fNIRS Sensor
Data Sheet

FNIRS09022022

IMPORTANT INFORMATION

The information presented in this datasheet applies to both FNIRS sensor options for analog biosignalsplux hubs and Hybrid-8 hubs:

[820201237] Functional Near-Infrared Spectroscopy (FNIRS) Sensor (Hybrid-8 Hubs)

[820201238] Functional Near-Infrared Spectroscopy (FNIRS) Sensor (Analog 4- & 8-Channel Hubs)

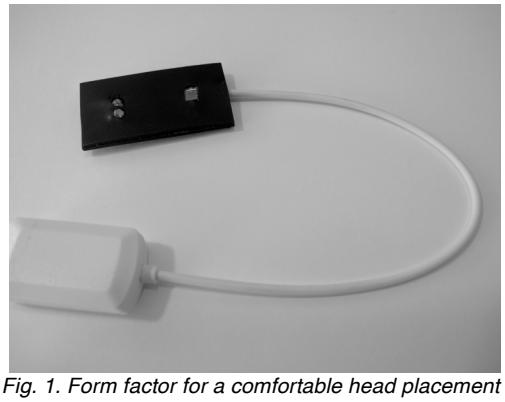

Fig. 1. Form factor for a comfortable head placement

SPECIFICATIONS

> **Infrared emitter***
- >Peak emission: 860nm
- >Half intensity beam angle: ±13 deg
- >Spectral bandwitdth: 30nm
- >Radiant intensity: 750mW/sr

> **Red emitter***
- >Peak emission: 660nm
- >Half intensity beam angle: ±18 deg
- >Spectral bandwitdth: 25nm
- >Power output: 7mW

> **Detector***
- >Wavelength of max sensitivity: 850nm
- >Range of sensitivity: 400nm-1100nm
- >Radiant sensitive area: 7.0 (mm^2)
- >Dimension of radiant sensitive area: 2.65mm x 2.65mm

> **Infrared/Red emitter**
- >Duty cycle: 25%

> **Resolution**: 16bit

> **Sampling frequency**: 500Hz

> **Communication with biosignalsplux Hub:** SPI

* Parameters provided for T_A = 25°C. For additional parameters please contact plux@plux.info

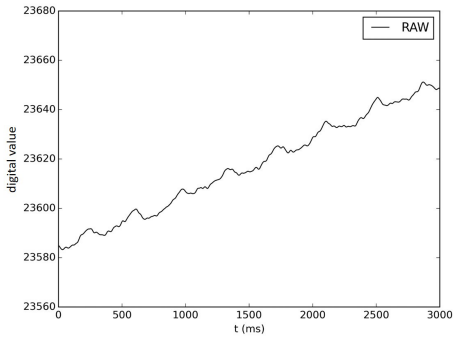

Fig. 2. Typical reflected red light raw data (acquired with biosignalsplux).

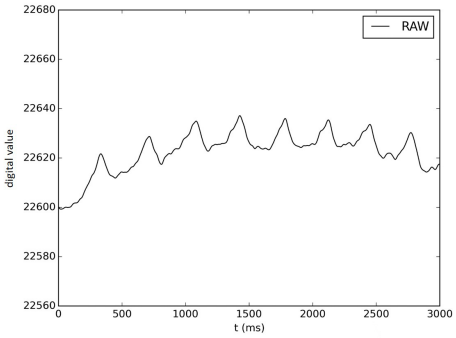

Fig. 3. Typical reflected infrared light raw data (acquired with biosignalsplux).

FEATURES

> Adjustable current for each LED using the API
> Pre-conditioned digital output
> High signal-to-noise ratio
> Ready-to-use form factor
> Magnetic binding for easy attachment to third-

biosignalsplux
wearable body sensing platform

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party accessories

APPLICATIONS

> Oximetry
> Heart rate & heart rate variability
> Life sciences studies
> Biomedical research
> Human-Computer Interaction

GENERAL DESCRIPTION

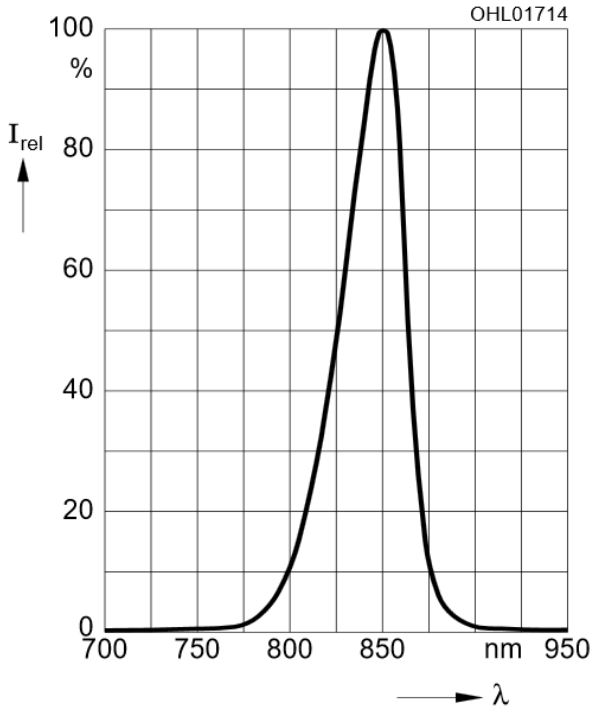
The fNIRS (functional near-infrared spectroscopy) sensor uses two emitting LED's one in the red region and the other in the infrared region of the spectrum. The reflected light of each one of these LED's is absorbed by a photodiode and then this current is converted into a digital value that is sent via SPI. This sensor can be used to estimate the local oxygen saturation level in the blood to derive information about the activity of the perfused tissue, for example, to measure and track activity of a specific brain region by measuring variations in oxygen saturation levels. Additionally, this sensor can be used to extract heart rate data.

USAGE NOTES

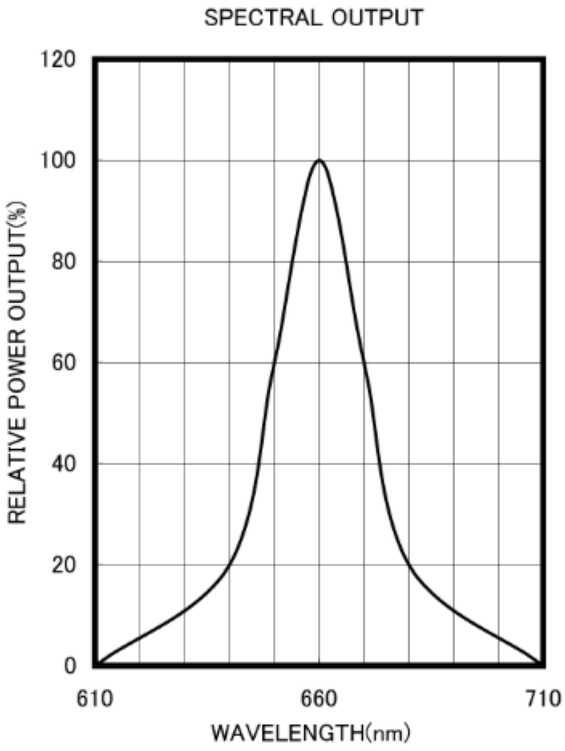
> Should be placed on the center of the forehead for accurate readings
> biosignalsplux firmware version 3.4 or greater required

OPTICAL CHARACTERISTICS

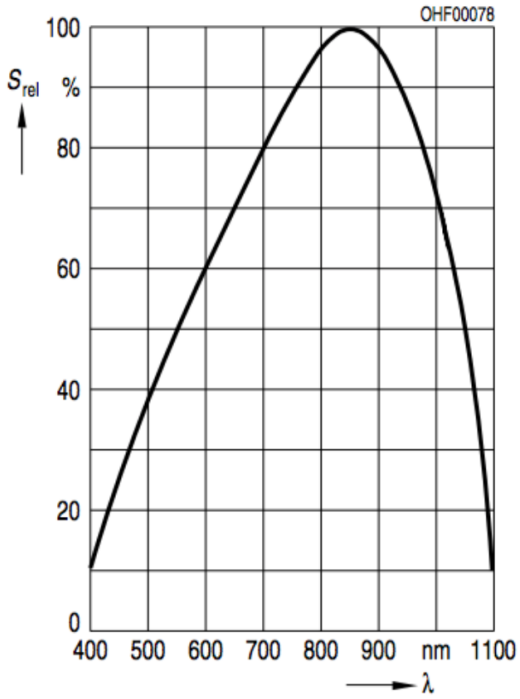
Infrared emitter relative spectral emission
$I_{rel}=f(\lambda)$, $T_A=25^oC$, $I_F= 20mA$


OHL01714
100
%
I_{rel}
80
60
40
20
0
700
750
800
850
nm
950
λ

Red emitter relative spectral emission
$I_{rel}=f(\lambda)$, $T_A=25^oC$, $I_F=20mA$



Detector relative spectral sensitivity
$S_{rel}=f(\lambda)$, $T_A=25^oC$



TRANSFER FUNCTION

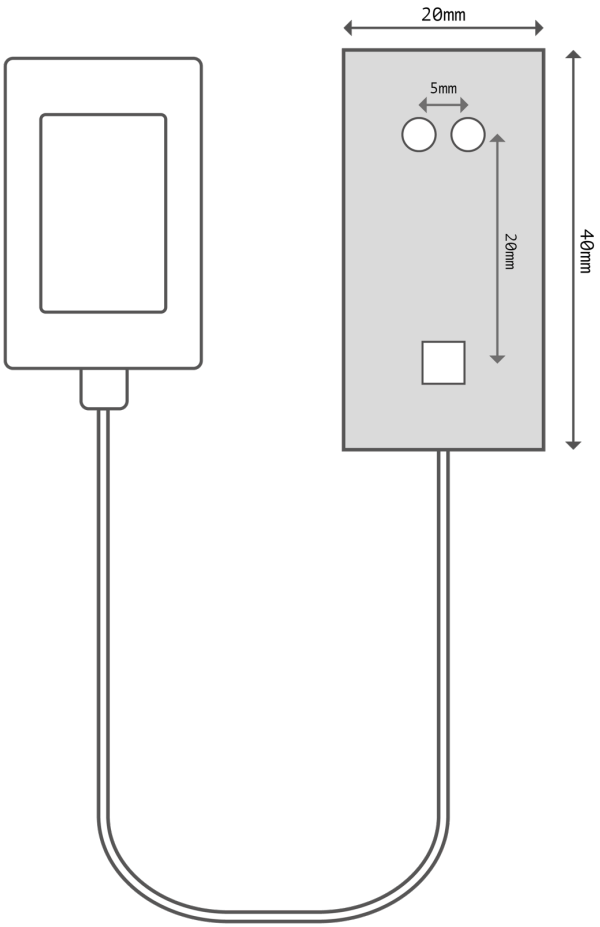
[0μA, 0.15μA]

$$Current(\mu A) = \frac{0.15 * ADC}{2^n}$$

$Current(\mu A)$ – Photodiode current in microamperes (μA)
ADC – Value sampled from the channel
n – Number of bits of the channel[1]

PHYSICAL CHARACTERISTICS

> Red and infrared emitters angle with horizontal plane: 45°



[1] The number of bits for each channel depends on the resolution of the Analog-to-Digital Converter (ADC); in biosignalsplux the default is 16-bit ($n = 16$), although 8-bit ($n = 8$) may also be found.

ORDERING GUIDE

Reference	Package Description
SENSADV-FNIRS	Functional near-infrared spectroscopy sensor (fNIRS) with standard physical characteristics.