BOPP & REUTHER
MESSTECHNIK

Density- and Concentration meter

DIMF 1.3 TVS
DIMF 2.0 TVS
DIMF 2.1 TVS

for continuous measurement of liquid density and concentration

Operating Manual

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A-EN-06530-00Rev.J
04/2024

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I. Transport, Delivery, Storage

Storage and transport:

Always protect devices against humidity, dirt, shock and damages.

Inspection of delivery:

Check shipment for completeness upon receipt. Compare the data marked on the device with the data on the packing slip and the order documents.

Report any transport damage immediately after the delivery. Damages which are reported later will not be recognized.

II. Warranty

For the scope and period of warranty, please refer to the contractual terms of delivery.
Claims under warranty shall be conditional to expert installation and start-up in compliance with the operating instructions for the device. The required installation, start-up and servicing work may only be performed by qualified and authorized personnel.

III. General Safety Instructions

1. Density meters are high-precision and reliable measuring devices. These may only be used according to their purpose. The pressure and temperature limits specified on the type plate as well as the other technical data of the devices and safety instructions must be observed during installation, commissioning and operation of the devices.
2. National and international regulations for the operation of pressurized devices and systems must be observed.
3. Before installation, the operator must ensure that the pressurized parts have not been damaged during transport.
4. The equipment must be installed, operated and maintained by qualified personnel. The operator is responsible for ensuring that the personnel are adequately and appropriately qualified. In the case of doubts, the manufacturer must be consulted.
5. The operator must ensure that the materials used (wetted parts) of the device are chemically resistant to the measuring liquid.
6. For corrosive media, the material resistance of the oscillating tube/fork must be clarified.
7. The gaskets or sealing elements must be handled with care according to the operating instructions.
8. Damaged devices must be taken out of service.
9. If, due to operational reasons (also when starting up and shutting down the system) zone 0 could be present in the pipeline, it must be ensured that no solids can flow in the pipe which generate mechanical impact and friction sparks

IV. Basic Safety Information

Description of symbols:

	**IMPORTANT NOTES!** Please consider these notes carefully to achieve a reliable functional system. The accompanying text contains important information about the product, handling the product or about a section of the document that is of particular importance.

	**WARNING!** Failure to take the prescribed precautions could result in death, severe bodily injury, or substantial material / product damage.

V. Intended Use

	The intended user is not allowed to open, manipulate or dismantle the device. The device may be maintained, serviced or opened only by dedicated and qualified service personnel.

1. Identification

Manufacturer Bopp & Reuther Messtechnik GmbH
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Product type: Density and concentration meter

Product name: Density and concentration meter DIMF with Transmitter

Version no.: A-EN-06530-00J

2. Range of Application

Continuous monitoring of density, mass flow measurement, fiscal measurement, quality control, monitoring of waste water, product recognition, dosing, injection or blending of additives, control of chemical reactions, measurement of concentrations; monitoring and control of distillation, filtration sedimentation, mixing or fermentation processes, process control, measurement of solid percentages in liquids, measurement of foams and suspensions etc.

3. Measuring principle

The DIMF series density transducer is used for continuous measurement of density or concentration for liquids or liquid mixtures.

The proven tuning fork principle (DIMF 1.3) or oscillating U-tube principle (DIMF 2.0 and 2.1) ensures high measuring accuracy with very good long-term stability. The uncomplicated design ensures reliable operation even under harsh operating conditions.

DIMF 1.3

The sensor of the density transducer is a hollow oscillation fork. The measured liquid passes continuously through the oscillation fork. Excited electromagnetically by an excitation coil, it will oscillate at its natural frequency. Changes in the density of the liquid lead to changes in the natural frequency. This change in frequency, sensed by a pick-up coil, represents the measurement effect. An additional built-in resistance thermometer measures the process temperature, which can also be used to equalise the temperature influence in the transducer.

Each density transducer is calibrated with various liquids of different densities. The transducer constants for calculating the density from the frequency, the calibration temperature and the correction coefficients for the temperature influence can be seen in the configuration data protocol (for example see appendix A).

DIMF 2.0 and 2.1

The sensor of the density transducer is an oscillating element in the form of a tube bent into an oscillation fork. The measured liquid passes continuously through this element. Excited electromagnetically by an excitation coil, it will oscillate at its natural frequency. Changes in the density of the liquid lead to changes in the natural frequency. This change in frequency, sensed by a pick-up coil, represents the measurement effect. An additional built-in resistance thermometer measures the process temperature, which can also be used to equalize the temperature influence in the transducer.

Each density transducer is calibrated with various liquids of different densities. The transducer constants for calculating the density from the frequency, the calibration temperature and the correction coefficients for the temperature influence can be seen in the configuration data protocol (for example see appendix A).

4. Technical Data

4.1 Density transducer

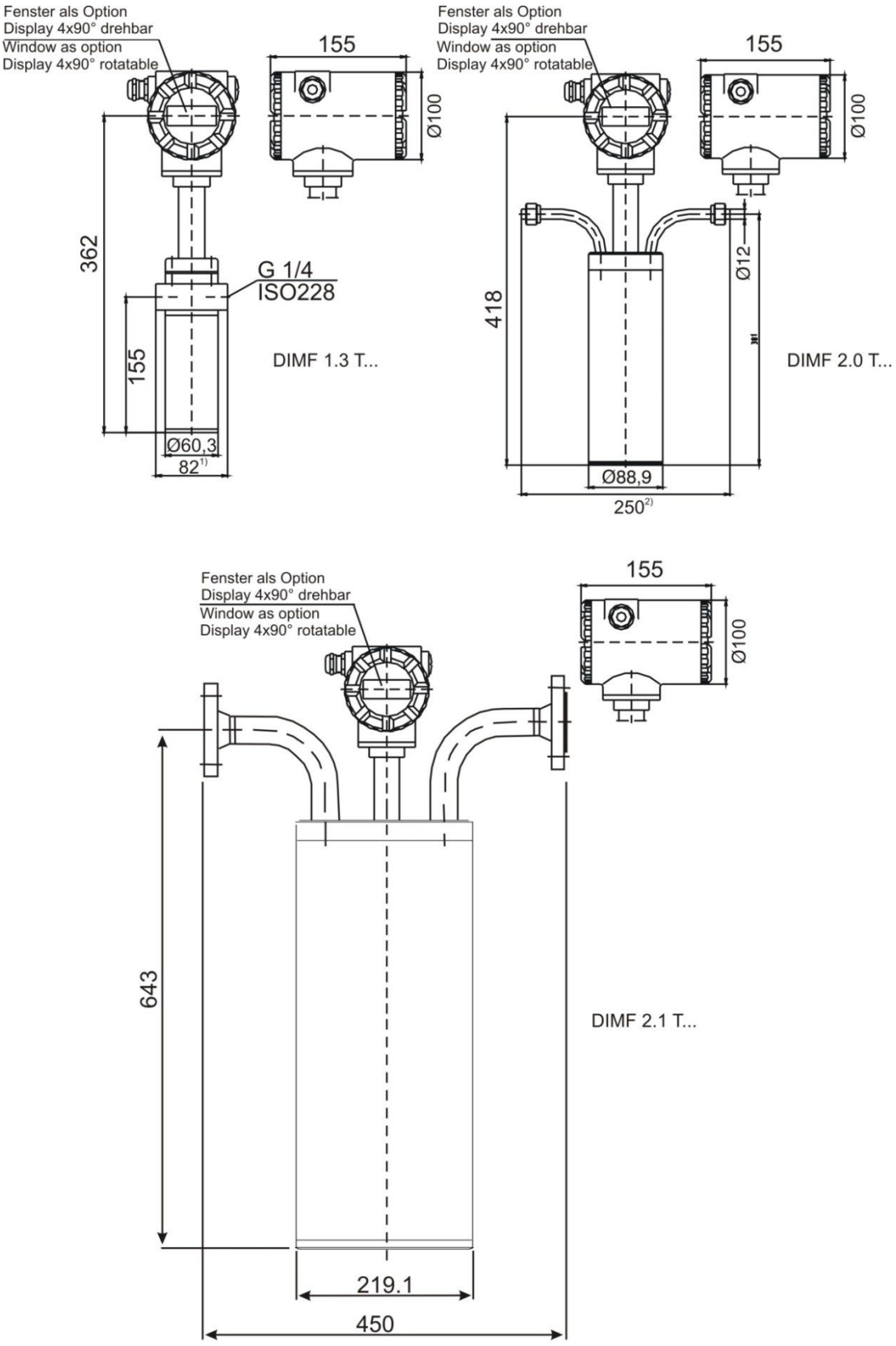
	DIMF 1.3	DIMF 2.0	DIMF 2.1
Density range	400 to 3000 kg/m³		
Calibration range	400 to 1450 kg/m³		
Measuring accuracy	better than ±0.01 % (±0.1 kg/m³)	better than ±0.02 % (±0.2 kg/m³)	better than ±0.02 % (±0.2 kg/m³)
		better than ±0.01 % (±0.1 kg/m³) with special calibration	
Repeatability	better than ±0.005 % (±0.05 kg/m³)	better than ±0.005 % (±0.05 kg/m³)	better than ±0.005 % (±0.05 kg/m³)
Medium temperature	-40°C to +100°C	-40°C to +150°C (up to 210°C on request)	-40°C to +150°C
Temperature compensation	via integrated PT1000 according to DIN class A directly in the Transmitter		
Pressure influence	Less than 0.02 kg/m³/bar		
Operating pressure	100 bar	100 bar (160 bar on request)	40 bar
Liquid	for non-aggressive liquids or liquid mixtures especially for hydrocarbons	pumpable liquids	pumpable liquids
Material: wetted parts	Special alloy made of NiFeCr and 1.4571	stainless steel 1.4571 or Hastelloy C4 or Tantalum or Inconel 600 or Monel 400 or others on request	stainless steel 1.4571, others on request
Material: Transmitter housing	Stainless steel 1.4571		
Smallest inside diameter	2 x 5 mm parallel	∅ ca. 10 mm	∅ ca. 25 mm
Special features	gasket-free construction, optional material certificates acc. to DIN ISO 10204-2.2	gasket-free construction, optional material certificates acc. to DIN ISO 10204-3.1	gasket-free construction, optional material certificates in acc. to DIN ISO10204-3.1
Weight	approx. 3 kg	approx. 4.2 kg	approx. 21 kg
Process connection	internal thread G ¼ ISO 228	Swagelok screw couplings for 12 mm Flange DN15 or DN25, PN40 acc. to DIN 2501 or Class 150/300 RF ANSI B 16.5) Other pressure stages on request, as well as various food connection	Flange DN25, PN 40 acc. to DIN EN 1091 DN50, PN 40 acc. to DIN EN 1091 (or Class 150/300 RF ANSI B16.5)

All percentages refer to a density of 1000 kg/m³.
The exact specification of the device version can be found in the specification sheet of the supplied device.
The possibility of a special calibration depends on the application and must be clarified in advance with the sales department.

4.2 Evaluation electronics of Transmitter Type TR

Functions	Excitation of the oscillating element in the density transducer to its natural frequency, with graphic display and four buttons for displaying and configuring the transmitter on site, simple modification of the set parameters by the user is possible if the process data changes.
Display parameters	Density, concentration, operating temperature etc.
programmable Parameter	Initial and final value of the output signal, calibration constant, medium constants, reference temperature, etc.
Output signal	4-20 mA, could be assigned to any desired display value, e.g. operating density, reference density, concentration, medium temperature or other values derived from density Status output according to NAMUR, for the output of error messages
Power supply	24 V DC (min. 16 V DC / max. 30 V DC)
Connection	2-wire technology via screw terminals; Cable entry via cable gland with M20 x 1.5 or ½" NPT thread for pipe installation (conduit system)
Cable specification	2-wire twisted
Ambient temperature	-20°C to +75°C
Storage temperature	-20°C to +75°C
Degree of protection (housing)	IP65
Dimensions (housing)	Ø100 (D) x 155 (L) x 120 (H) mm
Material (housing)	Cast aluminium
Weight	1.2 kg
Calibration and configuration	According to ordering data at Bopp & Reuther Messtechnik GmbH

4.3 Dimensions



1) overall length DIMF 1.3 in flange design 200 mm
2) overall length DIMF 2.0 in flange design 250 mm

4.4 Required differential pressure

DIMF-series density transducers are measuring independent from flow rate and at zero flow rate. Its operating is therefore considered hassle-free. However, it has to be ensured that the operating flow rate in the transducer

- updates the sample fast enough
- equalises the temperature in the transducer
- prevents air or gas bubbles or deposits in the oscillating tube / fork
- does not cause cavitation in the oscillating tube / fork
- does not cause wear through abrasives

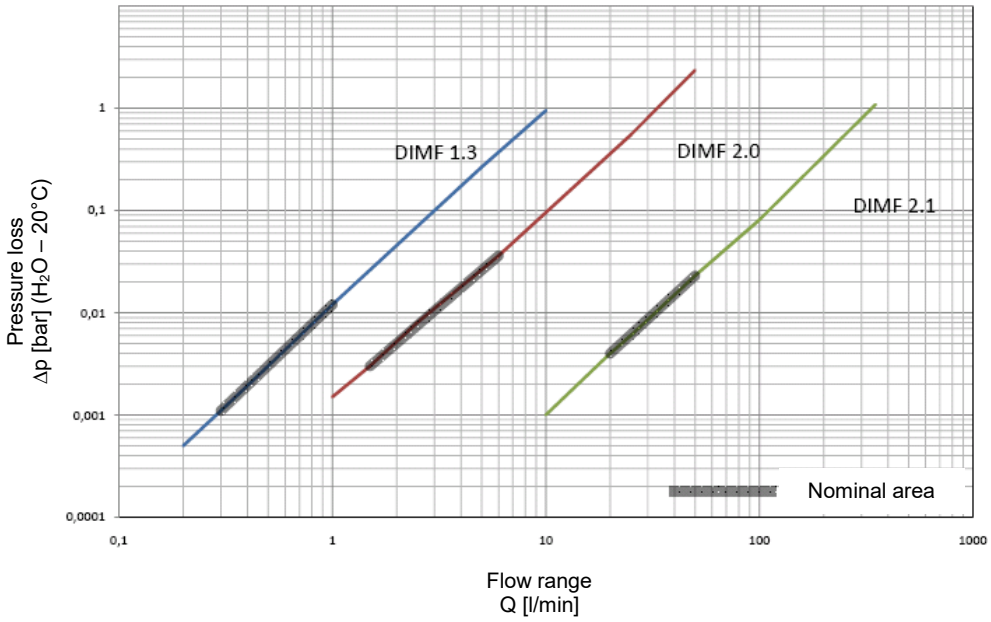
The following operating flows are recommended to ensure a sufficiently fast sample update:

DIMF 1.3	0.3 to 1 l/min
DIMF 2.0	1.5 to 6 l/min
DIMF 2.1	20 to 50 l/min

max. flow range:

DIMF 1.3	0 to 10 l/min
DIMF 2.0	0 to 50 l/min
DIMF 2.1	0 to 350 l/min

Pressure loss diagram



5. Installation / Assembly

The device can be installed directly in the main product line (for possible flow rates, see point 4.4).
For larger flow rates or for measurements on tanks, installation in the bypass is recommended.

5.1 Density transducer

- Handle the measuring device carefully, do not knock
- Install in the Bypass or the product line
- De-aerate before commissioning
- Ensure constant flow
- Any flow possible
- Flow rate see information chapter 4.4
  (to ensure an up-date sample, prevents sedimentation)
- Avoid steam bubbles
- A clamp or bracket for mounting is recommended
  (accessories: mounting clamps of Bopp & Reuther Messtechnik GmbH)
- For self-draining installation position, it is essential to secure or support the device with a bracket
- The pipe connection bends of the DIMF 2.0 and 2.1 transducer must not be adopted be bending

Piping

- min. cross section of connecting pipe

  DIMF 1.3: 6 mm
  DIMF 2.0: 12 mm
  DIMF 2.1: DN25

- fit sampling connection laterally if the main line is horizontal
- supply pipe should be as short as possible
- if necessary, provide heat insulation for supply pipe
- if necessary, provide flushing connections close to the density transducer

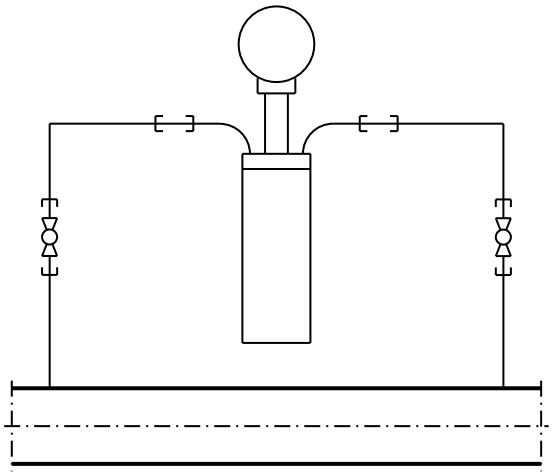
Process connections

Check whether the connection of your density transducer and the connections of your sample lines match.
The connection type of your density transducer can be found on the supplied data sheet.

5.2 Installation in Bypass **(using the DIMF 2.0 as an example)**

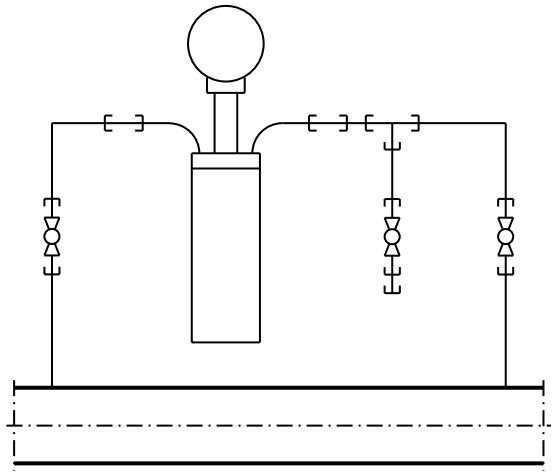
If installed in bypass, the customer must ensure that there is sufficient flow through the device.

5.2.1 Standard version



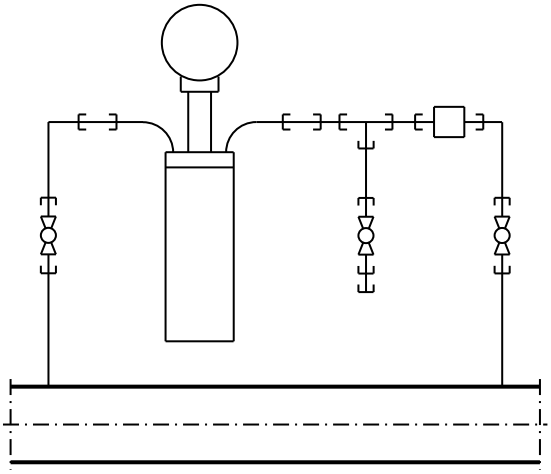
Description	Qty
Plug tap ø12	2
Straight screw connection	2

5.2.2 with sampling



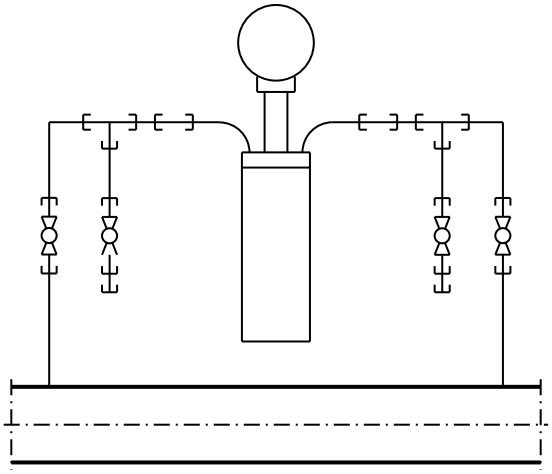
Description	Qty
Plug tap ø12	3
straight screw connection ø12	2
T-fitting ø12	1
Stopper ø12	1

5.2.3 with sampling and sight glass



Description	Qty
Sight glass R3/8“	1
plug tap ø12	3
straight screw connection ø12	2
Screw-in fitting R3/8“- ø12	2
T-fitting ø12	1
Stopper ø12	1

5.2.4 with sampling and calibration or rinsing connection



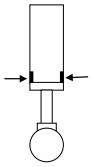
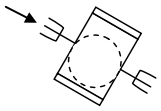
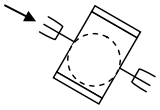
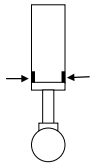
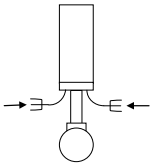
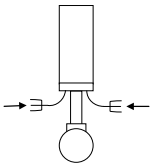
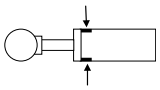
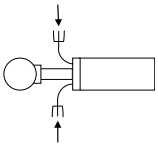
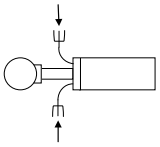
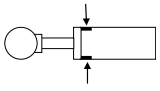
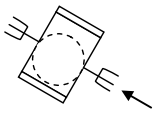
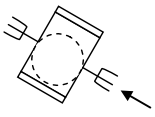
Description	Qty
Plug tap ø12	4
straight screw connection ø12	2
T-fitting ø12	2
stopper ø12	2

5.3 Installation in the main product line

Installation in the product main line is possible. Observe the permissible flow ranges (see details under point 4.4). For other viscosities, take into account the pressure loss that differs from that of water.

	**Caution!** The pressure in the product line should never fall below the vapour pressure. The density sensor must be protected from direct sunlight. Provide thermal insulation if necessary. Only half of the support tube should be fitted with thermal insulation (see point 10.3 "BTempError").

5.4 Examples of installation

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Standard installation position • clean liquids • also lower flow rates • without gas admixtures	any	any	any
Self-draining Installation		 inclination angle 20°-30°	 inclination angle 20°-30°
Installation for liquids which are subject to sedimentation			
			
Installation for liquids in which gas bubbles can occur		 inclination angle 20°-30°	 inclination angle 20°-30°

The arrow indicates the possible flow direction.

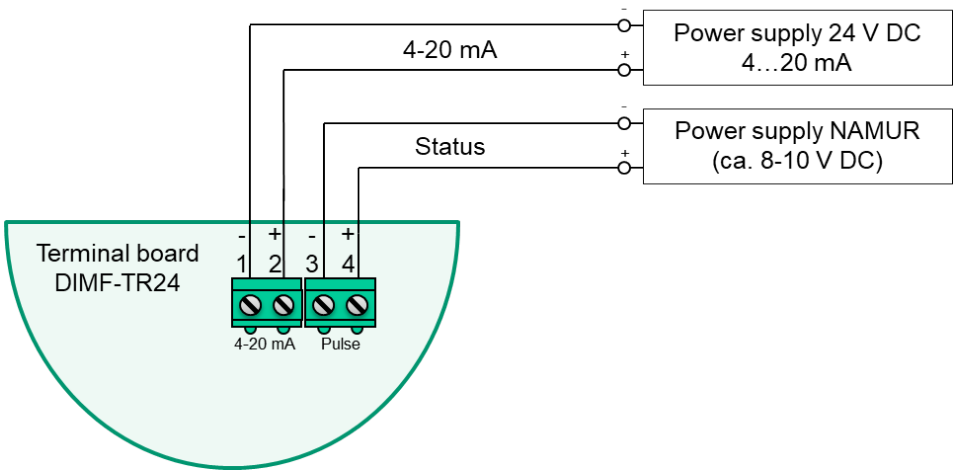
It is possible to rotate the electronics in 90° steps so that the display can be read easily in all installation positions. Instructions for rotating the electronics can be found in section 9.2.3 "Installing the electronics".

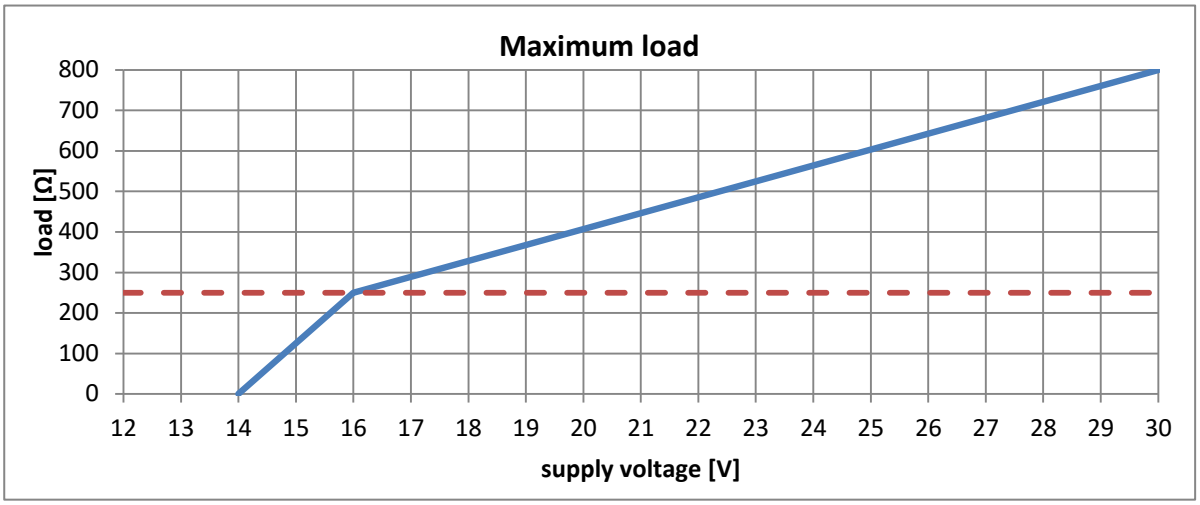
6. Electrical connection

6.1 Supply voltage

- the Transmitter Type TR24 is supplied with 24 V DC, 2-wire technology
- terminal voltage (terminal 1 and 2) 16 ...30 V DC
- The status output is supplied with a voltage in accordance with NAMUR (approx. 8-10 V). Depending on the output status of the status output, the current consumption is less than 1 mA or greater than 2 mA.
- 2 or 4-core, twisted and shielded connection cables are recommended (cable diameter 6 - 12 mm)
- if available, place the shielding in the cable gland
- observe the maximum sum of line and load resistance as a function of the supply voltage, see diagram below

Wiring plan Transmitter





6.2 Current output

The density sensor has a 2-wire current output.
Depending on the set operating mode, different measured variables can be output as current. The measurement signal is output in a range of 3.8 to 20.5 mA in accordance with NE43. In the event of an error, the current alarm is activated and a current of 21.8 mA is output (see error messages)

6.3 Status output

Error messages from the device are output at the status output according to NAMUR. In the event of an error, the status output is activated. Depending on the setting of the "status output mode" parameter, the output is automatically deactivated again once the error has been cancelled or remains activated until the error is manually confirmed in the "error code" channel (see error messages).

7. Configuration / Operation

To operate the buttons, open the screw cover on the longer end of the housing. The degree of housing protection is not guaranteed when the cover is open.

Screw the cover back on hand-tight when you have finished operating the device. Ensure that the sealing ring is undamaged.

7.1 Key operation

The display is divided into two areas. The measured variable and the measured value of the currently selected operating mode are displayed in the upper area. The available parameters and other measured variables can be displayed in the lower area.

The device is operated using 4 buttons located below the display.

If no authorisation has been assigned, you can use the ▲ and ▼ buttons to display the available measured values or parameters in the lower area of the display as a "user". It is not possible to accidentally change the parameters.

The following parameters or measured values can be displayed by the user without authorisation. A detailed explanation of all parameters follows on the next pages.

Description	Meaning
temperature	Medium temperature
operating density	Operating density
4mA	Measuring range start value
20mA	Measuring range end value
boardtemp	Electronics compartment temperature
error code	Error code
checksum	Checksum of the parameterisation
serial number	Serial number of the device
access	Access authorisation
current	Current output
span	Output span of the current output
frequency	Oscillation frequency

7.2 Access authorisation

To change parameters in the density meter, you can enable the service level. To do this, select the "access" parameter, which is currently set to "user".

Press the "P" button to activate input mode. Now enter the correct 5-digit access code for the service level.

When the density meter is delivered, the access code for the service level is set to "00001". You can change the code in the "set password" channel if required.

After changing the service code, access to the service level is only possible with the new code. Please keep the code in a safe place.

7.3 Parameters of the electronics

	**Changing certain parameters can lead to errors and changes in the process**

Parameters are changed using the 4 buttons:

P Change the currently displayed parameter (authorisation required)
Press briefly: move the cursor one position to the left.
Multiple short presses: exit the entry without accepting the changes.
Long press: set a decimal point to the right of the cursor.

▲ Increase the currently highlighted digit or call up the next selection value.

▼ Decrease the currently highlighted digit or call up the previous selection value.

↵ Selection of the next digit in change mode. Press several times: Ends the entry and accepts the new value.

The following measured values or parameters can be displayed or changed by the service:

Description	**Meaning**	changeable
temperature	Medium temperature	
operating density	Operating density	
4mA	Measuring range start value	✓
20mA	Measuring range end value	✓
constant K0	Transducer constant K0	✓
constant K1	Transducer constant K1	✓
constant K2	Transducer constant K2	✓
constant Kt0	Transducer constant Temperature correction Kt0	✓
constant Kt1	Transducer constant Temperature correction Kt1	✓
constant Kt2	Transducer constant Temperature correction Kt2	✓
tkal	Calibration temperature	✓
constant Kx0	Constant polynomial function Kx0	✓
constant Kx1	Constant polynomial function Kx1	✓
constant Kx2	Constant polynomial function Kx2	✓
constant Kc0	Constant polynomial function Temperature correction Kc0	✓
constant Kc1	Constant polynomial function Temperature correction Kc1	✓
constant Kc2	Constant polynomial function Temperature correction Kc2	✓
ref-temperature	Reference temperature	✓
trimm 4mA	Current adjustment 4mA point	✓
trimm 20mA	Current adjustment 20mA point	✓
current simulation	Current simulation	✓
offset Pt1000	Offset correction medium temperature sensor	✓
boardtemp	Electronics room temperature current value	
boardtemp min	Electronics room temperature Minimum value	
boardtemp max	Electronics room temperature Maximum value	
power supply	Power supply current value	
power supply min	Power supply Minimum value	
power supply max	Power supply Maximum value	
temp. min	Medium temperature Minimum value	
temp. max	Medium temperature Maximum value	
status output mode	Output mode Status output	✓
error code	Error code	
checksum	Checksum of the parameterisation	
serial number	Serial number of the device	
production date	Production date	
set password	Set service password	✓
operating mode	Operating mode	✓
access	Access authorisation	✓
current	Output current	
span	Output span of the current output	
frequency	Vibration frequency	

temperature (medium temperature):
This is the current medium temperature in the appliance.

operating density:
Regardless of the selected operating mode, the current operating density of the measured medium is displayed here.

4mA (lower range value)
20mA (measuring range end value):
Display of the measured variable that is assigned to the lower range value (LRV) or the upper range value (URV). Depending on the operating mode, this can be either density, reference density, concentration, temperature or similar. Usual values can be e.g. 800 kg...1200 kg/m³ or 0 %...100 %.

constant K0 (transducer constant K0):
K0 is determined during calibration during production. Change this value to carry out an on-site adjustment (see point 9.2.1).

constant K1 (transducer constant K1):
constant K2 (transducer constant K2):
constant Kt0 (transducer constant temperature correction Kt0):
constant Kt1 (transducer constant temperature correction Kt1):
constant Kt2 (transducer constant temperature correction Kt2):
tkal (calibration temperature):
K1 and K2 as well as Kt0, Kt1, Kt2 and tkal are determined during calibration during production. These parameters should **not be** changed by the user.

constant Kx0 (constant polynomial function Kx0):
constant Kx1 (constant polynomial function Kx1):
constant Kx2 (constant polynomial function Kx2):
constant Kc0 (constant polynomial function temperature correction Kc0):
constant Kc1 (constant polynomial function temperature correction Kc1):
constant Kc2 (constant polynomial function temperature correction Kc2):
ref-temperature (reference temperature):
The polynomial parameters Kx0, Kx1 and Kx2 as well as Kc0, Kc1, Kc2 and ref-temperature are used to determine a concentration from the operating density. If the device uses a polynomial function to calculate a concentration from the operating density, these parameters are assigned values. These parameters should **not be** changed by the user.

trim 4 mA (current adjustment 4 mA point):
trimm 20 mA (current adjustment 20 mA point):
These are the adjustment values of the current output. These parameters should **not be** changed by the user. Please refer to "Current equalisation" in these instructions.

current simulation:
In the normal state, this parameter has the value "OFF". Any current can be output for test purposes. Press the "P" button to start the simulation. Use the arrow buttons to set the desired current. The set value of the output current immediately changes the output current during input. Press the↵ button several times until the input marker disappears to end the current simulation. The value "OFF" then appears again in the parameter and the current simulation is ended. **Attention:** The status output is also set for the duration of the current simulation!

offset PT1000 (offset correction of medium temperature sensor):
This parameter is normally set to 0. This parameter can be used to perform a temperature correction of the internal temperature sensor. Changing the value by +0.5, for example, results in a change in the temperature display of +0.5°K. This parameter should not normally be changed by the user.

boardtemp (electronics room temperature current value):
The current temperature in the electronics compartment is displayed here. This value should be between -40°C and +75°C.

boardtemp min (electronics compartment temperature minimum value):
boardtemp max (electronics room temperature maximum value):
These values indicate the lowest or highest measured temperature in the electronics compartment. These **cannot be** reset by the user.

power supply (power supply current value):
The current voltage at the input of the electronics is displayed here. This value should be between 16 and 30 V. Please note: This value may be lower than expected due to a power supply unit and / or an additional load or a high line resistance. This voltage can collapse considerably, especially when high current values are output. Ensure that a sufficient supply voltage is available under all circumstances.

power supply min (power supply minimum value)
power supply max (maximum power supply value)
These values indicate the lowest or highest voltage measured at the terminals in the electronics compartment. These **cannot be** reset by the user.

temp. min (medium temperature minimum value):
temp. max (medium temperature maximum value):
These values indicate the lowest or highest measured temperature of the medium. These **cannot be** reset by the user.

status output mode (output mode status output):
The status output can be used to output error messages from the density meter. Depending on the requirements of the process, select how error messages are to be signalled at the status output. (see error code)

permanently: Fault messages from the device are displayed until reset or until the Device restart is displayed at the status output. The lighting also flashes of the display.

nonpermanent: Fault messages at the status output and the flashing of the display are automatically deleted when the device recognises that the error is no longer present.

error code (error code):
Display of current or recently occurred errors. Displayed errors can be deleted with the "P" button. If the error appears again, the error is still present. Delete all errors here to delete the permanent status message.

checksum (checksum of the parameterisation):
The value in this channel is calculated from all parameters that can be changed by the user. A change to any parameter results in a change to the checksum. Use this parameter to track changes to the device.

serial number (serial number of the device):
Display of the serial number of this device.

production date (production date):
Display of the production date of this device

set password (set service password):
The service password can be changed in this channel. Activate input mode by pressing the "P" button. Now enter a new 5-digit password for the service level.

operating mode (operating mode):
Selection of which measured variable is output on the current output (see point 7.4)

access (access authorisation):
The current access authorisation is displayed here. This can be either "user" or "service". If "user" is currently displayed here, you can activate input mode by pressing the "P" button. Now enter the correct 5-digit access code for the service level (00001 on delivery).
Access to the service level is automatically blocked if no changes are made to a parameter for 10 minutes.
If you have changed the code for the service level and no longer have access to it, please contact the Bopp & Reuther Messtechnik GmbH sales department.

current (output current):
Display of the current value of the current output

span (output span of the current output):
This is the percentage display of the current output from 4 to 20mA. 0 % means that currently 4 mA, 100 % means that 20 mA is currently being output.

frequency (oscillation frequency):
Display of the current oscillation frequency of the appliance. Depending on the device type, this value can be between 400 and 1500 Hz. The oscillation frequency should be a stable value that changes only slowly. Depending on the process conditions, at least the 2nd decimal place should remain stable and not change abruptly. Very unstable frequency values may indicate air pockets in the device.

7.4 Operating mode

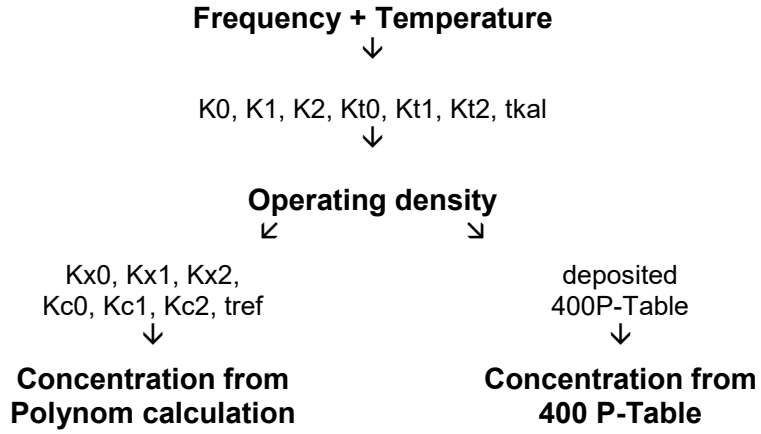
By selecting the operating mode in the "operating mode" channel, the calculation method used to record the measured variable and display the output signal is determined.
The choice of operating mode determines:

- the display of the measured variable in the top line of the display
- the output variable that is output on the current output
- the unit of the parameters 4mA (LRV) and 20mA (URV)
- the calculation method for calculating the concentration (polynomial or table calculation)

Operating mode		Unit	Calculation type
op.density	Operating density	kg/m³	
temperature	Temperature	°C	
w% conc. tab	Concentration m%	w%	400P table
w% conc. pol	Concentration m%	w%	400P table
ref. density	Reference density	kg/m³	Polynomial
g/l conc. tab	Concentration g/l	g/l	400P table
g/l conc. pol	Concentration g/l	g/l	Polynomial
v% conc. tab	Concentration vol%	vol%	400P table
v% conc. pol	Concentration vol%	vol%	Polynomial
ref.dens. tab	Reference density	kg/m³	400P table
ref.dens. pol	Reference density	kg/m³	Polynomial

7.5 Calibration parameter

The parameters K0, K1, K2, Kt0, Kt1 and Kt2, tkal are different for each device. These parameters are determined during calibration. They are used to convert the device-specific resonance frequencies to the various operating densities while correcting for the device-specific temperature characteristics.
Each density meter can measure the operating densities of any liquid after calibration.



7.5.1 Calculation of the concentration via the polynominal parameters

The parameters Kx0, Kx1, Kx2 and Kc0, Kc1, Kc2 and tref are used to convert operating density to mass or volume concentration or reference density at different temperatures within the concentration and temperature range specified when ordering. If you use several devices that measure the same medium under different operating conditions, these parameters may also differ.

If two devices measure the same medium in the same concentration and temperature range, the same parameters can be used. These are not dependent on the device, but on the medium.

The density meter calculates the current concentration values even if they are outside the measuring range specified by the customer at the time of purchase. If a customer table of e.g. 20°C - 30°C was used to calculate the parameters, the device can also display a concentration at 10°C or 40°C, albeit with reduced accuracy.

7.5.2 Calculating the concentration using the 400 P-Table

In this calculation method, the concentration or the reference density is determined from the operating density and the temperature using a table. The calculation is performed by linear interpolation between the individual table values.
The table must be available either as a medium table or as a sampling point table. The conversion of a substance value table into a support point table takes place during production.
In order to use the conversion from operating density to concentration, the customer must provide a table suitable for his medium.

Medium table

% \ t	Temperature
Concentration	Density

Sampling point table:

ρ \ t	Temperature
Density	Concentration

The table is transferred to the density meter during production.
If a table is used, the density meter can only calculate and display the concentration values that lie within the limits of the table. The concentration **cannot** be calculated if the operating density and / or the operating temperature are outside the range of the programmed table. The density meter recognises that the range has been exceeded and reports the error at the current output. (see error messages "TabError")

The table function can also be used if polynomial parameters are stored in the device. The concentration is then determined either via the polynomial parameters or the stored table, depending on the operating mode setting.

8. Maintenance

Cleaning and zero-point adjustment must be carried out as maintenance work.

Cleaning

Depending on the tendency of the medium to deposit, the density transducer must be cleaned. In the simplest case, the flow rate through the density transducer is increased to the maximum flow rate for a few minutes so that deposits are flushed away. If cleaning cannot be achieved by increasing the flow rate, the density transducer can also be flushed with cleaning fluid if flushing connections are provided in accordance with point 5.2. Attention must be paid to the corrosion resistance of the density transducer material.

Zero point adjustment

The zero point of the density transducer may shift due to abrasion, deposits or corrosion. A zero point shift can be determined by a comparative measurement and corrected by an on-site adjustment (see chapter 9.2.1).

9. Fault detection / troubleshooting

Regular checks of the density transducer facilitate fault detection and can provide information about possible sources of error.

As a rule, the check can be limited to a comparison between the value measured by the density transducer and a reference measurement (e.g. sampling with laboratory measurement or a comparative density meter connected in series).

As requirement the reference measurement is sufficiently reliable and accurate (calibratable if necessary) to ensure correct results. When making this comparison, it must be ensured that the reference conditions are comparable with the actual operating conditions (the temperature coefficient of the liquid used must be taken into account if necessary).
If the value measured by the density transducer does not match the result of the reference measurement, carry out the following measures:

- Check the transmitter electronics
  (electrical connection and power supply as well as cabling up to the density transducer)
- ensure that the data in the configuration log or service list and the programmed parameters of the transmitter electronics are identical
- Inspect the density transducer for gross damage
  (annealing colours on the housing due to high temperatures and obvious mechanical damage, e.g. damaged electronics housing, seal, connection terminal, etc.)
- Search for process-related malfunctions (e.g. empty product line, gas bubbles)

A severely damaged density transducer must be dismantled and sent to Bopp & Reuther Messtechnik GmbH (see point 11).

Otherwise, troubleshooting should be carried out as described below. There are three general sources of error:

- Errors caused by the medium (see point 9.1)
- Errors caused by the transmitter electronics (see point 9.2)
- Errors caused by the transducer system of the density meter (see point 9.3)

9.1 Causes of errors attributable to the medium

Error	Possible cause	Remedy
Negative measurement error Unstable display	Air inclusions or gas bubbles in the product or in the density transducer	Increase pressure in the product line
		Venting the product line
		Increasing the flow velocity in the density transducer
Positive measurement error Long-term drift	Deposits in the density transducer	Increase the flow velocity in the transducer (guide value e.g. 5 m/s)
		Remove any deposits in the density transducer with a suitable solvent (note the corrosion resistance of the density transducer)
		Use a small pig to clean the measuring tube several times with the appropriate pressure (only for DIMF 2.0 and DIMF 2.1, **not** for DIMF 1.3).
Negative measurement error Long-term drift	Corrosion	Check the material resistance of the oscillating element
	Abrasion	Reduce the flow velocity in the density transducer (guide value e.g. 1 m/s)
Display does not change or is too slow Temperature display too low	Flow rate in the density transducer is too low or zero	Open all shut-off valves
		Increasing the flow velocity in the density transducer

Faults caused by deposits, corrosion and abrasion can often be detected after dismantling the density transducer.

If necessary, the density transducer must be sent to Bopp & Reuther Messtechnik GmbH (see point 11) for recalibration.

9.2 Causes of faults that can be traced back to the transmitter electronics

Malfunction	Possible cause	Remedy
Display illumination flashes	An error has been detected	Read out "error code" channel
Current output provides 21.8 mA	There is an error	
Status output is activated	There is an error	
	There was an error	Confirm "error code" channel
Error message "MemError"	Data stored in the flash is faulty	Contact Bopp & Reuther Messtechnik GmbH
Error message "FreqError"	there is air in the medium	See causes of errors originating from the medium see point 9.1
	Transmitter incorrectly connected to transducer	Check the colours of the coil connections (sensor + actuator)
	Coil defective	Disconnect the coil connections (sensor + actuator) and measure with an ohmmeter. Values between 50 and 600 Ω should be measured. There must be no connection to earth. (see point 9.3)
TempError" error message or displayed temperature value is incorrect	Transmitter incorrectly connected to transducer	Check PT1000 connections
	PT1000 failure	Disconnect the PT1000 connections from the transmitter and measure the PT1000 with an ohmmeter. At 20°C, approx. 1078 Ω should be measured here (see point 9.3)
	PT1000 offset set incorrectly	Set PT1000 offset to 0.0.
Error message "BtempError"	Electronics compartment temperature too high or too low	Ensure that the ambient temperature is maintained
Error message: "SupplyError"	Supply voltage too low	Supply voltage must be > 16 V DC at the connection terminal
	Burden too high	Check resistors in the supply
Error message: "TabError"	No 400 P table available in the device	Have the table transferred to the device
	Density/temperature range of the table exceeded/not reached	Have the table adapted to current measurement conditions
Display measured value "Overflow"	The measured value cannot be displayed	Note error message
Current output does not react or reacts incorrectly	Operating mode set incorrectly	Check "operation mode" parameter
	Measuring range limits set incorrectly	Check parameter "4 mA" or "20 mA"
	Current output defective	Check current output with current simulation
	Process control system set incorrectly	Set LRV and URV in DCS/PLC as parameter "4 mA" or "20 mA"
	Faulty current adjustment	Carry out current equalisation (see point 9.2.2)
Current output unstable	Interference radiation	Lay the cable shield or potential equalisation cable in the cable gland
	Unstable supply voltage	Check supply
Display shows incorrect density or concentration or temperature is not compensated	Incorrect parameterisation	Check programmed log data and its sign
	Specified measuring range was exceeded	New substance data required
No frequency signal or frequency much too high	Air inclusions in the medium	See causes of errors originating from the medium (see point 9.1)

9.2.1 On-site synchronisation

An on-site adjustment is carried out if, after checking the causes of the error (see point 9 onwards), a deviation has been confirmed due to certain on-site conditions. A simple adjustment can be carried out by changing the transducer constant $K_{.0}$
During on-site calibration, the displayed operating density and temperature should be shown as stable measured values. Do not carry out an on-site calibration if the measured values are very unstable or drift away significantly over a short period of time.
Make a note of the previous value of K0 before the adjustment if you want to restore the original parameterisation.

Example:

Rho measured = 996.6 kg/m³
Rho should = 996.0 kg/m³ (e.g. according to table)

determined offset = +0.6 kg/m³
K_0-Wert aktuell = -7360.708 kg/m³

K_0-value soll = K_0 (current) – offset

K_0-value soll = -7360.708 kg/m³ - 0.6 kg/m³
= -7361.308 kg/m³

Enter this newly determined value into the electronics as the "constant K0" parameter. The measured value of the operating density changes immediately and should correspond to the desired Rho.
Please note that a large deviation in the displayed density is often caused by deposits in the appliance. Observe point 9.1 and check whether cleaning the appliance can eliminate the deviation before carrying out an on-site calibration.

The other constants should **not be** changed by the user if possible.

9.2.2 Current equalisation

The current output current is shown in the "current" parameter on the display. This should correspond to the actual current output. If there is a deviation here, check the function of the current output using the current simulation in the "current simulation" parameter with the aid of an accurate current meter in the supply current loop. If you notice that there is a slight deviation between the displayed and the output current, you can recalibrate the output current.

If you notice in the current simulation that the current output deviates considerably, i.e. several mA, from the current to be output, then you should not carry out this adjustment, but first check the supply to the device and then contact Bopp & Reuther Messtechnik GmbH directly if necessary.

Carrying out the current equalisation:

The current output can be calibrated in the supply current loop using an accurate external current meter.
Call up the "trim 4 mA" parameter and press the "P" button. The device will now attempt to output a current of approx. 4 mA. Read this current from the external current meter and enter the value read in the "trim 4 mA" parameter. Then carry out the adjustment for the 20 mA current value in the same way. Then check the function of the current output using the current simulation in the "current simulation" parameter. Repeat the current adjustment if necessary.

9.2.3 Removing and installing the electronics

CAUTION!
This product contains electronic components that can be damaged by electrostatic discharge.

The electronics should be removed in a clean environment. Use ESD-compliant work materials (e.g. earthing wrist strap). Earth yourself before carrying out any work where you could come into contact with the electronics. To do this, touch earthed metallic surfaces (e.g. water pipes or earthed system components). Avoid mechanical impact on the electronics.

After switching off the supply voltage, open the screw cover and loosen the two fixing screws of the dial.

Use a screwdriver with a blade no wider than 3 mm to loosen the screws at the top right or bottom left. The screws are located behind the display board and can be reached through two holes in the board.

Hold the electronics with two fingers on the right and left and carefully pull them out of the housing. If necessary, turn the electronics so that they can be removed completely.

Disconnect the two green connectors from the electronics.

Replacing the display board

The display board can be easily removed from the electronics once it has been removed. Use an SW 5.5 socket spanner and completely loosen the threaded bolts at the top left and bottom right. Pay particular attention to the glass of the LC display when loosening the upper screw so as not to damage it. Pull the display board straight forwards away from the rest of the electronics. Replace the new display board in the same way. Ensure that the connectors underneath the display are correctly seated. Secure the display board by carefully screwing the threaded bolts back in. Take care not to damage the glass of the LC display!

Installation of the electronics

Reconnect the two green connectors to the electronics. Hold the electronics with two fingers to the right and left of the display board.

Turn the entire electronics 360° clockwise when pushing it into the housing so that the connection cables can be positioned correctly behind the electronics. Make sure that all cables are behind and not to the side of the electronics. If you want to mount the electronics in a different orientation, you can do this in 90° steps. There are 4 threaded bushes on the rear wall of the housing. Two threaded rods protrude from the back of the electronics (top right and bottom left). Align the electronics correctly horizontally and in the centre of the housing and push them into the housing. As soon as the threaded rods are correctly positioned on the threaded bushes, the electronics can be very easily tilted back and forth on these threaded bushes. Maintain this position and tighten the screws alternately through the holes at the top right and bottom left. If the alignment does not work straight away, pull the electronics out another 1 cm, change the position slightly and push the electronics in again. Place the dial on the display board and secure it with two screws.

Check the sealing ring on the glass lid for damage and screw the housing hand-tight.

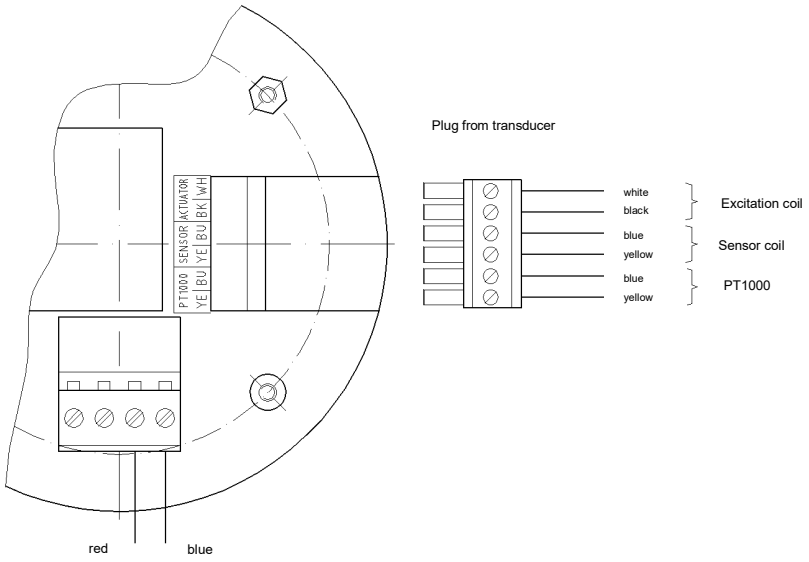
9.3 Causes of errors attributable to the density meter's transducer system

Checking the coils and the temperature sensor

After removing the electronics (see point 9.2.3), the coils or the PT1000 can be measured on the 6-pin connector. This requires a multimeter that can measure the resistance value.

Assignment of the 6-pin plug connector

Colour	Function
White	Excitation coil connection
Black	
Blue	Sensor coil connection
Yellow	
Blue	PT1000 connection
Yellow	



	DIMF 1.3	DIMF 2.0	DIMF 2.1
Resistance of the pick-up coil (at 20°C) between blue (BU) and yellow (YE)	60 Ω	60 Ω	408 Ω
Resistance of the excitation coil (at 20°C) between black (BK) and white (WH)	60 Ω	125 Ω	408 Ω
Resistance to ground	≥ 100 MΩ		

Measure the coils one after the other and compare the measured values with the table values shown here for your transducer type. Also check the respective insulation resistance to housing ground. A certain deviation of up to ±20 % can be accepted and should not impair the function. If there is a fault in the transducer system, the deviation will be significantly greater. In this case, please contact the service department of Bopp & Reuther Messtechnik GmbH.

Depending on the variant, either PT100 or PT1000 are installed in the density sensor, the connecting cables of which are led out of the sensor individually. These 4 wires of the temperature sensors are labelled with a black shrink sleeve. The TR24 transmitter electronics only use the PT1000 for temperature measurement.

Resistance values of a PT1000 between blue (BU) and yellow (YE) connection cable:

Temperature (°C)	-20	0	20	40	60	80	100	120	140
Resistance (Ω)	922	1000	1078	1155	1232	1309	1385	1460	1536

Error	Possible cause	Remedy
Coil resistance zero or infinite	Coil defective	Send density meter to Bopp & Reuther Messtechnik
Temperature sensor resistance zero or infinite	Temperature sensor defective	Send density meter to Bopp & Reuther Messtechnik
Short circuit between a cable and the housing	Ground fault	Send density meter to Bopp & Reuther Messtechnik

10. Self-monitoring functions / Error messages

The transmitter electronics offer a wide range of monitoring functions to ensure safe operation. As soon as the electronics detect that reliable measurement is no longer possible, it will enter an error state and show the failure information on the display, at the status output and at the current output.

During the boot process of the electronics, the basic functions of the electronics are checked. If an error is detected here, the start is interrupted and a current of < 3.6 mA is output as failure information. An error is shown on the display during initialisation until it is confirmed manually using the buttons on the device. Possible errors that are recognised during the boot process are, for example, faulty communication between the microcontroller and other electronic units or faulty parameters in the internal memory. Such errors usually require the device to be sent to our service centre.

The boot process takes approx. 15 seconds. The measurement signal is then available on the display and at the current output. During operation, a green LED next to the display board flashes continuously as a sign of life. This can be seen when the glass lid is open. When the glass lid is closed, it can be recognised by looking diagonally to the left through the lid into the housing.

During operation, the electronics continuously monitor the vibration frequency, the medium temperature and other internal functions for plausible measured values. If a malfunction is detected here that could mean that a reliable measurement cannot be guaranteed, no measurement information is output but an error situation is signalled. This happens simultaneously in 3 different ways:

10.1 Error message via current alarm

The failure information is displayed via the current value as soon as a critical fault is detected. Depending on the fault, the current value is changed to a value < 3.6 mA or > 21 mA. Faults are thus reliably signalled to the process control system. While the device outputs a current alarm, a red LED next to the display board lights up continuously, which is only visible when the glass cover is open. If the cause of the fault no longer exists, the device automatically returns to normal operation and outputs the current value of the measurement signal again.

10.2 Error message at the status output

All errors are also output at the galvanically isolated status output (in accordance with NAMUR). The status output is set at the same time as the current alarm as soon as an error is detected. In the menu item "status output mode", the user can select whether the error signal at the status output should continue to be displayed after the error has been cancelled. There are 2 options to choose from:

permanently: Error messages from the device are displayed until the manual reset on the device or until the device is restarted, is displayed at the status output. This option also makes it possible to reliably recognise errors that have occurred briefly

nonpermanent: Error messages at the status output disappear when the device recognises that the error is no longer present.

While the device outputs an error at the status output, a yellow LED lights up continuously next to the display board, which is only visible when the glass lid is open.

The status output is also activated if the measured variable of the current operating mode cannot be properly output as a 4 to 20 mA value on the current output. In addition to normal error situations, this is also the case if a current calibration or current simulation is currently being carried out on the device. Once the calibration or current simulation is complete, the message on the status output is automatically cancelled again, provided there is no other error

10.3 Error message on the display

As soon as an error is detected, the display backlighting starts to flash to clearly indicate a current or recent error. Whether the display flashes permanently after an error or stops flashing automatically after the error has disappeared depends on the "status output mode" setting.

The signalled error can be read and deleted in the "error code" channel. If the error still exists, it cannot be deleted. The "service" access authorisation is required to delete the error. A normal "user" can only display the error, but cannot delete it.

Clearing the error stops the display flashing and resets the error message at the status output (only for status output mode "permanent"). If several errors have occurred, all errors may have to be deleted.

The following error messages can be displayed in the "error code" channel.

`none`: There is **currently no error:**
In normal operation, "none" should always be displayed in the "error-code" channel. If the display lighting flashes, this is an indication that an error is displayed in the "error-code" channel.

`MemError`: Memory error:
The electronics have recognised an error in the checksum of the internal memory. This could indicate that data has been corrupted and is no longer readable. This error is also signalled if basic parameters of the electronics have not yet been programmed. Please restart the electronics and check whether the error is displayed again. Check the device parameters programmed in the electronics (e.g. calibration constants, LRV, URV,...) to see if they deviate from the factory settings. If the error occurs again, please contact the Bopp & Reuther Messtechnik GmbH service department (see point 11).

`FreqError`: Frequency error:
The electronics constantly measure the current oscillation frequency of the oscillating tube. If the electronics measure a frequency that is very far from the expected frequency, a frequency error is signalled. One cause of such an error can be air admixtures in the oscillating tube. In this case, the oscillating tube will vibrate irregularly and the electronics will not be able to measure the correct oscillation frequency. (see point 9.1).
A fault in the pick-up system can also lead to this message. If one of the two coils has a fault due to a short circuit, an open circuit or a short to earth to the housing, this fault will also be signalled. If you can rule out air in the medium, you should check the coils in the device (see point 9.3).

`TempError:` Temperature error:
The electronics have recognised that the temperature measurement is not working correctly or that the permissible measuring range has been exceeded. Check the measured temperature value in the "temperature" channel. The current medium temperature should be displayed here. If the measured value "temperature" is displayed with "overflow", this indicates an error in the temperature sensor. First make sure that the PT1000 offset parameter is set to the value "0.0". Then check the connection of the PT1000 (see point 9.3).

`BtempError`: Electronics room temperature error:
The temperature sensor in the electronics has measured a temperature in the electronics housing that is much too high or much too low. Log in to the "access" menu item as "service" and display the

"boardtemp" measured value. This temperature should be within the range -20°C to +75°C. If the electronics compartment temperature is outside this range, it is no longer possible to determine the density accurately.
If the actual electronics compartment temperature is within the permissible range and an implausible temperature is incorrectly displayed in the "boardtemp" measured value, then there is a fault in the electronics. In this case, please contact the Bopp & Reuther Messtechnik GmbH service department (see point 11).

Tip: Avoid completely insulating the transmitter when measuring media with high temperatures. The insulation should end several centimetres below the electronics housing. By mounting the entire device horizontally or with the electronics housing facing downwards, the heat from the process has less influence on the heating of the electronics. For measurements with low ambient temperatures of less
< -20°C, insulation around the electronics housing can help to achieve the permissible range of the electronics room temperature.

`TabError:` Error during measurement with the 400P table:
The device is currently set so that the current measured value is calculated from the medium temperature and the operating density using an integrated table. A "taberror" may occur if no table is stored in the device, but the operating mode requires a table, e.g. v%/m% concentration from table (see point 7.5.2). If a table has been stored, you should check whether the temperature range and the density range of the table are adhered to. If the current temperature or the current operating density is outside the table, the electronics cannot calculate a correct concentration (or reference density, content, etc...) from the table.

Tip: When ordering your appliance, provide us with a complete table that covers your entire operating range (density and temperature) plus operating conditions that occur less frequently. Only then will your device not display any error messages during operation.

`SupplyError:` Power supply error:
When the device is switched on, the electronics measure the load in the supply line. Together with the load and the supply voltage currently measured at the connection terminals of the device, the electronics can recognise at an early stage whether the supply voltage may drop so sharply at higher output currents (e.g. 20 mA) that operation is not possible. In this case, the error message "SupplyError" is displayed. Check the supply voltage directly at the electronics. Log in as "service" in the "access" menu item and display the "power supply" measured value. This value should always be between 16 and 30 V. If the voltage is too high, it can destroy the electronics and lead to faulty output currents (4-20 mA). Supply voltages that are too high are stored in the electronics as a trailing indicator.

Tip: Activate the current simulation (see point 7.3) and output a current of 21.8 mA as a test. Measure the voltage that is still present at the electronics. This should still be at least 15-16 V during the output of 21.8 mA. Check whether there are any additional resistors in the supply line for communication with HART® that are not required. Reduce excessively high resistance values (see point 6.1).

11. Service

Please contact our service department in the event of faults with density and concentration measuring devices.

Bopp & Reuther Messtechnik GmbH
Service
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67346 Speyer / Deutschland
Phone: +49 6232 657-420
Fax: +49 6232 657-561
E-Mail: service@bopp-reuther.com

If you receive deviating measured values that you cannot rectify using the options listed in point 9, please also contact the Service department.
Having the following information ready when you first contact us simplifies and speeds up problem solving:

Information on	Where can you find this data	Field for your notes
Serial number of the device	Type plate or "serial number" parameter	
Current vibration frequency	Parameter "frequency"	
Current temperature	Parameter "temperature"	
Current operating density	Operating density" parameter	
Current operating mode	Operating mode" parameter	
Current measured value	Upper display line	
Displayed error message	Parameter "error code"	
What measured value do you expect?	Laboratory measurement e.g. ..... kg/m³, ... % at .... °C	
Which medium do you measure?	Operator	
Contact person on site? Phone number?	Operator	

Appendix

A. Example of a configuration data log

Density and concentration meter
Log of the configuration data

Created: 05.01.2024

BOPP & REUTHER MESSTECHNIK

Device

Manufacturer	**Bopp & Reuther**
Device type	**DIMF**
Serial number	**10000000**
Sensor number	**10000001**
Device identification	**1234**
Model code	**DIMF2.0TVS-0-71-S12-M-1-0-4-0**

Measuring range limits

Final value	**5000,00**
Initial value	**0,00**
min. Measuring span	**0,00**
Unit	**Vol%**

Current output

Final value	**95,00**	
Initial value	**5,00**	
Unit	**Vol%**	
Damping	**1,0**	s

Application

Liquid	**Ethanol**

Operating mode

Operating mode	**Concentration (vol./vol.) from polynomial approximation**	PV unit	**Vol%**

Drag indicator

Medium max. temperature	**37,80** °C	Electronics max. temperature	**27,00** °C
Medium min. temperature	**15,20** °C	Electronics min. temperature	**19,50** °C

Transducer data

Density polynomial

K0	**-5425,66000**	(-100000...100000)
K1	**0,00000**	(-100000...100000)
K2	**40,85030**	(-100000...100000)

Temperature correction

KT0	**-2,54911**	(-10...10)
KT1	**-49,50000**	(-100...0)
KT2	**0,00000**	(-10...10)

Calibration temperature

T cal	**20,09** °C	(-50...210)

Measuring liquid data

Polynomial approximation

KX0	**2291,31700**	(-100000...100000)
KX1	**-4,93821**	(-100000...100000)
KX2	**265,48080**	(-100000...100000)

Temperature compensation

KC0	**-3,60016**	(-100000...100000)
KC1	**0,00388**	(-100000...100000)
KC2	**0,00389**	(-100000...100000)

Reference temperature

T ref.	**20,00** °C	(-50...210)

This document was created by machine and is valid without signature

Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
67346 Speyer
P.O. Box 1709, 67327 Speyer

Phone +49 (0) 6232 657-0
Internet: www.bopp-reuther.com
e-mail: Info@bopp-reuther.com

B. Declaration of decontamination

Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
67346 Speyer
Germany

BOPP & REUTHER MESSTECHNIK

Telephone: +49 (0) 6232 / 657 420
Fax: +49 (0) 6232 / 657 561
Mail: service@bopp-reuther.com
Web: www.bopp-reuther.com

ERA number:

DECLARATION ON DECONTAMINATION OF METERS AND COMPONENTS

Please complete this form and return in advance by email or by Fax to +49(0)6232 / 657 561 in order to receive an Equipment Return Authorisation (ERA) number (not necessarily required). No action to repair or examine the meter will be done, until a valid declaration of decontamination has been received.

Contact information

Company Name:
Company Address:
Contact Person:
Name:
Phone:
Email:

Meter information

Type:
Id. no.:
Serial no.:

Reason for return (e.g. calibration, repair). Please describe in detail.

Contamination information

The meter was contaminated with:

- ☐ poisonous 
- ☐ hazardous 
- ☐ explosive 
- ☐ corrosive, irritant 
- ☐ oxidizing 
- ☐ environmental hazardous 
- ☐ flammable 
- ☐ cancer-causing, harmful 
- ☐ other:

The meter was cleaned with:

Packaging and shipping Instructions

- Remove all cables, connectors, separate filters and mounting materials
- Please pack each item in two suitable sealed protective foil bags
- Transport in suitable shipping package (e.g. original Bopp & Reuther Messtechnik shipping package)
- Include a copy of this declaration form along with the shipping documents on the outside

By signing this form, you are accepting the full responsibility for its contents and confirming that appropriate decontamination has taken place in accordance with legal regulations.

Print name: **Date:**

Legally valid signature:

C. EU- Declaration of conformity

BOPP & REUTHER MESSTECHNIK

EU - Konformitätserklärung
EU - Declaration of conformity
UE - Déclaration de conformité

Hiermit erklärt der Hersteller in alleiniger Verantwortung, dass die nachfolgend bezeichnete Baueinheit den Anforderungen der zutreffenden EU-Richtlinien entspricht. Bei nicht mit uns abgestimmten Änderungen verliert diese Erklärung ihre Gültigkeit.

The manufacturer herewith declares under sole responsibility that the unit mentioned below complies with the requirements of the relevant EU directives. This declaration is no longer valid if the unit is modified without our agreement.

Par la présente, le fabricant déclare sous sa seule responsabilité que les appareils décrits ci-dessous, correspondent aux exigences de la réglementation UE qui les concerne. Toute modification des appareils sans notre accord entraine la perte de validité de cette déclaration de conformité.

Hersteller *Manufacturer* Fabricant	Bopp & Reuther Messtechnik GmbH Am Neuen Rheinhafen 4 67346 Speyer / Germany
Bezeichnung *Description* Description	Dichtemesser *Density meter* Capteur de masse volumique
Typ, Modell *Type, model* Type, modèle	DIMF1.3 / DIMF2.0 / DIMF2.1 mit *with* avec TR24

Richtlinie *Directive* Directive	2014/30/EU /UE L 96/79 Elektromagnetische Verträglichkeit *Electromagnetic interference* Compatibilité électromagnétique
Normen und normative Dokumente *Standards and normative documents* Normes et documents normatifs	EN IEC 61000-6-2:2019 EN IEC 61000-6-3:2021

Richtlinie *Directive* Directive	2011/65/EU /UE L 174/88 Beschränkung gefährlicher Stoffe *Restriction of hazardous substances* Limitation de substances dangereuses
Delegierte Richtlinie *Delegated Directive* Directive Déléguée	(EU /UE) 2015/863 L 137/10 Änderung Anhang II der Richtlinie 2011/65/EU *Amending Annex II to Directive 2011/65/EU* Modifiant l'annexe II de la directive 2011/65/UE
Normen und normative Dokumente *Standards and normative documents* Normes et documents normatifs	EN IEC 63000:2018

Ort, Datum / *Place, Date* / Lieu, Date: **Speyer, 2024-02-27**

Dr. J. Ph. Herzog
Geschäftsführer
Managing director / Gérant

Bopp & Reuther Messtechnik GmbH, Am Neuen Rheinhafen 4, 67346 Speyer / Germany
Telefon: +49(0)6232 657-0, **Telefax**: +49(0)6232 657-505, **Email**: info@bopp-reuther.com, **Internet**: www.bopp-reuther.com

Z-ML-KE DIMF-TR24-V1 2024-02-27

Our product portfolio:

Volume flowmeter:

- Oval wheel meter
- Turbine meter
- Electromagnetic flowmeter

Mass flowmeter:

- Vortex meter
- Compact orifice
- Coriolis mass flowmeter

Density and concentration meter (Measuring and testing equipment)

Dosing measurement technology

- Electromagnetic flowmeter
- Coriolis mass flowmeter
- Oval wheel meter
- Dosing control system

Measurement Accessories

- Processing electronics
- Mechanical indicator
- Pulse pick-ups
- Components

Measuring and testing equipment

Conformity assessment according to MID Directive 2014/32/EU

After Sales Service

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BOPP & REUTHER MESSTECHNIK