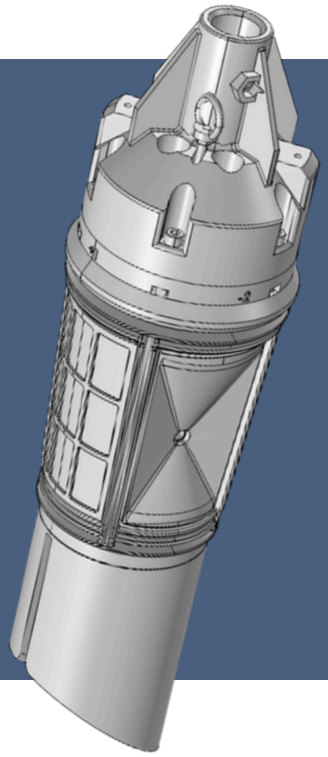
www.iFLUX.be

iFLUX
Horizontal Flux Sensor

Technical sheet



The iFLUX Horizontal Flux Sensor is a high-precision groundwater flux probe that measures the Darcy velocity (Flux magnitude and direction) in the horizontal plane.

Installed in a monitoring well with dedicated prepack filter, they are calibrated for use in unconsolidated sediments and operate reliably up to 100 m depth under diverse hydraulic conditions.

Model versions:

- **HC1-02:** for low-flow, stable environments
- **HC1-40:** for high-flow or highly variable environments

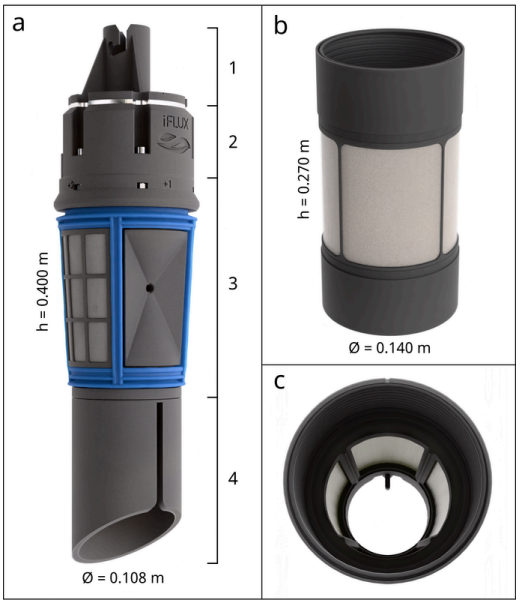
Key Applications

- Monitoring groundwater flow in situ and in real time
- Assessing the impacts of groundwater extraction and groundwater recharge
- Mitigating contamination risks and follow-up of remediation efforts
- Characterizing groundwater flow dynamics for design and prefeasibility studies (infrastructure or nature restoration)
- Quantifying the effects of Nature Based Solutions
- Optimizing numerical groundwater models

Operating Principle

The sensor probe features two perpendicular flow channels, each equipped with bidirectional microfluidic thermal flow chips. A central heating element warms the passing water, while paired temperature sensors detect heat displacement to accurately calculate flow rates.

Transformation of the vector sum allows to determine flux magnitude and direction, while funnels overcome bypass to ensure a 360° measurement range. The dedicated iFLUX prepack filter ensures proper, calibrated, connectivity with the surrounding sediments.



Technical Specifications

Mechanical

Parameter	Sensor Probe (a)	Prepack Filter (b,c)
Length	0.400 m	0.270 m
Diameter	0.108 m	0.140 m
Weight	1.20 kg (excl. cable)	1.95 kg (incl. filter sand)
Materials	Body: PA12 Seal: Food-grade silicone Mesh: SS316 Cable: PUR	Body: HDPE/SLA resin* Mesh: SS316/Nylon** Sand: Quartz 1–1.6 mm

* SLA for neutral pH, HDPE for polluted environments, KIWA-certified HDPE for drinking water sites.
** Stainless steel for HDPE, nylon for SLA prepack

Power Supply

Parameter	Value
Power Input	3.3–5 V DC (via external datalogger)
Consumption	50 mA (measuring)
Battery configuration	Connected to a datalogger which has an internal battery pack.
System autonomy*	Depends on datalogger, measuring frequency, connectivity: typically +2 years

* The sensor operates autonomously when connected to a datalogger.

Operating Conditions

Parameter	HC1-02	HC1-40
Max Depth	100 m	100 m
Max Pressure	15 bar	12 bar
Temp Range	10–50 °C	5–50 °C
Soil Type	Unconsolidated, non-cohesive	
Soil saturation status	Fully saturated at all times (underneath the groundwater table)	
Saturated Hydraulic Conductivity	10^2–10^4 cm/day	

Data

Parameter	Value
Output	RS485, 9600 baud
Wireless	IoT communication through datalogger.
Sampling Interval	Configurable with a minimum threshold of 30 seconds
Warm-up after installation	4 s
Cable Length	Customizable, up to 150m

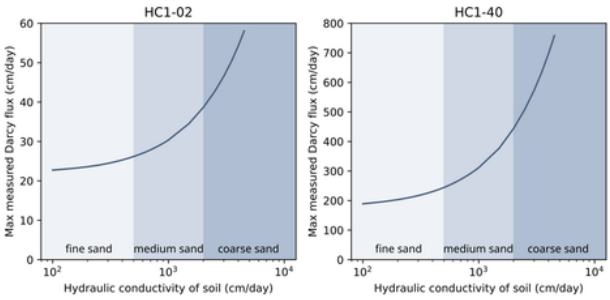
Model Selection Guide

Performance

Parameter	HC1-02	HC1-40
Measurement Range Magnitude • Min • Max (cf. Graph)	• 0.1 cm/d • 20 to 60 cm/d	• 1.0 cm/d • 200 to 800 cm/d
Accuracy Magnitude (Maximum Error) • Lower Range • Higher Range	Flux (cm/d): • <15: ±0.5 cm/d • >15: ±5%	Flux (cm/d): • <30: ±4.0 cm/d • >30: ±15%
Accuracy Direction • RMSE	• ±5°	• ±5°
Smallest Detectable Change	• 0.1 cm/day	• 1.0 cm/day
Response time	Depends on setting datalogger & chosen network connectivity. Minimum response time: quasi real-time.	

Model Application

Condition	Recommended Model
Low to medium flow Natural groundwater systems	HC1-02
High or highly variable flow Near active extraction or recharge facilities	HC1-40



Upper limit of flux magnitude that can be measured by the HC1-02 and HC1-40 probes. (Valid for a soil anisotropy of 3)

Calibrations

Measured values require correction using hydraulic conductivity-dependent factor α from CFD simulations. Accurate measurement of in situ hydraulic conductivity, is carried out during sensor installation (e.g., via slug or pumping tests).

Maintenance

Annual inspection is recommended; semi-annual in challenging environments, this involves:

- Check-up of cable integrity
- Cleaning of filter mesh if fouling occurs

Ordering Information

- Model: HC1-02 or HC1-40
- Prepack filter material: HDPE or SLA resin
- Accessories: Datalogger, solar kit, installation & retrieval tools

More info can be found on www.iflux.be or requested by email (info@iflux.be).