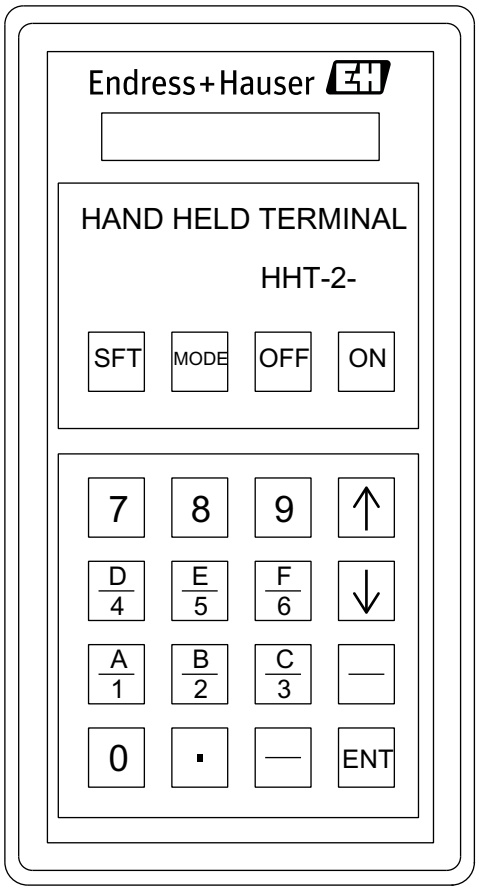
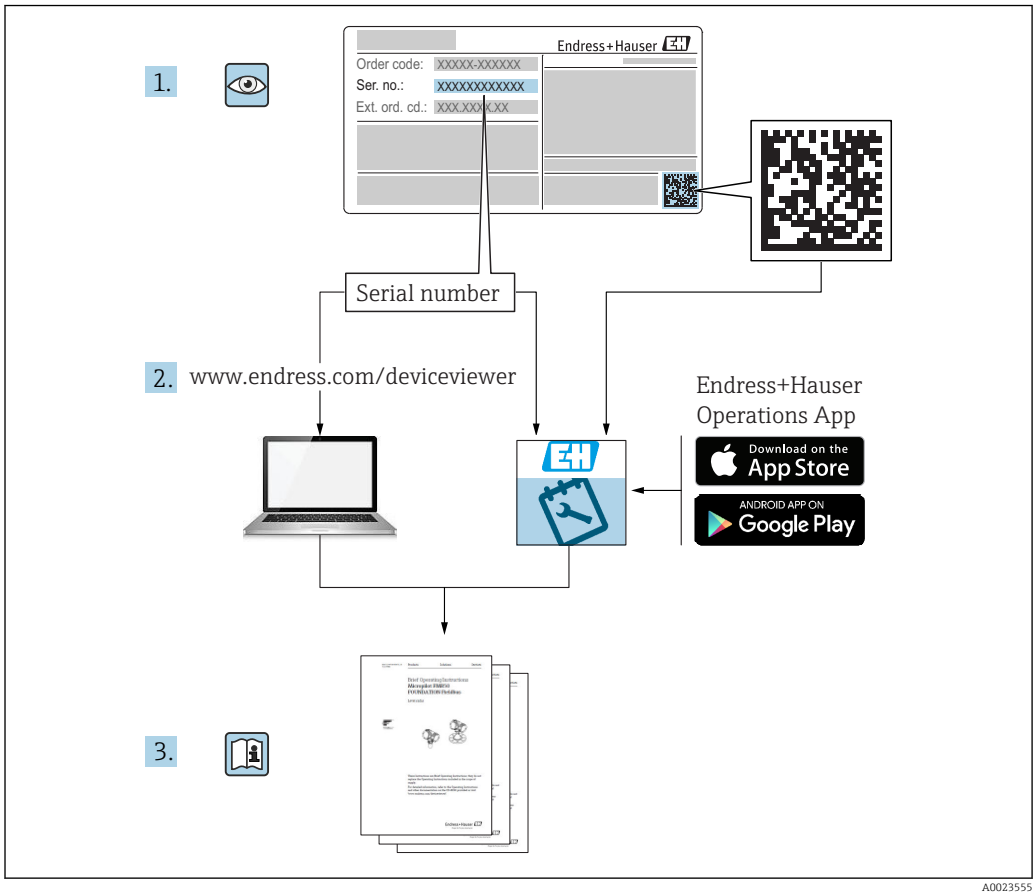
BA00429G/00/EN/03.19
71427112
2019-12-27

Operating Instructions
TMD1000 TMD1

HHT2 Hand Held Terminal



Endress+Hauser
People for Process Automation


1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXX
Ext. ord. cd.: XXX XXX XX XX
Serial number
2. www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the App Store
ANDROID APP ON Google Play
3.
A0023555

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1 About this document

1.1 Document function

These Operating Instructions contain all the information that is required during various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2 Symbol

1.2.1 Safety symbols

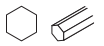
Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury, as well as a risk of fire or explosion.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in a risk of serious or fatal injury, fire or explosion.
CAUTION	**Note** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in a risk of minor or moderate injury and damages to properties.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts that do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	**Ground connection** A grounded terminal that, as far as the operator is concerned, is grounded via a grounding system.
	**Protective ground connection** A terminal that must be connected to the ground prior to establishing any other connections.
	**Equipotential connection** This connects with the grounding system at the plant.It includes equipotential line and single point ground systems, depending on the norms of each country or company.

1.2.3 Tool symbols

Symbol	Meaning
 A0013442	Torx screwdriver
 A0011220	Flat blade screwdriver

Symbol	Meaning
 A0011219	Phillips screwdriver
 A0011221	Allen key
 A0011222	Open-ended wrench

1.2.4 Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted
	**Preferred** Procedures, processes or actions that are preferred
	**Forbidden** Procedures, processes or actions that are forbidden
	**Tip** Indicates additional information
	Reference to documentation
	Reference to page
	Reference to graphic
	Notice or individual step to be observed
1., 2., 3. ...	Series of steps
	Result of an operation or commissioning
	Help in the event of a problem
	Visual inspection
	Operation via the local display
	Operation via operating tool
	Write-protected parameter

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1., 2., 3. ...	Series of steps
A, B, C, ...	Graphics
A-A, B-B, C-C, ...	Cross-sections

Symbol	Meaning
	**Hazardous area** Indicates the hazardous area
	**Safe area (non-hazardous area)** Indicates the non-hazardous area

1.2.6 Device symbol

Symbol	Meaning
	**Safety instructions** Observe the safety instructions contained in the associated Operating Instructions.
	**Temperature resistance of the connection cables** Specifies the minimum value of the temperature resistance of the connection cables.

1.3 Documentation

For an overview of the scope of the relevant Technical Documentation included with the product, refer to the following:
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer).
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate.

1.3.1 Technical Information

The Technical Information contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

Device	Technical Information
Digital Transmitter TMD1000 TMD1	TI00463G

1.3.2 Operating Instructions (BA)

The Operating Instructions contain all the information that is required during various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

The Operating Instructions also contain detailed descriptions of each parameter in the operation menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

Device	Operating Instructions
Digital Transmitter TMD1000 TMD1	BA00427G BA00428G BA00429G

1.3.3 Safety Instructions (XA)

Feature 030 "Approval"	Meaning	XA
4	TIIS Exd IIB T4	XA01072G
5	FM XP Cl.I Div.1 Gr.C-D, AEx d IIB T4	XA01089G

1.4 Registered trademarks

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

2 Basic safety instructions

2.1 Requirements for personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
- Be specialists who are trained and have a relevant qualification for this specific function and task.
- Be authorized by the plant owner-operator.
- Be familiar with local/national regulations.
- Before starting work, read and understand the instructions in the Operating Instructions and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:
- Be instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

2.2 Designated use

Application and measured materials
Depending on the version ordered, the device can also be used with potentially explosive, flammable, poisonous or oxidizing materials.

Devices that are used in hazardous areas have corresponding labels on their nameplates.

To ensure that the device remains in proper condition for the operation time:
- Only use the device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- Check the nameplate to verify if the device can be put to its intended use in hazardous areas.
- If the device is not operated at an atmospheric temperature, compliance with the relevant basic conditions specified in the relevant device documentation is absolutely essential.
- Protect the device permanently against corrosion from environmental influences.
- Observe the limit values in the "Technical Information".

The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment according to local/national regulations.

2.4 Operational safety

Risk of injury!
- ▶ Operate the device in proper technical conditions and fail-safe conditions only.
- ▶ The plant owner-operator is responsible for interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:
- ▶ If modifications are nevertheless required, contact your Endress+Hauser Sales Center.

Repair

To ensure continued operational safety and reliability:
- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe local/national regulations pertaining to repair of an electrical device.
- ▶ Use only original spare parts and accessories from Endress+Hauser.

Ex-area

Observe the following notes to eliminate the risk of danger to persons or the facility when the device is used in Ex-areas (e.g. explosion protection, pressure equipment safety):
- ▶ Check the model nameplate to ensure that the ordered device is explosion proof.
- ▶ Observe the specifications in the separate supplementary documentation attached to these Instructions.

2.5 Product safety

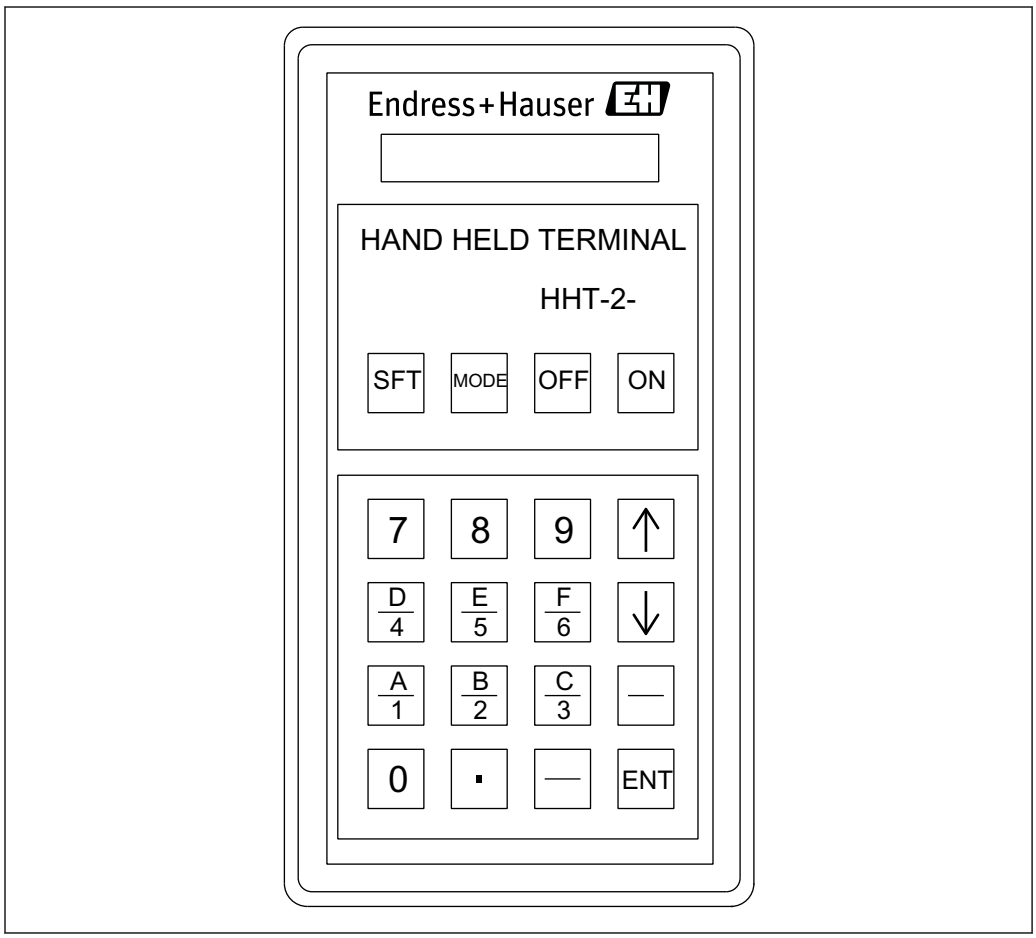
This device was designed in accordance with GEP (Good Engineering Practice) to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. It meets the general safety standards and legal requirements.

3 Product description

3.1 Product design

All operations on HHT2 are done by using twenty keys on the key pad. The upper four keys are used to turn on/off the power and select modes. Lower sixteen keys are used to select items and input values.

Refer to "Basic Operations and Setting" and "Option Input and Output Setting" for details.



1 *HHT2 Display*

3.2 Keypad

Name	Descriptions
ON	Power ON switch: Keep pressing until the display appears on the LCD screen.
OFF	Power OFF switch: Keep pressing until the display appears on the LCD screen. The power will turn off approximately 4 minutes after the completion of key operation due to the auto-power off function.
MODE	Mode display switch: MODE No.input standby screen will appear.↑ and ↓ keys are usedto change the MODE No.
SFT	Shift key: Press an alphabet key or the ESC key while holding down the shift key when entering alphabets A through F and ESC.

Name	Descriptions
↑	Device selection screen: The name of the previous device will appear. MODE, ITEM selection screen: The MODE or ITEM screen that is one step smaller than the MODE or ITEM that is being displayed will appear.
↓	Device selection screen: The name of the next device will appear. The MODE or ITEM screen that is one step larger than the MODE or ITEM that is being displayed will appear.
ESC/BS	ESC: Pressing ESC and SFT key simultaneously will return the screen to the Device Selection screen when the mode and item that is currently being displayed have been entered. BS: Backspace key, which deletes one character from the input characters
ENT	Setting mode key (Input key)

3.3 Technical data

Category	Items	Descriptions
Displays	Display element	Liquid Crystal Display (LCD)
	Display character	16 characters x 2 digits
	Dot configuration	5 x 7 dot + cursor
	Display font size	2.95 (width) x 5.55 (height)
Key board	Key top	Vinyl sheet splash resistant
	Switch	Membrane switch
Interface	Basic format	Optical data link
	Transmission form	A type: 2-way, 2-wire
	Transmission rate	1953.2bps
Power supply	Battery	AA alkaline battery (LR6 1.5 V) x 4 batteries
	Consumption current	45 mA (Typ)
	Uptime (continuous use)	Approximately 25 hours (LR6 （LR6 x 4 batteries / ambient temperature 25 °C (77 °F))
	Automatic power off	Approximately 4 minutes after the last input recognition
	Low battery alarm	Approximately 5 V alarm is displayed when there is no communication
Appearance	External Dimensions	191 mm (7.52 in) x 102 mm (4.01 in) x 29 mm (1.14 in)
	Material	Plastic (ABS resin)
	Weight	Approximately 430 g (0.95 lb)
Structure	Intrinsically safe construction	i2G3
Temperature	Ambient temperature	−10 to 40 °C (14 to 104 °F) (however, there should be no condensation)
Accessory	Soft case	Vinyl leather x 1 case
	Battery	LR6 x 4 batteries
	Communication cable	Optic fiber with optic cable (1 m (3.28 ft)) x 1 cable

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Upon receipt of the goods check the following:
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions (XA) enclosed?

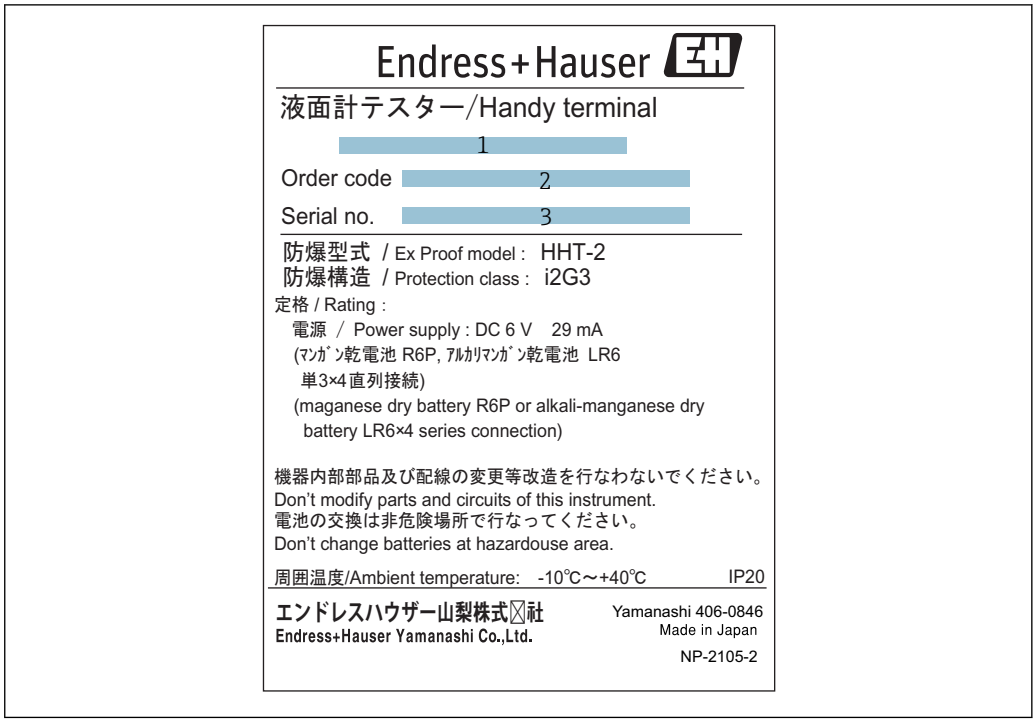
If any one of these conditions is not met, contact your Endress+Hauser Sales Center.

4.2 Product identification

The following options are available for the identification of the measuring device:
- Nameplate
- Extended order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in the *W@M Device Viewer* (www.endress.com/deviceviewer); all information about the device is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*; all the information for the measuring device is displayed.

For an overview of the scope of the enclosed associated Technical Documentation, refer to the following:
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer).
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

4.2.1 Nameplate



2 *HHT2 nameplate*

1 *Required contents by a customer (e.g. Tag No.)*
2 *Order code*
3 *Meter number*

4.3 Manufacturer contact address

Endress+Hauser Yamanashi Co., Ltd.
862-1
Mitsukunugi, Sakaigawa, Fuefuki, Yamanashi, Japan
Address of the manufacturing plant: See nameplate.

4.4 Storage and transport

4.4.1 Storage conditions

- Storage temperature: –20 to +60 °C (–4 to 140 °F)
- Store the device in its original packaging.

4.4.2 Transport

NOTICE

The housing may become damaged or dislodged.
Risk of injury

- ▶ Transport the transmitter to the measuring point in its original packaging or hold by the process connection.
- ▶ Do not secure the lifting devices (hoisting slings, lifting eyes etc.) at the housing; instead, secure it to the process connection.Take into account the center of gravity of the device in order to avoid unintended tilting.
- ▶ Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs) (IEC61010).

NOTICE

Risk of injury

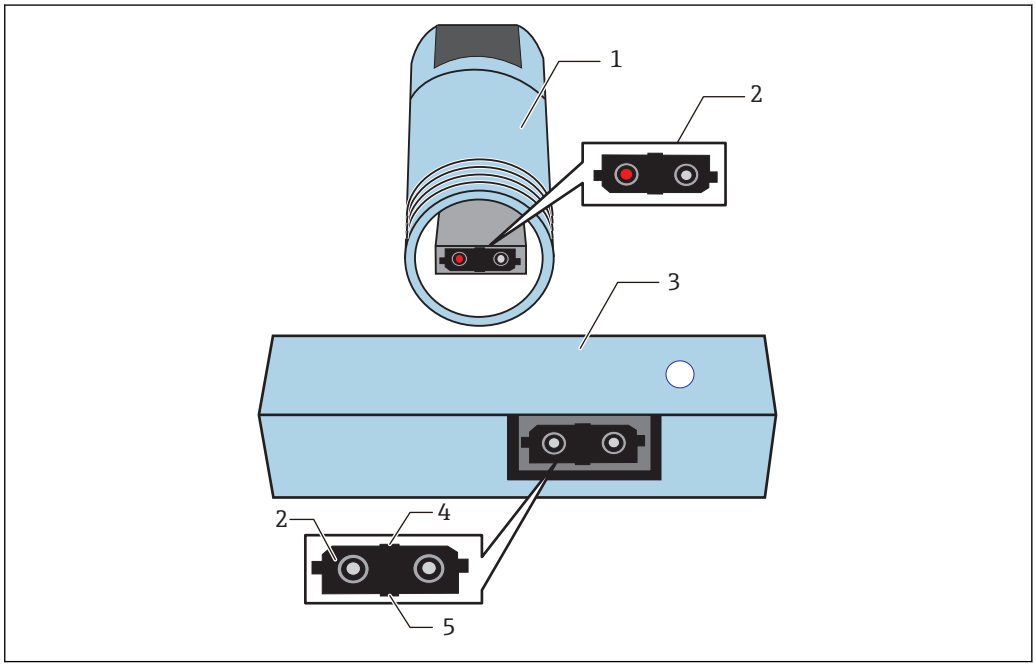
- Transport the measuring device to the measuring point in its original packaging.
- Take into account the center of gravity of the device in order to avoid unintended tilting.
- Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs) (IEC61010).

5 Electrical connection

5.1 Wiring

Wiring HHT2 with TMD1:Because HHT2 operation and signals for setting are communicated by a dedicated fiber-optic, a dedicated connecting coupler are mounted on the sending and receiving entry of HHT2 and TMD1.

- HHT2 communication has two types of optical communication modules and connection couplers as follows: 1) 2-way, 2-wire, 2) 2-way, single wire.
- There is a specific direction for the coupler insertion port. Connect according to the TMD1's insertion port.
- When removing fiber-optic cable, hold the connector tip while removing the fiber-optic cable.
- Always cover the TMD1 HHT2 port to prevent light, except when communicating with HHT2.



3 *TMD1, HHT2 main unit, HHT2 optic communication coupler*

1 *TMD1 HHT2 port*
2 *Coupler insertion port*
3 *HTT2 main unit keypad side*
4 *Top*
5 *Bottom*

6 Operation

6.1 Pre-operation and settings

Check the connection environment between HHT1 and TMD1 before starting TMD1 operation and settings. Because the HHT2 is used for operation and settings of both the TMD1 and the servo level gauge TGM5, follow the instructions in this chapter and set the TMD1 appropriately.

6.2 Power ON

Connect TMD1 and HHT2 with the included fiber-optic cable, then turn on HHT2.Confirm that TMD1 is operating.HHT2 starts to access CPU of the connected device immediately after turning on HHT2. If TMD1 is not turned on, the following message may not be displayed.

For type B (single/2-wire fiber-optic module compatible model) HHT2 setting procedure

1. Turn on the power.
2. Set the desired fiber cable from the following table.
   ↳ Select [2] of 2-way, 2-wire fiber-optic for TMD1.

A0038096

This completes the setting procedure.

6.3 Device selection

Selecting procedure

1. Turn on the power (after selecting 2-wire on B type).
   ↳ The first screen shows the following:

SELECT	DEVICE
E: 1/F ↓	: NEXT

A0038097

2. Using the [↑] and [↓] keys, display the TGM/TM screen and press the [ENT] key.
   ↳ The lower display shows the ROM version that is installed on the HHT2.

PUSH	TGM/TM
HHT2	ROM V5x

A0038098

3. Press the MODE key and check that the following display is shown.
   ↳

MODE NO 01	TGM (TMD)
OPERATION ?	

A0038099

4. Using [↑] and [↓] key, select desired MODE and press [ENT] key.
   ↳ The initial ITEM in the MODE will appear.

This completes the selecting procedure.

6.4 MODE00 function display and setting change

In MODE00, the display of module type installed in TMD1, function and setting change can be performed.After selecting MODE00, select the following ITEM using ↑ and ↓ key and press ENT to finalize it..

No.	Functions	Descriptions
01	Wiring Classification Display/ Change	TMD1 wiring classification data (maximum number of characters: 3)
02	Slot 1 substrate display	Name of the board installed in TMD1's main unit
03	Slot 2 substrate display	Name of the board installed in TMD1's main unit
04	Slot 3 substrate display	Name of the board installed in TMD1's main unit
05	Slot 4 substrate display	Name of the board installed in TMD1's main unit
06	Slot 5 substrate display	Name of the board installed in TMD1's main unit
07	Slot 6 substrate display	Name of the board installed in TMD1's main unit
08	TAG NAME display change	Enter the tank number(Maximum number of characters: 6)
12	Memo No.1	Refer to NOTE.
13	Memo No.2	Refer to NOTE.
14	Memo No.3	Refer to NOTE.
18	Measuring function display and setting	20: NONE 2A: Level gauge operation 2 points 2B: Level gauge operation 2 points + external device operation 6 points 2C: External device operation 8 points

No.	Functions	Descriptions
19	Temperature measurement function selection	0: Single element average temperature 1: Multi-element average temperature 2: Spot temperature 4 points 3: Spot temperature 1 point
20	Selection of temperature conversion method	Thermo-A conversion method 0: Pt100 1: JPt100 2: Cu ADC-1 conversion table method 3: Cu 4: Pt100 (70 to 350℃) 5: Pt100 (-50 to 200℃)
21	Display unit selection	0: mm & ℃ 1: Ft1/8 & ℉ 2: Ft1/16 & ℉
22	NRF560 connection and selection	0: Disconnected 1: Connected In TMD1, it is HART output when both NRF560 connection and NMT53x connection are set to 0, and it is HART input if either one of them is set to 1.
23	NMT53x connection and selection	0: Disconnected 1: Connected In TMD1, it is HART output when both NRF560 connection and NMT53x connection are set to 0, and it is HART input if either one of them is set to 1.
24	Memory initialization	0: NONE 1: MAIN-CPU 2: MOTOR (not used) Setting descriptions to be initialized vary depending on the access code. ▪ 74: Initialize only the error history ▪ 530: Use when an access code is required (initialization of error history, cumulative operation hours) ▪ 987: Full initialization (cumulative operation hours is also initialized)
25	Access code	Change the access authority to change the operation and function settings.
27	Level selection	0: Innage 1: Ullage Upper limit stop and lower limit stop is reversed.
28	Selection of level 90 mm and higher	0: Change to 0 mm 1: Unchanged
29	Error history	DDD: Date (since TMD's power was turned on) MMMMM: Minutes (time is displayed in terms of days and minutes) EEEEE: Error code PP: History number from 0 to 99 Error is saved from 0 to 99, then overwriting starts from 0.

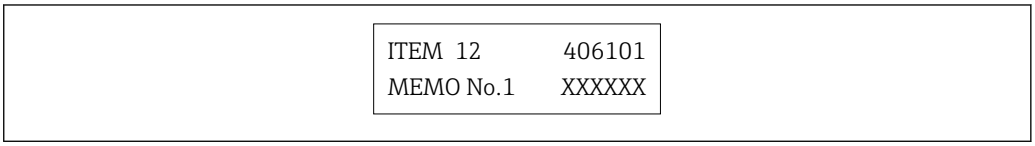
TMD1's program control flag

In TMD1, certain data is written in the "Memo" area of Mode00, Item12, Item13 and Item14 in order to control various programs (it cannot be used for memos). Example: If "123456" is displayed, "1" is the first digit and "6" is the sixth digit.

Memo No.1 (M00, I12)

Digit	Descriptions	Default	memo
1	4: Gauge status = LEVEL balance flag = Fixed to ON	4	Everything other than 4 is status = LEVEL, balance flag = OFF.
2	1: Written data from HART CMD#31 64,387 is output to DO port. Other: No output to DO port	0	Written data is output from HART master to DO (port 1 to 4) (0x01 to 0x0f) If it is 1, it is given priority over the alarm output [Mode 6]. [1)]
3	HART slave address setting (restart is required)	6	Restart after resetting HART address. [2)]
4	1: Temperature element exposure error is not processed (LCD error display prohibition processing) Other than 1: Temperature element exposure error is processed	1	
5	2: No V1 dummy pulse (New V1 only)	0	Default is 0 except for specific users.There is a dummy pulse if the default is other than 2.
6	0: External status input is the same NC contact point processing as that of TGM4000 1: External status input is NO contact point processing (the logic is opposite of TGM4000) Other than above: There is no external status input	1	

1) This function is only enabled in HART slave mode.
2) This function is only enabled in HART slave mode.



4 *Memo No.1 screen display example*

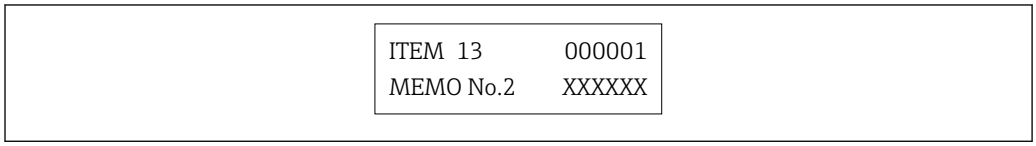
Memo No.2 (M00, I13)

Digit	Descriptions	Default	memo
1	"HART HART CMD#1, #3, #14, #15 transmission level unit selection 1: Ft 2: Inch Other: mm	0	1: Temperature unit is converted to Deg_F only when Ft or 2: Inch has been selected. It only applies to HART CMD#1, #3, #14, #15. (It is not linked to [Mode0:Item21: Ft, Inch] setting. [1)]
2	N/A	0	
3	N/A	0	
4	N/A	0	

Digit	Descriptions	Default	memo
5	N/A	0	
6	1: There is NMT matrix scan	1	It is enabled only in HART input.Setting other than 1: It does not scan other than the average liquid temperature and average gas temperature.

1) The feature is only enabled in HART slave mode.

HART slave: Digital input is Port1 = TV, Port2 = QV fixed (compatible with CMD#3 only)



5 Memo No.2 screen display example

Memo No.3 (M00, I14)

Digit	Descriptions	Applicable version No.
1	Reserved	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	

For details on the latest flag for program control, contact your Endress+Hauser Sales Center.

6.5 MODE01 Operation and display setting

In MODE01, the external device operation can be changed.

No.	Functions	Descriptions
06	External device ON/OFF operation External device operation output 1	External device operation output: 8 points (The number of point for operation output varies depending on the use of TMD1.) CSR specification (C: Cancel, S: Set, R: Reset) ▪ If Cancel is selected, operation output is invalid (there is no change on operation output status). ▪ Operation output switches to ON when the set is configured (contact point is turned on when N/O is applied). ▪ If Reset is selected, operation output is OFF (if N/O is used, contact is OFF).
07	External device ON/OFF operation External device operation output 2	Same as above
08	External device ON/OFF operation External device operation output 3	Same as above
09	External device ON/OFF operation External device operation output 4	Same as above
10	External device ON/OFF operation External device operation output 5	Same as above
11	External device ON/OFF operation External device operation output 6	Same as above
12	External device ON/OFF operation External device operation output 7	Same as above
13	External device ON/OFF operation External device operation output 8	Same as above
14	Switching the operation command source	If setting 0, perform external device operation output according to operation command from 2-way, 2-wire. If setting 1, perform external device operation output using HHT2 connected to TMD1.

No.	Functions	Descriptions
15	Gauge operation	0: Liquid surface 1: Hoisting 2: Stop 3: Bottom 4: Operation cancellation 5: Density 6: Interface B: Table C: 10 mm descend D: 10 mm elevation
16	LCD screen selection	0: Home screen 1: Address 2: V1 (2-wire transmission output details) 3: Displacer detection weight 4: Lifespan (calculation data based on the cumulative operation time) 5: Date 6: NMT communication status 7: NRF communication status 8: Inter-CPU communication status 9: Error history 10: ROM version 11: Temperature system

6.6 MODE02 level and status

This mode is to display before/after calibrated data in MODE03 and MODE04.

No.	Functions	Descriptions
11	Level data display	GLEVEL: Before correction NLEVEL: After correction
13	Error code display	Displays TMD's error code (see "7.23 Error message list")
14	Displays HART communication error list	NMT:000.000 % NRF:999.999 %

6.7 MODE03 data setting operation for level

This setting is mainly related to level-related data setting operation.

No.	Functions	Descriptions
04	Level command calibration setting	Sets the level value when the level is determined with manual dip.

6.8 MODE05 parallel output

When installing parallel output board OUT-3 or OUT-4, the following operation and settings are available.

No.	Functions	Descriptions
01	Output data and code display	LEVEL BCD: Level BCD code output LEVEL-SIC: Level SIC code output TEM-BCD: For temperature BCD code output terminal table, see electrical compartment internal wiring diagram.
04	Level encoder reading Error codes	Sets the output code in case were a level encoder error occurs when outputting level (BCD, SIC code). Example: Set Level XXXX.X mm.
10	Output code selection	0: SAKURA code 1: BCD code level 2: BIN code level 3: BCD code temperature

6.9 MODE06 contact output (Alarm)

When Exp-A or alarm output board is installed, this mode is available. Up to 4 points alarms are available to be output for standard.

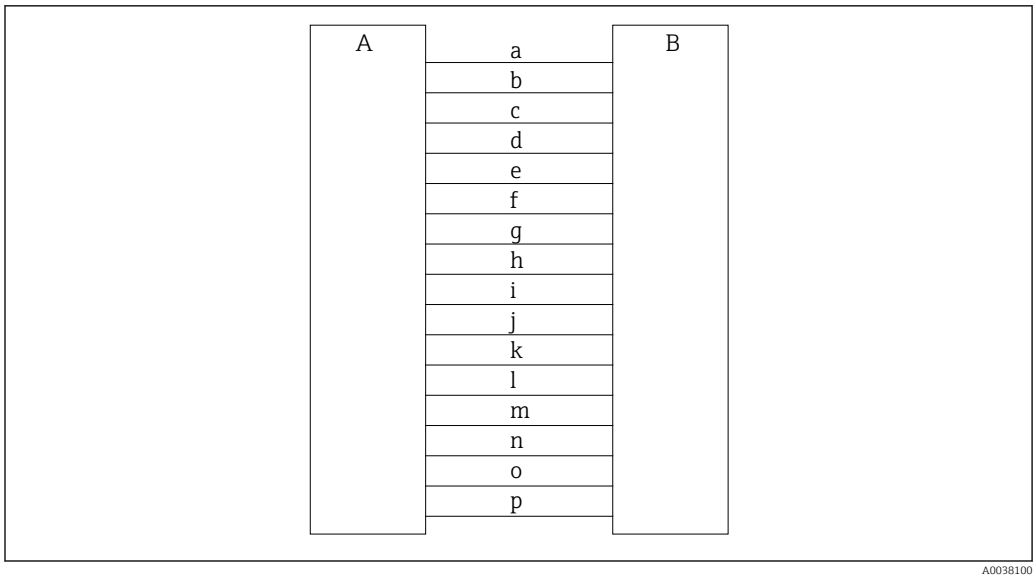
However, alarms can be set for up to 8 points depending on the application.

No.	Functions	Descriptions
01	Alarm 1	Specification of LEVEL H, L, NON H: High alarm L: Low alarm NON: No output
02	Alarm 1	LEVEL setting value
03	Alarm 1	LEVEL hysteresis value
04	Alarm 1	NO/NC contact point specification

The pattern shown above is repeated up to alarm 8.

No.	Functions	Descriptions
33	Alarm 1	Specification of LEVEL H, L, NON H: High alarm L: Low alarm NON: No output
34	Alarm 1	TEMP setting value
35	Alarm 1	TEMP hysteresis value
36	Alarm 1	NO/NC contact point specification

The pattern shown above is repeated up to alarm 8.



6 *Alarm 1 to 8 output*

A Alarm output board OUT-2
B Terminals
a Alarm 1
b Alarm 1 Common
c Alarm 2
d Alarm 2 Common
e Alarm 3
f Alarm 3 Common
g Alarm 4
h Alarm 4 Common
i Alarm 5
j Alarm 5 Common
k Alarm 6
l Alarm 6 Common
m Alarm 7
n Alarm 7 Common
o Alarm 8
p Alarm 8 Common

- The terminal number and the number of wires from alarm output board to terminals vary depending on the specifications.Refer to delivery specification enclosed with the main unit or terminal wiring diagram for details.
- If level or temperature is specified in same alarm (Alarm 1), the level is given priority.

6.10 MODE07 spot temperature device 1 point input

This mode is only available when Thermo-A is installed.

No.	Functions	Descriptions
01	Input temperature data	GTEMP: Measurement value display NTEMP: Measurement value ± Temperature correction value (This value will be reflected on the LCD display and external output data.)
02	Temperature correction data setting	Display add-subtract value to measurement value as "±".

6.11 MODE08 spot temperature device 3 point input

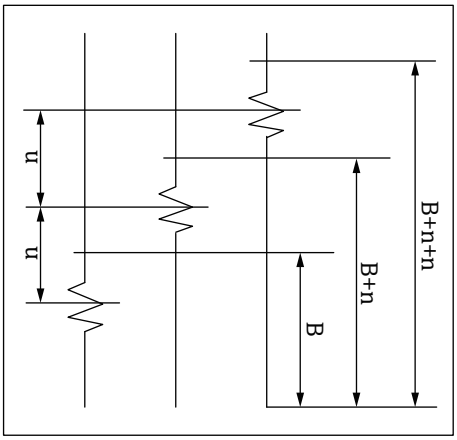
TMD1 can connect spot temperature devices to up to 3 points.As with the spot temperature device, this mode is only available when Thermo-A is installed.

No.	Functions	Descriptions
01	No.1 spot	GTP: Spot temperature device 1 measurement value NTP: Measurement value ± Temperature correction value
02	No.2 spot	GTP: Spot temperature device 2 measurement value NTP: Measurement value ± Temperature correction value
03	No.3 spot	GTP: Spot temperature device 3 measurement value NTP: Measurement value ± Temperature correction value
05	Number of connections	Number of connected spot temperature devices
06	Correction value setting for No.1 spot temperature device	Display add-subtract value to measurement value as "±".
07	Correction value setting for No.2 spot temperature device	
08	Correction value setting for No.3 spot temperature device	
09	Correction value setting for No.4 spot temperature device	
10	Direct selection	Select No.1 to No.4 spot temperature devices in direct mode.In direct mode, only the specified spot temperature device data will be updated. This function is useful for temperature line adjustment and calibration because the data update is fast. In free mode (specified 0), No.1 to No.4 will be updated in this order.

6.12 MODE09 multi-element average temperature device input

TMD1 can connect MRT (Multi Resistance Thermo) type average temperature devices configured with RCV series platinum resistors.When installing temperature input board ADC-1 and average temperature switching board TSL-1A, this mode is available. NMT53x is configured in FieldCare.This mode can be set by HHT2 with software ver.5.8 or later.

No.	Functions	Descriptions
01	Displays average temperature data	GTEMP: Temperature input board's direct reading value NTEMP: GTEMP ± ITEM: 05 Correction value
02	Sets the number of connected elements	The number of average temperature device elements in a switching interval is input (maximum 12 points).
03	Set bottom level value	In the case of the following average temperature device

No.	Functions	Descriptions
04	Switch interval	 A0038101 7 *Bottom level value* n: Element interval B: Bottom level value (The level at which the first point element is in the liquid) When "B" is set in ITEM03 and "n" is set in ITEM04 = level value: Up to n + B < select point 1 Up to n + B ≤ level < n + n + B select point 2 If the level value exceeds the number of connected elements, select the setting connection element (number of elements set in ITEM02). For example, when setting three elements in ITEM02: Up to n + n + B ≤ select point 3 This setting is ignored for specifications with unequal switching intervals.
05	Set temperature correction value	Sets the ITEM01 GTEMP value ±XXX.X ℃ temperature correction value (Default: ±0.0).

6.13 MODE10 single-element average temperature

Only when temperature input board ADC-1 and average temperature switching board TSL-1B is installed is this mode available.

- NMT53x is configured in FieldCare.This mode can be set by HHT2 with software ver.5.8 or later.
- Both multi- and single-elements have several temperature resistors installed inside an average temperature device; however, the average temperature calculation logic is different.If the elements are connected to an average temperature device with incorrect settings, they will fail to read the temperature correctly.

No.	Functions	Descriptions
01	Display average temperature data in liquid	GAVE: Measurement and calculation data NAVE: Measurement and calculation data ± Temperature correction value
02	No.1 element data	GTP: No. 1 element measurement value NTP: No. 1 element calculation value ± Temperature correction value
03	No.2 element data	GTP: No. 2 element measurement value NTP: No. 2 element calculation value ± Temperature correction value
04	No.3 element data	GTP: No. 3 element measurement value NTP: No. 3 element calculation value ± Temperature correction value

No.	Functions	Descriptions
05	No.4 element data	GTP: No. 4 element measurement value NTP: No. 4 element calculation value ± Temperature correction value
06	No.5 element data	GTP: No. 5 element measurement value NTP: No. 5 element calculation value ± Temperature correction value
07	No.6 element data	GTP: No. 6 element measurement value NTP: No. 6 element calculation value ± Temperature correction value
08	No.7 element data	GTP: No. 7 element measurement value NTP:No. 7 element calculation value ± Temperature correction value
09	No.8 element data	GTP: No. 8 element measurement value NTP：No. 8 element calculation value ± Temperature correction value
10	No.9 element data	GTP: No. 9 element measurement value NTP: No. 9 element calculation value ± Temperature correction value
11	No.10 element data	GTP: No. 10 element measurement value NTP: No. 10 element calculation value ± Temperature correction value
12	No.11 element data	GTP: No. 11 element measurement value NTP: No. 11 element calculation value ± Temperature correction value
13	No.12 element data	GTP: No. 12 element measurement value NTP: No. 12 element calculation value ± Temperature correction value
14	Temperature correction value	Set add-subtract value to each element as "±".
15	Number of elements	Inputs the maximum point of temperature resistor for temperature input (maximum 12 points).
16	Set bottom level	Same as MODE09, ITEM03 and 04
17	Set switching interval level value	
18	Direct selection	Select No.1 to No.12 elements in direct mode. ▪ In direct mode, the only specified spot temperature data will be updated. ▪ This function is useful for temperature line adjustment and calibration because the data update is fast. ▪ In free mode (specified 0), No.1 to No.12 will be updated in this order.
19	Display average gas temperature data	GTP-A: Measurement and calculation data NTP-A: Measurement and calculation data ± Temperature correction value

6.14 MODE11 Analog 4 to 20 mA output (No. 1)

TMD1 can output a maximum of two analog 4 to 20 mA data.Set and operate the first board in MODE11.

No.	Functions	Descriptions
01	Display output current	Displays the current value that is being output at that time as 0 to 100 %.
02	Set level output	0: NON 1: Set as YES (set with "1" and "ENT")
03	Set level FULL data	Sets the level value at 100 % output

No.	Functions	Descriptions
04	Set level ZERO	Sets the level value at 0 % output
05	Set temperature output	0: NON 1: Set as YES (set with "1" and "ENT") When selecting level output in ITEM02, the temperature output will be automatically canceled.
06	Set temperature FULL data	Set temperature value at 100 % output
07	Set temperature ZERO	Set temperature value at 0 % output
08	Specify temperature type	0: AVE (Average temperature device) 1: S1 (First spot point) 2: S2 (Second spot point) 3: S3 (Third spot point) 4: S4 (Fourth spot point) Specify 0: AVE for spot 1 point element specification.
09	Configure and adjust current output	0: INS (outputs the measurement value) 1: AJ-4 (4 mA output) 2: AJ-20 (20 mA output) The fixed values of 4 mA and 20 mA are output from 1 and 2.
10	Set output value in case of failure	▪ Over-tension ▪ Under-tension ▪ Level A/D ▪ Level flow Sets the current value that is output when each of the above error occurs (the current can be set arbitrarily between 0.00 to 20.00 mA) / Default:20.00 mA

6.15 Analog 4 to 20 mA output No. 2

It is possible to set analog 4 to 20 mA output and the second output operation.The substrate display is required, just as it is for No. 1 output.

No.	Functions	Descriptions
01	Display output current	Displays the current value that is being output at that time as 0 to 100 %.
02	Set level output	0: NON 1: Set as YES (set with "1" and "ENT")
03	Set level FULL data	Sets the level value at 100 % output
04	Set level ZERO	Sets the level value at 0 % output
05	Set temperature output	0: NON 1: Set as YES (set with "1" and "ENT") When selecting level output in ITEM02, the temperature output will be automatically canceled.
06	Set temperature FULL data	Set temperature value at 100 % output
07	Set temperature ZERO	Set temperature value at 0 % output
08	Specify temperature type	0: AVE (Average temperature device) 1: S1 (First spot point) 2: S2 (Second spot point) 3: S3 (Third spot point) 4: S4 (Fourth spot point) Specify 0: AVE for spot 1 point element specification.

No.	Functions	Descriptions
09	Configure and adjust current output	0: INS (outputs the measurement value) 1: AJ-4 (4 mA output) 2: AJ-20 (20 mA output) The fixed values of 4 mA and 20 mA are output from 1 and 2.
10	Set output value in case of failure	▪ Over-tension ▪ Under-tension ▪ Level A/D ▪ Level flow Sets the current value that is output when each of the above error occurs (the current can be set arbitrarily between 0.00 to 20.00 mA) / Default:20.00 mA

6.16 MODE13 2-way, 2-wire transmission output

No.	Functions	Descriptions
01	Set select code	Set the read address for reading out from a receiver.The setting value must be matched to the receiver's setting value. In DX type communication mode (1-way, 2-wire), there is no need to set the read address.
04	Select data line resistance	Set 16 types line resistance from 0 to F. 20 Ω step with 0 to 300 Ω between 0 and F
06	Maximum alarm value data setting for 2-wire transmission	Sets the maximum alarm value for the maximum alarm bit in the 2-wire transmission data.
07	Minimum alarm value data setting for 2-wire transmission	Sets the minimum alarm value for the maximum alarm bit within the 2-wire transmission data.
18	Output code selection	Select 2-way transmission output (level in case of error). 0: Outputs code for each error (Item 21, 22) 1: Conventional level-only output
21	Output level value setting for level encoder (counter) error	Sets output level value when level encoder (counter) error occurs. Sets level XXXXX.X mm.
26	Selects communication mode	02: BBB 04: MDP 08: V1
27	Hysterias setting for level alarm	0 to 99 999 mm
28	Level alarm output method selection	0: HL 1: LH 2: HH 3: LL Select one shown above. Match with a receiver display.

6.17 MODE14 Analog 4 to 20 mAinput

No.	Functions	Descriptions
01	% display of the input value	GINPUT: Displays the % of the input value NINPUT: (input value x SPAN correction value) ± zero correction amount
02	Set zero correction value	Sets value as ± %
03	Set SPAN correction value	Sets value as ± %

6.18 MODE15 FFi transmission output

No.	Functions	Descriptions
01	FFi communication address setting	Set FFi communication address 00 to 07.
04	FFi level transmission range setting	0: FFi level transmission method (± 32 767 mm) 1: SAKURA level transmission method (0 to 65 535 mm)

6.19 MODE21 MIF-4 data setting

No.	Functions	Descriptions
01	Display MIF-4 error	0: Code error
02	Set absolute counter	In case of 12345 890 1: 4-digit delay 2: 4-digit advance 3: 3-digit delay 4: 3-digit advance 5: Second digit Translation example In case of "12345", adopt the delay for each digit "135". In case of 12344, adopt the advance for each digit "244". (The sample shown above is different from actual data.) 890 is lower level MTL encoder value.
03	Set current black-and-white pattern threshold	Sets the threshold to sort the current white pattern and black pattern (0 - 255). When changing threshold, error history is cleared. However the same value is ignored. The threshold is automatically changed.
04	Set current white pattern measurement	The measurement is shown in the range of 0 to 255.
05	Set current black pattern measurement	The measurement is shown in the range of 0 to 255.
06	Set black-and-white pattern threshold of initial value	This is data for comparing initial threshold to current threshold.
07	Set white pattern of initial value	This is data for comparing initial value to current value.
08	Set black pattern of initial value	This is data for comparing initial value to current value.
09	Threshold buffer address	A storage address of threshold which starts from 0 x F800. Address is added by +4 at a time of updating.
10	Software version MIF-4	It signifies X X X X → X X. X X.
11	Software version Main - CPU	It signifies X X X X → X X. X X.
12	History number setting	Number is to select history data in ITEM: 13 (0 - 1023).
13	History data	History data set in ITEM: 12.

6.20 MODE30 NMT: V0 (temperature value) setting

No.	Functions	Descriptions
01	Average liquid temperature	Average value of element temperature in liquid Calculation is not possible: All elements are open in liquid; however, if all elements are exposed, the gas temperature will be displayed. Applicable devices: 183, 184, 186
02	Average gas temperature	When it is not possible to calculate the average airborne element temperature: All elements in the air are open, etc.
03	Liquid level	Liquid level in tank (no water scale sensor)
08	Zero element temperature	Temperature conversion value at 100 Ω built-in precision resistance
09		
10	17 element temperature	Temperature conversion value at 100 Ω built-in precision resistance

Device type

183: NMT535, 536, 538

184: NMT539 temperature device

185: NMT539 water scale device

186: NMT539 temperature device + water scale device

6.21 MODE31 NMT: V1 (Element temperature) setting

No.	Functions	Descriptions
01	Element No.1 temperature	Temperature conversion value of element No.1 to No.10 connected to NMT. It is 358 ˚C when elements are open or short circuit. Applicable devices: 183, 184, 186 (see MODE30 device types)
02	Element No.2 temperature	Same as above
03	Element No.3 temperature	Same as above
04	Element No.4 temperature	Same as above
05	Element No.5 temperature	Same as above
06	Element No.6 temperature	Same as above
07	Element No.7 temperature	Same as above
08	Element No.8 temperature	Same as above
09	Element No.9 temperature	Same as above
10	Element No.10 temperature	Same as above

6.22 MODE32 NMT: V2 (Element temperature) setting

No.	Functions	Descriptions
01	Element No.11 temperature	Temperature conversion value of element No.11 to No.16 connected to NMT. It is 358 ˚C when elements are open or short circuit. Applicable devices: 183, 184, 186 (see MODE30 device types)
02	Element No.12 temperature	Same as above
03	Element No.13 temperature	Same as above

No.	Functions	Descriptions
04	Element No.14 temperature	Same as above
05	Element No.15 temperature	Same as above
06	Element No.16 temperature	Same as above
07	Select averaging method	0: Standard. Divides the total value of each element temperature with the number of elements. (T1 + T2 + T3) / 3 1: Advanced - Divides the total value, which was derived by multiplying each element temperature with their corresponding volume factors, with only the volume factor. (T1 x V1 + T2 x V2 + T3 x V3) / (V1 + V2 + V3) Applicable devices: 184, 186 (see MODE30 device types)
08	Select element configuration	0: Spot (Single element configuration) 1: Multi (Multiple element configuration) Applicable devices: 184, 186 (see MODE30 device types)
09	Element temperature lower limit	This is used for reference value of element temperature lower limit. Applicable devices: 184, 186 (see MODE30 device types)
10	Element temperature upper limit	This is used for reference value of element temperature upper limit. Applicable devices: 184, 186 (see MODE30 device types)

6.23 MODE33 NMT: V3 (element position) setting

No.	Functions	Descriptions
01	Element No.1 temperature	Each element distance from tank bottom Equal interval: automatic calculation / Unequal interval: manual calculation Applicable devices: 183, 184, 186 (see MODE30 device types)
02	Element No.2 temperature	Same as above
03	Element No.3 temperature	Same as above
04	Element No.4 temperature	Same as above
05	Element No.5 temperature	Same as above
06	Element No.6 temperature	Same as above
07	Element No.7 temperature	Same as above
08	Element No.8 temperature	Same as above
09	Element No.9 temperature	Same as above
10	Element No.10 temperature	Same as above

6.24 MODE34 NMT: V4 (element position) setting

No.	Functions	Descriptions
01	Element No.11 temperature	Each element distance from tank bottom Equal interval: automatic calculation / Unequal interval: manual calculation Applicable devices: 184 ,186 (see MODE30 device types)
02	Element No.12 temperature	Same as above
03	Element No.13 temperature	Same as above
04	Element No.14 temperature	Same as above
05	Element No.15 temperature	Same as above
06	Element No.16 temperature	Same as above

No.	Functions	Descriptions
07	Element switching point hysteresis	When the liquid level increases, add only the increased level to the switching point, and when the level decreases, subtract only the decreased level, to limit element switching due to waves in the liquid, etc. Applicable devices: 184, 186 (see MODE30 device types)
08	Memory initialization	1: Memory initialization start Applicable devices: 184, 185, 186 (see MODE30 device types)
09	Gas offset	When the element in the air is above the gas offset from liquid level, this gas offset is used for average calculation of gas temperature. Applicable devices: 184, 186 (see MODE30 device types)
10	Liquid offset	When the element in the liquid is below the liquid offset from liquid level, this liquid offset is used for average calculation of liquid temperature. Applicable devices: 183, 184, 186 (see MODE30 device types)

6.25 MODE35 NMT: V5 (water scale temperature) setting

No.	Functions	Descriptions
01	Water scale	Water I/F level which is calculated from the frequency value Water scale = (measurement frequency - frequency of all oil in tank) / probe coefficient Span + Water scale offset Applicable devices: 185, 186 (see MODE30 device types)
02	Capacitance	Capacitance which is calculated from the frequency value Applicable devices: 185, 186 (see MODE30 device types)
03	Measurement frequency	Output frequency of farad meter is set as follows 1 000 mm: 10 to 1 000 pF: 1 200 to 4 500 Hz 2 000 mm: 10 to 2 200 pF: 1 200 to 4 500 Hz 3 000 mm: 10 to 3 000 pF: 1 200 to 4 500 Hz are set. Applicable devices: 185, 186 (see MODE30 device types)
04	Element number (For volume factor average temperature calculation)	Select element number for creating calculation table of volume factor average temperature. Set the value of element number - 1. Applicable devices: 184, 186 (see MODE30 device types)
05	Element position (For volume factor average temperature calculation)	Element position for creating calculation table of volume factor average temperature The element position which has been specified in Item 04. Applicable devices: 185, 186 (see MODE30 device types)
06	Element volume (For volume factor average temperature calculation)	Element volume for creating calculation table of volume factor average temperature The element volume which has been specified at Item 04. Applicable devices: 185, 186 (see MODE30 device types)
08	Water scale probe	Select the length of capacitance probe 0: 1 000 mm 1: 2 000 mm 2: 3 000 mm Applicable devices: 185, 186 (see MODE30 device types)

No.	Functions	Descriptions
09	Water scale offset (correction value)	This value is used for the following formula to find water scale. Water scale = (measurement frequency - frequency of all oil in tank) / probe coefficient Span + Water scale offset Applicable devices: 186 (see MODE30 device types)
10	Water scale span value (correction value)	This value is used for the following formula to find water scale. Water scale = (measurement frequency - frequency of all oil in tank) / probe coefficient Span + Water scale offset Default: 1.0 Applicable devices: 185, 186 (see MODE30 device types)

6.26 MODE36 NMT: V6 (water scale and power supply) adjustment

No.	Functions	Descriptions
01	Frequency of all oil in tank	Measure the lower frequency and input the value to find the probe coefficient when the probe is submerging in the oil layer. Applicable devices: 185, 186 (see MODE30 device types)
02	Frequency of all water in tank	Measure the higher frequency and input the value to find the probe coefficient when water accumulated at some level. Applicable devices: 185, 186 (see MODE30 device types)
03	Probe length	Measure and input water level from the bottom end of the probe in Item 02 to find the probe coefficient. Applicable devices: 185, 186 (see MODE30 device types)
04	Probe coefficient	It is determined by calculating the probe's factor, which is expressed in terms of frequency volume per 1 mm, (frequency when it's only water - frequency when it is only oil) / (probe length) Hz/mm. Applicable devices: 185, 186 (see MODE30 device types)
08	Temperature common line voltage	0 to 3 V: It is displayed in count values from 0 to 255. It is approximately 0 V when the common line is disconnected. Approximately 0 V is displayed continuously when the common line is disconnected. Applicable devices: 184, 186 (see MODE30 device types)
09	Output current adjustment	It is adjusted to 5 mA: approximately 16000 or 12 mA: approximately 45000 when shipped from the factory.Change this value if adjustment is required. Applicable devices: 184, 185, 186 (see MODE30 device types)
10	Reference voltage of power supply voltage reduction	When the initial value is 94, a power supply low voltage warning is issued when it becomes 16 V or lower.Change this value if adjustment is required. Applicable devices: 184, 185, 186 (see MODE30 device types)

6.27 MODE37 NMT: V7 (Temperature adjustment) setting

No.	Functions	Descriptions
01	Specify element number for temperature adjustment	Specify the element number for adjustment. 0 to 15: Element 1 to 16 Applicable devices: 183, 184, 186 (see MODE30 device types)
02	Zero-adjustment for element temperature	Perform zero-adjustment for the specified element. Wait for the adjustment value in each element. Applicable devices: 183, 184, 186 (see MODE30 device types)
03	Element temperature span adjustment	All elements are multiplied by this setting value. Element temperature = Measurement element temperature * Span + Each element zero adjustment Applicable devices: 183, 184, 186 (see MODE30 device types)

No.	Functions	Descriptions
04	Element temperature	Temperature for specified element This is used to calculate liquid average temperature or gas average temperature as element temperature. Applicable devices: 183, 184, 186 (see MODE30 device types)
05	Element position	Element position for specified element Element position for unequal interval can be adjusted using this function. Applicable devices: 183, 184, 186 (see MODE30 device types)
06	Element resistance value	Element resistance value for specified element Each resistance zero correction has been added to each measurement resistance. Applicable devices: 184, 186 (see MODE30 device types)
07	Element resistance zero offset	Element resistance zero offset for specified element Applicable devices: 184, 186 (see MODE30 device types)
08	Select element resistance type	0: Pt100 0 ℃ or higher R= -0.580195e-04 * T * T + 0.390802 * T + 100 0 ℃ or lower R = -4.2735e-10 * T4 + 4.2735e-8* T3 -0.58019e-4*T2 + 3.90802e-1*Tn_1 + 100 1: Cu90 R=0.3809*T + 90.4778 2: Cu100 R = 0.38826*T + 90.2935 3: PtCu100 R = 3.3367e-7*T3 - 2.25225e-5*T2 +0.38416*T+100.17 Select one from the number above. Applicable devices: 184, 186 (see MODE30 device types)
09	Average number of resistance sampling value	Average number of sampling resistance value Sampling conditions: Element selection cycle - approx. 2 seconds/ element 21 sampling maximum element number Number of elements: 16 Internal reference resistance: 5 Applicable devices: 184, 186 (see MODE30 device types)
10	Access code	530: Writable Applicable devices: 184, 185, 186 (see MODE30 device types)

6.28 MODE38 NMT: V8 (Device) setting

No.	Functions	Descriptions
01	Error information	0: No error 1: Common line open 2: 3: No. 1 element open 4: No. 1 element short 5: No. 2 element open 6: No. 2 element short 7: No. 3 element open 8: No. 3 element short 9: No. 4 element open 10: No. 4 element short 11: No. 5 element open 12: No. 5 element short 13: No. 6 element open 14: No. 6 element short 15: No. 7 element open 16: No. 7 element short 17: No. 8 element open 18: No. 8 element short 19: No. 9 element open 20: No. 9 element short 21: No. 10 element open 22: No. 10 element short 23: No. 0 element over range 24: Memory failure: ROM 25: No. 11 element open 26: No. 11 element short 27: No. 12 element open 28: No. 12 element short 29: Element exposure 30: 31: 32: Reduced power supply 33: No. 13 element open 34: No. 13 element short 35: No. 14 element open 36: No. 14 element short 37: No. 15 element open 38: No. 15 element short 39: No. 16 element open 40: No. 16 element short 41: Memory failure: ROM 42: Memory failure: ROM 43: W.B: Disconnected 44: W.B: Short circuit Applicable devices: 183, 184, 185, 186 (see Information on MODE30)
02	Temperature unit	Select from 32: C, 33: F, 35: K
03	Number of element	Set number of measurement lines (in case of multi-element) or number of elements (in case of single element). Applicable devices: 183, 184, 186 (see MODE30 device types)
04	Number of preambles (for HART communication)	Set the number of preambles for use of HART communication. Applicable devices: 183, 184, 185, 186 (see MODE30 device types)
05	Level unit	Select from 44: Ft 45: m 47: inch 48: cm 49: mm Applicable devices: 183, 184, 185, 186 (see MODE30 device types)
06	Select element interval	0: Equal interval 1: Unequal interval Select one of the above. Applicable devices: 184, 186 (see MODE30 device types)
07	Set bottom level	The position from the bottom of the tank to the lowest position element Applicable devices: 183, 184, 186 (see MODE30 device types)

No.	Functions	Descriptions
08	Element interval	Element interval in equal element interval Applicable devices: 183, 184, 186 (see MODE30 device types)
09	Output data from element short circuit	For multi-element, when selected element short-circuits, this data is output.For single element, the data is calculated with the remaining elements because short-circuited element is not included in the average calculation. For example: Element temperature: average calculation of T1, T2, T3 = T1, T2, T3/3 Element temperature: average calculation of T1, T2 (short), T3 = T1, T3/2 (T2 is not included in this calculation.) Applicable devices: 184, 186 (see MODE30 device types)
10	Output data in element open	For multi-element, when selected element opens, this data is outputted.For single element, the data is calculated with the lest of elements because opened element is not included in the average calculation. For example: Element temperature: average calculation of T1, T2, T3 = T1, T2, T3/3 Element temperature T1, T2 (open), T3 average calculation = T1, T3/2 (T2 is not included in this calculation.) Applicable devices: 184, 186 (see MODE30 device types)

6.29 MODE39 NMT: V9 (Device) setting

No.	Functions	Descriptions
01	Device ID (for HART communication)	When connecting to multi drop, this function is used to distinguish same device type. When changing the data, communication error may occur due to address mismatch. Restart is required. Applicable devices: 183, 184, 185, 186 (see No. 10 below)
02	Error history	Refer to Mode 38, Item 01 details on error descriptions. Applicable devices: 183, 184, 185, 186 (see No. 10 below)
03	Selection of error display for when element short circuit is open	0: OFF, 1: ON 1: When ON is selected, data from Mode 38, Item 9, 10 are output 0: It is 358 ℃ when it is OFF Applicable devices: 183, 184, 186 (see No. 10 below)
04	Write-protect (For bond)	0: OFF, 1: ON 1: All data is protected from writing when ON is selected Applicable devices: 183, 184, 186 (see No. 10 below)
05	Polling address (HART communication)	Short address for HART communication Applicable devices: 183, 184, 185, 186 (see No. 10 below)
06	Manufacture ID (HART communication)	17: Code for Endress+Hauser Applicable devices: 184, 186 (see No. 10 below)
07	Software version	Displays the software version Applicable devices: 183, 184, 185, 186 (see No. 10 below)
08	Hardware version	Displays the hardware version 10: Ver.1.0 Applicable devices: 183, 184, 185, 186 (see No. 10 below)
09	Hardware version	0: OFF 1: ON 1: Element exposure error code is output when it is ON
10	Device type	183: NMT535, 536, 538 184: NMT539 temperature device 185: NMT539 water scale device 186: NMT539 temperature device + water scale device Applicable devices: 183, 184, 185, 186

7 Diagnostics and troubleshooting

7.1 General troubleshooting

7.1.1 Error Message

Error codes	Displays	Items	Error descriptions	Causes
1	0000 0000 0000 0001	HART Communication	NMT Communication	No response
2	0000 0000 0000 0010		NMT device	Error codes
4	0000 0000 0000 0100		NRF COMM	
8	0000 0000 0000 1000		NRF Devise	
256	0000 0001 0000 0000	EEROM	EEROM	Inaccessible
8192	0010 0000 0000 0000		SRAM	
512	0000 0010 0000 0000	System	External 12V	Disconnection
1024	0000 0100 0000 0000		Internal 12V	Disconnection
2048	0000 1000 0000 0000		Bord for MIF-4 module	No response or other
4096	0001 0000 0000 0000	Temperature system	Element trouble	Open, short

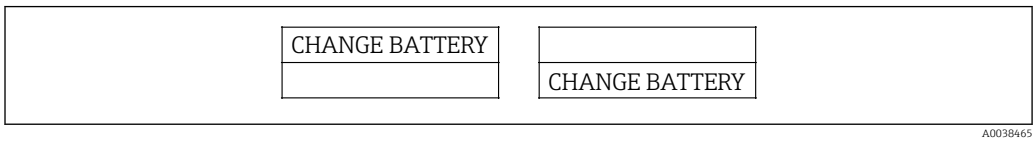
7.2 Maintenance and update

When HHT2 is not activated excluding the following reasons: 1) low battery and 2) faulty wiring (coupler) with TMD1, contact your Endress+ Hauser Sales Center immediately for repair service.

7.3 Battery replacement

Replace the batteries with new ones in the non-hazardous area and confirm that the LCD is flashing on power On/OFF.

Battery: AA alkaline battery (RL6), 4 batteries.



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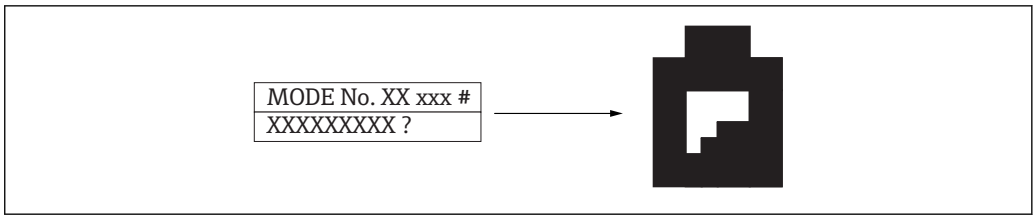
Replacement timing

It is when there are five flashes when turning on HHT2 or pressing the MODE key.

If the status above is shown, replace the batteries as soon as possible. After displaying the status above and completing replacement, low battery mark will appear on the first row, 16th digit on the MODE screen.



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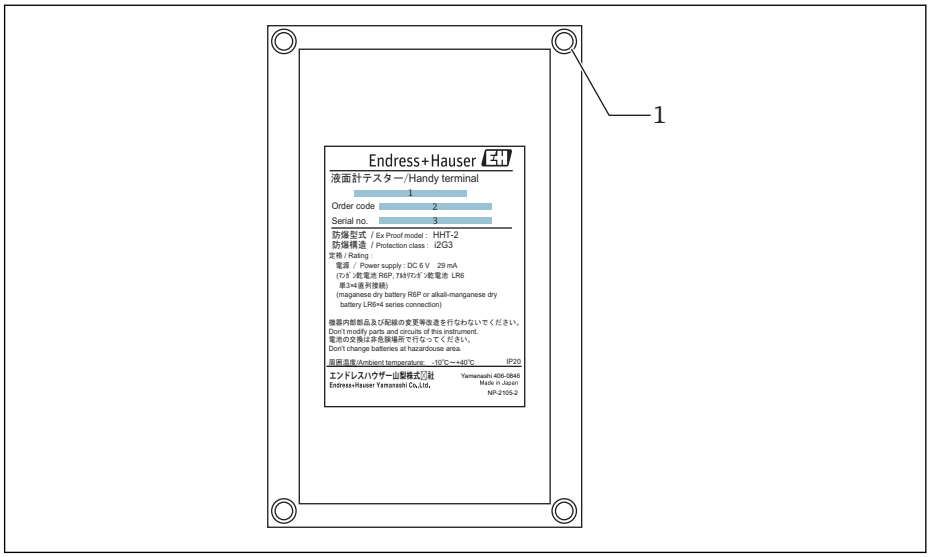
8 Battery mark

Replacement procedure

1. Remove the screws (4 pcs.) and HHT2 rear cover.



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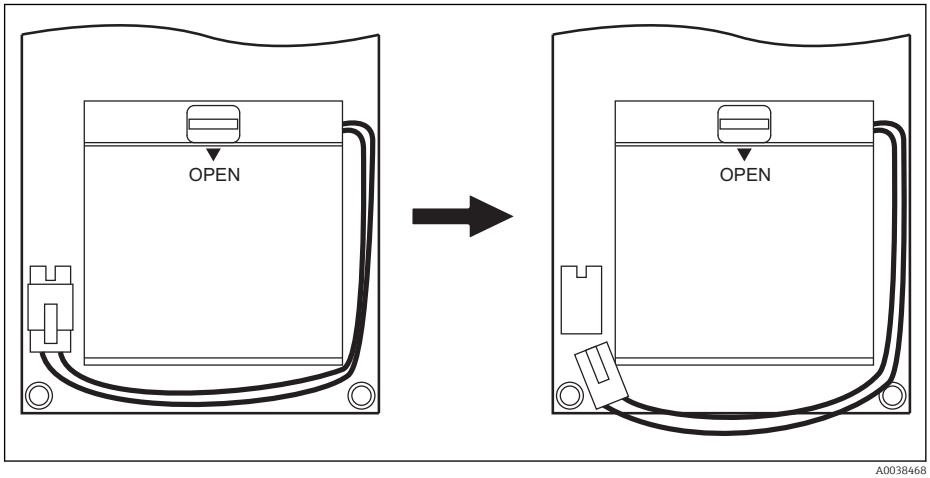
9 HHT2 rear cover

1 Screws (4 pcs)

2. Pull the connector on the printed circuit from the battery case.
   ↳ Slide the upper tab upwards, then pull the tab.



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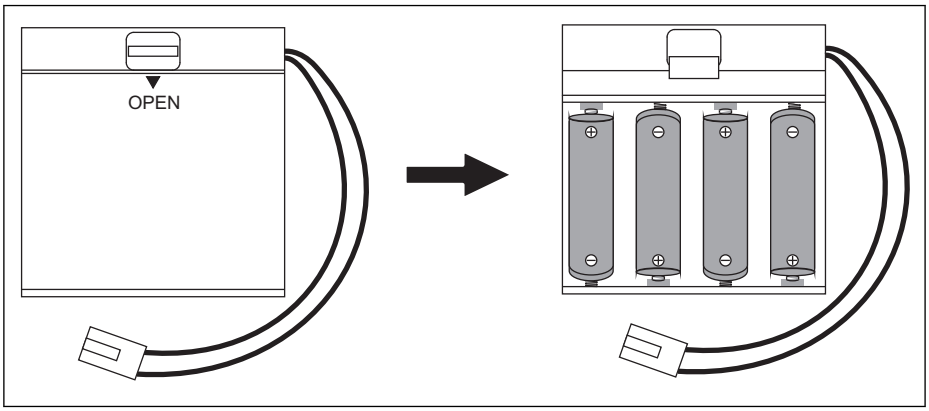
10 Battery replacement 1

3. Remove the battery case, then push "OPEN" on the battery cover and slide the cover to the allow direction to open it.



11 Battery replacement 2

4. Replace the batteries with new ones. Be sure to set the batteries in correct direction + and -.
5. Replace the battery cover, then insert the connector in the printed circuit J4, and install the batteries in HHT2 with the battery case sponge side facing down.
6. Protect the conductor from being pinched and replace the rear cover with four screws.

This completes the replacement procedure.

7.4 Firmware history

Date	Software version	Modifications	Relevant documentation (TMD1)	
			Operating Instruction	Technical Information
09.2008	V1.10	Original versions	BA1007N	TI024N
05.2009	V1.11	Change in valve control	BA1007N	TI024N
08.2010	V1.12	V1 NMT data change	BA01007G	TI00024G
02.2014	V1.13	Change in ullage flag ON & 90 m flag ON & minimum 900000 processing	BA00427G	TI00024G
07.2014	V1.14	Minor updates Updated Tankvision level value to correspond to the float level	BA00427G	TI00024G
12.2017	V1.16	HART output (for demo)	BA00427G	TI00024G
12.2018	V1.17	HART output	BA00427G	TI00024G

8 Repair

8.1 General information on repairs

8.1.1 Repair concept

The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser Service Department or specially trained customers.

Spare parts are included in appropriate kits. They contain the related replacement instructions.

For more information on service and spare parts, contact the Endress+Hauser Service Department.

8.1.2 Repairs to Ex-approved devices

When carrying out repairs to Ex-approved devices, note the following:

- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service Department.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, perform the specified routine test on the device.
- Only the Endress+Hauser Service Department may convert a certified device into a different certified variant.
- Document all repair work and conversions.

8.2 Spare parts

Some interchangeable device components are listed on an overview label on the connection compartment cover.

The spare part overview label contains the following information:
- A list of the most important spare parts for the device, including their ordering information
- The URL for the *W@M Device Viewer* (www.endress.com/deviceviewer):
  All the spare parts for the device, along with the order code, are listed here so that they can be ordered. If available, users can also download the associated Installation Instructions.

8.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

Your Endress+Hauser Sales Center can provide detailed information on the services.

8.4 Return

The device must be returned if it is in need of repair or a factory calibration, or if the wrong device has been delivered or ordered. According to legal regulations, Endress+Hauser, as an ISO-certified company, is required to follow certain procedures when handling returned products that have come into contact with measured materials.

To ensure safe, swift and professional device returns, refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at http://www.endress.com/support/return-material.

8.5 Disposal

Observe the following notes during disposal:
- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

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