Technical Information

Teqwave F/I

Measuring device with surface acoustic wave technology

Smart, flexible concentration measuring device – individually for your process

Application

- The acoustic waveguide measures precisely and reliably, even the smallest changes are detected
- Continuous concentration measurement of liquids in pipes or vessels

Device properties
- Accurate in spite of pressure (F) or flow profile (I)
- F: Nominal diameter: DN 8 to 25 (⅜ to 1")
- I: Insertion length: 180 mm (7") or 500 mm (20")
- Industry-compliant, easy installation via DIN rail
- 3.5" TFT color touch display or LED indication
- 4-20 mA, Modbus TCP

Your benefits

- Easy and efficient – real-time in situ liquid analysis
- Full transparency – constant monitoring of product quality without sampling
- Highest process safety – reliable metering due to robust, maintenance-free sensor
- Fewer measuring points - multivariable measurement
- Customized usage – innovative app concept, easily expandable for changing measuring tasks
- Simplified process control – user-friendly operation and clear status visualization
- Local data backup – integrated data storage for measured values up to 7.5 years

Endress+Hauser [EH]

People for Process Automation

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About this document

Symbols and abbreviations used

Electrical symbols

Symbol	Meaning
A0011197	**Direct current** A terminal to which DC voltage is applied or through which direct current flows.
A0011198	**Alternating current** A terminal to which alternating voltage is applied or through which alternating current flows.
A0017381	**Direct and alternating current** • A terminal to which alternating voltage or DC voltage is applied. • A terminal through which alternating current or direct current flows.
A0011200	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
A0035455	**Signal ground connection** A terminal that can be used as the ground contact for the digital input.
A0035456	**Relay output connection** A terminal that can be used as a relay output.

Symbols for certain types of information

Symbol	Meaning
A0011182	**Permitted** Indicates procedures, processes or actions that are permitted.
A0011183	**Preferred** Indicates procedures, processes or actions that are preferred.
A0011184	**Forbidden** Indicates procedures, processes or actions that are forbidden.
A0011193	**Tip** Indicates additional information.
A0011194	**Reference to documentation** Refers to the corresponding device documentation.
A0011195	**Reference to page** Refers to the corresponding page number.

Symbols in graphics

Symbol	Meaning
1, 2, 3, …	Item numbers
A, B, C, …	Views
A-A, B-B, C-C,..	Sections
A0013441	Flow direction

Function and system design

Measuring principle

The core component of the measuring device is an acoustic wave guide for the precise and rapid measurement of liquid concentrations with acoustic surface waves.

A piezoelectric interdigital transducer (1) stimulates these high-frequency sound waves, which then propagate in the wall of the measuring device (A and B). A second piezoelectric interdigital transducer (2) acts as the receiver.

If the sound waves come into contact with liquid, the waves disperse into the liquid. This involves mode conversion at a Rayleigh angle (Θ_R) . This angle depends on the ratio of the speed of sound of the surface waves to the speed of sound of the liquid.

The double transducer arrangement with one transducer acting as a transmitter and another as a receiver enables extremely accurate analysis of the transmission times and amplitudes of the sound waves.
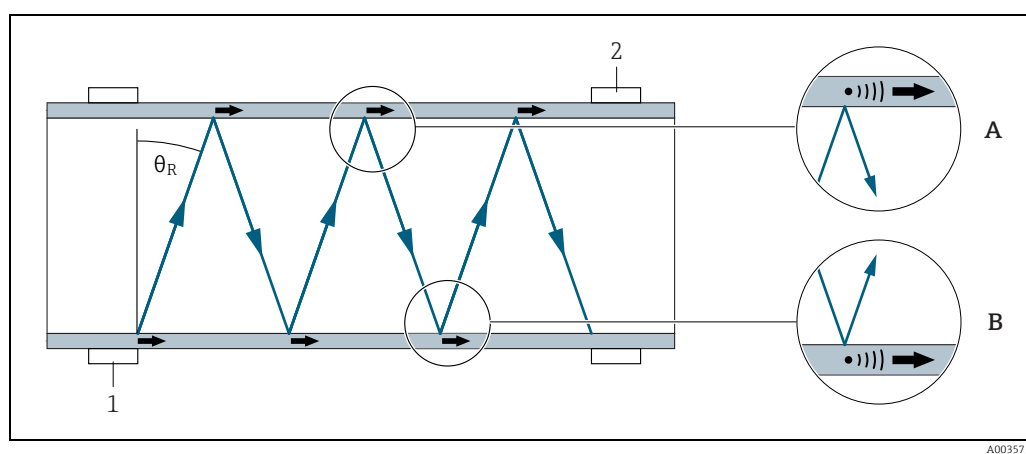
A0035710

During this process, the measuring device also determines the acoustic impedance and the acoustic density of the liquid, in addition to the speed of sound. Another sensor also measures the temperature. By combining all these characteristic values and applying the concentration app, it is possible to determine the concentration of substances in a liquid mixture.

Concentration measurement
The measuring device calculates the concentration of the liquid from the measured speed of sound, temperature and acoustic density.

Temperature measurement
A temperature sensor measures the temperature of the liquid. Due to the location of the sensor and the good thermal conduction, the sensor also reliably detects fast changes in temperature. If the Kalman filter is enabled, the measuring device also uses additional information from the transit time of the acoustic wave. The measuring device displays the temperature as a separate measured variable, and also uses the temperature measured variable to calculate the concentration of the liquid.

Sonic velocity measurement
The measuring device determines the speed of sound (sonic velocity) in a non-invasive manner based on the propagation of the acoustic waves in the wave guide.

Density measurement
The measuring device calculates the acoustic density of the liquid directly from the speed of sound and the acoustic impedance. In the case of acoustical determined density, change of the alteration absorption property is also recorded.
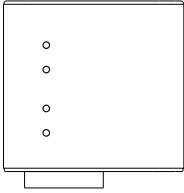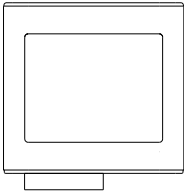
Measuring system

The measuring device consists of a transmitter and a sensor. The sensor sends the measured signals to the transmitter for analysis. The transmitter transmits the measured values to the "Teqwave Viewer" operating tool via an Ethernet interface and the operating tool visualizes the measured values. Here, the measuring device uses concentration apps, which are individually tailored to the measurement task and encoded to work only with the serial number of a specific transmitter.
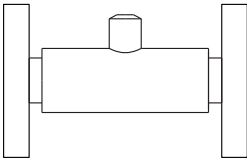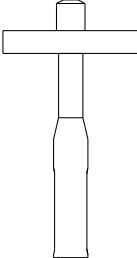
Transmitter

Two versions of the transmitter are available.

Transmitter with LED status indication	Order code for "Display; operation", option **A**
A0035711	Materials: • Transmitter housing: anodized aluminum Configuration: • Operation via the "Teqwave Viewer" operating tool supplied
Transmitter with a touchscreen	Order code for "Display; operation", option **B**
A0035712	Materials: • Transmitter housing: anodized aluminum • Window material: glass plate Configuration: • Operation via the "Teqwave Viewer" operating tool supplied • Operation via the graphic local display with a touch screen

Sensor

Two versions of the sensor are available.

"Teqwave F" sensor	Measurement directly in the flow
A0035713	Nominal diameters: • DN 8($\frac{3}{8}$") • DN 15 (½") • DN 25 (1") Process connections: • Flange, EN 1092-1 (DIN 2501), PN16 • External thread • Internal thread Materials: stainless steel, 1.4571 (V4A)
"Teqwave I" sensor	Measurement directly in the tank or in the pipe
A0035714	Installed lengths: • 180 mm (7") • 500 mm (20") Process connections: • Flange, EN 1092-1 (DIN 2501), DN 25 (1"), PN16 • External thread Materials: stainless steel, 1.4571 (V4A)

Concentration apps

A concentration app contains specific configurations for the measurement of a certain liquid and, along with the measured sensor signals, is used as the basis for calculating the concentration. Endress+Hauser provides a separate concentration app for every type of fluid.

The concentration app is a file with mf2 or lmf format. A list of the available concentration apps is provided in the Applicator. If you require a concentration app that is not already listed in the Applicator, Endress+Hauser requires a sample of the fluid to create the concentration app. Every transmitter can use a maximum of 50 concentration apps.

Concentration apps are individually encoded to work only with the serial number of a specific transmitter. The transmitter in service uses the serial number saved in the .mf2 or .lmf file to check whether the concentration app has been specifically configured for use with this transmitter. If this is not the case, it is not possible to add the concentration app.

The data sheet provided with the concentration app contains information about the fluid, the permitted measuring ranges and the accuracy of the concentration measurement.

Operating tool

Two versions of the "Teqwave Viewer" operating tool are available. Supported functions:

Included in the scope of supply: **Teqwave Viewer V2.1 – basic package**	Order code for "Application package", option EP: **Teqwave Viewer V2.1 - Viewer with interface for data download**
• Live display and graphic visualization of measured variables • Save graph • Manage concentration apps on the transmitter • Device configuration • Switch between multiple transmitters • Self-test	• Live display and graphic visualization of measured variables • Save graph • Manage concentration apps on the transmitter • Device configuration • Switch between multiple transmitters • Self-test • Read saved measured values • Offline analysis with graphic visualization of the measured values • Measured value logging and export function

Security

IT security

We only provide a warranty if the measuring device is installed and used as described in the Operating Instructions. The measuring device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.
IT security measures, which provide additional protection for the measuring device and device data transfer, must be implemented by the operators themselves in line with their security standards.

Input

Measured variables

Direct measured variables

• Temperature
• Speed of sound

Derived measured variables

• Concentration
• Dispersion
• Density

Measuring ranges

Concentration	As per concentration app data sheet, maximum 0 to 100 %
Speed of sound	600 to 2000 m/s
Temperature	Concentration app data sheet, maximum 0 to +100 ℃ (32 to +212 ℉)
Density	0.7 to 1.5 g/cm³

Input signal

Digital input

Function	Choice of analog channel 1-4; inputs "0" and "1" are connected to ground.
Version	Open and ground Do not connect external voltage to these terminals.

Output

Output signal

Ethernet (Modbus protocol)

Physical interface	RJ-45 (8P8C)

Current output 4 to 20 mA/voltage output 0 to 10 V

Function	Can be configured as a current output or voltage output, as required
Version	Galvanically isolated
Open-circuit voltage	DC 15.5 V
Freeze time	Configurable: 0 to 10000 s
Assignable measured variables	• Off • On • Concentration 1-2 • Temperature • Speed of sound • Dispersion • Density (optional) • Freeze measurement
Current output	4 to 20 mA
Maximum output value	20 mA
Load	0 to 500 Ω
Resolution	1.5 µA
Voltage output	0 to 10 V
Maximum output value	10 V
Load	> 750 Ω
Resolution	1 mV

Relay output

Function	Relay output
Version	Relay output, galvanically isolated
Maximum switching capacity	AC/DC 50 V, 1 A
Switching behavior	• NC contact • NO contact

Assignable functions	• Off
	• On
	• Limit value (can be configured as a range or trigger value, as required):
	  – Concentration 1...n
	  – Temperature
	  – Speed of sound
	  – Dispersion
	  – Density

Signal on alarm

Breakdown information and failsafe mode of the outputs are configurable (Operating Instructions document, "Configuring failsafe mode" section).

Ethernet (Modbus protocol)

Status bit	Diagnostics information via status bits

Current output 4 to 20 mA/voltage output 0 to 10 V

Failsafe mode	The breakdown information to be displayed in the event of a breach of the measuring range (over-range/under-range) can be configured in the **Analog output settings** parameters: • Failure value for measured variable if the "0V/2mA exceeding limits" option is selected: 2 mA or 0 V • Limit value for measured variable if the "Min/Max exceeding limits" option is selected: 4 to 20 mA or 0 to 10 V
	The breakdown information to be displayed in the event of a breach of the calibration range (over-range/under-range) can be configured in the **Display filter** parameter: • Failure value for measured variable if the "Calibration range" option is selected: 2 mA or 0V • If the measuring device exceeds or drops below the calibration range for the temperature, a failure value is also displayed for the concentration measured variable if it is active.
	The breakdown information to be displayed if the process is not stationary (stationarity) can be configured in the **Display filter** parameter: • Failure value for the **concentration measured variable if the "Enable stationarity" option is selected:** 2 mA or 0 V
	The breakdown information to be displayed if the rate of change exceeds the limit value can be configured in the **Change in [measured variable]** parameter. If the function is enabled: • Failure value for the **concentration** measured variable: 2 mA or 0 V
	In the event of interference influences (dispersion) above the limit value: • Failure value for the **concentration** measured variable: 2 mA or 0 V
	If there is not enough liquid or the sensor is defective: • Failure value for all measured variables: 2 mA or 0 V

Relay output

Failsafe mode	If the temperature measurement range is exceeded or undershot: • For the **concentration** measured variable: the current status is held
	If the temperature calibration range is exceeded or undershot: • For the **concentration** measured variable: the current status is held
	The breakdown information to be displayed if the process is not stationary (stationarity) can be configured in the **Display filter** parameter. If the "Enable stationarity" option is selected: • For the **concentration** measured variable: the current status is held
	The breakdown information to be displayed if the rate of change exceeds the limit value can be configured in the **Change in [measured variable]** parameter. If the function is enabled: • For the **concentration** measured variable: the current status is held
	In the event of interference influences (dispersion) above the limit value: • For the **concentration** measured variable: the current status is held
	If there is not enough fluid: • Measured value for all measured variables with the exception of temperature: 0 Switch status as per the setting for the switching threshold or switch point ("Operating Instructions" document, "Configuring the switch output" section)
	If there is a sensor defect: • Measured value for all measured variables: 0 Switch status as per the setting for the switching threshold or switch point ("Operating Instructions" document, "Configuring the switch output" section)

Local display (transmitter with touch screen)

Color coding	Color field signalizes measuring and device errors ("Operating Instructions" document, "Diagnostics information on local display and in operating tool" section)
Plain text display	Information on the cause

Local display (transmitter with LED)

Light emitting diodes (LED)	Status indication with four light emitting diodes ("Operating Instructions" document, "Diagnostics information for transmitter with LED status indication" section)
	The light emitting diodes indicate the following information: • Supply voltage active • Error-free measuring system • Device alarm/error has occurred • Problem with connection to sensor

"Teqwave Viewer" operating tool

Color coding	Color field signalizes measuring and device errors ("Operating Instructions" document, "Diagnostics information on local display and in operating tool" section)
Plain text display	Information on the cause

Galvanic isolation The current and relay outputs are galvanically isolated from the rest of the system.

Protocol-specific data

Protocol	Modbus Applications Protocol Specification V1.1
Response times	Typically 10 to 50 ms
Device type	Slave
Function codes	0x04: Read Input Registers
Modbus data transmission	Little endian
Data access	Each measured variable can be accessed via Modbus (Ethernet).

Power supply

Terminal assignment

Terminal	Assignment	
V+	V_{in} 24 V DC	Supply voltage
V-		
+	out 0 to 10 V; 4 to 20 mA	Analog output
-		
0	output selection	Digital input
1		
⊥		Signal ground
⌒	alarm max. 50 V, 1 A	Relay output
⌒		

Supply voltage	Transmitter	24 V DC (18 to 35 V)

ℹ️ The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

Power consumption	Transmitter	4 W

Current consumption	Transmitter maximum switch-on current	6 A

Power supply failure The configuration and recorded data are retained in the device memory.

Electrical connection **Connections and measuring device connecting cable**
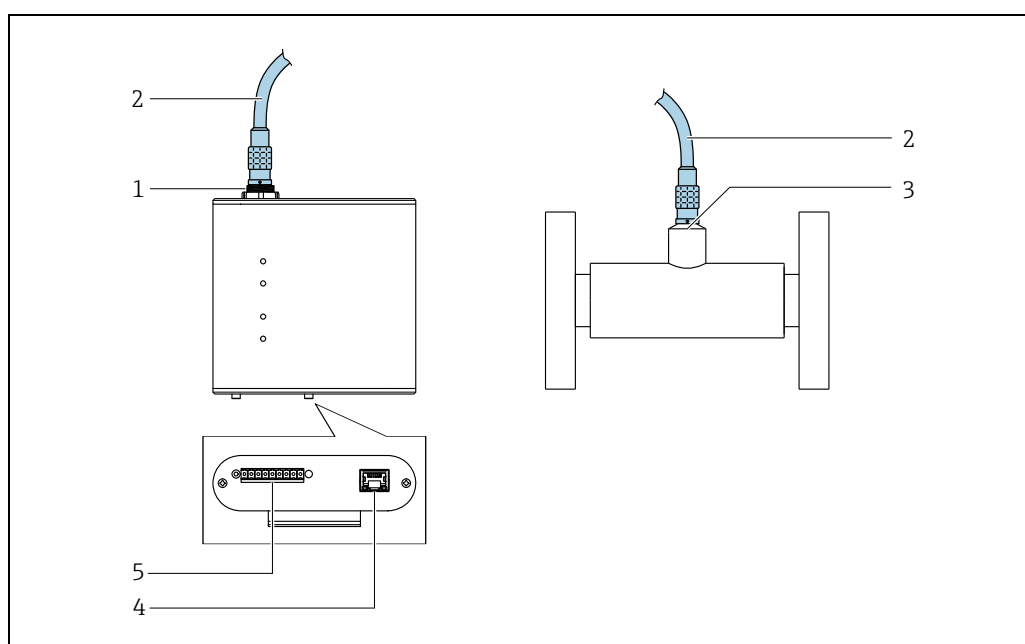
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Connections and measuring device connecting cable

1   Transmitter push-pull connection
2   Connecting cable
3   Sensor push-pull connection
4   Ethernet interface for digital signal transmission ("Teqwave Viewer" operating tool and Modbus protocol)
5   Terminal strip with supply voltage, analog output, relay output and digital input, terminal assignment → 🖺 9

ℹ️ The connecting cable is available in different lengths.

Connection examples

Current output 4 to 20 mA
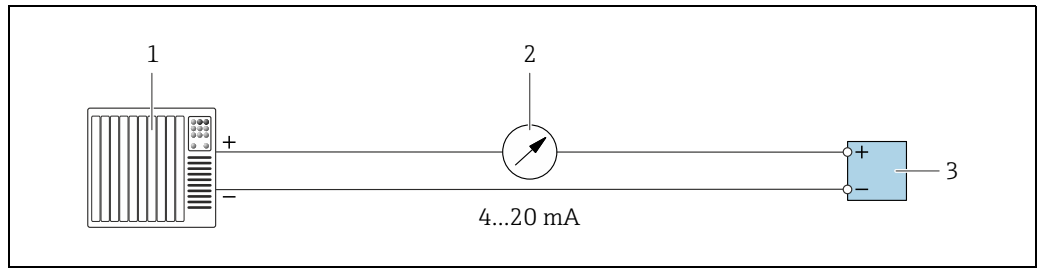
Connection example for current output, active, 4 to 20 mA

1   Automation system with current input (e.g. PLC)
2   Analog display unit: maximum load 500 Ω
3   Transmitter

Voltage output 0 to 10 V
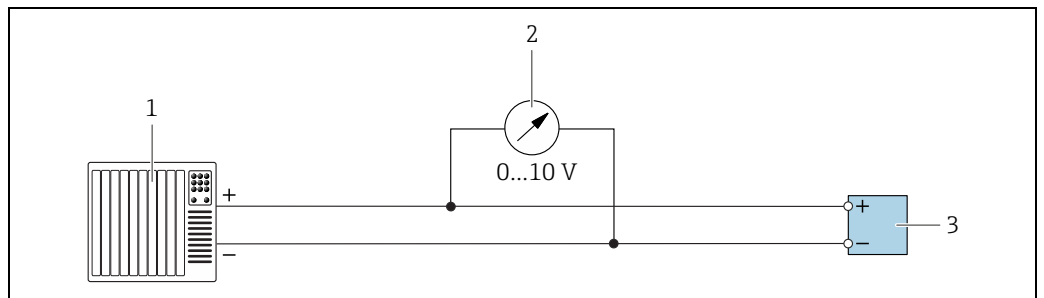
Connection example for voltage output, active, 0 to 10 V

1   Automation system with current or voltage input (e.g. PLC))
2   Analog display unit for voltage: minimum load 750 Ω
3   Transmitter

Relay output
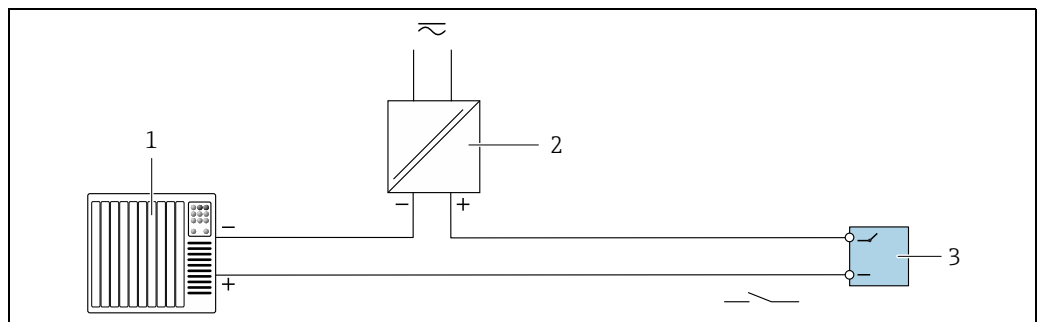
Connection example for relay output, passive

1   Automation system with switch input (e.g. PLC)
2   Power supply: max. 50 V AC/DC
3   Transmitter

Digital input (elective inputs)

The digital input can output up to four measured variables on the analog output.

Configuration options:

Active analog output	Digital input "0"	Digital input "1"
Channel 1	Open	Open
Channel 2	Ground	Open
Channel 3	Open	Ground
Channel 4	Ground	Ground

NOTICE

Interference at the digital input

If the device is connected incorrectly, this can impact the functional integrity of the measuring device.
- If the digital input is used, connect digital inputs "0" and "1" to signal ground.

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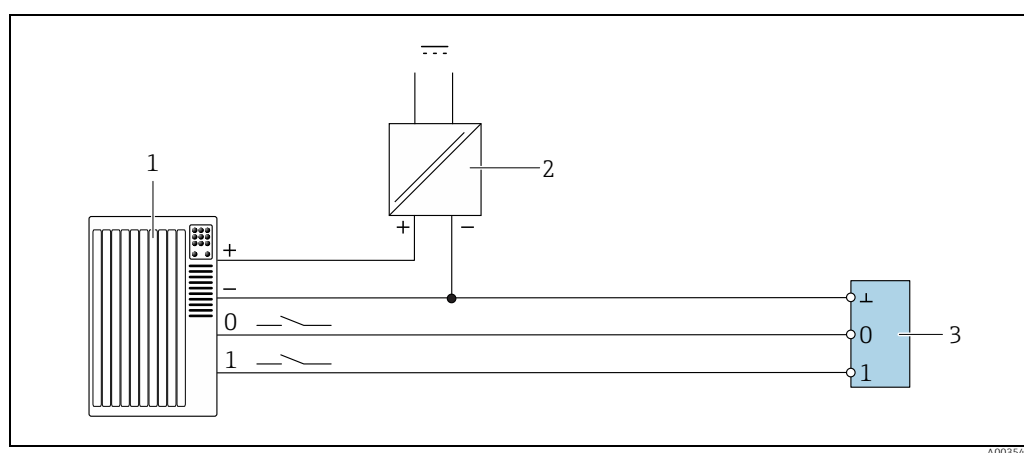
Connection example for the digital input

1   Automation system with switch input (e.g. PLC)
2   Power supply
3   Transmitter

> If the transmitter is connected as illustrated in the example, the outputs are no longer galvanically isolated.

Potential equalization

The measuring device must be included in the potential equalization. The transmitter and sensor are connected to the same potential via the connecting cable. This potential must be current-free.

> Terminal V- is electrically connected to the transmitter housing and can be used for potential equalization.

Terminals

Terminal type	Screw terminals
Conductor cross-section	0.129 to 1.31 mm^2 (16 to 26 AWG)

Cable specification

Permitted temperature range

- Comply with the installation guidelines and regulations that apply in the country of installation.
- The cables must be suitable for the minimum and maximum temperatures to be expected.

Connecting cable between sensor and transmitter

Only use the cable supplied.

Modbus Ethernet cable

Cable type	100 Base-TX
Cable category	Min. CAT5
Plug type	RJ-45 (8P8C)
Shielding	S/FTP, F/FTP, SF/FTP, S/UTP, F/UTP or SF/UTP
Cable length	Max. 30 m (98 ft)

Power supply and signal cables

Cable type	Strand or solid wire
Conductor cross-section	0.129 to 1.31 mm^2 (16 to 26 AWG)
Temperature range	• −40 to 70 °C (−40 to 158 °F) when mounted in a fixed position • -10 to 50 °C (14 to 122 °F) when cable can move freely
Cable length	Max. 30 m (98 ft)
Power supply cable	Standard installation cable is sufficient.
Analog output	
Digital input	
Relay output (alarm)	

Requirements for the supply unit

Supply voltage	DC 24 V (nominal voltage: DC 18 to 35 V)
Power unit	The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

Performance characteristics

Max. measured error

Speed of sound	±2 m/s
Temperature	±0.5 K
Density	±5 kg/m³

Accuracy

Accuracy of concentration measurement

The measuring device can achieve an accuracy of up to 0.01 %. The accuracy depends on the concentration app. Detailed information on the accuracy is provided in the data sheet.

Response time

Measuring frequencies

Concentration	10 Hz
Speed of sound	10 Hz
Temperature	1 Hz
Density	10 Hz

Influence of medium temperature

The response time of the temperature measurement depends on the transfer of heat from the fluid to the steel. Activation of the Kalman filter accelerates the response time. An erratic change in the temperature generates an error message. It is possible to set a threshold for displaying the error.

Influence of variations in the fluid temperature

If the fluid temperature changes quickly (>1.5 °C/min), the measured error can be greater than specified in the "Max. measured error" section.

Influence of vibrations	The measured error can be greater than specified in the "Max. measured error" section as a result of mechanical or acoustic vibrations in the 0.8 to 2.0 MHz range.

Influence of ambient temperature	**Current/voltage output**

Temperature coefficient	100 µV/°C or ±1 µA/°C

Influence of air bubbles	Air bubbles and particles are disturbance factors when measuring with acoustic surface waves. The recommended installation positions and the "Dispersion" diagnostic information largely prevent incorrect measurement results caused by air bubbles or particles.

Installation

Mounting location	

Mounting location

Ideally, the sensor should be installed in an ascending pipe, while ensuring a sufficient distance is kept to the next pipe elbow: h ≥ 5 x DN.

Orientation	**Teqwave I**

Orientation of Teqwave I

Mount Teqwave I so that the active sensor area can be fully immersed in the liquid under measurement.
If installing the sensor in a pipe, make sure the sensor is aligned correctly to avoid irregular flow to the sensor. Rotate the sensor so that the dot on the process connection is aligned with the flow direction.
If installing the sensor in a horizontal position, make sure the sensor is aligned correctly to avoid the buildup of deposits around the sensing element. Rotate the sensor so that the black dot on the process connection points up or down.

> **NOTICE**
>
> **Measurement result is not representative**
> Heterogeneous mixing of the fluid and irregular flow to the sensor can distort the measurement results, which are only valid for the layer of liquid in which the sensor is located.
> - Ensure the homogeneous mixing of the liquid and continuous flow of liquid to the sensor.

Inlet and outlet runs

Observe the following inlet and outlet runs to comply with accuracy specifications:
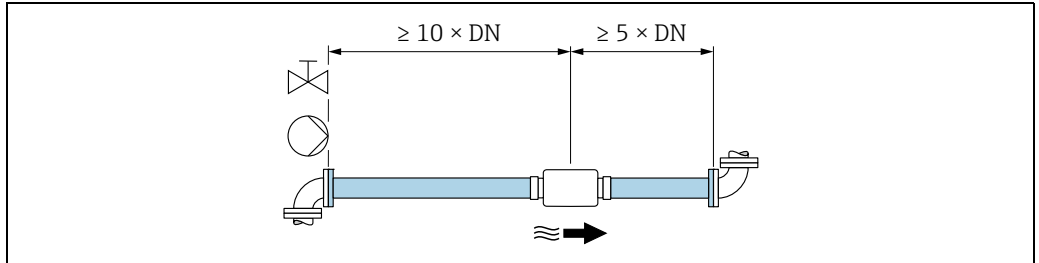
Inlet and outlet runs

Installing the transmitter

DIN rail mounting
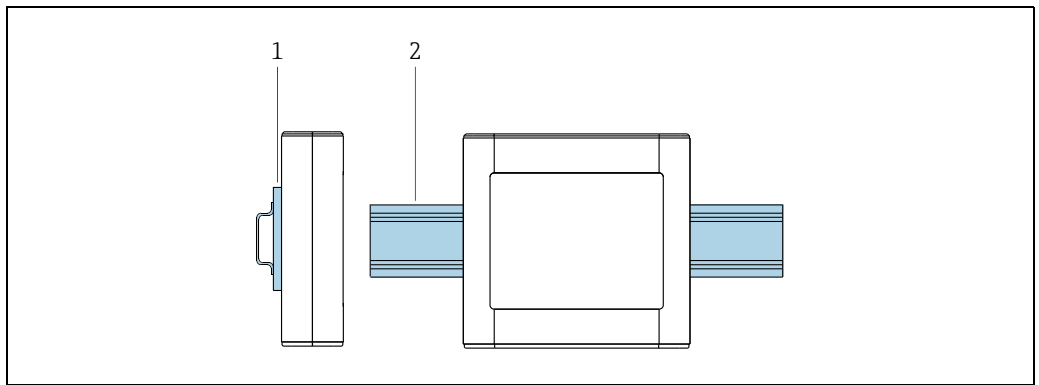
DIN rail mounting

1   DIN rail holder
2   DIN rail according to DIN EN 60715 TH 35

Environment

Ambient temperature range

Sensor	0 to +50 ℃ (+32 to +122 ℉)
Transmitter	0 to +50 ℃ (+32 to +122 ℉)

Storage temperature

0 to +50 ℃ (+32 to +122 ℉)

Degree of protection

Sensor	IP 68 with cable plugged in
Transmitter	IP 40

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326-1
- Complies with emission limit for industry as per EN 55011 (Class A)

For details, refer to the Declaration of Conformity.

Process

Medium temperature range	**Sensor** 0 to +100 °C (+32 to +212 °F)
Nominal pressure	**Sensor** Max. 16 bar (232 psi) at 20 °C
Flow velocity	Max. 5 m/s (16.4 ft/s)

Mechanical construction

Dimensions

Transmitter
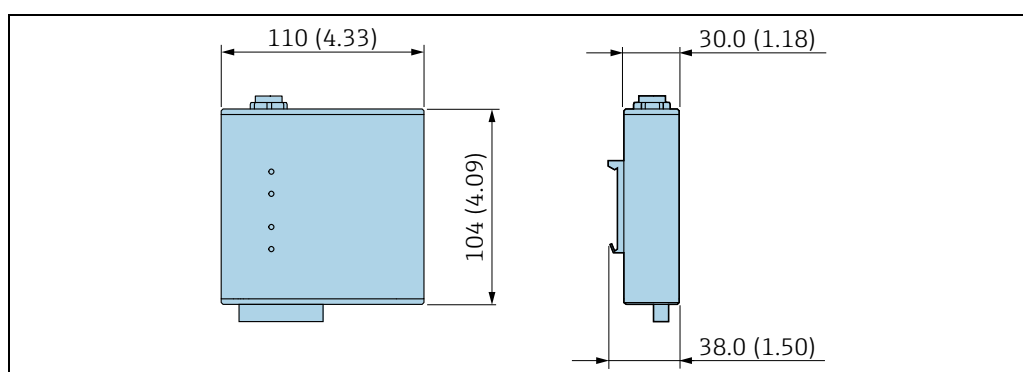
Transmitter dimensions. Dimensions in mm (in)

"Teqwave F" sensor, internal and external thread
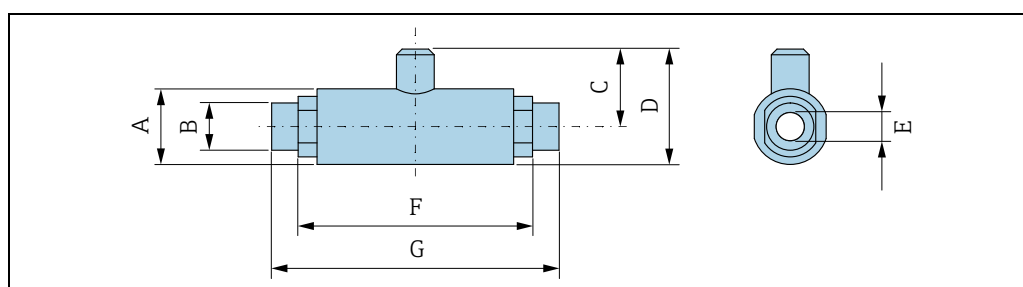
Dimensions in SI units

Nominal diameter	A	B	C	D	E	F	G
DN 8 (⅜")	35.0	G ¼"	38.0	55.5	8.0	106	130
DN 15 (½")	40.0	G ½"	41.0	61.0	15.0	124	152
DN 25 (1")	54.0	G 1"	48.0	75.0	25.0	160	210

All dimensions in [mm]

Dimensions in US units

Nominal diameter	A	B	C	D	E	F	G
DN 8 (⅜")	1.38	G ¼"	1.50	2.19	0.31	4.17	5.12
DN 15 (½")	1.57	G ½"	1.61	2.40	0.59	4.88	5.98
DN 25 (1")	2.13	G 1"	1.89	2.95	0.98	6.30	8.27

All dimensions in [in]

"Teqwave F" sensor, flange
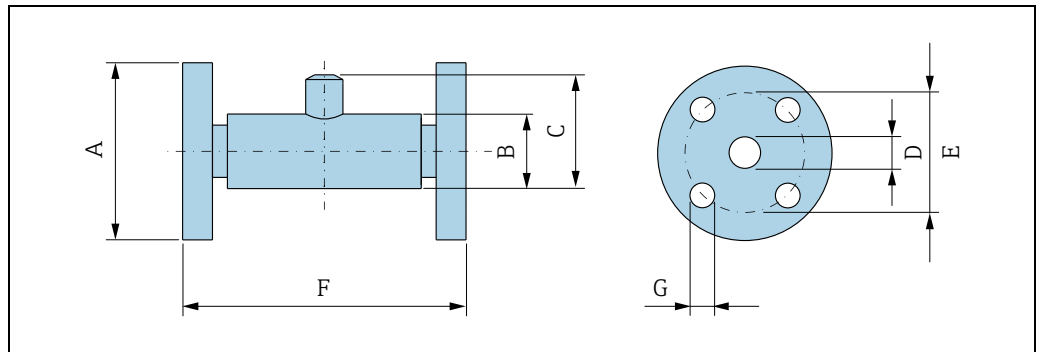
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Dimensions in SI units

Nominal diameter	A	B	C	D	E	F	G
DN 8 (⅜")	95.0	35.0	56.0	8.0	65.0	134	14.0
DN 15 (½")	95.0	40.0	61.0	15.0	65.0	152	14.0
DN 25 (1")	115	54.0	75.0	25.0	85.0	192	14.0

Data for flange process connections. All dimensions in [mm]

Dimensions in US units

Nominal diameter	A	B	C	D	E	F	G
DN 8 (⅜")	3.74	1.38	2.20	0.31	2.56	5.28	0.55
DN 15 (½")	3.74	1.57	2.40	0.59	2.56	5.98	0.55
DN 25 (1")	4.53	2.13	2.95	0.98	3.35	7.56	0.55

Data for flange process connections. All dimensions in [in]

"Teqwave I" sensor, external thread
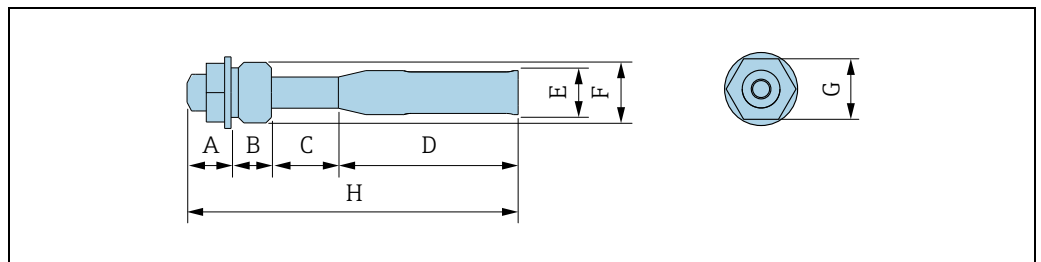
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Dimensions in SI units

Installed length	A	B	C	D	E	F	G	H
180 (7")	24.0	22.0	36.5	98.0	24.0	G 1"	32.0	180.5
500 (20")	24.0	22.0	362.5	98.0	24.0	G 1"	32.0	506.5

All dimensions in [mm]

Dimensions in US units

Installed length	A	B	C	D	E	F	G	H
180 (7")	0.94	0.87	1.44	3.86	0.94	G 1"	1.26	7.11
500 (20")	0.94	0.87	14.3	3.86	0.94	G 1"	1.26	19.94

All dimensions in [in]

"Teqwave I" sensor, flange
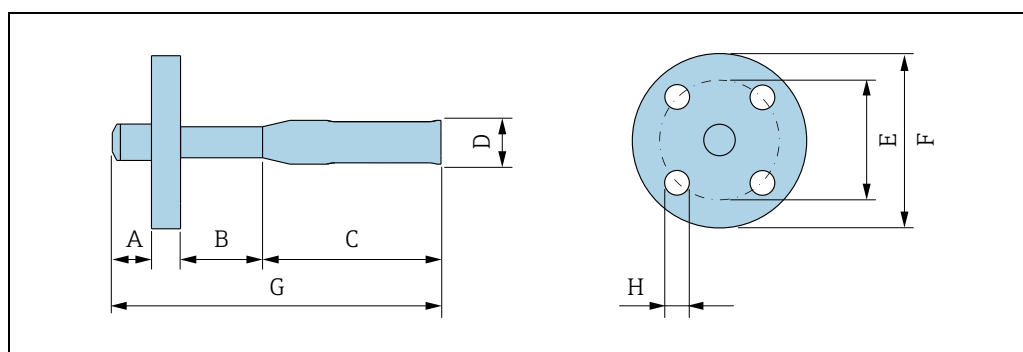
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Dimensions in SI units

Installed length	A	B	C	D	E	F	G	H
180 (7")	21.5	48.0	98.0	24.0	85.0	115	180.5	14.0
500 (20")	21.5	371	98.0	24.0	85.0	115	506.5	14.0

All dimensions in [mm]

Dimensions in US units

Installed length	A	B	C	D	E	F	G	H
180 (7")	0.85	1.77	3.86	0.94	3.35	4.53	7.11	0.55
500 (20")	0.85	14.6	3.86	0.94	3.35	4.53	19.94	0.55

All dimensions in [in]

Weight

Transmitter

Weight of transmitter	0.34 kg (0.8 lbs)

"Teqwave F" sensor

Nominal diameter	Flange	External thread	Internal thread
DN 8 (⅜")	1.85 kg (4.08 lbs)	0.45 kg (0.99 lbs)	0.45 kg (0.99 lbs)
DN 15 (½")	2.0 kg (4.4 lbs)	0.6 kg (1.3 lbs)	0.6 kg (1.3 lbs)
DN 25 (1")	4.0 kg (8.8 lbs)	1.4 kg (3.1 lbs)	1.4 kg (3.1 lbs)

"Teqwave I" sensor

	Flange	External thread
Weight 180 mm (7") Order code for "Insertion Length, Insertion Tube Material:" option AS	1.52 kg (3.35 lbs)	0.42 kg (0.93 lbs)
Weight 500 mm (20") Order code for "Insertion Length, Insertion Tube Material:" option BS	1.70 kg (3.75 lbs)	0.61 kg (1.35 lbs)

Materials

Transmitter

Housing	Anodized aluminum
Window material	Glass plate
Terminal connection	Polybuteneterephthalate (PBT)

Ethernet interface	• Socket: ferrite • Contact housing: thermoplastic • Contacts: 100% tin with nickel coating, gold-plated
Push-pull connection	• Socket: brass, nickel-plated • Contact housing: polyetheretherketone (PEEK) • Contacts: brass, gold-plated

Sensor

Stainless steel, 1.4571 (V4A)

Connecting cable

Cable, external material	Polyurethane as per DIN EN 60811-2-1 (oil-resistant, halogen-free)
Connector	• Socket: brass, nickel-plated • Contact housing: polyetheretherketone (PEEK) • Contacts: brass, gold-plated

Process connections
"Teqwave F" sensor

- Flange, EN 1092-1 (DIN 2501), PN16
- External thread
- Internal thread

"Teqwave I" sensor

- Flange, EN 1092-1 (DIN 2501), PN16
- External thread

Operability

Local operation
Via display module

Two display modules are available:
- Order code for "Display, operation", option A: LED status indication
- Order code for "Display, operation", option B: 3.5" TFT touch display

Supported operating tools
- Operation via "Teqwave Viewer" Windows Desktop operating tool.

Reliable operation
- If the power supply fails, data saved in the device and device configurations are retained.

Languages
Can be operated in the following languages:

- Via local operation (transmitter with touch screen)
  English, German, French, Spanish, Italian
- Via operating tool
  English, German, French, Spanish, Italian

Certificates and approvals

CE mark
The measuring system meets the legal requirements of the EU Directives.
Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

C-tick symbol
The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Other standards and guidelines	• EN 60529 Degrees of protection provided by enclosures (IP code)
	• EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
	• IEC/EN 61326-1 Electromagnetic compatibility (EMC requirements)
	• RoHS and EN 50581 Restriction of hazardous substances in electric and electronic devices.

Ordering information

Detailed ordering information is available:
- In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
- From the Endress+Hauser Sales Center: www.endress.com/worldwide

Product Configurator - the tool for customized product configuration

- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to measuring point, such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format

Application packages

Application packages are available for the device to expand the device functions, depending on user needs. The application packages can be ordered with the device or subsequently from Endress+Hauser. The Endress+Hauser Sales Center can provide detailed information on the relevant order code. The product page on the Endress+Hauser website www.endress.com also contains additional information on the order code.

Package	Description
Viewer with interface for data download	**Retrieval and storage of measured values.** The application package allows users to retrieve measured data saved in the internal device memory. In addition, the measured data can be saved in a text file which can be imported into a database. (Order number: DK9501)

Accessories

Various accessories are available for the measuring device, and can be ordered with the device or at a later stage from Endress+Hauser. The Endress+Hauser Sales Center can provide detailed information on the relevant order code. The product page on the Endress+Hauser website www.endress.com also contains additional information on the order code.

For the transmitter

Accessories	Description
Transmitter • LED status indication • Touch screen	Transmitter for replacement or storage. The serial number of the current transmitter must be specified when ordering. On the basis of the serial number, device-specific data in the replaced device can also be used in the new transmitter. (order number: DK9BXX)
Connecting cable between sensor and transmitter	The following cable lengths are available: order code for "Cable, sensor connection": • Option **B**: 1 m (3 ft) • Option **D**: 2 m (6 ft) • Option **E**: 5 m (15 ft) • Option **F**: 10 m (30 ft) (Order number: XPD0047)

Device-specific accessories

Accessories	Description
Concentration app	Data record for integrating new fluids into the measuring device. The concentration apps are available on the CD-ROM. A list of the available concentration apps and measuring ranges is provided in the Applicator. If you require a concentration app that is not already listed in the Applicator, Endress+Hauser requires a sample of the fluid to create the concentration app. Endress+Hauser provides the concentration app as a file in mf2 or lmf format. Every transmitter can use a maximum of 50 concentration apps. (Order number: DK9500)

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: • Calculation of all the data needed to identify the optimum measuring device • Graphic representation of the calculation results Administration, documentation and access to all project-related data and parameters throughout the entire life cycle of a project and database with available concentration apps. Applicator is available: • Via the Internet: https://portal.endress.com/webapp/applicator • On CD-ROM for local PC installation
W@M	Life cycle management for your plant. W@M provides support with a wide range of software applications over the entire process: from planning and procurement to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of the Endress+Hauser devices. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: • Via the Internet: www.endress.com/lifecyclemanagement • On CD-ROM for local PC installation

Documentation

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

Standard documentation

Document type	Documentation code
Operating Instructions	BA01823D
Brief Operating Instructions	KA01371D

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