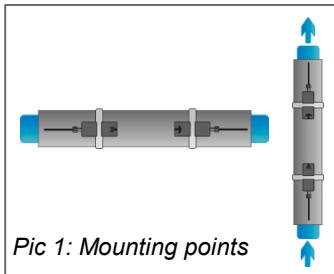
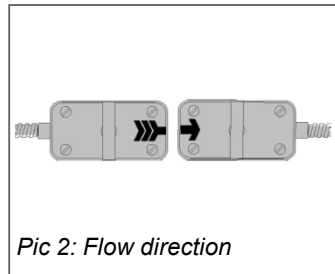


Step 1: Selection of measurement point & pipe preparation

- Avoid installation of sensors in the vicinity of deformations and pipe defects, near welding seams or where deposits could have accumulated.
- Select a measuring point with sufficient straight pipe to obtain accurate measurements. Please consult the manual for the recommended distances from sources of disturbance.
- For a horizontal pipe, mount the sensors on the side of the pipe. For a vertical pipe, mount the sensors at a location where the liquid flows upwards. (Pic 1)
- Mount the sensors in the direction of the flow. (Pic 2)
- Clean the pipe at the measurement point. Remove loose paint and rust with a wire brush or file.
- Apply coupling paste to the face of the clamp-on sensors before attaching them to the pipe.



Pic 1: Mounting points



Pic 2: Flow direction

Step 2: Keyboard familiarisation



- Show **NEXT** (1) available item
- **Q ON** (2) = Start totalizer function
- Show next **DISP**lay (3)
- **Q OFF** (8) = Stop totalizer function
- **DIRECT** (9) access to trend plot
- Move menu / selection item **UP**
- Move menu / selection item **DOWN**
- **ESC**ape entry without saving
Switch device **OFF** (press > 2 sec.)
- **ENTER** selection with saving
Switch device **ON** (press > 2 sec.)

Step 3: Quick Start menu and Setup Wizard

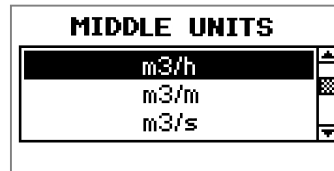
The flow meter can be prepared for measurement with the **Setup Wizard** as found in the **Quick start** menu.



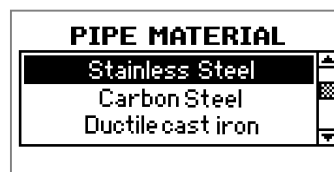
Upon first power on and the boot up sequence, the Main Menu is displayed. Use the **UP** and **DOWN** cursor keys to select **Quick start** and confirm by pressing **ENTER**.



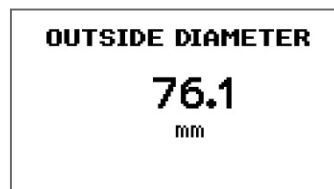
Select **Setup Wizard CH1** to set up measurement channel 1, or **CH2** for channel 2. Confirm selection by pressing **ENTER**. If the sensors are recognised, the serial number will be shown. If not, they can be selected.



Select the main measurement unit using the cursor keys and confirm with **ENTER**. This unit will be displayed in the middle of the measurement screen. Selecting **OFF** deactivates the measurement channel.



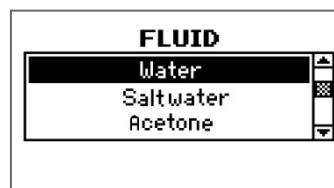
Select the pipe material using the cursor keys and confirm with **ENTER**.



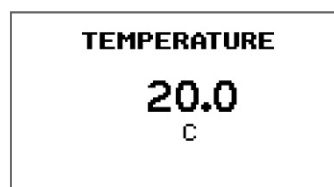
Enter the outer pipe diameter using the keypad and confirm with **ENTER**. Use **UP** key as backspace to correct for entry errors. If "0" is entered and confirmed, an additional screen appears that allows entry of the circumference. Press **ENTER** to confirm.



Enter pipe wall thickness using the keypad and confirm with **ENTER**. Use **UP** key as a backspace to correct for entry errors.



Select fluid using cursor keys. Confirm by pressing **ENTER**.

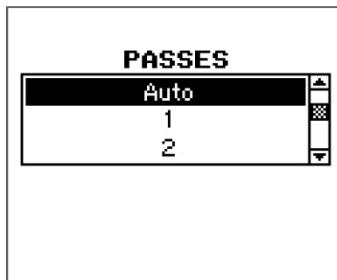


Enter the fluid temperature using the keypad. Confirm by pressing **ENTER**. Use **UP** key as a backspace to correct for entry errors.



Select pipe liner material using cursor keys and confirm by pressing **ENTER**. If a liner material is chosen, an additional screen appears that allows entry of liner thickness.

Step 3: Quick Start menu and Setup Wizard (continued)



Select number of sound passes (sound paths) using cursor keys. **Auto:** Selection by flow meter according to entered parameters (number of passes shown later on Sensor Positioning Screen).

- 1: 1 pass, (diagonal mode)
- 2: 2 passes (reflection mode)
- 3: 3 passes (diagonal mode)
- 4: 4 passes (reflection mode)
- 5: 5 passes (diagonal mode)
- ..etc.

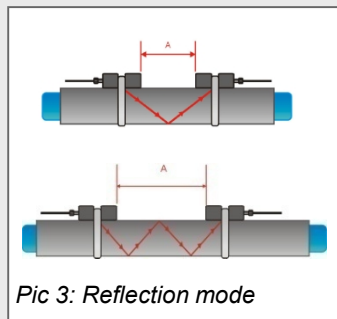
Even number of passes: Both sensors on same side of pipe. Odd number of passes: Sensors on opposite sides (see below for more information). Confirm with **ENTER**. Your second channel can be prepared now by selecting **Setup Wizard CH1** or **CH2**.

1. Reflection mode

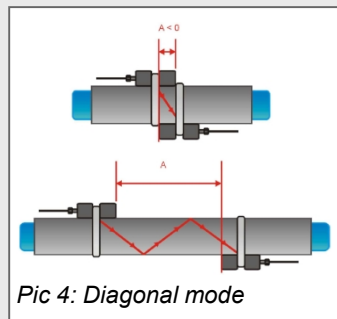
The flow meter uses an even number of passes. This is the most convenient mounting arrangement, as the transducer separation distance can be measured very easily and the sensors can be accurately aligned. Use whenever possible. (Pic 3)

2. Diagonal mode

Signal travels on odd number of passes through the pipe. Used for larger pipes and for dirty/aerated liquids where greater signal attenuation can occur. The sensor distance on this mounting configuration can be negative (sensors overlapping). (Pic 4)



Pic 3: Reflection mode



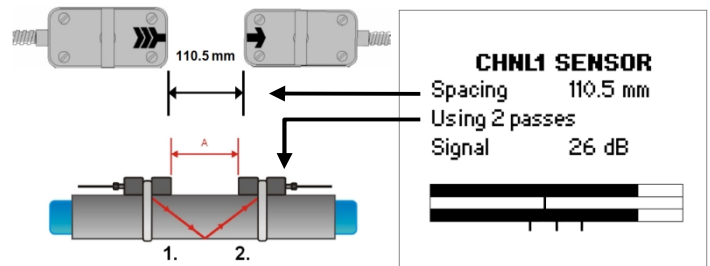
Pic 4: Diagonal mode



Select **Start Measurement** and confirm with **ENTER** to start the sensor positioning procedure. When both channels have been activated, the procedure for CH2 follows the one of CH1.

Sensor Positioning Screen

Mount the transducers with the suggested spacing between the inside of the sensor heads. This distance has been determined by the flow meter on the basis of the entered parameters. Use the displayed number of passes to install the sensors on the correct side of the pipe (see modes above). Observe the upper bar (signal-to-noise ratio) and lower bar (signal quality). These should both be filled to about the same level with a filling level of around 1/3 or more desired. Use the moving mark between the two signal bars for fine adjustment of the sensor position.



With correct pipe parameters entered and the sensors mounted at the suggested spacing, the mark should be near the central indication line (see three lines below the bottom signal bar). If the mark is to the left-hand side of the central indication line, the sensors are too close to each other. If the mark is to the right, the sensors are too far apart. Slide one sensor carefully along the pipe to bring the mark into a more central position. Measurements can be obtained with the mark being between the left and right indication line. Press **ENTER** to start measurement.

Measurement screen



The main measurement unit is displayed when first entering the measurement screen. Press **MUX** to switch between channels 1 and 2. Press **NEXT** to see up to 3 units displayed with the main one in the middle.

Two further measurement units can be assigned to that screen by going to *Main Menu - Display - Channel 1 / Channel 2*.

Totalizer

The totalizer is shown when in measurement mode after pressing **NEXT** three times. It can also be assigned to the three line display, datalogger or process outputs by selecting a volumetric unit. The totalizer function is started with **Q_{ON}** when in measurement mode (measurement screen displayed). Pressing **Q₊** resets the total in positive flow direction. Pressing **Q₋** resets the total in negative flow direction. The totalizer function can be stopped with **Q_{OFF}**. Pressing **Q_{ON}** again will reset the positive, negative and overall totalizer. Change displays without resetting the totalizer by pressing **DISP** or **NEXT**.

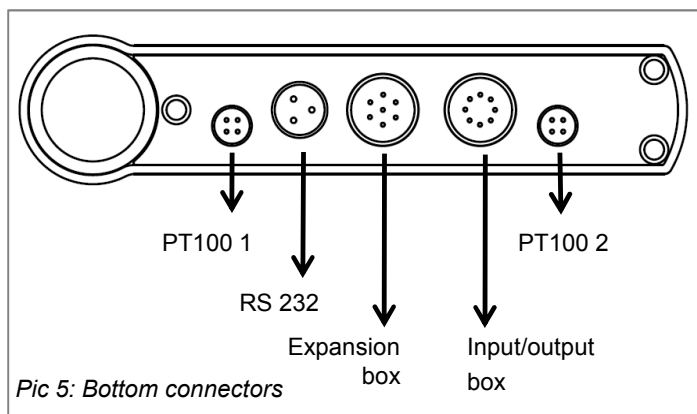
Internal data logger

The data logger is reached via *Main Menu - Output*. It is activated in *Datalogger - Interval* by entering and confirming a non-zero value. Enter "0" and confirm to disable the logger. Up to 10 measurement units can be selected for logging under *Datalogger - Selection*. Use the cursor keys to highlight a unit and press **ENTER** to select it. Press "0" to deselect it. An activated data logger is indicated by a "document" symbol in the top left corner of the display. On start of measurement (measurement screen displayed) the logger records the selected measurement units. A blinking "document" symbol indicates a recording data logger. Separation markers are set by the data logger whenever a session begins. Leave the measurement screen by pressing **ESC** to stop recording. The recording interval can be changed in *Datalogger - Interval*. The data logger is cleared under *Datalogger - Log Erase*. Ensure all required data has been downloaded.

Heat quantity measurement (where specified)

The KATflow 230 is capable of measuring heat flow and heat quantity. If you wish to measure heat flow, select a heat flow unit (W, kW, MW) as Middle Unit when going through the Setup Wizard of the selected measurement channel. If you wish to measure heat quantity, select a heat quantity unit (J, kJ, MJ). On selection of one of these units, the flow meter requests the entry of the specific heat capacity of the medium in J/(g.k). Enter the value for your fluid and confirm with **ENTER**. Complete the remaining steps of the Setup Wizard.

The temperatures at the inlet and outlet of the monitored system are used to determine heat flow and heat quantity. Connect the supplied PT100 temperature sensors to the bottom of the flow meter by plugging them into the left and right sockets. (Pic 5)



Pic 5: Bottom connectors

After setting up the flow measurement channel go to *Main Menu - In/Output*, in order to assign the PT100 inputs to the channel:

- 1.) Use the cursor keys to select **PT100 4 WIRE** and confirm with **ENTER**.
- 2.) On the next screen, use the cursor keys to select the flow channel which the temperature input has to be applied to. You can choose between **Channel 1** or **2**. Selecting **OFF** will disable the input. Confirm with **ENTER**.
- 3.) On the following screen choose **PT100** to employ the temperature measured on the pipe. If you wish to enter a fixed temperature value, select **User** and enter the value.
- 4.) As next step define whether the PT100 sensor measures the inlet or outlet temperature. Use the cursor keys to select the appropriate and confirm with **ENTER**.
- 5.) On the next screen a temperature offset can be applied. After confirming again with **ENTER** you reach the Main Menu.

Once the setup of the first temperature input has been completed repeat steps 1 to 5 for the configuration of the second input.

Medium at 25 °C unless stated differently	Heat capacity (J/g.K)
Ethanol (0 °C)	2.30
Ethylene glycol (100%)	2.36
Ethylene glycol (25%, 26.7 °C)	3.85
Ethylene glycol (30%, 26.7 °C)	3.77
Ethylene glycol (50%, 26.7 °C)	3.41
Ethylene glycol (65%, 26.7 °C)	3.11
Freon R22 (30 °C)	6.60
Freon R134a	8.87
Mineral oil	1.67
Water	4.18

Temperature and flow measurement

For separate measurement of flow and temperature select a flow unit as Middle Unit in the Setup Wizard. Complete the wizard and then go to *Main Menu - In/Output*. Assign one PT100 input to the flow channel as described on the left. Define it as an inlet temperature source.

Now go to *Main Menu - Datalogger - Selection* and choose **Tin** as one of the recorded measurement units. Upon start of each measurement the flow meter will now record selected flow units as well as the temperature measured by the PT100 sensor.

Process outputs: Setup

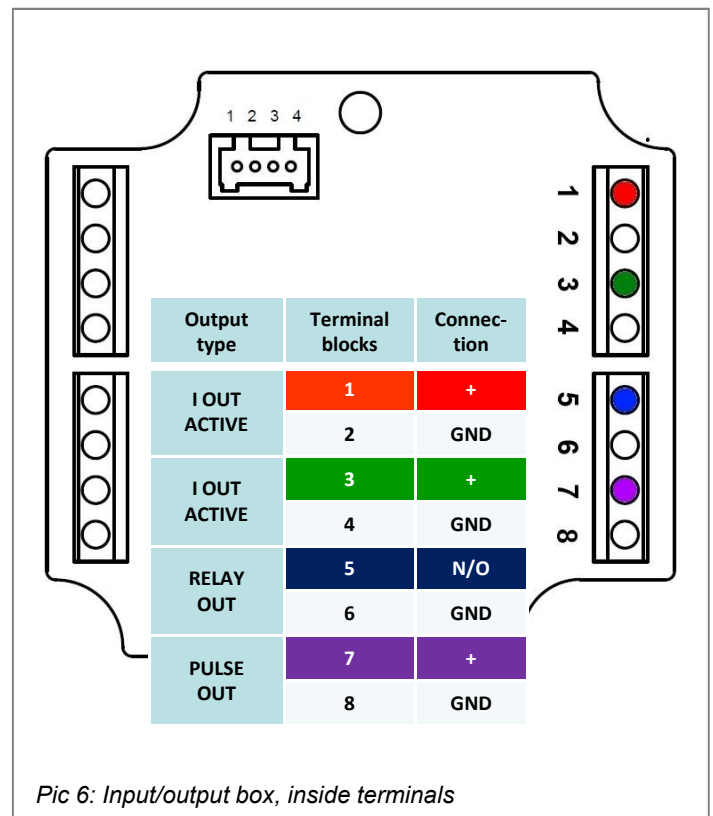
Process outputs can be set up in *Main Menu - In/Output*. Depending on which outputs are available, you can choose between **RELAY OUT** (relay output), **I OUT ACTIVE** (0/4 ... 20 mA) and **PULSE OUT** (Open-Collector).

- 1.) After selecting an output, it can be assigned to a measurement channel. Selecting **OFF** disables the output.
- 2.) On the next screen you can choose the unit you wish to be transferred by the output.
- 3.) The structure of the further steps depends on the individual type of output.

Process outputs: Connection

The process outputs can be connected to third party devices via a dedicated input/output box. This connects to the KATflow 230 via a circular plug which is found on the bottom of the flow meter (see pic 5).

Connection to the outputs can be established by wiring transfer cables into the respective terminal blocks of the I/O box. The illustration below gives an overview of the output allocation.



Pic 6: Input/output box, inside terminals