ENGINEERING
TOMORROW

Installation guide

# SonoSelect and SonoSafe
## Energy Meters



ENGINEERING TOMORROW

# EU DECLARATION OF CONFORMITY

## Danfoss A/S

**Danfoss Energy Metering**

6430 Nordborg, Denmark | CVR nr.: 20 16 57 15 | Telephone: +45 7488 2222 | Fax: +45 7449 0949

declares under our sole responsibility that the

**Product category:** Energy Meters **Type designation(s):** SonoSelect 10 and SonoSafe 10

Covered by this declaration is in conformity with the following directive(s), standard(s) or other normative document(s), provided that the product is used in accordance with our instructions.

**[RED] – Radio Equipment Directive 2014/53/EU**[2]

**Article 3.1a (LVD)**

EN 61010-1: 2010 - Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements
EN 60950-1: 2006 + A11: 2009+ A1: 2010+A12:2011+AC:2011+A2:2013 - Information technology equipment. Safety. General requirements
EN 62311: 2008 - Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

**Article 3.1b (EMC)**

EN 301 489-3 V2.1.1: 2017-03 - Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz
EN 301-489-1 V2.1.1: 2017-02 - Common technical requirements

**Article 3.2 (Radio)**

EN 300 220-2 V3.1.1 - Short Range Devices (SRD) operating in the frequency range 25 MHz to 1000 MHz

**[EMC] – Electromagnetic Compatibility Directive 2014/30/EU**[1]

EN 61000-6-1: 2007 – Immunity for residential, commercial and light-industrial environments
EN 61000-6-3: 2007/A1:2011 – Emission standard for residential, commercial and light-industrial environments

**[LVD] – Low Voltage Directive 2014/35/EU**[1, 3]

EN 62311: 2008 - Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

EN 61010-1: 2010 - Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements

**[MID] – Measuring Instruments Directive 2014/32/EU**

Module B +D
EN1434-4:2015 - Heat meters - Part 4: Pattern approval tests

Notified Body: Force Certification, 0200, performed type approval and issued certificate DK-0200-MI004-034

**[RoHS] – Restriction of Hazardous Substances Directive 2011/65/EU**

EN 50581: 2012 - Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substancesv

1 For variants with Radio Module the declaration for EMC & LVD shall be ignored
2 For variants without Radio Module the declaration for RED shall be ignored.
3 For variants without Radio Module and Mains power supply (230Vac) the declaration for RED and LVD shall be ignored.

| | | | |
|---|---|---|---|
| Date: 2019.01.04<br>**Place of issue:**<br>6430 Nordborg, DK | **Issued by**<br>**Signature:**<br>**Name: Martin Steffensen**<br>**Title: R&D Program Manager** | Date: 2019.01.04<br>**Place of issue:**<br>6430 Nordborg, DK | **Approved by**<br>**Signature:**<br>**Name: Henrik Bork Steffensen**<br>**Title: Director R&D** |

Danfoss only vouches for the correctness of the English version of this declaration. In the event of the declaration being translated into any other language, the translator concerned shall be liable for the correctness of the translation

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***Note:*** *To ensure latest version of declaration, please visit danfoss.com.*

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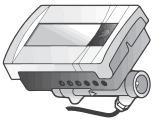
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# 1. General

| | |
|---|---|
| Ambient operating temperature | class A 5 - 55 °C (Indoor installation, non-condensing) |
| Ambient storage temperature | -25 - 60 °C |
| Temperature media | 5 - 95 °C |
| Power supply | 3.6 V DC lithium battery (2 AA SonoSelect 1 AA SonoSafe), Mains supply 230V AC +10/-15 % 50/60 Hz, battery back up in case of power cuts: 1 hour |
| Mechanical environment | class M2 |
| Electromagnetic environment | class E1 |
| Pressure | PN16 |
| MID | Accuracy Class 2 |

## 1.1 Inside the box

Description of components included in the box



*1 x*
*Energy meter*



*2 x Gaskets &*
*1 temperature sensor O-ring*



*4 x*
*Wired seals*



*1 x Installation*
*& User Guide*

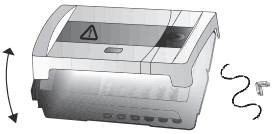
***Note:***

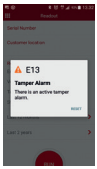
- *For cooling and combined meters a wall mounting kit is delivered with the product.*
- *For mains supply meters a M12 gland is delivered with the product.*

# 2. Installation

## 2.1 Preparation

SonoSelect incorporates a tamper monitoring function. If the calculator is opened the meter will set alarm E13 in display. Don't open unless for adding communication module, replacing battery or installing cables.
Reset requires Bluetooth dongle 014U1963 and SonoApp service tool.






SonoSelect is delivered with the option of reconfiguring supply/return using the Bluetooth dongle 014U1963 and SonoApp service tool.



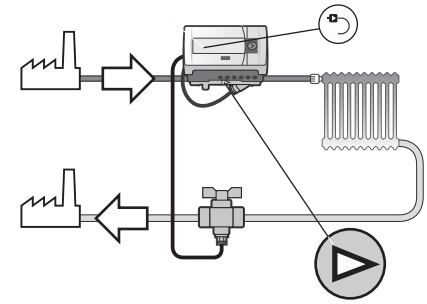




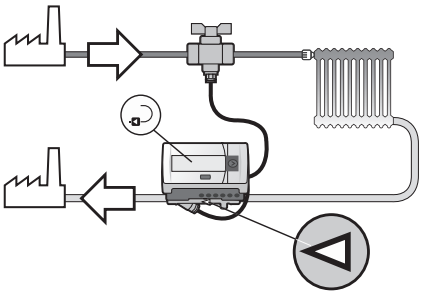
***Note:***

- *Product is approved for ambient temperature between 5-55 °C, non-condensing (indoor installation). It is recommended to install Calculator at max. 45 °C to secure optimal conditions for battery lifetime. At media temperatures below ambient temperature (cooling, bifunctional) the calculator must be mounted separately from the flow sensor to prevent condensation.*
- *Avoid installation stress from pipes and fittings.*
- *Flush the system.*

## 2.2 Identification of installation: Supply/Return pipe installation



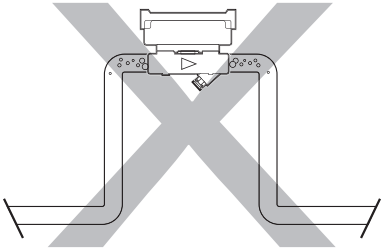
*Supply installation*



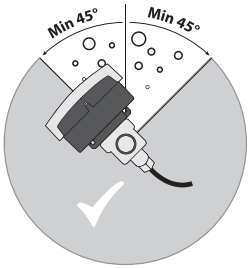
*Return installation*

***Note:*** *Heat meters and bifunctional meters have red temp sensor in supply pipe and all cooling meters have blue temp sensor in supply pipe.*

## 2.3 Flow sensor installation



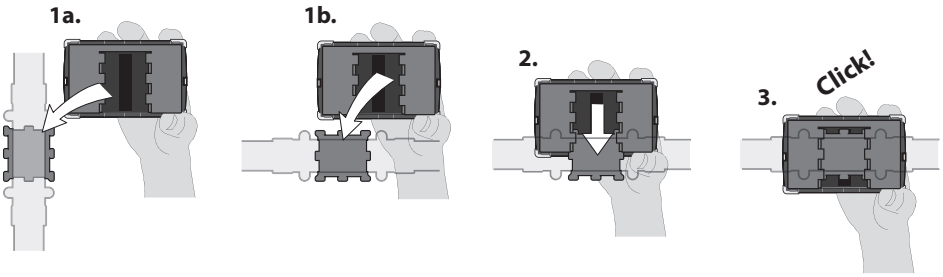
***Pipe position:*** *No limitations but avoid positions where air can be collected.*




***Rotation in pipe axis:*** *Flow sensor should be angled in 45 to 315° to avoid air collection in flow sensor.*

## 2.4 Mounting orientation, calculator

4 x 90°

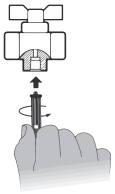


## 2.5 Mounting of O-ring and temperature sensor

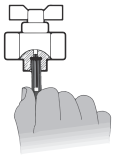
One temperature sensor is factory mounted in the flow sensor. The other must be mounted in the opposite pipe relative to the flow sensor installation. Mounting pin available as accessory.



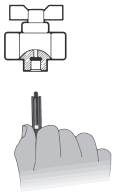
*1.*
*Mount O-ring on pin.*



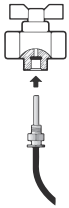
*2.*
*Insert pin with O-ring.*



*3.*
*Position O-ring.*

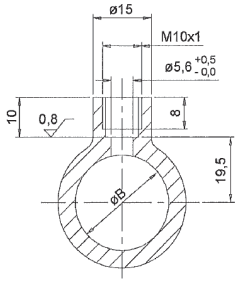


*4.*
*Remove pin.*

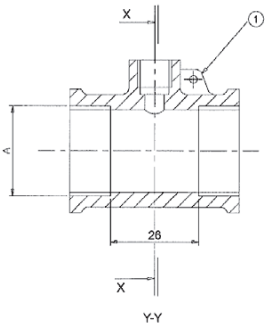


*5.*
*Moist and insert sensor probe. Tighten at torque 12 ± 2 Nm.*

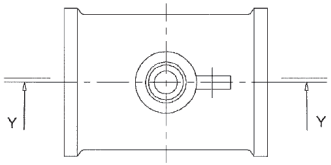
To ensure accuracy and a tight seal the sensor installation should comply to EN1434-2 annex A:




X-X




Y-Y




**Key**

| Threaded connection size A | Tapping bore size B |
|---|---|
| G½ | 18.5 mm |
| G¾ | 24 mm |
| G1 | 30.5 mm |
| G1¼ | 39mm |

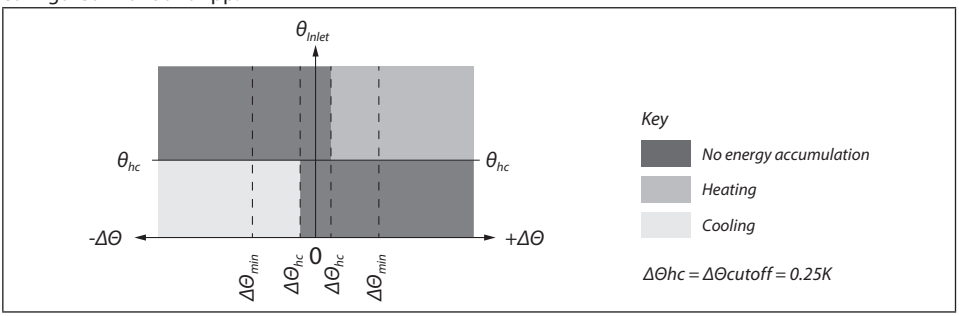
***Note:***

- *Tolerance on machined dimensions = ± 0.5 mm.*
- *Pipe fittings for use with probe type DS (Direct Short).*

*①: Provision for security sealing.*

## 2.6 Bifunctional meters

Bifunctional meter are for combined heating and cooling applications. $\Theta_{hc}$ default value is 30°C it can be configured with SonoApp.




## 2.7 Communication modules

### Modules in general

To adapt the meter for various applications SonoSelect 10 and SonoSafe 10 features a slot for mounting communication modules.
Each module features its own µ-controller.
Modules have their own parameter set which is saved in the module µ-controller flash memory. A local copy of the energy meter parameters used for communication is stored in the module.
Modules with pulse input have the inputs stored in legal backup every 10 minute.
Power: Lithium Thionyl Chloride battery (half of AA size) or mains power supply (230V). In case of power cuts on mains power the module has no power back up.
2 pulse in/outputs have common ground.
Modules are galvanically isolated from main Energy Meter circuitry

### Wired M-Bus module with 2 pulse inputs

Once installed the meter will display the icon for wired communication and pulse inputs in loop 2 of the display. Wired M-Bus is galvanically isolated from µ-controller and pulse inputs.
The two pulse inputs can be programmed independently of each other (see specification for pulse input module).

| | |
|---|---|
| M-Bus (primary) | Lithium Thionyl Chloride battery (half of AA size) or mains powered |
| M-Bus (secondary) | M-Bus supply |
| Baud rate supported | 300, 2400, 4800, 9600 |
| Communication protocol | According to EN1434-3 & EN13757-3 |
| Battery life time | 16+1 year |
| Addressing | Serial number: **sssss**vvNNy**yWW**<br>**ss**: Primary address, ***yWWsssss***: Secondary address |

**Wireless OMS communication module, 868.95MHz with 2 pulse inputs**

Once installed the meter will display the icon for wireless communication and pulse inputs in loop 2 of the display. The two pulse inputs can be programmed independently of each other (see specification for pulse input module).

| | |
|---|---|
| Standard | Open Metering System (OMS) issue 4.0.2 |
| Frequency | 868.95 MHz |
| Antenna | Internal |
| Transmission power | 10mW (Max. 25mW; 13,9 dBm) |
| Mode | T1 mode |
| Encryption | AES 128 bit encryption (mode 5), Parameterized Static key |
| Sending interval | Battery power: Fixed network 15 min<br>Walk by: 2 min<br>Mains power: 16 seconds |
| Telegram | Standard telegram* |
| Battery life time | 16+1 year (with pulse inputs off) |
| Addressing | Serial number: **sssss**vvNNy**yWW**<br>***yWWsssss***: Secondary address |

** See section with data telegram.*

**2 pulse input module**

Once installed the meter will display the icon for pulse inputs in loop 2 of the display. Accumulated volume is only readable by communication. The two pulse inputs can be programmed independently of each other.

| | |
|---|---|
| Pulse value | 0.001 $m^3$ to 1 $m^3$ per pulse |
| Voltage supply | ≤ 6.0 V |
| Source current | ≤ 0.1 mA |
| High level input threshold | ≥ 2 V |
| Low level input threshold | ≤ 0.5 V |
| Pull-up resistor | 100 kΩ |
| Pulse length | ≥100 ms |
| Maximum frequency | ≤ 5 Hz |
| Pulse inputs | According to EN1434-2, section 7.1.5 (Classification of pulse input devices Class IB) |
| Battery life time | 16+1 year |

** Suitable for both electronic switch and Reed contact.*

## 2 pulse output module

Once installed the meter will display the icon for wired communication in loop 2 of the display.

| | |
|---|---|
| Pulse 1 (energy*) | + terminal 16, - terminal 17 |
| Pulse 2 (volume*) | + terminal 18, - terminal 19 |
| Pulse value* | Unit follow the display. Scaling follow least significant digit of the display (default setting can be changed via SonoApp) |
| Pulse timing | Updates every 15 seconds |
| Polarity reversal: | Not possible, but can withstand -30V, max 27 mA without damage |
| Pulse length | ≥100 ms |
| Pulse Pause: | ≥100 ms |
| Voltage supply | 3-30 V |
| Source current | ≤ 27 mA |
| "ON" condition | U<2,0 @ 27mA |
| "OFF" condition | R>=6 MΩ |
| Maximum frequency | ≤ 5 Hz |
| Pulse outputs | According to EN1434-2, section 8.2.3 (Classification of pulse output devices Class OB) |
| Battery life time | 16+1 year |
| Cable length | Max 25 m |
| Alarms | E32 activates in meter if: 1) Module battery is empty 2) When no. of delayed pulses exceeds 5000 (incorrect scaling) |

** Default setting. Can be changed via SonoApp.*

## Data telegram

| **Wired M-bus** | **Wireless M-bus (OMS)** | **Wireless M-Bus (Walk -by)** |
|---|---|---|
| Standard telegram (16 seconds if mains powered):<br>• Accumulated Energy (heat and cooling for bifunctional)<br>• Accumulated Volume (heat and cooling for bifunctional)<br>• Current flow<br>• Current power<br>• Supply temperature<br>• Return temperature<br>• Difference temperature<br>• Enclosure temperature<br>• Current time<br>• Hour counter factory<br>• Hour counter OK | Standard telegram fixed network (15 minutes sending interval, 16 seconds if mains powered):<br>• Accumulated Energy (heat and cooling for bifunctional)<br>• Accumulated Volume (heat and cooling for bifunctional)<br>• Current power<br>• SupplyTemperature<br>• ReturnTemperature<br>• CurrentTime | Standard telegram Walk by (2 minutes sending interval, 16 seconds if mains powered):<br>• Accumulated Energy (heat and cooling for bifunctional)<br>• Accumulated Volume (heat and cooling for bifunctional)<br>• CurrentTime<br>• Hour counter factory<br>• Month log 1 (last month log) |

** Can be changed via SonoApp*

## Terminals and cables

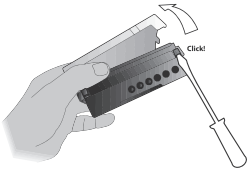
| Communication | Name | Terminal No. |
|---|---|---|
| M-Bus | Meter bus (blue or orange) | 24 |
| | Meter bus (blue or orange) | 25 |
| Pulse input | Pulse input 1 + (brown) | 50 |
| | Pulse input 1 - (white) | 51 |
| | Pulse input 2 + (brown) | 52 |
| | Pulse input 2 - (white) | 53 |
| Pulse output | Pulse output 1+ (brown) | 16 |
| | Pulse output 1- (white) | 17 |
| | Pulse output 2+ (brown) | 18 |
| | Pulse output 2 – (white) | 19 |

| | Name | Dimensions |
|---|---|---|
| Cable specification | Pulse input cables 22AWG | <10m |
| | Pulse output cables 22AWG | <25m |
| | To ensure IP protection class connecting cable outerjackets must be | Ø4.2 ± 0.1 mm |
| | Communication cables delivered with energy meter. Cable ends are stripped with crimped ferule. | 1.0m |
| Mains power cable | Mains power meters are delivered with M12x1.5 cable gland suitable for outside cable diameter Ø3-Ø6.5mm 2x0.75 $mm^2$. In case stranded wire is used Ferrules are required. Pre fuse of max 6A must be used | |

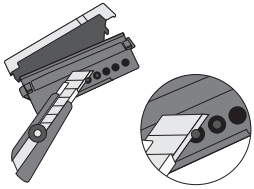
## 2.8 Installation of module/cable



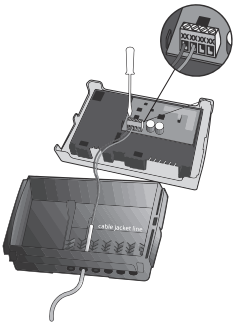
1. Before handling module PCB ensure relevant ESD regulations are observed (IEC 61340-5-1).



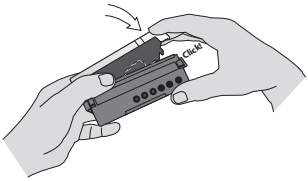

2. Break wired seal for enclosure.



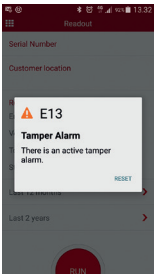
3. Cut rubber parallel to enclosure.




4. Insert module following guide on PCBA cover.
Insert cable through hole, connect cable and fix to screw terminals matching colour and terminal numbers.
Fix cable(s) to cable relief. Outer jacket no longer than 9 mm from cable relief (line). Press down.




5. Close enclosure making sure that no cables interfere with rubber sealing and other internal parts.

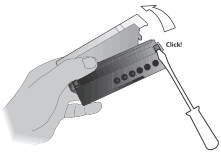



6. Reset tamper alarm via Sono-App for SonoSelect 10.
For module configuration, see SonoApp user guide.

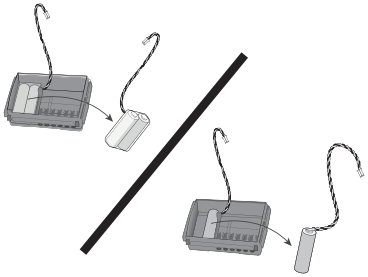
## 2.9 Battery



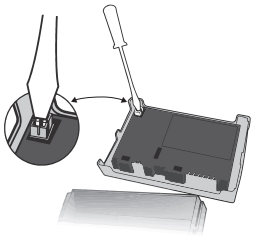
1. Before handling module PCB ensure relevant ESD regulations are observed (IEC 61340-5-1).



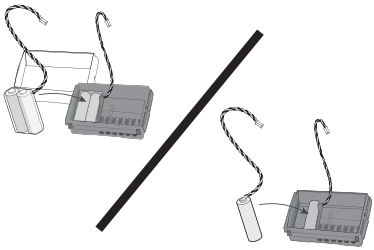

2. Break installation seal and open enclosure.



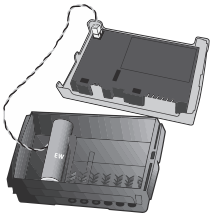
3. Disconnect battery connector and remove battery.



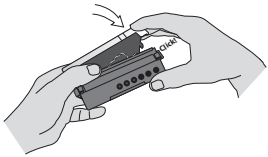
4. Short circuit battery connectors on PCB using a small flat head screwdriver.



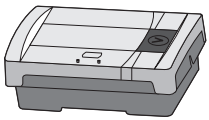
5. Connect new battery to PCB.



6. Fit battery in enclosure.




7. Close enclosure making sure that no cables interfere with rubber sealing or other internal parts.



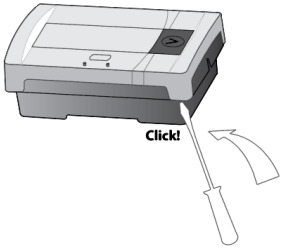
8. Meter displays “use app” on power up. Use SonoApp to set date/time and confirm battery change (and reset tamper alarm E13 for SonoSelect). If no Sonoapp is available a long press of 5 seconds when display shown “use app” will also confirm the battery change. Note that date and time will not be updated.

## 2.10 Mains supply

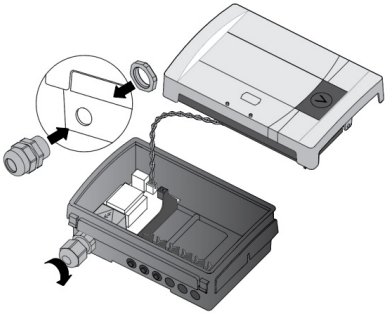




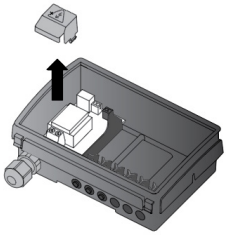

1. Before handling module PCB ensure relevant ESD regulations are observed (IEC 61340-5-1).
1.1 Do not connect the cable to 230V before installing it in energy meter



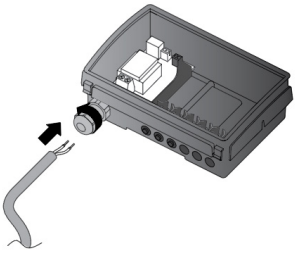

2. Break installation seal on both sides and open enclosure.



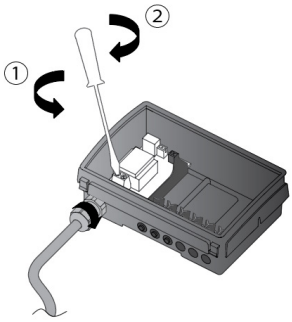
3. Screw on the cable gland.



4. Remove protective cap from screw terminals.

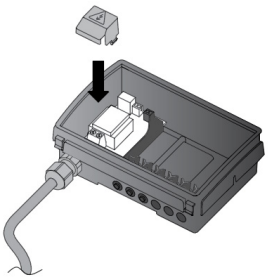


5. Insert cable through cable gland hole to secure IP class and strain relief. In case stranded wire is used Ferrules are required.

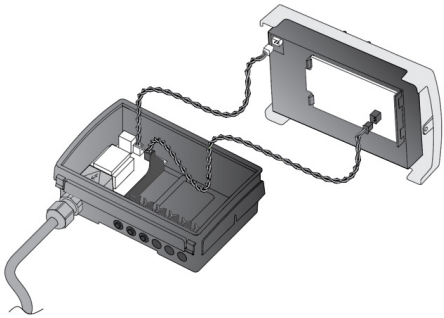



6. Connect cable and fix it to screw terminals. Tighten the cable gland.

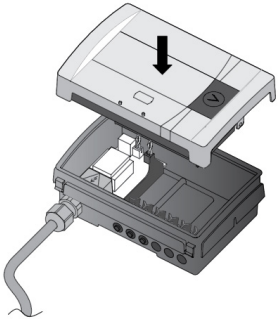
## 2.10 Mains supply (continuous)



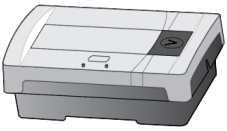
7. Secure cable-terminal connection with protective cap.



8. Connect mains supply module with PCB and communication module. Left [white] plug for meter (to have back up for power cut). Right [black] for module



9. Close enclosure making sure that no cables interfere with rubber sealing or other internal parts. Power up the meter.



10. USE APP appears in display:
1) Use SonoApp to set up confirm mains supply and set date & time
or
2) Hold button for 5 seconds to continue without setting date & time

# 3. Commissioning

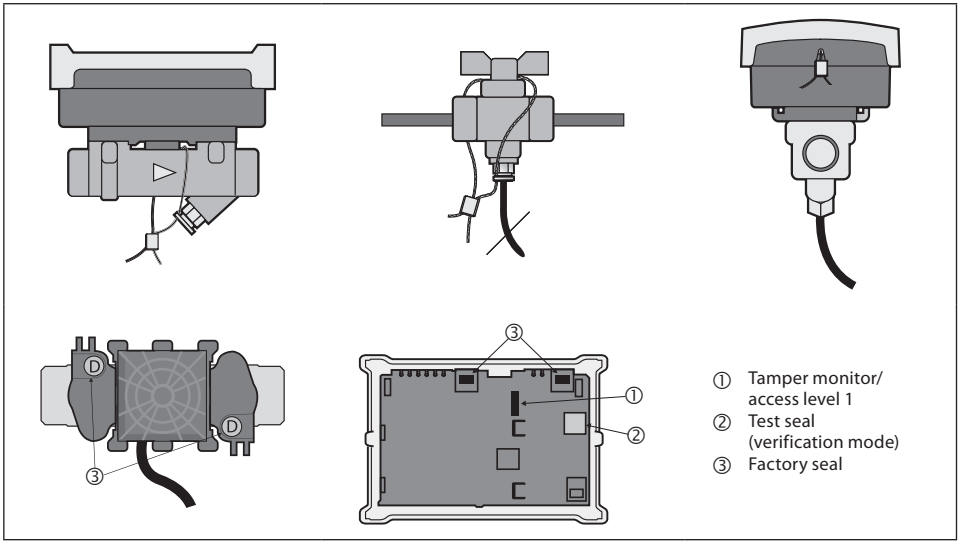
## 3.1 Bleeding

Bleed the system until the flow rate display is steady.
Make sure no error codes are displayed.
Check the display for a plausible indication of flow rate and temperatures.
For SonoSelect: Run installation check using Bluetooth dongle 014U1963 and SonoApp service tool.

## 3.2 Supply/return configuration

Only available for SonoSelect: Use Bluetooth dongle 014U1963 and SonoApp service tool/Configuration.

## 3.3 Meter sealing




## 3.4 IP class

| | |
|---|---|
| Calculator | IP65 (SonoSelect) / IP54 (SonoSafe) |
| Flow sensor | IP65 |
| Temperature sensor | IP65 |

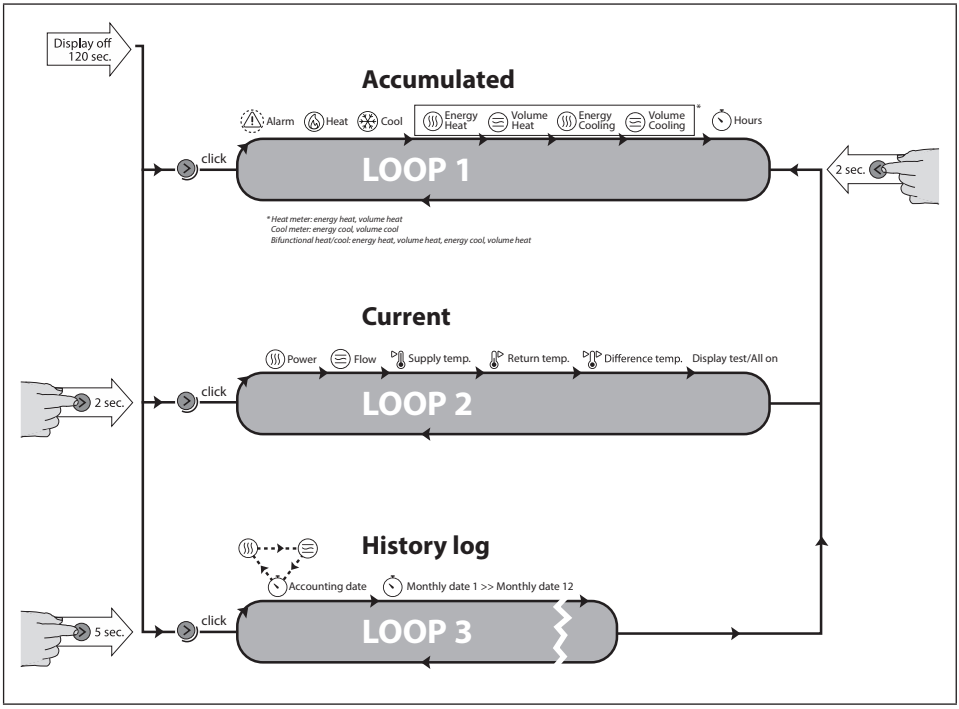
***Note:*** *The IP class can be compromised if cables are subjected to angled tension.*

## 4. Function overview

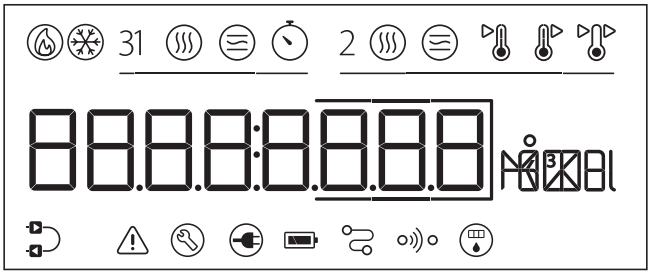
The accumulated measured values as well as the current and historical values are stored in the calculator and can be displayed via the control button.

** Tarif function can be added via SonoApp*

### 4.1 Menu structure



## 4.2 Display explanation




| | | |
|---|---|---|
| | Heating symbol | |
| | Cooling symbol | |
| | Accumulated energy | Loop 1 |
| | Accumulated flow | |
| | Total hours | Loop 2 |
| | Instant power | |
| | Instant flow | |
| | Supply temperature | |
| | Return temperature | |
| | Temperature difference | |

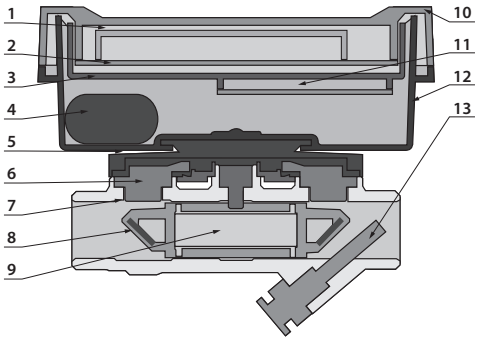
| | | |
|---|---|---|
| | Accounting date (yearly log) | Loop 3 |
| | Monthly log 1...12 | |
| | Supply/return mounted installation | |
| | Alarm | |
| | Service/maintenance | |
| | Mains power icon | |
| | Battery full or low | |
| | Wired communication | |
| | Wireless communication | |
| | Pulse | |
| | Decimal emphasizer | |
| | Units field | |

## 4.3 Alarms

| | |
|---|---|
| E01 | System error |
| E02 | PCB error |
| E03 | Battery empty (less than 1 month) |
| E04 | Battery low voltage |
| E05 | Battery low (less than 12 months) |
| E06 | Supply Temperature Error |
| E07 | Return Temperature Error |
| E08 | Absolute/Difference temperature outside accumulated range |
| E09 | Low transducer signal |

| | |
|---|---|
| E10 | Transducer error |
| E11 | Outside measured range |
| E12 | Negative flow |
| E13 | Tamper alarm |
| E14 | High flow > qss |
| E15 | Battery consumption too high |
| E16 | Display overflow (energy/volume) |
| E18 | Bifunctional meter dead band error |
| E32 | Communication module error |

## 5. Device overview




1. Display
2. PCBA
3. Cover part (PC)
4. Battery (Lithium)
5. Enclosure connection (PC)
6. Transducer (PZT/stainless steel/ PEI)
7. Spool piece (Brass)
8. Liner fixture (PPS/PEI/stainless steel)
9. Liner (PPS)
10. Top part (PC, TPE)
11. Module (PCB)
12. Bottom part (PC)
13. Temperature sensor

## 6. Disposal



| Item | Material | Disposal |
|---|---|---|
| Battery | AA-cell Lithium/thionyl chloride 620 mg Lithium | Approved deposit for lithium batteries |
| PCBA with display and communication module | Coppered epoxy laminate components soldered on, PC, TPE | Electronic waste |
| Cables | Copper with PUR or PVC jackets | Cable recovery |
| Flow sensor (including transducer and liner) | Brass, stainless steel, PPS | Metal recovery |
| Transducer | PZT, stainless steel, PEI | Approved deposit for PZT |
| Other plastic parts | PC, PPS, PEI, TPE | Plastic recovery |

ENGINEERING
TOMORROW

**Danfoss A/S**
Heating Segment • heating.danfoss.com • +45 7488 2222 • E-Mail: heating@danfoss.com

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