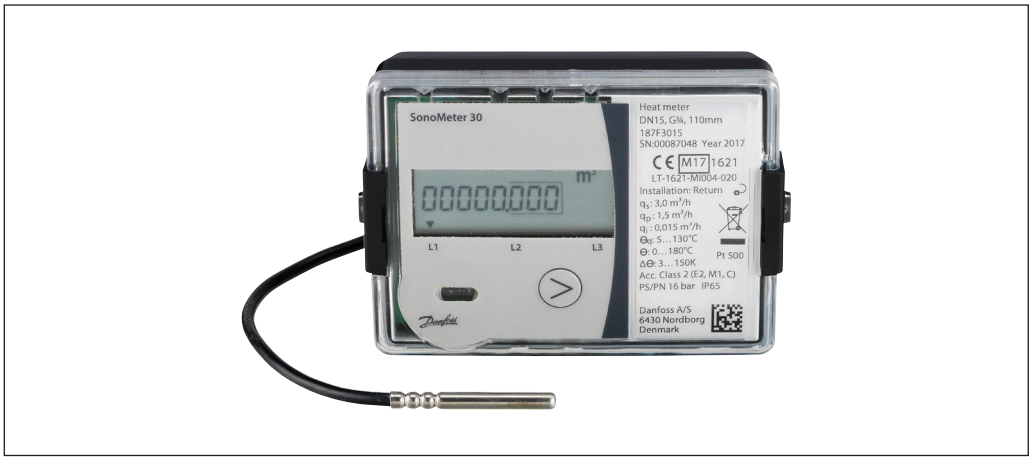
ENGINEERING
TOMORROW

User guide

Ultrasonic heat meter SonoMeter 30
Test and calibration instruction



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1. General information

This instruction designed for ultrasonic heat meter SonoMeter 30 flow and energy verification and calibration.

Heat meter energy measurement error (δ_{Es}) assess the application of the partial verification method: assesses the calculator thermal energy measurement error (δ_E), the flow volume measurement error (δ_V) and temperature sensor temperature difference measurement error (δ_T). Heat meter energy measurement error (δ_{Es}) are all components of the arithmetic sum of the errors:

$$\delta_{Es} = |\delta_E| + |\delta_T|$$

2. Test instruction

2.1 Calculator energy measurement error (δ_E) test

1) Energy pulse out terminals (Fig. 1) connected to the pulse counter (not required when reading the measurement results directly from the display or via a digital interface)
   Pin 53 - Energy Pulse output (Pulse)
   Pin 52 - Energy Pulse output (GND)

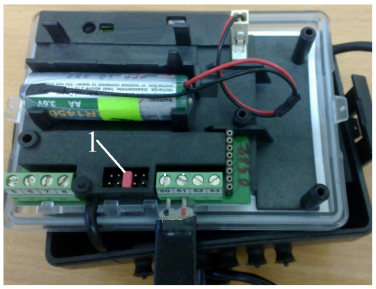

Fig. 1

2) Temperature sensors placed in the temperature testing bench (for temperature difference simulation).
3) Verification mode is activated by connecting TEST jumper contacts 1 (Flg. 1).
4) Determination errors:
   - before each measurement run automatic verification mode with long button clicking on the meter (simulated flow pulses),
   - When the LCD display stops blinking "TEST", energy and volume values can be read directly from the LCD screen or through the optical / digital interface. The pulses shall begin calculated with the corresponding nominal flow pulse values as follows:

Permanent flow q_p (m^3/h)	Energy pulse value, (Wh/imp)
0.6	0.1
1.0	0.2
1.5	0.2
2.5	0.5
3.5	0.5
6.0	1
10.0	2
15.0	5

   - energy E (kWh) measurement error is calculated by formula:

$$\delta_E = (E - E_0) / E_0 \cdot 100\ \%$$

there:
E_0 – the conventional true energy E value (kWh), calculated in consideration of the fluid temperature values simulated Θ1, Θ2 and simulated change in volume values:

Flow sensor mounting place	E_0 calculating formula
Supply pipe	$E_0 = V1 \cdot \rho1 \cdot (h_{T1} - h_{T2})$
Return pipe	$E_0 = V1 \cdot \rho2 \cdot (h_{T1} - h_{T2})$

There:
E_0 – the estimated true value of the energy component (kWh);
V1 – simulated water volume value (m^3);
ρ1…ρ2 – density of water, corresponding to the sumulated temperature value Θ1,Θ2, (kg/m^3);
h_{T1}… h_{T2} – relative enthalphy of water, corresponding to the simulated temperature value Θ1,Θ2

2.2 Volume measurement errors (δ_V) test

1) Volume pulse output terminals (Fig. 1) connected to the pulse counter (not required when the measurement results are directly reading from the display or via a digital interface)
   Pin 51 - Volume Pulse output (Pulse)
   Pin 50 - Volume Pulse output (GND)
2) Switched on verification mode by connecting TEST jumper contacts 1 (1 pav),
3) The meter mounted on the flow test bench, flow are simulating.

Recommended minimum pulse content and measurement time:

Flow	Pulse content	Measurement time
$0.1\ q_p < q \le q_s$	N≥1000	T> 1 (min)
$q_i \le q \le 0.1\ q_p$	N>500	T > 1 + 8 q_i/q, (min)

2.2 Volume measurement errors (δ_V) test *(continuous)*

It must be maintained both minimum time and minimum pulse quantities.

4) After the simulation of flow measured volume V (m^3) value is read directly from the display (or through a digital interface) or calculated pulse counter calculates the volume pulse multiplied by the pulse value:

- volume V (m^3) measurement error calculated by formula:

$$\delta_V = (V - V_0) / V_0 \cdot 100\ \%$$

there:
V_0 – device true value of simulated volume (m^3).

Permanent flow q_p, (m^3/h)	**Volume pulse value,** (l/imp)
0.6	0.001
1.0	0.001
1.5	0.001
2.5	0.002
3.5	0.01
6.0	0.01
10.0	0.02
15.0	0.02

3. Calibration instruction

3.1.1 Calibration mode

To enter calibration mode it is necessary to connect the verification jumper 1, remove metrological seal and short circuit calibration contacts 2. (Fig.2).

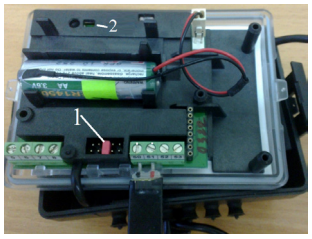

Fig. 2

3.2 Software installation

The software "SonoMeter30Config.exe" is used to read and configure SonoMeter 30 device via OG-1-USB optical reader.

Meter configuration / calibration cab be made also via M-Bus interface module then converter COM/M-Bus (MB-1) can be used.

Open "SonoMeter30Config.exe". Press "Next". Then, you can choose installation directory.

3.3 Program interface

"SonoMeter30UserConfig" has five user interface windows for different purposes:

- "Actual" – actual data window;
- "LCD Menu" – LCD configuration window.
- "Configuration" – configuration window for pulse channels, archive and tariffs;
- "Archive" – window for information from device archive;
- "Manufacturer" – device calibration, reset and configuration window.

3.4 "Manufacturer" window

"SonoMeter30UserConfig" "Manufacturer" window is shown in Fig. 3, information about window parameters is in Table 1.

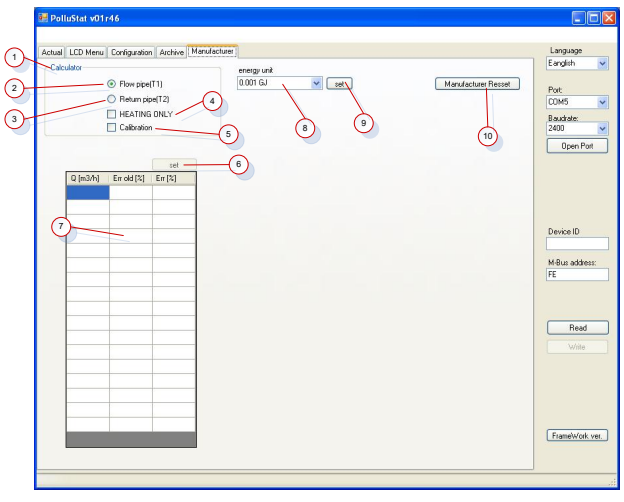

Fig. 3
"Manufacturer" window

3.5 Volume calibration

Measurement units, flow pipe tagging, calibration can be configured in "*Manufacturer*" window.
Select energy units option in "*energy unit*" field and press "*set*" in order to configure what energy units are used for measurements. If device is successfully configured message "*Operation done*" will pop up.

3.5.1 Changing pipe type

If device is going to be placed on flow pipe, tag "*Flow pipe*". If device is going to be placed on return pipe, tag "*Return pipe*". Press "*set*" to save configuration into device. If device is successfully configured message "*Operation done*" will pop up. If is it needed that device measure only heating energy, "*heating only*" box should be tagged.

3.5.2 Resetting device

Press "*Read*" and then press "*Manufacturer Reset*". Disconnect the battery from the device. Use a jumper to short the contacts on the device for 3 seconds in place where need to be connect the battery. Connect a battery to the device and reconfigure the date and time parameters.

3.5.3 Calibration

Place jumper under removed device cover (see Fig. 4). Press "*Read*" and then write error "*Err %*" and flow "*Q*" data. Press "*set*" to save configuration into device. If device is successfully configured message "*Operation done*" will pop up.

Fig. 4
Jumper Position "TEST"

Table 1 "Manufacturer" window parameters

No.	Name	Note
1	Calculator	-
2	Flow pipe (T1)	
3	Return pipe (T2)	
4	Heating only	Check this when device is only for heating energy measurements
5	Calibration	-
6	set	Press button to save configuration to device device
7	Calibration parameters	Write calibration parameters here
8	Energy unit	-
9	set	Press set to save energy unit parameter configuration
10	Manufacturer Reset	Press to reset the device

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