






Conductivity sensor for hygienic applications

- Perfect for demanding applications in the hygienic industry (CIP and SIP compatible)
- Wide measuring range thanks to various options available
- Support of the most important process connections ensures specific customer requests can be implemented
- Perfectly suited to the multi-purpose transmitter/controller Type 8619

Product variants described in the data sheet may differ from the product presentation and description.

Can be combined with

- | | |
|---|---|
|  | Type 8619 ▶
multiCELL - Multi-channel and multi-function transmitter/controller |
|  | Type 8200 ▶
Armatures for conductivity probes (with PG 13.5 connection) |
|  | Type BBS-25 ▶
Clamp ferrules, clamps and gaskets - acc. DIN 32676 |

Type description

The 8221 hygienic conductivity probes are used to determine electrical conductivity in a wide range of pure or concentrated liquids. Due to their hygienic and robust design, these conductivity probes are suitable for use in various application sectors, including the food & beverage, pharmaceutical, biotechnology and chemical industry.

Two technologies of conductivity probes are available:

- Probes based on the 2-electrode principle are suited for measurements in liquids, especially (ultra) pure water. Contaminations affect the measurements.
- Probes based on the 4-electrode principle exclude polarisation phenomena and are not sensitive to contamination. The clever design guarantees an excellent linearity over the entire measurement range.

An integrated temperature sensor (Pt1000) is a standard feature of all versions.

The probe has to be connected to the multiCELL transmitter/controller Type 8619.

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1. General technical data

Note:

The technical data depends on the probe version. The probes are based on the 2 or 4 electrode principle.

The common technical data are described in this chapter and detailed information on the specifics can be found in chapter „2. Product versions“ on page 5.

1.1. 4-electrode conductivity probe

Product properties	
Material	
Depending on the probe version. Detailed information can be found in chapter „2. Product versions“ on page 5.	
Seal	EPDM (conform to FDA - 21CFR177.2600)
Temperature sensor	Pt1000
Surface quality	Ra < 0.4 µm (15 µin.), electro-polished (wetted metal surfaces)
Measuring element	4-electrode
Performance data	
Linearity ¹⁾ (relative)	± 0.5...5 %
Media data	
Fluid temperature	Depending on the probe version. Detailed information can be found in chapter „2. Product versions“ on page 5.
Fluid pressure	Depending on the probe version. Detailed information can be found in chapters „2. Product versions“ on page 5 and „5.2. Pressure temperature diagram“ on page 13.
Process/Port connection & communication	
Process connection	Depending on the probe version. Detailed information can be found in chapter „2. Product versions“ on page 5.
Electrical connection	Depending on the probe version. Detailed information can be found in chapter „2. Product versions“ on page 5.
Approvals and Certificates	
Standards	
Protection class according to IEC/ EN 60529	IP67, with connected device, inserted and screwed cable plug
Directives	
CE directives	The applied standards, which verify conformity with the EU Directives, can be found on the EU Type Examination Certificate and/or the EU Declaration of conformity (if applicable)
Pressure equipment directives	Complying with Article 4, Paragraph 1 of 2014/68/EU directive Detailed information on the pressure equipment directive can be found in chapter „3.2. Pressure Equipment Directive“ on page 8.
Certificate	<ul style="list-style-type: none"> FDA declaration of conformity (only for version with PEEK armature and EPDM seal) USP class VI declaration Inspection certificate 3.1 2-point calibration certificate (on request) Depending on the probe version. Detailed information can be found in chapter „2. Product versions“ on page 5.
Environment and installation	
Ambient temperature	Depending on the probe version. Detailed information can be found in chapter „2. Product versions“ on page 5

1.) An uncertainty of ± 5 % arises when using only one single cell constant over the full range. ± 0.5 % measurement deviations can be achieved when calibration is performed in a conductivity range close to that of the used solution.

1.2. 2-electrode conductivity probe

Product properties

Material

Electrode	Stainless steel 316L/1.4404
Armature	PEEK (conform to FDA - 21CFR 177.2415) and Stainless steel 316L/1.4404
Seal	EPDM (conform to FDA - 21CFR 177.2600)
Temperature sensor	Pt1000
Measuring element	2-electrode
Surface quality	<ul style="list-style-type: none"> Clamp process connection version: Ra < 0.4 µm (15 µin.), electro-polished (wetted metal surfaces) Other process connection versions: Ra < 1.6 µm (60 µin.), (wetted metal surfaces)

Performance data

Linearity ^{1.)} (relative)	± 0.5...5 %
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Media data

Fluid temperature	-20...+ 150 °C (-4...+302 °F)
Fluid pressure	PN 16 for -20...+ 120 °C (-4...+248 °F) and PN 10 at 150 °C (302 °F) Detailed information on the fluid pressure can be found in chapter "5.2. Pressure temperature diagram" on page 13.

Process/Port connection & communication

Process connection	<ul style="list-style-type: none"> 1½" clamp connection G 1" connection G ¾" connection NPT ¾" connection
Electrical connection	5 pin M12 male fixed connector

Approvals and Certificates

Standards

Protection class according to IEC/EN 60529	IP67, with connected device, inserted and screwed M12 female cable plug
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Directives

CE directives	The applied standards, which verify conformity with the EU Directives, can be found on the EU Type Examination Certificate and/or the EU Declaration of conformity (if applicable)
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Pressure equipment directives

Complying with Article 4, Paragraph 1 of 2014/68/EU directive
Detailed information on the pressure equipment directive can be found in chapter "3.2. Pressure Equipment Directive" on page 8.

Certificate

- FDA declaration of conformity (only for version with stainless steel and PEEK armature and EPDM seal)
- USP class VI declaration
- Inspection certificate 3.1
- 2-point calibration certificate (on request)

Environment and installation

Ambient temperature	<ul style="list-style-type: none"> Operation: -20...+ 150 °C Storage: -10...+ 60 °C
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1.) An uncertainty of ± 5 % arises when using only one single cell constant over the full range. 0.5 % measurement deviations can be achieved when calibration is performed in a conductivity range close to that of the used solution.

2. Product versions

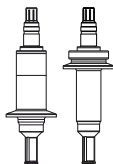
2.1. 4-electrode conductivity probe

Probes based on the 4-electrode principle are available in two electrode architectures.

Four active electrodes positioned laterally on the periphery of the armature



Product details	
Materials	Electrode in stainless steel 1.4435/316L, armature in PEEK (conform to FDA - 21CFR 177.2415) and stainless steel 1.4435/316L
Measuring range	0.1 μ S/cm...500 mS/cm
Cell constant ¹⁾	0.147 cm ⁻¹
Fluid temperature	-20...+135 °C (-4...+275 °F)
Fluid pressure	Max. 6 bar (87.06 PSI)
Process connection	<ul style="list-style-type: none"> In short or long immersion depths: 1½" clamp connection G 1¼" process connection (on request)
Electrical connection	VarioPin (VP 6.0) connector
Certificate	ECR1935/2004 declaration
Ambient temperature	Storage: +4...+40 °C (+39.2...+104 °F)



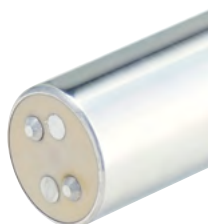
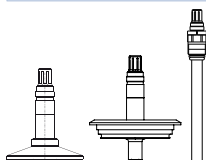
1.) Nominal cell constant. Every product is measured according to a Bürkert standard procedure. The individual cell constant is reported on the calibration report, delivered with the product and on the label of the product. The cell constant can be influenced by the assembly situation.

Four active electrodes positioned at the base of the armature.

Two of the electrodes have a flat electrode architecture (measurement electrodes), while the other two electrodes are conical (excitation electrodes).



Product details	
Materials	Electrode in stainless steel 1.4435/316L ¹⁾ and armature in PEEK (conform to FDA - 21CFR 177.2415) and stainless steel 1.4435/316L
Measuring range	1 μ S/cm...300 mS/cm
Cell constant ²⁾	0.36 cm ⁻¹
Fluid temperature	-20...+150 °C (-4...+302 °F)
Fluid pressure	Max. 20 bar (290.2 PSI) for -20...+135 °C (-4...+275 °F) and max. 10 bar (145.1 PSI) at 150 °C (302 °F)
Process connection	<ul style="list-style-type: none"> • 2" clamp connection • 2" (DN 50/40) connection adapted for GEA Tukenhagen VARINLINE • PG 13.5 connection
Electrical connection	VarioPin (VP 6.0) connector
Certificate	ECR1935/2004 declaration
Ambient temperature	Storage: +4...+40 °C (+39.2...+104 °F)



Product details	
Materials	Electrode in stainless steel 316L/1.4404 and armature in PEEK (conform to FDA - 21CFR 177.2415) and stainless steel 316L/1.4404
Measuring range	1 μ S/cm...20 mS/cm
Response time (t ₉₀)	120 s
Cell constant ²⁾	0.33 cm ⁻¹
Fluid temperature	-20...+150 °C (-4...+302 °F)
Fluid pressure	PN 16 for -20...+120 °C (-4...+248 °F) and PN 10 at 150 °C (302 °F)
Process connection	1½" clamp connection
Electrical connections	8 pin M12 male fixed connector
Ambient temperature	<ul style="list-style-type: none"> • Operation: -20...+150 °C • Storage: -10...+60 °C



1.) Other materials on request

2.) Nominal cell constant. Every product is measured according to a Bürkert standard procedure. The individual cell constant is reported on the calibration report, delivered with the product and on the label of the product. The cell constant can be influenced by the assembly situation.

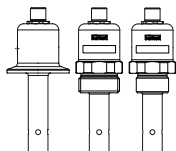
2.2. 2-electrode conductivity probe

Probes based on the 2-electrode principle are available in two electrode architectures:



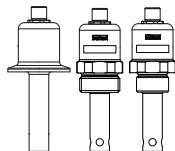
The hole is located 19 mm from the base of the armature. The electrode spacing is short and the inner electrode has a large cross-section area.

Product details	
Measuring range	0.05...20 $\mu\text{S}/\text{cm}$
Response time (t90)	60 s
Cell constant ^{1.)}	0.01 cm^{-1}



The hole is located 11 mm from the base of the armature. The electrode spacing is large and the inner electrode has a small cross-section area.



Product details	
Measuring range	1...200 $\mu\text{S}/\text{cm}$
Response time (t90)	100 s
Cell constant ^{1.)}	0.1 cm^{-1}



1.) Nominal cell constant. Every product is measured according to a Bürkert standard procedure. The individual cell constant is reported on the calibration report, delivered with the product and on the label of the product. The cell constant can be influenced by the assembly situation.

3. Approvals

3.1. Certificates

Certificates	Description
	FDA The versions with the housing made of PEEK materials and the seal made of EPDM materials comply in their composition with the Code of Federal Regulations published by the FDA (Food and Drug Administration, USA).
	EC-Regulation 1935/2004/EC The versions with the housing made of PEEK materials and the seal made of EPDM materials are suitable in their composition for use with foodstuffs and beverages (according to EC Regulation 1935/2004/EC).
	USP Class VI The versions with the housing made of PEEK materials and the seal made of EPDM materials are approved according to USP Class VI.

3.2. Pressure Equipment Directive

The device conforms to Article 4, Paragraph 1 of the Pressure Equipment Directive 2014/68/EU under the following conditions:

Device used on a pipe

Note:

- The data in the table is independent of the chemical compatibility of the material and the fluid.
- PS = maximum admissible pressure, DN = nominal diameter of the pipe

Type of fluid	Conditions
Fluid group 1, Article 4, Paragraph 1.c.i	DN ≤ 25
Fluid group 2, Article 4, Paragraph 1.c.i	DN ≤ 32 or PS*DN ≤ 1000
Fluid group 1, Article 4, Paragraph 1.c.ii	DN ≤ 25 or PS*DN ≤ 2000
Fluid group 2, Article 4, Paragraph 1.c.ii	DN ≤ 200 or PS ≤ 10 or PS*DN ≤ 5000

Device used on a vessel

Note:

- The data in the table is independent of the chemical compatibility of the material and the fluid.
- PS = maximum admissible pressure, V = vessel volume

Type of fluid	Conditions
Fluid group 1, Article 4, Paragraph 1.a.i	V > 1 L and PS*V ≤ 25 bar.L or PS ≤ 200 bar
Fluid group 2, Article 4, Paragraph 1.a.i	V > 1 L and PS*V ≤ 50 bar.L or PS ≤ 1000 bar
Fluid group 1, Article 4, Paragraph 1.a.ii	V > 1 L and PS*V ≤ 200 bar.L or PS ≤ 500 bar
Fluid group 2, Article 4, Paragraph 1.a.ii	PS > 10 bar and PS*V ≤ 10000 bar.L or PS ≤ 1000 bar

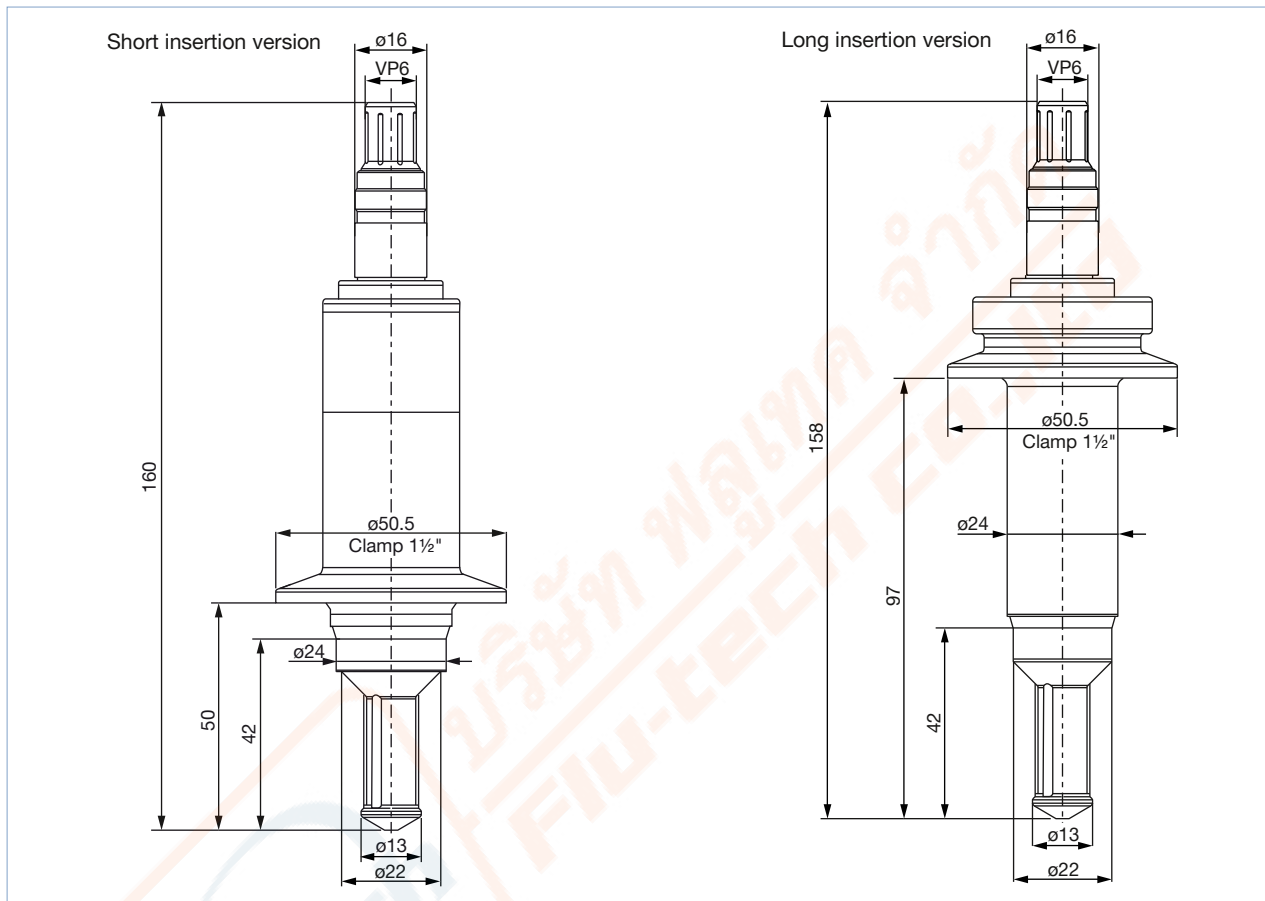
4. Dimensions

4.1. 4-electrode conductivity probe with VarioPin electrical connection

With 1½" clamp process connection

Note:

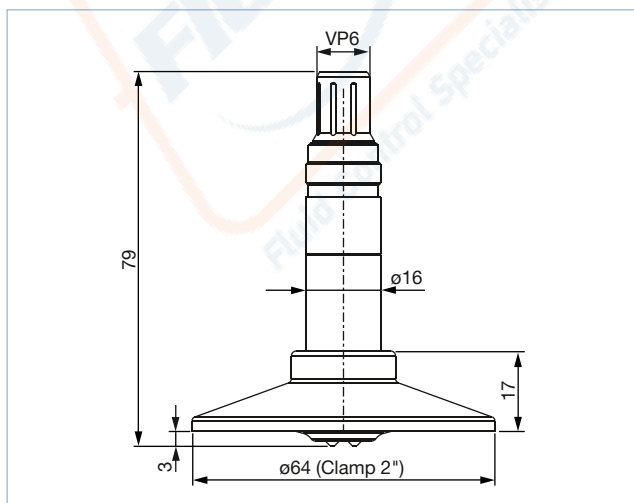
Specifications in mm



With 2" clamp process connection

Note:

Specifications in mm

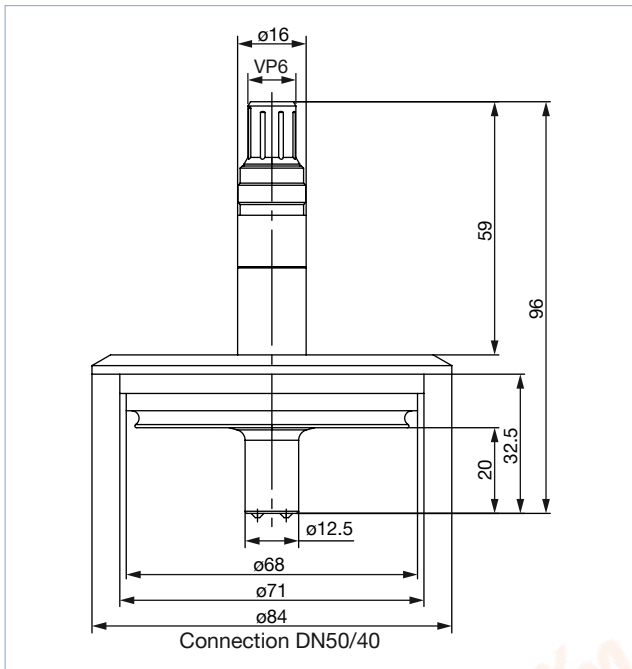


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With 2" (DN 50/40) process connection adapted for GEA Tuchenhagen VARINLINE process connections

Note:

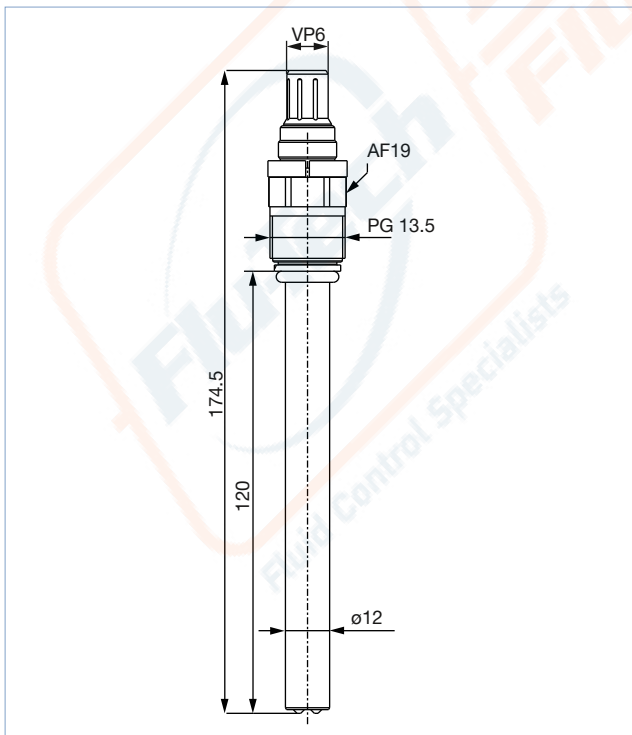
Specifications in mm



With PG 13.5 process connection

Note:

Specifications in mm



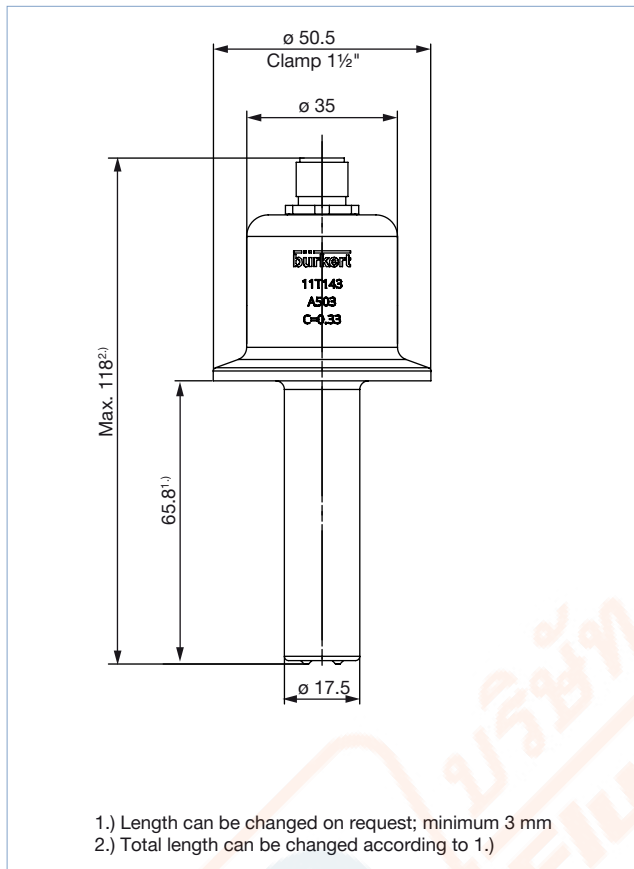
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4.2. 4-electrode conductivity probe with 8 pin M12 male connector

With 1½" clamp process connection

Note:

Specifications in mm

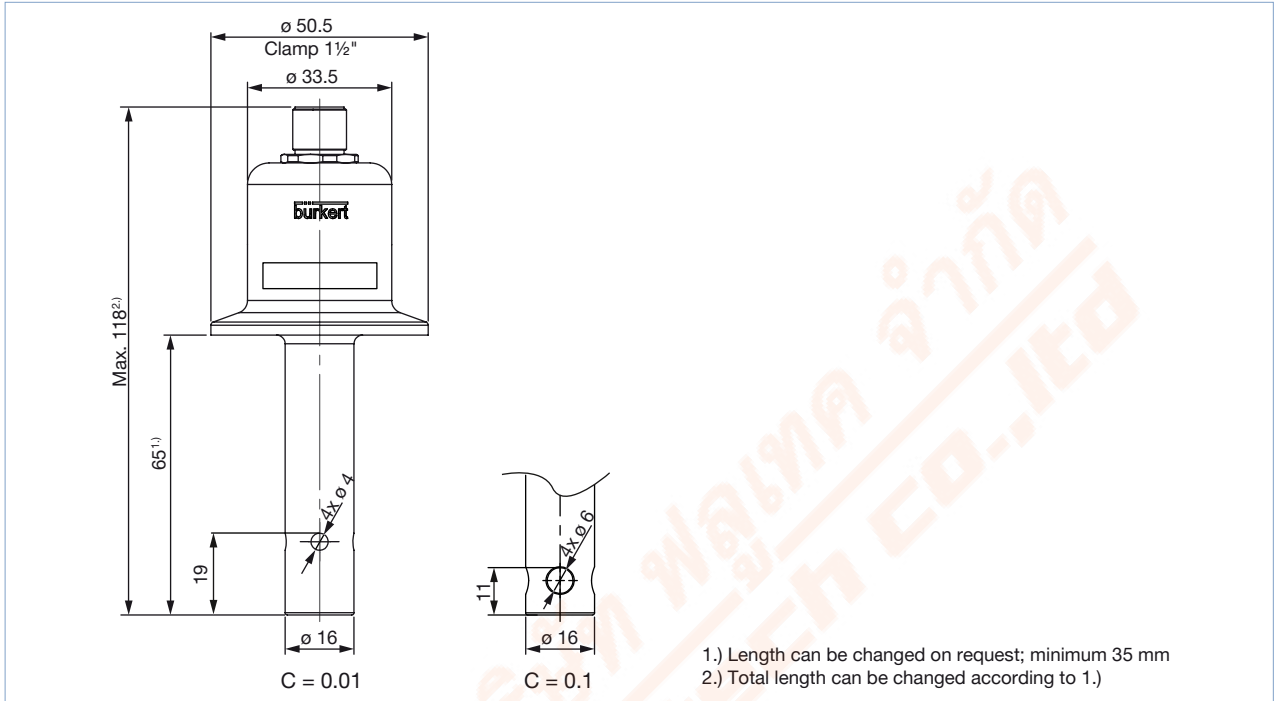


4.3. 2-electrode conductivity probe with 5 pin M12 male connector

With 1½" clamp process connection

Note:

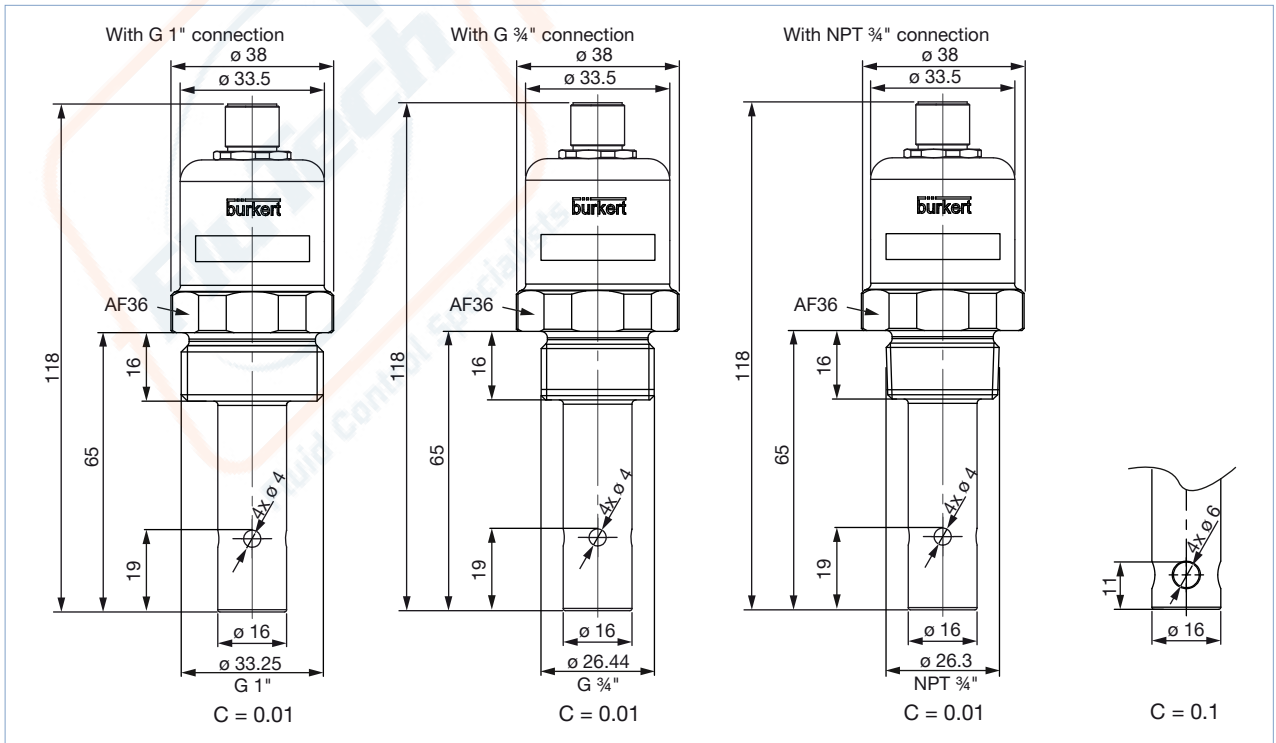
Specifications in mm



With screw-on process connection

Note:

Specifications in mm

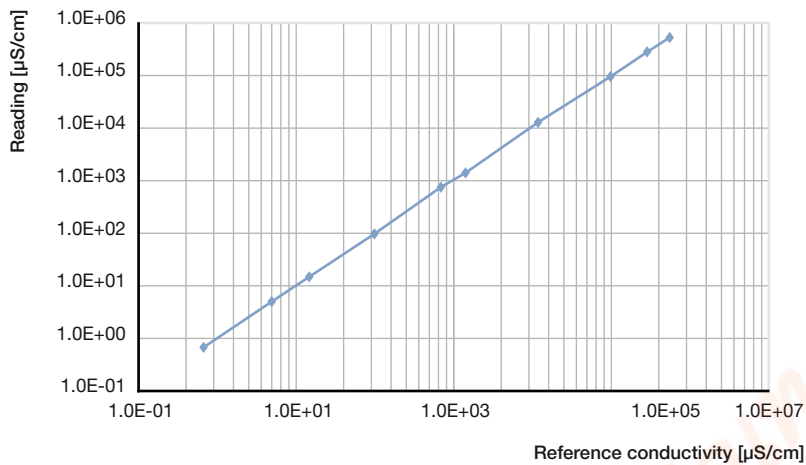


5. Performance specifications

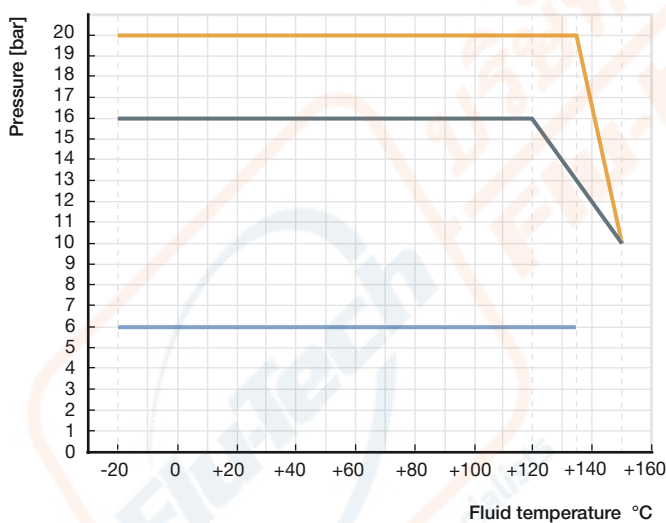
5.1. Linearity diagram

Note:

The following table applies exclusively to the conductivity probes which are constructed according to the 4-electrode principle and with VarioPin electrical connection.



5.2. Pressure temperature diagram



Application range for conductivity probe

- 2 or 4 electrodes, 1 1/2" clamp connection, G 1", G 3/4" or NPT 3/4" connection version with M12 connector
- 4 electrodes, G 1 1/4" and 1 1/2" clamp connection (short/long)
- 4 electrodes, 2" clamp connection, 2" (DN50/40) adapted for GEA Tuchenhausen VARINLINE devices and PG 13.5 connection

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6. Product installation

6.1. Installation notes

4-electrode conductivity probe with 1½" clamp or G 1¼" process connection

Note:

- The process connection must be sufficiently clean.
- The conductivity probe should be installed following the instructions mentioned below.

Installation example	Description
<p>A: ø 60 mm min</p>	<p>The cell constant and the linearity of the probe can vary with the fitting situation.</p> <ul style="list-style-type: none"> • A symmetrical setup is recommended. • Leave a minimum space of 60 mm minimum diameter. • Partitions made of non-conductive material should preferably be used.
	<p>A symmetrical setup is recommended in order to ensure a high linearity.</p> <ul style="list-style-type: none"> • To achieve high precision the cell constant should be calibrated in the final setup. • Make sure that all the 4 electrodes are completely and continuously immersed in the measuring sample.

4-electrode conductivity probe with PG 13.5 process connection

Note:

- To install the conductivity probe in a T-fitting or in a pipe, a probe holder Type 8200 has to be used.
- Around the tip of the electrode there should be a space of 10 mm.

See **data sheet Type 8200** ▶ for more information.

Installation example	Description
	<p>The conductivity probe PG 13.5 is installed in a hygienic direct welded probe holder Type 8200 without adapter.</p>
	<p>The conductivity probe PG 13.5 is installed in a hygienic direct welded probe holder Type 8200 with adapter.</p>

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2- or 4-electrode conductivity probe with clamp, G or NPT process connection and with M12 connector

Note:

- Mount the probe in a stainless steel 1½” T fitting or threaded port as shown below, taking into account the entire length of the thread and the depth of the insertion of the probe.
- The drawing shows the assembly with a process clamp connection, but this also applies to a G or NPT process connection

Installation examples	Description
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Probe with C = 0.01</p> </div> <div style="text-align: center;"> <p>Probe with C = 0.1</p> </div> </div>	<ul style="list-style-type: none"> • Align the probe hole as closely as possible with the centre of T fitting outlet. • Make sure that the line is thoroughly flushed of its air during the filling

7. Product operation

7.1. Measuring principle

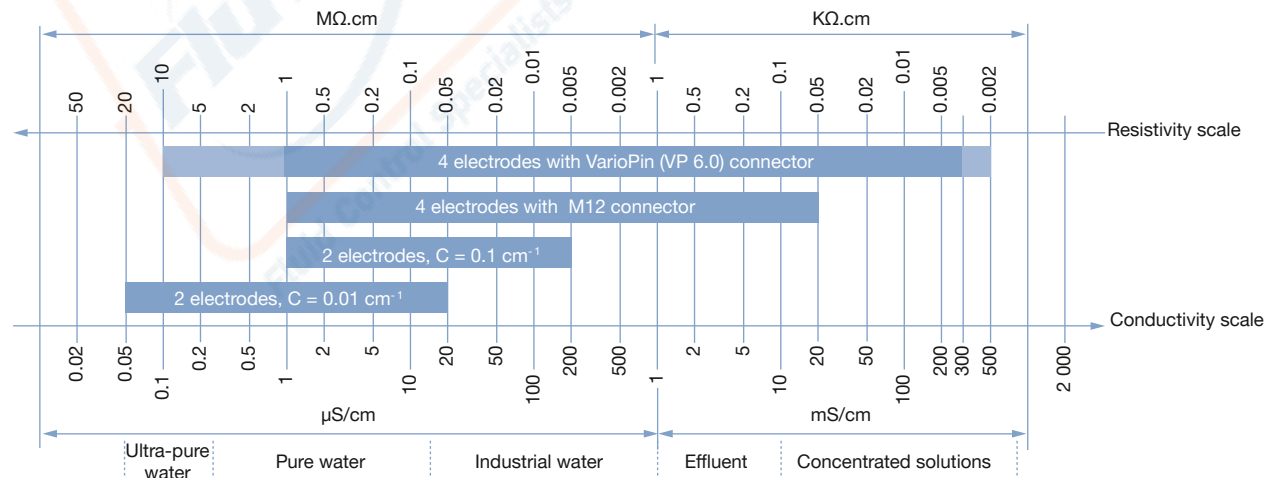
Conductivity is defined by the property of a solution to conduct electrical current. The charge carriers are ions (e.g. dissolved salts or acids).

In the simplest case the measurement cell consists of two metal electrodes which are set at a fixed distance apart and with a known specified surface. An AC voltage supplied from the connected transmitter/controller Type 8619 is applied to the electrodes. The measured current is a direct function of the quantity of ions contained in the solution, and with help of Ohm's law the conductivity is calculated.

The 4-electrode probe consists of two current and two voltage electrodes. Between the two current electrodes, an AC electric current flows, which is regulated by the transmitter/controller Type 8619. With the two voltage electrodes a resulting AC voltage drop is measured across the sample. The voltage drop depends on the conductivity of the sample. As a result of this measurement principle, 4 electrode sensors have a much broader linear measurement range, are insensitive to contamination and polarisation effects by adjusting the frequency of the AC current.

There are countless types of conductivity probes whose measurement values vary by a great margin - depending on the electrode assembly. To compensate for the geometry of the conductivity cell a cell constant is used: Conductivity [S/cm] = Measurement [S] x Cell constant [1/cm].

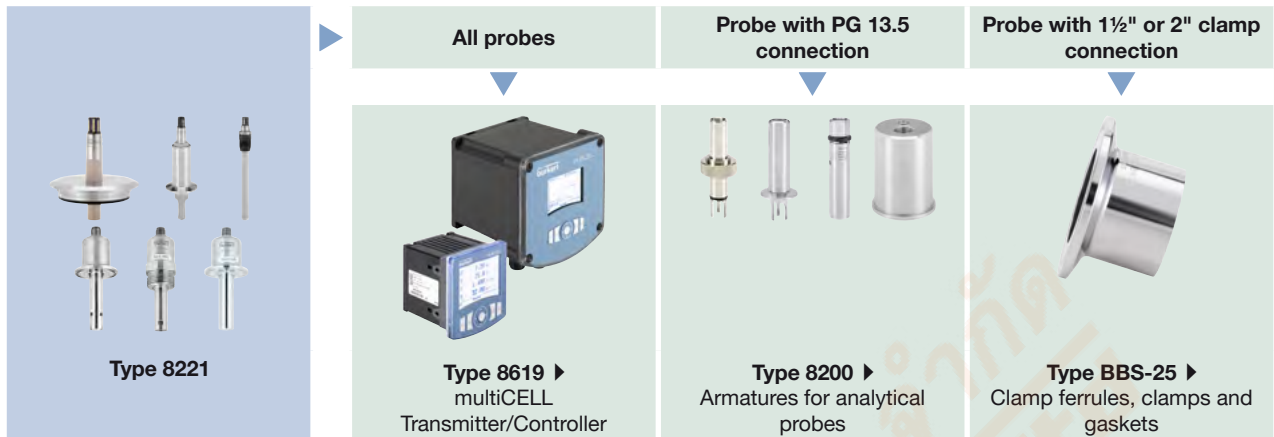
The cell constant is either known or it is determined by means of conductivity standards, and has to be entered into the transmitter prior to measurement.



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8. Networking and combination with other Bürkert products

Example:



9. Ordering information

9.1. Bürkert eShop – Easy ordering and quick delivery




Bürkert eShop – Easy ordering and fast delivery

You want to find your desired Bürkert product or spare part quickly and order directly? Our online shop is available for you 24/7. Sign up and enjoy all the benefits.

[Order online now](#)

9.2. Bürkert product filter



Bürkert product filter – Get quickly to the right product

You want to select products comfortably based on your technical requirements? Use the Bürkert product filter and find suitable articles for your application quickly and easily.

[Try out our product filter](#)

9.3. Ordering chart

Cell constant [cm ⁻¹]	Measuring range [μS/cm]	Process connection	Electrical connection	Probe version	Certifications			Article no.
					FDA	ECR 1935/2004	USP class VI	
Conductivity probe 4-electrode								
0.147	0.1...500 000	1½" clamp	VarioPin (VP 6.0)	Short	Yes	Yes	Yes	562420
				Long				564064
0.36	1...300 000	2" clamp 2" (DN 50/40) adapted for GEA Tuchenhagen VARINLINE PG 13.5		-				559120
								563269
								563186
0.33	1...20 000	1½" clamp	8 pin M12 male			No		571162
Conductivity probe 2-electrode								
0.01	0.05...20	1½" clamp	5 pin M12 male	-	Yes	No	Yes	568818
		G 1"						569644
		G ¾"						570452
		NPT ¾"						570454
0.1	1...200	1½" clamp						569643
		G 1"						569645
		G ¾"						570453
		NPT ¾"						570455

Further versions on request



Process connection
Others...e.g. G 1¼"

9.4. Ordering chart accessories

Description	Article no.
Buffer solution, 5 μS/cm conductivity standard, ± 1 % accuracy, 300 ml	440015
Buffer solution, 15 μS/cm conductivity standard, ± 5 % accuracy, 300 ml	440016
Buffer solution, 100 μS/cm conductivity standard, ± 3 % accuracy, 300 ml	440017
Buffer solution, 706 μS/cm conductivity standard, ± 2 % accuracy, 300 ml	440018
Buffer solution, 1413 μS/cm conductivity standard, ± 1 % accuracy, 300 ml	440019
Buffer solution, 100 mS/cm conductivity standard, ± 1 % accuracy, 300 ml	440020
Connection cable VarioPin (VP 6.0) female connector, 3 meters	554855
Connection cable VarioPin (VP 6.0) female connector, 5 meters	554856
Connection cable VarioPin (VP 6.0) female connector, 10 meters	554857
5 pin M12 female straight cable plug with plastic threaded locking ring, to be wired	917116
5 pin M12 female straight cable plug moulded on cable (2 m, shielded)	438680
5 pin M12 female straight cable plug moulded on cable (5 m, shielded)	560365
5 pin M12 female straight cable plug moulded on cable (10 m, shielded)	563108
8 pin M12 female straight cable plug with plastic threaded locking ring, to be wired	444799
8 pin M12 female straight cable plug moulded on cable (2 m, shielded)	444800
8 pin M12 female straight cable plug moulded on cable (10 m, shielded)	555675
EPDM sealing for conductivity sensor with G ¾" screw-on process connection	561955
EPDM sealing for conductivity sensor with 1½" clamp process connection	730277
FKM sealing for conductivity sensor with 1½" clamp process connection	730285
EPDM sealing for conductivity sensor with 2" clamp process connection	730289
FKM sealing for conductivity sensor with 2" clamp process connection	730299