Data sheet

SONOMETER™500
Ultrasonic compact energy meter

Description/Application

**MID examination certificate
No.: DE-13-MI004-PTB011**

The SONOMETER™500 is an ultrasonic static compact energy meter designed for heating applications in buildings, especially residential sub-metering (e.g. in flat stations).

The SONOMETER™500 as a compact energy meter consists of the following components:

- Ultrasonic flow sensor
- Calculator for measuring energy consumption, flow rate and temperatures
- Pair of temperature sensors
- M-Bus interface on board

Features

- MID approval for ultrasonic meter with dynamic range of qi:qp 1:100
- M-bus communication as standard
- Nominal flow range 0.6, 1.5 and 2.5 m³/h
- Temperature range 15 – 90°C
- Unique free-beam principle
- Accuracy class 2 according to EN 1434
- High long term stability, tested and verified at independent AGFW test
- Extensive readable data memory
- Battery supply with 10 years lifetime
- Low pressure loss
- Insensitive against dirt
- Swirl-free flow around reflector
- Robust stainless steel reflector

Special Features

- Power safe mode
- Remote reading via M-Bus or optical interface
- Internal history memory for 10 years
- Display view history memory for 24 month
- Extensive diagnostic display
- Dedicated district energy application telegram
- IZAR@SET parameterization software for user's specific needs (available in 2014)
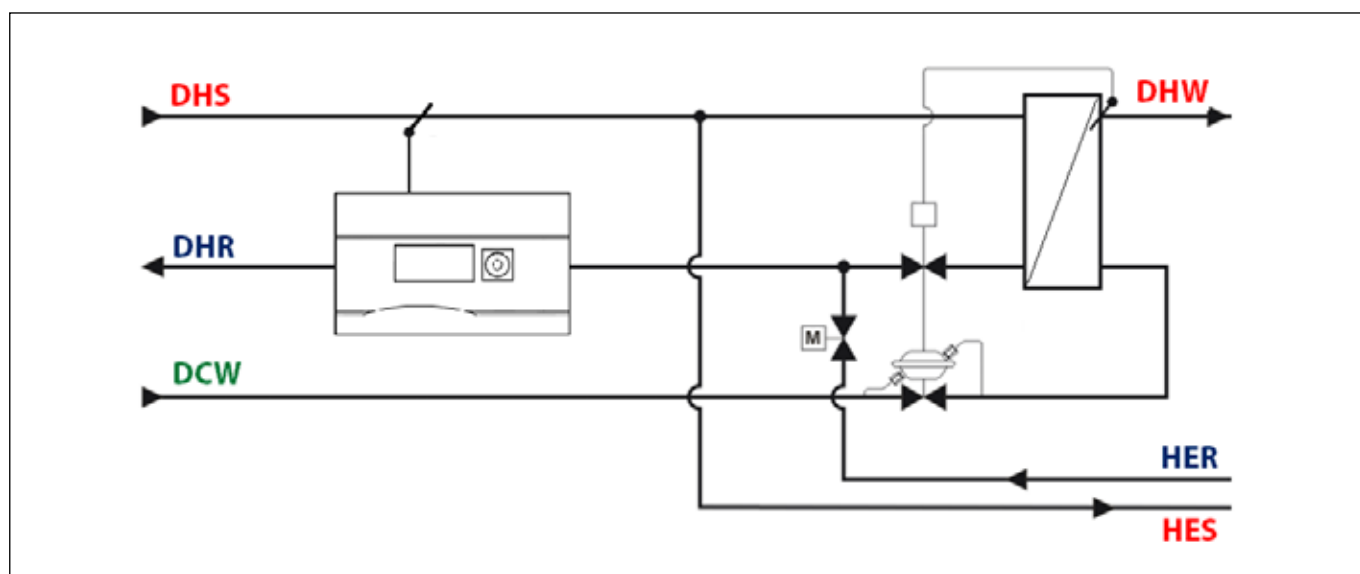
Ordering:
The standard codes are used for ordering.

Heat meter standard codes:

Code no.	Flow sensor [1]	Nominal pressure	Installation	Interface	Cable length [2]	Energy unit
187F0500	qp 0.6 m^3/h / 110 mm thread / DN 15 / G3/4B	PN16	low temp.	M-Bus	1,45 m	kWh (without digit after comma)
187F0501	qp 1.5 m^3/h / 110 mm thread / DN 15 / G3/4B	PN16	low temp.	M-Bus	1,45 m	kWh (without digit after comma)
187F0502	qp 1.5 m^3/h / 130 mm thread / DN 20 / G1B	PN16	low temp.	M-Bus	1,45 m	kWh (without digit after comma)
187F0503	qp 2.5 m^3/h / 130 mm thread / DN 20 / G1B	PN16	low temp.	M-Bus	1,45 m	kWh (without digit after comma)
187F0504	qp 0.6 m^3/h / 110 mm thread / DN 15 / G3/4B	PN16	high temp.	M-Bus	1,45 m	kWh (without digit after comma)
187F0505	qp 1.5 m^3/h / 110 mm thread / DN 15 / G3/4B	PN16	high temp.	M-Bus	1,45 m	kWh (without digit after comma)
187F0506	qp 1.5 m^3/h / 130 mm thread / DN 20 / G1B	PN16	high temp.	M-Bus	1,45 m	kWh (without digit after comma)
187F0507	qp 2.5 m^3/h / 130 mm thread / DN 20 / G1B	PN16	high temp.	M-Bus	1,45 m	kWh (without digit after comma)

[1] Cable length between flow sensor and calculator is 0,5m.

[2] Cable length of M-Bus communication and temperature sensors cable.

Accessories

Ball valves

	Dimension (IG)	Set	Code No.
	G ½″	1	**187F0593**
		12	**087H0118**
	G ¾″	1	**187F0592**
		12	**087H0119**

Adapter for mounting temperature sensors

	Coupling thread	Sensor thread	Set	Code No.
	R ½″	M10×1	1	**087G6075**
			32	**087G6076**

Tailpieces

	Dimension (AGV × AGZ)	Set	Code No.
	Threaded	R ½″ × G ¾ B	2	**087G6071**
		R ¾″ × G 1 B	2	**087G6072**

Adapter for parallel calculator mounting

pieces	Code No.
1	**187F0599**
15	**187F0597**

Adapter for wall calculator mounting

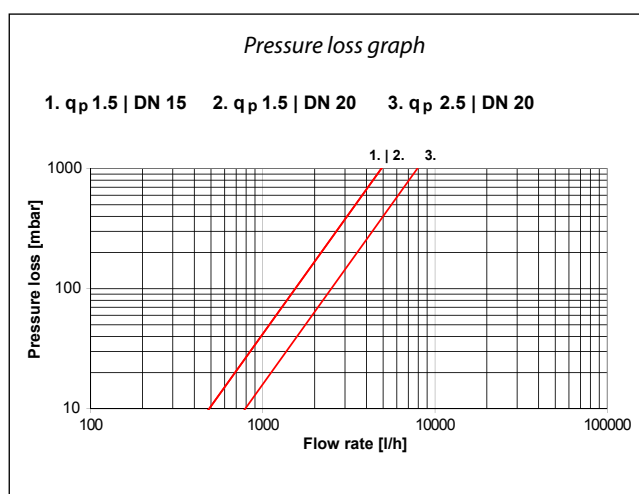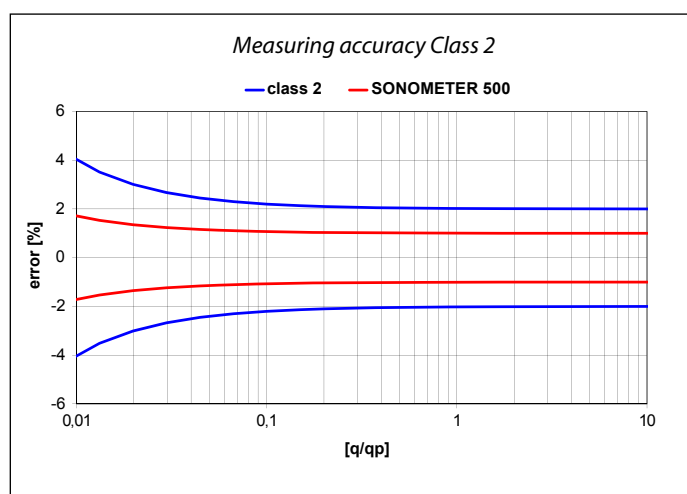| pieces	Code No.
1	**187F0598**
15	**187F0596**

Software

The Windows based IZAR@SET parameterization software is a convenient tool for commissioning and verifying the energy meter.

It is used for:

- commissioning
- reading out measured values
- printing out energy meter logs
- energy meter configuration
- application analysis
- print the meter protocol

Technical data

Flow rate ranges	Nominal	q_p [m³/h]	0.6	1.5	1.5	2.5
	Maximum	q_s [m³/h]	1.2	3	3	5
	Standard minimum	q_i [l/h]	6	15	15	25
	Starting	[l/h]	1	2.5	2.5	4
Diameter	Nominal	DN [mm]	15	15	20	20
	Connections	AGZ	G¾B	G¾B	G1B	G1B
	Tailpiece	AGV	R½	R½	R¾	R¾
Operating pressure	Maximum	PN [bar]	16	16	16	16
Flow sensor	Temperature range	[°C]	15...90			
	Volume measuring cycle	V [s]	2			
Medium		water	If additives are used, it must meet AGFW FW510 specifications			
Pressure loss	At q_p	Δp [mbar]	85	75	75	100
Overall length		[mm]	110	110	130	130
Input	Temperature sensors	Type	Pt 500 with 2-wire leads			
	Sensor current	[mA]	Pt 500 peak < 2; rms < 0.012			
	Measuring cycle	T [s]	16			
	Max. temperature difference	$\Delta\theta_{max}$ [K]	87			
	Min. temperature difference	$\Delta\theta_{min}$ [K]	3			
	Starting temperature difference	$\Delta\theta$ [K]	0.125			
	Absolute temperature measuring range	θ [°C]	15 ... 90			
Supply voltage	Operating voltage	U_N	3.6 V DC (Lithium-battery)			
Basic features	Ambient class		class E1 + M1			
	Protection class		Flow sensor and calculator: IP 54			
	Ambient storage temperature		−25...+ 55 °C (>35°C max 4 weeks)			
	Type		Static energy meter			
	Measuring process		Ultrasonic volume measurement			
Display indication	Display		LCD, 8-digit			
	Units		kWh			
	Total values		99, 999.999			
	Values displayed		Energy - volume - flow rate - power - temperature and more			

Measuring accuracy Class 2

— class 2   — SONOMETER 500

Pressure loss graph

1. q_p 1.5 | DN 15   2. q_p 1.5 | DN 20   3. q_p 2.5 | DN 20

Data Sheet ## SONOMETER™500 – Ultrasonic energy meter

Design and function

The SONOMETER™500 as a compact energy meter consists of the following components:

- Ultrasonic flow sensor
- Calculator with integral hardware and software for measuring flow rate, temperature and energy consumption
- Pair of temperature sensors
- M-Bus interface on board

The calculator contains all the necessary circuits for recording the flow rate and temperature and for calculating, logging and displaying the data. The calculator housing can be mounted directly on the flow sensor or on the wall. The energy meter can be conveniently read from a single-line 8-digit display with units and symbols. A push-button provides user-friendly control of the various display loops.

All failures and faults are recorded automatically and shown on the LC display. To protect the reading data, all the relevant data are saved in a non-volatile memory. This memory saves the measured values, device parameters and types of error at regular intervals.

Ultrasonic flow sensor

The ultrasonic technology of the flow sensor permits very high measuring accuracy and can be used in the forward or return pipe. The flow sensor meets the requirements of MID in class 2. The cable length between the calculator and the flow sensor is 0.5 m.

Supply voltage:

- Lithium battery 3.6 V DC (10 years typical lifetime)

Temperature Sensors

Pairs of Pt 500 ø5.2 mm temperature sensors with 2-wire leads are used. Cable length is 1.5 m.

Interfaces (already built-in)

- Optical: ZVEI interface as standard, for communication and testing, M-Bus protocol.
- M-Bus: Configurable telegram (via IZAR@SET software), according to EN13757. Data reading and parameterization are via two wires with polarity reversal protection.

> ✍
>
> **In AMR (Automatic meter reading) systems the fastest reading interval is every 3 minutes!**

Display control

The readings are displayed on the calculator by a 8-digit LCD with units and symbols.

Loop structure

The SONOMETER™500 display has four loops. Some display windows consist of more (to maximum four) displays that are shown alternately at 1 to 4 second intervals. Some pictures in loops or a complete loop can be deactivated separately.

> ✍
>
> For quick visual guidance, the loops in the display are numbered from 1, 2, 3 or 6.
>
> The main loop with the current data, e.g. for energy, volume and flow rate is programmed as default setting.

Event Memory

Events such as changes and faults are stored in a non--volatile memory with a capacity of up to 127 entries. The following events are recorded:

- Checksum error
- Temperature measurement error
- Ultrasonic operating time measurement errors
- Start and end of test mode
- Set in configuration/field mode
- Battery close to empty

Monthly Memory (available at display in loop6)

The SONOMETER™500 has a history memory of 24 months. The following values are stored in the EEPROM:

- Date / Time
- Cumulated energy
- Cumulated volume

Daily Memory ("Log1" - download via IZAR@SET)

The SONOMETER™500 has an additional history memory Log1. The following values are stored in the EEPROM with 736 entries (2 years):
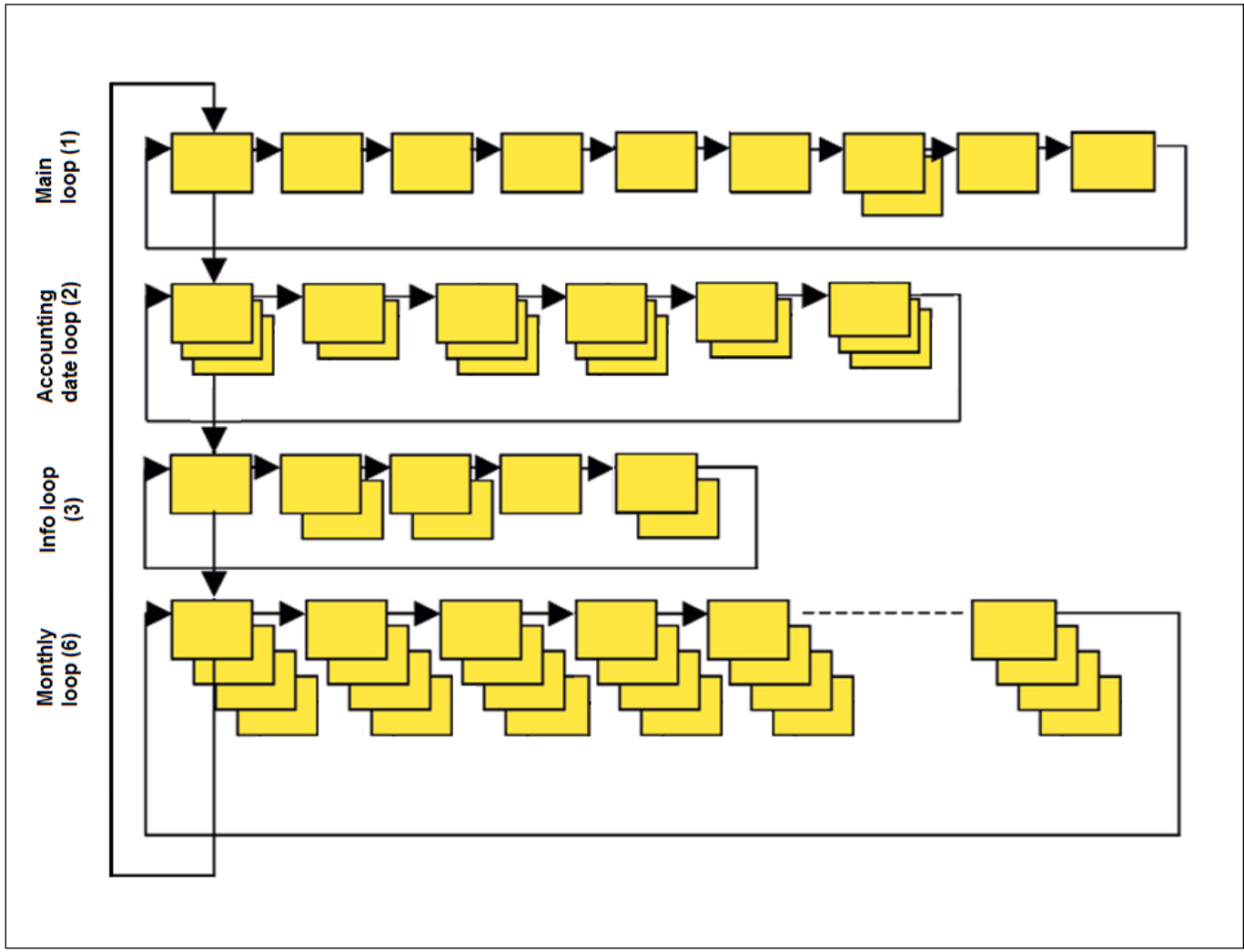
- Main Energy
- Volume
- Error hours
- Time
- Date
- Error state
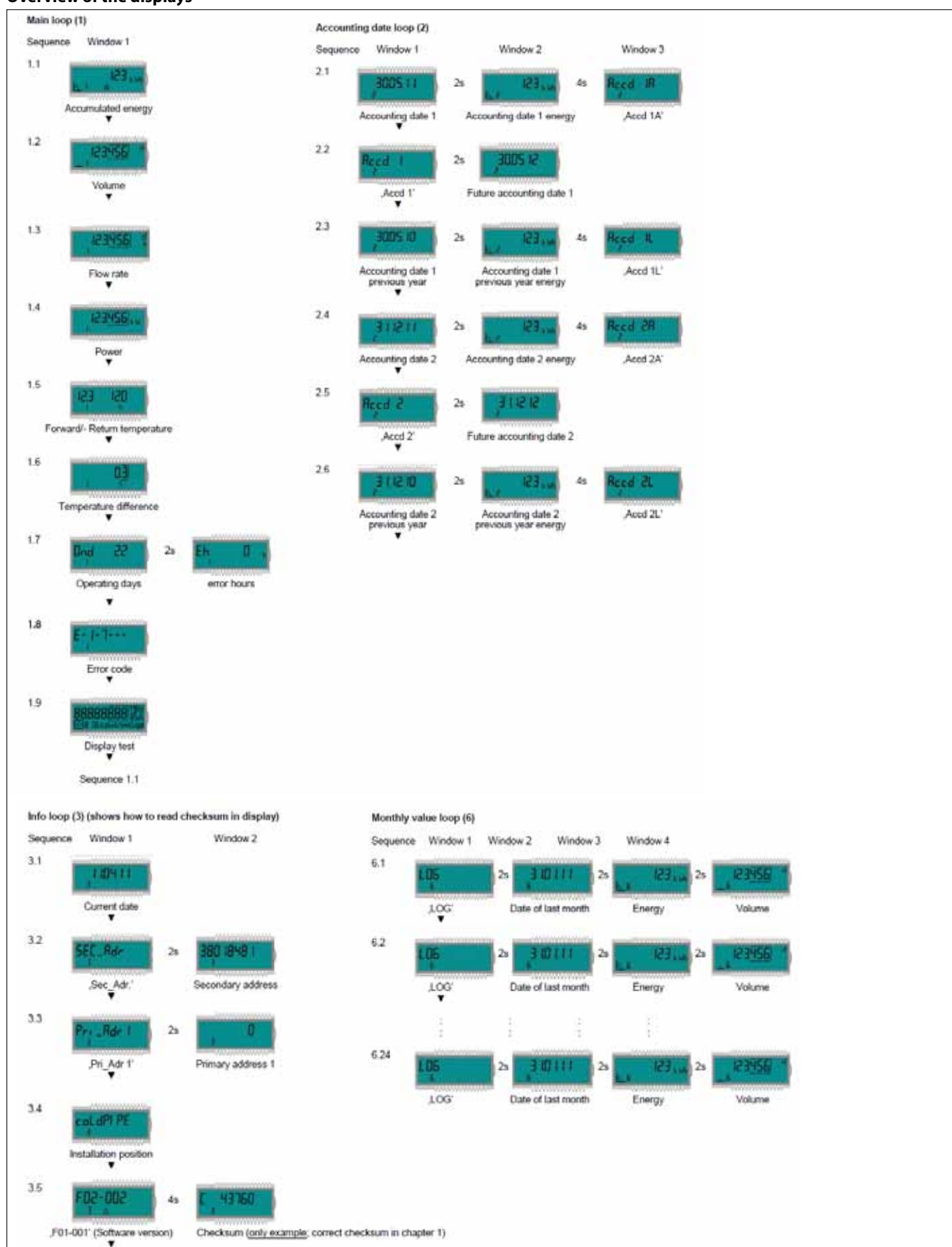
Monthly Memory ("Log2" - download via IZAR@SET)

The SONOMETER™500 has an additional history memory Log2. The following values are stored in the EEPROM with 120 entries (10 years):

- Main Energy
- Volume
- Error hours
- Time
- Date
- Error state

Overview of loops

Overview of the displays

Main loop (1)

Sequence   Window 1

1.1

Accumulated energy
▼

1.2

Volume
▼

1.3

Flow rate
▼

1.4

Power
▼

1.5

Forward/- Return temperature
▼

1.6

Temperature difference
▼

1.7
  2s
Operating days   error hours
▼

1.8

Error code
▼

1.9

Display test
▼
Sequence 1.1

Accounting date loop (2)

Sequence   Window 1   Window 2   Window 3

2.1
 2s 4s
Accounting date 1   Accounting date 1 energy   ‚Accd 1A'
▼

2.2
 2s
‚Accd 1'   Future accounting date 1
▼

2.3
 2s 4s
Accounting date 1   Accounting date 1   ‚Accd 1L'
previous year   previous year energy
▼

2.4
 2s 4s
Accounting date 2   Accounting date 2 energy   ‚Accd 2A'
▼

2.5
 2s
‚Accd 2'   Future accounting date 2
▼

2.6
 2s 4s
Accounting date 2   Accounting date 2   ‚Accd 2L'
previous year   previous year energy
▼

Info loop (3) (shows how to read checksum in display)

Sequence   Window 1   Window 2

3.1

Current date
▼

3.2
 2s
‚Sec_Adr.'   Secondary address
▼

3.3
 2s
‚Pri_Adr 1'   Primary address 1
▼

3.4

Installation position
▼

3.5
 4s
‚F01-001' (Software version)   Checksum (only example; correct checksum in chapter 1)
▼

Monthly value loop (6)

Sequence   Window 1   Window 2   Window 3   Window 4

6.1
 2s 2s 2s
‚LOG'   Date of last month   Energy   Volume
▼

6.2
 2s 2s 2s
‚LOG'   Date of last month   Energy   Volume
▼

6.24
 2s 2s 2s
‚LOG'   Date of last month   Energy   Volume

Informative displays

Loop	Sequence	Window 1	Window 2	Window 3	Window 4
Main loop (1)	1.1	Accumulated energy			
	1.2	Volume			
	1.3	Flow rate			
	1.4	Power			
	1.5	Forward ∕ ⁻ return temperature			
	1.6	Difference temperature			
	1.7	Operating days	Error hours		
	1.8	Error status			
	1.9	Display test			
Loop	Sequence	Window 1	Window 2	Window 3	Window 4
Accounting date loop (2)	2.1	Accounting date 1 date	Accounting date 1 energy	‚Accd 1A'	
	2.2	‚Accd 1'	Future accounting date 1		
	2.3	Accounting date 1 previous year	Accounting date 1 previous year energy	‚Accd 1L'	
	2.4	Accounting date 2 date	Accounting date 2 energy	‚Accd 2A'	
	2.5	‚Accd 2'	Future accounting date 2		
	2.6	Accounting Date 2 previous year	Accounting date 2 previous year energy	‚Accd 2L'	
Loop	Sequence	Window 1	Window 2	Window 3	Window 4
Info loop (3)	3.1	Current date			
	3.2	‚SEC_Adr'	Secondary address		
	3.3	‚Pri_Adr 1'	Primary address 1		
	3.4	Installation position			
	3.5	Software version	Check sum		
Loop	Sequence	Window 1	Window 2	Window 3	Window 4
"6" Monthly value loop	6.1	‚LOG'	Date last month	Energy	Volume
	6.2	‚LOG'	Date month - 1	Energy	Volume
	6.3	‚LOG'	Date month - 2	Energy	Volume
	...	...			
	6.24	‚LOG'	Date month - 23	Energy	Volume

Simple operation

A push-button mounted on the front of the calculator is used to switch to the various displays. The button can be pressed for a short or long time. A short press of the button (< 3 seconds) switches to the next display within a loop and a long press (> 3 seconds) switches to the next display loop. The "Energy" window (sequence 1.1) in the main loop is the basic display.

The calculator switches automatically to power save mode if the button is not pressed for approx. 4 minutes and returns to the basic display when the button is pressed again.

**Installation
of energy meter**

Depending on the application, the energy meter is installed in the forward or return pipe of the system. The installation location is printed on the meter. The flow sensor must be installed so that the direction of flow corresponds to the direction of the arrow on the sensor. Calming sections are not needed before or after the energy meter.

The energy meter can be installed in both horizontal and vertical pipe sections, provided air bubbles cannot collect in the meter.

The flow sensor must always be filled with water. We recommend installing the flow sensor in a tilted position. The minimum system pressure must be 1 bar to avoid cavitation.
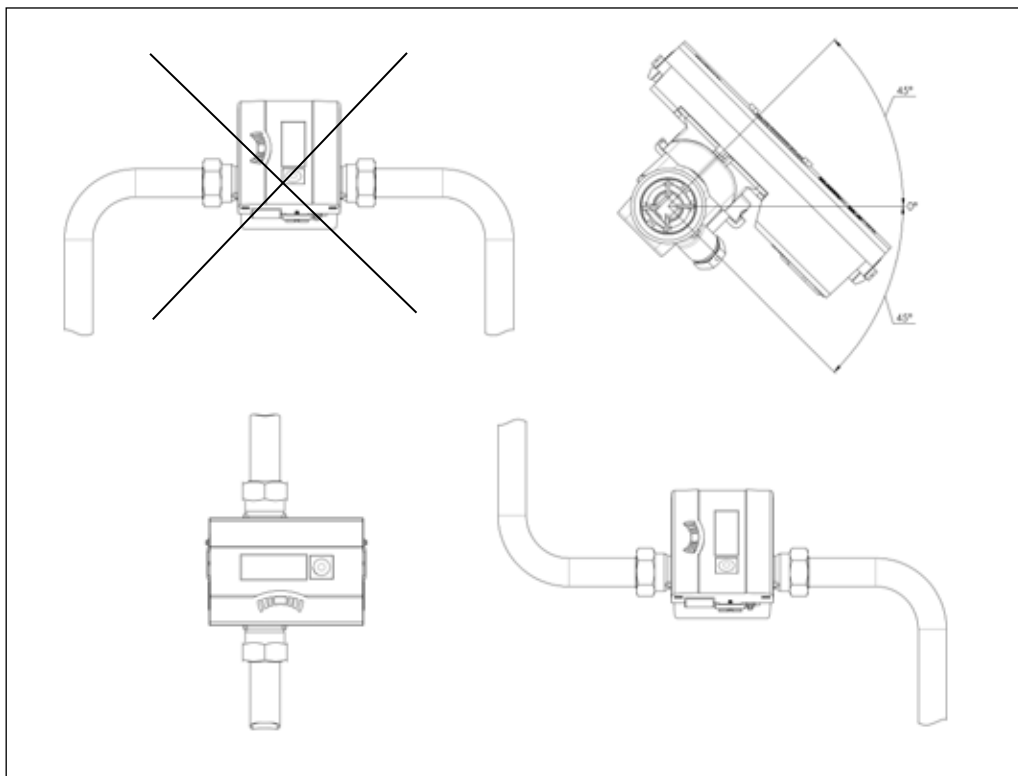
Make sure the energy meter is installed sufficiently far away from possible sources of electromagnetic interference (switches, electric motors, fluorescent lamps, etc...).

To simplify the removal of the energy meter it is recommended to install isolating valves before and after the meter. The energy meter should be installed in an accessible position for service and operating personnel.

For the further information pls. refer to the SONOMETER™500's instructions.

Dimensions
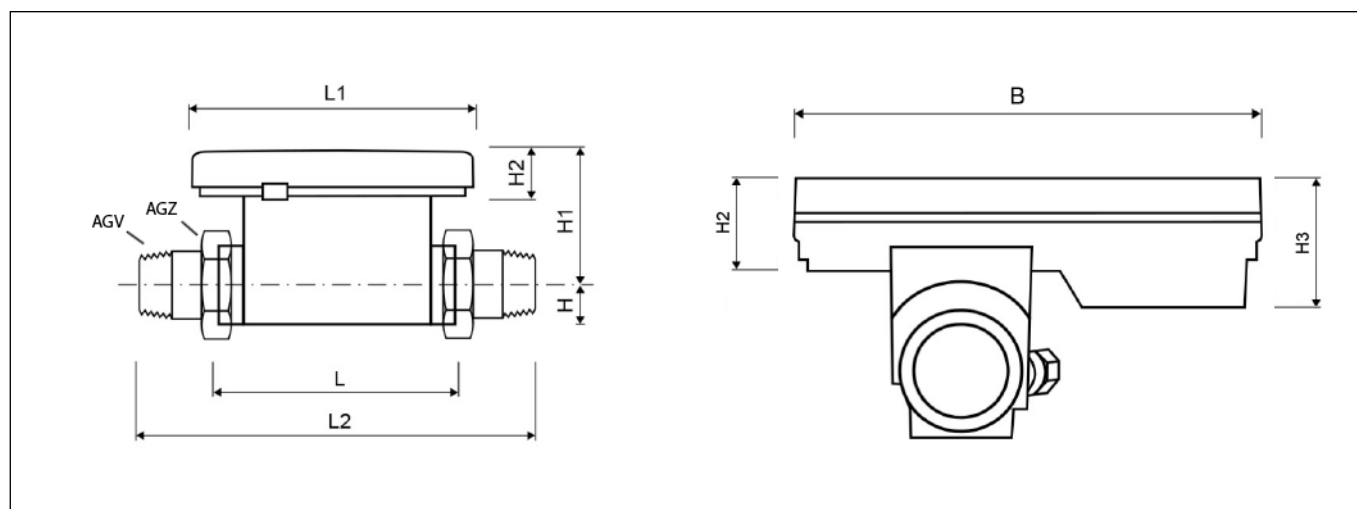
Nominal flow rate	q$_p$	m³/h	0,6	1,5	1,5	2,5
Nominal diameter	DN	mm	15	15	20	20
Overall length	L	mm	110	110	130	130
Overall length with coupling	L2	mm	180	180	225	225
Length of calculator	L1	mm	90	90	90	90
Height	H	mm	14,5	14,5	18	18
Height	H1	mm	55	55	58	58
Height of calculator	H2	mm	27	27	27	27
Height of calculator	H3	mm	40	40	40	40
Width of calculator	B	mm	135	135	135	135
Connection thread on meter	AGZ	Inch	G¾B	G¾B	G1B	G1B
Connection thread of coupling	AGV	Inch	R½	R½	R¾	R¾
Weight		kg	0,70	0,70	0,77	0,77

Temperature sensors

Designation	Type	Dimension D (mm)	L (mm)
Direct mounted	Pt 500	ø 5.2	45