Calorio 500

Static heat and cooling meter

The Calorio 500 is Secure's next-generation thermal energy meter, succeeding the well-known Calorio 150. This new series is characterised by user-friendly modularity in design and fully meets customer-specific requirements, including simplified system integration, tariff and data logger functions, universal data transfer and connection to system processors.

It is suited as a heat or cooling meter. According to standard EN1434, class 2 is based on the fluid oscillation principle. It covers a wide range of flows for all industrial and district heating and cooling applications or building automation applications. It guarantees high stability and repeatability for reliable and precise flow and thermal energy measurements.

The Calorio 500 design aims for a high degree of flexibility while keeping future standards in mind. The additional pulse inputs allow the connection of hot or cold water, gas, oil, and electricity meters. In addition to its extensive range of data communication options and flexibility for collecting and recording dynamic plant data.

Features

- Calculator for heat meters, cooling meters or combined heat / cooling meters
- Battery or mains powered for increased flexibility
- Calculator upper part can be exchanged while wiring remains in place
- Modules can be retrofitted or replaced at any time without affecting approval
- Self-recognition of optional modules
- Native M-Bus or two extension slots (BACnet, Modbus, and others)
- Optical interface according to IEC 62056-21:2002
- 2- or 4-wire sensors without configuration
- 2 pulse / state inputs and 2 pulse/state open-drain outputs
- User-friendly menu navigation
- Accuracy better than EN 1434 requiremen
- Interchangeable measuring head
- Complete range of pipes 1–1500 m3/h
- Purchase and maintenance costs are reasonable compared with other static flow sensors
- Corrosion-resistant materials
- Protection degree of flow sensor IP68
- Threaded and flanged fittings

- Straight sections of piping of 3 DN in flow and return of any flow meter or heat meter must be respected. For the Calorio 500 up to DN 40 (qp10), the straight sections of piping of 3 DN are already included in the length of the flow sensor
- No moving parts, no wear
- Not sensitive to dirt
- For horizontal, upstream and downstream pipes, independent mounting position
- Common spare parts qp 1–1500 m3/h
- Dynamic range: 1:100 at qp 1–25 m3/h
  1:50 at qp 40–400 m3/h
  1:25 at qp 800–1500 m3/h
- Direct pick-up of voltage pulses without reflectors
- Measurement independent of medium
- Long-term, stable, accurate and reliable measurement, even in poor water quality

SECURE
energy together

Calorio 500

Fluid oscillation flow sensor: The principle

Picture 1: The central part of the flow passes through a Venturi nozzle in the pipe, creating differential pressure to bypass the other part of the flow through the fluid oscillator. In the oscillator, the liquid is led to a nozzle and accelerated to a jet. Opposite the nozzle, the jet is redirected to the left or right into a channel that leads upwards to the sensor head equipped with a piezo sensor. The liquid pressure on the sensor creates an electrical pulse. The liquid flows back to the pipe through a return loop and redirects the jet into the other channel. This action is repeated and a fluid oscillation is created. The frequency of this oscillation is linearly proportional to volume flow. A supplementary benefit is the self-cleaning effect due to its oscillating character.
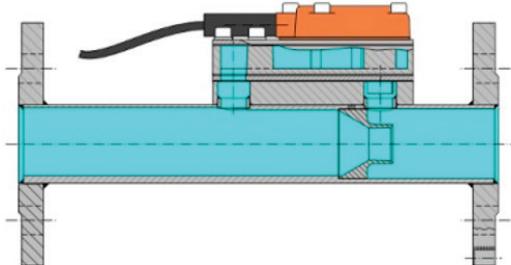
Picture 2: The animated top view of the oscillator shows the velocity differences of the liquid. Red represents the jet accelerated by the nozzle with the highest velocity, while blue represents the jet accelerated at a slower velocity.
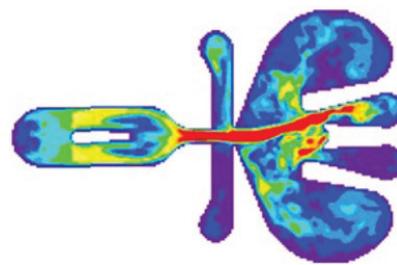
Temperature sensor pair

The temperature sensors, in combination with the Calorio 500, are Pt 500. They come in pairs and must not be separated, extended or shortened. In the case of temperature sensor pairs with a cable longer than 3m, we recommend screened temperature sensor pairs.

Multifunctional calculator
Innovations

- Optimisation of the housing for easier installation
- NFC technology for simplified and user-friendly configuration using Superprog Android.
- Large illuminated dot-matrix display (128×64) for improved navigation
- 2 LEDs indicate, in real-time, the calculator's status
- Fully customisable tariff and data logger functions
- Extended data logging (up to 2 175 entries)
- Modular concept: power supplies, communication and inputs / outputs
- Increased cabling space

Optional Modules

Up to two plug-and-play modules can be retrofitted, either ex-works or on-site, or replaced at any time without affecting the calculator approval. The calculator automatically recognises the following types of modules:
- Analog module with 2 inputs (0..20 mA, 4..20 mA, 0(2) V .. 10 VDC
- Digital module with 2 inputs (state / pulse)
- Digital module with 2 outputs (state /pulse)
- M-Bus
- BACnet / Modbus

Optional radio communication
WM

- Frequency: 868.95 MHz
- Communication: Unidirectional
- Protocol: Wireless M-Bus according to EN 13757-4
- Encryption: AES-128
- Broadcasting interval: Standard 120 sec. (Mode T1/C1,
- encryption mode 5/7)
- Broadcasting performance: 25 mW (14 dbm)

LoRaWAN
- Frequency: 868.95 MHz, EU868, norme by ETSI (EN300.220)
- Communication: Bidirectional
- Protocol: Radian – EN60870-5 (M-Bus)
- Encryption: AES-128
- Broadcasting performance: 25 mW (14dBm)
- Cycle: Standard every 2 hours

Optional Power Supply Modules

One plug-and-play power supply module can be retrofitted, either ex-works or on-site, or replaced at any time without affecting the calculator approval. The calculator automatically recognises the following types of power supplies:
- D Battery 3,6 V
- Mains 24 V (12 VAC to 36 VAC or 12 VDC to 42 VDC)
- Mains 230 VAC (110 VAC to 240 VAC, 50/60 Hz)

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Design

The thermal energy meter consists of a fluidic oscillator flow sensor, a battery or mains-powered calculator and a pair of temperature sensors. Consumption values can easily be read over the display, Software Superprog Windows, or Superprog Android. Communication interfaces like an optical probe, NFC, M-Bus, BACnet, Modbus, wM-Bus or LoRaWAN are also available.

Data logger

The calculator's data logger is fully customisable and allows the following recordings:
• Up to 4 totaliser values
• Average values
• Maximum values
• Event log
The only limitation is the available memory, ten kB. Each value takes 4 bytes of storage except the maximum values and event log values, which take 8 bytes. As a result, up to 2 175 values can be recorded.

Compatibility matrix

Functions	w/o any Power Supply	D-Battery	External Mains
LCD display	Yes	Yes	Yes
Backlight (LCD display)			Yes
NFC interface	Yes	Yes	Yes
Optical interface	Yes	Yes	Yes
M-Bus interface	Yes	Yes	Yes
Outputs	5 Hz	200 Hz	200 Hz
Inputs	5 Hz	200 Hz	200 Hz
Measurement cycle	Slow	Fast	Fast
Energy measurement (temperatures and volume)	Yes	Yes	Yes
Supply of the flow meter		Yes	Yes
Radio		Yes	Yes
Communication Modules 3	Yes	Yes	Yes
Life span (years)	6+1	12+1	5

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Technical data display

Temperature measurement	• Pt 500 according to EN 60751	
	• 2 - or 4-wire	
	• Absolute temperature range	−20 °C to 200 °C
	• Approved range	1 °C to 200 °C
	• Homologation range	3 K to 150 K
	• Response limit	0,2 K
	• Temperature resolution t	0,1 K
	• Temperature resolution Δt	0.01 K
	• Environment class A	E1/M1
Temperature measuring cycle	• Battery operated	10 s
	• Mains operated	3 s
Medium temperature	• Operation	5 °C to 55 °C
	• Storage and transport	−20 °C to 70 °C (dry environment)
Display	Illuminated dot-matrix	128 × 64 pixels
Display units	• Energy	kWh, MWh, MJ, GJ, kBtu, MBtu, Mcal, Gcal
	• Volume	
	• Additional pulse inputs	L, m3, gal (US), kgal (US), ft3 (US)
	• Temperature	Energy or volume °C, °F
Lifespan supply modules	• w/o supply	6 + 1 years (backup for metrological part)
	• D battery	12 + 1 years
Degree of protection	IP code	IP 65 in accordance to IEC 60529
Pulse inputs	Frequencies	maximum 5 Hz maximum 200 Hz
	• Without supply D battery	maximum 200 Hz 0 to 30 V
	• External mains	
	Input voltage	
Pulse outputs	Frequencies	maximum 5 Hz maximum 200 Hz
	• Without supply D battery	maximum 200 Hz
	• External mains output voltage	0 to 60 V
Optical interface	Interface	according to IEC 62056-21:2002
NFC interface	Interface	according to ISO/IEC 14443 Type A
M-Bus interface	• Interface	according to EN 13757-2/3
	• Baud rate	300 to 4800 baud
	• Galvanic isolation	3.75 kV

Technical data flow meter Calorio 500

Dimensions:

Material: Brass (DN 15–DN 40)
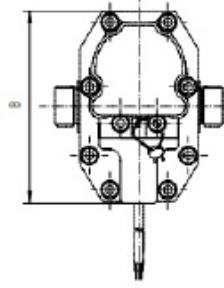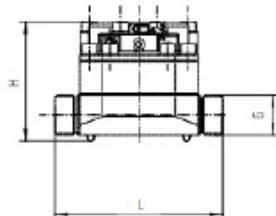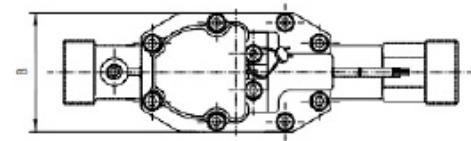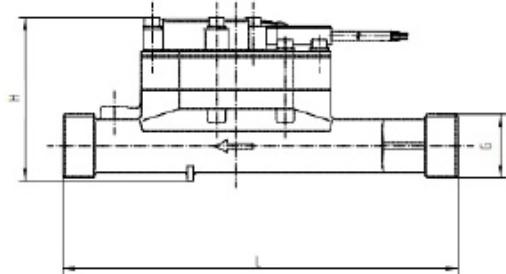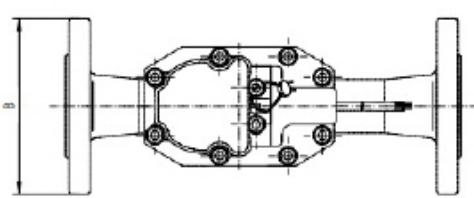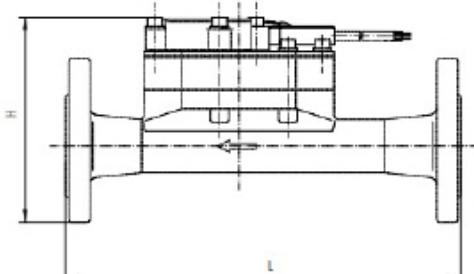
Fig1   Fig2   Fig3

Dimension fluidic oscillator flow sensor Superstatic 440

| qp	DN	G	PN	Fig. No	B (mm)	H (mm)	L (mm)	h (Ø mm)	# bolts (M)
1 m3/h	-	0.75"	16 / 25	1	125	79	110		
1 m3/h	-	1 "	16 / 25		125	79	190		
1,5 m3/h	-	0.75"	16 / 25		125	79	110		
1,5 m3/h	-	1"	16 / 25		125	79	190		
2,5 m3/h	-	1"	16 / 25		125	79	190		
3,5 m3/h		1.25"	16 / 25	2	78	105	260		
3,5 m3/h	25		16 / 25	3	115	134	260	Ø 85	4 (M 12)
6 m3/h		1.25"	16 / 25	2	78	105	260		
6 m3/h	25	-	16 / 25	3	115	134	260	Ø 85	4 (M 12)
10 m3/h		2"	16 / 25	2	78	122	300		
10 m3/h	40		16 / 25	3	150	157	300	Ø 110	4 (M 16)

Technical data flow meter Calorio 500

Dimensions:

Material: Stainless steel (DN 50–DN 250)

Material: Spheroidal cast iron (DN 50–DN 150)

Material: Steel (DN 350–500)
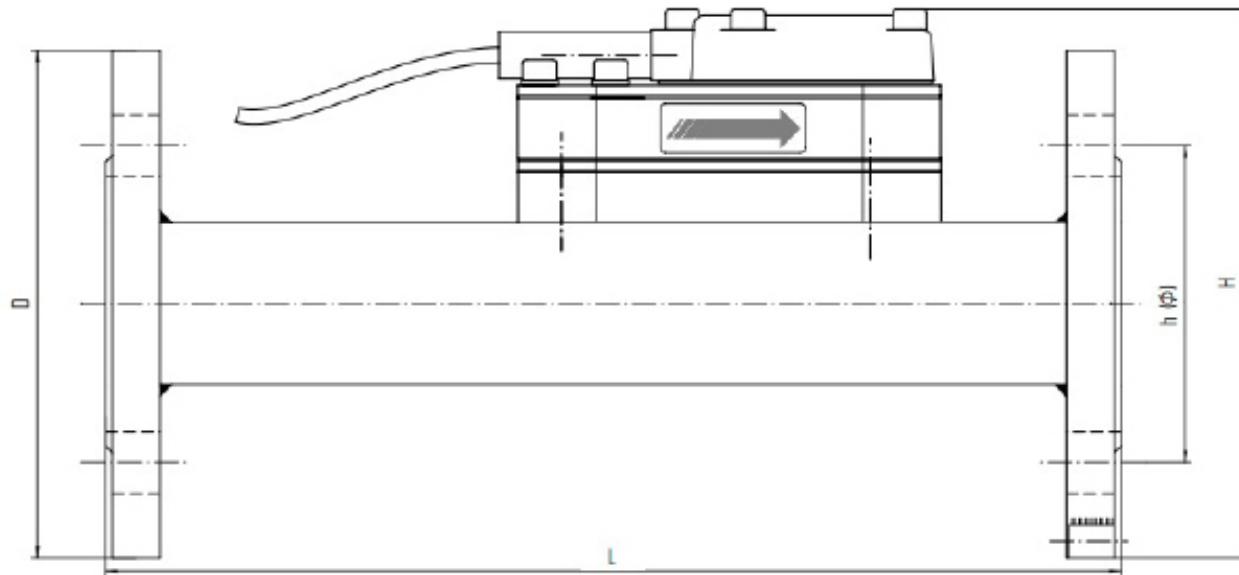
qp	DN	PN	L (mm)	D (mm)	h (Ø mm)	H (mm)	# bolts (M)
15 m3/h	50	16, 25	270	165	Ø125	171	4 (M 16)
25 m3/h	65	16, 25	300	185	Ø145	189	8 (M 16)
40 m3/h	80	16, 25	225	200	Ø160	203	8 (M 16)
40 m3/h	80	16, 25	300	200	Ø160	203	8 (M 16)
60 m3/h	100	16	250	220	Ø180	226	8 (M 16)
60 m3/h	100	25	250	235	Ø190	235	8 (M 20)
60 m3/h	100	16	360	220	Ø180	226	8 (M 16)
60 m3/h	100	25	360	235	Ø190	235	8 (M 20)
100 m3/h	125	16	250	250	Ø210	254	8 (M 16)
100 m3/h	125	25	250	270	Ø220	270	8 (M 24)
150 m3/h	150	16	300	285	Ø240	286	8 (M 20)
150 m3/h	150	25	300	300	Ø250	300	8 (M 24)
150 m3/h	150	16	500	285	Ø240	286	8 (M 20)
150 m3/h	150	25	500	300	Ø250	300	8 (M 24)
250 m3/h	200	16	350	340	Ø295	340	12 (M 20)
250 m3/h	200	25	350	360	Ø310	360	12 (M 24)
400 m3/h	250	16	450	405	Ø355	405	12 (M 20)
400 m3/h	250	25	450	425	Ø370	425	12 (M 27)
800 m3/h	350	10	500	505	Ø460	505	12 (M 20)
800 m3/h	350	16	500	520	Ø470	520	12 (M 24)
1500 m3/h	500	10	500	670	Ø620	670	12 (M 24)
1500 m3/h	500	16	500	715	Ø650	715	12 (M 30)

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Technical data flow meter Calorio 500

qp	Threaded connection	Flanged connection	Length	Mat	PN	Maximal flow qs	Minimal flow qi	Low flow threshold value (50°C)	Thread hole for senor	Weight (*) (**)	Kvs value (at 20°C)	Pressure loss at qp
m3/h	G"	DN	mm		PN	m3/h	l/h	l/h		kg	m3/h	bar
	(EN ISO 228-1)	(ISO 7005-3)										
1	0.75"	15	110	Brass	16/25	2	10	7	Yes	2,9	2,09	0,20
1	1"	20	190	Brass	16/25	2	10	7	Yes	3,2	2,09	0,20
1,5	0.75"	15	110	Brass	16/25	3	15	11	Yes	2,9	2,06	0,25
1,5	1"	20	190	Brass	16/25	3	15	11	Yes	3,2	5,44	0,09
2,5	1"	20	190	Brass	16/25	5	25	18	Yes	3,2	5,21	0,25
3,5	1.25"	25	260	Brass	16/25	7	35	25	Yes	3,5	7,46	0,16
3,5		25	260	Brass	16/25	7	35	25		5,4	7,46	0,16
6	1.25"	25	260	Brass	16/25	12	60	42	Yes	3,5	13,4	0,16
6		25	260	Brass	16/25	12	60	42		5,4	13,4	0,16
10	2"	40	300	Brass	16/25	20	100	70	Yes	4,5	20,9	0,25
10		40	300	Brass	16/25	20	100	70		8,1	20,9	0,25
		(ISO 7005-1)										
15		50	270	SS/CI	16/25	30	150	150		9,1	31,6	0,25
25		65	300	SS/CI	16/25	50	250	175		11,2	51,6	0,25
40		80	225	SS	16/25	80	800	560		14,4	142	0,09
40		80	300	SS/CI	16/25	80	800	560		13,1	142	0,09
60		100	250	SS	16/25	120	1200	840		NA	210	0,10
60		100	360	SS/CI	16/25*	120	1200	840		19	210	0,10
100		125	250	SS/CI	16/25*	200	2000	1400		NA	343	0,10
150		150	300	SS/CI	16/25*	300	3000	2100		27,2	514	0,10
150		150	500	SS	16/25	300	3000	2100		NA	514	0,10
250		200	350	SS	16/25	500	5000	3500		NA	857	0,10
400		250	450	SS	16/25	800	8000	5600		38,1	1372	0,10

						m3/h	m3/h	m3/h				
800		350	550	Steel	10/16	1600	32	22		90/105	2,667	0,10
1500	0.75"	500	500	Steel	10/16	3600	60	42		130/195	5,000	0,10

Degree of protection	Standard		IP 68
Ambient temperatures	• Operation		5 … 55°C
	• Storing and transport		–25 … 70°C
Measurement	Approved temperature range		5 … 130°C

Calorio 500

Pressure loss

Pressure loss
Secure   Calorio 500
Log log