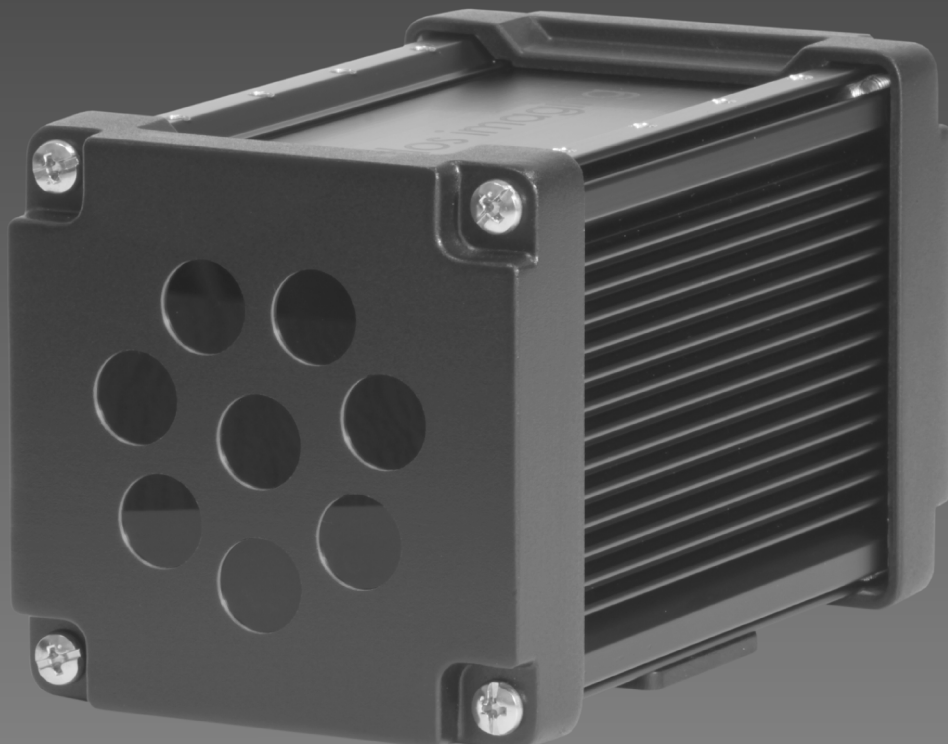# StarForm SWIFT

StarForm Swift™

3D Time-of-Flight Camera

OI-SW-0480 (STD)

Hardware Guide

Version 1.0.3 , August 15, 2017

For Customers in the United States of America

This device complies with part 15 of FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that any changes or modifications not expressly approved by **odos imaging Limited**, could void the user's authority to operate the equipment.

The shielded ethernet cable recommended within this manual must be used with the equipment in order to comply with the limits for a Class A digital device pursuant to Subpart J of Part 15 of the FCC Rules.

Trademarks

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Warranty

The information provided by **odos imaging Limited** is supplied without any guarantees or warranty whatsoever, be it specific or implicit. Also, excluded are all implicit warranties concerning the negotiability, the suitability for specific applications or the non-breaking of laws and patents. Even if we assume that the information supplied to us is accurate, errors and inaccuracy may still occur.

Copyright

All texts, pictures and graphics are protected by copyright and other laws protecting intellectual property. It is not permitted to copy or modify them for trade use or transfer, nor may they be used on websites.

Declaration of Conformity

We herewith declare under our own sole responsibility that the following product complies with the requirements of the listed directives and standards:

- **Designation**: 3D Time-of-Flight Camera
- **Type**: StarForm Swift™ Series
- **Manufacturer**:
  odos imaging limited
  Scottish Microelectronics Centre
  Alexander Crum Brown Road
  Edinburgh
  EH9 3FF
  United Kingdom

- **EC Directives**:
  2004/108/EC
  2011/65/EU

- **Applied Standards**:
  ### EN 62471:2006
  Exempt. The illumination does not pose any photo biological hazard for the end points of the standard EN 62471:2006. [illumination does not pose: 1) an actinic ultraviolet hazard within 8-hours exposure, nor 2) a near-UV hazard within 1000 s, nor 3) a retinal blue-light hazard within 10000 s, nor 4) a retinal thermal hazard within 10 s, nor 5) an infrared radiation hazard for the eye within 1000 s. Additionally the illumination emits infrared radiation without a strong visual stimulus (less than 10 cd.m^{-1}) and does not pose a near-infrared retinal hazard within 1000 s.]
  ### EN 55032:2012 plus corrigenda Aug. 2012 & Dec. 2012:
  Class A
  ### EN 55024:2010 + A1:2015:
  EN61000-4-2: 2009
  EN61000-4-3: 2006 + A1:2007 + A2:2010
  EN61000-4-4: 2004
  EN61000-4-5: 2006
  EN 61000-4-6: 2009
  EN61000-4-11:2004
  ### 47CFR: 2011, Part 15, Subpart B:
  Class B Device
  Clause 15.107 Conducted Emissions
  Clause 15.109 Radiated Emissions

Signed for and behalf of odos imaging limited:

October 2, 2017, Dr Chris Yates, CEO

Contents

1   Contact

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2 Introduction

This hardware manual contains a description of the technical specifications and features of the StarForm Swift™ 3D time-of-flight camera, including system components, physical dimensions and interfaces. For details regarding the software interface and SDK installation, please refer to the provided User Interface Manual[1]. Additional resources which are of interest are detailed in Section 7.

2.1 Styles

This manual uses certain typographical conventions in order to maintain an easily accessible and consistent layout. The styles contained in Table 2.1 and symbols noted below are used throughout the manual.

Style	Function	Example
Bold	important information, key words, headings,	**Bold**
Italic	filenames	*helpfile.pdf*

Table 2.1: Description of typographical styles used throughout this manual.

Note   **This symbol highlights important information to note.**

Caution   **Use of the CAUTION heading throughout this manual explains risks that are potentially harmful to either the product or personnel. These sections should always be read carefully and understood.**

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[1] *StarForm Swift™ Software Manual*

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2.2 Precautions

Caution **Avoid Cleaning.** This product may be damaged by volatile cleaning agents. Avoid cleaning the image sensor and LED optical windows with volatile or aggressive cleaning agents.

Caution **Do not disassemble the camera housing.** The StarForm Swift™ camera contains no user serviceable parts. Disassembling will void all warranties and may result in damage to the system.

Caution **Check electrical connections.** Verify all electrical connections, particularly for appropriate voltage levels and polarity, signal integrity, and power requirements before applying power to the system. Failure to do so may result in physical damage to the system.

Caution **Keep packaging material.** All packaging materials should be kept to avoid damage to the system through poor packing.

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2.3 Safety

The following information should be read carefully, and understood, before using the StarForm Swift™ camera. The StarForm Swift™ is intended for use by competent personnel who are familiar with the safety precautions required to avoid possible injury. All installation, operation, and maintenance instructions should be read carefully before using the system.

⚠ Caution

Do not stare at the illumination sources for long time periods or from distances closer than 200 mm. The system emits invisible infrared radiation.

⚠ Caution

Do not disassemble the camera housing or optical windows. Disassembly may result in the creation of electrical or radiation hazards.

⚠ Caution

Do not use the camera if the front optical windows show signs of damage. Contact **support@odos-imaging.com** .

⚠ Caution

Consider the environment in which the camera is to be used. Consider the use of optical shielding or eye protection as appropriate.

Caution

Do not exceed environmental specifications as detailed in Section 4 of this document. Additional care must be taken to maintain a reasonable operating temperature. If the system is operated at temperatures higher than the specified range, additional heat dissipation (e.g. heat sinks) should be used.

2.4 Cleaning

Caution

Avoid touching the front optical elements with fingers. Doing so can result in either damage to fragile surface coatings or unwanted optical artefacts.

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3   System Overview

This section provides an overview of the StarForm Swift™ 3D time-of-flight camera. Figure 3.1 provides details on the main components of the StarForm Swift™ camera.

The StarForm Swift™ 3D time-of-flight camera is designed for industrial environments and provides calibrated metric 3D point cloud output, corresponding to each pixel in the image sensor array, together with an active infrared image from the integrated infrared LEDs.
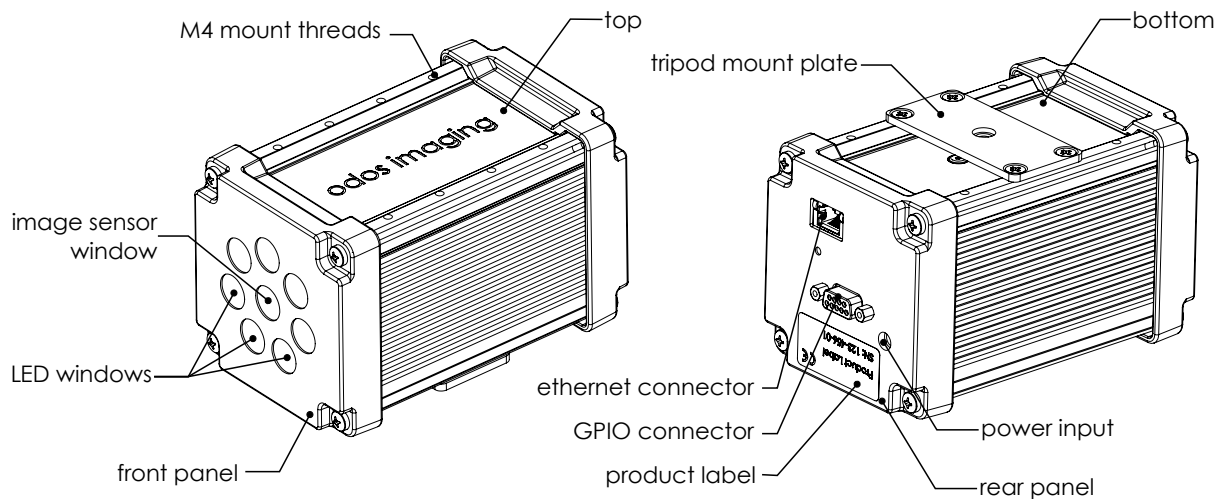

Figure 3.1: Overview of main components of the StarForm Swift™ camera.

The StarForm Swift™ camera uses standard gigabit ethernet for connectivity and requires a single 12 VDC power supply. A robust industrial housing can be further configured by specifying optional tripod mount plates and ruggedized end caps to provide greater protection when the camera is not fixed into single location during use.

3.0.1 Labelling

The StarForm Swift™ camera has a single product label located on the rear housing containing the product serial number, MAC address, and compliance information. Figure 3.2 provides a summary of the information contained on the label.
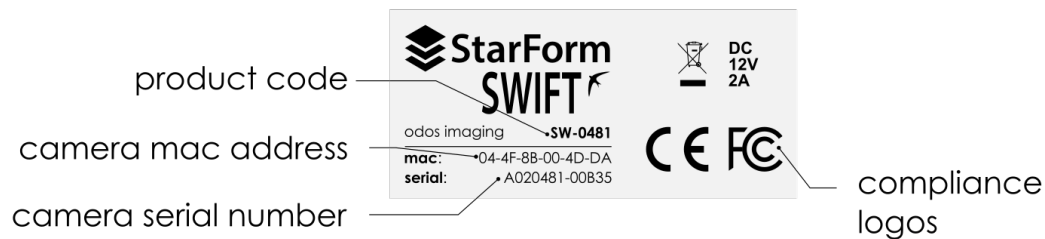

Figure 3.2: Information contained on the product label.

3.0.2 Accessories

The StarForm Swift™ camera is optionally provided with several accessories to enable rapid setup and integration. Available accessories are detailed in the sections below.

Tripod Mount Plate

A custom tripod mount plate can be specified to allow simple connection of the StarForm Swift™ camera to standard tripods. This mount plate attaches to the base of the camera and provides a standard 1/4" x 20 UNF tripod thread.

AD/DC Power Supply

A 12 VDC, 5A, 60–65 W IEC AC/DC switch mode desktop power supply can be specified to provide power to the StarForm Swift™ camera.

Ruggedized Endcaps

Ruggedized silicone endcaps are provided to increase protection for the StarForm Swift™ camera in harsh or testing environments.

Figure 3.3: Optional tripod mount plate.

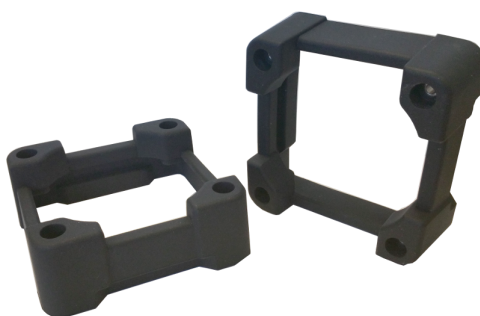Figure 3.4: Optional AC/DC desktop power supply.

Figure 3.5: Optional silicone endcaps for ruggedization.

Ethernet Cable

A 2 m Cat 6a SIFTP shielded gigabit ethernet cable can be used to connect the StarForm Swift™ camera to any suitable PC or network port.

Figure 3.6: Optional ethernet cable.

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4   Specifications

This section details the specification of the StarForm Swift™ 3D time-of-flight camera.

4.1   StarForm Swift™ 3D Time-of-Flight Camera

Parameter	Specification
Image Sensor Resolution	640 × 480 pixels
Lens	Internal fixed focus, 4.5 mm focal length
Field-of-View	43° × 33° (H × V)
Data Output	Range / Active Infrared / 3D Point Cloud [a]
Range Data Bit Depth	16 bit
Acitve IR Data Bit Depth	12 bit
Range Precision	up to 10 mm (1 σ)
Operating Range	0 – 6 m
Mass	950 g
Operating Temperature	-20°–50°
Storage Temperature	-20°–60°
Hardware Interface Standard	GigE Vision
Standards Compliance	CE, RoHS (2011/65/EU)
Power Requirement	12 VDC
Power Consumption	20 W (typical)

Table 4.1: StarForm Swift™ 3D time-of-flight camera specifications.

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[a] range is converted to (x,y,z) format through SDK function on PC

5 Dimensions

The following sections provide mechanical dimensional information for the StarForm Swift™ 3D time-of-flight camera.

5.1 StarForm Swift™ 3D Time-of-Flight Camera

Figures 5.1–5.3 provide critical mechanical dimensions for the StarForm Swift™ camera in various configurations.

Note **All dimensions are provided in millimetres, with the exception of the tripod thread contained on the optional mount plate.**

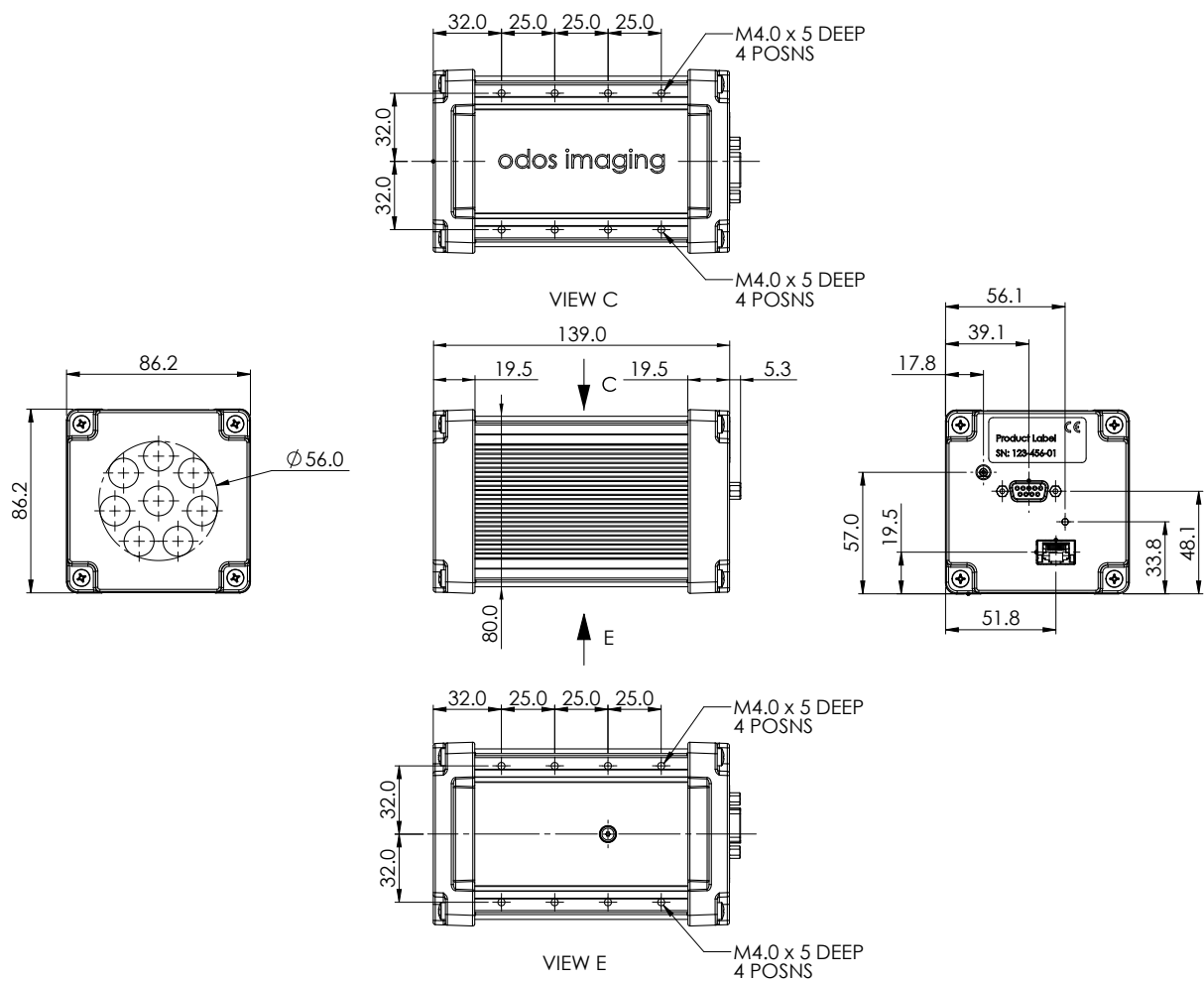### 5.1.1 StarForm Swift™ Base Configuration

VIEW C

VIEW E

Figure 5.1: Mechanical dimensions of the base StarForm Swift™ camera model.

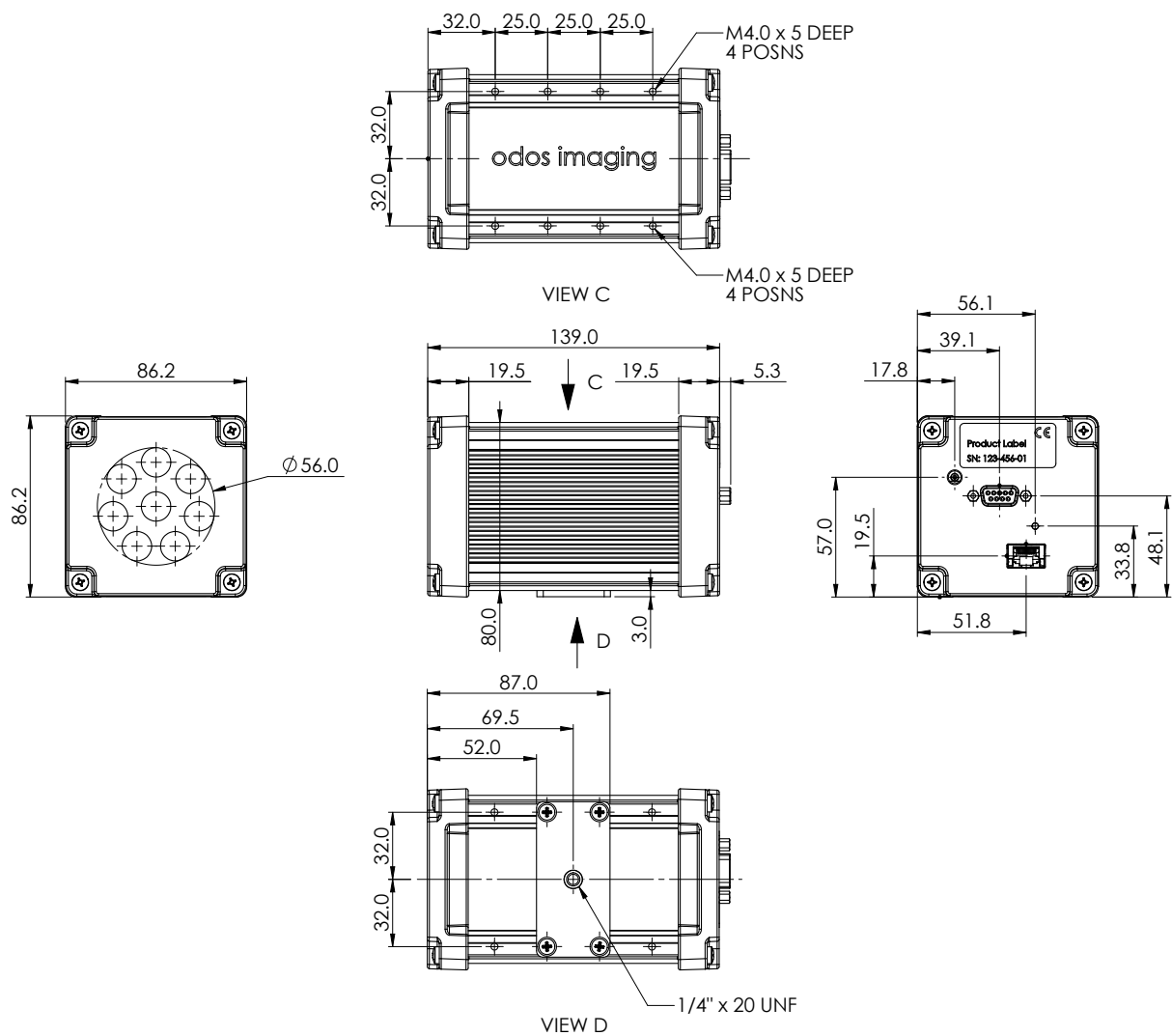### 5.1.2 StarForm Swift™ Optional Tripod Mount Plate

Figure 5.2: Mechanical dimensions of the base StarForm Swift™ camera model fitted with optional tripod mount plate.
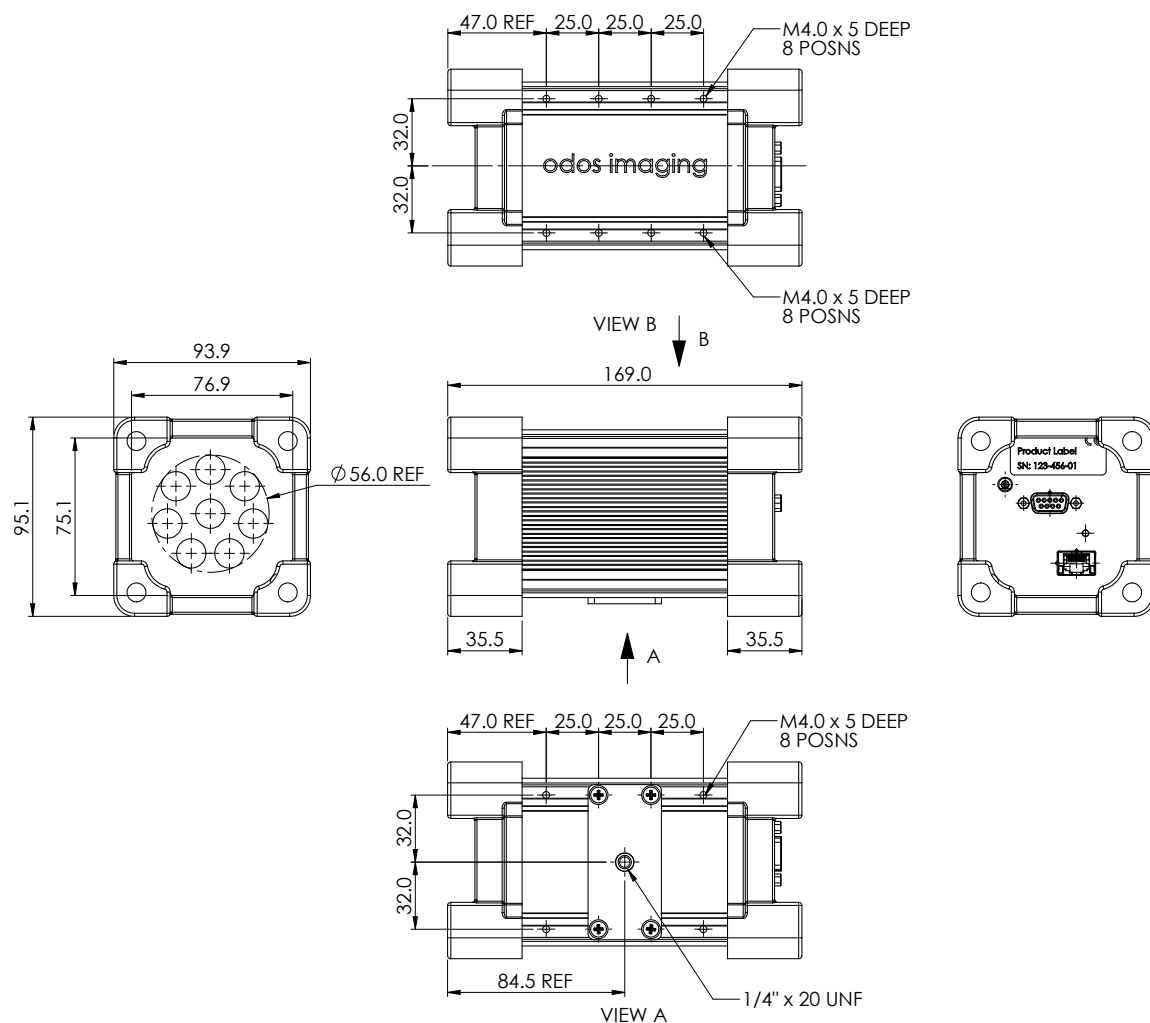
5.1.3 StarForm Swift™ Optional Ruggedization

Figure 5.3: Mechanical dimensions of the StarForm Swift™ camera model fitted with ruggedized end caps.

6   Interfaces

This section provides information on the interfaces present in the StarForm Swift™ 3D time-of-flight camera.

6.1   StarForm Swift™ Camera Interfaces

Figure 6.1 provides a summary of the interfaces present on the StarForm Swift™ time-of-flight camera. Each interface is noted in the sections below and in Table 6.1.
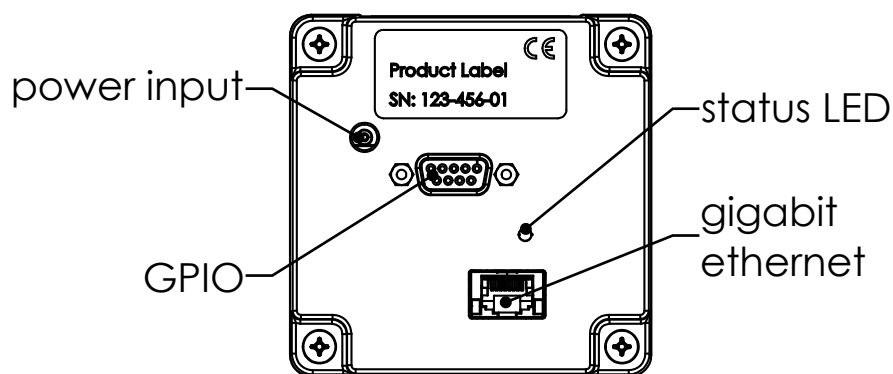

Figure 6.1: Overview of the interface present on the StarForm Swift™ camera.

6.1.1   StarForm Swift™ Camera Power

The StarForm Swift™ 3D time-of-flight camera is powered through a single 12 VDC power connector (Multicomp MJ-179PH Jack Socket), The StarForm Swift™ camera is optionally provided with a 12V, 5A, 60–65 W, switch mode desktop power supply for powering the camera from a mains electricity source.

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Interface Name	Purpose
Gigabit Ethernet Port	interface to host PC
Camera Power Input	main power supply
General Purpose IO	external synchronisation and trigger functions
Status LED	provides indication and status information to user

Table 6.1: Summary of interface names and functions.

6.1.2 Camera Status LEDs

The StarForm Swift™ camera incorporates a single status LED on the rear panel as shown in Figure 6.1. The LED provides information to the user regarding the internal operation and status of the camera. Table 6.2 provides the an overview of the meaning for each state of the LED during startup and operation.

Camera Status LED	StarForm Swift™ Camera Status
Startup	
off (10 s)	initial boot of camera system
red (16 s / 45 s)	hardware configuration and test (longer time of 45 s required if no DHCP server present)
solid red	boot failure [power cycle camera to redress error]
white (1 s)	successful hardware configuration
flashing blue (3 s)	firmware configuration
Operation	
solid blue	system is awaiting connection
solid green	system is connected to a PC
flashing green	system is streaming data

Table 6.2: Possible StarForm Swift™ camera status LED states and interpretation during startup and operation.

6.1.3 Gigabit Ethernet Port

The StarForm Swift™ camera uses a GigEVision compliant gigabit ethernet port for transfer of image data and configuration of the camera. The gigabit ethernet port incorporates two status LEDs. Table 6.3 provides the meaning for different states of the LEDs.

6.1.4 General Purpose Input/Output

The StarForm Swift™ camera incorporates a single General Purpose Input Output (GPIO) interface, to allow the user access to

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LED	State/Colour	Status
GigE LED0	flashing/solid orange	ethernet activity
GigE LED1	flashing green	system is powered
GigE LED1	solid green	link to host established

Table 6.3: Possible gigabit ethernet LED states and interpretation.

various trigger inputs, strobe outputs, and synchronization capabilities. The specific configuration and pinout of this port is adjusted on a custom basis. Please contact **support@odos-imaging.com** for further details.

7 Appendices

7.1 Additional Documentation and Resources

7.1.1 GNU General Public Licence Notice

The software included in the StarForm Swift™ product contains copyrighted code that is licensed under the GPL. You can get more information about the GNU GPL at the GNU Project home page at `https://www.gnu.org`. You may obtain the complete Corresponding Source code for these GPL portions from us for a period of three years after our last shipment of this product, which will be no earlier than 2020-08-31, by contacting us at `support@odos-imaging.com` (there may be a small charge to cover costs of distribution).

This offer is valid to anyone in receipt of this information

8 Document History

Date	Version	Changelog
18.11.2016	0.1.0	Internal release
19.12.2016	1.0.0	External release
27.04.2017	1.0.2	Updated for IEC62471 variants
15.08.2017	1.0.3	Added GPL notice

Manual Build: d199825b287edc289bc6ec13eab0a9e48203920f