



Oval wheel meter Miniflow

with pulse pick-up

Reed RM

Magnetic field sensor

NAMUR pulse pick-up

Operating manual



Picture: Miniflow with magnetic field sensor

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Foreword

I. Transport, Delivery, Storage

Storage and Transport

Always protect devices against humidity, soiling, impacts and damages

Delivery Inspection

Check the delivery for completeness upon receipt. Compare the device data with the data on the delivery note and in the order records.

Report any in-transit damage immediately. Damage reported at a later date shall not be recognised.

II. Warranty

Please refer the contractual terms and conditions relating to delivery for the scope and period of warranty.

Warranty claims shall be conditional to correct installation and commissioning in accordance with the operating instructions of the device. The necessary installation, commissioning and maintenance work should only be carried out by qualified and authorised personnel.

1. Identification

Manufacturer Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
67346 Speyer, Germany
Phone: +49 (0) 6232 657-0
Fax: +49 (0) 6232 657-505

Type of product: Direct volumetric meter (displacement flow meter)
Product name: Miniflow oval wheel meter
Doc version no.: A-EN-01291-00B

2. Area of Application

The application area for Flowal oval wheel meters encompasses the simple, reliable and cost-effective measurement of liquid volumes or volumetric flow rates. They have an extremely robust design and combine years of experience with state-of-the art technologies. They can be used in various industries, e.g. mechanical engineering, plant construction, food industry, semiconductor industry, environment industry, automotive industry, etc.

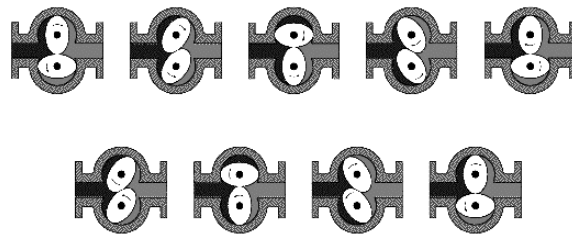
Due to the available material combinations, this series is also suitable for measuring aggressive or corrosive media. The Flowal oval wheels meters 03 to 1 are manufactured with a G $\frac{1}{8}$ " internal thread connection as standard and can be used for an operating pressure of up to 10 bar. The max. operating temperature is 80° C.

3. Principle of Operation and System Design

3.1 Measuring Principle

Oval wheel meters belong to the group of direct volumetric meters for liquids with movable partition walls (displacement flow meters). The oval wheel meter consists of a measurement chamber housing with two pivoted oval wheels which are toothed and roll off around each other in counter-rotations.

The diagram displays oval wheel movement during the measurement process.



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

3.2 System Design

The oval wheel meter type Miniflow comprise of following main components:

- **Measuring chamber cover** with tapped hole (M12x1) for pulse pick-up
- **Measuring chamber** with process connection
- **Pulse pick-up:** Reed, NAMUR, magnetic field sensor

3.2.1 Measuring chamber cover

The cover complies following functions:

- Cover for the Measuring chamber
- Contains the tapped hole (M12x1) for the pulse pick-up (M12x1)

3.2.2 Measuring chamber

The measuring chamber contains the oval wheels and the proces connection (G 1/8" internal thread connection (standard) or G 1/4" internal thread connection (optional)).

3.2.3 Pulse pick-up

1. Reed RM – e.g. for connection to evaluation electronics or the user's PLC
Max. switching capacity 10W
Max. switching current 0.5A
Max. switching voltage 100V
2. Magnetic field sensor (NPN) – e.g. for connection to evaluation electronics or the user's PLC; sensor has to be supplied with 10-30 V DC. Connection via 3m PVC wire 3 x 0.34mm². 2 LEDs at the sensor for supply and contact.
3. NAMUR pulse pick-up for explosion hazardous area – Ex II 2G EEx ib II C T6 – The pick-up supplies pulses according to NAMUR for evaluation units (e.g. flow computer CSM from Bopp & Reuther Messtechnik GmbH) connection via 2 m PVC wire 2 x 0.34 mm². LED for contact at the sensor. Supply the sensor according to NAMUR with 8.2 V DC. Always observe country-specific regulations for explosion hazardous areas (for Germany: EN 60079-14 or VDE 0165).

Overview: The number of pulses per litre depending on the pick-up, and counter size

Type	Measuring Range l/min	n _{max} 1/l 1/min		Pulse Pick-Up:								
				Magnetic Field			NAMUR			Reed RM		
				Imp/n	Imp/l	Hz	Imp/n	Imp/l	Hz	Imp/n	Imp/l	Hz
Miniflow	0,1 bis 1	1500	1500	2	3000	50	2	3000	50	2	3000	50

The number of the pulses per liter depends on the viscosity. (the table shows the values for water)

4. Input

4.1 Measured Variable

Liquid volumes and volumetric flow rate

4.2 Measuring Range

Type	Measuring range [l/min]
Miniflow	0,1 – 1

5. Characteristic Values

5.1 Reference Conditions

Pressure: 2 to 7 bar, temp.: 20 to 30°C, test medium: water

5.2 Measured Error

Typ	Standard measured error in % of measured value	Standard measured error in % of measured value
Miniflow	5	2,5

5.3 Repeatability

< 0.1 % of measured value

6. Operating Conditions

6.1 Installation Conditions

6.1.1 Installation Information

Warning

Thoroughly read and observe the operating instructions prior to installation and commissioning.
Depressurize the system and allow it to **cool down** before installing or de-installing the device.

6.1.1.1 General Information

- Bopp & Reuther oval wheel meters are precision flow meters. The input and output are fitted with protective caps to protect against impurities. Only remove the protective caps immediately prior to installation.
- Always observe operating data stated on the oval wheel meter. Always observe the data in the order confirmation and the configuration data sheet. Use with other operating data is only possible after prior consultation with and release by Bopp & Reuther Messtechnik GmbH (always state serial number).
- Install the oval wheel meter in the pressure pipe behind the pump (approx. 3 m liquid column pressure loss for nominal flow rate).
- Install the oval wheel meter in a way that it remains completely filled with liquid even when idle.
- In order to prevent measuring errors due to trapped gas or soiling etc., the user should take appropriate preventative measures (gas separator, strainer).
- Oval wheel meters which are to be used for liquid foodstuffs and stimulants should be thoroughly cleaned prior to use (see Maintenance and Cleaning).

6.1.1.2 Installation

- Remove any impurities from the pipework. For this task, install a fitting part instead of the oval wheel meter and flush the pipework.
- Only remove the protective caps at the oval wheel meter input and output immediately prior to installation. Prevent any impurities entering the device during installation.
- When installing the oval wheel meter ensure that the oval wheel axles are positioned horizontally, irrespective of the pipework.

6.1.2 Start-Up Conditions

Important

- **Start up the oval wheel meter and gradually increase the 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 operation. Subsequently start up the oval wheel meter while gradually increasing the flow rate.**

6.2 Ambient Conditions

6.2.1. Ambient temperature

Miniflow: -10 to +60°C

6.2.2 Storage temperature

Miniflow: -10 C to + 40° C

Pulse pick-up: (M12x1)

Reed contact	-20° C to +100° C
Magnetic field sensor	-25° C to +70° C
NAMUR-pulse pick-up	-25° C to +70° C

6.2.3 Degree of Protection

IP 67

6.2.4 Electromagnetic Compatibility

Electromagnetic compatibility is guaranteed

6.3 Process Conditions

6.3.1 State of Aggregation

Suitable for liquids

6.3.2 Viscosity

1 to 150 mPas

6.3.3 Liquid Temperature Limits

-10°C to +80°C

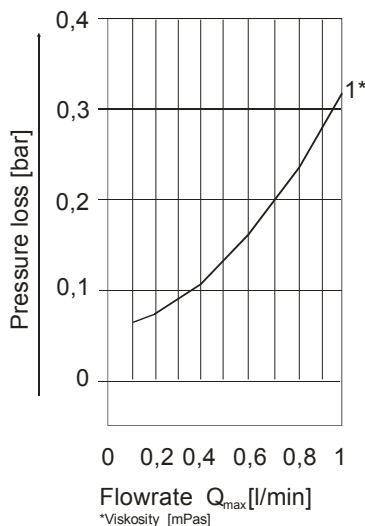
6.3.4 Liquid Pressure Limits

	PVDF	ALU	ALU/PC	F5/PPS	F5
Miniflow	PN 10	PN 10	PN 10	PN 10	PN 10

6.3.5 Flow Rate Limits

Typ	Q _{max} [Liter/min]
Miniflow	1

6.3.6 Pressure loss

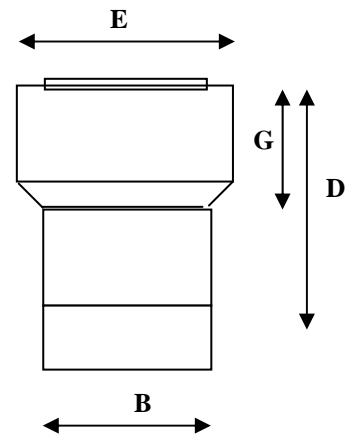


7. Constructive Design

7.1 Model/Dimensions

All details in mm

Internal thread connection	A	B	C
G 1/8"	65	60	ca. 30
G 1/4"	65	65	ca. 30



7.2 Materials

	PVDF	ALU	ALU/PC	F5/PPS	F5
Process connection	PVDF	Aluminium	PC	Stainless steel 1.4571	Stainless steel I 1.4571
Measurement chamber housing	PVDF	Aluminium	Aluminium	Stainless steel 1.4571	Stainless steel 1.4571
Oval wheels	PPS	PPS	PPS	PPS	Stainless steel 1.4571
Bearing	none	none	none	none	none
Axle	1.4571	1.4571	1.4571	1.4571	1.4571
O-ring	NBR	NBR	NBR	NBR	NBR

7.3 Weight

All details in kg

	PVDF	ALU	ALU/PC	F5/PPS	F5
with G 1/8" Internal thread connection	0,180	0,280	0,425	0,730	0,750
with G 1/4" Internal thread connection	0,200	0,300	0,470	0,800	0,820

7.4 Process connection

The Miniflow oval wheel meters can be equipped with the following process connections:

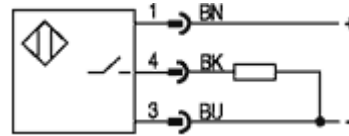
- G 1/8" internal thread connection (standard)
- G 1/4" internal thread connection (optional)

7.5 Electrical Connection

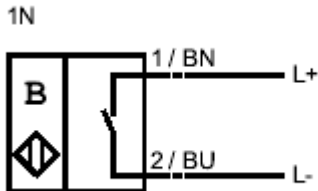
Magnetic field sensor NPN



Magnetic field sensor PNP



NAMUR sensor



Caution!

Always observe the respective national installation regulations when installing the Flowal oval wheel meter in explosion hazardous areas (only possible with **NAMUR sensor**) (for Germany: EN 60079-14 or VDE 0165).

8 Pulse Value, K Factor

The measured volume is displayed in pulses.

A test certificate is supplied with calibrated devices; this certificate states the device-specific pulse value (K factor) in pulses per litre. This K factor is also specified on the device.

This K factor is required in the installed electronics (e.g. digital indicator, flow computer, PLS) to calculate the measured volume.

9. Certificates and Approvals

CE Mark:

The measuring system fulfils the legal requirements of the EC Directives 89/336/EEC and 94/9/EC including all published revisions or amendments to date. Bopp & Reuther Messtechnik GmbH confirms successful device testing and affixing of the CE Mark.

Pressure equipment directive

Flowal oval wheel meters are suitable for group 1 liquids.

Classification acc. to Article 3, §3 (designed and produced according to excellent engineering techniques)

Appendix

A. Trouble Shooting

The oval wheel meter operates maintenance-free. If a fault occurs or there is suspicion of an incorrect message, check the installation conditions as stated in section 6.1. If the fault cannot be cleared, please contact Bopp & Reuther Messtechnik GmbH.

Warning

Always observe local regulations and all the safety instructions in these operating instructions when working at the electrical connections.

General:

If the fault cannot be detected, please contact the service department of Bopp & Reuther Messtechnik GmbH or return the device for repair work to Bopp & Reuther Messtechnik GmbH (see Appendix B2).

B Maintenance and Cleaning

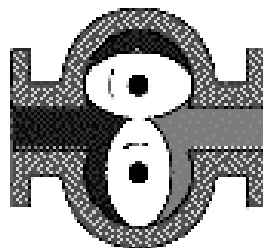
B.1 Maintenance, Cleaning, Repairs, Hazardous Substances

If the oval wheel meter is to be de-installed or the system shut down for a longer period, make suitable arrangements for its storage or maintenance. Cover the input and output with protective caps. Ensure that the oval wheel meter is stored in a dry room.

Cleaning Oval Wheel Meters

De-install the oval wheel meters if the pipework is to be flushed with hot water.

- Unscrew the cheese head screws at the process connector, raise the measurement chamber and remove the oval wheels individually from their axles, handle with care.
- During assembly, position and mesh the oval wheel meters so that the oval wheels are orthogonal to each other. Check by manually rotating the wheels once. Ensure that the gasket is inserted correctly. If an FEP gasket is used, replace it. Tighten the cheese head screws to 2 Nm torque.



B.2 Repairs, Hazardous Substances

The following measures have to be carried out before sending the oval wheel meter to Bopp & Reuther Messtechnik GmbH for repairs:

- **Always** enclose a note with the device which describes the fault, the application as well as the chemical and physical properties of the measured liquid (see Appendix C).
- Remove any residual liquid. Carefully check gasket grooves and slots in which residual liquid may be trapped. This is extremely important if the liquid is classed as a risk to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.
- We request you never to return devices if you are not absolutely sure that there is no risk to health.

Costs for disposal or personal injury (burns, etc.) due to incorrect cleaning shall be borne by the operator.

Please contact our service department with regard to oval wheel meter faults:

Bopp & Reuther
Messtechnik GmbH
Service
Am Neuen Rheinhafen 4
67346 Speyer, Germany
Phone: +49 (0) 6232 657-402
Fax: +49 (0) 6232 657 561

Bopp & Reuther
Messtechnik GmbH
Werkstatt Karlskron
Münchener Str. 23
85123 Karlskron, Germany
Industrial Estate Brautlach, on the B 13
Phone: +49 (0) 8450 928330
Fax: +49 (0) 8450 928332

C. Certificate of Non-Objection for the Contractor

Unbedenklichkeitsbescheinigung für Auftragnehmer / Certificate of non-objection for contractor
 Fiche de Renseignements / Confirmación de no objeción para mandatarios

Kunde / Client / Client / Cliente:

Auftragsnr. / Lieferschein: Order No.: / Delivery note: No. d'ordre / Bordereau de livraison: N° de orden/Talón de entrega	Datum: Date: Date: Fecha :	
.....

Auftragstext / Order text / Caractéristiques / Características:

GEFAHRENHINWEISE – ATTENTION - ATENCION

Letzter Stoff / Last medium / Dernier liquide mesuré / Ultimo líquido:	Eigenschaften angeben! z.B. ätzend, brennbar, giftig State characteristics! i.e. corrosive, flammable, toxic Identification des dangers! p.e. corrosif, inflammable, toxique Indicar características, p.ej. corrosivo, inflamable, tóxico
Gerät entleert / Unit drained / Vidangé complètement / unidad vacía? ja / yes / oui / si <input type="checkbox"/> <input type="checkbox"/> nein / no / non / no
Spülung mit / drained with / liquide de rinçage / enjuague con:
Restverschmutzung / rest of medium / impuretés restantes / impurezas restantes? ja / yes / oui / si <input type="checkbox"/> <input type="checkbox"/> nein / no / non / no

SCHUTZMASSNAHMEN – PROTECTION MEASURES- MESURES DE PROTECTION – MEDIDAS DE PROTECCION

Schutzmaßnahmen/protection measures/mesures de protection / medidas de protección	ja / yes / oui <input type="checkbox"/>	<input type="checkbox"/> nein / no / non
Handschuhe / gloves / gants / guantes	<input type="checkbox"/>	<input type="checkbox"/>
Schutzanzug / protection suit/ tenue de sécurité / traje protector	<input type="checkbox"/>	<input type="checkbox"/>
Gestellbrille / eye glasses/ lunettes / gafas	<input type="checkbox"/>	<input type="checkbox"/>
Korbbrille und Gesichtsschutz / Glasses with face protection/ Lunettes avec protection du visage / gafas con protección facial	<input type="checkbox"/>	<input type="checkbox"/>
Atemschutz / respirator / appareil respiratoire / protección respiratoria	<input type="checkbox"/>	<input type="checkbox"/>
Mit Absaugungsarbeiten / extractor cowl / travailler sous hotte aspirante / trabajar con aspiración	<input type="checkbox"/>	<input type="checkbox"/>
Besondere Schutzmaßnahmen / special protection / mesures de protection Particulieres / medidas particulares de protección	<input type="checkbox"/>	<input type="checkbox"/>
Bitte angeben / please state / à préciser / Por favor especificar		
Beauftragter / Mandatory / Mandataire / Mandatario: Name in Druckbuchstaben/name in printed letters/ nom en lettres capitales / Nombre en letras mayúsculas		
Ort und Datum / place and date / lieu et date / Lugar y fecha:	Unterschrift / signature / signature / firma:	
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