

Electromagnetic Flowmeters



Electromagnetic flowmeters

- Variable area flowmeters
- Vortex flowmeters
- Flow controllers
- Ultrasonic flowmeters
- Mass flowmeters
- Level measuring instruments
- Pressure and temperature
- Heat metering
- Communications technology
- Switches, counters, displays and recorders
- Engineering systems & solutions

Electromagnetic flowmeters



The first installed OPTIFLUX flowmeter as standard version in the UPM Kymenne Paper Works in Augsburg, Germany.

Thanks to intensive research and development in our facilities in Germany, The Netherlands, United Kingdom and France we have been able to continuously improve our meters and therefore expand the range of applications.

Modern electronics and state-of-the-art production facilities supported by a sophisticated quality management guarantee continuously high and consistent quality.

The KROHNE strategy

KROHNE is present in almost every plant and process in the world. As a global player, we react quickly to your demands, whatever you ask, wherever you are.

We are members in all important industrial associations to ensure we anticipate the industrial trends of the future, and then set the benchmarks that others follow.

At KROHNE, we pride ourselves on being easy to do business with. Our key objectives are to offer the best products for your applications and to ensure that working with us is as easy as possible by supporting all our sales activities with extensive pre- and post-sales consultancy and technical assistance.

Go for the OPTimum with KROHNE

"The ingenious part of OPTIFLUX is its innovative and intelligent diagnostics capabilities.

KROHNE offers a level of reliability in operation that has never been experienced anywhere before.

OPTIFLUX sets the standards for all other competing meters."

Dr. Brucker, BASF AG

This quotation from an expertise on the new OPTIFLUX family confirms that KROHNE has once again succeeded in setting a new standard in flow measurement technology. This has happened time and again during our 40 years of experience of cooperation with users of electromagnetic flowmeters. We are proud that our pioneering leaps in technology and our wide range of products has made us one of the world leaders in the market.

Our focus in the development of the new OPTIFLUX range was clearly set on fulfilling the demands from customers and their desire for the perfect meter.

Input from all industries from all corners of the globe, alongside rapid changes in laws and standards, led to a gigantic number of variants and functions.

And we were able to deliver. The solution to the almost unsolvable is: OPTIFLUX.

Factory Mutual System



OPTIFLUX exceeds your expectations

Diagnostics - Technology - Universal use



Highlights of the new OPTIFLUX family:

3 x 100% Diagnostics

We were not satisfied with simply 100% device diagnostics. We wanted complete application diagnostics and an accuracy and linearity verification. The maintenance engineer now has information on the state of his instrument and the quality of the measurement together with any possibly unnoticed application faults.

OPTIFLUX sets new standards in flow measurement

The improvements in the measurement technology are impressive and expand the use of electromagnetic flowmeters to a level you never expected.

The construction of the new IFC 300 flow converter is the particular highlight of the new OPTIFLUX family since it integrates all conceivable functions even into the standard converter, including custody transfer and conductivity measurement.

One for all applications

"A converter for all applications is being offered for the first time by KROHNE.

Reducing the number of variants rationalizes procurement, engineering and stock-keeping, and leads to cost benefits."



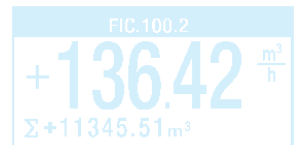
OPTIFLUX with

3 x 100% Diagnostics ...

100% Application Diagnostics

VDI/VDE/NAMUR Guideline 2650

Possible problems	Shown by
• Gas bubbles <input checked="" type="checkbox"/>	Noise measurement
• Electrode corrosion <input checked="" type="checkbox"/>	Noise measurement
• Electrode fouling <input checked="" type="checkbox"/>	Resistance measurement > Limit 1
• Electrode short circuit <input checked="" type="checkbox"/>	Resistance measurement = 0
• Conductivity too low <input checked="" type="checkbox"/>	Resistance measurement < Limit 2
• Partially filling <input checked="" type="checkbox"/>	Magnetic field inverse polarization
• Liner damage <input checked="" type="checkbox"/>	Linearity measurement, magnetic field inverse polarization
• External magnetic fields <input checked="" type="checkbox"/>	Linearity check
Additional Diagnostics	
• Flow profile monitoring	Magnetic field inverse polarization
• Coil (medium) temperature check	Resistance measurement



100% Accuracy Diagnostics

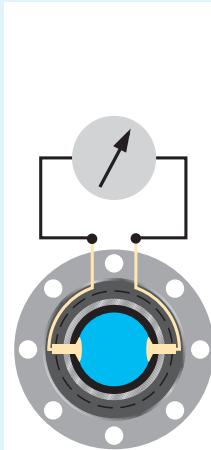
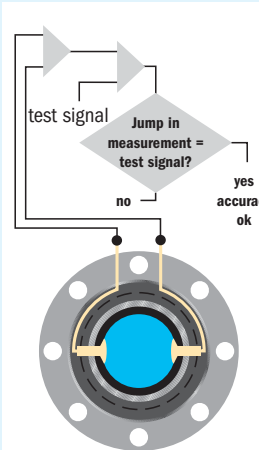
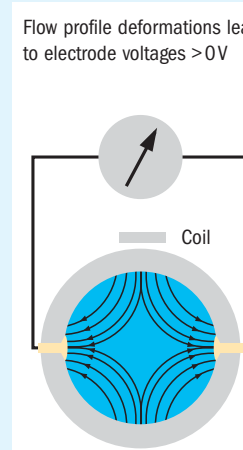
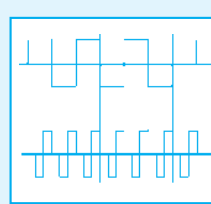
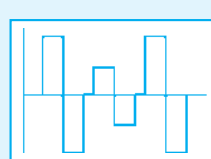
Tests	Tested by
• Accuracy check	Fed-in test signal
• Linearity check	Linearity test
• Field current check	Current measurement

100% Instrument Diagnostics

Tests	Tested by
• Microprocessor	Software
• Memory	Software
• Temperature of electronics	Temperature measurement
• Outputs tests	Hard- and Software
- Interruption	
- Load	
• Software	Software



Checks in detail

<p>Resistance measurement</p> 	<p>Accuracy check</p> 	<p>Magnetic field inverse polarization</p> <p>Flow profile deformations lead to electrode voltages > 0V</p> 	<p>Noise measurement</p>  <p>The upper electrode signal multiplied with the test signal (1, -1) must be 0.</p> <p>Linearity measurement</p>  <p>Even at half the field strength and corresponding internal correction, the measured value has to remain constant.</p>
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... much more than SIL2

Field devices can obtain a "SIL2" certificate in various ways, including:

- Onsite trouble-free operation
- Manufacturing according to IEC 61508

In both cases,

- Unidentified device problems can occur
- Application problems can occur (gas bubbles, external magnetic fields)
- And the accuracy and the linearity is not tested



With the 3 x 100% diagnostics, OPTIFLUX will achieve much higher reliability than with a meter with only SIL2 certification.

OPTIFLUX sets new standards in measurement technology



Improved measurement performance

Utilizing all optimization potentials in the sensor and converter has led to better and more reliable results even in the most difficult applications, e.g.:

- Rapid product changes and pH jumps
- In conjunction with piston pumps
- In pulp and paper applications where special converters were previously needed

Custody transfer is standard

The new OPTIFLUX comes ready in the standard meter for custody transfer applications. The accuracy checks and safety features needed for custody transfer are already integrated.

Better accuracy

The better measuring performance leads to improvements in reproducibility and accuracy to a new level of 0.15% of measured value.

New integrated conductivity measurement

With the new conductivity measurement a further customer dream has been fulfilled. This opens up new interesting applications, such as:

- Recognition of product changes
- Quality check of inline cleaning

Periodic verification simplified

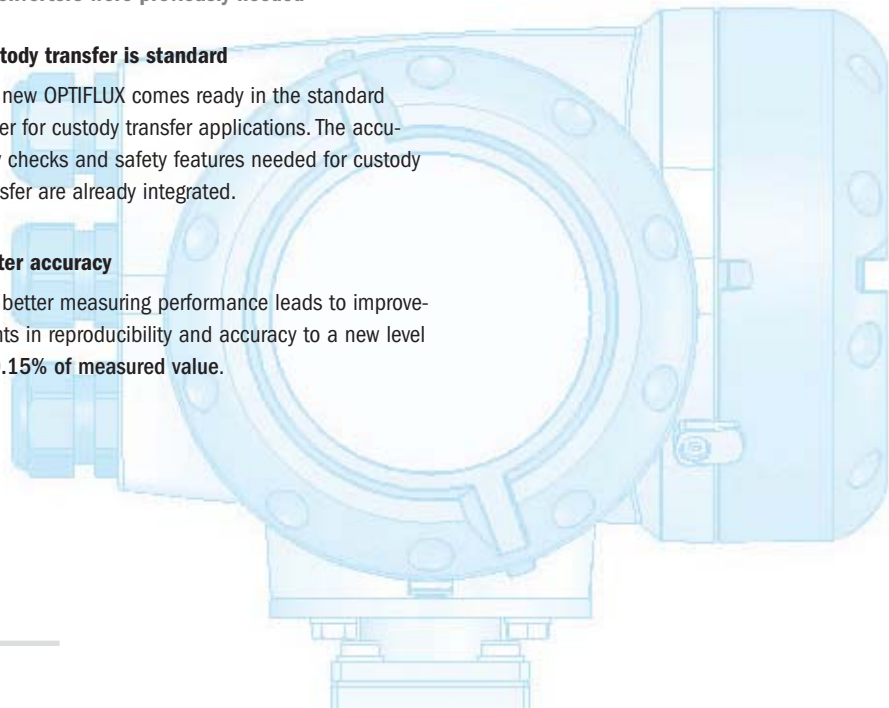
The functionality of our mobile in-situ verification instrument MagCheck has been integrated into the new IFC 300. The check is now performed every few seconds, and the instrument gives an immediate warning if any parameters are out-of-spec. A certificate can be printed out via HART and PACTware.

Optimization of the sensor

Highly effective internal screening produced the following improvements:

- Optimum zero-point stability independent of changes in medium properties
- Optimum long-term zero-point stability
- Improved performance even with low-conductivity products

For a number of sensors there is a **Secondary Containment** that is pressure-resistant to the nominal pressure of the flange.



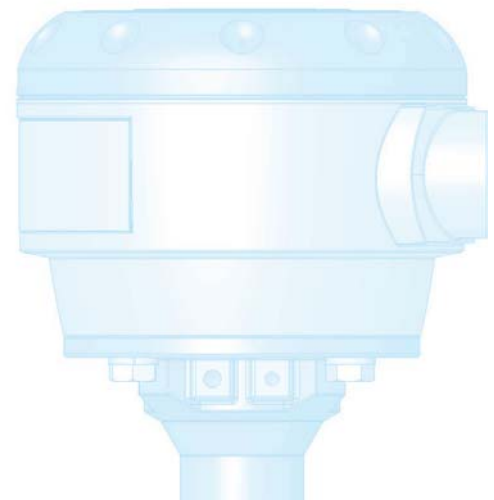
There is an **OPTIFLUX** for every application

Always the optimal one

	OPTIFLUX 1000	OPTIFLUX 2000	OPTIFLUX 4000	OPTIFLUX 5000	OPTIFLUX 6000	OPTIFLUX 4040 C	OPTIFLUX 7300 C	TIDALFLUX 4110 PF	BATCHFLUX 5015 C
Water & wastewater									
Water distribution	◆	◆			◆				
(Waste)water treatment	◆	◆	◆	◆	◆				
Sludge / sewage		◆	◆	◆	◆				
Partially filled pipelines								◆	
Chemical									
Dosing of additives			◆	◆	◆	◆			
Corrosive, abrasive liquids / Slurries			◆	◆	◆	◆			
Hazardous areas			◆	◆	◆	◆			
Paper & Pulp									
Pulp		◆	◆						
Liquor			◆	◆	◆				
Additives, bleaches, colourants			◆	◆	◆				
Hygienic / Sanitary									
Food & Beverages, Pharmaceutical				◆	◆	◆	◆	◆	◆
Blending, dosing, batching				◆	◆	◆	◆	◆	◆
Volumetric filling machine									◆
Other									
HVAC	◆	◆			◆				
Machinery	◆			◆		◆			
Dredging, Metals & Mining, Ores			◆	◆					
Master / transfer meters				◆					

One for all applications with the new converter IFC 300:

- For products from water to chemicals, to pulp in the paper industry
- For difficult applications such as rapid product changes or pulsating flow
- For simple local measurements to custody transfer plants
- One set of electronics for all housing variants
- Up to 4 I/Os, fully galvanically separated - in all possible combinations
- Integrated into all common systems such as FDT, AMS, PDM via HART, Profibus, FF



The complete OPTIFLUX - range

OPTIFLUX converters

All converters fit to all sensors

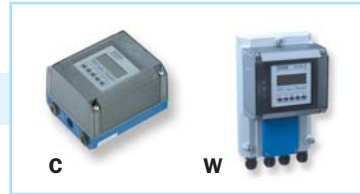
IFC 300

One for all applications



IFC 010

Economic Converter



OPTIFLUX sensors

OPTIFLUX 2000

Water and waste-water specialist



OPTIFLUX 4000

All-round process specialist



OPTIFLUX 5000

Highly accurate & abrasion resistant



OPTIFLUX 1000

Economical solution



OPTIFLUX 6000

Sanitary and hygienic solution



Special-purpose flowmeters

OPTIFLUX 4040 C

The 2-wire EMF



OPTIFLUX 7300 C

The electrode-free EMF



TIDALFLUX 4110 PF

For partially filled pipelines



BATCHFLUX 5015 C

For volumetric filling



BATCHCONTROL 5014 C

For volumetric filling



Electromagnetic flowmeters

OPTIFLUX – the complete range

OPTIFLUX 1000

Economical solution
Sandwich flow sensor



With robust stainless-steel reinforced PFA-lined measuring tubes

OPTIFLUX 2000

Water and wastewater specialist
Flanged flow sensor



For all kind of drinking and waste water. KTW-approved liners.

Nominal diameter

DIN
ANSI

DN 10...150
3/8"...6"

Nominal flange pressure

DIN
ANSI
Process pressure

PN 40, 16, JIS 10 K, 20 K
150#, 300# (up to 230 psi)
up to 16 bar (230 psi)

Temperature

Process
Ambient

-25...+120°C (-13...+248°F)
-40...+65°C (-40...+149°F)

Electrical conductivity

Liquids exc. water
Water

min. 5 µS/cm
min. 20 µS/cm

Materials used

Liner
Electrodes
Grounding rings
Stud bolts and nuts
Measuring tube
Housing
Connection box

PFA
Hastelloy
Stainless steel
Rubber sleeves, Steel, Stainless steel
Stainless steel
Steel (Polyurethane coated)
Aluminium (Polyurethane coated)

Protection category

Standard
Optional

IP 66 / 67 eq. NEMA 4/4X / 6
IP 68 eq. NEMA 6

Approvals

Hazardous area
Sanitary

-
-

DN 25...3000
1"...120"

PN 40, 25, 16, 10, 6, 2,5, JIS 10 K, 20 K
150#, 300#, AWWA
up to 40 bar (580 psi)

-5...+90°C (+23...+194°F)
-40...+65°C (-40...+149°F)

min. 5 µS/cm
min. 20 µS/cm

Polypropylene, Hardrubber
Hastelloy, Stainless steel, Ti
Hastelloy, Stainless steel, Ti
Steel, Stainless steel
Stainless steel
Steel (Polyurethane coated)
Aluminium (Polyurethane coated)

IP 66 / 67 eq. NEMA 4/4X / 6
IP 68 eq. NEMA 6P

Ex, FM, CSA, SAA, TIIS

-

OPTIFLUX 4000

All-round process specialist

Flanged flow sensor



For all difficult processes.
Chemical and vacuum resistant.
Up to 180°C / 356°F.

DN 2.5...3000
1/10"...120"

*Secondary containm. PN40 (DN 25...150)
PN 40*, 25, 16, 10, 6, 2,5, JIS 10 K, 20 K
150#, 300#
up to 40 bar (580 psi)

-60...+180°C (-76...+356°F)
-40...+65°C (-40...+149°F)

min. 1 µS/cm
min. 20 µS/cm

PTFE, PFA, ETFE, PU, Hardrubber
Hastelloy, Pt, Stainless steel, Ta, Ti
Stainless steel, Hastelloy, Ta, Ti
Steel, Stainless steel
Stainless steel
Steel (Polyurethane coated)
Aluminium (Polyurethane coated)

IP 66 / 67 eq. NEMA 4/4X / 6
IP 68 eq. NEMA 6P

EEx, FM, CSA, SAA, TIIS

-

OPTIFLUX 5000

Most accurate & abrasion resistant

Sandwich flow sensor



With ceramic sensor extremely abrasion
resistant and highly accurate.

DN 2.5...100
1/10"...4"

PN 40, 25, 16, JIS 10 K, 20 K
150#, 300#
up to 40 bar (580 psi)

-60...+180°C (-76...+356°F)
-40...+65°C (-40...+149°F)

min. 1 µS/cm
min. 20 µS/cm

Aluminiumoxide (Ceramic)
Cermet, Pt
Stainless steel, Hastelloy, Ti, Ta
Rubber sleeves, Steel, Stainless steel
Aluminiumoxide (Ceramic)
Stainless steel
Aluminium (Polyurethane coated)

IP 66 / 67 eq. NEMA 4/4X / 6
IP 68 eq. NEMA 6

EEx, FM, CSA, SAA, TIIS
FDA

OPTIFLUX 6000

Sanitary and aseptic solution



For all sterile applications
EHEDG, 3A, FDA, CIP + SIP.

DN 2.5...150
1/10"...6"

Process connections
DIN 11850, 11851, 11864-2a, 32676
ISO 2037, 2852, 2853, SMS 1145, TRICLOVER
up to 40 bar (580 psi)

-60...+150°C (+76...+302°F)
-40...+65°C (-40...+149°F)

min. 1 µS/cm
min. 20 µS/cm

PFA
Hastelloy, Pt, Stainless steel, Ta, Ti
-
Stainless steel
Stainless steel
Stainless steel
Aluminium (Polyurethane coated)

IP 66 / 67 eq. NEMA 4/4X / 6
IP 68 eq. NEMA 6

EEx, FM, CSA, SAA, TIIS
3A, EHEDG, FDA

IFC 300

All-round flow converter



IFC 010

Economical flow converter



Performance

Process conditions

Accuracy (Under reference conditions)

Repeatability

Liquids with maximum solid content
< 30% (by volume)
± 0.2% of MV (OPTIFLUX 5000: 0.15%)
± 0.06% of MV

Liquids with maximum solid content
< 3% (by volume)
± 0.5% of MV
± 0.1% of MV

Model

C (Compact)

F (Remote)

W (Wall)

IFC 300

C

F

W

IFC 010

C

W

Combinations

OPTIFLUX 1000

OPTIFLUX 2000

OPTIFLUX 4000

OPTIFLUX 5000

OPTIFLUX 6000

OPTIFLUX 7000

DN 10...150
DN 25...3000
DN 2.5...3000
DN 2.5...250
DN 2.5...150
DN 25...100

DN 10...150
DN 25...1000
DN 10...1000
DN 2.5...100
DN 10...150
-

Communication

In-/Output

Bus Protocol (Option)

Current, HART, Pulse, Status out, Control in
Foundation Fieldbus, Profibus PA/DP

Current, Pulse, Status out

-

Verification

Diagnostics

Online, Continuous, Application diagnostics,
Device diagnostics, Accuracy check

MAGCHECK

Materials used

C (Compact)

F (Remote)

W (Wall)

Aluminium (PU coated);
Option: Stainless steel
Aluminium (PU coated);
Option: Stainless steel
Polyamide (nylon)

Alu (PU coated) / Polyamide (nylon) cover

-

Alu (PU coated) / Polyamide (nylon) cover

Protection category

(Acc. to IEC 529 (EN 60 529))

C (Compact), F (Remote)

W (Wall)

IP 67 (eq. to NEMA 6)
IP 65 (eq. to NEMA 4/4X)

IP 67 (eq. to NEMA 6)
IP 65 (eq. to NEMA 4/4X)

Power Supply

AC voltage

DC voltage

85...250 V ac
12...24 V dc

24, 48, 100, 115/120, 200, 230/240 V ac
24 V dc

Approvals

Hazardous area

Custody transfer

EEx, FM, CSA, SAA, TIIS
KIWA BKR 618/4, OIML R49, OIML R117

-

-

Special-purpose flowmeters – Sizing

OPTIFLUX 4040 C

2-wire technology



The 2-wire EMF for all processes.
Chemical and vacuum resistant.

OPTIFLUX 7300 C

Electrodeless flowmeter



With ceramic sensor, no danger of leakage, for lowest conductivities.

Nominal diameter DIN ANSI	DN 10...150 3/8"...6"
Nominal flange pressure DIN ANSI Process pressure	*Secondary containment PN 40 (DN 25..150) PN 40*, 25, 16, JIS 10 K, 20 K 150#, 300# up to 40 bar (580 psi)
Temperature Process Ambient	-60...+140°C (-76...+248°F) -40...+65°C (-40...+149°F)
Electrical conductivity Liquids exc. water Water	min. 5 µS/cm min. 20 µS/cm
Performance Process conditions Accuracy Repeatability	Liquids with maximum solid content < 3% (by volume) ± 0.5% of MV (Reference conditions) ± 0.1% of MV
Communication In-/Output Bus protocol (option)	Current, HART, Pulse, Status, Control in Foundation Fieldbus, Profibus PA/DP
Power supply AC voltage DC voltage	- 14...36 V dc
Materials used Liner Electrodes Grounding rings Flanges Measuring tube Housing Flow converter	PTFE, PFA Hastelloy, Pt, Stainless steel, Ta, Ti Stainless steel, Hastelloy, Ta, Ti Steel, Stainless steel Stainless steel Steel (Polyurethane coated) Aluminium (Polyurethane coated)
Protection category (Acc. to IEC 529 (EN 60529)) Standard Optional	IP 66 / 67 eq. NEMA 4/4X / 6 IP 68 eq. NEMA 6
Approvals Hazardous area Sanitary	EEx, FM -

Nominal diameter DIN ANSI	DN 25...100 1"...4"
Nominal flange pressure DIN ANSI Process pressure	PN 40, 25, 16, JIS 10 K, 20 K 150#, 300# up to 40 bar (580 psi)
Temperature Process Ambient	-20...+100°C (-4...+212°F) -40...+65°C (-40...+149°F)
Electrical conductivity Liquids exc. water Water	min. 0,05 µS/cm min. 1 µS/cm
Performance Process conditions Accuracy Repeatability	Liquids with maximum solid content < 3% (by volume) ± 0.5% of MV (Reference conditions) ± 0.06% of MV
Communication In-/Output Bus protocol (option)	Current, HART, Pulse, Status, Control in Foundation Fieldbus, Profibus PA
Power supply AC voltage DC voltage	85...250 V ac 12...24 V dc
Materials used Liner Electrodes Grounding rings Flanges Measuring tube Housing Flow converter	Zirconiumoxyde, Aluminiumoxyde - Stainless steel, Hastelloy, Ta Rubber sleeves, Steel, Stainless steel Zirconiumoxyde, Aluminiumoxyde Stainless steel Aluminium (Polyurethane coated)
Protection category (Acc. to IEC 529 (EN 60529)) Standard Optional	IP 66 / 67 eq. NEMA 4/4X / 6 -
Approvals Hazardous area Sanitary	EEx, FM, CSA, SAA, TIIS FDA

TIDALFLUX 4110 PF

For partially filled pipelines



For all water applications with accurate level measurement for best accuracy.

DN 200...1800
8"...72"

PN 10, 6
150#, AWWA
up to 10 bar (150 psi)

-5...+60°C (+23...+140°F)
-40...+65°C (-40...+149°F)
-40...+65°C (-40...+149°F) (IFC 110 PF)

min. 50 µS/cm
min. 50 µS/cm

Liquids with maximum solid content
< 10% (by volume)
± 1% of MV
± 0.5% of MV

Current, Pulse, Status, Control in (IFC 110 PF)

-

24, 115/120, 230/240 V ac;
115/230 V ac (IFC 110 PF)

-

PU
Hastelloy, Stainless steel
Hastelloy, Stainless steel
Steel
Stainless steel
Steel (Polyurethane coated)
Aluminium (Polyurethane coated) (IFC 110 PF)

IP 66 / 67 eq. NEMA 4/4X / 6
IP 65 eq. NEMA 4/4X (IFC 110 PF)
IP 68 eq. NEMA 6

EEx

-

BATCHFLUX 5015 C BATCHCONTROL 5014 C

For volumetric filling



With ceramic sensor for maximum reproducibility, specially developed for filling machines.

DN 2.5...40
1/10"...1 1/2"

PN 40, 25, 16, JIS 10 K, 20 K
150#, 300#
up to 10 bar (150 psi)

-60...+140°C (-76...+356°F)
-40...+65°C (-40...+149°F)

min. 5 µS/cm
min. 20 µS/cm

Liquids with maximum solid content
< 3% (by volume)
± 0.2% of MV
± 0.1% of MV (std. dev., filling time > 5 sec.)

Pulse (5015 C)
Binary contact (5014 C)
CANopen (5014 C)

-

24 V dc

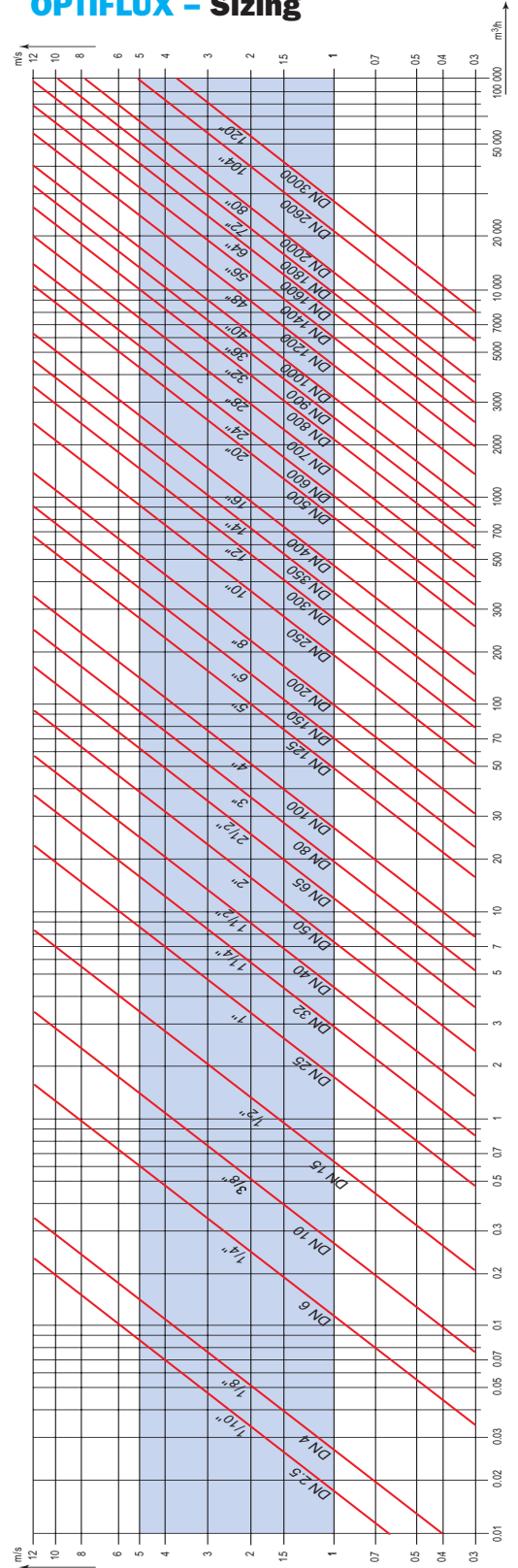
Ceramics
Cermet
-
Rubber sleeves, Steel, Stainless steel
Ceramics
Stainless steel
Stainless steel

IP 66 / 67 eq. NEMA 4/4X / 6

-

3A, FDA

OPTIFLUX - Sizing

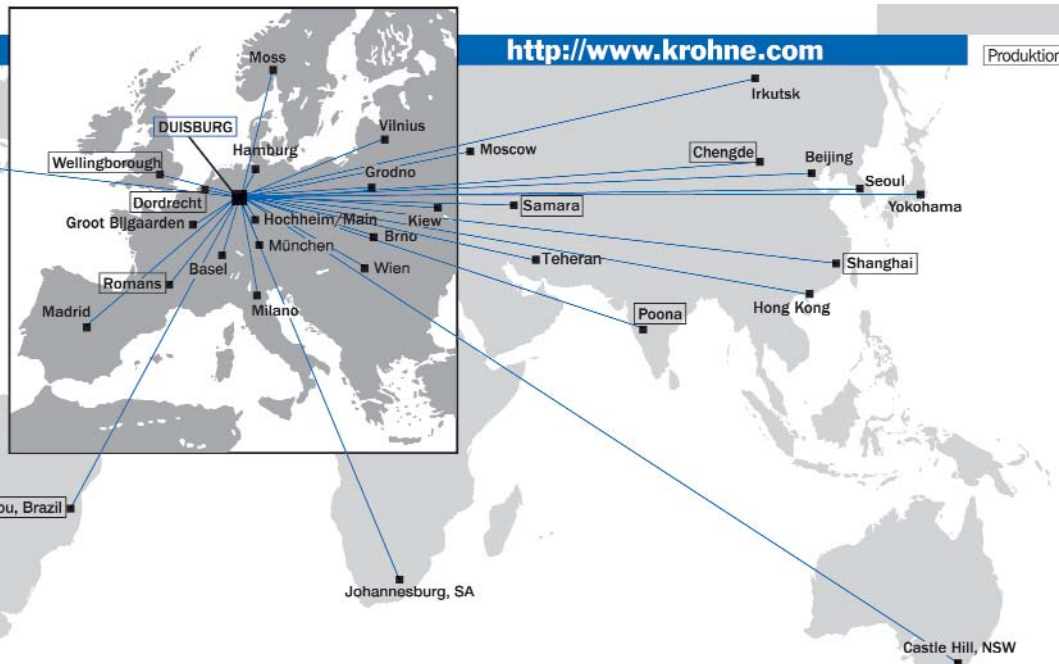


The blue area is the typical operating range.
OPTIFLUX can measure down to 0 m/s.

<http://www.krohne.com>

Produktion

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