



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Operating instructions

iTEMP[®] HART[®] TMT182

Temperature head transmitter

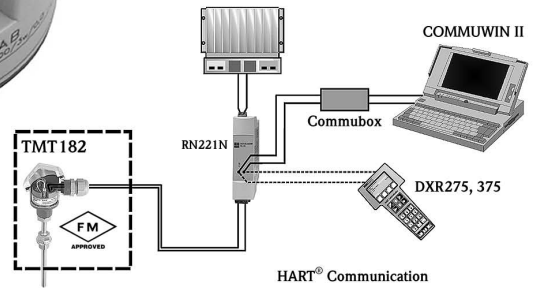


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Safety Message

Instructions and procedures in the operation instructions may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by safety pictograms and symbols. Please refer to the safety messages before performing an operation preceded by pictograms and symbols, see chapter 1.5.

Though the information provided herein is believed to be accurate, be advised that the information contained herein is NOT a guarantee of satisfactory results. Specifically, this information is neither a warranty nor guarantee, expressed or implied, regarding performance; merchantability, fitness, or other matter with respect to the products; and recommendation for the use of the product / process information in conflict with any patent. Please note that Endress+Hauser reserves the right to change and / or improve the product design and specifications without notice.



Warning!

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before connecting a Model 275, DXR375 HART[®] Communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.

Short form instructions

Using the following short form instructions you can commission your system easily and quickly:

Safety notes	page 6
▼	
Installation	page 9
▼	
Wiring	page 12
▼	
<p style="text-align: center;">Commissioning (including a description of the unit functions) A complete description of all the functions as well as a detailed overview of the function matrix can be found in this chapter.</p> <p style="text-align: center;">Quick Setup - Fast entry into the unit configuration for standard measuring.</p>	page 16
▼	
<p style="text-align: center;">Trouble-shooting / fault-finding</p> <p style="text-align: center;">If problems occur after commissioning or during operation always start fault finding using the check list. Special questions will act as a guide to the cause of the fault and the necessary cure.</p>	page 25

1 Safety notes

Safe and secure operation of the head transmitter can only be guaranteed if the operating instructions and all safety notes are read, understood and followed.

1.1 Designated use

Designated use

- The unit is a universal, presettable temperature transmitter for resistance thermometer (RTD), thermocouple (TC) as well as resistance and voltage sensors. The unit is constructed for mounting in a connection head (DIN form B) or field housing.
- The manufacturer cannot be held responsible for damage caused by misuse of the unit.
- Separate Ex documentation is part of in this operating manual, for measurement systems in hazardous areas. The installation conditions and connection values indicated in these instructions must be followed!

1.2 Installation, commissioning and operation

Installation, commissioning and operation

The unit is constructed using the most up-to-date production equipment and complies to the safety requirements of the local guidelines. The TMT182 temperature transmitter is fully factory tested according to the specifications indicated on the order. However, if it is installed incorrectly or is misused, certain application dangers can occur. Installation, wiring and maintenance of the unit must only be done by trained, skilled personnel who are authorized to do so by the plant operator. This skilled staff must have read and understood these instructions and must follow them to the letter. The plant operator must make sure that the measurement system has been correctly wired to the connection schematics.

Electrical temperature sensors such as RTD's and thermocouples produce low-level signals proportional to their sensed temperature. The temperature transmitter converts the low-level sensor signal to a standard 4 to 20 mA DC signal that is relatively insensitive to lead length and electrical noise. This current signal is then transmitted to the control room via two wires.

The transmitter can be commissioned before or after installation. It may be useful to commission it on the bench, before installation, to ensure proper operation and to become familiar with its functionality. Make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices before connecting a HART[®] communicator in an explosive atmosphere.

The transmitter electronics module is permanently sealed within the housing, resisting moisture and corrosive damage. Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.



Warning!

Electrical shock could cause death or serious injury. If the sensor is installed in a high voltage environment and a fault or installation error occurs, high voltage may be present on the transmitter leads and terminals.

SAFETY INSTRUMENTED SYSTEMS (SIS)

Third party validated metrics are available for the temperature transmitter. Testing is done per IEC 61508 for Safety Instrumented Systems. The safety manual can be separated ordered separately under order code: **SD 006R09EN**.

More details and download see:
www.us.endress.com

Temperature Effects

The transmitter will operate within specifications for ambient temperatures between -40 and 185 °F (-40 and 85 °C). Heat from the process is transferred from the thermowell to the transmitter housing. If the expected process temperature is near or beyond specification limits, consider the use of additional thermowell lagging, and extension nipple, or a remote mounting configuration to isolate the transmitter from the process.

1.3 Operational safety

Operational safety

Hazardous areas

When installing the unit in a hazardous area, the national safety requirements must be met. Make sure that all personnel are trained in these areas. Strict compliance with installation instructions and ratings as stated in this documentation is mandatory.

The measuring device complies with the general safety requirements in accordance with IEC61010, the EMC requirements of IEC61326 and NAMUR recommendation NE21 and NE43.



Warning!

The unit must only be powered by a power supply that operates using an IEC 61010- 1 compliant energy limited circuit: "SELV or Class 2 circuit".

Technical advancement

The manufacturer reserves the right to modify technical data without prior notice. Your E+H distributor can supply you with current information and updates to these Operating Instructions.

1.4 Returns

Returns

Please follow the Return Authorization Policy which is attached with these instructions.

1.5 Safety pictograms and symbols

Safety pictograms and symbols

Safe and reliable operation of this unit can only be guaranteed if the safety notes and warnings in these operating instructions are followed. The safety notes in these instructions are highlighted using the following symbols.



Note!

This icon indicates activities and actions that, if not followed correctly, could have an indirect influence on the unit operation or could lead to an unforeseen unit reaction.



Caution!

This icon indicates activities and actions that, if not followed correctly, could lead to faulty unit operation or even damage to the unit.



Warning!

This icon indicates activities and actions that, if not followed correctly, could lead to personal injury, a safety risk or even total damage to the unit.



Explosion protected, type examined operating equipment

If one of these icons is on the device's nameplate, the device can be used in hazardous areas.



Hazardous area

This symbol identifies the hazardous area in the diagrams in these Operating Instructions.

- Devices that are used in hazardous areas or cables for such devices must have the corresponding type of protection.



Safe area (non-hazardous areas)

This symbol identifies the non-hazardous area in the diagrams in these Operating Instructions.

- Devices in non-hazardous areas must also be certified if connection cables run through a hazardous area.

2 Identification

2.1 Unit identification

Unit identification

Compare the legend plates on the head transmitter with the following figures:



fig. 1: : Head transmitter legend plate (example)

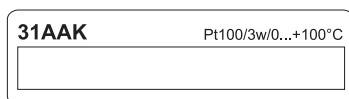


fig. 2: : Order code with configuration (example) - K = Standard model, North America region

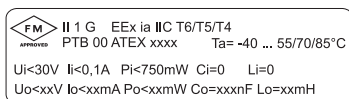


fig. 3: : Identification for hazardous area use (example, only on FM certified units)

CE Mark, declaration of conformity

The devices are designed to meet state-of-the-art safety requirements, have been tested, and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with IEC61010 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures" and with the EMC requirements of IEC61326.

The measuring system described in these Operating Instructions thus complies with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

UL recognized component to UL 3111-1

CSA GP approved

GL German Lloyd marine approval

GL Type Approval for temperature measurements in hazardous locations on GL Classed Vessels, Marine and Offshore Installations.

2.2 Registered trademarks

- HART®
Registered trademark of HART® Communication Foundation, Austin, Tx, USA
- PROFIBUS®
Registered trademark of PROFIBUS Nutzerorganisation e. V., Karlsruhe, Germany
- Microsoft® Windows NT® and Windows® 2000
Registered trademarks of Microsoft Corporation, Redmond, USA
- iTEMP® and ReadWin® 2000
are registered trademarks of Endress+Hauser Wetzler GmbH + Co. KG, Nesselwang, Germany

2.3 Delivery contents

Delivery contents

The delivery contents of a temperature head transmitter are as follows:

- Head transmitter TMT182
- Installation screws, installation springs and E-ring
- Operating instructions
- Control drawing for use in hazardous areas



Note!

Please take note of the head transmitter accessories in chapter 8 "Accessories".

3 Installation

3.1 Installation conditions

Installation conditions

- When installing and operating the unit, please take note of the allowable ambient temperature (see chapter 10 "Technical Data").
- When using the unit in a hazardous area, the limits indicated in the certification must be adhered to (see control drawing).

Dimensions

The head transmitter dimensions can be found in chapter 10 "Technical Data".

Installation point

- Sensor connection head to DIN 43 729 Form B
- Field housing

Installation angle

There are no limits as to the angle of installation.

3.2 Installation

3.2.1 Typical European installation

Installation

For installation, proceed as follows:

Installing in a sensor connection head to DIN 43 729 Form B (see fig. 4, left side)

- Feed the sensor inset cables (Pos. 5) through the central hole in the head transmitter (Pos. 4).
- Place the installation springs (Pos. 3) onto the screws (Pos. 2).
- Feed the installation screws (Pos. 2) through the holes in the head transmitter and the holes in the sensor inset (Pos. 5). Fix both screws using the E-rings (Pos. 6).
- Position the head transmitter in the connection head in such a way so that the current output terminals (terminal 1 and 2) are towards the cable entry gland (Pos. 7).
- Fix the head transmitter (Pos. 4) and sensor inset (Pos. 5) into the connection head.

Installation in a field housing TAF10 (see fig. 4, right side)

- Feed the installation screws (Pos. 2) with installation springs (Pos. 3) through the holes in the head transmitter (Pos. 4). Fix these using the E-rings (Pos. 5).
- Screw the head transmitter into the field housing using a screwdriver.



Caution!

In order to avoid damaging the head transmitter, do not over-tighten the installation screws.

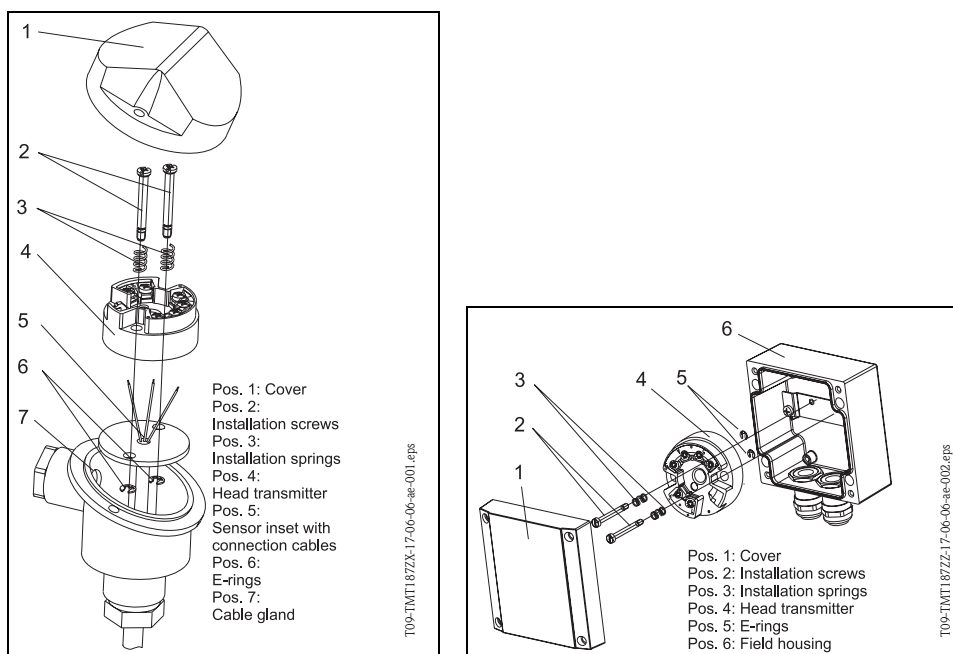


fig. 4: Installation of transmitter into a sensor connection head (left side) and a field housing TAF10 (right side).

3.2.2 Typical North American installation

Industrial thermocouple or RTD assembly with head transmitter (see fig. 5)

- Attach the thermowell (Pos. 1) to the pipe or process container wall. Install and tighten thermowells before applying process pressure.
- Attach necessary extension nipples and adapters (Pos. 3) to the thermowell. Seal the nipple and adapter threads with silicone tape.
- Install drain seals if required for severe environments or to satisfy code requirements.
- Feed the installation screws (Pos. 6) through the holes in the head transmitter (Pos. 7).
- Position the head transmitter assembly in the transmitter housing (Pos. 4) in such a way so that the current output terminals (terminal 1 and 2) are towards the conduit.
- Screw the head transmitter assembly (Pos. 5) into the transmitter housing (Pos. 4) using a screwdriver.
- Feed the sensor inset cables through the conduit of the transmitter housing and the central hole in the head transmitter.
- Attach the transmitter housing (Pos. 4) with built in head transmitter assembly to the nipples and adapters (Pos. 3). Seal adapter threads with silicone tape.



Caution!

In order to avoid damaging the head transmitter, do not over-tighten the installation screws.



Caution!

Pull the field wiring leads through the conduit into the transmitter housing. Attach the sensor and power leads to the head transmitter. Avoid contact with other terminals.



Caution!

Install and tighten the transmitter housing cover. Enclosure covers must be fully engaged to meet explosion-proof requirements.

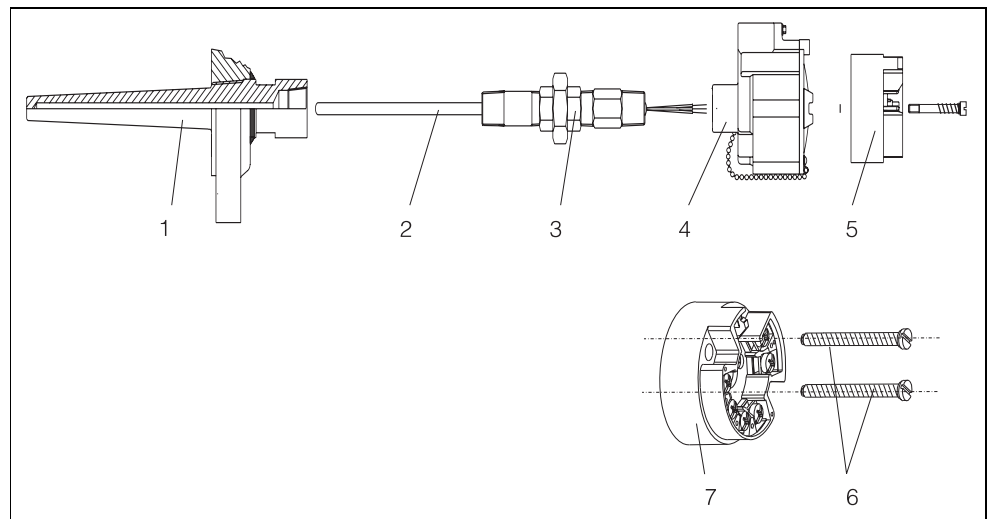


fig. 5: : Installing the head transmitter - Head transmitter assembly

Pos. 1: Thermowell

Pos. 2: Measuring inset

Pos. 3: Extension neck

Pos. 4: Transmitter housing

Pos. 5: Head transmitter assembly

Pos. 6: Installation screws

Pos. 7: Head transmitter

4 Wiring

4.1 Overview

Wiring overview

Terminal layout

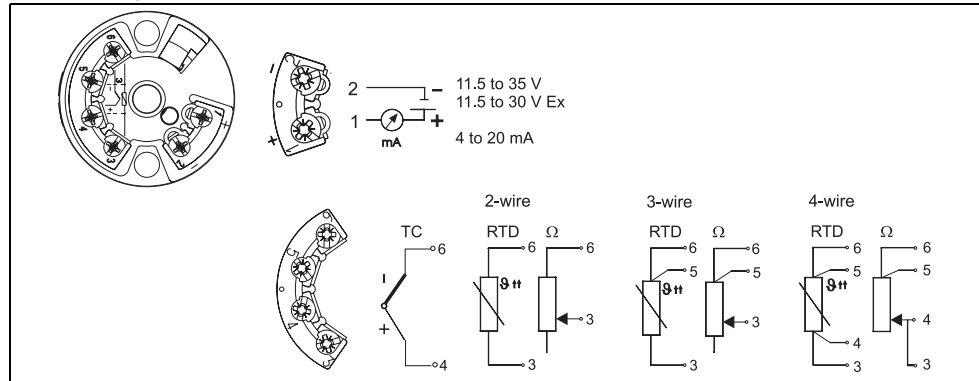


fig. 6: : Head transmitter wiring

4.2 Measurement unit connection

Measurement unit connection



Caution!

Switch off power supply before opening the housing cover. Do not install or connect the unit to power supply. If this is not followed parts of the electronic circuit will be damaged.

4.2.1 Sensors

Connect the sensor cables to the respective head transmitter terminals (Terminals 3 to 6) by following the wiring diagram (see fig. 6).

4.2.2 Output signal and power supply

Open the cable gland on the head transmitter or field housing. Feed the cable through the opening in the cable gland and then connect the cable wires to terminals 1 and 2 according to the wiring diagram (see fig. 6).



Note!

The screws on the terminals must be screwed in tightly.

4.2.3 HART[®] connection

Connection is made directly using the 4 to 20 mA signal cables or the communication sockets fitted to a power supply or barrier (see fig. 7 and see fig. 8).

In order to connect the transmitter in hazardous area, please read the separate Ex documentation.



Note!

The measurement circuit must have a load of at least 250 Ω. If using the E+H power supplies RNS221 and RN221N, this resistance is already installed in the unit and is therefore not required externally (see fig. 7, and see fig. 8)!

Connection of a HART[®] hand operated module DXR275, DXR375

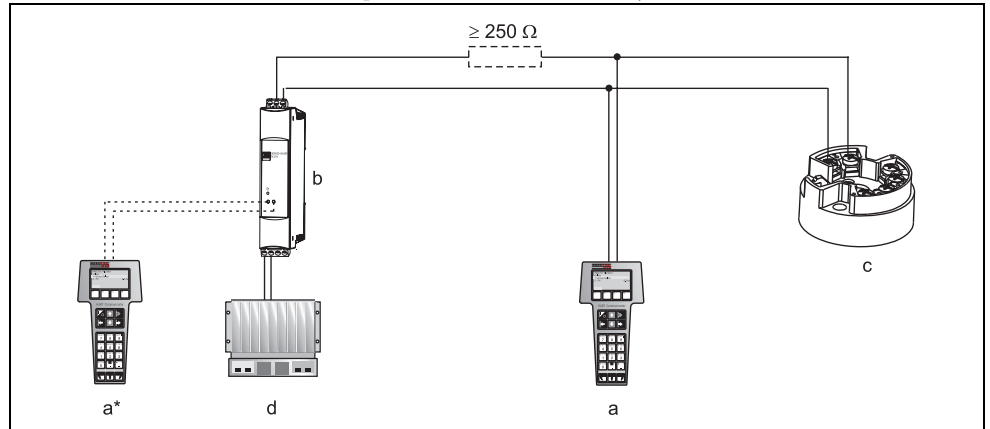


fig. 7: : Electrical connection of the HART[®] operated module

a = HART[®] module, a* = HART[®] module connected to the communication sockets of a power supply, b = Loop power supply (e.g. RNS221 power supply or RN221N active barrier), c = HART[®] transmitter, d = PLC with passive input

Connection of Commubox FXA191



Note!

Set the Commubox DIP switch to 'HART[®]'!

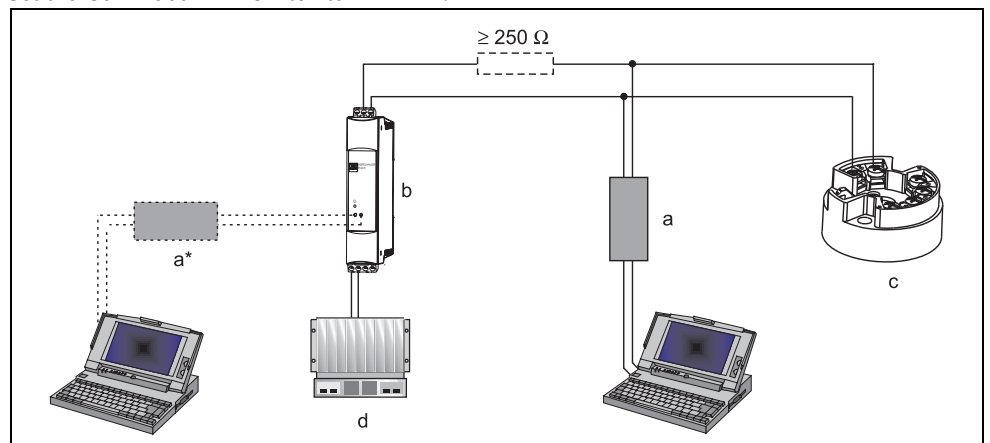


fig. 8: : Electrical connection of the Commubox FXA191

a = Commubox FXA191 (in combination with a PC - E+H operating software 'Commuwin II'), a* = Commubox FXA191 connected to the communication sockets of a power supply unit, b = Loop power supply (e.g. RNS221 power supply or RN221N active barrier), c = HART[®] transmitter, d = PLC with a passive input

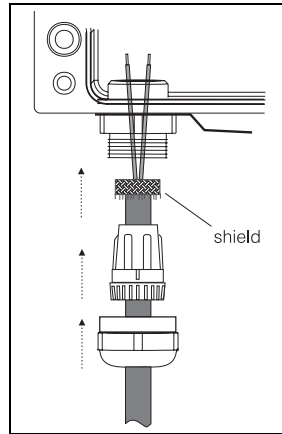
4.3 Potential grounding



Note!

Please take note of the following when remotely installing the head transmitter in a field housing. The shield on the output (output signal 4 to 20 mA) must be at the same potential as the shield at the sensor connection.

For an effective shielding the cable shield must be solidly connected to the field housing. This can be achieved by connecting the cable shield to the special EMC cable gland.



Open the field housing cable gland and connect the shield of the output and sensor connection according to the figure opposite (see fig. 9). When using grounded thermocouples, shielding of the output cable (4 to 20 mA cable) is recommended.

In plants with strong EMC problems shielding of all cables with a low ohm connection to the transmitter housing is recommended.

fig. 9:: Shielding on remote installation

4.4 Ground the Transmitter

The transmitter will operate with the current signal loop either floating or grounded. However, the extra noise in floating systems affects many types of readout devices. If the signal appears noisy or erratic, grounding the current signal loop at a single point may solve the problem. The best place to ground the loop is at the negative terminal of the power supply. Do not ground the current signal loop at more than one point. The transmitter is galvanically isolated to 2 kV AC (from the sensor input to the output), so the input circuit may also be grounded at any single point. When using a grounded thermocouple, the grounded junction serves as this point.

5 Operation

5.1 Communication

The temperature head transmitter is set up using the HART[®] protocol. The values measured can also be read using the HART[®] protocol. In order to do this the user has two possibilities:

- Operation using a universal hand operated module “HART[®] Communicator DXR275, DXR375”.
- Operation using a PC and operating software (e.g. Commuwin II) as well as a HART[®] modem (e.g. “Commubox FXA191”).

5.1.1 HART[®] Communicator DXR275, DXR375

Selection of the unit functions using the “HART[®] Communicator” is done using various menu levels as well as with the help of a special HART[®] function matrix (see page 18).



Note!

- When using the HART[®] hand unit all parameters can be read out, however, programming is locked. It is possible to access the HART[®] function matrix by entering 281 in the LOCK function.

This condition remains even after a power failure. The HART[®] function matrix can be locked again by entering the personal code number.

- More detailed information on the HART[®] hand operation module can be found in the respective operating manual in the carrying case.

5.1.2 COMMUWIN II-operating program

Commuwin II is a universal program for remote operation of field and panel-mounted instrumentation. Application of the Commuwin II operating program is possible independent of the type of unit and communication mode (HART[®] or PROFIBUS[®]). Commuwin II offers the following functions:

- Setting up unit functions
- Visualization of measured values
- Data security of unit parameters
- Unit diagnostics
- Measurement point documentation



Note!

More detailed information on Commuwin II can be found in the E+H documentation:

- Operating manual: BA124F/00/en “Commuwin II” operating program

More details see:

www.us.endress.com

6 Commissioning

6.1 Installation and function check

Installation check

Monitor all connections making sure they are tight. In order to guarantee fault-free operation, the terminal screws must be screwed tightly onto the connection cables.

Function check

Measuring the analog 4 to 20 mA output signal or following failure signals:

Measurement range under-cut	linear fall to 3.8 mA
Measurement range excess	linear rise to 20.5 mA
Sensor break; sensor short circuit ^a	$\leq 3.6 \text{ mA}$ or $\geq 21.0 \text{ mA}$ Guaranteed values for setting "high alarm" ($\geq 21.0 \text{ mA}$): <ul style="list-style-type: none"> ■ Standard model: $> 21.5 \text{ mA}$ ■ Advanced diagnostic model: $> 22.5 \text{ mA}$

a. not for thermocouples

6.2 Commissioning

Commissioning

Once the power supply has been connected, the head transmitter is operational.



Note!

If there are any communication faults in the Microsoft[®] Windows NT[®] Version 4.0 and Windows[®] 2000 operating system please follow these instructions:

Switch of the 'FIFO active' setting.

In order to do this proceed as follows:

- Windows NT[®] Version 4.0:
Using the menu 'START' 'SETTINGS' 'SYSTEM CONTROL' 'CONNECTIONS' select the menu point 'COM-Port'. Switch off the 'FIFO active' command off using the menu path 'SETTINGS' 'EXPANDED'.
- Windows[®] 2000 and Windows[®] XP (classic category view):
Select 'Expanded settings for COM1' using the menu 'START' → 'SETTINGS' → 'SYSTEM CONTROL' → 'SYSTEM' → 'HARDWARE' → 'DEVICE MANAGER' → 'CONNECTIONS (COM and LPT)' → 'COMMUNICATION CONNECTION (COM1)' → 'CONNECTION SETTINGS' → 'ADVANCED' menu. Deactivate "Use FIFO buffer". Now restart the PC.

6.2.1 Quick Setup

Using the Quick Setup, the operator is led through all the most important unit functions that must be set up for standard measurement operation of the unit.

Using the HART[®] hand module a quick setup of the black highlighted fields of the HART[®] function matrix (see fig. 11) is possible. Using the Commuwin II operating matrix (see fig. 12) a quick setup is possible with the following fields:

- Type of sensor (V2H0)
- Unit meas. value (V2H2)
- Value for 4 mA (V2H4)
- Value for 20 mA (V2H5)
- Connection (V2H6)

6.2.2 Configuration with HART[®] protocol and DXR275, DXR375 hand operated module



Note!

Selection of all hand transmitter functions using the HART[®] hand module is done with various menu levels with the help of the E+H function matrix (see fig. 11). All transmitter functions are described in 6.2.5 "Description of unit functions".

What needs to be done:

1. Switch on hand module:
 - Measurement unit is not yet connected. The HART[®] main menu appears. This menu level appears for all HART[®] programming independent of the type of instrumentation. Information to off-line programming can be found in the "Communicator DXR275, DXR375" operating manual.
 - Measuring unit is connected. The menu level "Online" appears. In this "Online" menu level the actual measured data such as measured value (PV) and output current (AO) are continuously displayed. Entry into the transmitter operating matrix is done using the line "Matrix Parameter". This matrix systematically contains all HART[®] accessible functions.
2. Using "Matrix Parameter" the function group can be selected (e.g. basic calibration) and then followed by the required function, e.g. "Sensor input".
3. Enter numeric values or change settings. Then acknowledge using the F4 "Entry" function key.
4. "SEND" appears when operating the F2 function key. Once the F2 key has been pressed all values entered in the hand module are transmitted to the transmitter measurement system.
5. A return to the "Online" menu level is made using the F3 "HOME" function key. Here, the actual transmitter values measured with the new settings can be read.



Note!

- When using the HART[®] hand unit all parameters can be read out, however, programming is blocked. It is possible to access the HART[®] function matrix by entering 281 in the LOCK function. This condition remains even after a power failure. The HART[®] function matrix can be locked again by entering the personal code number.
- More detailed information on the HART[®] hand operated module can be found in the respective operating manual in the carrying case.

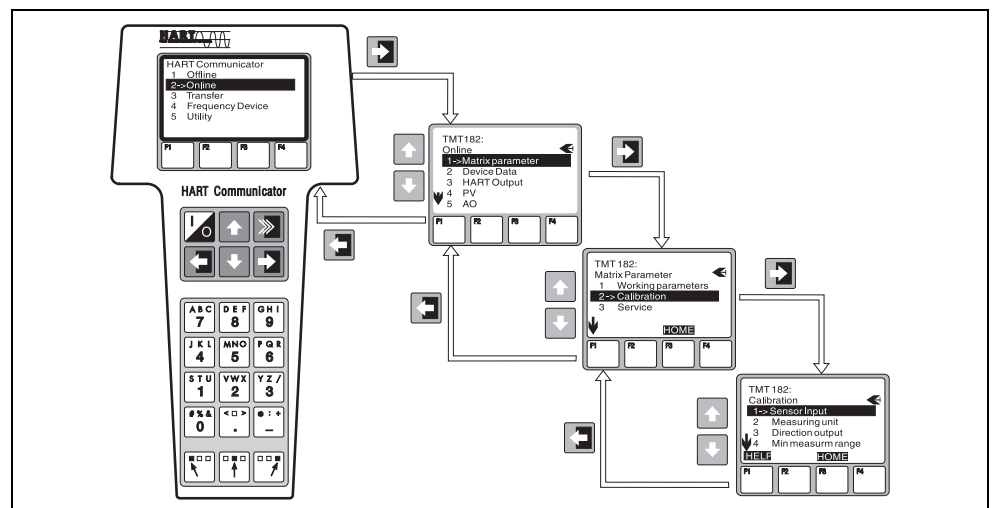
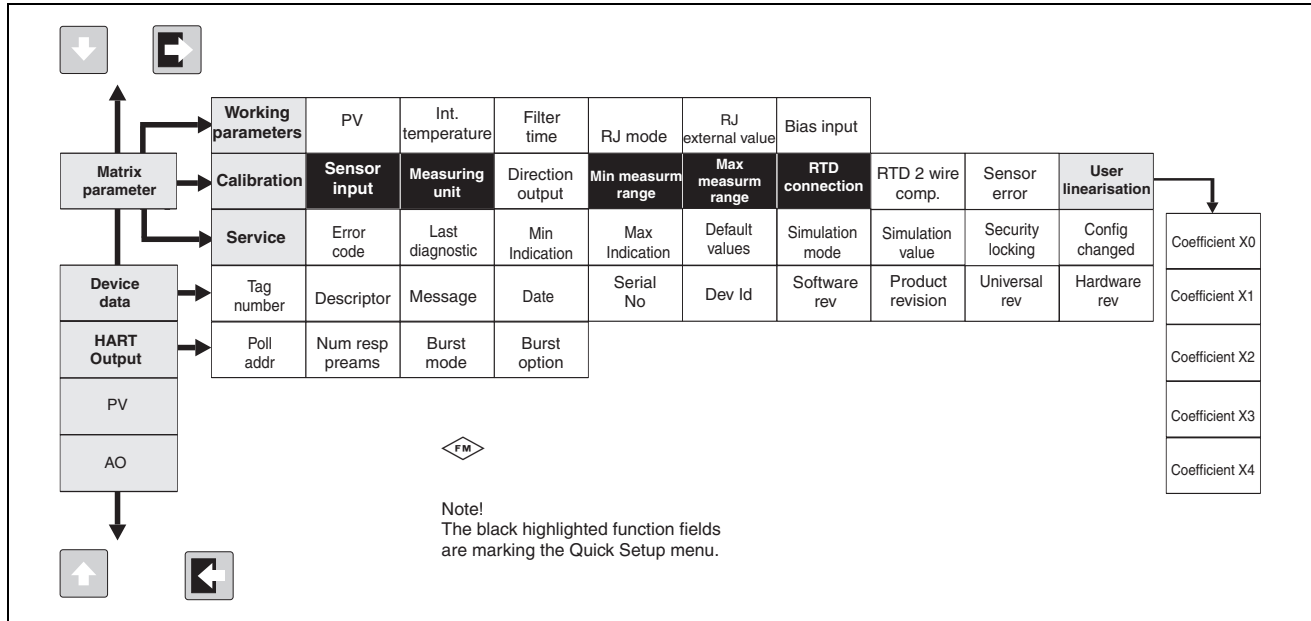


fig. 10: : Configuration of hand module example, "Sensor input"

HART[®] function matrixfig. 11: : HART[®] function matrix

6.2.3 Configuration with HART[®] protocol and COMMUWIN II

Commuwin II is a universal program for remote operation of field and panel-mounted instrumentation. Application of the Commuwin II operating program is possible independent of the type of unit and communication mode (HART[®] or PROFIBUS[®]). Commuwin II offers the following functions:

- Setting up unit functions
- Display
- Data security of unit parameters
- Unit diagnostics
- Measurement point documentation



Note!

More detailed information on Commuwin II can be found in the E+H documentation:

- Operating manual: BA 124F/00/en “Commuwin II” operating program

More details see:

www.us.endress.com

Commuwin II operating matrix

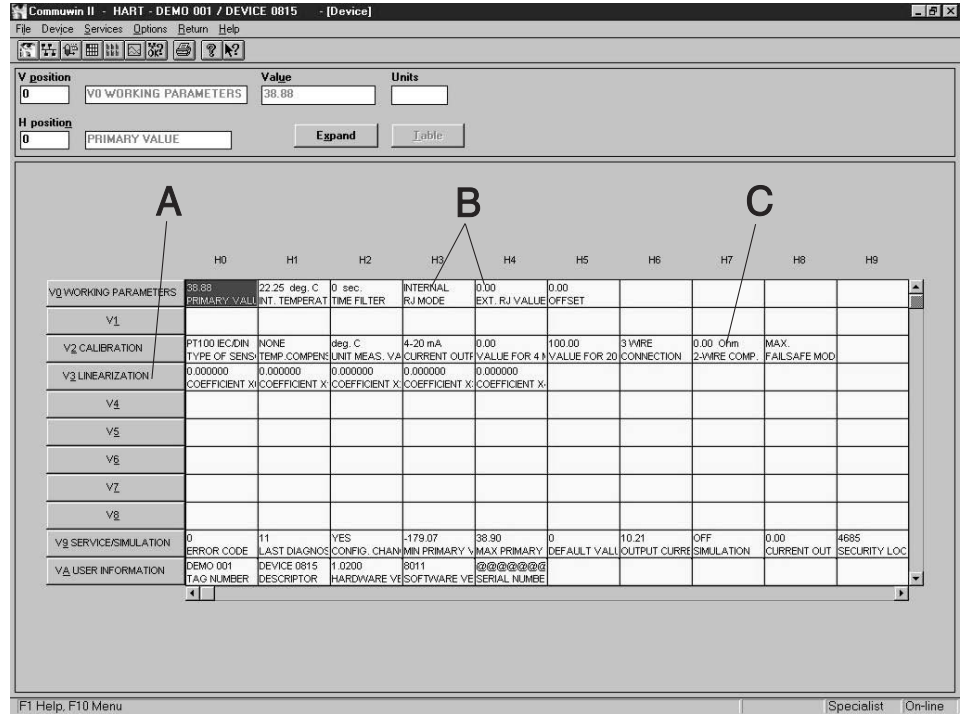


fig. 12: : Commuwin II operating matrix:
 A = Unit functions only active on customer specific linearization
 B = Unit functions only active on TC connection
 C = Unit functions only active on RTD 2 wire connection

6.2.4 Configuration using HART® protocol and PC configuration software ReadWin® 2000

The configuration of the transmitter can be done using both the HART® protocol and the ReadWin® 2000 configuration software. The following table shows the structure of the interactive menu led operation of READWIN® 2000.

Configurable parameters (Unit function description see “Description of unit functions” on page 20)	
Standard settings	<ul style="list-style-type: none"> – Type of sensor – Connection mode (2-,3-, or 4-wire connection on RTD) – Units (°C, °F or K) – Measurement range start value – Measurement range end value – Coefficient X0 to X4 (on sensor type polynom RTD/TC) – Temp.-compensation (on sensor type polynom TC)
Expanded settings	<ul style="list-style-type: none"> – Cold junction compensation internal/external (on TC) – Temperature external (on TC with cold junction compensation external) – Cable resistance compensation (on RTD 2-wire connection) – Fault condition reaction – Output (4 to 20 mA/20 to 4 mA) – Damping (filter) – Offset – TAG (Measurement point description) – Identifier (Descriptor)
Service functions	<ul style="list-style-type: none"> – Simulation (on/off) – Reset/factory default – Series number (only display) – Operation code (=release code 281)

For detailed ReadWin[®] 2000 operating instructions, please read the on-line documentation contained in the ReadWin[®] 2000 software. ReadWin[®] 2000 can be downloaded free of charge from the Internet at the following address:

- www.readwin2000.com

Customer-specific linearization

Customer-specific linearization and sensor matching are activated after the **POLYNOM RTD** sensor type is selected. Pressing the **“LINEARIZATION”** key starts the **SMC 32** module. The sensor's support points and temperature deviation are entered in the **SMC 32**. Pressing the **“CALCULATE”** key calculates the linearization and **“OK”** adopts it into ReadWin[®] 2000.

Linearization coefficients X0 to X4 are entered into the COMMUWIN II operating matrix or in the DXR275, 375 HART[®] handheld terminal.


6.2.5 Description of unit functions






The following table contains a listing and description of all unit functions of the HART[®] protocol that can be used for setting up the temperature head transmitter.





Note!

Factory default values are shown in bold text.





The HART[®] operating module (DXR275, DXR375) display is indicated by the following symbol .

Function group: WORKING PARAMETERS	
Primary value ■ VOH0 ■  (PV)	Display of actual measured temperature. Display: 7-digit number with floating decimal point and engineering unit. (e.g. 199.98 Ohm; -62.36 °C, 407.76 °F)
Int: temperature ■ VOH1	Display of the actual measured temperature of the internal comparison measurement point.  Note! Display: 7-digit number with floating decimal point and engineering unit. (e.g. 23.70 °C, 71.04 °F) ^a
Time filter ■ VOH2	Digital filter selection 1 st grade. Input: 0 to 100 seconds 0 sec.
RJ Mode ■ VOH3	Selection of internal (Pt100) or external (32 to 176 °F/0 to 80 °C) cold junction compensation. Entry: internal; external internal  Note! Entry only possible on selection of thermocouple (TC) in unit function SENSOR TYPE. ¹
Ext. RJ Value ■ VOH4	Entry of external cold junction value. Entry: -40.00 to 185.00 °F (-40.00 to 85.00 °C) (°C, °F, K) 0 °C  Note! Entry only possible on selection of an external cold junction compensation in unit function RJ MODE.
OFFSET ■ VOH5	Entry of zero point correction (Offset). Entry: -18.00 to 18.00 °F (10.00 to 10.00 °C) (°C, °F, K) 0.00 °C  Note! Entry returns to factory default values when changing sensor type!

a. Only for Commuwin II operating matrix



Function group: BASIC CALIBRATION																																																																												
Type of sensor ■ V2H0	Entry of sensor used: <table border="1"> <thead> <tr> <th>Sensor type</th> <th>Range start</th> <th>Range end value</th> </tr> </thead> <tbody> <tr> <td>-10..75 mV</td> <td>-10 mV</td> <td>75 mV</td> </tr> <tr> <td>10..400 Ohm</td> <td>10 Ω</td> <td>400 Ω</td> </tr> <tr> <td>10..2000 Ohm</td> <td>10 Ω</td> <td>2000 Ω</td> </tr> <tr> <td>Pt100 DIN</td> <td>-200 °C (-328 °F)</td> <td>850 °C (1562 °F)</td> </tr> <tr> <td>Pt100 JIS</td> <td>-200 °C (-328 °F)</td> <td>649 °C (482 °F)</td> </tr> <tr> <td>Pt500</td> <td>-200 °C (-328 °F)</td> <td>250 °C (482 °F)</td> </tr> <tr> <td>Pt1000</td> <td>-200 °C (-328 °F)</td> <td>250 °C (482 °F)</td> </tr> <tr> <td>Ni100</td> <td>-60 °C (-76 °F)</td> <td>180 °C (356 °F)</td> </tr> <tr> <td>Ni500</td> <td>-60 °C (-76 °F)</td> <td>150 °C (302 °F)</td> </tr> <tr> <td>Ni1000</td> <td>-60 °C (-76 °F)</td> <td>150 °C (302 °F)</td> </tr> <tr> <td>Polynom RTD</td> <td>-270 °C (-454 °F)</td> <td>2500 °C (4532 °F)</td> </tr> <tr> <td>Type B</td> <td>0 °C (32 °F)</td> <td>1820 °C (3308 °F)</td> </tr> <tr> <td>Type C</td> <td>0 °C (32 °F)</td> <td>2320 °C (4208 °F)</td> </tr> <tr> <td>Type D</td> <td>0 °C (32 °F)</td> <td>2495 °C (4523 °F)</td> </tr> <tr> <td>Type E</td> <td>-270 °C (-454 °F)</td> <td>1000 °C (1832 °F)</td> </tr> <tr> <td>Type J</td> <td>-210 °C (-346 °F)</td> <td>1200 °C (2192 °F)</td> </tr> <tr> <td>Type K</td> <td>-270 °C (-454 °F)</td> <td>1372 °C (2501 °F)</td> </tr> <tr> <td>Type L</td> <td>-200 °C (-328 °F)</td> <td>900 °C (1652 °F)</td> </tr> <tr> <td>Type N</td> <td>-270 °C (-454 °F)</td> <td>1300 °C (2372 °F)</td> </tr> <tr> <td>Type R</td> <td>-50 °C (-58 °F)</td> <td>1768 °C (3214 °F)</td> </tr> <tr> <td>Type S</td> <td>-50 °C (-58 °F)</td> <td>1768 °C (3214 °F)</td> </tr> <tr> <td>Type T</td> <td>-270 °C (-454 °F)</td> <td>400 °C (752 °F)</td> </tr> <tr> <td>Type U</td> <td>-200 °C (-328 °F)</td> <td>600 °C (1112 °F)</td> </tr> <tr> <td>Polynom TC</td> <td>-270 °C (-454 °F)</td> <td>2500 °C (4532 °F)</td> </tr> </tbody> </table> Pt100 DIN	Sensor type	Range start	Range end value	-10..75 mV	-10 mV	75 mV	10..400 Ohm	10 Ω	400 Ω	10..2000 Ohm	10 Ω	2000 Ω	Pt100 DIN	-200 °C (-328 °F)	850 °C (1562 °F)	Pt100 JIS	-200 °C (-328 °F)	649 °C (482 °F)	Pt500	-200 °C (-328 °F)	250 °C (482 °F)	Pt1000	-200 °C (-328 °F)	250 °C (482 °F)	Ni100	-60 °C (-76 °F)	180 °C (356 °F)	Ni500	-60 °C (-76 °F)	150 °C (302 °F)	Ni1000	-60 °C (-76 °F)	150 °C (302 °F)	Polynom RTD	-270 °C (-454 °F)	2500 °C (4532 °F)	Type B	0 °C (32 °F)	1820 °C (3308 °F)	Type C	0 °C (32 °F)	2320 °C (4208 °F)	Type D	0 °C (32 °F)	2495 °C (4523 °F)	Type E	-270 °C (-454 °F)	1000 °C (1832 °F)	Type J	-210 °C (-346 °F)	1200 °C (2192 °F)	Type K	-270 °C (-454 °F)	1372 °C (2501 °F)	Type L	-200 °C (-328 °F)	900 °C (1652 °F)	Type N	-270 °C (-454 °F)	1300 °C (2372 °F)	Type R	-50 °C (-58 °F)	1768 °C (3214 °F)	Type S	-50 °C (-58 °F)	1768 °C (3214 °F)	Type T	-270 °C (-454 °F)	400 °C (752 °F)	Type U	-200 °C (-328 °F)	600 °C (1112 °F)	Polynom TC	-270 °C (-454 °F)	2500 °C (4532 °F)
Sensor type	Range start	Range end value																																																																										
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Polynom TC	-270 °C (-454 °F)	2500 °C (4532 °F)																																																																										
Temp.Compensation ■ V2H1	Selection of temperature compensation of the cold junction when using customer specific linearization of the TC polynom Input: None, Type B, Type C, Type D, Type E, Type J, Type K, Type L, Type N, Type R, Type S, Type T, Type U None																																																																											
Unit meas. value ■ V2H2	Enter engineering units. Entry: °C °F K °C																																																																											
Current output ■ V2H3	Enter standard (4 to 20 mA) or inverse (20 to 4 mA) current output signal. Entry: 4 to 20 mA 20 to 4 mA 4 to 20 mA																																																																											
Value for 4 mA ■ V2H4	Entry: For limits see unit function SENSOR TYPE. 0 °C																																																																											
Value for 20 mA ■ V2H5	Entry: For limits see unit function SENSOR TYPE. 100 °C																																																																											
Connection ■ V2H6 ■  RTD connection	Entry of RTD connection mode Entry: 2 wire 3 wire 4 wire 3 wire  Note! Function field is only active on selection of resistance thermometer (RTD) in the unit function SENSOR TYPE (V2H0) ^a .																																																																											

a. Only for Commuwin II operation matrix

2 wire comp. ■ V2H7	Entry of cable compensation on RTD 2 wire connection. Entry: 0.00 to 30.00 Ohm 0.00 Ohm  Note! Function field is only active on selection of 2 wire cable connection in unit function CONNECTION TYPE (V2H6) ^a .
Failsafe mode ■ V2H8	Entry of failure signal on sensor open or short circuit. ^b Entry: max (≥ 21.0 mA) min (≤ 3.6 mA) max  Note! Guaranteed values for setting "high alarm" (≥ 21.0 mA): ■ Standard model: > 21.5 mA ■ Advanced diagnostic model: > 22.5 mA
Function group: LINEARIZATION  USER linearization The following function fields are only active in the unit function SENSORTYPE (V2H0) on selection of customer-specific linearization (polynome RTD or polynome TC). ¹	
Coefficient X0 ■ V3H0	Input of first coefficient for customer-specific linearization (polynome 4 th grade with five coefficients), see chapter 6.2.4
Coefficient X1 ■ V3H1	Input COEFFICIENT X1, see chapter 6.2.4.
Coefficient X2 ■ V3H2	Input COEFFICIENT X2, see chapter 6.2.4.
Coefficient X3 ■ V3H3	Input COEFFICIENT X3, see chapter 6.2.4.
Coefficient X4 ■ V3H4	Input COEFFICIENT X4, see chapter 6.2.4.
Function group: SERVICE	
Error code ■ V9H0	Display of actual error code. Display: See "Application fault messages" on page 25. 0
Last diagnostic ■ V9H1	Display of previous error code. Display: See "Application fault messages" on page 25. 0
Config. changed ■ V9H2	Parameter changes are done. Display: Yes/No No
Min primary value ■ V9H3	Display the minimum process value. The process value is accepted at the beginning of the measurement.  Note! Min. process value will be changed to the actual process value on access. On reset to factory default, the default value is entered. +10000

a. Only for Commuwin II operation matrix

b. Not for thermocouples (TC)

Max primary value ■ V9H4	Display the maximum process value. The process value is accepted at the beginning of the measurement.  Note! Max. process value will be changed to the actual process value on access. On reset to factory default, the default value is entered. -10000
Default values ■ V9H5	Entry: 182 (Reset to factory default settings) 0
Output current ■ V9H6	Display of the actual output current signal.
Simulation ■ V9H7	Entry of simulation mode. Entry: Off On Off
Current out (sim) ■ V9H8	Entry of simulation value (current). Entry: 3.58 to 21.7 mA
Security locking ■ V9H9	Release code for setting up. Entry: Lock = 0 Release = 281 281
Function group: USER INFORMATION	
Tag number ■ VAH0	Entry and display of measurement point description (TAG). Entry: 8 characters -
Descriptor ■ VAH1	Entry and display of plant description. Entry: 16 characters -
Hardware Version ■ VAH2	Display of unit version, e.g.: 1.0000 indicates version 1.00.00.
Software Version ■ VAH3 ■  Software Rev.	Display of software version, e.g.: 8010 indicates version 1.0.
Serial number ■ VAH4	8-digit display of E+H device serial numbers (see legend plates on the device).

6.2.6 Supported HART® commands

No.	Description	Access
Universal Commands		
00	Read unique identifier	r
01	Read primary variable	r
02	Read p.v. current and percent of range	r
03	Read dynamic variables and p.v. current	r
06	Write polling address	w
11	Read unique identifier associated with tag	r
12	Read message	r
13	Read tag, descriptor, date	r
14	Read primary variable sensor information	r
15	Read primary variable output information	r
16	Read final assembly number	r
17	Write message	w
18	Write tag, descriptor, date	w
19	Write final assembly number	w
Common practice		
34	Write primary variable damping value	w
35	Write primary variable range values	w
38	Reset configuration changed flag	w
40	Enter/Exit fixed primary variable current mode	w
42	Perform master reset	w
44	Write primary variable units	w
48	Read additional transmitter status	r
59	Write number of response preambles	w
108	Write burst mode command number	w
109	Burst mode control	w
E+H specific		
144	Read matrix parameter	r
145	Write matrix parameter	w
148	Upload	r
149	Download	w

7 Maintenance

Maintenance

The temperature head transmitter has no moving parts and requires minimal scheduled maintenance.

Sensor Checkout

To determine whether the sensor is at fault, replace it with another sensor or connect a test sensor locally at the transmitter to test remote sensor wiring. Select any standard, off-the-shelf sensor for use with a TMT182 temperature transmitter, or consult the factory for a replacement special sensor or transmitter combination.

8 Accessories

Accessories

Commubox FXA191, PC-Software Commuwin II and ReadWin[®] 2000, DIN rail clip according to IEC 60715 for E+H temperature head transmitters (**order code:** 51000856), Field housing TAF10 suitable for all E+H temperature head transmitters.

ReadWin[®] 2000 can be downloaded free of charge from the internet from the following address:
www.readwin2000.com

Please contact your supplier when ordering (e.g. spare parts)!
When ordering accessories or spare parts, please state the serial number of the unit!

9 Trouble-shooting

9.1 Trouble-shooting instructions

If faults occur after commissioning or during measurement, always start any trouble-shooting sequence using the following check. The user is led towards the possible fault cause and its rectification via question and answer.

9.2 Application fault messages

Application fault messages

Application fault messages are shown in the display of the HART[®] hand operating module "DXR275, DXR375" once the menu point "ERROR CODE" has been selected or in the PC operating surface of Commuwin II (V9H0 - ERROR CODE).

Fault code	Cause	Action/cure
0	No fault, Warning	None
10	Hardware fault (unit defective)	Replace head transmitter
11	Sensor short circuit	Check sensor
12	Sensor cable open circuit	Check sensor
13	Reference measurement point defective	None
14	Unit not calibrated	Return head transmitter to manufacturer

Fault code	Cause	Action/cure
106	Up-/Download active	None (will be automatically acknowledged)
201	Warning: Measured value too small	Enter other values for measured value range start
202	Warning: Measured value too large	Enter other values for measured value range end
203	Unit is reset (to factory default settings)	None

9.3 Application faults without messages

Application fault without messages

General application faults

Fault	Cause	Action/cure
No communication	No power supply on 2 wire circuit	Check current loop
	Power supply too low (<10 V)	Connect cables correctly to terminal plan (polarity)
	Defective interface cable	Check interface cable
	Defective interface	Check PC interface
	Defective head transmitter	Replace head transmitter

Application faults for RTD connection (Pt100/Pt500/Pt1000/Ni100)

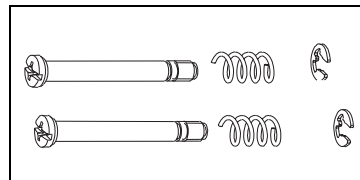
Fault	Cause	Action/cure
Fault current (≤ 3.6 mA or ≥ 21 mA)	Defective sensor	Check sensor
	Incorrect RTD connection	Reconnect cables correctly (connection diagram)
	Incorrect 2 wire connection	Connect cables correctly to terminal plan (polarity)
	Transmitter programming faulty (wire number)	Change parameter 'CONNECTION' (See "Description of unit functions" on page 20.)
	Programming	Thermocouple set up (see chapter 6.2.5); change to RTD
	Defective head transmitter	Replace head transmitter
Measured value incorrect/inaccurate	Faulty sensor installation	Install sensor correctly
	Heat conducted via sensor	Take note of sensor installation length
	Transmitter programming faulty (wire number)	Change parameter 'Connection type'
	Transmitter programming faulty (scale)	Change scale
	Wrong RTD used	Change parameter 'Sensor type'
	Sensor connection (2 wire)	Check sensor connections
	Sensor cable (2 wire) not compensated	Compensate cable resistance
	Offset incorrectly set	Check offset

Application faults for TC connection

Fault	Cause	Action/cure
Fault current (≤ 3.6 mA or ≥ 21 mA)	Sensor incorrectly connected	Connect sensor correctly to terminal plan (polarity)
	Defective sensor	Replace sensor
	Programming	Sensor type 'RTD' setup; set up correct thermocouple
	Incorrect 2 wire connection (current loop)	Connect the cables correctly (see connection diagram)
	Defective head transmitter	Replace head transmitter
Measured value incorrect/inaccurate	Faulty sensor installation	Install sensor correctly
	Heat conducted via sensor	Take note of sensor installation length
	Transmitter programming faulty (scale)	Change scale
	Incorrect thermocouple setup	Change parameter 'Sensor type'
	Incorrect cold junction setup	See chapter 'Operation' and 'Technical data'
	Offset incorrectly set up	Check offset
	Fault on the thermowell welded thermo wire (coupling of interference voltages)	Use sensor where the thermo wire is not welded

9.4 Spare parts

Spare parts



Head transmitter installation set

■ (8 screws, 8 springs, 8 E-rings)

■ For U. S. style installation: (8 machine screws M4x20)

→ Order code: TMT181A-KA

fig. 13: Head transmitter installation set

9.5 Returns

Returns

Please follow the return Authorization Policy which is attached with these instructions.

9.6 Disposal

Disposal

Due to its construction, the head transmitter cannot be repaired. When disposing of the head transmitter please take note of the local disposal regulations.

9.7 Software history

Software version / date	Changes to software	Changes to documentation
V 1.0 / 02.2001	Original software Compatible with: <ul style="list-style-type: none"> ■ HART[®] Communicator DXR 275 (from OS 4.6) with DevRev 1, DDRev 1 ■ Readwin[®] 2000 ■ Commuwin II (version 2.07.01-2 and higher) ■ AMS (version 5.X and higher) ■ PDM (version 5.2 and higher) 	
V1.1 / 10.2001	New parameter (V2H1) for selection of temperature compensation of the cold junction when using customer specific linearization of the TC polynom Compatible with: <ul style="list-style-type: none"> ■ HART[®] Communicator DXR 275 with DevRev 2, DDRev 1 ■ Readwin[®] 2000 ■ Commuwin II (version 2.07.01-4 and higher) ■ AMS (version 5.X and higher) ■ PDM (version 5.2 and higher) 	

10 Technical Data

10.1 Function and system design

Measuring principle	Electronic monitoring and conversion of input signals in industrial temperature measurement.
Measuring system	The temperature head transmitter is a two wire transmitter with an analog output. It has measurement input for resistance thermometers (RTD) in 2-, 3- or 4-wire connection, thermocouples and voltage transmitters. Setup of the TMT 182 is done using the HART [®] -Protocol with hand operating module (DXR275, DXR375) or PC (COMMUWIN II or ReadWin [®] 2000 operating software).

10.2 Input

Measured variable	Temperature (temperature linear transmission behavior), resistance and voltage
Measuring range	The transmitter monitors different measuring ranges depending on the sensor connection and input signals.

Type of input

Input	Designation	Measuring range limits	Min. span
Resistance thermometer (RTD) to IEC 751 ($\alpha = 0.00385$) to JIS C1604-81 ($\alpha = 0.003916$) to DIN 43760 ($\alpha = 0.006180$)	Pt100 Pt500 Pt1000	-328 to 1562 °F (-200 to 850 °C) -328 to 482 °F (-200 to 250 °C) -328 to 482 °F (-200 to 250 °C)	18 °F (10 °C) 18 °F (10 °C) 18 °F (10 °C)
	Pt100	-328 to 1200 °F (-200 to 649 °C)	18 °F (10 °C)
	Ni100 Ni500 Ni1000	-76 to 482 °F (-60 to 250 °C) -76 to 302 °F (-60 to 150 °C) -76 to 302 °F (-60 to 150 °C)	18 °F (10 °C) 18 °F (10 °C) 18 °F (10 °C)
<ul style="list-style-type: none"> ■ Connection type: 2-, 3- or 4-wire connection ■ Software compensation of cable resistance possible in the 2 wire system (0 to 30 Ω) ■ Sensor cable resistance max. 20 Ω per cable in the 3 and 4 wire system ■ Sensor current: ≤ 0.2 mA ■ Corrosion detection as per NAMUR NE 89 for Pt100 4-wire connection (optional for 'Advanced Diagnostics' version, see 'Product structure'). If corrosion detection is active, the response time is 2 s 			
Resistance transmitter	Resistance Ω	10 to 400 Ω 10 to 2000 Ω	10 Ω 100 Ω
Thermocouples (TC) to NIST Monograph 175, IEC 584 to ASTM E988 to DIN 43710	Type B (PtRh30-PtRh6) ^a Type E (NiCr-CuNi) Type J (Fe-CuNi) Type K (NiCr-Ni) Type N (NiCrSi-NiSi) Type R (PtRh13-Pt) Type S (PtRh10-Pt) Type T (Cu-CuNi)	32 to 3308 °F (0 to +1820 °C) -454 to 1832 °F (-270 to +1000 °C) -346 to 2192 °F (-210 to +1200 °C) -454 to 2501 °F (-270 to +1372 °C) -454 to 2372 °F (-270 to +1300 °C) -58 to 3214 °F (-50 to +1768 °C) -58 to 3214 °F (-50 to +1768 °C) -454 to 752 °F (-270 to +400 °C)	900 °F (500 °C) 90 °F (50 °C) 90 °F (50 °C) 90 °F (50 °C) 90 °F (50 °C) 900 °F (500 °C) 900 °F (500 °C) 90 °F (50 °C)
	Type C (W5Re-W26Re) Type D (W3Re-W25Re) Type L (Fe-CuNi) Type U (Cu-CuNi)	32 to 4208 °F (0 to +2320 °C) 32 to 4523 °F (0 to +2495 °C) -328 to 1652 °F (-200 to +900 °C) -328 to 1112 °F (-200 to +600 °C)	900 °F (500 °C) 900 °F (500 °C) 90 °F (50 °C) 90 °F (50 °C)
<ul style="list-style-type: none"> ■ Internal cold junction (Pt100) ■ Accuracy of cold junction: ± 1.8 °F (1 °C) 			
Voltage transmitter (mV)	Millivolt transmitter (mV)	-10 to 75 mV	5 mV

a. High measuring error increase for temperature lower than 572 °F (300 °C)

10.3 Output

Output signal

Analog 4 to 20 mA, 20 to 4 mA

Breakdown information

Breakdown information to NAMUR NE 43

Breakdown information is created when the measuring information is invalid or not present anymore and gives a complete listing of all errors occurring in the measuring system.

		Signal (mA)
Under ranging	Standard	3.8
Over ranging	Standard	20.5
Sensor break; sensor short circuit low	To NAMUR NE 43	≤ 3.6
Sensor break; sensor short circuit high	To NAMUR NE 43	≥ 21.0

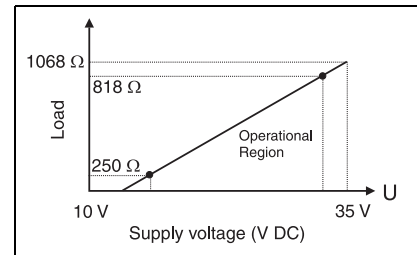
**Note!**

Guaranteed values for setting "high alarm" (≥ 21.0):

- Standard model: > 21.5 mA
- Advanced diagnostic model: > 22.5 mA

Source impedance

max. $(V_{\text{Power supply}} - 11.5 \text{ V}) / 0.022 \text{ A}$ (current output)
 e.g. $(24 \text{ V} - 11.5 \text{ V}) / 0.022 \text{ A} = 568.2 \Omega$

**Transmission behavior**

Temperature linear, resistance linear, voltage linear

Filter

1st order digital filter: 0 to 100 s

Galvanic isolation

$U = 2 \text{ kV AC}$ (input/output)

Input current required

$\leq 3.5 \text{ mA}$

Current limit

$\leq 23 \text{ mA}$

Switch on delay

4 s (during power up $I_a \leq 3.8 \text{ mA}$)

10.4 Power supply

Electrical connection

See "Overview" on page 12.

Supply voltage

$U_b = 11.5$ to 35 V , polarity protected (For hazardous location please see control drawing)

**Warning!**

The unit must only be powered by a power supply that operates using an IEC 61010- 1 compliant energy limited circuit: "SELV or Class 2 circuit".

Undervoltage detection

Optional for 'Advanced Diagnostic' version.

If the supply voltage is not sufficient to output the output signal corresponding to the measured temperature, a signal on alarm $\leq 3.6 \text{ mA}$ is generated. After approx. 2 to 3 s, the system makes another attempt to output the signal corresponding to the temperature.

Residual ripple

Allowable ripple $U_{ss} \leq 3 \text{ V}$ at $U_b \geq 13 \text{ V}$, $f_{\text{max.}} = 1 \text{ kHz}$

10.5 Performance characteristics

Response time	1 s (TC), 1.5 s (RTD)
Reference operating conditions	Calibration temperature: 77 °F ± 9 °F (+25 °C ± 5 °C)

Maximum measured error

	Type	Measurement accuracy ¹
Resistance thermometer RTD	Pt100, Ni100	0.36 °F (0.2 °C) or 0.08%
	Pt500, Ni500	0.9 °F (0.5 °C) or 0.20%
	Pt1000, Ni1000	0.54 °F (0.3 °C) or 0.12%
Thermocouple TC	K, J, T, E, L, U N, C, D S, B, R	typ. 0.9 °F (0.5 °C) or 0.08% typ. 1.8 °F (1.0 °C) or 0.08% typ. 3.6 °F (2.0 °C) or 0.08%

	Measurement range	Measurement accuracy ^a
Resistance transmitter (Ω)	10 to 400 Ω 10 to 2000 Ω	± 0.1 Ω or 0.08% ± 1.5 Ω or 0.12%
Voltage transmitters (mV)	-10 to 75 mV	± 20 μV or 0.08%

a.% is related to the adjusted measurement range. The value to be applied is the greater.

Influence of supply voltage	≤ ±0.01%/V deviation from 24 V Percentages refer to the full scale value.
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Influence of ambient temperature (Temperature drift)	<ul style="list-style-type: none"> ■ Resistance thermometer (RTD): $T_d = \pm(8.3 \text{ ppm}/^\circ\text{F} * \text{max. meas. range} + 27.8 \text{ ppm}/^\circ\text{F} * \text{preset meas. range}) * \Delta \vartheta$ ■ Resistance thermometer Pt100: $T_d = \pm(8.3 \text{ ppm}/^\circ\text{F} * (\text{range end value} + 328) + 27.8 \text{ ppm}/^\circ\text{F} * \text{preset meas. range}) * \Delta \vartheta$ ■ Thermocouple (TC): $T_d = \pm(27.8 \text{ ppm}/^\circ\text{F} * \text{max. meas. range} + 27.8 \text{ ppm}/^\circ\text{F} * \text{preset meas. range}) * \Delta \vartheta$
	$\Delta \vartheta =$ Deviation of the ambient temperature according to the reference condition (77 °F ± 9 °F).

Influence of load	± 0.02%/100 Ω Values refer to the full scale value
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Long-term stability	≤ 0.18 °F/year (0.1 °C/year) or ≤ 0.05%/year Values under reference operating conditions. % refer to the set span. The highest value is valid.
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Influence of cold junction	Pt100 IEC 60751 Cl. B (internal cold junction for thermocouples TC)
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10.6 Installation conditions

Installation instructions	<ul style="list-style-type: none"> ■ Installation angle: no limit ■ Installation area: Connection head accord. to DIN 43 729 Form B; TAF10 field housing

10.7 Environmental conditions

Ambient temperature limits	-40 to 185 °F (-40 to +85 °C) for Ex-area, see Ex-certification or control drawing
Storage temperature	-40 to 212 °F (-40 to +100 °C)
Climate class	as per IEC 60654-1, class C
Condensation	allowed
Degree of protection	IP 00, NEMA 4 (IP 66) installed
Shock and vibration resistance	4g / 2 to 150 Hz as per IEC 60 068-2-6

Electromagnetic compatibility (EMC)

CE Electromagnetic Compatibility Compliance

The device meets all requirements listed under IEC 61326 Amendment 1, 1998 and NAMUR NE 21

This recommendation is a uniform and practical way of determining whether the devices used in laboratory and process control are immune to interference with an objective to increase its functional safety.

Discharge of static electricity	IEC 61000-4-2	6 kV cont., 8 kV air	
Electromagnetic fields	IEC 61000-4-3	80 to 1000 Hz	10 V/m
Burst (signal)	IEC 61000-4-4	2 kV	
Transient voltage	IEC 61000-4-5	1 kV unsym. / 0.5 kV sym.	
HF coupling	IEC 61000-4-6	0.15 to 80 MHz	10 V
Line interference	IEC 61000-4-16	10 kHz to 150 kHz	10 V

10.8 Mechanical construction

Design, dimensions

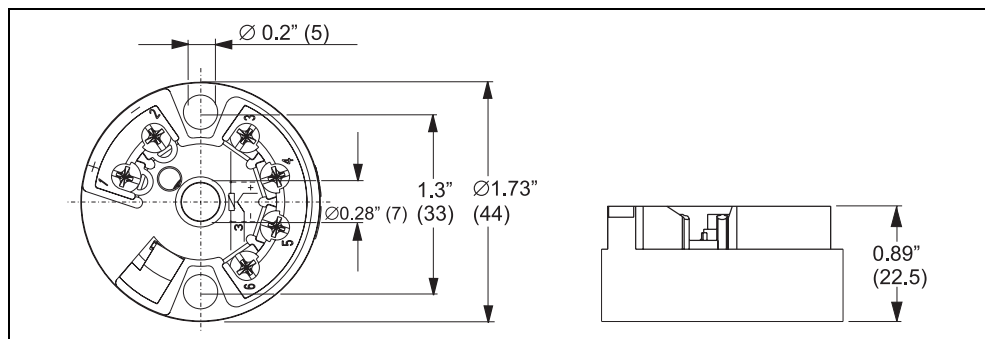


fig. 14: : Dimensions of the head transmitter in inches (mm)

Weight approx. 1.4 oz (40 g)

Material

- Housing: PC
- Potting: PUR

Terminals	<ul style="list-style-type: none"> ■ Cable up to max. 16 AWG (secure screws) ■ or 16 AWG with wire end ferrules ■ eyelets for easy connection of a HART[®]-handheld terminal with alligator clips
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10.9 Human interface

Display elements	No display elements are present directly on the temperature transmitter. The measured value display can be called up using the ReadWin [®] 2000 or COMMUWIN II PC software.
Operating elements	No operating elements are present directly on the transmitter to prevent from manipulation. The device parameters of the head transmitter are configured using the DXR275, DXR375 handheld terminal or a PC with Commubox FXA191 and operating software (e.g. COMMUWIN II or ReadWin [®] 2000)
Remote operation	<p>Configuration Handheld terminal DXR275, DXR375 or PC with Commubox FXA191 and operating software (ReadWin[®] 2000 or COMMUWIN II).</p> <p>Interface PC interface RS232 and Commubox FXA191.</p> <p>Configurable parameters Sensor type and connection type, engineering units (°C/°F), measurement range, internal/external cold junction, compensation of wire resistance with 2-wire connection, failure mode, output signal (4 to 20/20 to 4 mA), digital filter (damping), offset, TAG + descriptor (8 + 16 characters), output simulation, customer specific linearization, min./max. process value indicator function</p>

10.10 Certificates and approvals

CE-Mark	The measurement system fulfills the requirements demanded by the EU regulations. Endress+Hauser acknowledges successful unit testing by adding the CE mark.
Hazardous area approvals	<ul style="list-style-type: none"> ■ FM IS, Class I, Div. 1+2, Group A, B, C, D / FM NI, Class I, Div. 2, Group A, B, C, D ■ CSA IS, Class I, Div. 1+2, Group A, B, C, D ■ ATEX II1G EEx ia IIC T4/T5/T6 ■ ATEX II3G EEx nA IIC T4/T5/T6 ■ ATEX II3D in compliance with EN 50281.1
GL	Ship building approval (Germanischer Lloyd)
UL	Recognized component to UL 3111-1
CSA GP	CSA General Purpose
Other standards and guidelines	<ul style="list-style-type: none"> ■ IEC 60529: Degrees of protection by housing (IP-Code) ■ IEC 61010: Safety requirements for electrical measurement, control and laboratory instrumentation. ■ IEC 61326: Electromagnetic compatibility (EMC requirements) ■ NAMUR: Standardization association for measurement and control in chemical and pharmaceutical industries. (www.namur.de) ■ NEMA: Standardization association for the electrical industry

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