# Manual

Version 2.0 dated 06.11.2012

## Absorption Turbidity Sensor
## Model 22 (CSW)

# Content

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## 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.

# 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.

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

**Using the system in hazardous areas (Ex Zone I / Ex Zone II) will only be safe with the installation of the optional special Ex-proof designs 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 when the enclosure is open (e.g. during calibration procedure). Be careful that no moisture enters the enclosure.

**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 than thoroughly dried.
2. The instrument should be placed in the original packing material.
   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.

**Transport damage**

Please inspect the instrument immediately after receiving for potential shipping damages.
For any claims to the transportation insurance or warranty repair, it is absolutely required to notify transportation damages immediately after receiving the instrument.
In case of obvious damages of the outer packaging, the carrier must give a receipt for this damage to make demands for the insurance.
In case of a delayed announcement the insurance will not pay for damages and Galvanic Applied Sciences will not assume liability for these damages.

### 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.

# 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

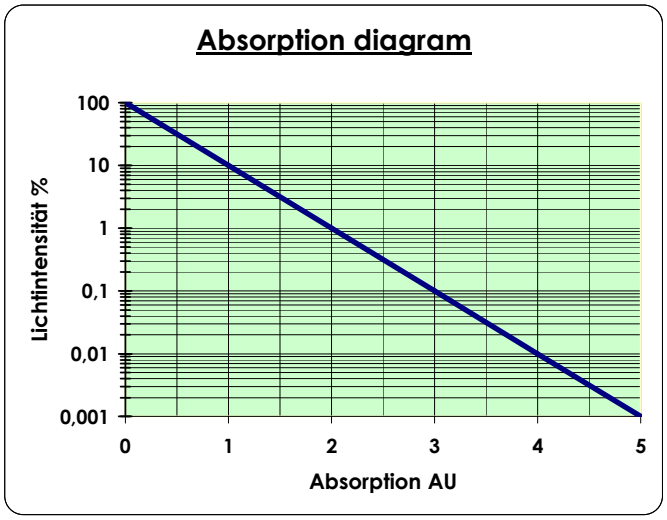
Turbidity is not a clearly defined magnitude like e.g. temperature or pressure. Turbidity is a subjective impression. For this reason turbidity measurement systems will be typically calibrated by using a comparison's standard such as Formazin or Diatomatious Earth.

## 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: | **P**arts **p**er **m**illion | FNU[1]: | **F**ormacine **n**ephelometric **u**nit |
| FTU: | **F**ormacine **T**urbidity **U**nit | mg/l: | Milligram per liter |
| TEF: | **T**rübungs**e**inheiten **F**ormazin (German for FTU) | gr/l: | Gram per liter |
| EBC: | **E**uropean **b**rewery **c**onvention | % TS: | Percent total solids |
| NTU[1]: | **N**ephelometric **t**urbidity **u**nit | AU | **A**bsorption **u**nit |

### The Dependencies on the Different Measurement Units

1 FTU = 1 TEF = 1 NTU[1] = 1 FNU[1] = 0,25 EBC

[1] 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.

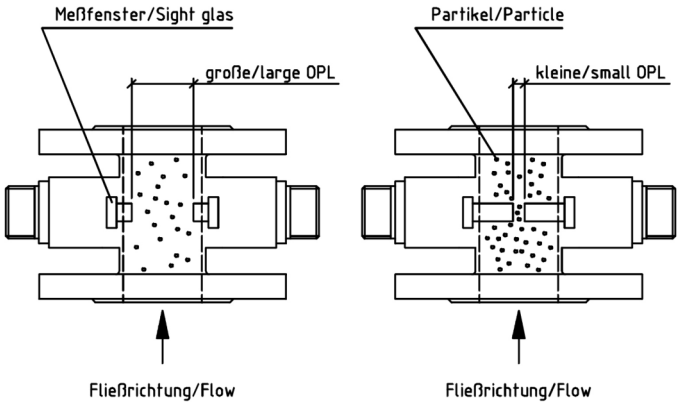
1 FTU = 1 TEF = 0,25 EBC = 2,05ppm = 2,05 mg/l = 0,00205 g/l = 0,00000205 % TS

* 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[1])
   The optical path length is variable and can be changed to match the requirements of specific applications.
   To measure low concentrations, a large OPL is required. Otherwise there is not enough change in light intensity, to get good measurement results.
   To measure 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

[1] 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[2]) |
| 50 mm | approx. 0 - 200 mg/l | approx. 0 - 6 g/l |

The OPL has to be specified according to the conditions of customers application.
Construction of sensor's, and various measurement windows, allows for OPL's, 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 / Diatomatious 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**

2 % TS [= total solids]

# Maintenance

## Replacement of measurement lamp

Introduction

***<u>Ignoring of the following hints will cause a loss of warranty</u>***

- 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 lamp cable.
- Avoid applying excessive force during assembling and disassembling of the sensor.
- Screw in all bolts and cable glands stalwart only.
- Please work carefully during the replacement of the measurement lamp.
- The lamp replacement should be done in a dry and clean location, to protect the optical components from dirt.
- Please be sure that no dust or other particles penetrates into the optical assembly.
- Do not touch the lenses.
- 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 of gaskets

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

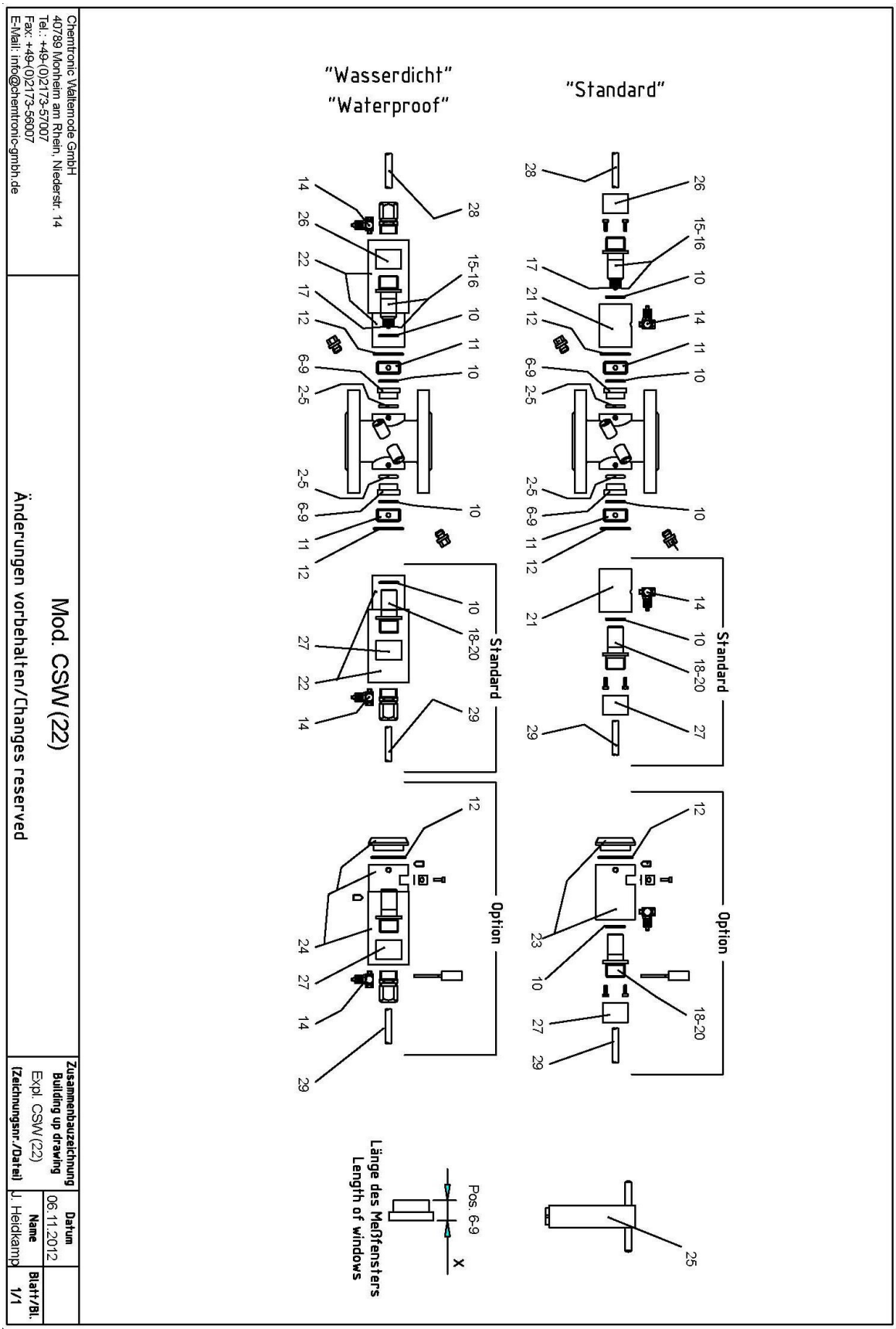


- Qualified technical personnel must perform repair and maintenance.
- Before beginning any work the sensor must be cleaned and flushed thoroughly. Depending on customers' application product residues can be very dangerous (aggressive, poisonous). Please handle the system very carefully due to possible leakage etc.
- Avoid pulling and twisting of the lamp cable.
- Avoid applying excessive force during assembling and disassembling of the sensor.
- Screw in all bolts and cable glands stalwart only.
- Please work carefully during the replacement of the measurement gaskets.
- The gasket replacement should be done in a dry and clean location, to protect the optical components from dirt.
- Please be sure that no dust or other particles penetrates into the optical assembly.
- Do not touch the lenses.
- In case of any 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

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 year. The maximum lifetime in easy applications can go up to 2 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.

# Components Model 22 (CSW)

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Mod. CSW (22)

Änderungen vorbehalten/Changes reserved

| Zusammenbauzeichnung Building up drawing | Datum |
|---|---|
| Expl. CSW (22) | 06.11.2012 |
| (Zeichnungsnr./Datei) | Name: J. Heidkamp |
| | Blatt/Bl.: 1/1 |

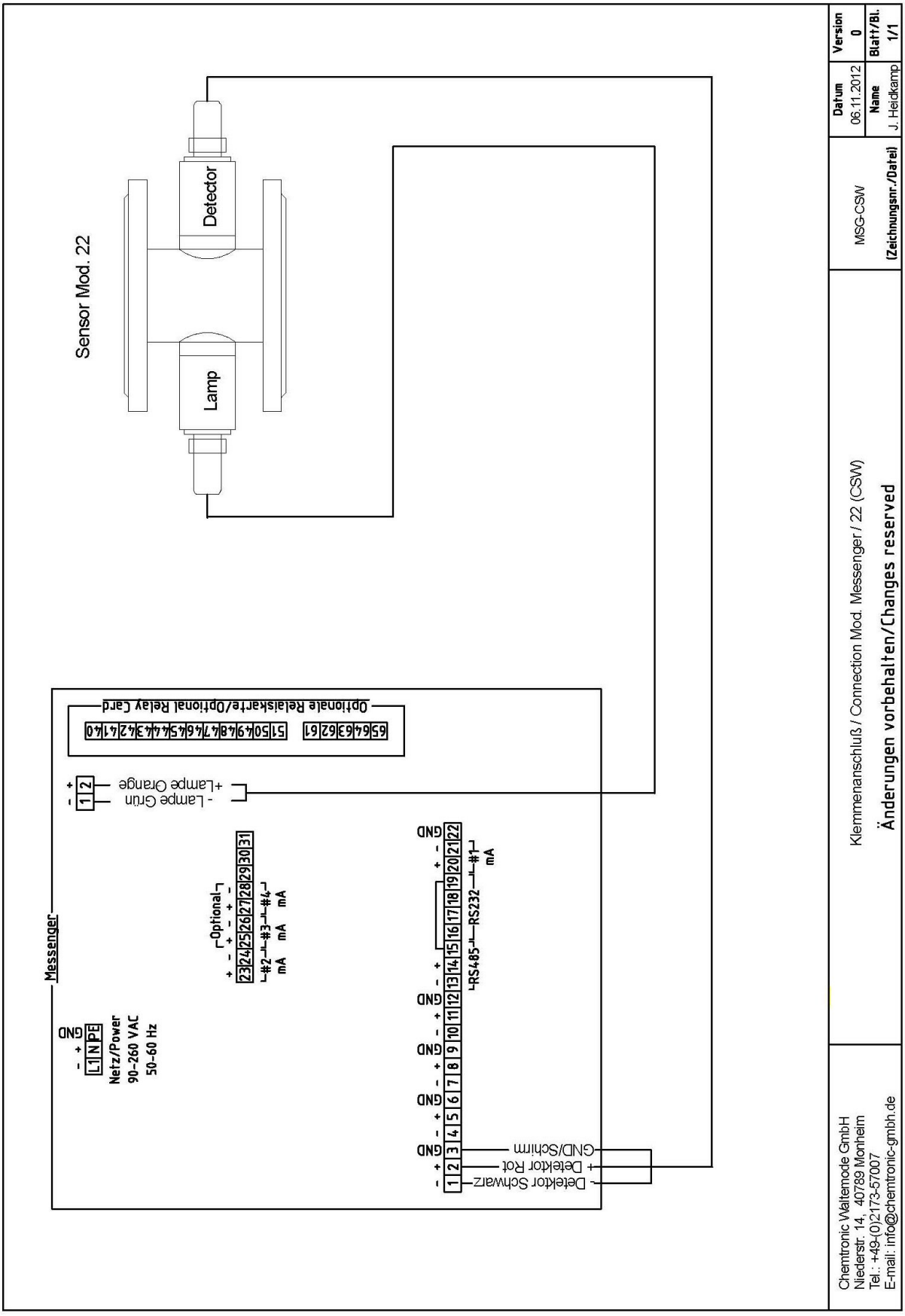
# Spare Part List Model 22 (CSW)

| Pos. | Qty required | Article-No. | Article-Description |
|---|---|---|---|
| 001 | 1 | S-0000-0010-00 | Stückliste CSW (22) |
| 002 | 2 | C208-2020-EP | O-Ring (22 • EP • 18,72x2,62) |
| 003 | 2 | C208-2020-KA | O-Ring (22 • KA • 18,72x2,62) |
| 004 | 2 | C208-2020-SI | O-Ring (22 • SI • 18,72x2,62) |
| 005 | 2 | C208-2020-VI | O-Ring (22 • VI • 18,72x2,62) |
| 006 | 2 | 2200-1150-SA | Messfenster / measuring window (Saphir 11,5mm) - (22 , 45) |
| 007 | 2 | 2200-2200-PY | Messfenster / measuring window (Pyrex 22.0mm) - (22 , 45) |
| 008 | 2 | 2200-2800-PY | Messfenster / measuring window (Pyrex 28,0mm) - (22 , 45) |
| 009 | 2 | 2200-3250-PY | Messfenster / measuring window (Pyrex 32,5mm) - (22 , 45) |
| 010 | 4 | C208-2018-00 | O-Ring (22 • SI • 18,77x1,78) |
| 011 | 2 | 1022-0016-00 | Messingverschraubung / Packing nut - (22 , 45) |
| 012 | 2 | C208-2026-00 | O-Ring (22 • SI • 31,47x1,78) |
| 013 | 2 | 2200-1027-EX | Dichtung / gasket (Ex-Arm) - (22 , 45) |
| 014 | 2 | C305-1002-00 | Luftanschluss 90°/Connector air purge 90° |
| 015 | 1 | 1022-0003-00 | Messlampe (inkl.Stecker) / lamp assy (incl.plug) - (22 , 45) |
| 016 | 1 | 1022-0003-IR | Messlampe (IR-Diode inkl.Stecker) / lamp assy (IR-Diode incl.plug) - (22 , 45 |
| 017 | 1 | C402-0127-00 | Messlampe / measuring lamp - (22 , 45) |
| 018 | 1 | 1022-0004-00 | Detektor IR / detector IR - (22 , 45) |
| 019 | 1 | 1022-0004-10 | Detektor VIS / detector VIS - (22 , 45) |
| 020 | 1 | 1022-0004-95 | Detektor Sonderwellenlänge / detector Special wavelength - (22 , 45) |
| 021 | 2 | 1022-0012-00 | Messarm Standard CSW / Hausing standard mod. CSW |
| 022 | 2 | 1022-0012-WS | Messarm CSW IP65 / housing CSW Nema 4x |
| 023 | 1 | 2200-0000-KG | Kalibrierarm standard CSW / filter housing standard CSW |
| 024 | 1 | 1022-0012-WD | Kalibrierarm IP 65 Modell CSW / housing cal. filter Nema 4x |
| 025 | 1 | 1022-0020-00 | Fensterschlüssel / Spanner wrench - (22 , 45) |
| 026 | 1 | C305-0098-00 | Steckverbinder / Connector Cannon (2p • w • Kabelmontage) |
| 027 | 1 | C305-0096-00 | Steckverbinder / Connector Cannon (3p • w • Kabelmontage) |
| 028 | 1 | 1022-0120-00 | Lampenkabel / lamp cable - (22 , 45) |
| 029 | 1 | 1022-0121-00 | Detektorkabel / detector cable - (22) |

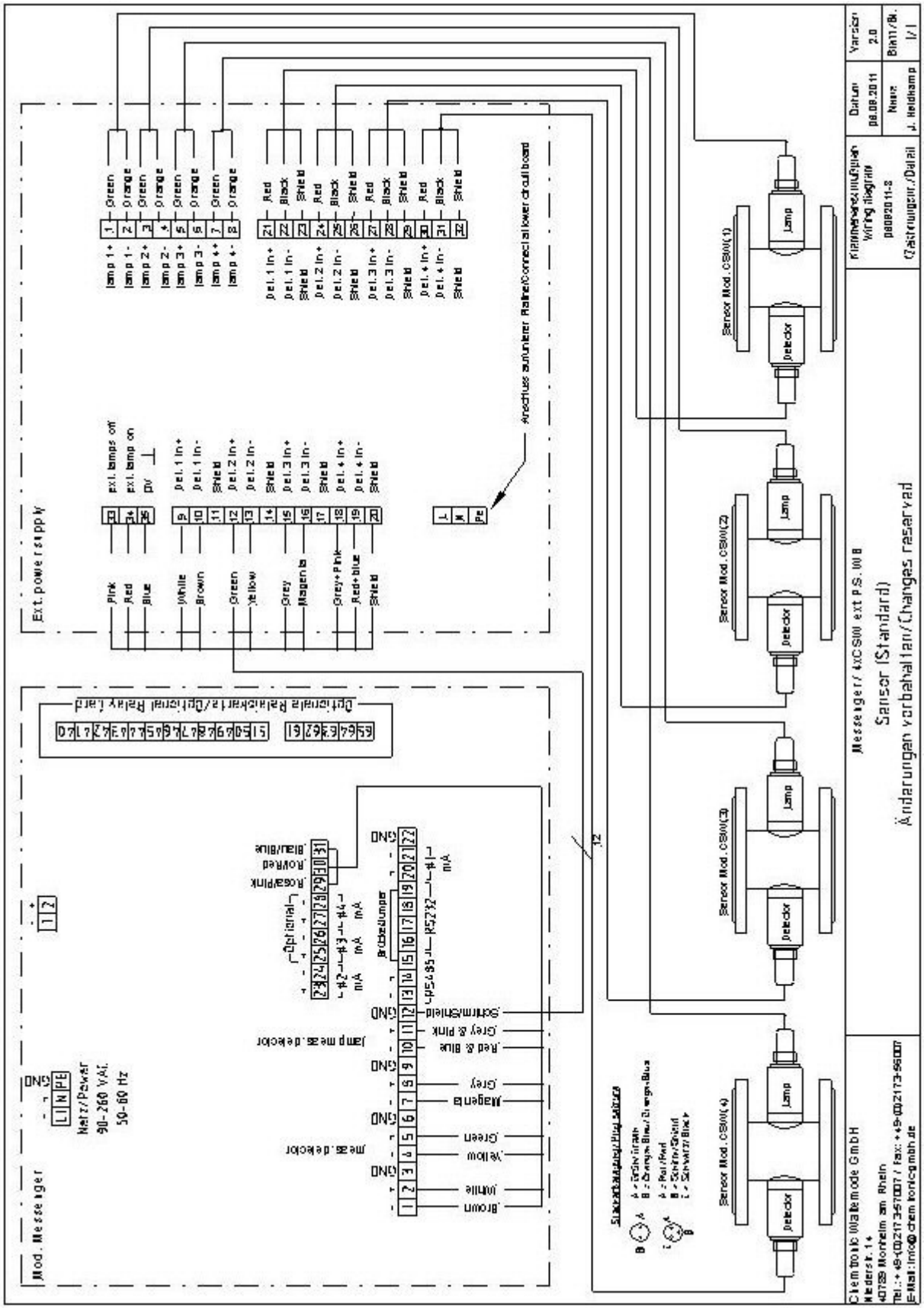
Die Liste enthält die gängigsten Ersatzteile für nicht gelistete Teile kontaktieren Sie Chemtronic / This list contains the most common spare parts, for non listed parts contact Chemtronic.

Site of Company: 40213 Düsseldorf, Amtsgericht Düsseldorf, HRB 45293

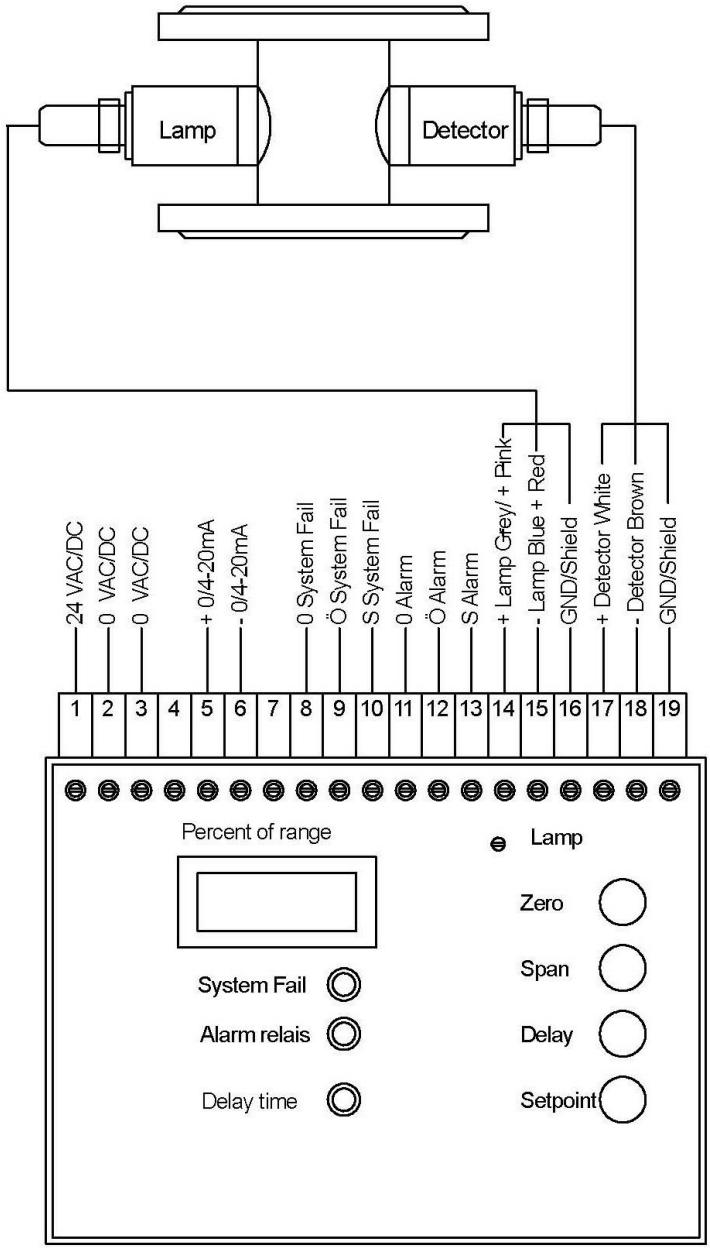
# Wiring Diagram Model 22 (CSW) / Messenger (single Sensor)



# Wiring Diagram Model 22 (CSW) / Messenger (four Sensors)

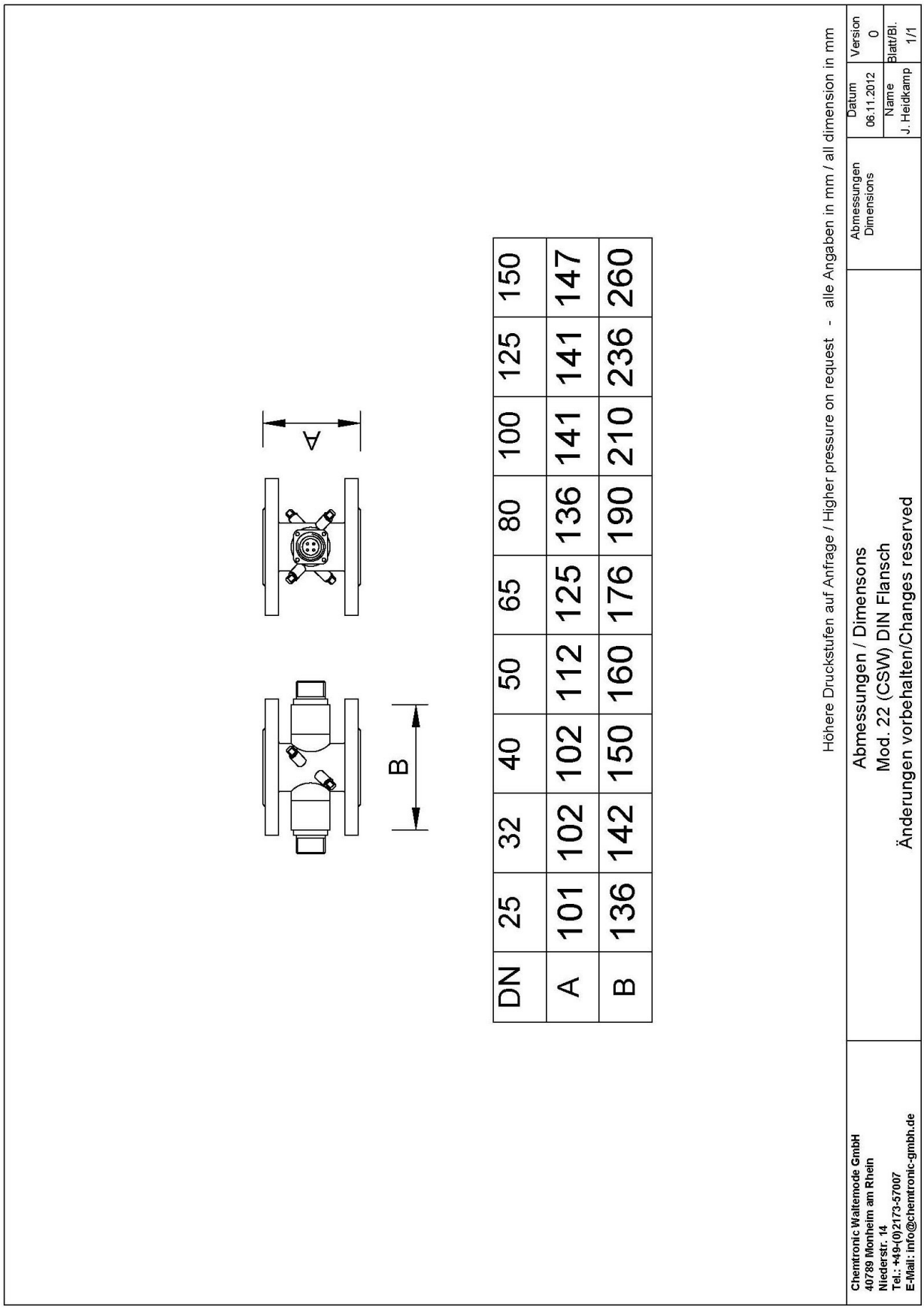


# Wiring Diagram Model 22 (CSW) / CCAb



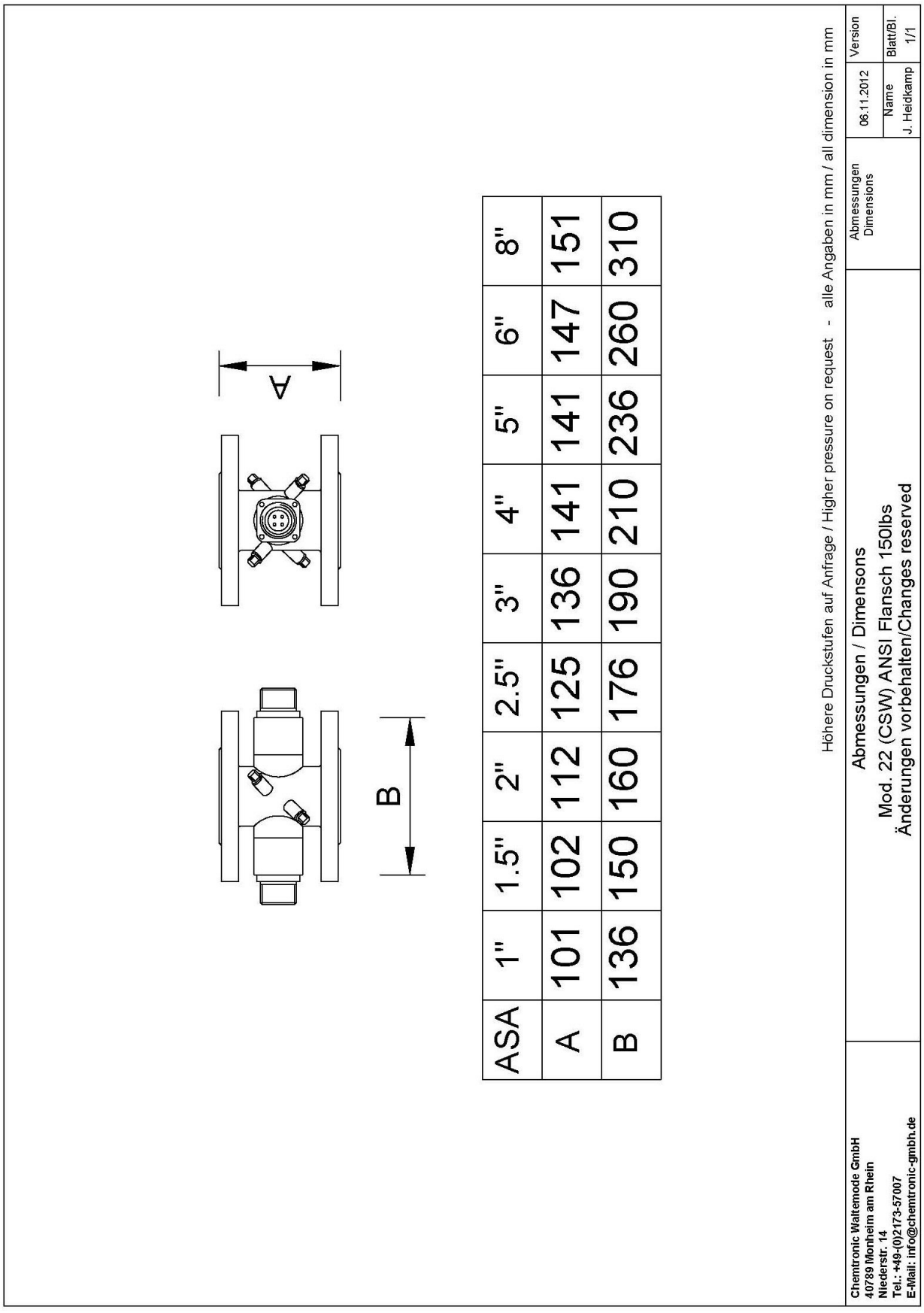

| | | | | | |
|---|---|---|---|---|---|
| | | 03.01.05 | J. Heidkamp | Maßstab : | Datei : KA-CCAb_22 |
| | | | | CCAb | |
| | | | | Benennung:<br>Klemmenanschlussplan Modell 22 ( CSW) / CCAb | Blatt : 1 |
| | | | | Chemtronic Waltemode GmbH<br>40789 Monheim, Niederstr. 14 | v : 1 |
| Zust. : | Änderung : | Datum : | Name : | | |

# Dimensional Drawing Model 22 (CSW) DIN- Flange



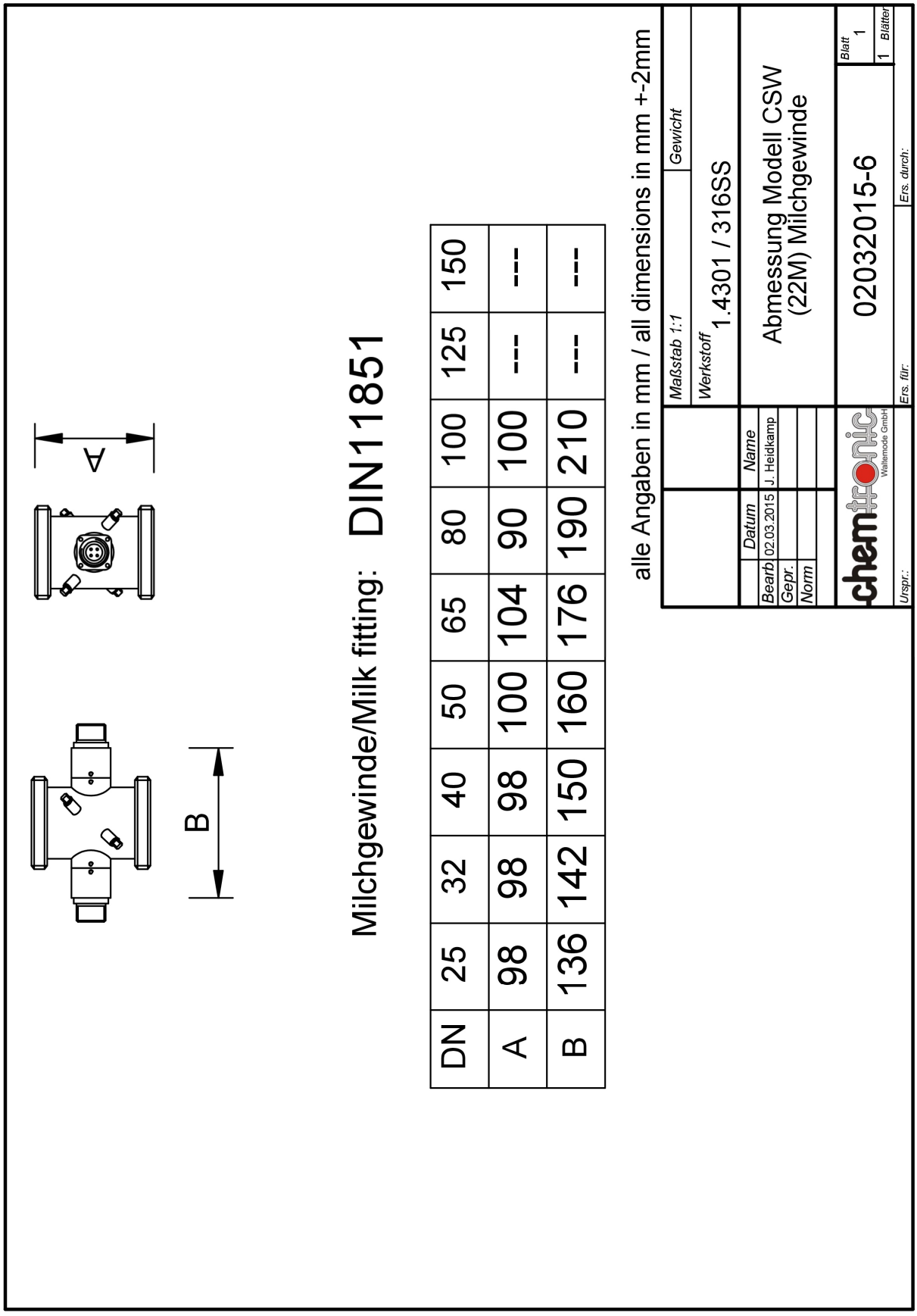

| DN | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 150 |
|---|---|---|---|---|---|---|---|---|---|
| A | 101 | 102 | 102 | 112 | 125 | 136 | 141 | 141 | 147 |
| B | 136 | 142 | 150 | 160 | 176 | 190 | 210 | 236 | 260 |

# Dimensional Drawing Model 22 (CSW) ANSI- Flanges



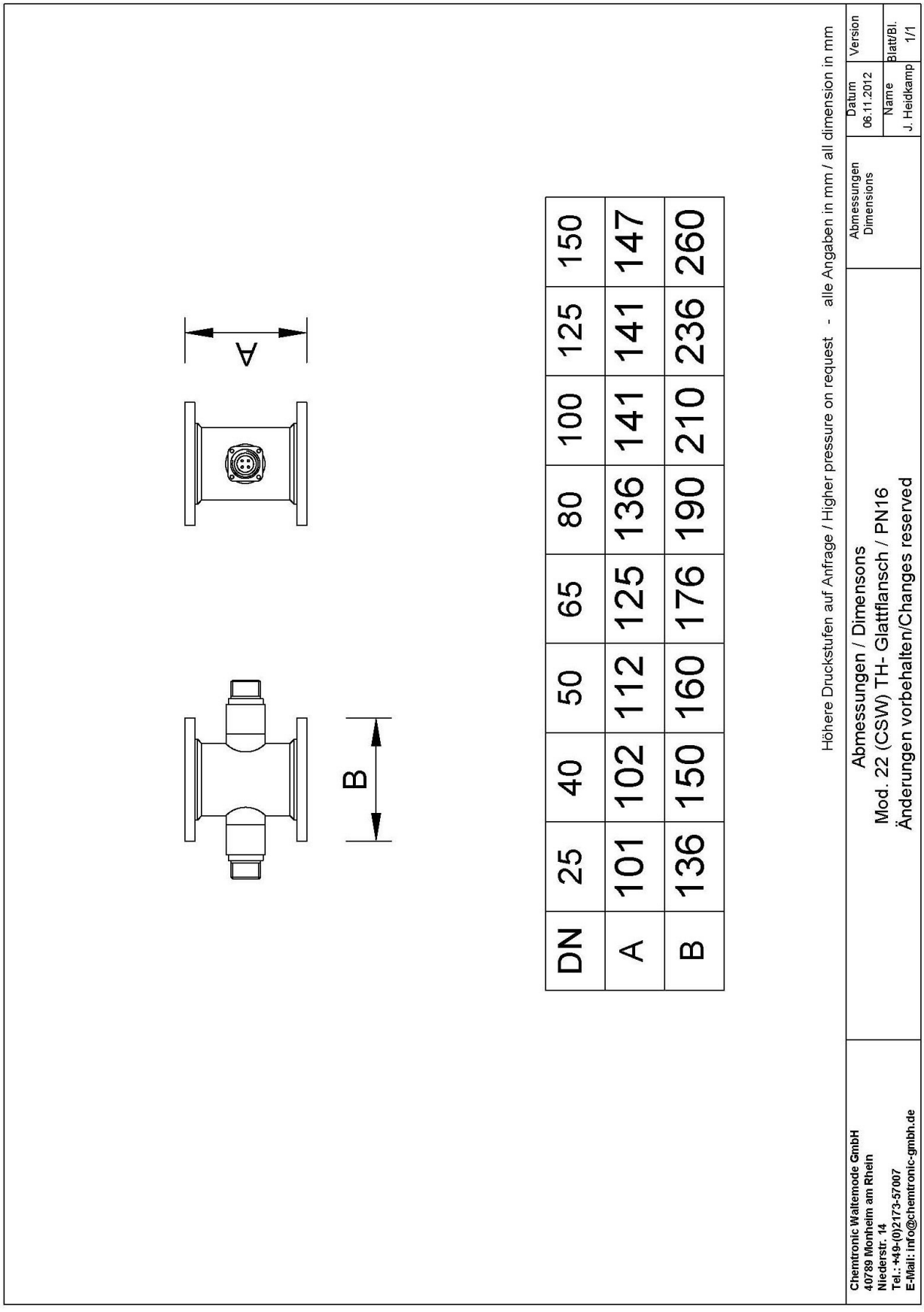

| ASA | 1" | 1.5" | 2" | 2.5" | 3" | 4" | 5" | 6" | 8" |
|---|---|---|---|---|---|---|---|---|---|
| A | 101 | 102 | 112 | 125 | 136 | 141 | 141 | 147 | 151 |
| B | 136 | 150 | 160 | 176 | 190 | 210 | 236 | 260 | 310 |

## Dimensional Drawing Model 22 (CSW) Milk Fittings



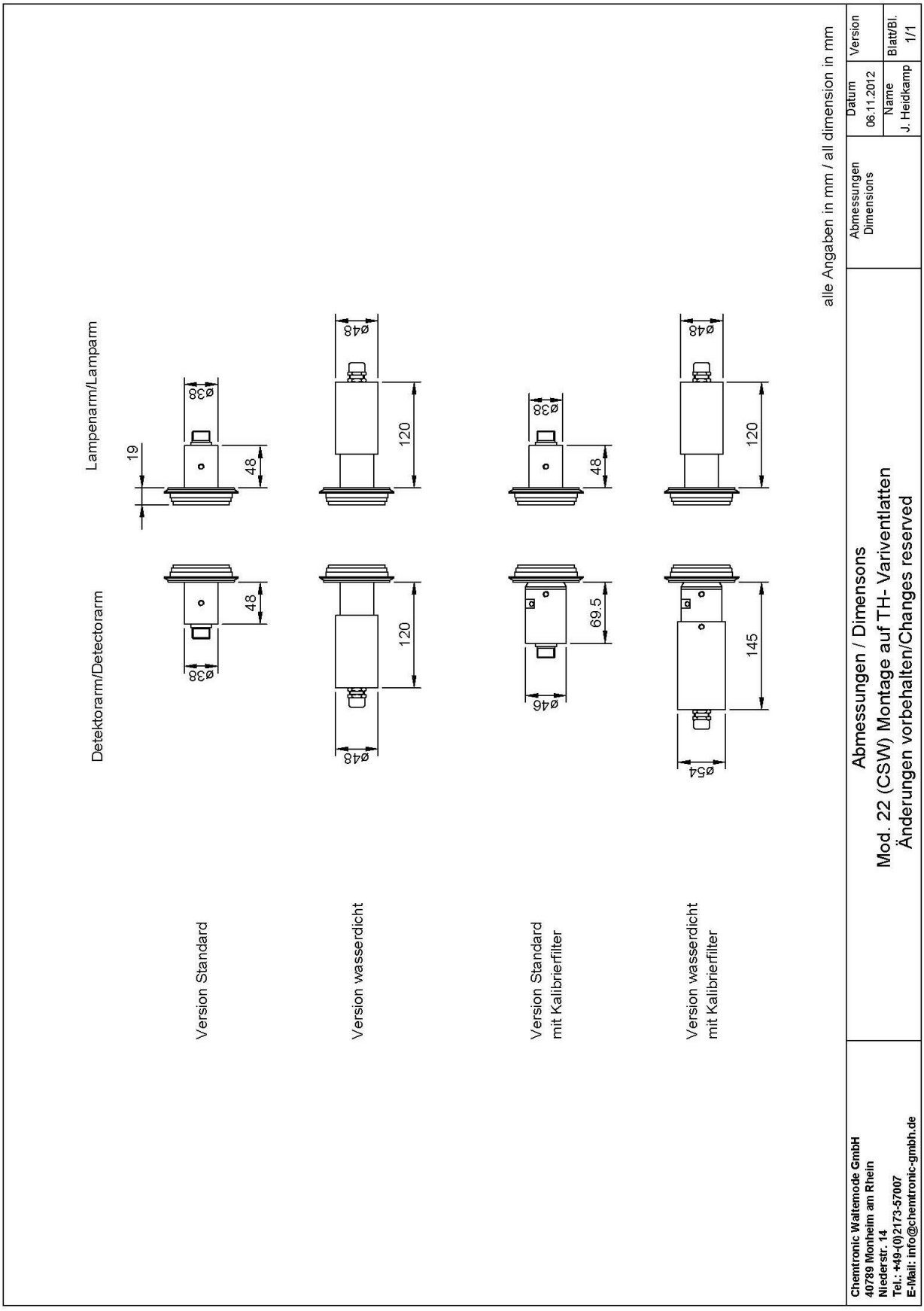

| DN | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 150 |
|---|---|---|---|---|---|---|---|---|---|
| A | 98 | 98 | 98 | 100 | 104 | 90 | 100 | --- | --- |
| B | 136 | 142 | 150 | 160 | 176 | 190 | 210 | --- | --- |

# Dimensional Drawing Model 22 (CSW) TH- Flanges

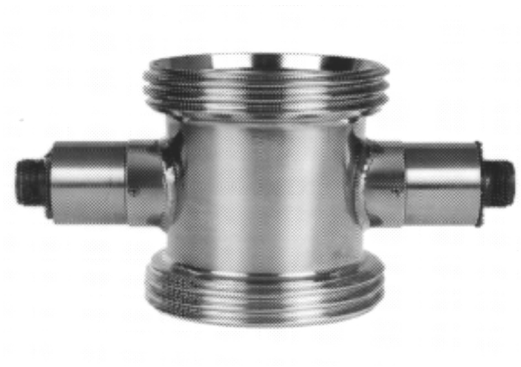



| DN | 25 | 40 | 50 | 65 | 80 | 100 | 125 | 150 |
|---|---|---|---|---|---|---|---|---|
| A | 101 | 102 | 112 | 125 | 136 | 141 | 141 | 147 |
| B | 136 | 150 | 160 | 176 | 190 | 210 | 236 | 260 |

# Dimensional Drawing Model 22 (CSW) TH- Varivent Plates



# Technical Data Model CSW (22)



- **Principle of measurement: Light absorption**
- **Material 1.4571 (316SS) other materials on request**
- **Nema4X (IP 65)**
- **Process connection: DIN, ANSI, SMS, NPT, APV, TH, ...**
- **Line size 10 mm to 150 mm (1/4“ to 6“)**
- **Max. pressure 16 bar**
- **Max. temperature 140 °C**
- **Multiple optical path lengths available**
- **Max. cable length 100 m (300 feet)**
- **Detector system: 450 nm – 900 nm**
- **Optional hazardous area Ex-zone I and Ex-zone II**
- **Compatible to converter type: Messenger**

## Applications

The Monitek sensor Model 22, in connection with a Monitek converter, measures turbidity or colour in liquids. The system can be used for inspection, control and optimisation of industrial processes:

- **Drinking water** • **Beer** • **Beverages** • **Wine** • **Spirits** • **Milk** •
- **Separator inlet / outlet** • **Yeast** • **Suspension** • **Product concentration** • **Wort** •

## Description

The concentration sensor Model 22 works on the principle of light absorption, to detect dissolved or suspended particles / colours in liquids. The sensors can be installed into almost any type of pipe. Process connection, pressure, temperature, gasket material, etc. will be application specific constructed.
The optional feature for hazardous area, zone I or zone II, allows for wide range of applications. A maximum cable length of 100 m (approx. 300 feet) allows the converter to be located, outside the hazardous area.

## Specifications

| | | | |
|---|---|---|---|
| Line size: | DN 10 – DN 150 (1/4" to 6") | Optical path length: | Application specific |
| Pressure: | Max. 16 bar | Measurement range: | Application specific (max. 5 AU/Ext.) |
| Temperature range: | Max. 140 ° C | Detector system: | 450 – 900 nm (application specific) |
| Sensor material: | 1.4571 (316SS) other materials on request | Optional hazardous area: | on request |
| Gasket material: | Application specific | CIP: | Standard |