

Titel: „Multiplexer for the evaluation of multiple sensor systems using a single electronic unit“

Unternehmenseinheit: Diehl Metering GmbH

Description:

The invention relates to flow measurement in water-carrying systems. In particular, the invention relates to a method for the temperature-compensated determination of water flow at several spatially separated measuring points using ultrasonic sensors.

In water-carrying systems, such as drinking water installations, heating systems, cooling circuits or industrial pipework systems, there is often a requirement to measure the flow rate at several different measuring points.

Ultrasonic sensors are frequently used to determine flow rate. As the speed of sound in water is temperature-dependent, the temperature of the water is usually also measured and taken into account during evaluation in order to increase measurement accuracy.

In systems with multiple measuring points, separate measuring and evaluation units are often provided for each measuring point. This increases the hardware requirements, the wiring effort, energy consumption and manufacturing costs. Alternatively, several sensors can be connected to a central evaluation unit, in which case reliable temperature compensation specific to each measuring point must be ensured.

The invention is therefore based on the objective of providing a method which enables accurate, temperature-compensated flow measurement at several spatially separated measuring points whilst simultaneously reducing hardware and installation costs.

In this method, each measuring point is assigned an ultrasonic sensor and a temperature sensor. The sensors of the various measuring points are connected via a multiplexer to a common measurement and evaluation electronics unit. By means of the multiplexer, the sensors of the individual measuring points are connected in turn to the measurement and evaluation electronics unit.

An ultrasonic measurement signal and a temperature measurement signal are recorded for the selected measuring point. The shared measurement and evaluation electronics then determine a flow rate value for the selected measuring point from the ultrasonic measurement signal, taking into account the associated temperature measurement signal. The use of a single measurement and evaluation unit for multiple measuring points reduces the number of electronic components required. At the same time, the assignment of an individual temperature signal to each measuring point enables location-specific temperature compensation, thereby improving the accuracy of the flow measurement.

In a preferred embodiment, the measuring points are queried cyclically one after the other. To this end, the measurement and evaluation electronics control the multiplexer in such a way that the sensors of a particular measuring point are connected to the measurement and evaluation electronics in turn.

Preferably, the temperature measurement signal from the selected measuring point is first recorded, followed by the ultrasonic measurement signal. This allows a temperature value current at the time of the ultrasonic measurement to be taken into account when calculating the flow rate.

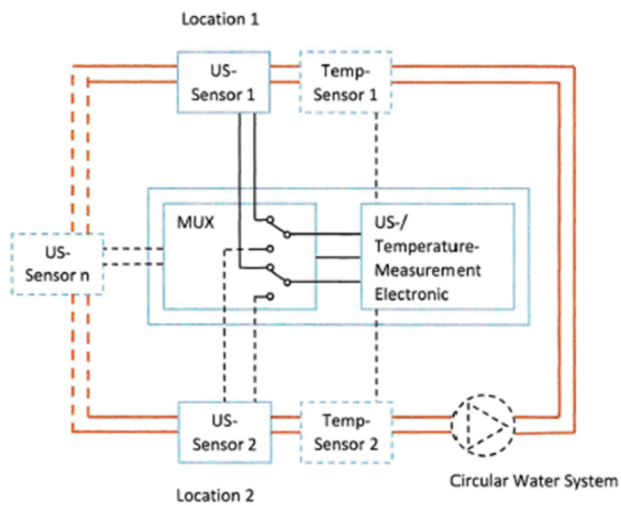
The measurement and evaluation electronics may comprise a microcontroller, a signal processor or a comparable processing unit. The evaluation electronics calculate a flow rate from the ultrasonic measurement signals, taking into account the temperature-dependent speed of sound in water.

In a further embodiment, the determined flow rates from several measuring points are stored, compared with one another and/or transmitted to a higher-level control or monitoring device. The multiplexer may be designed as an analogue or digital multiplexer. Preferably, both the ultrasonic sensors and the temperature sensors of the various measuring points are connected via the same multiplexer to the shared measurement and evaluation electronics.

1. A method for the temperature-compensated determination of the flow rate of water at at least two spatially separated measuring points of a water-carrying system, wherein each measuring point is assigned one ultrasonic sensor and one temperature sensor, and the ultrasonic sensors and the temperature sensors are connected via a multiplexer to a common measuring and evaluation electronics via a multiplexer, whereby, by means of the multiplexer, the ultrasonic sensor and the temperature sensor of one of the measuring points are connected in turn to the common measurement and evaluation electronics, whereby an ultrasonic measurement signal and a temperature measurement signal are recorded for each selected measuring point, and wherein the common measurement and evaluation electronics determine a flow rate value associated with the selected measuring point from the ultrasonic measurement signal, taking the temperature measurement signal into account.
2. A method according to claim 1, characterised in that, for each measuring point, the temperature measurement signal is first recorded and the ultrasonic measurement signal is subsequently recorded.
3. A method according to claim 1 or 2, characterised in that the flow rate is determined using a sound velocity value derived from the recorded temperature measurement signal.
4. A method according to one of the preceding claims, characterised in that the measuring points are selected cyclically one after the other at a predetermined sampling interval.
5. A method according to one of the preceding claims, characterised in that the multiplexer connects both the ultrasonic sensors and the temperature sensors to the measurement and evaluation electronics via common signal lines.
6. A method according to one of the preceding claims, characterised in that the common measurement and evaluation electronics comprise a microcontroller which both controls the multiplexer and determines the flow rates.
7. A method according to one of the preceding claims, characterised in that the temperature measurement signals from the individual measuring points are stored and used in a subsequent determination of the flow rate for the same measuring point.
8. A method according to one of the preceding claims, characterised in that the water-carrying system is a drinking water, heating, cooling or industrial process system.
9. A method according to one of the preceding claims, characterised in that the measurement and evaluation electronics carry out a plausibility check on the temperature measurement signals and/or the flow rates.

10. A method according to one of the preceding claims, characterised in that the flow rates of several measuring points are determined within a common measurement cycle and are stored or output together.

Drawing:



Abstract

A method for the temperature-compensated determination of the flow rate of water at at least two spatially separated measuring points of a water-carrying system, wherein each measuring point is assigned an ultrasonic sensor and a temperature sensor, and the ultrasonic sensors and the temperature sensors are connected via a multiplexer to a common measurement and evaluation electronics unit, whereby, by means of the multiplexer, the ultrasonic sensor and the temperature sensor of one of the measuring points are connected in turn to the common measurement and evaluation electronics, whereby an ultrasonic measurement signal and a temperature measurement signal are recorded for each selected measuring point, and wherein the common measurement and evaluation electronics determine a flow rate value associated with the selected measuring point from the ultrasonic measurement signal, taking the temperature measurement signal into account.