

- : dielectric sensors
- : immune to EMI/RFI
- : oil-permeable cable
- : multi-sensor head
- : pressure-tight feedthrough
- : ruggedized construction
- : high sensitivity



### OVERVIEW

The Hot•Spot solution is a complete monitoring system for measuring temperatures on Power Transformers. It complies with IEC 60076 standard by measuring the hot spot and its surrounding area. The multi-headed sensor measures multiple spots within the transformer with transient information. The system is prepared for monitoring temperature during customer acceptance tests as well as during life time operation of the machine.

### SYSTEM INTEGRATION

Typically, a Hot•Spot System is composed of one measurement unit, a flange and temperature probes. A system with a single measurement unit can reach tenths of measuring points. The measurement unit is supplied with HotSpotMONITOR software to be installed on the control PC. This application is specifically designed for fiber Bragg grating temperature sensors acquisition and data transmission. It makes it possible to visualize actual data from all sensors, check on the sensing network status and display sensor history.

### SENSORS

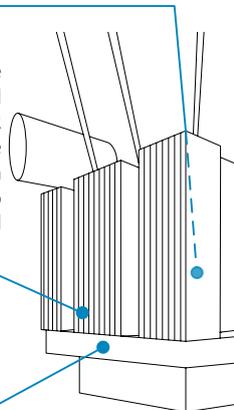
The temperature sensors for the Hot•Spot solution are Fiber Bragg Grating (FBG) based sensors featuring inherent immunity to electromagnetic effects. The sensor head and cable are completely non-metallic and employ only heat-resistant and highly dielectric materials. The probe cabling has a ruggedized construction designed to provide both longitudinal and transversal protection. The sensor is designed to resist severe installation and operation conditions. It is rated for Power Transformers up to 500 MVA/220 kV withstanding high temperatures and intense electromagnetic fields. The sensor is provided with a feedthrough to ensure vacuum/oil resistant connections.

### MEASUREMENT UNIT

The measurement unit used for the Hot•Spot system is based on the standard FS2100 | FS2200 Industrial BraggMETER with 1 S/s acquisition rate. It measures the absolute Bragg wavelength with high dynamic range allowing a high resolution to be attained even for long fiber leads and lossy connections.

### FLANGE

A flange with up to 8 connections guarantees the sealing between interior and exterior. It is made of stainless steel body and viton® o-rings.



### APPLICATIONS

The Hot•Spot system is designed for applications on different types of power transformers, namely

- : oil filled or dry
- : core or shell

FiberSensing also provides turnkey solutions for temperature monitoring of other types of electric machines.

### ORDERING INFORMATION

Hot•Spot Measurement Unit

P/N
702 101 001 XXX

112 – Single Channel  
412 – Quad Channel  
812 – Octo Channel

Hot•Spot Dielectric Temperature Probe

P/N	Type	WL <sup>2</sup>
706 308 050 803	yy	z

N – 1503.3 nm  
O – 1509.7 nm  
K – 1516.1 nm  
L – 1522.5 nm  
A – 1528.9 nm  
B – 1535.1 nm  
C – 1541.5 nm  
D – 1547.9 nm  
E – 1554.3 nm  
F – 1560.8 nm  
G – 1567.2 nm  
H – 1573.8 nm  
I – 1580.2 nm  
J – 1586.6 nm  
M – 1593.0 nm

1G – One Measuring Point  
3G – Three Measuring Points  
5G – Five Measuring Points

Hot•Spot Flange

P/N
708 680 110 00X

n – number of connectors (from 1 to 8)

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### SPECIFICATIONS

	MEASUREMENT UNIT	TEMPERATURE SENSOR	FLANGE
<b>Measurement</b>			
operating range	100 nm (1500 to 1600 nm)	0 to 150 °C	-
sensitivity (typical)	-	10 pm/°C	-
resolution	1.0 pm	0.1 °C	-
absolute accuracy	±2.0 pm	±1.6 °C	-
sensors per probe	-	1, 3 or 5	-
optical channels/connections	1, 4 or 8 (in parallel)	-	1 to 8
sample rate	1 S/s	-	-
optical detection	logarithmic	-	-
dynamic range <sup>1</sup>	> 50 dB	-	-
<b>Optical</b>			
optical output power	single: 0 dBm quad: -3 dBm octo: -6 dBm	-	-
line width	< 500 MHz	-	-
central wavelength	-	FiberSensing Bands <sup>3</sup>	-
spectral width (FWHM)	-	< 0.2 nm	-
reflectivity	-	> 65%	-
side lobe suppression	-	> 10 dB	-
<b>Connectors</b>			
optical	FC/APC	FC/APC feedthrough	FC/APC feedthrough
electrical	Weidmüller Terminal Block SLDF 5,08 2-way	-	-
communication	RJ45 Ethernet	-	-
cable type	-	Ø 3 mm high temperature dielectric (polyimide, kevlar, PTFE)	-
cable length <sup>4</sup>	-	3 m (±5 cm)	-
<b>Control</b>			
interface	Ethernet (TCP/IP)	-	-
<b>Environmental</b>			
operation temperature	10 to 40° C	-50 to 200 °C	-50 to 200 °C
relative humidity	< 90% at 40° C	-	-
<b>Mechanical</b>			
dimensions	155 x 125 x 275 mm	100 x Ø 3.0±0.5 mm <sup>5</sup>	21 x Ø 155 mm
mounting	6 screws M6	-	-
enclosure	aluminum	teflon®, silica, polyimide, kevlar®	stainless steel
weight	4 kg	40 g	850 g
<b>Power</b>			
voltage	11-36 VDC	-	-
consumption	40 W (1.5 W in sleep mode)	-	-

<sup>1</sup> considered as the ratio between the optical power emitted at an optical channel and the minimum detectable optical power reflected by a fiber Bragg grating

<sup>2</sup> one different wavelength should be specified per measuring point

<sup>3</sup> sensor bands are defined under the topic "ordering information"

<sup>4</sup> cable lengths can be customized up to 20 m.

<sup>5</sup> 100 mm is the length of the sensing region at the tip, which contains one, three or five sensors

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