DATA SHEET

Type MS09

Nitrate sensor

- UV photometer for Nitrate monitoring
- Optical measurement without any reagents
- EDIP sensor: compatible with Type 8905/8906 monitoring stations
- Xenon flash lamp, 3 optical measurements with reduced interferences
- Nano coated window for long service intervals

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

Can be combined with

Type 8905 ▸
Online Analysis System

Type 8920 ▸
Bürkert Communicator

Type 8923 ▸
USB-büS Interface Set

Type description

The sensor Type MS09 is an optical sensor for absorption measurement in the UV range to determine the nitrate content in drinking water.

The sensor has a xenon flash lamp as a light source and can measure the nitrate content with reduced interference through three different detection channels. The nitrate content is determined at 212 nm, the organic content at 254 nm and the turbidity at 360 nm. This makes the sensor less sensitive to cross influences in the water.

The sensor is mainly used in drinking water to ensure compliance with regulatory limits. The measurement is carried out in raw water as well as in pure water.

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1. General technical data

The MS09 is a nitrate measuring system consisting of a photometer with 2 m cable with 8 pin M12 connector, a measuring chamber (flow cell) which allows a bypass installation, an büS interface, 3 cables of 1 m equipped with M12 connectors and a Y-splitter .

Product properties	
Material	
Please make sure the device materials are compatible with the fluid you are using. Detailed information can be found in chapter "2.1. Chemical Resistance Chart – Bürkert resistApp" on page 5.	
Photometer	Housing in stainless steel (1.4571/1.4404)
Flow cell	• Housing in POM • Seal in NBR • Screw in stainless steel 316 (A4)
büS interface	• Front side housing: PC (Polycarbonate) • Rear side housing: polyurethane potting resin, natural
Fixed connector and cable	• Cable in PUR • Screw connection in Zinc die casting, matte nickel-plated
Dimensions	
Detailed information can be found in chapter "3. Dimensions" on page 5.	
Photometer	469 x 48.3 mm (L x Ø) with a 5 mm path
Flow cell	108 x 65 x 65 mm
büS interface	210 x 65 x 18 mm
Weight	
Photometer	Approx. 3.20 kg
Flow cell	Approx. 0.65 kg
büS interface	Approx. 0.40 kg
Compatibility	With Online Analysis System Type 8905 Detailed information can be found in the data sheet of the online analysis system, see **data sheet Type 8905** ▶ for more information.
Measurement technology	Photometry • Light source: Xenon flash lamp • Detector: 3 photodiodes + filter
Measurement principle	Attenuation
Optical path	5 mm (others on request)
Measured variable	NO_3
Measuring range	0.44…53 mg/l with a 5 mm path
Compensation	Turbidity
Data-logger	
büS interface	Micro SD card (not included in delivery) (for storage of device parameters, configuration and for easy replacement of photometer)
Calibration/maintenance interval	24 months
Performance data	
Nitrate measurement	
Measurement deviation	±(5 % + 0.88) of the measured value
Measurement interval	≥ 10 s
Response time (t_{100})	10 s
Electrical data	
Operating voltage	
Photometer	24 V DC ± 10 % (through connector X8 of büS interface)
büS interface	24 V DC ± 10 % - residual ripple 10 %[1)] (through connector X4 connected to Online Analysis System Type 8905. Detailed information can be found in the data sheet of the Online analysis system, see **data sheet Type 8905** ▶ for more information.)
Power consumption	
Photometer	≤ 7 W
büS interface	≤ 2 W (of module alone)

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Current	
büS interface	• Max. input current: 4 A for supply via X4 (M12, A-coded, plug) • Max. output current: 4 A in total with supply via X4
Output	
Photometer	Ethernet (TCP/IP)
büS interface	Bürkert büS
Media data	
Fluid	Water without particles: drinking water, industrial water
Sample water	
Temperature	+2…+40 °C (+36…+104 °F)
Pressure	• Photometer alone: 3 bar • With flow cell: ≤1 bar
Flow rate	With flow cell: 2…4 l/min
Inflow velocity	0.1…10 m/s (0.33…33 fps)
Process/Port connection & communication	
Process connection	Hose connections of flow cell (6 or 8-mm inlet, 6-mm outlet)
Electrical connection	M12 male plug, A-coded (X4 (IN)) of büS interface
Data transfer	
External communication	• Through büS (Bürkert system bus, CANopen protocol) • By status LED: with RGB-LED based on NAMUR NE 107 on the büS interface
Approvals and Certificates	
Standards	
Degree of protection	
Photometer	IP68 according to IEC/EN 60529, NEMA 6P
büS interface	IP65, IP67 and IP69k according to EN/IEC 60529 (with cables connected and with protective caps on unused connections)
Cable	IP65, IP67 according to EN/IEC 60529
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).
Environment and installation	
Ambient temperature	
Photometer	• Operating: +2…+40 °C (+36…+104 °F) • Storage: -20…+80 °C (-4…+176 °F)
büS interface	• Operating: -20…60 °C (-4…+140 °F) • Storage: -20…70 °C(-4…+158 °F)
Relative air humidity	≤90 %, without condensation
Height above sea level	Max. 2000 m
Operating condition	Continuous
Equipment mobility	Fixed
Application range	Indoor and outdoor (Protect the device against electromagnetic interference, ultraviolet rays and, when installed outdoors, against the effects of climatic conditions)
Installation category	Category I according to UL/EN 61010-1
Pollution degree	Degree 2 according to UL/EN 61010-1

1.) The requirements of the attached components need to be considered in the selection of the power supply as well.

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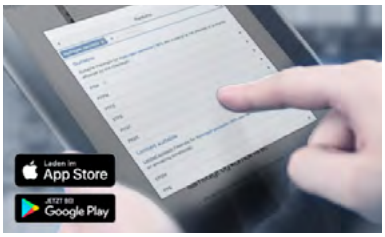
2. Materials

2.1. Chemical Resistance Chart – Bürkert resistApp



Bürkert resistApp – Chemical Resistance Chart

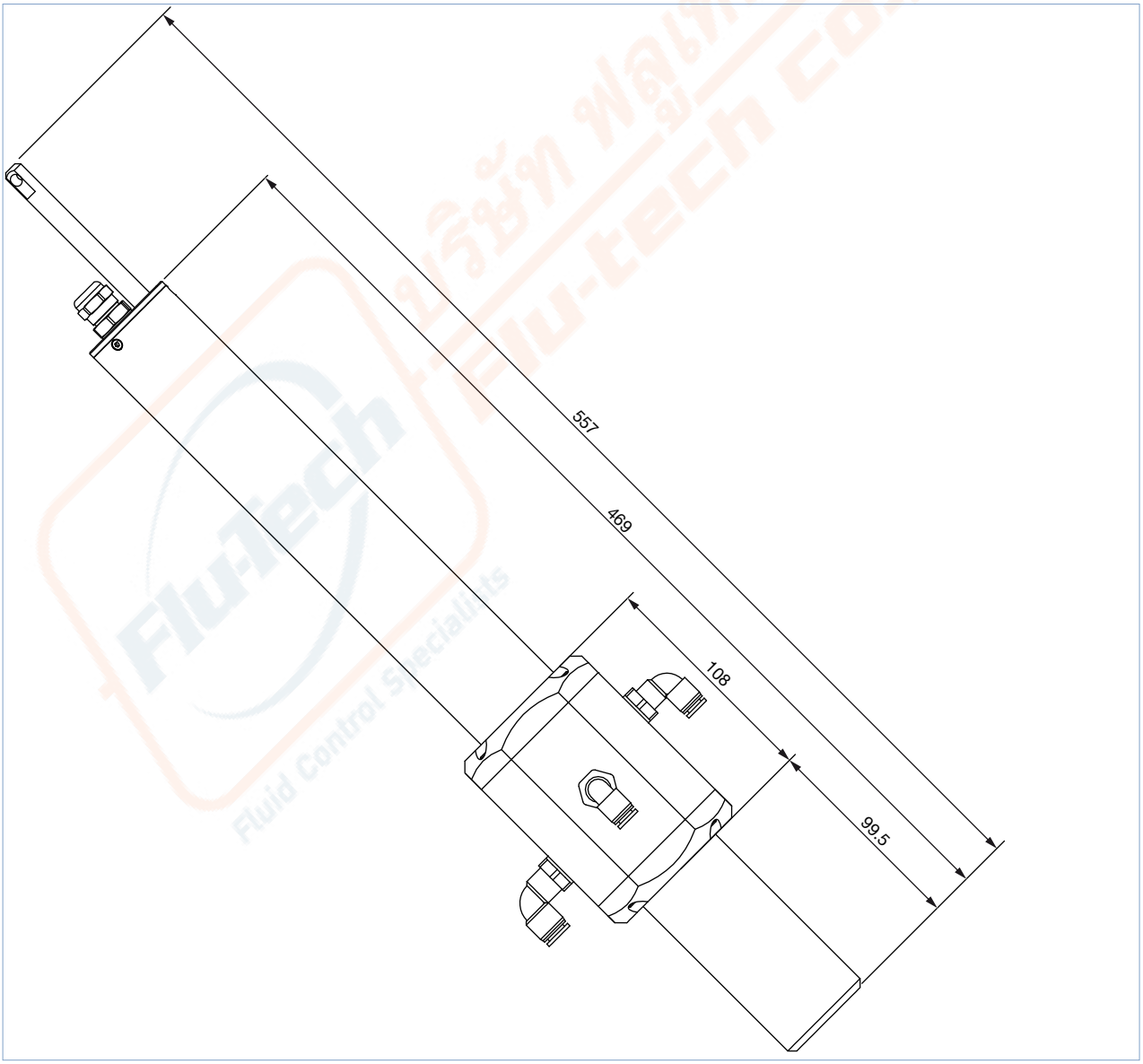
You want to ensure the reliability and durability of the materials in your individual application case? Verify your combination of media and materials on our website or in our resistApp.

Start Chemical Resistance Check

3. Dimensions

3.1. Photometer installed into the measuring chamber (flow cell)

Note:
Dimensions in mm



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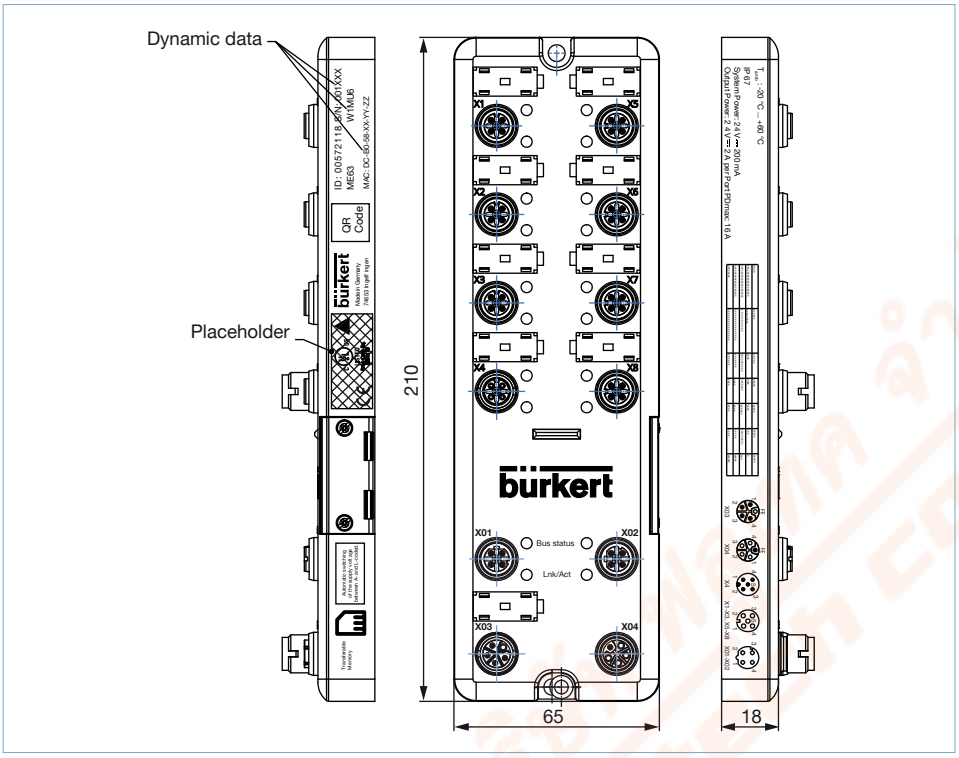
3.2. büS interface

Note:
Dimensions in mm

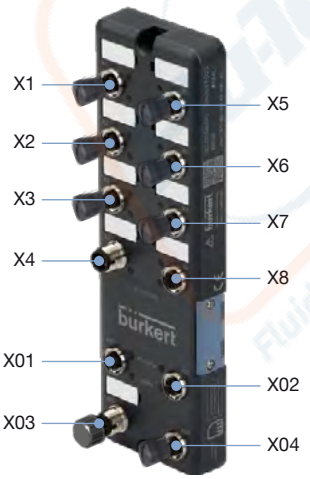


4. Device/Process connections

4.1. büS interface

Connection details

Note:
Device automatically detects whether the power supply is connected to X4.



No.	Description
X1	M12-A, socket, not used
X2	M12-A, socket,not used
X3	M12-A, socket, not used
X4	M12-A, plug, Power IN 24 V DC, max. 4 A and büS/CANopen
X5	M12-A, socket, not used
X6	M12-A, socket, not used
X7	M12-A, terminating resistor 120 Ω, if necessary
X8	M12-A, socket, Power OUT 24 V DC, max. 4 A, to power the photometer
X01	M12-D, socket, not used
X02	M12-D, socket, Ethernet, e.g. for Ethernet integration of the photometer
X03	M12-L, plug, not used
X04	M12-L, socket, not used

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5. Product installation

5.1. Installation notes

Note:

- The nitrate measuring system is designed for use with the online analysis system, Type 8905. It is simply connected via a cable to Type 8905.
- It is also possible to connect the nitrate measuring system to a PC with the Bürkert Communicator Software Type 8920 with help of the USB-büS Interface Set Type 8923.

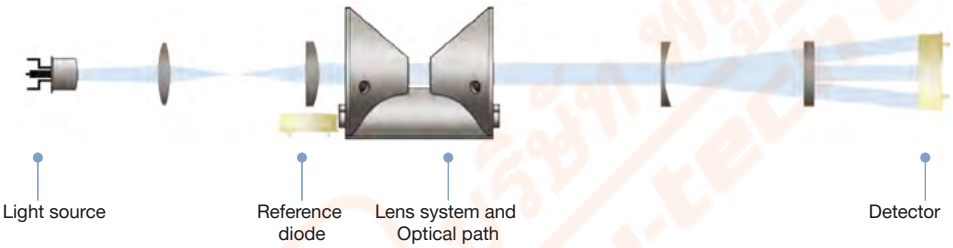
See **data sheet Type 8905** ▶ Online Analysis System, **software manual Type 8920** ▶ or chapter "8.2. USB-büS Interface Set Type 8923" on page 9 for more information.

6. Product operation

6.1. Measuring principle

Note:
For optimal use of the sensor, it is essential to understand the measuring principle and measurement setup which the sensor is based on. The following is an overview of the measurement principle, the optical arrangement and the subsequent calculation.

The photometer essentially consists of four parts: a defined light source, a lens system, the optical path through the medium and a second lens system with three photodiodes as detectors. The arrangement of these parts is represented schematically in the following illustration.



A xenon flash lamp is used as a broadband light source. The light passes through the medium in the optical path and is partially absorbed by it. The photodiodes pick up the remaining light and determine its intensity "I" at defined wavelength points.

The weakening of the light when passing through the measurement medium is compared to the weakening caused by ultra-pure water. The measurement in ultra-pure water provides the so-called basic intensity "I_0". Using equation, the photometer determines the transmission T (=I/I_0) and the absorbance A (=-$\log_{10}$T) for three defined wavelengths.

The integrated analysis software can calculate the corresponding concentrations from the absorption. The unit of the absorption value is the absorption unit [AU]. The manufacturer calibration is based on an allocation of the absorption units to a defined nitrate concentration based on standard nitrate solutions at a wavelength of 212 nm. An integrated compensation of turbidity and organics allows the measurement principle of the photometer to be described as attenuation.

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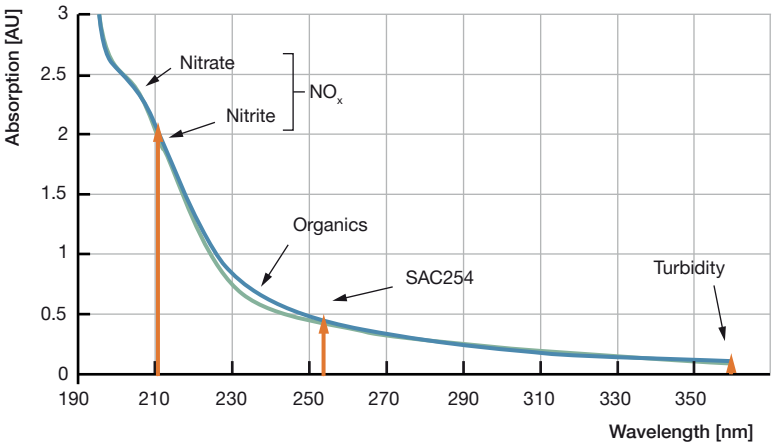
6.2. Analysis



Detection at wavelength 212, 254 and 360 (orange arrows)

6.3. Parameters

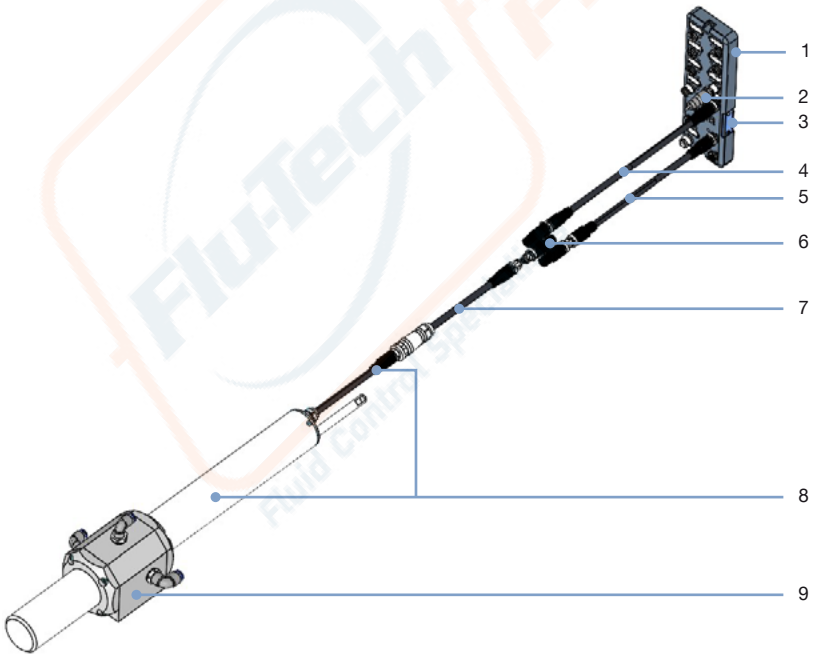
The photometer measures absorption at 212 nm. The parameter NO_3 is output.

Taking the path length into account, the absorption values [AU] are calculated with the unit [1/m] at 212, 254 and 360 nm.
The photometer sensor uses the absorption at 212 nm for the detection of NO_3. Absorption at 254 (SAC_{254}) and 360 nm is used to correct organic compounds and turbidity. Optical path lengths of 0.3, 1, 2, 5 or 10 mm are available for the photometer. A longer version of the photometer allows longer path lengths of 20 and 50 mm.

It is possible to adapt the sensor with scaling factors to laboratory analyses and local conditions. Please note that the manufacturer's calibration is not affected by the customer-specific calibration. The parameter NO_3 parameter can be scaled.

7. Product design and assembly

7.1. Product assembly



No.	Element
1	büS interface
2	Terminating resistor 120 Ω, if needed
3	Micro SD card for saving device specific settings
4	büS/CANopen shielded cable, 1 m length, with 5 pin M12 male and 5 pin M12 female connectors
5	Ethernet shielded cable, 1 m length, with two 4 pin M12 male connectors
6	Shielded Y-splitter with 8 pin M12 female connector Y-coding + 4 pin M12 female connector D-coding + 5 pin M12 male connector A coding
7	Adaptation shielded cable, 1 m length, with 8 pin M12 male and female connectors
8	Photometer with connection cable, 2 m length, with 8 pin M12 female connector A-coding
9	Measuring chamber (flow cell)

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8. Product accessories

8.1. Bürkert Communicator Software Type 8920

Note:
To install the software, click **here** ▶.

Part of Bürkert's new EDIP program (Efficient Device Integration Platform) is the Bürkert Communicator. This software can be run under MS-Windows and it is available on Bürkert's website for free. The Bürkert Communicator allows convenient system configuration and parametrisation of all connected field devices. An accessory part, the büS stick serves as the interface between computer and process instruments (see "9.4. Ordering chart accessories" on page 10). The Communicator allows:

- Diagnostics
- Parametrization
- Registration and storage of process data
- Graphical monitoring of the process data
- To update firmware of the büS device connected
- Guided re-calibration

8.2. USB-büS Interface Set Type 8923

See "9.4. Ordering chart accessories" on page 10 for ordering information.

Accessories	No.	Description
	1	Quick-Start
	2	Power supply: 100…240 V AC/ 24 V DC 1 A and adaptors for power supply worldwide use
	3	büS terminating resistor on büS Y-splitter
	4	5 pin M12 male connector wired on free end cable
	5	büS connection cable with 5 pin M12 plug, micro USB B plug
	6	büS adapter with 5 pin M12 plug, A-coded to 5 pin M12 plug, A-coded
	7	büS stick (USB to büS/CANopen adaptor)
	8	büS service cable with 5 pin M12 plug, mini USB and circular plug-in connectors for power supply
	9	Magnetic key
	10	CD - Communicator (30-day license without registration, update and licensing over Bürkert home page)

9. Ordering information

9.1. Bürkert eShop – Easy ordering and quick delivery

Bürkert eShop – Easy ordering and fast delivery

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Order online now

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9.2. Bürkert product filter

Bürkert product filter – Get quickly to the right product

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Use the Bürkert product filter and find suitable articles for your application quickly and easily.

Try out our product filter

9.3. Ordering chart

Description	Article no.
Nitrate measuring system (photometer + measuring chamber (flow cell) + büS interface + cables)	572113

9.4. Ordering chart accessories

Description		Article no.
Nitrate photometer		572115
Measuring chamber (flow cell)		572117
büS interface		572118
Micro SD card		774087
Fluidic accessories		
Sample water pipe 4/6 mm	5 m	567793
	10 m	567701
	25 m	567794
Hose connector angle, ¼" pipe 4/6 mm		782348
Strainer 100 µm		772703
Pressure reducer		772437
Cleaning system, 2 solutions		567124
Set with a pressure reducer (including a 100 µm strainer, a sampling point and two G ¼" connections), a wall-mounting bracket with nut (for the pressure reducer), a pressure gauge (for the pressure reducer) and two quick-connect couplings		566319
Bubble trap		568492
Filter housing made of plastic with NBR seal for filter element 50 µm, inlet and outlet ¼"		774292
Filter housing made of plastic with NBR seal for filter element 90 µm or 140 µm, inlet and outlet ¼"		774287
Filter element	50 µm	774293
	90 µm	774290
	140 µm	774291
Interface accessories		
büS Stick Set		
 USB-büS-Interface Set 1, Type 8923 Detailed information can be found in chapter "8.2. USB-büS Interface Set Type 8923" on page 9.		772426
USB-büS Interface Set 2, Type 8923 (only büS Stick, cable and büS service cable)		772551
Connectors and sockets		
büS Y-connector, 5 pin M12 female to 5 pin M12 male and 5 pin M12 female		772420
büS Y-connector, 5 pin M12 female to 5 pin M12 male and 5 pin M12 female (power interrupt)		772421
büS adaptor M12 male A-coded - M12 male A-coded		772867
büS termination, 5 pin M12 male cable plug		772424
büS termination, 5 pin M12 female cable plug		772425

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Description		Article no.
Extensions		
 5 pin M12 female and male straight cable plug moulded on cable, shielded	0.5 m	772403
	1 m	772404
	3 m	772405
	5 m	772406
	10 m	772407
	20 m	772408
Software		
Software Bürkert Communicator		Download **Type 8920**

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