

# Manual

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## Absorption Turbidity Sensor Model TURBImat-LC (TBMLC)

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**Sales- & Service Partner for Your MONITEK Products.**

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## Copyright

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## Non-warranty

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Chemtronic Waltemode GmbH is by no means liable for any consequential damages or miscellaneous damages, which occur during the use or storage of the system.

Some countries do not allow the limitation of liability, so that this exclusion is possibly not valid for you.

## Warranty conditions

The warranty for this product takes place according to the legal provisions. As places of warranty we explicitly name Chemtronic Waltemode GmbH, Niederstr. 14, 40789 Monheim am Rhein, Germany. In case of warranty service at the customer site, we will charge additional expenses e.g. travel expenses, overnight cost, etc. Consumable parts as well as wearing parts e.g. lamps, gaskets, etc. are not covered by warranty. Improper use, gross negligence, use of the system outside of the technical specifications, missing or improper maintenance will cause a loss of the warranty claim. Please take notice to our general terms of contract.

## Shipment of the instrument

Please clean the instrument carefully before shipment (e.g. for revision / repair). Please use fixed packaging to protect the instrument against any shipping damages.

If at all possible the original packaging should be used.

## Before installation and start-up

### Installation guidelines

- The sensor is manufactured according to the customer's application (variable line size, flange type, cleaning jets, gasket material etc.).
- It is recommended to run the calibration of the system before installation of the sensor.
- The location / installation of the sensor should be in a vertical standpipe.
- The process pressure should never exceed the specification of the delivered sensor.
- The process temperature should never exceed the specification of the delivered sensor.
- Avoid air and gas bubbles inside the sensor, they cause disturbances. Air and gas bubbles will cause noise and drift of the measurement signal. (The air bubbles are not expected at pressures upwards of 2 bar in aqueous solutions).
- In case the process temperature should fall under the dew point or rise above 85 °C purge the sensor optic housings with dry instrument air (approx. 10 l/h). Condensed water and excessive temperatures can damage the sensor and cause inaccurate measurements.
- Due to potential noise problems it is recommended not to extend the sensor cables.
- Due to potential noise problems use original parts only.
- In case the optional cleaning jets are being used, make sure the pressure of the cleaning fluid is at least 50% higher than the process pressure.

**We strictly recommend, installing a non-return valve in the supply line of the cleaning jets, to make sure that the process liquid cannot flow backwards through the cleaning jets into the probe!**



**Danger:**  
Exceeding the specified maximum pressure and /or the specified maximum temperature will cause a very high safety risk.



**Please read the additional safety instructions before installation and start-up.**

## Safety instructions

Pay attention to the following general safety instructions during use and operation of the system. Ignoring these instructions or special warnings inside of this manual can damage the sensor, cause inaccurate measurements, and possibly result in unsafe installations. Galvanic Applied Sciences will not take any responsibility for consequences arising from ignoring the safety instructions and warnings.

### For ALL chemical liquids



The reagents or standards may be toxic or otherwise harmful to human health. Observe appropriate precautions when handling and disposing the reagents. Review the appropriate published material safety data sheets regarding the safe handling and disposal of all reagents or standards.

### Electrical installation

Qualified technical personnel must install the electrical installation of the system.

### Hazardous area Installation

DO NOT INSTALL the system in hazardous area without the optional Ex-proof equipment. Operation of non Ex- proof systems in hazardous area causes a high risk.



**Using the system in hazardous areas (Ex Zone I / Ex Zone II) is safe only, with the optional Ex-proof equipment including all required certifications.**

### Maintenance



Always disconnect the instrument from power during maintenance, replacement of components, installation of additional components or any other operations at the open instrument. Only qualified technical personnel must perform this work.

### Operating the instrument with open enclosure

**Only qualified technical personnel should operate the instrument while the enclosure is open (e.g. during calibration procedure).**

**Some components inside the instrument are energized with voltages, which can cause lethal shocks in case of contact. Be careful during installation, handling and operation of the instrument.**

### Improper installation / operation of the system

Warranty is void if the system is installed improperly, handled improperly, used outside of the technical specifications (of the instrument), or damaged by gross negligence.

## Storage

Please inspect the instrument immediately after receiving for potential shipping damages. In case the instrument has already been unpacked for inspection or testing, or if the instrument has been removed from the process and it is not to be installed or reinstalled for more than 1 day, the following procedure should be observed:

1. If the instrument has been in service, the wetted portion should be thoroughly cleaned (typically with clean water) and then thoroughly dried.
2. In case the original packing material is not available place the instrument in a sealed heavy plastic bag with a desiccant added to assure clean dry storage.
3. The instrument should then be stored in a protected area until time of installation.

## General

### What does Turbidity mean?

Turbidity is an optical impression, which describes the characteristic of a transparent product, to scatter and absorb 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 aerosol's.

### Turbidity Measurement

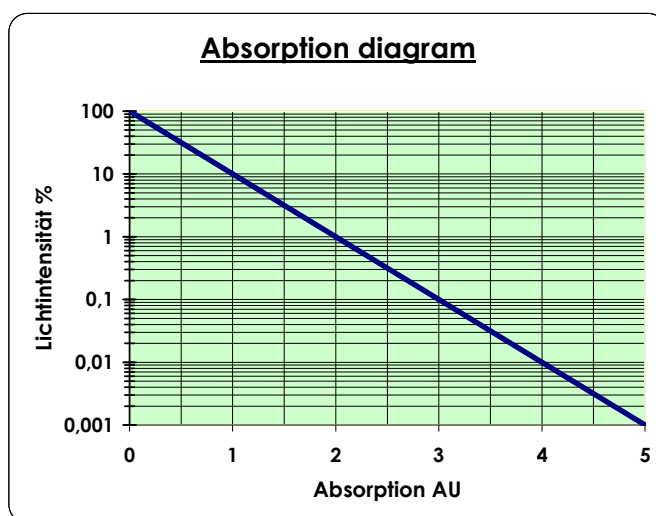
Turbidity is not a clearly defined magnitude like e.g. temperature or pressure. Turbidity is a subjective impression. For this reason turbidity measurement systems will be typically calibrated by using a comparison's standard such as Formazin or Diatomaceous Earth.

### Principle of Absorbance Measurement

A light source and a detector are located parallel over against. The changing of light intensity, caused by the product between lamp and detector, will be detected and displayed as measuring result. The application is the measurement of concentrations (color or solids) in a liquid. The basic measurement unit of an absorption photometer, is called AU (Absorption - Unit).

#### Definition of AU:

- 1 AU = 90 % loss of light intensity
- 2 AU = 99 % loss of light intensity
- 3 AU = 99,9 % loss of light intensity
- 4 AU = 99,99 % loss of light intensity
- 5 AU = 99,999 % loss of light intensity



## Typical Turbidity Units

|                    |                                             |                    |                              |
|--------------------|---------------------------------------------|--------------------|------------------------------|
| ppm:               | Parts per million                           | FNU <sup>1</sup> : | Formazine nephelometric unit |
| FTU:               | Formazine Turbidity Unit                    | mg/l:              | Milligram per liter          |
| TEF:               | Trübungseinheiten Formazin (German for FTU) | gr/l:              | Gram per liter               |
| EBC:               | European brewery convention                 | % TS:              | Percent total solids         |
| NTU <sup>1</sup> : | Nephelometric turbidity unit                | AU                 | Absorption unit              |

## The Dependencies on the Different Measurement Units

1 FTU = 1 TEF = 1 NTU<sup>1</sup> = 1 FNU<sup>1</sup> = 0,25 EBC

<sup>1</sup> Nephelometry describes the method of side scattered turbidity measurement, these units are used at 90° side scattered turbidimeter only.

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

1 FTU = 1 TEF = 0,25 EBC = 2,05ppm = 2,05 mg/l = 0,00205 g/l = 0,0000205 % TS

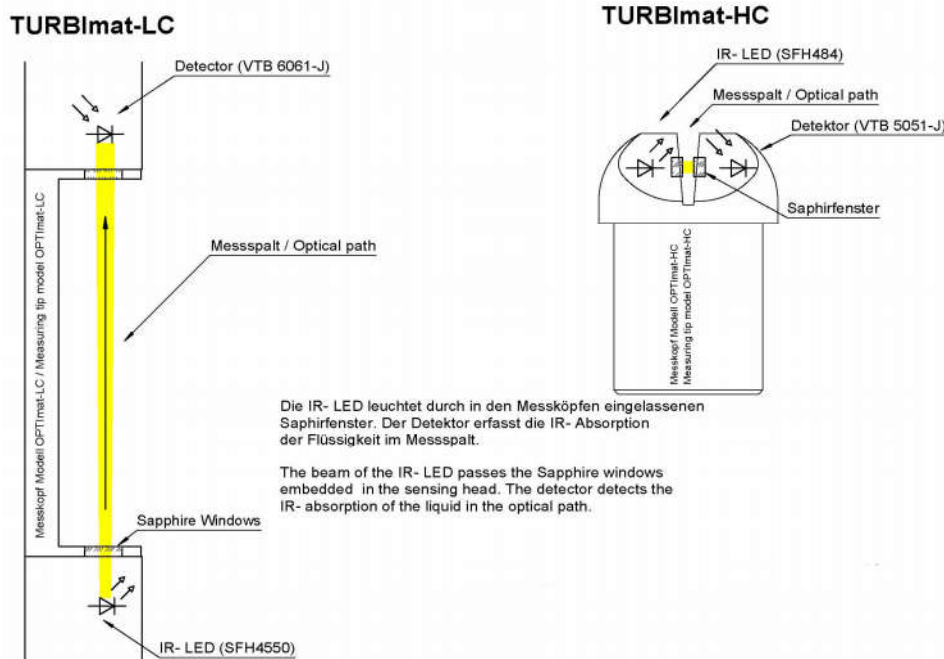
\* At a specific particle weight of 1kg/dm, 1mg/l particles in 1kg of water will correspond to 1ppm.

## Concentration Measurement

The sensitivity of a turbidity measurement system, based on the principle of light absorption, is mainly dependent by two parameters.

1. The intensity of the light source, which is typically constant.
2. The optical path length (OPL<sup>1</sup>): The optical path length is variable and can be changed to match the requirements of specific applications.

For measuring low concentrations, a large OPL is required. Otherwise there is not enough change in light intensity, to get good measurement results. For measuring high concentrations, a small OPL is required. Otherwise there is not enough light energy, to pass the product.



Large OPL = Low concentrations / high sensitivity

Small OPL = High concentrations / low sensitivity

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

## Typical Ranges (depending by product)

| OPL    | lowest range        | highest range                             |
|--------|---------------------|-------------------------------------------|
| 3 mm   | approx. 0 - 2 g/l   | approx. 0 - 100g/l (10% TS <sup>2</sup> ) |
| 150 mm | approx. 0 - 100mg/l | approx. 0 – 0,5g/l                        |

The OPL has to be specified according to the conditions of customers application.

Construction of sensor's, and various measurement windows, allow for optical path length between 1/10" (2 mm) up to 20" (500 mm).

### The absolute range of absorption sensors:

- 0 to 0.1 AU (lowest range)
- 0 to 5 AU (highest range).

## Typical Applications

The absorption measurement is the most common method to measure turbidity. This measurement method can be used in various applications, due to a large measurement range, and many different shapes of sensors (immersion probes, insertion probes, flow cells, etc.).

- **Measurement of lauter wort in breweries**
- **Measurement of yeast concentration**
- **Dosage systems (Yeast / Diatomaceous earth)**
- **Concentration measurement of various products**
- **Freight measurement systems (in combination with a flow meter)**
- **Centrifuge control**
- **Oil in water**
- **Water in oil**
- **Monitoring of coatings inside of pipe systems**
- **Sludge concentration**
- **Sludge level**
- **Measurements in flotation- / sedimentation tanks**
- **Pulp and paper**
- **Retention at paper machines**

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<sup>2</sup> % TS [= total solids]

## Maintenance

### Replacement of measurement head

Introduction

**Ignoring of the following hints will cause a loss of warranty**

- Qualified technical personnel must perform repair and maintenance.
- Before beginning any work the sensor must be cleaned and flushed thoroughly. Depending on customers' application product residues can be very dangerous (aggressive, poisonous). Please handle the system very careful due to possible leakage etc.
- Avoid pulling and twisting of the measuring cable.
- Avoid applying excessive force during assembling and disassembling of the sensor.
- Screw in all bolts and cable glands stalwart only.
- Please work carefully at the replacement of parts.
- Please be sure that no dust or other particles penetrates into the assembly.
- In case of dirty component please clean carefully by using fresh water and a cloth (lint-free), dry all components by using instrument air.
- Use suitable tools only.

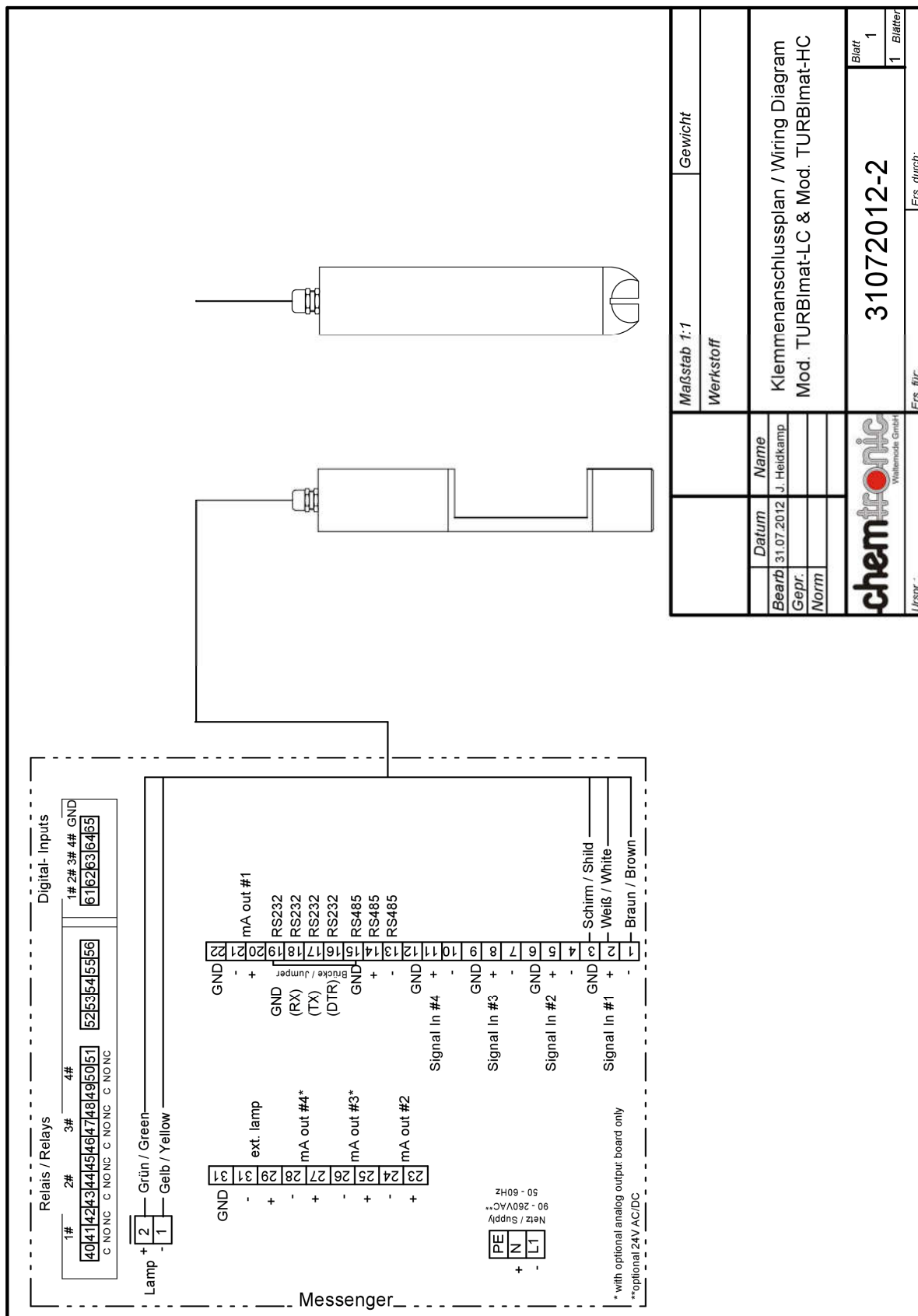
### Replacement interval of the Gaskets

The interval to replace the gaskets depends on the specific application.

The replacement cycle depends on process pressure, process temperature, sealing material and product characteristics. In worst case (high temperature, high pressure and aggressive medium) the gaskets must be replaced every month. Under normal conditions the gaskets should be replaced every second year. The maximum lifetime in easy applications can go up to 3 years.

We strictly recommend that the customer establishes a maintenance interval based on local conditions. In case of further questions, or if you require more information please contact Chemtronic Waltemode GmbH.

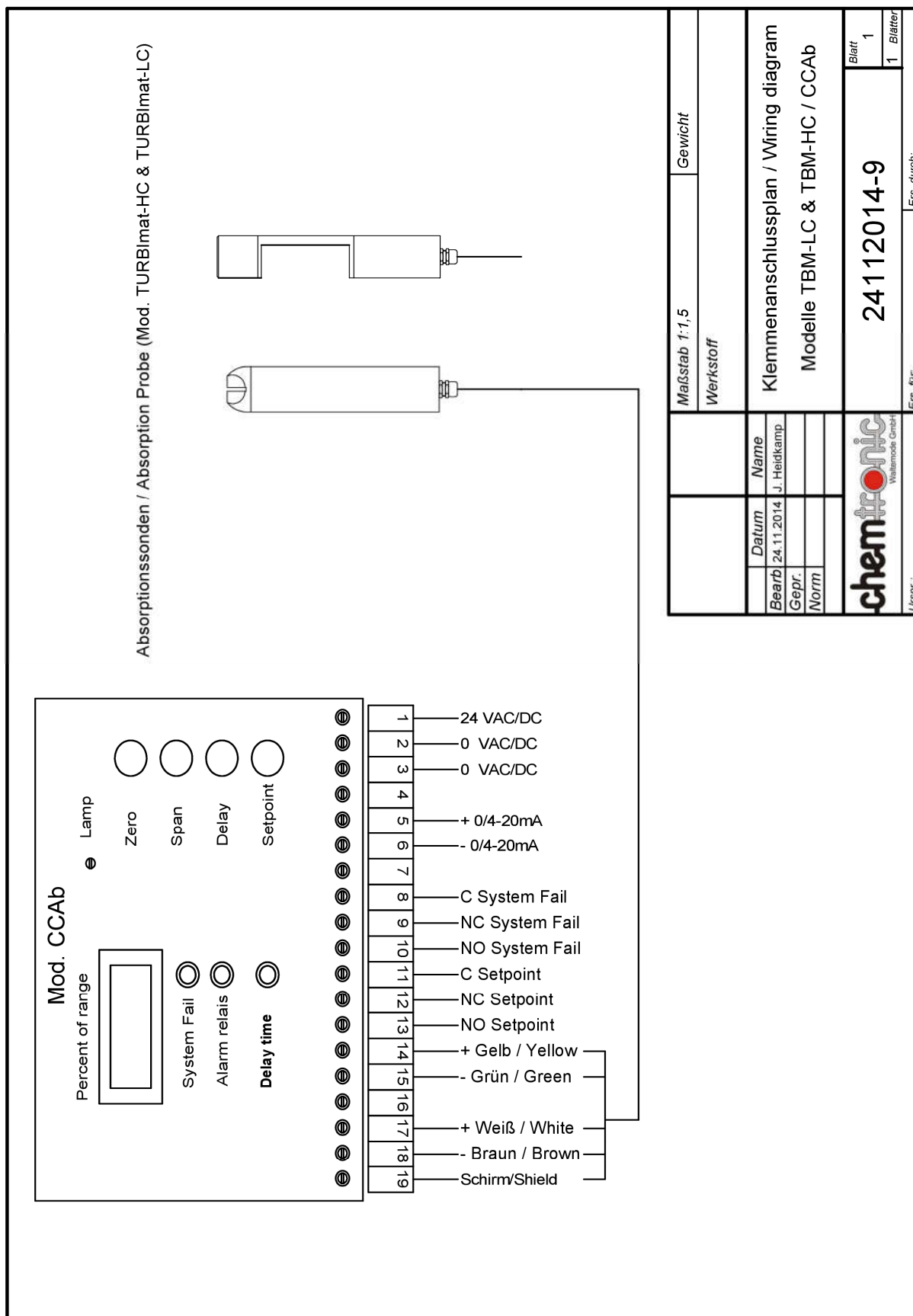
# Wiring Diagram TURBImat-LC / Messenger (single Probe)



Take notice, refer to the specific wiring diagrams within the Ex- documentation, in case of hazardous area installation!



## Wiring Diagram TURBImat-LC / CCAb

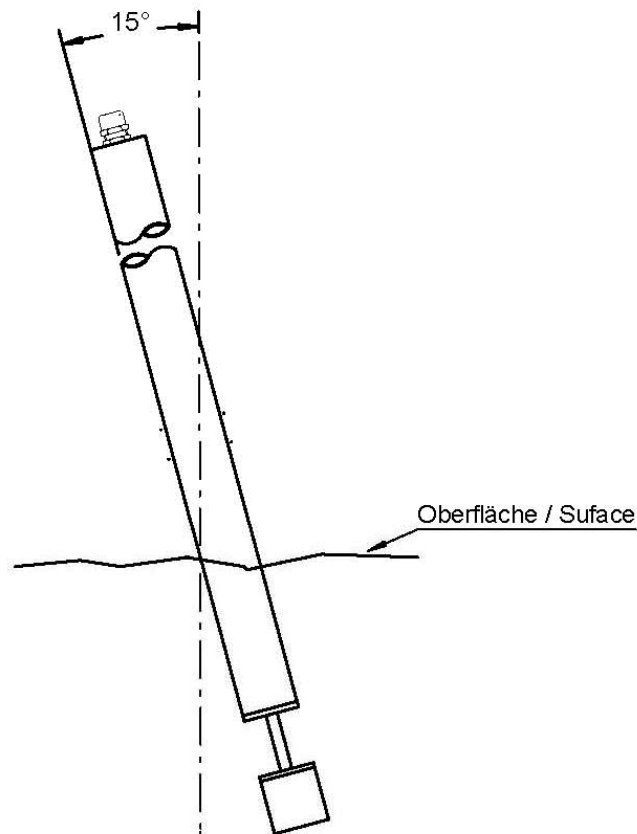


## Installation in open Channel or Basin

### Vertikaler Einbau in offenem Gerinne oder Basin Vertical installation in open channel or basin

Die Sonde sollte bei vertikalem Einbau um mindestens 15° geneigt werden, so das eventuelle Luftblasen aus dem Messspalt ausgetragen werden.

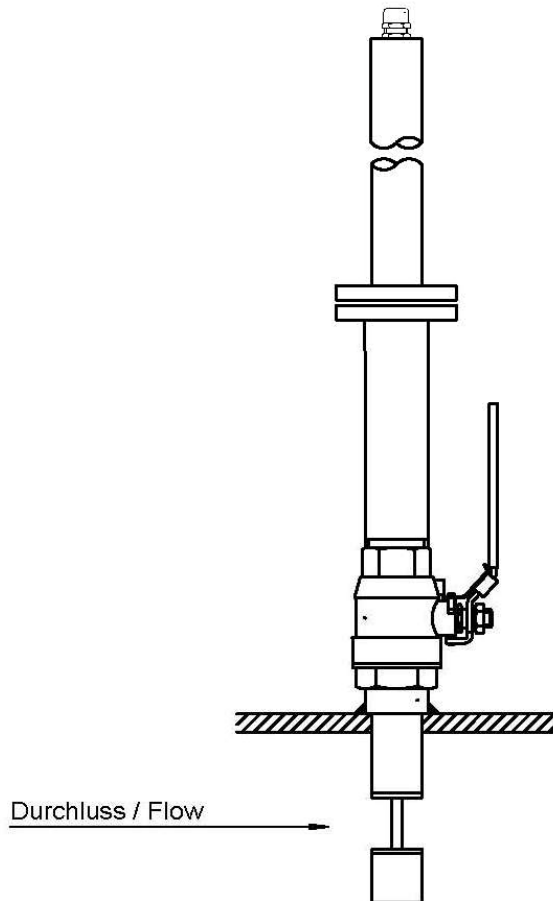
The vertical installation should be done in an angle of at least 15°, to allow eventual bubbles to escape.



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|  |  |  |  |       |            | Maßstab 1:2 |  | Gewicht                               |  |
|  |  |  |  |       |            | Werkstoff   |  |                                       |  |
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## Installation in Pipes or closed Tanks

Horizontaler Einbau in Rohrleitung oder Behälter.  
Horizontal installation in pipe or tank.

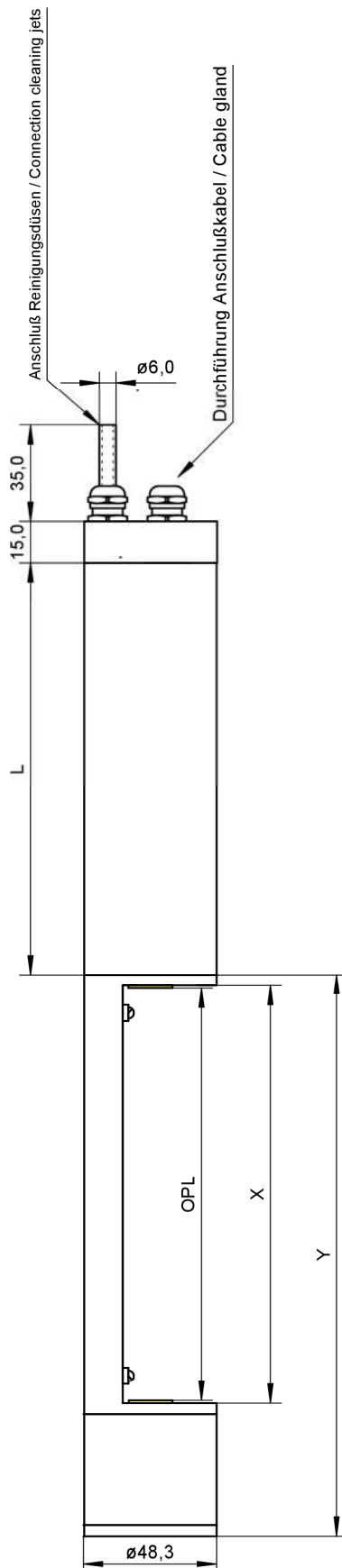


|       |          |       |       |                        |                                          |             |
|-------|----------|-------|-------|------------------------|------------------------------------------|-------------|
|       |          |       |       | Maßstab 1:2            |                                          | Gewicht     |
|       |          |       |       | Werkstoff              |                                          |             |
|       |          |       | Datum | Name                   | TURBImat<br>Einbau in Rohrleitung / Tank |             |
|       |          |       | Bearb | 08.08.2012 J. Heidkamp |                                          |             |
|       |          |       | Gepr. |                        |                                          |             |
|       |          |       | Norm  |                        |                                          |             |
|       |          |       |       | chemtronic             |                                          | Blatt 1     |
|       |          |       |       | Waltemode GmbH         |                                          | 1 Blätter   |
| Zust. | Änderung | Datum | Name  | Urspr.                 | Ers. für:                                | Ers. durch: |

## Dimensional Drawing Model TURBlmat-LC

Optionale Schaftlängen (L) / Optional shaft length (L)

|        |
|--------|
| 150mm  |
| 700mm  |
| 1200mm |
| 2000mm |

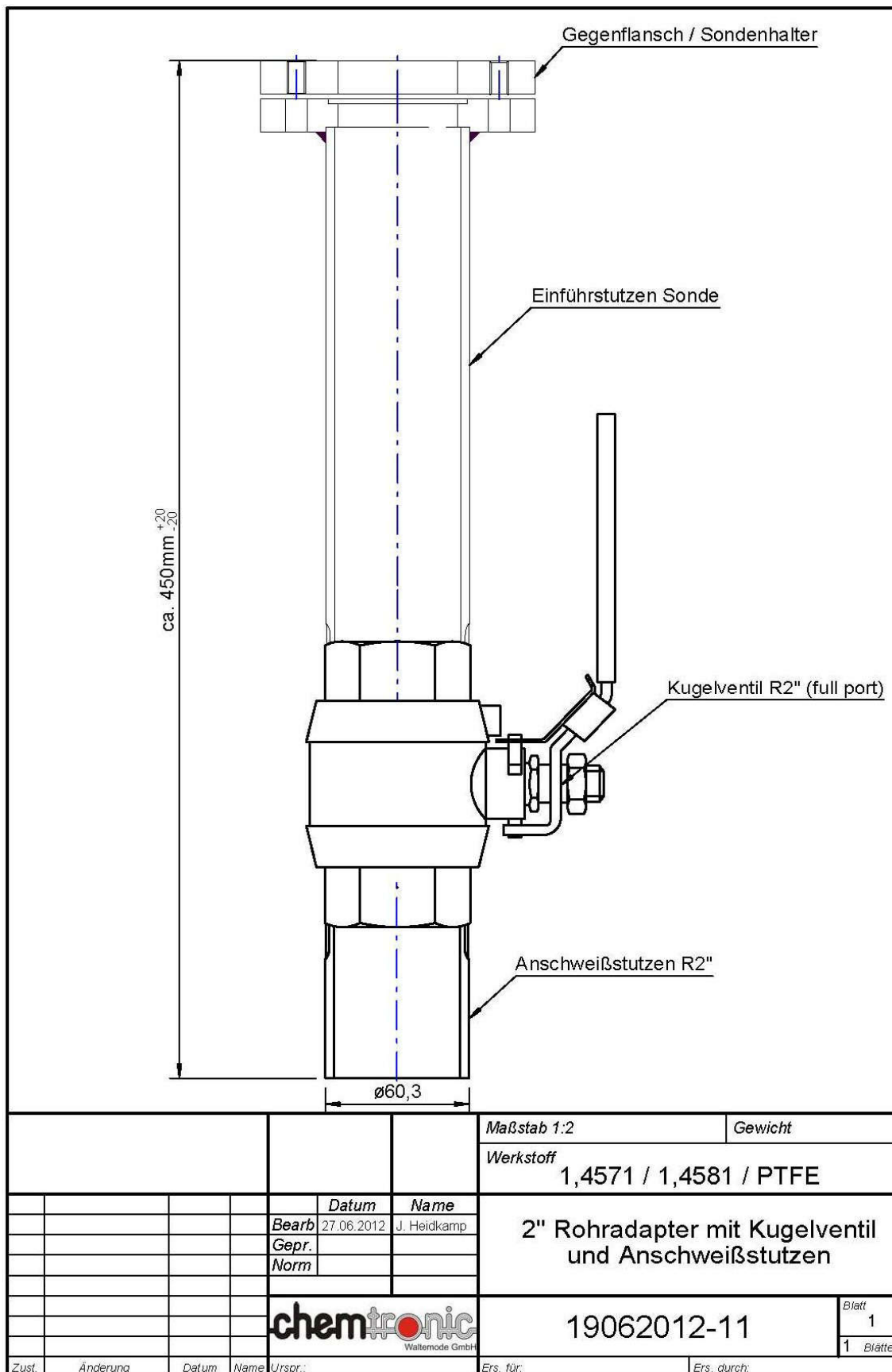


Optionale Schichtdicken (OPL) / Optional path length (OPL)

| OPL   | X     | Y     |
|-------|-------|-------|
| 10mm  | 12mm  | 64mm  |
| 30mm  | 32mm  | 84mm  |
| 50mm  | 52mm  | 104mm |
| 100mm | 102mm | 154mm |
| 150mm | 152mm | 204mm |

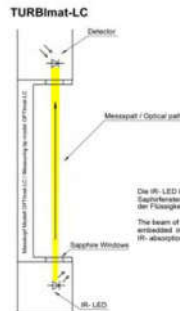
|                                |                                       |
|--------------------------------|---------------------------------------|
| Maßstab 1:2                    | Gewicht                               |
| Werkstoff                      | 1.4571 / 1.4404                       |
| Abmessungen Modell TURBlmat-LC | Dimensional Drawing Model TURBlmat-LC |
| chemtronic<br>Waltemode GmbH   | 25012016-2                            |
| Urspr.:                        | Ers. für:                             |
| Blatt 1                        | 1 Blätter                             |

## Dimensional Drawing Insertion Adapter incl. 2" Ball Valve



## Technical Data Model TURBImat-LC

### Model TURBImat-LC (TBMLC)



- 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 |

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