

## OPTIFLUX 2000 Handbook

Electromagnetic flow sensor

The documentation is only complete when used in combination with the relevant documentation for the signal converter.

© KROHNE 03/2011 - 4000839501 - HB OPTIFLUX 2000 en R01

**KROHNE**



## **■ IMPRINT**



All rights reserved. It is prohibited to reproduce this documentation, or any part thereof, without  
the prior written authorisation of KROHNE Messtechnik GmbH.

Subject to change without notice.

Copyright 2011 by  
KROHNE Messtechnik GmbH - Ludwig-Krohne-Str. 5 - 47058 Duisburg [Germany]

**CONTENTS**

<b>1 Safety instructions</b>	<b>5</b>
1.1 Intended use .....	5
1.2 Certification .....	5
1.3 Safety instructions from the manufacturer .....	6
1.3.1 Copyright and data protection .....	6
1.3.2 Disclaimer .....	7
1.3.3 Product liability and warranty .....	7
1.3.4 Information concerning the documentation .....	7
1.3.5 Warnings and symbols used .....	8
1.4 Safety instructions for the operator .....	8
<b>2 Device description</b>	<b>9</b>
2.1 Scope of delivery .....	9
2.2 Device description .....	10
2.3 Nameplates .....	10
<b>3 Installation</b>	<b>11</b>
3.1 Notes on installation .....	11
3.2 Storage .....	11
3.3 Transport .....	11
3.4 Installation conditions .....	12
3.4.1 Inlet and outlet .....	12
3.4.2 Mounting position .....	12
3.4.3 Flange deviation .....	13
3.4.4 T-section .....	13
3.4.5 Vibration .....	13
3.4.6 Magnetic field .....	14
3.4.7 Bends .....	14
3.4.8 Open discharge .....	15
3.4.9 Control valve .....	15
3.4.10 Air venting .....	15
3.4.11 Pump .....	16
3.4.12 Temperatures .....	16
3.5 Mounting .....	17
3.5.1 Torques and pressures .....	17
<b>4 Electrical connections</b>	<b>20</b>
4.1 Safety instructions .....	20
4.2 Grounding .....	20
4.3 Virtual reference for IFC 300 [C, W and F version] .....	22
4.4 Connection diagrams .....	22
<b>5 Service</b>	<b>23</b>
5.1 Spare parts availability .....	23

## ■ CONTENTS

OPTIFLUX 2000

5.2 Availability of services .....	23
5.3 Returning the device to the manufacturer.....	23
5.3.1 General information.....	23
5.3.2 Form [for copying] to accompany a returned device.....	24
5.4 Disposal.....	24
<b>6 Technical data</b>	<b>25</b>
6.1 Measuring principle.....	25
6.2 Technical data.....	26
6.3 Dimensions and weight .....	32
6.4 Vacuum load .....	35
6.5 Metrological performance.....	36
6.6 Measuring accuracy .....	37
<b>7 Notes</b>	<b>38</b>

### 1.1 Intended use

The OPTIFLUX 2000 electromagnetic flow sensor is the optimum solution for water and wastewater applications. Its long-term reliability and durability make it the standard flow sensor for the water market.

### 1.2 Certification



The device fulfils the statutory requirements of the following EC directives:

- EMC Directive 2004/108/EC in conjunction with EN 61326-1: 2006
- Low Voltage Directive 2006/95/EC in conjunction with EN 61010-1: 2001
- Pressure Equipment Directive 97/23/EC

The manufacturer certifies successful testing of the product by applying the CE marking.



**DANGER!**  
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

## **■ SAFETY INSTRUCTIONS ■**

HB OPTIFLUX 2000

### **1.3 Safety instructions from the manufacturer**

#### **1.3.1 Copyright and data protection**

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

#### **1.3.2 Disclaimer**

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

**1.3.3 Product liability and warranty**

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation and operation of the devices [systems] will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

**1.3.4 Information concerning the documentation**

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of underneath icons.

## ■ SAFETY INSTRUCTIONS ■

### 1.3.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



#### DANGER!

*This information refers to the immediate danger when working with electricity.*



#### DANGER!

*This warning refers to the immediate danger of burns caused by heat or hot surfaces.*



#### DANGER!

*This warning refers to the immediate danger when using this device in a hazardous atmosphere.*



#### DANGER!

*These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.*



#### WARNING!

*Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.*



#### CAUTION!

*Disregarding these instructions can result in damage to the device or to parts of the operator's plant.*



#### INFORMATION!

*These instructions contain important information for the handling of the device.*



#### LEGAL NOTICE!

*This note contains information on statutory directives and standards.*



#### • HANDLING

*This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.*

#### ⇒ RESULT

*This symbol refers to all important consequences of the previous actions.*

### 1.4 Safety instructions for the operator



#### WARNING!

*In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.*

*This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.*

## 2.1 Scope of delivery

**INFORMATION!**

Check the packing list to check if you received completely all that you ordered.

**INFORMATION!**

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

The device will arrive in two cartons. One carton contains the converter and one carton contains the sensor.

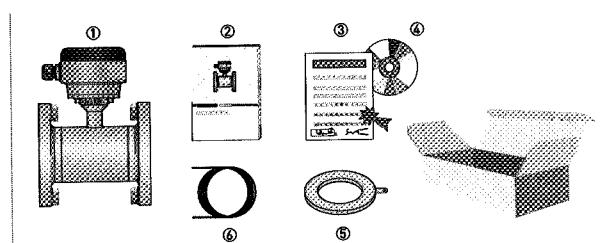


Figure 2-1: Scope of delivery

- ① Ordered flowmeter
- ② Product documentation
- ③ Factory calibration report
- ④ CD-ROM with product documentation
- ⑤ Grounding rings (optionally)
- ⑥ Cable (remote versions only)

**INFORMATION!**

Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

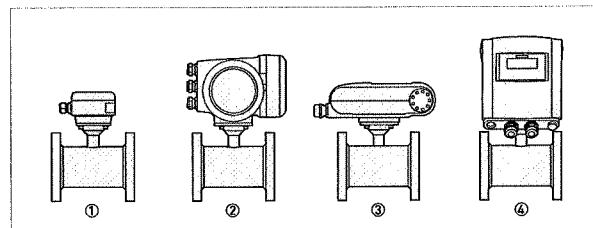
## ■ DEVICE DESCRIPTION ■

### 2.2 Device description

Your measuring device is supplied ready for operation. The factory settings for the operating data have been made in accordance with your order specifications.

**The following versions are available:**

- Compact version (the signal converter is mounted directly on the measuring sensor)
- Remote version (electrical connection to the measuring sensor via field current and signal cable)



- ① Remote version  
② Compact version with IFC 300 signal converter  
③ Compact version with IFC 100 [0°] signal converter  
④ Compact version with IFC 100 [45°] signal converter

### 2.3 Nameplates



**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order.  
Check for the correct supply voltage printed on the nameplate.

①	<b>KROHNE</b>	Almster, Dordrecht NL - 3313 LC	
②	OPTIFLUX 2000 SN: Axx xxxx	Manufactured : 20XX CE 0038	
③	GK = 2.714 GKL = 5.123 DN: 150mm / 6 Inch IP68 / 67	PED (97/23/EC) PT = 60 bar @ T = 40°C P20=32 bar @ T = 180°C PT = 60 bar @ T = 20°C	
④			

- ① Name and address of the manufacturer  
② Type designation of the flowmeter and CE sign with number[s] of notified body / bodies  
③ Calibration data  
④ PED data

### 3.1 Notes on installation

**INFORMATION!**

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Check the packing list to check if you received completely all that you ordered.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

### 3.2 Storage

- Store the device in a dry and dust-free location.
- Avoid lasting direct exposure to the sun.
- Store the device in its original packing.

### 3.3 Transport

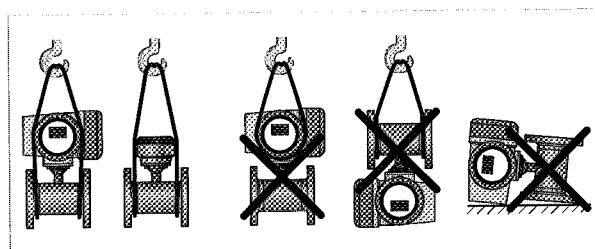


Figure 3-1: Transport

## **INSTALLATION**

OPTIFLUX 2000

### **3.4 Installation conditions**

#### **3.4.1 Inlet and outlet**

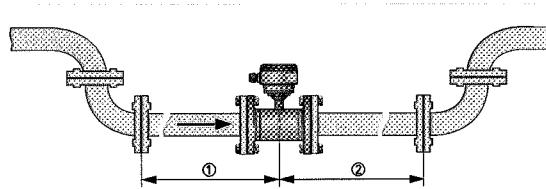


Figure 3-2: Recommended inlet and outlet sections

- ①  $\geq 5$  DN
- ②  $\geq 2$  DN

#### **3.4.2 Mounting position**

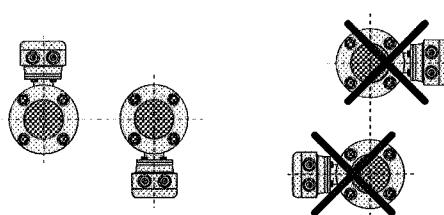


Figure 3-3: Mounting position

### 3.4.3 Flange deviation

**CAUTION!**

Max. permissible deviation of pipe flange faces:  
 $L_{max} - L_{min} \leq 0.5 \text{ mm} / 0.02"$

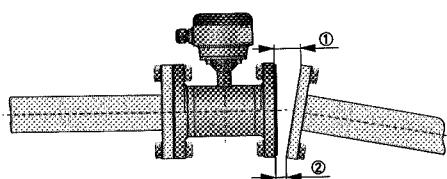


Figure 3-4: Flange deviation

①  $L_{max}$   
②  $L_{min}$

### 3.4.4 T-section

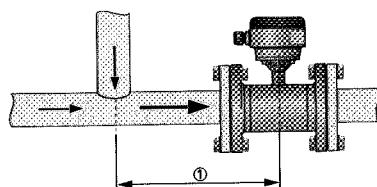


Figure 3-5: Distance after T-sections

①  $\geq 10 \text{ DN}$

### 3.4.5 Vibration

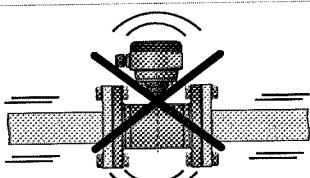


Figure 3-6: Avoid vibrations

## INSTALLATION

0100839501/2006

### 3.4.6 Magnetic field

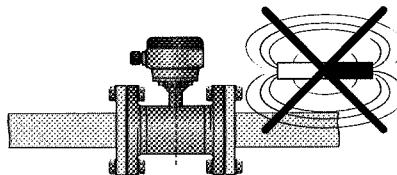


Figure 3-7: Avoid magnetic fields

### 3.4.7 Bends

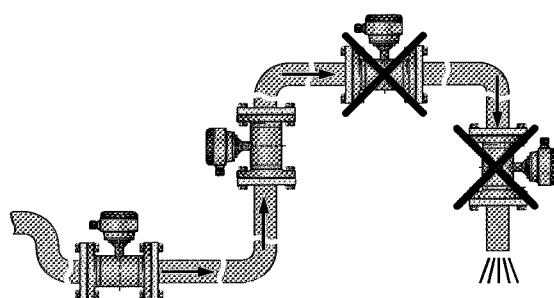


Figure 3-8: Installation in bending pipes

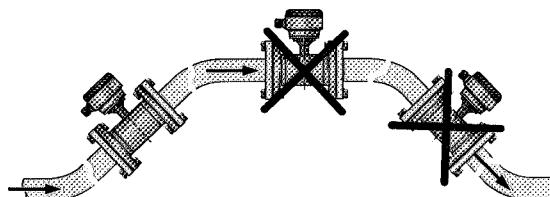


Figure 3-9: Installation in bending pipes

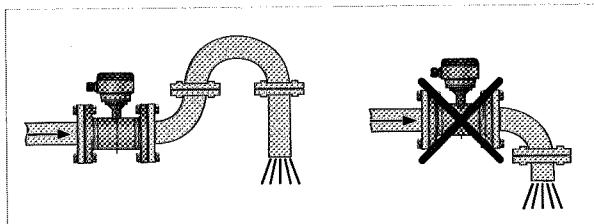
**3.4.8 Open discharge**

Figure 3-10: Installation before an open discharge

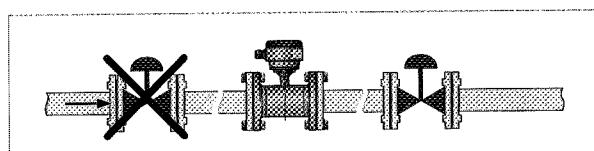
**3.4.9 Control valve**

Figure 3-11: Installation before control valve

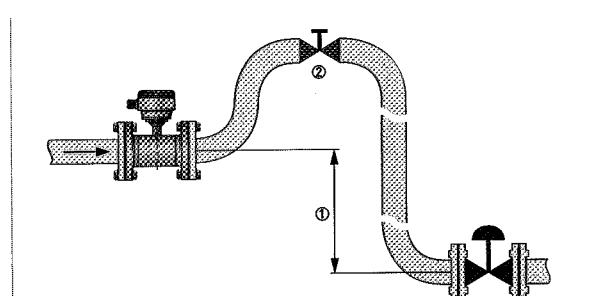
**3.4.10 Air venting**

Figure 3-12: Air venting

- ① ≥ 5 m
- ② Air ventilation point

## ■ INSTALLATION

HB OPTIFLUX 2000

### 3.4.11 Pump

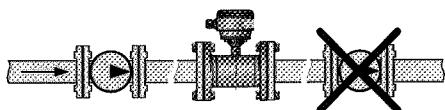


Figure 3-13: Installation after pump

### 3.4.12 Temperatures



**CAUTION!**  
Protect the device from direct sunlight.

Temperature range	Process [°C]		Ambient [°C]		Process [°F]		Ambient [°F]	
	min.	max.	min.	max.	min.	max.	min.	max.
<b>Hard rubber</b>								
Separate flow sensor	-5	80	-40	65	23	176	-40	149
Compact with IFC 300	-5	80	-40	65	23	176	-40	149
Compact with IFC 100	-5	80	-40	65	23	176	-40	149
<b>Polypropylene ①</b>								
Separate flow sensor	-5	90	-40	65	23	194	-40	149
Compact with IFC 300	-5	90	-40	65	23	194	-40	149
Compact with IFC 100	-5	90	-40	65	23	194	-40	149

① Polypropylene available for DN25...150

### 3.5 Mounting

#### 3.5.1 Torques and pressures

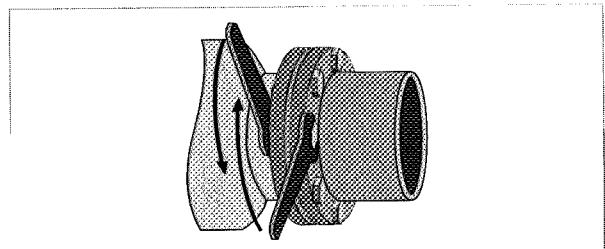


Figure 3-14: Tightening of bolts



##### Tightening of bolts

- ① Step 1: Apply approx. 50% of max. torque given in table.
- ② Step 2: Apply approx. 80% of max. torque given in table.
- ③ Step 3: Apply 100% of max. torque given in table.

## ■ INSTALLATION

HB OPTIFLUX 2000

Nominal DN [mm]	Pressure rating	Bolts	Max. torque [Nm]	
			Polypropylene	Hardrubber
25	PN 40	4 × M 12	22	11
32	PN 40	4 × M 16	37	19
40	PN 40	4 × M 16	43	25
50	PN 40	4 × M 16	55	31
65	PN 16	4 × M 16	61	42
65	PN 40	8 × M 16	38	21
80	PN 40	8 × M 16	47	26
100	PN 16	8 × M 16	39	30
125	PN 16	8 × M 16	53	40
150	PN 16	8 × M 20	68	47
200	PN 10	8 × M 20	-	68
200	PN 16	12 × M 20	-	45
250	PN 10	12 × M 20	-	65
250	PN 16	12 × M 24	-	78
300	PN 10	12 × M 20	-	76
300	PN 16	12 × M 24	-	105
350	PN 10	16 × M 20	-	75
400	PN 10	16 × M 24	-	104
450	PN 10	20 × M 24	-	93
500	PN 10	20 × M 24	-	107
600	PN 10	20 × M 27	-	138
700	PN 10	20 × M 27	-	163
800	PN 10	24 × M 30	-	219
900	PN 10	28 × M 30	-	205
1000	PN 10	28 × M 35	-	261

Nominal size [inch]	Flange class [lb]	Bolts	Max. torque [Nm]	
			Polypropylene	Hardrubber
1	150	4 × 1/2"	6.7	4.4
1 1/2	150	4 × 1/2"	13	12
2	150	4 × 5/8"	24	23
3	150	4 × 5/8"	43	39
4	150	8 × 5/8"	34	31
6	150	8 × 3/4"	61	51
8	150	8 × 3/4"	-	69
10	150	12 × 7/8"	-	79
12	150	12 × 7/8"	-	104
14	150	12 × 1"	-	93
16	150	16 × 1"	-	91
18	150	16 × 1 1/8"	-	143
20	150	20 × 1 1/8"	-	127
24	150	20 × 1 1/4"	-	180
28	150	28 × 1 1/4"	-	161
32	150	28 × 1 1/2"	-	259
36	150	32 × 1 1/2"	-	269
40	150	36 × 1 1/2"	-	269

## ELECTRICAL CONNECTIONS

### 4.1 Safety instructions



#### DANGER!

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!



#### DANGER!

Observe the national regulations for electrical installations!



#### DANGER!

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.



#### WARNING!

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.



#### INFORMATION!

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

### 4.2 Grounding



#### DANGER!

The device must be grounded in accordance with regulations in order to protect personnel against electric shocks.

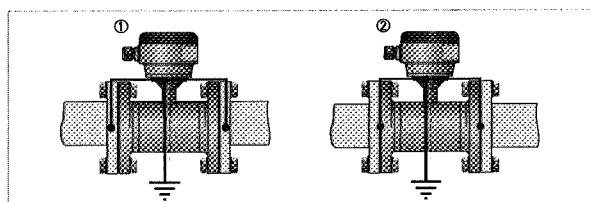


Figure 4-1: Grounding

① Metal pipelines, not internally coating. Grounding without grounding rings.

② Metal pipelines with internal coating and non-conductive pipelines. Grounding with grounding rings.

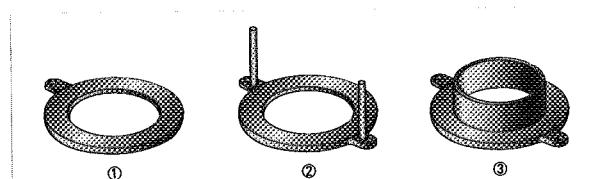


Figure 4-2: Different types of grounding rings

- ① Grounding ring number 1
- ② Grounding ring number 2
- ③ Grounding ring number 3

**Grounding ring number 1:**

- 3 mm / 0.1" thick (tantalum: 0.5 mm / 0.2")

**Grounding ring number 2:**

- 3 mm / 0.1" thick
- Prevents damage to the flanges during transport and installation
- Especially for flow sensors with PTFE liner

**Grounding ring number 3:**

- 3 mm / 0.1" thick
- With cylindrical neck (length 30 mm / 1.25" for DN10...150 / 3/8...6")
- Prevents damage to the liner when abrasive liquids are used

## ■ ELECTRICAL CONNECTIONS ■ OPTIFLUX 2000

### 4.3 Virtual reference for IFC 300 (C, W and F version)

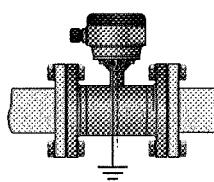


Figure 4-3: Virtual reference

Possible if:

- $\geq$  DN10
- Electrical conductivity  $\geq 200 \mu\text{S}/\text{cm}$
- Electrode cable max. 50m., type DS

### 4.4 Connection diagrams



#### INFORMATION!

For the connection diagrams please refer to the documentation of the applicable converter.

## 5.1 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

## 5.2 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.



### INFORMATION!

*For more precise information, please contact your local representative.*

## 5.3 Returning the device to the manufacturer

### 5.3.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.



### CAUTION!

*Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:*

- Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.
- This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.



### CAUTION!

*If the device has been operated with toxic, caustic, flammable or water-endangering products, you are kindly requested:*

- *to check and ensure, if necessary by rinsing or neutralizing, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that is safe to handle and stating the product used.*

## SERVICE

OPTIFLUX 2000

### 5.3.2 Form (for copying) to accompany a returned device

Company:	Address:
Department:	Name:
Tel. no.:	Fax no.:
Manufacturer's order no. or serial no.:	
The device has been operated with the following medium:	
This medium is:	water-hazardous
	toxic
	caustic
	flammable
	We checked that all cavities in the device are free from such substances.
	We have flushed out and neutralized all cavities in the device.
We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.	
Date:	Signature:
Stamp:	

### 5.4 Disposal



**CAUTION!**

Disposal must be carried out in accordance with legislation applicable in your country.

## 6.1 Measuring principle

An electrically conductive fluid flows inside an electrically insulated pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils. Inside of the fluid, a voltage  $U$  is generated:

$$U = v * k * B * D$$

in which:

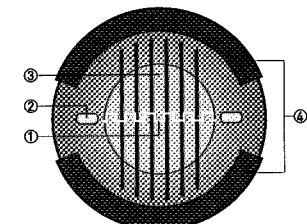
$v$  = mean flow velocity

$k$  = factor correcting for geometry

$B$  = magnetic field strength

$D$  = inner diameter of flow meter

The signal voltage  $U$  is picked off by electrodes and is proportional to the mean flow velocity  $v$  and thus the flow rate  $q$ . A signal converter is used to amplify the signal voltage, filter it and convert it into signals for totalising, recording and output processing.



- ① Induced voltage (proportional to flow velocity)
- ② Electrodes
- ③ Magnetic field
- ④ Field coils

## TECHNICAL DATA

OPTIFLUX 2000

### 6.2 Technical data



#### INFORMATION!

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.
- Additional information [certificates, special tools, software,...] and complete product documentation can be downloaded free of charge from the website [Download Center].

#### Measuring system

Measuring principle	Faraday's law of induction
Application range	Electrically conductive fluids
Measured value	
Primary measured value	Flow velocity
Secondary measured value	Volume flow

#### Design

Features	Fully welded maintenance-free sensor. Flange version with full bore flow tube. Standard as well as higher pressure ratings. Large diameter range from DN25...3000 with rugged liners approved for drinking water. Industry specific insertion lengths.
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as separate version.
Compact version	With IFC 100 converter: OPTIFLUX 2100 C With IFC 300 converter: OPTIFLUX 2300 C
Remote version	In wall (W) mount version with IFC 100 converter: OPTIFLUX 2100 W In field (F), wall (W) or rack (R) mount version with IFC 300 converter: OPTIFLUX 2300 F, W or R
Nominal diameter	With IFC 100 converter: DN25...1200 / 1...48" With IFC 300 converter: DN25...3000 / 1...120"
Measurement range	-12...+12 m/s / -40...+40 ft/s

**Measuring accuracy**

Reference conditions	Flow conditions similar to EN 29104 Medium: Water Electrical conductivity: $\geq 300 \mu\text{S}/\text{cm}$ Temperature: $+10\dots+30^\circ\text{C} / +50\dots+86^\circ\text{F}$ Operating pressure: 1 bar / 14.5 psig Wet calibrated on EN 17025 accredited calibration rig by direct volume comparison.
Accuracy curves	Option: verification to MI-001 (Only in combination with IFC 300) Option: calibration according to OIML R49 (Only in combination with IFC 300) Related to volume flow [MV = Measured Value] These values are related to the pulse / frequency output. The additional typical measuring deviation for the current output is $\pm 10 \mu\text{A}$ . For information refer to <i>Measuring accuracy</i> on page 37
Repeatability	$\pm 0.1\%$ of MV, minimum 1 mm/s
Long term stability	$\pm 0.1\%$ of MV
Special calibration	On request.

**Operating conditions**

Temperature	
Process temperature	Hard rubber liner: $-5\dots+90^\circ\text{C} / 23\dots+176^\circ\text{F}$ Polypropylene liner: $-5\dots+90^\circ\text{C} / 23\dots+194^\circ\text{F}$ For Ex versions different temperatures are valid. Please check the relevant Ex documentation for details. For detailed information see chapter "Temperatures".
Ambient temperature [all versions]	Standard (with aluminium converter housing): $-40\dots+65^\circ\text{C} / -40\dots+149^\circ\text{F}$ (Protect electronics against self-heating with ambient temperatures above $55^\circ\text{C}$ ) Option (with stainless steel converter housing): $-40\dots+55^\circ\text{C} / -40\dots+130^\circ\text{F}$ For Ex versions different temperatures are valid. Please check the relevant Ex documentation for details.
Storage temperature	$-50\dots+70^\circ / -58\dots+158^\circ\text{F}$

## 6 TECHNICAL DATA

OPTIFLUX 2000

Pressure	
EN 1092-1	DN2200...3000: PN 2.5 DN1200...2000: PN 6 DN200...1000: PN 10 DN65 and DN100...150: PN 16 DN25...50 and DN80: PN 40 Other pressures on request
ISO insertion length	Optional for DN15...600
ASME B16.5	1...24": 150 lb RF Other pressures on request.
AWWA [class B or D FF]	Option DN700...1000 / 28...40": ≤ 10 bar / 145 psi DN1200...2000 : ≤ 6 bar / 87 psi
JIS	DN50...1000 / 2...40": 10 K DN25...40 / 1...1½": 20 K Other pressures on request
Vacuum load	For information on pressure limits depending on liner material see chapter "Vacuum load".
Pressure ranges for secondary containment	For DN25...150: Pressure resistant up to 40 bar / 580 psi Burst pressure up to approx. 160 bar / 2320 psi
Pressure drop	Negligible
Chemical properties	
Physical condition	Electrically conductive liquids
Electrical conductivity	≥ 20 µS/cm
Permissible gas content [volume]	≤ 5%
Permissible solid content [volume]	≤ 70%

### Installation conditions

Installation	Take care that flow sensor is always fully filled. For detailed information see chapter "Installation".
Flow direction	Forward and reverse Arrow on flow sensor indicates positive flow direction.
Inlet run	≥ 5 DN
Outlet run	≥ 2 DN
Dimensions and weights	For detailed information see chapter "Dimensions and weights".

**Materials**

Sensor housing	Sheet steel, polyurethane coated Other materials on request.
Measuring tube	Austenitic stainless steel
Flanges	Carbon steel, polyurethane coated Other materials on request.
Liner	Standard DN25...150 / 1...6": polypropylene DN200...3000 / 8...120": hard rubber  Option DN25...150 / 1...6": hard rubber  See pressure and temperature limits for various liners in the relevant chapter.
Connection box (only remote versions)	Standard: polyurethane coated die-cast aluminium Option: stainless steel
Measuring electrodes	Standard: Hastelloy® C Option: stainless steel, titanium Other materials on request.
Grounding rings	Standard: stainless steel Option: Hastelloy® C, titanium, tantalum Grounding rings can be omitted with virtual reference option for the IFC 300 converter.
Grounding electrodes (option)	Same material as measuring electrodes.

**Process connections**

Flange	
EN 1092-1	DN25...3000 in PN 6...40
ASME	1...120" in 150 lb RF
AWWA	DN700...2000 in 6...10 bar
JIS	25...1000 in 10...20K
Design of gasket surface	RF
	Other sizes or pressure ratings on request.

**Electrical connections**

Signal cable	
Type A [DS]	Standard cable, double shielded. Max. length: 600 m / 1950 ft [dep. on electrical conductivity and measuring sensor]. See documentation of the converter for more information.
Type B [BTS]	Optional cable, triple shielded. Max. length: 600 m / 1950 ft [dep. on electrical conductivity and measuring sensor]. See documentation of the converter for more information.

## ■ TECHNICAL DATA

OPTIFLUX 2000

### Approvals and Certificates

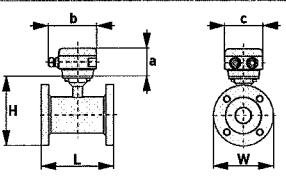
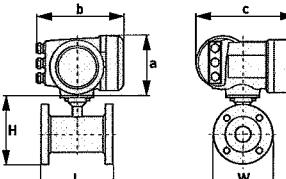
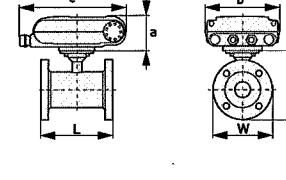
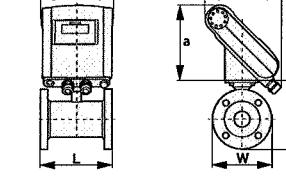
CE	
	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Electromagnetic compatibility	Directive: 2004/108/EC, NAMUR NE21/04 Harmonized standard: EN 61326-1 : 2006
Low voltage directive	Directive: 2006/95/EC Harmonized standard: EN 61010 : 2001
Pressure equipment directive	Directive: 97/23/EC Category I, II or SEP Fluid group 1 Production module H
Hazardous areas	
ATEX	Please check the relevant Ex documentation for details. <u>Compact version with IFC 100 converter</u> II 2 GD <u>Compact version with IFC 300 converter</u> II 2 GD or II 2(1) GD <u>Remote version</u> II 2 GD
FM	<u>In combination with IFC 300 converter</u> Class I, Div. 2, Groups A, B, C and D Class II, Div. 2, Groups F and G Class III, Div. 2, Groups F and G
CSA	<u>In combination with IFC 300 converter</u> Class I, Div. 2, Groups A, B, C and D Class II, Div. 2, Groups F and G
NEPSI	GYJ05234 / GYJ05237 Ex me ia IIC T6...T3 Ex de ia II T6...T3 Ex qe ia IIC T6...T3 Ex e ia IIC T6...T3

Other approvals and standards	
Custody transfer	Standard: without verification Only in combination with IFC 300 converter. For diameters: DN25...500 (other materials on request)
	<b>Cold water</b> MI-001 type examination certificate OIML R49 certificate of conformity Conformity with ISO 4064 and EN 14154
Drinking water approvals	Hard rubber liner: ACS, WRc, NSF Polypropylene liner: ACS, KIWA, KTW, WRc, NSF
Protection category acc. to IEC 529 / EN 60529	Standard: IP 66 / 67 [NEMA 4/4X/6] Option: IP 68 [NEMA 6P] IP 68 is only available for separate design and with a stainless steel connection box.
Shock test	IEC 68-2-27
Vibration test	IEC 68-2-34

## ■ TECHNICAL DATA

HB OPTIFLUX 2000

### 6.3 Dimensions and weight

Remote version		<p>a = 77 mm / 3.1"      b = 139 mm / 5.5" ①      c = 106 mm / 4.2"      Total height = H + a</p>
Compact version with IFC 300		<p>a = 155 mm / 6.1"      b = 230 mm / 9.1" ①      c = 260 mm / 10.2"      Total height = H + a</p>
Compact version with IFC 100 [0°]		<p>a = 82 mm / 3.2"      b = 161 mm / 6.3"      c = 257 mm / 10.1" ①      Total height = H + a</p>
Compact version with IFC 100 [45°]		<p>a = 186 mm / 7.3"      b = 161 mm / 6.3"      c = 184 mm / 2.7" ①      Total height = H + a</p>

① The value may vary depending on the used cable glands.



#### INFORMATION!

- All data given in the following tables are based on standard versions of the sensor only.
- Especially for smaller nominal sizes of the sensor, the converter can be bigger than the sensor.
- Note that for other pressure ratings than mentioned, the dimensions may be different.
- For full information on converter dimensions see relevant documentation.

EN 1092-1

Nominal size		Dimensions [mm]				Approx. weight [kg]	
DN	PN [bar]	L		H	W		
		DIN	ISO				
25	40	150	200	140	115	5	
32	40	150	200	157	140	6	
40	40	150	200	166	150	7	
50	40	200	200	186	165	11	
65	16	200	200	200	185	9	
80	40	200	200	209	200	14	
100	16	250	250	237	220	15	
125	16	250	250	266	250	19	
150	16	300	300	300	285	27	
200	10	350	350	361	340	34	
250	10	400	450	408	395	46	
300	10	500	500	458	445	58	
350	10	500	550	510	505	78	
400	10	600	600	568	565	101	
450	10	600	-	618	615	111	
500	10	600	-	671	670	130	
600	10	600	-	781	780	165	
700	10	700	-	898	895	248	
800	10	800	-	1012	1015	331	
900	10	900	-	1114	1115	430	
1000	10	1000	-	1225	1230	507	
1200	6	1200	-	1417	1405	555	
1400	6	1400	-	1619	1630	765	
1600	6	1600	-	1819	1830	1035	
1800	6	1800	-	2027	2045	1470	
2000	6	2000	-	2259	2265	1860	

## ■ TECHNICAL DATA

OPTIFLUX 2000

### 150 lb flanges

Nominal size		Dimensions [inches]			Approx. weight [lb]
ASME	PN [psi]	L	H	W	
1"	284	5.91	5.39	4.25	18
1½"	284	5.91	6.10	5.00	22
2"	284	7.87	7.05	5.98	29
3"	284	7.87	8.03	7.50	37
4"	284	9.84	9.49	9.00	51
5"	284	9.84	10.55	10	60
6"	284	11.81	11.69	11	75
8"	284	13.78	14.25	13.5	95
10"	284	15.75	16.30	16.0	143
12"	284	19.69	18.78	19.0	207
14"	284	27.56	20.67	21.0	284
16"	284	31.50	22.95	23.5	364
18"	284	31.50	24.72	25.0	410
20"	284	31.50	26.97	27.5	492
24"	284	31.50	31.38	32.0	675

### 300 lb flanges

Nominal size		Dimensions [inches]			Approx. weight [lb]
ASME	PN [psi]	L	H	W	
1"	741	5.91	5.71	4.87	11
1½"	741	7.87	6.65	6.13	13
2"	741	9.84	7.32	6.50	22
3"	741	9.84	8.43	8.25	31
4"	741	11.81	10.00	10.00	44
6"	741	12.60	12.44	12.50	73
8"	741	15.75	15.04	15.0	167
10"	741	19.69	17.05	17.5	247
12"	741	23.62	20.00	20.5	375
14"	741	27.56	21.65	23.0	474
16"	741	31.50	23.98	25.5	639
20"	741	31.50	28.46	30.5	937
24"	741	31.50	33.39	36.0	1346



#### CAUTION!

- Pressures at 20°C / 68°F.
- For higher temperatures, the pressure and temperature ratings are as per ASME B16.5.

**OPTIPLUX 2000 TECHNICAL DATA****6.4 Vacuum load**

Diameter [mm]	Vacuum load in mbar abs. at a process temperature of			
	20°C	40°C	60°C	80°C
<b>Liner in Polypropylene</b>				
DN25...150	250	250	400	400
<b>Liner in Hard rubber</b>				
DN200...300	250	250	400	400
DN350...1000	500	500	600	600
DN1200...3000	600	600	750	750

Diameter [inches]	Vacuum load in psia at process temperature of			
	68°F	104°F	140°F	176°F
<b>Liner in Polypropylene</b>				
1...6"	3.6	3.6	5.8	5.8
<b>Liner in Hard rubber</b>				
8...12"	3.6	3.6	5.8	5.8
14...40"	7.3	7.3	8.7	8.7
48...120"	8.7	8.7	10.9	10.9

## ■ TECHNICAL DATA

OPTIFLUX 2000

### 6.5 Metrological performance

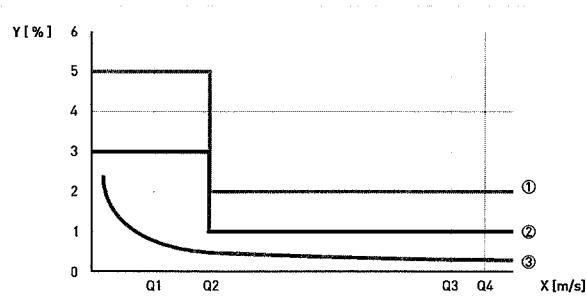


Figure 6-1: Maximum deviation Y [%] vs flow velocity X [m/s]

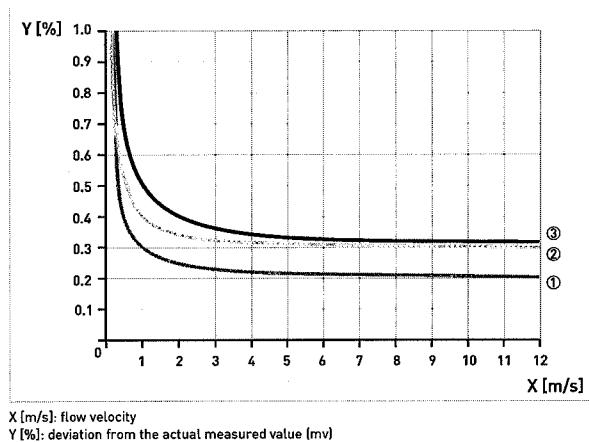
- ① Demands according to EN 14154 OIML R49 class 2
- ② Demands according to EN 14154 OIML R49 class 1
- ③ OPTIFLUX 2300

DN	Q1	Q2	Q3	R	Q4
	[Q3 / R]	[Q1 * 1.6]		[Q3 / Q1]	[Q3 * 1.25]
	[mm]	[m³/h]			[m³/h]
25	0.04	0.064	16	400	20
32...40	0.063	0.1	25	400	31.3
50	0.1	0.16	40	400	50
65	0.16	0.25	100	630	125
80	0.25	0.41	160	630	200
100	0.4	0.63	250	630	313
125...150	0.63	1.02	400	630	500
200	1	1.6	1000	1000	1250
250	1.6	2.56	1600	1000	2000
300	2.5	4	2500	1000	3125
350	5	8	2500	500	3125
400...450	8	12.8	4000	500	5000
500...600	12.6	20.2	6300	500	7975
650...750	20	32	10000	500	12500
800...950	32	51.2	16000	500	20000
1000...1200	50	80	25000	500	31250
1300...1500	80	128	40000	500	50000
1600...1700	100	160	40000	400	50000
1800...2100	160	256	40000	250	50000
2200...2500	250	400	40000	160	50000
2600...3000	400	640	40000	100	50000

## 6.6 Measuring accuracy

### Reference conditions

- Medium: water
- Temperature: 20°C / 68°F
- Pressure: 1 bar / 14.5 psi

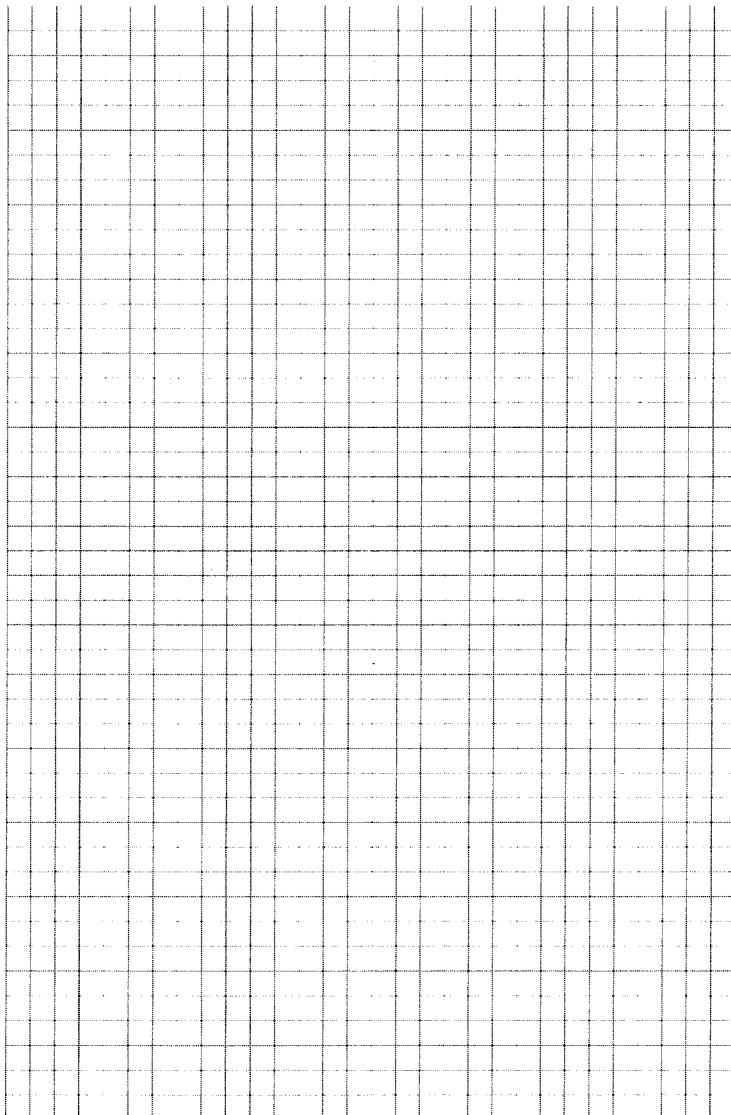


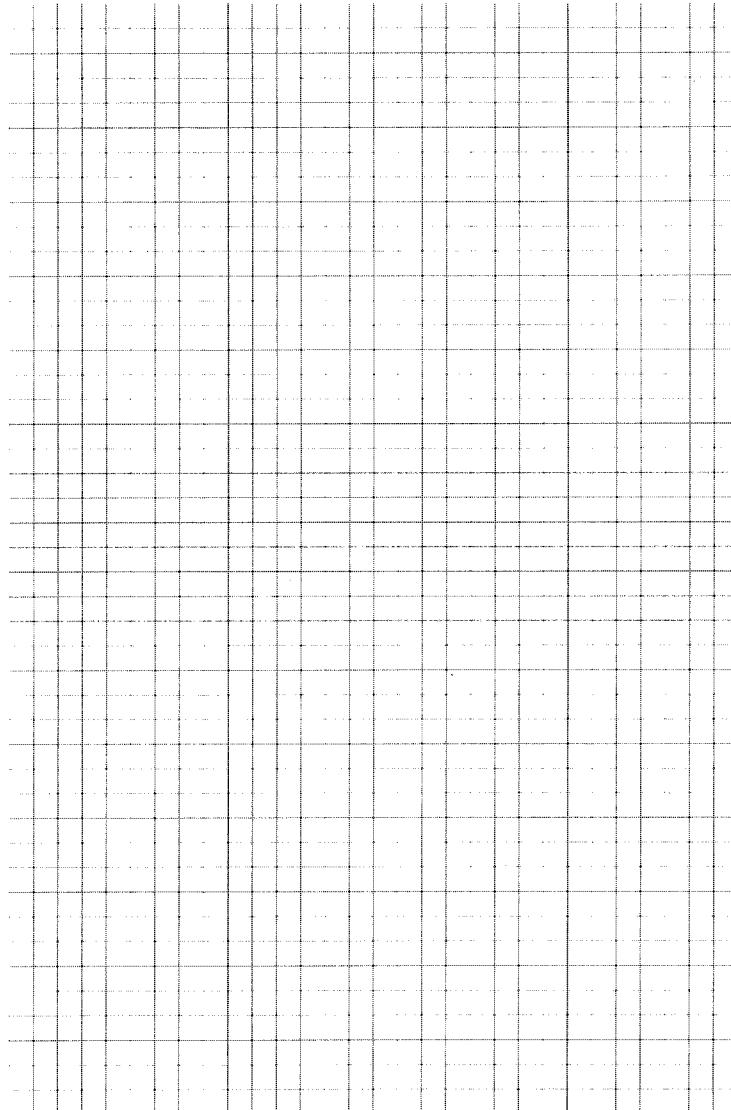
Compact with IFC 300	Accuracy	Curve
DN25...1600 / 1...64"	0.2% of mv + 1 mm/s	①
DN1600...3000 / > 64"	0.3% of mv + 2 mm/s	③

Compact with IFC 100	Accuracy	Curve
DN25...1200 / 1...48"	0.3% of mv + 1 mm/s	②

 NOTES

OPTIFLUX 2000







#### KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

© KROHNE 03/2011 - 4000839501 - HB OPTIFLUX 2000 en R01 - Subject to change without notice.

Head Office KROHNE Messtechnik GmbH  
Ludwig-Krohne-Str. 5  
D-47058 Duisburg (Germany)  
Tel.: +49 (0)203 301 0  
Fax: +49 (0)203 301 10389  
[info@krohne.de](mailto:info@krohne.de)

The current list of all KROHNE contacts and addresses can be found at:  
[www.krohne.com](http://www.krohne.com)

**KROHNE**

