HUKX

Sensor
Technology

Brochure

Water-cooled heat flux sensor

SBG01

SBG01
Water-cooled heat flux sensor

SBG01 is a water-cooled sensor that measures heat flux. Since its introduction in 2008, SBG01 has rapidly become the sensor of choice for fire testing. The most common applications are to test reaction to fire and fire resistance. The sensor also serves as a calibration reference standard for test equipment, including flammability and smoke chamber tests. SBG01 complies with the requirements of most common ASTM and ISO standard test methods.

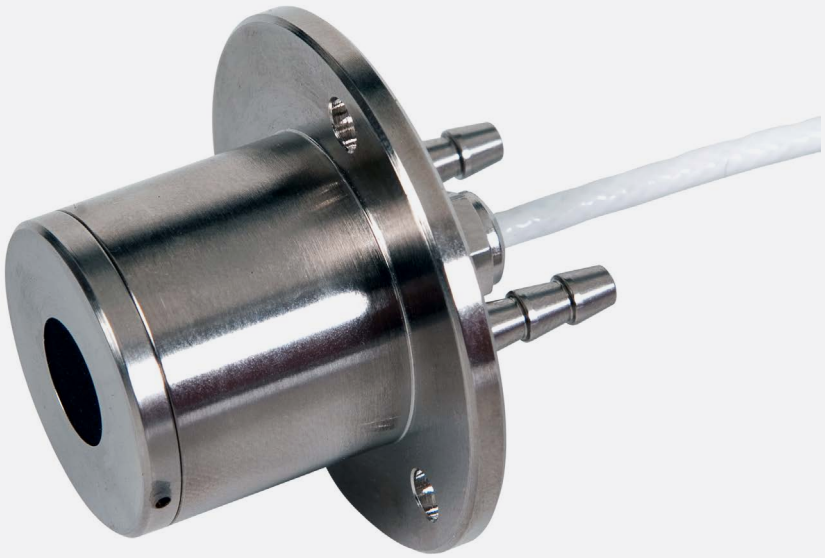
Introduction

SBG01 is the preferred choice for fire testing, capable of measuring heat fluxes from (5 to 200) x 10^3 W/m^2. Equipped with a black absorber and water-cooled, the sensor is designed to measure heat flux from strong radiative sources.

Using an open detector, SBG01 is also sensitive to convective heat flux—a contribution that is often overlooked. Application in environments with lower than 20 x 10^3 W/m^2 irradiance levels, or with significant heat transfer by convection, is possible but requires a careful evaluation of the measurement uncertainty.

SBG01's thermopile sensor generates an output voltage proportional to the incoming heat flux. The sensor is cooled, usually via tap water, which keeps the sensor body relatively cool despite temperatures of the surrounding air and the radiant source reaching 1000 °C and higher.

Figure 1 SBG01 water-cooled heat flux sensor.



water-cooled

for fire testing

next-level technology

available in six models

SBG01 is available in 6 models, each with a different rated measurement range and with a different calibration reference irradiance level. There are several optional body designs, with the standard body equipped with a smooth cylindrical body and flange (model SBG01). Another common option is a smooth cylinder body without a flange (model SBG03). Also, thermocouple (Type T or K) can be fitted upon request.

Next-level technology

SBG01 features a novel sensor design that combines the benefits of the technology of traditional Gardon gauges and the more recent thermopile technology of Schmidt-Boelter gauges.

SBG01 has several advantages:

– robust and serviceable water tubes
– scratch-resistant absorber coating (slightly lowered surface)
– safe transport and storage with a practical protection cap

Suggested use

SBG01 has quickly become the sensor of choice for fire testing. The heat flux sensor is mainly used to test reaction to fire and fire resistance. It also serves as a calibration reference standard for test equipment, for example, in flammability and smoke chamber tests.

Measurement uncertainty

The measurement uncertainty of SBG01 should be determined on a case-by-case basis. It depends on several factors:

1. heat flux sensor properties
2. uncertainty of calibration and quality assurance of the local calibration reference standard
3. verification of the sensor's stability in day-to-day measurements, both before and after use
4. application-related uncertainties, for example, caused by the unknown contribution of convection and the representativeness of the measurement location

Figure 2 SBG01 is the sensor of choice for fire testing.

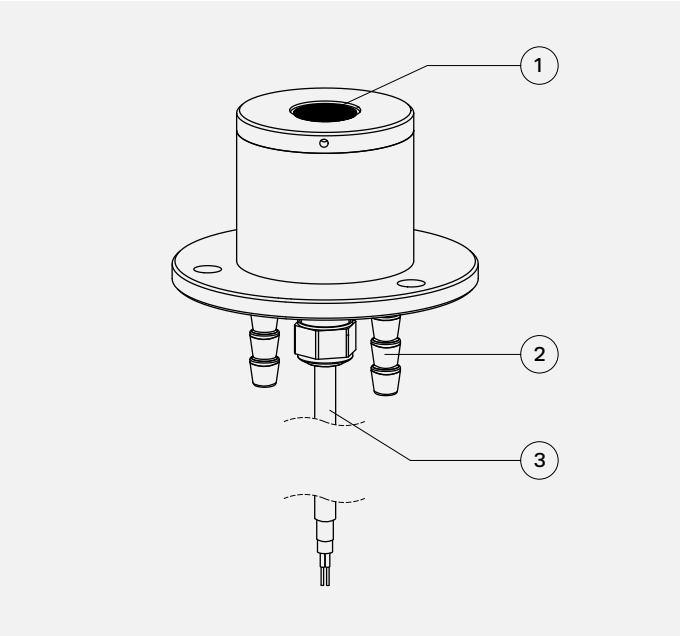


Figure 3 SBG01 standard model with a smooth body and a flange. Overview: (1) thermopile sensor with black coating, (2) water cooling tube, and (3) cable (standard length: 2 m). SBG01 is supplied with a practical protection cap for safe storage.

Calibration

With every SBG01 sensor, Hukx provides a calibration traceable to a secondary reference standard.
The reference has been calibrated by comparison to the primary standard of the RISE Research Institutes of Sweden AB.

SBG01 sensors are factory calibrated according to ISO 14934-3. Hukx is ISO 9001 certified but not an ISO /IEC 17025 accredited measurement laboratory.

ISO/ASME standardized practices

Calibration and the use of heat flux sensors (officially "heat flux meters"), such as SBG01, are subject to standardized practices, according to ISO 14934, Reaction-to-Fire tests — Calibration and use of heat flux meters. The same procedures will also be adopted by ASTM. In case the user performs accredited testing or works in an accredited organization, the user must comply with these standards.

The ISO 14934 standard has 4 parts:

Part 1: General principles
Part 2: Primary calibration methods
Part 3: Secondary calibration methods
Part 4: Guidance on use of heat flux meters

The most important requirements are:

– Secondary reference standards: You should have 3 local "secondary standard" calibration reference instruments (i.e., sensors calibrated using the primary standard per ISO 14934-2) for calibration of your local "working standards" (i.e., instruments used for daily work and test equipment calibration). Calibration of your reference instruments may be done at NIST (USA), RISE (Sweden), or LNE (France). Of the 3 calibration reference instruments, 2 instruments must remain unused until unexpected results appear or the first calibration reference standard is sent away for recalibration.
– Periodic recalibation: Every 2 years, you should calibrate 1 of the reference standards against the primary standard. Then use this instrument to verify the uncertainty of the other 2 calibration reference standards. A single calibration reference sensor is usually calibrated at multiple heat flux levels, allowing it to be used as a reference within that range or at higher levels by extrapolation.
– Appropriate usage: You may only use working standards at an irradiance level close to its calibration reference condition.
– Routine verification: Before (and preferably after) each test, you should compare working standards to a local calibration reference standard following the method specified in ISO 14934-3. The comparison is done under a local irradiance source, for example, a cone calorimeter.

Options

– rated measurement ranges:
(5, 10, 20, 50, 100, 200) x 10^3 W/m^2
– longer cable: 5, 10, or 20 m (standard cable: 2 m)
– smooth cylindrical body without flange (model SBG03)
– thermocouple (Type T or K) can be fitted upon request
– for more options, see the user manual

See also

– GG01 Gardon gauge water-cooled high heat flux sensor for measurements up to 2500 x 103 W/m^2
– SBG04 water-cooled sensor—for cone calorimeters
– HFS01 for heavy industrial applications

SBG01 specifications

General specifications

measurand	heat flux
measurand in SI units	irradiance in W/m^2
sensor technology	both Gardon and Schmidt-Boelter
rated cooling water temperature range	10 to 30 °C
rated cooling water flow*	> 10 l/h (0.003 l/s), preferably 30 l/h (0.01 l/s)
rated measurement ranges	(5, 10, 20, 50, 100, 200) x 103 W/m^2
response time (63 %) at different rated measurement ranges:	
5, 10 x 10^3 W/m^2 20, 50 x 10^3 W/m^2 100, 200 x 10^3 W/m^2	< 450 x 10^{-3} s < 250 x 10^{-3} s < 200 x 10^{-3} s
limiting measurement range	150 % of rated measurement range
spectral range	0 to 50 x 10^{-6} m
full field of view angle	180°
black coating emmissivity	> 0.90
calibration traceability	to ITS-90
calibration laboratory: – management system certification – accreditation – calibration method	 ISO 9001 not accredited SBGC secondary calibration method according to ISO 14934-3
standard cable length	2 m (see options)
order code standard version	SBG01/rated measurement range

*see the user manual for more information

About Hukx

Hukx is the leading innovator in solar radiation and heat flux sensor technology. We are proud to set the standard in high-accuracy measurement, and to be working at the heart of the energy transition.

Customers worldwide rely on our bestselling pyranometers and heat flux sensors. From sensor design and selection to supply and recalibration, we support you across the entire lifecycle.

Hukx is headquartered in the Netherlands, with locally owned representative sales offices in the USA, Brazil, India, China, Southeast Asia, and Japan.

Let us help you select the best sensor for your application.
Get in touch with our experts today via: info@hukx.com

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