Instruction Manual

Digital Large Display Meter, Model 4016
Temperature & Humidity

I-01938

1. Preface

- Please take care that this instruction manual is certainly delivered to the person in charge of operating this instrument.
- Unpack the product and confirm that the following items are included.
  (1) 4016 itself (2) Sensor (3) Instruction manual

For safe use of this product, please observe the following warning and caution.
In order to help the users' safe use of the products, the following symbol marks are used in this manual.

⚠ WARNING This is the warning to avoid the danger when it is assumed that such danger as may cause fatal accident or severe injure to a user occurs in case that the product is mishandled.

⚠ CAUTION This is the caution to avoid the danger when it is assumed that such danger as may cause minor injure to a user or generate only physical obstacle occurs in case that the product is mishandled.

⃠ PROHIBITION This display shows the contact of "Prohibition" not done.

⚠ WARNING

- **There is no power on-off switch on the model 4016. It immediately starts to operate after turning the power.**
- **Do not touch terminals when turning the power on.**

⚠ CAUTION

- **The rated data is, however, defines with more than 15 minutes warming-up times.**
- **When the product is installed in the cabinet, perform the appropriate heat radiation to keep less than 50 °C in it.**
- **Do not install under the following conditions.**
  - **Where it is exposed to direct sunlight, dust, corrosive gases, rain, etc.**
  - **Where ambient temperature or humidity is high.**
  - **Where it is exposed to excessive noise or static electricity.**
  - **Where there is constant vibration or shock.**
- **Store the instrument within the specified temperature range for storage (-20 ~ 70°C).**
- **When the front panel or the case becomes dirty, wipe it with soft cloth. For heavy dirt, wipe it lightly with the soft cloth wetted with the neutral cleaner thinned by water, and finish the cleaning with dry cloth. Do not use organic solvent like benzene or paint thinner as they may deform or discolor the case.**

⃠ PROHIBITION

This is not an approved weather device by the Japan Meteorological Agency.
Do not use for meteorological service.

2. Specifications

2.1 Installation

Power supply	:	AC 100～120V 50/60Hz AC 200～240V 50/60Hz DC 24V
Allowable power supply	:	AC85～132V, AC170～250V, DC20～30V
Power consumption	:	approx. 13VA at AC100V approx. 18VA at AC200V approx. 270mA at DC24V
Operation temperature and humidity	:	0～+50 °C / 20～85 %RH (without dew)
Storage temperature and humidity	:	-20～+70 °C / 20～95 %RH (without dew)
Weight	:	approx. 2.5 kg
Unit	:	°C , %RH

2.2 General specifications

2.2.1 Sensor

Connection	:	Terminals
Operation range	:	-10.0～+60.0°C / 0～100%RH
Measuring range	:	-10.0～+60.0°C / 5～95%RH
Protection	:	IP20
Accuracy	:	Temperature; +/- 0.5 °C (within the range of 5 to 40 °C), and +/- 1.0 °C (any other range)
	:	Humidity; +/- 3%RH (within the range of 20 to 80%RH), and +/- 5%RH (any other range)
Resolution	:	Temperature; 0.1 °C
	:	Humidity; 1%RH

2.2.2 Display

Display	:	Red or Green LED (character height 45mm), with zero-suppress function.
Display range	:	-19.9～+99.9°C / 0～99%RH
Measuring range	:	-10.0～+60.0°C / 5～95%RH
Over-range indication	:	Temperature; Blinking with minimum or maximum value of display range.
		Humidity; Blinking with maximum value of display range.
Disconnection indication	:	- - . - °C - - %RH
Faulty sensor indication	:	Err °C %RH
Display cycle	:	2 seconds
Noise through power supply line	:	1000V (at AC voltage power supply)
Insulation Resistance	:	DC500V 100MΩ or more (50MΩ or more at DC power supply)
Withstanding Voltage	:	Input & output terminals - Case : AC1500V each for 1 min.
		Power supply terminals - Case : AC1500V each for 1 min.
		Power supply terminals - Input & output terminals : AC1500V each for 1 min.
		(at DC power supply, AC500V each for 1 min.)
		Between each output terminals : AC500V each for 1 min.
Protection	:	IP44 (Wall-mount and Hanging-mount), IP65 (Sticking-mount with water-proof works)

2.3 Data output (optional specifications)

2.3.1 Analog output

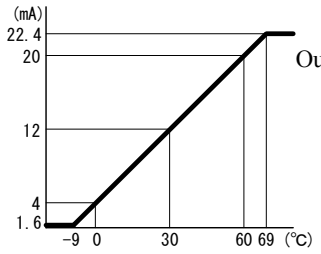
CH1 or CH2 is output in accordance with display. Any output is available for temperature and/or humidity.

Conversion	:	PWM method
Rated output	:	DC4～20mA
Output impedance	:	5MΩ or more
Tolerable resistive load	:	600Ω or less
Allowable display error	:	+/- 0.15% of SPAN at 23°C +/- 2°C
Temperature coefficient	:	+/- 200ppm/°C
Resolution	:	1/1000 for temperature at 0 to 99.9°C
		1/100 for humidity at 0 to 99%RH
Output cycle	:	2 seconds
Output scaling	:	Refer to the chapter 4.2.1

Standard type (-29)
CH1: Set one of the followings: 0.0 to 60.0°C, -10.0 to +60.0°C, 0.0 to 100.0°C, or 0 to 100%RH.
CH2: Set humidity 0 to 100%RH only.
Special type (-29C)
Set the specified value within the range of -20.0 to +100.0°C, 0 to 100%RH.

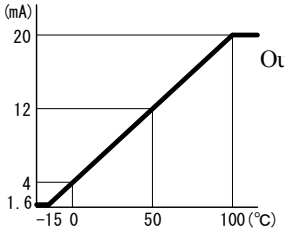
CH1 output example

Ex. 1) Output 4-20mA in accordance with 0 to 60°C.



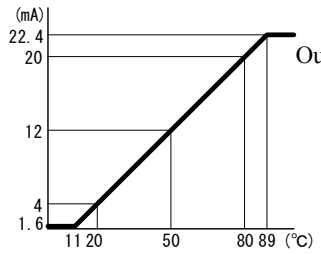
Output function setting switch
1: OFF
2: OFF
3: OFF

Ex. 2) Output 4-20mA in accordance with 0 to 100°C.



Output function setting switch
1: OFF
2: OFF
3: ON

Ex. 3) Output 4-20mA in accordance with 20 to 80%RH. Please specify when ordering due to special scaling.



Output function setting switch
1: ON
2: *
3: *

* No definition

2.3.2 Common specifications for RS-232C, RS-485

Transmission	:	Start-Stop half-duplex transmission
Transmission speed	:	4800, 9600, 19200, 38400 bps (by setting switch)
Data	:	In conjunction with JIS 8 units code.
Data length	:	7bit
Stop bit	:	1bit
X parameter	:	None
Error detection	:	Vertical parity and BCC
Parity check	:	None, Odd, Even
Transmission process	:	Concord type, unidirectional type

2.3.3 RS-485

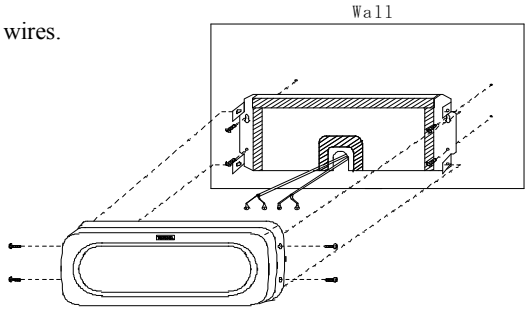
Connected device	:	Max. 32 units, including the upper PC
Line length	:	Up to 500 m by using shielded twisted-pair cable, AWG28 or more.
Terminator	:	Switched by the jumper at the terminal, terminated at 200Ω

*NOTE followings for the use of multi-drop.
- Unify the transmission format.
- Do not duplicate the device number.

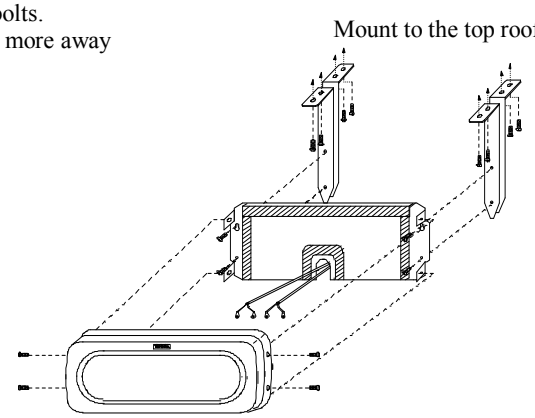
3. Mounting

3.1 Installation of main unit

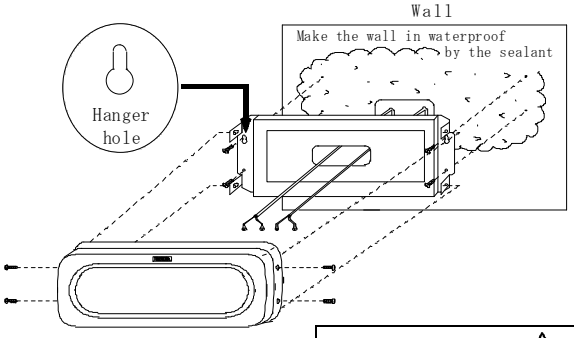
● **Wall-mount (model code-51)**
Cut the case bottom or side to pull out lead wires.



● **Hanging-mount (model code-52)**
Fix lifting brackets to the top roof by eyebolts.
Fixing points should be locating 40mm or more away from the wall to keep maintenance space.



● **Sticking-mount (model code-53)**
Use coaching bond or appropriate sealant to keep IP65 protection.

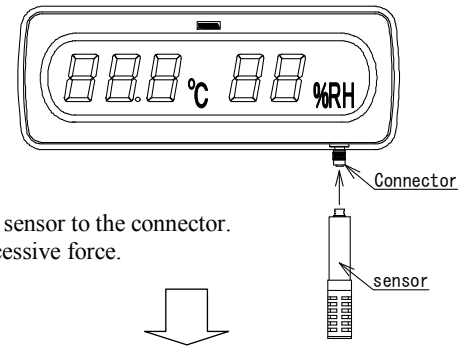


⚠ CAUTION

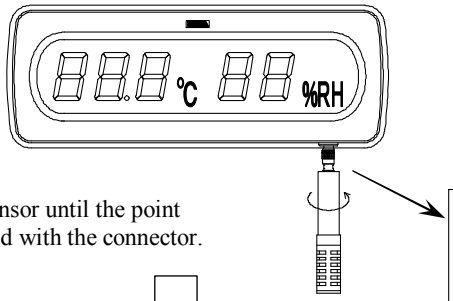
- **Hanger hole of the mounting panel should be upright position as shown in the drawing.**

3.2 Attachment and detachment of sensor (Sensor integral model)

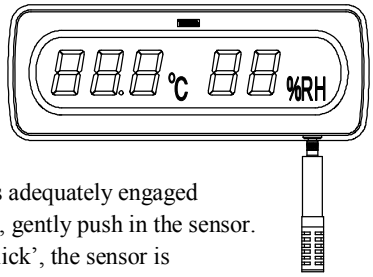
●Attachment of sensor



Gently insert the sensor to the connector.
Do not apply excessive force.

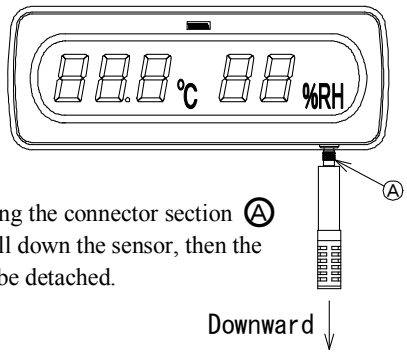


Gently turn the sensor until the point where it is engaged with the connector.



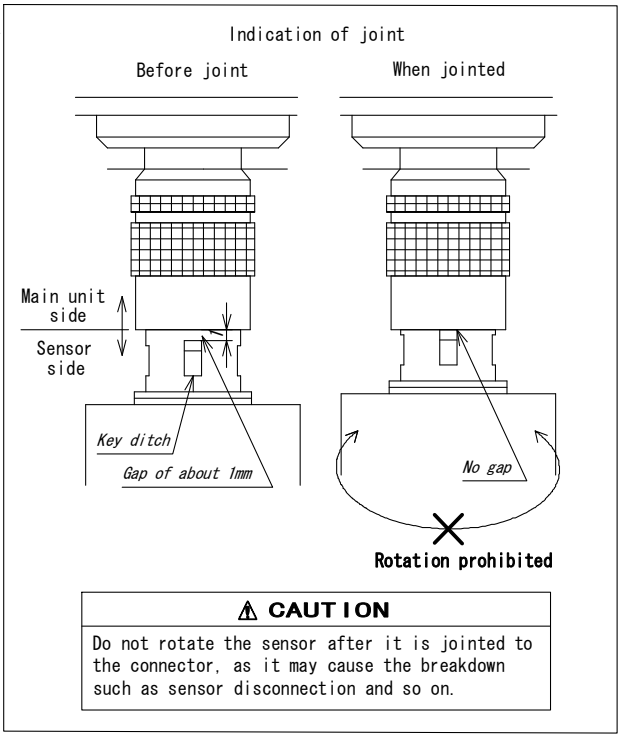
When the sensor is adequately engaged with the connector, gently push in the sensor. When it sounds 'click', the sensor is properly attached.

●Detachment of sensor



Keep pushing the connector section Ⓐ upward, pull down the sensor, then the sensor can be detached.

Downward

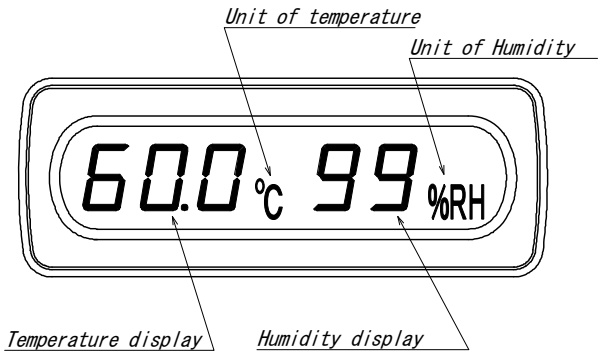


⚠ CAUTION

Do not rotate the sensor after it is jointed to the connector, as it may cause the breakdown such as sensor disconnection and so on.

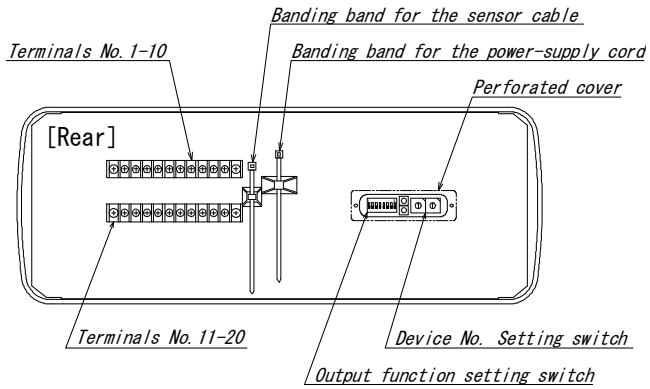
4. Name of each part

4.1 Front panel

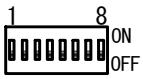


4.2 Layout & Function of Terminals and switches

If the mounting panel is removed, the terminal plate and switches comes out.



4.2.1 Output function setting switch (optional output's product)



In case of analog output products, RS-232C or RS-485 output product, each function should be set.

Switch 1: To select the operation of the analog output scaling setting

1		Contents
OFF		Set with the switch 2 and 3
ON		Set in a optional scaling or serial communication. Range: -20.0 to 100.0°C in temperature, 0 to 100%RH in Humidity

Switch 2 and 3: To select the analog output scaling setting of CH1

2	3	Contents
OFF	OFF	4 to 20mA output in response to 0.0 to 60.0°C
ON	OFF	4 to 20mA output in response to -10.0 to 60.0°C
OFF	ON	4 to 20mA output in response to 0 to 100.0°C
ON	ON	4 to 20mA output in response to 0 to 100%RH

* CH2: 4 to 20mA output in response to 0 to 100%RH

Switch 4 and 5: To select serial communication speed

4	5	Contents
OFF	OFF	4800bps
ON	OFF	9600bps
OFF	ON	19200bps
ON	ON	38400bps

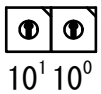
Switch 6 and 7: To select serial communication parity

6	7	Contents
OFF	OFF	None
ON	OFF	Even
OFF	ON	Odd
ON	ON	None

Switch 8: To select data output of serial communication

8		Contents
OFF		Concord
ON		Unidirectional (transmit the measuring data at 2-second cycle)

4.2.2 Device No. Setting switch



In case of RS-485 output product, device number should be set.
Device number: 00～99
Set the device No. to each device, and match each command of device.
Do not overlap the device number.

5. Terminal Connection

⚠ WARNING

- **To avoid an electrical shock, turn the power off when wiring.**
- **Do not wire with moistened hands. Locate away from the wet place.**
- **Do not touch terminals when turning the power on.**

⚠ CAUTION

- **Power supply and load should be within the suitable range.**
- **Power supply should be rapidly reach the rated power within few seconds.**
- **When the power is turned OFF and ON again soon after, provide the downtime of 10 seconds or more.**
- **Do not miswiring.**
- **Distribution cable should be wired from underside of the terminal block to maintain waterproof performance.**

[NOTE for wiring]
Lay the input cable and the power cable separately.
Otherwise indication may be fluctuated which causes malfunction.

Upper terminals

1	2	3	4	5	6	7	8	9	10
SENSOR						A1OUT+	A1OUT-	P2(+)	P1(-)
Sensor *2						CH1 analog output *3		Power supply	

Lower terminals (for CH2 analog output)

11	12	13	14	15	16	17	18	19	20
NC	NC	NC	NC	NC	NC	A2UT+	A2OUT-	NC	NC
						CH2 analog output *4			

Lower terminals (for RS-232C output and CH2 analog output)

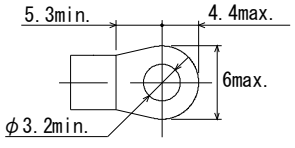
11	12	13	14	15	16	17	18	19	20
SD	RS	RD	CS	SG	NC	A2UT+	A2OUT-	NC	NC
						CH2 analog output *4			

Lower terminals (for RS-485 output and CH2 analog output)

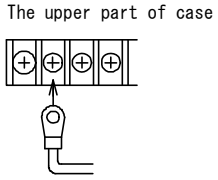
11	12	13	14	15	16	17	18	19	20
Terminator		NC	+	−	NC	A2UT+	A2OUT-	NC	NC
						CH2 analog output *4			

NOTES
*2: If you choose the connector for sensor connection, this terminal is NC.
*3: If CH1 analog output is not provided, this terminal is NC.
*4: If CH2 analog output is not provided, this terminal is NC.
- NC is not connected, but do not use to relay wiring.

Terminal screws: M3
Fastening torque: 0.46～0.62N m
Crimp terminal: As shown on the right.



[Direction of wiring]
Distribution cable should be wired from underside of the terminal block to maintain waterproof performance.
Distribution cable should be fixed by the banding band to avoid cable disconnection.



6. Model designation

Model name 4016 – ☐ – ☐ – ☐ – ☐ – ☐ – ☐ – ☐ – ☐
(1) (2) (3) (4) (5) (6) (7) (8)

(1) Power Supply

No.	Power
3	AC100 to 120V
5	AC200 to 240V
9	DC 24V

(2) CH1 analog output (DC4-20mA)

No.	Specifications
Null	No output
29	Standard scaling
29C	Special type

(3) CH2 analog output (DC4-20mA)

No.	Specifications
Null	No output
29	Standard scaling
29C	Special type

NOTE: It becomes the same rating output at 2-output.
When 29C is selected, both outputs become 29C.
One output only of CH2 cannot be selected.
CH1 and CH2 are electrically insulated from each other.

(4) Serial communication

No.	Specifications
Null	No output
E0	RS-232C
E1	RS-485

NOTE: Scaling is available if analog output is also provided with your model.

(5) Mounting

No.	Type
51	Wall-mount
52	Hanging-mount
53	Sticking-mount

(6) Sensor Protection

No.	Type
20	IP20(5816-22)

(7) Sensor cable connection and configuration

No.	Function
000	One-piece body
103	Crimp terminal (5816-01-103), 3m length

NOTE: Cable length is shown by the last two digits of the model code.
Standard length is 3m. Cable is available up to 100m in 1m-length.
10m : ☐10 100m : ☐A0

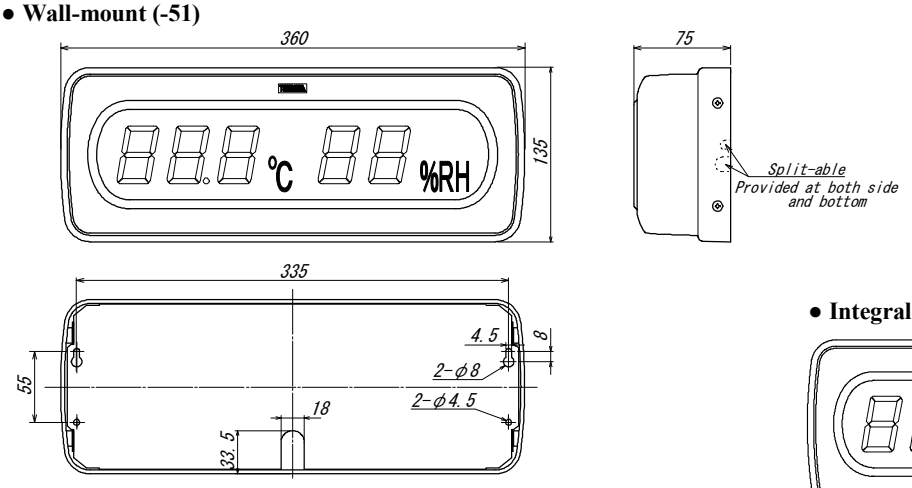
(8) Color

No	Type
Null	Red LED
G	Green LED

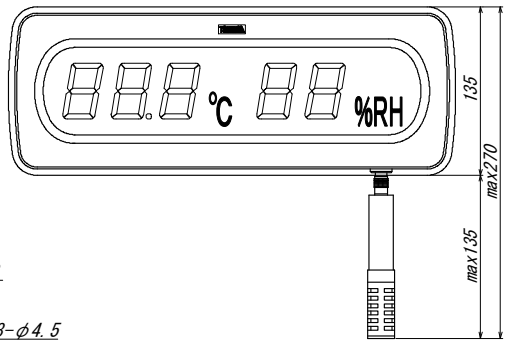
7. Dimensions

［Unit: mm］

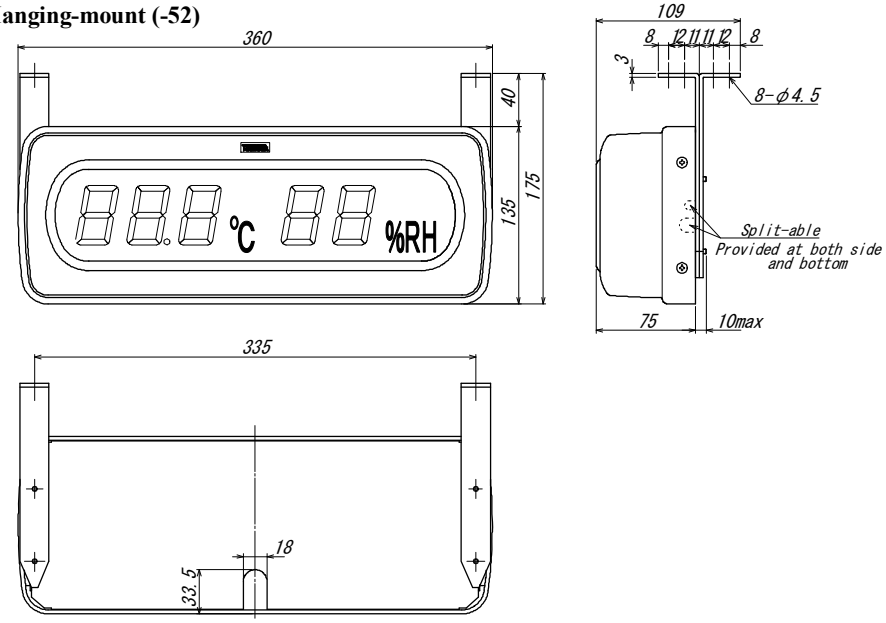
● **Wall-mount (-51)**



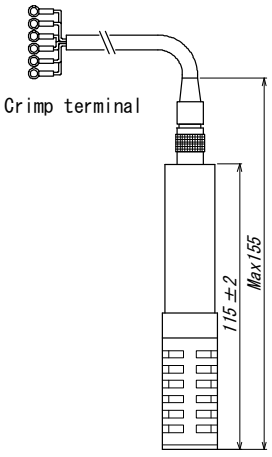
● **Integral IP20 sensor, front elevation view**



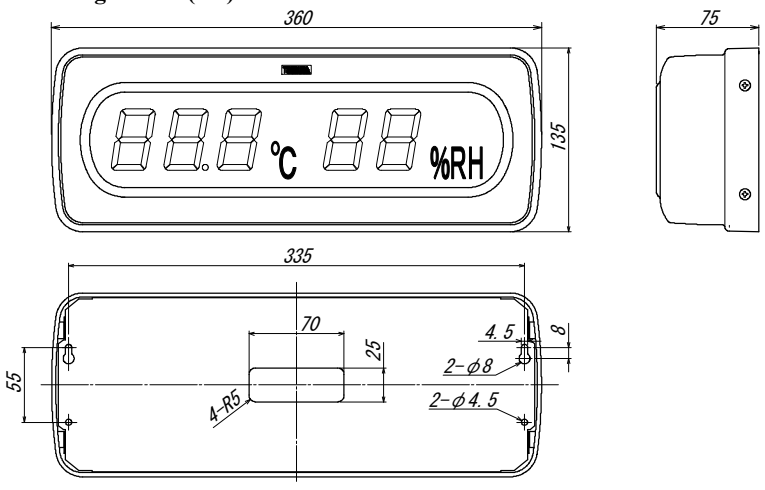
● **Hanging-mount (-52)**



● **IP20 type sensor (-1☐☐)**



● **Sticking-mount (-53)**



Contact Information
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Address : 1-3-23 Minami-Sumiyoshi, Sumiyoshi-ku, Osaka-shi 558-0041 Japan

Instruction Manual

Digital Large Display Meter, Model 4016
RS-232C / RS-485 Output

I-01939

1. Data Output Code

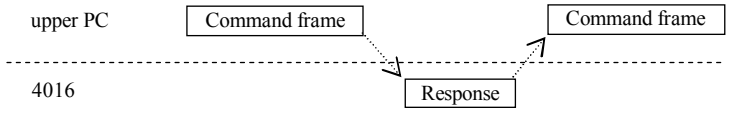
Code	Output
E0	RS-232C
E1	RS-485

2. Specifications

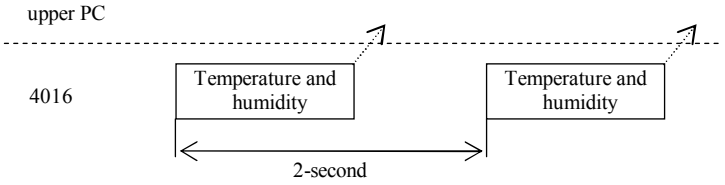
● Common specifications for RS-232C and RS-485

The measuring input and the RS-232C and RS-485 output is insulated.

Transmission : Start-Stop half-duplex transmission.
Transmission speed : 4800, 9600, 19200, 38400 bps
Data length : 7bit
Parity : None, Even, Odd
Stop bit : 1bit
Data : In conjunction with JIS 8 units code.
X parameter : None
Error detection : Parity and BCC
BCC: Operation results of exclusive logic sum just after STX to ETX.
Control character : STX (02H) start of text / ETX (03H) end of text.
Device No. : 00 to 99,
Set the device No. to each device, and match each command of device.
Set 00 for RS-232C output.
Transmission character : Max. 32
Concord Transmission : Ignored
4016 transmits response in accordance with command frame from the upper PC.



Unidirectional Transmission : 2-second cycle output,
4016 transmits temperature and humidity data in every 2-second.



● RS-485

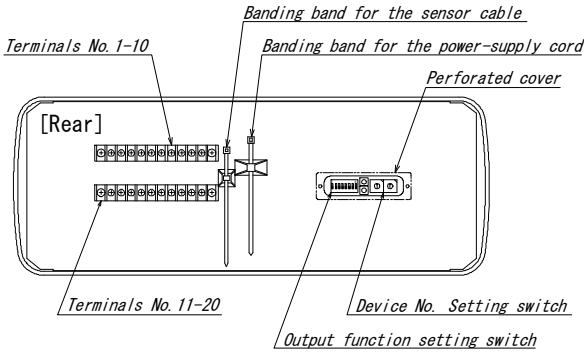
Connected device numbers: Max.32, including the upper PC.
Line length : Up to 500 m by using shielded twisted-pair cable.
AWG28 or more.
Terminator : Switched by the jumper at the terminal, terminated at 200Ω

NOTE followings for the use of multi-drop.
-Unify the transmission format.
-Do not duplicate the device number.

3. Terminals and Connections

3.1 Layout

If the mounting panel is removed, the terminal plate and switches comes out.



Terminals No.11-15: I/O terminal for RS-232C and RS-485.
Output function setting switch: Set several functions for serial communication.
Device No. Setting switch: Set the device number for RS-485.

3.1.1 Terminal connections

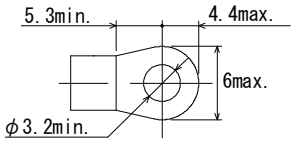
Lower terminal plate (for RS-232C output)

11	12	13	14	15	16	17	18	19	20
SD	RS	RD	CS	SG	NC	NC	NC	NC	NC

Lower terminal plate (for RS-485 output)

11	12	13	14	15	16	17	18	19	20
Terminator		NC	+	−	NC	NC	NC	NC	NC

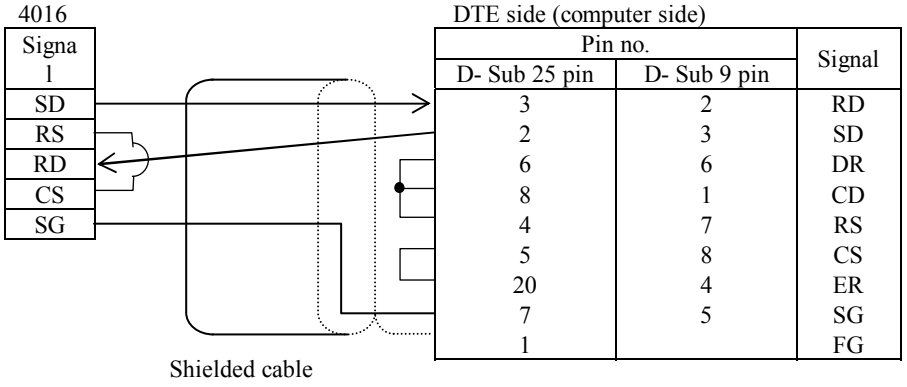
Terminal screws: M3
Fastening torque: 0.46 to 0.62N m
Crimp terminal: As shown on the right.



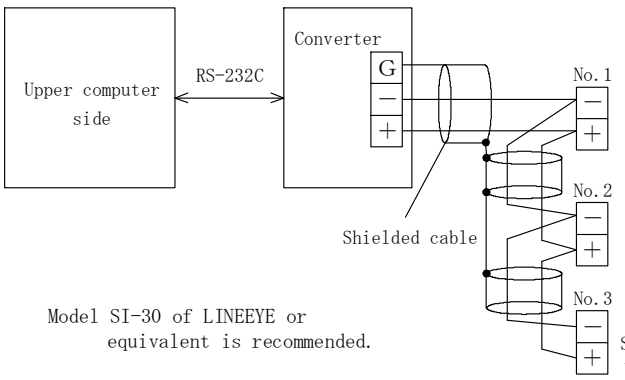
NOTE: NC is not connected, but do not use to relay wiring.

3.1.2 Connection method

● RS-232C



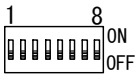
● RS-485



In case of RS-485 connection, up to 32 devices, includes the upper computer, are possible to connect. Specify the end station for both ends of device on the line. Set the terminator to be short-circuited for the identification of the end station. Lead wire for short-circuit is not attached. Use the converter for another identification to set the terminator.

Terminator: When sort-circuiting the connector, 200Ωresistor is connected in parallel to the line.
Input/Output: "+" is non-inverse output, and "-" is inverse output.

3.2 Output function setting switch



Switch 1: To select the operation of the analog output scaling setting

1		Contents
OFF		Set with the switch 2 and 3
ON		Set in a optional scaling or serial communication. Range: -20.0 to 100.0°C in temperature, 0 to 100%RH in Humidity

Switch 2 and 3: To select the analog output scaling setting

2	3	Contents
OFF	OFF	4 to 20mA output in response to 0.0 to 60.0°C
ON	OFF	4 to 20mA output in response to -10.0 to 60.0°C
OFF	ON	4 to 20mA output in response to 0.0 to 100.0°C
ON	ON	4 to 20mA output in response to 0 to 100%RH

Switch 4 and 5: To select serial communication speed

4	5	Contents
OFF	OFF	4800bps
ON	OFF	9600bps
OFF	ON	19200bps
ON	ON	38400bps

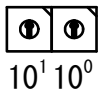
Switch 6 and 7: To select serial communication parity

6	7	Contents
OFF	OFF	None
ON	OFF	Even
OFF	ON	Odd
ON	ON	None

Switch 8: To select data output of serial communication

8		Contents
OFF		Concord
ON		Unidirectional (transmit the measuring data at 2-second cycle)

3.3 Device No. Setting switch



In case of RS-485 output product, device number should be set.
Device number: 00 to 99
Set the device No. to each device, and match each command of device. Do not overlap the device number.

4. Communication command

RS-232C and RS-485 sharing

4.1 Notes for Command

1) All frame of command
   Command: STX, device No., Command or Command frame, ETX (BCC)
   Response: STX, device No., End code, Response, ETX (BCC)
2) Character of command is effective with 4-character from the top. Ex) "DATA?" → "DATA"
3) Numerical configuration
   Decimal point cannot be set for the analog output scaling setting of temperature.
   Ex) 50.0 → W1TF +0500
4) Both space and "=" is effective as the command and numerical configuration separator.
   Ex) "W1TF +0600" or "W1TF=+0600"
5) Both "NULL" and space is effective in between separator.
   Ex) STX Device No. W1TF +0600 ETX BCC
   STX Device No. "NULL" W1TF "NULL" +0600 "NULL" ETX BCC
   Max. receiving character count is 32, farther characters are beyond recognition.
6) End code
   Return the receive condition of the command frame.

End code	Contents
A (41H)	Normal end
C (43H)	Setting error (out of setting range or error)
D (44H)	BCC error (with BCC function)
P (50H)	Command error (impossible to analyze the received command)

   Response at the command error:

STX	Device No.		End code	ETX	BCC
(02H)	(30H)	(30H)	(50H)	(03H)	

Device No. 00-

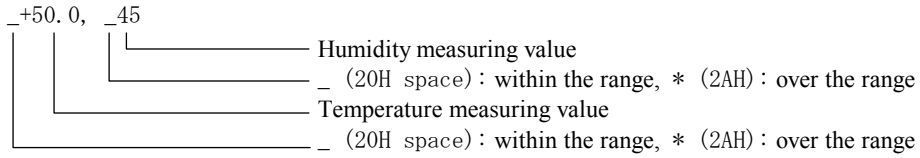
4.2 Command / Response

●Measuring command

Command: DATA? Ask to judge the current data

Response: response to DATA? (Temperature measuring value and Humidity measuring value)

Data format:



Command frame:

STX	Device No.		D	A	T	A	?	ETX	BCC
02H	30H	30H	44H	41H	54H	41H	3FH	03H	

Device No. 00-

Response:

		End code													
STX	Device No.		↓	_	+	5	0	.	0	,	_	4	5	ETX	BCC
02H	30H	30H	41H	20H	2BH	35H	30H	2EH	30H	2CH	20H	34H	35H	03H	

+50.0 °C, 45%RH

●Readout the setting data

Command: R1TO?, CH1 Read out the analog output offset setting (20.0°C readout)

Response: response to R1TO?.

0200

Command frame:

STX	Device No.		R	1	T	0	?	ETX	BCC
02H	30H	30H	52H	31H	54H	4FH	3FH	03H	

Device No. 00-

Response:

		End code							
STX	Device No.		↓	+	0	2	0	0	ETX	BCC
02H	30H	30H	41H	2BH	30H	32H	30H	30H	03H	

●Set the function command data

Command: W1HF_050 CH1 Read out the analog output full-scale setting (set to 50%RH)

Response: response to W1HF_050

050

Command frame:

		End code										
STX	Device No.		↓	W	1	H	F	_	0	5	0	ETX	BCC
02H	30H	30H	41H	57H	31H	48H	46H	20H	30H	35H	30H	03H	

Device No. 00-

Response:

		End code						
STX	Device No.		↓	0	5	0	ETX	BCC
02H	30H	30H	41H	30H	35H	30H	03H	

●Memory control command

-Write command: Write the setting data into the EEPROM.

Command: STOR

Response: End code

Command frame:

STX	Device No.		S	T	O	R	ETX	BCC
02H	30H	30H	53H	54H	4FH	52H	03H	

Device No. 00-

Response:

		End code			
STX	Device No.		↓	ETX	BCC
02H	30H	30H	41H	03H	

Normal end

-Memory initialization: Setting datum resets to default.

Command: DEFAULT

Response: End code

Command frame:

STX	Device No.		D	E	F	A	U	L	T	ETX	BCC
02H	30H	30H	44H	45H	46H	41H	55H	4CH	54H	03H	

Device No. 00-

Response:

		End code			
STX	Device No.		↓	ETX	BCC

02H	30H	30H	41H	03H		Normal end

●Response at measuring error
-Disconnection error
Response:

			End code ↓													
STX	Device No.		_	_	-	-	.	-	,	_	-	-	ETX	BCC		
02H	30H	30H	41H	20H	20H	2DH	2DH	2EH	2DH	2CH	20H	2DH	2DH	03H		Device No. 00-

-Check sum error
Response:

			End code ↓													
STX	Device No.		_	_	E	r	r	_	,	_	_	_	ETX	BCC		
02H	30H	30H	41H	20H	20H	45H	72H	72H	20H	2CH	20H	20H	20H	03H		Device No. 00-

●Output data at the unidirectional Transmission
End code is space (20H).
Response:

			End code ↓													
STX	Device No.		_	+	5	0	.	0	,	_	4	5	ETX	BCC		
02H	30H	30H	20H	20H	2BH	35H	30H	2EH	30H	2CH	20H	34H	35H	03H		Device No. 00-

4.3 Command table

●Setting command

Function	Readout command		Specified command			EEPROM Default data
	Command	Response	Command frame	Response	Function, Range	
CH1 Analog output offset for Temperature	R1T0?	+0000	W1T0 +0000	+0000	-0200～+1000	+0000 (0℃)
CH1 Analog output full-scale for Temperature	R1TF?	+0600	W1TF +0600	+0600	-0200～+1000	+0600 (60℃)
CH1 Analog output offset for Humidity	R1H0	+000	W1H0 +000	+000	0～+100	+000 (0%RH)
CH1 Analog output full- scale for Humidity	R1HF	+060	W1HF +060	+060	0～+100	+100 (100%RH)
CH1 analog output, Temperature-humidity switch	R1TH	0	W1TH 0	0	0: Temperature 1: Humidity	0 (Temperature)
CH2 Analog output offset for Temperature	R2T0?	+0000	W2T0 +0000	+0000	-0200～+1000	+0000 (0℃)
CH2 Analog output full- scale for Temperature	R2TF?	+0600	W2TF +0600	+0600	-0200～+1000	+0600 (60℃)
CH2 Analog output offset for Humidity	R2H0	+000	W2H0 +000	+000	0～+100	+000 (0%RH)
CH2 Analog output full- scale for Humidity	R2HF	+060	W2HF +060	+060	0～+100	+100 (100%RH)
CH2 analog output, Temperature-humidity switch	R2TH	0	W2TH 0	0	0: Temperature 1: Humidity	1 (Humidity)

●Measuring command

Function	Requested command	
	Command	Response
Current value data	DATA?	_+50.0,_50

●Memory control command

Function	Control command	
	Command	Response
Write	STORE	End code
Default	DEFAULT	End code

5. Dos and Don'ts

⃠ PROHIBITION
This is not an approved weather device by the Japan Meteorological Agency. **Do not use for meteorological service.**

Contact Information	
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