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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 in) or 500 mm (20 in)
- Industry-compliant, easy installation via DIN rail
- 3.5" in 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
People for Process Automation

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About this document

Symbols

Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	**Protective Earth (PE)** A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: ▪ Inner ground terminal: Connects the protectiv earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.
	**Signal ground connection** A terminal that can be used as the ground contact for the digital input.
	Relay output connection A terminal that can be used as a relay output.

Communication symbols

Symbol	Meaning
	**Wireless Local Area Network (WLAN)** Communication via a wireless, local network.
	**Bluetooth** Wireless data transmission between devices over a short distance.
	**LED** Light emitting diode is off.
	**LED** Light emitting diode is on.
	**LED** Light emitting diode is flashing.

Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation.
	Reference to page.

Symbol	Meaning
	Reference to graphic.
	Visual inspection.

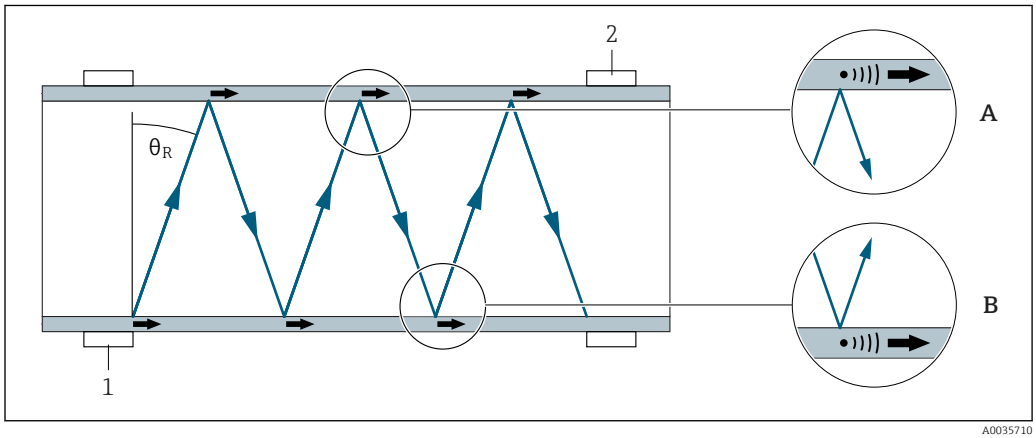
Symbols in graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
1., 2., 3., ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
EX	Hazardous area
EX	Safe area (non-hazardous area)
	Flow direction

Function and system design

Measuring principle

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



A0035710

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.

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 according to the measured speed of sound, temperature and acoustic density.

Temperature measurement

A temperature sensor measures the temperature of the liquid. The location of the sensor and good thermal conduction allow to reliably detect 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

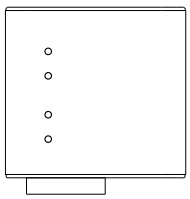
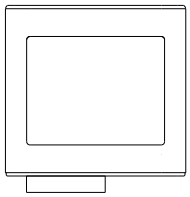
The measuring device calculates the acoustic density of the liquid directly from the speed of sound and the acoustic impedance. In the case of acoustical determined density, change of the alteration absorption property is also recorded.

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 displays the measured values. 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.

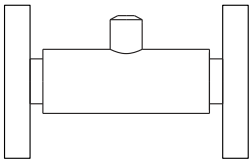
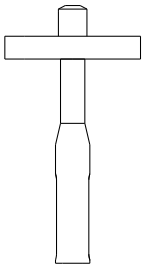
Transmitter

Two versions of the transmitter are available.

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

Sensor

Two versions of the sensor are available.

"Teqwave F" sensor  A0035713	Measurement directly in the flow Nominal diameters: ▪ DN 8 (⅜") ▪ DN 15 (½") ▪ DN 25 (1") Process connections: ▪ Flange, EN 1092-1 (DIN 2501), PN 16 ▪ External thread → 🖹 17 ▪ Internal thread → 🖹 17 Materials: Stainless steel, 1.4571 (V4A)
"Teqwave I" sensor  A0035714	Measurement directly in the tank or in the pipe Installed lengths: ▪ 180 mm (7 in) ▪ 500 mm (20 in) Process connections: ▪ Flange, EN 1092-1 (DIN 2501), DN 25 (1") , PN 16 ▪ External thread → 🖹 18 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 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 25 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 .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

IT security

Our warranty is valid only if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the device and associated 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 range

Concentration	As per concentration app data sheet, maximum 0 to 100 %
Speed of sound	600 to 2 000 m/s
Temperature	Concentration app data sheet, maximum 0 to 100 °C (+32 to +212 °F)
Density	0.7 to 1.5 g/cm^3

Input signal

Digital input

Function	Choice of analog channel 1 to 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
Suspend time	Configurable: 0 to 10 000 s
Assignable measured variables	▪ Off ▪ On ▪ Concentration 1-2 ▪ Temperature ▪ Speed of sound ▪ Dispersion ▪ Density (optional) ▪ Suspend 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 to n
	  ▪ Temperature
	  ▪ Speed of sound
	  ▪ Dispersion
	  ▪ Density

Signal on alarm

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 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 "0 V/2 mA 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 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 0 V ▪ If the measuring device exceeds or drops below the temperature calibration range, a failure value is also displayed for the concentration measured variable if it is active. The breakdown information 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 LEDs indicate the following information: ▪ Supply voltage active ▪ Error-free measuring system ▪ Device alarm/error has occurred ▪ Problem with connection to the 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	0×04: 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)

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

Power consumption

Transmitter	Max. 4 W

Current consumption

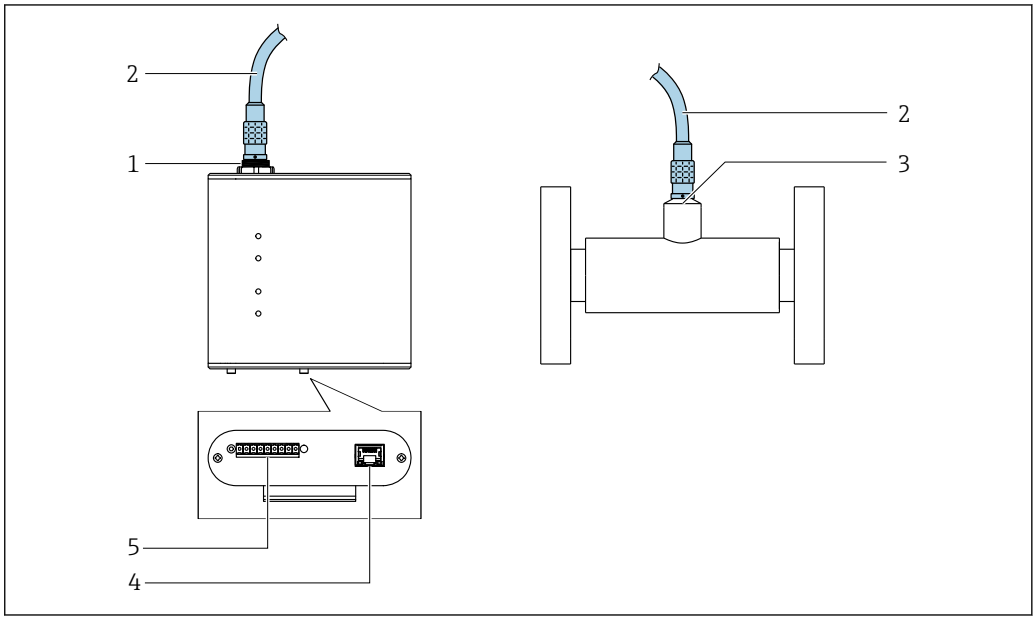
Transmitter maximum switch-on current	6 A

Power supply failure

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

Electrical connection

Connections and measuring device connecting cable



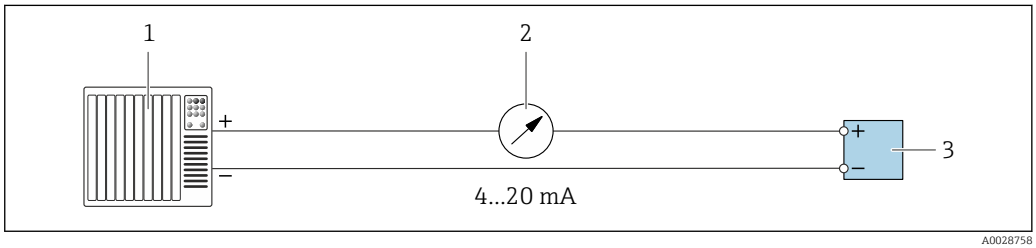
1 *Connections and measuring device connecting cable*

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* → 10

The connecting cable is available in different lengths.

Connecting examples

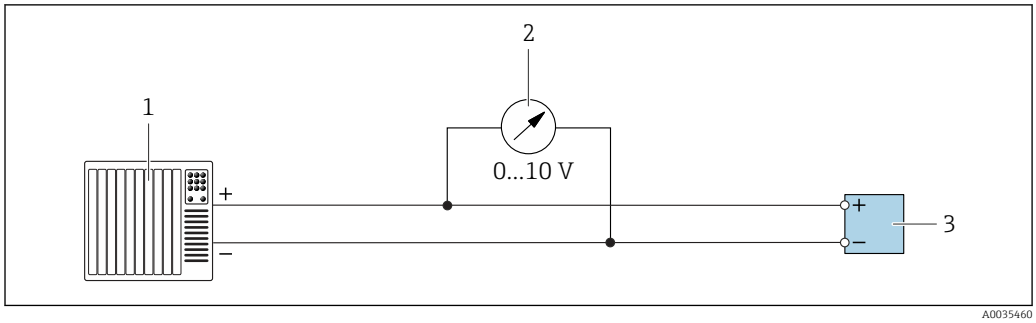
Current output 4 to 20 mA



2 *Connection example for current output, active, 4 to 20*

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

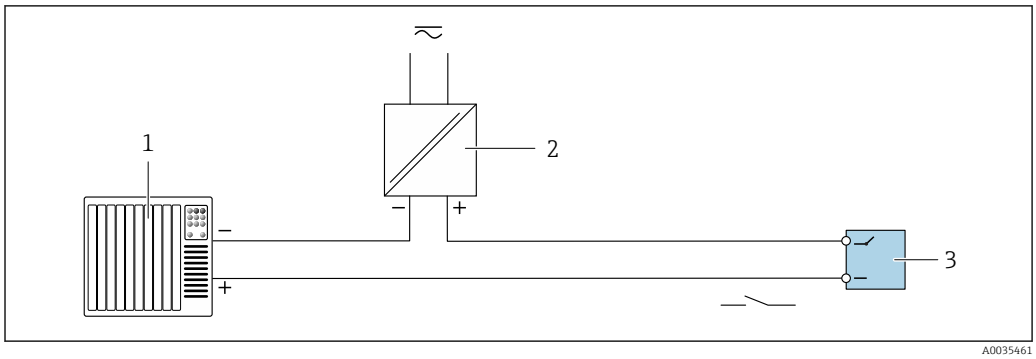
Voltage output 0 to 10 V



3 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



4 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 create up to four measured variables on the analog output.

Configuration options:

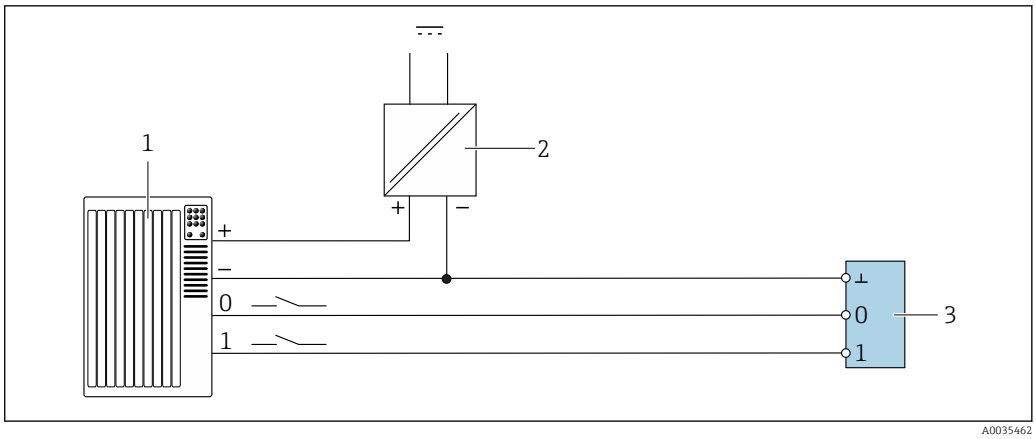
Active analog output	Digital input "0"	Digital input "1"
Channel 1	Open	Open
Channel 2	Ground	Open
Channel 3	Open	Ground
Channel 4	Ground	Ground

NOTICE

Interference at the digital input

If the device is connected incorrectly, this impacts the functional integrity of the measuring device.

► If the digital input is used, connect digital inputs "0" and "1" to signal ground.



5 *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 mm² (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 expected minimum and maximum temperatures.

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 mm² (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 (±6.56 ft/s)
Temperature	±0.5 K
Density	±0.01 g/cm³

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.

Reaction time

Influence of medium temperature
The response time of the temperature measurement depends on the heat transfer 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 (34.7 °F/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

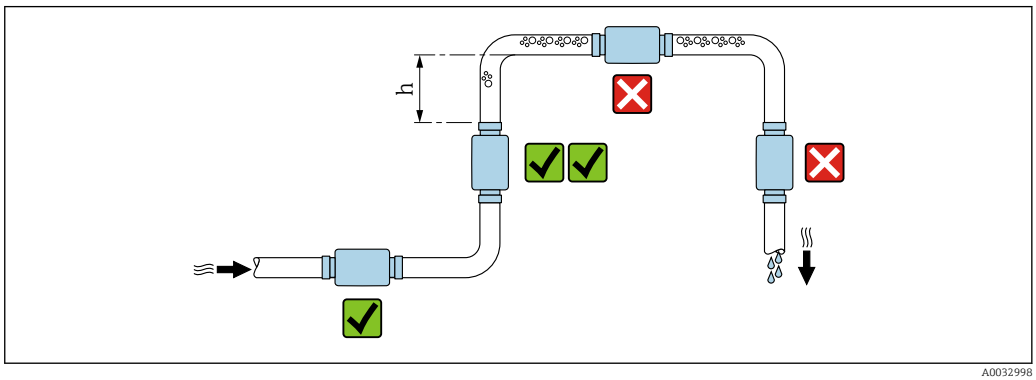
Temperature coefficient	100 µV/°C (µV/°F) or ±1 µA/°C (µA/°F)

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

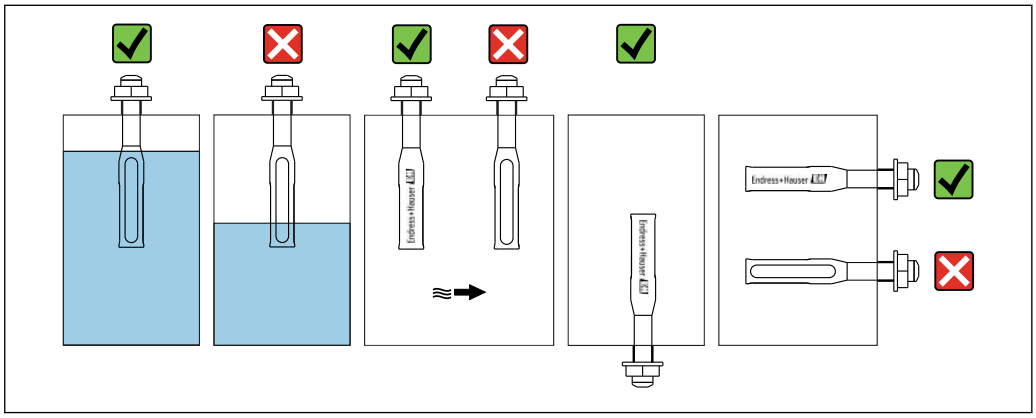
Mounting location



6 *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 × DN.

Orientation Teqwave I



7 *Orientation of Teqwave I*

Mount Teqwave I so that the active sensor area can be fully immersed in the measured liquid.

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

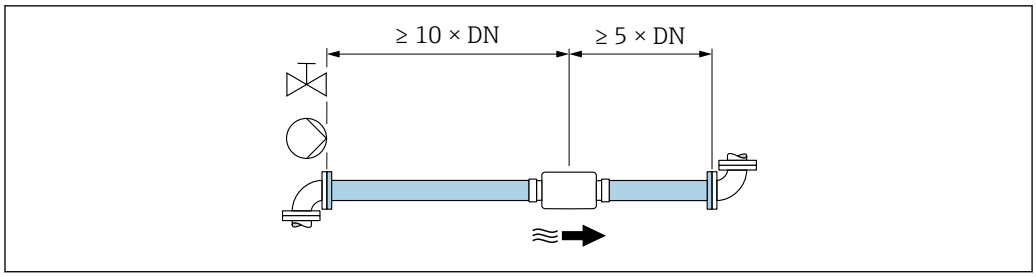
Measurement result is not representative

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

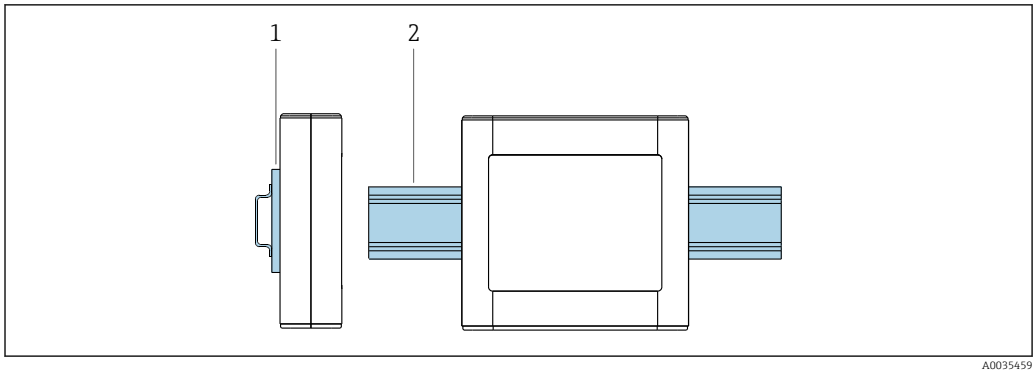
Observe the following inlet and outlet runs to comply with accuracy specifications:



8 Inlet and outlet runs

Installing the transmitter

DIN rail mounting



9 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 °C (+32 to +122 °F)
Transmitter	0 to +50 °C (+32 to +122 °F)

Storage temperature

0 to +50 °C (+32 to +122 °F)

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 (68 °F)

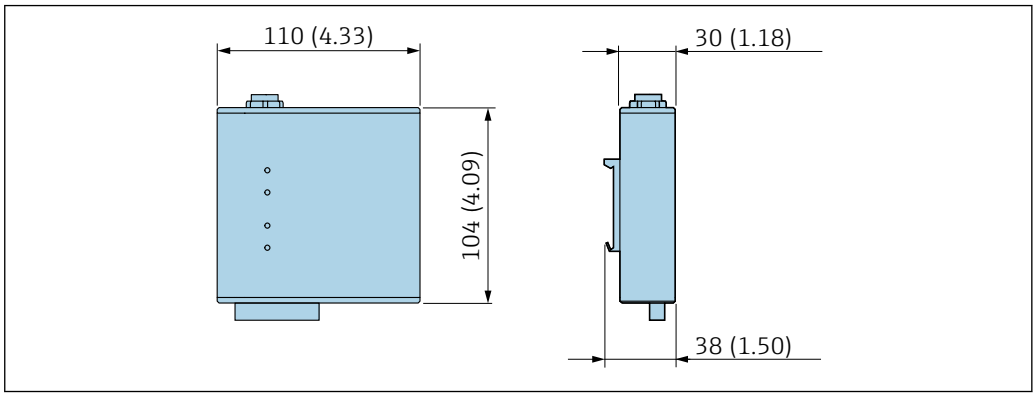
Flow velocity

Max. 5 m/s (16.4 ft/s).

Mechanical construction

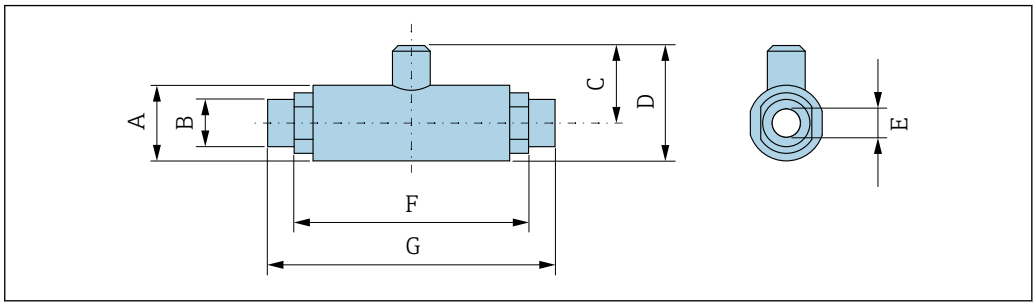
Design dimensions

Transmitter



10 Dimensions in mm (in)

"Teqwave F" sensor, internal and external thread



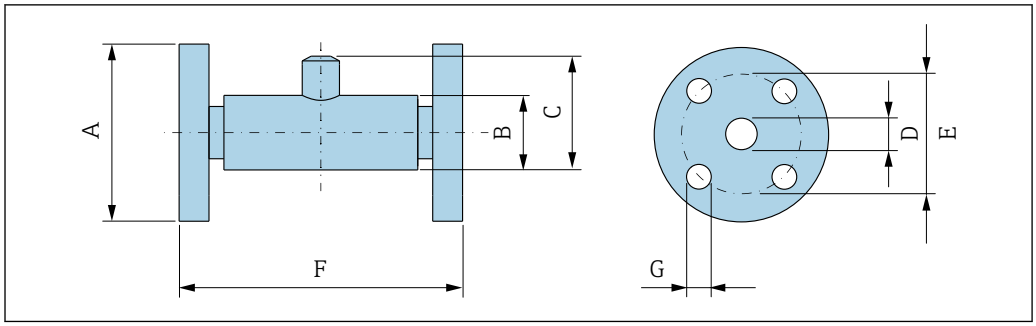
Dimensions in SI units

DN [mm]	A [mm]	B	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
8	35	G ¼"	38	55.5	8	106	130
15	40	G ½"	41	61	15	124	152
25	54	G 1"	48	75	25	160	210

Dimensions in US units

DN [in]	A [in]	B	C [in]	D [in]	E [in]	F [in]	G [in]
⅜	1.38	G ¼"	1.50	2.19	0.31	4.17	5.12
½	1.57	G ½"	1.61	2.40	0.59	4.88	5.98
1	2.13	G 1"	1.89	2.95	0.98	6.30	8.27

"Teqwave F" sensor, flange



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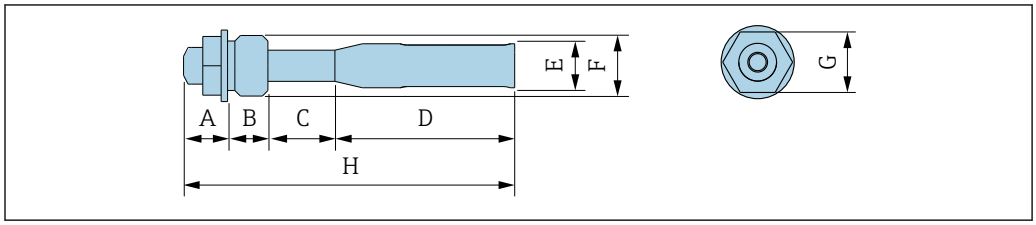
Dimensions in SI units

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
8	95	35	56	8	65	134	14
15	95	40	61	15	65	152	14
25	115	54	75	25	85	192	14

Dimensions in US units

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]
3/8	3.74	1.38	2.20	0.31	2.56	5.28	0.55
½	3.74	1.57	2.40	0.59	2.56	5.98	0.55
1	4.53	2.13	2.95	0.98	3.35	7.56	0.55

"Teqwave I" sensor, external thread



A0035719

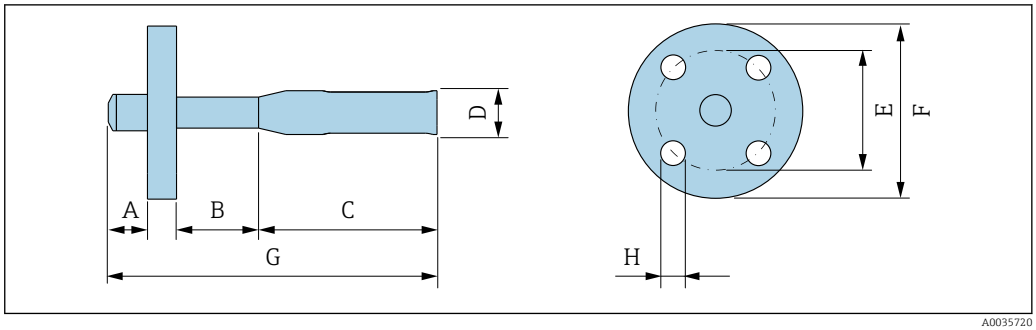
Dimensions in SI units

Installed length [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F	G [mm]	H [mm]
180	24	22	36.5	98.0	24	G 1"	32	180.5
500	24	22	362.5	98	24	G 1"	32	506.5

Dimensions in US units

Installed length [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F	G [in]	H [in]
7	0.94	0.87	1.44	3.86	0.94	G 1"	1.26	7.11
20	0.94	0.87	14.3	3.86	0.94	G 1"	1.26	19.94

"Teqwave I" sensor, flange



A0035720

Dimensions in SI units

Installed length [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]
180	21.5	48	98	24	85	115	180	14
500	21.5	371	98	24	85	115	506	14

Dimensions in US units

Installed length [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]
7	0.85	1.77	3.86	0.94	3.35	4.53	7.11	0.55
20	0.85	14.6	3.86	0.94	3.35	4.53	19.94	0.55

Weight

Transmitter

Weight of transmitter	0.34 kg (0.8 lb)

"Teqwave F" sensor

DN [mm (in)]	Flange [kg (lb)]	External thread [kg (lb)]	Internal thread [kg (lb)]
8 (⅜")	1.85 (4.08)	0.45 (0.99)	0.45 (0.99)
15 (½")	2.0 (4.4)	0.6 (1.3)	0.6 (1.3)
25 (1")	4.0 (8.8)	1.4 (3.1)	1.4 (3.1)

"Teqwave I" sensor

Installed length [mm (in)]	Flange [kg (lb)]	External thread [kg (lb)]
180 (7") Order code for "Insertion Length, Insertion Tube Material", option AS	1.52 (3.35)	0.42 (0.93)
500 (20") Order code for "Insertion Length, Insertion Tube Material", option BS	1.70 (3.75)	0.61 (1.35)

Materials

Transmitter housing

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 housing

Stainless steel, 1.4571 (V4A) / 316Ti

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), PN 16
- External thread → 17
- Internal thread → 17

"Teqwave I" sensor

- Flange, EN 1092-1 (DIN 2501), PN 16
- External thread → 18

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 device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

RCM-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 as follows:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center:www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information 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
- Ability to order directly in the Endress+Hauser Online Shop

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, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

About 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

Communication 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 → 🖹 22. 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 lmf format. Every transmitter can use a maximum of 25 concentration apps. Order number: DK9500

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Choice of measuring devices for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. ▪ Graphic illustration of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ As a downloadable DVD for local PC installation.
W@M	W@M Life Cycle Management Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle. W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement

Documentation

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

Standard documentation

Document type	Documentation code
Operating Instructions	BA01823D
Brief Operating Instructions	KA01371D

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