THERMAL DRIFT DENSITY MAP

BY RAFAEL LOZANO-HEMMER

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GENERAL IMPORTANT INFORMATION

This short section must be read for proper operation.

THERMAL DRIFT DENSITY MAP (2022)

BY RAFAEL LOZANO-HEMMER

Technique

Custom made generative software, computer, thermal camera, display.

Description

"Thermal Drift" is an interactive artwork that visualises the dispersion of body heat as emissions of thermal energy in the form of slow-moving packets or quanta that flow away from the participant.

Operation

Please refer to Appendix I - Installation for detailed system information and wiring diagram.

1. Connect the computer and the display to electrical power with the supplied power cables.

2. To turn the piece ON, press the power button of the computer for a second then release it.
   Important notes: Please do not push the button again as this will shut down the piece. Wait at least 2 minutes before pressing it again as the computer might take that long to boot. After 2 minutes (maybe faster), you should see the piece. The display might require to be turned on, for this use it's remote or the button at the back of the display.

3. To turn the piece OFF, press the computer's button all the way down until you've seen the "Shutting down…" screen appearing and fading to a black screen (shouldn't be required for more than 2 seconds).

4. If the piece doesn't start within 2 minutes, try to turn on the piece again. If it still doesn't turn on, then hold the power button all the way down for 10 seconds. Then, wait at least 3 seconds and press the power button all the way down for 1 second and you should be up and running again.

   Note: the Windows' Display orientation has to match the physical display orientation. Please refer to our Troubleshooting section for more information on how to change the Windows' Display orientation accordingly.

General Artwork Behaviours

The screen shows a view of what the camera is pointed at and the whole scene slowly emits floating particles or dots of different sizes which float around, influenced by the objects' temperature in view. When a subject moves in view of the camera, the dots will drift and react to their motions. The imagery is driven by heat which the camera senses and so adding or removing layers of clothing or showing different temperature objects creates more dynamic dots and contrasting tones.

Maintenance

Please do not clean the display surfaces with Windex or soap. Use a lint-free cloth and LCD screen liquid cleaner, such as Kensington Screen Guardian found in most computer stores. While cleaning the camera, avoid applying too much pressure onto its surface, otherwise the camera could move on its mounting base and get misaligned or the lens can be rotated and go unfocused.

The camera lens shouldn't be cleaned with the same product: please air an air puffer to remove the dust from the lens, if need be.

We recommend cleaning the piece at least every two months.

Placement Instructions

      This artwork is made up of 3 main components: the display, the computer and the camera. You should begin by screwing your display mount into the wall, ensuring a stable mount for the weight listing.

      If your version of the artwork is intended to display in landscape mode, set the display mount so that there is 1.5 metres from the floor to the centre of the screen.

      If your version of the artwork is intended to display in portrait mode you will need to set the display mount at a different height depending on the screen size. For a 75" display in portrait mode, the bottom edge of the display should be at 45 centimetres from the ground. If the display is bigger than 75", please contact the studio to confirm which height suits the situation.

      While setting your display on the mount, ensure you have access to the power cable and HDMI ports, then connect these to your computer.

1,50m - Floor to display center

0,45m - Floor to display edge
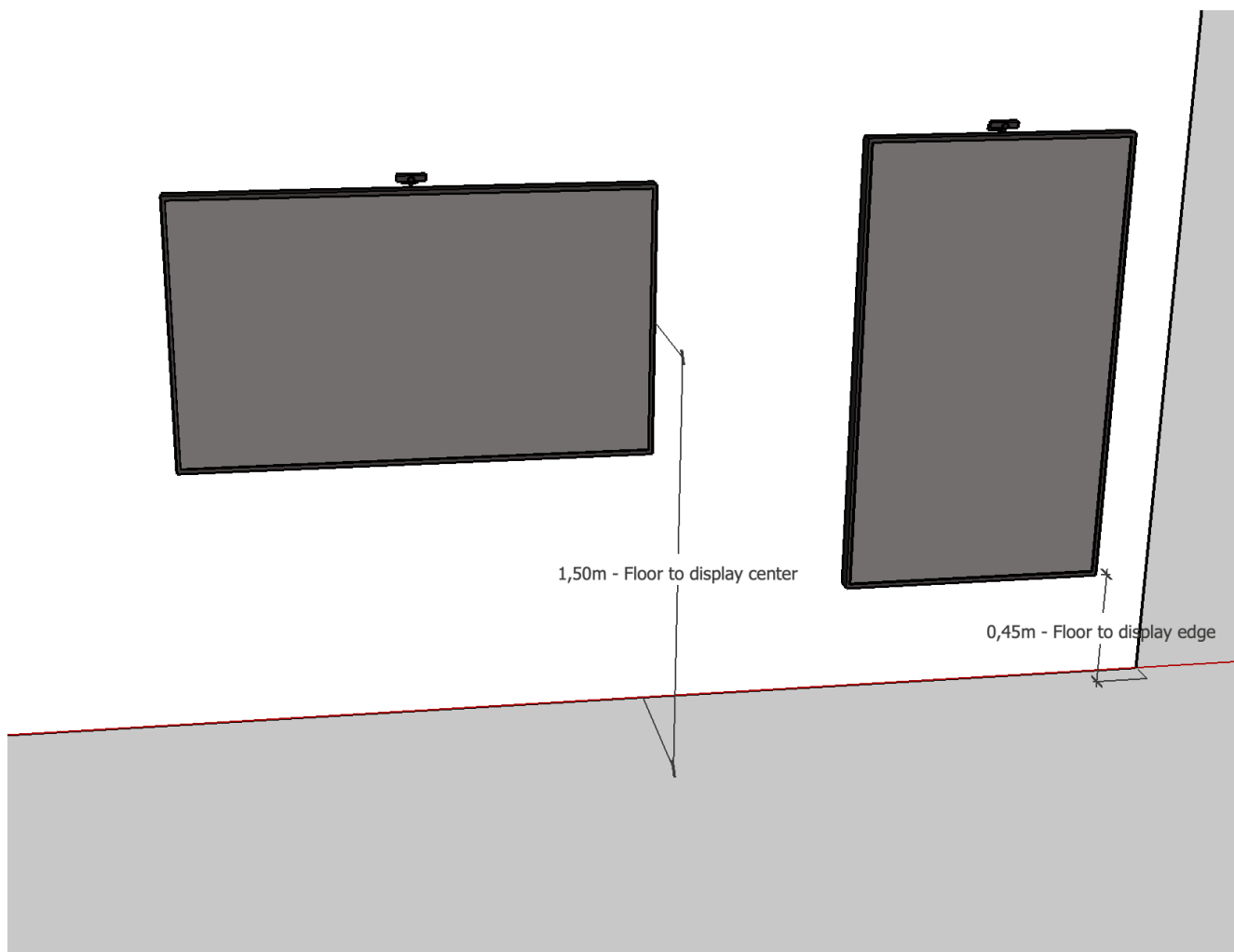
Mounting the Camera

The camera and its bracket should be installed behind the display so that only the top camera is showing as seen in the photos below. In some instances, like with an upscaled treatment version, we might prefer mounting the camera further away on the side of the display or projection: in such case, confirm position and mounting method with the studio. The mounting process will not differ based on the piece's orientation. Follow the directions below for both portrait and landscape pieces.

If the camera did not ship attached to the arm and plate, screw it gently into place so that it looks like the image to the left below. Extend the arm of the camera fully. Then position the camera bracket behind the display so that the centre of the camera lens is perfectly centred in the display. Move the bracket downwards until the base of the camera is even with the top of the display. Carefully mark this position.

We suggest you remove the display from its mount while proceeding to the next step. Screw the camera bracket to the wall. To ensure that the bracket is level first screw in one side of the bracket lightly. Then use a level to identify when the other side is even. Screw this side down tightly and then tighten the other screw.

Ensure that the camera lens is slightly angled downwards as seen in the photo below. This usually takes some adjustment using the vice screw handles on the mount arm. The goal here is to get a situation where someone 1.8m tall, standing at 2m away from the display, has the top of the silhouette's head rendered just below the display's top edge.

Fully assembled bracket, arm and camera

Variation of the fully mounted bracket

| Indoor model | Outdoor model |

Note the protuberance at the bottom of the image cameras. In landscape mode, it should be installed pointing towards the floor while in portrait mode, it should be towards the left.
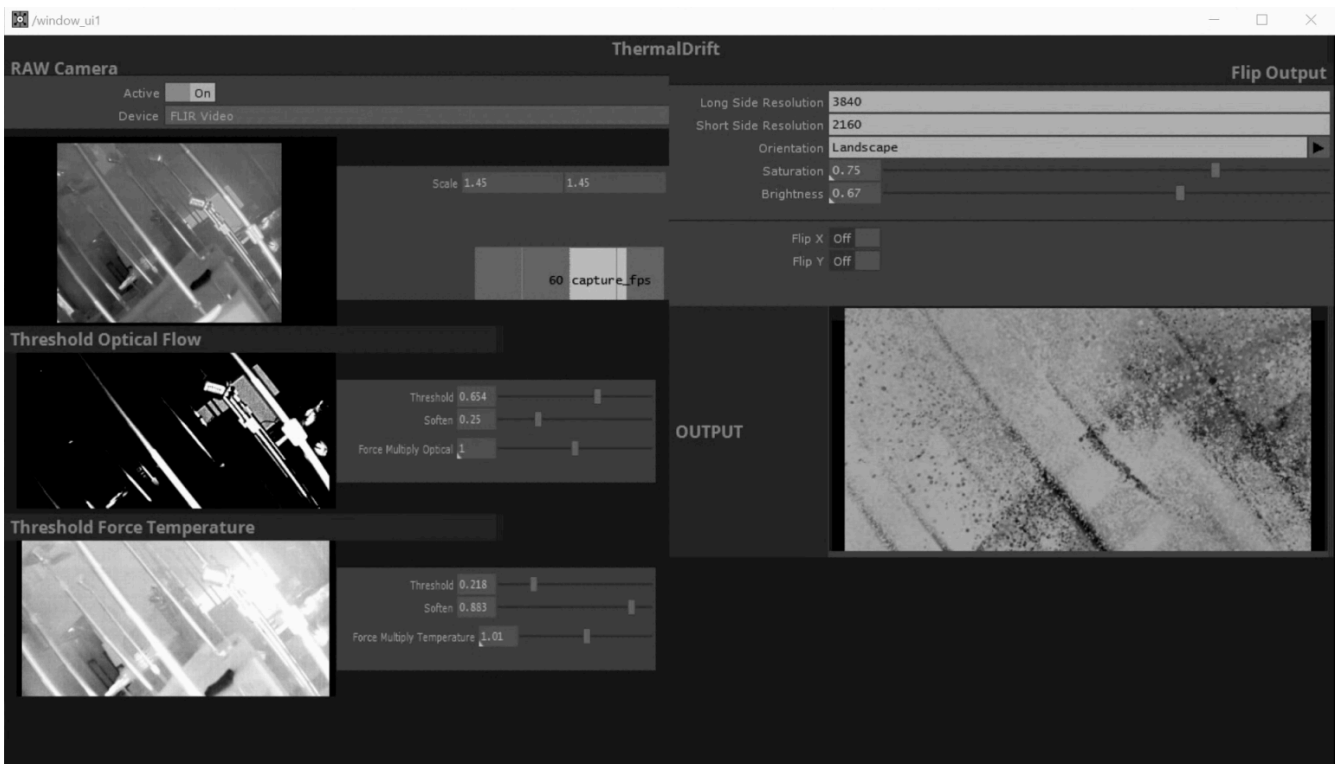
DETAILED TECHNICAL INFORMATION

Normal Software Operation

The artwork is set to automatically start when the computer is powered on and is set to reboot daily, at night. We do recommend turning off the artwork when you don't plan to look at it for a longer period, to extend the lifetime of the components.

Few controls are available to adjust this software. To pull up the GUI for the piece press the **ALT+G** key at the same time. To exit the menu, simply press on the **X** button on the top right corner of the newly opened window. If settings are changed, press **CTRL+S** to save them to the system.

Setting	Description
RAW camera	Displays the camera feeds received by the computer. Can be used to confirm that the camera is properly connected.
RAW camera - Device	Ensure the right camera is selected here. With Flir Boson cameras, it should typically list FLIR Video.
RAW camera - Scale	These values are impacting how much we stretch the camera FOV in the 2 axis.
RAW camera - capture_fps	Shows camera's frame rate. With Flir Boson cameras, this should be at 60 fps.
Threshold Optical Flow - Camera View	Optical Flow affects which part of the image creates a force when it moves. The camera feed is properly set when a person or object emitting heat shows up with strong white areas and is clearly distinct against the background.
Threshold Optical Flow - Threshold	If this threshold is too high the environment around someone will not affect the particle's motion in the piece. **A good default is 0.633**
Threshold Optical Flow - Soften	If this threshold is too low the environment of a room may affect particles equally or more than humans. **A good default is 0.25**
Threshold Optical Flow - Force Multiply Optical	This amplifies the "force related to movement" values set in the Optical Flow Threshold and Optical Flow Soften values. **A good default is 1.**
Threshold Force Temperature - Camera View	Temperature determines how heat affects the piece, the hotter something is the more push it has and the colder something is the more static it is. A well configured camera feed will show someone as clearly distinct from their surroundings as seen in the image above, with details, brightness fluctuations within background and the person.
Threshold Force Temperature - Threshold	Adjusting this value increases the curve between how strongly a hot or cold element affects movement. **A good default value is 0.271**

Threshold Force Temperature - Soften	Adjusting this value decreases the curve between how strongly a hot or cold element affects movement. **A good default value is 0.91**
Threshold Force Temperature - Force Multiply Temperature	This amplifies the "temperature related to movement" values set in the Temperature Force Threshold and Temperature Force Soften values. **A good default is 1.**
Flip Output - Long Side Resolution	Resolution (long side of display) can be changed here to adapt to different aspect ratios. Consider adapting the corresponding camera scale if you change the aspect ratio of the resolution, to prevent people's deformation.
Flip Output - Short Side Resolution	Resolution (short side of display) can be changed here to adapt to different aspect ratios. Consider adapting the corresponding camera scale if you change the aspect ratio of the resolution, to prevent people's deformation.
Flip Output - Orientation	To change the orientation of the artwork simply hit the dropdown box and select the relevant orientation.
Flip Output - Saturation	Will modify the overall saturation of the work. At the time of writing this manual, the default value is 0.75.
Flip Output - Brightness	Will modify the overall brightness of the work. At the time of writing this manual, the default value is 0.67.
Flip Output - Flip X	Flips (mirror) the camera feed on the X axis when ON.
Flip Output - FlipY	Flips (mirror) the camera feed on the Y axis when ON.

Preliminary Troubleshooting Steps

After plugging the cables in, if nothing seems to happen.

Ensure your camera is pointed towards you and nothing is blocking it. Ensure your PC and display are on and running. Check that the input on your display is set to the HDMI port for your cable.

If the piece is improperly oriented (software orientation doesn't match display orientation).

The first element to verify here is if Windows' Display orientation is matching the physical display orientation. To do so: press **Escape** key on the keyboard to quit the rendering of the software. If the TouchDesigner Windows display at this time is in the right orientation, the Windows settings are good, simply press F2. Otherwise, click the **Start button** at bottom left of your screen, then **Settings**, then **System**, then **Display**, and choose a screen orientation from the drop-down list labelled **Orientation** or **Display Orientation**.

Refer to the <u>Software Operation</u> section and use the GUI to orient the piece properly.

If the artwork does not show up, or displays in an unusual way.

You can connect a keyboard and mouse to the PC. hit the **ESC** key to stop the artwork. You can navigate to the windows 'start' icon, on the power button icon, select 'restart' and let your computer turn off then on again. It should come on and start the artwork again; if it does not come back on, you may need technical support from our team.

System doesn't react to the presence of people in front of it.

While the artwork is running, you can at all time press **alt+g** to show the raw camera feed. If there is no image there, verify the USB cable is connected to the PC and to the camera. A blue light behind the camera means it is properly functioning.

If the piece has an unusual colour, for example if it is in black and white when it's meant to be in colour.

Please <u>contact the studio</u>.

Remote Access to Artwork's Computer

There is a software installed on the computer running this artwork that allows the studio to connect remotely to the artwork. This feature is helpful when you require assistance from the studio, as we can remotely connect to it, do a quick inspection, and do a debugging session of your components, if needed. In order to enable this feature, the computer has to be connected to the internet at all times. Depending on the computer's operating system (Windows 7/8/10, OSX), the procedure to set the computer online will vary. Please look online for tutorials, if necessary.

Troubleshooting Assistance

Prior to contacting the Antimodular Studio with a problem about your artwork, please ensure that you went through the preliminary troubleshooting steps outlined in the previous section.

The troubleshooting process will vary depending on the problem. In order to make the process easier, it is recommended that you collect and send the following information to the studio:

- Date and time when the problem first happened;
- Description of the problem;
- Actions taken so far and conclusions;
- Detailed photographs (or videos) displaying the problem;
- Detailed photographs (or videos) of the suspected faulty component;
- Detailed photographs (or videos) of the whole artwork and its surroundings;
- Personnel involved.

Support (Contact Us)

If you would like support for the piece, please feel free to call Lozano-Hemmer's studio in Canada:

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APPENDIX I - INSTALLATION

Glossary of Components

This artwork requires the following components:

Component	Description
Computer	PC running on at least Windows 10, with an NVidia graphics card (at least RTX 2060) and USB 3.0 ports.
Video signal cable	Is used to connect the computer to the display. Usually it is an HDMI cable.
Display	A 4K display of at least 75" of diagonal. Ideally the monitor would be as matte (non-reflective) as possible, as slim as possible with bevels as small as possible.
Camera	Allows the system to track people present in front of the artwork.
Camera Arm + Mount	Screw-in wall plate with threaded socket for arm, may also be a C-clamp.
Camera cable	USB-C cable interconnecting camera to computer. Connector can be USB-C or USB-A. USB extension could be used to extend the signal, but always ensure to keep a proper camera frame rate for best results.

Wiring Diagrams

In order for the piece to run properly, the computer should be connected according to the following diagrams. *Note: USB C-C can also be used to connect the camera to the computer instead of the USB C-A pictured.*
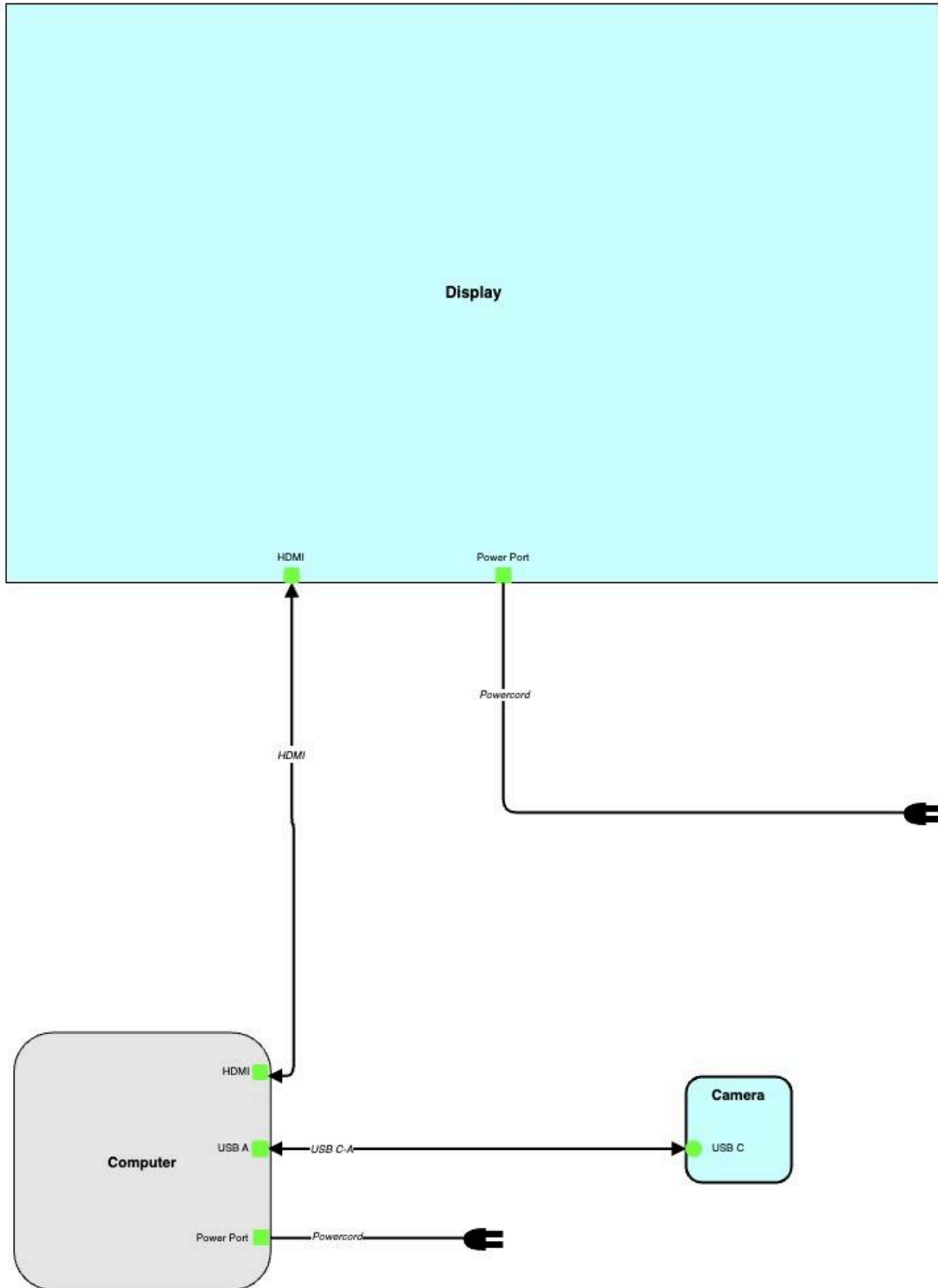
APPENDIX II - TECHNICAL DATASHEETS

Thermal Camera FLIR Boson 640 - Indoor model

Specification	Detail
Resolution	640 × 512 (60Hz baseline; 30 Hz runtime selectable)
HFoV	50 or 95 degrees
Pixel size	8 μm – 14 μm VOx microbolometer
Dimensions	21 × 21 × 11 mm (0,83 × 0,83 × 0,43 in) - without lens
Weight	7.5 g without lens (configuration dependent)
Power consumption	3.3 VDC (USB2)
Operating temperatures	-40°C to +80°C (-40°F to +176°F)
Thermal sensitivity	< 60 mK

Thermal Camera FLIR ADK - Outdoor model

Specification	Detail
Resolution	640 × 512 (30 & 60 Hz selectable)
HFoV	24 degrees
Pixel size	12 μm VOx microbolometer
Dimensions	35 × 40 × 47 mm (1.38 × 1.57 × 1.8 in)
Weight	~100 gm (3.5 oz)
Power consumption	1 W, 5 VDC (USB2)
Operating temperatures	-40°C to +75°C (-40°F to +167°F)
Thermal sensitivity	< 50 mK
Environmental protection	IP67