BOPP & REUTHER
MESSTECHNIK

Oval wheel meter

with pulse pick-ups

with mechanical counters

OP series

AG 19/20/01-08

E/D/M5

Operation manual

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Foreword

I. Transport, delivery, storage

Storage and Transportation:

Equipment shall be protected from moisture, humidity, contamination, shock and damage.

Inspection of delivery:

The shipment is to be checked for completeness upon receipt. The data of the device are to be compared with the data of the delivery note and the order documents.

Any transport damage must be reported immediately after delivery. Damage reported later cannot be accepted.

II. Warranty

The scope and period of a warranty can be found in the contractual delivery conditions.

A warranty claim presupposes professional assembly and commissioning in accordance with the operating instructions valid for the device. The necessary assembly, commissioning and maintenance work may only be carried out by competent and authorized persons.

III. General Safety Instructions

1. Oval wheel meters are reliable, high-precision volumetric instruments and may only be used in accordance with their intended purpose. The pressure and temperature limits of use indicated on the nameplate 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. The seals or sealing elements must be handled with care in accordance with the specifications in the operating instructions.
7. The tightening torques for the screw connections between the cover and the lower part of the housing as well as for the flange connections in the pipeline, are available on request.
8. The drain screws and all screw connections of the pressure-bearing parts must not be loosened until it has been ensured that the meter is depressurized.

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

This flowmeter of series OP is designed to measure the volume of liquids such as gasolines, heating oils, lubricating oils, diesel oil, bio ethanol and other chemical liquids.

Intended User
The intended user is not a general purpose user.

	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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Telephone : +49 6232 657-0
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Product Type: Direct volumetric meter (positive displacement meter)

Product Name: Oval wheel meter of the series OP with pulse pick-up AG19/20/01-08 and / or mechanical counters E/D/M5

Version-No.: A-EN-01225-00B

2. Range of Application

Volume control of liquid products in the petroleum, chemical and petrochemical industries require volumetric instruments whose design and material construction are adapted to the special operating conditions of the conveyed media.

The field of application for all oval wheel meters of the series OP lies in the measurement, metering, regulation and control of liquid quantities, filling tank trucks, tank wagons and ships, as well as in pipeline operation. Oval wheel meters of the series OP meet all these requirements. They are used for measuring liquid intermediates and finished products, such as acids, alkalis, fats, oils, alcohols, solvents, dispersions, polymers, poly-condensates, varnishes, paints, adhesives, and others.

The measurement of liquids of very high viscosity at low pressure drop should be particularly emphasized here. Due to their high measuring accuracy, oval wheel meters of the series OP ensure the highest quality of products to be manufactured.

Oval wheel meters of the series OP are manufactured in nominal sizes 15 to 150 mm. Depending on the nominal width, they can be used up to PN40; the maximum permissible operating temperature can be up to 110°C.

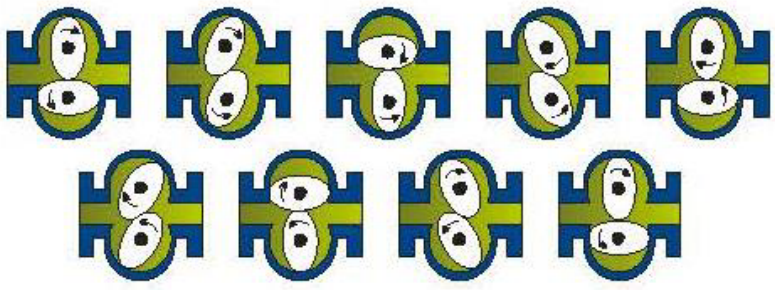
An extensive range of accessories is available for oval wheel meters: e.g. mechanical, electrical and electronic transducers, whose signals can be used for remote counting, flow measurement and control, as well as for feeding data processing systems. Also available are volume preselection devices suitable for metering, with matching valves of various designs and operating modes.

3. Mode of operation and system structure

3.1 Measuring principle

Oval wheel meters belong to the group of direct volume meters for liquids with movable partitions (positive displacement meters). The oval wheel meter consists of measuring chamber housing with two rotating oval wheels, which mesh with each other and roll off each other in a counter rotations.

The following sketch displays the movement of oval wheels during the measuring process.



Each rotation of the oval wheels displaces four discrete volumes of liquid through the meter (between the oval wheel and measurement chamber).

For measurement, the rotary motion of the oval wheels is transmitted from the pressure chamber to the outside via a permanent-magnetic coupling without feedback and without glands, processed further and made available as a standardized electrical measurement signal or as a totalizer display.

3.2 System design

The Oval wheel meters can be combined with the following components for its efficient application:

Transducer: The measured values are taken by oval wheel meters of the series OP.

Pulse pick-up AG19 and AG20:

The AG 19 or AG 20 pulse pick-ups are employed to control electromechanical counters, indicators, recorders, controllers, electronic counters, data processing systems and remote counters with stepper motors. It can be used in conjunction with the oval wheel meter in hazardous areas where an "intrinsic safety" type of protection is required. They are approved for mounting on oval wheel meters used in custody transfer applications, whereby the AG 19 pulse pick-up may only be used for internal measurements (OIML certificate: PTB-1.5-4074844 / national approval: AG 19: 411.007; AG 20: 411.005).

Pulse pick-up AG01-08:

The AG 01-08 pulse pick-ups are employed to control electromechanical counters, indicators, recorders, controllers, electronic counters, data processing systems and remote counters with stepper motors. It can be used in conjunction with the oval wheel meter in hazardous areas where a type of protection "flameproof enclosure" is required. It is approved for mounting on oval wheel meters used in custody transfer applications (OIML certificate: PTB-1.5-4074844).

Single Pointer Indicator E:

The E single-pointer totalizer is used for the mechanical display of the volume. It is equipped with a 6-digit roller set (without reset). The single-pointer totalizer can be combined with the pulse pick-ups listed above. A T-adapter is needed in order to combine single-pointer totalizer E with AG01-08.

Double Pointer Indicator D:

The double pointer totalizer D is used for the mechanical display of the volume. It is equipped with a 6-digit roller set (with zeroing lever). The double pointer totalizer can be combined with the pulse pick-ups listed above. A T-adapter is needed in order to combine the double pointer totalizer D with AG01-08.

Roller counter M5 and variants:

The M5 and M5V roller counters are used to display the volume. They can be equipped with valve control. The roller counters M5 and M5V can be supplied with a drive from below, rotatable, straight or inclined. In the case of the version from below, a raised arrangement of the totalizers above the oval wheel counter is possible. All versions can be supplied with the dial in vertical or inclined position (console form). The roller counter can be combined with the pulse pick-ups listed above. A T-adapter is needed in order to combine roller counter M5 or M5V with AG01-08.

4. Input

4.1 Measured variable

Volume and volumetric flow rate

4.2 Measuring range

Measuring ranges for media with Newtonian flow behaviour

Oval wheel meter OP series 1

Basic Type	DN	Nominal flow rate	Load at viscosity	< 0.3 mPa·s		0.3 -1.5 mPa·s		1.5 -150 mPa·s		up to 350 mPa·s		up to 1000 mPa·s		up to 3000 mPa·s	
		l/min		l/min	m³/h	l/min	m³/h	l/min	m³/h	l/min	m³/h	l/min	m³/h	l/min	m³/h
OP 15	15	30	min	4.5	0.27	5	0.18	3	0.18	1.5	0.09	0.075	0.045	0.25	0.015
			max	22.5	1.35	30	1.8	30	1,8	15	0.9	7.5	0.45	2.5	0.15
			continuous	9	0.54	19.8	1.188	19.8	1.188						
OP 20	20	50	min	8	0.3	5	0.3	5	0.3	2.5	0.15	1.25	0.075	0.45	0.027
			max	40	2.4	50	3	50	3	25	1.5	12.5	0.75	4.5	0.27
			continuous	10	0.6	33	1.98	33	1.98						
OP 32	32	100	min	8	0.48	10	0,6	10	0,6	7	0.42	3.5	0.21	1.2	0.072
			max	80	4.8	100	6	100	6	70	4.2	35	2.1	12	0.72
			continuous	16	0.96	66	3.96	66	3.96						
OP 40	40	150	min	12	0.72	15	0.9	15	0.9	9	0.54	4.5	0.27	1.5	0.09
			max	120	7.2	150	9	150	9	90	5.4	45	2.7	15	0.9
			continuous	24	1.44	100	5.94	99	5.94						
OP 50	50	300	min	50	3	30	1.8	30	1.8	18	1.08	9	0.54	3	0.18
			max	250	15	300	18	300	18	180	10.8	90	5.4	30	1.8
			continuous	100	6	200	11.88	198	11.88						

Measuring ranges for cold water: Column 0.3 - 1.5 mPa·s; for continuous load 50% and for max. load or batch operation 70% of line 2 (max) are to be applied (water applications only with stainless steel version F).

Oval wheel meter OP series 2

Basic Type	DN	Nominal flow rate	Load at viscosity	0.3-1.5 mPa·s		1.5-150 mPa·s	
		l/min		l/min	m³/h	l/min	m³/h
OP 250	80	1666	min	166	10	166	10
			max	1666	100	1666	100
			continuous	1000	60	1333	80
OP 470	100	2500	min	250	15	250	15
			max	2500	150	2500	150
			continuous	1500	90	1500	90
OP 600	100 / 150	3333	min	333	20	333	20
			max	3333	200	3333	200
			continuous	2000	120	2000	120
OP 1200	150	5000	min	500	30	500	30
			max	5000	300	5000	300
			continuous	3000	180	3000	180

Measuring ranges for cold water: column 0.3 - 1.5 mPa·s; for continuous load 50% and for max. load or batch operation 70% of line 2 (max) are to be applied (water applications only with stainless steel version F55).

5. Output

5.1 Output signal

5.1.1 Pulse pick-up AG19, AG20 and AG01-08

AG19 and AG20

The pulse pick-up consists of one or two wear-free, inductive sensors with NAMUR output and a slotted disc. Due to the NAMUR signals supplied directly by the sensor, no amplifier electronics are necessary. These NAMUR signals are processed and evaluated in suitable flow computers.

Technical data:

max. Number of control vanes	32
max. permissible number of revolutions	350 / min
max. pulse frequency	356 Hz depending on meter design
Perm. ambient temperature	see Section 7.2.2
Protection class for housing	see Section 7.2.4
Protection class for control head	see Section 7.2.4
Ex-protection	see Section Appendix
Devices to be connected	according to DIN EN 60947-5-6 (NAMUR) and Ex-approval

Pulse pick-up AG 01-08

The pulse pick-up consists of a wear-free open collector with NPN output. The signals supplied by the pulse pick-up can be processed and evaluated in suitable flow computers without further amplification.

Technical Data:

Number of pulses per revolution	200
Max. permissible number of revolutions	600/min
Max. Pulse frequency	1.852 kHz depending on the meter type
Perm. ambient temperature	see section 7.2.2
Protection class	see section 7.2.4
Ex-protection	see section Appendix
Devices to be connected	according to Ex-approval

5.1.2 Mechanical roller counter M5 with variants

Roller counter M5

The instrument is equipped with a five-digit roller set which counts and displays the unit of measurement. A 6th roller is covered by an aperture. After completion of the measurement and actuation of the zeroing lever, this cover opens and the graduation mark value of the 5th roller is displayed as a digit at this point. After reading the measured value, the zeroing lever is operated again. The rollers are reset to 0; the 6th digit is covered again. The instrument is ready for a new measurement. An eight-digit totalizer counter which cannot be reset adds up all the readings of the roller set at the same time.

M5V roller counter with pre-setting device

The pre-setting unit can be mounted to allow pre-setting and dispensing of a maximum five-digit quantity. It is attached to the bottom of the M5 roller counter described above. The quantity is entered via pushbuttons after actuating the zeroing lever (red marking). The setting level always corresponds to 1/10th of the rotating value of the fastest-running roller in the M5 roller counter. During delivery, the set value is retained. Switch-off takes place in 4 stages at the numerical values 20, 10, 3 and when the set value is reached. The switching movement can be removed from the right and/or left of the housing. Return of the originally set quantity after zero setting (important for can or drum filling). Stop button to interrupt the measuring process. By switching on again at the operating lever, the measurement can be brought to an end.

IG2 (Pulse pick-up, 2 channel)

Applicable for roller counters M5 and M5V.

The listed roller counters can be equipped with an integrated two-channel pulse pick-up.
2 proximity switches, type SJ 3.5-N, in conjunction with a slotted disc (10 flags) form the pulse pick-up system with intrinsically safe control circuit according to NAMUR. It is placed inside the counter housing and is driven by the coupling gearwheel. It is equipped with a reverse-run safety mechanism which ensures that no pulses are delivered when the counter is reversing.
For each scale of the fastest counter roller in the M5 roller counter one pulse is triggered per transmitter. Both pulses are delivered delayed in phase so that the second pulse is triggered in the mid of the pulse length of the first pulse.
Optionally a linking switch (KSN), designed as a proximity switch according to Namur (Type NJ 1.5-6.5-N) can be added.
The connecting wire is to be fixed onto the terminal box at the back of the housing.

The following table give information regarding the different OP meters.

Basic type	Roller counter M5					Volume setting unit V	
	resettable roller counter			Roller Summing Unit			
	Final value	Initial roller 1 revolution	Initial roll smallest pitch	Final value	smallest readable quantity	Setting level	Setting quantity
OP 15 OP 20 OP 32 OP 40 OP 50	99999 l	10 l	0.1 l	99999999 l	1 l	1 l	99999 l
OP 250 OP 470 OP 600 OP 1200	999,99 m³	0.1 m³	0.001 m³	999999.99 m³	0.01 m³	0.01 m³	999.99 m³

5.1.3 Mechanical single-pointer indicator E and double-pointer indicator D

Both versions (E and D) are available with a non-resettable roller counter for continuous totalizing (roller totalizer with 6-digit rollers). The double pointer mechanism is also available with a resettable totalizer. The counter head is available in vertical, inclined or horizontal versions.

The following table gives information about the oval wheel meter data.

Basic type	Single pointer movement E				Double hand movement D			
	Pointer counter		Roller Summing Unit		Pointer counter		Roller Summing Unit	
	Dial Division	smallest readable quantity	Final score	smallest readable quantity	Dial Division	smallest readable quantity	Final score	smallest readable quantity
OP 15 OP 20 OP 32	0-10 l	0.1 l	999990 l	10 l	0-10 l; 0-500 l	0.1 l	999999 l	1 l
OP 40 OP 50 OP 250	0-100 l	1 l	9999900 l	100 l	0-100 l; 0-5000 l	1 l	9999900 l	10 l
OP 470 OP 600 OP 1200	0-1 m³	0.01 m³	99999 m³	1 m³	0-1 m³; 0-50 m³	0.01 m³	99999.9 m³	0.1 m³

5.2 Electrical and thermal safety-related data

see appendix EC type-examination certificates

6. Characteristic values

6.1 Reference conditions

The oval wheel meters are calibrated on test rigs monitored by the German calibration authorities.
Pressure: 2 to 7 bar
Temperature: 20°C to 30°C

6.2 Measurement deviation

Lin. ± 0.3 % to ± 0.5 % of measured value (depending on product property and measuring range)

6.3 Repeatability

< 0.02 %

6.4 Influence of the medium temperature

Negligible

7. Operating conditions

7.1 Installation conditions

7.1.1 Installation instructions

	The operating instructions must be read and observed before assembly and commissioning. The system must be **depressurized** and **cooled down** before assembly and disassembly of the device.

7.1.1.1 General information

- Only trained specialist personnel authorized by the plant operator may carry out assembly, electrical installations, commissioning, maintenance work and operation. They must have read and understood the operating instructions and follow their instructions without fail.
- Bopp & Reuther Messtechnik oval wheel meters are precision volumetric meters. To protect against foreign bodies, the inlet and outlet ports are sealed. Do not remove the protective caps until immediately before use.
- Observe the operating data specified on the oval wheel meter. Observe the specifications in the order confirmation and design data sheet. Use with other operating data only after consultation, stating the factory number.
- Generally, install oval wheel meters in the discharge line downstream of the pump. (approx. 3 m liquid column pressure loss at nominal flow rate).
- Install the oval wheel meter so that it remains completely filled with liquid even when at a standstill.
- To avoid measuring errors due to gas inclusions or contamination, etc., the user must take appropriate precautions (gas separator, sieve basket filter).

7.1.1.2 Installation

- Clear the pipeline of foreign bodies. Flush the pipeline, installing a fitting piece instead of the oval wheel meter.
- Do not remove the protective caps from the inlet and outlet connections of the oval wheel meter until immediately before installation. During installation, the ingress of foreign bodies must be prevented.
- Observe the flow direction arrow on the oval wheel meter housing.
- Housing cover of the oval wheel meter must be vertical so that the oval wheel axes are horizontal, regardless of the position of the pipeline.

- Install the oval wheel meter in the pipeline without stress.

The transducer can be used together with the pulse pick-up of the series AG 19/20 in accordance with the "intrinsic safety" type of protection and with the AG 01-08 pulse pick-up in accordance with the "flameproof enclosure" type of protection in the Ex-area, taking into account the relevant Ex-approval (see section appendix).

AG19, AG20 and IG2:	Ⓔx II 2 G Ex ia IIC T6
AG01-08:	Ⓔx II 2 G Ex d IIB T6 Gb
Coupler switch KSN:	Ⓔx II 2 G Ex ia IIC T6

The EMC protection can only be guaranteed with shielded cables. The shielding must be applied in the metal cable glands.

7.1.2 Start-up Conditions

- Start oval wheel meter with a gradually increasing flow rate.
- In measuring systems for viscous liquids which require heating, switch on the heating system of the oval wheel meter, filter and pipework in sufficient time prior to start-up; subsequently start up the device with a gradually increasing flow rate.

7.2 Environmental Conditions

7.2.1 Ambient Temperature

-10°C to +70°C

7.2.2 Ambient Temperature Limit

OP with AG19 or/and AG20:	-25°C to +90°C
OP with AG01-08:	-25°C to +60°C
OP with M5 with Variant:	-20°C to +60°C
OP with mechanical indicator:	-20°C to +110°C

7.2.3 Storage Temperature

OP:	-20°C to +70°C
Pulse pick-up	-25°C to +70°C
Roller counters M5:	-20°C to +70°C
Mechanical indicator:	-20°C to +110°C

7.2.4 Protection Class

OP with AG19 and / or AG20:	IP54
OP with AG01-08:	IP54
OP with M5 roller counter and variants:	IP54
OP with mechanical indicator:	IP54

according to IEC 529 / EN 60529

7.2.5 Electromagnetic Compatibility

Applies only to devices with pulse pick-ups:

According to EMC Directive 2014/30/EU, DIN EN 61000-6-2, DIN EN 61000-6-3

“Electromagnetic compatibility" is only guaranteed when the electronics housing is closed.
When the electronics housing is open, interference can occur due to EMC signal pick-up.

7.3 Process Conditions

7.3.1 Medium Temperature

Basic type	Pulse pick-up		Roller counter M5	Pointer movements E/D	Extension	Special tolerances	Medium temperature °C
	AG19 / AG20	AG01-08					
OP 15 OP 20 OP 32 OP 40 OP 50	•						-10…90
		•					-10…70
			•				-10…110
				•			-10…110
OP 250 OP 470 OP 600 OP 1200	•						-10…60
	•					•	-10…90
	•				•	•	-10…110
		•					-10…60
		•				•	-10…70
			•				-10…60
			•			•	-10…110
				•			-10…60
				•		•	-10…110

7.3.2 State of Aggregation

Suitable for liquid media

7.3.3 Viscosity

OP series 1: 0.3 – 3000 mPa·s
OP series 2: 0.3 - 150 mPa·s

7.3.4 Medium Temperature Limit

-10° to +110°C (depending on the selected pulse pick-up or display, see Section 7.3.1)

7.3.5 Fluid Pressure Limit

Depending on the process connection (see Section 8.4)
Oval wheel meter series OP1

Material design	Basic type				
	OP15	OP20	OP32	OP40	OP50
F	PN 40	PN 40	PN 40	PN 40	PN 40

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.

Oval wheel meter series OP2

Material design	Basic type			
	OP250	OP470	OP600	OP1200
C23	PN 20	PN 20	PN 20	PN 20
C25				
F55				

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 Maximum Flowrate

max. Flow rate	Basic type								
	OP15	OP20	OP32	OP40	OP50	OP250	OP470	OP600	OP1200
l/min	30	50	100	150	300	1666	2500	3333	5000

7.3.7 Pressure Loss

Specification for Water	Basic type								
	OP15	OP20	OP32	OP40	OP50	OP250	OP470	OP600	OP1200
(In bar)	<0.3	<0.3	<0.25	<0.3	<0.25	<0.4	<0.45	<0.45	<0.45

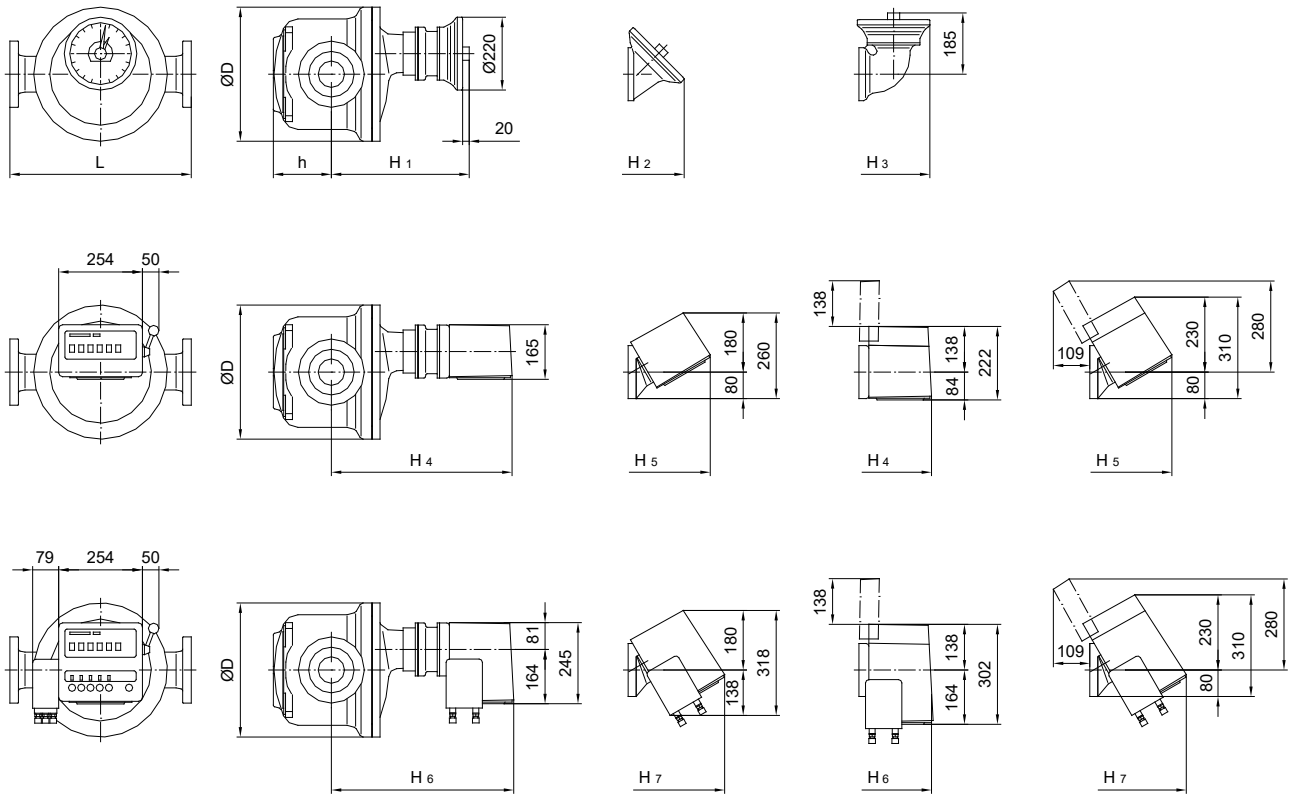
8. Constructive Design

8.1 Design / Dimensions

For oval wheel meters of the series OP with mechanical indicator mechanisms or roller counters M5 and optionally with pulse pick-ups AG19, AG20 or AG01-08.

Basic type		OP15	OP20	OP32	OP40	OP50	OP250	OP470	OP600	OP1200
Overall length	L	170	170	220	300	325	550	650	650	800
Dimensions	H_1	262	265	275	285	292	418	479	484	481
	H_2	342	345	355	365	372	498	559	564	561
	H_3	387	390	400	410	417	543	604	609	606
	H_4	392	395	405	415	422	548	609	614	611
	H_5	421	424	434	444	451	577	638	643	640
	H_6	397	400	410	420	427	553	614	619	616
	H_7	466	469	479	489	496	622	683	688	685
Dimension	h	51	53	65	95	110	176	253	258	280
Dimension	ØD	144	128	170	225	250	405	405	480	615

Shown series 2



For meters with pulse pick-up AG19, AG20, AG01-08 or extension, the dimensions H1 to H7 change as follows:

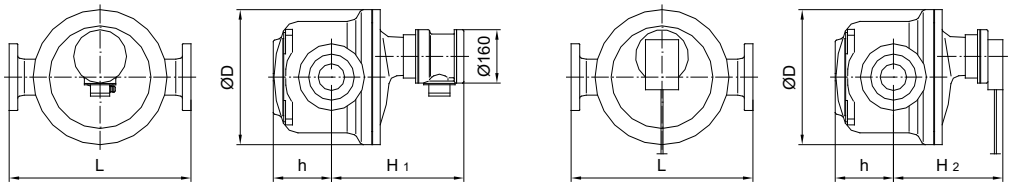
- Pulse pick-up AG 19 + 115 mm
- Pulse pick-up AG 20 + 115 mm
- Pulse pick-up AG 01-08 + 190 mm
- Extension + 300 mm

Example:
OP 250 with double indicator D, extension and Pulse pick-up AG19
Total height (H1+h) + additional dimensions =
418+300+115=833mm

For oval wheel meters of type series OP only with pulse pick-up AG19, AG20 or AG01-08 the following construction dimensions apply

Basic type		OP15	OP20	OP32	OP40	OP50	OP250	OP470	OP600	OP1200
Overall length	L	170	170	220	300	325	550	650	650	800
Dimension	H_1	245	248	258	264	271	401	462	467	464
	H_2	175	178	188	194	201	331	392	397	394
Dimension	h	51	53	65	95	110	176	253	258	280
Dimension	ØD	144	128	170	225	250	405	405	480	615

Shown series 2



8.2 Weights

Basic type		OP15	OP20	OP32	OP40	OP50	OP250	OP470	OP600	OP1200
Weight (in kg) approx.	E/D	12	14	19	32	41	112	157	287	387
	M5	17	19	24	37	46	117	162	292	392
	M5B	20	22	27	40	49	120	165	295	395
	M5V	20	22	27	40	49	120	165	295	395
	M5BV	23	25	30	43	52	123	168	298	398
	AG19/20	12	14	19	32	41	112	157	287	387
	AG01-08	11	13	18	31	40	111	156	286	386

All weights mentioned in the table above are an approximate value.
This may vary depending upon the material used for the oval wheels in the respective meters.

8.3 Material

Material design	Series 1	Series 2		
	F	C23	C25	F55
Measuring chamber	CrNiMo	C-steel	C-steel	CrNiMo
Housing	CrNiMo	C-steel	C-steel	CrNiMo
Oval wheels	CrNiMo	Aluminium	CrNiMo	CrNiMo
Bearings	Hard Carbon	Hard Carbon	Hard Carbon	Hard Carbon

Water applications only with material versions F or F55!

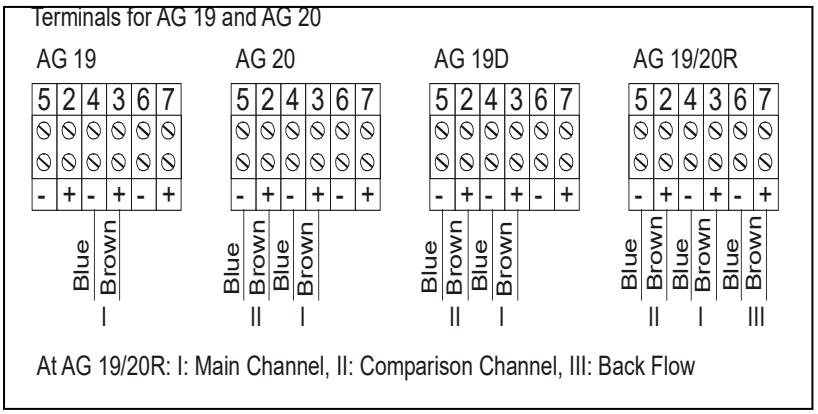
8.4 Process Connection

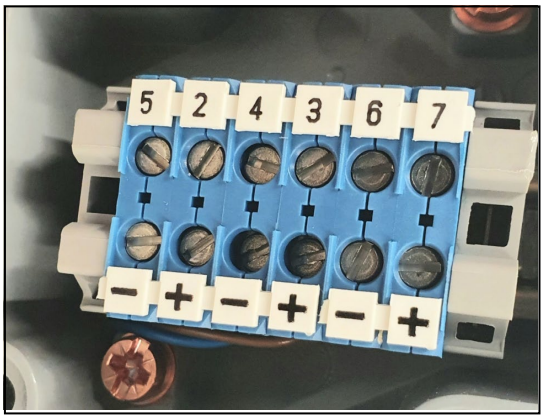
Basic type	OP15	OP20	OP32	OP40	OP50	OP250	OP470	OP600		OP1200
DIN / UNI	15	20	32	40	50	80	100	100	150	150
ANSI	½“	¾“	1¼“	1½“	2“	3“	4“	4“	6“	6“

8.5 Electrical Connection

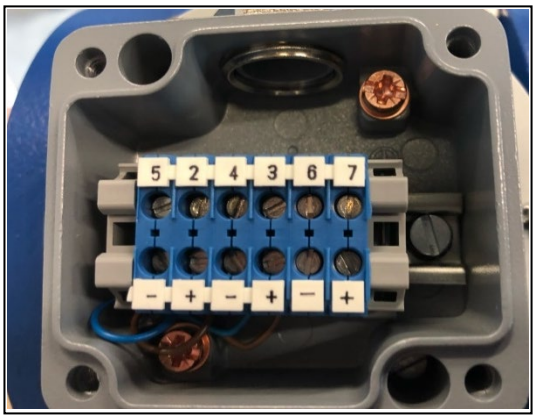
AG19 and AG20

Devices to be connected	according to DIN EN 60947-5-6 (NAMUR) and Ex-approval
Control line	max. up to 50 Ohm/wire AG19: 2-wire, shielded AG20: 4-wire, twisted pairs
Cable connection	M20x1,5





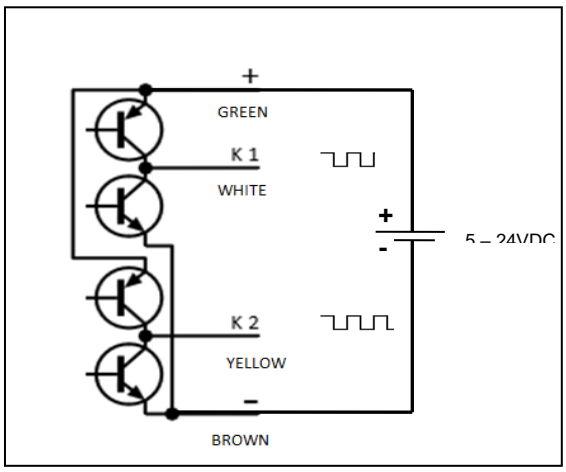
AG19

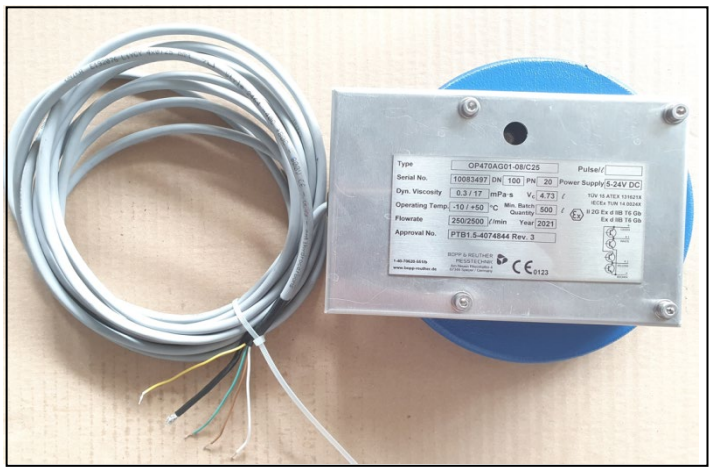


AG19(D)

AG01-08

Devices to be connected	according to Ex-approval
Control line	4-wire cable attached
Power supply	5-24 V DC **+** : Green **-** : Brown
Current consumption	10-30mA
Output current	max. 30mA
Pulse Output	Channel 1: **K1** Channel 2: **K2**

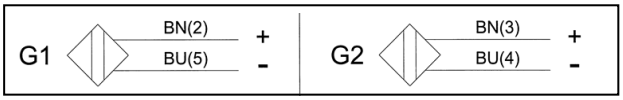




The above depicted image gives an overall view of the AG01-08 pulse pick-up used in OP meters

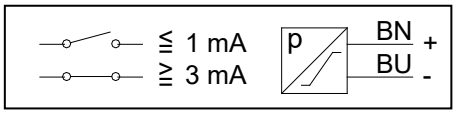
IG2

Devices to be connected	according to DIN EN 60947-5-6 (NAMUR) and Ex-approval
Control line	max. up to 50 Ohm/wire
Cable connection	2-wire, shielded



KSN

Devices to be connected	according to DIN EN 60947-5-6 (NAMUR) and Ex-approval
Control line	2-core cable attached



When installing in hazardous areas, the respective national installation regulations must be observed (for Germany: EN 60079-14 or VDE 0165).

9. Display

Single-pointer indicator E:

The E single-pointer indicator is used for the mechanical display of the volume. It is equipped with a roller totalizer with 6 digit rollers (without zeroing device). The single pointer movement can be combined with the pulse pick-ups AG19, AG20 or AG01-08.

Double-pointer indicator D:
The double pointer indicator D is used for the mechanical display of the volume. It is equipped with a roller totalizer with 6 digit rollers (with zeroing device). The double pointer movement can be combined with the pulse pick-ups listed above.

Roller counter M5 and variants:
The M5 and M5V roller counters are used to display the volume. They can be equipped with valve control. The roller counters M5 and M5V can be supplied with a drive from below, rotatable, straight or inclined. In the case of the version from below, a raised arrangement of the totalizers above the oval wheel counter is possible. All versions can be supplied with the dial in vertical or inclined position (console form). The roller counter can be combined with the pulse pick-ups AG19, AG20 or AG01-08.

10. Nameplate details

The nameplate of the OP meter consists of the following information as shown below in the example. Upon the type of meter/ application, the marked contents on the nameplate are subjected to vary. In any case, it is always advised to check whether the information written on the flowmeter's nameplate meet your installation requirements. It is also the sole responsibility of the user to ensure that local regulations are respected.

Example:

The nameplate details of pulse pick-up used for the OP meter consist of the following information as shown below in the example. Depending upon the type of the pulse pick-ups used, the marked contents on the name plate are subjected to vary.

Example:

Appendix

A. Troubleshooting and Fault rectification

The oval wheel meter with pulse pick-ups and mechanical totalizers operates maintenance-free. If a fault occurs, or if incorrect measurement is suspected, the following instructions will help you to identify the cause of possible faults and provide information on how to rectify them.

	When working on the electrical connections, the local regulations and all safety instructions in this operating manual must be observed.

For Ex devices, all information and regulations from the Ex documentation must also be observed. In the following, possible errors are described and the necessary measures for remedial action are explained.

	If the error of the device cannot be found, the service of Bopp & Reuther Messtechnik must be called in or the device must be sent the headquarter Speyer / Germany for repair (see Appendix B2).

B Maintenance, Cleaning

B.1 Maintenance, Cleaning

In order to achieve the maximum efficiency out of Bopp & Reuther Messtechnik products, it is always advised to use original spare parts provided by the manufacturer. This ensures maximum safety, better durability and best working conditions of the meters and its accessories. It is also to be noted that we decline any responsibility in case of usage of non-original spare parts.

If the oval wheel meter is taken out of service for a longer period of time, it must be removed, thoroughly cleaned and preserved with acid-free oil. Preservation is prohibited for oval wheel meters for liquid foods. Inlet and outlet nozzles must be fitted with protective caps. Make sure that the oval wheel meters are stored in a dry room.

B.2 Repairs, Hazardous materials

The following measures must be taken before you send the oval wheel meter for repair to Bopp & Reuther Messtechnik for repair:

- In any case, enclose a note with the device describing the error, the application as well as the chemical-physical properties of the measuring medium (form see appendix C1).
- Remove all adhering medium residues. Pay particular attention to sealing grooves and crevices where medium residues can adhere. This is particularly important if the medium is hazardous to health, e.g. corrosive, toxic, carcinogenic, and radioactive, etc.
- We ask you to refrain from returning the medium if it is not possible for you to completely remove substances hazardous to health with absolute certainty.

Costs incurred for possible disposal or personal injury (burns, etc.) due to inadequate cleaning of the device will be charged to the operator.

In the case of malfunction of the oval wheel meter, please contact our customer service:

Bopp & Reuther Messtechnik GmbH
Service
Am Neuen Rheinhafen 4
67346 Speyer, Germany
Phone: +49 6232 657-420
Mob.: +49 15115233023
Fax: +49 6232 657 561
Email: service@bopp-reuther.com

C. Declaration on Decontamination

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

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

D. Certificates

D.1. Explosions protection certificates

D.1.1 Proximity switch SJ. (AG19/20 and IG2): EC type examination certificate PTB 99 ATEX 2219 X

see homepage: https://www.bopp-reuther.com/en/download/ Explosion protection certificates external companies

D.1.2 Pulse pick-up AG01-08: EC type examination certificate PTB 99 ATEX 2219 X

see homepage: https://www.bopp-reuther.com/en/download/ Explosion protection certificates external companies

D.1.3 Proximity switch NJ (KSN): EC type examination certificate PTB 99 ATEX 2048 X

see homepage: https://www.bopp-reuther.com/en/download/ Explosion protection certificates external companies

D.2. Pressure Equipment Directive

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.: **Z-IS-AN1-MAN-19-07-2681356-23083220**
Certificate No.:

Name und Anschrift des Herstellers: **Bopp & Reuther Messtechnik GmbH**
Name and address of manufacturer: **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.: **P-IS-AN1-MAN-19-07-2681356-23083220**
Evaluation report No.:

Geltungsbereich: **Ovalradzähler der Typen OI, OUI, OaP, OuaP, OV, OK, OT, OKT, OF, OR, OC, OP, DN 50 - 400, PN 10 - 100**
Scope of examination:

Fertigungsstätte: **Bopp & Reuther Messtechnik GmbH**
Manufacturing plant: **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.:
Test report No.:
P-IS-DDB-MAN-15-05-100067376-009

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

D.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 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 D-67346 Speyer
Bezeichnung *Description* Description	Ovalradzähler *Ovalwheel meter* Compteur à roues ovales
Typ, Modell *Type, model* Type, modèle	OI / OUI / OaP / OUaP / OK / OP mit *with* avec UST, AG, MFE, IG, SE, KSE, KSN, NK

Richtlinie *Directive* Directive	2014/30/EU /UE Elektromagnetische Verträglichkeit *Electromagnetic interference* Compatibilité électromagnétique	L 96/79
Normen und normative Dokumente *Standards and normative documents* Normes et documents normatifs	EN 61000-6-2:2005 EN 61000-6-3:2012	

Richtlinie *Directive* Directive	2014/34/EU /UE Explosionsschutz *Explosion protection* Protection contre les explosions	L 96/309
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)
	EPS 14 ATEX 1766 X	KSE, NK (07-2511)
Notifizierte Stelle *Notified Body* *Organisme Notifié*	BVS, DMT: DEKRA EXAM	0158
	PTB	0102
	TÜV, EPS: Bureau Veritas	0044
Normen und normative Dokumente *Standards and normative documents* Normes et documents normatifs	EN IEC 60079-0:2018	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, 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 ORZ-OI-OAP-OK-OP-elektrisch-V15 2023-01-30

BOPP & REUTHER MESSTECHNIK

Richtlinie *Directive* Directive	2014/68/EU /UE L 189/164 Druckgeräte *Pressure equipment* Équipements sous pression
Konformitätsbewertungsverfahren *Conformity assessment procedure* Procédures d'évaluation de la conformité	Modul B + Modul C2
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
Einstufung Druckgerät *Classification équipement sous pression* Classification pressure equipment	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
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, 2023-01-30**

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

i . V. J. Riedl
stv. QM Beauftragter
Deputy *QM Officer* / Adjoint chargé de la qualité

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 ORZ-OI-OAP-OK-OP-elektrisch-V15 2023-01-30

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 D-67346 Speyer
Bezeichnung *Description* Description	Ovalradzähler *Ovalwheel meter* Compteur à roues ovales
Typ, Modell *Type, model* Type, modèle	OI / OUI / OaP / OUaP / OK / OP mit *with* avec E, D, M5

Richtlinie *Directive* Directive	2014/68/EU /UE L 189/164 Druckgeräte *Pressure equipment* Équipements sous pression
Konformitätsbewertungsverfahren *Conformity assessment procedure* Procédures d'évaluation de la conformité	Modul B + Modul C2
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
Einstufung Druckgerät *Classification équipement sous pression* Classification pressure equipment	Kategorie III *Category III* Catégorie III

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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 ORZ-OI-OAP-OK-OP-mechanisch-V13 2023-01-30

BOPP & REUTHER
MESSTECHNIK

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, 2023-01-30**

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

i . V. J. Riedl
stv. QM Beauftragter
Deputy *QM Offider* / Adjoint chargé de la qualité

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 ORZ-OI-OAP-OK-OP-mechanisch-V13 2023-01-30

NOTES:

NOTES:

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

Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
67346 Speyer
Germany
Phone: +49 6232 657-0
Fax: +49 6232 657- 505
Email: info@bopp-reuther.com
https://www.bopp-reuther.com

BOPP & REUTHER MESSTECHNIK