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FLOWave SAW-Flowmeter

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

Type 8098 can be combined with...



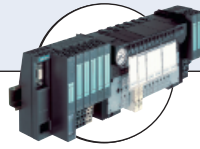
Type 8802-DF
ELEMENT
Continuous system



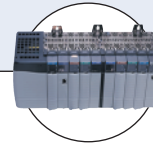
Type 8802-GD
ELEMENT
Continuous system



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 liquids.

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

Type of fluids	Water similar homogeneous liquids, free of air and free of gas bubbles. Non emulsified liquids, no gas, no steam. Viscosity ≤ 2 mPa.s Non dangerous fluids complying with article 3 of §3 from 97/23/CE directive (see * on page 3)			
Clamp/Pipe size acc. to	<ul style="list-style-type: none"> ▪ DIN 32676 Series B ▪ ASME BPE (DIN 32676 Series C) DN15, DN25, DN40 and DN50 3/4", 1", 1 1/2", 2"			
Materials	Wetted parts Measurement tube and Clamp: Stainless steel 316L/1.4435 BN2 Unwetted parts Transmitter and sensor housings: Stainless steel 304/1.4301 Seal / Display: VMQ silicone / Float glass, stainless steel 304/1.4301 Cable glands / Blind plugs: Nickel plated brass / Black POM M12 male connector and blind plug: Nickel plated brass Pressure compensating element: Nickel plated brass Name plate: Metallized polyester			
Surface finish	Measurement tube (inner surface): Ra < 0.8 μm (30 $\mu\text{in.}$) or Ra < 0.4 μm (15 $\mu\text{in.}$) (electropolish) Meas. tube (outer surface), housing: Ra < 1.6 μm			
Display	2.4", monochrome graphic (240 x 160 pixel) German, English, French languages			
Electrical connection	2 cable glands M20 x 1.5 and 1 x 5-pin M12 male fixed connector			
Recommended cable for	Cable with operating temperature of min. 90°C			
Cable glands	5...14 mm diameter, shielded cable, 0.2...1.5 mm ² cross-section,			
M12 female connector (not supplied)	3...6.5 mm diameter, shielded cable, 0.75 mm ² cross-section			
Weight [approx. - kg]	DN15 / 3/4"	DN25 / 1"	DN40 / 1 1/2"	DN50 / 2"
	2.2	2.4	3.2	3.4

General technical data - continued	
Flow rate measurement¹⁾	
Measuring range	0...7 m ³ /h to 0...90 m ³ /h (see ordering chart on pages 8)
Measurement deviation ²⁾	
from 10% of F.S.* up to F.S.*	±0.4% of the measured value
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 rate	240 ms
Temperature measurement	
Measuring range	-20...+140°C (-4...+284°F)
Measurement deviation ²⁾ for temperatures < 100°C	±1°C (1.8°F)
between 100°C and 140°C	±1.5%
Maximum temperature gradient	10°C/s (18°F/s)
Liquid temperature	
The maximum liquid temperature can be restricted by the ambient operating temperature	Max. conditions for sterilisation process: up to +140°C (284°F) for 60 min.
Liquid pressure max	
DN15, DN25, ¾", 1", 1½"	PN25 (363 PSI)
DN40, DN50, 2"	PN16 (290 PSI)

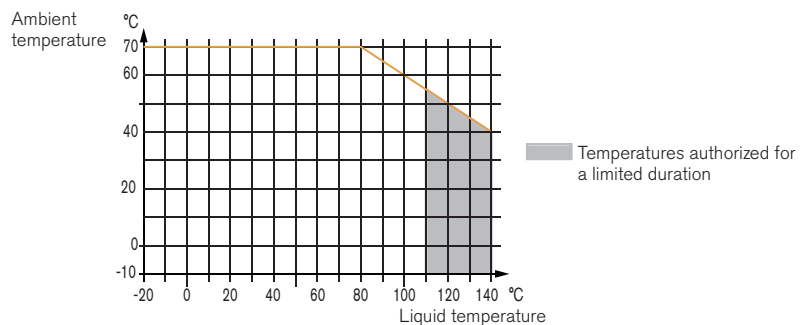
¹⁾ Under reference conditions i.e. measuring fluid=water, ambient and water temperature = 23°C (73.4°F), applying the minimum inlet (40 x DN) and outlet (1 x DN) straight pipe lengths, matched inside pipe dimensions.



²⁾ ="measurement bias" as defined in the standard JCGM 200:2012

* F.S.= of Full scale (see ordering chart on page 8)

Electrical data	
Operating voltage	12...35 V DC filtered and regulated, limited energy source (according to UL 61010-1, paragraph 9.4) Tolerance: ±10%
Reversed polarity of DC	Protected
Power consumption	Max. 5 W (without any consumption of output)
Digital outputs	
Transistor	Overload information (through diagnostic software function) Type: NPN or PNP (wiring dependent), open collector, galvanically isolated Operating modes: pulse (by default), On/Off, PFM, 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 short-circuits
Analogue output	
Current	Open loop detection (through diagnostic software function) 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
4...20 mA output uncertainty	±0.04 mA
4...20 mA output resolution	0.8 µA
Environment conditions	
Ambient temperature	
Operation / Storage	Depends on the liquid temperature (see drawing) -10...+70°C (14...+158°F) / -20...+70°C (-4...+158°F)
Relative humidity	< 85%, without condensation
Height above sea level	max. 2000 m

Ambient and liquid temperatures



Standards, directives and approvals	
Protection class 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.
Standard and directives  EMC Pressure Vibration / Shock	EN 61000-6-2, EN 61000-6-3 Complying with article 3 of §3 from 97/23/CE directive.* EN 60068-2-6 / EN 60068-2-27
Certificate	EHEDG (Type EL - CLASS I) (Pending) 3A (28-04) Inspection certificate 3.1; Certification of compliance ASME BPE; on request: Test report 2.2 for surface finish
Approvals 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	
Intended for an inner pollution	Pollution degree 2, according to EN61010-1
Installation category	Category II, according to UL61010-1

* For the 97/23/CE pressure directive, the device can only be used under following conditions (dependent on max. pressure, pipe diameter and fluid).

Type of fluid	Conditions
Fluid group 1, §1.3.a	Forbidden
Fluid group 2, §1.3.a	DN ≤ 32, or DN > 32 and PN*DN ≤ 1000
Fluid group 1, §1.3.b	PN*DN ≤ 2000
Fluid group 2, §1.3.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.

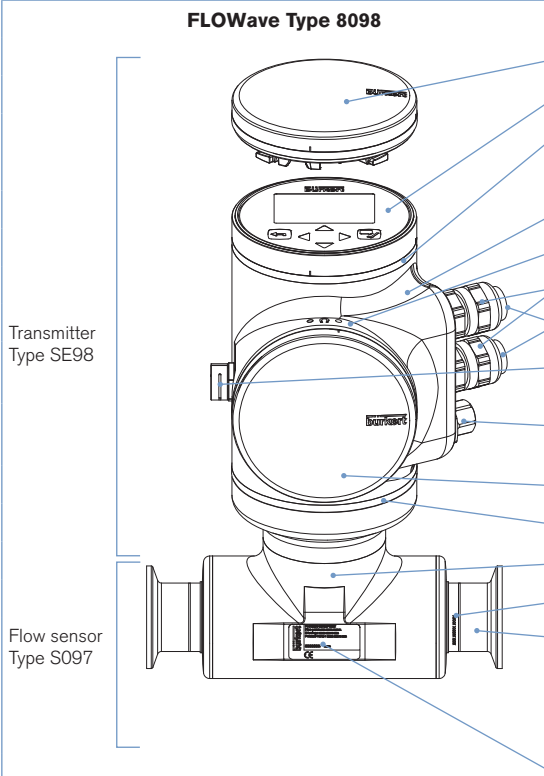
The flow sensor includes the measurement tube equipped with the interdigital transducers, the sensor housing and the clamp process connections in accordance to the standards ISO, ASME BPE.

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 without or with display. The display with high resolution 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 (AO, 4... 20 mA) and one digital output (DO); while a third output signal can be switched between AO and DO 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
		Blind cover or Display module	Stainless steel 304/1.4301
		Multi-colour LED behind seal (used for e.g. indicating the status of the product, based on the NAMUR NE 107 standard)	VMQ silicone
		Transmitter housing	Stainless steel 304/1.4301
		Seal	VMQ silicone
		Cable glands	Nickel plated brass
		Blind plug	Black POM
		Pressure compensating element	Nickel plated brass, with diaphragm in Acrylic-Copolymer, O-Ring in NBR
		M12 male fixed connector (wired to bus) with screwed plug	Nickel plated brass
		Blind cover	Stainless steel 304/1.4301
		Seal	VMQ silicone
		Sensor housing	Stainless steel 304/1.4301
		Sensor measurement tube	<ul style="list-style-type: none"> Stainless steel 316L/1.4435 BN2 for process connection acc. to DIN 32676 Series B Stainless steel 316L/1.4404 ASME BPE for process connection acc. to ASME BPE (DIN 32767 Series C)
		Process connection	
		Name plate	Metallized polyester

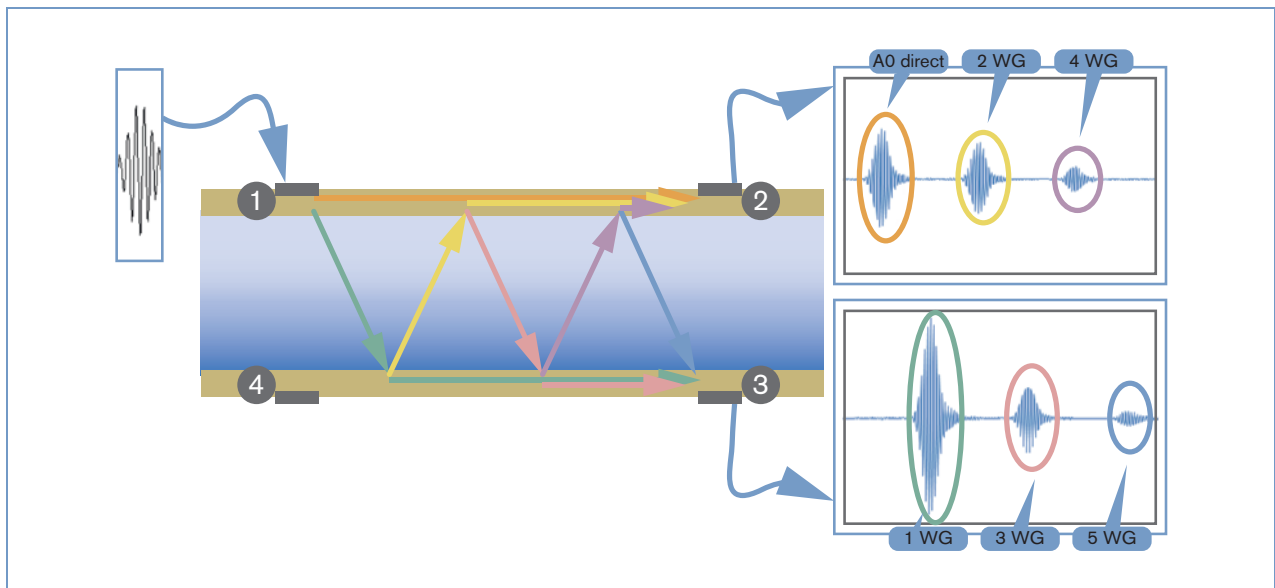
Operating principle

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 and 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 liquids once, twice, three or even four times back and forth. Several measurements can be performed based on the collected information. Many properties of the liquid 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.

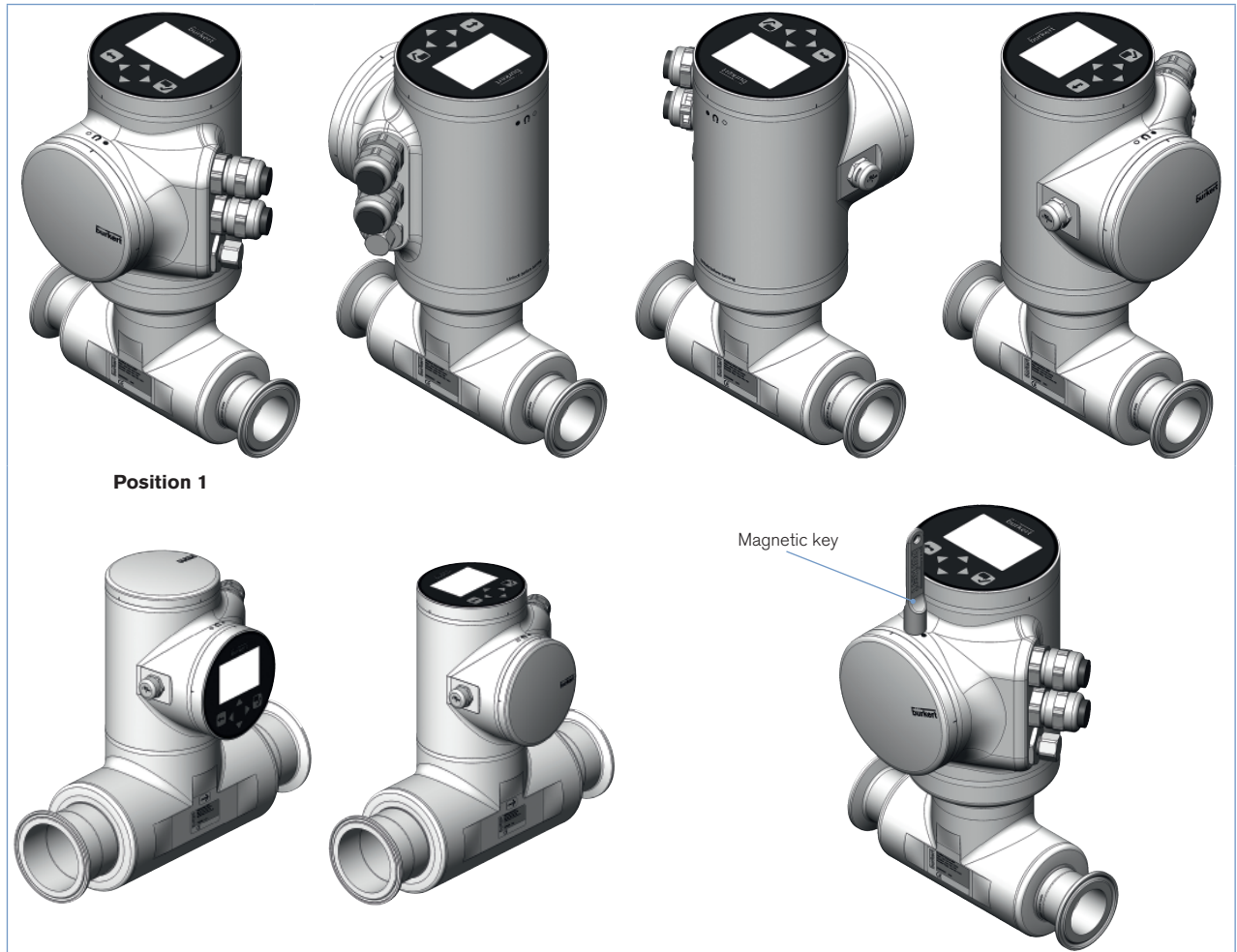
There are two effects appearing:

- A wave propagates along the surface of the tube (see orange line).
- A wave couples into the liquid (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 liquid, 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 liquid (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 magnet. A magnetic key is delivered for this purpose with 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 most important layouts that could lead to turbulence in the flow are shown below, together with the associated prescribed minimum inlet and outlet distances determined according to the standard ISO 9104.1991.

Installation (continued)

The device can be installed into either horizontal 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 diagramm on the right).

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

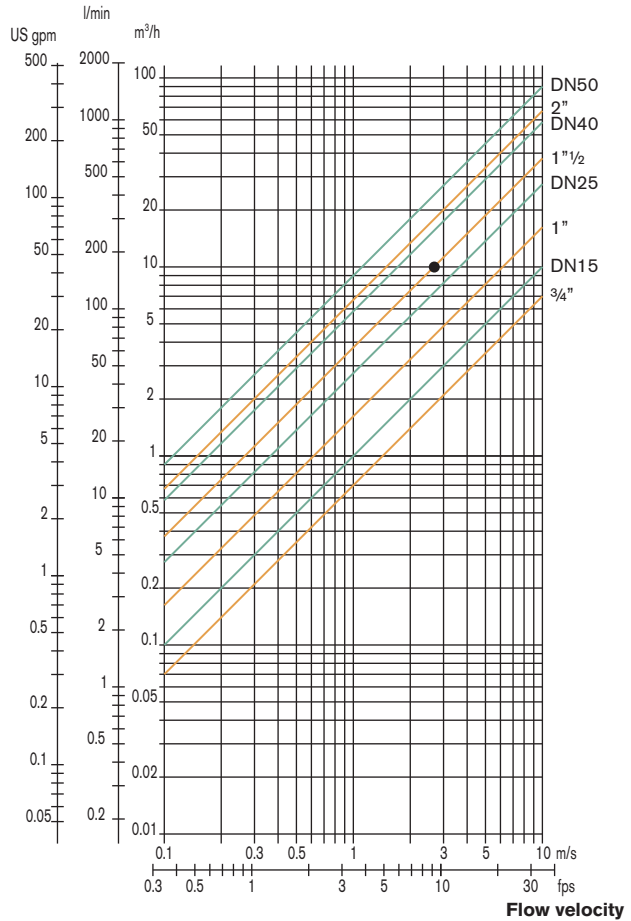
Diagram Flow rate/Velocity/DN

Example:

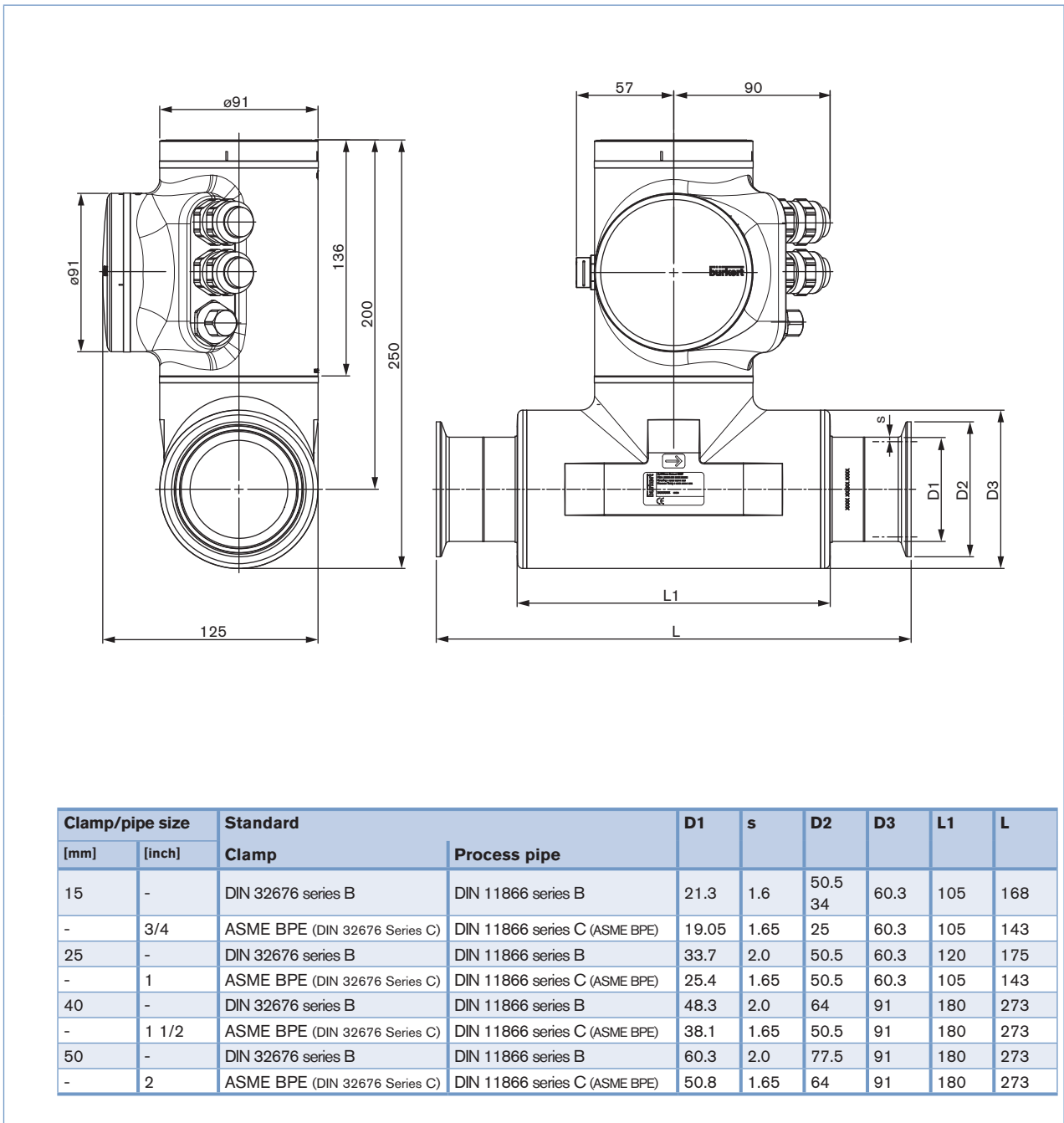
- Flow rate: 10 m³/h
- Ideal flow velocity: 1...3 m/s

For these specifications, the diagram indicates a pipe size of DN40

Flow rate of liquid



Dimensions [mm]



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, D3	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				
		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
		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
		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, D3	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				
		12...35 V DC		7 m³/h	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				
		12...35 V DC		14 m³/h	Yes		566 212		
		No		566 216					
1½	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				
		12...35 V DC		35 m³/h	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				
		12...35 V DC		64 m³/h	Yes		566 214		
		No		566 218					

Ordering chart for accessories for Type 8098

	Description	Item no.
	USB-büs-Interface Type 8920 (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 straight cable plug moulded on cable (2 m, shielded)	438 680

USB-büs-Interface Type 8920



