

Technical Information

Fermentation Monitor

QWX43

Continuous measurement of density, viscosity, temperature and concentration for liquids



Application

Multi-sensor technology with density, sound velocity, viscosity and temperature measurement for liquids. Compact device for continuous monitoring of processes such as fermentation in breweries.

- Maximum accuracy for density, ultrasonic, viscosity and temperature measurement
- Installation in tanks with IP66/67 housing protection
- Hygienic sensor made of 316L, constructed in accordance with 3A and EHEDG specifications
- Sensor lengths up to 2 m (6.6 ft)
- Ideal alternative to costly laboratory measurements in the brewery sector
- Brewing data sheet and brewing data can be downloaded via the Endress+Hauser Netilion cloud

Your benefits

- Minute-by-minute updating of key parameters in fermentation process – enables continuous monitoring
- No on-site presence required - accurate and repeatable measurements instead of hydrometer measurements and laboratory analysis
- Information can be accessed anytime and anywhere – via smartphone, tablet or PC
- Automatic notifications, for example when desired fermentation levels are reached – for more efficient cooling and green beer transfer, among other things
- Comparison of values from previous batches – enables data-based process improvements
- Automatic creation, storage and download of batches and values – reduces the effort involved in documentation and filing and replaces manual batch tracking

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Document information

Symbols

Safety symbols



This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.



This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.



This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.



This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols



Direct current



Alternating current



Direct and alternating current



Ground connection

Grounded clamp, which is grounded via a grounding system.



Protective earth (PE)

Ground terminals, which must be grounded prior to establishing any other connections. The ground terminals are located on the inside and outside of the device.

Symbols for certain types of Information



Permitted

Procedures, processes or actions that are permitted



Preferred

Procedures, processes or actions that are preferred



Forbidden

Procedures, processes or actions that are forbidden



Tip

Indicates additional information



Reference to documentation



Reference to page



Reference to graphic

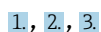


Visual inspection

Symbols in graphics

1, 2, 3, ...

Item numbers




Series of steps

A, B, C, ...


Views

A-A, B-B, C-C etc.

Sections

 **Hazardous area**

Indicates the hazardous area

 **Safe area (non-hazardous area)**

Indicates the non-hazardous area

Function and system design

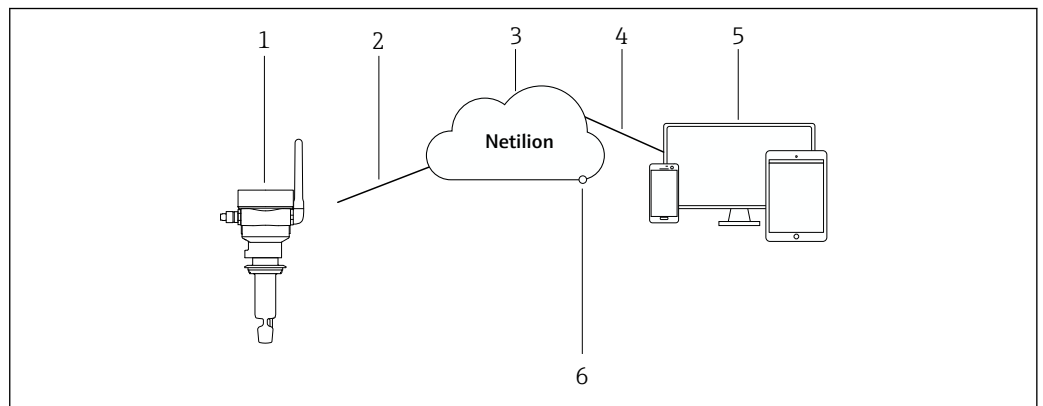
Measuring principle

The Fermentation Monitor QWX43 is a measuring device for monitoring temperature, density, viscosity and sound velocity. It is specifically intended for monitoring the concentration of sugar, alcohol and the brewing process during the fermentation of beer, for example.

The measurement method is based on a combination of the vibronic principle with an integrated temperature measurement and a sound velocity measurement using ultrasound. The compact device is installed directly in the tank and is powered by a separate supply voltage. The IP66/67-rated housing contains a WLAN connection which transmits the sensor measured values to the Endress+Hauser Netilion Cloud. The values can be called up and saved via Netilion Value.

System design


The Fermentation Monitor QWX43 can be put into operation with the following digital application:
 Netilion Value: <https://Netilion.endress.com/app/value>



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1 System design Fermentation Monitor QWX43

- 1 Fermentation Monitor QWX43
- 2 WLAN connection
- 3 Netilion Cloud
- 4 https Internet connection
- 5 Netilion Services: Netilion Service app based on Internet browser
- 6 Netilion Connect: Application Programming Interface (API)

 Detailed information on Netilion Cloud: <https://netilion.endress.com>

Input

Measured variable

Measured process variables

- Viscosity
- Density
- Temperature
- Sound velocity

Calculated process variables

Process variable	Unit	Notes
Density (20 °C)	g/cm ³	Density, standardized to 20 °C
Density (15.6 °C)	g/cm ³	Density, standardized to 15.6 °C
Dry mass, original wort	%mass	Percentage of total solids in the original wort after drying at 120 °C
Dry mass, extract	%mass	Percentage of total solids in the currently available extract after drying at 120 °C
Original wort	°Plato	Converted from the values of the total solids calculated
Extract	°Plato	Extract, converted from the values of the total solids calculated
Extract (Balling)	°Plato	Based on density measurement and conversion according to Balling formula
Residual extract (Balling)	°Plato	Predicted residual extract based on density measurement and conversion according to Balling formula
Alcohol	%mass	Alcohol content calculated from the combination of ultrasonic and density measurement
Alcohol (Vol)	%vol	Alcohol content calculated from the combination of ultrasonic and density measurement
Alcohol (Balling)	%vol	Alcohol content based on density measurement and conversion according to Balling formula
Real degree of fermentation	%	Based on the values of the total solids of original wort and extract
Degree of fermentation (Balling)	%	Based on the values from the Balling formula
Fermentable sugars	%mass	Percentage of short-chain sugars, e.g. maltose, determined from the original wort before fermentation
Non-fermentable sugars	%mass	Percentage of long-chain sugars, e.g. dextrine, determined from the original wort before fermentation
Concentration CO ₂	%mass	Calculated from the equilibrium pressure depending on the tank top pressure and medium temperature

Measuring range

Measured process variables

- Viscosity: 0 to 1 000 mPa·s
- Density: 0.3 to 2.0 g/cm³
- Temperature: -5 to +95 °C (+23 to +203 °F)
- Sound velocity: 800 to 2 200 m/s
- Measured values also visible in the gas phase

Calculated process variables

- Original wort / extract: up to 20 °Plato
- Alcohol: up to 15 %mass alcohol or. 15 %vol

Output

Output signal

A web server is integrated in the Fermentation Monitor. This web server is used to connect the Fermentation Monitor to the Endress+Hauser Netilion Cloud via the customer WLAN.

- WLAN: 2.4 GHz
- Transmission rate: 1/min

The measured data are saved for a maximum of one week.

Signal on alarm

- LED signaling directly on the device
- Diagnostic messages via Netilion Value

Protocol-specific data

The Fermentation Monitor QWX43 uses:

- TCP/IP Internet protocol and the secure transport layer TLS (v1.2)
- Application layer protocol: HTTPS

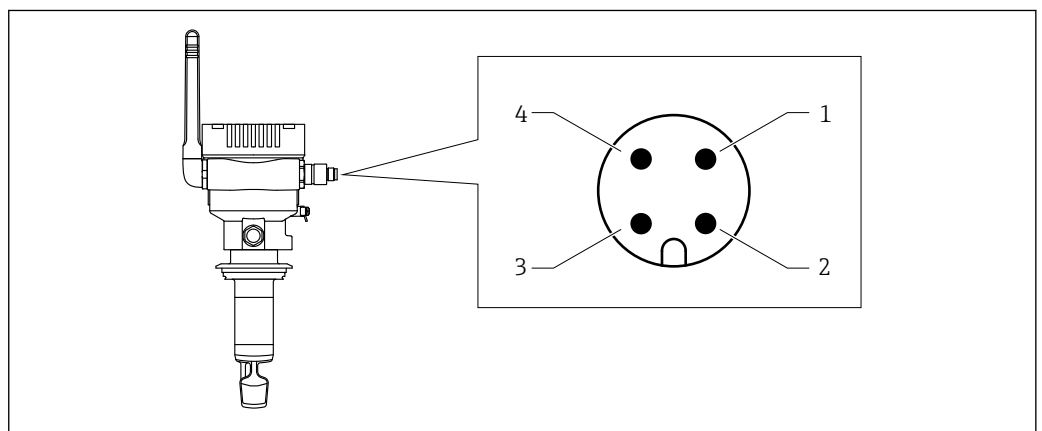
Power supply

Supply voltage Recommended supply voltage: 24 V DC
 Permitted supply voltage: 20 to 35 V DC
 The power unit must provide safe electrical separation and be tested to ensure it meets safety requirements (e.g., PELV, SELV, Class 2).
 A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.

Power consumption 2.4 W

Current consumption 100 mA at 24 V DC

Electrical connection The device is powered via the M12 plug.



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2 Electrical connection via M12 plug and PIN assignment

- 1 Minus (-), blue
- 2 N.C.
- 3 Plus (+), brown
- 4 Shield

i You can order a connecting cable with plug-in jack with the device → 22.

i Position the connecting cable so that it is pointing downwards to ensure that no moisture can penetrate the connection compartment.

If necessary, create a drip loop or use a weather protection cover.

Potential equalization Potential equalization is not mandatory.
 If necessary, connect the grounding of the cable / protective ground to PIN 4 of the M12 socket.

Overvoltage protection Overvoltage protection must be installed on the customer side in the following cases:

- The power supply line to the Fermentation Monitor is longer than 30 meters
- The power supply line to the Fermentation Monitor goes outside the building
- Additional devices are connected to the supply unit for the Fermentation Monitor in parallel

Install the overvoltage protection as close as possible to the Fermentation Monitor.
 You can use the Endress+Hauser HAW569 or HAW562 modules for overvoltage protection for example.

Performance characteristics

Response time	20 s
Reference operating conditions	<ul style="list-style-type: none"> ■ Distilled water, degased: +10 °C (+50 °F) ■ Density: 999.7 kg/m³
Measured value resolution	<ul style="list-style-type: none"> ■ Viscosity: 0.01 mPa·s ■ Density: 0.0001 g/cm³ ■ Temperature: 0.01 °C ■ Sound velocity: 0.05 m/s
Measured error	<p>As per DIN EN IEC 62828-1. The measured error satisfies ± 2 sigma.</p> <p>Under reference operating conditions</p> <ul style="list-style-type: none"> ■ Viscosity: 0.02 mPa·s ■ Density: 0.0001 g/cm³ ■ Temperature: 0.08 °C ■ Sound velocity: 0.23 m/s <p>Resulting measured error</p> <ul style="list-style-type: none"> ■ Extract: 0.02 %mass ■ Extract: 0.02 °Plato ■ Alcohol: 0.02 %vol
Repeatability	<p>As per DIN EN IEC 62828-1. The repeatability satisfies ± 2 sigma.</p> <p>Under reference operating conditions</p> <ul style="list-style-type: none"> ■ Viscosity: 0.01 mPa·s ■ Density: 0.00006 g/cm³ ■ Temperature: 0.05 °C ■ Sound velocity: 0.06 m/s <p>Resulting measured error</p> <ul style="list-style-type: none"> ■ Extract: 0.01 %mass ■ Extract: 0.01 °Plato ■ Alcohol: 0.01 %vol
Measurement uncertainty	<p>Under reference operating conditions</p> <ul style="list-style-type: none"> ■ Viscosity: 0.02 mPa·s ■ Density: 0.00008 g/cm³ ■ Temperature: 0.07 °C ■ Sound velocity: 0.14 m/s <p>Resulting measuring uncertainty</p> <ul style="list-style-type: none"> ■ Extract: 0.02 %mass ■ Extract: 0.02 °Plato ■ Alcohol: 0.02 %vol
Bases for calculation	<p>For process variables marked "Balling", the Balling formula applies, which is used to calculate the alcohol content in percent by weight (weight%).</p> <p>Balling formula: $P = ((A * 2.0665 + W_r) * 100\%) / (100 + A * 1.0665)$</p> <ul style="list-style-type: none"> ■ P: original wort ■ W_r: actual residual wort in weight% ■ A: alcohol content in weight%
Vibration effects	Mount the device in such a way that the device is not exposed to any vibrations. Vibrations affect the accuracy of the measured value.

Installation

Mounting location

Recommended mounting locations

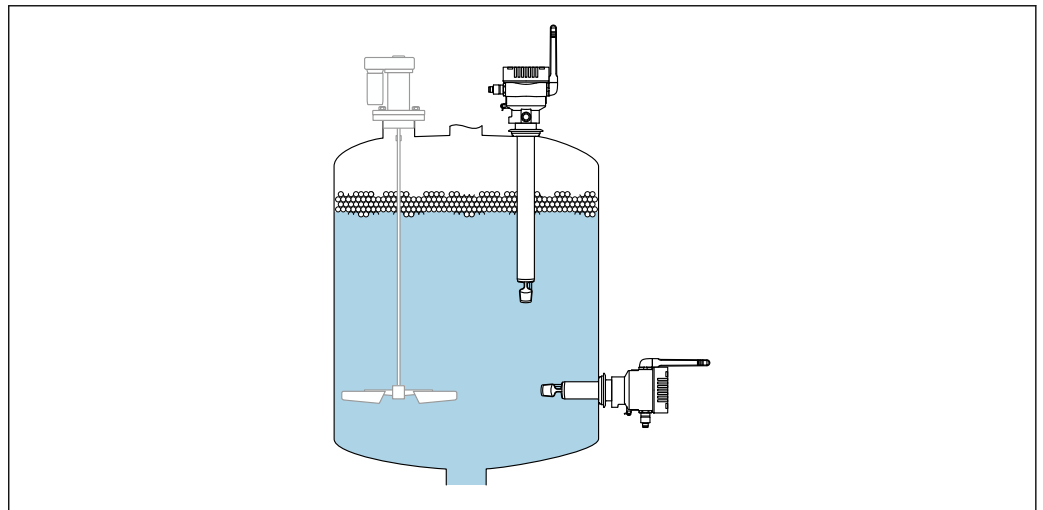
- Compact version: On the side of the tank (horizontal orientation)
- Devices with pipe extension: From above (vertical orientation)
- Minimum distance of sensor tip to tank wall: 10 cm (3.94 inch)
- The measuring elements must be fully immersed in the medium
- The measuring elements should be in the bottom third of the tank but above the cone for optimized measurement during fermentation
- Tanks with agitators: Align the tuning fork in the direction of flow parallel to the tank wall

Avoid the following mounting locations

Mounting locations where a buildup of yeast or gas is likely to occur such as at the bottom of the tank or near the filling limit for example

Pipes

- The device can be mounted in a pipe from a pipe diameter of 200 mm (7.87 in) to a flow velocity of ≤ 2 m/s
- We do not recommend that the device be installed in pipes as the pipe wall is likely to cause feedback effects on the measuring signal
- Please contact your Endress+Hauser representative for further information

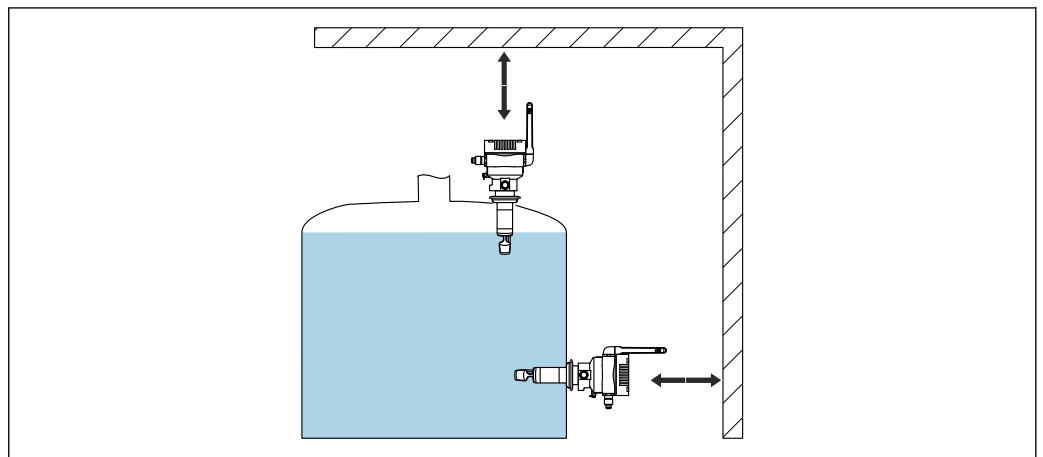


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3 Possible orientation

Installation instructions

Take clearance into consideration



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4 Take clearance into consideration

Allow sufficient space for mounting and electrical connection.

M12 plug

The M12 plug of the device must be pointing downwards.

i Position the connecting cable so that it is pointing downwards to ensure that no moisture can penetrate the connection compartment.

If necessary, create a drip loop or use a weather protection cover.

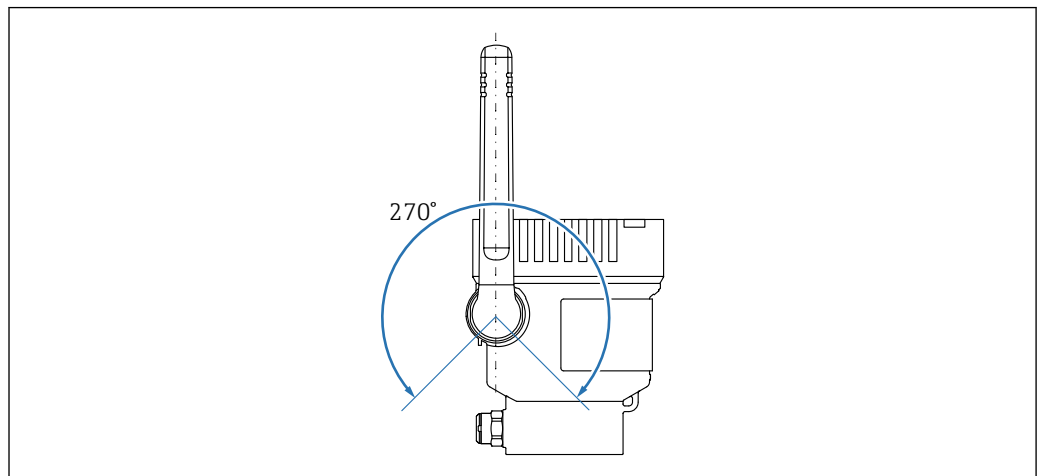
Positioning the antenna

To optimize the transmission quality, position the antenna in such a way that it is not emitting its signal directly on metal. You can rotate the antenna within an angle of 270°.

NOTICE**Angle of rotation of antenna too large!**

Damage to internal wiring.


- ▶ Rotate the antenna within a maximum angle of 270°.



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5 Possible angle of rotation of the antenna

Environment

Ambient temperature range	<p>–20 to +60 °C (–4 to +140 °F)</p> <p>The device is also suitable for outdoor operation.</p> <p>Outdoor operation in strong sunlight:</p> <ul style="list-style-type: none"> ■ Mount the device in the shade. ■ Avoid direct sunlight, particularly in warmer climactic regions. ■ Use a weather protection cover.
Storage temperature	<p> Store indoors if possible</p> <p>–20 to +60 °C (–4 to +140 °F)</p>
Operating height	<p>As per IEC 61010-1 Ed.3: 2 000 m (6 562 ft) above sea level</p>
Humidity	<p>Operate up to 100%. Do not open in a condensing atmosphere.</p>
Climate class	<p>As per IEC 60068-2-38 test Z/AD</p>
Degree of protection	<p>IP66/67, NEMA Type 4X</p> <p>IP66/67</p> <ul style="list-style-type: none"> ■ Complete protection against contact and complete protection against dust (dust-proof) ■ Protected against powerful water jets or protected against temporary immersion in water <p>NEMA Type 4X Indoor or outdoor installation, protects against windblown dust and rain, splashing water, water jets and corrosion</p>
Shock and vibration resistant	<p>Vibration resistance according to EN60068-2-64 and shock resistance according to DIN EN60068-2-27</p>
Mechanical stress	<p>Avoid mechanical deformation of, or shocks to the device's fork tines as this can have a negative influence on the measuring accuracy.</p>
Internal cleaning	<p>CIP cleaning</p> <p>Suitable for CIP cleaning with a constant temperature of 110 °C (230 °F) maximum</p>
Electromagnetic compatibility (EMC)	<p>As per IEC/EN 61326 series</p> <p>Overvoltage category II</p> <p>Maximum deviation under interference influence: < 1 % of measuring range</p> <p>Overvoltage protection must be installed at the customer site in the following cases:</p> <ul style="list-style-type: none"> ■ The power supply line to the Fermentation Monitor is longer than 30 meters. ■ The power supply line to the Fermentation Monitor leaves the building. ■ Other consumers are connected in parallel to the power supply unit for the Fermentation Monitor. <p>Install the overvoltage protection as close to the Fermentation Monitor as possible.</p> <p>You can install Endress+Hauser surge arresters HAW569 or HAW562, for example, as an overvoltage protection.</p>

Process

Process temperature range -10 to +110 °C (+14 to +230 °F)

Process pressure range 0 to 16 bar (0 to 232.1 psi) depending on the selected process connection and possible certificate-related restrictions (e.g. CRN)

Mechanical construction

Design, dimensions

Device height

The device height is calculated from the following components:

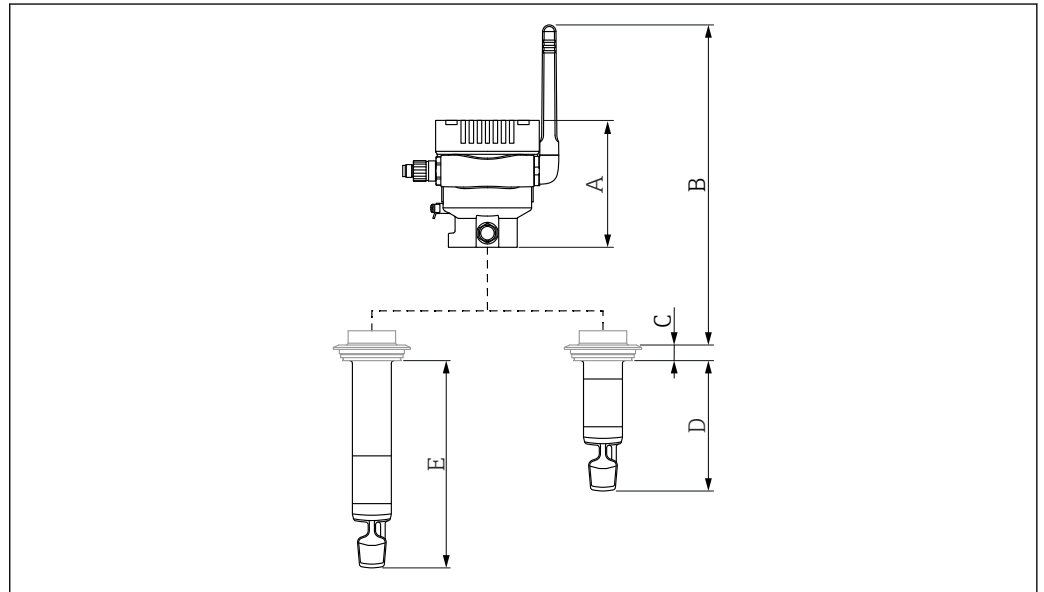
- Housing including cover
- Antenna
- Process connection
- Probe design: compact version or pipe extension



You can rotate the antenna.

The individual heights of the components can be found in the following sections:

- Determine the height of the device and add the individual heights.
- Take the installation space into account (the space required to install the device)



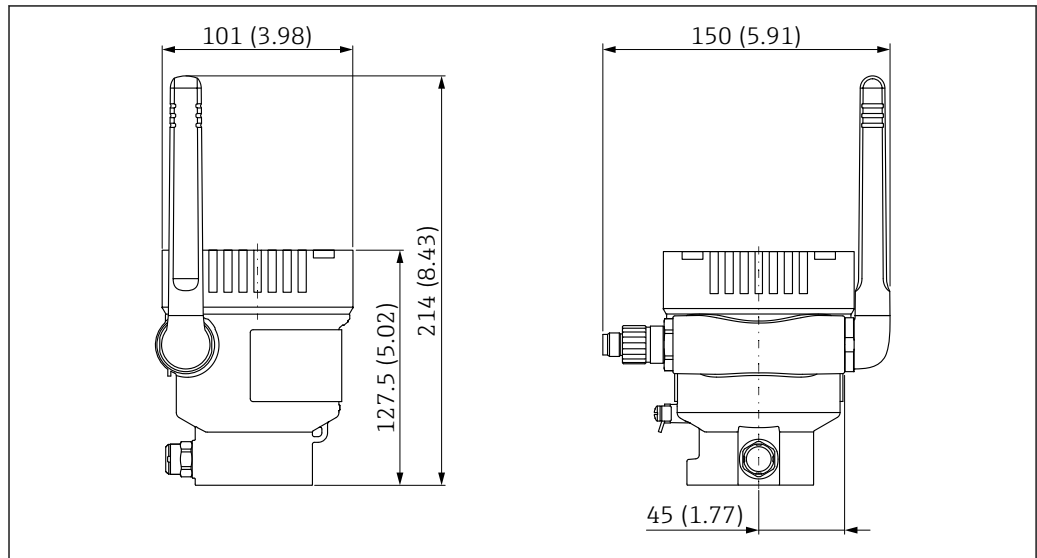
A0046639

6 Components for determining the height of the device

- A Housing including cover
- B Maximum height of housing with antenna
- C Height of process connection
- D Probe design: compact version
- E Probe design: pipe extension

Dimensions

Housing



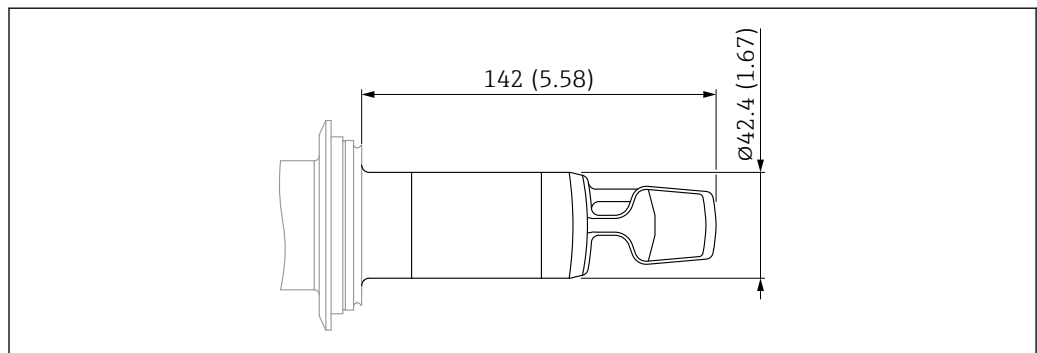
A0045366

7 Single-compartment housing (dimensions in mm (in)). Unit of measurement mm (in)

Probe design

Compact version

Material: 316L

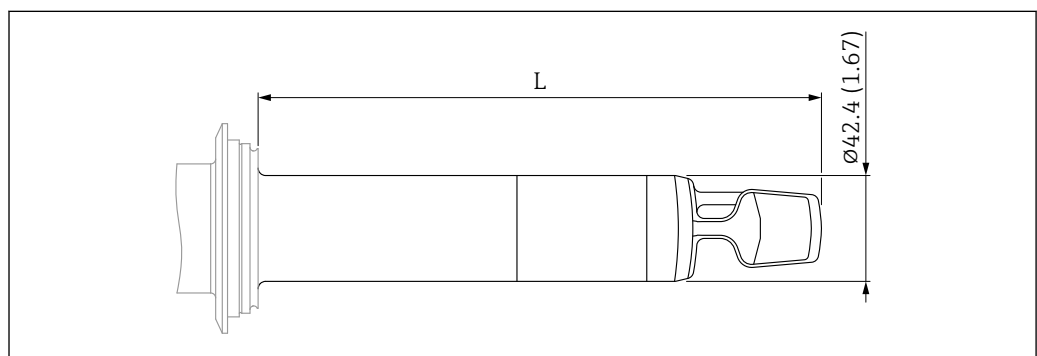


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8 Probe design: compact version (dimensions in mm (in))

Pipe extension

Material: 316L



A0046703

9 Probe design: pipe extension (dimensions in mm (in))

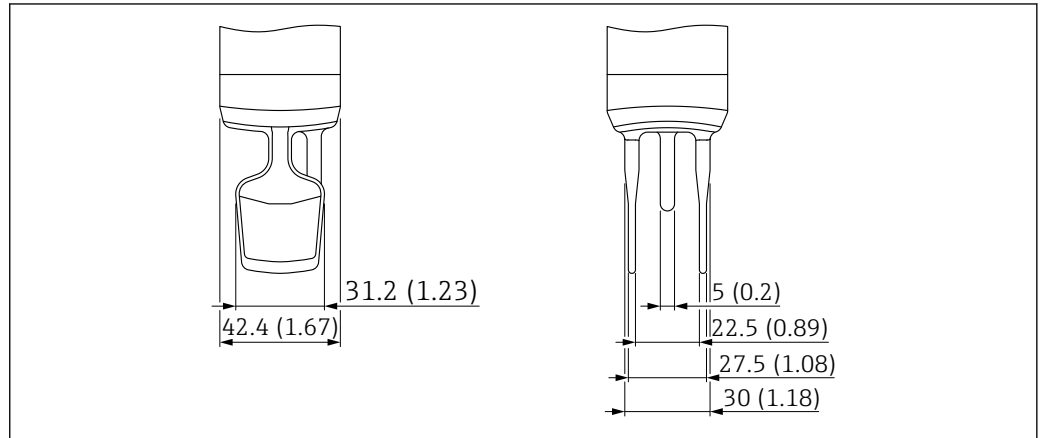
L Sensor length

Sensor length L

- 1 000 mm (39.4 in)
- 1 500 mm (59.1 in)
- 2 000 mm (78.7 in)

Measuring elements

Material: 316L



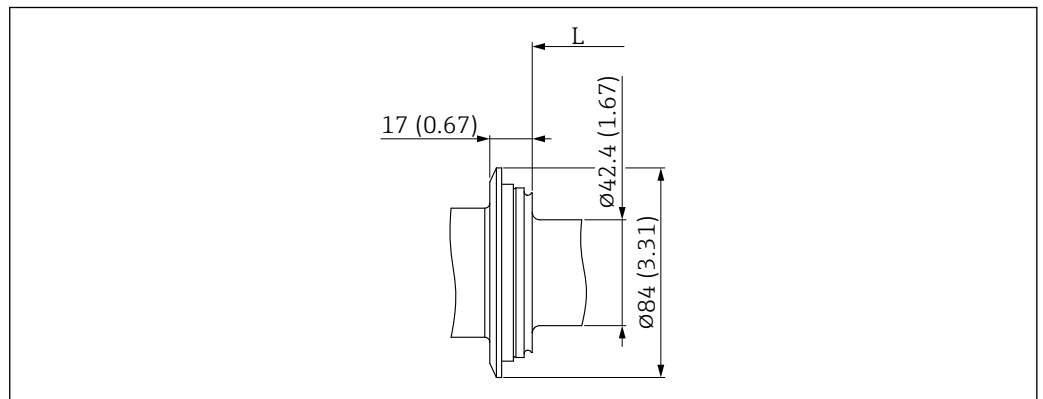
A0046704

10 Measuring elements (dimensions in mm (in)). Unit of measurement mm (in)

Process connections

Material: 316L

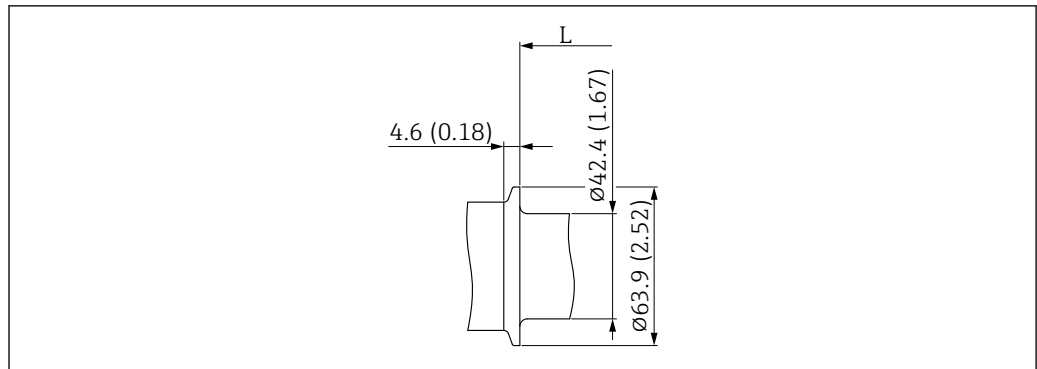
Varivent N DN50 PN40



A0046705

11 Varivent N DN50 PN40 (dimensions in mm (in))

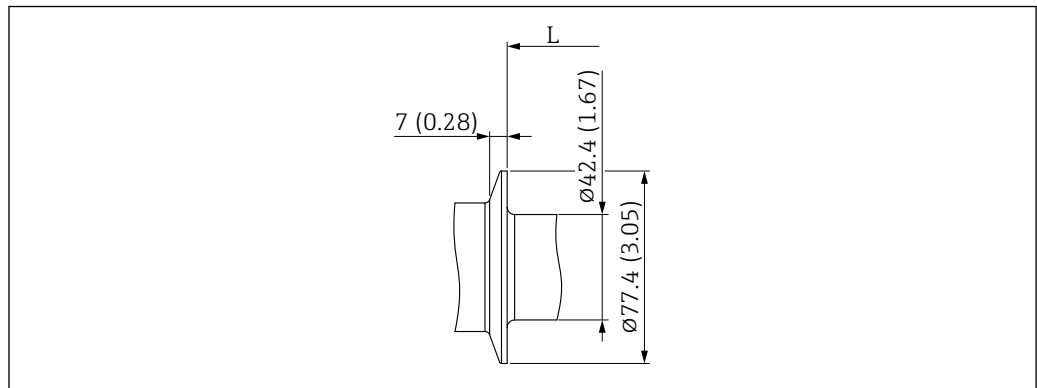
2" Tri-Clamp



A0046706

12 Tri-Clamp 2" (dimensions in mm (in))

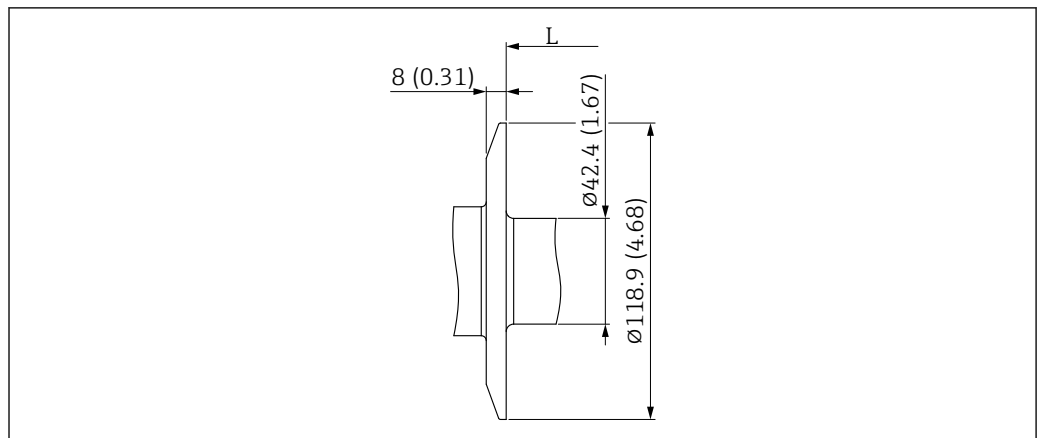
2.5" Tri-Clamp



A0046707

13 Tri-Clamp 2.5" (dimensions in mm (in))

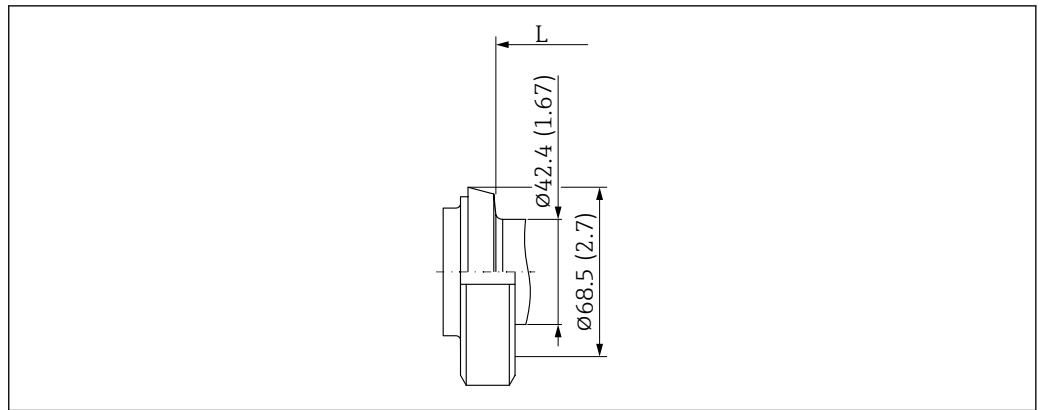
4" Tri-Clamp



A0046708

14 Tri-Clamp 4" (dimensions in mm (in))

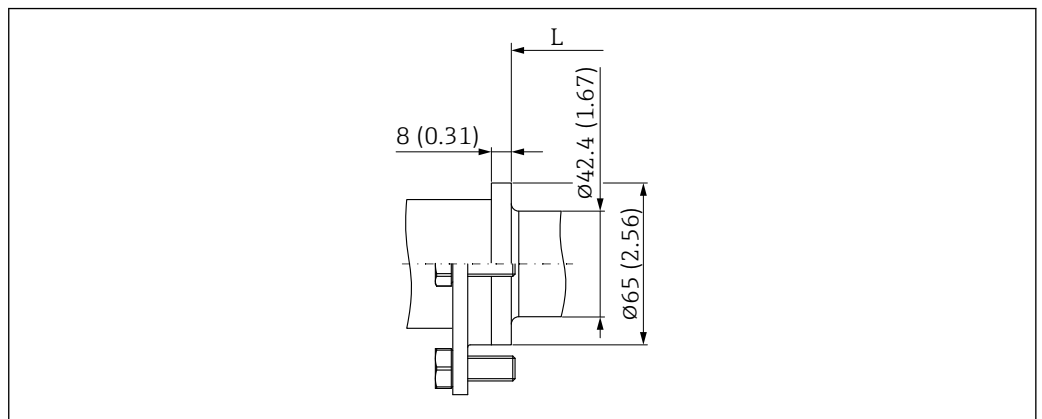
DIN11851 DN50 PN25



A0046709

15 DIN11851 DN50 PN25 (dimensions in mm (in))

DRD DN50 PN25

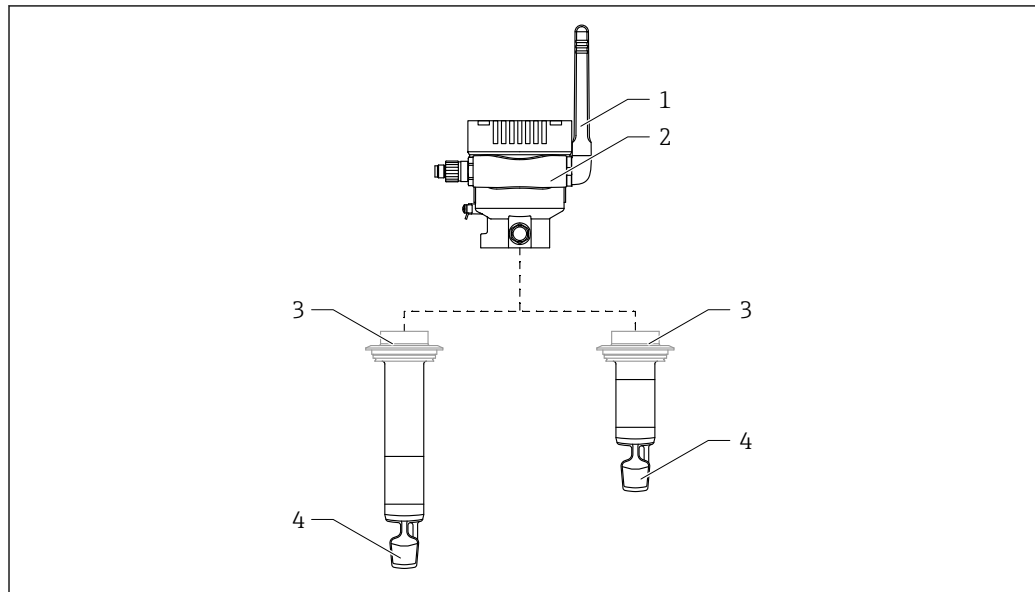


A0046710

16 DRD DN50 PN25 (dimensions in mm (in))

Weight

- Compact version with Varivent N process connection: approx. 2.5 kg (5.5 lb)
- Pipe extension 1000 mm, additional weight: approx. 2 kg (4.4 lb)

Materials**17 Materials**

- 1 Omnidirectional dipole antenna: polyester
- 2 Single-compartment housing with cover: polyester powder coating on aluminum as per EN 1706 AC-43400, adhesive label made of plastic
- 3 Process connection: 1.4404/316L
- 4 Measuring elements: 1.4404/316L

Also for versions with pipe extension: filler metal 1.4430

Surface roughness

Ra: < 0.76 µm of surfaces in contact with process

Human interface

The device has no display or operating keys. It has LEDs that provide feedback signals.

Once the device is supplied with voltage and logged onto the Endress+Hauser Netilion Cloud via WLAN, the measured data are transmitted immediately to the cloud. The device is connected to the Endress+Hauser Netilion Cloud via the customer's WLAN. You configure and operate the device using Netilion Value.



- Detailed information on Netilion Cloud: <https://netilion.endress.com>
- Detailed information on Netilion Value: <https://Netilion.endress.com/app/value>
- Netilion Help & Learning (Troubleshooting, Tips & Tutorials, Getting Started: <https://help.netilion.endress.com>)

Certificates and approvals

Current certificates and approvals for the product are available via the Product Configurator at www.endress.com.

1. Select the product using the filters and search field.
2. Open the product page.

The **Configuration** button opens the Product Configurator.

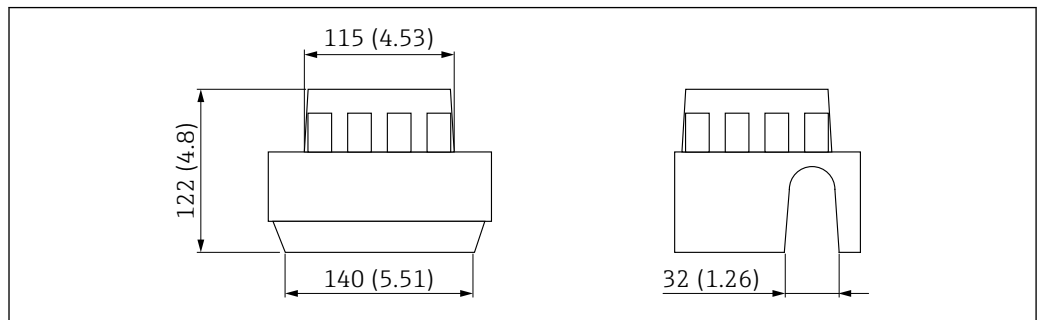
CE mark The device meets the legal requirements of the relevant EU/EC directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

Sanitary compatibility All materials in contact with foodstuffs comply with framework regulation (EC) 1935/2004. The device is available with hygienic process connections (overview: see order code).
The Fermentation Monitor QWX43 meets the hygiene requirements for food processing machinery as per EN 1672-2:2005+A1:2009. The product is designed in accordance with EHEDG hygienic design principles.

Accessories

Weather protection cover for single-compartment housing

- Material: plastic
- Order number: 71438291



18 Weather protection cover for single-compartment housing (dimensions in mm (in)). Unit of measurement mm (in)

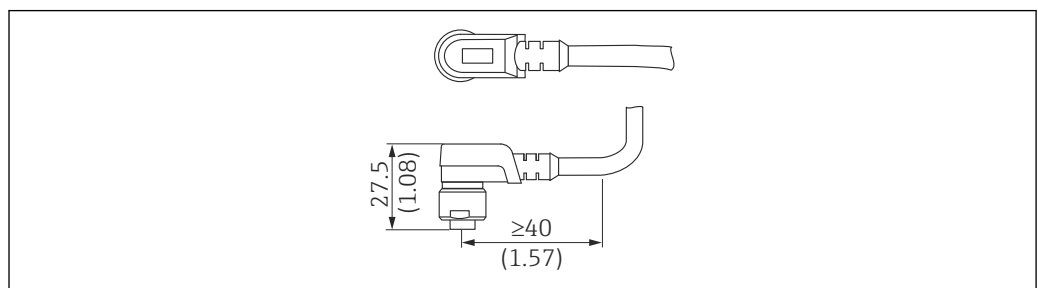
Plug-in jack with connecting cable

i You can order the plug-in jack with the device.

Ordering information: → 23

Plug-in jack M12 IP67

- Elbowed 90°
- 5 m (16 ft) PVC cable (gray)
- Slotted nut Cu Sn/Ni
- Body: PUR (black)
- Operating temperature range: -25 to +70 °C (-13 to +158 °F)
- Order number: 52010285



19 Plug-in jack M12 IP67. Unit of measurement mm (in)

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configuration at www.endress.com :

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.



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

Scope of delivery

Fermentation Monitor QWX43

Documentation

The following document types are available in the Downloads section of the Endress+Hauser website (www.endress.com/downloads):



- 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 the nameplate
 - *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the matrix code on the nameplate

Standard documentation QWX43

Operating Instructions
BA02162F

Special Documentation
SD02875F: Commissioning

Registered trademarks

TRI-CLAMP®

Registered trademark of Ladish & Co., Inc., Kenosha, USA

VARIVENT® N

Registered trademark of GEA Group AG, Düsseldorf, Germany



www.addresses.endress.com
