CamBoard pico flexx

Getting Started

Version **3.19.0**

PUBLIC

Technical information subject to change without notice.
This document may also be changed without notice.

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1. Preliminary note / Vorbemerkung

EN

This document is intended for specialists. These specialists are people who are qualified by their appropriate training and their experience to see risks and to avoid possible hazards that may be caused during operation or maintenance of the device. The document contains information about the correct handling of the device.

Read this document before use to familiarize yourself with operating conditions and installation. Keep this document at hand during the entire duration of use of the device.

All references to software package and viewer application are valid for revision 3.19.0. Changes in future revisions will be reflected in an updated corresponding getting started document.

DE

Das Dokument richtet sich an Fachkräfte. Dabei handelt es sich um Personen, die aufgrund ihrer einschlägigen Ausbildung und ihrer Erfahrung befähigt sind, Risiken zu erkennen und mögliche Gefährdungen zu vermeiden, die der Betrieb oder die Instandhaltung des Gerätes verursachen kann. Das Dokument enthält Angaben zum korrekten Umgang mit dem Gerät.

Lesen Sie dieses Dokument vor dem Einsatz, damit Sie mit den Einsatzbedingungen und der Installation vertraut werden. Bewahren Sie das Dokument während der gesamten Einsatzdauer des Gerätes auf.

Alle Referenzen zu dem Software Paket und der Viewer Applikation sind gültig für Version 3.19.0. Änderungen in zukünftigen Versionen werden in einer aktualisierten Version dieses Getting Started Dokuments behandelt.

2. Safety Instructions / Sicherheitshinweise

EN

These instructions are part of the device. They contain texts and figures concerning the correct handling of the device and must be read before installation or use.

Note the safety instructions. Use the device in accordance with its designated use.
The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the device.

Only the signals indicated in the technical data or on the device label may be supplied to the connections or wires.
The unit may only be opened by the manufacturer or by a person authorized by the manufacturer.

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Diese Anleitung ist Bestandteil des Gerätes. Sie enthält Texte und Abbildungen zum korrekten Umgang mit dem Gerät und muss vor einer Installation oder dem Einsatz gelesen werden.

Beachten Sie die Sicherheitshinweise. Verwenden Sie das Gerät bestimmungsgemäß.

Der Einbau und Anschluss muss den gültigen nationalen und internationalen Normen entsprechen. Die Verantwortung trägt derjenige, der das Gerät installiert.

An den Anschlüssen dürfen nur die in den technischen Daten, bzw. auf dem Geräteaufdruck angegebenen Signale eingespeist werden.

Das Gerät darf nur vom Hersteller oder von einer durch den Hersteller autorisierten Person geöffnet werden.

3. Intended Use / Bestimmungsgemäße Verwendung

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The CamBoard pico flexx is a Time-of-Flight camera module for the operations on a USB port. The camera module may be use under the following conditions:

- The CamBoard pico flexx is intended for indoor use only.
- Connect this module to a compliant USB port only.
- Do not use the Camboard pico flexx in hot, cold, dusty or humid environment.
- Keep the CamBoard pico flexx away from moisture.
- Do not touch the lens with your hand or any sharp objects.
- Use only clean, dry, soft cloth for cleaning.

Highly divergent laser radiation

Do not open the enclosure. Unauthorized opening of the device will void all liability and warranty claims. The manufacturer assumes no liability for any resulting damage

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Das CamBoard pico flexx ist eine Time-of-Flight-Kameramodul für den Betrieb an einem USB-Port. Das Kameramodul darf unter folgenden Bedingungen genutzt werden:

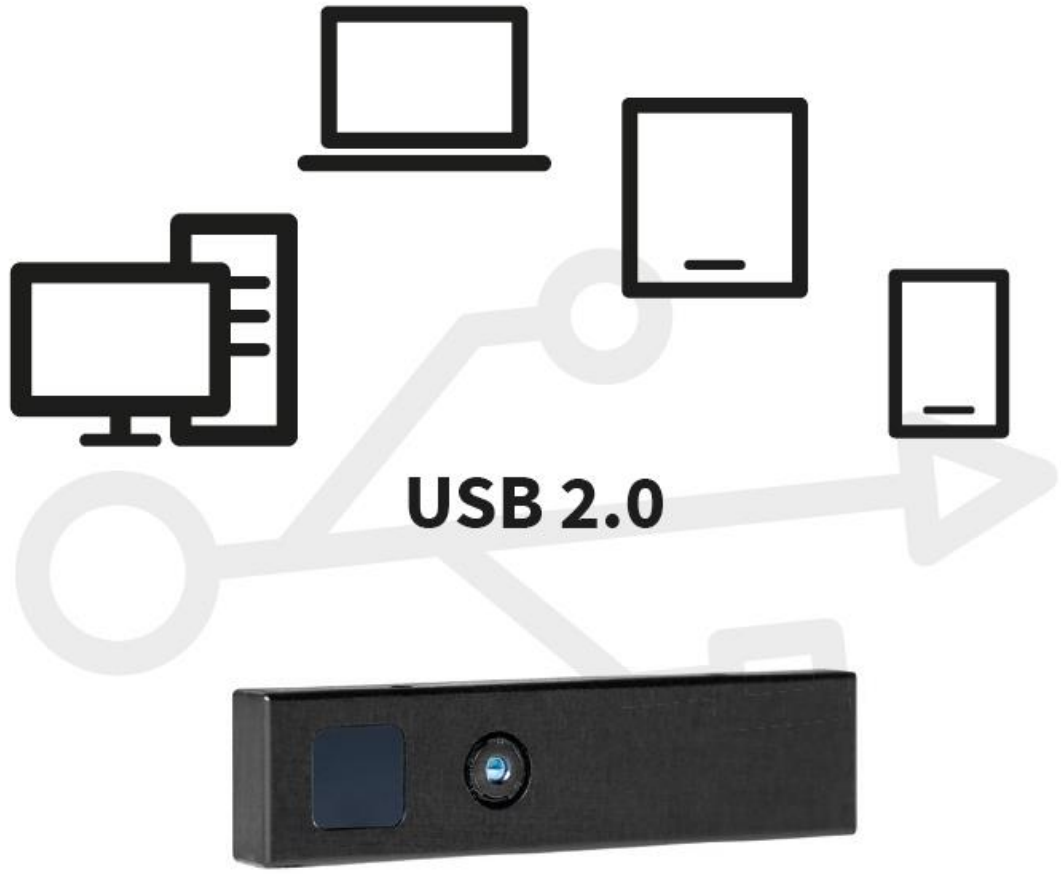
- Das CamBoard pico flexx ist ausschließlich zum Betrieb in geschlossenen Räumen bestimmt.

- Verbinden Sie dieses Modul ausschließlich mit standardkonformen USB-Ports.
- Nutzen Sie das CamBoard pico flexx nicht in heißen, kalten, staubigen oder feuchten Umgebungen.
- Halten Sie das CamBoard pico flexx von Feuchtigkeit fern.
- Berühren Sie die Linse nicht mit Ihrer Hand oder scharfen Gegenständen.
- Reinigen Sie das Modul ausschließlich mit einem sauberen, trockenen, weichen Tuch.

Hochdivergente Laserstrahlung.

- Öffnen Sie das Gehäuse nicht. Bei unautorisiertem Öffnen des Gerätes erlöschen jegliche Haftungs- und Gewährleistungsansprüche. Der Hersteller übernimmt keine Haftung für dadurch entstandene Schäden.

4. Electrical connection / Elektrischer Anschluss



5. Approvals & standards / Zulassungen & Normen

EN

The EU declaration of conformity is available at:

pmdtec.com/picofamily/conformity

The CamBoard pico flexx is CE compliant. It conforms to EN61010-1:2010, EN 55032 Kl. B:2012, EN 55024:2010 and EN 61326-1:2013 IEC 60825-1: 2007 / IEC 60825-1: 2014, RoHS compliant 2011/65/EU

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the

instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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Die EU-Konformitätserklärung ist abrufbar unter:

pmdtec.com/picofamily/conformity

Das CamBoard pico flexx ist CE konform. Es entspricht der EN61010-1:2010, EN 55032 Kl. B:2012, EN 55024:2010 und EN 61326-1:2013 IEC 60825-1: 2007 / IEC 60825-1: 2014, RoHS konform gemäß 2011/65/EU

Attention: warning of hot surfaces.

During operation do not touch the device directly.

Only use the CamBoard flexx with the software delivered in this package. Don’t use this module with prior software versions!

Though profound testing we cannot guarantee seamless operation with all USB chipsets on the market. Utilize an active USB hub if problems occur with notebook or tablet operation

6. Items supplied

1.	**CamBoard pico flexx**	
2.	**USB cable**	
3.	**USB - OTG cable adapter**	
4.	**Getting Started Guide**	

7. Installation

Please use the **software download portal on the bottom of www.pmdtec.com/picofamily** to **download the software package** including full API documentation for the CamBoard pico family.

SOFTWARE DOWNLOAD **Password: Sh!2CBpf**

Unpack the ZIP file. You will find several packed files inside that correspond to the supported OS platforms.

Choose the file for your OS and unpack it to a location of your choice e.g. your desktop or a folder on your Android device.

7.1. Android

For Android the software/driver is an APK installer. Please extract the Android package (this will result in a “libroyale-3.19.0.X-ANDROID-arm-32Bit” folder). Then either

- transfer the complete “libroyale-3.19.0.X-ANDROID-arm-32Bit” folder to your device
- Execute libroyale-3.19.0.X-ANDROID-arm-32Bit\bin\RoyaleViewer.apk
- Make sure that "installation from unknown sources" is enabled in your security settings

Or if you have an Android Development Kit installed,

- you can use “adb install ./RoyaleViewer.apk” in the folder “libroyale-3.19.0.X-ANDROID-arm-32Bit\bin\”
- See also http://developer.android.com/tools/help/adb.html

The “royale viewer” app should now show up in your applications.

7.2. Windows

- There are installers for installing software and drivers for the CamBoard pico flexx (libroyale-3.19.0.X-WINDOWS-x86-64Bit.exe and libroyale-3.19.0.X-WINDOWS-x86-32Bit.exe).
- Please follow the instructions of the installation assistant. Choose “Weiter”/”Continue” on the first screen, then accept the license agreement on the second screen (“Annehmen”/”Accept”).
- Make sure that the checkboxes for Desktop icon and install of the drivers on the third screen are checked.
- On the fourth screen you may change the installation path.

- After successful installation you may
  - Connect the CamBoard pico flexx to your PC via USB.
  - Open the device manager (on a console or in the Win8-search type "mmc devmgmt.msc" and hit RETURN)
  - The CamBoard pico flexx should show up in the "PMD Devices" section. For each connected CamBoard pico flexx an entry should exist.

7.3. Linux

Please extract the Linux package (will result in a “libroyale-3.19.0.X-LINUX-x86-64Bit” or “libroyale-3.19.0.X-LINUX-x86-32Bit” folder). Then transfer the complete folder to your computer.

Make sure that you have proper permissions to the USB device. The installation package contains a proper rules file which can be used. It is located in the /driver/udev directory, please refer to the README file in that directory for more details.

7.4. Mac OS X

For Mac OS X please extract the zip package (will result in a “libroyale-3.19.0.X-APPLE-x86-64Bit” folder). Then transfer the complete folder to your computer. You will find the royaleviewer app in the /bin subfolder.

7.5. Raspberry Pi

You find the binaries for Raspberry Pi in the “libroyale-3.19.0.X-LINUX-arm-32Bit” folder. They were built and tested on a Raspberry Pi 2 with Raspbian, but should also work on a Raspberry Pi 1 and 3.

8. API documentation (Royale documentation)

The **Royale** software package provides a light-weight camera framework for time-of-flight (ToF) cameras. While being tailored to pmd cameras, the framework enables partners and customers to evaluate and/or integrate 3D TOF technology on/in their target platform. This reduces time to first demo and time to market.

The full html documentation can be found within the doc subfolder in the installation path (Windows) or in the unpacked folder (Linux, Android, and Mac OS X).

- *C:\Program Files\libroyale\3.19.0.X\doc\html\index.html*
- *libroyale-3.19.0.X-[platform]/doc/html/index.html*

9. Royale viewer

Once the CamBoard pico flexx is attached to a free USB port, and the drivers are in place, you may start the **Royale viewer** application which gives you a first indication, if the CamBoard pico flexx is working on your target system. The Royale viewer displays a 2D and a 3D representation of the captured depth data. Please refer to the separate RoyaleViewer.pdf for an explanation of the functionality.

10. Use cases

Please note that these settings are initial proposals. When investigating your specific application do not hesitate to try a different use case, in order to verify whether it provides more beneficial data.

Nr	Use Case	Name	Range [m]	Framerate	max. Exposure Time (us)
1	Indoor room reconstruction	MODE_9_5FPS_2000	1 - 4.0	5 fps	2000
2	Room scanning, indoor navigation	MODE_9_10FPS_1000	1 - 4.0	10 fps	1000
3	3D object reconstruction	MODE_9_15FPS_700	0.5 - 1.5	15 fps	700
4	Medium size object recognition, face reconstruction	MODE_9_25FPS_450	0.3 - 2.0	25 fps	450
5	Remote collaboration, step by step instruction, table-top gaming	MODE_5_35FPS_600	0.3 - 2.0	35 fps	600
6	Small object/product recognition, Hand tracking	MODE_5_45FPS_500	0.1 - 1.0	45 fps	500
7	Mixed Mode	MODE_MIXED_30_5		30/5fps	300/1300
8	Mixed Mode	MODE_MIXED_50_5		50/5fps	250/1000

10.1.1. Indoor room reconstruction

pmd sensors are a viable solution to locate objects or people inside large environments, such as buildings. This use case is optimized for long range scanning at a maximum data quality. By making use of multiple frequencies the ambiguity range of the sensor signal can

be increased by several magnitudes. At the same time this sampling methods leads to an increase in data confidence and applications with very high demands in data quality can be realized.

10.1.2. Room scanning, indoor navigation

For mapping applications demanding an enhanced situational awareness quick response times are a necessity. These demands are met by increasing the framerate at a minimum cost in data quality.

10.1.3. 3D object reconstruction

Scanning and reproduction of man-sized objects in close proximity demands high data confidence equal to environmental mapping. Since in general the objects of interest are in closer proximity, the range requirements and necessary integration time can be lowered in favor of faster scanning speed.

10.1.4. Medium size object Recognition, face reconstruction

In general the quality demands of applications in the field of pattern and object recognition are less demanding than metrological applications. On the other hand, a quick system response time is mandatory. Therefore the integration time and correspondingly the data quality is lowered in favor of faster framerates.

10.1.5. Remote collaboration, step by step instruction, table-top gaming

For modern gaming and collaborative applications a quick system response is even more important. Since the range requirement can be lowered and the noise performance of **pmd** sensors is directly related to the object distance, higher framerates at equal data quality can be realized.

10.1.6. Small object/product recognition

For hand-size objects and products the necessary range requirements can be further limited and only one scanning frequency is sufficient. Therefore the framerate can be almost doubled and vice versa the overall scanning speed.

10.1.7. Hand tracking

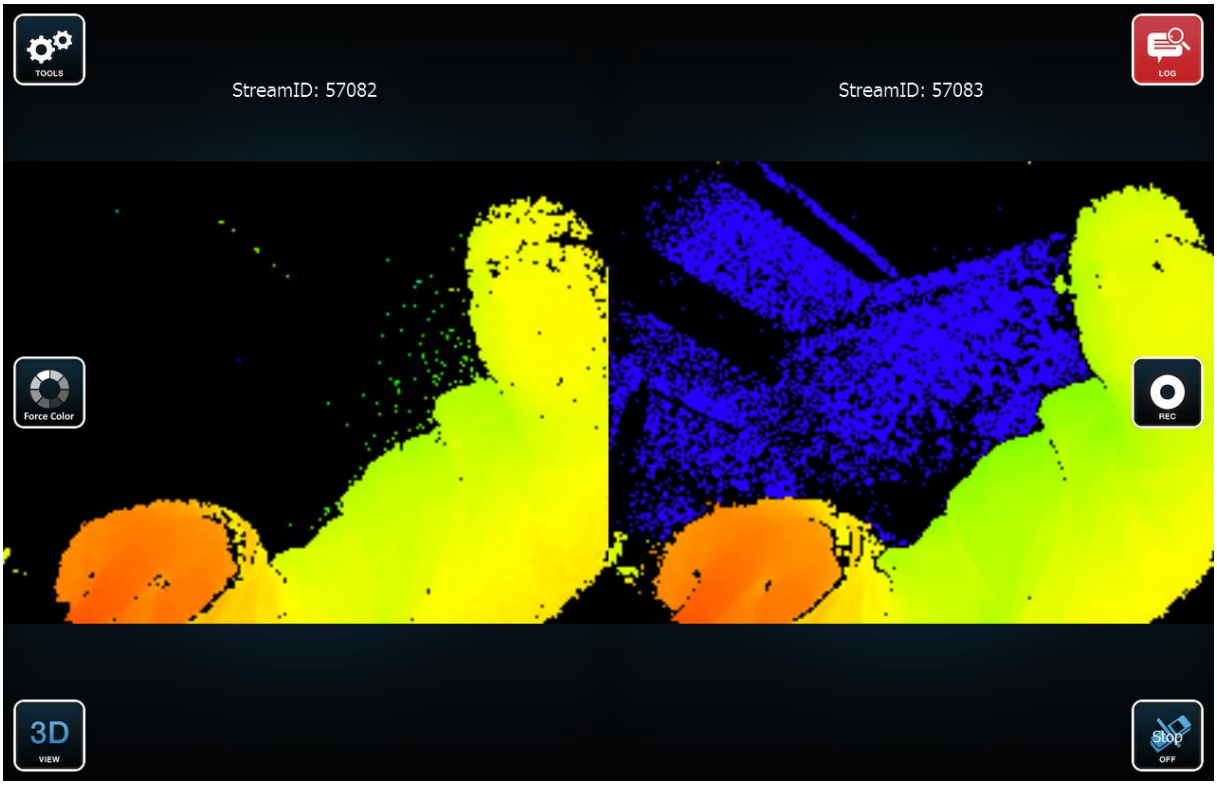
The precise detection and recognition of hand gestures in 3D space is very demanding, both in data quality and processing speed. Hence a special use case has been devised offering optimum setting for this special application.

10.1.8. Mixed Modes

The mixed modes can be used to run two or more different modes at the same time, by capturing frames that fit into separate use cases.

For the pico flexx, Royale offers mixed modes that are a combination of short range/high fps (e.g. for hand tracking) and long range/low fps (environmental scanning). They can be selected like any other use case; to enable the application to distinguish the different use cases the frames will be delivered as separate streams.

In the RoyaleViewer application this is visualized like this:



If you're using one of the mixed modes some settings will require you to select a StreamId:


TOOLS
Color Range
Use Case (FPS)
Exposure Time
Data
Load File
Flip vertically
StreamID :
57082
Distance Minimum Value (0.10 m)
Distance Maximum Value (1.80 m)
Force Color

11. Troubleshooting/ Known Bugs/ Errata

Problem	Possible solution
Camera not recognized (“FX3” in device manager)	Install drivers as described in chapter 7.
Camera not functional on USB2 port	Possibly power-supply of USB port out of spec. • Try another port closer to your supply plug. • Try using an active USB-HUB
Camera not functional on USB3 port	Try using another USB cable. (Recommended: USB-to-microUSB3).
Camera not recognized on Android device	• Check connection of the USB cable(s) • Try using an active USB-HUB • Try activating the OTG functionality (e.g. for Sony : Settings > Device Connection > USB Connectivity > Detect USB device)
Nothing happens after pressing start in the RoyaleViewer.	Starting the visualization might take a few seconds. Please click the “Info” Button to check if the camera was found. If the camera was not found please install drivers as described in chapter 7.
Android: application is not quitting correctly	Please tap your home button to return to your home screen. Then hold your home button (or tap your app list button) to show your recent apps. Slide the “royale viewer” app to remove from the list
Android: Settings > Use Case (FPS) dialog to small	The default mode is 5 fps (long range) We recommend devices >7’’ for the best user experience
Low FPS on ARM based Android device	Code is not yet optimized for special ARM platforms but should work on most. Please report your device/used application processor.

12. Tested configurations

OS	Comment
Android 4.4.2+	Working devices • Samsung Galaxy S6 • Samsung Galaxy S7 • Samsung Galaxy Note 10.1(SM-P605) • Samsung Galaxy Note Pro 12.2'' Wifi • LGE G Pad 8.3'' • OnePlus 2 • Nexus 6 • Huawei Mate 9
Windows 7	No special action required
Windows 8	No special action required
Windows 8.1	No special action required
Windows 10	Tested with Intel USB 3 Controller on Windows 10 (Version 1703)
Linux (Ubuntu 16.04 + Qt5.5)	Tested with Ubuntu 16.04 32/64 bit
Mac OS X	No special action required