

We Measure Oil in Water



Optical or Acoustic

Process measurement of liquids

- Oil in Water
- Ultrasonic Turbidimetry
- UV- / VIS- / NIR- Photometry
- Optical Turbidimetry

Instruments:

Application Examples:

Oil in / on Water

- Model FLUCOmat
- Model IRmat

Oil at water intake / outlet of plants
Oil at rain water collection tanks
Oil at river water, well water
Oil at potable water, seawater
Oil at pump sumps
Oil in condensate or cooling water

Ultrasonic Turbidimetry

- Model AS3/AT3

Oil in condensate
Oil in cooling water
....
etc.

UV- / VIS- / NIR- Photometry

- Model UVS-1
- Model MoniSpec - UV
- Model MoniSpec – UVD
- Model MoniSpec – A

APHA colour (Hazen)
ASTM colour, Saybolt colour
EBC colour
Lovibond colour
Icumsa, RBU,
Application specific colour

UV₂₅₄, UV₂₈₀, SAC₂₅₄
TOC, COD, DOC (at 254nm)
Organic components (in Bio Reactors) etc.

Optical Turbidimetry

- Transmitter Model Messenger
- Model MoniTurb - F
- Model MoniTurb – FS
- Model TSW (210)
- Model TurbiLab –FS
- Model MZNV (micro organism growth)
- Transmitter Model CCAb
- Model MoniSpec - A
- Models CSW & LAS
- Model AP2
- Models CSK & TURBIImat-LC

Filtration control
Turbidity of beer, water, etc.
Water in fuel
Quality control
Total solids (%TS)
Yeast concentration (million cells / ml)
Yeast dosage (million cells / ml)
Turbidity of wort (EBC)
Water in oil
etc.

Product News 2014

Modell UVS-1/Messenger

Process- Absorption- Photometer

- Optional installation to TH- Variline flow cells
- Available as 200mm insertion probe
- Long Life LED Light / UV- source
- Wavelengths in a spectral range of 240nm – 880nm



Probe model UVS-1 with TH- Varivent plate

Model TURBImat-LC / Messenger

Absorption- Turbidity probe

- Low maintenance
- 30cm immersion probe
- Pipe extension 0,5m for pipe insertion via ball valve
- Insertion/removal without process interruption
- Pipe extension up to 2m f. installation in open channel
- Calibration interval: Typical 6 month
- Optimized cleaning jets



Immersion probe model TURBImat-LC (1m)

Instruments:

Oil in / on Water

- Model FLUCOmat
- Model IRmat

Application Examples:

Oil at water intake / outlet of plants
Oil at rain water collection tanks
Oil at river water, well water
Oil at potable water, seawater
Oil at pump sumps
Oil in condensate or cooling water



Everything all right?

Oil on Water Monitor Model

FLUCOmat (FLU 103)

Non Contact Detection of:

- **Mineral oils**
- **Synthetic oils**
- **Oil- Emulsions**
- **Free Hydrocarbons**

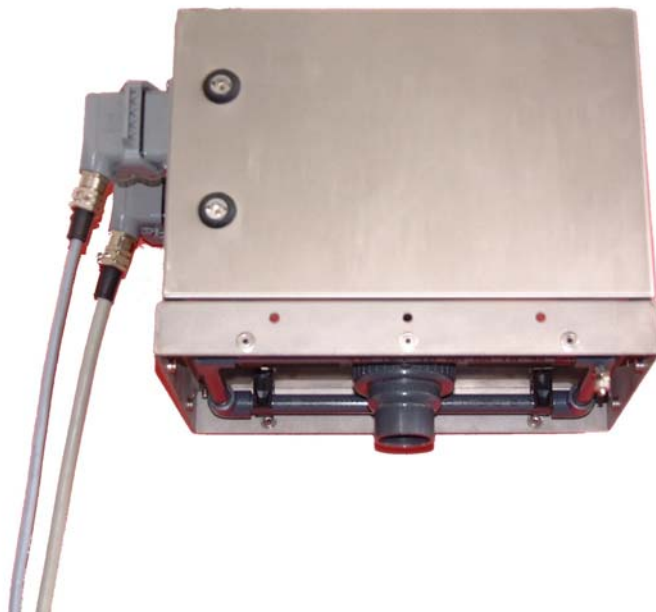
Transmitter Oil on Water Monitor FLUCOmat (FLU-103-WA)



Transmitter Oil on Water Monitor FLUCOmat (FLU-103-19)



Sensor Oil on Water Monitor Modell FLUCOmat (FLU-103)



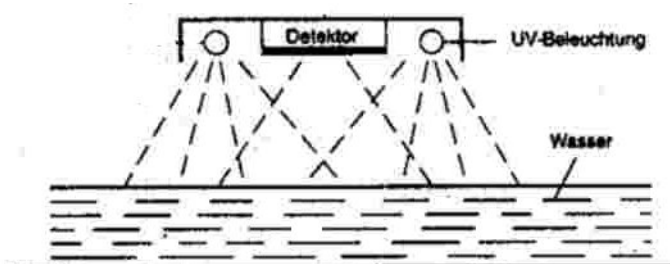
What does Fluorescence mean?

Fluorescence is defined as the characteristic of solid, liquid or gaseous products, after irradiation with light, UV-, Roentgen- or electron rays, to return a part of the absorbed energy with the same or a longer wavelength.

The detection of oil on water

The water surface will be irradiated by UV – light. Oil, located on the water surface will absorb a part of this UV– light. This absorbed energy will be given off immediately with a different wavelength as visible light.

The visible light created by this effect will be detected by a photomultiplier, and transformed.



Why oil on water and not oil in water?

This question is easy to answer, oil swims!

The conception of the oil on water monitor, model FLUCOmat is mainly for the monitoring of open channels, surface water, basins, etc. These applications make it impossible to take a representative sample with the average oil content of the total volume, because the oil is not homogeny mixed in the water.

Example:

In case a sample is taken in a depth of 1m, you may find no oil at all. In a depth of 0,5m you may find 1ppm of oil, in 10mm depth 1000ppm, and at the surface you find a 3 mm thick oil film. Even small quantities of oil can be a problem. Especially in cases where the water is drained directly into a river or into a public waste water system. Different government laws will oblige everybody to keep care to the environment. So facilities that accidentally put oil into the environment need to monitor their water continuously.

Typical measurement units

The monitoring results of model FLUCOmat will display, how many percent under the detection area is covered by the specific oil used for calibration. Due to the fact that the total quantity of water and the distribution of oil and type of oil is typically unknown, it is not possible to calibrate the system in ppm, mg/l, etc. at installations in open channel. An installation in Bypass (flow through) allows a ppm calibration.

Detection sensitivity

The fluorescence method shows an excellent sensitivity against the unsettled hydrocarbons in oil. So typically you can detect 1 drop of oil per m² without any problem.

Advantages:

- > Detection of Mineral Oils
- > Detection of synthetic Oils
- > Detection of Emulsions
- > Detection of free hydrocarbons
- > Non contact surface scanning
- > High sensitivity
- > Factory calibration
- > Transfer standard, calibration without liquid samples
- > Big measurement area of approx. 20 cm diameter
- > High long term stability, calibration interval 1 year
- > Low maintenance
- > No moving parts
- > Long life UV- Lamps (optional UV- LED´s)
- > Automatic selve diagnostic routine

Application:

Continuous monitoring of water surfaces. Swimming oil will be detected with excellent sensitivity. Oil contaminations will be recognized in an early stage, environment und process problems will be avoided.

Installation at pontoons (Stormwater detention basin)



Installation at bypass container



Flucomat with ultrasound controlled elevation system



Typical locations:

- Chemical Industry
- Petro Chemie
- Power Stations
- Oil separators
- Waste Water Plants
- Produced Water
- Water Reservoirs
- Cooling Water
- Potable Water

Applications:

- Oil at drinking water reservoirs
- Turbine Oil in power stations
- Oil of Hydraulik- maschine parks
- Oil in cooling water (heat exchanger oil)
- Oil in produced water
- Oil in stormwater detention basins
- Water return of plants to rivers or lakes
- Water return to public waste water systems

Technical data:

Transmitter FLUCOmat (FLU 103)

FLU-103-WA (IP 65 / Nema 4x wall mount enclosure)

Supply voltage:	115, 230 VAC, 50 - 60 Hz (24 VAC/DC)	Ambient temperature:	-20°C – +45°C
Power requirement:	maximal 80 VA	Analog- output:	0/4 - 20 mA
Set point relay:	48V / 2A	Dimensions transmitter:	ca.355 x 235 x 325mm
System fail relay:	48V / 2A	Protection class transmitter:	IP65 / Nema 4X
Self test relay:	48V / 2A	Dimensions Sensor:	approx. 360 x 240 x 280 mm
Range:	Application specific	Protection classt Sensor :	mm
Reproducibility:	± 2 %	Optional Ex-cert. (ATEX):	IP65 / Nema 4X
Cable length:	maximum 60 m		Ex-Zone I und Ex-Zone II

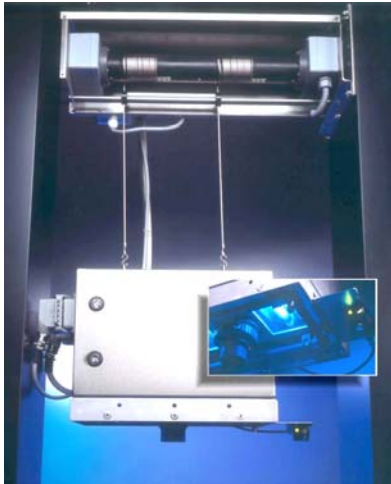
Technical Data:

Transmitter FLUCOmat (FLU 103)

FLU-103-19 (19“- Rack)

Supply Voltage:	115, 230 VAC, 50 - 60 Hz (24 VAC/DC)	Ambient temperature:	-20°C – +45°C
Power requirement:	maximal 80 VA	Analog- output:	0/4 - 20 mA
Set point relay:	48V / 2A	Dimensions transmitter:	19" / 3HE / 84TE
System fail relay:	48V / 2A	Protection class transmitter:	IP30
Self test relay:	48V / 2A	Dimensions Sensor:	approx. 360 x 240 x 280 mm
Range:	anwendungsspezifisch	Protection class Sensor :	IP 65
Reproducibility:	± 2 %	Optional Ex-cert. (ATEX):	Ex-Zone I und Ex-Zone II
Cable length:	maximum 60 m		

Model FLUCOmat (FLU 103) / Summary



- Low maintenance
- High detection sensitivity
- Non-contact measurement
- Large measurement surface of approx. 20cm diameter
- Adjustable setpoint
- Automatic self diagnostic routine
- 3 1/2 digit LED display and additional bargraph
- Installation via bypass container, pontoons or NiveauTron
- Long live UV- lamps (optional UV- LED's)

Description:

The oil on water monitoring system Model FLUCOmat is used for continually monitoring of water surfaces for the presence of oil. The instrument provides a very high sensitivity. Oil leakage can be recognised at an early stage, and damage to facilities and the environmental can be avoided or minimised. The system uses the principle of UV stimulated fluorescence. To raise the sensitivity, the instrument is adjustable to detect fractions of reflection in addition to the fluorescence signal. The use of modulated light compensates, for ambient light, ageing of lamps and contamination of the detector, to a high degree. Thus assures highly stable and reproducible monitoring results. The sensor requires a constant distance of approx. 40cm above the water surface. Level fluctuations in open channels can be compensated by using pontoons or the ultrasonic level elevation. An optional bypass container is also available to allow flow through measurements and a calibration in ppm.

Applications:

- Cooling water
- Rainwater catchment's
- Water reservoirs
- Turbine Water

Operational areas:

- Chemical industry
- Petrochemical industry
- Drinking water
- Power stations

Technical Data:

Supply voltage:	115, 230 AC / 50 – 60 Hz	Measurement range:	typical 1 drop/m ²
Power consumption:	maximum 80 VA	Reproducibility:	± 1 %
Set point:	1 Relay (48V / 2A)	Detector:	Photo Multiplier
System fail:	1 Relay (48V / 2A)	Protection:	IP65 / NEMA4X
Self test:	1 Relay (48V / 2A)	Enclosure:	1.4571 / 316SS (alternative ABS)
Analogue output:	0/4 - 20mA / 800Ohm	optional hazardous area:	ATEX div. I or div. II

Everything all right?

Oil on Water Monitor Model IRmat (IR 21)

Non Contact Monitoring of:

- **Mineral Oil**
- **Synthetic Oil**
- **Food Oil**
- **Silicone Oil**



Oil on Water Monitor Model IRmat

General

The oil monitor model **IRmat** detects the intensity of reflected infrared light caused by oil, swimming at the water surface. The different refractive index between oil and water is used for the non-contact detection of oil films. The sensor provides hereby an automatic compensation against the interferences caused by ambient light. The non-contact monitoring technology allows the continuous real time detection of oil and other IR- reflecting substances located on water surfaces, without having frequent cleaning cycles. Due to these features and due to the extended calibration interval is the instrument almost free of maintenance.

Technical Data Model IRmat (Sensor)

microcontroller based oil on water detection

Enclosure material:	316SS and PE
Dimension:	Ø 89mm, length 21mm
Enclosure rating:	IP65 (Nema 4X)
Cable length:	maximum 50m
Cable gland:	M16 x 1.5
Purge air connector:	R 1 / 8 "
Installation:	by swivel clamp Ø30mm
Distance to water surface*:	120mm ±5%
Size of detection area:	Ø ca.100mm
Supply voltage:	24 VDC
Power consumption:	< 30VA
Analogue output:	4 - 20mA, max. 500 Ohm
Set points:	2x NPN (adjustable)
System fail:	1x NPN
Measurement range:	application specific
Ambient temperature:	-15°C to +45°C (Ice-free water)
Ambient humidity:	85% rel. humidity without air purge
Detection diameter:	100mm



The sensor has to be installed in a vertical position to the water surface.

*Distance between water surface and probe tip has to be constant to guarantee reproducible results!

Measurement range: application specific

- Rainwater basins
- Oil separation
- Water reservoirs
- River water
- Process water
- Sea water
- Cooling water
- Produced water

Application

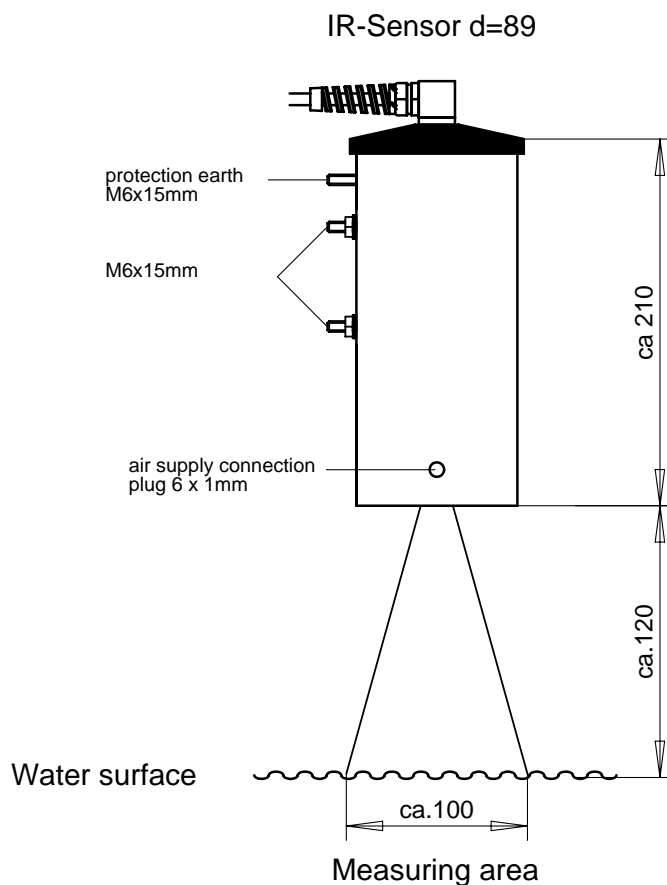
The oil on water monitoring system model IRmat is used for the continuous monitoring of water surfaces to detect the presence of oil. Oil leakages will be recognised in an early stage, this will avoid damages to facilities or to the environment.

Oil on Water Monitor Model IRmat

Optional features:

- Installation:**
- Swivel clamp (typical pipe length 600mm, Ø30mm)
 - Pontoon installation
 - NiveauTron ultrasonic level elevation system
 - Bypass container
 - Special mounting devices on request
 - Pre assembled sampling system incl. pump / flow control / system fail
 - Skimmer to catch the surface water (used with sampling system)
 - Ultrasonic niveau compensation

Dimension Model IRmat



Oil on Water Monitor Model IRmat

Model IRmat (Transmitter)

The microprocessor controlled transmitter will be connected to the probe model IRmat. The transmitter supplies the probe with 24 VDC and converts the detector signals into utilizable measuring results. A 3 1/2 digit LED display and a 0/4-20mA isolated analog output are used to show or transfer the measurement values. Set point and system fail relays can provide alarm messages to the control room.

Take notice:

The optional ultrasonic level compensation allows compensating level changes up to a maximum of $\pm 75\text{mm}$ by using this transmitter.



- Microprocessor based signal-converter
- 3 1/2 digit LED display / bar graph
- Analogue output: 0/4 – 20mA
- Adjustable set point
- System fail relay
- Probe defective relay
- IP65 wall mount enclosure
- Optional stainless steel enclosure (IP54)

- Water reservoirs
- Rainwater catchment's
- Cooling water
- Oil separator
- Process water

Technical Data IRmat (Transmitter)

Supply voltage:	115, 230 VAC, 50-60 Hz 30VA (optional: 24V AC/DC)	Temperature range:	-15°C to +45°C
Sensitivity:	Programmable according to application	Enclosure:	PVC with front window, IP65
Display:	3 1/2 digit LED and bar graph	Dimensions:	B=258mm, H=237mm, T=148mm
Analogue output:	0/4 - 20mA, isolated, max load 500 Ohm	Menu :	4 digit 7 segment LED display
Relay output:	Oil alarm / System fail / Probe fail	Relay capacity:	30 V DC, 1 A

Instruments:

Application Examples:

Ultrasonic Turbidimetry

- Model AS3/AT3

Oil in condensate
Oil in cooling water

....
etc.



Everything all right?

Optical or Acoustic

Process measurement of liquids

- **Turbidity**
- **Colour**
- **Oil in Water**
- **Water in Oil**
- **Oil on Water**

Ultrasonic Reflection Model AS3/AT3

Ultrasonic- Turbidimeter, Monitek Product Line of Galvanic Applied Sciences Inc.

Model AS3



- Free of maintenance
- Extended calibration interval: Typical 24 month
- Process insertion through pipe adapter with ball valve
- Insertion/removal without process interruption (max. 5 bar)
- Optional available with DIN- or ANSI flanges
- Wide span of ranges
- Insensitive to colour
- Insensitive to coatings
- Self cleaning effect due to ultra sonic pulses
- No wearing parts

Description:

The ultrasonic probe model AS3, together with transmitter model AT3, has been specially designed to measure particle concentration in a variety of liquids. According to the application, calibration can be done in multiple ranges and measurement units like EBC, ppm, %, etc.. The measurement system has been designed for continuous operation with long life time. The probe design allows an installation into process pipes, tanks or open channels. Up to a process pressure of 5bar and non critical product, process insertion and removal of the probe can be easily done via a 1"ball valve. Calibration and maintenance ensues without process interruption. Other process connections like flanges, swagelok fittings, etc. are available on request.

Applications:

- Product concentration
- Filtration control
- Oil in condensate
- Oil in water / Water in oil

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Power plants

Technical Data:

Line size:	< DN 50 / 2"	Measurement range:	0–10ppm, 0–30000ppm
Process pressure:	maximum PN 40 / ANSI class 300	Reproducibility:	± 1 %
Process temperature:	maximum 80°C / 110°C with air purge	Length of probe pipe:	approx. 300mm
Probe material:	1.4471 / 316SS (other material on request)	Weight:	approx. 3kg
Lens material:	Peek (other material on request)	Protection:	IP65 / NEMA 4X
Gasket material:	typical Kalrez	optional hazardous area:	ATEX Zone I / Zone II



Principle of measurement: Ultrasonic reflection

- Intuitive user interface
- High reproducibility
- Programmable range
- Linearization of measurement values
- Programmable measurement units (ppm, m/l, %, etc.)
- Analogue output: 0/4 – 20mA (isolated)
- Four programmable set point relays
- Backlit graphic display

Description:

The transmitter model AT3, together with a probe model AS3, has been specially designed to measure particle concentration in a variety of liquids. The large span of measurement ranges of 0 – 1ppm to 0 – 30000ppm allows a wide range of applications. A user friendly interface provides great assistance in setting up of the instrument. Between two and sixteen samples are required to define a calibration curve for a specific customer application. Calibration can be done in multiple ranges and measurement units like mg/l, %, g/l, ppm, ppb, etc. according to customer specification. The 0/4-20mA output allows transferring the measurement results to an external PLC system.

Applications:

- Product concentration
- Filtration control
- Oil in condensate
- Oil in water / Water in oil

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Power plants

Technical Data:

Supply voltage: 90 - 260 VAC, 50 - 60 Hz
 Power consumption: maximum 50 VA
 Relay capacity: (48V / 2A) programmable
 Analogue output: 0/4 - 20mA isolated / 800Ohm
 Display: Backlit graphic display

Measurement range: 0–10ppm, 0–30000ppm
 Reproducibility: ± 1 %
 Ambient temperature: -10°C to 50°C
 Enclosure: 1.4301 / IP65 (NEMA 4X)
 Dimensions: 440 x 360 x 205 mm / 10 Kg
 optional hazardous area: ATEX Zone I / Zone II

What does ultrasonic Particle Measurement mean?

The ultrasonic particle measurement is used to detect non-dissolved (suspended) particles in a liquid, similar to a turbidimeter.

Due to the fact that turbidity is an optical effect, the acoustical method is named as particle or concentration measurement.

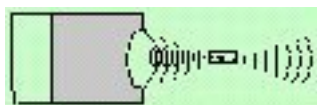
Method of Measurement

Equal to a sonar system, the acoustic probe will transfer ultrasonic pulses into the measurement sample. When the acoustic pulses hit particles inside this sample a part of this ultrasonic energy will be reflected as an echo.

The quantity and intensity of these echoes will be detected, evaluated and shown as measurement values.

What do we mean by “Particle”?

In this case, particles are described as pieces, with a different speed of sound as the carrier liquid. This term “particle” not only describes solids as minerals, metals, organic cells, etc., but it also includes components like free oil in water, gas bubbles, etc.. Turbidity caused by colloids, proteins, polymers, etc. will not be detected in a water based solution. These materials consist to a high degree of water and will not show a difference in speed of sound as water.



The ultrasonic pulses hit the particles and will be reflected as echoes.

Comparison of different Measurement Methods

The ultrasonic measurement method is not directly comparable with optical turbidity measurements.

Even in case the same calibration method is used at an optical, as well as at an acoustical instrument, the measured products can show deviating measurement results in this both systems. This deviating behavior is caused by different particle size distributions inside the different samples, compared to the particle size inside the calibration liquid. Depending on particle size distribution, different measurement methods will respond different.

Typical Measurement Units

ppm: Parts per million
 mg/l: Milligrams per Litre
 gr/l: Grams per Litre
 % TSS: Percent Total Suspended Solids

Please pay attention:

Measurement units based on the Formazin turbidity standard (like e.g. NTU, FTU, FNU, EBC), are typically not used for the acoustical measurement method.

Formazin creates polymer based turbidity without particles (see the above definition of a particle), therefore Formazin will not create acoustic reflections (echoes).

Typical ranges

The ultrasonic measurement system model AS3/AT3 is used for the detection of low, as well as of high particle concentrations. The resolution of the system at lower ranges is at 0,1ppm and better. The maximum range is at approx. 20.000ppm (2 %), higher ranges can be possible depending on product.

When will an ultrasonic particle measurement be used

The ultrasonic particle measurement is used for applications where optical systems will not (or poorly) work.

Another wide range of applications is where systems with extreme low maintenance and extreme high long term stability are required.

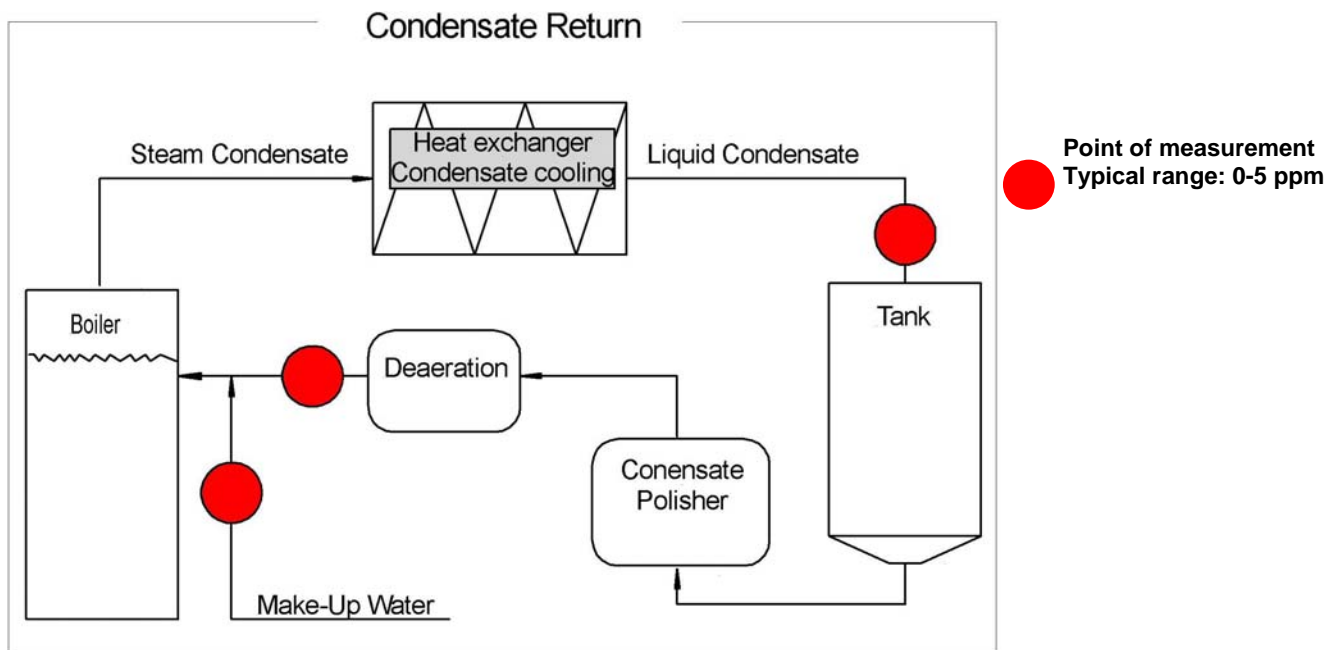
Advantages of an acoustical particle measurement

- No wearing parts
- Free of maintenance
- Long term stability
- Insensitive to coatings on the probe
- Self cleaning effect caused by the ultrasonic energy
- Lowest range approx. 0 – 1ppm
- Highest range approx. 0 – 20,000ppm
- Measurements in black, extreme coloured, opaque liquids
- Measurements in light sensitive liquids
- Not effected by ambient light
- 1" probe technology
- Easy installation in open channels or basins, tanks, etc.
- Easy installation to a pipe, via an 1" ball valve
- Pressure rates up to 600 PSI (40 Bar)
- Max. process temperature 110°C
- Optional use in hazardous area

Typical applications

- **Measurement of oil in condensate.**
The measurement results are not affected by mineral or oil coatings, high sensitivity against free oil.
- **Measurement of oil in cooling water.**
The measurement results are not affected by algae growing or oil coatings, high sensitivity against free oil. Possible positive interference caused by particles.
- **Measurement of particles in black ink or other extreme colored liquids.**
The measurement results are not affected (influenced) by opacity of liquids.
- **Measurement of particles or bubbles in film development liquid.**
The light sensitive product is not affected (influenced) by the ultrasonic pulses.
- **Selective measurement of yeast cells in beer with additional protein based turbidity.** The measurement results are not affected (influenced) by the proteins inside the beer.
- **Filtration control in industrial applications**

Application Example



Condensate is typically clean water. Condensate return is used as boiler feedwater whenever possible, since it is clean and hot. It takes significantly less energy to reboil condensate return than to use fresh make-up water.

Condensate goes through turbines, pumps, heat exchangers and other equipment. Oil or other contaminants may leak unrecognized into the condensate. These contaminants involve coating, foaming, corrosion and other problems if they reach the boiler. Even if there are no oil leaks, the condensate can become contaminated with iron resulting from an improperly treated piping system or corrosion. This iron will cause high erosion at the turbine blades. Sometimes condensate is cleaned by passing it through polishing filters to remove filterable contaminants, but this is expensive and the measurement system is required for filtration control.

Optical or Acoustic

Two different principles of measurement are typically used for oil and particle monitoring of condensate or feedwater, the classic optical 12° forward scatter turbidity measurement as well as the ultrasonic reflection. Both methods detect even low contaminations (down to ppb level) immediately.

Optical: forward scatter turbidity (model MoniTurb-F / Messenger)

The optical measurement allows very high process temperatures. The sapphire windows of the sensor typically become opaque after some weeks or month of operation, due to mineral coatings. This requires a consistent manual cleaning of the windows in diluted HCL.

Acoustic: Ultrasonic reflection (model AS3 / AT3)

The ultrasonic pulses of the measurement probe are not affected by any coatings. The accruing of mineral coatings is prevented by the ultrasonic cleaning effect additionally. The probe does not have any wearing parts, shows extreme high long term stability and is usually free of maintenance. The design of the probe allows an easy and cost-effective installation. These advantages make the ultrasonic reflection to a perfect technology for this application.

UV- / VIS- / NIR- Photometry

- Model UVS-1
- Model MoniSpec - UV
- Model MoniSpec – UVD
- Model MoniSpec – A

APHA colour (Hazen)
ASTM colour, Saybolt colour
EBC colour
Lovibond colour
Icumsa, RBU,
Application specific colour

UV₂₅₄, UV₂₈₀, SAC₂₅₄
TOC, COD, DOC (at 254nm)
Organic components (in Bio Reactors) etc.



Everything all right?

Optical or Acoustic Process measurement of liquids

- **Turbidity**
- **Colour**
- **Oil in Water**
- **Water in Oil**
- **Oil on Water**

Process UV- Photometry

Models UVS-1, MoniSpec-UV & MoniSpec-UVd

Model UVS-1 general information

The UV- photometer model UVS-1 / Messenger measures UV- absorbing compounds in liquid products. Optionally the probe may be upgraded to additionally detect the IR-absorbing compounds. This second IR- absorption signal is used to compensate for the turbidity caused by particles.

Principle of measurement

UV- Absorption:

The emitted light from a pulsed UV-LED (measuring wavelength typically 254nm or 280nm) passes the process stream when the resulting light is sensed by the measurement detector. Other wavelengths in a spectral range of 240nm to 880nm are available as an option. Please pay attention to the specification of your probe. The decrease in UV- energy is caused by the absorbance of the light by organic species, benzene and other substances with UV- absorption, e.g. turbidity, caused by particles.

A second, reference detector, controls the output of the UV-LED and thus corrects for any changes in the intensity of the UV output.

IR- Absorption: (optional)

As with the UV- absorption the light from a pulsed IR-LED (alternates with the UV- LED) passes through the same path as described above. The decrease in IR- energy (typical wavelength 850nm) is caused by the IR-absorbance of particles (turbidity) only and will be displayed as a second measuring result. Now the reference detector corrects alternating eventual intensity changes of the IR- LED and the UV- LED.

Dual Beam / Dual Wavelength: (optional)

Alternating measurement of UV- and IR- absorption is used to compensate for turbidity caused by particles.

The absorption at measuring wavelength detects the UV- absorption caused by UV- absorbing compounds and total solids.

The absorption at reference wavelength detects primary the absorption caused by total solids.

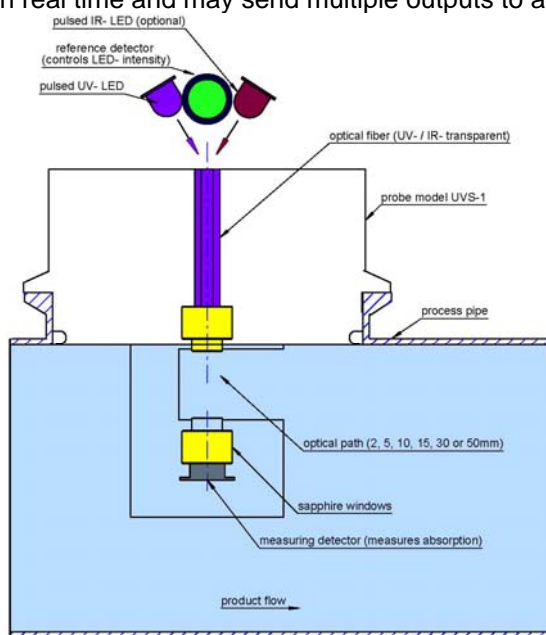
The difference between the two signals gives the concentration of UV- absorbing substances only (e.g. organics, proteins, etc) this method compensates for the absorption of turbidity / particles and provides a measurement of the substances which absorb in the UV- spectrum only. If the probe is specified to measure the absorption in the visible spectrum (colour measurement) the result will be calculated as follow: $([\text{colour absorption} + \text{turbidity absorption}] - \text{turbidity absorption}) = \text{colour absorption}$. The dual wavelength measurement compensates for turbidity and results UV- / colour- absorption only without being affected by turbidity.

Temperature:

The model UVS-1 is equipped with two built-in temperature sensors.

Sensor 1 is located in the measuring tip and provides the product temperature and may be displayed as an additional measuring signal. Sensor 2 measures the temperature of the UV- LED and is used to shut down the probe in case the upper temperature limit is reached or exceeded.

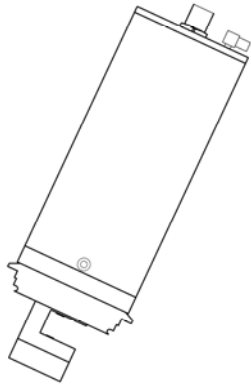
All probe signals are converted and processed by the Messenger transmitter. The Messenger transmitter provides the calculated measuring results in real time and may send multiple outputs to a process control system.



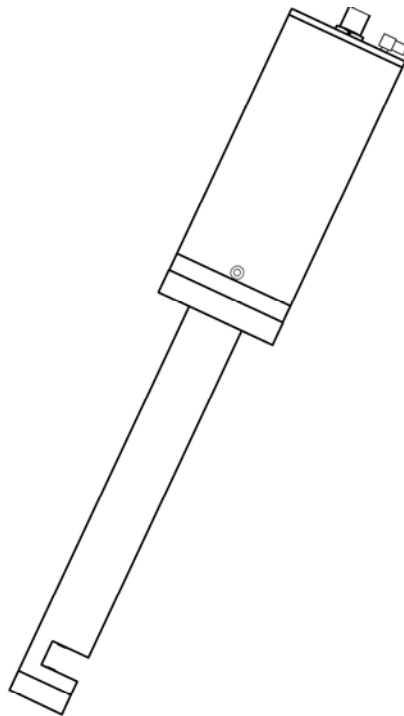
* The reference detector controls the intensity of the pulsed UV- / IR- LED
 ** The measuring detector receives the alternating UV- / IR- absorption signals (IR- absorption is optional)

Take notice: The figure shows the probe 90° turned in the process, this is just for better view.
 The typical positioning of the probe makes sure that the process stream flows thru the optical path.

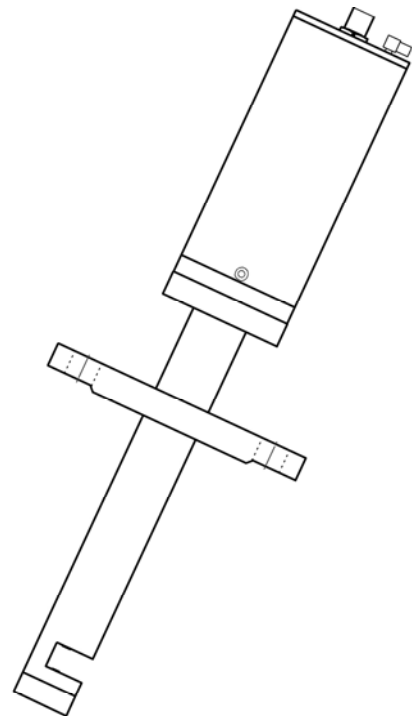
UVS-1 Probe Designs



TH- Variline version
Pipe installation in Variline flow cell



Insertion probe
Open channel or ball valve pipe installation



insertion probe with flange
instalation via several flange types

The UV- probe model UVS-1 is available in three different designs.

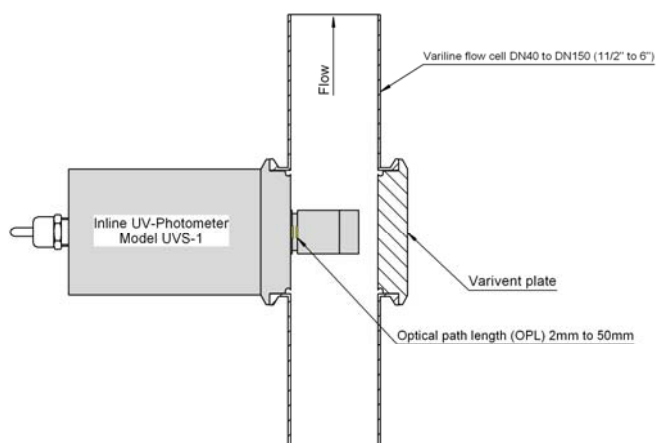
- Hygienic designed with TH- Varivent plate for installation in pipes with installed Variline flow cell.
- As 215mm probe for pipe mounting via a ball valve or for direct insertion in the liquid.
- As insertion probe with mounting flange.



Version with Varivent plate.

Model UVS-1

Process UV/VIS/NIR- Absorption Photometer



- **Low Maintenance**
- **Typical calibration interval 12 Month**
- **Material measuring windows: Sapphire**
- **Typical measuring wavelength: 254nm or 280nm**
- **Other wavelength in UV/VIS- spectrum available on request**
- **Optional dual wavelength measurement**
- **Optional process temperature measurement**
- **Installation via TH- Varivent plate (TH- Variline flow cell)**
- **Variline flow cell sizes: DN40 to DN150 (1 1/2" to 6")**
- **Optional extended probe length (insertion length 215 mm)**
- **Optional flanges: DIN, ANSI, Tri clover, APV, TH, ...**
- **Optional Air purge**
- **Cleaning: CIP / SIP**

Description:

The sensor model UVS-1 is used to detect UV- absorbing substances in liquids at wavelength of 254nm or 280nm. Other wavelengths are available on request (240 – 880nm). The lifetime of the LED- light sources is between 2 and 5 years (depending by wave length and application).

The probe detects all UV- absorbing substances at the specified wavelength. This means the probe is sensitive against substances which absorb only UV- light (e.g. benzene) and substances which absorb in the whole UV/VIS/NIR spectrum (e.g. solids). Therefore the dual wavelength option offers a second reference measurement, typical in the NIR- spectrum at 850nm. The UV- absorption is affected by UV- absorbing substances and turbidity (solids). The NIR- absorption is affected by particles (turbidity) only.

The difference of the both absorption signals ([UV- absorption + turbidity absorption] - turbidity absorption) allows to detect all substances which absorb in the specified UV- range only.

If the probe is specified to measure the absorption in the visible spectrum (colour measurement) the result will be calculated as follow: ([colour absorption + turbidity absorption] - turbidity absorption) = colour absorption. The dual wavelength measurement compensates for turbidity and results UV / colour absorption the influences of the turbidity will be compensated.

A temperature sensor provides a shut down of the probe in case of to high product temperature.

This temperature signal can be displayed as an additional option (accuracy approx. +/- 1°C).

The transmitter model Messenger is required to process the sensor signal of the UV- absorption, respectively the optional signals of dual wavelength absorption and temperature.

Calibration can be done in multiple ranges and measurement units by using up to 8 calibration samples. The UVS-1 covers a wide span measuring ranges, due to the availability of multiple optical path lengths (2mm up to 50mm).

Applications:

- UV254 (optional with reference wavelength 850nm)
- UV280 (optional with reference wavelength 850nm)
- Spectral Absorption Coefficient (SAC)
- TOC / COD / PAC
- Toluene, Benzene, ...
- Colour measurements in the visible spectrum

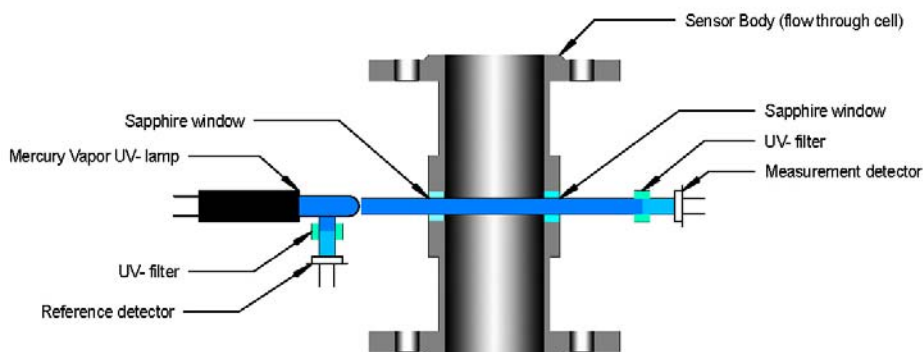
Operational areas :

- Potable water / Waste water treatment
- Produced water
- Food and drinking industry
- Bio technology
- Pharmaceutical
- ...

Technical Data:

Line sizes:	DN40 – DN150 / 1/2" to 6"	Measuring range absorption:	typical: 0–4AU
Process pressure:	PN25 at DN40 & DN50 PN16 at DN65 & DN80 PN10 at DN100 to DN150	Measuring range temp.:	typical 0-140°C (optional)
Temperature range:	maximal 75° (110°C w. purge air) short time 140°C	Optical path length:	2mm, 5mm, 10mm, 15mm, 30mm or 50mm
Flow cell material:	1.4404 (316L)	Reproducibility:	± 1 %
Window material:	Sapphire	Measuring wavelength:	254nm or 280nm (other on request)
Gasket material:	EPDM (other on request)	Reference wavelength:	850nm
		Protection class:	IP65 / NEMA 4X
		Cleaning:	CIP / SIP

Principle of single Wavelength UV- Absorbance Measurement



UV- light from a Mercury Vapor UV- Lamp passes through sapphire windows and process stream. The narrow band pass UV- filter blocks all transmitted light except the specified UV- wavelengths. These UV- light can pass the filter and the measurement detector registers the specified UV- wavelengths only.

The UV- light also passes directly through an UV- filter with equal specification located next to the lamp. The reference detector behind that filter measures the current UV- intensity. This reference detector signal is used to compensate any intensity fluctuations of the UV- source caused by lamp aging, extreme temperature changes, etc.

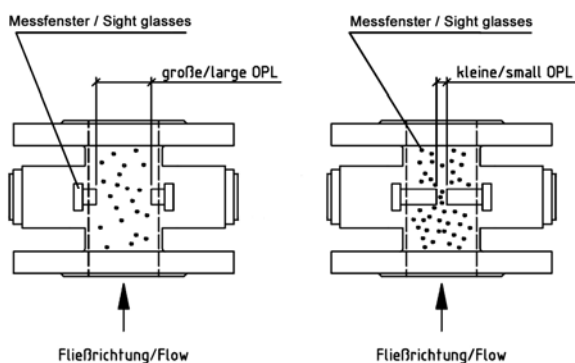
The application is the measurement of UV- decrease caused by particles, organic components, or solvents within the process liquid. The resulting photocurrents of measurement and reference detector will be amplified, converted and processed by the Messenger transmitter. The Messenger transmitter provides the calculated measurement results in real time and can send multiple outputs to a process control system.

The sensitivity of an UV- measurement system is mainly dependent on two parameters.

1. **The intensity of the UV- source.**
2. **The optical path length (OPL¹).**

The Intensity of the UV- source is measured by using a reference detector. The reference detector compensates changes of the UV- intensity caused by lamp aging.

The **optical path length** is variable and can be changed to meet the requirements of specific applications. A large OPL is required for low concentration measurement. Otherwise there is not enough change in UV- intensity to get valid measurement results. A small OPL is required for high concentration measurements. Otherwise there is not enough UV- energy to pass the product.



Large OPL = Low concentrations / high sensitivity
Small OPL = High concentrations / low sensitivity

¹OPL [= optical path length] specifies the product slot between light source and detector

Model MoniSpec-UV (MSUV)



- Low maintenance
- Extended calibration interval: Typical 12 month
- Sight glass material: Sapphire, alternative Quartz
- Typical measurement wavelengths: 254 or 280nm
- Sight glass cleaning: Via cleaning jets
- Cleaning in place (CIP)
- Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...
- Optional air purge connection: 4mm

Description:

The sensor model MoniSpec-UV uses the principle of single wavelength absorption to detect UV- absorbing substances in liquids. Typical measurement wavelengths are 254 or 280nm. The transmitter model Messenger is required to use this sensor. Each sensor provides two detectors. The reference detector detects the UV- intensity directly next to the lamp. The measurement detector registers the UV- absorption caused by the product stream. Both of the detector signals are used to calculate the measurement values. The technology compensates for any changes of the UV- intensity caused by lamp aging or other factors. The sensor can be installed into almost any type of pipe and has been designed for continuous operation with long life time and low maintenance. Process connection, gasket material, etc. can be selected according to the specific application. Optional cleaning jets will allow a cleaning of the measurement windows in user determined intervals. The availability of multiple optical path lengths allows a wide span of measurement ranges.

Applications:

- UV₂₅₄
- UV₂₈₀
- Spectral absorption coefficient (SAC)
- TOC

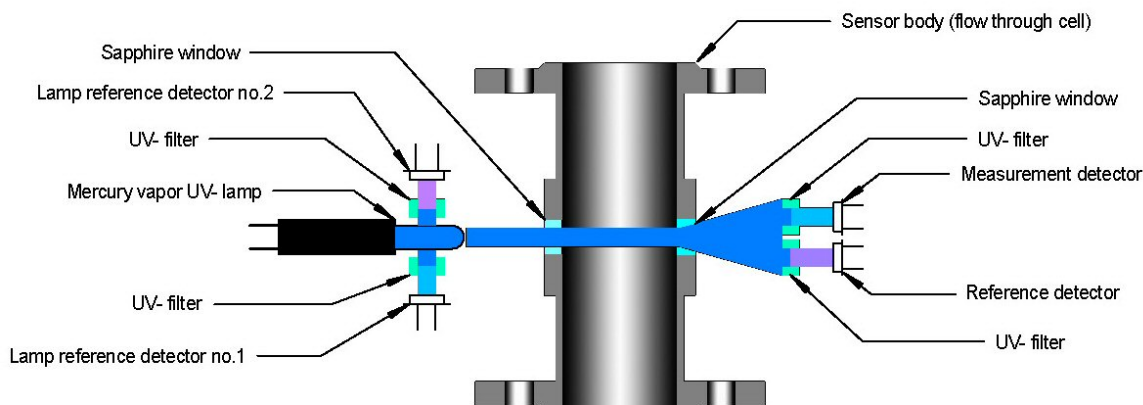
Operational areas:

- Chemical industry
- Petrochemical industry
- Water & Wastewater
- Bio technology

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 4"	Measurement range:	typical 0–2 AU ±
Process pressure:	PN16 / ANSI class 150	Reproducibility:	1 %
Process temperature:	maximum 90° (140°C short time)	Detector:	Silica diodes
Sensor material:	1.4404 / 316L	Measurement wavelength:	254nm or 280nm (other on request)
Sight glass material:	Sapphire	Cleaning:	optional cleaning jets
Gasket material:	application specific		CIP (cleaning in place)
Protection class:	IP65 / NEMA 4X	Optional hazardous area:	on request

Principle of dual wavelength single beam UV- absorption



The light from the Mercury Vapour UV- lamp passes through sapphire windows and process stream. The resulting light passes through two different filters. The narrow band pass UV- filter in front of the measurement detector blocks all wavelengths except the specified measurement wavelengths.

The second narrow band pass filter in front of the reference detector blocks all wavelengths except the specified reference wavelengths. The reference filter can be specified for UV-, Vis-, or IR- light, depending on application. The application is the measurement of UV- decrease. This absorption is typically caused by organic components or other substances with UV- absorption at the specified measurement wavelength.

The reference detector is used to compensate absorption caused by particles, window coatings, etc.

Light from the Mercury Vapour UV- lamp also passes through two other narrow band pass filters located next to the lamp. These filters have the same specification as the measurement and reference filters. The signals of the both lamp reference detectors are used to compensate any intensity fluctuations of the UV- source caused by lamp aging, extreme temperature changes, etc.

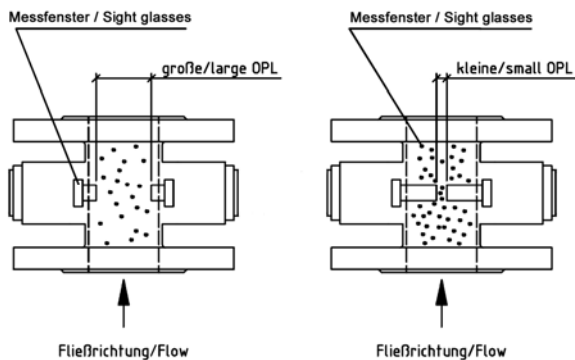
The resulting photocurrents of all detectors will be amplified, converted and processed by the Messenger transmitter. The Messenger transmitter provides the calculated measurement results in real time and can send multiple outputs to a process control system.

The sensitivity of an UV- measurement system is mainly dependent on two parameters.

3. The intensity of the UV- source.
4. The optical path length (OPL¹).

The **Intensity of the UV- source** is measured by using a reference detector. The reference detector compensates changes of the UV- intensity caused by lamp aging.

The **optical path length** is variable and can be changed to meet the requirements of specific applications. A large OPL is required for low concentration measurement. Otherwise there is not enough change in UV- intensity to get valid measurement results. A small OPL is required for high concentration measurements. Otherwise there is not enough UV- energy to pass the product.



Large OPL = Low concentrations / high sensitivity
Small OPL = High concentrations / low sensitivity

¹OPL [= optical path length] specifies the product slot between [light source and detector]

Model MoniSpec-UVd (MSUVd)



- **Low maintenance**
- **Extended calibration interval: Typical 12 month**
- **Sight glass material: Sapphire, alternative Quartz**
- **Typical measurement wavelength 254nm or 280nm**
- **Typical reference wavelength 545nm**
- **Sight glass cleaning: Via cleaning jets**
- **Cleaning in place (CIP)**
- **Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...**
- **Optional air purge connection: 4mm**

Description:

The sensor model MoniSpec-UVd uses the principle of dual channel absorption to detect UV- Absorption in liquids. The measurement detector registers the UV- absorption caused by UV- absorbing substances and particles inside the product stream. The reference detector registers the absorption caused by particles within the product stream. Both of the signals are used to compensate the measurement results against effects caused by particle turbidity and coatings of the flow cell windows. Typical measurement wavelengths are 254 or 280nm. A typical wavelength for the reference channel is 545nm.

Two additional detectors are located next to the UV- lamp. These detectors register directly the lamp intensity at measurement and reference wavelength. Changes in lamp intensity caused by lamp aging or other factors are compensated by using these two additional detector signals. The micro controller of the Messenger transmitter uses the four detector signals to calculate highly stable measurement results. Calibration can be done in multiple ranges and measurement units.

The sensor is designed for continuous operation with long life time and low maintenance. Optional cleaning jets will allow a cleaning of the measurement windows in user determined intervals. The availability of multiple optical path lengths allows a wide span of ranges.

Applications:

- UV₂₅₄
- UV₂₈₀
- Spectral absorption coefficient
- TOC

Operational areas:

- Chemical industry
- Petrochemical industry
- Water & Wastewater
- Bio technology

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 4"	Measurement range:	typical 0–2 AU
Process pressure:	PN16 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 90° (140°C short time)	Detector:	Silica diodes
Sensor material:	1.4404 / 316L	Measurement wavelength:	254nm or 280nm (other on request)
Sight glass material:	Sapphire	Reference wavelength:	545nm (other on request)
Gasket material:	application specific	Cleaning:	CIP (cleaning in place) Cleaning jets
Protection class:	IP65 / NEMA 4X	Optional hazardous area:	on request

Model Monitek Messenger

Universal Transmitter, Monitek Product Line of Galvanic Applied Sciences Inc.



- Configuration via PC, Laptop or Netbook
- Optional with implemented Panel PC
- Menu - based, intuitive User Interface
- Instruction Manual available via Help Function
- Serial Interface RS 232C / RS 485 (Modbus RTU Protocol)
- Simultaneous Use of up to 4 Sensors
- Sensors for Turbidity, Colour or Absorption measurement
- Fully Programmable Units (ppm, EBC, FTU, g/l, % TS...)
- Two Independent, fully programmable Cleaning Cycles
- Linearization of Measurement Values
- Integrated Data Logger for up to 8000 measurement Values
- Recovery via Back-up File

Description:

The universal transmitter model Messenger can be used with all optical sensors of the Monitek series. The Messenger allows the simultaneous use of multiple sensors. Hereby you can use up to four single channel sensors. Even different sensors can be used with one transmitter. The measurement results can be linked together using almost any mathematical equation. This ensures an easy setup of e.g. dosage systems. The programming / calibration of the system will be done via a PC, Netbook or Laptop using the menu-based software. Only one PC or Panel- PC is required to configure an instrument in a network of up to 255 Messengers. Using the Messenger with an integrated Panel- PC allows the paperless recording or displaying of the measurement results as bar- or line graph's.

Applications:

- Scatter light turbidity measurement
- Absorption turbidity measurement
- Single channel colour measurement
- Dual channel colour measurement

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Beer and beverages

Technical Data:

Supply voltage:	90-260 VAC, 50-60 Hz optional: 24 V AC/	optional digital inputs:	4x 5V High
Power consumption:	DC	Reproducibility:	± 1 %
Relay capacity:	maximum 50 VA	Temperature:	-10°C to 50°C
Analogue output:	4 Relays fully programmable (48V / 2A)	Enclosure / Protection:	1.4301 / IP65 (NEMA 4X)
Interfaces:	Up to 4x 0/4 - 20mA (isolated)	optional hazardous area:	ATEX Zone I / Zone II
	RS 232C / RS 485 Modbus RTU		

UV- Photometry in Water Treatment Applications

UV PHOTOMETER

MONITORING OF DISSOLVED ORGANICS IN WATER

The amount and character of dissolved organic carbon is a very important factor in the majority of the water treatment processes. This parameter is relevant for cost, effectiveness and quality of water treatment.

Our advanced inline UV-Colour photometer allow for reliable and accurate in-line detection of the dissolved organics and coloured species. The instruments contribute to determine the chlorine demand and the disinfection requirement to prevent by-product formation. The real time monitoring of dissolved organics will reduce costs through improved coagulation control, disinfection by chlorination or UV irradiation.

THE UV- PHOTOMETER ARE USED IN AREAS OF:

- Wastewater
- Drinking water
- Surface water
- Chemical/industrial process water
- BioTec & Fermentation processes

Dissolved organic substances in water are normally derived from biological substances and processes. These organic substances can reduce the efficiency of water treatment processes and lead to new toxic substances. A high load of these organic substances:

- Require removal with coagulation, flocculation and sedimentation
- Contribute to colour and taste issues
- Reduce the effectiveness of UV disinfection processes
- Form chlorinated disinfection by-products such as THMs (trihalomethanes) or haloacetic acids

IMPROVED MONITORING OF DISSOLVED ORGANICS

- Our instrument design incorporates the following features:
- Real time monitoring of the sample with or without compensation for turbidity
- Low maintenance, high long-term reproducibility and stability.
- Extreme long life time of the Hg- UV- lamp
- Automated cleaning of the flowcell (optional)
- Dual wavelength option

254nm MONITORING OF ORGANICS AN ALTERNATIVE FOR TOC DETERMINATION

In response to the increasing use of UV measurement for dissolved organic substances in water and wastewater, The Standard Methods Organization, authors of Standard Methods for the Examination of Water and Wastewater, adopted Method 5910 in 2000. This method describes the measurement of dissolved organics using absorbance of UV light at 254 nm. 4 von 5

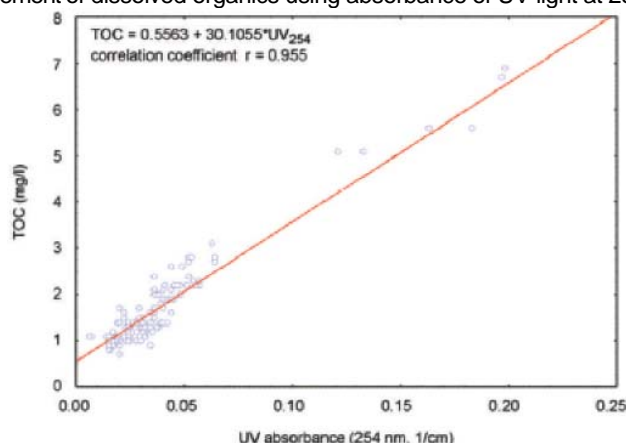


Figure 1. Correlation between TOC and UV absorbance.

There have been numerous studies that have characterized the relationship between total organic carbon or dissolved organic carbon and UV absorbance at 254 nm. TOC and UV_{254} are complete different methods but fortunately there is a general correlation between the two measurements.

Figure 1 shows the correlation between TOC and UV absorbance for water from the Alberta river system.

APPLICATIONS

UV- photometer can be used on the clean water side to improve control of UV irradiation or to predict THM formation due to chlorine addition. The monitoring of the raw water provides information about dissolved organics in the water. The degree that the dissolved organics are removed during the water treatment process depends on the nature of these organics and the treatment process itself. Treatments such as enhanced coagulation and the addition of activated carbon may be required for some surface waters.

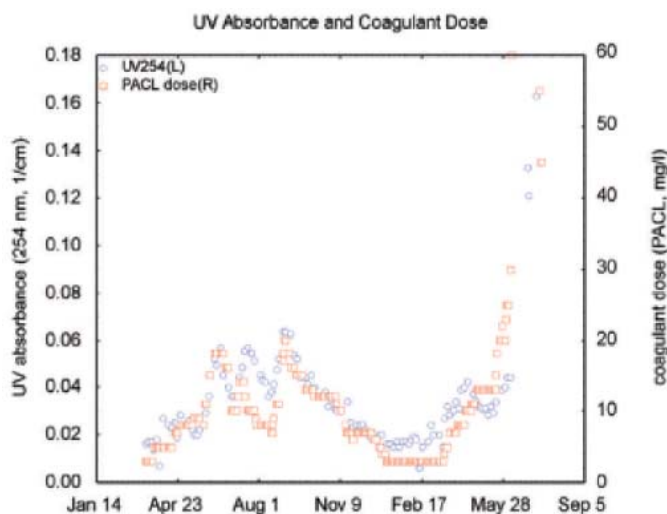


Figure 1. Correlation between UV absorbance and coagulant dosage

The coagulation levels are typically controlled to achieve certain settled and filterable turbidity levels. Turbidimeters do not show a good correlation between chemical addition and turbidity. The correlation of the UV- absorbing organics compared to the required coagulant dose is shown in Figure 2. In this figure it is clear that the coagulant dose trends very closely to the UV absorbance. The correlation between UV-Absorption and coagulant dose is much better than the correlation between the raw turbidity values and coagulant dose.

Numerous studies have shown that UV absorbing species are more reactive to chemicals used for adsorption, coagulation, and disinfection. Normally dissolved UV absorbing substances may dominate the water purification chemistry even though these substances are not the target substances. For these reasons UV absorbance is excellent for measurement of dissolved organics in control or addition of the following water treatment chemicals:

- **Activated carbon**
- **Coagulants (alum, PACl, ferric chloride)**
- **Disinfectants (chlorine, chloroamines)**
- **etc.**



Everything all right?

Optical or Acoustic Process measurement of liquids

- **APHA Colour in Hazen Units**
- **ASTM / Saybolt Colour**
- **EBC Colour**
- **Application Specific Colours**
- **Quality Control**

Colour Photometry

What does Colour mean?

Colour is defined as a light released sense impression mediated by eye. The physical science considers light as electromagnetic waves. Colour is not a clear defined magnitude like e.g. temperature or pressure, colour is a subjective impression.

How arises a Colour Impression?

A colour impression will be caused, in case electromagnetic waves of the visible spectrum (wavelengths of about 380nm up to 750nm) will fall on the eye.

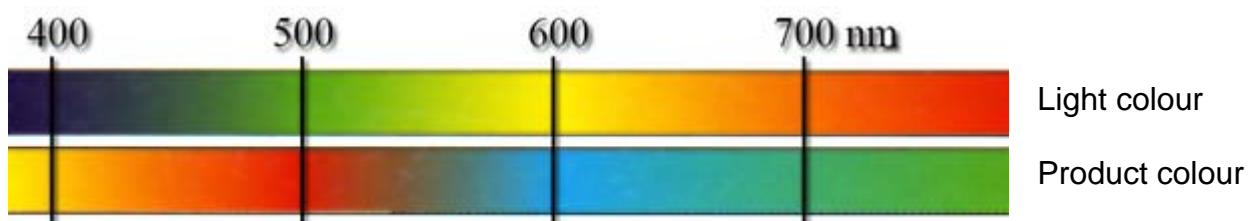
How accrues Colour?

White light (colourless) consists from the summation of all colours of the visible spectrum. A colour impression accrues for the eye, in case a specific range of wavelengths within the visible spectrum will be absorbed.

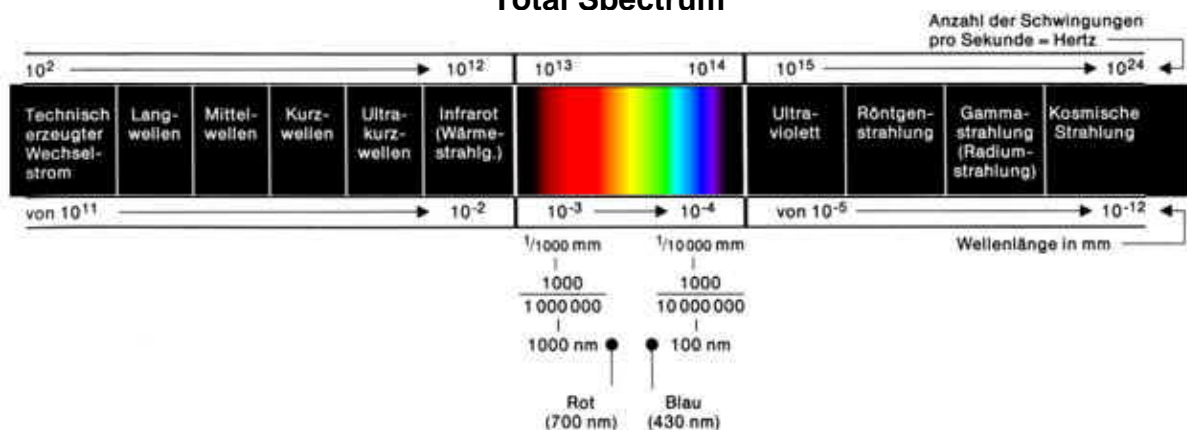
Context between Wavelength and Colour

Absorbed Wavelength λ [nm]	Colour of absorbed Light	Visual impression human eye
380 – 435	violet	yellow-green
435 – 480	blue	yellow
480 – 490	greenish-blue	orange
490 – 500	bluish-green	red
500 – 560	green	magenta
560 – 580	yellow-green	violet
580 – 595	yellow	blue
595 – 650	orange	greenish-blue
650 – 780	red	bluish-green

Comparison absorbed light colour / product colour



Total Spectrum



Measurement of Colour

The following methods are used for the measurement of a “colour concentration” in a liquid; both methods are based on the principle of light absorption at specific wavelengths.

Example single wavelength absorption:

Measurement of blue colour in a liquid.

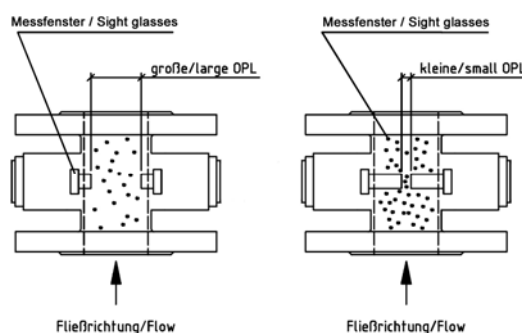
The light absorption in a spectral range of approximately 600nm will be detected and evaluated; this is the range of wavelengths where the blue colour generates light absorption.

Mainly two parameters will affect the sensitivity of the measurement.

1. The initial intensity of the white light source, which is a constant value of the respective sensor.
2. The optical path length (OPL) which is a variable magnitude of the sensor.

The sensor requires a large optical path length (OPL) to generate enough light attenuation at low colour concentration.

The sensor requires a small optical path length (OPL), to ensure enough light intensity penetrates the product at high colour concentration.



Large optical path length/OPL = measurement of low concentrations/high sensitivity
 Small optical path length/OPL = measurement of high concentrations/low sensitivity

Single Beam dual Wavelength Measurement

The previously described method of single wavelength absorption operates with filtrated liquids with low particle content only, because the particles in the liquid absorb the light as well as colour. Therefore particles affect the measurement results. Particles absorb the light at the complete spectral range and not at specific wavelengths only. Colour absorbs the light at specific wavelengths in the visible spectrum. Therefore colour is typically measured at two different wavelengths ranges. The measurement channel detects in a spectral range where colour and particles absorb. The reference channel detects in a spectral range where only colour absorbs. This method is called, single beam dual wavelength measurement.

The measurement channel detects the absorption caused by colour and particles.
 The reference channel detects the absorption caused by particles only.

The difference of both signals will result the absorption caused by colour only.

The difference measurement compensates for cross interference's caused by particles, window coatings and lamp ageing

Example dual wavelength absorption:

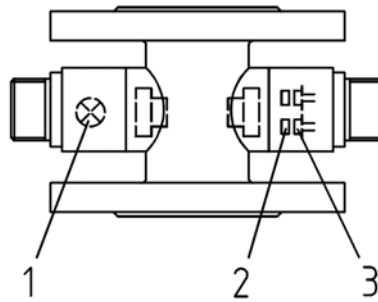
Measurement of blue colour in liquid.

The measurement channel detects the light absorption in a range of approx. 600nm (colour and particles).
 The reference channel detects the particle absorption at 850nm (invisible NIR light, unaffected by colour).

Measurement Ch. (blue colour + particles) – Reference Ch. (particles only) = Colour Concentration

The difference of both signals will result the absorption caused by colour only.

Basic Construction



1. Light source
2. Interference filter, transparent for defined ranges of wavelengths.
3. Light sensitive detector used for the detection of light intensity (Absorption).

Typical Applications and Measurement Units

Colour- EBC:	Measurement of beer colour or wort
Hazen colour acc. APHA:	Measurement of yellow colour in water / chemicals
Saybolt:	Measurement of refining products
ASTM D-1500:	Measurement of refining products
%:	Product specific colour / quality control
OD (optical density):	Measurement of cell growth in bio reactors
....	

Model MoniSpec-AD (MSAD)

Inline- Colour Photometer, Monitek Product Line of Galvanic Applied Sciences Inc.



- **Low maintenance**
- **Extended calibration interval: Typical 12 month**
- **Sight glass material: Sapphire**
- **Sight glass cleaning: Via cleaning jet probe**
- **Cleaning in place (CIP)**
- **Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...**
- **Optional air purge connection: 4mm**

Description:

The sensor model MoniSpec-AD uses the principle of dual channel light absorption to detect colour in liquids. The transmitter model Messenger is required to use this sensor. The system has been designed for continuous operation with long life time. The difference between measurement and reference channel ($[\text{colour} + \text{turbidity}] - \text{turbidity} = \text{colour}$) provides the colour signal. The sensor can be installed into almost any type of pipe. Process connection, gasket material, etc. will be selected application specific. Optional cleaning jets will allow a cleaning of the sapphire windows in determined intervals. Calibration can be done in multiple ranges and measurement units like Hazen, APHA, ASTM, ppm, etc.. Due to the availability of multiple optical path lengths (2mm up to 500mm) the sensor allows measurement ranges of approximately 0-20Hazen up to 0-50000Hazen.

Applications:

- Product colour
- Hazen colour according APHA
- ASTM 1500 colour & Saybolt Colour
- Lovibond colour & EBC colour

Operational areas:

- Chemical industry
- Petrochemical industry
- Water & vegetable oil
- Brew & Beverage

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 5"	Measurement range:	typical 0–20Hazen, 0–50000Hazen
Process pressure:	PN16 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 140°C	Detector:	Silica diode
Sensor material:	1.4404 / 316L	Measurement wavelength:	390 - 900nm
Sight glass material:	Sapphire	Cleaning:	optional cleaning jet probe
Gasket material:	application specific	Sterilization:	CIP (cleaning in place)
Protection class:	IP65 / NEMA 4X	optional hazardous area:	ATEX Zone I or Zone II

Model Messenger (MSG)

Universal Transmitter, Monitek Product Line of Galvanic Applied Sciences Inc.



- Configuration via PC or Laptop
- Menu - based, intuitive User Interface
- Instruction Manual available via Help Function
- Serial Interface RS 232C / RS 485 (Modbus RTU Protocol)
- Simultaneous Use of up to 4 Sensors
- Sensors for Turbidity, Colour or Absorption measurement
- Fully Programmable Units (ppm, EBC, FTU, g/l, % TS...)
- Two Independent, fully programmable Cleaning Cycles
- Linearization of Measurement Values
- Integrated Data Logger for up to 8000 measurement Values
- Recovery via Back-up File

Description:

The universal transmitter model Messenger can be used with all optical sensors of the Monitek series. The Messenger allows the simultaneous use of multiple sensors. Hereby you can use up to four single channel sensors. Even different sensors can be used with one transmitter. The measurement results can be linked together using almost any mathematical equation. This ensures an easy setup of e.g. dosage systems. The programming / calibration of the system will be done via a PC, PDA or Laptop using the menu-based software. Only one PC or Panel PC is required to configure an instrument in a network of up to 255 Messengers. Using the Messenger with an integrated Panel- PC allows the paperless recording or displaying of the measurement results as bar- or line graph's and the configuration without external equipment.

Applications:

- Scatter light turbidity measurement
- Absorption turbidity measurement
- Single channel colour measurement
- Dual channel colour measurement

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Beer and beverages

Technical Data:

Supply voltage:	90-260 VAC, 50-60 Hz optional: 24 V AC/ DC	optional digital inputs:	4x 5V High
Power consumption:	maximum 50 VA	Reproducibility:	± 1 %
Relay capacity:	4 Relays fully programmable (48V / 2A)	Temperature:	-10°C to 50°C
Analogue output:	Up to 4x 0/4 - 20mA (isolated)	Enclosure / Protection:	1.4301 / IP65 (NEMA 4X)
Interfaces:	RS 232C / RS 485 Modbus RTU	optional hazardous area:	ATEX Zone I / Zone II

Chemtronic Waltemode GmbH, European distributor for your MONITEK products!

Optical Turbidimetry

- Transmitter Model Messenger
 - Model MoniTurb - F
 - Model MoniTurb – FS
 - Model TSW (210)
 - Model TurbiLab –FS
 - Model MZNV (micro organism growth)
 - Transmitter Model CCAb
 - Model MoniSpec - A
 - Models CSW & LAS
 - Model AP2
 - Models CSK & TURBlmat-LC
- Filtration control
Turbidity of beer, water, etc.
Water in fuel
Quality control
Total solids (%TS)
Yeast concentration (million cells / ml)
Yeast dosage (million cells / ml)
Turbidity of wort (EBC)
Water in oil
etc.



Everything all right?

Optical or Acoustic Process measurement of liquids

- **Oil on Water**
- **UV- / VIS- / NIR- Photometer**
- **Oil in Water**
- **Ultrasonic Turbidimeter**
- **Optical Turbidimeter**

Model Messenger

Universal Transmitter, Monitek Product Line of Galvanic Applied Sciences Inc.

TURBIDITY, SUSPENDED SOLIDS, COLOR



- > Up to four sensors / probes
- > 8 point calibration / linearization
- > Mathematical equation of meas. results
- > Menu-based, intuitive user interface
- > Data logger for up to 8000 meas. results
- > Analog output, relay board, digital input
- > RS232 and RS485 interface (Modbus)
- > Compatible with Monitek sensors / probes

THE MONITEK® MESSENGER WAS DEVELOPED TO MEET THE NEEDS OF INDUSTRIAL AND MUNICIPAL APPLICATIONS FOR TURBIDITY, SUSPENDED SOLIDS AND COLOR MONITORING.

COST CONTROL

Most turbidity, concentration or colour transmitters are capable of handling only one probe connected to them. In situations where a number of sensors are required, the cost of multiple transmitters can be high. The Messenger addresses this by allowing up to 4 inputs into one transmitter. All inputs are discrete, allowing control of the sensor and transmission of data on a completely individual basis. One transmitter controlling up to 4 detector signals keeps the cost per data point very low. Also, the Messenger is available in three different versions. Version 1: Panel PC with Touch screen; version 2: 4 line LCD- display; or version 3: with no display. This allows for a cost saving configuration related to your specific application.

COMMUNICATIONS

Today, communications between analytical devices and the data collection system is one of the driving factors in process control. The Messenger provides for a wide range of communications, including (4x) 0/4-20mA, (4x) relay alarms, RS 232, RS 485 Modbus protocols and internal data logging. The four digital inputs allow execution of external control commands.

FLEXIBILITY

Our customers requested flexibility and the Messenger delivers. We provide flexibility in connecting sensors, reporting, displaying data, configuration and implementation.

Sensors for Turbidity, Concentration and Colour can all be connected to a Messenger. One Messenger can handle any combination of sensors, with up to 4 signal outputs. Each sensor is controlled independently.

Reporting can be done in various formats, including data to be output as bar graphs*, line graphs*, or as numeric results. Measurement results are displayed and outputted individually with different units of measurement including NTU, JTU, AU, Hazen, EBC, PPM, g/l, %TS and others. Again, the reporting is individualized for each sensor. The timing of reporting is also controlled for each sensor, allowing for process control or meeting regulatory requirements in one transmitter.

Configuration: The programming / calibration of the Messenger without display and with an LCD display will be done via a PC, Laptop or handheld PDA. The programming / calibration of the Messenger with Panel PC will be done via the integrated touch screen.

Implementation can be a single Messenger on a single sensor, a single Messenger on multiple sensors, or can be a network of Messengers and sensors. Only one PC or Panel PC with RS-484 interface (Modbus protocol) will be required for the configuration / calibration of the instruments in the network. Beyond these general provisions for flexibility are some that are more specialized. An example of this is in the equation of measurement results, e.g., difference (result1 – result2) measurements. Control of chemical dosing is important in waste treatment or in water plants. The Messenger can link incoming and post-dosage measurements to provide for more precise control of the chemical addition.

Environment: ATEX, UL or FM certified enclosures are available for use in hazardous areas zone I and zone II with no display or with LCD display configurations.

SETUP

The Messenger is simple to setup, with a graphical user interface that facilitates this process. The software is the same whether the Messenger is a Panel PC version or one requiring a computer or PDA for setup. Each setup parameter has its own menu page allowing the user to work down the menu for each parameter; sensor selection, measurement units, display format, data logging frequency, cleaning frequency cycles etc. Typically, factory calibration of the sensor with the Messenger is done prior to shipment, using turbidity or colour standards, making most installations quick and simple. If you prefer to have the calibration performed on your own sample, you can provide known concentrations to us and we will calibrate it to arrive in the field nearly ready for use. Additionally, a process calibration curve should be created for correlation to your application. For any parameter being setup, the Instruction Manual is available through the Help Function.

OPERATION

The Messenger is designed for permanent maintenance free operation. All sensors and probes of the Monitek product series are as well designed for permanent operation and require only a minimum of maintenance. The Messenger allows you to program two independent cleaning cycles to purge the sensors and extend the operating time additionally.

APPLICATION

- > Turbidity measurement
- > Colour measurement
- > Absorption measurement

LOCATION

- > Chemical Industry
- > Petrochemical Industry
- > Water & Wastewater
- > Food & Beverage
- > Breweries & Dairies

TECHNICAL DATA

Supply voltages:

90-260 VAC, 50-60 Hz

Power requirement:

Max. 50 VA

Interfaces:

RS 232C /RS485 Modbus

Analogue outputs: (2 optional)

Max. four 0/4-20mA (isolated)

Alarm relays: (optional)

Four Programmable (48V / 2A)

Digital inputs: (optional)

Four Programmable

Ambient temperature:

-10°C to 50°C

Accuracy:

Application specific

Reproducibility:

± 1%

Enclosure material:

1.4301 / 304 ST.ST.

Protection:

IP65 / NEMA 4X

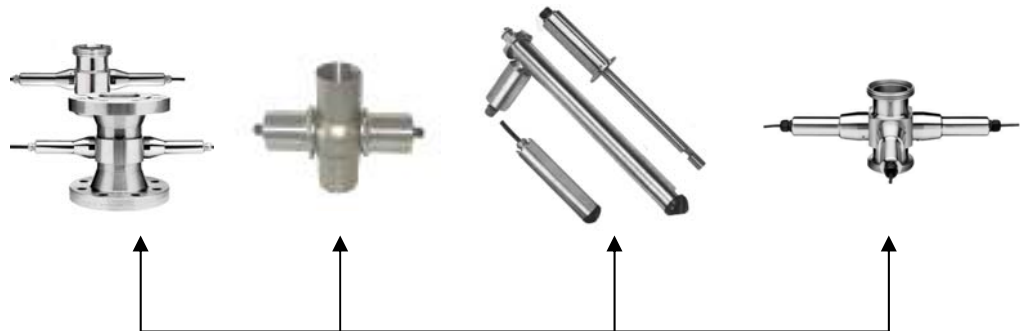
Dimensions:

Blind transmitter: H=235mm, B=160mm, T=91mm

LCD Display: H=235mm, B=160mm, T=105mm

Panel PC: H=345mm, B=280mm, T=141mm

- **Compatible to all optical Monitek sensors**
- **Parallel use of up to four single channel sensors**
- **Parallel use with a combination of different sensors**
- **Data logger to store up to 8000 measurement values**
- **Menu based, easy to use Software**
- **Manual available via software help- function**
- **Calibration with up to eight laboratory samples per sensor**
- **Equation of measurement results to setup dosage systems**



Parallel use of different sensors / probes for turbidity or colour measurement.



Bus- system, allows the configuration of up to 255 transmitters by using one Panel-PC, PC, Laptop or PLC-programmer only.

Units used for configuration and calibration.



PLC- programmer



Laptop / Netbook



Messenger with panel-PC

- Up to four 0/4-20mA outputs
- RS-232 C Interface
- RS-485 Interface (Modbus RTU protocol)
- Up to four relays (programmable)
- Up to four digital inputs (programmable)

Sensors & Probes for model Messenger



Current Sensors with single detector signal	Current Sensors with two detector signals	Current Sensors with three detector signals
Model MoniSpec-A (MSA)	Model MoniTurb-F (MTF)	Model MoniTurb-FS (MTFS)
Model 22 (CSW)	Model UVS-1	
Model LAS (LAS)	Model MoniSpec-AD (MSAD)	
Model TURBimat-LC (TBMLC)	Model MoniSpec-UV (MSUV)	
Model 25E-HC (CSK)	Green = Sensors absorption turbidity measurement	
Model AP2	Red = Sensors scatter light turbidity measurement	
Model TURBimat-A	Blue = Sensors absorption colour measurement (VIS- / NIR- Photmeter)	
Model UVS-1	Orange = Sensors UV- absorption measurement (UV- / VIS- / NIR- Photmeter)	

***The Messenger allows the parallel, mixed use of all listed Sensors up to a maximum of four detector signals.**

Model Messenger Summarize

Universal Transmitter, Monitek Product Line of Galvanic Applied Sciences Inc.



Model Messenger with Panel PC

- Configuration via PC, Laptop or Netbook
- Optional with implemented Panel PC
- Menu - based, intuitive User Interface
- Instruction Manual available via Help Function
- Serial Interface RS 232C / RS 485 (Modbus RTU Protocol)
- Simultaneous Use of up to 4 Sensors
- Sensors for Turbidity, Colour or Absorption measurement
- Fully Programmable Units (ppm, EBC, FTU, g/l, % TS...)
- Two Independent, fully programmable Cleaning Cycles
- Linearization of Measurement Values
- Integrated Data Logger for up to 8000 Measurement Values
- Recovery via Back-up File

Description:

The universal transmitter model Messenger can be used with all optical sensors of the Monitek series. The Messenger allows the simultaneous use of multiple sensors. Hereby you can use up to four single channel sensors. Even different sensors can be used with one transmitter. The measurement results can be linked together using almost any mathematical equation. This ensures an easy setup of e.g. dosage systems. The programming / calibration of the system will be done via a PC, Netbook or Laptop using the menu-based software. Only one PC or Panel PC is required to configure an instrument in a network of up to 255 Messengers. Using the Messenger with an integrated Panel- PC allows the paperless recording or displaying of the measurement results as bar- or line graph's and the configuration without external equipment.

Applications:

- Scatter light turbidity measurement
- Absorption turbidity measurement
- Single channel colour measurement
- Dual channel colour measurement

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Beer and beverages

Technical Data:

Supply voltage:	90-260 VAC, 50-60 Hz optional: 24 V AC/ DC	Digital inputs:	4x (optional) 5V High
Power consumption:	maximum 50 VA	Reproducibility:	± 1 %
Relay capacity:	4 Relays fully programmable (48V / 2A)	Ambient temperature:	-10°C to 50°C
Analogue output:	Up to 4x 0/4 - 20mA (isolated)	Enclosure / Protection:	1.4301 / IP65 (NEMA 4X)
Interfaces:	RS 232C / RS 485 Modbus RTU	optional hazardous area:	ATEX Zone I / Zone II



Everything all right?

Optical or Acoustic Process measurement of liquids

- **Oil on Water**
- **UV- / VIS- / NIR- Photometry**
- **Ultrasonic Turbidimetry**
- **Optical Turbidimetry**

Models MoniTurb, TSW (210) & TurbiLab-FS

Scattered light Turbidity Measurement

What does turbidity mean?

Turbidity is an optical impression, which describes the characteristic of a transparent product, to scatter light. A focused light beam will be attenuated and scattered in hazy products, so that this product can become practically opaque in bigger layers.

What causes turbidity?

Turbidity is caused by particles in transparent products. A particle is defined as something with a different refractive index as the carrier product. Some examples of particles are minerals, yeast cells, metals, oil drops in water, milk in water, gas bubbles and aerosoles.

Measurement of turbidity

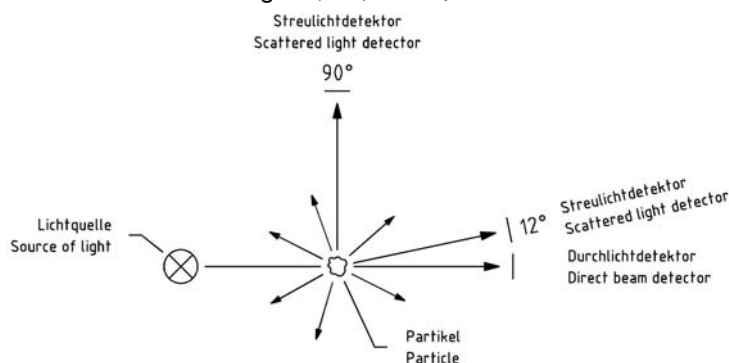
Turbidity is not a clearly defined magnitude like e.g. temperature or pressure.

Turbidity is a subjective impression. For this reason turbidity measurement systems will be typically calibrated by using a comparison's standard such as Formazin and Diatomaceous Earth.

Measuring methods

The most common scattered light turbidity measuring methods are:

- Side scattering (90°) The detector is located in a right angle (90°) to the light beam
- Forward scattering (12°) The position of the detector is 12° shifted to the axis of light beam



As shown in the figure above, an intense collimated beam of light is projected through a sample contained within the sensor. The intensity of this light beam is measured by the direct beam detector, located opposite to the light source.

The light, scattered by particles inside the sample is measured by a scatter light detector. Depending on sensor specification, this detector can be located 12° or 90°, displaced from the direct light axis.

The signals caused by scattered and direct light will be amplified and processed by the electronics. The results displayed, is the turbidity value.

$$\frac{\text{Scattered light signal}}{\text{Direct light signal}} = \text{Turbidity}$$

The particles inside the liquid flow decrease the intensity of direct light, and increase the intensity of the scattered light, i. e. the turbidity rises.

Colour decreases the intensity of direct and scattered light in same ratio. I. e. the turbidity value is constant. Lamp ageing and window coatings are compensated as well by this ratio.

Comparison the different measurement methods

The two different measurement methods (12° forward scattering / 90° side scattering) are not comparable.

Even in if you use the same calibration standard to calibrate the systems, different samples will show you different measurement results.

This deviations of the results, is caused by the different particle size distribution inside different samples. The measurement methods will respond different, depending on current particle distribution inside the actual sample.

Very Important:

When comparing measurement results. The same methods must be compared to one another. For example, 90° vs. 90°, 12° vs. 12°. Never 90° vs. 12°.

Context between particle size, measurement method and measurement results

The most common Calibration standard for turbidity is based on Formazin liquid.

When using Formazin as calibration standard, defined Formazin suspensions have to show identical measurement results with all different methods 12° and 90°.

During observation of a real sample, such as filtrated beer, the different methods will show different measurement results. The measurement results of the 90° side scatter method are typically by factor 3 to 10 above the measurement results of the 12° forward scatter method.

There are typically a lot of small particles left inside the filtrated beer, such as proteins, etc. This colloidale turbidity will be overvalued with the 90° method, due to the fact that this method is more affected by the quantity of the particles as by particle size. The 12° forward scatter method is affected more by particle size.

90° method: small particles and large particles will cause comparable scatter light intensities.

12° method: small particles / low scatter light intensity; large particles / high scatter light intensity.

At a particle size of approx. 0.3 µm (Formazin) both methods will show approx. equal scatter light intensities.

The combination of both measurement results informs about the tendency of the particle size distribution.

Measurement value 90°, above the measurement value 12°, average particle size smaller as 0,3 µm.

Measurement value 90°, below the measurement value 12°, average particle size larger as 0,3 µm.

particle size	result 90° scatter light	result 12° scatter
larger 0,3 µm	lower value	higher value
smaller 0,3 µm	higher value	lower value

Application Example

Example filtration control:

90° side scatter:

Small particles (e.g. proteins, colloides, etc.) within the filtrated beer will be monitored perfectly by the using the 90° instrument. A filter breakthrough will be monitored delayed with this technology due to the fact that this is typically a slow process at witch you will see first just a few large particles within the filtrate. The total amount of particles will be raised minimally; therefore the measurement value will be raised minimal as well.

12° forward scatter:

Small particles (e.g. proteins, colloides, etc.) within the filtrated beer can be monitored well by the using the 12° instrument. The beginning of a filter breakthrough will be monitored immediately due to the large particles (e.g. DE, yeast cells, etc.) within the filtrate. The few large particles will be monitored immediately and the measurement value will rise sharply. This is also a mass related measurement principle which will allow calibration in mg/l if necessary.

Typical Measuring units

ppm:	P arts p er m illion	FNU ¹ :	F ormazin n ephelometric u nit
FTU:	F ormazin T urbidity U nit	mg/l:	M illigram per liter
TEF:	T rübungseinheiten F ormazin (German for FTU)	gr/l:	G ram per liter
EBC:	E uropean b rewery c onvention	% TS:	P ercent total solids
NTU ¹ :	N ephelometric t urbidity u nit		

The dependencies on the different measuring units

$$1 \text{ FTU} = 1 \text{ TEF} = 1 \text{ NTU}^1 = 1 \text{ FNU}^1 = 0,25 \text{ EBC}$$

¹Nephelometry describes the method of side scatter turbidity measurements, these units are used at 90° side scatter turbidimeter only.

Based on comparisons measurements, by using a 12° forward measurement system we have found the following dependencies.

$$1 \text{ FTU} = 1 \text{ TEF} = 0,25 \text{ EBC} = 2,05 \text{ ppm} = 2,05 \text{ mg/l} = 0,00205 \text{ g/l} = 0,0000205 \% \text{ TS}$$

* At a specific particle weight of 1 kg/dm, 1mg/l particles in 1 kg of water will correspond to 1ppm.

Typical ranges

The original design of scatter light turbidimeter was used for the detection of low turbidities. The resolution of these instruments is suited easily in ranges lower as 0.1ppm (approx. 0.05 TEF / FTU / FNU / NTU or approx. 0.01EBC) and better. The maximum range is in ideal case lower as 200ppm, but there are as well systems available with a range of more as 8000ppm.

Select your measuring method

The 12° forward scatter method:

The forward scatter method is typically used at low turbidities and produces nearly mass related measurement results. Main applications are quality control, filtration control, oil in water, etc.

The 90° side scatter method:

The side scatter method is typically as well used at low turbidities. This principle of measurement will produce measurement results related to the number of particles inside the product.

The main application is the observation of small, well distributed particles e.g. beyond a filter. The second typical application is the monitoring of potable water as well as waste water according ISO7027 or according to the US- FDA requirements.

The measurement results of a 90° scatter light system has to be handled with care, due to the fact, that a turbidity caused by many large particles can show a similar measurement result as a turbidity caused by the same quantity of small particles.

The combined 12°/ 90° forward- / side- scatter method:

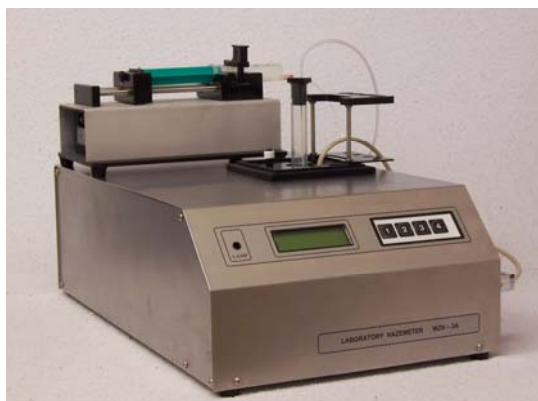
The 12° measurement method shows higher sensitivity with large particles. The 90° measurement method shows higher sensitivity with small particles. The most common application for the combined systems is filtration control. A filter break through is recognized early, with the 12° forward scattered instrument. Some particles inside the filtrate will raise the 12° measurement value significant.

The 90° side scattered method shows only a small increase of the measurement values in case some big particles pass the filter. A filter break through would be shown very late, due to the fact that the number of particles will not raise significant in case the filter starts to break.

Please note:

The combination of forward- and side- scatter turbidity measurement does not replace a particle size analysis, but it can provide a tendency of the particle size distribution.

Model Turbilab-FS (TBL-FS)



- Calibration Interval 24 Month
- Water Bath
- Direct Measuring in Bottles
- Bottle Revolving
- Optional Software Package
- Optional Temperature controlled measuring Chamber
- Optional Titration Pump

Description:

The turbidimeter model TurbiLab-FS works on the principles of measurement of 12° forward and 90° side scattered measurement. The measurement can be performed directly in bottles or in a cuvette. The instrument detects the turbidity only. Product- or bottle colorations will be compensated. The instrument does 200 individual measurements per bottle rotation. This automatic bottle revolving in the water bath of the measuring chamber compensates for scratches and unevenness of the bottle. The evaluation of the quotient scattered light / transmitted light ensures long-term stability and reproducibility of the device. The comparison of the two measurements (12° / 90°) allows the user to draw conclusions on the particle size distribution in the product. The measured values are displayed in EBC units or alternatively in FTU, NTU or ppm. The measuring units can be selected from the keyboard. The optional software package, titration pump, magnetic stirrer and the temperature-controlled sample chamber makes the device to a full-titrator. The Windows software controls the measurement cycles, the reagent pump for and allows the evaluation, archiving and presentation of the measuring results.

Application Examples:

- Forcier Test
- Tannoid Content Test (Polyphenol reaction)
- Sensitive Protein Content
- SASPL (saturated ammonium Sulphate precipitation limit)
- Monitoring and recording of the sedimentation of yeast
- Monitoring and recording of the yeast activity
- Monitoring and recording of the sedimentation of diatomite
- Monitoring and recording of the sedimentation behaviour of PVPP...

Technical Data:

Measuring Range (90 °):

0-250EBC, 0-1000NTU, 0-2000ppm (auto ranging)

Measuring Range (12 °):

0-80EBC, 0-250FTU, 0-500ppm (auto ranging)

Measuring Units:

EBC, NTU, FTU, ppm (Based on Formazin standard)

Resolution in EBC:

0.01 at 0-10EBC / 0.1EBC at 10-100EBC / 1EBC at 100-250EBC

Accuracy

better 2%

Display:

Backlit LC-Display (2 rows, 16 characters)

Light Source:

650nm Mebak conform (alternative 860nm conform to ISO7027 / EN27027)

Measuring Chamber:

Standard Cuvettes Ø 40mm / Bottles maximum Ø 100mm (1,5L PET, NRW, Euro, etc) / Test tubes / Cuvettes Ø 25mm (min. sample volume 20 ml)

Interface: RS-232 (alternative RS-485, Blue tooth or USB)

Supply Voltage: 115VAC / 230V (50-60 Hz)

Power consumption: max. 12 W

Dimensions: 450 x 300 x 500mm

Weight: 10 kg

Model MoniTurb-F (MTF)

Process- Turbidimeter, Monitek Product Line of Galvanic Applied Sciences Inc.



- Low maintenance
- Extended calibration interval: Typical 24 month
- Sight glass material: Sapphire
- Sight glass cleaning: Via cleaning jet probe
- Cleaning in place (CIP)
- Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...
- Optional air purge connection: 4mm

Description:

The turbidity sensor Model MoniTurb-F uses the principle of 12° forward scattered light to detect suspended particles in liquids. The transmitter model Messenger is required to use this sensor. The system has been designed for continuous operation with long life time. A ratio measurement of direct- / scatter light assure highly reliable and repeatable measurement results. Inaccuracies caused by product colour, lamp ageing or window coating will be compensated. The forward scatter measuring results are nearly independent of particle size and will correlate to product concentration. Calibration can be done in multiple ranges and measurement units like EBC, ppm, mg/l, etc. The sensors can be installed into almost any type of pipe. Process connection, pressure, temperature, gasket material, etc will be application specific. Optional cleaning jets will allow a cleaning of the sapphire windows in determined intervals.

Applications:

- Filtration control
- Product quality
- Water in fuel
- Oil in water / Water in oil

Operational areas:

- Chemical industry
- Petrochemical industry
- Power plants
- Brew & Beverage

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 5"	Measurement range:	typical 0–1ppm, 0–500ppm
Process pressure:	PN16 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 140°C	Detector system:	Silica diodes
Sensor material:	1.4404 / 316L	Cleaning:	optional cleaning jet probe
Sight glass material:	Sapphire	Sterilization:	CIP (cleaning in place)
Gasket material:	application specific	optional hazardous area:	ATEX Zone I or Zone II
Protection class:	IP65 / NEMA 4X		

Model MoniTurb-FS (MTFS)

Process- Turbidimeter, Monitek Product Line of Galvanic Applied Sciences Inc.



- **Low maintenance**
- **Calibration interval: typical 24 month**
- **Sight glass material: Sapphire**
- **Sight glass cleaning: Via cleaning jet probe**
- **Cleaning in place (CIP)**
- **Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...**
- **Optional air purge connection: 4mm**

Description:

The turbidity sensor model MoniTurb-FS uses the principles of 12° forward- and 90° side scattered light to detect particles in liquids. The transmitter model Messenger is required to use this sensor. The system has been designed for continuous operation with long life time. The measuring results of the 12° system are not affected by particle size. The 90° system shows a high sensitivity for small particles (< 0.3 µm). Comparing both measurement values will allow conclusion of particle size distribution inside the liquid. The sensors can be installed into almost any type of pipe. Process connection, gasket material, etc. will be application specific. A ratio measurement of direct- / scatter light assure highly reliable and repeatable measurement results. Inaccuracies caused by product colour, lamp ageing or window coating will be compensated. Calibration can be done in multiple ranges and measurement units like EBC, ppm, mg/l, etc. Optional cleaning jets will allow a cleaning of the sapphire windows in determined intervals.

Applications:

- Filtration control
- Product quality
- Water / Waste water

Operational areas:

- Chemical industry
- Petrochemical industry
- Power plants
- Brew & Beverage

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 5"	Measurement range:	typical 0–1ppm, 0–500ppm
Process pressure:	PN16 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 140°C	Detector system:	Silica diodes
Sensor material:	1.4404 / 316L	Cleaning:	optional cleaning jet probe
Sight glass material:	Sapphire	Sterilization:	CIP (cleaning in place)
Gasket material:	application specific	optional hazardous area:	ATEX Zone I or Zone II
Protection class:	IP65 / NEMA 4X		

Model TSW (210-F)



- **Low maintenance**
- **Extended calibration interval: Typical 24 month**
- **Sight glass material: Sapphire**
- **Sight glass cleaning: Via cleaning jet probe**
- **Cleaning in place (CIP)**
- **Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...**
- **Optional air purge connection: 4mm**

Description:

The turbidity sensor Model TSW uses the principle of 12° forward scattered light to detect suspended particles in liquids. The transmitter model Messenger is required to use this sensor. The system has been designed for continuous operation with long life time. A ratio measurement of direct- / scatter light assure highly reliable and repeatable measurement results. The special design of lamp- and detector optic allow measurements of extreme low particle concentrations in ranges down to ppb level. Inaccuracies caused by product colour, lamp ageing or window coating will be compensated. The forward scatter measuring results are nearly independent of particle size and will correlate to product concentration. Calibration can be done in multiple ranges and measurement units like EBC, ppm, mg/l, etc.. The sensors can be installed into almost any type of pipe. Process connection, pressure, temperature, gasket material, etc will be application specific. Optional cleaning jets will allow a cleaning of the sapphire windows in determined intervals.

Applications:

- Filtration / Ultra filtration of liquids
- Product quality
- Water in fuel
- Oil in water / Water in oil

Operational areas:

- Chemical industry
- Petrochemical industry
- Power plants
- Brew & Beverage

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 5"	Protection class:	IP65 / NEMA 4X
Process pressure:	PN16 / ANSI class 150	Measurement range:	typical 0–0,5ppm, 0–500ppm
Process temperature:	maximum 140°C	Reproducibility:	± 1 %
Sensor material:	1.4404 / 316L	Detector system:	Silica diodes
Sight glass material:	Sapphire	Sterilization:	CIP (cleaning in place)
Gasket material:	application specific		

Model Monitek Messenger

Universal Transmitter, Monitek Product Line of Galvanic Applied Sciences Inc.



- Configuration via PC, Laptop or Netbook
- Optional with implemented Panel PC
- Menu - based, intuitive User Interface
- Instruction Manual available via Help Function
- Serial Interface RS 232C / RS 485 (Modbus RTU Protocol)
- Simultaneous Use of up to 4 Sensors
- Sensors for Turbidity, Colour or Absorption measurement
- Fully Programmable Units (ppm, EBC, FTU, g/l, % TS...)
- Two Independent, fully programmable Cleaning Cycles
- Linearization of Measurement Values
- Integrated Data Logger for up to 8000 measurement Values
- Recovery via Back-up File

Description:

The universal transmitter model Messenger can be used with all optical sensors of the Monitek series. The Messenger allows the simultaneous use of multiple sensors. Hereby you can use up to four single channel sensors. Even different sensors can be used with one transmitter. The measurement results can be linked together using almost any mathematical equation. This ensures an easy setup of e.g. dosage systems. The programming / calibration of the system will be done via a PC, Ntbook or Laptop using the menu-based software. Only one PC or Panel- PC is required to configure an instrument in a network of up to 255 Messengers. Using the Messenger with an integrated Panel- PC allows the paperless recording or displaying of the measurement results as bar- or line graph's.

Applications:

- Scatter light turbidity measurement
- Absorption turbidity measurement
- Single channel colour measurement
- Dual channel colour measurement

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Beer and beverages

Technical Data:

Supply voltage:	90-260 VAC, 50-60 Hz optional: 24 V AC/	optional digital inputs:	4x 5V High
Power consumption:	DC	Reproducibility:	± 1 %
Relay capacity:	maximum 50 VA	Temperature:	-10°C to 50°C
Analogue output:	4 Relays fully programmable (48V / 2A)	Enclosure / Protection:	1.4301 / IP65 (NEMA 4X)
Interfaces:	Up to 4x 0/4 - 20mA (isolated)	optional hazardous area:	ATEX Zone I / Zone II
	RS 232C / RS 485 Modbus RTU		



Everything all right?

Optical or Acoustic

Process measurement of liquids

- **Bacteria growing measurement system**
- **AOC (assimilable organic carbon)**
- **Determination of reproduction rate**
- **Determination of reproduction factor**

Model MZNV

Model MZNV (Bacteria growing measurement system)



- Principle of measurement: 12° forward scattered light
- Measuring range: 0 – 100ppm
- Sensitivity 0,005ppm
- Use of large volume precision cuvettes
- Calibration interval: 12 month
- Comfortable calibration software
- Built-in magnetic stirrer to homogenize the samples
- Software for magnetic stirrer & measuring cycle control as well as for data acquisition & analysis with up to 8 measuring systems
- Quantitative information on the assimilability of dissolved organic substances in water
- Creation of defined growth curves
- Determination of the bacterial growth rate

AOC (assimiable organic carbon)

Description:

The bacterial propagation measurement system model MZNV measures the turbidity according to the principle of the 12 ° forward scattered light. The measurements are performed in large volume precision cuvettes. Typically 4-8 measuring systems model MZNV are connected to a PC. The included software controls the magnetic stirrer inside the measuring units as well as their measuring cycles. Additionally the software collects and stores the measured values for the visualization and analysis of the experiments.

The number of measuring instruments, the number of measurement cycles and the time interval between measurements (typically 30 minutes) are programmable.

After completing a experiment, the individual growth curves and the rate of propagation will be displayed, the propagation factor and the acetate-C equivalents are determined.

- **Applications:**
- **Groundwater**
- **Surface water**
- **Water after different treatment stages**
- **Drinking water**

Technical Data:

Supply Voltage:	115 / 230 VAC, 50 - 60 Hz	Display:	ALPHA numeric LCD / backlit
Power requirement:	maximal 30 VA (pro System)	Reproducibility:	± 0,5 %
Measuring range:	typical 0-5ppm (auto ranging)	Temperature range:	Typical 21°C / controlled
Measuring interval:	typical 30 Min. (programmable)	Dimensions:	450 x 300 x 300mm
Measuring cycles:	typical 120 (programmable)	Weight:	approx. 9kg
Interface:	RS232 C / USB / Bluetooth		

Determination of the propagation dynamics of bacteria

Scope of the method

Analysis of

- Groundwater and surface water
- Water after various processing stages
- Drinking water

Target

- Determination of degradability contained in the water substrates
- Evaluation of treatment methods for the removal of AOC (assimilable organic carbon)

Results

- Defined growth curves, quantitative information about the assimilability dissolved organic substances in water
- Characterization of recoverability of individual substances by a biocenosis

Growth Curves

be determined by metrics that provide information about

- Propagation rate (μ) and
- Propagation factor (f)

Principle

An experiment will be performed in three steps

Sample Preparation

Sterile filtration

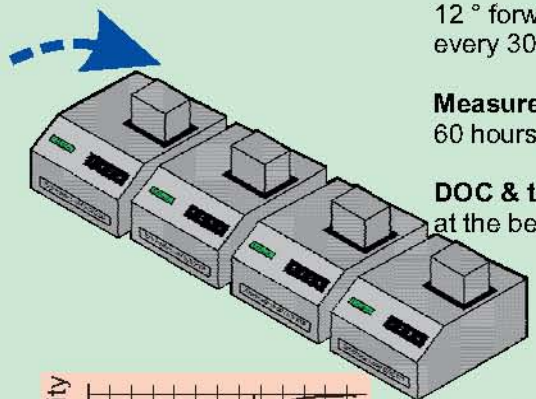
0.2 micron polycarbonate filter

Cuvette

300 ml of sterile-filtered sample
And 30 ml of sterile nutrient solution

Inoculum

mixed culture in
0,9% NaCl- Solution



Recording of the growth curves

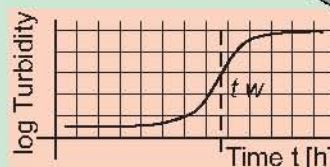
4-8 turbidimeter

AOC analyzers model MZNV
12 ° forward scattering
every 30 minutes one measured value

Measurement duration

60 hours

DOC & total cell count determination
at the beginning and at the end



Evaluation Growth Curve

Propagation rate [h^{-1}]

$$\frac{d}{dt} \ln(\text{Trüb}) \Big|_t = t_w$$

- Gradient of the logarithmic growth curve during the logarithmic growth phase of the bacteria
- A measure of the substrate quality

Propagation factor

$$\frac{\text{Trüb}_{\text{Ende}}}{\text{Trüb}_{\text{Anfang}}}$$

- Ratio of the biomass at the end of the experiment ($\text{Trüb}_{\text{Ende}}$) versus the beginning of the experiment ($\text{Trüb}_{\text{Anfang}}$)
- A measure of the substrate quantity

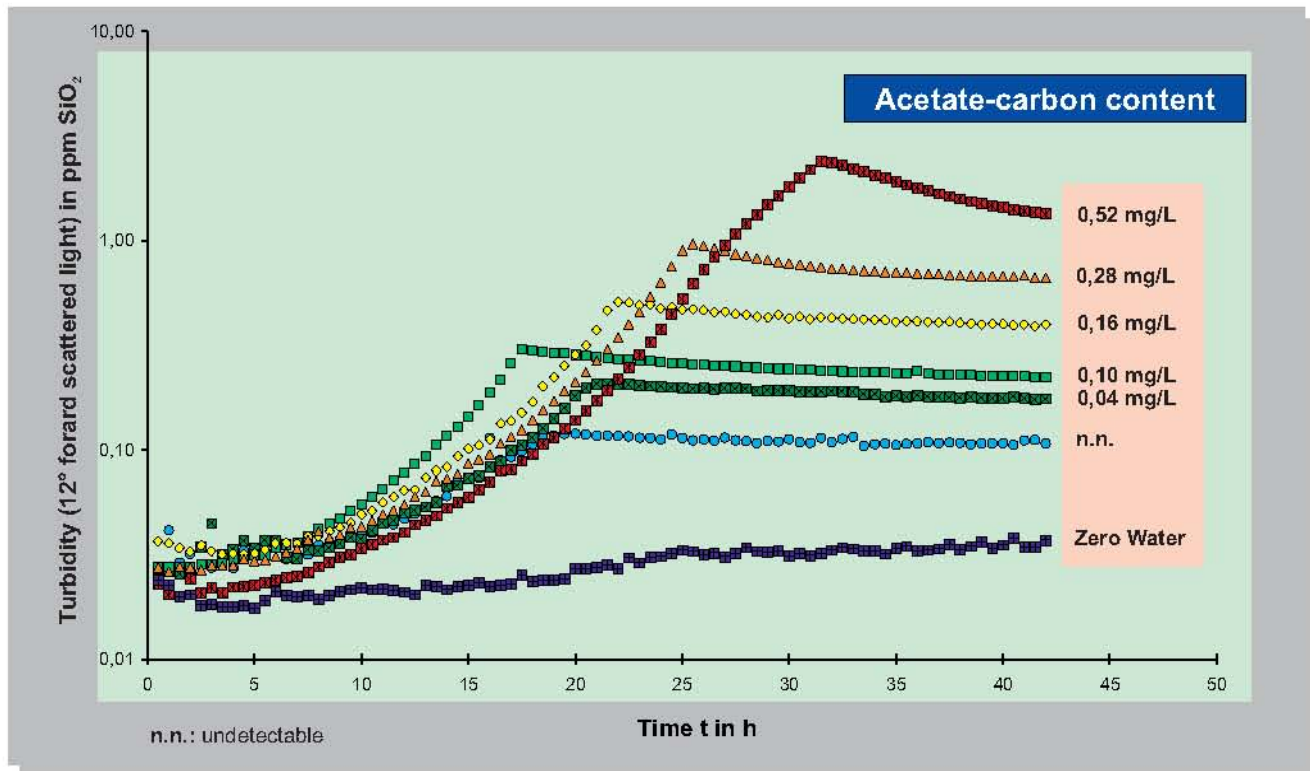
Acetate-C equivalent [$\mu\text{g/L}$]

$$\frac{\Delta \text{Trüb} \cdot 1000}{2,3}$$

- Conversion of turbidity increase in acetate-C equivalents
- Comparison with acetate calibration series

Example

Growth of a mixed culture with increasing acetate carbon concentrations



Versuchsansätze

- 6 Experimental approaches with increasing acetate carbon content as a substrate
- Zero water (UV-oxidized, deionized water) as a negative control

Ergebnis

- Acetate-carbon curves with a typical course of increase of the slope and total haze by increasing substrate content
- Zero water with no rise in the curve

Numerical Values

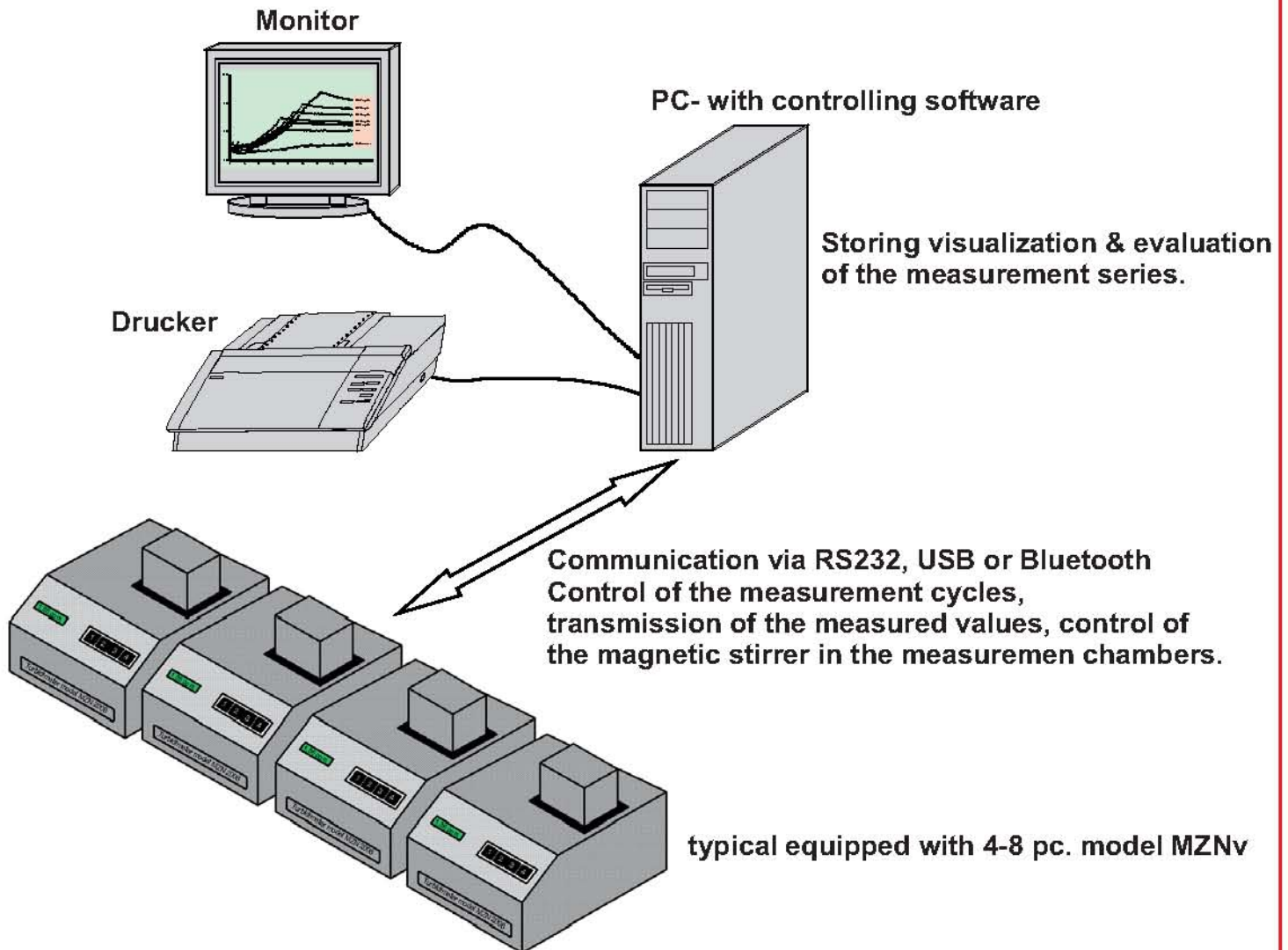
The numerical values of the individual samples are shown in this table

Acetat-C- conc. [mg/L]	μ [h ⁻¹]	f corr.*	Acetat-C equivalents [μ g/L]	Total cell count ** [1/mL]		DOC [mg/L]	
				Start	End	Start	End
0,52	0,31	45,1	576	$2,7 \times 10^4$ ($4,5 \times 10^3$)	$2,0 \times 10^6$ ($3,7 \times 10^5$)	0,65	0,13
0,28	0,32	23,1	289	$2,7 \times 10^4$ ($5,1 \times 10^3$)	$1,3 \times 10^6$ ($1,2 \times 10^5$)	0,38	0,10
0,16	0,27	13,9	169	$2,6 \times 10^4$ ($3,7 \times 10^3$)	$1,1 \times 10^6$ ($5,6 \times 10^4$)	0,31	0,15
0,10	0,30	8,3	95	$2,8 \times 10^4$ ($4,9 \times 10^3$)	$5,0 \times 10^5$ ($4,1 \times 10^4$)	0,19	0,09
0,04	0,23	6,4	70	$2,6 \times 10^4$ ($4,1 \times 10^3$)	$3,2 \times 10^5$ ($6,6 \times 10^4$)	0,13	0,09
n.n.	0,14	3,8	37	$2,7 \times 10^4$ ($4,9 \times 10^3$)	$2,4 \times 10^5$ ($3,5 \times 10^4$)	0,08	0,08
Zero Water	0,05	1,6	7	$2,7 \times 10^4$ ($4,3 \times 10^3$)	$6,5 \times 10^4$ ($1,2 \times 10^4$)	0,10	0,10

* Relative to 0.03 ppm SiO₂ initial turbidity
** Standard deviation in parentheses

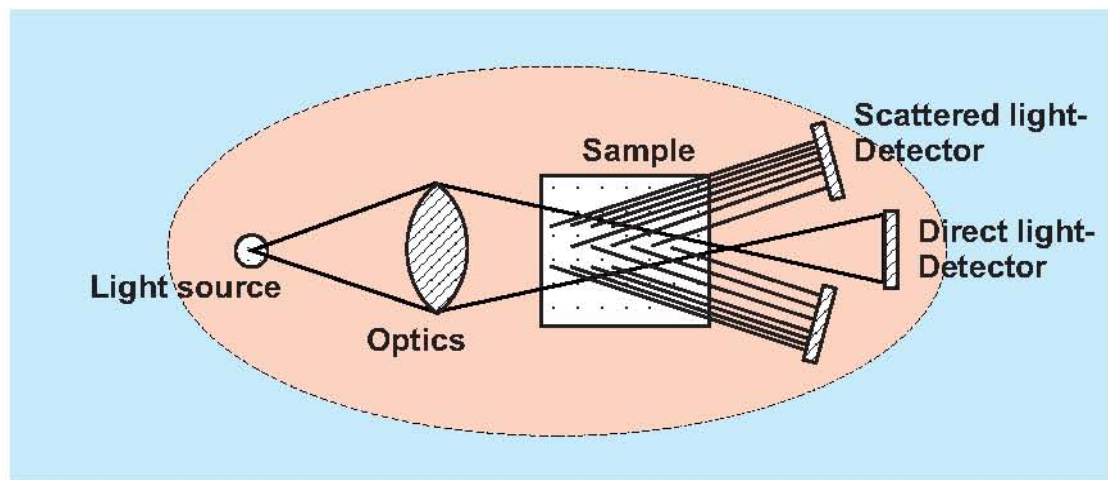
Components of the bacterial propagation measurement system

Chemtronic AOC-Analyzer Model MZNV-4 mAOC and its Periphery



Beam path model MZNV

Principle measurement 12 ° forward scattering



What does turbidity mean?

Turbidity is an optical impression, which describes the characteristic of a transparent product, to scatter light. A focused light beam will be attenuated and scattered in hazy products, so that this product can become practically opaque in bigger layers.

What causes turbidity?

Turbidity is caused by particles in transparent products. A particle is defined as something with a different refractive index as the carrier product. Some examples of particles are minerals, yeast cells, metals, oil drops in water, milk in water, gas bubbles and aerosoles.

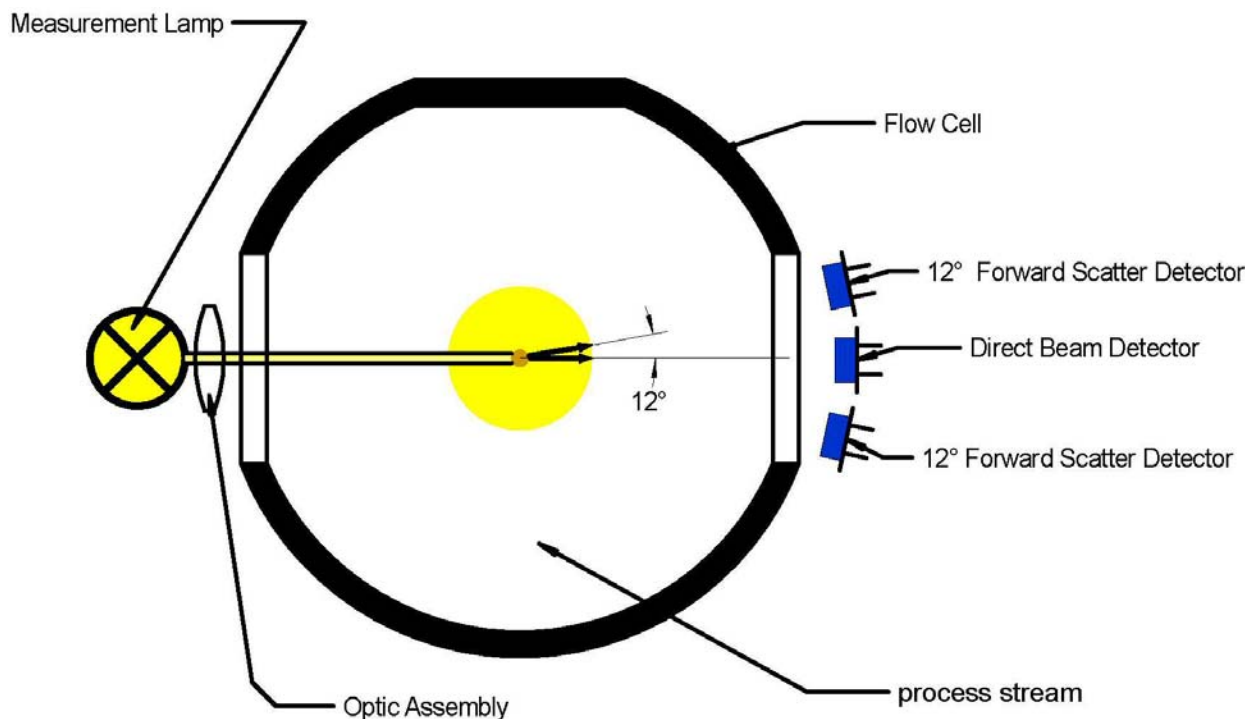
Measurement of turbidity

Turbidity is not a clearly defined magnitude like e.g. temperature or pressure. Turbidity is a subjective impression. For this reason turbidity measurement systems will be typically calibrated by using a comparison's standard such as Formazin and Diatomatious Earth.

Measurement method

The 12° forward scattered light turbidity measurement method:

- Forward scattering (12°) The position of the detector is 12° shifted to the axis of light beam



An intense collimated beam of light is projected through a sample contained within the sensor. The intensity of this light beam is measured by the direct beam detector, located opposite to the light source. The light, scattered by particles inside the sample is measured by a scatter light detector. Depending on sensor specification, this detector is located 12°, displaced from the direct light axis. The signals caused by scattered and direct light will be amplified and processed by the electronics. The results displayed, is the turbidity value.

$$\frac{\text{Scattered light signal}}{\text{Direct light signal}} = \text{Turbidity}$$

The particles inside the liquid flow decrease the intensity of direct light, and increase the intensity of the scattered light, i. e. the turbidity rises. Colour decreases the intensity of direct and scattered light in same ratio i. e. the turbidity value is constant. Lamp ageing and window coatings are compensated as well by this ratio.

Very Important:

When comparing measurement results. The same methods must be compared to one another. For example, 90° vs. 90°, 12° vs. 12°. Never 90° vs. 12°.

The measurement methods will respond different, depending on current particle distribution inside the actual sample.

12° forward scatter light:

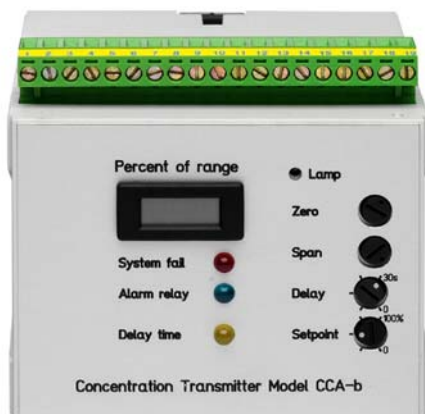
The forward scatter method is a mass related measurement principle which will allow calibration in mg/l if necessary.

A big particle in the measured product will cause a high measurement signal and a small particle in the measured product will cause a low measurement signal.

Typical applications:

- **Bacteria Growth**
- **Oil in Condensate**
- **Filtration control**
- **Product Turbidity**
- ...

Model CCAb



- Wide measurement range (max. 4 AU / Ext.)
- Analogue output: 0 / 4 – 20mA
- Adjustable set point
- Adjustable delay time (max. 30 Sec. set point relay)
- 3,5 digit LCD display
- Automatic self diagnostic
- Rail mount enclosure

Description:

The turbidity transmitter model CCAb can be used with different Monitek sensors model 22 ..., 25 ... or LAS. The system uses the principle of light absorption to detect dissolved or suspended particles in liquids. The transmitter as well as the sensor is distinguished by easy operation and low maintenance. The calibration of the system is done via zero and span adjustment. Because of the automatic self diagnostic routine, highly reliable measurement results are assured. Actual measurement values are shown by the implemented display. The 0/4-20mA output allows transferring of the measurement results to an external PLC- system.

Applications:

- Product concentration
- Turbidity measurement
- Oil in water / Water in oil
- Single channel colour measurement

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Bear & Beverage

Technical Data:

Supply voltage: 24 V AC/DC
 Power consumption: Maximum 25 VA
 Set point: 1 Relay (48V / 2A)
 System fail: 1 Relay (48V / 2A)
 Analogue output: 0/4 - 20mA / 800Ohm

Measurement range: 0 – 4 AU
 Reproducibility: ± 1 %
 Ambient temperature: 5 °C to 45 °C
 Enclosure: IP30 / NEMA1 ABS- rail mount
 Dimensions: 100 x 90 x 110mm / 0,3Kg

Model LAS



- Low maintenance
- Extended calibration interval: Typical 12 month
- Measuring windows directly melted to the Steel
- No additional window gaskets required
- No overreaching components inside the flow cell
- Perfect hygienic design
- Cleaning in place (CIP)
- Build in calibration filters
- Process installation via TH- Varivent plates

Description:

The sensor model LAS uses the principle of light absorption to detect dissolved or suspended particles in liquids. The transmitter model Messenger or CCAb is required to use this sensor. The system has been designed for continuous operation with long life time. The use of metal melted measurement windows without any additional gaskets guarantee for a perfect hygienic design. The installation by using TH-Varivent plates offers a cost saving process installation via standardized flow cells. The implemented calibration filters allow the calibration of the system without using liquid calibration standards. The absorption caused by turbidity will be detected at a wavelength of 850nm. Therefore the measurement results are not affected by product colour.

Applications:

- Product concentration
- Turbidity measurement
- Suspension
- Product separation

Operational areas:

- Breweries
- Beverages
- Dairies

Technical Data:

Line size:	DN 40 – DN 125 (TH- flow cells)	Measurement ranges:	typical 0–50EBC, 0–500EBC
Process pressure:	PN10 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 140°C	Detector:	Silica diode
Sensor material:	1.4404 / 316L	Measurement wavelength:	typical 830nm
Sight glass material:	Metaglas	Protection:	IP65 / NEMA4X
Gasket material:	No window gaskets required	Sterilization:	CIP

Model MoniSpec-A (MSA)

Process- Photometer, Monitek Product Line of Galvanic Applied Sciences Inc.



- Low maintenance
- Extended calibration interval: Typical 12 month
- Sight glass material: Sapphire
- Sight glass cleaning: Via cleaning jet probe
- Cleaning in place (CIP)
- Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...
- Optional air purge connection: 4mm

Description:

The sensor model MoniSpec-A uses the principle of light absorption to detect dissolved or suspended particles / colour in liquids. The transmitter model Messenger is required to use this sensor. The system has been designed for continuous operation with long life time. The sensors can be installed into almost any type of pipe. Process connection, pressure, temperature, gasket material, etc will be application specific. Optional cleaning jets will allow a cleaning of the sapphire windows in determined intervals. Calibration can be done in multiple ranges and measurement units like EBC, ppm, %, g/l, etc.. Due to the availability of multiple optical path lengths (2mm up to 120mm) the sensors can cover measurement ranges from 0-100ppm up to 0-50000ppm. The sensor will detect IR-absorption for turbidity measurement. Therefore the measurement results are not affected by product colour. In case the customer wants to detect the product colour, the absorption will be measured at an application specific wavelength.

Applications:

- Product concentration
- Suspension
- Cell concentration
- Oil in water / Water in oil

Operational areas:

- Chemical industry
- Petrochemical industry
- Dairies
- Brew & Beverage

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 5"	Measurement range:	typical 0–100ppm, 0–5%TS
Process pressure:	PN16 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 140°C	Detector:	Silica diode
Sensor material:	1.4404 / 316L	Measurement wavelength:	390 – 900nm
Sight glass material:	Sapphire	Cleaning:	optional cleaning jet probe
Gasket material:	application specific	Sterilization:	CIP (cleaning in place)
Protection class:	IP65 / NEMA 4X	optional hazardous area:	ATEX Zone I or Zone II

Turbidity Sensor Model TURBImat-A



- Low Maintenance
- NIR LED- Technology (860nm DIN / EN 27027 / ISO7027)
- Wide measuring Range
- Typical calibration Interval 12 Month
- PVC-U Flow Cell (d63 DN50) / PN16 / 50°C
- Access to Sapphire Windows via GF- Fittings
- Ultra fast Window cleaning
- Process connection via Solvent Cement jointing, Flanges or GF- Fittings

The sensor model TURBImat-A uses the principle of NIR- light absorption to detect dissolved or suspended particles in liquids. The transmitters model Messenger or CCAb are required to use this sensor. The system has been designed for continuous operation with long life time. Calibration can be done in multiple ranges and measurement units like FTU, ppm, etc.. The sensor detects the absorption of infra red light. Therefore the measurement results are not affected by product colour. Ranges of 0-50FTU up to 0-20000FTU are possible, due to the availability of multiple optical path lengths (2mm up to 60mm). The sapphire windows of the sensor are accessible via GF- fittings, this allows a very fast window cleaning if required.

Applications:

- Process water
- Potable water
- Product separation
- Centrifuge In- / Outlet
- Filtration control (break through)

Areas of Application:

- Chemical Industry
- Waste water treatment
- Food / Beverages Industry
- ...

Technische Daten:

Line size:	DN50 / d63	Measuring range:	typical 0-50 - ...20000FTU
Pressure rating:	PN 16	Optical path length:	2mm to 60mm*
Process temperature:	maximum 50°C	Reproducibility:	± 2 %
Sensor material:	PVC-U	Detector system:	Silica Pin diode
Window material:	Sapphire	Measuring wavelength:	860nm
Gasket material:	EPDM (other on request)	Protection class:	IP65 / NEMA 4X

*optical path length depending by specified range!

Turbidity Probe Model AP2



- 19 mm probe technology
- Measurement method: Absorbance
- Different measurement wavelength on request
- Low maintenance
- Extended calibration interval: Typical 12 month
- Sapphire measuring windows
- Hygienic design
- Cleaning in place (CIP)
- Process installation via TH- Varivent plates available
- Process installation via DIN / Ansi flange available
- Process insertion via ball valve with adapter available

Description:

The probe model AP2 uses the principle of light absorption to detect colour or turbidity in liquids. The transmitter model Messenger or CCAb is required to use this sensor. The system has been designed for continuous operation with long life time. The 19mm probe design allows insertion to laboratory fermentation tanks. Different flanges, TH- Varivent plates, APV- plates or ball valves are as well available and allow the easy installation of the probe to many applications.

Applications:

- Product Separation
- Turbidity measurement
- TSS concentration measurement

Operational areas:

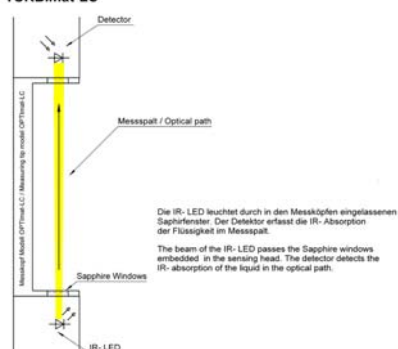
- Breweries
- Beverages
- Dairies
- Bio technology
- Water / Waste water
- Chemical industry

Technical Data:

Line size:	DN 25 / 1" up to	Measurement ranges:	typical 0–100EBC, 0–500EBC
Process pressure:	PN16 / ANSI class 300	Reproducibility:	± 1 %
Process temperature:	45°C (131°C short time CIP)	Measurement wavelength:	880nm (other on request)
Sensor material:	1.4404 / 316L	Protection:	IP65 / NEMA4X
Sight glass material:	Sapphire	Hazardous Area:	ATEX, Zone 1 & Zone 2 (option)
Gasket material:	EPDM (other on request)	Sterilization:	CIP

Model TURBImat-LC (TBLC)

TURBImat-LC



- Low maintenance
- 30cm immersion probe
- Pipe extension 0,5m for pipe insertion via ball valve
- Insertion/removal without process interruption
- Pipe extension up to 2m for installation in open channel
- Calibration interval: Typical 6 month
- Wide span of measurement ranges
- Sight glass material: Sapphire
- Sight glass cleaning via cleaning jets
- Optional available with DIN- or ANSI flanges

Description:

The turbidity probe model TURBImat-LC uses the principle of light absorption to detect dissolved or suspended particles in liquids. The transmitter model Messenger or CCAb is required to use this probe. The system has been designed for continuous operation with long life time. The probe design allows installation into large process pipes, tanks or open channels. Up to a process pressure of 3bar and non critical product, process insertion and removal of the probe can be easily done via a 2"ball valve. So calibration and maintenance ensues without process interruption. Other process connections like flanges, swivel clamps, etc. are available on request.

Applications:

- Product concentration
- Sedimentation
- Flotation
- Oil in water / Water in oil

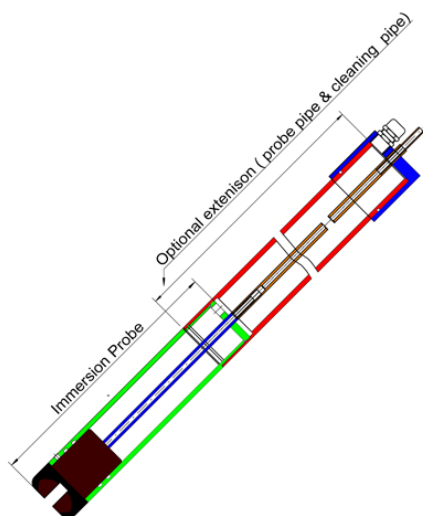
Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Power plants

Technical Data:

Line size:	minimum diameter DN 200	Measurement range:	0–100ppm, 0–2000ppm
Process pressure:	maximum PN 16 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 60°C	Detector:	Silica diode
Probe material:	1.4471 / 316SS	Measurement wavelength:	typical 880nm
Sight glass material:	Sapphire	Protection:	IP65 / NEMA 4X
Gasket material:	Application specific		optional hazardous area: ATEX Zone I / Zone II

Model TURBImat-HC (TBMHC)



- Immersion probe
- Low maintenance
- Extended calibration interval: Typical 6 month
- Multiple probe extensions available
- Immersion / or pipe installation via 2" insertion adapter
- Insertion / removal without process interruption
- Multiple optical path lengths available (max. 10 mm)
- Optional available with DIN- or ANSI flanges
- Optional 316 SS measurement head / sapphire windows
- Optional cleaning jets
- Wide span of range

Description:

The turbidity probe model TURBImat-HC uses the principle of light absorption to detect dissolved or suspended particles in liquids. The basic probe is 230mm long and will be immersed into the measured product.

Extension tubes allow the installation to pipes as well as the immersion in tanks or open channels. Pipe installation is typically done by using a 2" ball valve or a mounting flange at the probe shaft.

The sensor requires the transmitter model Messenger or CCAb and is suitable for the measuring of high concentrations in liquids. The calibration depends by application, measuring range and unit.

Applications:

- Product concentration
- Sedimentation
- Flotation
- Sludge concentration

Operational areas:

- Chemical industry
- Petrochemical industry
- Pulp & Paper
- Power plants & Waste water

Technical Data:

Line size:	minimum diameter DN 80	Immersion depth:	maximum 80m
Process pressure:	maximum 8Bar	Measurement range:	typical 0-6%
Process temperature:	maximum 60°C	Reproducibility:	± 1 %
Probe material:	1.4471 / 316SS	Detector:	Silica diode
Measurement head:	PVC (optional 1.4571 / Sapphire)	Measurement wavelength:	typical 880nm
Gasket material:	Application specific	Protection:	IP68
Cleaning:	Optional cleaning jets (air/water)	optional hazardous area:	ATEX Zone I / Zone II

Model 22 (CSW)



- **Low maintenance**
- **Extended calibration interval: Typical 12 month**
- **Sight glass material: Sapphire**
- **Flow cell material: 1.4404**
- **Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...**
- **Cleaning in place (CIP)**
- **Optional air purge connection: 4mm**

Description:

The sensor model 22 uses the principle of light absorption to detect dissolved or suspended particles / colour in liquids. The transmitter model Messenger or CCAb is required to use this sensor. According to the application, calibration can be done in multiple ranges and measurement units like EBC, ppm, %, etc.. The measurement system has been designed for continuous operation with long life time. The sensors can be installed into almost any type of pipe. Process connection, gasket material, etc will be application specific. Due to the availability of multiple optical path lengths (2mm up to 120mm) the sensors can cover measurement ranges of 0-50EBC up to 0-10000EBC. The sensor will detect the IR-absorption for turbidity measurement. Therefore the measurement results are not affected by product colour. In case the customer wants to detect the product colour, the absorption will be measured at an application specific wavelength.

Applications:

- Product concentration
- Turbidity measurement
- Suspension
- Oil in water / Water in oil

Operational areas:

- Chemical industry
- Petrochemical industry
- Dairies
- Brew & Beverage

Technical Data:

Line size:	DN 25 – DN 125 / ½" - 5"	Measurement range:	Typical 0–50EBC, 0–10000EBC
Process pressure:	PN16 / ANSI class 150	Reproducibility:	± 1 %
Process temperature:	maximum 140°C	Detector:	Silica diode
Sensor material:	1.4471 / 316SS	Measurement wavelength:	typical 830nm
Sight glass material:	Sapphire	Protection:	IP65 / NEMA4X
Gasket material:	Application specific	Sterilization:	CIP