



Density and concentration, temperature and flow online gauge

Online density and concentration gauges can be used to contactless measurement of density of liquids in industrial pipelines or completely filled measuring space. Measurement is based on absorption of ionizing radiation by measured medium. The measure of density or concentration is a degree of radiation absorption or reflection. The radiation beam gets into detector, which process radiation changes to electrical signal. Changing the density or concentration of the measured medium causes a change in the detector current, which is sent to the CPU microprocessor controller. The controller in accordance with program interprets the input signal changes and reports measurement results of density / concentration digitally on the screen and on current and analog outputs.

Digital - analog outputs can be used to control valves or pumps which regulate the density and concentration of the medium in the tank or pipe.

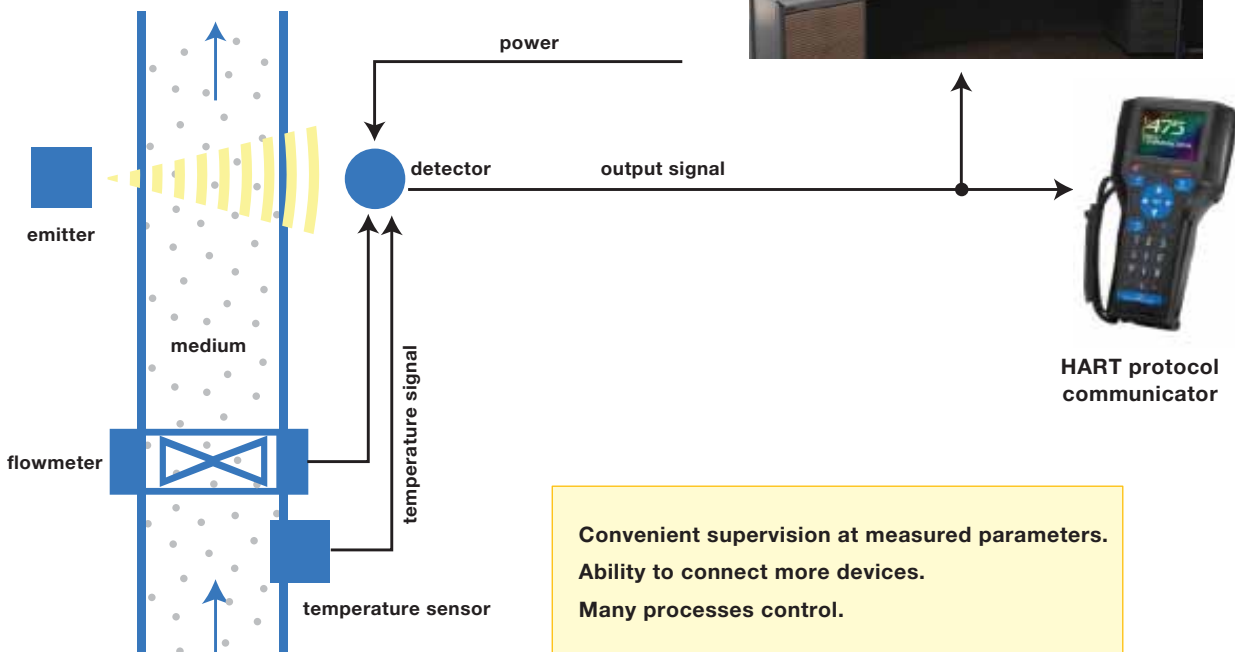
Functions

- density, concentration, temperature, flow measurement of acids, bases, saline solutions elements and others;
- measurement results are presented on the digital display and digital - analog outputs;
- continuous work suitable for industrial environment;
- automatic registration and archiving of results;
- automatic temperature correction;
- protocols: MODBUS RTU, HART.

Applications

- density measurement of acids, bases, saline solutions, suspensions;
- monitoring of crystallization and polymerization;
- measuring the solids content of suspensions and exhaust;
- density measurement of powders;
- concentration of elements.

Remote supervision system



- Convenient supervision at measured parameters.
- Ability to connect more devices.
- Many processes control.



Measurement methods

Radiation is absorbed as it passes through a measured material. Absorption level depends on optical path length, which is passed in measured material or parameters of this material – density, concentration, chemical composition, temperature. Constant distance between detector and emitter allows to measure parameters in function of radiation absorption in measured material.

Measuring system

Measuring system consists of emitter, mounting kit, detector and control panel. Whole components are connected via cables. Detector is based on scintillation counter with NaI crystal or other type depending on the application. All of components are located in one housing.

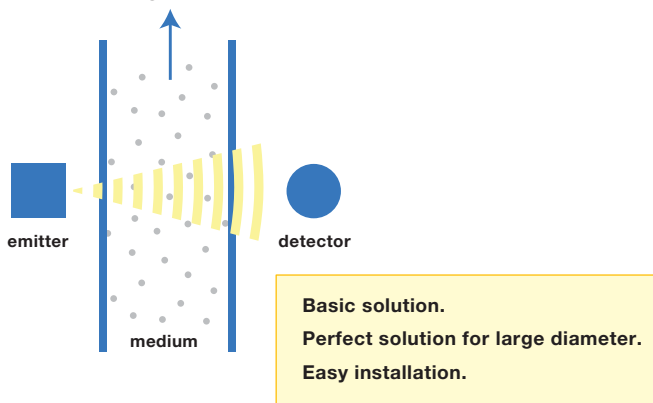
Installation

Installation of gauge does not interfere in pipelines construction therefore there is no need for stopping production process. Both emitter and detector can be mounted on a pipeline using clamps. There is also a possibility to mount a gauge at the different angles, for example 90°, 45° or 30°. In case of smallest pipe diameters, to use S or U-shaped measuring path. Temperature changes can be compensated by temperature sensor or internal current signal.

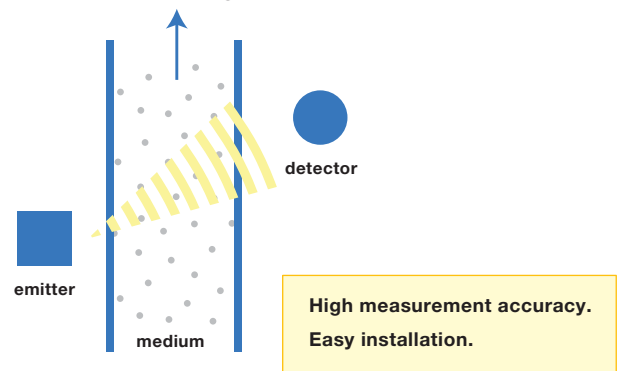
Flow measurement

Mass flow measurement requires informations about volume flow and density. Flowmeters are often used for liquids. Current signal can be processed directly through detector. The same principle can be used to measure suspensions stream at the pneumatic transportation.

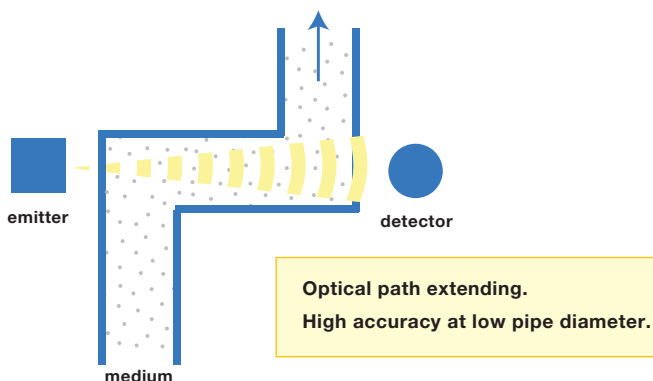
1) 90° - angle measurement



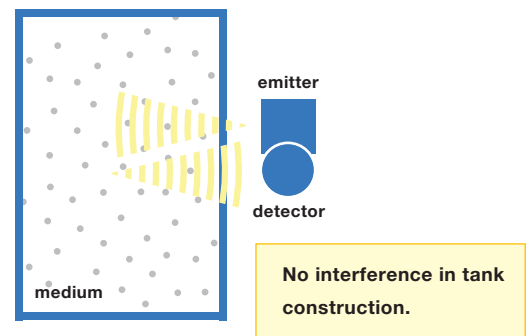
2) 45° / 30° - angle measurement



3) S- or U- shaped measuring path



4) Tank measurement





Gauge designing

All of the meters are matched to Client needs and requirements. To achieve this it is necessary to study conditions and kind of medium that gauge should work on. This approach guarantees safety and maximum gauge precision at the minimal source activity.

Gamma radiation source detector

Detector is based on scintillation counter with NaI crystal. Gamma radiation causes photo flashes. The amount of those flashes is proportional to the intensity of radiation. Crystal is „observed” by a photocell, which together with electronics processes flashes to electrical signal. In comparison with other detection technologies (such as ionization chambers) this method stand out by:

- great gamma radiation sensitivity
- low required source activity
- much longer lifetime of the gauge

High temperature changes resistance is additionally optimized by electronic loop. This loop provide excellent parameters stability even for short measuring range. Other, long-term variations (for example aging of the gauge) are compensated too.

Source protection

Whole radiation sources in industrial installations are sealed in stainless steel container. It separates source from an operating medium. Usually used sources are Cs-137 although it can also be used Co-60 or Am-241. Massive source housing has an opening aperture through which the radiation beam comes out. Aperture is adapted to source activity, consequently users are never exposed to high radiation level. It is not possible to contaminate of measured medium. Depending on the individual requirements, it is possible to use another type of aperture, for example for tanks measurements.

Parameters to determine in design phase

- measured values
- measuring range
- required accuracy
- temperature range
- external pipe dimensions, wall thickness
- for suspensions: solid and liquid density – minimum and maximum
 - for liquids: measuring range [g/m³], minimum and maximum concentration, chemical formula (if possible)
- working environment temperature and humidity range
 - input and output signal type
 - communication port type

MEASURING RANGE	
density	measuring ranges and accuracy are matched to the user's needs
concentration	
temperature	
medium flow	
WORKING CONDITIONS	
power supply	95 do 250 VAC, 50 do 60 Hz, 15VA
ambient temperature	-40 do +60°C
working temperature	-40 do +60°C
STANDARD INPUTS/ OUTPUTS	
communication protocols	MODBUS RTU, HART (option)
4 on/off outputs	load ≈ 24 V, 1A
2 analog outputs	0 ÷ 10 V, I _{max} = 10 mA / 4 ÷ 20 mA, R = 0,5 kΩ
serial output	RS485/ RS232/ RS422/ ETHERNET
ELECTRONICS	
CPU	continuous work suitable for industrial environment; automatic registration and archivisation of results; automatic temperature correction
EQUIPMENT	
standard	measuring head; microprocessor controller; cables; documentation (DTR, manual, warranty card, Declaration of Conformity)
optional	explosion-proof equipment; spark-proof equipment; controller and measuring head tightness dustproof and; splash-proof class IP-64



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We closely co-operate with Central Radiological Safety Laboratory (Warsaw), Radiochemistry and Nuclear Technology Institute (Warsaw), Atomic Energy Institute (Świerk) and Institute of Physics at Warsaw University. Our long experience in narrow specialization allows us to reduce production costs, what gives our products very competitive price.

The company holds Permits of the Ionization Radiation Application Supervision Department of the National Atomic Agency of Poland for the manufacture of isotopic equipment and XRF spectrometers.

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