

# Magnetic inductive run-off measurements for open and partially filled systems

# UFM 535-F-MAG



# **General description**

In order to comply with the strict limits imposed on industry and local authorities through environmental and particularly water protection legislation, measurement and controls systems are needed to record, monitor and control the run-off.

Magnetic-inductive measuring systems are ideal for an exact determination of flows. The complete measuring system **UFM 535-F-MAG** with flow rate and level measurement enables a reliable measurement of the flows, even with backpressures and runback.

The measuring computer **UFM 535** can also be used to control external recorders.

## **Fields of application**

Magnetic-inductive flow measurement equipment are suitable to measure flows in wastewater as well as fluids, slurries, sludges and pastes. The choice of correspondingly resistant materials also allows the measurement of aggressive media.

Examples for fields of application include:

- sewage plants
- sewerage systems
- rainwater purification plants
- drinking water supplies
- water treatment plants
- cooling water control and monitoring
- chemical and pharmaceutical plants
- flow measurements in industry

# **Advantages / Special features**

- Can be retrofitted in all sewerage systems and types of channels with no structural changes
- No additional slope necessary
- Largely insensitive to soiling
- No moving parts
- Sensors for explosion-proof areas on request EEX ib e m IIC T6
- Maintenance-free measurements
- Flow rate measurement according to magnetic inductive measuring principle
- Level measurement with ultrasound sensor or alternatively pressure sensor
- Conductivity has no effect on the measurement result (if minimum conductivity observed)
- Temperature, pressure, viscosity and density have no effect on the measurement result
- The temperature-controlled ultrasonic measurement is compensated through either temperature measurement or a reference bow
- Simulation of all outputs possible

# General measuring principle

Magnetic-inductive flow measurements are based on Faraday's law of induction (movement of a conductor in a magnetic field = generation of a voltage in the conductor).

U<sub>M</sub>=B\*v\*l

- U<sub>M</sub>: Measurement voltage vertical to the direction of flow and magnetic field which is measured at two electrodes
- B: Magnetic induction
- v: Flow rate of medium
- l: Length of conductor (distance between electrodes)

A voltage is induced in the magnetic field which is vertical to the direction of flow of a conductive medium flowing, for example through a channel. This measurement voltage is then recorded by the electrodes on the sensor. The value of the measurement voltage generated is proportional to the flow rate of the measured medium.

# Design and mode of operation

The run-off measurement system consists of the following components:

- Flow computer **UFM-535** with integrated ultrasonic measurement evaluation
- Ultrasonic sensor US-... or level pressure sensor ATM-...
- Flow rate sensor (mouse) MAG-Flow OG
- Measurement transducer MAG-Flow 535
- The limiting component **MAG-Flow BB2** is necessary for use in explosion-proof areas

The run-off measurement system UFM 535-F-MAG uses a magnetic-inductive flow rate sensor which can be fastened directly to the bottom of the channel. The magnetic-inductive flow rate sensor is combined with an ultrasonic sensor for level measurements. The flow is calculated by the measurement computer UFM 535 ( $Q = v \ge A$ ) from the measured flow rate and the level.

The combination of flow rate and level measurement ensures a correct measurement even with backpressures and runbacks.



### MAG-Flow OG

The **MAG-Flow OG** sensor is used to measure the flow rate.

#### **Special features**

- The magnetic-inductive flow rate sensor is suitable for channel widths from 200 to 1000 mm
- Measurement in wider channels possible by using two sensors
- No moving parts
- Self-cleaning electrodes, suitable for even very dirty media
- Largely insensitive to soiling
- Media with high solids contents can be measured

#### Ultrasonic sensor

An ultrasonic sensor matched to the respective application case is used to measure the level. The transit time between the emission of an ultrasonic pulse and the recording of the reflected pulse by the sensor is hereby determined. The ultrasonic measurement is directly evaluated in the measurement computer UFM 535.



US - Sensor FMU 40





#### UFM 535 W1

UFM 535 SC

The measurement computer **UFM 535** can handle measurement, control and monitoring tasks. It controls the entire measuring sequence and has not only limit value and analogue outputs but also a sampled-data system and continuous controller to control the run-off volumes. A relay output for the time or quantity-dependent control of a sampler has also been integrated.

It is programmed and parameterised via the integrated keyboard or with parameterisation software via the serial interface (RS232).

All data is saved for at least 5 years with the internal buffer battery.

### **Planning notes**

- The length of the inlet and outlet sections should be at least 5-10 times the nominal width.
- The magnetic-inductive mouse can be installed directly on the bottom of the channel.
- An on-the-spot calibration is recommended for partially filled pipes and channels.
- A pressure sensor for level measurements should be used with foaming media.

An exact measurement is guaranteed from a minimum conductivity of as little as  $1 \mu$ S/cm.

### **Structural dimensions:**

### MAG-Flow OG



#### Ultrasonic senosr FMU 40

Depending on necessary measuring range (dimensions on request)

#### Scope of delivery

- Measurement computer UFM 535
- Flow rate sensor MAG-Flow OG
- Ultrasonic level sensor FMU 40
- Operating instructions