

TERABEE

3Dcam 80x60

User Manual for Terabee 3Dcam 80x60



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1. Introduction

The purpose of this document is to give guidelines for installation, use and integration of Terabee 3Dcam 80x60 depth camera. This user manual includes camera setup instructions on Windows and Linux OS, installation of the SDK and visualization tool (NIViewer) for streaming depth data on your PC.

1.1. About Terabee 3Dcam 80x60

The 3D Time-of-Flight (ToF) camera is designed to support research projects, application software developers and system integrators in the fields of Smart Buildings, Automation and Robotics. Enable the third dimension with the cameras 80x60 pixel resolution over a 74° x 57° Field of View. Benefit from the cameras robust aluminum casing while still offering a compact (83 grams) and discreet design. Developed for indoor use, the camera features two operating range modes. For close range applications such as hand gesture recognition choose close-range mode and capture depth data as close as 20 centimeters. Switch to standard mode with its 4 meter range for volume measurement, people and movement monitoring and robot navigation applications.



Figure 1. Terabee 3Dcam 80x60

Our compact ToF camera comes with an SDK containing all logic to operate your camera, and a visualization tool for quick tests on your PC. Setup your Terabee 3Dcam 80x60 in no time and stream depth data via USB interface on Windows or Linux OS. An SDK and OpenNI framework code library is available to kick-start your application development.

For more information on Terabee 3Dcam 80x60 please visit the [official product page of the Terabee website](#).

1.2. Technical Specifications

Part Number	TB-3DCAM-8060-USB
Technology	Infrared Time-of-Flight
Resolution	80 x 60 pixels
Range	Close range mode: 0.2m to 1.2m Standard mode: 1m to 4m
Field of View (H x V)	74° x 57°
Frame Rate	30 fps
Depth Resolution	1% of distance
Supply Voltage	5V DC (USB powered)
Power Consumption (max.)	4W
Operating Temperature	0°C to 40°C
Storage Temperature	-20°C to 60°C
Interfaces	USB 2.0 Micro-B
Weight	83g
Use Environment	Indoors
Dimensions	54 x 53 x 24mm
Supporting OS	Windows, Linux
Software	Terabee SDK OpenNI 2.2 based, C/C++, Python, ROS package
Conformity	CE; RoHS

2. Package contents

The product package (Figure 2) contains the following items:

- Terabee 3Dcam 80x60 camera
- USB 2.0 Micro-B (Y cable)
- Software development kit (available for download on the Terabee 3Dcam 80x60 product page, Downloads section)



Figure 2. Product package contents

3. Mechanical integration

3.1. Mechanical design and mounting

For increased robustness, Terabee 3Dcam 80x60 offers an anodized aluminum casing. Figure 3 illustrates external dimensions of the camera.

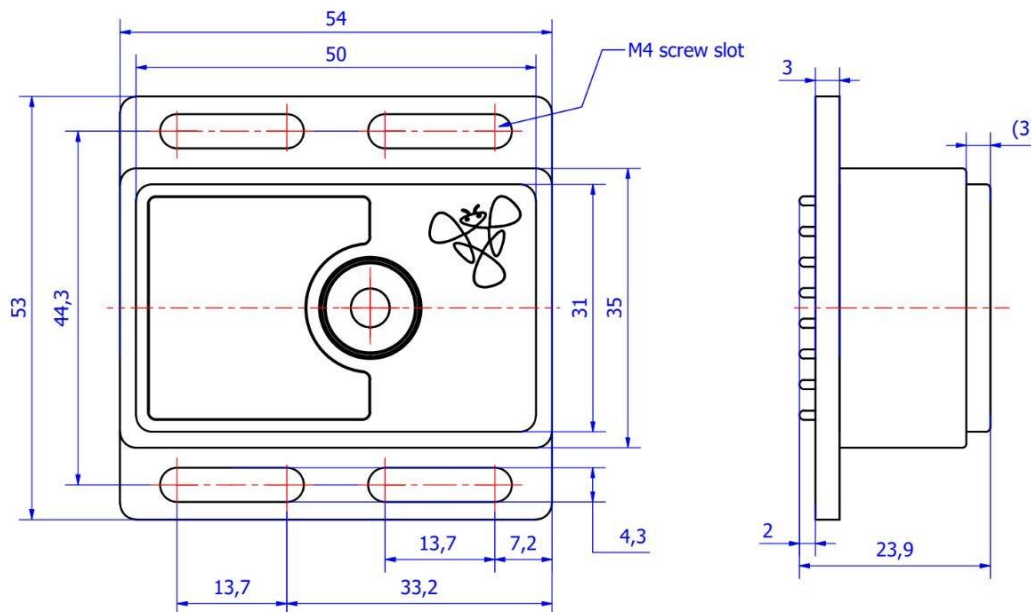


Figure 3. External dimensions of Terabee 3Dcam 80x60

The bottom casing (flat) part includes four slots for mounting the camera using M4 screws. You can mount the Terabee 3Dcam 80x60 using the following two methods: (1) front-panel mount using the long M4 screw slots or (2) for a more discreet and integrated look use the back-panel mounting shoulder in the front side of the camera. The 3mm ledge offers users the possibility to mount the camera behind a surface (e.g panel), ideally with a 3mm thickness. See figures 4 and 5 for visualizations. Please note that mounting components (e.g. screws) are not included in the product package. For more information on mounting, please contact us at teraranger@terabee.com.

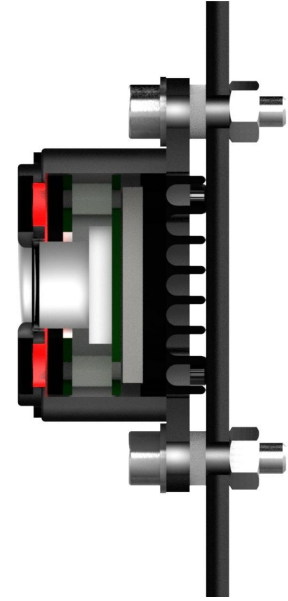


Figure 4. Front-panel mounting example

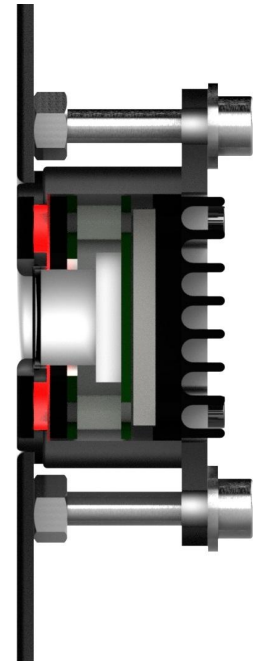


Figure 5. Back-panel mounting example

When choosing a place for mounting, please consider the following recommendations:

- Terabee 3Dcam 80x60 is developed for use in indoor environments, using the camera in outdoor conditions (in direct sunlight) can reduce its performance
- Choose a place which is in accordance with the optical constraints listed below
- Mounting close to sources of heat or strong electromagnetic fields can decrease the sensing performance
- Do not mount anything directly in front of the camera
- It is better to avoid having other sources of continuous wave or modulated IR light close to the sensor
- Please consider that dust, dirt and condensation can affect the sensor performance.
- It is not advised to add an additional cover in front of the camera - please note that this may reduce its performance

Please consult figure 6 for correct camera position when mounting to a surface or hand-testing the device. This also translates into a correctly oriented and visualized data output (depth image).

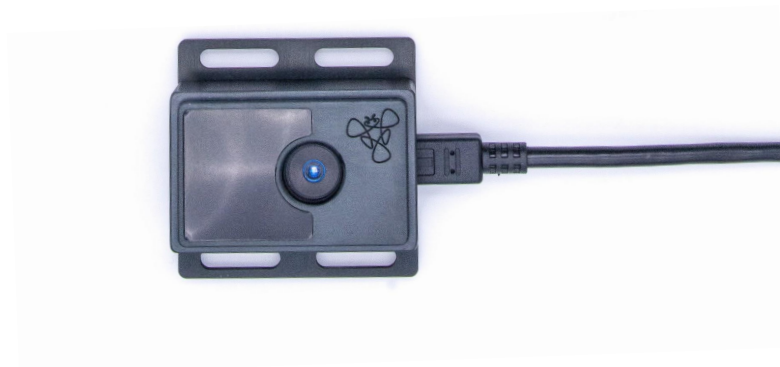


Figure 6. Correct camera position

4. Installation guide

4.1. Hardware setup

The Terabee 3Dcam 80x60 is shipped with a **USB 2.0 Micro Y cable** to provide an appropriate amount of power to the camera. Please note that using only one cable may affect camera performance.

Connect the Micro USB cable (micro B side) into the camera's USB port.



Plug the other two ends of Micro USB cable into your PC USB port.



You've successfully completed the hardware setup.

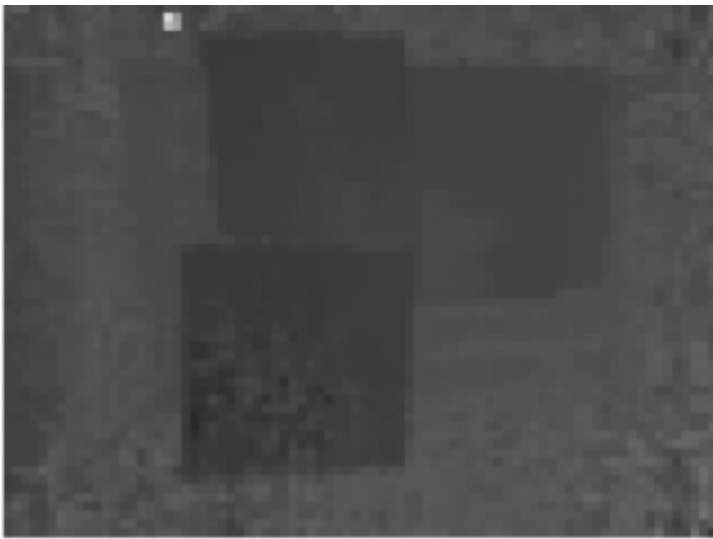


4.2. Power connection

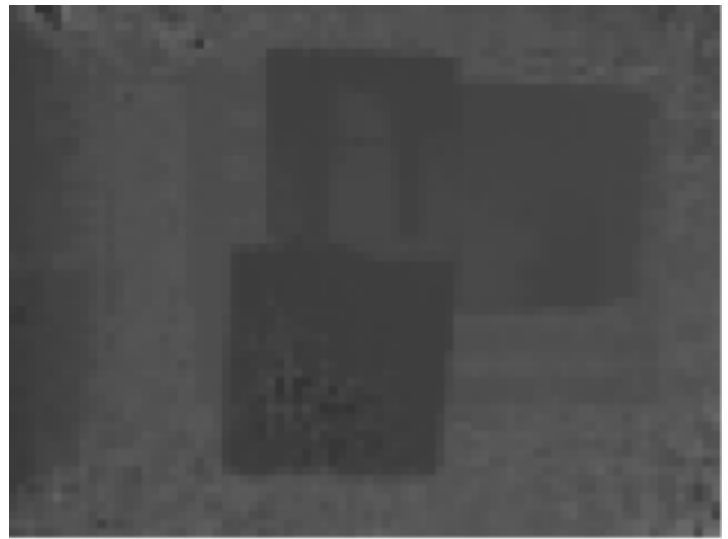
This section aims to clarify issues on powering 80x60.

There are some devices like RPi or other companion computers which cannot give the proper amount of power even if using the Y cable provided by Terabee. Those devices usually have limitations on draining power from the USB ports. This affects the performance of the 80x60, increasing the noise level.

Therefore, it is recommended to ensure that other devices connecting the companion computer are not drawing too much energy. If there are power issues the best practice is to connect an external power supply to the Ycable (shorter cable). The following images show this effect on a Raspberry Pi.



One single USB port powering the 3D cam and RPi is powering another sensor.



One single USB port powering the 3D cam.

The following picture shows the performance of the camera connected in the right way. This allows optimal performance and depth quality of the 3D cam.




4.3. Software setup for Windows

4.3.1. SDK installation

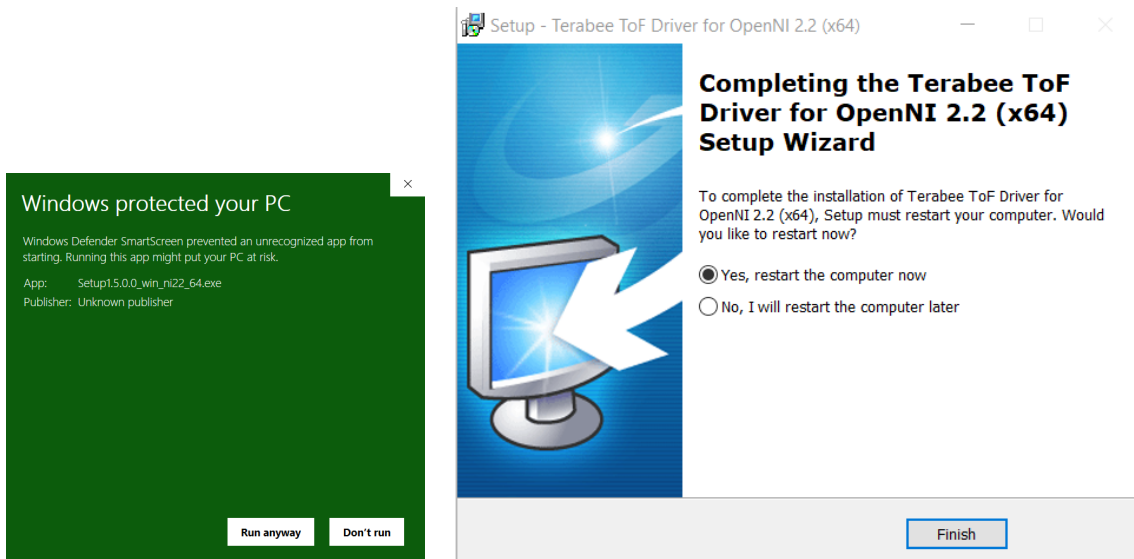
An SDK is available for download on the Terabee website, providing users with drivers for communicating with the camera, OpenNI code library and a visualization tool. Terabee 3Dcam 80x60 SDK is compatible with OpenNI 2.2 frameworks. There is a video tutorial available on the website which resumes the following steps.

Please download the SDK installation file by following this link: [Terabee 3Dcam 80x60 SDK](#) (available in the downloads section of the Terabee 3Dcam 80x60 product page on the Terabee website).

After downloading, please unzip the SDK and open the exe file. The package contains OpenNI2.2 versions of the SDK for both x32 and x64 architectures. For the purposes of this guide, the OpenNI 2.2 (x64) driver is used.

 Terabee_Setup1.6.0.0_win_ni22_32.exe	24,675,521	24,648,849	Application
 Terabee_Setup1.6.0.0_win_ni22_64.exe	33,742,500	33,717,699	Application

A window will open offering to proceed with SDK installation on your PC. To proceed, click **Install**. During installation of the GUI, you might receive a notification from Windows about an unknown application trying to start. In the “Windows protected your PC” screen select **More info > Run anyway** to proceed with SDK installation and please be advised that running this application will not put your PC at risk.



As a last step to complete your installation, please select the option to restart your PC and click **Finish**.

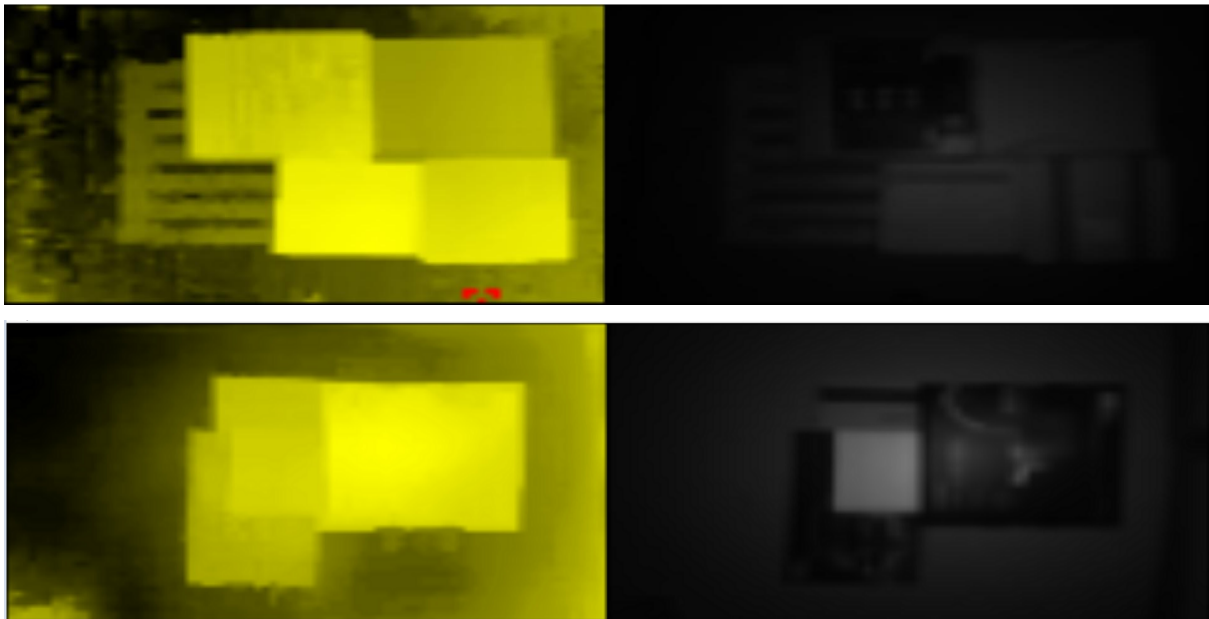
4.3.2. Streaming depth data on Windows

The OpenNI SDK comes with a visualization tool: **NiViewer**. This tool is a generic data visualizer of OpenNI compatible devices, including depth, RGB and IR cameras. Hence some of the functionality/features might not be supported for the Terabee 3Dcam 80x60. In order to stream depth data on your PC, please launch **NiViewer** in the newly created TerabeeDemo folder. NiViewer 2.2 (x64) is used for the purposes of this demo.

<input type="checkbox"/>	Name	Size	Type
<input type="checkbox"/>	NiUserTracker_x64	1 KB	Shortcut
<input type="checkbox"/>	NiViewer1.5_x64	1 KB	Shortcut
<input checked="" type="checkbox"/>	NiViewer2.2_x64	1 KB	Shortcut

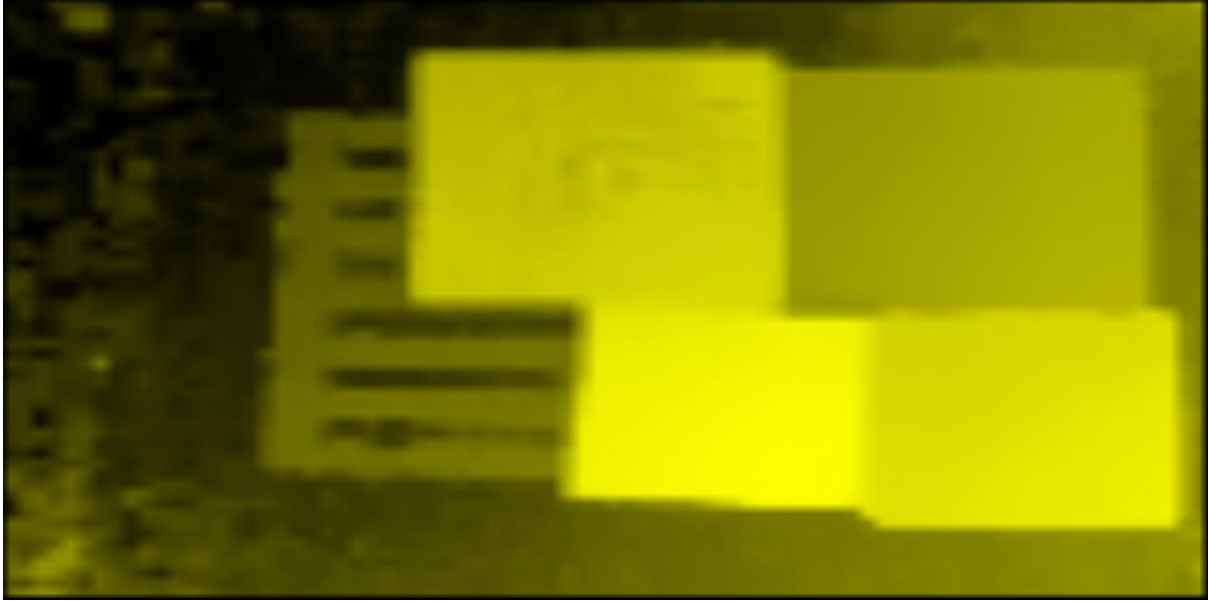
A window will now open on your PC with the depth data streamed real time in the top left corner of your screen.

Optional: To activate infrared image provided by the camera, right click on the interface and select **Device > Streams > Color > On/Off**.



Press “**p**” on your keyboard to activate **pointer mode**. An interactive color/distance scale will now open on the bottom of your screen to represent the distance value of the red pointer. This allows to target a specific pixel in the depth image and obtain its distance measure in cm (displayed under “pointer value”).

To display cameras depth image in full screen press “**1**” on your keyboard.



Press “?” on your keyboard to display all shortcut keys and their corresponding functions.

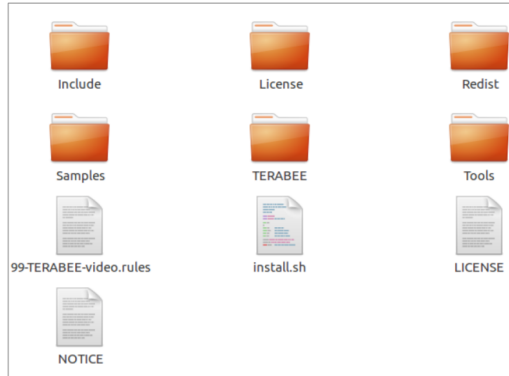
4.4. Software setup for Linux (Debian-based)

4.4.1. SDK installation

The Terabee 3Dcam 80x60 SDK is compatible with OpenNI 2.2 frameworks. Please download the SDK installation file by following this link: [Terabee 3Dcam 80x60 SDK](#) (available in the downloads section of the Terabee 3Dcam 80x60 product page on the Terabee website). There is a video tutorial available on the website which resumes the following steps.

The package contains the OpenNI2.2 version of the SDK for both x64 and x86 architectures. The Linux version of the SDK is compatible with most of the debian-based distributions including : Debian (up to Stretch), Ubuntu 16.04, 18.04, Linux-Mint, Elementary OS (0.3).

After the download is complete, please extract the desired version that corresponds to your system architecture and save in your chosen installation location. The SDK folder content should contain the following:



OpenNI2.2

Next, in the SDK folder, launch the install script with sudo permissions. For this, please open a terminal in that directory and type: **sudo ./install.sh**

After successful installation, the terminal output should display the following data:

```
[sudo] password for plk:
Detect OS distribution version and create links
It's Ubuntu 16.04

copying TERABEE Video Rules...OK..
copying TERABEE Driver...OK..
DONE...
```

OpenNI and the Terabee 3Dcam driver are now installed on your PC. As a next step, please install dependencies as described in the following paragraph, in order for the SDK to function.

- OpenCV 3.4.1. For your convenience instructions are available on GitHub [here](#)

In order for NiViewer to function, the following dependency is required:

- Freglut (please use this command: `sudo apt-get install freeglut3`)

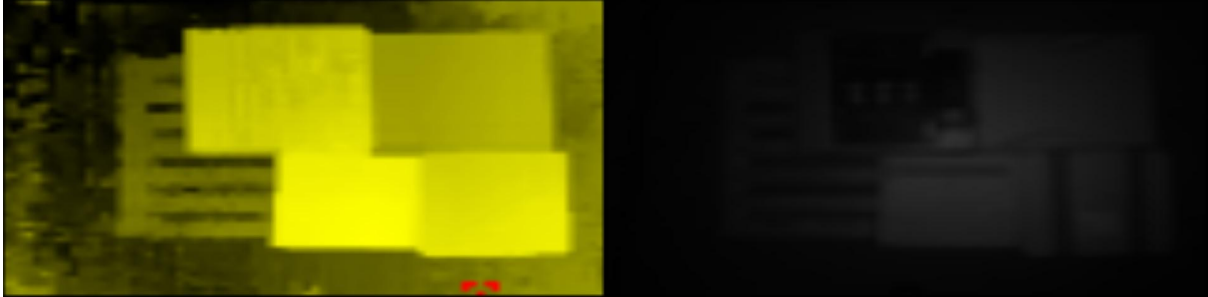
After successful installation of mentioned dependencies, you are now ready to go and start streaming depth data.

4.4.2. Streaming depth data on Linux

The OpenNI SDK comes with a visualization tool: **NiViewer**. This tool is a generic data visualizer of OpenNI compatible devices, including depth, RGB and IR cameras. Hence some of the functionality / features might not be supported for the Terabee 3Dcam 80x60. In order to stream depth data on your PC This tools is available in the following directories:

- For OpenNI 2.2: `<root of the sdk>/Tools`

To activate the tool, right-click on the directory and click **Run**. You can also open a terminal and type **./NiViewer**. A window will now open on your PC with the depth data streamed real time in the top left corner of your screen, alongside with cameras infrared data on the top left corner.



Press **"p"** on your keyboard to activate **pointer mode**. An interactive color / distance scale will now open on the bottom of your screen to represent the distance value of the red pointer. This allows to target a specific pixel in the depth image and obtain its distance measure in cm (displayed under "pointer value" field).

Press **"1"** on your keyboard to display cameras depth image in full screen.



Press **"?"** on your keyboard to display all shortcut keys and their corresponding functions.

This photo corresponds to the depth images shown.



5. Switching between range modes

Terabee 3Dcam 80x60 offers 2 operating range modes. You can select between:

- Close range mode (0.2m to 1.2m)
- Standard mode (1.2m to 4m)

Standard mode is set as default. To switch between operating range modes, you will need to edit the "ModuleConfig.json" file. Depending on your operating system, this file will be located in the following directories:

- Windows: C:\Program Files\TERABEEToF\ModuleConfig.json
- Linux: /usr/etc/TERABEE/lib

To edit the file in Windows please locate and run the text editor with elevated privileges - this can be done with "**right-click**" > "**Run as administrator**". Next, in the top bar menu select **File > Open..** (or Ctrl+O) and import the "ModuleConfig.json" file.

To edit the file in Linux, please launch your text editor with elevated privileges with the "sudo" command.

As a final step to select an operating range mode, please use a text editor tool to update the "**lens_mode**" parameter with following values:

- 1 for "Standard mode"
- 0 for "Close range mode"

6. Start developing your application

Once the SDK installation is completed, you're now ready to kick-off your application development. The following sections provide instructions on how to get started developing of Terabee 3Dcam 80x60 applications using different software environments.

6.1. OpenNI 2 C++ sample code

To get you started, Terabee has made available a list of C++ sample codes available on GitHub. These samples will illustrate how to initialize Terabee 3Dcam 80x60 and access depth data from it using OpenNI 2.2 frameworks. Here is a list of available Terabee 3Dcam 80x60 sample code repositories on GitHub:

OpenNI 2 Linux sample code:

- https://github.com/terabee/linux_openni2_samples

OpenNI 2 Windows sample code:

- https://github.com/terabee/windows_openni2_samples

Each repository comes with a README file (displayed on the front page of the repository), explaining the different steps necessary to compile and run sample codes.

6.2. OpenNI 2 Python sample code

In order to allow fast code prototyping we also provide Python3 samples, which are compatible with both Windows and Linux OS. Please follow the link below to access the Python3 sample code repository on GitHub, including instructions on how to run them.

- https://github.com/Terabee/python_openni2_samples

Note: These Python3 samples are based on the "openni" python module which is only compatible with OpenNI 2.

6.3. ROS package

In order to use the Terabee 3Dcam 80x60 in ROS environment, we also provide a modified version of the official ROS OpenNI2 package. The ROS Package and instructions are available in the link below:

- https://github.com/terabee/openni2_camera

7. Compliance

RoHS	CE
Yes	Yes