BOPP & REUTHER MESSTECHNIK

Oval Wheel Meter OI-Serie

with Universal Smart Transmitter UST

with HART® Communication

Ex d – version	**USTD**
Ex d (connection room) / Ex i (installation room electronics) – version	**USTX**

Operating Manual

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Foreword

I. Transport, Delivery, Storage

Always protect devices against humidity, soiling, impacts and damages

Delivery Inspection:

Check the delivery for completeness upon receipt. Compare the device data with the data on the delivery note and in the order records.
Report any in-transit damage immediately. Damage reported at a later date shall not be recognized.

II. Warranty

Please refer the contractual terms and conditions relating to delivery for the scope and period of warranty.
Warranty claims shall be conditional to correct installation and commissioning in accordance with the operating instructions of the device. The necessary installation, commissioning and maintenance work should only be carried out by qualified and authorized personnel.

III. General safety instructions

1. Oval Wheel Meters are reliable, high accurate volumetric measuring devices. They should only be used for their intended purpose. Always observe the pressure and temperature limits stated on the type plate, as well as all other technical data and safety information during device installation, start-up and operation.
2. Always observe national and international regulations concerning the operation of devices and systems under pressure.
3. Prior to installation, the operator has to ensure that the pressure bearing parts have not been damaged during transportation.
4. The devices have to be installed, operated and serviced by qualified personnel. The operator has the responsibility to ensure that the personnel have received sufficient and appropriate training. In cause of doubt, please contact the manufacturer.
5. The operator must ensure that the materials used (wetted parts) of the device compared with the measured liquid are chemically resistant.
6. The gaskets or sealing elements must be handled with care according to the operating instructions.
7. The tightening torques for the screw connections at the cover and lower part of the housing, as well as for the flange connections in the pipework are available on request.
8. The sensors (for the pulse pick-up and, if necessary, for the temperature measurement) should only be replaced once it has been ascertained that the meter is depressurised.
9. Symbols used

Warning!
Failure to observe this warning can lead to injury of persons or a security risk.

Attention!
Non-compliance can lead to faulty operation or damage to the device.

IV. CMOS - Components

The electronic transmitter uses CMOS chips. Therefore, when the electronics casing is opened, static electricity discharges must be avoided. These can damage the electronic transmitter. Bopp & Reuther Messtechnik GmbH may not be held liable for any damages, which are caused either indirectly or directly by improper handling.

Use only antistatic transport containers for transport of electronic assembly groups.

1. Identification

Manufacturer: Bopp & Reuther Messtechnik GmbH
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67346 Speyer
Phone: +49 6232 657-0
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Product type: direct volumetric meters (positive displacement flow meters)

Product name: Oval Wheel Meter series OI with Universal Smart Transmitter (UST) and HART® Protocol
USTD: Ex d - version
USTX: Ex d (connection room) / Ex i (installation room electronics) – version

Version no.: A-EN-01216-XD Rev.D

2. Range of Application

Quantity control of certain industrial liquids is an economic necessity considering the high value of these products. The volume measuring instruments required for these procedures must be adjusted to the particular operating conditions and the characteristics of the liquids to be measured, both with respect to design and the materials used for these instruments.

The field of application of all Oval Wheel Meters of the OI series comprises measuring, dosage, and controlling of liquids. Oval Wheel Meters of the OI series meet all of these requirements. They are used for the measurement of intermediate and final liquid products such as liquified gases, acids, alkaline solutions, fats, alcohol, solvents, dispersions, polymers, polycondensates, paints, colors, adhesives and other media.
Please note the Oval Wheel Meter's capability to measure liquids with very high viscosities with nearly no pressure loss.

The high accuracy provided by the OI series Oval Wheel Meters ensure a maximum quality of the products being manufactured.

Oval Wheel Meters of the OI series are manufactured with nominal widths of 6 to 100 mm. Depending on the nominal width they can be used for up to PN 40 with a maximum operating temperature of up to 170 °C.

Other models of the Oval Wheel Meter series may be used for a variety of purposes e.g. in the petrochemical industry for loading tank trucks and oil tankers, in the food industry to measure milk, vegetable oils, fruit juices, wine, spirits, beer or their respective initial products.

For all Oval Wheel Meters a wide choice of accessories is available including mechanical, electrical and electronic transmitters. Their signals may be used for remote counting, flow measuring and flow control as well as for data processing systems. In addition, automatic batch control systems (with appropriate valves) of the most varied constructions and working principles are available to facilitate dosage of media.

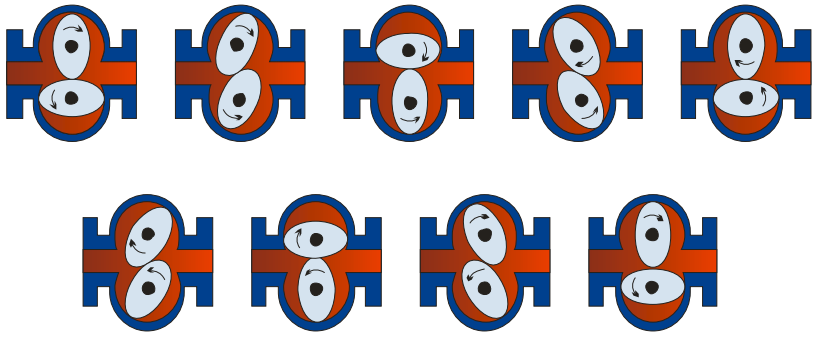
The UST Universal Smart Transmitter represents state-of-the-art transmitter electronics. It processes the electrical pulses of the different sensor systems to display volume and flow of the fluid. The flow-rate is displayed with an analogue 4-20mA current loop (in accordance with NAMUR NE 43). The UST is 2-wire-based and is also supplied with auxiliary power by this current loop. Additionally a separate pulse output according to NAMUR is provided – not **USTX**.

With the integrated HART®-interface, long-distance data transmission to a control room or a portable on-site data terminal may be achieved by the same analog current loop. All relevant operating or configuration data can be read out from the transmitter or stored into the transmitter. Thus the operational mode of the Oval Wheel Meter can be optimized for any measuring task directly on-site or via a control system.

3. Working Principle and System Design

3.1 Measuring Principle

Oval Wheel Meter belongs to the group of direct volumetric meters for liquids with movable partition walls (displacement flow meters).
The Oval Wheel Meter consists of a measurement chamber housing with two pivoted oval wheels which are toothed and roll off each other in counter-rotations.
The diagram displays oval wheel movement during the measurement process.



Each revolution the oval wheels displaces a discrete volume of liquid (defined by the space between the oval wheel and measurement chamber) through the chamber.

For measuring purposes the rotation of the oval wheel is transmitted from the pressure chamber to the outside via an electromagnetic sensor according to the Wiegand principle and processed to be available as standardized electrical signal or counter display.

3.2 System Design

The Oval Wheel Meter with Universal Smart Transmitter (UST) consists of the following components:

Transducer:
Measuring of the volumetric flow and the volume of liquids is performed by the Oval Wheel Meter.

Pulse pick-up:

AG4x (AG41, 42 and 43) or models of the series AG5x are used for transmission.

Transmitter (UST):
The UST electronic transmitter pre-processes and evaluates the meter pulses.
An analog 2-wire based 4-20 mA current loop, a digital communication module with HART® protocol as well as a separate pulse output for the measuring of the volume (original pulses or scaled pulses) according to NAMUR are standard features of the device.

Version **USTX** has no NAMUR-pulse output.

4. Input

4.1 Measured value

Volume and volumetric flow

4.2 Measuring Range

Type	DN	Flowrate Qmax [ℓ/h]	Ranges at viscosity	0.3 – 0.8 mPa·s		0.8 - 2 mPa·s		2 – 50 mPa·s		50 – 150 mPa·s		150 - 350 mPa·s		350 - 1000 mPa·s	
				[ℓ/min]	[ℓ/h]	[ℓ/min]	[ℓ/h]	[ℓ/min]	[ℓ/h]	[ℓ/min]	[ℓ/h]	[ℓ/min]	[ℓ/h]	[ℓ/min]	[ℓ/h]
OI 03	6 15	120	Min Max Continous Batching	0.3 1.6 1.0 1.3	20 100 60 80	0.2 2.0 1.3 1.8	12 120 80 110	0.2 2.0 1.8 2.0	12 120 110 120	0.18 1.8	11 110	0.1 1.0	6 60	0.03 0.4	2 25
OI 06	10 15	250	Min Max Continous Batching	0.6 3.3 2.1 2.6	40 200 130 160	0.4 5.1 2.6 3.7	25 250 160 225	0.4 4.1 3.7 4.1	25 250 225 250	0.3 3.7	20 225	0.2 2.1	13 130	0.08 0.8	5 50
OI 1	15	600	Min Max Continous Batching	1.6 8.3 5.0 7.5	100 500 300 450	1.0 10.0 6.6 9.0	60 600 400 540	1.0 10.0 9.0 10.0	60 600 540 250	0.9 9.0	54 540	0.6 6	36 360	0.2 2.0	12 120
OI 2	25	1800	Min Max Continous Batching	5.0 25.0 15.0 21.6	300 1500 900 1300	3.0 30.0 20.0 26.0	180 1800 1200 1600	3.0 30.0 26.0 26.6	180 1800 1600 1800	2.6 26.0	160 1600	1.6 17.5	100 1000	0.6 6.0	36 360

Measuring ranges for other viscosities available, measuring range for sulphuric acid: see list L 419.1
Measuring range for cold water:
For column 0.3 – 0.8 mPa·s continuous operation this is 50 % and for max. resp. charge operation 70 % of line 2 (max)

Measuring range for media with Newtonian flow properties applicable to oval wheels with sleeve bearings

Typ	DN	Flowrate Q_{max} [ℓ /min]	Range at viscosity	< 0.3 mPa·s normal tooth profile		0.3 – 1.5 mPa·s normal tooth profile		1.5 - 150 mPa·s normal tooth profile		upto 350 mPa·s special tooth profile except OI5		upto 1000 mPa·s special tooth profile except OI5		upto 3000 mPa·s special tooth profile except OI5	
				[ℓ /min]	[m³/h]	[ℓ /min]	[m³/h]	[ℓ /min]	[m³/h]	[ℓ /min]	[m³/h]	[ℓ /min]	[m³/h]	[ℓ /min]	[m³/h]
OI 5	25	50	Min Max Continous Batching	8 40 16	0.5 2.4 1	5 50 33 45	0.3 3 2 2.7	5 50 33 45	0.3 3 2 2.7	2.5 25	0.15 1.5	1.25 12.5	0.075 0.75	0.45 4.5	0.027 0.27
OI 10	25	100	Min Max Continous Batching	16 80 33	1 5 2	10 100 66 90	0.6 6 4 5.4	10 100 80 90	0.6 6 4.8 5.4	7 70	0.42 4.2	3.5 35	0.20 2	1.2 12	0.072 0.72
OI 50	50	300	Min Max Continous Batching	50 250 100	3 15 6	30 300 200 270	1.8 18 12 16.2	30 300 240 270	1.8 18 14.4 16.2	18 180	1.08 10.8	9.5 90	0.54 5.4	3 30	0.18 1.8
OI 100	50	660	Min Max Continous Batching	110 550 230	6.6 33 13.2	66 660 440 590	3.9 39.6 26.4 35.4	66 660 530 600	3.9 39.6 31.8 39.6	48 480	2.9 29	24 240	1.45 14.5	10 100	0.6 6
OI 200	80	700	Min Max Continous Batching	110 560 230	6.6 34 14	70 700 420 560	4.2 42 25.2 33.6	70 700 525 630	4.2 42 31.5 37.8	50 500	3 30	25 250	1.5 15	12 120	0.72 7.2
OI 400	100	1200	Min Max Continous Batching	200 1000 400	12 60 24	120 1200 720 960	7.2 72 43.2 57.6	120 1200 1000 1100	7.2 72 60 66	100 1000	6 60	60 600	3.6 36	30 300	1.8 18

Measuring range for media of low and high viscosity with Newtonian flow properties applicable to oval wheels with ball bearings

Type	DN	Flowrate Q_{max} [ℓ /min]		1.5 - 20 mPa·s		upto 350 mPa·s		upto 2000 mPa·s		upto 5000 mPa·s		upto 10000 mPa·s		upto 20000 mPa·s		upto 60000 mPa·s	
				[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]
OI 50	50	300	Min	60	3.6	30	1.8	15	0.9	7.5	0.45	4	0.24	2	0.12	1	0.06
			Max	300	18	300	18	200	12	150	9	80	5	40	2.5	12	0.72
OI 200	80	700	Min	140	8.4	70	4.2	30	1.8	15	0.9	10	0.6	4	0.25	3	0.18
			Max	700	42	700	42	700	42	350	20	180	11	80	5	25	1.5
OI 400	100	1200	Min	240	14.5	120	7.2	60	3.6	35	2	17	1	10	0.6	4	0.24
			Max	1200	72	1200	72	1200	72	700	42	350	21	180	11	50	3

Measuring range for media of intrinsic viscosity that do not display Newtonian flow properties (e.g. dispersions) applicable to oval wheels with ball bearings

Type	DN	Flowrate Q_{max} [ℓ/min]		1.5 - 20 mPa·s		upto 300 mPa·s		upto 3000 mPa·s		upto 6000 mPa·s		upto 100000 mPa·s	
				[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]	[ℓ/min]	[m³/h]
OI 50	50	300	Min	60	3.6	30	1.8	12	0.72	7.5	0.45	4.5	0.27
			Max	300	18	300	18	240	14.5	150	9	90	5.4
OI 200	80	700	Min	140	8.4	70	4.2	25	1.5	15	0.9	10	0.6
			Max	700	42	700	42	500	30	300	18	200	12
OI 400	100	1200	Min	240	14.5	120	7.2	45	2.7	30	1.8	18	1.1
			Max	1200	72	1200	72	900	54	600	36	360	22

The figures in the table are general nominal ratings. The exact range depends on measured media, viscosity and counter type and is listed in the respective sheet attached.

5. Output

5.1 Outputsignal

The output signals are available as analog output or as current pulse output with two-wire technology, as well as separate NAMUR pulse output.
Version **USTX** has no NAMUR-pulses.

5.1.1 Analog current output

The flow is a unit signal output of 4-20 mA. Initial value, final value and attenuation can be pre-set.
The analog current output transmits the analog flow measurement value within the range of 4-20 mA.

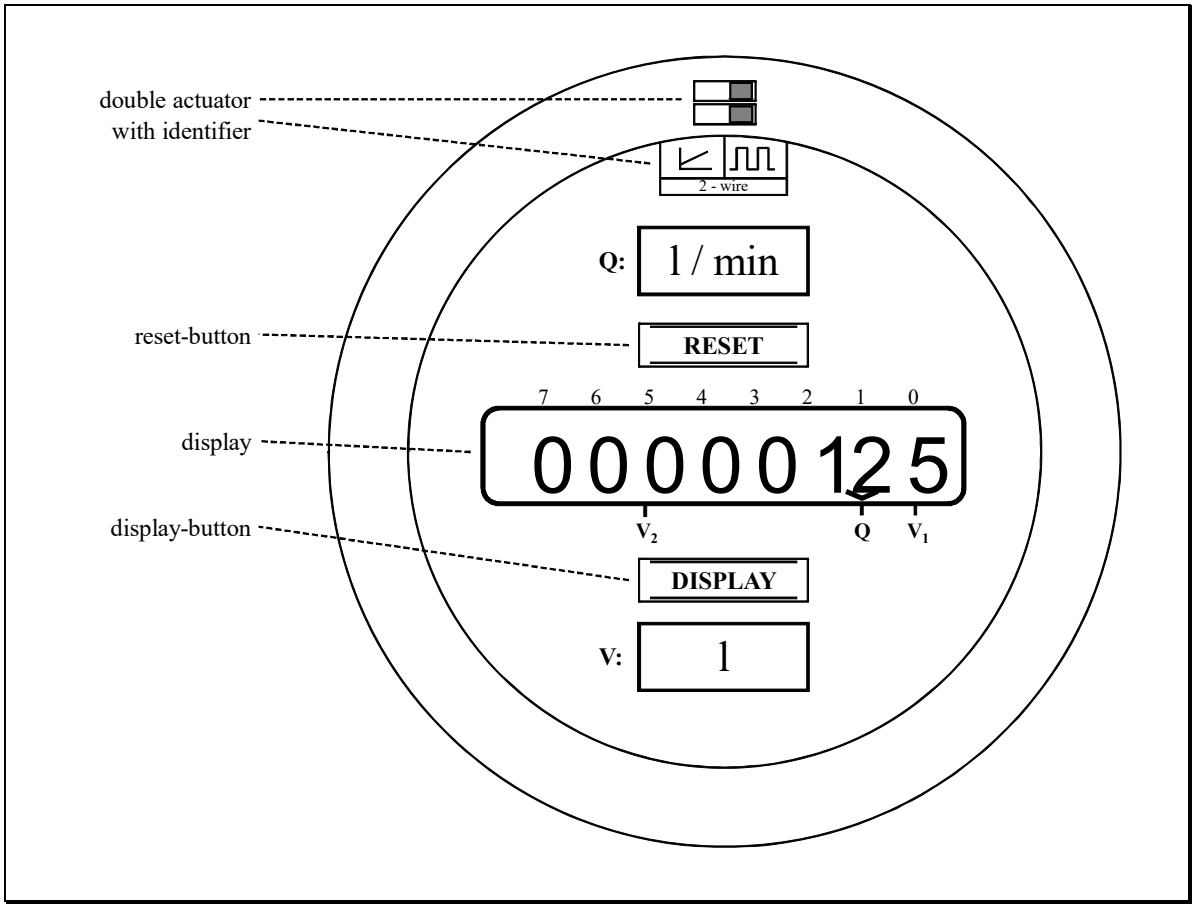
5.1.2 Pulse output

Two different types of pulse outputs (current pulse or NAMUR pulse) are available for the transmission of the volume flow. Output can either be set as original pulse without evaluation or as scaled pulse with selectable

pulse width. This applies to both types of pulse outputs. The pulse value can be scaled with an additional factor regarding the internal meter increments. The original pulse has a set pulse width of 0.5 ms. The maximum output frequency is 1 kHz. The pulse width for the scalable pulse can be selected, thus putting a limit to the maximum output frequency.

5.1.2.1 Two-wire current pulse output

On the two-wire current loop, the output signal is a current pulse between 4 mA = low and 20 mA = high. This pulse output can be activated by means of a double actuator on the power supply circuit board. The current pulse is provided at terminal 1 and 2 of the current loop. (The analog signal of 4-20 mA for the volume flow is no longer available). HART®-communication is restricted.



5.1.2.2 Pulse output according to NAMUR– not at Version USTX

The NAMUR-output pulse is provided at terminals 3 and 4. The signals are structured according to the European standard, EN 60947-5-6.

5.2 Load

Several parameters have to be considered for the load tolerance.
To ensure trouble-free HART® communication, the minimal load is RL ≥ 230 Ω and the maximum load is RL ≤ 1100 Ω.

Maximum load:

The maximum load depends on the supply voltage:

Applies to **USTD**:

for U_B < 15.2V :

$R = (U_B – 14V) / 0.004A$

for $U_B \geq$ 15.2V:

$R = (U_B –8,5V) / 0.022A$

Applies to **USTX**:

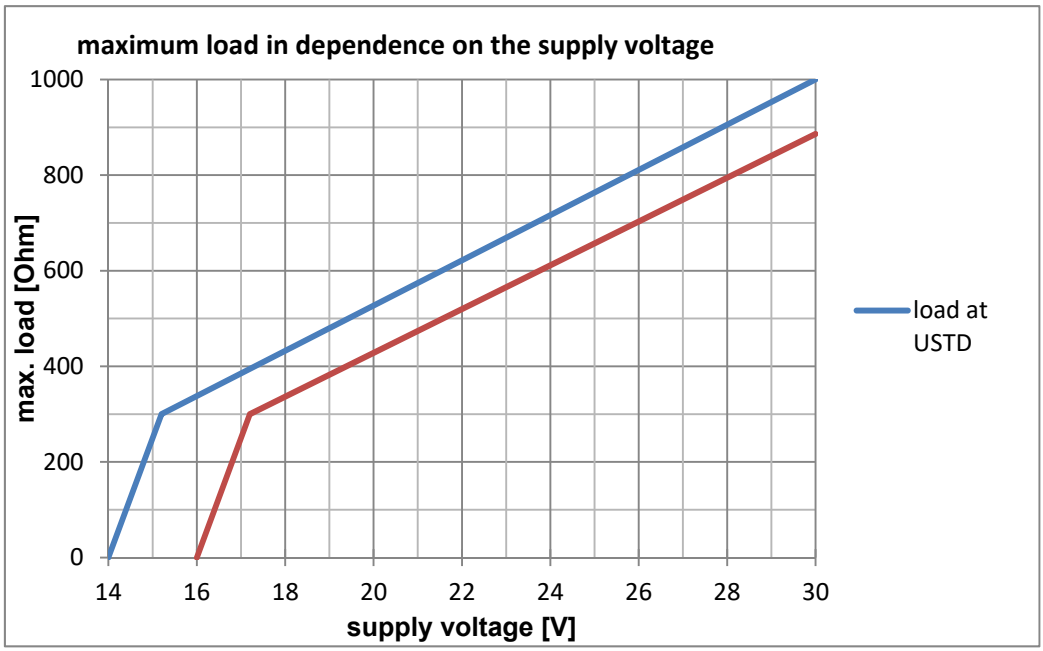
for U_B < 17.2V :

$R = (U_B – 16V) / 0.004A$

for $U_B \geq$ 17.2V:

$R = (U_B –10,5V) / 0.022A$

The resistance values are in Ω.



5.3 Electrical and thermal safety data

5.3.1 USTD –> Ex d UST flameproof enclosure

1. Power supply and signal circuits (terminals 1+2)

Reference Voltage	U_N	=	DC 24 V
	U_M	=	AC 250 V
Reference Amperage	I_N	=	4-20 mA
Nominal Output	P_N	=	600 mW

2. NAMUR opto-coupler output (terminals 3+4)

Reference voltage	U_N	=	DC 8 V
	U_M	=	AC 250 V

3. Sensor circuit with protection type Ex ia IIC (to be connected to pulse emitting sensors).

Voltage	Uo	=	UC 9.25 V
Amperage	Io	=	5.2 mA
Output	Po	=	12 mW
Internal inductivity	Li	=	negligible
Charcteristic line			linear

	IIC	IIB
Max. concentrated capacity Ci + Co and concentrated inductivity Lo (mixed connection)	200 nF 846 mH	200 nF 2.325 H
Relation inductivity-resistance Li/Ri	-	11.82 mH/Ω

4. The ambient temperature for the Universal Smart Transmitter is:
Type ***__USTD__***: -40°C ≤ Ta ≤ +70°C (Ex d - variant)

Special conditions for safe use
For versions of the Universal Smart Transmitter for direct mounting on the sensor, the influence of external heat sources (process temperature) on the housing temperature must be taken into account.

An optional thermal insulation may extend to half of the extension. The ambient temperature must be maintained directly next to the electronics housing.

Class	T_U	T_{Media}	
T3	64	170	
T4	66	135	
T4	67	110	
T4	70	70	
minimum	-20	-10	for all classes
		Optional -60	

5.3.2 USTX -> Ex d (connection room flameproof enclosure) / Ex i (installation room electronics instrinsically safe)

(Note: In approval USTI, because electronic intrinsically safe)

1. Non instrinsically safe supply and signal circuit (clamps 1+2) (4-20 mA current loop)

Rated voltage	U_N	=	DC 24 V
max. permitted voltage for normal operation			DC 26 V
	U_m	=	AC 250 V
Power consumption	P_N	=	1 W

Special conditions for safe use
The "-" pole of the non-intrinsically safe supply and signal circuit is connected to the housing. The earthing of the non-intrinsically safe supply and signal circuit / housing must comply with section 6.6 of EN 50020:2002.

2. Internal instrinsically safe supply and signal circuit
(internal safety shunt assembly providing current limitation; level of protectiont Ex ib IIC)

Voltage	U_o	=	DC 30 V
Short circuit current	I_o	=	26.6 mA
Power	P_o	=	798 mW

3. Pick-up circuits (types of protection Ex ib IIC) for connection passive pick-ups;
   Galvanically connected with the supply and signal circuit

Pick-up	Inductor	Contact
Terminals	7 and 8	5 and 6
Voltage U_0	1 V	6.6 V
Stromstärke I_0	4 mA	23 mA
Current P_0	1 mW	37 mW
max. external capacitance C_0	≤ 100 µF	≤ 22 µF
or		
max. external inductance L_0	≤ 1 H	≤ 35 mH
max. external capacitance C_0 max. external inductance L_0 (combined connection)	≤ 4 µF ≤ 1 H	≤ 0.9 µF ≤ 1.5 mH
Inductance- resistance ratio L_0/R_0	40.5 mH/Ω	0.93 mH/Ω

4. The ambient temperature for the Universal Smart Transmitter is:
   Type ***__USTX__***: -40°C ≤ Ta ≤ +60°C

An optional thermal insulation may extend to half of the extension. The ambient temperature must be maintained directly next to the electronics housing.

Class	T_U	T_{Media}	
T3	64	170	
T4	66	135	
T4	67	110	
T4	70	70	
minimum	-20	-10	for all classes
		Optional -60	

6. Characteristic Parameter

6.1 Reference conditions

All oval wheel counters are calibrated at test benches approved for fiscal metering. Pressure: 2 to 7 bar, temperature: 20°C to 30°C

6.2 Tolerated deviation

OI 03, OI 06, OI 1, OI 2: ± 0.3% (up to ± 1% depending on viscosity)
OI 5, OI 10, OI 50, OI 100, OI 200; OI 400: ± 0.1% (up to ± 1% depending on viscosity)

6.3 Repeatability

< 0.02%

6.4 Settling time

1 s

6.5 Switch-on drift

2 s

6.6 Long-term drift

< 0.005% / year

6.7 Influence of ambient temperature

< 0.005% / °C

6.8 Influence of media temperature

Depends on the viscosity of the media.

7. Operating conditions

7.1 Installation conditions

7.1.1 Installation instructions

Warning!

Before mounting and operating the device, carefully read and observe the installation instructions.

Before mounting or disassembling the device, **depressurize** and **cool down the system**.

7.1.1.1 General information

- Bopp & Reuther Oval Wheel Meters are precision flow meters. Inlet and outlet are covered with protective caps against foreign substances. Remove caps shortly before putting the device into operation.
- Observe the operating data marked on the oval wheel, the order confirmation and the configuration data sheet. If you want to use the device under differing operating conditions, consult Bopp & Reuther Messtechnik GmbH indicating the factory number.
- Install the Oval Wheel Meter in the pressure pipe behind the pump (approximately 3 m liquid column pressure drop for nominal flow rate).
- Install the Oval Wheel Meter in such a way, that it remains filled with liquid also in non-operating condition.
- To avoid measuring inaccuracies due to gas bubbles or contamination, preventive measures must be taken (e.g. gas separator or type N strainer).
- Oval Wheel Meters intended for liquid food products must be cleaned thoroughly before putting them into operation (see Maintenance and Cleaning).

7.1.1.2 Installation

- Flush and purge the pipe. When doing so, replace the Oval Wheel Meter with a suitable piece of piping.
- Do not remove the caps on the in- and outlet of the Oval Wheel Meter until the device is being installed to prevent ingress of foreign substances.
- The flow direction is indicated by an arrow on the housing of the Oval Wheel Meter.
- The housing cover of the Oval Wheel Meter is to be placed vertically so that the axes of the Oval Wheel are in a horizontal position independent of the position of the pipe.
- The Oval Wheel Meter must be installed free from strain.

USTD:
The **USTD** can be used together with the pulse trigger series AG4x (41,42,43) according to the protection type „flameproof“ **II 2G Ex d [ia] IIC /** ⟨Ex⟩ **T6** in the Ex-area. ⟨Ex⟩

USTX:
The **USTX** can be installed together with the pulse trigger series AG4x (41,42,43) according to the protection type „flameproof“ (Ex-d), supplied (connection room) and connected.

For the electronic and sensors the supply in Ex-d (in the connection room) is converted in Ex-ib, thereby instrinsically safe (Ex-ib) supplied and operated.
The identification for this combination is: ⟨Ex⟩ **2G Ex d [ib] IIC T4**

EMV protection can only be granted with shielded wires. The shielding must be grounded in the metal-PG-connecting bolts.

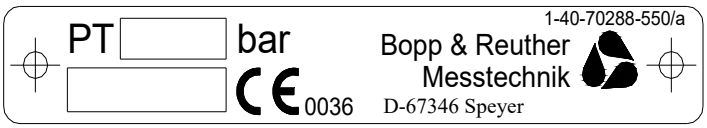
7.1.2 Start-up instructions

Important

- **Start-up the Oval Wheel Meter slowly increasing the flow quantity.**
- **For systems measuring viscous fluids, which have to be heated, be sure to switch on the heater of the Oval Wheel Meter, the filter and the pipe well ahead in time; only then the Oval Wheel Meter may be started-up while the flow quantity is slowly increased.**

Type plates with pressure relevant information

Additional type plate at the flange connection with CE0036 mark.
The used abbreviations have the following meaning:
PT: Achieved test pressure and test date



7.2. Environmental conditions

7.2.1 Ambient temperature

USTD -10° C to +70° C
USTX -10° C to +60° C

7.2.2 Ambient temperature range

USTD -10° C to +70° C
USTX -10° C to +60° C

7.2.3 Storing temperature

OI: -25° C to +100° C

USTD: -20° C to +70° C
OI mit **USTD**: -20° C to +70° C

USTX: -20° C to +60° C
OI mit **USTX**: -20° C to +60° C

7.2.4 Climatic category

Class D IEC 654-1

7.2.5 Degree of protection

IP65 IEC 529 / EN 60529

7.2.6 Electromagnetic compatibility

DIN EN 61000-6-2; DIN EN 61000-6-3

Electromagnetic compatibility may only be warranted when the electronics housing is closed.

7.3. Process conditions

7.3.1 Media temperature

		Material group (see 8.3)				
	pulse pick-up AG	A4	G1	G2	F5	F57
-10°C - 60°C	41 / 42 / 43	x	x	x	x	x
-10°C - 110°C nur DN 25	41[2] / 42 / 43	x	x	x	x	
-10°C - 110°C [1]	41[2] / 42 / 43	x	x	x	x	x
-10°C - 170°C [1]	41[2] / 42[2] / 43[2]	x	x	x	x	x
lower limit -40°C [3]	41[2] / 42[2] / 43[2]			x	x	x

1) with high temperature tolerances
2) with spacer
3) operating pressure = 50 % PN

7.3.2 State of aggregation

Suitable for liquids

7.3.3 Viscosity

OI 03, OI 06, OI 1, OI 2, OI 5: 0,3 - 3000 mPa·s
OI 10, OI 50, OI 100, OI 200; OI 400: up to 100.000 mPa·s (special gearing)

7.3.4 Media temperature range

90°C (170°C) () = optional

7.3.5 Media pressure range

Depends on the material used (for materials see section 8.3.)

	DN 6	DN 10	DN 15	DN 25	DN 50	DN 80	DN 100
A4	PN 25	PN 25	PN 25	PN 25	PN 10	PN 10	PN 10
G1				PN 25	PN 16	PN 10	PN 10
G2				PN 40	PN 40	PN 25	PN 25
F5	PN 40	PN 40	PN 40	PN 40	PN 40	PN 25	PN 25
F57				PN 40	PN 40	PN 25	PN 25

Attention!

At temperatures higher than 50°C, the maximum pressure must be reduced according to the nominal pressure according to the tables "Pressure/temperature assignment of the flange standard DIN EN 1092

7.3.6 Flow rate range

Values in l/min

OI 03	OI 06	OI 1	OI 2	OI 5	OI 10	OI 50	OI 100	OI 200	OI 400
2	4,2	10	30	50	100	300	660	700	1200

7.3.7 Pressure loss

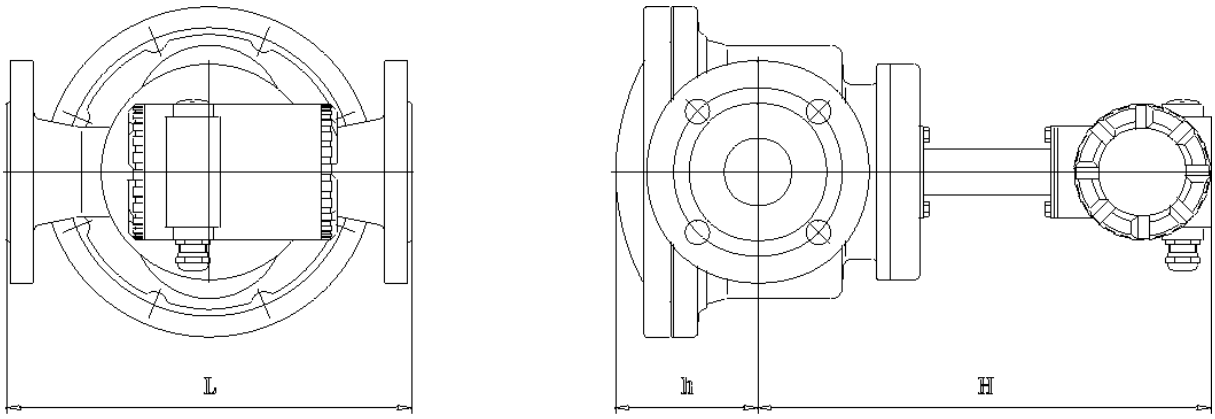
Value in bar for water

OI 03	OI 06	OI 1	OI 2	OI 5	OI 10	OI 50	OI 100	OI 200	OI 400
<0,3	<0,15	<0,15	<0,15	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3

8. Construction details

8.1 Design/dimensions

OI 03	OI 06	OI 1	OI 2	OI 5	OI 10	OI 50	OI 100	OI 200	OI 400
L=170 (flange)	L=170 (flange)	L=170	L=220	L=220	L=220	L=300 (DIN) L=330 (ANSI) under develop ment	L=370 (DIN, ANSI 150) L=390 (ANSI 300)	L=450 (DIN, ANSI 150) L=470 (ANSI 300)	L=550 (DIN, ANSI 150) L=560 (ANSI 300)
				h=52	h=71	h=104	h=146	h=145	h=183
H=225	H=	H=	H=	H=	H=	H=395	H=	H=	H=



8.2 Weight

OI 03	OI 06	OI 1	OI 2	OI 5	OI 10	OI 50	OI 100	OI 200	OI 400
5 kg	5 kg	13 kg	18 kg	13 kg	16 kg	35 kg	66 kg	75 kg	120 kg

8.3 Material

	OI 03	OI 06	OI 1	OI 2	OI 5	OI 10	OI 50	OI 100	OI 200	OI 400
housing	bras CrNiMo	bras CrNiMo	bras CrNiMo	bras CrNiMo	bras cast iron cast steel CrNiMo	bras cast iron cast steel CrNiMo	bras cast iron cast steel CrNiMo	bras cast iron cast steel CrNiMo	bras cast iron cast steel CrNiMo	bras cast iron cast steel CrNiMo
wheels	bras CrNiMo	bras CrNiMo	bras CrNiMo	bras CrNiMo	Cast iron bras CrNiMo	Cast iron bras CrNiMo	Cast iron bras CrNiMo	Cast iron bras CrNiMo	Cast iron bras CrNiMo	Cast iron bras CrNiMo
bearing	hard carbon	hard carbon	hard carbon	hard carbon	hard carbon; ball bearing	hard carbon; ball bearing	hard carbon; ball bearing	hard carbon; ball bearing	hard carbon; ball bearing	hard carbon; ball bearing

	A 4		G 1		G 2			F 5		F 57	
	bras	hard carbon	cast iron	hard carbon	cast iron	hard carbon	cast iron	CrNiMo	hard carbon	CrNiMo	ball bearing
housing	•		•		•			•		•	
wheels	•		•			•		•		•	
cover meas. chamber	•		•			•		•[1]	•	•	
bearing plates							•		•		
bearings		•		•			•		•		•

1) there is no CrNiMo measuring chamber cover for nominal widths < DN 80

8.4 Process connection

OI 03	OI 06	OI 1	OI 2	OI 5	OI 10	OI 50	OI 100	OI 200	OI 400
DN 15 flange DN 6 pipe	DN 15 flange DN 10 pipe	DN 15 flange	DN 25 flange	DN 25 flange	DN 25 flange	DN 50 flange	DN 50 flange	DN 80 flange	DN 100 flange

8.5 Electrical connection

The electrical connections are located under the cover of the shorter casing side.

cable connection screws : M20 x 1,5 mm

or

NPT ½"

When you connect the transmitter is essential to ensure that the individual free wires are no longer than 50mm. This can be done by cutting the casing, an insulating tube or a cable tie just before the connecting terminal.

To operate the UST a two-wire connection (terminals 1 + 2) is sufficient. This line serves three functions:

- Transmission of the analog signal representig the flow volume with 4-20 mA.
- Generation of auxiliary energy by the UST itself from the live zero with 4mA.
- Modulation of the FSK-signal (Frequency Shift Keying) on the current loop for digital data transmission according to HART® specifications.

The output of the NAMUR-pulses are terminals 3+4. Not at **USTX**!

No further connections are required. For test purposes the connection circuit board is equipped with three soldering pins (see below) to which either a HART®-Interface for data-transmission on-site or a measuring device in order to monitor the current can be connected.

There are several possibilities to connect HART®-communication, but the loop resistance must be within the values given under section 5.2. The HART® interface can be connected to test-points TP2 and TP3 in the terminal connection area while the cover is open. If the HART® interface is to be used at a different position in the loop it can be connected to points X-Y or X-Z as shown in figure 2. However it must not be connected directly to the power supply device at point Y-Z.

In the example of figure 1 the connections of the HART® communicator can be interchanged with those of the PC or laptop.

Warning!

The use of a PC or a Laptop and HART®-Interface in an Ex-Zone requires special approval certificates.

Attention!

When installed in areas with potentially explosive atmospheres observe the respective country's specific regulations (for Germany: EN 60079-14 resp. VDE 0165).

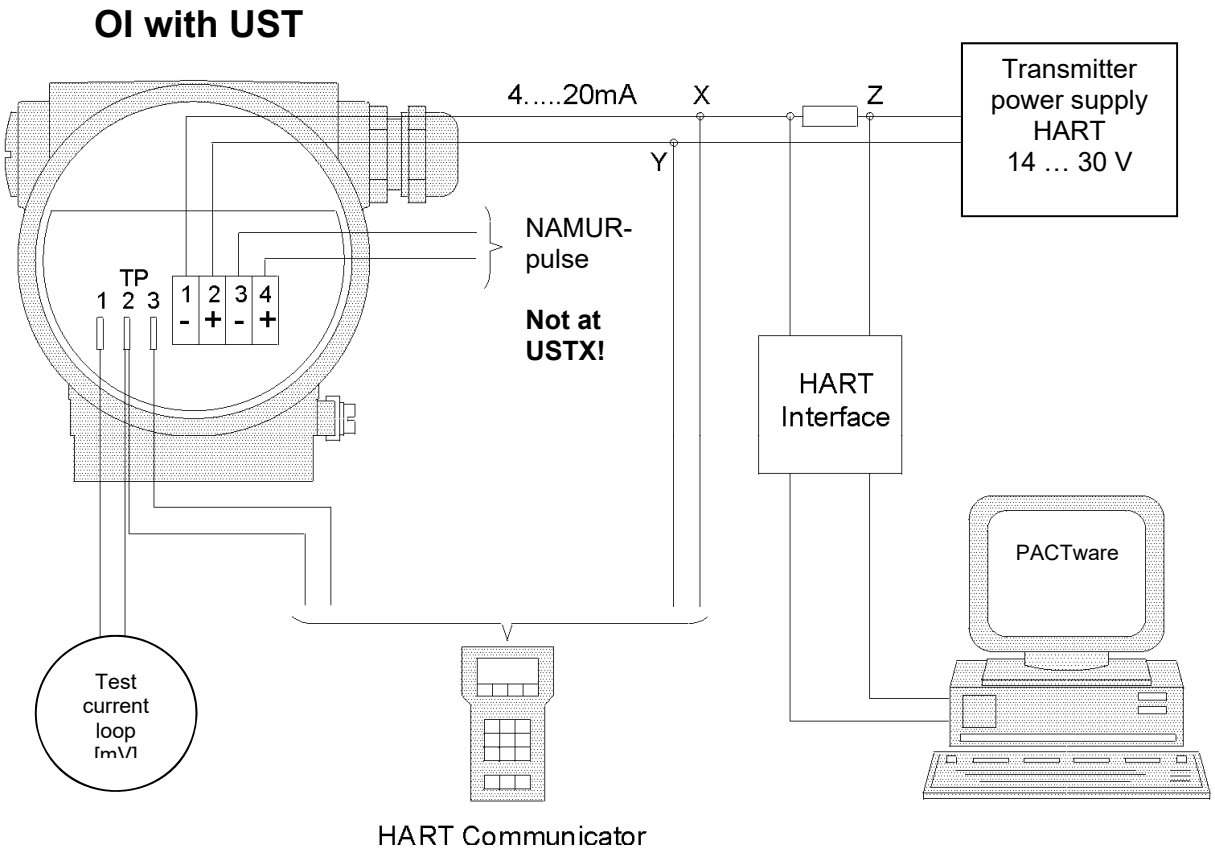


Figure 1 shows various connections as described in section 8.5.

8.5.1 Operation with PACTware Software

To operate the UST's with the PACTware operating software a HART®-Interface is required. The Interface transforms the level of the RS232 interface or USB- interface into a frequency shift keying (FSK) signal. The interface can also be installed permanently. The connection is set up as shown in figure 1.

Warning!

The use of a PC or a Laptop and HART®-Interface in an Ex-Zone requires special approval certificates.

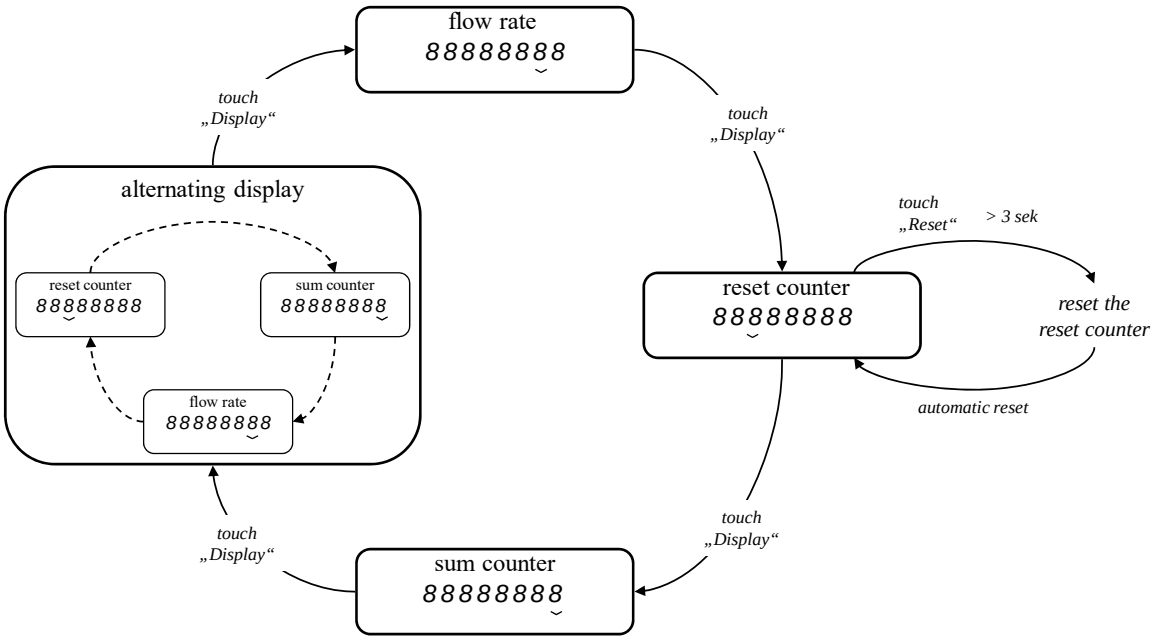
9. Display and user interface

9.1 General

The meters are set before delivery according to the operating conditions specified in your order. For further information please refer to attached configuration data sheet.
For the configuration respectively the operation of the transmitter you have the choice between the following two options:
1. HART® communication
2. On-site control of simple functions by means of a switching magnet.

9.2 LC - Display

The flow rate, the sum and the reset counter can be displayed on the 8-digit LCD display. The displayed value is selected via the switching magnet, which is operated by touching the “Display” button below the display window. The value chosen is identified by a line below the decimal point. After pressing the button the display switches as shown in the overview below:



In the alternating display mode all three indications are activated sequentially at preset time intervals.

The resetting of the reset counter can only be effected while this specific value is being displayed. The contact must be actuated for at least three seconds. For better legibility the display circuit board may be rotated mechanically by 90° or 180°. (See also Appendix B3).

9.3. Operation with HART®-Kommunikation

9.3.1 PACTware

To operate the Oval Wheel Meter with USTI the PACTware software can be used. PACTware is a configuration- and operation software that provides all UST functions via HART®communication. The individual functions are listed in chapter 9.4 “Device functions and parameter”. A PC is required for the use of PACTware with the following minimum system requirements:

- Pentium III 400
- Windows XP, VISTA or 7
- Hard drive with 100MB free space

The software is free to download: https://www.bopp-reuther.de/en/download/ software

UST is connected to the RS232 or USB-interface of the PC using a HART®interface (see chapter 8.5.1).

9.3.2 HART®-Communicator

A HART® communicator (e.g. handheld HC-375 from Emerson) is another operating element which can be used. The operating functions for HC-375 are defined in a DD (Device Description). Using the HC-375 it is possible to operate or configure the OI on-site. The connection is described in appendix C.
The Device Description Language (DD) can be downloaded from the Internet (HART® Foundation www.hartcomm.org).

9.4 Device functions and parameter

9.4.1 Measuring values

- **Volume flow:**
  Display of the actual volumetric flow in the selected unit.
- **Flow unit:**
  Units to define the volumetric flow. Options are: l/s, l/min, l/h, m^3/s, m^3/min, m^3/h, gal/s, gal/min, gal/h, impgal/s, impgal/min, impgal/h, ft^3/s, ft^3/min, ft^3/h.
- **Reset counter:**
  The reset counter adds up the volume values measured in the selected unit and can be reset. After a power outage the counter is automatically reset to zero.
- **Sum counter:**
  The sum counter adds up the volume values measured in the selected unit. This counter can only be reset when being serviced. The value displayed does not change after a power outage.
- **Unit of Volume:**
  This unit defines the value of the reset and the sum counter. If this unit is changed during operation, the new volume units are added up to the old volume units. Therefore please set the counters to zero before changing the unit. Choose between l, m^3, gal, impgal, ft^3.
- **Frequency history**:
  The maximum sensor frequency is recorded. The display cannot be set to zero or altered (drag hand function) and remains unchanged after a power outage.
- **Pulse Meter:**
  The Pulse Meter displays the number of all original pulses without evaluation. The display cannot be set to zero and remains unchanged after a power outage.

9.4.2 Output

- **End value of measuring range:**
  The end sensor value is pre-set in the UST of all meters regardless of the series. This value must not be exceeded during operating.
- **Initial Value of Measuring Range:**
  The initial sensor value is pre-set in the UST of all meters regardless of the series. Below this value there is no defined error curve.
- **Minimum Measuring Span**:
  The minimum measuring span can be set as desired within the measuring range. The minimum measuring span should be maintained as a lower value can lead to fluctuations of the output current.
- **Initial Value of Current Output:**
  The desired initial flow value in the selected unit is assigned to the initial value of 4mA. Usually the flow value of zero is assigned to 4 mA.
- **Final Value of Current Output:**
  The desired final flow value in the selected unit is assigned to the final value of 20mA.
- **Attenuation:**
  Attenuation affects the output current and the flow rate display. Choose a value between 1s and 200s. The resolution is approx. 1s.
- **Current Alarm:**
  When the current alarm is activated the current output is set to 22mA, as soon as a current alarm occurs.
- **Pulse Output:**
  The pulse output can either be set as original pulse with the frequency und pulse value corresponding to the K-factor of the meter or as a scaled pulse with a pulse value and pulse width that can be scaled in decade steps.

9.4.3 Device parameter

- **Sensor Type:**
  Indicates to which sensor type (Wiegand, Reed or inductive pick-up) the electronics are set.
- **K_P Factor:**
  The test factor is device specific and cannot be changed. It is defined during the calibration process, the unit is pulses/l.
- **K_K Factor:**
  The correction factor is without dimension and serves to adjust the error curve to various media. The factor can be adjusted by the servicing staff. Thus viscosity correction is possible.
- **K_B Factor:**
  The operating factor is the product of test factor times correction factor. This factor is not stored in the UST but calculated and displayed with PACTware.
- **Display Mode:**
  The display can be switched between flow rate, reset counter and sum counter. The three values are shown alternately at intervals of about 2 seconds (see section 9.2).
- **Pulse Value Factor:**
  The values of the output pulses and of the meter are set using the pulse value factor F_w. Together with the selected unit the pulse value factor corresponds to the pulse value and to the increment of the meter.

$$1\,lpulse \triangleq \underbrace{\underbrace{0{,}1}_{Factor} \cdot \underbrace{l}_{Unit}}_{value}$$

Example: pulse value factor 0.1 means:

When the factor is set, the display automatically adjusts the decimal point accordingly so that the values can be read directly from the meter.

The pulse value factor can be set as follows:

Pulse value factor	1	0.1	0.01	0.001

If this factor is changed during operation the meters should be set to zero as otherwise mixing various volume evaluations will lead to incorrect figures. Please make sure that the maximum output frequency is not exceeded, which depends on the selected pulse width (see table “pulse width” below). If the output frequency is exceeded, the excessive pulses are counted into a buffer memory; the output is effected with a time delay.

- **Pulse Relation Factor:**
  Using the pulse relation factor F_i ratio the meter and the pulse output can be evaluated differently. The pulse relation factor is the relation of the value of the meter increment and the value of the pulse output.

  The standard setting is F_i =1, i.e. one increment on the meter corresponds to one pulse output.

  If the factor is set to $F_i \neq 1$ the value of the pulse output is changed whereas the value of the meter remains unchanged. The maximum output frequency must be checked.

- **Pulse Width:**
  Choose the pulse width according to the table below:

Pulse width	150 ms	50 ms	20 ms	10 ms
Maximum output frequency	3,3 Hz	10 Hz	25 Hz	50 Hz

This setting applies to both pulse outputs, i.e. current pulse and NAMUR pulse. NAMUR not at **USTX**!

The maximum output frequency has to be taken into account when choosing pulse value and pulse relation factor. See Chapter 9.5 Calculation examples.

9.4.4 Dialog / Functions

- **Reset of the reset counter:**
  The reset counter can be reset to zero at any time.
- **Reset sum counter:**
  The sum counter may only be reset by our service staff. If the units of the volume or the pulse value are changed, this meter has to be reset to zero.
- **Current Simulation:**
  For testing serially connected devices a fixed output current may be set. After testing the current value 0 mA must be entered to end the simulation.
- **Calibration of Current Output:**
  The characteristic curve of the analog current output may be calibrated at 4mA for the zero point and at 20mA for the end value. Please note that the zero point has to be calibrated before the end value.

9.4.5 HART®

- **Software Version:**
  The number indicates the version of the UST software.
- **Hardware Version:**
  The number indicates the version of the UST hardware.
- **Polling Address:**
  If the UST is to be installed for multi-drop application a polling address from 1 – 15 must be entered. This means that a point-to-point connection with the desired address has to be configured beforehand. If the polling address is set to zero the operation is analog.

9.5 Checking the maximum output frequency of the pulse output

To ensure that the maximum output frequency is not exceeded observe the following

For $F_i=1$, $F_w \mathrel{\hat{=}} W_{countl}=W_{puls}$ the following applies:

$$F_W \geq \frac{Q_{max}}{f_{max}}$$

For $F_i \neq 1$, $F_w \mathrel{\hat{=}} W_{zähl}$ the following applies:

$$F_W \geq \frac{Q_{max}}{f_{max}} \cdot F_i$$

and

$$W_{puls} = \frac{W_{count}}{F_i}$$

Meaning of formula symbols:

Q_{max}: maximum flowrate $\left[\frac{selected\ unit}{second}\right]$

f_{max}: max. output frequency (see table)

pulse width	150 ms	50 ms	20 ms	10 ms
max. output frequency	3.3 Hz	10 Hz	25 Hz	50 Hz

F_w: pulse value factors

pulse value factor	1	0.1	0.01	0.001

F_i: pulse relation factor

W_{count}: counting value in l, m^3, ...

W_{puls}: pulse value in l, m^3, ...

Calculation examples to check the scaled pulse output taking into account the maximum output frequency

1. Example
   for a selected pulse width of 150 ms the
   maximum output frequency is f_{max} = 3.3Hz.

   - selected volume unit [l]

   - maximum flow rate (e.g. OU 5) Q_{max} = 0.83 l/s

   The smallest possible pulse value factor is calculated as follows:

   $$F_W \geq \frac{Q_{max}}{f_{max}} = 0.83 / 3.3 = 0.25$$

   According to the table (see chapter 9.5 pulse value factors) for the pulse value factors

   $$F_w = 1$$

   the next larger value or the same value must be selected.

   Thus the value of the meter and the pulse output is 1 l, i.e. 1 l per pulse.

2. The same meter data as in example 1 are assumed, but the value on the meter is to be one tenth of the value of the pulse output (meter is 10 times faster). A pulse relation factor of 0.1 needs to be set.

   The smallest possible pulse value factor is calculated as follows:

   $$F_W \geq \frac{Q_{max}}{f_{max}} \text{ x } Fi = 0.83/3.3 \text{ x } 0.1 = 0.025$$

   The next larger value must be selected, i.e.:

   $$Fw = 0.1$$

   The pulse value of the pulse output is calculated as follows:

   $$W_{pulse} = \frac{W_{count}}{F_i} = 0,1 / 0,1 = 1 \text{ l} \qquad \text{(for } F_i \neq 1 \text{ ist } F_w \mathrel{\hat{=}} W_{count}\text{)}$$

   Higher pulse values can be selected by setting the pulse value factor to a higher decimal level.

   Note: The maximum output frequency will be exceeded, if the pulse value factors are smaller than the calculated critical value.

10. Connection of the UST

Power supply

The supply voltage is within 14 - 30 V DC and must not exceed
30 V DC at **USTD**
28 V DC at **USTX**

cable connection screws	:	M20 x 1.5
cable diameter	:	6 - 12 mm
terminals	:	GKDS Ex
core cross section	:	0.2-2.5 mm²

When you connect the transmitter it is essential to ensure that the individual free wires are no longer than 50mm. This can be done by cutting the casing, an insulating tube or a cable tie just before the terminal.

Appendix

A. Trouble Shooting and Debugging

The Oval Wheel Meter and the UST do not require servicing. If a malfunction or incorrect measuring occurs, the following instructions offer help to identify the cause of possible errors and information for debugging.

Warning!

When working on electrical connections observe local regulations and all safety instructions in the operating instructions.

For Ex-devices all information and regulations from the Ex-documentation must be observed in addition to the above. The following describes possible malfunctions and the necessary measures for remedy. For some tests it is necessary to remove the UST electronics from the casing. To do so, remove the cover and the face of the counter so that you can loosen both diagonally opposed cylinder head studs on the circuit board. Please take care not to loose the two plastic washers.

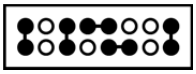
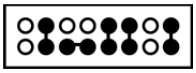
A.1 Fault in the electronic transmitter

No LCD display :

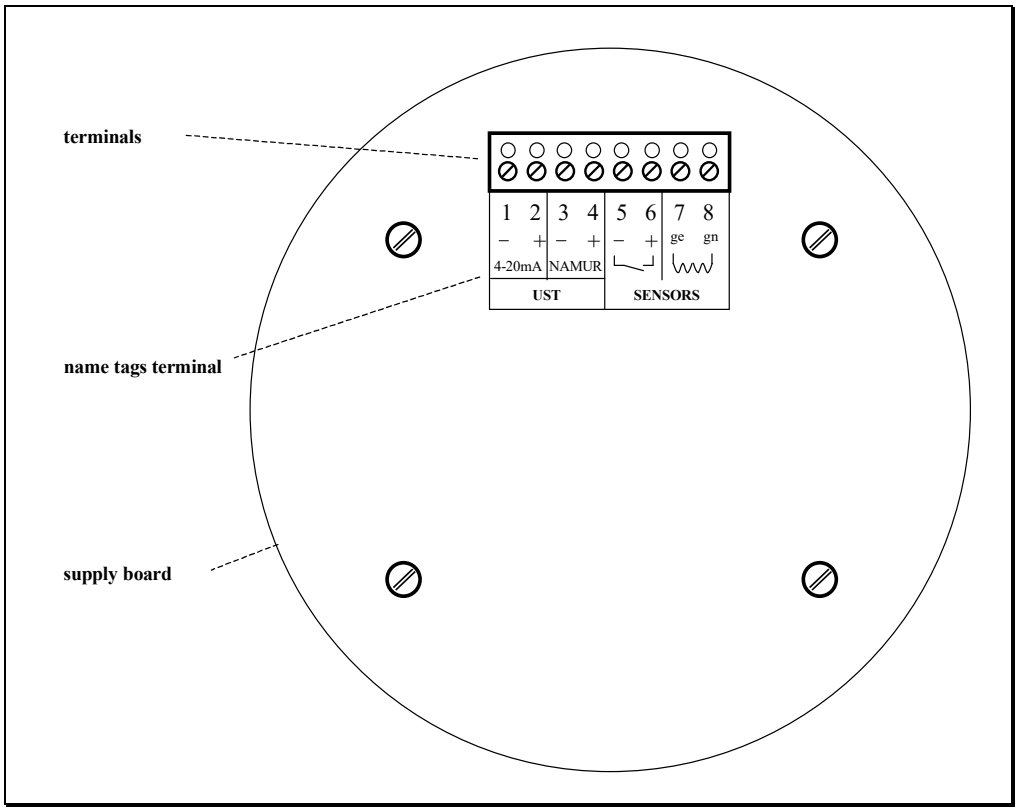
Check the current loop, the load and the voltage supply. The supplied voltage should be between 14 V DC and 30 V DC at **USTD** resp. 28 V DC at **USTX.** The maximum load is based on the supply voltage. See section 5.2.

No flow information on the LCD:

If a „zero“ flow is shown although there is a flow check the coding on the jumpers above the LCD according to the following diagram. To do so first remove the dial face. (See section 9.4.3: Type of Sensor).

Coding	Sensor	Type
	Oval Reed	AG 5x
	Oval Wiegand	AG 4x

The sensor pulse can be checked at the terminals on the supply board. Depending on the design, the terminals Reed (no. 5 and 6) or W/I (no. 7 and 8) are used. At the terminals of the Reed contact a pulse of approx. 5 V can be measured. The Wiegand pulse has an amplitude of approx. 200 mV to 400 mV with a pulse width of 20µs to 50µs



Volume counter cannot be deleted:

With the Reed "RESET" above the display only the reset counter may be reset to zero, not the sum counter. The reset counter can only be reset if this display mode is active. The display mode may be changed by means of the HART® protocol or with the "DISPLAY" Reed below the display. Actuate > 3 seconds.

Current output does not function correctly:

If the value of the output current deviates from the theoretical reference value, the supply voltage and the maximum load limits must be checked. A load which is too large may result in a substantial decrease of the terminal voltage for the UST. The calibration of the 4mA and the 20 mA points of the output characteristic curve must be checked, too.
If the current output does not show analog values check the positioning of switch on the supply circuit board. (See also diagram in section 5.1.2.1)

Pulse output does not function correctly:

IF the UST current pulse output is used the double actuator must be set correctly (see diagram in section 5.1.2).

The current pulse is available at terminals 1 and 2, the NAMUR-pulse at terminals 3 and 4!

If the high level is lower than 20 mA check the supply voltage and the load (see section 5.2).

Pulse output at zero flow rate:

If pulses are transmitted to the pulse output although there is no flow rate check pulse value, pulse relation factor and pulse width. If a large pulse width has been selected, the output of the pulses is processed rather slowly. If the factors have been selected in such a way that the theoretical output frequency is significantly higher than the maximum possible frequency, the excess pulses are stored. The overflow memory then sends signals with a maximum frequency even if the flow is zero until the memory is empty. Thus no volume pulses are lost.

Counter increments are too small:

Check the volume rate unit, K_P-, K_K- and pulse value factors as well as the decimal point.

Counter increments are too high:

Check the volume rate unit, K_P-, K_K- and pulse value factors as well as the decimal point.

Output current is over 20mA:

The flow of the Oval Wheel Meter is larger than the maximum limit value of the measurement output. The range end must be increased accordingly.

Output current remains at 4mA for small flow rates:

The minimum limit value of the measurement output is set at a value that is too high. The minimum limit value must be reduced accordingly.

Output current fluctuates significantly:

The revolutions of the Oval Wheel Meter or the pulse frequency are low. The minimum measuring range has not been reached. Attenuation of > 1s may result in a smoothing.

Displayed flow rates are too high:

Check the volume rate unit, K_P-, K_K- and pulse value factors.

Displayed flow rates are too small:

Check the volume rate unit, K_P-, K_K- and pulse value factors.

Data transmission does not function properly:

The minimum load must be attained for reliable communication. The optimal minimum loop resistance is about 230 Ω. If the load is higher a sufficiently high supply voltage must be available (see chapter 5.2).

Data transmission not possible:

The UST must be connected by means of a point-to-point connection. Only one master may access the interface. The multi-drop address must be set to 0. Loop resistance and supply voltage must be within the limits given in diagrams 1 and 2. With these settings communication should be possible.

General:

If the cause of a malfunction cannot be identified please contact the Bopp & Reuther service or send the device to Bopp & Reuther for repair (see Appendix B1).

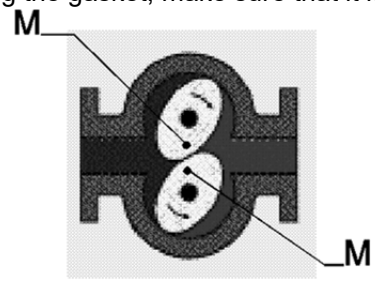
B Maintenance, Cleaning and Changing the Display

B.1 Maintenance, Cleaning

If the Oval Wheel Meter is put out of operation for a longer period of time it has to be dismounted, thoroughly cleaned, and protected with acid-free oil. Oval Wheel Meters used for liquid food must not be prepared for conservation in this manner. In- and outlet must be covered with caps. Make sure to store the Oval Wheel Meter in a dry room.

Cleaning the Oval Wheel Meter (e.g. for food)
The oval wheels have to be dismounted if the pipes are flushed with hot water.

- Loosen tommy nuts of the casing cover, lift-off casing cover with pressure screws, pull off oval wheels one by one from their shaft, handle with great care, do not place on stone floors, rather use a rubber pad or a wooden board.
- When assembling the oval wheels position them and make them mesh such that the marking points (M) on the faces match. Turn the oval wheel manually to make sure they are properly inserted (one revulotion). When placing the gasket, make sure that it is seated properly.



B.2 Repair / Hazardous Material

Before sending the Oval Wheel Meter to Bopp & Reuther, make sure to observe the following:

- Attach a note describing the malfunction, state the application field and the chemical/physical properties of the media (please find the respective form in section 14.2).
- Remove all residues of the media and pay special attention to sealing grooves and slits. This is of special importance if the medium is hazardous to health, i.e. caustic, toxic, carcinogenic or radioactive etc.
- Please do not return the device if you are not perfectly sure that all media hazardous to health have been cleaned off.

Costs incurred due to inadequate cleaning of the device and possible costs for disposal and/or personal injuries (causticization etc.) will be billed to the operating company.
Please ask our customer service for help and advice if your Oval Wheel Meter does not work properly:

Bopp & Reuther
Messtechnik GmbH
Service
Am Neuen Rheinhafen 4
67346 Speyer
Telefon: +49 6232 657-420
Fax: +49 6232 657-561

B.3 Rotating the display

If you want to change the display direction of the standard model, the LCD can be rotated in 90° steps by our service personnel or by yourself. Remove the cover with the pane of glass and unscrew the fastening screws of the dial face. If you want to rotate the display by 180° you only need to remove the electronics block and rotate it. If you want to rotate the display 90° you must remove the electronics block and the mounting plate below and rotate both. All assembly work may only performed off-circuit.

B.4 Rotating the housing

Rotating the housing might be advantageous for some applications (e.g. vertical installation of the Oval Wheel Meter). The connection between the housing and the spacer tube may be loosened and turned. Make sure that the sensor wires are not damaged.

C. Application examples

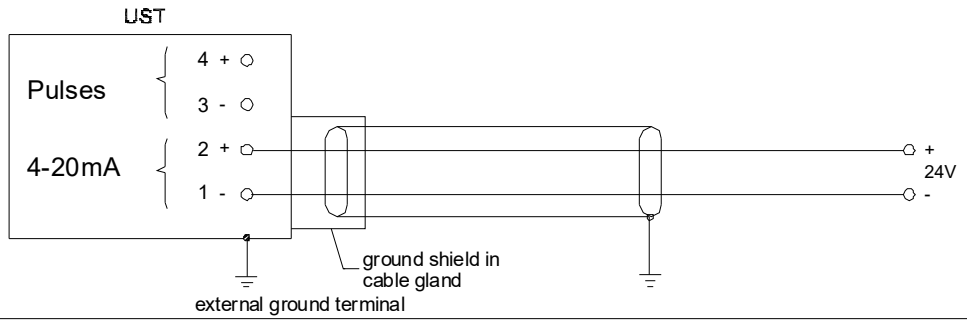
C.1 Application example 1: USTD / USTX

for

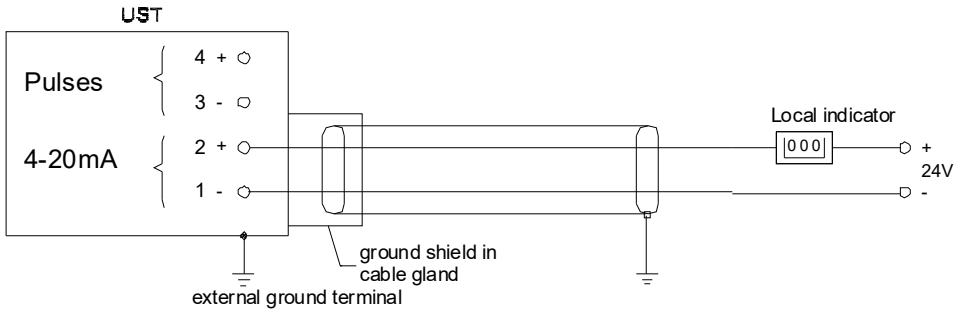
- application in non-hazardous areas
- for application in hazardous areas (Ex d)

When USTX : no terminals 3 and 4 !

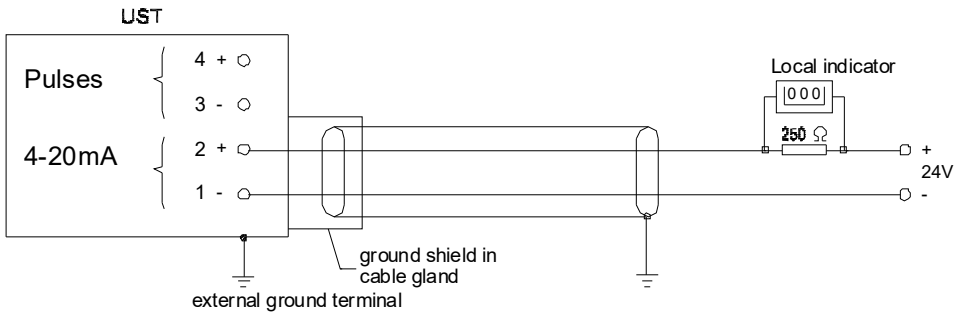
Local indication without signal transmission



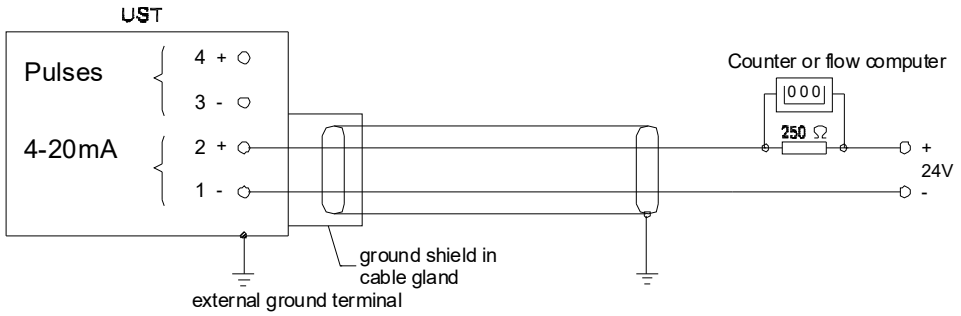
Analog transmission 4-20mA to indicator or recorder



Analog transmission 1...5V to indicator or recorder



Pulse transmission 1/5V to counter or flow computer

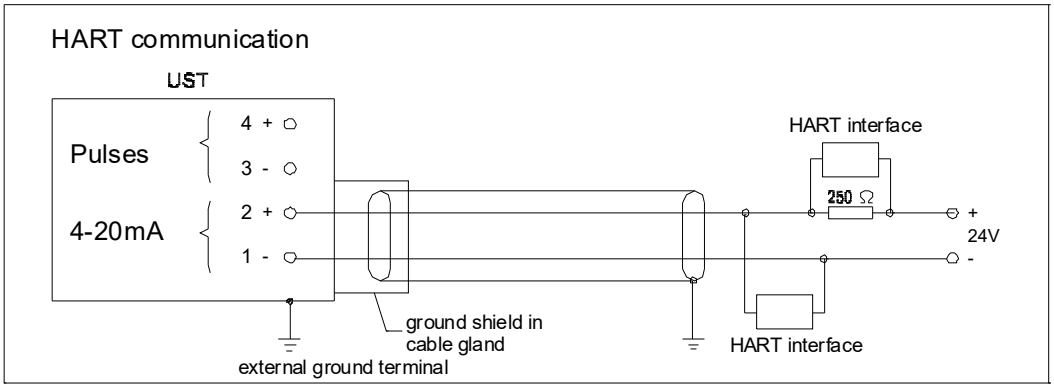


C.2 Application example 2: USTD / USTX

for

- application in non-hazardous areas with HART®
- for application in explosion hazardous areas (Ex d) with HART®

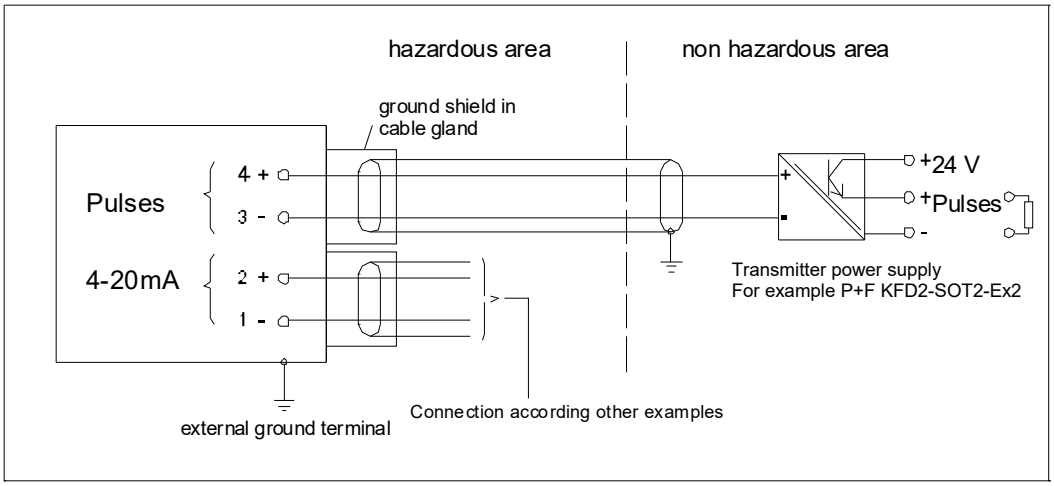
When USTX : no terminals 3 and 4 !



C.3 Application example 3: USTD

for

- application for the pulse output acc. to NAMUR in non-hazardous areas
- application for the pulse output acc. to NAMUR in hazardous areas



Attention!

For Ex safety reasons at the **USTX**, the negative pole of the terminal is earthed to the housing for this type of connection circuit. This can lead to interference with several 4-20mA current loops. In this case, a passive isolator, e.g. IsoTrans 36 from Knick, should be applied.

D. Forms

D.1 Certificate of non-objection for contractor

Bopp Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4

67346 Speyer

Germany

BOPP & REUTHER MESSTECHNIK

Telefon: +49 (0) 6232 657 420
Fax +49 (0) 6232 657 561
Mail: service@burmt.de
Web. www.bopp-reuther.de

DECLARATION ON CONTAMINATION OF PRODUCTS AND COMPONENTS

Please complete this form and return in advance by Fax to +49 (0) 6232 / 657 561 in order to receive an equipment return authorisation (ERA) number. No action to repair or examine the product will be done, until a valid declaration of contamination has been received.

ERA number: _____

Contact information

Company name + address

Contact person
Name:
Phone:
E-Mail:

Product information

Type: Id. no.: Serial no.:

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

Contamination information

The product was contaminated with:

☐ poisonous 	☐ corrosive, irritant 	☐ flammable 
☐ hazardous 	☐ oxidizing 	☐ cancer-causing, health hazard 
☐ explosive 	☐ environmental hazardous 	☐ other: _____

The product was cleaned with: _____

Packaging and shipping Instructions

- remove any cables, connectors, separate filters and mounting materials
- double bag each item in suitable protective foil (sealed)
- transport in suitable shipping container (e.g. original B & R shipping container) and include a copy of this declaration form at
- the shipping documents to the outside

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

Print name: Date:

Legally valid signature:

E. Certificates

E.1 Explosions protection certificates

E.1.1 USTD: EC Type Examination Ex-Approval DMT 00 ATEX E 025 X

see Homepage: https://www.bopp-reuther.de/en/download/ EC Type Examination Ex-Approvals Bopp & Reuther Messtechnik

E.1.2 USTX: EC Type Examination Ex-Approval BVS 04 ATEX E 022X

see Homepage: https://www.bopp-reuther.de/en/download/ EC Type Examination Ex-Approvals Bopp & Reuther Messtechnik

E.2 Pressure Equipment Directive

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

TÜV SÜD Industrie Service

ZERTIFIKAT

gültig bis: 22.07.2029

CERTIFICATE

valid until: 22.07.2029

EU-Baumusterprüfung (Modul B) - Baumuster - nach Richtlinie 2014/68/EU

EU Type examination (module B) - production type - according to Directive 2014/68/EU

Zertifikat-Nr.: *Certificate No.:*	**Z-IS-AN1-MAN-19-07-2681356-23083220**
Name und Anschrift des Herstellers: *Name and address of manufacturer:*	**Bopp & Reuther Messtechnik GmbH Am Neuen Rheinhafen 4 67346 Speyer**

Hiermit wird bescheinigt, dass das unten genannte Baumuster die Anforderungen der Richtlinie 2014/68/EU erfüllt.

We herewith certify that the type mentioned below meets the requirements of the Directive 2014/68/EU.

CE 0036

Prüfbericht Nr.: *Evaluation report No.:*	**P-IS-AN1-MAN-19-07-2681356-23083220**
Geltungsbereich: *Scope of examination:*	**Ovalradzähler der Typen OI, OUI, OaP, OuaP, OV, OK, OT, OKT, OF, OR, OC, OP, DN 50 - 400, PN 10 - 100**
Fertigungsstätte: *Manufacturing plant:*	**Bopp & Reuther Messtechnik GmbH Am Neuen Rheinhafen 4 67346 Speyer**

Mannheim, 23.07.2019
(Ort, Datum)
(Place, date)

TÜV SÜD Industrie Service GmbH
Zertifizierungsstelle für Druckgeräte

Ralf Brinkmann

+49 621 395-367

Echtheitsprüfung durch App TÜV SÜD Verify
Verification of Certificate by TÜV SÜD App Verify

Notifizierte Stelle, Kennnummer 0036
Notified Body, No. 0036
TÜV SÜD Industrie Service GmbH
Westendstr. 199
80686 München
GERMANY

Dokument ID: 2681356Y8193f

Seite 1 zum Zertifikat Nr. / Page 1 of the certificate No. Z-IS-AN1-MAN-19-07-2681356-23083220

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

TÜV SÜD Industrie Service

ZERTIFIKAT
Certificate

Konformität mit der Bauart (Modul C1)
nach Richtlinie 97/23/EG
Conformity to Type (Module C1) according to Directive 97/23/EC

Zertifikat-Nr.: Z-IS-DDB-MAN-15-05-100067376-007
Certificate No.:
Gültigkeit / *Validity:* 10 Jahre / *10 Years*

Name und Anschrift des Herstellers:
Name and postal address of manufacturer:
Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
D-67346 Speyer

Der Hersteller ist nach Prüfung der Voraussetzungen berechtigt, die von ihm im Rahmen des Geltungsbereichs hergestellten Druckgeräte mit unserer Kennnummer gemäß dem abgebildeten CE-Kennzeichen zu kennzeichnen:
The manufacturer is - after examination of the prerequisites - authorised to provide his pressure equipment manufactured within the scope of the examination our identification number to the CE-mark as illustrate:

CE 0036

Prüfbericht Nr.: P-IS-DDB-MAN-15-05-100067376-009
Test report No.:

Geltungsbereich:
Scope of examination:
Durchfluss Messgeräte (Ovalradzähler OI, OUI, OaP, OuaP, OV, OK, OT, Turbinenradzähler RQ, Wirbeldurchflussmesser VTX2, Kompaktblende Oriflow und Oriflow PVDF, Filter (Na, NC, N, Nu)

Fertigungsstätte:
Manufacturing plant:
Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
D-67346 Speyer

Mannheim, 08. Juni 2015
(Ort, Datum)
(Place, date)
Bitte beachten Sie die Hinweise auf der zweiten Seite.
Please note the remarks on the second page..

TÜV SÜD Industrie Service GmbH
Zertifizierungsstelle für Druckgeräte
TÜV SÜD Industrie Service GmbH 00 36 Benannte Stelle
(Dipl.-Ing. M. John)

Benannte Stelle, Kennnummer 0036
Notified Body, No. 0036
TÜV SÜD Industrie Service GmbH
Westendstr. 199
80686 München
GERMANY

E.3 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 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 *Manufacture* Fabricant	Bopp & Reuther Messtechnik GmbH Am Neuen Rheinhafen 4 D-67346 Speyer
Bezeichnung *Description* Description	Ovalradzähler *Ovalwheel meter* Compteur à roues ovales
Typ, Modell *Type, model* Type, modèle	OI / OUI / OaP / OUaP / OK mit *with* avec UST, AG, MFE, IG, SE, KSE, KSN, NK

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 61000-6-2:2005 EN 61000-6-3:2011

Richtlinie *Directive* Directive	2014/34/EU /UE L 96/309 Explosionsschutz *Explosion protection* Protection contre les explosions	
Baumusterprüfbescheinigung *Type examination certificate* Certificat d'approbation de type	DMT 99 ATEX E 014 X	USTI
	DMT 00 ATEX E 025 X	USTD
	BVS 04 ATEX E 022 X	USTX
	DMT 00 ATEX E 063 X	AG43-45 (PV11)
	PTB 99 ATEX 2219 X	AG19-20, IG (SJ3,5-N)
	TÜV 15 ATEX 131621 X	AG01-08 (01-08)
	BVS 09 ATEX E 031 X	MFE1-3
	BVS 00 ATEX 2048 X	KSN (NJ1,5-6,5-N)
	PTB 02 ATEX 1031 X	KSE, NK (8064/21)
Notifizierte Stelle *Notified Body* *Organisme Notifié*	BVS, DMT: DEKRA EXAM	0158
	PTB	0102
	TÜV	0044
Normen und normative Dokumente *Standards and normative documents* Normes et documents normatifs	EN 60079-0:2012/A11:2013	USTI, USTD, USTX, PV11, SJ3,5-N, 01-08, MFE1-3, NJ1,5-6,5-N, 8064/21
	EN 60079-1:2014	USTD, USTX, 01-08, 8064/21
	EN 60079-11:2012	USTI, USTD, USTX, PV11, SJ3,5-N, MFE1-3, NJ1,5-6,5-N
	EN 60079-26:2015	USTI

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

Z-ML-KE ORZ-OI-OAP-elektrisch-V12 2020-03-17

BOPP & REUTHER MESSTECHNIK

Richtlinie *Directive* Directive	2014/68/EU /UE L 189/164 Druckgeräte *Pressure equipment* Équipements sous pression
Konformitätsbewertungsverfahren / Zertifikat *Conformity assessment procedure / Certificate* Procédures d'évaluation de la conformité / Certificat	Modul B Z-IS-AN1-MAN-19-07-2681356-23083220 Modul C1 Z-IS-DDB-MAN-15-05-100067376-007
Notifizierte Stelle *Notified Body* *Organisme Notifié*	0036 TÜV SÜD Industrie Service GmbH Dudenstraße 28, D-68167 Mannheim
Normen und normative Dokumente *Standards and normative documents* Normes et documents normatifs	AD 2000 Regelwerk *AD 2000 Code* Code AD 2000
Klassifizierung *Classification* Classification	Rohrleitungsteil *Pipe* Tuyauterie
Fluid Kategorie ; Diagramm *Fluid category ; Diagramm* Dangerosité du fluide ; Tableau	Gruppe 1 ; Anhang II / 6 *Group 1 ; Attachment II / 6* Groupe 1 ; Appendice II / 6
Angewandtes Konformitätsbewertungsverfahren *Conformity assesment procedure beeing used* Procédure d'évaluation de la conformité appliquée	Kategorie III *Category III* Catégorie III

Die Angaben zur Richtlinie 2014/68/EU ist nur gültig für Druckgeräte die unter Artikel 4 Absatz 1 und 2 fallen, alle anderen unterliegen der guten Ingenieurspraxis nach Artikel 4 Absatz 3.
The information on Directive 2014/68 / EU is only valid for pressure equipment that falls under Article 4 Paragraph 1 and 2, all others are subject to good engineering practice according to Article 4 Paragraph 3.
Les informations sur la directive 2014/68 / UE ne sont valables que pour les équipements sous pression relevant de l'article 4, paragraphes 1 et 2, tous les autres sont soumis aux bonnes pratiques d'ingénierie conformément à l'article 4, paragraphe 3.

Richtlinie *Directive* Directive	2011/65/EU /UE L 174/88 Beschränkung gefährlicher Stoffe *Restriction of hazardous substances* Limitation de substances dangereuses
Normen und normative Dokumente *Standards and normative documents* Normes et documents normatifs	EN 50581:2012

Ort, Datum / *Place, Date* / Lieu, Date: **Speyer, 2020-03-17**

Dr. J. Ph. Herzog
Geschäftsführer / *Managing director* / Directeur

i. A. B. Bähr
QS Leiter / *QA Manager* / Responsable qualité

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

Z-ML-KE ORZ-OI-OAP-elektrisch-V12 2020-03-17