Data Sheet

Horizontal Distribution Units - HDU Multi-port

Application

Danfoss pre-fabricated HDU distribution units are made for distribution and measuring of water-based heating in 2-pipe horizontal systems.

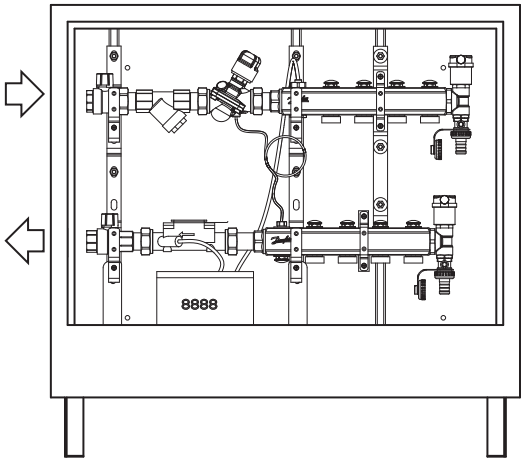
A HDU is easily mounted on the apartment wall and connected to the riser. The radiators in the apartment are connected through the manifold.

The unit design provides a good overview of the installation, which makes after-service easy.

All Danfoss distribution units are equipped with:

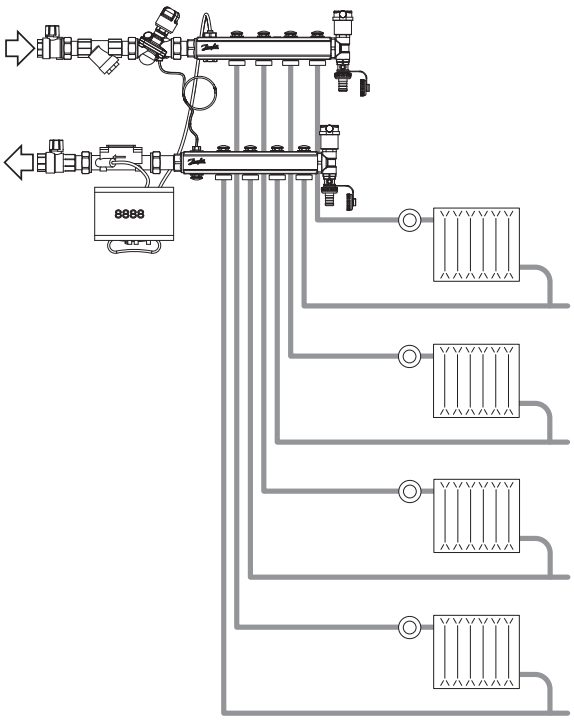
- heat meter, for individual measuring of energy consumption.
- dP controller, to ensure hydraulic stability in the heating system.

HDU multi-port units are wall-mounted and created for parallel radiator distribution. HDU multi-port units are available with 4 or 7 manifold ports, each in two versions with left or right connection.



HDU 4-port
- with left connection

Installation Example



HDU multi-port system

Technical Data

Max. temperature	90 °C
Max. working pressure in heating system piping before the unit	2 bar
Normal required differential pressure over unit (HDU-SF)	0.26 bar*
Max. differential pressure in a control loop	0.22 bar
Max. static pressure	10 bar (PN10)
Connection to riser (in and out)	R ¾"
Connection to manifold (out)	¾"
Power supply (Heat Meter)	A-cell battery, 3.6 VDC

*At differential pressure in control loop 10 kPa at 100% AB-PM setting.

Ordering

HDU-SF	Connection	Code no.
Horizontal Distribution Unit Single Flat - HDU-SF 4-port	left	**003L1222**
Horizontal Distribution Unit Single Flat - HDU-SF 4-port	right	**003L1228**
Horizontal Distribution Unit Single Flat - HDU-SF 7-port	left	**003L1225**
Horizontal Distribution Unit Single Flat - HDU-SF 7-port	right	**003L1231**

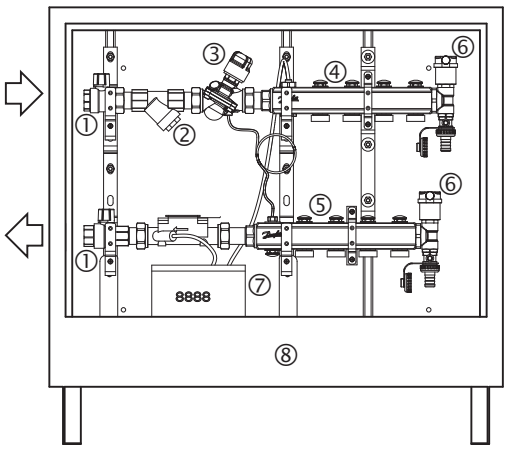
Accessories and Spare Parts	Code no.
Manifold port plug (10 pcs.)	**003L1246**
Capillary tube for AB-PM	**003L8152**
Filter for strainer	**065B8248**

Modules for Heat Meter		Code no.
Communication	M-Bus module	**087G6027**
	L-Bus module (use for external radio)	**087G6035**
	RS232 module	**087G6029**
	RS485 module	**087G6032**
Function	Analogue output module (4 - 20 mA)	**087G6034**
	Combined module (2 pulse inputs / 1 pulse output)	**087G6041**
	Pulse input module (2 inputs)	**087G6037**
	Pulse output module (2 outputs)	**087G6039**

Compression Fittings	Data	Size	Code no.
For PEX tubing (in accordance with ISO 15875)	PN6 G ¾" internal thread	16 x 2 mm	**013G4156**
		20 x 2 mm	**013G4160**
		20 x 2.25 mm	**013G4093**
		20 x 2.5 mm	**013G4161**
For ALUPEX tubing	PN10 G ¾" internal thread	16 x 2 mm	**013G4186**
		20 x 2 mm	**013G4190**
		20 x 2.25 mm	**013G4093**
		20 x 2.5 mm	**013G4191**
For steel and copper tubing	PN10 G ¾" internal thread	16 mm	**013G4126**
		18 mm	**013G4128**
Note! Max. flow temperature given by the tube manufacturer must not be exceeded.			

Design

1. *Ball valve for in- and outlet connection to the riser.*
2. *Strainer to trap dirt, sand etc. from pipe water (replacement filter available as accessory).*
3. *AB-PM automatic balancing valve, combines three functions: differential pressure controller, control valve with linear characteristic and flow limiter.*
4. *Manifold for radiator connection, flow.*
5. *Manifold for radiator connection, return.*
6. *Automatic air vent and drainage (both inlet and outlet has drainage and air vent possibilities).*
7. *Heat Meter for energy measuring, with 8-digit LCD.*
8. *Cabinet (with lockable door).*



Materials in Contact with Water

① **Shut- off valves**	Body, tailpiece, ball	Brass
	Seals	PTFE
	O-ring	EPDM

② **Strainer**	Body	Brass
	Filter	Stainless steel
	O-ring	EPDM

③ **AB-PM valve**	Body, cone (CV), seat (CV)	Brass
	Membrane, O-ring, seat (PC)	EPDM
	Spring, cone (PC), screw	Stainless steel
	Flat gasket	NBR
	Sealing agent	Dimethacrylate Ester
	Capillary tube	Copper

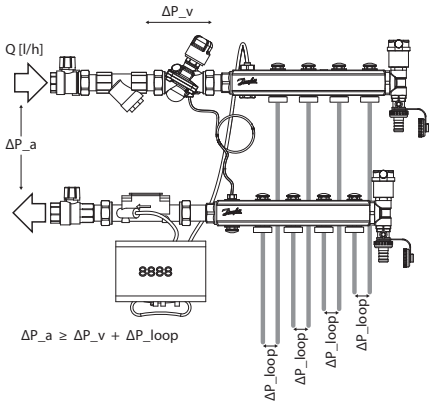
④ & ⑤ **Manifold**	Inlet adapter, shutter, manifold pipe, Euro cone connector	Brass
	O-rings	EPDM

⑥ **Air vent & drainage**	Body	Brass
	Seals	EPDM

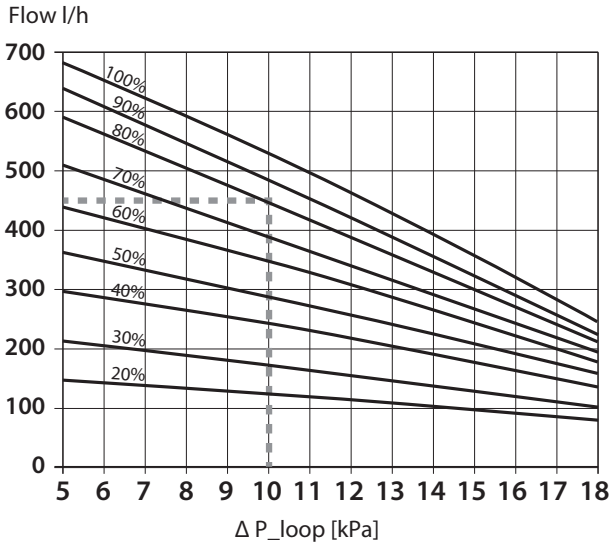
⑦ **Heat Meter**	Body of flow meter	Brass
	Temperature sensors, reflectors	Stainless steel
	Measuring tube	qp 0.6 - 2.5 --> PES qp 3.5 - 60 --> PEEK-GF or PPS-GF

Other parts	Assembly nipples	Brass
	Flat gaskets	Aramide fibres, NBR

Settings



Q = Needed design flow for the loop.
Δ P_loop = Needed design Δ P for the loop.
Δ P_a = available Δ P.
Δ P_V = min needed Δ P for AB-PM (starting Δ P_V) = 16 kPa



Δ P_loop [kPa]	Flow [l/h] - average								
	20%	30%	40%	50%	60%	70%	80%	90%	100%
5	142	209	294	360	443	509	591	642	684
6	138	201	284	346	424	484	563	611	655
7	134	193	274	331	405	460	534	580	626
8	129	185	263	316	386	435	505	548	595
9	125	177	252	300	366	410	476	516	564
10	120	168	240	285	346	386	447	484	531
11	115	160	228	269	326	361	418	452	498
12	110	151	215	253	305	337	388	420	464
13	104	142	202	237	284	313	359	388	430
14	99	134	189	221	263	288	329	355	394
15	93	125	175	205	241	264	299	322	357
16	87	116	161	188	219	240	269	289	320
17	81	107	146	172	196	216	239	256	282
18	74	97	131	155	174	192	209	222	243
19	68	88	116	138	150	168	179	189	203
20	61	79	100	120	127	144	148	155	162

Example Given:
Design flow trough radiatorsloop: 450 l/h
Pressure drop trough the loop at design flow: 10 kPa

Solution:
Set to 80 %, AB-PM will control differential pressure of 10 kPa when design flow is achieved. It will at any loads including keep it under 22 kPa at zero load, while limiting the flow to radiator system to 450 l/h.

AB-PM Automatic Balancing Valve

AB-PM is a combined automatic balancing valve. It features three functions in a compact valve body:

1. Differential pressure controller.
2. Control valve with linear characteristic.
3. Flow limiter.

Benefits:

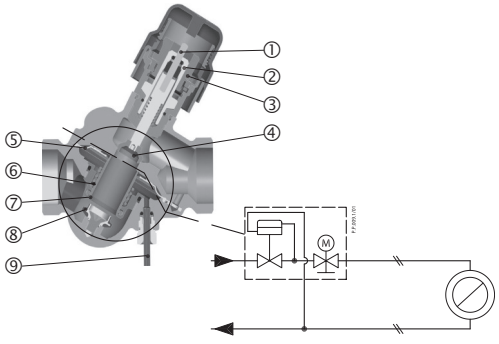
- Reliable heating system resulting in proper heat distribution even at partial loads and noise free operation based on stable low Δp over thermostatic radiator valves even in installation where higher pump head is needed.
- Lower heating cost.
- Better indoor temperature control • Faster in simpler installation with less installation space needed.

Technical data

Nominal diameter		DN20
Control valves characteristic		Linear
Shut-off leakage rate		Acc. to ISO 5208 class A - no visible leakage
CV stroke		2.25 mm
Connection	Ext. thread ISO 228/1	G 1 A
	Actuator	M 30 x 1.5

Design

1. Spindle.
2. Stuffing box.
3. Pointer.
4. Control valve's cone.
5. Membrane.
6. Main spring.
7. Hollow cone (pressure controller).
8. Vulcanized seat (pressure controller).
9. Impulse tube.

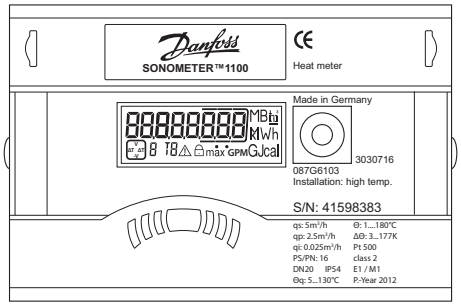


AB-PM is a combined automatic balancing valve. It is working as Δp controller, flow limiter and zone controller. Higher pressure acts on the upper side of the control diaphragm (5) while via an impulse tube (9) lower pressure in the return pipe acts on the lower side of the diaphragm. When available pressure increases at partial loads, the membrane closes and thus keeps stable Δp inside the controlled loop. Δp controller keeps constant differential pressure on the controlled loop including the control part of AB-PM (similar as if ASV-I would be integrated into ASV-P).
The control part of AB-PM is working as a flow limiter. This enables to set both the design flow as well as needed Δp. The flow rate is defined by presetting AB-PM, based on pressure demand of the loop. With actuator mounted on the valve, AB-PM can be used as zone valve. When connected to the room controller with time programs, functions such as night setback, holiday mode, etc become available.

Sonometer 1100 Heat Meter

The SONOMETER™1100 is an ultrasonic static compact energy meter especially designed for heating, cooling or combined heating/cooling application in local and district energy systems. The SONOMETER™1100 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.



Features

- Complete dynamic range: ≥ 1 : 1500.
- Lithium battery, 230 V AC or 24 V AC mains unit.
- Battery lifetime 11 years (16 years optional).
- Unique free- beam principle.
- Swirl-free flow around reflector.
- Lower pressure loss.
- Robust stainless steel reflector.
- Insensitive to dirt.
- Measuring accuracy meets the requirements of EN 1434 (MID) class 2.

Special features

- Remote reading via M-Bus, L-Bus, RS 232, RS 485, Radio or optical interface.
- Individual remote reading (Automatic Meter Reading) with add on modules Plug & Play.
- 2 communication ports (e.g. M-Bus + M-Bus).
- Insensitive to presence of magnetite parts in heating water.
- Straight parts before and after HDU-SF are not required.
- History memory for 24 months.
- Extensive diagnostic displays.
- IZAR@SET parameterization software on Windows basis guarantees optimum adaptation to the user's specific needs.

Software

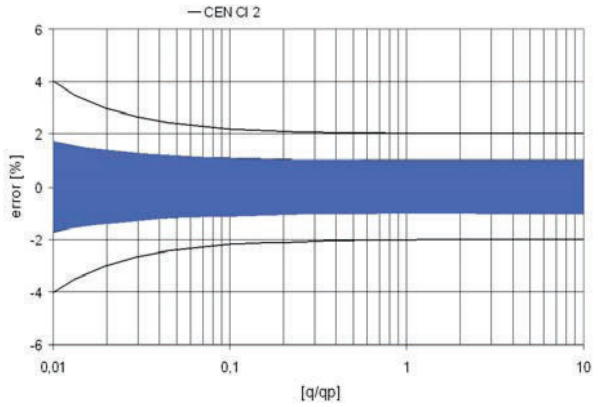
The IZAR@SET parameterization software on windows basis is a convenient tool for handling the energy meter. The IZAR@SET software is available on web site www.hydrometer.de.
It is used for:

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

Technical Data

Input	Temperature sensors	Type	Pt 500 with 2-wire leads
	Sensor current	mA	Pt 500 peak < 2; rms < 0.012
	Measuring cycle	T s	Mains unit supply: 2 (A-cell battery: 16; D-cell battery: 4)
	Max. temperature difference	Δθmax K	177
	Min. temperature difference	Δθmax K	3
	Starting temperature difference	Δθmax K	0.125
	Absolute temperature measuring range	θ °C	1...180
Supply voltage	Operating voltage	U_N	3.6 V DC (Lithium-battery) / 230 V AC / 24 V AC
Basic features	Ambient class		EN 1434 class E1 + M1
	Protection class		IP 54
	Type		Static energy meter to EN 1434 (MID)
	Measuring process		Ultrasonic volume measurement
Display indication	Display		LCD, 8-digit
	Units		MWh - kWh - GJ - Gcal - MBtu - gal - GMP - °C - °F - m^3 - m^3/h
	Total values		99 999 999 - 9999 999.9 - 999 999.99 - 99 999.999
	Values displayed		Power - energy - flow rate - temperature - volume

Measuring accuracy to EN 1434 Class 2



Design and Function

The SONOMETER™1100 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.
- Optimized pair of temperature sensors.

The calculator contains all the necessary circuits for recording the flow rate and temperature and for calculating, logging and displaying the data. 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 (EEPROM). 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 supply or return line. The flow sensor meets the requirements of EN 1434 / class 2.
Supply voltage: Lithium battery 3.6 V DC A-cell (11 years typical lifetime).

Temperature Sensors

Pairs of Pt 500 temperature sensors with 2-wire leads are used.

Interfaces

- Optical: ZVEI interface as standard, for communication and testing, M-Bus protocol.
- M-Bus: The M-Bus communication module is a serial interface for communication with external M-Bus control centre. The module contains a 2-pole terminal strip with terminals marked 24, 25, which are connected to M-Bus control centre. M-Bus protocol to EN 1434-3 standard.
  L-Bus: Adapter for external radio module; configurable telegram, according to EN1434-3. Data reading and parametrization are via two wires with polarity reversal protection. M-Bus protocol.
- RS232:The RS232 communication module is a serial interface for communication with external devices, e.g. PC. The module contains a 3-pole terminal strip with terminals marked 62(Dat), 63(Req) and 64(GND). A special adapter cable is required for connection. (order no. 087H0121).
- RS485: The RS485 communication module is a serial interface for communication with external devices, e.g. PC.
  The module contains a 4-pole terminal strip with terminals marked "D+", "D-", "+12V", "-12V".
  The module needs an external power supply of 12 V DC ±5 V.
- Pulse output: The module contains connections for 2 pulse outputs, , proportional to the flow or heat consumption. The module contains a 4-pole terminal strip with pulse input 1 marked as “O1 - |_” and input 2 as “O2 - |_”. External supply: Vcc = 3-30 V DC. Output current < 20 mA with a residual voltage of < 0.5 V Open collector (drain) Electrically isolated Output 1: f < 4 Hz. Pulse duration: 125 ms ±10 %. Pulse break: > 125 ms –10 %
- Output 1:
  - Output frequency: f < 4 Hz
  - Pulse duration: 125 ms ±10 %
  - Pulse break: > 125 ms –10 %
- Output 2:
  - Output frequency: f < 100 Hz
  - Pulse duration
  - Pulse break ~1:1
- Volume pulse value is configurablevia IZAR@SET software
- Pulse input: Module for two additional pulse counters. The module contains a 4-pole terminal strip with pulse input 1 marked as “I1 - |_” and input 2 as “I2 - |_”.
- Pulse inputs 1 and 2 are programmable for a value of: 1, 2.5, 10, 25, 100, 250, 1000, 2500 litres per pulse.
- Possible units are all the energy units available in the meter, the volume unit m^3 or no unit
- Input frequency is in the range < 8 Hz. Min. pulse duration 10 ms.
- Input resistance 2.2 MΩ.
- Terminal voltage 3 V DC.
- Data is accumulated separately in registers
- Data is readable as IN1 and IN2 in the display and can be transmitted over the communication modules
- Cable length up to 10 m
- The combined module is equipped with 2 inputs and 1 output. Combined pulse input / output:The pulse input specification is the same as that of the pulse input module above. The pulse output specification is the same as pulse output module above, but not electrically isolated. pulse duration /pulse break ~ 1:1. Configurable via IZAR@SET software.
- Analogue output:
  The module contains connections for 2 passive analogue outputs, which can be programmed as desired using the IZAR@SET software. The outputs are marked on the terminal strip as “1” and “2” with the respective polarity “+” and “–”.
- Passive; external power supply: 10…30 V DC
- Current loop 4 … 20 mA, where 4 mA = 0 value; 20 mA = programmed max. value
- Overload up to 20.5 mA, then fault current
- Errors are generated at 3.5 mA or 22.6 mA (programmable)
- Output values: power, flow rate, Configurable via IZAR@SET software.

Slot 1

- Analogue output module (4-20 mA).
- Combined module (2 pulse inputs / 1 pulse output).
- Pulse input module (2 inputs).
- M-Bus module.
- L-Bus module (use for external radio).
- RS232 module.
- RS485 module.

Slot 2

- Pulse output module.
- Combined module (2 pulse inputs / 1 pulse output).
- Pulse input module (2 inputs).
- M-Bus module.
- L-Bus module (use for external radio).
- RS232 module.
- RS485 module.

Event Memory

Events such as changes and faults are stored in a nonvolatile 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.
- Changing of the main configuration.

Monthly Memory

The SONOMETER™1100 has a history memory of 24 months. The following values are stored in the EEPROM on the programmable interval (daily, weekly, monthly):

- Date/ Time.
- Cumulated energy.
- Tariff energy 1.
- Tariff energy 2.
- Tariff definition 1.
- Tariff definition 2.
- Cumulated volume.
- Error hour counter.
- Value of max. flow.
- Time max. flow.
- Date max. flow.
- Value of max. power.
- Time max. power.
- Date max. power.
- Pulse input counter 1.
- Pulse input counter 2.
- Pulse 1 definition.
- Pulse 2 definition.
- Operating days.
- Max. forward temperature.
- Time max. forward temperature.
- Date max. forward temperature.
- Max. return temperature.
- Time max. return temperature.
- Date max. return temperature.

Log Memory

The large two log memory blocks are used to store consumption values. The storage frequency can be selected from various storage intervals (1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60 minutes or the default setting of 24 hours, Day in the month, Day of the week, (1024 seconds), 15th or end of month).
The data saved in the log memory can be used for the following analyses:

- Reading the calculator on a certain day. Example: If the day for reading is 01.10, the calculator reading is displayed for the period from 01.10 of the previous year to 30.09 of the current year.
- Comparison of the last consumption period with the preceding period.

Extract of possible log memory settings

Memory block	Storage interval	Values	Date block size example	Number of data records	Recording period
area 1	1 hour	Error status, overload time temperature, overload time flow rate, supply temperature, return temperature, date and time, energy, tariff energy 1, tariff energy 2, tariff definition 1, tariff definition 2, volume, error day counter	16 byte	556	23 days
area 2	24 hours		16 byte	299	299 days
area 1	1 hour		8 byte	1113	46 days
area 2	24 hours		8 byte	599	599 days

Max. Actual Values Memories

The calculator creates maximum values for power, flow rate and temperatures based on consumption time, which are stored in the EEPROM. The integration intervals are adjustable to 6, 15, 30 or 60 minutes, 24 hours (and 1024 seconds). Default setting is 60 minutes.

Tariff Function

The calculator offers four optional tariff memories for monitoring plant load states for limit tariffs. Extensive tariff conditions make it possible to adapt the energy meter individually to the required customer-specific applications.

The following limit types are possible (this example applies to the display with 3 decimal places):

Type	LIMIT	LIMIT resolution
ΔT	1 ... 255 °C	1 °C
T_R T_F	1 ... 255 °C	1 °C
P	1 ... 255 °C	1 kW
Q	100 ... 25 500 l/h	100 l/h
Z		15 minutes

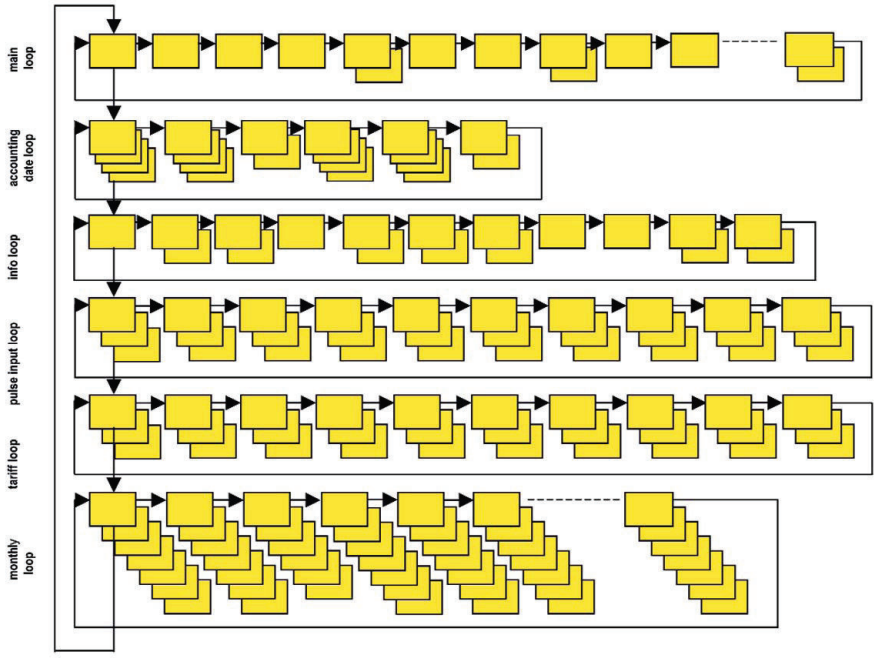
Display Control

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

Loop Structure

The SONOMETER™1100 display has six loops. Some display windows consist of two (to maximum seven) displays that are shown alternately at 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 to 6.
The main loop with the current data, e.g. for energy, volume and flow rate is programmed as default setting.

Overview of Loops



Informative Displays

Loop	Sequence	Window 1	Window 2
"1" Main loop	1.1	Accumulated energy	
	1.2	Volume	
	1.3	Flow	
	1.4	Power	
	1.5	Forward temperature	Return temperature
	1.6	Difference temperature	
	1.7	Operating days	
	1.9	Error status	
	1.10	Display test	

Loop	Sequence	Window 1	Window 2	Window 3
"2" Accounting date loop	2.1	Accounting date 1 (date 1)	Accounting date 1 energy	'Accd 1A'
	2.2	Next accounting date 1 (date 1)	Next accounting date 1 energy	'Accd 1L'
	2.3	Previous accounting date 1 (date 1)	Previous accounting date 1 energy	'Accd 1'
	2.4	'Accd 1'	Date of next accounting date 1	
	2.5	Accounting date 2 (date 2)	Accounting date 2 energy	'Accd 2A'
	2.6	Next accounting date 2 (date 2)	Next accounting date 2 energy	'Accd 2L'
	2.7	Previous accounting date 2 (date 2)	Previous accounting date 2 energy	'Accd 2'
	2.8	'Accd 2'	Date of next accounting date 2	

Loop	Sequence	Window 1	Window 2
"3" Info loop	3.1	Current date	
	3.2	'SEC_Adr'	Secondary address
	3.3	'Pri_Adr 1'	Primary address 1
	3.4	'Pri_Adr 2'	Primary address 2
	3.5	Installation position	
	3.6	'Port 1'	No. of the mounted module at port 1
	3.7	'Port 2'	No. of the mounted module at port 2
	3.8	Status integrated radio	(Sequence will be shown only in meters with integrated radio)
	3.9	No. of error hours	
	3.10	'F01-001' (software version)	Checksum

Loop	Se-quence	Window 1	Window 2	Window 3
"4" Pulse input loop	4.1	'In1'	Accumulated values pulse input 1	'PPI' pulse value 1
	4.2	'In2'	Accumulated values pulse input 2	'PPI' pulse value 2

Loop	Se-quence	Window 1	Window 2	Window 3	Window 4	Window 5	Window 6	Window 7
"5" Tariff loop	The tariff loop is switched off as a standard at the heat meter or meter for cooling.							

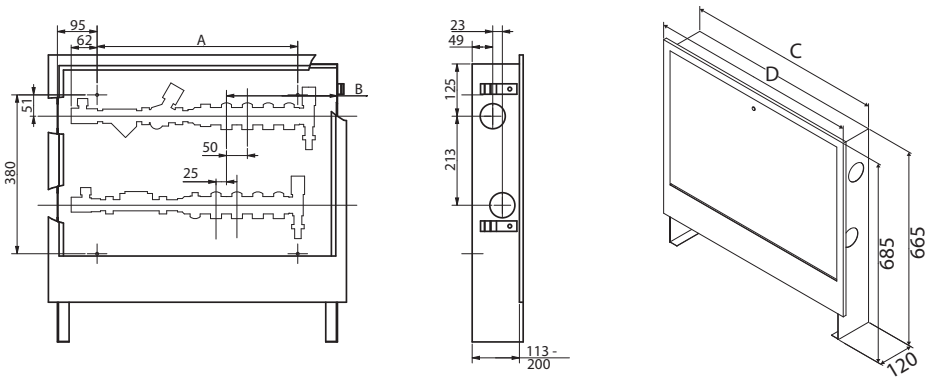
Loop	Se-quence	Window 1	Window 2	Window 3	Window 4	Window 5	Window 6
"6" Monthly value loop	6.1	'Date last month'	Accumulated energy	Energy	Tariff 1	Tariff 2	Volume
	6.2	'Date month - 1'	date month - 1	Energy	Tariff 1	Tariff 2	Volume
	6.3	'Date month - 2'	date month - 2	Energy	Tariff 1	Tariff 2	Volume
	...						
	...			...			
	6.24	'Date month - 23'	date month - 23	Energy	Tariff 1	Tariff 2	Volume

Loop review

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. The loop settings can be programmed to suit the customer’s individual requirements using the IZAR@SET software.

Dimensions



	4-port	7-port
A	480 mm	630 mm
B	265 mm	365 mm
C	670 mm	820 mm
D	715 mm	865 mm

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