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## FLOWave SAW-Flowmeter

- No parts in the measurement tube
- Conform to hygienic requirements
- Ideal for low conductivity or non conductive fluids
- Digital communication
- Compact, low weight and energy-efficient

Type 8098 can be combined with...



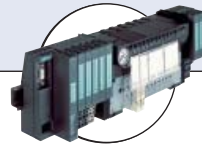
**Type 8802-DF**  
ELEMENT  
Continuous system



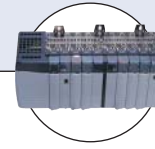
**Type 8802-GD**  
ELEMENT  
Continuous system



**Type 8619**  
multiCELL  
transmitter/controller



**Type 8644**  
Valve islands



**PLC**

The flowmeter Type 8098 is a product of the FLOWave range. It uses the SAW (Surface Acoustic Waves) technology and is at first designed for the use in applications requiring that all hygienic conditions are fulfilled.

This is achieved by using:

- the accepted stainless steel materials
- a tube free of any inner parts
- the ideal outer design (e.g. without any fixing components like screws)

The main use focus is on hygienic applications and for the measurement or monitoring of water similar fluids.

As an example low conductivity or non conductive water is a very preferred area of usage as FLOWave flow measurement is independent from conductivity.

FLOWave offers a range of features, including advantages by flexibility, cleanability (e.g. CIP and SIP), compact size, light weight, easy installation and handling, and is compliant with numerous standards.

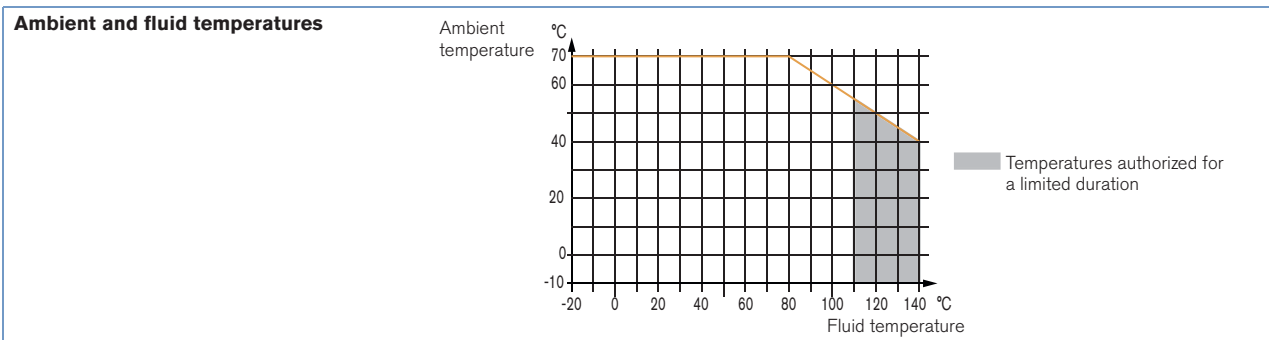
### General technical data



<b>Type of fluids</b>	Water similar homogeneous fluids, free of air and free of gas bubbles. Non emulsified fluids, no gas, no steam. Kinematic viscosity $\leq 2 \text{ mm}^2/\text{s}$ (2 cSt) Non dangerous fluids complying with article 3 of §3 from 97/23/CE directive (see * on page 3)
<b>Clamp/Pipe size acc. to</b>	DN15, DN25, DN40 and DN50
<ul style="list-style-type: none"> <li>▪ DIN 32676 Series B</li> <li>▪ ASME BPE (DIN 32676 Series C)</li> </ul>	3/4", 1", 1 1/2", 2"
<b>Materials</b>	
<b>Wetted parts</b>	Stainless steel 316L/1.4435 BN2
Measurement tube and Clamp	
<b>Unwetted parts</b>	Stainless steel 304/1.4301
Transmitter and sensor housings	VMQ silicone / Float glass, stainless steel 304/1.4301
Seal / Display	Nickel plated brass / Black POM
Cable glands / Blind plugs	Nickel plated brass
M12 male connector and blind plug	Diaphragm in ePTFE, Support in Polyester (PET), O-ring in Silicone 60 Shore A, Body in Aluminium-Zinc-alloy with nickel, copper sheathing
Pressure compensating element	Metallized polyester
Name plate	
<b>Surface finish*</b>	
Measurement tube (inner surface)	Ra < 0.8 $\mu\text{m}$ (30 $\mu\text{in.}$ ) or Ra < 0.4 $\mu\text{m}$ (15 $\mu\text{in.}$ ) (electro-polished)
Meas. tube (outer surface), housing	Ra < 1.6 $\mu\text{m}$ (excluding welding seams)
<b>Display</b>	2.4", monochrome graphic (240 x 160 pixel) German, English, French languages
<b>Electrical connection</b>	2 cable glands M20 x 1.5 and 1 x 5-pin M12 male fixed connector
<b>Recommended cable for</b>	
Cable glands	Cable with max. operating temperature of min. 90°C 5...14 mm diameter, shielded cable, 0.2...1.5 mm <sup>2</sup> cross-section,
M12 female connector (not supplied)	Cable with max. operating temperature of min. 80°C 3...6.5 mm diameter, shielded cable, 0.75 mm <sup>2</sup> cross-section

\* according to ISO 4288

General technical data - continued				
<b>Weight [approx. - kg]</b>	DN15 / 3/4"	DN25 / 1"	DN40 / 1 1/2"	DN50 / 2"
	2.2	2.4	3.2	3.4
<b>Flow rate measurement<sup>1)</sup></b>	0...7 m <sup>3</sup> /h to 0...90 m <sup>3</sup> /h (see ordering chart on page 8)			
Measuring range				
Measurement deviation <sup>2)</sup>	±0.4% of the measured value			
from 10% of F.S.* up to F.S.*				
from 1% of F.S.* up to 10% F.S.*	< ±0.08% of F.S.*			
Repeatability				
from 10% of F.S.* up to F.S.*	±0.2% of the measured value			
from 1% of F.S.* up to 10% F.S.*	±0.04% of F.S.*			
Refresh time	240 ms			
<b>Temperature measurement</b>	-20...+140°C (-4...+284°F)			
Measuring range				
Measurement deviation <sup>2)</sup> for				
T° ≤ 100°C	±1°C (1.8°F)			
100°C < T° < 140°C	±1.5%			
<b>Fluid temperature</b>	-20...+110°C (-4...+230°F)			
The maximum fluid temperature can be restricted by the ambient operating temperature	Max. conditions for sterilisation process: up to +140°C (284°F) for 60 min.			
Maximum temperature gradient	10°C/s (18°F/s) [measured by the integrated sensor on the device]			
<b>Fluid nominal pressure max for</b>				
DN15, DN25, 3/4", 1", 1 1/2"	PN25 (363 PSI)			
DN40, DN50, 2"	PN16 (290 PSI)			
<b>Electrical data</b>				
<b>Operating voltage</b>	12...35 V DC filtered and regulated, limited energy source (according to UL 61010-1, paragraph 9.4) Tolerance: ±10%			
<b>Reversed polarity of DC</b>	Protected			
<b>Power consumption</b>	Max. 5 W (without any consumption of output)			
<b>Outputs</b>	3 (1 digital, 1 analogue and 1 configurable: digital or analogue)			
<b>Digital outputs</b>	Overload information (through diagnostic software function)			
Transistor	Type: NPN or PNP (wiring dependent), open collector, galvanically isolated			
	Operating modes: pulse (by default), On/Off, Threshold, Frequency (user configurable)			
	0...2 kHz, 5...35 V DC, 700 mA max., Max. pulse duration : 65 ms;			
	Protected against polarity reversals of DC and overloads			
<b>Frequency resolution</b>	0.05 Hz over 0...2 kHz range			
<b>Analogue output</b>	Open loop detection (through diagnostic software function)			
Current	4...20 mA; 3.6 mA or 22 mA to indicate an error (only if 4...20 mA scale selected); galvanically isolated			
	max. loop impedance: 1300 Ω at 35 V DC, 1000 Ω at 30 V DC, 700 Ω at 24 V DC, 450 Ω at 18 V DC			
<b>4...20 mA output uncertainty</b>	±0.04 mA			
<b>4...20 mA output resolution</b>	0.8 µA			
<b>Environment conditions</b>				
<b>Ambient temperature</b>	Depends on the fluid temperature (see drawing)			
Operation / Storage	-10...+70°C (14...+158°F) / -20...+70°C (-4...+158°F)			
<b>Relative humidity</b>	< 85%, without condensation			
<b>Height above sea level</b>	max. 2000 m			

<sup>1)</sup> Under reference conditions i.e. measuring fluid=water, ambient and water temperature = 23°C (73.4°F), applying the minimum inlet (40 x DN) and outlet (1 x DN) straight pipe lengths, matched inside pipe dimensions.  
<sup>2)</sup> ="measurement bias" as defined in the standard JCGM 200:2012  
 \* F.S.= of Full scale (see ordering chart on page 8)



Standards, directives and certifications	
<b>Protection class</b> acc. to EN 60529	IP65 and IP67, NEMA250 4X, if the product is wired and if the cable glands are tightened and the covers are screwed tight. Unused cable glands must be sealed with the stopper gaskets provided (mounted at the delivery of the product). Unused M12 male fixed connector must be protected with the screwed plug.
<b>Standard and directives</b> 	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) Complying with article 4, §1 of 2014/68/EU directive*
Pressure	
<b>Certificates</b>	EHEDG (Type EL - CLASS I) (Pending); 3A (28-04); Inspection certificate 3.1; Certification of compliance ASME BPE; Calibration certificate; On request: Test report 2.2 for surface finish
<b>Certification</b> UL-Listed for US and Canada  (pending)	UL61010-1 + CAN/CSA-C22.2 No.61010-1 (Pending)
Specific technical data of UL-listed products for US and Canada	
<b>Intended for an inner pollution</b>	Pollution degree 2, according to EN61010-1
<b>Installation category</b>	Category II, according to UL61010-1

\* For the 2014/68/EU pressure directive, the device can only be used under following conditions (depending on max. pressure, pipe diameter and fluid).

Type of fluid	Conditions
<b>Fluid group 1, article 4, §1.c.i</b>	Forbidden
<b>Fluid group 2, article 4, §1.c.i</b>	DN ≤ 32 or PN*DN ≤ 1000
<b>Fluid group 1, article 4, §1.c.ii</b>	DN ≤ 25 or PN*DN ≤ 2000
<b>Fluid group 2, article 4, §1.c.ii</b>	DN ≤ 200 or PN ≤ 10 or PN*DN ≤ 5000

## Design and materials view

The **FLOWave** flowmeter **Type 8098** consists of a flow sensor Type S097 and a transmitter Type SE98.

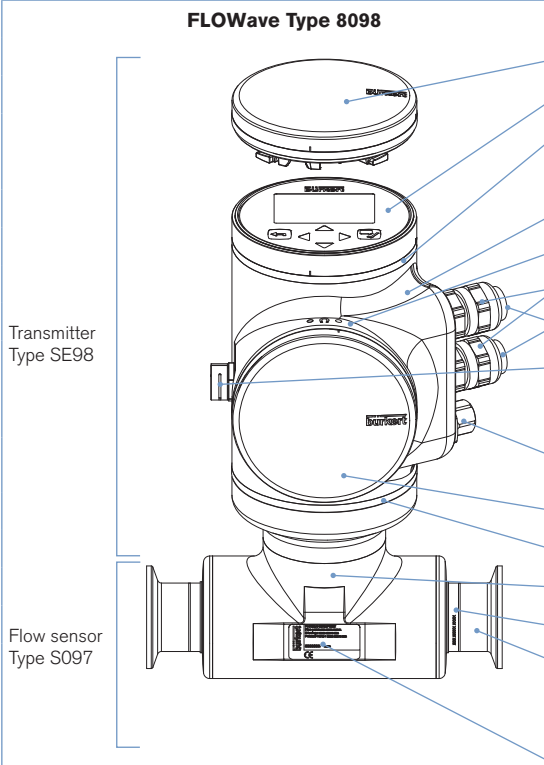
The flow sensor includes the measurement tube equipped with interdigital transducers, the sensor housing and the clamp process connections in accordance to the standards ISO, ASME BPE.

At present the sensor size ranges from DN15 to DN50 or from 3/4" to 2" covering a process pressure up to PN40.

The flowmeter is available as a compact device with or without display. The high resolution display with includes a capacitive working keypad for all user's interactive actions guided by a user friendly menu system.

The output signals include one analogue output and one digital output; while a third output signal can be switched between analogue and digital through parameterization. Electrical connection is done on push-in connectors via two cable glands and/or one M12 connector.

The detailed parts and materials are displayed in the following picture:

FLOWave Type 8098		Description	Material
		<b>Blind cover or</b>	Stainless steel 304/1.4301
		<b>Display module</b>	Float glass, Stainless steel 304/1.4301
		<b>Multi-colour LED behind seal</b> (used for e.g. indicating the status of the product, based on the NAMUR NE 107 standard)	VMQ silicone
		<b>Transmitter housing</b>	Stainless steel 304/1.4301
		<b>Seal</b>	VMQ silicone
		<b>Cable glands</b>	Nickel plated brass
		<b>Blind plug</b>	Black POM
		<b>Pressure compensating element</b>	Diaphragm: ePTFE, Support: Polyester, O-Ring: Silicone 60 Shore A, Body: Aluminium-Zinc-alloy with nickel, copper sheating
		<b>M12 male fixed connector (wired to bus) with screwed plug</b>	Nickel plated brass
		<b>Blind cover</b>	Stainless steel 304/1.4301
		<b>Seal</b>	VMQ silicone
		<b>Sensor housing</b>	Stainless steel 304/1.4301
		<b>Sensor measurement tube</b>	<ul style="list-style-type: none"> <li>Stainless steel 316L/1.4435 BN2 for process connection acc. to DIN 32676 Series B</li> <li>Stainless steel 316L/1.4435 BN2 for process connection acc. to ASME BPE (DIN 32767 Series C)</li> </ul>
	<b>Process connection</b>		
	<b>Name plate</b>	Metallized polyester	

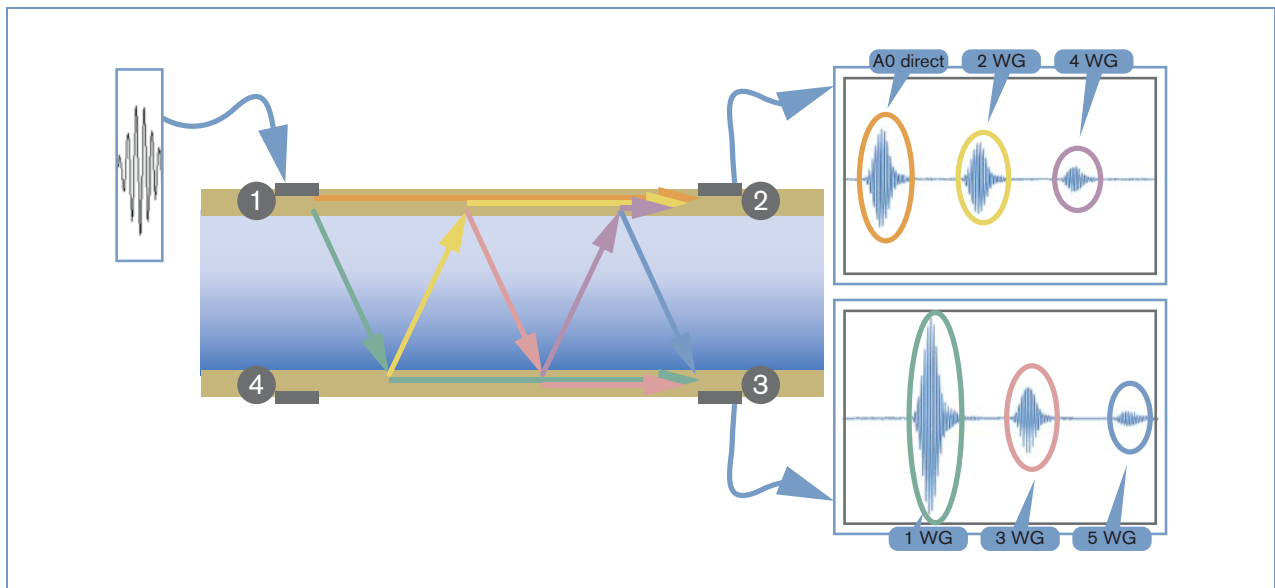
## Operating principle

The technology used is based on SAW (Surface Acoustic Waves). The kind of wave propagation is similar to what happens when it comes to earthquakes in the nature.

In the case of FLOWave it is a miniaturized signal, not running on the surface of the earth but on a measurement tube. FLOWave uses so called interdigital transducers which are placed on flattened areas of the tube surface. There are at least 4 of them. Each one acts as emitter as well as receiver. Two of them (no. 1 and 4) are emitting in the forward flow direction, the others (no. 2 and 3) in the backward flow direction. The propagation time is measured from emitter to receiver. The difference between the wave propagation times in the forward and backward directions is proportional to the volume flow.

The high performance measurement is based on:

- Each emitter creates multiple receiving signals at two other receivers
- The results are obtained by gathering the signals of waves transmitted through the fluids just one time and several times.
- Several measurements can be performed based on the collected information. Many properties of the fluid can be derived, including its velocity and information about the presence of gas bubbles or solid parts.



This figure indicates the receiving signals for just interdigital transducer 1 acting as emitter. The emitter excitation produces the SAW with a frequency of more than 1 MHz.

There are two effects appearing:

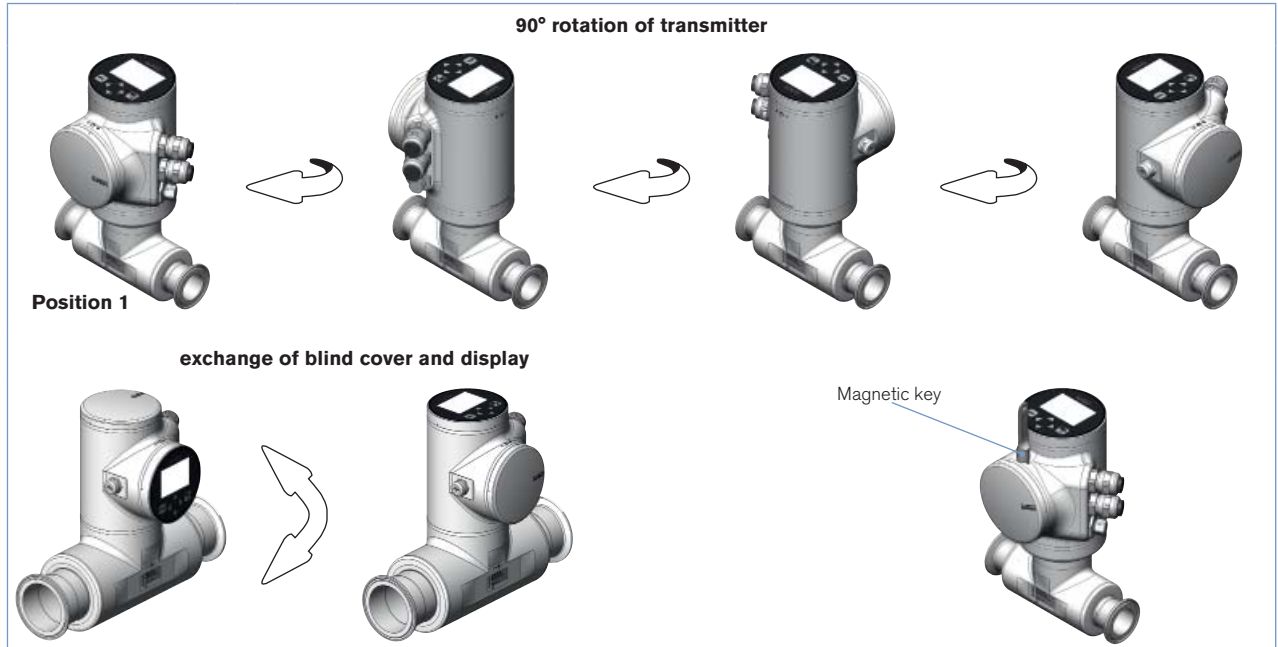
- A wave propagates along the surface of the tube (see orange line).
- A wave couples into the fluid (see green line) and propagates towards the other side of the tube under a certain angle. This angle depends mainly on the propagation speed on the surface and in the fluid, respectively.
- Upon reaching the opposite side of the tube, two effects take place
  - A wave couples into the tube and propagates (see green line) to receiver 3
  - A wave couples out to the fluid (see yellow line) and propagates again to the opposite side of the tube.

These effects get repeated at each reflection, resulting in all the different colour-coded signals indicated in the figure.

## Installation

The product is delivered as described in **position 1** in the below picture. The position of the transmitter SE98 can be changed in 90° steps. As well the position of the display module and the blind cover can be changed in steps of 90° in the position on top as well as on the front.

For safety reasons display module and blind cover on the top or on the front are locked. The unlocking of the display module and the blind cover can be done with a magnetic key which is included in the delivery of each device.



Minimum straight inlet and outlet distances must be observed. According to the pipe design, necessary distances can be bigger or use a flow conditioner to obtain the best results. The minimum inlet and outlet distances can be determined according to the standard ISO 9104.1991.

The device can be installed into either horizontal, oblique or vertical pipes. But an installation on a vertical pipe will be better to prevent air or gas bubbles inside the measurement area.

**For proper operation always ensure a totally filled measurement tube.**

Conformity to 3A and EHEDG requires to have an angle of minimum 3° against horizontal to ensure full drainability however this not a needed demand from FLOWave.

The suitable pipe size can be selected using the diagram Flow rate/Velocity/DN (see diagram on next page).

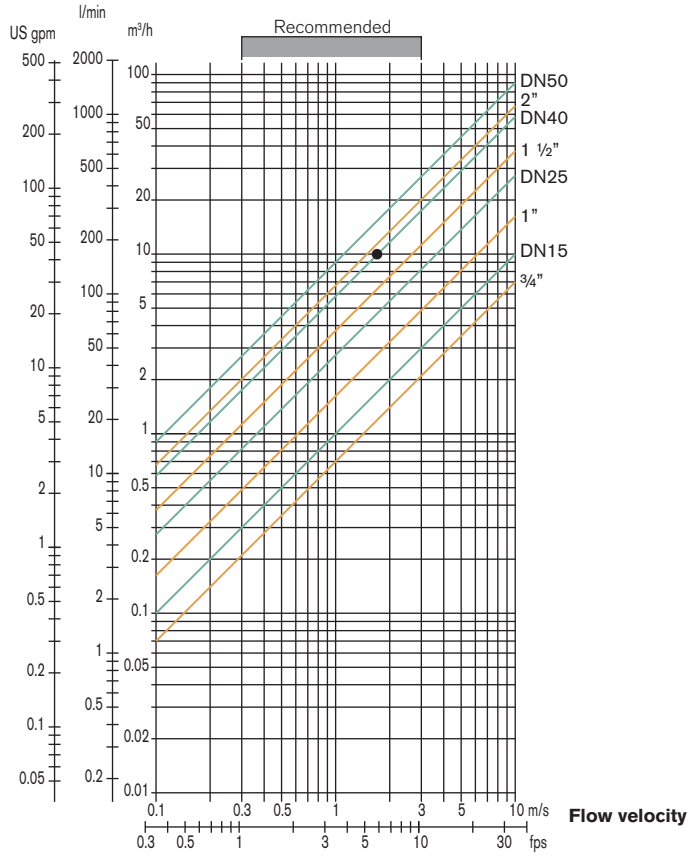
The flowmeter is not designed for gas or steam flow measurement.

Diagram Flow rate/Velocity/DN

**Example:**

- Flow rate: 10 m<sup>3</sup>/h
  - Ideal flow velocity: 1...3 m/s
- For these specifications, the diagram indicates a pipe size of DN40

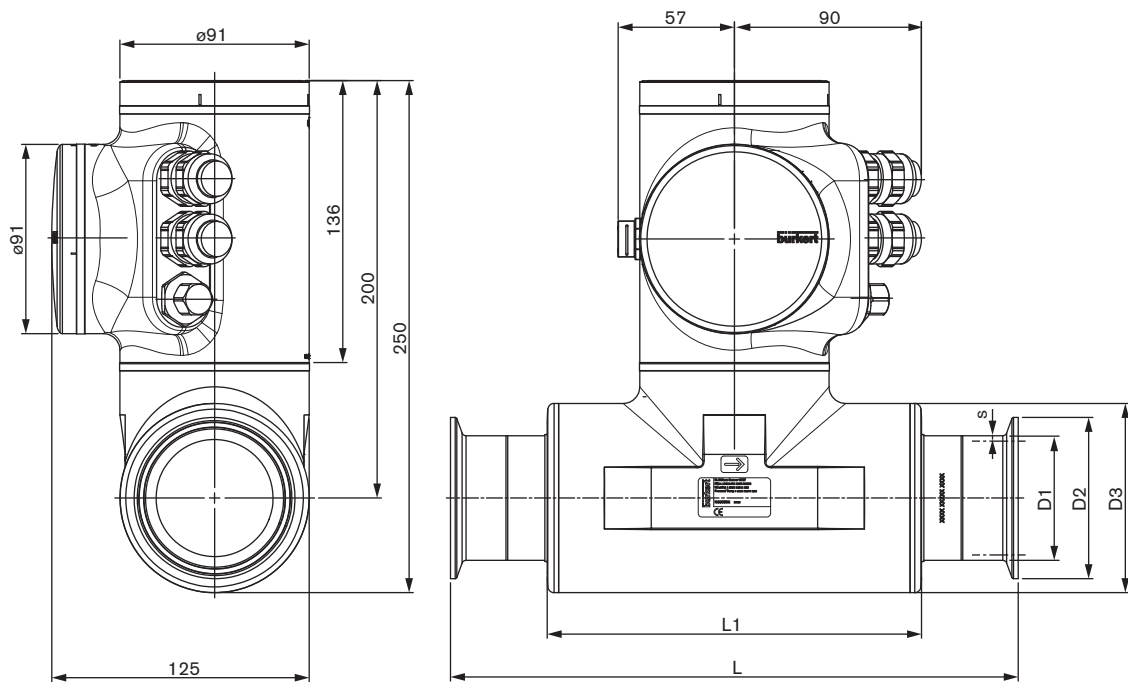
Flow rate of fluid



Recap chart

DN	Flow velocity [m/s]	0.1	1	10
¾"	Flow rate range [m³/h]	0.07	0.7	7
		< ±0.08% of F.S.		±0.4% of the measured value
15	Flow rate range [m³/h]	0.10	1.0	10
		< ±0.08% of F.S.		±0.4% of the measured value
1"	Flow rate range [m³/h]	0.14	1.4	14
		< ±0.08% of F.S.		±0.4% of the measured value
25	Flow rate range [m³/h]	0.25	2.5	25
		< ±0.08% of F.S.		±0.4% of the measured value
1 ½"	Flow rate range [m³/h]	0.35	3.5	35
		< ±0.08% of F.S.		±0.4% of the measured value
40	Flow rate range [m³/h]	0.56	5.6	56
		< ±0.08% of F.S.		±0.4% of the measured value
2"	Flow rate range [m³/h]	0.64	6.4	64
		< ±0.08% of F.S.		±0.4% of the measured value
50	Flow rate range [m³/h]	0.90	9.0	90
		< ±0.08% of F.S.		±0.4% of the measured value

Dimensions [mm]



Clamp/pipe size		Standard		D1	s	D2	D3	L1	L
[mm]	[inch]	Clamp	Process pipe						
15	-	DIN 32676 series B	DIN 11866 series B	21.3	1.6	50.5	60.3	105	168
		DIN 32676 series B*	DIN 11866 series B	21.3	1.6	34	60.3	105	168
-	3/4	ASME BPE (DIN 32676 Series C)	DIN 11866 series C (ASME BPE)	19.05	1.65	25	60.3	105	143
25	-	DIN 32676 series B	DIN 11866 series B	33.7	2.0	50.5	60.3	120	175
		ASME BPE (DIN 32676 Series C)	DIN 11866 series C (ASME BPE)	25.4	1.65	50.5	60.3	105	143
40	-	DIN 32676 series B	DIN 11866 series B	48.3	2.0	64	91	180	273
		ASME BPE (DIN 32676 Series C)	DIN 11866 series C (ASME BPE)	38.1	1.65	50.5	91	180	273
50	-	DIN 32676 series B	DIN 11866 series B	60.3	2.0	77.5	91	180	273
		ASME BPE (DIN 32676 Series C)	DIN 11866 series C (ASME BPE)	50.8	1.65	64	91	180	273

\* similar to DIN 32676 series B but with clamp 34.0

Ordering chart for FLOWave flowmeter Type 8098

**NOTE:**

To parameter a device without display please use the USB-büS-Interface Type 8920 (has to be ordered separately - see accessories on page 9)

**Clamp acc. to DIN 32676 series B (ISO 1127) process connection for pipe acc. to DIN 11866 series B (ISO 1127)**





Clamp/pipe size [mm]	Measurement tube (outer surface), housing	Measurement tube (inner surface)	Clamp Dimensions D1xs, D2	Operating voltage	Maximal flow rate	Electrical connection	Display	Approvals	Item no.
15	1.6 µm	0.8 µm (30 µin.)	21.3x1.6 - Cl:50.5	12...35 V DC	10 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 187
			21.3x1.6 - Cl:34.0				Yes		566 235
			21.3x1.6 - Cl:50.5				No		566 191
			21.3x1.6 - Cl:34.0				No		566 236
		0.4 µm (15 µin.)	21.3x1.6 - Cl:50.5				Yes		566 195
			21.3x1.6 - Cl:34.0				Yes		566 237
			21.3x1.6 - Cl:50.5				No		566 199
			21.3x1.6 - Cl:34.0				No		566 238
25	1.6 µm	0.8 µm (30 µin.)	33.7x2.0 - Cl:50.5	12...35 V DC	25 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 188
							No		566 192
		0.4 µm (15 µin.)					Yes		566 196
							No		566 200
40	1.6 µm	0.8 µm (30 µin.)	48.3x2.0 - Cl:64.0	12...35 V DC	56 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 189
							No		566 193
		0.4 µm (15 µin.)					Yes		566 197
							No		566 201
50	1.6 µm	0.8 µm (30 µin.)	60.3x2.0 - Cl:77.5	12...35 V DC	90 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 190
							No		566 194
		0.4 µm (15 µin.)					Yes		566 198
							No		566 202

**Clamp acc. to ASME BPE (DIN 32676 series C) process connection for pipe acc. to DIN 11866 series C (ASME BPE)**

Clamp/pipe size [inch]	Measurement tube (outer surface), housing	Measurement tube (inner surface)	Clamp Dimensions D1xs, D2	Operating voltage	Maximal flow rate	Electrical connection	Display	Approvals	Item no.
¾	1.6 µm	0.8 µm (30 µin.)	19.05x1.65 - Cl:25.0	12...35 V DC	7 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 203
							No		566 207
		0.4 µm (15 µin.)					Yes		566 211
							No		566 215
1	1.6 µm	0.8 µm (30 µin.)	25.4x1.65 - Cl:50.5	12...35 V DC	14 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 204
							No		566 208
		0.4 µm (15 µin.)					Yes		566 212
							No		566 216
1 ½	1.6 µm	0.8 µm (30 µin.)	38.1x1.65 - Cl:50.5	12...35 V DC	35 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 205
							No		566 209
		0.4 µm (15 µin.)					Yes		566 213
							No		566 217
2	1.6 µm	0.8 µm (30 µin.)	50.8x1.65 - Cl:64.0	12...35 V DC	64 m³/h	2 cable glands M20 x 1.5 + 1 male fixed connector M12	Yes		566 206
							No		566 210
		0.4 µm (15 µin.)					Yes		566 214
							No		566 218



Ordering chart for accessories for Type 8098

	Description	Item no.
	USB-büs-Interface (see drawing below )	772 426
	Unlocking magnetic key	690 309
	5-pin M12 female straight cable plug with plastic threaded locking ring, to be wired	917 116
	5-pin M12 female and male straight cable plug moulded on cable (1 m, shielded)	772 404
	5-pin M12 female and male straight cable plug moulded on cable (3 m, shielded)	772 405

**USB-büs-Interface**



**Note**  
You can fill out the fields directly in the PDF file before printing out the form.

**Standard configuration – request for quotation**

▶ Please fill out and send to your nearest Bürkert office\* with your inquiry or order

Company:	Contact person:
Customer no.:	Department:
Address:	Tel./Fax.:
Postcode/town:	E-Mail:

= mandatory fields to fill out

Quantity:

Required delivery date:

**Operating data**

<input type="checkbox"/> Process medium	<input type="text"/>		
<input type="checkbox"/> Type of media	<input checked="" type="checkbox"/> Fluid		
	min.	max.	Unit
<input type="checkbox"/> Flow rate (Q) <sup>1)</sup>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Temperature	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Absolute pressure	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Viscosity	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Density	<input type="text"/>	<input type="text"/>	<input type="text"/>

<sup>1)</sup> standard unit:  
Fluid Q = m<sup>3</sup>/h;

**Comments**

**Sketch**

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**Certifications\***

- |  |   |
|--|---|
| <input type="checkbox"/> Test report 2.2 acc. to EN 10204 (Item no. 803 722)   | <input type="checkbox"/> EHEDG - TYPE EL-CLASS I (Pending)              |
| <input type="checkbox"/> Inspection certificate 3.1 acc. to EN 10204 (included in delivery)  | <input type="checkbox"/> 3A - 28 04 (included in delivery)              |
| <input type="checkbox"/> Certification of Conformity for the Surface Quality DIN 4762; EN ISO 4287; EN ISO 4288 (Item no. 804 175) | <input type="checkbox"/> Calibration certificate (included in delivery) |
| <input type="checkbox"/> Certification of Conformity for Passivating and Electropolishing Processes (Item no. 444 900)             | <input type="checkbox"/> FDA certificate (included in delivery)         |
| <input type="checkbox"/> Certification of compliance ASME BPE (included in delivery)   |   |

\* If a certification which is not included in delivery with the FLOWave is requested, please order it separately. If you want to order one or more later, please contact your Bürkert office.

To find your nearest Bürkert office, click on the orange box →

[www.burkert.com](http://www.burkert.com)

In case of special application conditions, please consult for advice.

Subject to alteration.  
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