BECOM
it's possible.

Argos3D - P33x

Hardware User Manual

Version 12

BECOM Systems GmbH

Gutheil-Schoder-Gasse 17

1230 Wien

AUSTRIA

office.systems@becom-group.com

systems.becom-group.com

Argos3D - P33x – Hardware User Manual

Document No.: 900-308 / A

Publication date: June 29, 2020

Subject to change without notice. Errors excepted.

Table of Contents

The information herein is given to describe certain components and shall not be considered as a guarantee of characteristics.

Terms of delivery and rights of technical change reserved.

We hereby disclaim any warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

BECOM Systems makes and you receive no warranties or conditions, express, implied, statutory or in any communication with you. BECOM Systems specifically disclaims any implied warranty of merchantability or fitness for a particular purpose.

BECOM Systems takes no liability for any damages and errors causing of the usage of this board. The user of this board is responsible by himself for the functionality of his application. He is allowed to use the board only if he has the qualification. More information is found in the General Terms and Conditions (AGB).

Information

For further information on technology, delivery terms and conditions and prices please contact BECOM Systems
www.becom-group.com

Warning

Due to technical requirements components may contain dangerous substances.

1 General Information

This guide applies to the Argos3D - P33x camera platform from BECOM Systems. Follow this guide chapter by chapter to set up and understand your product. If a section of this document only applies to certain camera parts, this is indicated at the beginning of the respective section.

The document applies to X-Grade product from V1.0.

1.1 Symbols Used

This guide makes use of a few symbols and conventions:

Warning

Indicates a situation which, if not avoided, could result in minor or moderate injury and/or property damage or damage to the device.

Caution

Indicates a situation which, if not avoided, may result in minor damage to the device, in malfunction of the device or in data loss.

Note

Notes provide information on special issues related to the device or provide information that will make operation of the device easier.

Procedures

A procedure always starts with a headline

1. The number indicates the step number of a certain procedure you are expected to follow.
   Steps are numbered sequentially.

This sign ➤ indicates an expected result of your action.

References

This symbol  indicates a cross reference to a different chapter of this manual or to an external document.

1.2 Certification

1.2.1 CE Declaration

BECOM Systems hereby declares that this Argos3D - P33x product is in compliance with the essential requirements and other relevant provisions of Directive 2014/35/EU.

CE

1.2.2 Eye Safety

Illumination: **Laserdiodes**	**Wavelength**	**850nm (typ)**	This is a class 1 Laser product In accordance with IEC 60825-1:2014, Edition 3
	Output power	**48W peak**	

Label:

The following label is applied on the camera:

1.3 Safety instructions

Important

This manual is part of the device and contains information and illustrations about the correct handling of the device and must be read before installation or use. Observe the operating instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or handling can affect the safety of people and machinery.

The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the unit.

1.4 Electrical connection

Note

The unit must be connected by a qualified electrician.
Device of protection class III (PC III).
The electric supply must only be made via PELV circuits.
The device must only be powered by a limited energy source (≦ 30V; ≦ 8A; ≦ 100VA).
Disconnect power before connecting the unit.

2 Overview

2.1 Components

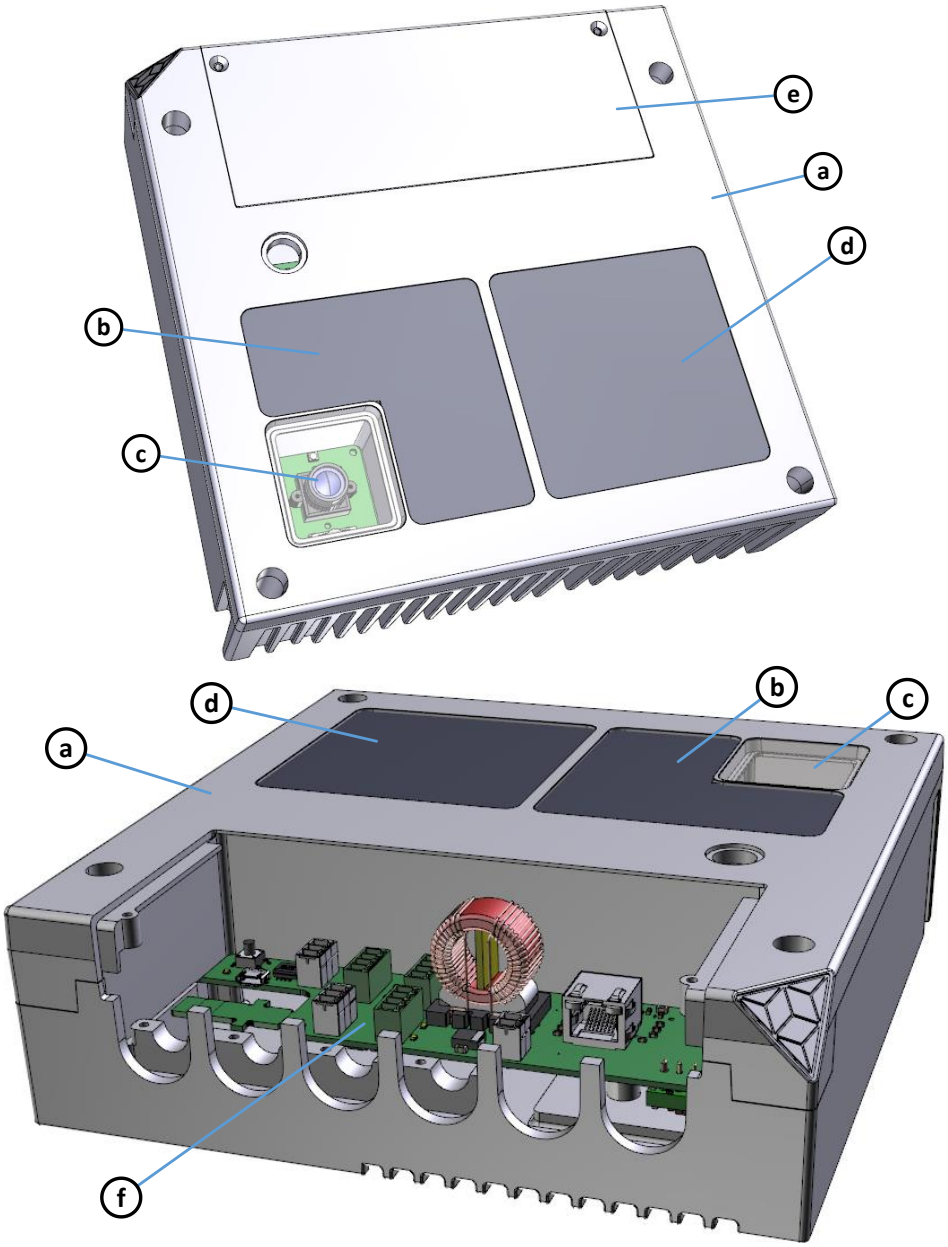

Figure 2-1: Argos3D - P33x components

a. Case
b. Viewing window for 3D sensor
c. Viewing window for 2D sensor (on the Argos3D-P331 the 2D sensor is not present)
d. Viewing window for illumination module
e. Interface cover
f. Interface board

2.2 Interfaces and Connectors

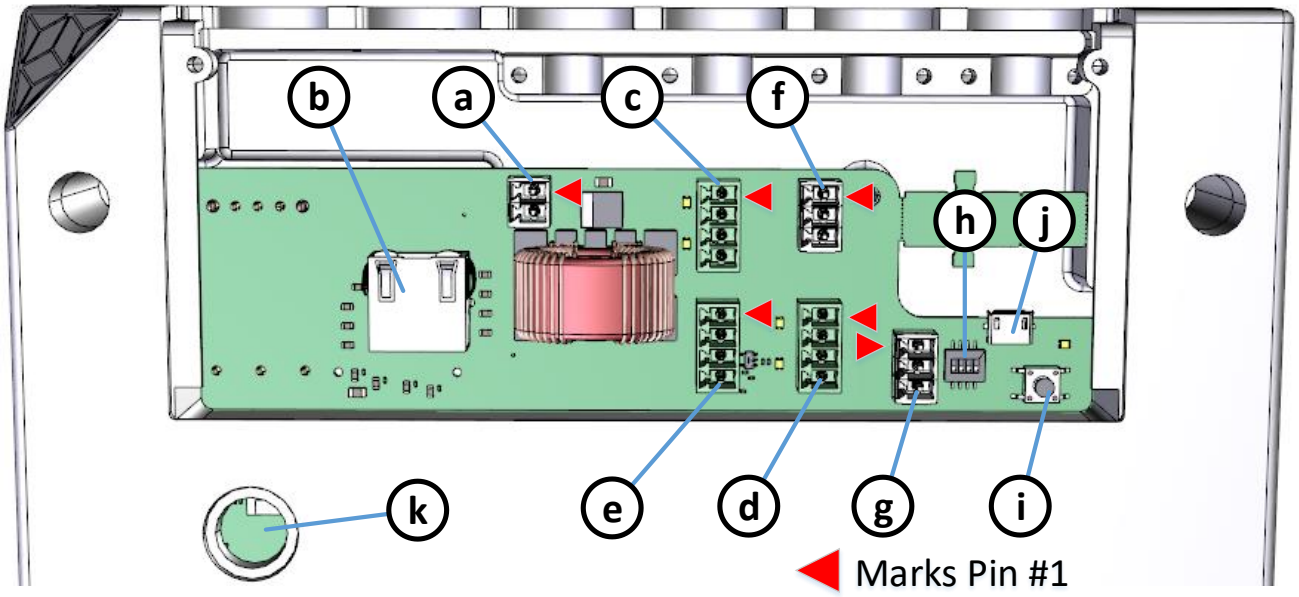

Figure 2-2: Argos3D - P33x connectors and interfaces

a. Power supply
b. Ethernet (RJ45) 10/100/1000Base-T with PoE++. POE is only available on P330 and P331.
c. General purpose inputs, galvanic isolated
d. General purpose outputs, galvanic isolated
e. Modulation Light Interface
f. Trigger
g. RS232/485
h. DIP-Switch
i. Reset-Button
j. Debug-UART
k. Status LED

3 Hardware Installation

3.1 Mounting

Caution

Case may become hot!

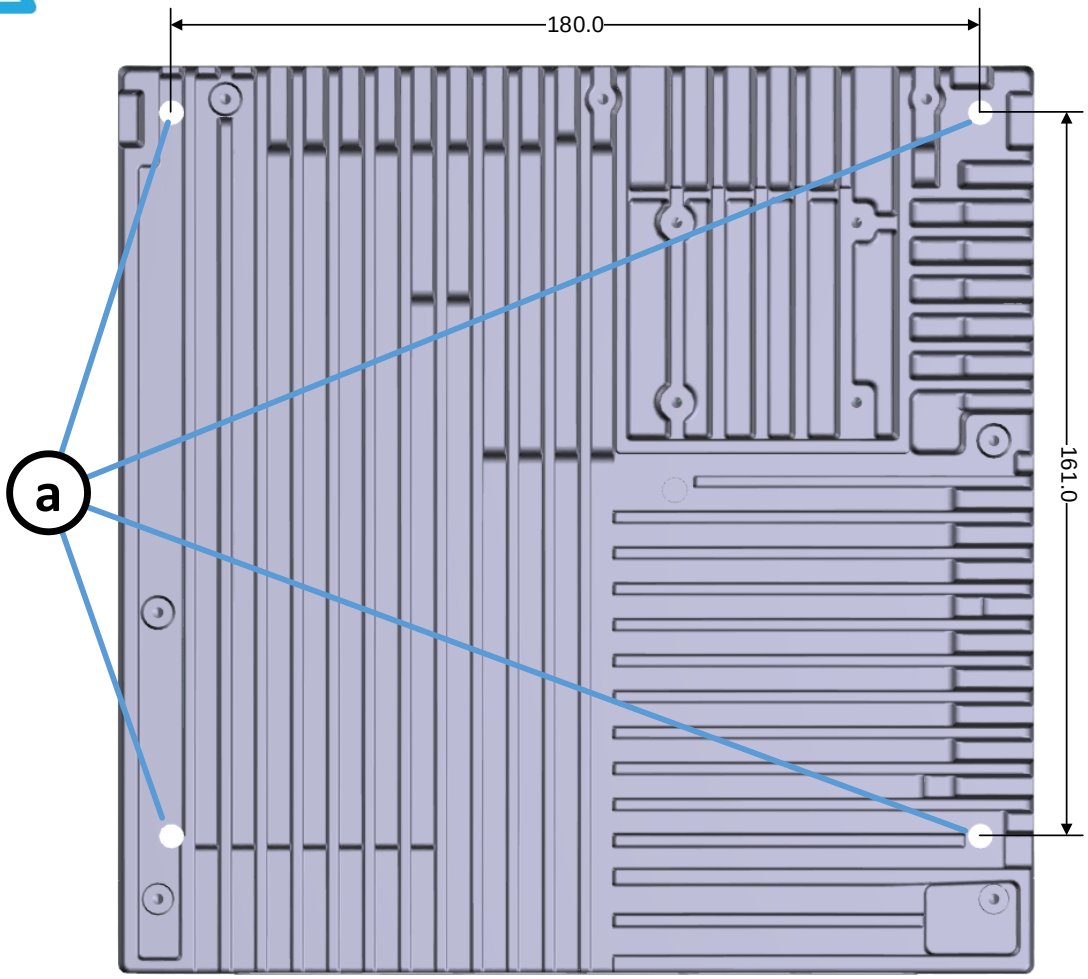

Figure 3-1: Mounting holes for the case

3.1.1 Mounting Holes (a)

The case has four holes for up to M5 screws that allows mounting the Argos3D - P33x.

3.1.2 Mount Spacing

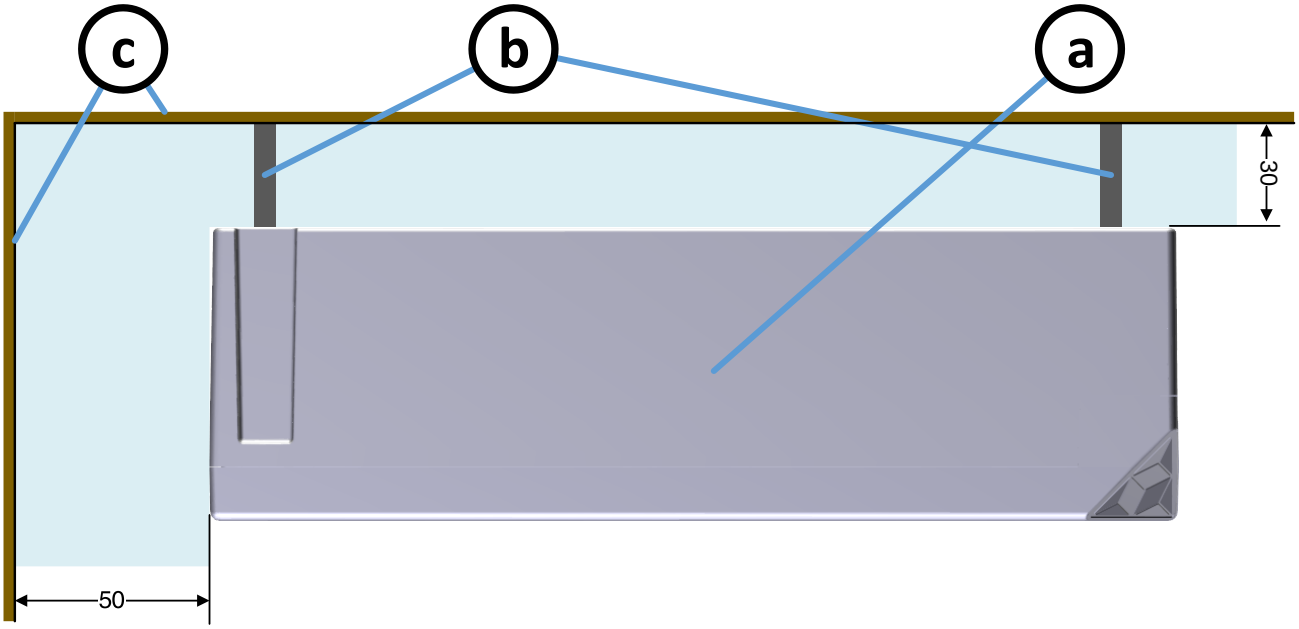

Figure 3-2: Distance to mounted wall

a. Argos3D - P33x

b. Spacers

c. Wall or mounting panel

To maintain a natural air flow behind the Argos3D - P33x, the device should not be mounted closer than 30 mm to the mounting panel. A keep-out area of at least 50 mm on the four small sides must be provided as well.

Caution

The user is responsible to take care for a correct mounting and to not exceed the operation temperatures.

4 Interface Description

4.1 Signal naming

Signal names are usually written in capital letters. They are noted in positive logic (positive asserted). If the signal is negative asserted an “n” will be added as prefix to the signal name.

Type:

The type describes the electrical characteristics of the signal. The following types are available:

- I Input
- O Output
- DN Negative Differential Output
- DP Positive Differential Output
- P Power supply

4.2 Connector Numbering

All pins no. 1 of each connector are marked in the figures with a red arrow. The connector numbering always starts at this pin, continuing in this row, and going backwards at the opposite side.

4.3 Interface-Slot

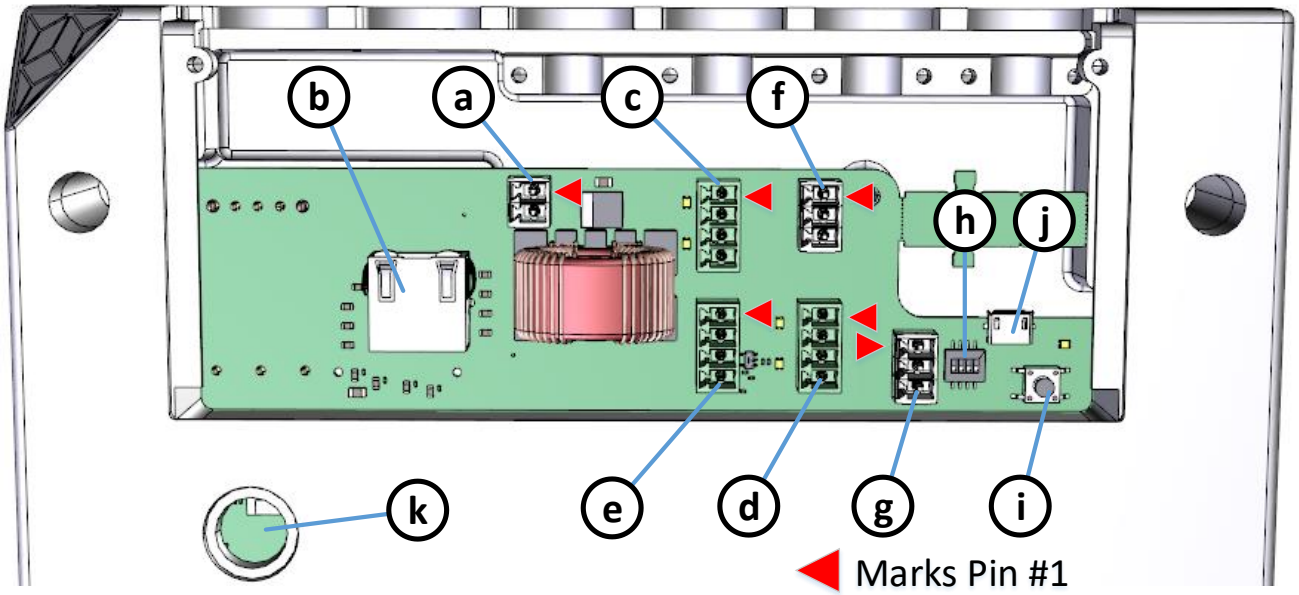

Figure 4-1: Argos3D - P33x connector location

a. Power Connector
b. Ethernet
c. General purpose input 1 & 2
d. General purpose output 1 & 2
e. Modulation Light Interface (not supported, please do not use)
f. Trigger
g. RS232 / RS485 (functionality depends on firmware version)
h. DIP-Switch
i. Reset-Button
j. Debug-UART
k. Status LED

4.3.1 Power Connector (a)

This 3.5mm terminal connector allows plugging a cable entry plug like **691361100002** from Würth Elektronik. Compatible connectors from other manufacturers may be found as well.

No.	Signal	Type	Description
1	VIN	P	Positive power supply
2	GND	P	Power ground

Table 4-1: Power connector description

Voltage range: 18V to 30V.

Note

Use inherently limited power sources only!

4.3.2 Ethernet and PoE (b)

This is a standard straight RJ45 10/100/1000 Base-T compatible Ethernet connector.

The Argos3D-P330 and Argos3D-P331 supports PoE++ as alternative power source. Please use a valid PoE++ (90W) injector or switch only. Using another PoE standard may cause the camera to be not fully operational. Please check the status of your PoE connection in the StatusRegister. Please refer to the Software User Manual for additional information and a register description.

4.3.3 General purpose input 1 & 2 (c)

This 4 pole 3.5mm terminal connector allows plugging a cable entry plug like **691361100004** from Würth Elektronik.

No.	Signal	Type	Description
1	IN2A	I (0V to 50V)	Opto-coupler contact A
2	IN2B	I (0V to 50V)	Opto-coupler contact B
3	IN1A	I (0V to 50V)	Opto-coupler contact A
4	IN1B	I (0V to 50V)	Opto-coupler contact B

Table 4-2: General purpose input 1 & 2 connector description

An optocoupler SFH6286-2T from Vishay is used for each general purpose input.

OFF-Range: 0V to 2V.
ON-Range: 5V to 50V.

4.3.4 General purpose output 1 & 2 (d)

This 4 pole 3.5mm terminal connector allows plugging a cable entry plug like **691361100004** from Würth Elektronik.

No.	Signal	Type	Description
1	OUT1A	SPST-A	Relay contact A
2	OUT1B	SPST-B	Relay contact B
3	OUT2A	SPST-A	Relay contact A
4	OUT2B	SPST-B	Relay contact B

Table 4-3: General purpose output 1 & 2 connector description

A solid state relay ASSR-3210 from Avago Technologies is used for each general purpose output.

Maximum voltage: 250V.
Maximum current: 200mA.

4.3.5 Trigger (f)

This 3 pole, 3.5mm terminal connector allows plugging a cable entry plug like **691361100003** from Würth Elektronik.

No.	Signal	Type	Description
1	TriggerOUT	O (open drain with internal 1k[1)] pull-up to 5V)	Trigger Output
2	TriggerIN	I Max Input Voltage: 20V Max High Threshold: 3,3V Min Low Threshold: 0,6V	Trigger Input
3	GND	P	Power ground

Table 4-4: Trigger connector description

Note

The usage of this interface may depend on the firmware version.

1) Depends on camera version. Only valid for version >V1.1.0 (P330, P331) and >V1.0.0 (P332).

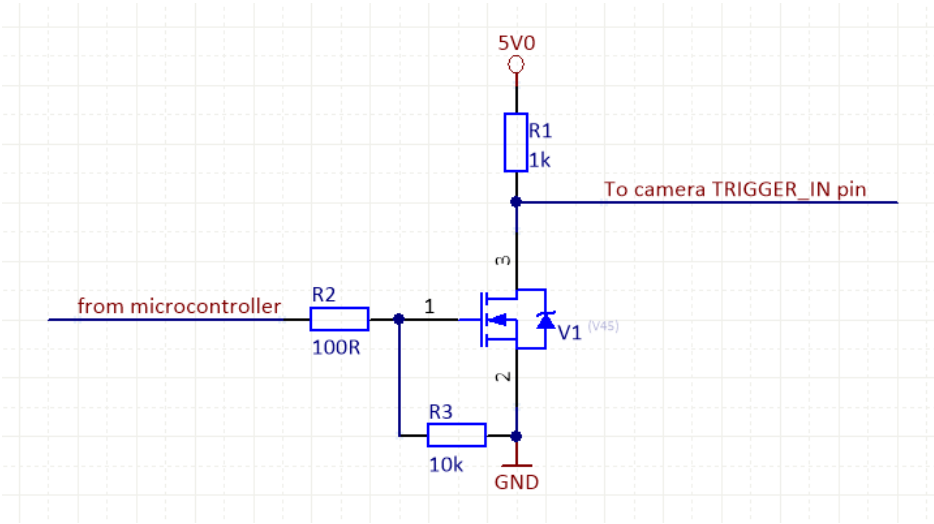

Figure 4-2: Example schematic for an external trigger circuit

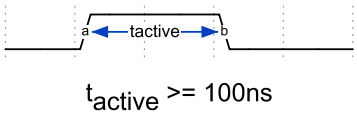

Figure 4-3: timing diagram of the hardware trigger signal, triggers on rising edge.

4.3.6 RS232/RS485 (g)

This 3 pole 3.5mm terminal connector allows plugging a cable entry plug like **691361100003** from Würth Elektronik.

No.	Signal	Type	Description
1	GND	P	Signal Ground
2	RS232 RxD[1)]	IO	RS232 Receive Data
	RS485 A/Y	DN	RS485 Negative Differential Data
3	RS232 TxD[1)]	IO	RS232 Transmit Data
	RS485 B/Z	DP	RS485 Positive Differential Data

Table 4-5: GPIO Connector Description

[1)] The interface mode can be selected with the DIP-Switch (see chapter 0).

The RS232 interface is running in full duplex mode and the RS485 is running in half duplex mode.

Note

The usage of this interface may depend on the firmware version.

4.3.7 DIP-Switch (h)

The DIP-Switch allows configuring the RS232/RS485 transceiver. The following table shows the functionality of each switch.

No.	Name	Description
1	-	Not used
2	-	Not used
3	RS485 Enable	ON: Transceiver works in RS485 mode OFF: Transceiver works in RS232 mode
4	RS485 Termination	ON: Enables the 120Ω RS485 termination resistor OFF: No termination resistor is active

Table 4-6: DIP-Switch Description

Note

Make sure that the termination resistor is always disabled, if the driver runs in RS232 mode.

4.3.8 Reset-Button (i)

This button can be used to perform a hardware reset and a factory default reset.

For further information about the factory default reset function see Software User Manual of the Argos3D - P33x.

4.3.9 Debug-UART (j)

This Micro-USB connector provides a Debug-UART interface to the camera.

A FT234 from FTDI is used as UART-to-USB-Converter.

4.3.10 Status LED (k)

The Status LED indicates whether the power supply is within the specified range (green), or not (red). Additional functionalities may be firmware dependent. Please refer to the Software User Manual for additional information.

5 Software

5.1 Firmware

For a description of the firmware related interfaces, protocol descriptions, register settings, etc. please refer to the Software User Manual.

5.2 Demo Application

For the first evaluation of the camera and to evaluate different settings and configurations a .NET demo application for Microsoft Windows is provided: BLT-ToF-Suite. The demo application can be downloaded from our support web site.

Software and documentation

support.systems.becom-group.com

5.3 Getting Started Software Development Example

To facilitate the integration of the Argos module in your own application a getting started example will be available on our download site. Please refer to our support site.

Software and documentation

support.systems.becom-group.com

5.4 Camera Firmware Development KITs

The camera offers the possibility to bring your own application onto the Argos3D - P33x. Using the quad core i.MX6 processor from Freescale Inc., one core is reserved for the calculation of the depth data, the other cores can be used by customers for their own applications.

The Argos3D - P33x is based on an embedded Linux system.

6 Appendix

6.1 Operating Conditions

Symbol	Parameter	Min	Typical	Max	Unit
V_{IN}	Input supply voltage	18	24	30	V
I_{IN}	Input current at 24V		1.2 [1)]	4.3 [2)]	A
I_{INT}	Input current during integration	5.4	5.5	5.6	A
I_{IR}	Inrush Current		7.3		
T	Operating Temperature [3)]	0°		50°	°C
T	Storage Temperature	-40		+85	°C
t_{INT}	Integration Time	0		7500	µs
FITP	Frame-rate Integration Time Product			780	
IP	Ingression protection		IP41 [4)]		

Table 6-1: Operating Conditions

1) Note

Valid for a typical operation condition: frame-rate of 40fps, an integration time of 1000µs and 24V input voltage supply. The input current depends on the applied frame-rate, integration time and input supply voltage.

2) Note

At maximum Framerate Integration-Time Product (FITP) of 26 fps and 7500µs t_{INT}.

3) Note

The maximum operating temperature strongly depends on the FITP.

4) Note

In preferred mounting situation

6.1.1 Input current

The input current depends on the selected frame-rate (fps) and the integration time (t_{INT}). The following figure shows typical values. The values for the x axis shows the FITP which has been calculated with the following equation:

$$FITP = t_{INT}\,[ms] \cdot fps\,\left[\frac{1}{s}\right] \cdot 4$$

TBD

Figure 6-1: Input power depending on frame-rate integration time product

6.2 Optical Characteristics

Symbol	Parameter	Min	Typical	Max	Unit
#LDs	Nr. of Laser Diodes		16		
$\Lambda_{CENTROID}$	Centroid-Wavelength of Illumination	840	850	860	nm
$\Delta\lambda$	Spectral Bandwidth		20		nm
I_e	Radiant intensity				W/sr
3D FoV_H	Horizontal Field of View		80		Deg
3D FoV_V	Vertical Field of View		65		Deg
Color FoV_H[1)]	Horizontal Field of View		90		Deg
Color FoV_V[1)]	Vertical Field of View		70		Deg

Table 6-2: Optical characteristics

Note 1) Not available on P321

6.3 Measurement Specifications

6.3.1 Measurement Environmental Conditions

All the following measurements have been acquired at the following constant environmental conditions.

Parameter	Value
Temperature	23 °C
Humidity	35 %
Ambient light	2 kLux
Modulation Frequency	20 MHz
Frame-rate	25 fps

Table 6-3: Environmental Specification

6.3.2 Typical Precision

The following table shows the standard deviation over 100 samples at an integration time of 650µs and a modulation frequency of 40MHz without HDR.

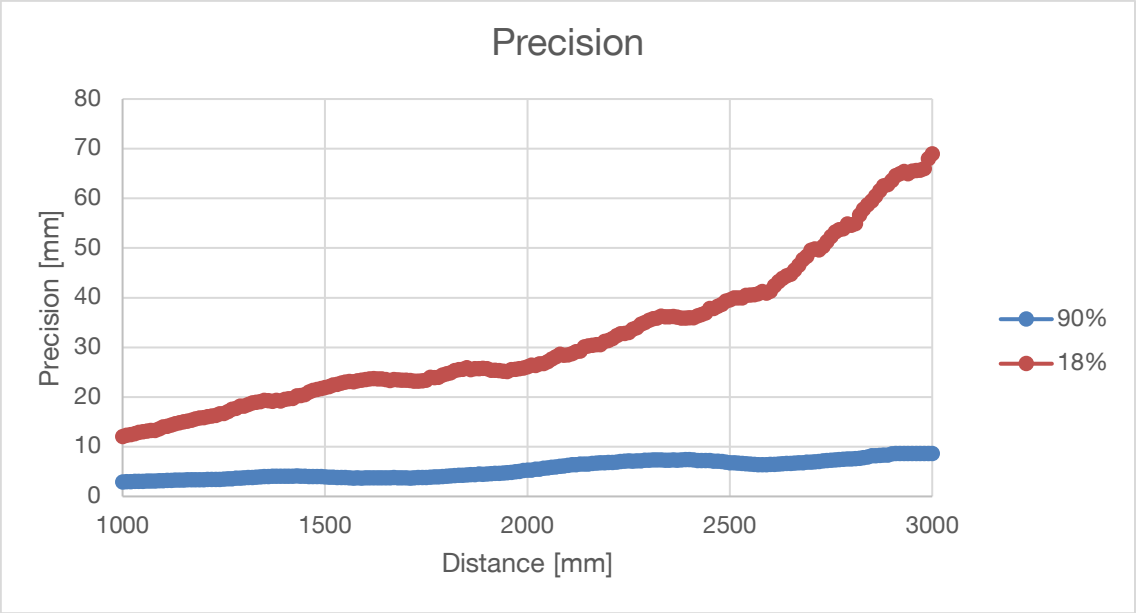

Figure 6-2: Typical precision

6.3.3 Accuracy of Distances

The following table has been determined by an integration time of 650µs and a modulation frequency of 40MHz without HDR.

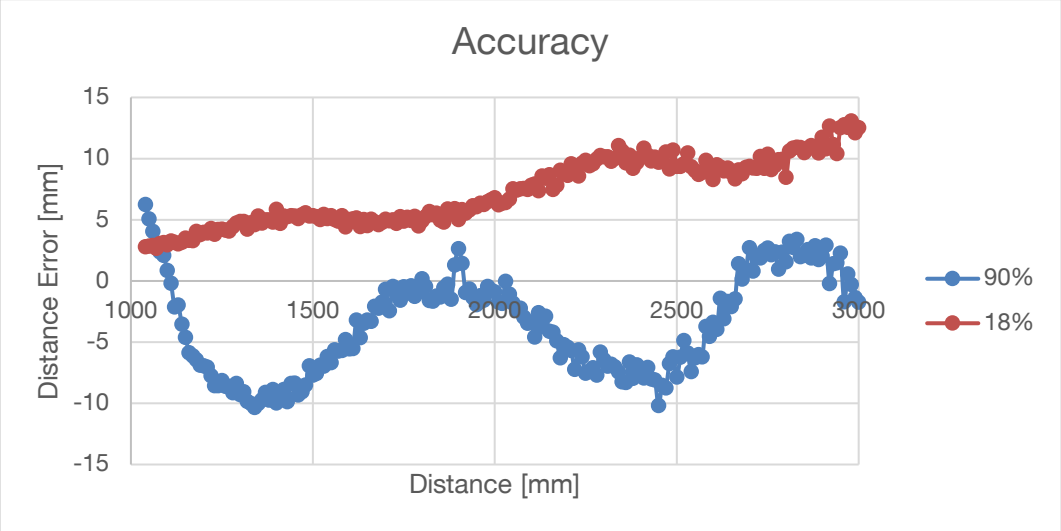

Figure 6-3: Typical accuracy

6.3.4 Temperature on the Cooling Plate

The following figure shows the expected case temperature depending on the frame-rate integration time product (FITP) and the ambient temperature. The FITP has been calculated as follow:

$$FITP = t_{INT}\,[ms] \cdot fps\,\left[\frac{1}{s}\right] \cdot 4$$

TBD

Figure 6-4: Expected cooling plate temperature depending on frame-rate integration time product

6.3.5 Integration Time vs. Frame-rate

The following table shows recommended frame-rate integration time combinations depending on the ambient temperature.

Caution

Be careful to not stress the device beyond the limits, otherwise you may damage the device.

TBD

Figure 6-5: Integration time vs. frame-rate

The diagram takes care to limit the FITP in a way that the temperature on the cooling plate doesn't exceed 70°C.

6.4 Mechanical Outline

All dimensions are given in mm.

Mechanical outline of the 'Bounding Box':

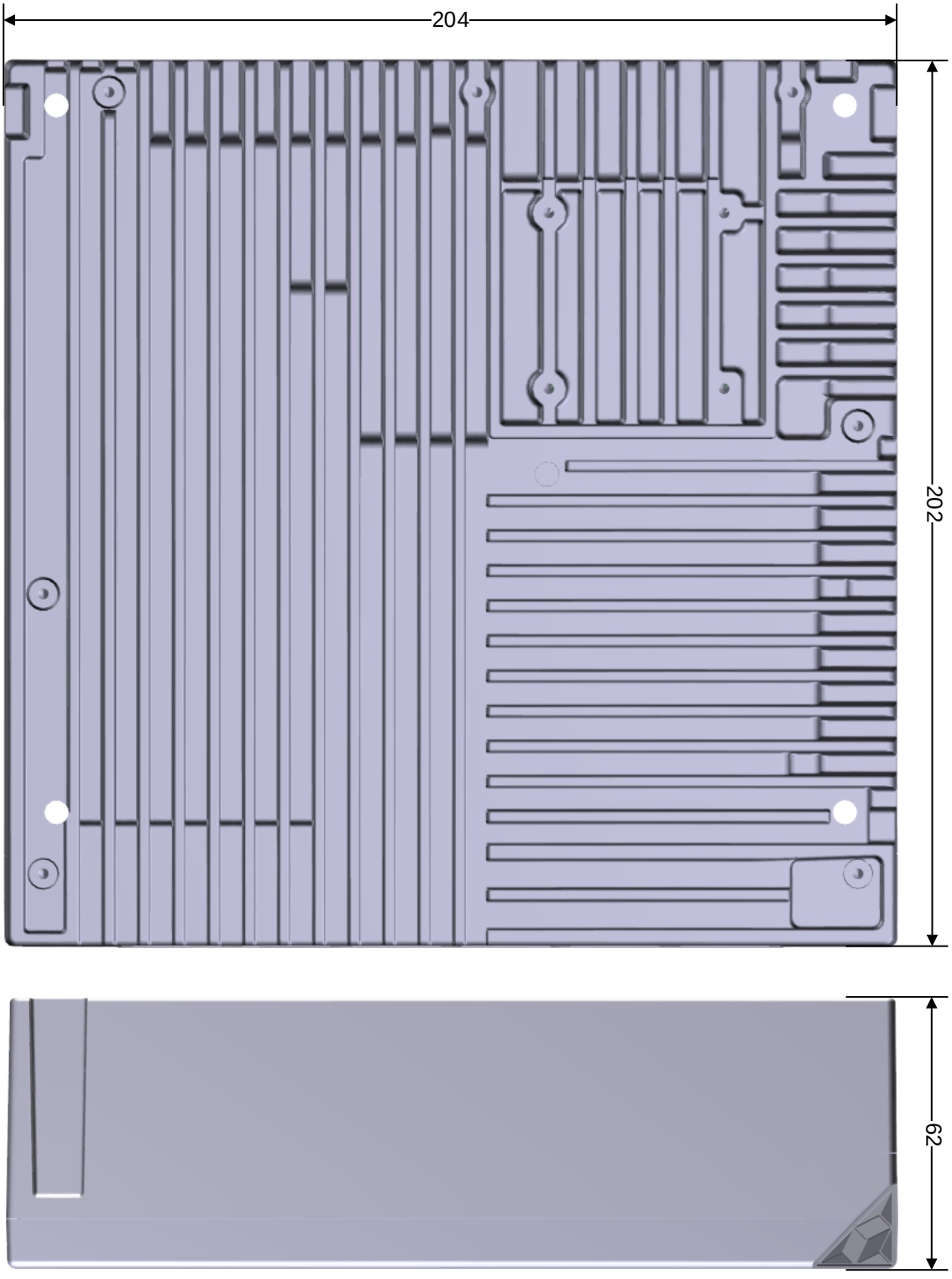

Figure 6-6: Mechanical outline of the bounding box (dimensions in mm)

6.5 Sensor Location

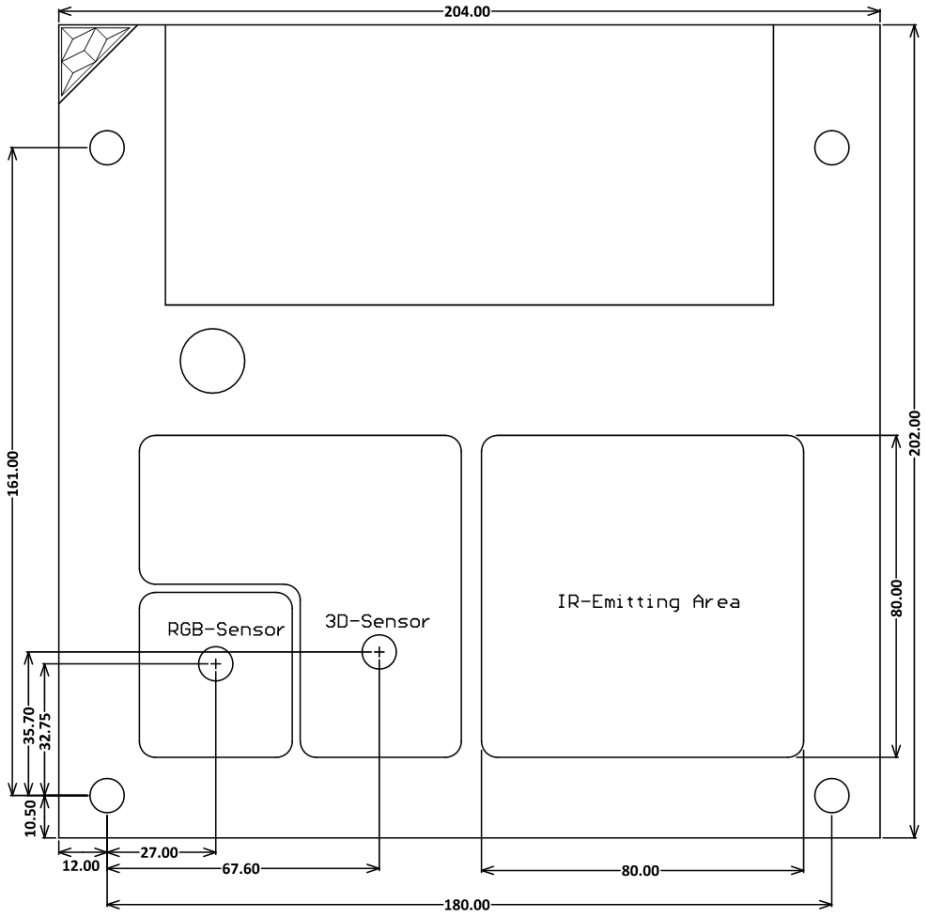

Figure 6-7: Sensor position and IR-emitting area (dimensions in mm)

7 Support

7.1.1 General Support

General support for products can be found at BECOM Systems' support site

Support Link

support.systems.becom-group.com

7.2 Software Packages

Software packages and software downloads are for registered customers only

Software Package

support.systems.becom-group.com

7.3 Related Products

- P3xx Vesa Adapter

8 Product History

8.1 Ordering information

Product	Article # (PON)	Features
Argos3D-P330	150-2037-1	Full featured
Argos3D-P331	150-2042-1	No RGB module
Argos3D-P332	150-2052-1	No PoE

Table 8-1: Ordering information

8.2 Product changes

Product	Version	Release date	Comment
Argos3D-P330	1.0.0	April 2017	
Argos3D-P331	1.0.0	April 2017	
Argos3D-P332	1.0.0	April 2017	
Argos3D-P330	1.1.0	October 2017	
Argos3D-P331	1.1.0	October 2017	
Argos3D-P330	1.2.0	January 2018	Anomaly 1 to 3 solved (seeTable 8-3)
Argos3D-P331	1.2.0	January 2018	Anomaly 1 to 3 solved (seeTable 8-3)
Argos3D-P332	1.1.0	January 2018	Anomaly 1 to 3 solved (seeTable 8-3)

Table 8-2: Overview Argos3D - P33x product changes

Note

Please refer to our support site for additional information about product changes.

8.3 Anomalies

Nr.	Applies to	Version	Description	Workaround
1	Argos3D-P330	1.0.0, 1.1.0	Direct connect between trigger out from one camera to trigger in of another camera doesn't work.	Please contact support@bluetechnix.com for a possible workaround.
2	Argos3D-P331	1.0.0, 1.1.0	Direct connect between trigger out from one camera to trigger in of another camera doesn't work.	Please contact support@bluetechnix.com for a possible workaround.
3	Argos3D-P332	1.0.0	Direct connect between trigger out from one camera to trigger in of another camera doesn't work.	Please contact support@bluetechnix.com for a possible workaround.

Table 8-3 – Product anomalies

9 Document Revision History

Version	Date	Document Revision
12	2019 10 07	CD change, company name change
11	2018 05 16	Timing diagram for hardware trigger added
10	2017 12 12	Sample schematic for trigger added Anomaly list updated.
9	2017 12 01	Precision diagram updated
8	2017 11 17	Precision and accuracy figures added. Digital output current and voltage limits changed I/O type of trigger pins changed
7	2017 09 19	Operating condition updated
6	2017 06 22	Company data updated
5	2017 05 29	Laser class 1 label added
4	2017 05 23	Laser standard and laser output power added
3	2017 02 24	Wrong diode count corrected Footer updated
2	2017 02 21	Measurement results added
1	2016 11 03	First preliminary of the document

Table 9-1: Revision history

A List of Figures and Tables

Figures

Tables