



# Oval Wheel Meters



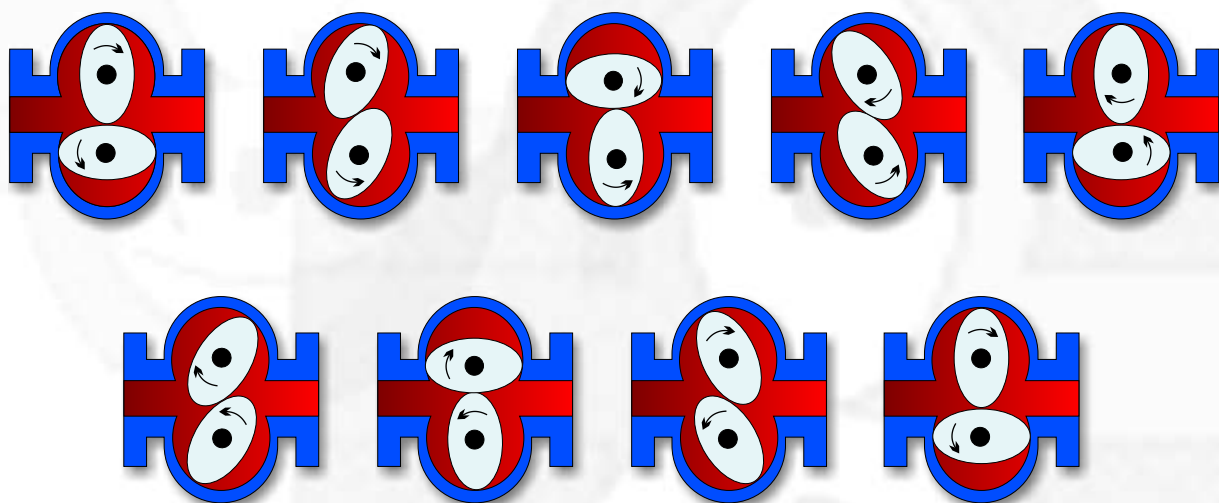


# 1932

The oval wheel flow meter principle was developed at Bopp & Reuther and protected under patent in 1932. The first license from a bureau of standards was issued by the PTR in Berlin in 1933.

This precision measuring instrument has proven itself wherever liquids are measured, for example, in the chemical industry, petrochemistry and the dosing and Filling technology.

Oval wheel flow meters are direct volume meters. Their measuring element consists of two toothed precision oval wheels, which are driven by the liquid and roll around each other. This allows a defined quantity of liquid to pass through the meter per each revolution of the oval wheel pair.



The number of revolutions is an exact measure of the quantity, which flows through.



## Table of Contents

OS, OC Series Oval Wheel Flow Meters .....	Page 4
OI Series Small Oval Wheel Flow Meters .....	Page 6
OI Series Oval Wheel Flow Meters .....	Page 9
OAP Series Oval Wheel Flow Meters .....	Page 14
OV Series Oval Wheel Flow Meters .....	Page 18
OM Series Oval Wheel Flow Meters .....	Page 20
OT Series Oval Wheel Flow Meters .....	Page 22
OK Series Oval Wheel Flow Meters .....	Page 24
Mechanical Meters .....	Page 26
Measuring Transducer, Pulse pick-up .....	Page 28
Accessories (Strainer, Gas separator) .....	Page 30
Communicative solutions .....	Page 31
Directive 93/27/EG (Pressure Equipment) .....	Page 31
Directive 94/9/EG (ATEX 100a) .....	Page 32
Requirements profile .....	Page 34

Application Area	Chemical	Petrochemical	Food	Dosing systems	Loading systems	Tank truck	Low flowrates < 50 l/min	High flowrates > 50 l/min
OI Series Small	✓	✓		✓	✓		✓	
OI Series	✓	✓	✓	✓	✓		✓	✓
OAP Series	✓	✓		✓	✓		✓	✓
OS2 Series / Compact	✓	✓		✓			✓	
OV Series		✓			✓			✓
OM Series			✓				✓	✓
OT Series		✓			✓	✓		✓
OK Series	✓	✓	✓	✓			✓	✓



## OS, OC Series Oval Wheel Flow Meters

This series was developed for the measurement or control of small flows and quantities in a process or in the laboratory. This is an economical alternative to the small OI oval wheel flow meter. The typical materials to be measured are lubricating oil, heating oil, hydraulic oil and diesel in power generators, burners, motors and oil circulation systems. In addition, there are many other materials which can be measured with the OS and OC oval wheel flow meters, where aluminum and stainless steel are resistant to corrosive action.

The OS2 oval wheel flow meter works without any mechanical transmission. The rotational movement of the oval wheels is picked up by Reed contacts.

### Oval Wheel Meter OS2

#### Nominal pressure

PN 16

#### Measuring accuracy

$\pm 0.25\%$  to  $\pm 1\%$  of set value

#### Allowable temperature of material being measured

$-10^{\circ}\text{C}$  to  $+90^{\circ}\text{C}$

(in special cases only to  $+40^{\circ}\text{C}$ )

#### Materials

Aluminum



OS2 EZDR/B-Q-F-L-1-0

### Measuring range

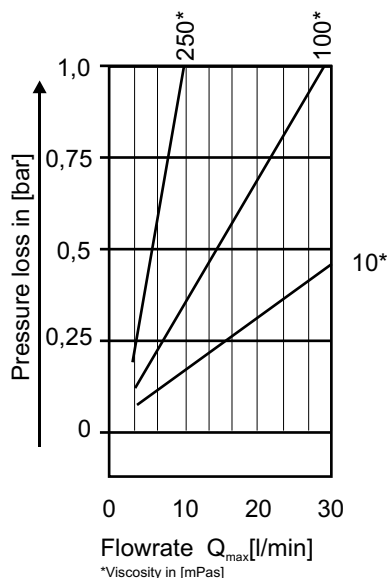
Typ		Flowrate [l/min] at viscosity			
		<0,3 mPas	0,3 – 1,5 mPas	1,5 - 150 mPas	150 – 350 mPas
OS2 $Q_{\max} = 30$ l/min	min	1	1	1	1
	max	25	30	30	17,5
	continuous	15	20	27	18

### Accessories

The following accessories are available for the oval wheel flow meter OS:

- Electronic counter EZ or EZD (only OS2 G3/4")
- Pulse output NAMUR
- Operating module type BEZW for EZD
- SensorPort for EZ / EZD
- Interface IF 232 for EZ / EZD

In order to prepare an offer for you, we need information on the material to be measured, viscosity, operating pressure, operating temperature, flow, length of operation and casing connection.



## Oval Wheel Meter OC

### Nominal pressure

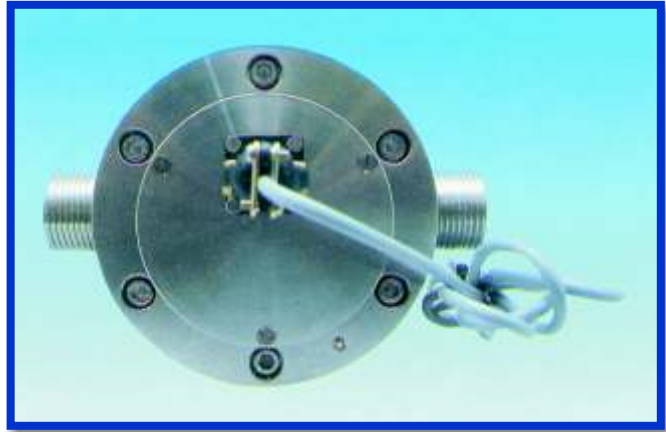
PN 16  
PN 25

### Measuring accuracy

OC1  $\pm 0,2\%$  of set value  
OC5, OC10  $\pm 0,5\%$  of set value

### Operating temperature

$-10^\circ$  to  $+70^\circ\text{C}$



Oval Wheel Meter OC5 with Reed contact

### Materials

OC5 aluminum or stainless steel; OC1, OC10 stainless steel

### Measuring range

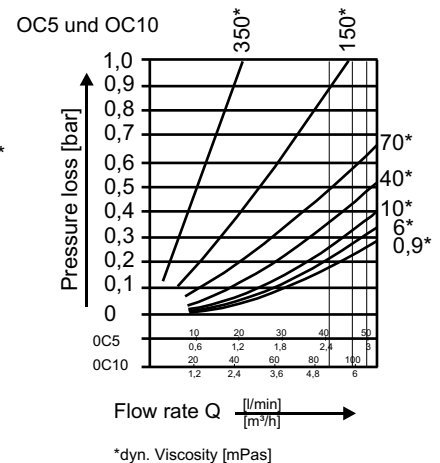
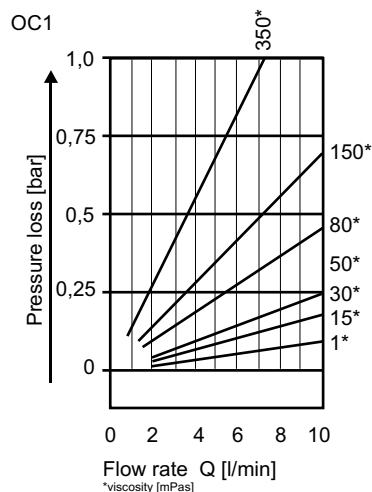
Type		Flowrate [l/min] at viscosity			
		<0,3 mPas	0,3 – 1,5 mPas	1,5 - 150 mPas	150 – 350 mPas
OC1 $Q_{\max} = 10$ l/min	min	1	1	1	0,75
	max	10	10	10	7,5
	continuous	6,6	6,6	6,6	6,6
OC 5 $Q_{\max} = 50$ l/min	min	8	5	5	2,5
	max	40	50	50	25
	continuous	16	33	45	25
OC 10 $Q_{\max} = 100$ l/min	min	16	10	10	7
	max	80	100	100	70
	continuous	33	70	80	70

### Accessories

The following accessories are available for the oval wheel flow meter OC:

- Electronic counter EZ or EZD
- Pulse output NAMUR
- Operating module type BEZW for EZD
- SensorPort for EZ / EZD
- Interface IF 232 for EZ / EZD

In order to prepare an offer for you, we need information on the material to be measured, viscosity, operating pressure, operating temperature, flow, duration of operation and casing connection.

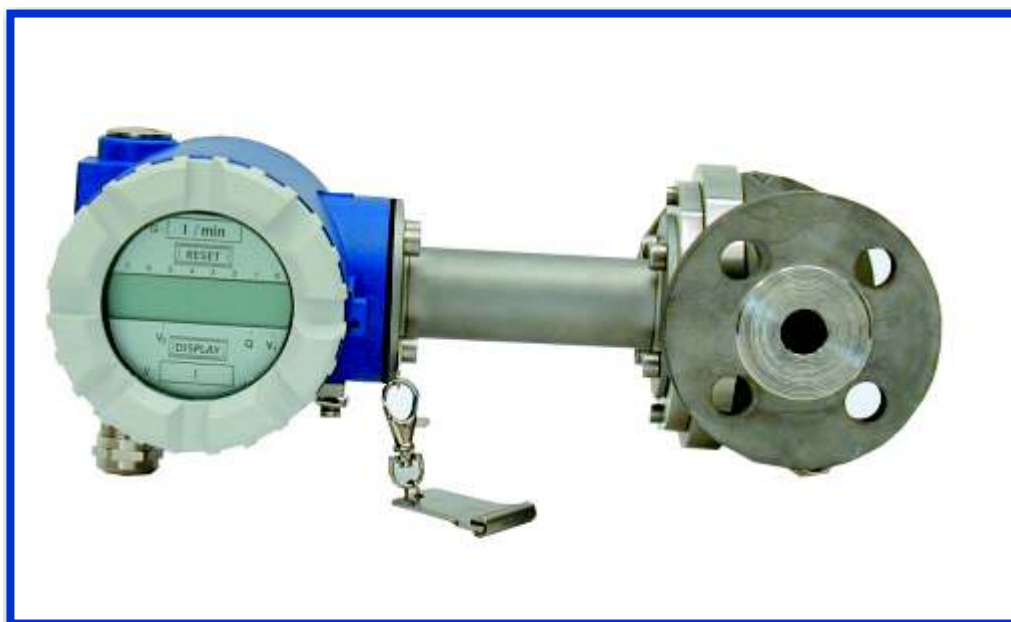




## OI Series Small Oval Wheel Flow Meters

The requirement for measuring or the control of small quantities of liquids in a process or in the laboratory led to the development of the small oval wheel flow meter. Its high measuring accuracy, highly developed design and material selection allows the employment of this instrument anywhere where small quantities must be measured precisely and reliably. This includes areas such as the measurement of fuel consumption, dosing, regulation and control etc.

For the meter types OI 03 to OI 2, the rotational movement of the oval wheels is transmitted through a magnet coupling and gear unit to a mechanical, seven-digit, nonre-settable roller meter. A pulse trigger for remote transmission can be attached. As an alternative, the meters can be equipped with only an electronic pulse pickup, AG 41, where the pulse is produced by magnets in the oval wheels. Modern display modules and transmitters, which provide the connection and communications, for example HART®, with process control systems etc., are available for the electronic pulse pick-up.



The oval wheel pair with hard carbon bushings runs on two axes pressed into the bottom of the casing. The measuring area is hermetically sealed. The rotational movement of the oval wheels is transmitted through the casing cover by means of a permanent magnetic coupling to the mechanical meter or permanent magnets are placed in the oval wheels and the magnets produce, through the casing cover, electrical voltage changes in an electronic sensor, which are then processed in a serially connected measuring transformer.

### Measuring Ranges Small Oval Wheel Meter OI 03 - OI 2, with sleeve bearings of the oval wheels

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	0,3	20	0,2	12	0,2	12	0,18	11	0,1	6	0,03	2
			Max	1,6	100	2,0	120	2,0	120						
			Continuous	1,0	60	1,3	80	1,8	110	1,8	110	1,0	60	0,4	25
			Batching	1,3	80	1,8	110	2,0	120						
OI 06	10 15	250	Min	0,6	40	0,4	25	0,4	25	0,3	20	0,2	13	0,08	5
			Max	3,3	200	5,1	250	4,1	250						
			Continuous	2,1	130	2,6	160	3,7	225	3,7	225	2,1	130	0,8	50
			Batching	2,6	160	3,7	225	4,1	250						
OI 1	15	600	Min	1,6	100	1,0	60	1,0	60	0,9	54	0,6	36	0,2	12
			Max	8,3	500	10,0	600	10,0	600						
			Continuous	5,0	300	6,6	400	9,0	540	9,0	540	6	360	2,0	120
			Batching	7,5	450	9,0	540	10,0	250						
OI 2	25	1800	Min	5,0	300	3,0	180	3,0	180	2,6	160	1,6	100	0,6	36
			Max	25,0	1500	30,0	1800	30,0	1800						
			Continuous	15,0	900	20,0	1200	26,0	1600	26,0	1600	17,5	1000	6,0	360
			Batching	21,6	1300	26,0	1600	26,6	1800						

Measuring ranges at other viscosities on request

Measuring ranges for cold water:

At range 0,3 - 0,8 mPa s for continuous operation use 50 % flowrate of max. and for max. operation resp. batching use 70% flowrate of max.

Measuring range for sulphuric acid : see data sheet L 419.1e

#### Nominal pressure

PN 25 to PN 40, at temperatures over 120°C pay attention to pressure reduction!

#### Measuring accuracy

Depends on the viscosity, flow and nominal size. Exact information is contained in the offer.

#### Average values

- Up to 0.8 mPa s in the range of 10% to 100% of Qmax about ± 1%.  
(for type OI 03 AG 19 R 7 about ± 2%)
- Up to 2 mPa s in the range of 10% to 100% of Qmax about ± 0.5%.  
(for type OI 03 AG 19 R 7 about ± 1%)
- Up to 50 mPa s in the range of 10% to 100% of Qmax about ± 0.4%.
- For 50 mPa s or higher in the range of 10% to 100% of Qmax about ± 0.3%.

#### Allowable temperature of material being measured

Depending on the model, -40°C to +170°C

#### Materials

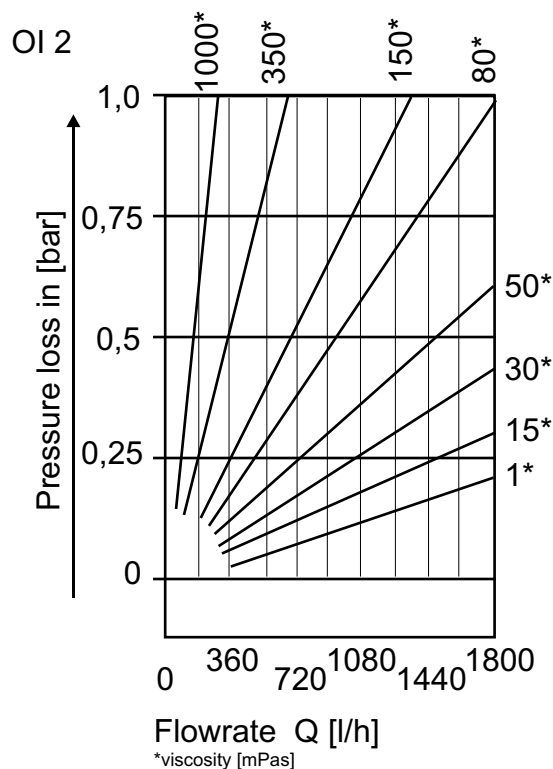
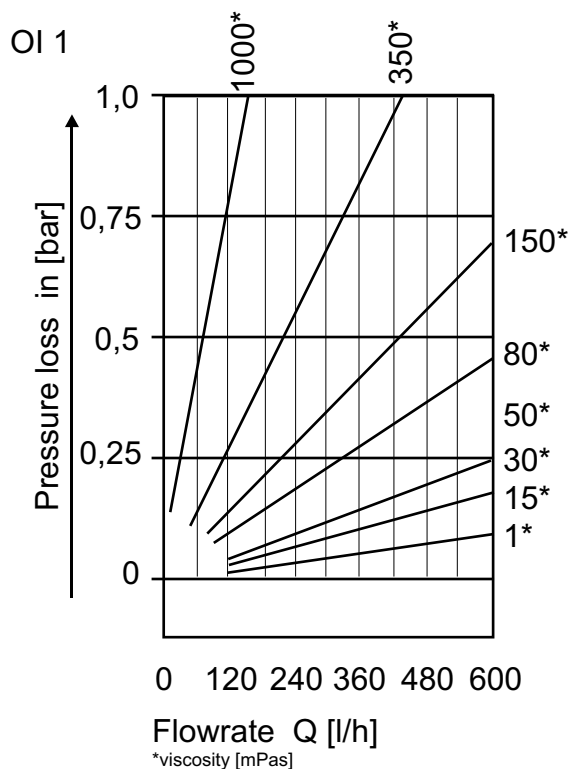
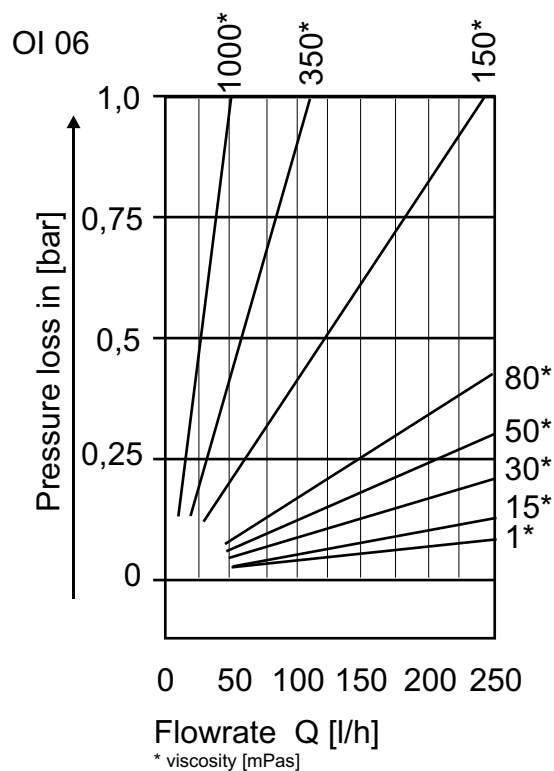
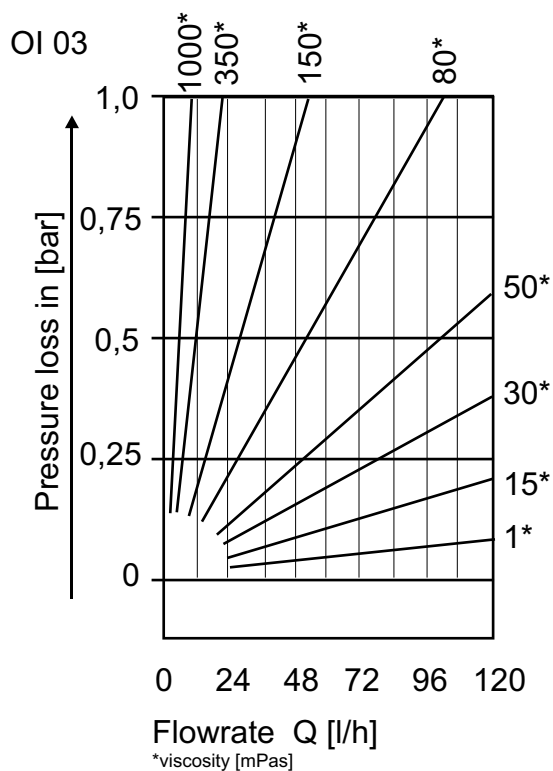
Stainless steel, brass/bronze

#### Accessories

- Mechanical counter R7
- Electronic counter EZ, EZD, UST
- Pulse pick-up AG 19, 20, 41
- Strainer
- Temperature extension
- Processing peripherals



### Pressure Loss



In order to prepare an offer for you, we need information on the material to be measured, viscosity, operating pressure, operating temperature, flow, length of operation and process connection.





## OI Series Oval Wheel Flow Meters

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

Oval wheel flow meters of the OI series meet all of these requirements. They are used for the measurement of liquid intermediate and finished products such as liquified gases, acids, alkaline solutions, fats, alcohols, solvents, dispersions, polymers, polycondensates, paints, colors and adhesives etc.

Special emphasis should be placed on the capability to measure liquids with very high viscosities but with low pressure loss.

The OI series of oval wheel flow meters assures a high degree of quality for the products being manufactured due to the high measuring accuracy of the flow meters.

There is an extensive program for accessories available for the oval wheel flow meters. This includes mechanical, electrical and electronic instrument transmitters, whose signals can be used for remote metering, flow measurements and control and supply of data processing systems. In addition, we also offer quantity preselection devices for dosing with appropriate valves of the most varied construction and functions.





**The OI series oval wheel flow meters have the following special design characteristics:**

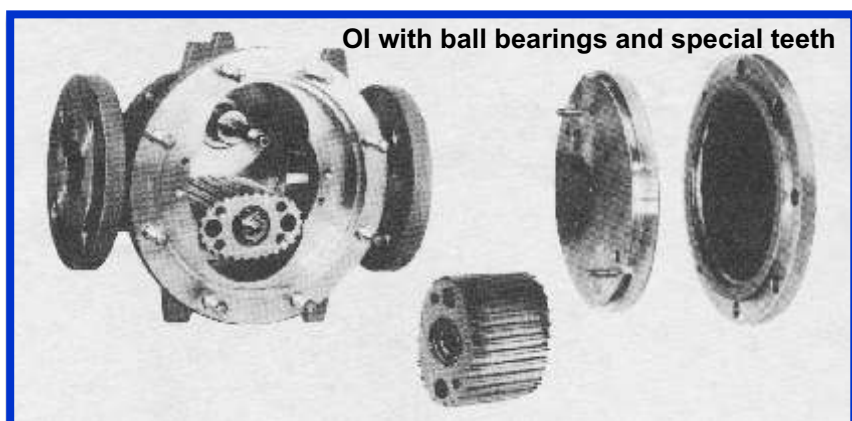
The casing is also the measurement chamber (single case meter design). The axles for the oval wheels are pressed into the casing bottom.

The magnet coupling is concentrically installed in one of the two axles. The bearings for the oval wheels can be either sleeve bearings or ball bearings.

Thus, the actual meter only consists of four parts:  
the casing, the pair of oval wheels, the measurement chamber and the casing cover.

A permanent magnetic coupling is the basis for the non-positive transmission, without a compression gland, of the rotational movement from the measurement area to the dry area or, instead of the magnet coupling, a pulse pick-up generates pulses through the magnets in the oval wheel for further processing.

The OI series of oval wheel flow meters is also produced with a heating jacket. This is given the series designation of OUI.



Oval wheel flow meters of the OI series can, as for all other oval wheel flow meters, be adjusted to almost all operating conditions by means of various combinations of materials for the casing, oval wheels and bearings.

**Nominal pressure**

PN 10 to PN 40, at temperatures over 120°C pay attention to pressure reduction!

**Measuring accuracy**

0.1% to 0.3% of the set value.

This depends on the measurement range and material being measured or in accordance with the particular calibration regulations. Oval wheel flow meters fulfill the regulatory requirements for the calibration of liquid measuring meters in Germany and other countries.

**Allowable temperature of material being measured**

Depending on the model, -40°C to +180°C.

**Licenses**

Licensed by the Bureau of Standards in Germany and in many other countries.



### Measuring ranges oval wheel meter OI 5 - OI 400, with sleeve bearings for liquids with Newtonian flow elasticity

Typ	DN	Flowrate Q <sub>max</sub> [l/min]	Ranges at viscosity	< 0,3 mPas		0,3 - 1,5 mPas		1,5 - 150 mPas		upto 350 mPas		upto 1000 mPas		upto 3000 mPas	
				Normal tooth profile		Normal tooth profile		Normal tooth profile		Special tooth profile except OI 5		Special tooth profile except OI 5		Special tooth profile except OI 5	
				[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	8	0,5	5	0,3	5	0,3	2,5	0,15	1,25	0,075	0,45	0,027
			Max	40	0,25	50	3	50	3	25	1,5	12,5	0,75	4,5	0,27
			Continuous Batch processing	16	1	33	2	33	2,4	25	1,5	12,5	0,75	4,5	0,27
OI 10	25	100	Min	16	1	10	0,6	10	0,6	7	0,42	3,5	0,20	1,2	0,072
			Max	80	5	100	6	100	6	70	4,2	35	2	12	0,72
			Continuous Batch processing	33	2	66	4	80	4,8	70	4,2	35	2	12	0,72
OI 50	50	300	Min	50	3	30	1,8	30	1,8	18	1,08	9,5	0,54	3	0,18
			Max	250	15	300	18	300	18	180	10,8	90	5,4	30	1,8
			Continuous Batch processing	100	6	200	12	240	14,4	180	10,8	90	5,4	30	1,8
OI 100	50	660	Min	110	6,6	66	3,9	66	3,9	48	2,9	24	1,45	10	0,6
			Max	550	33	660	39,6	660	39,6	480	29	240	14,5	100	6
			Continuous Batch processing	230	13,2	440	26,4	530	31,8	480	29	240	14,5	100	6
OI 200	80	700	Min	110	6,6	70	4,2	70	4,2	50	3	25	1,5	12	0,72
			Max	560	34	700	42	700	42	500	30	250	15	120	7,2
			Continuous Batch processing	230	14	420	25,2	525	31,5	500	30	250	15	120	7,2
OI 400	100	1200	Min	200	12	120	7,2	120	7,2	100	6	60	3,6	30	1,8
			Max	1000	60	1200	72	1200	72	1000	60	600	36	300	18
			Continuous Batch processing	400	24	720	43,2	1000	60	1000	60	600	36	300	18

Measuring ranges at other viscosities on request

Metering ranges for cold water:

Column 0.3 – 1.5 mPas--> 50% for continuous and 70% for max. processing and batching processing of line 2 (max.) are to be applied.

Metering ranges for hot water:

Column <0.3 mPas--> only the values min. to continuous processing to be applied.

Measuring range for sulphuric acid : see data sheet L 419.1e

For liquids with even higher viscosities or for liquids with non-Newtonian flow elasticity such as dispersions, polymers, meters with special profile wheels and ball bearings of stainless steel instead of graphite sleeve bearings are to be used – see Meter Selection Chart. This feature is expressed in the meter type by material key F 57 or F 27.

### Measuring ranges oval wheel meter OI 5 - OI 400, with ball bearings for flow ranges for low and high viscous liquids with Newtonian flow elasticity

Typ	DN	Flowrate Q <sub>max</sub> [l/min]	Range at viscosity	1,5 - 20 mPas		to 350 mPas		to 2.000 mPas		to 5.000 mPas		to 10.000 mPas		to 20.000 mPas		to 60.000 mPas		to 100.000 mPas	
				[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]	[l/min]	[m³/h]
OI 5	25	50	Min	15	0,9	5	0,3	2,5	0,15	1,2	0,072	0,6	0,036	0,3	0,018	0,1	0,006	--	--
			Max	50	3	50	3	25	1,5	12	0,72	6	0,36	3	0,18	1	0,06	--	--
OI 10	25	100	Min	30	1,8	10	0,6	8	0,5	4	0,24	2	0,12	1	0,06	0,3	0,018	--	--
			Max	100	6	100	6	80	5	40	2,4	20	1,2	10	0,6	3	0,18	--	--
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	0,6	0,036
			Max	300	18	300	18	200	12	150	9	80	5	40	2,5	12	0,72	6	0,36
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	1	0,06
			Max	700	42	700	42	700	42	350	20	180	11	80	5	25	1,5	12	0,72
OI 400	100	1200	Min	240	14,5	120	7,2	60	3,6	35	2	17	1	10	0,6	4	0,24	2	0,12
			Max	1200	72	1200	72	1200	72	700	42	350	21	180	11	50	3	25	1,5



### Measuring ranges oval wheel meter OI 5 - OI 400 (special tooth profile, except OI5), with ball bearings for liquid with non-Newtonian flow elasticity

Type	DN	Flowrate $Q_{max}$ [l/min]	Range at viscosity	1,5 - 20 mPas		to 300 mPas		to 30.000 mPas		to 60.000 mPas		to 100.000 mPas	
				[l/min]	[m <sup>3</sup> /h]	[l/min]	[m <sup>3</sup> /h]	[l/min]	[m <sup>3</sup> /h]	[l/min]	[m <sup>3</sup> /h]	[l/min]	[m <sup>3</sup> /h]
OI 5	25	50	Min	15	0,9	5	0,3	3,5	0,21	2,5	0,15	1,5	0,09
			Max	50	3	50	3	35	2,1	25	1,5	15	0,9
OI 10	25	100	Min	30	1,8	10	0,6	7,5	0,45	5	0,3	3	0,18
			Max	100	6	100	6	75	4,5	50	3	30	1,8
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 spread sheet data are universally valid nominal data. The particularly applicable range depends on measuring media, viscosity and counter version.

#### Materials

Cast iron, cast steel, stainless steel, brass/bronze, Hastelloy

#### Accessories

The following accessories are available for the OI oval wheel flow meters:

- Mechanical single indicator E, indicator cannot be reset
- Mechanical double indicator D, indicator can be reset
- Mechanical roller counter M5, which can be reset
- Mechanical roller counter with printer M5B, can be reset
- Resettable mechanical roller counter with quantity setting device M5V
- Resettable mechanical roller counter with printer and quantity setting device M5BV
- Electronic meter EZD
- Pulse pick-up AG 19, 20, 42, 43
- Universal Smart Transmitter (UST) with HART®
- Strainer
- Processing peripherals
- Centrifugal gas separator, especially for measuring systems requiring calibration < 20 mPas

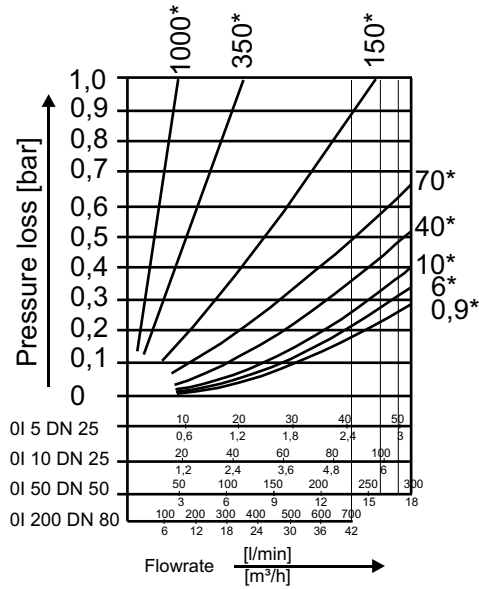


In order to prepare an offer for you, we need information on the material to be measured, viscosity, operating pressure, operating temperature, flow, length of operation and process connection.

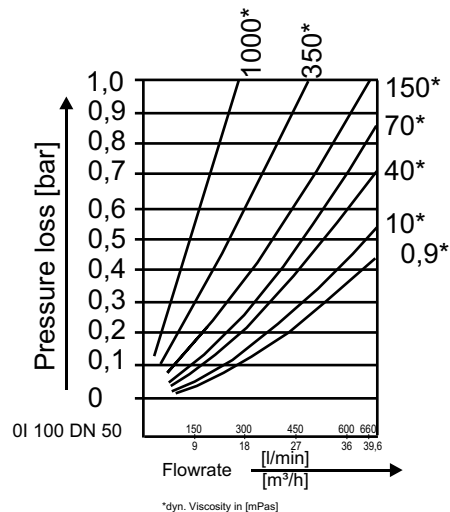
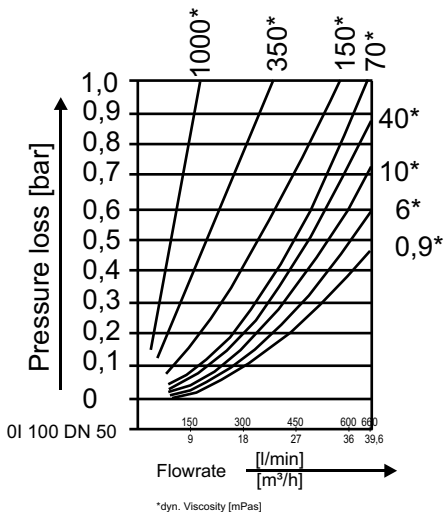
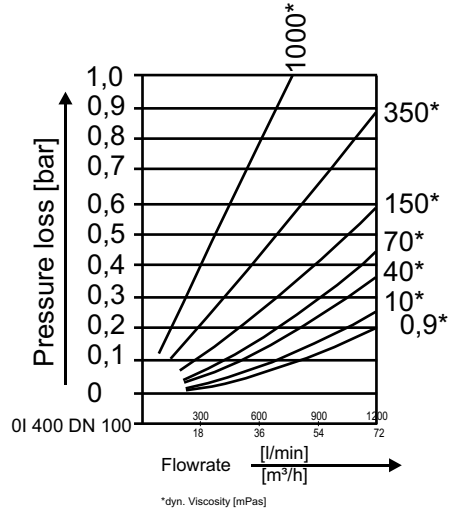
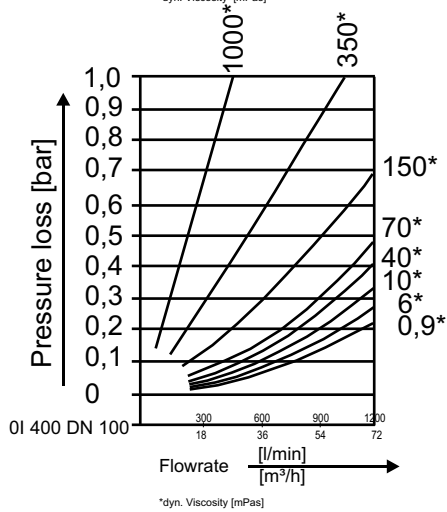
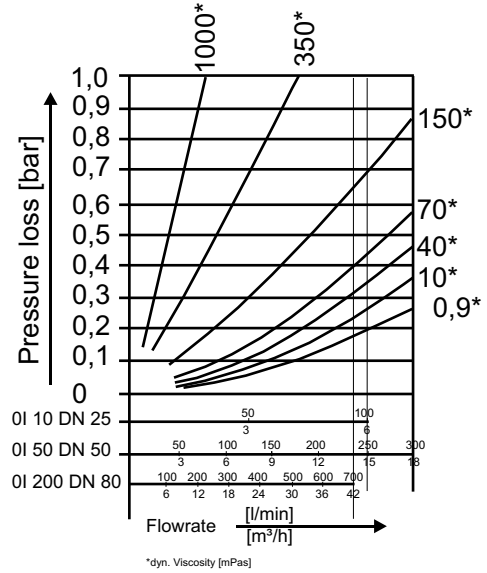


Pressure loss (OI with sleeve bearing)

normal tooth profile



special tooth profile





## OAP Series Oval Wheel Flow Meters

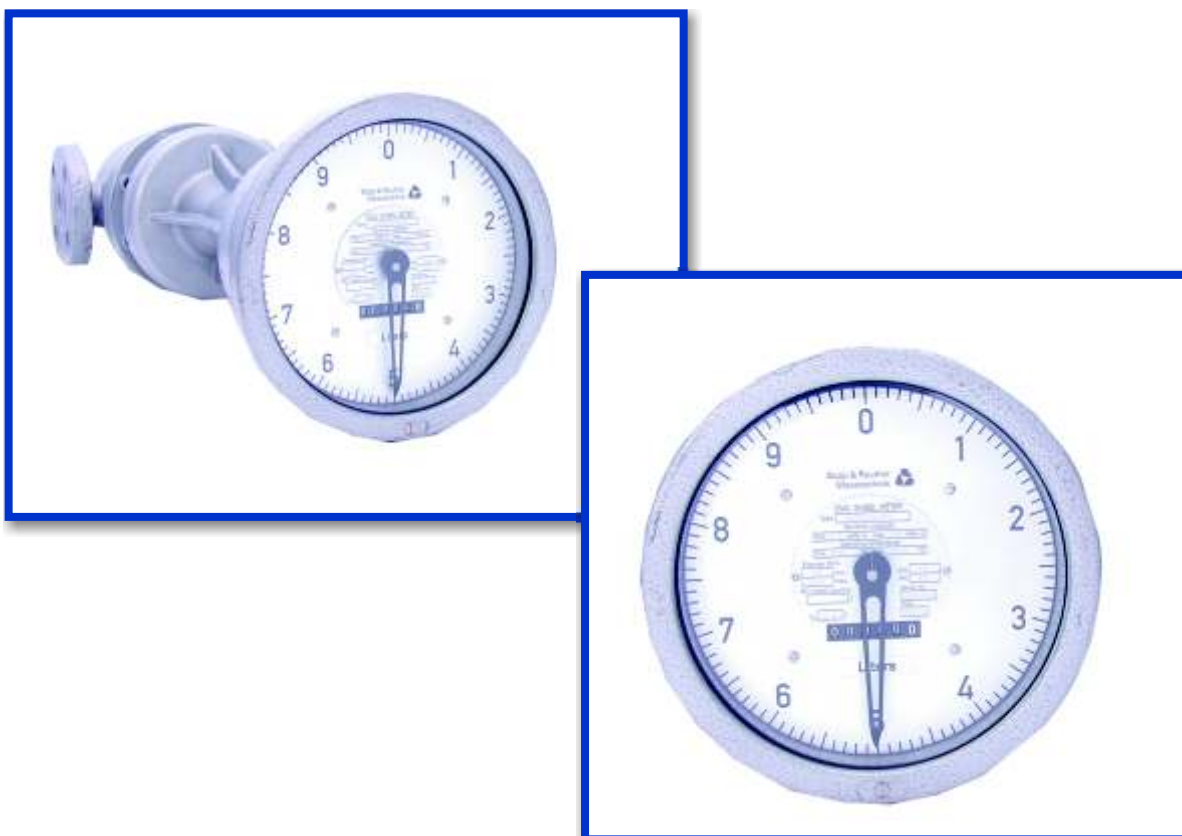
The control of the quantities of liquid products in the mineral oil industry and in the chemical and petrochemical industry requires volume-measuring instruments, which are adjusted to the special operating conditions and characteristics of the transported materials being measured both with respect to design and materials used.

Oval wheel flow meters of the OAP series meet these requirements. They are used for measuring liquid raw, intermediate and finished products such as liquified gases, gasolines, heating oils, lubricating oils, transmission oils, solvents, bitumen, alkaline solutions, acids and other chemical liquids.

The OAP series oval wheel flow meters are employed for the filling of tank trucks, rail tank cars and tanker ships, in pipeline operations and the process technology for the determination of balance sheets of materials such as heating oil consumption and the control of burners etc.

Due to the high measuring accuracy and operational safety, oval wheel flow meters from this series are preferred for employment in clearing transactions in the customs area and where calibration is required.

The rotational movement of the oval wheels is transmitted to a mechanical meter by means of a magnet coupling and gear unit. The meter displays the liquid flow quantities in the units of volume including liters, cubic meters and gallons. As an alternative, in place of the magnet coupling, a pulse pick-up AG 44 generates pulses for further processing.





**The OAP series of oval wheel flow meters has the following special design characteristics:**

The casing and the measurement chamber are separate components. The measurement chamber is pressure relieved, free from stresses and is installed in the meter casing. The axles for the oval wheels are placed in the measurement chamber bottom and for meter sizes  $\geq$  DN 65 they are also supported in the measurement chamber cover.

A permanent magnetic coupling is the basis for the transmission, without a compression gland, of the rotational movement from the measurement area to the dry area. Sleeve bearings insure the proper running of both oval wheels with high operational safety and long service life.

Oval wheel flow meters of the OAP series can, as for all other oval wheel flow meters, be adjusted to almost all operating conditions by means of various combinations of materials for the casing, measurement chamber, oval wheels and bearings.

The OAP series of oval wheel flow meters is also produced with a heating jacket. This is given the series designation of OUAP.

**Measuring ranges**

Type	DN	Flowrate Q <sub>max</sub> l/min	Ranges at Viscosity	< 0,3 mPa*s		0,3-1,5 mPa*s		1,5-150 mPa*s		upto 350 mPa*s		upto 1000 mPa*s		upto 3000 mPa*s	
				l/min	m <sup>3</sup> /h	l/min	m <sup>3</sup> /h	l/min	m <sup>3</sup> /h	l/min	m <sup>3</sup> /h	l/min	m <sup>3</sup> /h	l/min	m <sup>3</sup> /h
OaP2	25 1"	30	min	5	0,3	5	0,3	3	0,18	15	0,9	7,5	0,45	2,5	0,15
			max	25	1,5	30	1,8	30	1,8						
			continuous	10	0,6	20	1,2	27	1,62						
			Batch processing			27	1,6	30	1,8						
OaP5	25 1"	50	min	8	0,5	5	0,3	5	0,3	2,5	0,15	1,25	0,075	0,45	0,027
			max	40	2,5	50	3	50	3						
			continuous	16	1,0	33	2	45	2,7						
			Batch processing			45	2,7	50	3						
OaP10	25 1"	100	min	16	1,0	10	0,6	10	0,6	7	0,42	3,5	0,20	1,2	0,072
			max	80	5,0	100	6	100	6						
			continuous	33	2,0	66	4	90	5,4						
			Batch processing			90	5,4	100	6						
OaP50	50 2"	300	min	50	3,0	30	1,8	30	1,8	18	1,08	9,0	0,54	3	0,18
			max	250	15	300	18	300	18						
			continuous	100	6	200	12	270	16,2						
			Batch processing			270	16,2	300	18						
OaP125	65 2 1/2"	700	min	100	6	70	4,2	70	4,2	60	3,6	40	2,4	15	0,9
			max	500	30	700	42	700	42						
			continuous	200	12	420	25,2	525	31,5						
			Batch processing			560	33,6	630	37,8						
OaP250	80 3"	1200	min	200	12	120	7,2	120	7,2	100	6	60	3,6	30	1,8
			max	1000	60	1200	72	1200	72						
			continuous	400	24	720	43,2	1000	60						
			Batch processing			500	30	960	57,6						
OaP600	100 4"	3000	min	400	24	250	15	250	15	200	12	150	9	75	4,5
			max	2000	120	3000	180	3000	180						
			continuous	800	48	1650	100	2500	150						
			Batch processing			1000	60	3000	180						
OaP 1200 1200.1	150 8"	5000	min	800	48	500	30	500	30	400	24	250	15	120	7,2
			max	4000	240	5000	300	5000	300						
			continuous	1600	96	2500	150	3500	200						
			Batch processing			2000	120	4000	240						
OaP 2000	200 8"	8000	min	1300	80	800	48	800	48	660	40	400	24	200	12
			max	6500	400	8000	480	8000	480						
			continuous	2600	160	4000	240	5500	320						
			Batch processing			5000	300	6600	400						
OaP 3200	300 12"	12000	min	2000	120	1200	72	1200	72	1000	60	600	36	300	18
			max	10000	600	12000	720	12000	720						
			continuous	4000	240	6000	360	8000	480						
			Batch processing			8000	480	10000	600						
OaP 4000	400 16"	20000	min	3200	200	2000	120	2000	120	1500	90	1000	60	400	24
			max	16000	1000	20000	1200	20000	1200						
			continuous	6600	400	10000	600	13500	800						
			Batch processing			10000	600	15000	900						



### **Nominal pressure**

PN 16 to PN 100, at temperatures over 120°C pay attention to pressure reduction!

### **Measuring accuracy**

0.1% to 0.3% of the set value.

This depends on the measurement range and material being measured or in accordance with the particular calibration regulations. Oval wheel flow meters fulfill the regulatory requirements for the calibration of liquid measuring meters in Germany and other countries.

### **Allowable temperature of material being measured**

Depending on the model, -140°C to +290°C.

### **Materials**

Cast iron, cast steel, stainless steel, brass/bronze

### **Licenses**

Licensed by the Bureau of Standards in Germany and many other countries.

### **Accessories**

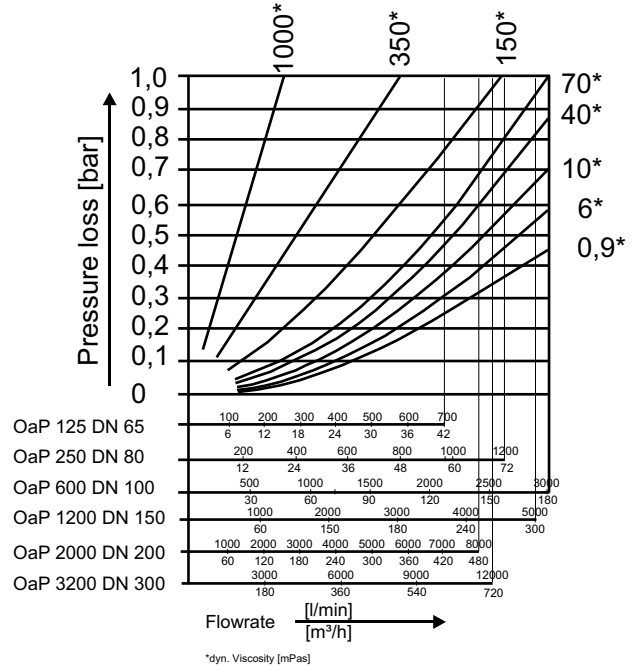
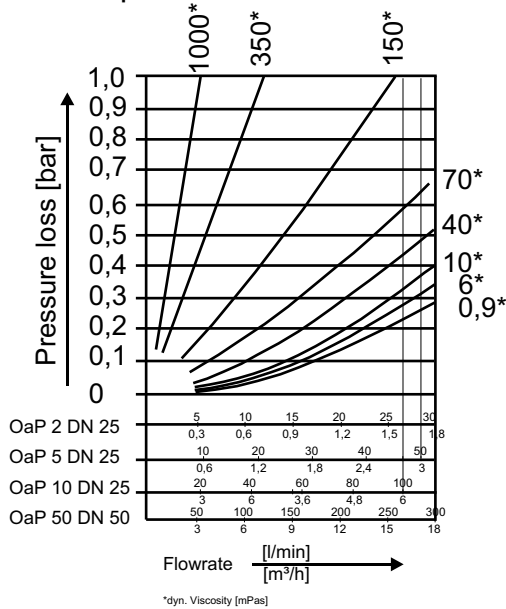
The following accessories are available for the OAP oval wheel flow meters:

- Mechanical single indicator E, indicator cannot be reset
- Mechanical double indicator D, indicator can be reset
- Mechanical roller counter M5, which can be reset
- Mechanical roller counter with printer M5B, can be reset
- Resettable mechanical roller counter with quantity setting device M5V
- Resettable mechanical roller counter with printer and quantity setting device M5BV
- Pulse pick-up AG 19, 20, 44
- Universal Smart Transmitter (UST) with HART®
- Strainer
- Processing peripherals
- Centrifugal gas separator, specially for measuring systems requiring calibration < 20 mPas
- Temperature compensation
- Temperature extension

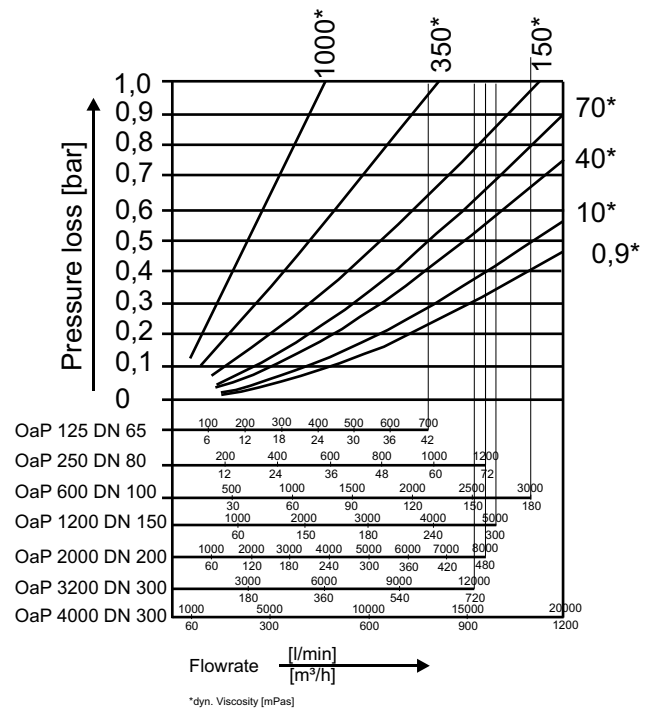
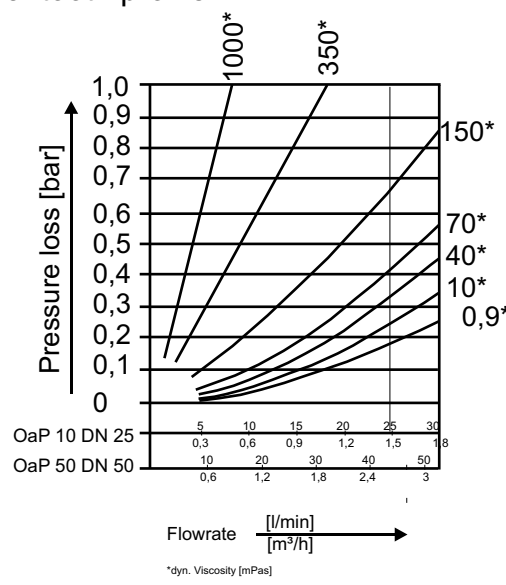


### Pressure loss OaP

Normal tooth profile



Special tooth profile





## OV Series Oval Wheel Flow Meters

The OV series of meters was specially developed for use in filling tank trucks and rail tank cars. The sizes and the selection of material are adjusted to the requirements of modern filling systems for mineral oil products such as gasoline, aircraft fuel, diesel and heating oil. The meters are suited for both top loading and bottom loading systems.

The filling meter contains **no**, except for the oval wheels, **moving parts**. The meter was designed as a pure volume transmitter and, therefore, a local display is not planned. Due to its design it has a large service life reserve.



OV800

The filling meters of the **OV series** have a new type of pulse trigger with two independent pickups. These insure the strict proportionality between the partial volumes measured and the volume pulse, without the previously used uniform motion gear unit. Periodical errors, which are system based, do not occur.

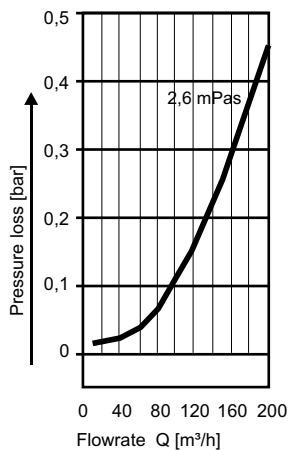
The use of two independently functioning pulse pickups insures not only the redundancy required for transactions, which require calibration, but this also allows a serially connected electronic device to identify and monitor return flow.

### Size, nominal flow

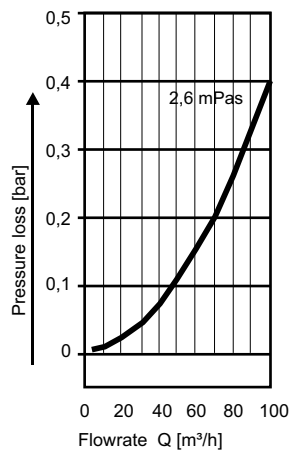
Type	Size	Flowrate [m³/h] At 0,3 – 120 mPas	
		min	max
OV800 Q <sub>max</sub> = 90 m³/h	80 3"	min	2,4
		max	90
		Continuous	70
OV1000 Q <sub>max</sub> = 200 m³/h	100 4"	min	5
		max	200
		Continuous	150

### Pressure loss

#### OV1000



#### OV800



### Nominal pressure

PN 40

### Measuring accuracy

For the entire measuring range  $\pm 0.3\%$  of the set value (Bureau of Standards preliminary test error limit). For the flow range of 10% to 100% of Q<sub>nominal</sub>  $\pm 0.1\%$  of the set value depending on the measurement range and the material being measured or the corresponding calibration regulations. The oval wheel flow meters fulfill the regulations concerning the calibration of liquid flow meters in Germany and other countries.

### Allowable temperature of material being measured

Depending on the model, -10°C to +60°C.

### Materials

Cast iron, cast steel, aluminum, brass/bronze

### Licenses

The oval wheel flow meters of the OV1000 series with the pulse pick-up, AG 54, have been approved for transport requiring calibration.

PTB License number 1.32.8 - 5.241 - BUR 91.41

### Accessories

The following accessories are available for the OV oval wheel flow meter:

- Strainer
- Centrifugal gas separator, specially for measuring systems requiring calibration < 20 mPas
- Processing peripherals



## OM Series Oval Wheel Flow Meters

The control of the quantities of liquid foods and liquid luxury foods and their preliminary and intermediate products, which are processed or handled in agricultural or industrial operations, is an economic necessity due to the high value of these liquids. The volume measuring instruments required for this must be adjusted to the particular operating conditions and the characteristics of the materials to be measured both with respect to design and the materials used for these instruments.

Bopp & Reuther manufactures liquid volume meters, which have been specially developed for the measurement of quantities of liquid foods and liquid luxury foods.

The OM series of oval wheel flow meters for the measurement of liquid foods and liquid luxury foods is used for the measurement of milk, whey, all liquid products similar to milk, fats, edible oils, cod-liver oil, herring oil, cocoa butter, fruit juices, wine, alcoholic beverages, beer and their preliminary products as well as in the pharmaceuticals and cosmetics areas.

Oval wheel flow meters are also used for mobile systems such as for milk trucks to account for the transported milk or other liquid dairy products.



The casing of the oval wheel flow meter for liquid foods and liquid luxury foods consists of high-gloss polished chromium-nickel steel and is also designed as the measuring chamber. The free-standing bearing axles, which have both toothed oval wheels of noncorroding steel mounted on them, are pressed into the casing bottom. A permanent magnetic coupling is the basis for the transmission, without a compression gland, of the rotational movement of both oval wheels from the measurement area to the dry area.

**OM Series oval wheel flow meters have the following special design characteristics:**

The meter in the pipe can be opened without the use of tools by removing the casing cover on the back of the meter. Cleaning can be done manually or automatically, CIP. If desired, a reversing drive can be installed between the measuring device and the meter, which allows the counter to be accessed from the reading side of the meter.

**Measuring ranges**

Type	DN	Flowrate Q <sub>max</sub> [l/mm]	Range at Viscosity	< 0,3 mPas		0,3 – 1,5 mPas		1,5 – 150 mPas		upto 350 mPa s		upto 1000 mPas		upto 3000 mPas	
				[l/min]	[m³/h]	[l/min]	[m³/h]	[l/min]	[m³/h]	[l/min]	[m³/h]	[l/min]	[m³/h]	[l/min]	[m³/h]
OM 10	32	100	min.	16	1	10	0,6	10	0,6	7	0,42	3,5	0,2	1,2	0,072
			max.	80	5	100	6	100	6	70	4,2	35	2	12	0,72
			continuous	33	2	66	4	80	4,8						
			Batch processing			90	5,4	90	5,4						
OM 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	14,4	240	14,4						
			Batch processing			270	16,2	270	16,2						
OM 115	65	500	min.	80	5	50	3	50	3	30	1,8	15	0,9	5	0,3
			max.	400	25	500	30	500	30	300	18	150	9	50	3
			continuous	166	10	330	20	400	24						
			Batch processing			450	27	450	27						
OM 400	80	1200	min.	200	12	120	7,2	120	7,2	100	6	60	3,6	30	1,8
			max.	1000	60	1200	72	1200	72	1000	60	600	36	300	18
			continuous	400	24	720	43,2	1000	60						
			Batch processing			960	57,6	1100	66						

**Nominal pressure**

PN 6

**Measuring accuracy**

For the entire measuring range ± 0.3% of the set value.  
Bureau of Standards preliminary test error limit.

**Allowable temperature of material being measured**

Depending on the model, -10°C to +100°C.

**Materials**

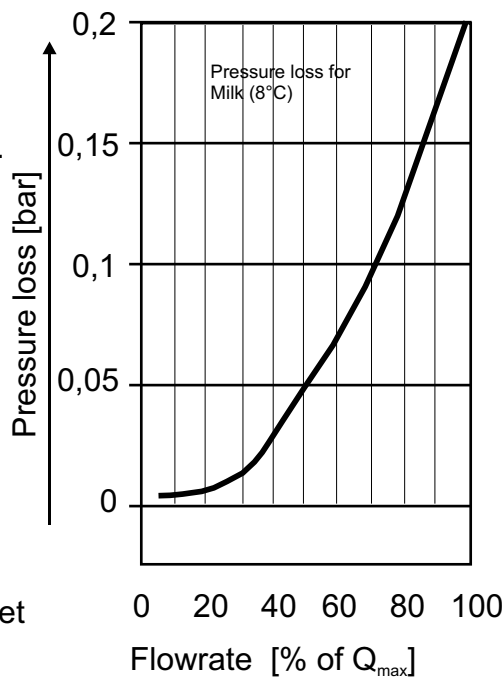
All parts, which are touched by liquids, are of chromium-nickel steel.

**Accessories**

The following accessories are available for the OM oval wheel flow meters:

- Mechanical single indicator E, indicator cannot be reset
- Mechanical double indicator D, indicator can be reset
- Mechanical roller counter M5, which can be reset
- Mechanical roller counter with printer M5B, can be reset
- Resettable mechanical roller counter with quantity setting device M5V
- Resettable mechanical roller counter with printer and quantity setting device M5BV
- Pulse pick-up AG 19, 20, 42, 43
- Dirt trap
- Processing peripherals
- Temperature extension
- Reversing drive

**Pressure loss**

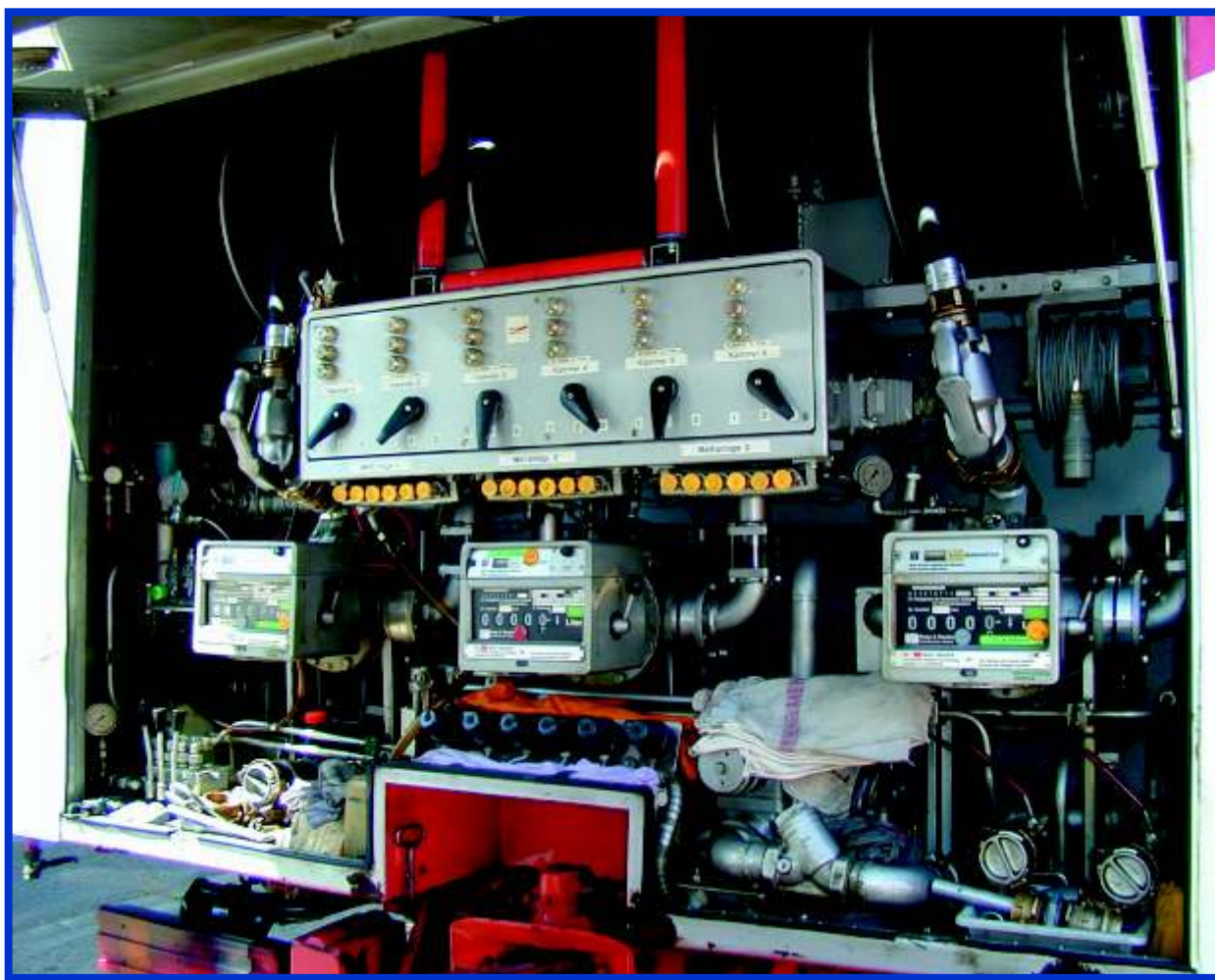




## OT Series Oval Wheel Flow Meters

Tank trucks must be equipped with a quantity-measuring device, which is licensed by the Bureau of Standards, so that the liquid products transported between the supplier and the recipient can be properly accounted for. The volume-measuring device required for this must be adjusted, with respect to both design and material, to the special operating conditions in the tank trucks. The OT series of oval wheel flow meters has been specially developed for these requirements. Stationary use in measurement systems can be done at any time.

Oval wheel flow meters of this type are used for measuring the volume of gasoline, petroleum, kerosine, gas oil, heating oils EL and L, motor oils and transmission oils etc.



Oval wheel flow meters in use in tank trucks for the measurement of lubricating oils.

**The OT series of oval wheel flow meters has the following special design characteristics:**

The casing of the oval wheel flow meter for tank trucks is made of light metal. For the oval wheel flow meters, type OT 60.1 and OT 115.1, the casing is also the measurement chamber. It is only for the oval wheel flow meter, type OT 200, that the casing has a separate measurement chamber of special cast brass installed in it. The oval wheels turn on two horizontally mounted axles.

The transmission of the rotational movement of the oval wheels from the measurement area to the dry area is done through a compression gland, which is sealed in the casing cover with an O-ring and requires no servicing.

**Measuring ranges**

Typ	Size	Flowrate [l/min] At 0,3 – 70 mPas
OT60.1 Q <sub>max</sub> = 500 l/min	40	30 – 300
		40 – 400
		50 - 500
OT115.1 Q <sub>max</sub> = 700 l/min	65	70 - 700
OT200 Q <sub>max</sub> = 1200 l/min	80	100 – 1000
		120 – 1200

**Nominal pressure**

PN 10

**Measuring accuracy**

For the entire measuring range ± 0.3% of the set value.  
Bureau of Standards preliminary test error limit.

**Allowable temperature of material being measured**

Depending on the model, -10°C to +60°C.

**Materials**

- OT 60.1: Casing and oval wheels of light metal, brass sliding disks
- OT 115.1: Casing and oval wheels of light metal, brass sliding disks
- OT 200: Casing and oval wheels of light metal, measurement chamber of special cast brass

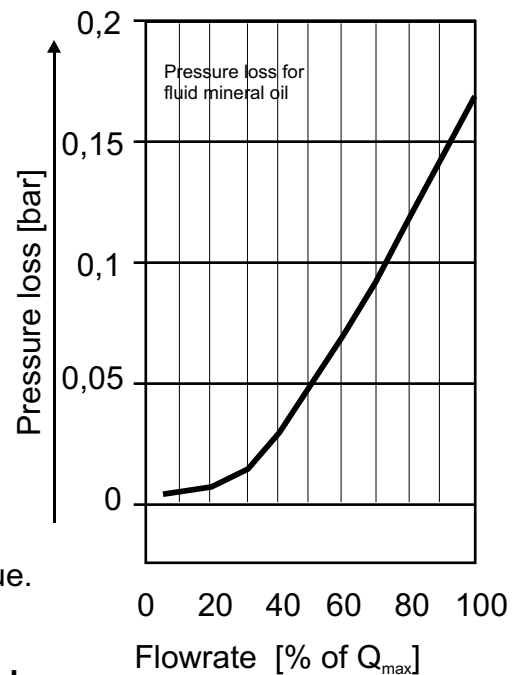
**Licenses**

Licensed by the Bureau of Standards in Germany and many other countries.

**Accessories**

The following accessories are available for the OT oval wheel flow meters:

- Resettable mechanical double indicator D
- Resettable mechanical roller counter M5, with printer M5B, with quantity setting device M5V and with printer and quantity setting device M5BV
- Pulse pick-up AG 19, 20
- Strainer
- Processing peripherals





## OK Series Oval Wheel Flow Meters (Dosimeter)

Oval wheel flow meters with shut-off valve, compact construction.

**Use:** For the automatic dosage of chemical liquids of all types such as solvents, resins, colors, paints and, with some individual limitations, alkaline solutions, organic and inorganic acids depending on temperature and concentration. Not suited for liquified gases and liquid foods.

**Oval wheel flow meter:** The casing is also the measurement chamber for all types. A permanent magnetic coupling is the basis for the transmission, without a compression gland, of the rotational movement of both oval wheels from the measurement area to the dry area.



**Meter M5V:** Resettable roller meter with five, digit rollers with a digit height of 19 mm including a dash-line display, which is shown as a digit beside the beginning roller after the metering process is ended and after operation of the operating handle on the right. Non-resettable roller sum meter with eight, digit rollers. Operating handle on the right with operating status display: GREEN = ready for operation, RED = not ready for operation. Available with resettable printer B with six print rollers.

**Quantity setting meter Vm4:** Setting of the dosage amount using five buttons on five digit rollers. Switch lever for the start of the dosage process. Mechanical shut-off device for four stage closing of the shut-off valve. Red Stop button for emergency interruption.

**Auxiliary equipment upon request:** Built-in zero contact, protection type (Ex)d3 nG5 PTB number Ex-80/1049 X, for switching at the beginning and end of the dosage process. Suited for signaling and ON-OFF control of pumps and valves etc.  
Max. switching capacity: 125/250 V~6/5A 125/250 V~0.6/0.4A  
Connection cable: H05VV-F 3 x 0.75 mm<sup>2</sup>, about 3 m long.

**Shut-off valve:** Opened with an operating lever, on the left or right depending on the flow direction, on the quantity setting device against spring tension and liquid pressure. Closes mechanically with spring tension and liquid pressure. Sealing without compression gland with bellows of chromium-nickel steel.

**Installation:** In horizontal pipes for flows from left to right or from right to left. Shut-off valve always behind the oval wheel flow meter seen from the flow direction.

**Caution!** If there is no operating pressure, closing force of the valve only up to 0.3 bars of opposing pressure.

### Measuring ranges

Type	Size	Dyn. Viscosity [mPas]	0,3 – 1,5 [l/min]	1,5 - 150 [l/min]	150 - 300 [l/min]	300 – 1000 (Ball bearing) [l/min]
OK5 Q <sub>max</sub> = 50 l/min	25	min	5	5	2,5	2,5
		max	50	50	25	25
		continuous	33	33	25	25
OK10 Q <sub>max</sub> = 100 l/min	25	min	10	10	7	8
		max	100	100	70	80
		continuous	66	80	70	80
OK50 Q <sub>max</sub> = 300 l/min	50	min	30	30	18	15
		max	300	300	180	200
		continuous	200	240	180	200
OK100 Q <sub>max</sub> = 500 l/min	50	min	66	66	48	-----
		max	500	500	480	-----
		continuous	440	500	480	-----

### Nominal pressure

DN 25 PN 10, DN 50 PN 6

### Measuring accuracy

For the entire measuring range  $\pm 0.3\%$  of the set value (Bureau of Standards preliminary test error limit).

### Allowable temperature of material being measured

Depending on the model, -10°C to +60°C, higher temperatures upon request.

### Materials

Cast iron, cast steel, stainless steel, brass/bronze

### Licenses

Licensed by the Bureau of Standards in Germany and in many other countries.

### Accessories

The following accessories are available for the OK oval wheel flow meters:

- Strainer
- Pulse pick-up IG 2 with two channels



## Mechanical Meters

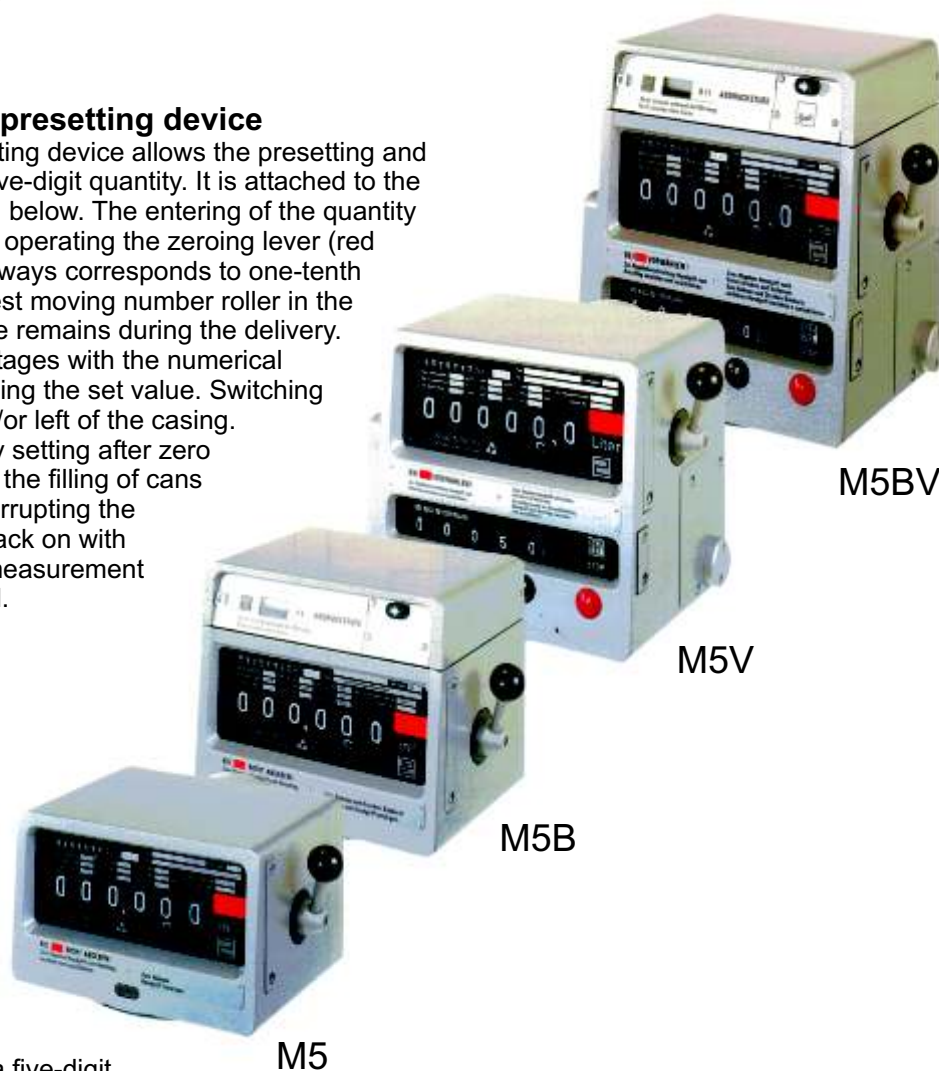
### Roller meters

#### Roller meter, M5BV, with printer and presetting device

The roller meter M5, printer B, and the presetting device V have been made into a combination device and placed in one casing. Reading of the measured quantity is done on the roller meter M5. Preparation of a printed card for the measured value in the printer B. Setting of the desired quantity to be delivered on the quantity-presetting device V.

#### Roller meter M5V with presetting device

The attachment of the presetting device allows the presetting and delivery of a maximum of a five-digit quantity. It is attached to the meter M5, which is described below. The entering of the quantity is done with the buttons after operating the zeroing lever (red marking). The setting level always corresponds to one-tenth of the cycle value of the fastest moving number roller in the M5 roller meter. The set value remains during the delivery. Switching off occurs in four stages with the numerical values of 20, 10, 3 and reaching the set value. Switching can be done on the right and/or left of the casing. Return of the original quantity setting after zero position. This is important for the filling of cans or drums. Stop button for interrupting the measuring process. Turn it back on with the operating lever and the measurement can be carried out to the end.



#### Roller meter M5

The device is equipped with a five-digit Roller set, which counts and displays the units of measure. A sixth number roller is covered by a cover. After the measurement is ended and operation of the zeroing lever, the cover opens and the value after the dash of the fifth number roller is shown at this position as a digit. After the measured value is read, the zeroing lever is operated again. The rollers are reset to zero and the sixth digit is covered. Again. The device is ready for a new measurement. An eight-digit sum meter, which cannot be zeroed, adds all values displayed on the roller set in a parallel process.

#### Roller meter M5B With printer

This device is used where a receipt is required in addition to the display of the quantity delivered. After the quantity is delivered, the zeroing lever is moved to zero the device. The sum for the quantity in the roller meter is now transferred to the printer and printed out on the inserted receipt. Zeroing of the combination device is also done by operating the zeroing lever. During the above function sequence, the zeroing lever is locked.

## Roller counter R7



The small OI oval wheel flow meters are available with a non-resettable meter and seven number rollers. The meter can be combined with the pulse pick-up AG 19 and AG 20. These serve as instrument transmitters for the measurement of flow, flow control, remote metering or for data processing.

## Indicators for OI, OAP, OM and OT oval wheel flow meters

### Single indicator E

Indicator cannot be reset



Both models (E and D) with non-resettable roller counter for running sums (roller sum counter) with six number rollers.

### Double indicator D

Indicator is resettable



The indicator head is available as a vertically standing, inclined or horizontal option.



## Measuring Transducer

Universal Smart Transmitter UST



- With two-wire technology
- With 4-20 mA output or NAMUR pulse output
- With local display
- Is user-friendly and simple to operate with special SensorPort software
- With HART® protocol
- With drivers acc. FDT-technology 1.2 available
- Can be operated with hand-held terminal
- Operating via solenoid switch
- EEx ia, EEx d



EZD



- Electronic display for flow and sum
- With scalable NAMUR pulse output
- Is user-friendly and simple to operate with special SensorPort software
- Operating via solenoid switch
- EEx ia

## Pulse pick-up

Magnetic-field controlled pulse pick-up



Type AG 41 according to NAMUR connectable to all oval wheel flow meters of series OI 03 to OI 2.

### Magnetic-field controlled pulse pick-up



Type AG 4x

AG 42 for attachment to OI5 - OI 10  
AG 43 for attachment to OI50 - OI 400  
AG 54 for attachment to OV 1000 and 800  
AG 44 for attachment to OAP

1 resp. 2 channel NAMUR pulse output

### Inductive pulse pick-up



Type AG 19, AG 20 acc. to DIN EN 60947-5-6  
connectable to all oval wheel flow meters,  
available with additional mechanical  
attachments.

1 resp. 2 channel NAMUR pulse output

Type AG 54 acc. DIN EN 60947-5-6 for to oval  
wheel meters OV 800 and OV1000

1 resp. 2 channel NAMUR pulse output with  
Return flow detection

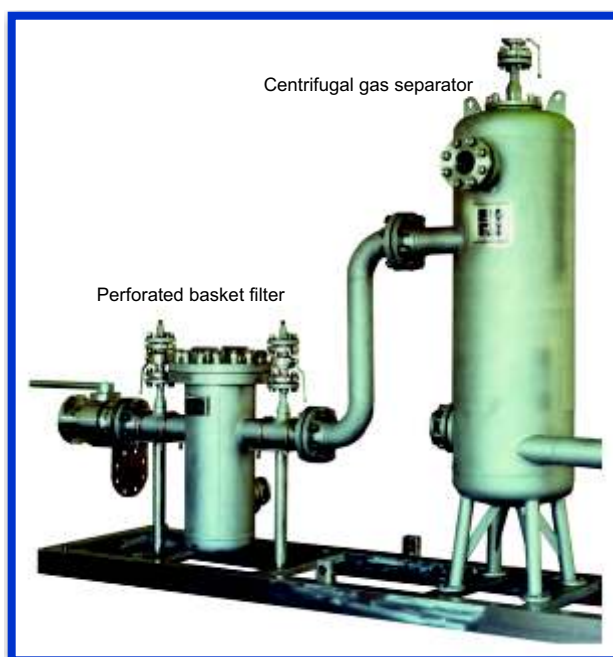


## Accessories

### Centrifugal gas separator

In order to avoid measuring errors due to the inclusion of air or gas mixtures and to protect the meter when measuring quantities of liquids with volume meters, a gas separator is installed in front of the meter, upstream, for mediums with a dynamic viscosity of  $< 20$  mPas at  $20^{\circ}\text{C}$ .

For measurement systems, requiring calibration, with pump operation for mediums up to 20 mPas, gas separators are prescribed by the calibration regulation in Germany. Centrifugal gas separators in conjunction with oval wheel flow meters fulfill the regulations concerning the calibration of measurement systems in Germany and other countries. Bopp & Reuther centrifugal gas separators have an EEC design approval and are thus approved for EEC initial calibrations.



### Strainer

A strainer consists of a cast or welded casing with a strainer insert with a metal fabric insert. The liquid flows from the top through the strainer insert and the impurities are filtered out by the fine mesh metal fabric. To allow cleaning of the strainer, the strainer insert can be removed after removing the cover. For chemical perforated basket strainer, all inner surfaces are cone shaped and the edges are distinctly rounded. This design characteristic guarantees that after the screw plug is opened, which is located at the lowest point, the chemical perforated basket strainer and the pipe part are 100% drained. After it is drained there are not any residual amounts or drops in the chemical strainer.

## Communicative Solutions

There are various transmitters available for our meters. With the software SensorPort or the DTM-drivers you can configure our meters. With the trendviewer of SensorPort its possible to protocol the measured values.



- HART® capable products
- Configuration of the HART® devices via own Software SensorPort
- Bopp & Reuther Messtechnik GmbH is member of:
  - the HART Communication Foundation
  - the Profibus Nutzerorganisation e.V.
  - the PACTware™ - Consortium
- Our communicace products support the FDT-technology 1.2
- HART® drivers for Bopp & Reuther meter are also available for PDM (Siemens) and AMS (Fisher Rosemount).

## Directive 97/23/EG (known as directive for pressure devices)

All meters manufactured by Bopp & Reuther Messtechnik fulfill the requirement acc. to the directive 97/23/EG.

Listing of the affected oval wheel meters:

OI 50 - 400	(DN 50 - DN 100)
OUI 50 - 400	(DN 50 - DN 100)
OaP 50 - 4000	(DN 50 - DN 400)
OJaP 50 - 600	(DN 50 - DN 100)
OV 800 - 1000	(DN 80 - DN 100)
OT 60 - 200	(DN 40 - DN 80)
OK 50 - 100	(DN 50)
OP 32 - 50	(DN 32 - DN 50)
OC 10	(R 1 1/2")



The corresponding certificates are available.



## European directive 94/9/EG (also known as ATEX 100a or ATEX 95)

The optionally available electrical equipment, pulse trigger and transmitter, fully comply with European Directive 94/9/EG and carry the appropriate approval.

### Classification of areas with potentially Explosive atmospheres

According to EN 1127-1

#### Zone 0

Continuously explosive atmosphere (> 1000h/Jahr)

Area in which a hazardous explosive gas atmosphere is present continuously or for long periods or in which a hazardous explosive gas atmosphere is frequently occurring..

#### Zone 1

Intermittently explosive atmosphere (10 to 1000h/year)

Area in which a hazardous explosive gas atmosphere is likely to occur in normal operation.

#### Zone 2

Episodically explosive atmosphere (< 10h/years)

Area in which a hazardous explosive gas atmosphere is not likely to occur in normal operation and, if it occurs, will only exist for a short time..Basis for the area classification is the IEC publication 79-10 "Classification of Hazardous Areas". An important factor for this classification is the probability of the occurrence of potentially explosive gas-air atmospheres.

#### Zone 20

Continuously explosive atmosphere (> 1000h/year)

Area in which a hazardous explosive gas atmosphere in the shape of a layer of dust is present continuously or for long periods. Area in which dust layers of unknown or excessive thickness may be formed.

#### Zone 21

Intermittently explosive atmosphere (10 to 1000h/year)

Area in which a hazardous explosive gas atmosphere in the shape of a layer of dust is present continuously or for long periods. Area in which dust layers of unknown or excessive thickness may be formed.

#### Zone 22

Episodically explosive atmosphere (< 10h/year)

Area which a hazardous explosive gas atmosphere in the shape of a layer of dust is not likely to occur in normal operation. If it occurs, it will only exist for a short time, or where layer-like accumulations of combustible dust are visible

### European Directive 94/9/EG

This directive applies to equipment and protective systems intended for use in potentially explosive atmosphere.

#### Group I

Electrical equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and / or combustible dust.

#### Category

##### M1

Equipment in this category is required to remain functional, even in the event of rare incidents relating to equipment, with an explosive atmosphere present (the requisite level of protection is assured in the event of two faults occurring independently of each other.

##### M2

This equipment is intended to be de-energized in the event of an explosive atmosphere.

#### Group II

Electrical equipment intended for use in areas in which explosive atmosphere caused (apart from those listed in Group I) by mixtures of air and gases, vapours or mists/sprays or by air-dust mixtures are present continuously, for long periods or frequently

#### Category

##### 1

Equipment in this category must ensure the requisite level of protection, even in the event of rare incidents relating to equipment (the requisite level of protection is assured in the event of two faults occurring independently of each other)

May be in Zones 0, 1,2,20,21,22

##### 2

The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account (the requisite level of protection is assured in the event of one fault occurring)

may be used in zone 1, 2, 21, 22

##### 3

Equipment in this category ensures the requisite level of protection during normal operation

may be used in zones 2, 22



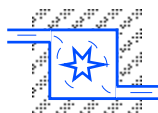
**Type of Protection**  
(Certification(s)/Approval(s))

Ex-area hatched

Oil housing "o"



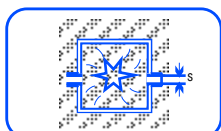
Overpressure housing "p"



Sand housing "q"



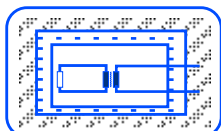
Pressure proof housing "d"



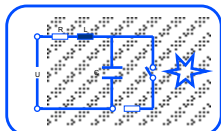
Increased safety "e"



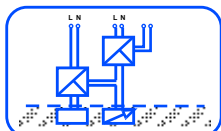
Encapsulating housing "m"



Intrinsic safety "i"



Intrinsically safe systems "i-SYST"



**Marking of Equipment in  
Conformity with European  
Directive 94/9/EG**

The marking must contain:

- Name and address of manufacturer
- CE-conformity marking
- year of production
- Ex-classification in connection with marking of the equipment group and category (for equipment group II "D" for dusts or "G" for gases, vapours and mists/sprays
- Marking necessary for safe operation of the equipment

Bopp & Reuther  
Messtechnik GmbH  
68305 Mannheim  
CE 0123  
II 2G EEx ia IIC T6

**Marking of Equipment in  
Accordance with  
EN 50014 (IEC 60079-0)**

EEx ia II C T6

Marking for electrical equipment with certification of conformity issued by an EC department

E complying to European standard  
Ex equipment protected against explosion

**Applied types of Protection**  
o Oil housing  
p overpressure housing  
q sand housing  
d pressure proof housing  
e increased safety  
i intrinsic safety  
m encapsulating housing  
SYST intrinsically safe systems  
n non incandive

**Equipment group**

**Sub-groups of group II, namely IIA, IIB, IIC only for**

d pressure proof housing  
e increased safety  
n non incandive

**Temperature Classes Tn**

(Tn equals maximum surface temperature)

T1: +450°C T2: +300°C  
T3: +200°C T4: +135°C  
T5: +100°C T6: +85°C



## Specification questionnaire for Oval Wheel Meters

Requesting company		Specialist	
Address		Phone	
Request / order no.		Date	
Our offer / order no.		Date	
<b>1. Material to be Measured</b>			
1.1	Name and composition (chemical formula)		
1.2	Chemically pure	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1.3	Impurities and contaminants in %		
1.4	Temperature	min. °C, normal. °C, max. °C	
1.5	Density	Kg/m <sup>3</sup> at °C	
1.6	Viscosity at various temperatures (indicate unit in mPas, cP, mm <sup>2</sup> /s, cSt)	at °C ≐ at °C ≐	
		at °C ≐ at °C ≐	
<b>2. Materials</b>			
2.1	Which materials are corrosion resistant		
2.2	Which materials are not corrosion resistant		
2.3	Which materials may not be used		
<b>3. Operating Values</b>			
3.1	Existing pipeline	DIN / ANSI	PN
3.2	Flange	DIN / ANSI	
3.3	Operating pressure at the installation location (indicate in bars)	max.	min.
3.4	For limitation of quantity and control indicate in bars	Inlet pressure	Back pressure
3.5	Flow in L/min. or m <sup>3</sup> /h	min.	Normal. max.
3.6	Number of daily operating hours for the meter		
3.7	Average total quantity daily in m <sup>3</sup>		
<b>4. Type of System</b>			
4.1	Use for	<input type="checkbox"/> Internal measurement <input type="checkbox"/> Measurement requiring calibration	
4.2	Type of conveyance	<input type="checkbox"/> Piston pump <input type="checkbox"/> Centrifugal pump <input type="checkbox"/> Free pressure gradient <input type="checkbox"/> Other	
4.3	For pump operation, installation in	<input type="checkbox"/> Suction line <input type="checkbox"/> Pressure line	
4.4	Maximum pump output, for example, m <sup>3</sup> /h		
4.5	Strainer available	<input type="checkbox"/> Yes <input type="checkbox"/> No Mesh width	



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