

Calorio 150

Static heat and cooling meter

The Calorio 150 a static heat or cooling meter according to standard EN1434 class 2 based on the fluid oscillation principle, covering a wide range of flows for all applications in district heating and cooling or building automation. The fluid oscillation principle guarantees a high stability and repeatability for a reliable and precise measurement of flow and thermal energy.

The heating and cooling meter consists of the fluid oscillator flow sensor, the integrator battery or mains powered, and a pair of temperature sensors. Consumption values can easily be read over the display or various data interfaces like optical probe, M-Bus, LON, BACnet, Modbus, GSM and so on.

The Calorio 150 integrator is suitable for connecting Pt 500 or Pt 100 temperature sensor pairs with 2 or 4-conducting wire techniques. Volume inputs can be combined with mechanical, magnetic-inductive, ultrasonic or fluidic oscillators flow sensors with a maximum nominal flow rate of 10'000 m³/h. The factor of the pulse value is defined in the flow meter unit. The volume input value is defined when the unit is produced. The pulse value can be modified one single time by means of the push button. The additional pulse inputs allow the connection of hot water, cold water, gas, oil and electricity meters.

Features: Calorio 150

The heat meters Calorio 150 are optimized for the measurement and calculation of energy consumption in district heating systems. They are also extremely well suited to use purely as volumetric flow meters for various media.

- 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 flange fittings
- No straight section necessary up to DN40
- No moving parts, therefore no wear
- Not sensitive to dirt
- Stable
- For horizontal, upstream and downstream pipes, independent mounting position
- Common spare parts 1qp 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 with poor water quality



Application

- Commercial and domestic heat metering
- District heating and cooling schemes
- Home automation
- Energy center heat metering
- Whole building heat metering – Riser, lateral or community

Features: display

- Mains or battery powered
- Exchangeable integrator module, the wiring base with the connections remain in place
- Communication options and functions can be equipped later and without compromising verification of the integrator
- EEPROM for the communication setup is pre-installed in the base part
- Programming of the specific installation data over two pushbuttons
- Fast support via the Internet
- Self-recognition of options and voltage supply
- M-Bus according to EN1434 (300 – 38'400 baud) variable and fix data structure
- Two or four wire connection techniques
- Up to 4 analogue outputs, M-Bus, two open collector outputs and two pulse inputs can be simultaneously used
- Clear and customer-friendly user concept
- Accuracy better than required by EN 1434

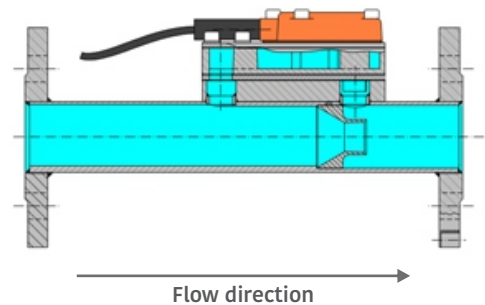
Calorio 150

Fluid oscillation flow sensor: The principle

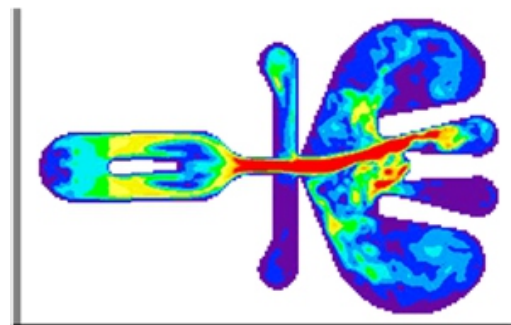
Picture 1: The main part of the flow passes through a Venturi nozzle in the pipe, creating the differential pressure to bypass the other part of the flow through the fluid oscillator.

In the oscillator the liquid is led to a nozzle and accelerated to a jet. Opposite of 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 pressure of the liquid 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 where the action is repeated and fluid oscillation is created. The frequency of this oscillation is linear proportional to the volume flow. A supplementary benefit is the self cleaning effect due to the oscillating character.

Picture 2: The animated top view on the oscillator shows the differences of velocity of the liquid. The jet accelerated by the nozzle with the highest velocity in red, slow velocity in blue.



Picture 1: Section through the flow sensor



Picture 2: fluidic oscillation with jet (RED)

Temperature sensor pair

The temperature sensors and the integrator Calorio 150 in combination with the flow sensor are available as Pt 500 or Pt100 version. The temperature sensors are paired. They are always supplied in pairs and must not be separated, extended or shortened. In the case of temperature sensor pairs with a cable longer than 3 m, we recommend the exclusive use of screened temperature sensor pairs.

Measurement technique

The integrator Calorio 150 with mains power supply records every 3 seconds the supply and the return temperature, with battery power every 30 seconds (D-type battery). The recording of the flow is dependent of the pulse value of the flow sensor and is constantly updated. With the mean flow rate, the temperature difference and the heat coefficient the energy is calculated of the captured medium and displayed on the 8-digit LCD display.

Open system

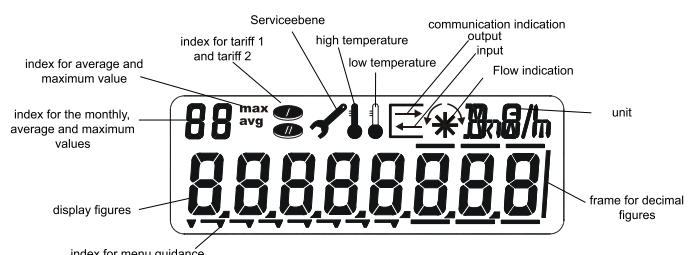
- In open system installations a flow sensor is mounted in the supply pipe and another one in the return pipe. By the difference of the temperatures and the two flows the integrator unit calculates the used heat energy.

Volume measurement

- The integrator Calorio 150 can also be used for volume measurement only. In order to ensure an accurate measurement the average water temperature is parameterized

Display

- In consideration of the person reading the LCD display of the Calorio 150, the display was arranged clear and particularly large.





Technical specifications - Calorio 150

Flow Sensor Calorio 150

qp	Threaded connection	Flanged connection	Length	Mat.	PN	Maximal flow qs	Minimal flow qi	Low flow threshold value (50°C)	Threaded hole for sensor	Weight.	Kvs value (at 20°C)	Pressure loss at qp
m ³ /h	G"	DN	mm		PN	m ³ /h	l/h	l/h		kg	m ³ /h	bar
1	(EN ISO 228-1) 3/4"	(ISO 7005-3) (15)	110	Brass	16/25	2	10	4	Yes	1.8	2.09	0.20
1	1"	(20)	190	Brass	16/25	2	10	4	Yes	2.3	2.09	0.20
1.5	3/4"	(15)	110	Brass	16/25	3	15	10	Yes	1.8	2.06	0.25
1.5	1"	(20)	190	Brass	16/25	3	15	10	Yes	2.3	5.44	0.09
2.5	1"	(20)	190	Brass	16/25	5	25	10	Yes	2.3	5.21	0.25
3.5	1 1/4"	(25)	260	Brass	16/25	7	35	15	Yes	1.96	7.46	0.16
3.5		25	260	Brass	16/25	7	35	15		1.96	7.46	0.16
6	1 1/4"	(25)	260	Brass	16/25	12	60	30	Yes	1.96	13.4	0.16
6		25	260	Brass	16/25	12	60	30		2.9	13.4	0.16
10	2"	(40)	300	Brass	16/25	20	100	50	Yes	6.1	20.9	0.25
10		40	300	Brass	16/25	20	100	50		7	20.9	0.25
		(ISO 7005-1)										
15		50	270	SS/CI	16/25	30	150	75		12.2	31.6	0.25
25		65	300	SS/CI	16/25	50	250	125		12.8	51.8	0.25
40		80	225	SS	16/25	80	800	400		11.5	142	0.09
40		80	300	SS/CI	16/25	80	800	400		12.2	142	0.09
60		100	250	SS	16/25	120	1200	600		14	210	0.10
60		100	360	SS/CI	16/25*	120	1200	600		14.6	210	0.10
100		125	250	SS/CI	16/25*	200	2000	1000		16	343	0.10
150		150	300	SS/CI	16/25*	300	3000	1500		26	514	0.10
150		150	500	SS	16/25	300	3000	1500		23	514	0.10
250		200	350	SS	16/25	500	5000	2500		30	857	0.10
400		250	450	SS	16/25	800	8000	4000		57	1372	0.10

SS: Stainless Steel; CI: Spheroidal cast iron

*: PN 25 only SS

						m ³ /h	m ³ /h	m ³ /h				
800		350	500	Steel	10/16	1600	32	16		90/105	2667	0.10
1500		500	500	Steel	10/16	3000	60	30		130/195	5000	0.10

Degree of protection

Standard IP68

Ambient Temperatures

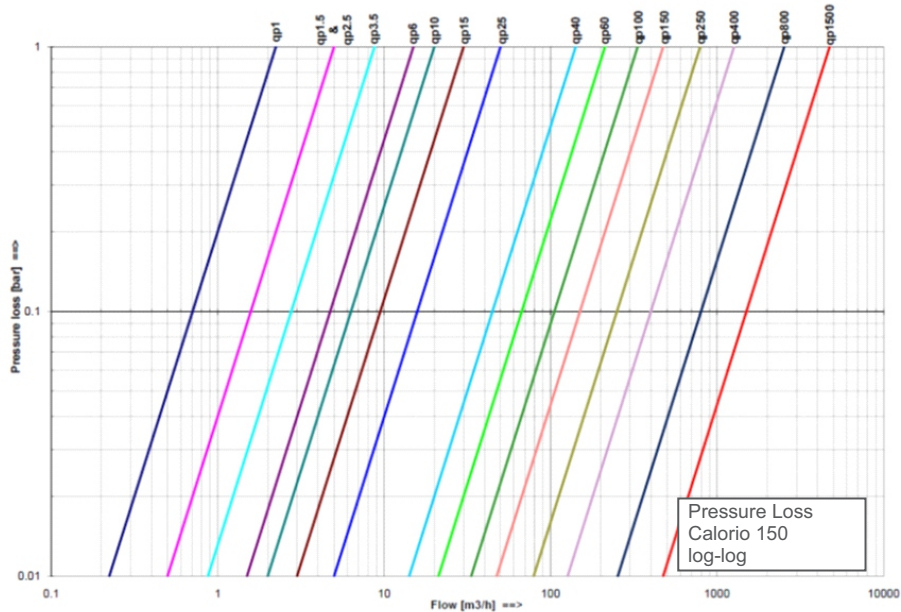
Operation 5...55°C
Storing and transport -25...70°C

Measurement

Approved temperature range 5...130°C



Technical specifications - Calorio 150



Integrator

Temperature measurement	
Pt100 or Pt500	
2- and 4-wire	
Absolute temperature range	-20...200°C
Approved range	2...200°C
Absolute temperature difference	1...150K
Homologation range	3...150K
Response limit	0.2 K
Temperature resolution t (display)	0.1°C
Temperature resolution t (display)	0.01 K

Measuring

Measuring cycle Temperature measurement:	precision better than EN1434-1 request 30 seconds when battery operated (Type D) 3 seconds when mains operated
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Display

Display units	8 digits LCD-Display
Energy	kWh, MWh, GJ, MJ, BTU
Volume	m3, Gallon
Additional pulse inputs	volume or energy
Temperature	°C, °F or K

Voltage supply modular optional

Battery type D	10 + 1 year
Mains	110...240VAC or 220...240VAC – 50/60 Hz
Mains	12...24VAC 50/60 Hz or 12...24VDC

Degree of protection

Flow sensor	IP68
Integrator	IP65



Technical specifications - display

Standard version

Temperature measurement

Pt100 or Pt500	
2- and 4-wire	
Absolute temperature range	-20...180°C
or approved range	0...200°C
	2...200°C
Absolute temperature difference	1...150K
Homologation range	2...150K
Response limit	0.2 K
Temperature resolution t	0.1 K
Temperature resolution Δt	0.01 K
Measuring precision better than EN1434-1 request	

Measuring cycle

Temperature measurement:	
- 30 seconds when battery operated (Standard Type C)	
- 20 seconds when battery operated (Type D)	
- 3 seconds when mains operated	
Volume measurement:	
- Pulse volume are constantly updated	

Medium temperature

Operation	5...55°C
Storing and transport	-25...70°C

Display 8 digit LCD-Display

Display units

Energy	kWh, MWh, GJ, MJ, BTU
Volume	m ³ , Gallon
Additional pulse inputs	volume or energy
Temperature	°C, °F or K

Voltage supply modular optional

Battery	11 + 1 year
Mains	115 or 230VAC – 45/65 Hz
Mains	24VAC 45/65 Hz or 12-24VDC

Data security

Verification- and measurement relevant part	EEPROM
Integrator base	EEPROM

Housing protection

Standard	IP65
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Test and calibration interface

- NOWA	
- Integrated integrator test program	

Pulse input

Input frequency	
Normal mode	max. 5 Hz
Fast mode	
Battery operation	max 5 kHz
Mains operation	max. 12 kHz
Input voltage	0 -30V
Volume pulse inputs	1-10-100-1000 l/pulse or 2.5-25-250-2500 l/pulse
Volume pulse fast	0.0001 –9999.9 pulse

2 additional pulse inputs

Input frequency	
Normal mode	max. 5 Hz
Schnell mode	max. 12 kHz
Input voltage	0 -30V
Pulse values	0.0001 –9999.9 pulse/l

2 pulse outputs

Output frequency	
Normal mode	max. 5 Hz (+/-20%)
Fast mode	max 10 kHz (+/-20%)
Short circuit	max 100 μ A
Pulse values	0.0001 –9999.9 pulse/l

Optical interface

Hardware according to DIN IEC1107	
Protocol according to M-BUS EN1434	

Options

M-Bus (mounted fix at work)	
Fix or variable Data structure	
Potential free, reverse battery proof	
Baud rate 300...9600 baud	

Radio module (mounted fix at work)

Mode	FM, bi-directional
Frequency	433,82 MHz
Transmitting power	< 10mW
Range	ca. 300 m (open filed)



Technical specifications - display

Optional communication module

The communication module can be adapted afterwards and when in operation without damaging the verification validity.

Standard Open Collector module with two outputs

Voltage	maximal 30V
Power	maximal 40 mA
Voltage drop	approx.. 1.3 V at 20 mA
Voltage strength	500 V eff against mass
Pulse width repetition rate	1 : 1
Pulse duration	100 ms transmitting
Max. pulse frequency	5 Hz

Fast Open Collector

module with two outputs

Voltage	maximal 30V
Power	maximal 40 mA
Voltage drop	ca. 1.3 V at 20 mA
Voltage strength	500 V eff against mass
Pulse duration	0.1 – 100 ms in 1 ms step
Max. pulse frequency	100 Hz

Relay output

module with two outputs

Contact potential maximal	100V AC/DC, 50/100mA
Cutt-off voltage	500 mA
Voltage to ground	maximal 100V AC/DC, 50/100mA
Cable length	max. 25 m
Maximal pulse frequency	1 Hz

Passive analog module with two outputs

Power supply	5...15VDC (external power supply)
Power range	4...20mA or 0...20mA
Resistance RL	(Ohm) max. at 24V = 950 Ω
Resolution	12 bit
Max. converter error	0.15% from meas. value + 0.15% from end value

LON module

Network	LONWORKS
Transmitting mean	2-twisted wire, FTT-10A
Power supply bus interface	24VDAC, max. 50 mA
Connection	4-Pol-terminal screw

RS-232 module

Fix or variable data structure
Potential free, reverse battery proof
Baud rate 300...38'400 baud

M-Bus module

Fix or variable data structure
Potential free, reverse battery proof
Baud rate 300...38'400 baud

Radio module

Mode	FM, bi-directional
Frequency	433,82 MHz
Transmitting power	< 10mW
Transmitting range	approx. 300 m (open field)

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