



**Figure 1** SBG01 from top to bottom: 3D view, side view, top view. Dimensions in mm. Coated sensing element (1), water cooling tube (2), Outer diameter tube: 4,2 mm, signal cable (3). Standard cable length is 2 m.

## SBG01

### WATER COOLED HEAT FLUX SENSOR ACCORDING TO SCHMIDT-BOELTER

*SBG01 is a water-cooled heat flux sensor. The ISO standards call this heat flux meter. Its main purpose is the study of reaction to fire and fire resistance, applied for instance in flammability tests and smoke chamber tests. SBG01 measurements are in accordance with various ASTM and ISO standards. SBG01 is on the market since 2008, and has rapidly become the sensor of choice for fire testing laboratories.*

### INTRODUCTION

SBG01 serves to measure the heat flux in the range up to 200 kW/m<sup>2</sup>. Heat flux sensors of this type are originally designed to work in an environment that is dominated by radiation (so above 50 kW/m<sup>2</sup>). Application in environments with lower irradiance levels and with much convection should be done with care. Working completely passive, using a thermopile sensor, SBG01 generates an output voltage proportional to the incoming flux. The sensor is water cooled. There are 6 types of SBG01; with different working range, sensitivity and response time.

Comparing to traditional Gardon and Schmidt Boelter gauges, SBG01 has several advantages:

- tubes with increased robustness
- increased scratch resistance of absorber paint (slightly lowered surface)
- practical protection cap

The measurement uncertainty of SBG should be determined case by case. It is a function of:

1. meter/sensor properties
2. calibration traceability of and quality assurance of the local reference at the user
3. quality assurance of calibration of SBG field meters or "working standards" in day to day measurements
4. measurement-related uncertainties, for instance caused by convection

Hukseflux provides traceable calibration (our secondary standard is calibrated at the Statens Provningsanstalt (SP), Sweden and by definition is thereby also traceable to NIST). Hukseflux is not a "certified lab"; if required, the user is responsible to maintain certified traceability.

## ISO/ASME STANDARDISATION

Heat flux sensors (officially "heat flux meters") like SBG are nowadays subject to standardisation according to ISO TS 14934 "Reaction-to-Fire tests-calibration of heat flux meters". This standard will also be adopted by ASME.

In case a user wishes to perform certified testing or works in an ISO certified organisation, the following is relevant:

The ISO 14934 standard has 4 parts:

1. general principles
2. primary calibration methods
3. secondary calibration methods
4. guidance on use of heat flux meters

The most important practical consequences of the standards are:

- the need to have local reference sensors calibrated at a "certified calibration institute".
- the need to work with a sensor closely around the area of calibration.
- the need, to have 3 "secondary standard" instruments for calibration of the "working standards" (these are the instruments used for day to day work).

Working standards must be compared to a local secondary standard before and preferably after every test session.

Working standard heat flux meters to be used in fire tests should be calibrated by comparison with the secondary standard heat flux meters following the method specified in ISO 14934-3. The comparison requires a local high intensity radiation source, for instance a cone calorimeter. Two out of the 3 secondary standard instruments are kept unused until unexpected results appear or the first secondary standard needs to be sent away for recalibration.

When carrying out certified testing, the user will typically choose to have three secondary standard SBG01's. Typically every 2 years one of these, "the reference instrument" is sent to a certified calibration lab (this may be NIST in the USA, LNF in France, or SP in Sweden). After calibration this instrument is again used to verify the uncertainty of the other 2 secondary standards. Because Hukseflux is not a certified laboratory, SBG01 sensors as delivered by Hukseflux are not 'secondary standard', nor 'working standard' according to ISO TS 14934-4. A single secondary standard sensor can be used at multiple flux levels.



**Figure 2** SBG01 has a practical protection cap.

## SBG01 SPECIFICATIONS

Temperature range cooling water:	10 to +30 °C
Cooling water flow:	> 10 liter/hr, preferably 30 liters per hour @ 3 bar (normal tap water)
Working ranges kW/m <sup>2</sup> :	5, 10, 20, 50, 100, 200
Response times:	
Working range 5, 10 kW/m <sup>2</sup> :	< 450 ms (63%)
Working range 20, 50 kW/m <sup>2</sup> :	< 250 ms (63%)
Working range 100, 200 kW/m <sup>2</sup> :	< 200 ms (63%)
Maximum range:	150% of working range
Output signal:	> 5 mV at working range
Spectral range:	to 50.000 nm
Field of view:	180 degrees
Emissivity:	> 0.95
Calibration traceability:	SP - NIST (not certified)
Calibration status:	against "working standard" (ISO 14934)
Standard cable length:	2 m
Order Code:	SBG01/working range/ cable length