BOPP & REUTHER
MESSTECHNIK

DENSITY AND CONCENTRATION
SERIES DIMF

1. IDENTIFICATION

Manufacturer
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Type of product: Oscillating element density meter

Product name: Density meter series DIMF

2. RANGE OF APPLICATION

The density transducer type DIMF allows the continuous measurement of the density of liquids and liquid mixtures. The proven oscillating element principle ensures great accuracy in combination with outstanding long-term stability. The robust design assures reliable operation, even under rough process conditions.

3. MEASURING PRINCIPLE AND SYSTEM CONFIGURATION

3.1 MEASURING PRINCIPLE

The basic sensor of the density transducer is an oscillating element The liquid to be measured 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 compensate the temperature influence in the transducer. Each meter is calibrated with reference liquids of different densities. In the configuration data sheet you can see the parameter for the calculation of the density out of the frequency and the correction coefficient of the influence of temperature

3.2 System Configuration

Sensor element
DIMF 1.3 hollow tuning fork
DIMF 2.0 and 2.1 oscillating pipe loop

Preamplifier PVS and PKS
Output:
operating density dependent frequency, non linearised, modulated on power suppy duty cycle 1:1, ca. 1400 Hz(depend on sensor type), linearisation and temperature compensation in connected flow computer.

Power supply:
24 VDC (min. 15 VDC / max. 30 VDC) intrinsically safe

Density connection:
2-wire-technology, connection over screw terminal and cable gland M20x1,5

Temperature connection:
4-wire-technology, connection over screw terminal and cable gland M20x1,5 (Pt 100 in DIMF integrated)

Cable specification
2- or 4-wired, twisted paired and shielded

Transmitter TVS, TWS and TWH
HART®- protocol:
Operating over PC or Laptop with the software PACTware (HART®-modem neccessary) or a handheld terminal (for example HH275 or HH375). FDT1.2 driver available.

Output:
4-20 mA, linearised and temperature compensated, configurable for every calculated ore measured value (for example operating density, reference density, concentration, °Brix, °Plato or other derived units).

Power supply:
24 V DC (min. 14 V DC / max. 30 V DC) intrinsically safe

Connection:
2-wire-technology, connection over screw terminal and cable gland M20x1,5 or ½“ NPT thread for pipe installation (Conduit-System)

Cable specification
2- or 4-wired, twisted paired and shielded

Displayed values:
Density, concentration, operating temperature and others

Types
- **V** Compact version - transmitter mounted on the sensor
- **K** Compact version - only for DIMF 1.3 with preamplifier „P“ and thread connection ¼“ acc. ISO228
- **W** Version with separate transmitter for wall mounting (cable 1,5m)
- **S** Standard temperature: - 40 ... +150°C
- **H** High temperature: - 40 ... +210 °C, (only for transmitter „TWx“

4. Input

4.1 MEASURED VALUE
Operating density, reference density, concentration

4.2 MEASURING RANGE
Operating density, density at reference temperature (reference density)

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Density range	0 up to 5000 kg/m³		

5. CHARACTERISTIC PARAMETERS

5.1 Reference condition

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Calibration range	400 up to 5000 kg/m³		

5.2 Accuracy

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Accuracy	better than ± 0,01 %	better than ± 0,02 % better than ± 0,01 % with special calibration	better than ± 0,02 % better than ± 0,01 % with special calibration

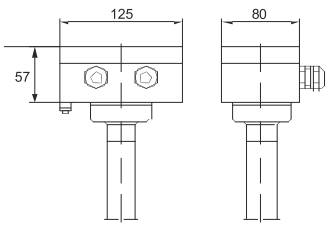
5.3 Repeatability

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Repeatability	better than ± 0,005 %	better than ± 0,005 %	better than ± 0,005 %

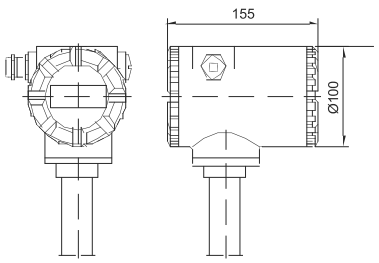
6. CONSTRUCTION DETAILS

6.1 DESIGN / DIMENSIONS

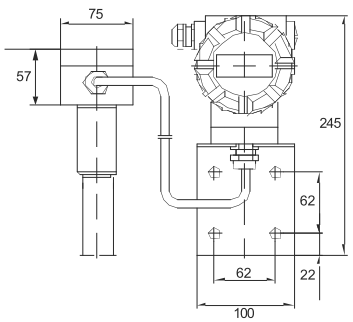
PV, PK preamplifier



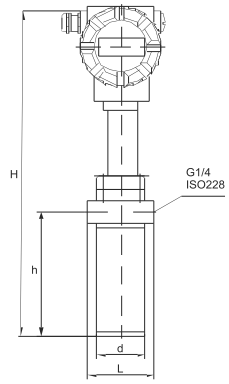
TV Transmitter



TW wall mounted with cable length 1,5m

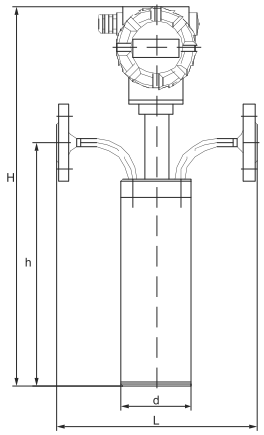


DIMF 1.3



Dimensions (mm)			DIMF 1.3 PV	DIMF 1.3 PK	DIMF 1.3 TV	DIMF 1.3 TW
Length acc. type (L)						
Female threads	Flanges					
82	200	H	374	241	412	408
		h	155	155	155	155
		d	60,3	60,3	60,3	60,3

DIMF 2.0 / DIMF 2.1



Dimensions (mm)			DIMF 2.0 PV	DIMF 2.0 TV	DIMF 2.0 TW	DIMF 2.1 PV	DIMF 2.1 TV	DIMF 2.1 TW
Length acc. connection type (L)								
Swagelok, Sanitary thread others on request	Flanges							
50	50							
DIMF 2.1 only with flanges Type L = 450 mm		H	430	468	464	776	814	810
		h	301	301	301	643	643	643
		d	88,9	88,9	88,9	219,1	219,1	219,1

6.2 Material

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Materials of wetted parts	Special alloy from NiFeCr und 1.4571	Stainless steel 1.4571 (SS316), Stainless steel 1.4306 (SS304L), Inconel 600 (.4816.10), Tantalum 2.6051.9, Monel 400 (.4360), Hastelloy C4 (.4610), Hastelloy B (.4617),	Stainless steel 1.4571 (SS316), Hastelloy C4 (.4610), Tantal
Material of sensor housing	Stainless steel 1.4571 (SS316)		
Specialities	Version without gaskets		

Attention: Please refer to chapter 7.2 for possible combinations of type and material

7. OPERATING CONDITIONS

7.1 Degree of protection

	Ambient temperature	Housing	Ex-protection
DIMF 1.3, 2.0, 2.1 TVS EExi	-40 to +58°C	IP67	II 1/2 G EEx ia IIC T4 Sensor element suitable for Zone 0 Observe special conditions
DIMF 1.3, 2.0, 2.1 TVS EExd	-40 to +58°C	IP67	II 2 G EEx d [ib] IIC T4 Observe special conditions
DIMF 1.3 PV EExi	-50 to +70 / +85°C	IP65	II 2 G EEx ib IIC T6/T5
DIMF 1.3 PV EExd	-40 to +60°C	IP65	II 2 G EEx d [ib] IIC T4
DIMF 2.0 PV EExi	-50 to + 70 / +85°C	IP65	II 2 G EEx ib IIC T6/T5

Protection for housing IP according IEC 59 / EN 6059, Ex-approval directive 94/9/EC
Attention: The LC-display of the transmitter TV work from -10°C up to +70°C. Tantalum type with TVS: EExi IIG EEx ia IIC T4.

7.2 Pressure limit and process connection

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Pressure limit	max. 100 bar depending on the process connection		40 bar
Process connection	Core thread G ¼ acc. ISO 8 Flange connection acc. DIN545: DN10 PN40 Flange connection acc. DIN547: DN10 PN100 Flange connection acc. ANSIB16.5: ½“ ANSI 150 RF, ½“ ANSI 300 RF, ½“ ANSI 600 RF	Swagelok for pipe diameter 12 mm Steril connection Flange connection acc. DIN545: DN15 PN40, DN5 PN40 Flange connection acc. DIN547: DN15 PN100, DN5 PN100 Flange connection acc. ANSIB16.5: ½“ ANSI 150 RF, ½“ ANSI 300 RF, 1“ ANSI 150 RF, 1“ ANSI 300 RF, ½“ ANSI 600 RF, 1“ ANSI 600 RF	Flange connection acc. DIN EN1091: DN 5 PN 40 DN 50 PN 40 Flange connection acc. ANSI B16.5: 1“ ANSI 150 RF, 1“ ANSI 300 RF, “ ANSI 150 RF, “ ANSI 300 RF

Achtung: DIMF1.3 is available only with transmitter option V or W
DIMF 2.0 with Swagelok or sanitary connection is available only with stainless steel 1.4571, stainless steel 1.4306 or Hastelloy C4.
DIMF 2.0 with NAUE-thread or TRI-Clamp connection is available only with stainless steel 1.4571

7.3 Temperature limit

	DIMF 1.3	DIMF 2.0	DIMF 2.1
Operating temperature	-40° upto +150°C		

High temperature version (H) is available only with DIMF 2.0

7.4 Flow range and pressure loss

	Flow in ℓ/min		Pressure loss in bar
	Recommended	Limits	(H_20, 20°C)
DIMF 1.3	0,3 to 1	0 to 10	1 l/min : 0,015
DIMF 2.0	1,5 to 6	0 to 50	6 l/min : 0,04
DIMF 2.1	20 to 50	0 to 350	50 l/min : 0,025

8. CERTIFICATES AND APPROVALS

EC-type exemination certificates

EC-certificate of conformity CE-DIMF (Bopp & Reuther Messtechnik)

Directive 94/9/EC (Ex-protection)
EN 13463-1: Non-electrical equipment for use in potentially explosive atmospheres
EN 1127-1: Ex-protection, basic concepts and methodology
EN 60079-0: Explosive atmospheres. Equipment. General requirements
EN 60079-11: Intrinsically safety „i“
EN 60079-1: Flameproof enclosures „d“
- DIMF with transmitter Typ TVS EEx ia ZELM 99 ATEX 0008 X
- DIMF with transmitter Typ TVS EEx d BVS 04 ATEX E 00 X
- DIMF with preamplifier PV24 EEx ib DMT 00 ATEX E 09 X
- DIMF1.3 with preamplifier PV24 EEx d DMT 00 ATEX E 09 X

Directive 2004/108/EC (EMC - Electromagnetic Compatibility)
- EN 61000-6-2 : Generic standards. Immunity for industrial environments
- EN 61000-6-3: Generic standards. Emission standard for residential, commercial and light-industrial environments

Directive 97/23/EC (PED - Pressure Equipment Directive)
- Classification acc. §3Abs.3 „Sound engineering practice“
- AD-Pamphlets

Type-approval certificate under German law Measuring Equipment Directive - MID

Other approvals and certificates

GOST- approval (GOST R Ex-approval, GOST R Pattern approval)
Gortechnadzor, NEPSI

9. DOCUMENTATION

Manuals

A-EN-06530-00 Rev.A Manual Density and Concentration MeterDIMF 1.3 TVS DIMF 2.0 DIMF 2.1 TVS
A-EN-06131-00 Rev. A Manual Density Meter DIMF1.3 PV
A-EN-06231-00 Rev. B Manual Density DIMF2.0 PV

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