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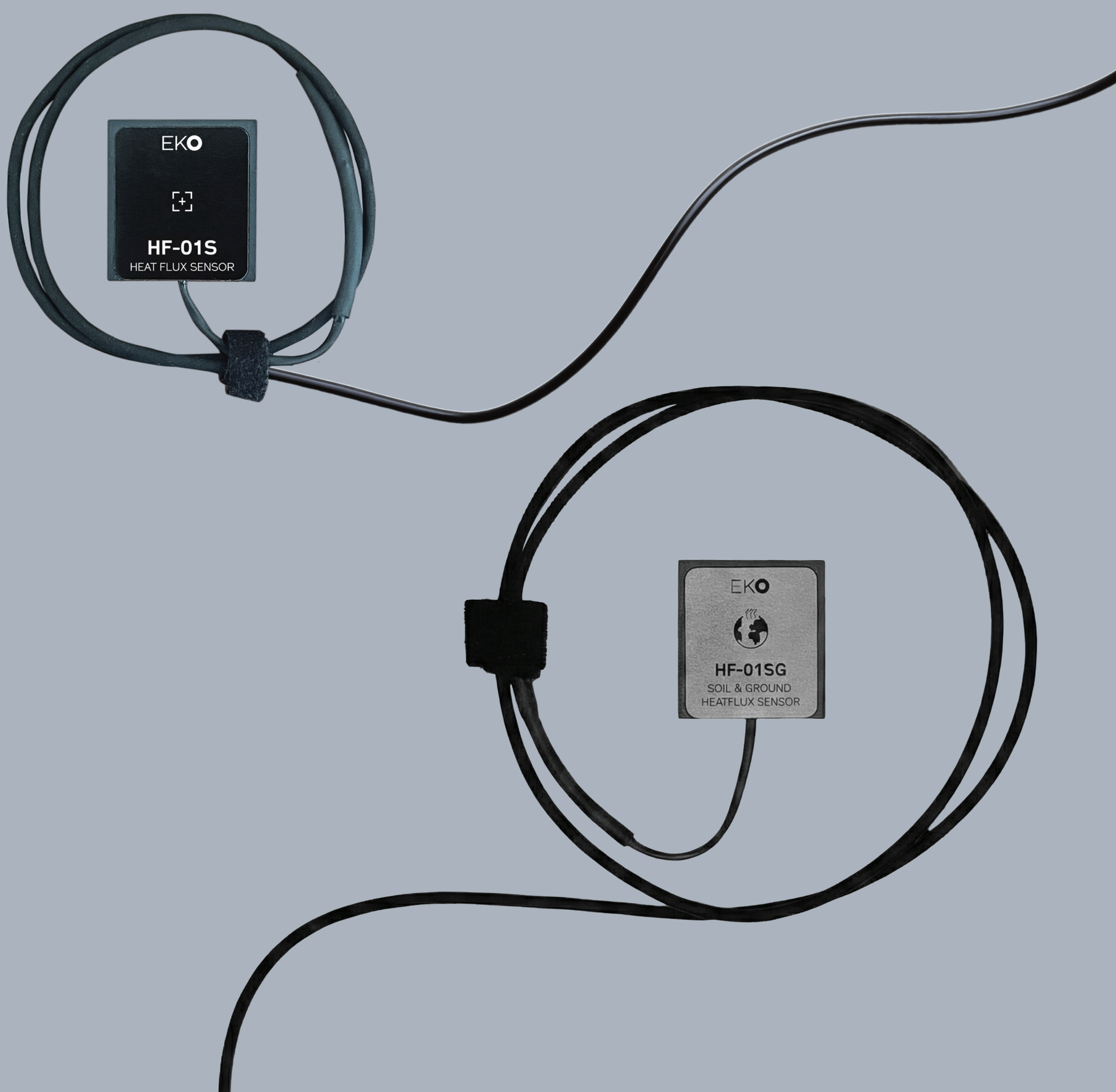
Beyond Accuracy.

Thermal Analysis 2026 Product Guide

High Precision Instruments for Thermal Analysis



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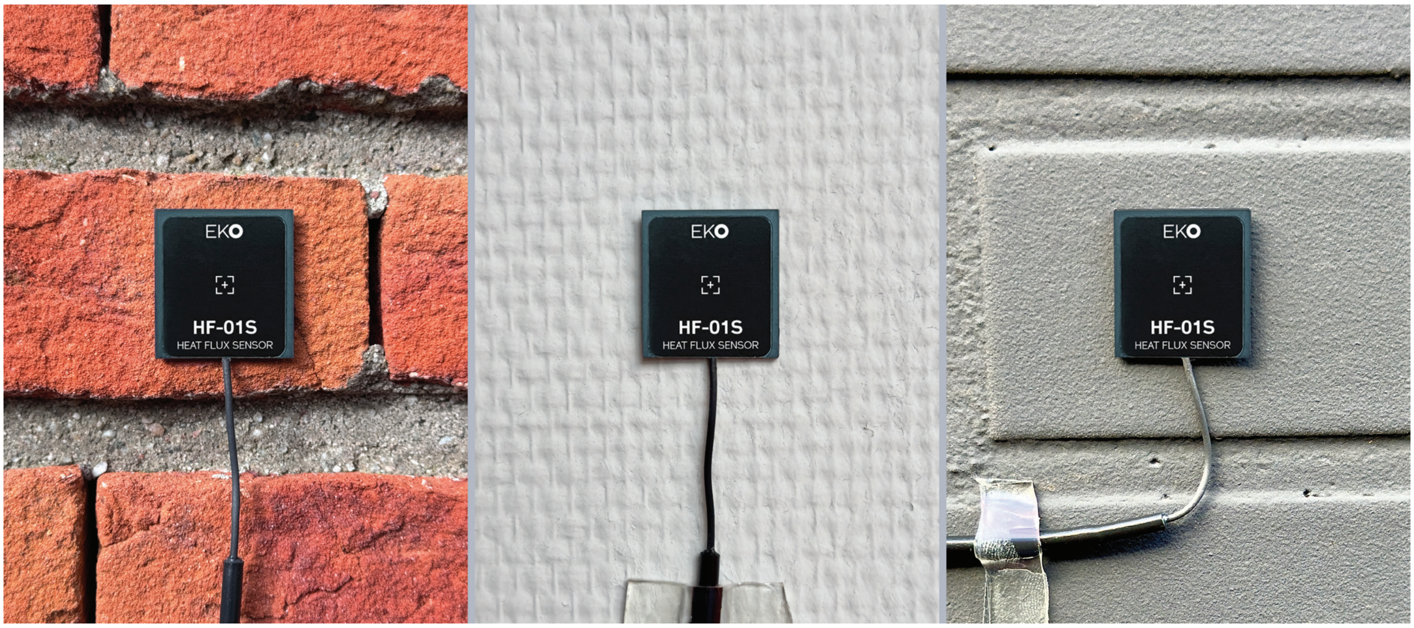
HF-01S

Standard Heat Flux Sensor



Real Size Model

The **HF-01S Standard Plate Type Heat Flux Sensor** has brought heat flux measurement applications to a new level. With a century of history and over 50 years of heat flux sensor manufacturing experience, **EKO** presents the **HF-01S**. This sensor represents a leap in thermal measurement precision. The standard, sensitive, fast-response, all-around sensor allows you to measure heat flux as accurately and precisely as possible.

Thanks to its small size and thin body, the disturbance of the sensor on the actual heat flow is minimized — bringing you one step closer to the true values of heat flux. In addition to its measurement-related benefits, the tiny, lightweight body allows easy installation without the risk of falling off. The limited surface area also minimizes the chance of air gaps between the sensor and the measurement surface. Manufactured carefully in Japan and passing the most critical quality tests, this sensor is built to last.

Sensor Specifications	
Nominal Sensitivity	55 $\mu V/W/m^2$
Time Constant (63%)	<2 sec
Thermal Resistance	2.3 x 10^{-3} m^2 K/W
Electric Impedance	8-12Ω
Operating Temperature Range	-30 to 100°C
Heat Flux Range	±10000 W/m^2
Dimensions (L x W x H)	25 x 24 x 2.0 mm
Sensing Area	500 mm^2
Guard Width	5x thickness of the sensor
Ingress Protection	IP67
Cable Dimensions	3m (Diameter: 2.1 mm)
Extension Cable Options	10m, 20m (Separate Connector Included)

HF-01SG

Soil & Ground Heat Flux Sensor

Meet the robust, precision-engineered **HF-01SG Soil and Ground Heat Flux Sensor**. As the sister of the **HF-01S**, this sensor helps you carry out soil and ground heat flux measurements with ease and accuracy under real-world conditions. **EKO** brings over 50 years of heat flux sensor manufacturing experience to this design. We developed the **HF-01SG** to meet the demanding requirements of environmental research, geotechnical analysis, and surface energy balance studies.

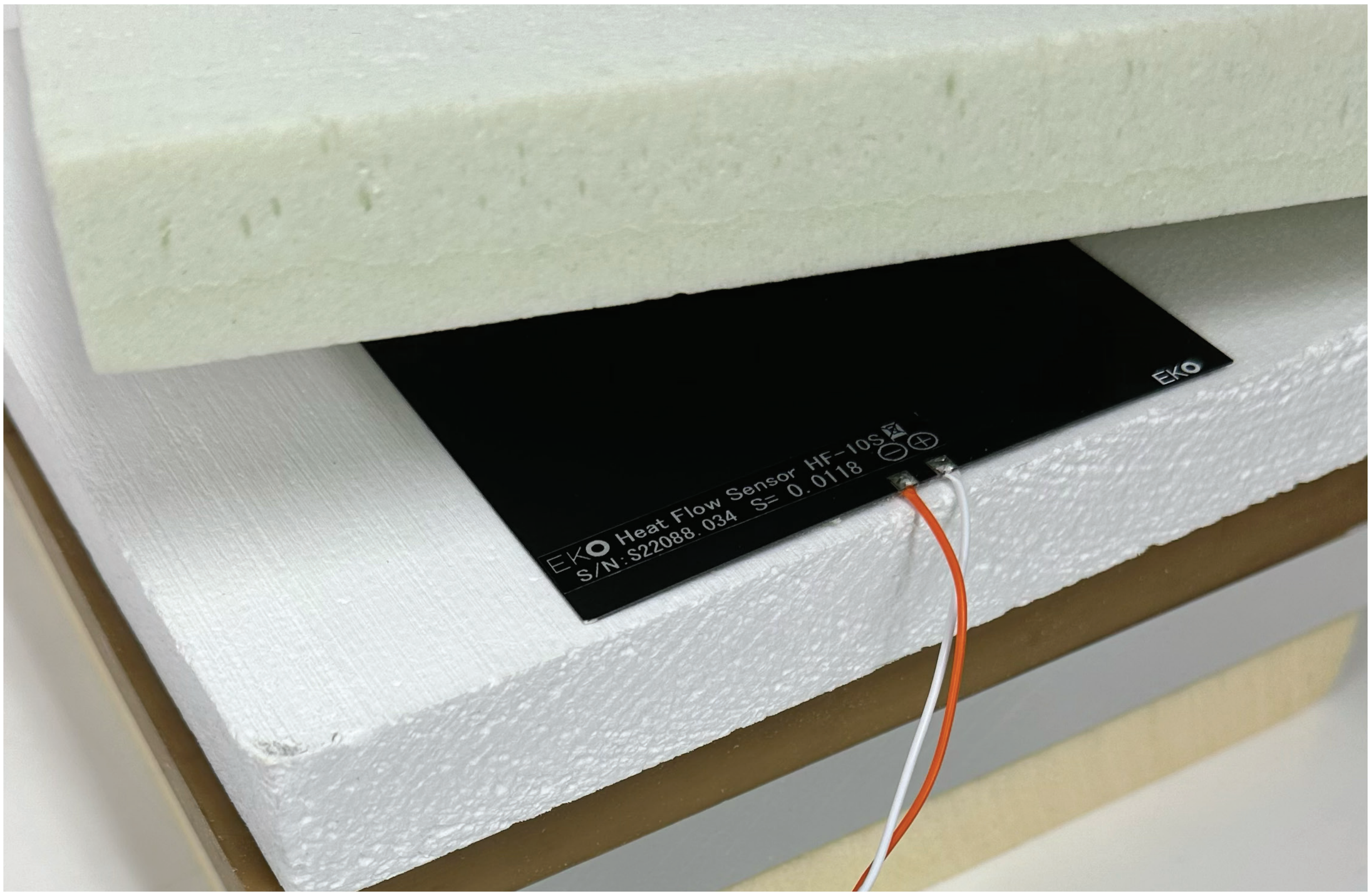
The rugged, sensitive, fast-response, weather-proof sensor allows you to measure soil and ground heat flux as precisely as possible. Its minimal form factor and thin body minimize the sensor's disturbance on the actual heat flow. This design makes installation easy without disturbing the soil environment. The limited surface area also minimizes the chance of water blockage during soil irrigation. We manufacture every sensor carefully in Japan and pass it through critical quality tests to ensure it lasts.

Real Size Model

Sensor Specifications	
Nominal Sensitivity	50 μV/W/m²
Time Constant (63%)	< 2 sec
Thermal Resistance	2.5×10^{-3} m² K/W
Electric Impedance	8 - 12Ω
Operating Temperature Range	-30 to 80°C
Heat Flux Range	±10000 W/m²
Dimensions (L x W x H)	25 x 24 x 2.0 mm
Sensing Area	500 mm²
Guard Width	5x thickness of the sensor
Ingress Protection	IP67
Cable Dimensions	3m (Diameter: 2.1 mm)
Extension Cable Options	10m, 20m (Separate Connector Included)

HF-10S

Thin Plate Heat Flux Sensor

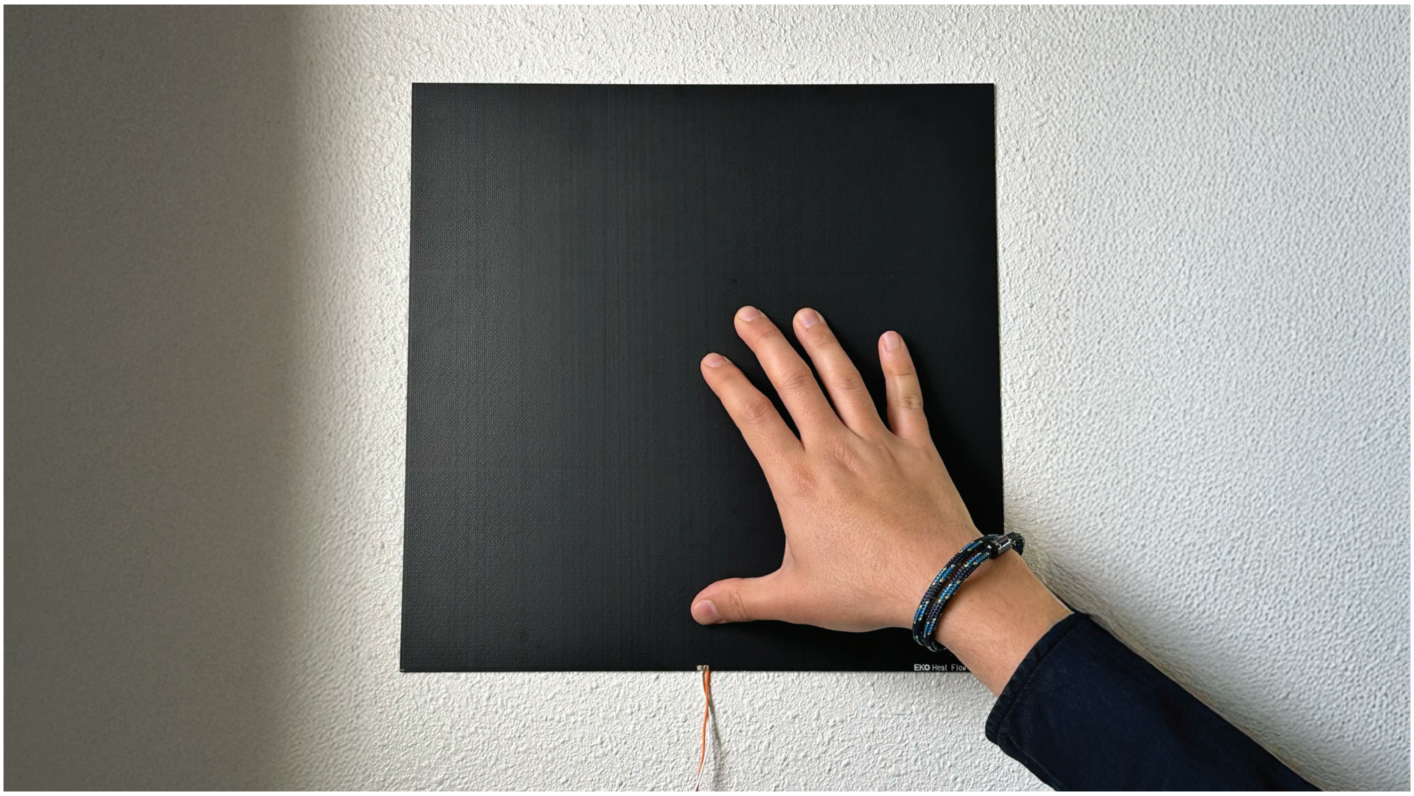


The **HF-10S**, only 0.5mm thick, is a thin heat flux plate option for applications where the sensor's thickness must be minimal, ideal for a variety of research applications and manufacturing control processes. The thin flat body of the sensor allows it to slide between layers of material to control and monitor heat flux. This includes insulation layer monitoring and heat flow management.

Sensor Specifications

Response time 95%	25 sec
Nominal sensitivity	12 μV/W/m²
Thermal resistance	0.0016 °C/(W/m²)
Impedance	90 - 180 Ω
Operating temperature range	-30 to 120°C
Cable lenght	10m (20 or 30m also available)
Dimensions (L x W x H) mm	100 x 100 x 0.5 mm
Weight	0.04 kg
Substrate	Glass epoxy
Cladding	Epoxy

HF-30S Extra Large Thin Plate Heat Flux Sensor



The **HF-30S** is a thin extra-large heat-flux sensor covering a large area of 30 x 30 cm². Its size ensures properly averaging the thermal distribution, minimizing the potential risk of missing local hot spot effects or thermal bridges. The sensor is used widely in applications such as Heat Flow Meter (HFM) Apparatus where large even area is monitored with heat flux changes. Thanks to the large area, the sensitivity of this senor is kept high, capturing heat flux at very low levels.

Sensor Specifications	
Response time 95%	28 sec
Nominal sensitivity	100 μV/W/m²
Thermal resistance	0.0016 °C/(W/m²)
Impedance	400 - 800 Ω
Operating temperature range	-30 to 120°C
Cable lenght	10m (20 or 30m also available)
Dimensions (L x W x H) mm	300 x 300 x 0.5 mm
Weight	0.12 kg
Substrate	Glass epoxy
Cladding	Epoxy

QHT-10

Thermal Monitoring Kit

The **QHT-10 Thermal Monitoring Kit** is a flexible heat flux and temperature monitoring solution, an ideal option for research and engineering applications as well as manufacturing control and monitoring processes. Pre-configured, easy to set up and use, the **QHT-10** comes housed in a weather-resistant case and is equipped with a long-life battery and an ultra-high-resolution data logger that can store up to 4 million data points.

Including **EKO HF-01S Heat Flux Sensors** and highly accurate 4-wire **RTD Temperature Sensors**, the **QHT-10** comes in three configurations; the dual 'Heat Flux' model 'HH', the dual temperature model 'TT' and the model 'HT' combination.

Specifications	
Number of measurement points	2
Logger operating temperature range	-40 to +90°C
Data storage	4 Million Data points
Datalogger battery life	Interval: >1min : 4 years - 10s : 230 days
Battery type of the data logger	Lithium type SL-750/S
Interface	USB to PC
Measurement unit IP level	IP67
Transport case IP level	IP67
Weight (measurement unit)	0.335 kg
Weight (incl transport case)	1.55 kg
Dimensions (measurement unit)	113 x 80 x 60 mm
Dimensions (transport case)	270 x 240 x 120 mm

QRU-100 Thermal Monitoring Kit For Buildings

The **EKO QRU-100 Thermal Monitoring Kit** is a practical solution for measuring the real thermal performance of building components under actual on-site conditions. By monitoring heat flux together with indoor and outdoor temperature, the **QRU-100** enables the determination of in-situ thermal resistance **R-value** and thermal transmittance **U-value**, helping users understand how much heat is actually passing through walls, roofs, floors, and other building envelope elements. This makes it especially useful for energy audits, insulation performance checks, renovation projects, and building physics research.

Designed for simple and reliable field measurement, the **QRU-100** uses independent indoor and outdoor measurement nodes, eliminating the need for cross-wiring between sensors. Its battery-operated, lightweight, plug-and-play design allows quick installation even in difficult locations, while its high-accuracy heat flux and temperature sensors support reliable measurements in line with major international standards such as **ISO 9869-1**, **ASTM C1046**, and **ASTM C1155**. The result is a convenient monitoring kit that helps users make better decisions about insulation quality, energy efficiency upgrades, and building envelope performance.

Specifications	
Number of measurement points	3
Logger Operating temperature range	-40 to +90°C
Data storage	4 Million Data points
Datalogger battery life	Interval: >1min : 4 years – 10s : 230 days
Battery type of the data logger	Lithium type SL-750/S
Interface	USB to PC
Software	InfraLog 5
Measurement unit IP level	IP66, IP68
Transport case IP level	IP67
Weight (Measurement unit)	0.335 kg
Weight (incl Transport case)	2.5 kg
Dimensions (Measurement Unit)	113 x 80 x 60 mm
Dimensions (Transport case)	350 x 295 x 150 mm

HC-10

VIP Thermal Conductivity Tester

The **EKO HC-10** Thermal Conductivity Tester is a compact, portable instrument designed for fast thermal conductivity estimation of homogeneous materials and vacuum insulation panels. Unlike conventional thermal conductivity testing methods that can take hours to conclude, the **HC-10** can complete a measurement in just 60 seconds, making it especially useful for research, material screening, production control, and VIP quality inspection.

The **HC-10** works by comparing the sensor readout with a calibration curve created from reference samples with known thermal conductivity. This approach provides fast, repeatable results and allows users to classify samples into defined performance groups, such as A, B, or C, based on selected thermal conductivity thresholds. With integrated heating and temperature sensing, PC software for calibration and data management, onboard data storage, and ±5% repeatability, the **HC-10** offers a simple and powerful way to improve material development, insulation performance verification, and manufacturing quality control.

Specifications

Thermal Conductivity Range (VIP Sample)	0.001 to 0.015 W/m•K
Conductivity Range (Homogeneous sample)	0.03 to 5.00 W/m•K
Method	Method Non-static transient heating
Calibration Requirements (VIP Sample)	3 or 4 reference samples of the same structure but different thermal conductivity
Calibration Requirements (Homogeneous sample)	3 or 4 different standard reference samples
Repeatability	± 5%
Evaluation	Thermal Conductivity of a sample can be classified (A, B or C) depending on the measurement result by setting TC thresholds ($\lambda 1$& $\lambda 2$)
Operating Temperature Range	+10°C to +40°C

MC-20

Signal Converter

The **MC-20** digital signal conditioner converts the voltage output of heat flux sensors, passive pyranometers, **PT-100** and10 kΩ NTC temperature sensors into a MODBUS 485 RTU output.
With the **MC-20**, the sensor cable can easily be extended over long distances without any signal loss or potential electromagnetic interference in noisy industrial environments. Robust input/output screw terminals can also be easily connected to the signal cable leading to any on-site measurement systems.

Enhance your measurement experience with **NETSU Software**, to visualize and log data from temperature and heat flux measurements simultaneously.

Specifications

Output	Digital (Modbs RTU)
Input range 1	0 to 100 mV
Input range 2	2W, 3W, 4W PT-100
Output range	-
Resolution (µV)	< 5
Resolution	< 0.1 °C
Impedance	> 15 MΩ
Temperature response	< 0.2 % (-20°C to 50°C)
Response time 95%	< 1 Sec
Non-linearity full span	< 0.1 %
Operating temperature range	-40 to 80 °C
Power supply	12 to 24 +/-10% VDC
Power Consumption	0.2 to 0.3 W
Dimensions	45 mm (D) x 27 mm (H)
Weight	0.03 kg
Ingress protection	IP20
USB programming kit	USB-M
Accessory type	Signal Converters

RTD PT-100

Temperature Sensor

Temperature measurement is fundamental to any thermal analysis process. However, not all sensors are manufactured equally. The difference between a common temperature sensor and a high-grade RTD can significantly impact the accuracy and reliability of your data and the conclusions you draw from it. Our **RTD PT1000** 4-wire temperature sensor is a high-accuracy sensor built for demanding thermal measurement applications. The **RTD PT-1000** offers Class 1/10 DIN rating and a precision of ±0.05 °C. This is one of the highest accuracy levels available for temperature sensing in building physics, especially within the **ISO 9869**-compliant range. Its slim 3 mm thickness makes it ideal for mounting on wall surfaces. Its **IP67** waterproof rating allows for reliable use in liquids, soil, or exposed environments. We offer this sensor for versatility and stability in both lab and field conditions, operating across a wide temperature range of −200 °C to +600 °C.

Specifications

Sensor type	RTD, PT-1000
Wire type	4-Wire
Cable material	Silicone
Accuracy class	1/10 DIN
Dimensions	Probe Length: 30mm Cable/Probe Diameter: 3mm Cable Length: 3m
IP rating	IP67

Extension Kit

For Heat Flux Sensors

Have you purchased our **HF-01S** or another **EKO Heat Flux Sensor**?

Don't let the cable length limit your measurements. While the standard **HF-01S** heat flux sensors come with a 3-meter cable, our Extension Package empowers you to go further—literally. Available with 10-meter or 20-meter cable options, it enables reliable, high-precision heat flux monitoring even in hard-to-reach or remote locations. Designed for seamless integration, this package ensures stable data transmission without signal loss. The excellent electrical specifications allow your data to transfer safely to your data acquisition units whether in the lab or out in the field. Need a longer cable? Contact us for tailored options.

Each kit includes a solder-free, screw-free connector, allowing you to complete installation entirely by hand—no special tools or skills required. Just follow the Quick Start Guide (QSG) or watch our installation video to get up and running in minutes. Whether you're expanding coverage across a facility or deploying in challenging environments, this easy-to-use upgrade keeps your setup clean, efficient, and fully compliant with your sensor needs.

Specifications	
Dimension (Length x Diameter)	Cable: 10m , 20m, D = 3.60 mm, ±0.15 mm Connector: 43.4 mm D=12.5 mm, Cable Range: 2.5 mm – 5 mm
Head thread type	M8
IP Rating	IP65 and IP67
Temperature Range	–25 °C to +80 °C
Cable/Connector Electrical Resistance	≦ 78 Ω/km / ≦ 5 mΩ
Cable/Connector Weight	10m cable: 180g, 20m cable: 360g / 8g

Applications

Glazing and Windows

In the quest for energy efficiency, double glazing windows have globally become a popular choice for facade insulation. The performance of these windows however, can vary significantly due to factors such as thermal bridges, manufacturing defects, and installation quality decay. To optimize the insulation performance of windows, understanding the heat flux patterns across the window is crucial. **EKO HF-01S** is the perfect tool for performing full-scale measurements and understanding the pattern of heat flux on the surface of glazing.

Traditional methods like temperature measurement and IR thermography provide surface temperature data though fall short in offering a complete picture as well as the rate of heat transfer, missing critical insights into insulation performance. On the contrary, heat flux measurements using heat flux sensors provide precise and quantitative data regarding the heat transfer rate, allowing for the identification of weak points in insulation that might not be apparent through temperature measurement alone. By placing these sensors at strategic points, such as the center and edges of the window, one can find the heat flux mapping and gather detailed information on heat transfer patterns. Identifying insulation weak points with in-situ data promotes cost savings by pinpointing energy loss.

PV Panel Monitoring

Promotion of energy conversion using renewable energy resources is essential for sustainability and environment. Photovoltaic (PV) panels are for instance, widely used to convert solar power into electricity. This process generates significant amount of heat, which transfers to the surfaces on which the panels are installed. When it comes to PV panel monitoring, heat flux sensors therefore offer substantial benefits by providing a deep understanding of the thermal dynamics at play and can be key to thermal management.

By Installing a combination of sensors (**EKO HF-01S, PT-1000 Temperature Sensor, and EKO ML-01 Pyranometer**) on a PV panel, the thermal performance of the panel can be depicted. The HF-01S sensors measure heat flux towards the roof and the heat flux from the back of the solar panel to capture the dynamics and energy changes. Additionally, the **HF-01S** can capture the heat balance between the two surfaces (the back of the PV panel and the surface of the roof) and can be used for optimal thermal management such as insulation application and PV cooling.

Building's Thermal Performance

Rapid depletion of fossil fuels necessitates an enhanced focus on energy management in the field of built environment. Consequently, energy efficiency measures are being actively implemented and continuously developed. Among the critical threats related to energy conservation is the high levels of heat loss in buildings, which can be effectively quantified using heat flux sensors. **EKO HF-01S** is used widely to measure the heat flux from or towards a surface of interest. It also aids in the precise determination of in-situ thermal resistance R-Value and thermal transmittance U-Value, which are known to often depart from their nominal values. This helps evaluate the insulation performance. Install the sensor on specific points, such as building façades, floors, roofs, doors, windows and any surface where the heat transfer rate is to be determined.

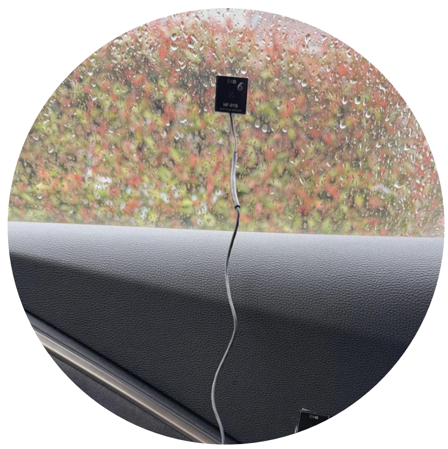
By capturing real-world conditions, heat flux sensors provide insights into the actual thermal performance of building components, aiding in informed decisions regarding energy efficiency improvements, insulation upgrades, and overall building envelope design. A wall's insulation level, for instance, can be evaluated qualitatively by observing the heat flux data on the surface.

Insulation Monitoring

In the process of quality control, when ensuring the thermal efficiency of insulated containers, pinpointing the exact areas of heat loss is crucial. While traditional temperature sensors and IR thermography barely provide basic insights, they often fall short in quantifying insulation problems accurately. EKO **EKO HF-01S**, however, excels in this domain. It not only measures the rate of heat transfer but can also help one to identify specific areas where insulation is compromised.

The traditional methods include monitoring internal temperature, which take significantly longer time to show small variations, despite the loss of insulation effects. This leads to a long delay and difficulties in addressing the insulation problems. Heat flux data on the contrary, shows significant difference, at multiple orders of magnitude, from the very beginning of the process, aiding in qualifying the insulation condition and quantifying the heat loss level. Such large deviations cannot be observed by IR camera or temperature sensors.

Automotive Cabin Heat Balance Analysis

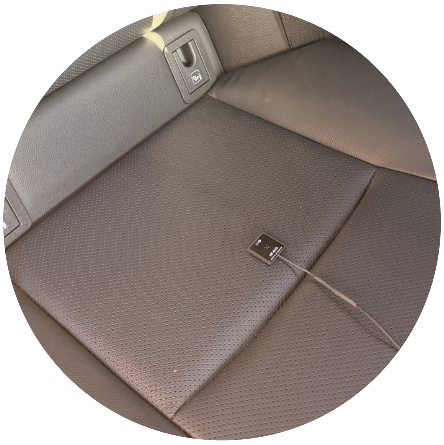


Automotive cabin thermal management is a key factor in passenger comfort, HVAC efficiency, and cold-weather vehicle performance. Heat loss through cabin components such as the windshield, side windows, roof, doors, floor, and sunroof can increase heating demand and reduce overall energy efficiency. The **EKO HF-01S** heat flux sensor enables direct measurement of heat transfer through these interior surfaces, providing engineers with real-world data on cabin heat loss under actual driving conditions.

By installing **HF-01S** sensors on selected cabin surfaces, manufacturers can observe how heating operation, outdoor temperature, vehicle speed, and cabin conditions affect thermal behavior. The measured heat flux data helps identify areas with higher thermal losses, weak insulation zones, and differences between cabin components. In vehicle testing, the windshield showed the highest heat loss, while other surfaces such as the roof, window, door, and floor demonstrated different insulation performance levels.

When combined with cabin and outdoor temperature measurements, **HF-01S** heat flux data can also be used to estimate component-level U-values. This allows engineers to compare the thermal performance of individual cabin parts and evaluate their contribution to total cabin heat loss. The results support improved insulation design, optimized HVAC control, reduced energy consumption, and enhanced thermal comfort in both conventional and electric vehicles.

Automotive Heat Generation Analysis



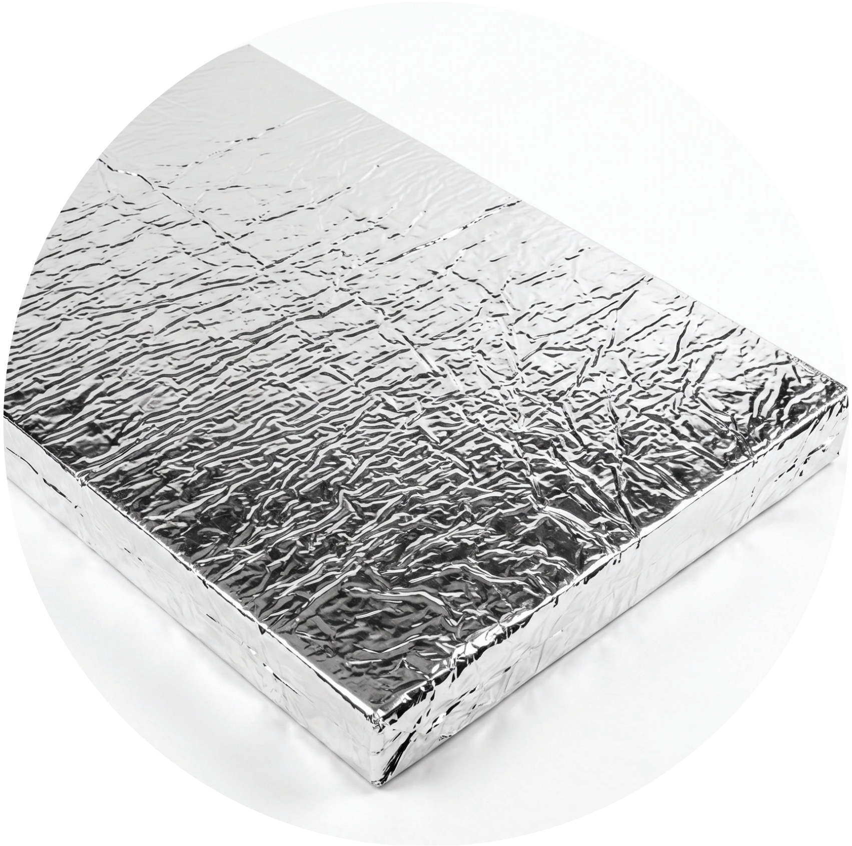
Automotive systems such as seat heaters and EV batteries generate and redistribute heat in complex ways, directly affecting passenger comfort, energy efficiency, and thermal safety. The **EKO HF-01S** heat flux sensor provides a practical method for evaluating how heat moves through seat surfaces and surrounding vehicle structures. By measuring both the magnitude and direction of heat transfer, **HF-01S** helps engineers understand thermal behavior that cannot be clearly identified from temperature data alone.

For seat heater evaluation, multiple **HF-01S** sensors can be installed across the seat back, cushion, and nearby surfaces to map local heat transfer during heater operation. In the case study, heater ON/OFF events produced immediate changes in heat flux at different seat locations, including positive and negative heat-transfer directions even between nearby points. This enables engineers to identify uneven heating, heat loss paths, residual heat behavior, and how effectively heat is delivered toward the passenger.

HF-01S can also be used to study heat transfer near EV battery locations, where cabin heating, battery operation, and vehicle structure interact. Measurements taken on the seat above the battery showed how local heat balance changed during EV operation and after cabin heating was stopped. These insights support improved seat heater design, battery thermal management, cabin comfort optimization, and more efficient use of vehicle heating energy.

Application | VIP Thermal Analysis

Vacuum Insulation Panel Thermal Bridge Evaluation



Vacuum insulation panels are high-performance insulation materials used in buildings, refrigeration, cold chain logistics, and equipment insulation to reduce thermal energy losses. However, their thermal performance can vary between the center and edges of the panel, creating thermal bridges that reduce overall insulation efficiency. The **EKO HF-01S** heat flux sensor provides a practical method for directly measuring heat transfer through VIP surfaces and quantifying local thermal performance.

While infrared thermography can visualize thermal edge effects, heat flux measurement is required to quantify the actual heat loss at specific locations. By attaching **HF-01S** sensors to selected points on a VIP, engineers can compare heat flux at the center, edge, and intermediate positions. In the application example, the measured heat flux was higher near the panel edge than at the center, demonstrating the ability of **HF-01S** to identify and evaluate thermal bridge effects.

HF-01S is also suitable for on-site monitoring of VIP installations due to its thin, compact plate-type design. The sensor can be inserted into narrow gaps between insulation materials, allowing heat flux and U-value evaluation under real installation conditions. These measurements help verify insulation performance, compare VIPs with conventional insulation materials, improve edge design, and support energy-efficiency decisions in building and industrial applications.

Soil Heat Flux and In-Situ Thermal Conductivity Evaluation

Soil and ground heat flux measurement is essential for understanding energy exchange between the surface, subsurface layers, and surrounding environment. In applications such as agriculture, geothermal studies, green roofs, bifacial PV systems, ground heat pumps, and construction foundation testing, heat transfer through soil directly influences thermal behavior, energy balance, and system performance. The **EKO HF-01SG Soil & Ground Heat Flux Sensor** is designed to measure this heat flow under real outdoor and buried conditions, providing reliable data for evaluating soil thermal dynamics.

By installing the **HF-01SG** at selected soil depths or directly on ground surface layers, users can monitor heat flux variations caused by solar radiation, weather changes, irrigation, vegetation, surface coverings, and subsurface thermal storage. Its thin, compact design minimizes disturbance to the natural heat flow, while the rugged IP67 weather-proof construction supports stable use in harsh soil and outdoor environments. The sensor's high sensitivity and fast response make it suitable for both short-term thermal behavior studies and long-term field monitoring.

When used together with temperature sensors placed above and below the heat flux plate, the **HF-01SG** enables in-situ thermal conductivity evaluation using Fourier's Law. This allows researchers and engineers to estimate how effectively heat is conducted through soil or ground materials under actual field conditions. The resulting data supports improved ground heat storage analysis, surface energy balance modeling, geothermal system design, agricultural thermal studies, and evaluation of insulation or ground-covering performance.

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