering information about display model, THD−DD☐−☐, THD−WD☐−☐.
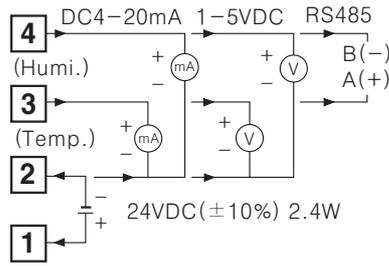
▣Connections

◎THD−R Series

1 Display LED

2 RS485 communication address (Communication speed) setting switch (SW1)

3 Terminal block

4 Jumper Pin (CAL) for setting the lower address
(It is on back side of PCB.)

Autonics

Temperature/Humidity Transducer

● **THD-R-PT/C**

6 — A
5 — B   TEMPERATURE SENSOR Pt100Ω SIGNAL
4 — B'

3 — + mA DC4−20mA (Humi.)
2 — −
1 — − +   24VDC(±10%) 2.4W

● **THD-R-C, V, T**

4 — DC4−20mA (Humi.)   + mA −
3 — (Temp.)   + mA −
2 —
1 — − +

1−5VDC   + V −   + V −

RS485   B(−) A(+)

24VDC(±10%) 2.4W

● **THD-R-PT**
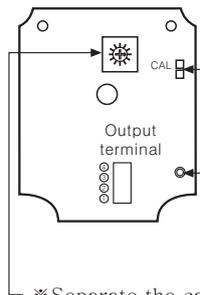
3 — A
2 — B   TEMPERATURE SENSOR Pt100Ω SIGNAL
1 — B'
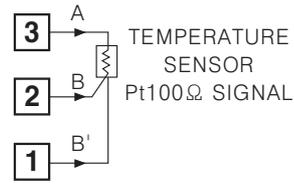
※Please note the terminal connection and be careful with power supply.

◎ THD-D / THD-W Series

※ CAL   Setting terminal for lower address

Output terminal   Operation LED
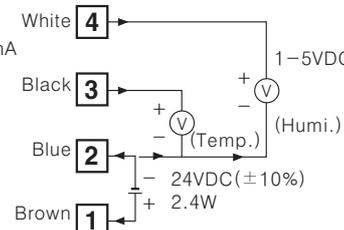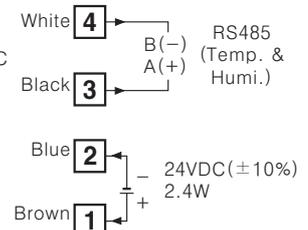
※Separate the case cover only in case of setting communication, set the unit code, communication speed using communication setting switch.

● Current output type

White — 4
Black — 3   + mA −
Blue — 2   −
Brown — 1   +

DC4−20mA   + mA − (Humi.)
(Temp.)
24VDC(±10%) 2.4W

● Voltage output type

White — 4
Black — 3   + V −
Blue — 2   −
Brown — 1   +

1−5VDC   + V − (Humi.)
(Temp.)
24VDC(±10%) 2.4W

● Communication output type

White — 4
Black — 3   B(−) A(+)   RS485 (Temp. & Humi.)
Blue — 2   −
Brown — 1   +
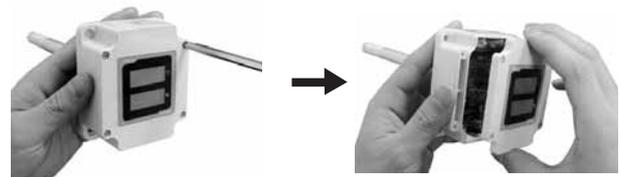
24VDC(±10%) 2.4W

■ Case detachment

● THD-R Series

Unscrew the bolt on the bottom of product and separate the case.
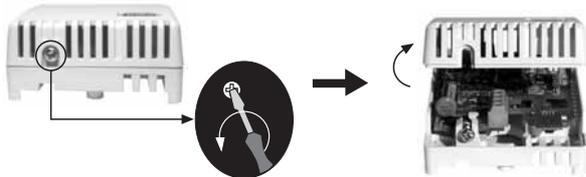
● THD-D / THD-W Series

Unscrew 4 bolts on the top of product and separate the case.

■ Functions

◎ Voltage output

It transmits current temperature/humidity to other equipments, PC or recorder and outputs 1−5VDC. 1VDC output represents −19.9℃ of temperature and 0.0% 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 divided as 1,000.

◎ Current output

It transmits current temperature/humidity to other equipments, PC or recorder and outputs DC4−20mA. It outputs DC4mA at −19.9℃ of temperature and 0.0%RH of humidity, DC20mA at 60.0℃ of temperature and 99.9%RH of humidity. The temperature and humidity output are separated and the resolution divisible by 1,000.

◎ Temperature sensor output(Pt 100Ω resistance value output)

It transmits current temperature/humidity to other equipments, recorder or thermometer. It outputs 100Ω at 0℃ and 119.40Ω at 50℃. (TCR=3850 ppm/℃)

THD Series

◎RS485 communication output

It is used to transmit current temperature and humidity to other equipment.

●Interface

| Standard	EIA RS485
Number of connections	31, It is available to set address 01~31
Communication method	Half Duplex
Synchronous method	Asynchronous type
Communication distance	Within max. 800m
Communication speed	1200 ~ 115200bps(Available to set)
Start bit	1bit(Fixed)
Stop bit	1bit(Fixed)
Parity bit	None(Fixed)
Data bit	8bit(Fixed)
Protocol	MODBUS RTU

※It is not possible to change parameter related to communication of THD under the communication with high order system.

※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.

※Please use a proper twist pair for RS485 communication.
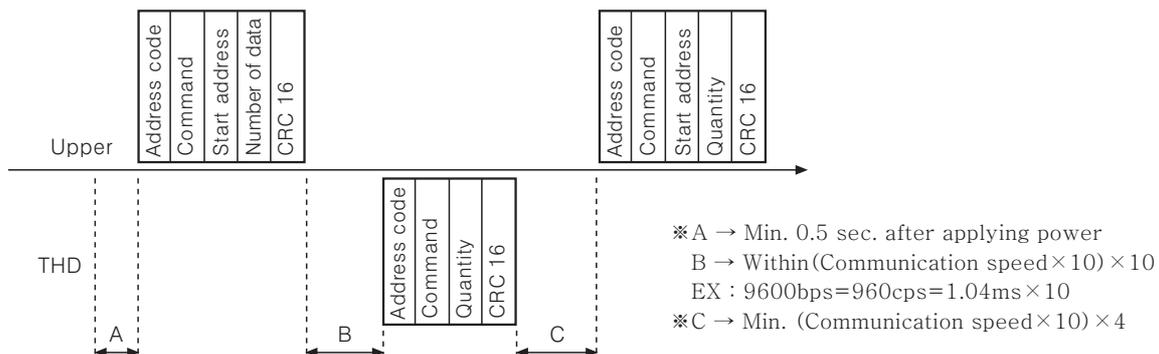
●Application of system organization
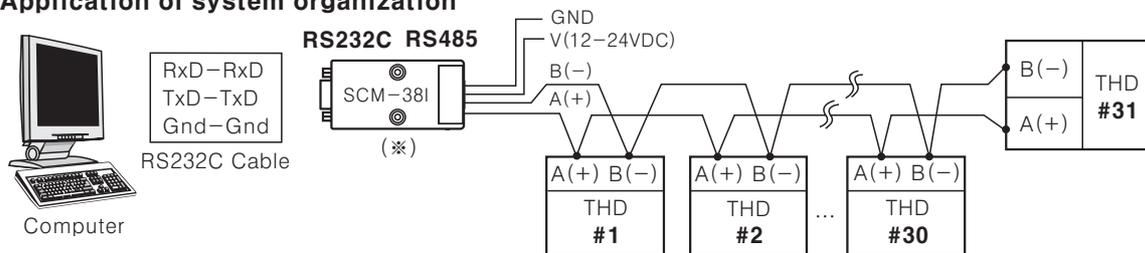
※SCM−38I made by Autonics is recommended to use with RS232C to RS485 converter.

◎Communication control ordering

●The communication method is MODBUS TRU(PI−MBUS−300 REV.J).

●After 0.5sec of power supply into the high order system, it starts to communicate.
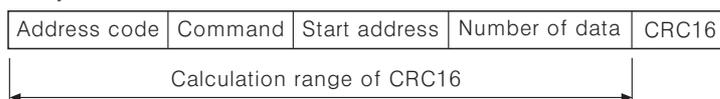
●Initial communication will be started by the high order system. When a command comes out from the high order system, THD will respond.

※A → Min. 0.5 sec. after applying power
  B → Within(Communication speed×10)×10
  EX : 9600bps=960cps=1.04ms×10
※C → Min. (Communication speed×10)×4

●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 code which the high order system can identify THD by. It can be set within range 01 to 1F.

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) It reads 2 of 16 bit data when start address is 0000 or reads 1 of 16 bit data is available when start address is 0001.

⑤CRC16 : Check Sum which checks 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

① Address code : The code, W the high order system can identify THD by. It can be set within range 01H－1FH.
② Command : Read command for input register.
③ Number of data : The number of 8 bit data to send from start address (No. of Bytes)
    It reads 4 of 8 bit data when start address is 0000 or reads 2 of 8 bit data is available when start address is 0001.
  (Refer to MODBUS Mapping Table)
④ Temperature data : To get a current temperature value, divide read value by 100.
    Ex) When read data is 0x09B6, decimal value 2486, the current value is 2486/100＝24.86℃.
⑤ Humidity data : To get a current humidity value, divide read value by 100.
    Ex) When read data is 0x12FE, decimal value 4862, the current value is 4862/100＝48.62%RH.
⑥ CRC16 : Check Sum which checks the whole frame. (Refer to E－34 for CRC16 Table.)

● **Application**
  (Query) : Address code(01), Start address(0000), The number of 16 Bit data to read(2) Check Sum(0x71CB)

01	04	00	00	00	02	71	CB
Unit number	Command	Start code		Amount of data		CRC16	
		High order	Low order	High order	Low order	High order	Low order

  (Response) : Address code(01), The number of 8 Bit data to read(4), Temperature(0x09B6), Humidity(0x12FE)
           CRC Check sum(0x94DE)

01	04	04	09	B6	12	FE	94	DE
Unit number	Reponse command	Amount of data	Temperature data		Humidity data		CRC16	
			High order	Low order	High order	Low order	High order	Low order

● **Error processing(Slave → Master)**
  1. Non－supportable command

01	81	01	81	90
Unit number	Response command	Exception code	CRC16	

    ※ Set a received highest bit and send it to response command and exception code 01.

  2. The start code of queried data is not matched to the transmittable code

01	81	02	81	90
Unit number	Response command	Exception code	CRC16	

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

  3. The number of queried data is bigger than transmittable one

01	84	03	X	X
Unit number	Response command	Exception code	CRC16	

    ※ Set a received highest bit and send it to response command and exception code 03.
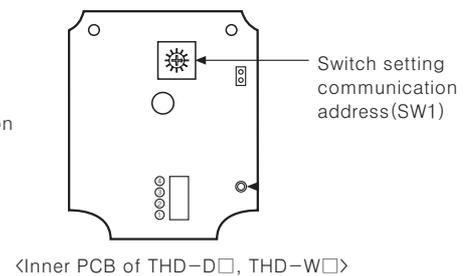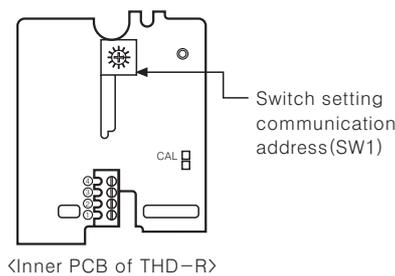
  4. Abnormal processing for a received command

01	84	04	X	X
Unit number	Response command	Exception code	CRC16	

    ※ Set a received highest bit and send it to response command and exception code 04.

◎ **Change the communication speed(THD-R Series)**
  1) Set SW1 to 0 and apply the power.
  2) Operation LED is flashing.
  3) Set a communication speed after choose SW1 within the range 1~8 and hold it for 3sec.
  4) After set a communication speed, LED will be ON.
  ※ Factory default communication speed is 9600bps(SW 1:4) for communication speed.
  ※ In order to change the communication speed, please turn off the power and repeat step 1) ~ 4).
  ※ Setting table of communication speed(bps).

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

Switch setting communication address(SW1)

CAL

〈Inner PCB of THD－R〉

Switch setting communication address(SW1)

〈Inner PCB of THD－D□, THD－W□〉

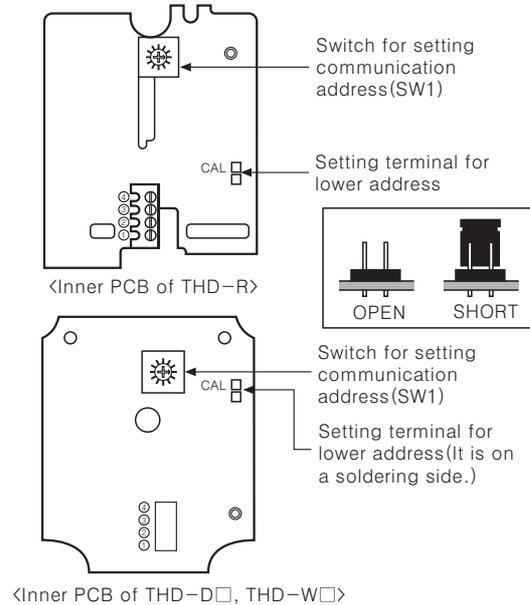# THD Series

◎Change the communication address(THD-R Series)

1) Set CAL Jump pin and SW1 at new address, apply the power.
2) The communication address is changed automatically.
※Factory default communication address is 01. (SW1 : 1, CAL Jump pin : Open)
※In order to change the communication address, please turn off the power and repeat step 1)~2).
※Setting table of communication address

CAL Pin	SW1	Add no.	CAL Pin	SW1	Add no.
OPEN	1	01	SHORT	0	16
OPEN	2	02	SHORT	1	17
OPEN	3	03	SHORT	2	18
OPEN	4	04	SHORT	3	19
OPEN	5	05	SHORT	4	20
OPEN	6	06	SHORT	5	21
OPEN	7	07	SHORT	6	22
OPEN	8	08	SHORT	7	23
OPEN	9	09	SHORT	8	24
OPEN	A	10	SHORT	9	25
OPEN	B	11	SHORT	A	26
OPEN	C	12	SHORT	B	27
OPEN	D	13	SHORT	C	28
OPEN	E	14	SHORT	D	29
OPEN	F	15	SHORT	E	30
−	−	−	SHORT	F	31

Switch for setting communication address(SW1)

Setting terminal for lower address

OPEN   SHORT

⟨Inner PCB of THD-R⟩

Switch for setting communication address(SW1)

Setting terminal for lower address(It is on a soldering side.)

⟨Inner PCB of THD-D□, THD-W□⟩

▣Caution for using

1. After checking the input specification, terminal polarity, connect the wires correctly.
2. Do not connect a wire, examine and repair when the power is applying.
3. Do not touch the temperature/humidity sensor module.
4. Please use THD-R series as wall mounting type.
5. Caution for cleaning
   ①Use dry towel
   ②Do not use acid, chrome acid and solvent but alcohol.
   ③Clean after turn off the power and turn it on 30 min. after.
6. Be sure that metal dust and wire-dregs are not flowed in the unit.
7. Connect the wires after checking polarity.
8. Please use separated line from high voltage line or power line in order to avoid inductive noise.
9. Keep away from the high frequency instruments. (High frequency welding machine & sewing machine, big capacitive SCR controller)
10. The switch or circuit breaker should be installed near by user for convenience.
11. Installation environment
    ①It shall be used indoor
    ②Altitude Max. 2000m
    ③Pollution Degree 2
    ④Installation Category Ⅱ

Autonics