General Safety Checklist Adapted from the Sensors Technology Handbook

Project	VO2 Max Mask	Role	Lead Developer
Rev	1	Date	2/28/2025
Customer	Athletes/Coaches	Engineer Responsible	Brayden Bell
Comments	Portable VO2 Max measurement device		

Category	Name	Part Number	Vendor	Quantity and Cost
Sensor	Thermistor	NTC-102K	Jameco ValuePro	1 / $0.49
Cables	Jumper Wires	N/A	ELEGOO	1 / $6.88
Power supply	Keysight Power Supply	E36313A	Keysight	1 / $2291
Amplifier	Instrumentation Amplifier	INA121	BURR-BROWN	1 / $9.47
DAQ	Microcontroller	ESP32-WROOM	ESPRESSIF	1 / $6.67
			Total	$2,314.51

Additional Info	Comments
Installation	Breadboard for now, PCB in later iteration
Have these components been used before?	YES
Datasheet on file	NTC-102K Datasheet.pdf

Sensor (and the environment)

Area	Check	Pass/Fail	Environment Range	Sensor Range	Comments
Environment*	Temperature Range	Pass	18°C - 35°C	-55°C - 150°C	Includes both temp of environment (gym - 18°C) and that of exhaled air (35°C)
	Max shock and vibration	Pass	N/A	N/A	Controlled environment
	Humidity	Pass	42% - 91%RH	Not Given	Environment Humidity is that from exhaled air from humans
	Pressure	Pass	101.325 kPa	Not Given	Atmospheric Pressure
	Acoustic Level	Pass	85 dB	Not Given	Ramsey Student Center
	Corrosive Gases	Pass	N/A	N/A	Controlled environment
	Magnetic and RF Fields	Pass	N/A	N/A	Controlled environment
	Nuclear Radiation	Pass	N/A	N/A	Controlled environment
	Salt Spray	Pass	N/A	N/A	Controlled environment
	Transient Temperatures	Pass	25°C - 35°C	-55°C - 150°C	Determined sesning range bbased on temperature of exhaled breath
	Strain in the Mounting Surface	N/A	N/A	N/A	

*Overall accuracy is MOST affected by sensors characteristics such as environmental effects and dynamic characteristics.

Sensor (is this the correct sensor?)

Area	Characteristics	Datasheet Value	At what temp/condition?	Comments
Sensor*	Sensitivity	Beta = 3636 +/- 2%	25°C	Nonlinear relationship characterized by Steinhart-Hart model. 25°C and 1000 Ω is the nominal temperature and resistance, respectively
	Frequency Response	Not Given	Not Given	Thermistors are best when used in low-frequency applications
	Resonance Frequency	N/A	N/A	
	Minor Resonances	N/A	N/A	
	Internal Capacitance	N/A	N/A	
	Transverse Sensitivity	N/A	N/A	
	Amplitude and Linearity	1000 Ω	25°C	Nonlinear relationship characterized by Steinhart-Hart model. 25°C and 1000 Ω is the nominal temperature and resistance, respectively
	Hysteresis	N/A	N/A	
	Temperature Deviations	25°C - 35°C		
	Weight	~9.07g	20°C	
	Size	(L x W x H) 3 x 2.8 x 34.5mm	25°C	See datasheet
	Internal Ω at max Temp	23.7 Ω	150°C	Max temperature given on datasheet
	Calibration Accuracy	(+/- 10%)	N/A	Temperature must be manually calibrated
	Strain Sensitivity	N/A	N/A	
	Damping at Temp extremes	Not Given	N/A	Thermistor relationship between resistance and temperature becoming more linear as you increase temperature
	Zero Measurand Output	1000 Ω	25°C	
	Thermal Transient Response	N/A	N/A	See "Sensitivity"

*The most important element in a measurement system is the sensor. If the data is distorted or corrupted by the sensor, there is often little that can be done to correct it.

Sensor Questions

Questions	Y/N	Comments/Description
Describe the mounting setup. Is the proper mounting being implemented?	Y	Mounted on a breadboard. Future iteration will be on a PCB
Are insulating studs used? Needed?	Y	Insulation will be needed, but not yet. Rubber O-Rings will be used to ensure that moisture cannot reach the main circuit on the breadboard/PCB
Do grounds Loops exist?	N	Common ground for all components.
Has a sensor calibration been performed?	Y	Sensor Calibration will be performed with the environment being 20C
Is adhesive mounting required?	N	No

If threads are used list all hardware required to mount sensor.	N	
Is extra adhesive (i.e. Blue Loctite) used?	N	
Is there additional testing needed?		