



# Technical specifications



## DIMENSIONS

Grael System Component	Size L x W x H	Weight
Amplifier	240mm x 144mm x 50mm 9.45in x 5.66in x 1.97in	700 grams 24.7 ounces

## NETWORK

POE (power over Ethernet)

## NETWORK CONNECTION

Drop in cradle for quick disconnect

## ANALOGUE TO DIGITAL CONVERTER

24 bit resolution

## DATA SAVE RATE

256, 512, 1024, 2048, 4096 sps

## SAMPLE RATE

16384 sps

## CHANNEL SKEW

Negligible (ADC per channel)

## PATIENT CONNECTIONS

CF as per IEC60601-1

## SAFETY

IEC60601-1, IEC60601-2-26

## EMC

IEC60601-1-2

## COMMUNICATION INTERFACE

**Network Type** 802.3/802.3u twisted pair  
Ethernet with auto  
MDIX; RJ45 connector

## 32 REFERENTIAL CHANNELS

**Range**  $\pm 150, \pm 300, \pm 600, \pm 1500\text{mV}$  (resolution  $< 50\text{nV}$ )  
**Frequency response** DC to 1150 Hz (user adjustable)  
**Input impedance**  $> 100\text{M}$   
**CMRR**  $> 100\text{dB}$   
**Noise (0.1 to 70Hz)**  $2\mu\text{Vpp}$  typical

## 16 DIFFERENTIAL CHANNELS

**Range**  $\pm 150, \pm 300, \pm 600, \pm 1500\text{mV}$  (resolution  $< 50\text{nV}$ )  
**Frequency response** DC to 1150 Hz (user adjustable)  
**Input impedance**  $> 20\text{M}$   
**CMRR**  $> 100\text{dB}$   
**Noise (0.1 to 70Hz)**  $2\mu\text{Vpp}$  typical

## RESPIRATORY

### IMPEDANCE PLETHYSMOGRAPHY

**Channel** Derived from ECG electrodes  
**Frequency response** DC to 6 Hz

### 2 RESPIRATORY INDUCTIVE PLETHYSMOGRAPHY CHANNELS

**Sensor** Inductive band  
**Frequency response** DC to 64 Hz

## PRESSURE

**Range**  $\pm 100\text{cmH}_2\text{O}$   
**Frequency response** DC to 1150 Hz (user adjustable)  
**Accuracy**  $\pm 1\text{cmH}_2\text{O}$  at  $25^\circ\text{C}$

## AIRFLOW

**Differential input** 2 male luer  
**Range**  $\pm 12\text{cmH}_2\text{O}$   
**Frequency response** DC to 1150 Hz (user adjustable)  
**Accuracy**  $\pm 0.6\text{cmH}_2\text{O}$  at  $25^\circ\text{C}$

## POSITION

**Sensor** Tri-axial accelerometer  
**Positions** Supine, prone, left, right, upright

## MICROPHONE

**Sensor** Electret  
**Frequency response** 5 to 1150 Hz (user adjustable)

## LIGHT

**Sensor** Integrated

## OXIMETER

**SPO<sub>2</sub> range** 25 to 100%  
**Heart rate range** 18 to 300 pulses per minute  
**SPO<sub>2</sub> accuracy** 70 – 100%  $\pm 2.5$  digits within 1 standard deviation

**Heart rate accuracy**  $\pm 1\%$   $\pm 1$  digit

## Sample rate

**(SPO<sub>2</sub>, HR, status)** 1 sample per second, up sampled to match the other channels

## Sample rate

**(plethysmograph)** 256 samples per second, up sampled to match the other channels

## ENVIRONMENTAL REQUIREMENTS

**Temperature** Ambient operating temperature range:  $0^\circ\text{C} - 40^\circ\text{C}$  ( $32^\circ\text{F} - 104^\circ\text{F}$ )  
Storage temperature range:  $-10^\circ\text{C} - 50^\circ\text{C}$  ( $-4^\circ\text{F} - 122^\circ\text{F}$ )

## Humidity

20% - 90%-relative humidity

(non-condensing)

## Altitude

Less than 3,000m

## ELECTRICAL SPECIFICATIONS

**Power Supply** All power provided by the network connection using Power Over Ethernet (either mid-span injector or POE Switch, per IEEE 802.3af standard)

## Operating voltage

48 volts

**Power consumption**  $< 10$  watts

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