

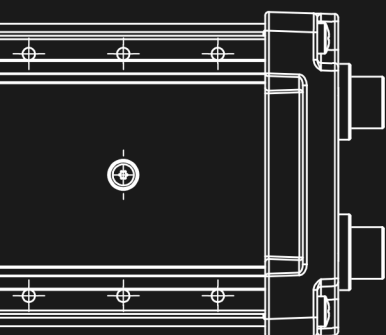
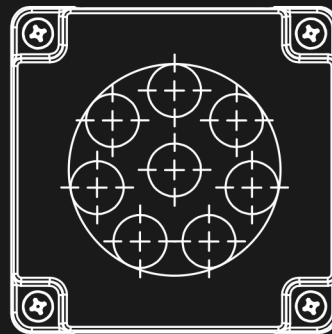
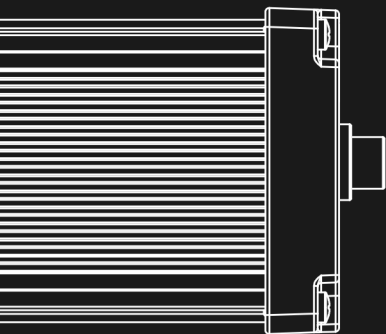
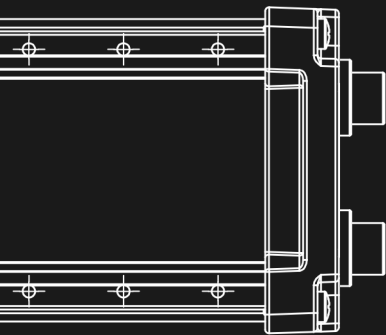


# Swift-E Reconfigurable 3D Sensor

Catalog Number OI-E1480

## User Manual

OIE1-UM001C-EN-P, July 2021



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# 1 Preface

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Industry is evolving. Consumer expectations for personalization have resulted in a growing demand for greater product variability, ultimately driving the need for more flexible manufacturing and increased spatial awareness. The new Swift-E is a fully reconfigurable 3D sensor that enables machine builders and production plants to adapt to new market trends. The capability to adapt to changing products or conditions makes Swift-E an ideal solution for production lines that require high flexibility.

Swift-E includes built-in capability for distance or height measurement with configuration via an easy to use interface that require no additional software. Firmware updates will enable Swift-E to extend its capabilities.

Swift-E integrates quickly and easily with Allen-Bradley® Logix controllers via EtherNet/IP™, providing real-time data access to help maximize productivity and avoid unplanned downtime.

## 1.1 Who Should Use This Manual

This manual is intended for qualified personnel. Familiarity with the Rockwell Automation Studio 5000® environment and EtherNet/IP networking is necessary. Swift-E is an advanced sensor with EtherNet/IP interface using the principle of time-of-flight to measure distance. Refer to product documentation before attempting to use Swift-E devices.

## 1.2 Styles

This manual uses certain typographical conventions in order to maintain an easily accessible and consistent layout. The styles contained in table 1.1 and symbols noted below are used throughout the manual.

**Table 1.1:** Typographical conventions

Style	Function	Example
Bold Font	important information, key words, headings	<b>Bold</b>
Fixed Space Font	IP addresses	192.168.1.40
Boxed Text	Controller Tag	<b>Web.Connect.Enable</b>
Blue Text	Hyperlink	<a href="https://www.odos-imaging.com/">https://www.odos-imaging.com/</a>



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, or have impact on performance. These sections should always be read carefully and understood

## 1.3 Features

Features of Swift-E reconfigurable 3D sensors include:

- Sensing Area of  $640 \times 480$  individual distance points, arranged in a field of view of  $43^\circ \times 33^\circ$
- Capability to add up to 64 user-defined Virtual Sensing Zones (VSZ) per template
- Storage for up to 255 templates (user-defined combinations of VSZs)
- VSZ typical measurement precision of  $\pm 1$  cm
- Operating range from 0.5 — 6 m (Approximately 1.5 to 20 ft)

## 1.4 Warning and Caution Summary



Caution

According to IEC 62471:2006, the light-emitting diodes (LEDs) that are used in the Swift-E are classified as exempt. This classification is considered safe and represents no photobiological hazard. As with any light source, they must be used consistent with their intended use. Do not stare directly at the infrared LED output through the windows on the front of the device.

## 1.5 Device Maintenance

Swift-E contains no user serviceable parts. Opening or dismantling the device will invalidate warranty, and will break on board calibration.

If required, the windows on the front of the device may be gently cleaned with a microfiber or lint free cloth and distilled water.

## 1.6 Additional Resources

Resource	Description
<a href="#">OI-E1480 Installation Instructions</a>	Provides detailed information on the physical installation of Swift-E devices
EtherNet/IP Network Devices, publication <a href="#">ENET-UM006</a>	Manual describing connection of EtherNet/IP communication modules in Logix 5000 control systems
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system
<a href="#">Link to Product Certification website</a>	Provides declarations of conformity, certificates, and other certification details

## 1.7 Contact Details

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	<a href="https://rockwellautomation.custhelp.com/">https://rockwellautomation.custhelp.com/</a>
Local Technical Support Phone Numbers	Locate the phone number for your country.	<a href="http://www.rockwellautomation.com/global/support/get-support-now.page">http://www.rockwellautomation.com/global/support/get-support-now.page</a>
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	<a href="https://www.odos-imaging.com/literature/">https://www.odos-imaging.com/literature/</a>
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	<a href="http://www.rockwellautomation.com/global/support/pcdc.page">http://www.rockwellautomation.com/global/support/pcdc.page</a>

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## 2 Introduction

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### 2.1 Device Summary

Swift-E is a reconfigurable 3D sensor. It uses time-of-flight technology to measure the distance to each and every one of  $640 \times 480$  individual distance points within the sensing area (over 300,000 points in total).

The **Web Connect** interface allows creation of arbitrary shaped selections of distance points - each selection of points is called a **Virtual Sensing Zone (VSZ)**. Virtual Sensing Zones are arranged on a **template**. Templates can be defined either as a distance templates or height templates. Swift-E measures either the mean distance to each VSZ, or the mean height measured from the reference (reference is captured during configuration).

Capability to store up to 255 unique templates, each with up to 64 VSZ.

Over EtherNet/IP™ networking, Swift-E delivers the measurement for each VSZ directly into the controller. The controller is able to define which template to use, allowing it to reconfigure the sensing area as required. That is, the controller is able to make decisions based on a user-defined VSZ arrangement.

### 2.2 Quick Start

To prepare the Swift-E reconfigurable 3D sensor to work on an EtherNet/IP network, it is necessary to complete the following steps:

1. Mount the Swift-E (Section 3.4)
2. Connect the power and network cables (Sections 3.1 and 3.3)
3. Ensure computer or laptop has an Ethernet interface configured in the 192.168.1.xx subnet (Section 3.10)
4. Use **Web Connect** interface to configure (Chapter 4)
5. Add the device to a Rockwell Automation Studio 5000® application and connect a Logix 5000™ controller (Chapter 5)

After successfully completing these steps it will be possible to configure Swift-E via a Web Connect browser session, and connect the device to an Allen-Bradley® Logix 5000 controller.

## 2.3 Hardware and Software Compatibility

**Table 2.1:** Firmware Compatibility

Product Catalog No.	Firmware Version / Software Release
OI-E1480	Firmware 1.001 and later

**Table 2.2:** Application Compatibility

Product	Firmware Version / Software Release
Rockwell Automation Studio 5000®	V20 or later
Logix 5000™ Controllers	Any with EtherNet/IP support
RSLinx®	2.56 or later (or FactoryTalk® Linx)
Internet Browser	Any, Tested with Desktop Chrome v80, Mozilla Firefox v74 and Microsoft® Edge v80

## 2.4 Swift-E and Time-of-Flight (ToF) Technology

Swift-E uses time-of-flight technology to measure distance to each and every individual distance point within the sensing area.

The principle of operation is as follows:

1. A very short flash of invisible infrared light (850 nm wavelength) is emitted from the sensor.
2. A small amount of this light is reflected back to the device from objects in the sensing area.
3. A lens focuses light onto the time-of-flight sensor, and the round-trip time is measured. The speed of light is a known constant, and therefore the round-trip distance to the object that reflected the light can be calculated based on the time for the reflected pulse to arrive.



Note

**It is a requirement for Swift-E that light is returned directly from the target object for optimal measurement performance.**

In common with many electro-optic measurement devices, objects that allow infra-red light to: pass through (eg translucent objects like clear glass or plastic bottles), reflect away (mirrored surfaces), or be absorbed entirely (dark matte surfaces) may prove challenging. In case of such challenging objects, an alternative method of distance measurement should be employed.

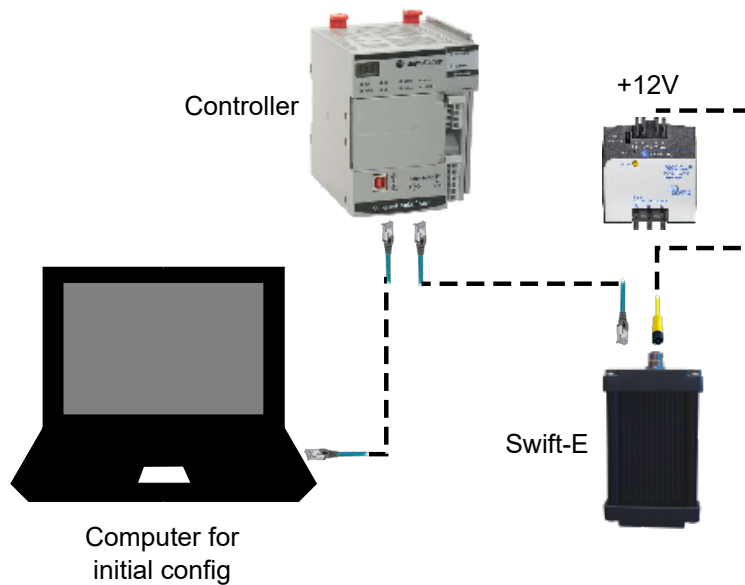
### 2.4.1 Effect of Ambient Light

The effect of ambient light from normal indoor lighting sources is not detectable in the measurement provided by Swift-E .

However, in some cases, direct sunlight on the sensing area may introduce an error in the measurement. For installations where measurement accuracy is critical, and there is a chance of direct sunlight, then it is recommended that a shade is introduced.

Where there are multiple Swift-E devices in the same area, care should be taken that the sensing areas are well separated to avoid cross-talk between the devices. In these situations, it may be possible to pause the illumination while a device is not actively measuring (see section 5.3.2 for more details).

## 2.5 Example System Setup



## 3 Installation

### 3.1 Connections

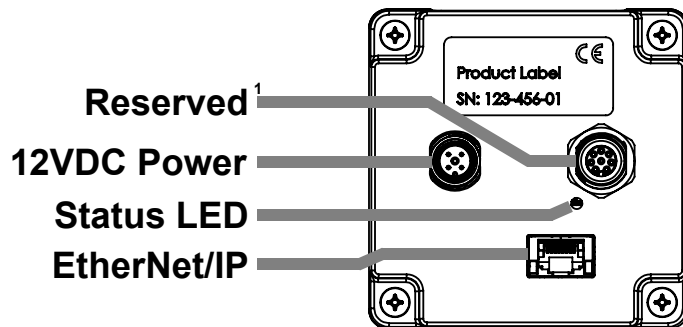
The sensor should be powered with an industrial 12 V / 5 A (min) DC power supply via the 4-pin M12 power connector (figure 3.1 and table 3.1). EtherNet/IP™ connection to host is via RJ45.



Caution

**IMPORTANT: Swift-E requires a 12 VDC power supply.**

Figure 3.1: Sensor connections

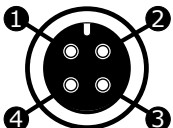


1. Reserved for future use.

Table 3.1: M12 Power connector on device

Face View of Male DC Micro	Pin	Signal / Receiver
	1	Not Connected
	2	12 VDC
	3	GROUND
	4	Not Connected

**Table 3.2:** M12 Power cable connections

Face View of Female DC Micro	Pin / Color	Signal / Receiver
	1 / Brown	Not Connected
	2 / White	12 VDC
	3 / Blue	GROUND
	4 / Black	Not Connected

### 3.2 Grounding and Power Requirements

The GROUND / 0 V / negative power input to the Swift-E should normally be connected to earth ground. It is directly connected to the metal housing of the Swift-E for shielding purposes, as well as the shells of all connectors. If there is a concern for ground loops in the application, it is recommended to keep the connection from the power supply to Swift-E short, and consider disconnecting the shield of the Ethernet cable at the opposite end, if the connected equipment also has a low-ohmic d.c. connection to ground. If there is a suspicion of noise problems in operation, besides keeping power cables short, and using shielded cables where possible, clip-on ferrites applied near the Swift-E unit can be a simple and cost-effective solution.

To ensure stability is provided in the 12 VDC supply to Swift-E , it is recommended that both +12 VDC and ground are connected directly to the power supply. Power requirements for Swift-E may vary based on the illumination settings, in addition there can be a requirement to support up to 50% inrush on power-up, it is therefore recommended that a power supply of sufficient rating is used (60 W or greater), for example, the Allen-Bradley® 1606–XLP90B power supply.

It may also be useful to refer to Rockwell Automation Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

### 3.3 EtherNet/IP wiring



Caution

**To comply with the limits for a Class A digital device pursuant to Subpart J of Part 15 of the FCC Rules, it is required that a shielded ethernet cable is used.**

A suitable gigabit Ethernet cable (e.g. CAT5E or CAT6) must be used with Swift-E . For best immunity to RFI in noisy environments, and to minimize any radiated RF emission from the unit, a shielded Ethernet cable (e.g. S/FTP type) is recommended, and may be required for compliance with EMC regulations in some cases. A range of suitable cables is available from Allen-Bradley (<https://ab.rockwellautomation.com/Connection-Devices/RJ45-Network-Media#selection>).

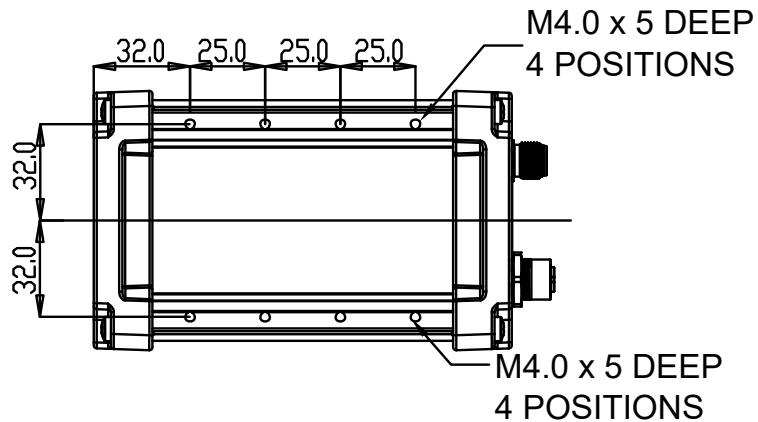
It may also be useful to refer to the [ODVA EtherNet/IP Media Planning & Installation Manual](#).

### 3.4 Mounting

Swift-E supports two different methods of mounting:

1. The sensor has sixteen M4 threaded screw holes for flexible attachment to a structure (figure 3.2)
2. An optional tripod mount plate accessory (part number: OI-TMOUNT) can be ordered. The mount plate offers a standard 1/4" UNC tripod thread for attaching to any standard camera mounting device.

**Figure 3.2:** Location of M4 mounting points (distances in mm)



For initial evaluation, the Swift-E can be mounted using a flexible approach (e.g. clamp or camera grip) and the tripod mount accessory (OI-TMOUNT), as this will allow optimization of the setup.

For permanent mounting, use of a custom mount is recommended. This can be appropriately designed to provide a robust solution according to the application requirements. Direct mounting onto a metal structure will also assist with dissipation of heat from the Swift-E housing. Note that the housing may become warm or even hot to touch - this is perfectly normal.

CAD files are available for download from <https://www.odos-imaging.com/literature/>.

### 3.5 Height Requirements and Field-of-View

When positioned perpendicular to a surface, the Swift-E sensing area is a rectangle. The width of the rectangle is approximately  $0.8 \times$  height from Swift-E to surface. The height of the rectangle is approximately  $0.6 \times$  height from Swift-E to surface.

Due to optical limitations, measurement reliability in the center will be better than at the extremities and corners of the sensing area.

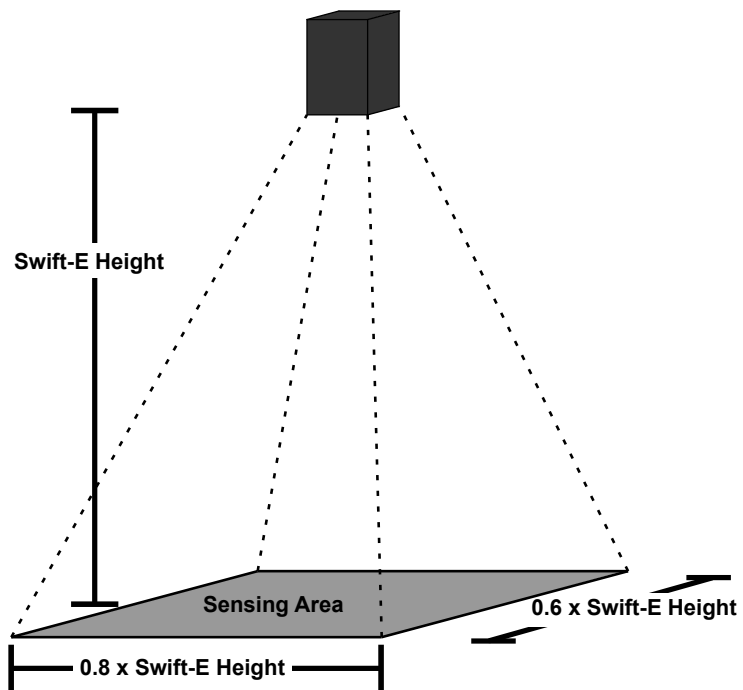
**Table 3.3:** Size of sensing area with increasing installation height. Optimal measurement performance is achieved with closer positioning.

Installation height	Sensing area		Min. recommended detectable object area <sup>1</sup>
	width (approx.)	height (approx.)	
0.5 m	0.4 m	0.3 m	0.5×0.5 cm
1.0 m	0.8 m	0.6 m	1.0×1.0 cm
1.5 m	1.2 m	0.9 m	1.5×1.5 cm
2.0 m	1.6 m	1.2 m	2.0×2.0 cm
2.5 m	2.0 m	1.5 m	2.5×2.5 cm
3.0 m	2.4 m	1.8 m	3.0×3.0 cm
4.0 m	3.2 m	2.4 m	4.0×4.0 cm
5.0 m	4.0 m	3.0 m	5.0×5.0 cm
6.0 m	4.8 m	3.6 m	6.0×6.0 cm

1. Minimum recommended detectable object area is based on the ability to accurately position a Virtual Sensing Zone consisting of 8×8 individual distance points using zoom feature in **Web Connect** (section 4.10.3).
2. Maximum operating range is 6 m (approximately 20 ft), however at longer operating ranges (greater than 3 m or 10 ft), quality of measurement may be reduced.

In summary, the greater the distance between Swift-E and target objects, the larger the **sensing area**. This is depicted in figure 3.3.

**Figure 3.3:** Height requirements - note the pyramid shape with sensing area at base



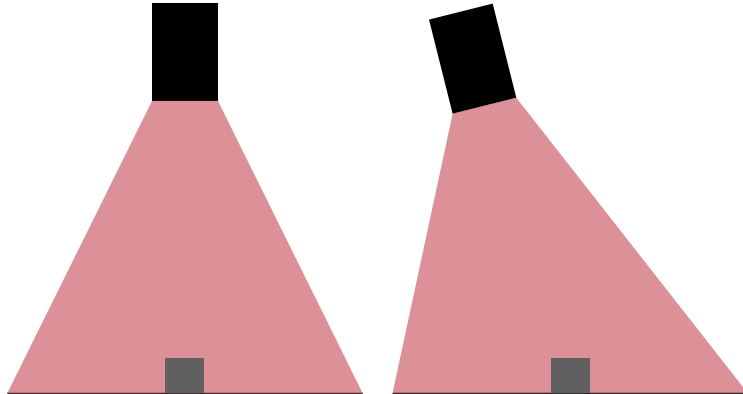


Note

**Illumination may 'spill' beyond this area, therefore care should be taken if Swift-E devices are to be positioned in proximity to each other.**

## 3.6 Device Positioning

**Figure 3.4:** Example mounting options



Swift-E should be mounted no closer than 0.5 m (approximately 1.5 ft) to the target object(s). Maximum operating range is 6 m (approximately 20 ft), however at longer operating ranges (greater than 3 m or 10 ft), quality of measurement may be reduced.

In general, the sensor can be mounted using the most suitable method for the application. In some circumstances (particularly with highly reflective target objects) signal light generated by the sensor may be reflected directly back to the device (which can cause saturation of the time-of-flight measurement - section 4.10.11). In such situations, it may be necessary to mount the device at a slight angle (e.g. 10°) with respect to the target objects.

Further consideration may have to be taken due to changes in the measurements as a result of the change in application geometry (that is, any target plane will be at an angle with respect to the Swift-E - in these applications it may be most useful to use **height** based templates - section 4.10.10).

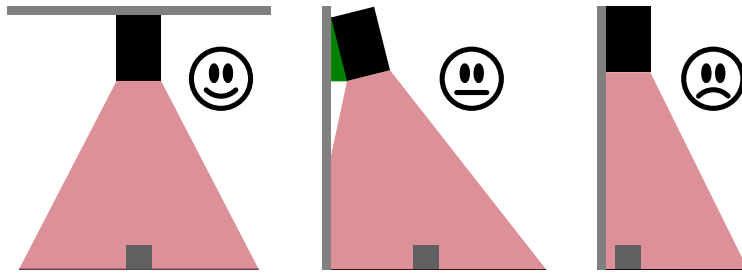
### 3.6.1 Optimal Mounting Configurations

Any unwanted material or object that is within the field-of-view of Swift-E (where the sensing area is the base of a pyramid shape) can cause unwanted reflections to occur, potentially introducing error to the measurement.

If possible, no objects other than the target objects and background should be within the pyramid. If this is not possible, then ensure any large objects are fixed, and use height templates where possible.



**Figure 3.5:** Ensure mounting avoids possibility for unwanted reflections



## 3.7 Object Shadowing

Like many optical sensors, objects closer to Swift-E can block the view of objects further away, preventing possibility of a measurement from the more distant object. Similarly, objects on the same plane, and close to the external border of the sensing area may produce a shadow over smaller objects further towards the extremity.

## 3.8 Object Parameters

### 3.8.1 Size

Consideration should be taken with regard to the size of the object to be measured. Small objects might present challenges even at short distances. In general, the larger the object, the easier it will be to create proper VSZs and for Swift-E to make accurate measurements. If the size of the object is such that it requires very small VSZs, the number of individual sensing points to be used for the measurement will be low and the quality of measurement may be compromised. Even if an object is large, mounting Swift-E too far away could result in small VSZ, therefore running into the same challenge. Minimum detectable object areas are shown in table 3.3. The larger the VSZ over the object, the more accurate the measurement.

In presence or absence applications, for optimal reliability it is recommended that a measurable difference of 3 — 4 cm is allowed between the object surface (present state) and the surface from where the object needs to be discerned - the background (absent state).

### 3.8.2 Motion

Swift-E is also suitable for use in applications where the objects are moving (e.g. conveyor belts). However, in these applications, there are several considerations:

1. The size of the object will affect the capability of Swift-E to measure while it is moving. The larger the object, the smaller the impact of movement on the object.
2. The speed of movement will have an impact on the timing of the measurement. Since this is strongly dependent on each particular

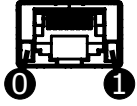
situation, we recommend the use of a variable timer to control the time between object detection (e.g. using a photoelectric sensor) and measurement trigger. In many cases, Swift-E is capable of measuring objects moving at average conveyor belt speeds (around 1 m/s or 200 ft/min). Measurement or detection of faster objects may be more reliable if the Swift-E can be positioned further from the belt (effectively slowing the lateral speed of the object across the sensing area).

3. It may also be possible to develop a template and a controller program to allow Swift-E to self trigger (that is, for the controller to select a particular template, based on the result of a measurement change identified in another template - this will require some custom code in the controller).
4. In some cases, patterned or textured objects can be more difficult for Swift-E to measure accurately when moving. In this case, it is recommended to configure the VSZ on an area of the object that is uniform, if possible (e.g. for a moving carton, configure the VSZ on a blank area, not on any label or logos).

### 3.9 Status Indicators

Swift-E has a single, multicolor Status LED on the rear of the housing plus dual communication status LEDs at the bottom of the RJ45 Ethernet connector.

**Table 3.4:** Possible gigabit Ethernet LED states and interpretation.

Face View of RJ45 connector	LED	Color	Status
	LED0	flashing/solid orange	Ethernet activity
	LED1	flashing green	system is powered
	LED1	solid green	link to host established

**Table 3.5:** Status LED states and interpretation during startup and operation.

Sequence	Status LED	Sensor Status
Startup	off (15 s)	initial boot of device
	green (0.5 s), red (0.5 s) then green	power up sequence
	solid red	boot failure [power cycle device to attempt to redress error]
	solid blue	boot failure [power cycle device to attempt to redress error]
Operation	flashing blue	device powered up in out-of-box condition <sup>1</sup>
	flashing green	device started and <b>Edit Mode</b> is enabled, device available for configuration. See section 4.5 for more detail.
	solid green	device started and running
	flashing red	major recoverable fault
	solid red	major unrecoverable fault

1. Out-of-box condition means IP address is default (192.168.1.40), and no password has been set on the device. Opening the **Web Connect** interface will require the user to set a password).

## 3.10 Network Setup

### 3.10.1 IP Address and Subnet

When connecting with a Swift-E device for the first time, it is necessary that the computer is on the same subnet as the device. Swift-E ships by default with the following configuration:

- IP Address: 192.168.1.40
- Subnet: 255.255.255.0



Note

**Swift-E can only be used with static IP addressing. Neither BOOTP or DHCP protocols are supported.**

The IP address identifies each node on the Ethernet network (or system of connected networks). Each TCP/IP node on a network must have a unique IP address.

The IP address is 32 bits long and has a Net ID part and a Host ID part. Networks are classified A, B, C, or other. The class of the network determines how an IP address is formatted.

It is possible to distinguish the class of the IP address from the first integer in its dotted-decimal IP address as follows:

**Table 3.6:** Classes of IP Address

Range of First Octet	Class
0 . . . 127	A
128 . . . 191	B
192 . . . 223	C
224 . . . 255	Other

Each node on the same logical network must have an IP address of the same class and must have the same Net ID. Each node on the same network must have a different Host ID thus giving it a unique IP address.

IP addresses are written as four decimal integers (0 . . . 255) separated by periods where each integer gives the value of one byte of the IP address.

### 3.10.2 Gateway Address



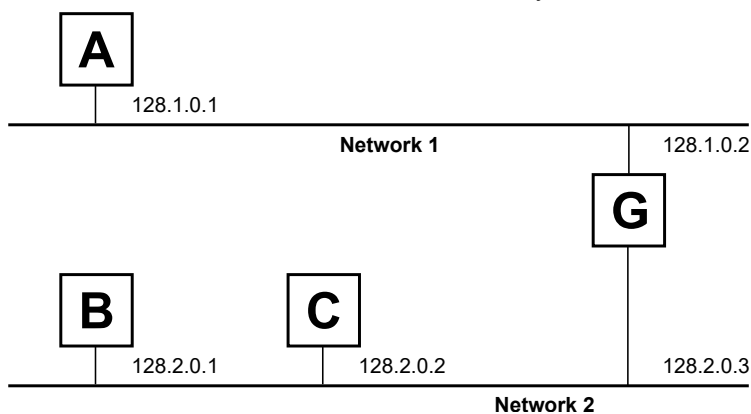
Note

**If the controller in use, Swift-E and computer are all on the same network, skip this section.**

This section applies to multi-network systems. The gateway address is the default address of a network, it provides a single domain name and point of entry to the site. Gateways connect individual networks into a system of networks.

When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks. Figure 3.6 shows gateway G connecting Network 1 with Network 2.

**Figure 3.6:** Two Network Connection with Gateway G



When host B with IP address 128.2.0.1 communicates with host C, it knows from C's IP address that C is on the same network. In an Ethernet environment, B then resolves C's IP address into a hardware address (MAC address) and communicates with C directly.

When host B communicates with host A, it knows from A's IP address that A is on another network (the net IDs are different). In order to send data to A, B must have the IP address of the gateway connecting the two networks. In this example, the gateway's IP address on Network 2 is 128.2.0.3.

The gateway has two IP addresses (128.1.0.2 and 128.2.0.3). The first must be used by hosts on Network 1 and the second must be used by hosts on Network 2. To be usable, a host's gateway must be addressed using a net ID matching its own.

### 3.11 Establishing a Web Connect Session With Swift-E

To connect with Swift-E, the Ethernet interface on the host computer must have an IP address within the same subnet. That is, the interface settings in the device should have:

- IP Address: 192.168.1.xx (xx being any number between 0 and 255, except 40)
- Subnet: 255.255.255.0

With network settings correctly configured, opening a browser (Chrome, Edge or Mozilla Firefox recommended) and navigating to the default address (<http://192.168.1.40>) should establish a connection to the device and present the **Web Connect** page.

#### 3.11.1 Reset of Network Settings

If the network settings are lost or forgotten, Swift-E can be reset to default network settings by carrying out a hard reset. A hard reset **removes the password**, and **returns IP address settings to default** 192.168.1.40.

A hard reset is achieved by cycling power to the device 5 times in succession. On each cycle, power must be removed within a specific time window:

- **after** startup (that is, when the status LED initially becomes green)
- **before** 60 seconds after power is applied

If power remains for longer than 60 seconds, then the cycle count is reset. After the 5th power cycle, the Swift-E may take up to 90 s for the **Web Connect** interface to become available.



Note

**A hard reset does not remove any stored templates.**

---

## 4 Configuration of Swift-E with Web Connect

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Note

Swift-E is tightly integrated with the controller mode of operation. For simplicity of the first time configuration, it is highly recommended that Swift-E is NOT connected to a controller.

### 4.1 First Time Login

When connecting to the device for the first time (or after a password reset function), it is necessary to create a new password. The password can be of any length between 0 and 64 characters and it may contain any character.



Caution

Be sure to safely note the password used.

Figure 4.1: First-time login

odoss imaging  
A Rockwell Automation Company

Swift-E Reconfigurable 3D Sensor

Create Password

Enter New password

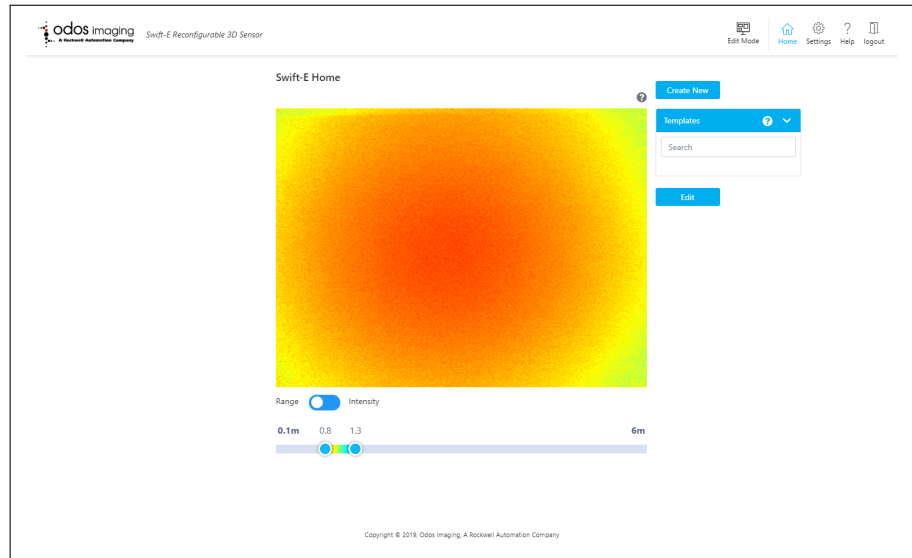
Confirm New Password

Log in

Enter a password (confirming it in the second box) and select **Log in**.

Once logged in, the **Home** page will be presented (figure 4.2). The top bar is common to all the pages in the application.

**Figure 4.2: Home page (in Edit Mode)**




If a controller is present in RUN mode and the Swift-E is configured in its I/O tree, then the sensing area may display the text **Waiting for trigger**. In this case, it is recommended that either the controller is placed into **Program** mode, that the `Web.Connect.Enable` bit is set in the **output assembly**, or that the Swift-E is temporarily disconnected from the controller.

#### 4.1.1 Forgotten Password








If the device password is lost, the only way to access the configuration pages is to perform a hard reset. See section 3.11.1 for details.

## 4.2 Contextual Help

Across the application there are several instances of the  icon, clicking on the icon will open a popup with quick contextual help.



## 4.3 Top Bar - Web Connect Mode and Menu

The top bar indicates Web Connect Mode and also functions as a Menu bar. Depending on the state of the controller, and the login authentication, there will be a number of icons visible:



1.  Edit Mode or  Edit Lock .
2.  Home
3.  Settings
4.  Help
5.  logout or  login

The **Edit Mode** and **Edit Lock** icons are particularly important - indicating **Web Connect** mode. Depending on Web Connect status, certain functions may or may not be available.

### Edit Mode

- In  Edit Mode , Swift-E can be configured, and templates can be created and edited.
- To enable  Edit Mode , authentication is required (that is, password has been entered in the **Login** page) AND the device is either disconnected from a controller OR if connected, the controller is in PRO-GRAM mode OR in RUN mode AND `Web.Connect.Enable` is set.

### Edit Lock

- In  Edit Lock , Swift-E is in a read-only mode, and can be monitored over **Web Connect**, but not configured.
- If  Edit Lock is displayed, the controller is connected and in RUN mode and `Web.Connect.Enable` is not set.

Web Connect Modes are explained in more detail in the section 4.5.

## 4.4 Swift-E Mode of Operation

Depending on controller state and the state of the `Web.Connect.Enable`, Swift-E will operate in either a free-running (continuous measurement) mode, or will respond to `Trigger` (see section 5.3.2).

- In free-running mode, VSZ measurements on the active template are continuously delivered to the controller
- In triggered mode, VSZ measurements will be delivered only in response to receipt of a `Trigger` request from the controller



These modes are shown in table 4.1.




**Table 4.1:** Swift-E Mode of operation

Controller State	Web.Connect.Enable	Swift-E Mode of Operation
PROGRAM or DISCONNECTED	0 or 1	Free-running
RUN	0	Triggered
	1	Free-running

## 4.5 Web Connect Mode of Operation

The level of interaction via the **Web Connect** interface that is possible with the device depends on a number of factors: controller state, authentication state and **Web.Connect.Enable** state.



**Table 4.2:** Web Connect Mode of Operation

Controller State	Web.Connect.Enable	Authentication State	Web Connect Mode
PROGRAM or DISCONNECTED	0 or 1	Authenticated	 Edit Mode
		Not Auth	No access
RUN	1	Authenticated	 Edit Mode
		Not Auth	No access
	0	Auth Bypass	 Edit Lock




Caution

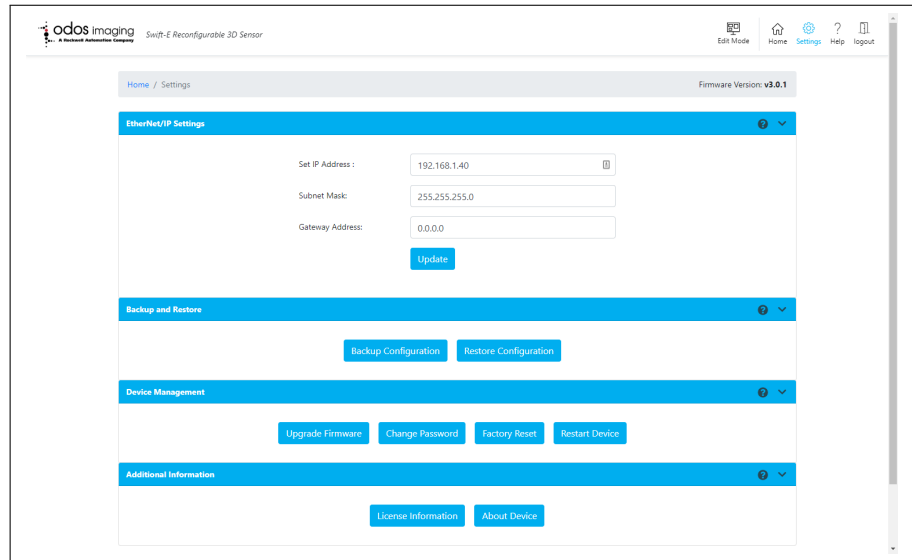
Changing controller state, or **Web.Connect.Enable** status when authenticated, may force the device

from  Edit Mode to  Edit Lock. Exercise caution when changing either of these, as this may cause loss of work (for example if done while editing a template)

## 4.6 Device Settings Page

To access the device settings, click on the  icon on the right of the top bar. The page shown in figure 4.3 is displayed

**Figure 4.3:** Device **Settings** page



In the top gray bar there is a link to **Home** on the left and the current firmware version of the device on the right.

#### 4.6.1 EtherNet/IP Settings

Preferred IP address, subnet mask and (if required) gateway address can be set here. Select **Update** to confirm.

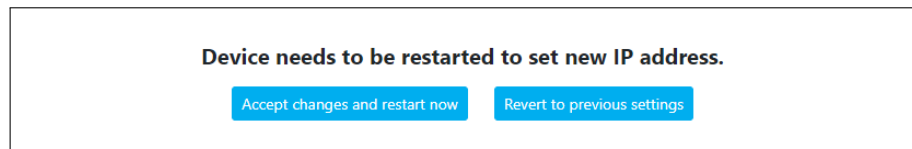


Note

**If no gateway is to be used for the communication of this device with the controller or computer (most common scenario), leave the gateway field set as 0.0.0.0**

Confirm intention to proceed with IP Address change by selecting **Accept Changes and restart now**, this will apply the new IP address and restart the device (IP address change will not take effect until the device is restarted). A link to the new address will be offered upon restart.

**Figure 4.4:** IP address change confirmation request



If **Revert to previous settings** is selected, then changes will be discarded.

If the EtherNet/IP settings are lost or incorrectly set, the device can be restored to default (192.168.1.40) by performing a hard reset. See section 3.11.1 for details.

## 4.6.2 Configuration Backup and Restore

### Backup

During **Backup**, a file will be created and downloaded to the browser that can be used to restore templates in case of device factory reset or replacement.

1. Click the **Backup Configuration** button.
2. Enter device password when prompted.
3. A backup file is assembled on the device, which may take a few moments (it takes much longer – up to 30s – if there are a large number of templates).
4. The backup file is called `yyyy_mm_dd_hhmm.swiftecfg` and will be downloaded to the default download location defined in the browser settings (typically in the `Downloads` folder for the current user).

### Restore

Note that the **Restore** process does **NOT** update either device password or IP address, but will **REPLACE** any existing templates with those in the backup file being restored.

1. Click the **Restore Configuration** button.
2. Enter device password when prompted.
3. Select the file to be restored in the dialog box. Only files with extension `.swiftecfg` can be restored.
4. The file will be uploaded to the Swift-E and the restoration will initiate (which may take up to 30 s, depending on the number of templates in the file).
5. Swift-E will restart automatically, and the login page will be presented. The restored templates will be shown in the **Template Management** list.

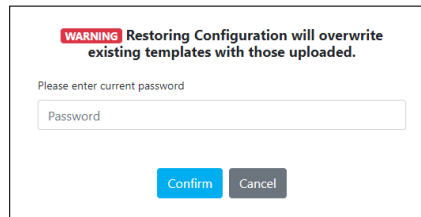


Note

**Due to manufacturing tolerances, there may be slight differences in measurements or lens alignment between devices. It is recommended that after restoration of the configuration from one device into another, that VSZ measurements, alignments and any background are re-validated.**

Only files with extension `.swiftecfg` can be restored.

**Figure 4.5:** Restoring a saved configuration

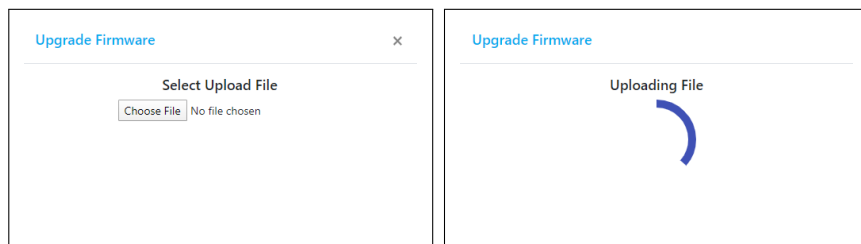


### 4.6.3 Device Management - Firmware Upgrade

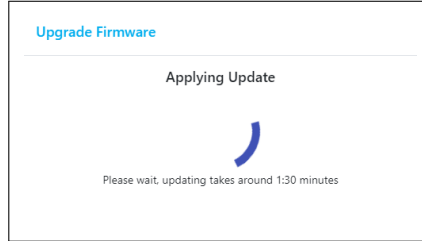
Firmware files are provided by Odos Imaging, are uploaded to the device via this interface. A typical firmware upgrade process follows these steps:

1. Download the latest firmware file from <https://www.odos-imaging.com/downloads/>
2. Click the **Upgrade Firmware** button
3. Enter device password when prompted
4. Click the **Choose File** box (figure 4.6) and select the new firmware file from the download location. Only files with extension .swift can be uploaded. On clicking OK, this will be uploaded to the device (figure 4.7). Firmware files can be more than 40 MB, and may take a few minutes to upload depending on the speed of the Ethernet connection between host computer and Swift-E .
5. When the file has been fully transferred, the upgrade procedure will begin (figure 4.8). The upgrade may complete in a few minutes, but in some circumstances it may require 5 — 10 minutes to complete. **DO NOT TURN OFF THE DEVICE DURING THIS TIME.**
6. When the upgrade procedure has completed (figure 4.9), the device will automatically restart and the login page will be presented.

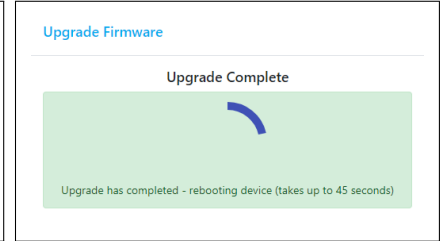
**Figure 4.6:** Firmware upgrade (1)      **Figure 4.7:** Firmware upgrade (2)



**Figure 4.8:** Firmware upgrade (3)



**Figure 4.9:** Firmware upgrade (4)



#### 4.6.4 Device Management - Change Password

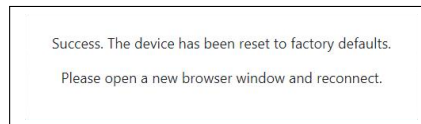
It is possible to change the Swift-E authentication password. Re-authentication is required prior to entering a new password.

#### 4.6.5 Device Management - Factory Reset

It is possible to return all user settings (templates, password and network settings) to factory default. Re-authentication is required prior to initiating a factory reset.

Factory reset requires approximately 45 seconds to complete the reset and restart cycle.

**Figure 4.10:** Confirmation received after factory reset procedure



After the device has restarted, close the current **Web Connect** session, open a new session in a new browser window and navigate to the Swift-E via default IP address (192.168.1.40). Create a new password to login as normal. Refer to section 3.11 for more detail.


#### 4.6.6 Device Management - Restart Device

This function initiates a device restart. Re-authentication is not required. A restart requires approximately 45 seconds to complete, and the interface will automatically return to the login page.

#### 4.6.7 Additional Information

Here, it is possible to view Device License Information. Selecting **About Device** shows detail on Firmware version and build, serial number and hardware ID.

## 4.7 Home Page

After login, the  page is presented. In this page, it is possible to:

- Create new templates
- Edit existing templates
- Delete existing templates



Note

**If a controller is present on the same network, Swift-E is configured in its I/O tree, and the controller is in RUN mode, then the frame may display the text ‘Waiting for trigger’. In this case, it is recommended that either the controller is placed into Program mode, that the `Web.Connect.Enable` bit is set in the output assembly, or that the Swift-E is temporarily disconnected from the controller.**

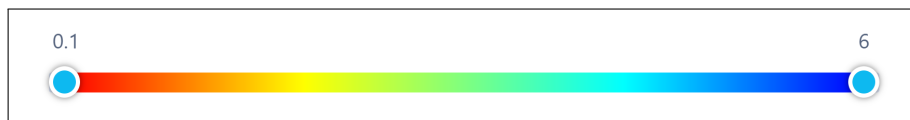
When **Edit Mode** is enabled, the Web Connect Mode icon will be:  Edit Mode . Refer to section 4.5 for more information regarding modes of operation.

### 4.7.1 Range Representation

In the center of the **Home** page, there is a representation of the sensing area. The representation is a realtime view of each individual sensing point measured by Swift-E .

The colors used represent distance from the device to the object in the sensing area (red is closer, blue is farther). The bar in the bottom allows adjustment of the color scale for optimal visibility of the target objects (note that colors do NOT affect the measurement in any way).

**Figure 4.11:** Color scale bar, 0.1 — 6 m



By moving the two controls (low and high limits), it is possible to select the range for which the color scale will be applied.

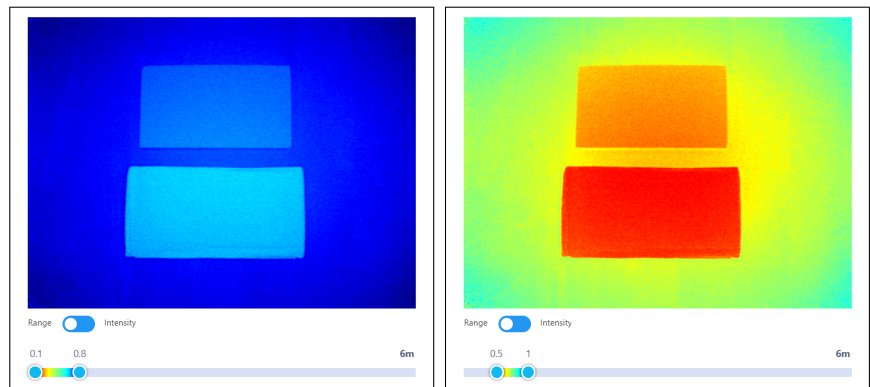


Note

Even with Swift-E pointing directly at a flat surface, colors may change from the center of the representation to the edges. Swift-E measures distance *radially* - that is, the distance to the edge of the representation is farther from Swift-E than the distance to the center. This is shown in figure 4.34.

For example, in the screen captures below (figures 4.12 and 4.13), the left representation shows a range of 0.1 to 0.8 m, while the one on the right a range of 0.5 to 1 m for the same conditions. The narrower the range (within the application needs) the more the variation in color and the more the colors are separated between objects of different distance.

**Figure 4.12:** Case 1 - 0.1 to 0.8 m    **Figure 4.13:** Case 2 - 0.5 to 1 m



Note

**Default values for Color Scale are 0.5 — 3 m. Color scale settings will return to default values each time the Swift-E is power cycled. Colors do not affect the measurement.**

- Any sensing points that are closer than the minimum distance (left slider) will be colored deep red.
- Any sensing points that are further than the maximum distance (right slider) will be colored deep blue.
- Any sensing points that are colored black are either:
  - saturated (see section 4.9.1). Reduce **Illumination Power** to resolve.
  - thresholded out (see section 4.9.2). Reduce **Signal Strength Threshold** to resolve.
  - have received no return light from the object (see section 2.4). Increase **Illumination Power** or reduce **Signal Strength Thresh-**

old (or both), to resolve.

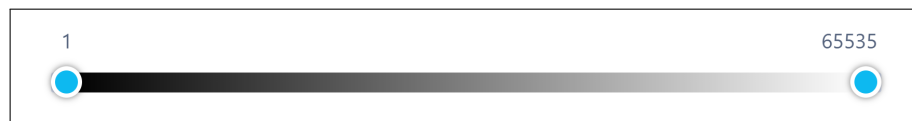
## 4.7.2 Intensity Representation

The **Range / Intensity** switch allows selection between the range (color scaled by distance) or intensity (active infrared) representations.

If **Intensity** is selected, the bottom bar will change to an intensity scale that allows adjustment of the representation for optimal visibility (this adjustment will not affect the measurement).

This is similar to a 'brightness' setting - it is mainly recommended to set the left slide to default minimum value (100), and adjust the right slider until an acceptable intensity representation is achieved.

**Figure 4.14:** Intensity scale bar, 1 — 65535



Note

**Default values for Intensity Scale are 100 to 3000. Intensity scale settings will return to default values each time the Swift-E is power cycled. Intensity (brightness) settings do not affect the measurement.**

**Figure 4.15:** Intensity representation



- Any sensing points that have intensity lower than the minimum intensity (left slider) will be colored black.
- Any sensing points that are colored white may have either:
  - intensity higher than the maximum intensity (right slider).
  - saturated due to too much illumination (see section 4.9.1).



Objects out of measurement range (6 m), but still visible in the intensity representation are illuminated as a result of ambient infrared light. No measurement is possible beyond 6 m.



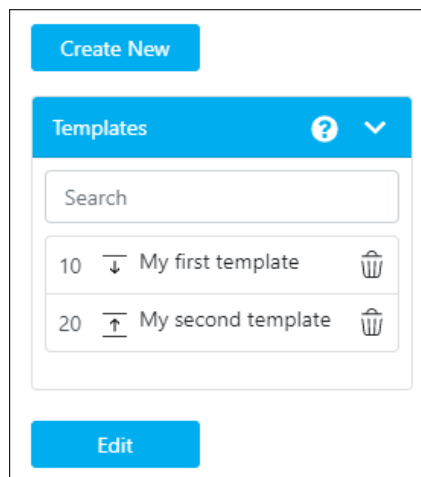
Caution

**While the intensity representation may be useful for accurate positioning of VSZ, the Range Representation gives a better indication of illumination, clearly showing any saturation - see section 4.10.11. It is therefore highly recommended that VSZ configuration is carried out using the Range representation.**

### 4.7.3 Template Management

On the right of the **Home** page, there are a selection of controls for managing Templates:

**Figure 4.16:** Template Management



Select **Create New** to create a new template. When templates are created, they will show in the **Templates** list box. It is possible to filter, select and delete templates from this box. Select **Edit** to edit the currently selected template.



Note

**Templates can be copied by selecting Edit an existing template and saving with a new name (thus leaving original template intact).**

Templates in the list are marked with either a  $\downarrow$  (**Distance** template) or  $\uparrow$  (**Height** template). The **Template ID** is shown in the Template

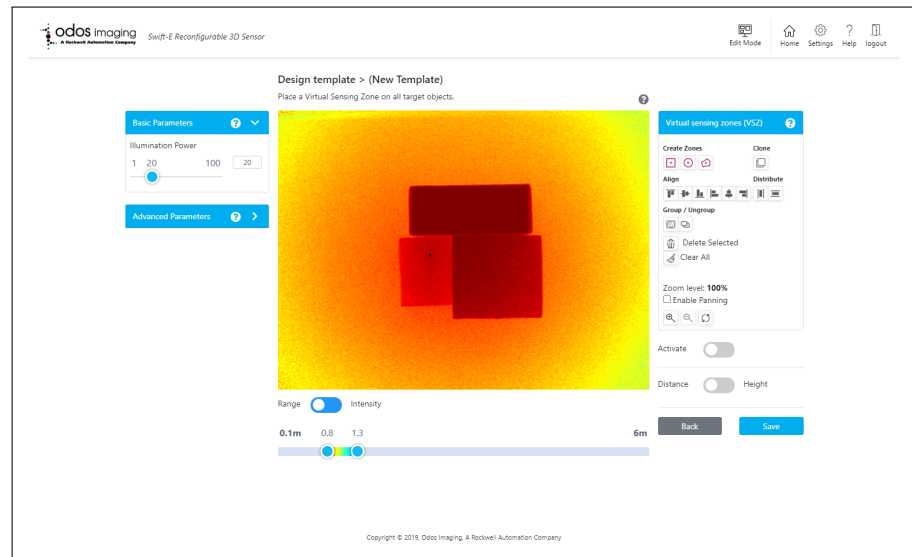
Management box. This is the number that should be set by the controller in the **Template.To.Use** tag to carry out a measurement with that particular template.

## 4.8 Template Editor - Designing or Editing a Template

When **Create New** or **Edit** is selected from the template management area, the **Design Template** page is opened. In this page, it is possible to set acquisition parameters and place Virtual Sensing Zones (VSZ) on the template.

The representation in the center of the page is exactly the same as in the **Home** page, and it is still possible to switch between **Range** and **Intensity** representations and to adjust the color or intensity scale bars.

**Figure 4.17: Design Template page**



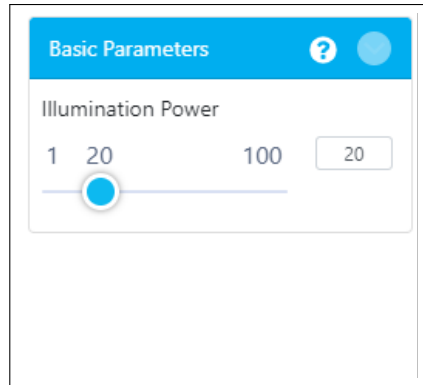
The steps for creating a new **Template** are as follows:

1. Set **Basic** Acquisition Parameters (section 4.9.1)
2. *Optional:* Set **Advanced** Acquisition Parameters (frequently not required) (section 4.9.2)
3. *Optional:* Set upper and lower levels on the **Color Scale Bar** (section 4.7.1)
4. *Extra step for height template:* Remove all target objects, acquire a **Background**, replace target objects (section 4.10.10)
5. Create and place VSZ on the template (section 4.10.2)
6. Save the template (section 4.11)

## 4.9 Acquisition Parameters

On the left of the representation there are **Basic** and **Advanced** acquisition parameter controls for the Swift-E .

**Figure 4.18:** Basic Parameters



**Figure 4.19:** Advanced Parameters



### 4.9.1 Basic Parameters

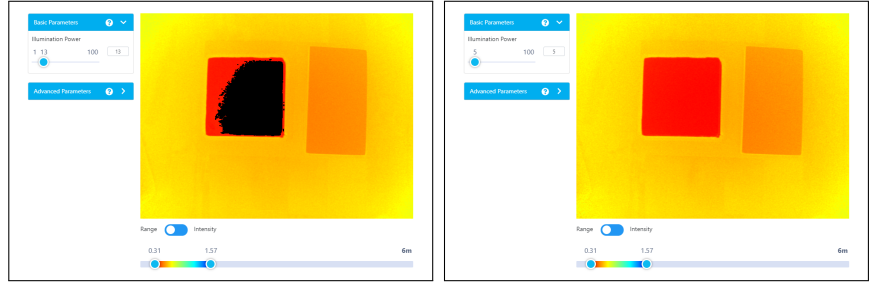
**Illumination Power:** This controls the amount of illumination generated by the device. The higher the number, the more illumination (infrared light used to measure distance) is generated.

At higher levels of illumination (greater than 60), Swift-E will be noticeably hot to touch. It is generally recommended to keep illumination to the lowest acceptable level (avoiding large black areas where the VSZ are to be positioned which indicate where the measurement is 'saturated', meaning there is too much light) that allows target objects to be successfully measured - this ensures device temperature is kept to a minimum, and minimizes chance of causing crosstalk.

Note that the stability of the measurement may improve with increased illumination, therefore in applications where repeatability is an important parameter (for example, measurement or detection of objects under 10 cm) then it is recommended to use higher levels of illumination (but ensure that no part of the target object is saturated).

In the representations below, the object on the left has excessive signal, and is has become saturated (no measurement is possible on black areas of the image). In the right hand representation, illumination has been reduced, and return signal level is acceptable.

**Figure 4.20:** Excessive illumination **Figure 4.21:** Good illumination



Note that illumination cannot be completely disabled. If it is required to do this (eg. to minimize crosstalk between multiple Swift-E sensors), then the `Illumination.Pause` tag can be set in the controller (note requirements for cyclical control of the pause feature in the footnotes of the table in section 5.3.2).

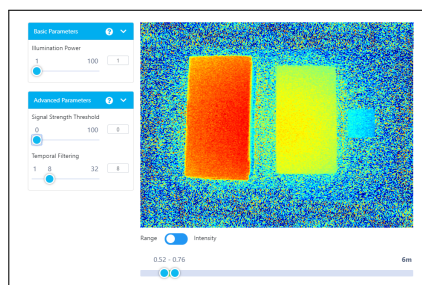
#### 4.9.2 Advanced Parameters

The **Advanced Parameter** box is minimized by default, as most applications should not need to modify these parameters. In applications where optimization of the data acquisition may be required, the following parameters can be adjusted.

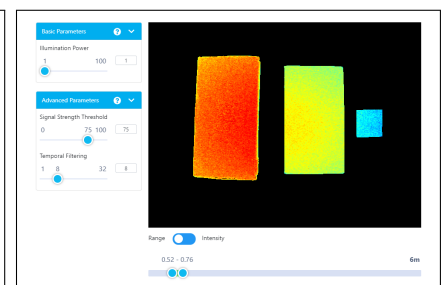
**Signal Strength Threshold:** This parameter controls the filter for distance points with lower signal. (Note that this parameter has **no effect** on the intensity representation.)

Increasing this value increases the minimum signal strength needed for a point to be considered usable. When the value is increased, the result will be black areas appearing in the representation corresponding to the distance points that have been filtered out. Any measurements from VSZ that are entirely black will be out of range (refer to section 4.10.11 for more details on VSZ measurements). By default, this parameter is set to 10.

**Figure 4.22:** Threshold OFF (0)



**Figure 4.23:** Threshold set to 75





Note

### Signal Strength Threshold can help to highlight the object to be measured while eliminating non-relevant data

In figure 4.22, the background area is returning a very limited signal (distance points have many different colors, indicating very wide variability). The introduction of threshold setting of 75 (shown in figure 4.23) completely eliminates all 'noisy' distance points, and the 3x target objects can be clearly identified. This approach may also be useful for presence and absence detection of even very small objects - the small blue square on the right is a single sheet of paper, yet is clearly distinguished from the background - which has been 'thresholded' out.

This is an excellent example of the flexibility of Swift-E in even challenging applications.

**Temporal Filtering:** Swift-E contains very powerful internal processing capability - this processing optimizes measurement quality in static applications. However, the **Temporal Filtering** allows a level of control of this processing, supporting applications where target objects are in motion. Although in practice, the internal filtering is significantly higher performing than a simple temporal filter - control of this has been simplified to a single slider.

Figure 4.24: Temporal Filter Off

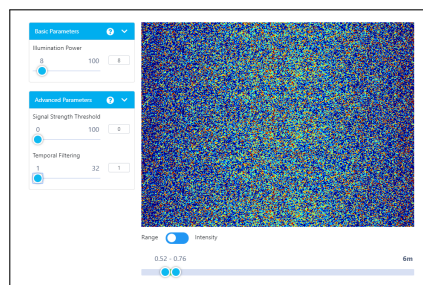
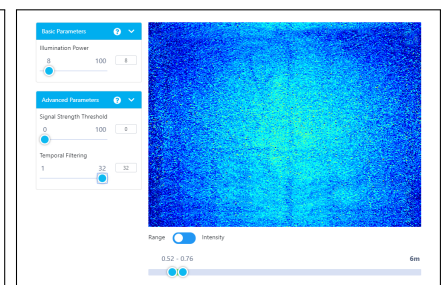


Figure 4.25: Temporal Filter Max



This parameter helps reduce noise in measurements, but with higher values there is a risk for errors in VSZ measurement.

Referring to figure 4.24 temporal filtering is off (set to 1), and the individual distance points are highly variable (in this example, the background is returning a very low level of signal).

In 4.25, temporal filtering has been set to maximum (32), and the colors are more uniform (lighter blue in the center, and darker blue to the corners).

If objects in the sensing area are completely static, then higher numbers increase the filtering (and measurement stability) without affecting performance. For moving objects, setting the filtering too high could result in poor quality measurements. Default value is 8.



Note

**Temporal Filtering can produce a cleaner representation, but at the risk of error in the measurement if the object is in motion. If measuring moving objects, keep this value as low as possible.**

### 4.9.3 Effect on Response Time

#### **Illumination and Signal Strength Threshold Parameters**

Response time (time for data to arrive in controller after receiving a **Trigger**) is ~100 ms. Changing of **Illumination** or **Signal Strength Threshold** parameters will add up to an additional ~100 ms. Therefore, switching between templates that have different parameters could require around ~200 ms from trigger until data is available in the controller.

Swift-E minimum response time (~100 ms) occurs when consecutively triggering with the same template, or when different templates use the **same acquisition settings**.

If the application demands that Swift-E will be rapidly switching between templates, it is highly recommended that all templates are saved with the same acquisition settings. If this is not possible (for example, if the application has large dynamic range requirements), then ensure that sufficient time is allowed for Swift-E to alter the acquisition settings for **Illumination** and **Signal Strength Threshold** (~200 ms minimum, but longer is preferred). Switching too quickly can result in lost measurements and / or reduced measurement accuracy under some conditions. Do not attempt to rapidly switch between templates with different settings for temporal filtering (an unrecoverable error may occur).

#### **Temporal Filtering Parameter**

The Temporal Filtering function has a significant impact on the internal measurement acquisition process. It is therefore **not recommended** to quickly change between templates with different settings for **Temporal Filtering**. If this cannot be avoided, then allow at least 60 seconds for data acquisition to settle after changing **Temporal Filtering**.



Note

**Allow sufficient time in your controller application when switching between templates with different acquisition settings.**



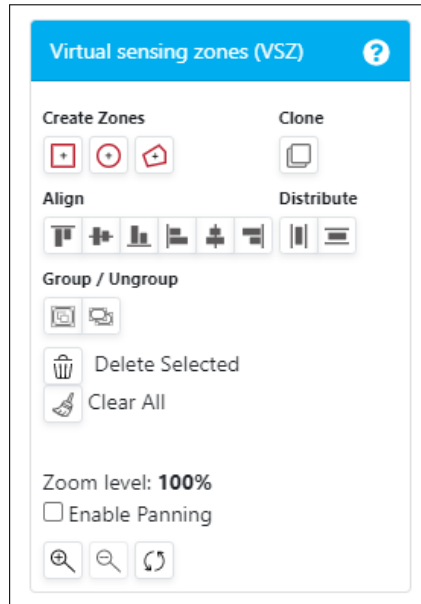
Caution

**If the application requires fast switching between templates, it is not recommended to use templates with different Temporal Filtering. Only use templates with different Temporal Filtering as a last resort, and when switching happens infrequently, less than once per minute.**

## 4.10 Adding Virtual Sensing Zones (VSZ) to a Template

On the right of the representation of the sensing area, there is the Virtual Sensing Zones (VSZ) palette.

**Figure 4.26:** Virtual Sensing Zone Palette



### 4.10.1 How Virtual Sensing Zones Work

VSZ represent an **average** of distance or height reported by every distance point contained in the VSZ. VSZ measurements are in **centimeters**.

Virtual Sensing Zones (VSZ) allows creation of zones of interest on a template where distance or height will be evaluated. The measurement recorded by each VSZ is delivered to the controller, and that VSZ appears in the controller as a physical sensor, with the same measurement.

Swift-E provides full flexibility for definition of what is measured, and the capability to change this set-up every time the device produces new data (by changing templates).

Every VSZ within a template has a unique number (1 — 64) which is related to the corresponding tag in the EtherNet/IP input assembly. For example, a VSZ labelled 1 (in the active template), will have measurement result available in tag `Data.VSZ1`.

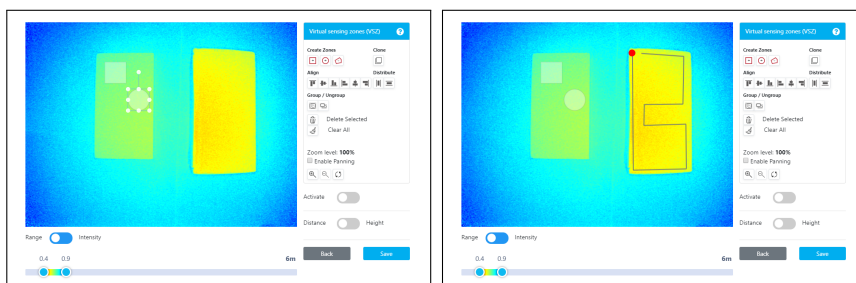
### 4.10.2 Creating VSZ

**Create Zones** allows creation of new VSZ by **placing** them directly on the representation of the sensing area. The drawing tools are similar to those

found in common graphics creation software. To do so click on one of the icons to create a square, circular or polygon VSZ:

- Selecting a Square will create a VSZ immediately. Square VSZ can be resized, shaped into a rectangle or rotated using the handles.
- Selecting a Circle will create a VSZ immediately. Circular VSZ can be resized, shaped into an ellipse or rotated using the handles.
- Selecting a Polygon allows a custom VSZ to be created, but will require drawing of the polygon in the sensing area. To do so, click on the starting point in the image and then move to the next corner and click again, continue this cycle of click and move until the polygon is closed by clicking again on the red dot (origin point). Note that after creation, polygons can only be resized. They cannot be rotated, nor can any edits be made to individual nodes in the polygon.

**Figure 4.27: Squares and ellipses**      **Figure 4.28: Polygons**



Measurements from each VSZ are generated when VSZ are **Active**. See section 4.10.9 for details on how to activate VSZ. VSZ cannot be edited when **Active**.

**IMPORTANT: Create New always uses default acquisition settings: Illumination 20, Threshold 10, Temporal Filter 8.**



Note

**Settings (and backgrounds) can be inherited from another template by editing it first, then using Save and New function.**

### 4.10.3 Zooming

The zoom tools are useful for accurate positioning of small VSZ. Note that the when zoom is used, it is necessary to check **Enable Panning** to be able to pan the representation to the area of interest. Manipulation of VSZ can only be done when **Enable Panning** is disabled again. The **Reset** button will restore zoom to default.





Note

For sizing and positioning of very small VSZ, it may be easier to initially create the VSZ larger than required, then reduce the size using a corner handle.

#### 4.10.4 Cloning VSZ

**Clone** allows duplication of VSZ. To use this function, first select a VSZ (or a group of VSZ). Once the VSZ are selected, pressing **CLONE** will duplicate them. The newly created VSZ can be moved to the desired position.



Note

To select multiple VSZs, press **SHIFT** on keyboard while clicking on each VSZ, or draw a selection area around the VSZ to select. VSZ can be removed from a group by pressing **SHIFT** and clicking on the VSZ to deselect.

#### 4.10.5 VSZ Numbering

VSZ are numbered consecutively, starting with 1. When multiple VSZ are copied, they will be numbered accordingly.

If VSZ1, VSZ2 and VSZ3 are created and then VSZ2 is subsequently deleted, remaining VSZ will retain their original numbering (VSZ3 will not replace VSZ2). Instead, the next VSZ to be created will be VSZ2. This ensures correlation of sensor data between the device and the controller.

Every VSZ within a template has a unique number (1 — 64) which is related to the corresponding tag in the EtherNet/IP input assembly. Data from each VSZ (1 — 64) is available in tags `Data.VSZ1` — `Data.VSZ64`.

#### 4.10.6 Grouping VSZ

**Group** and **Ungroup** functions are used to manage groups of VSZ. This is useful for handling and aligning many VSZs.



Note

**Groups are not saved, and are only maintained during the current session. Multilevel groups (groups of groups) are not supported.**

#### 4.10.7 Deleting VSZ

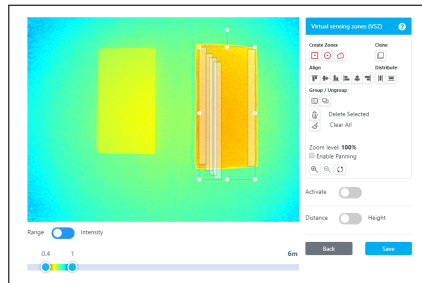
Individual (or groups of) VSZ can be deleted from the template with the **Delete Selected** tool. Remaining VSZ will not be renumbered (see section 4.10.5). **Clear All** will remove all VSZ from the template.

## 4.10.8 Aligning and Distributing VSZ

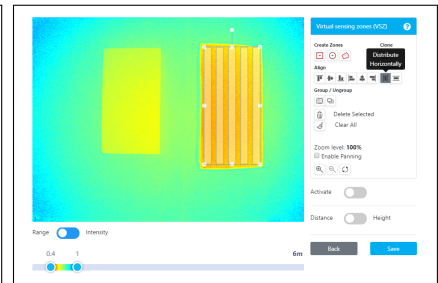
The **Align** and **Distribute** functions allow large arrays of VSZ to be quickly and easily created (especially when used in conjunction with the **Group** tool). Available functions include:

- Align **Top**, **Middle** or **Bottom** allow for vertical positioning
- Align **Left**, **Center** or **Right** allow for horizontal positioning
- Distribute **Horizontally** allows for even positioning between the left-most and rightmost VSZ in a selection
- Distribute **Vertically** allows for even positioning between the top and bottom VSZ in a selection

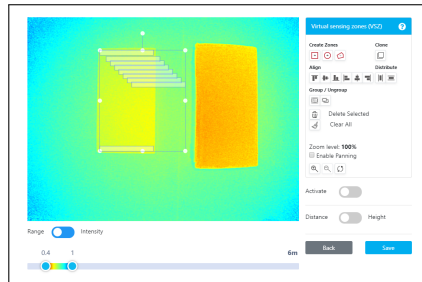
**Figure 4.29:** A square sensor - created, resized and cloned



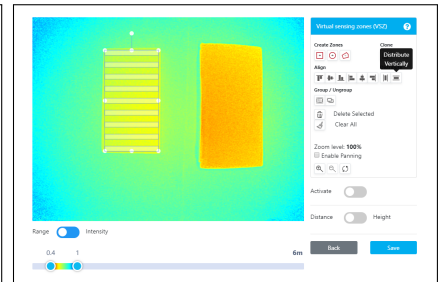
**Figure 4.30:** After top alignment and horizontal distribution



**Figure 4.31:** A square sensor - created, resized and cloned



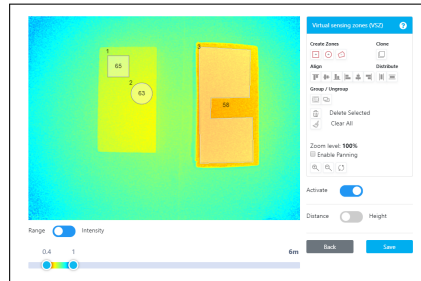
**Figure 4.32:** After left alignment and vertical distribution



## 4.10.9 Activating VSZ

After VSZ are created, the **Activate** switch allows Swift-E to acquire live measurements to each VSZ. The measurement is in centimeters. Measurement for each VSZ is transmitted to the controller over EtherNet/IP. VSZ cannot be edited or moved when active.

**Figure 4.33:** VSZ have been activated and measurements taken



### Data Refresh

The refresh rate of the distance representation will be slower than the rate of the actual measurement - both in the **Web Connect** session and measurements delivered to controller over Ethernet/IP. This is intentional and is designed to minimize the impact of producing the graphics and data for the **Web Connect** session (requiring a considerable amount of the available processing power on board Swift-E ). Swift-E is optimized for headless operation to maximize performance and repeatability.

**Performance at the controller level will be slower (by about 50-100ms) when live data is being consumed by the Web Connect session either in**



Caution

**Edit Mode**  or **Edit Lock**  .

**It is advised that a Web Connect session is NOT active during normal / production operation.**

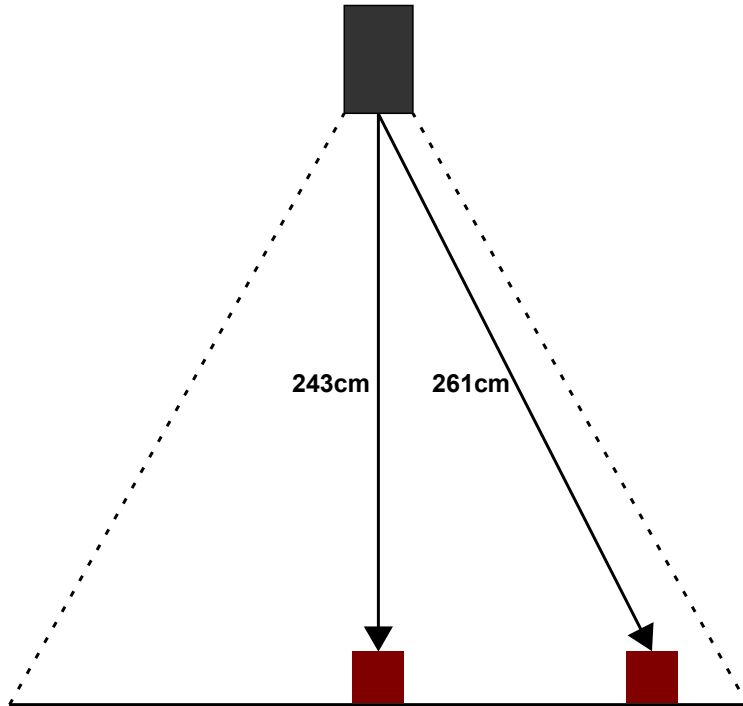
### 4.10.10 Distance / Height Selection

During template design, it is possible to set VSZs to produce **either Distance or Height** measurements. Note that it is **not** possible to have a mixed template with distance and height VSZ.

#### Distance Templates

Templates are set to distance measurement by default. In a distance template the VSZ measurement is the average of all distances from the sensor to each individual point grouped in the VSZ. As a result of this, objects in a plane will produce a slightly larger measurement the farther they are from directly in front of the center of Swift-E . This is shown in figure 4.34.

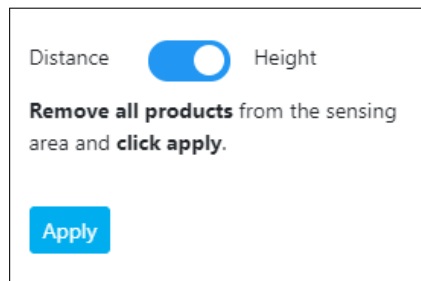
**Figure 4.34:** Distance measurement concept



### Height Templates

Templates can be configured to provide height measurements for VSZ by toggling the Distance / Height switch to **Height**. A popup will request removal of all products from the sensing area and click **Apply** (Figure 4.35).

**Figure 4.35:** Applying a background

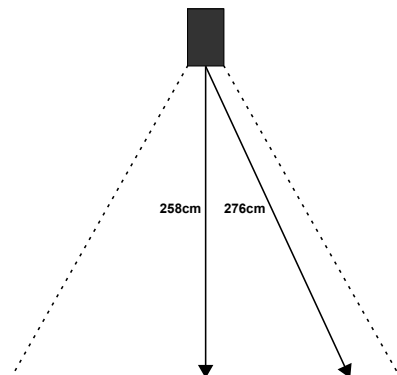


The process behind this step is depicted in figure 4.36 - Swift-E will capture a reference distance to every distance point in the sensing area (a **background**).

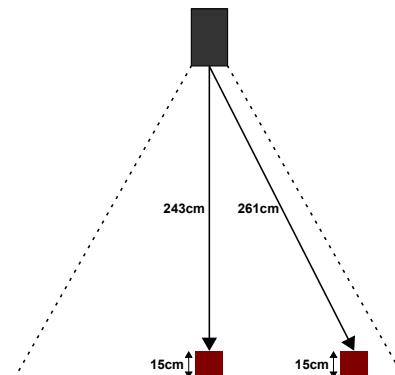
After the background is set, all VSZ measurements will be **height**. That is, processed as the difference between the background and the actual distance measured (in the center VSZ in figures 4.36 and 4.37 this is  $258 - 243 = 15$  cm).

Height can be a negative value if the VSZ average distance is larger than the background distance.

**Figure 4.36:** Acquisition of background



**Figure 4.37:** Height measurement after background acquired



In many cases, using a height template can result in measurements that are more stable. It is therefore generally recommended to use height in applications looking to validate presence or absence of objects.



Note

**Changing from Height to Distance will remove the background. Switching back to Height will require re-acquisition of background.**

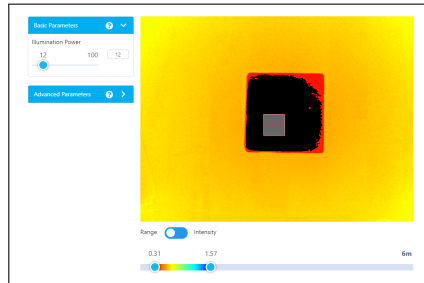
#### 4.10.11 VSZ Measurements

VSZ measurements are in centimeters, and are typically within the range 0 — 600 (negative measurements may be possible in height templates). The measured number shown in **Web Connect** is the number that is delivered to the controller. If **OOR** (Out Of Range) is observed, then there is no measurement possible for that VSZ. The controller will receive 999 in `Result_VSZn` for any VSZ showing **OOR** in **Web Connect**, and `Status_VSZ` will be set to 1. VSZ may be **OOR** for one of two possible reasons:

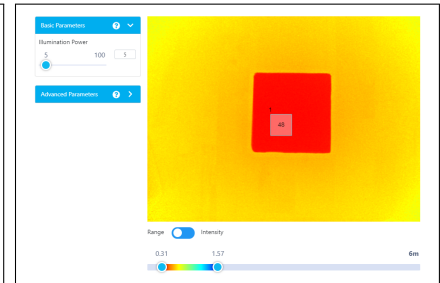
- Excessive signal light is being returned to the Swift-E from the target object, causing **saturation** of the sensor
- Insufficient signal light is being returned to the Swift-E from the target object

For more detail on appropriate settings for illumination, refer to section 4.9.1.

**Figure 4.38:** VSZ is saturated, measurement is OOR



**Figure 4.39:** VSZ is not saturated, measurement is OK



### Excessive Signal

Excessive signal will result in an Out of Range measurement, and is most likely to occur when the target object is close to the device, and illumination is set too high on the active template. Reduce illumination power for the active template. Refer to Section 4.9.1 for more detail. It may also be necessary to adjust physical setup - refer to section 3.6 for more details.

### Insufficient Signal

Similarly, insufficient signal will result in an Out of Range measurement, and is most likely to occur when the target object is far from the device or the target object is of a particularly non-reflective material. Increase illumination power for the active template or move the Swift-E closer to the target object. Refer to Section 4.9.1 for more detail.

## 4.11 Saving a Template

Clicking **Save** will open the **Save Template** pop up. Templates require a **Template ID** and a **Template Name**. The **Template ID** is a number from 1 — 255, the name is a text string for user friendly naming, and easy identification of templates in the **Template Manager**.

The controller may instruct Swift-E to use the given template by writing its **Template ID** in `Template_To_Use` tag. After a `Trigger` has been issued, the controller then confirms the template used for measurement in `Template_In_Use`.



Note

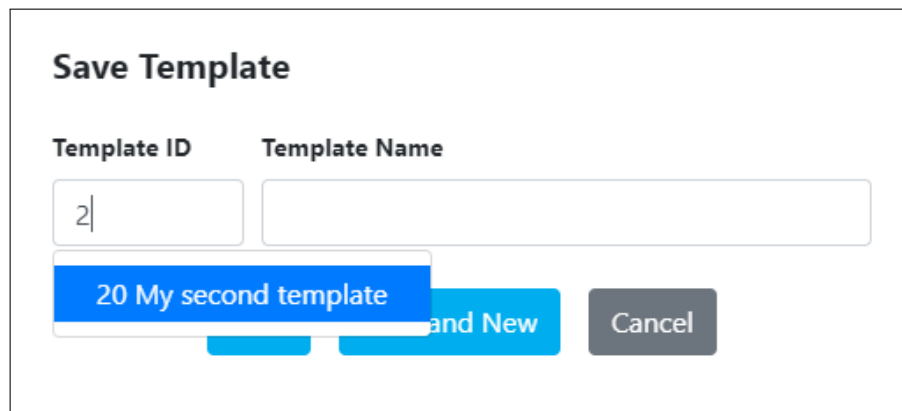
**Template ID is the number to be used by the controller to instruct Swift-E to use a given template. Template Name is for user reference only, and is a convenient way to identify Templates in the Template Manager.**

As the Template ID is entered, a live search will indicate if another template has already been allocated the chosen Template ID (see figure 4.40).

**Save** will return to the **Home** page with the new template activated. **Save and New**, will save the template, returning to the **Design Template** page

- and will retain the background and currently set acquisition parameters. Cancel will close this dialog without any action.

Figure 4.40: Save Template Popup



**Save and New is a convenient and easy way to create many similar templates after acquisition of a just single background. Save and New will also retain all current acquisition parameters for the new template.**

## 4.12 Application Considerations

In some applications it might be better to use distance measurements, while in others height will provide a better measurement.

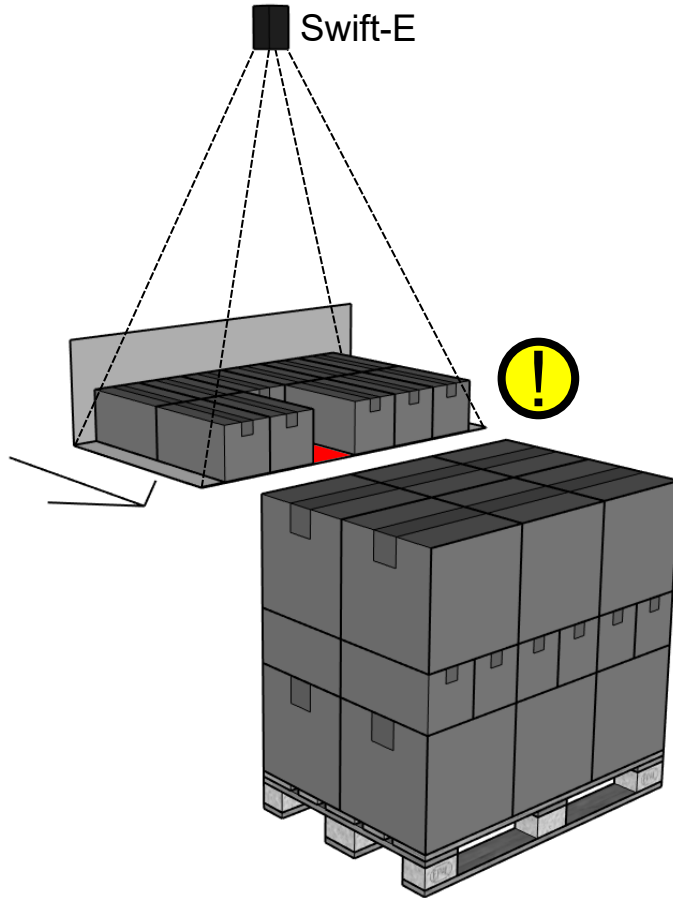
Typically, applications requiring validation of presence or absence of objects are best suited to use of height based templates (use of a reference). This is explained in section 4.10.10. For optimal reliability it is recommended that a measurable difference of 3 — 4 cm is allowed between the object surface (present state) and the background (absent state), allowing easy thresholds to be set in the controller logic for presence / absence decision making.

Examples of presence / absence applications include:

- **Validation of product in case:** Typically used in secondary packaging, confirmation that a product is properly positioned/located in the case.
- **Pallet layer verification:** In palletizing / depalletizing applications, Swift-E can be used to confirm that a layer of a pallet has been properly formed (e.g. when using a robot palletizer) or removed. Positioning Swift-E above the pallet (in a fixed location), it is recommended to build a different template for each of the layers of the pallet (and repeat

for different product sizes if necessary). An example is shown in figure 4.41.

**Figure 4.41:** Example - layer verification on a push palletizer



Some examples of applications where distance measurement may be preferred include:

- **Flexible distance measurement:** As a single sensor with wide operating range and easy to use configuration interface, Swift-E is an ideal alternative for many fixed distance measurement devices.
- **Arrays of laser measurement devices:** Many applications may benefit from use of Swift-E to replace an array of laser measurement devices sensors (or other type of measurement devices) to provide the flexibility and reconfigurability that the application might require. Swift-E requires minimal installation, configuration and wiring.



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## 5 Connecting to Logix 5000 Controllers

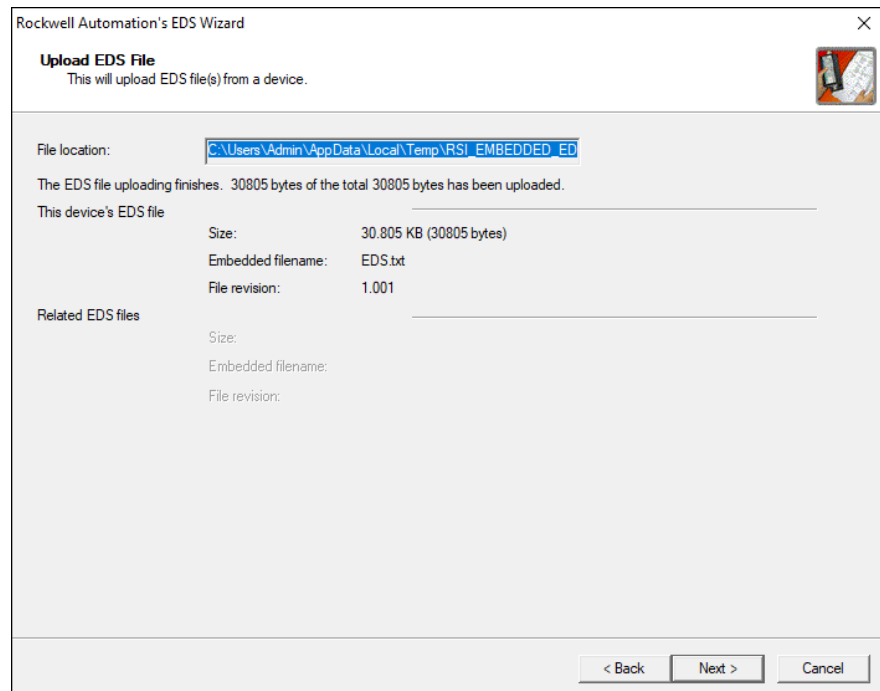
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### 5.1 EDS File

Swift-E ships with an embedded EDS file. When the device is connected to a computer, the EDS file can be uploaded directly from the device. To do this, open **RSLinX® Classic** application (this can also be done using **FactoryTalk® Linx**) and ensure a driver is set up for the EtherNet/IP™ network (for more information about how to do this, consult **RSLinX Classic** application documentation).

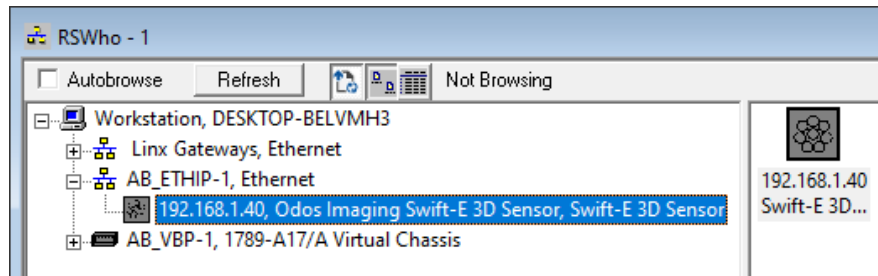
Once Swift-E shows in **RSWho**, right click on the device and select **Upload EDS file from device**. This will initiate the upload of the EDS file.

**Figure 5.1:** EDS file upload



Once the upload finishes, click on NEXT until the process is completed. Then click on FINISH. Swift-E should now show as follows in **RSLinX** application:

**Figure 5.2:** EDS file upload



Note

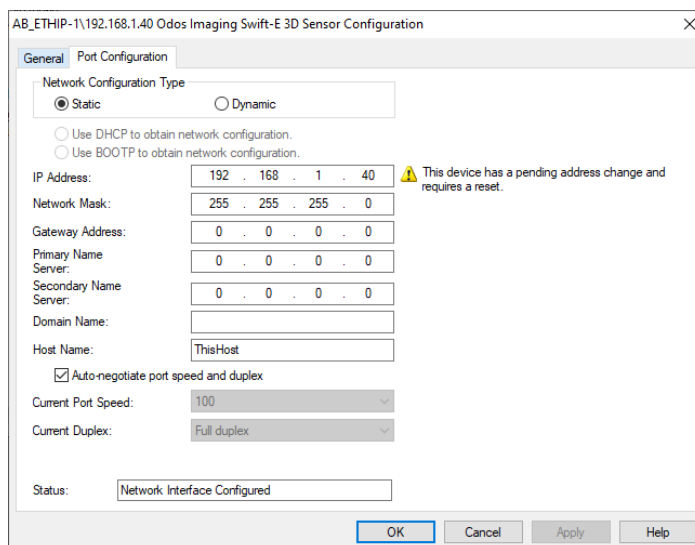
Alternatively, Swift-E EDS file can be downloaded from Rockwell Automation's [PCDC](#) (Product Compatibility and Download Center)

### 5.1.1 Changing Swift-E IP Address using RSLinx

It is possible to change Swift-E IP address using the RSLinx application. To do this, right click on the device and select **Module Configuration**. Click on **Port Configuration** to change the IP address. When the IP address has been set, Swift-E will need to be restarted.

Swift-E can be restarted using the **Web Connect** interface (section 4.6.6). Note that until restart, the **Web Connect** interface will continue to be available on the old IP address. Swift-E **Module Configuration** will show the message shown in figure 5.3.

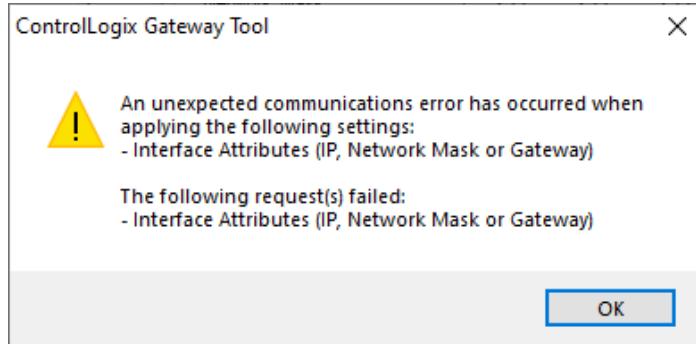
**Figure 5.3:** RSLinx showing pending address change



If the error shown in figure 5.4 is flagged by the RSLinx application during

setting of a new IP address, then the controller is connected to Swift-E AND Swift-E is set up in the controller IO Tree.

**Figure 5.4:** IP address error in RSLinx



It is still possible to change Swift-E IP address by carrying out any of the following steps:

1. Use the **Web Connect** interface (section 4.6.1).
2. Physically disconnect the device from the controller, and re-apply the desired IP address change.
3. To proceed to change the IP address from within the RSLinx application, open Rockwell Automation Studio 5000 Logix Designer application, and in the Swift-E Add On Profile, go to **Connection** and select **Inhibit Module**. This will temporarily inhibit the connection with the controller. Once the IP address has been changed, the Add On Profile will need to be updated with the new one, and **Inhibit Module** should be unchecked.



Note

**After changing settings in RSLinx application, Swift-E will continue to be available on the old IP address until restarted.**

## 5.2 Add Swift-E to Rockwell Automation Studio 5000 Logix Designer Application

Swift-E connects via EtherNet/IP with Logix 5000™ controllers. To establish a connection between Swift-E and the controller, open a new or existing Rockwell Automation Studio 5000 Logix Designer® application. On the I/O Configuration tree, right click on the controller Ethernet port where Swift-E is connected, and select **New Module**

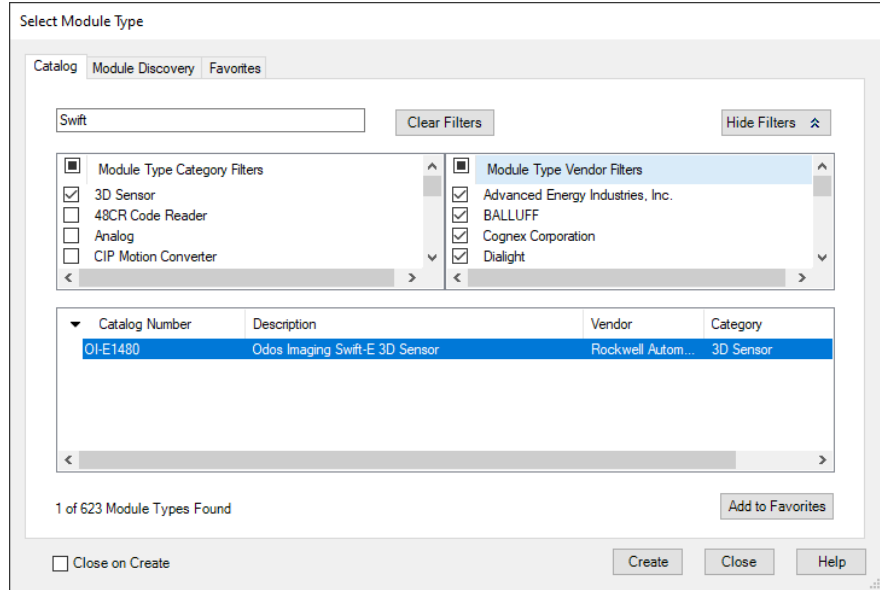


Note

**Make sure that both Swift-E and the port used in the controller are in the same EtherNet/IP subnet**

In the Catalog tab, enter Swift in the Search text box (it is also possible to search for **Odos**, **OI-E1480** or **3D Sensor**)

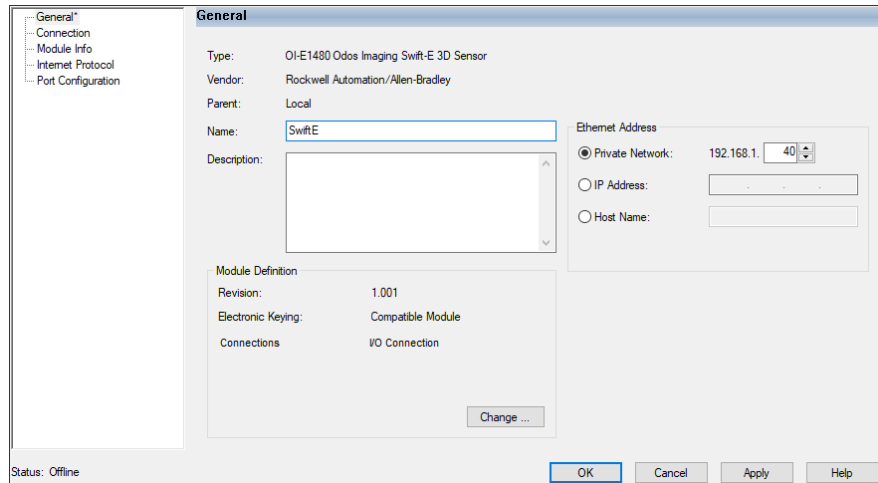
**Figure 5.5:** Adding Swift-E to Rockwell Automation Studio 5000 as a new module



Click on OI-E1480 in the bottom box and then **CREATE**.

A New Module window will appear. Enter a name for the device, and the Ethernet Address selected while configuring the device (default is 192.168.1.40).

**Figure 5.6:** Swift-E add-on profile shown in Rockwell Automation Studio 5000



In most cases, it is acceptable to leave everything else as default, but if needed, the Connection RPI can be adjusted to match the application needs. The minimum possible RPI for Swift-E is 10 ms.



Note

**Swift-E default RPI is 20 ms, with Unicast connection and cyclic input trigger.**

Once all the configuration is completed, select **OK** to close the window.

Swift-E is now added to the I/O configuration tree of the controller application.

### 5.3 Input and Output Assembly Tags

Once Swift-E has been added to the controller application, its Input and Output data assemblies will appear in the Controller Tags database. The tags will show up as **[device name]:I** for the input assembly and **[device name]:O** for the output assembly.

### 5.3.1 Input Assembly

**Table 5.1:** Input Assembly - [device name]:[tag name]

Tag	Type	Description
ConnectionFaulted	BOOL	will be 0 when connected and 1 when the connection to the device is lost
Status	SINT	provides the status of the last measurement, its values can be: <ul style="list-style-type: none"> <li>• 0 - OK (default)</li> <li>• 63 - InProgress (measurement is in progress, but not yet finished)</li> <li>• 64 - Warning / Recoverable Fault</li> <li>• -128 - Internal Error</li> </ul>
Template_In_Use	INT	template number used for the last valid measurement
Number_of_VSZ	SINT	number of VSZ in the template used for the last valid measurement
Trigger_Counter	INT	will increase by one every time a new measurement is completed after a trigger (will reset to 0 once it reaches 32767)
Data_VSZn <sup>1</sup>	INT	measurement data for VSZn in centimeters, will be 999 if measurement is out of range
Status_VSZn <sup>2</sup>	BOOL	will be 0 if normal, 1 if out of range or other error is present
Used_In_Template_VSZn <sup>3</sup>	BOOL	will be 1 if VSZn is present in the active template, 0 if not
Type_VSZn <sup>4</sup>	BOOL	indicates the type of VSZ in the template: <ul style="list-style-type: none"> <li>• 0 - the data is DISTANCE data</li> <li>• 1 - the data is HEIGHT data</li> </ul>

1. There are 64 Data tags in the input assembly (Data\_VSZ1 — Data\_VSZ64), corresponding to the distance or height measurement provided by each of the 64 possible VSZs on the active template.
2. There are 64 Status tags in the input assembly (Status\_VSZ1 — Status\_VSZ64), corresponding to the status of each of the 64 possible VSZs on the active template.
3. There are 64 Used\_In\_Template tags in the input assembly (Used\_In\_Template\_VSZ1 — Used\_In\_Template\_VSZ64), corresponding to each of the 64 possible VSZs on the active template.
4. As templates can be either distance or height, Type\_VSZn will be the same for all VSZ used in a given template.

### 5.3.2 Output Assembly

**Table 5.2:** Output Assembly - [device name]:O.[tag name]

Tag	Type	Description
<code>Template.To.Use</code> <sup>1</sup>	INT	template ID to be passed to the device for the NEXT measurement
<code>Trigger</code> <sup>2</sup>	BOOL	this should be a pulse, toggling it to 1 initiates the measurement
<code>Illumination.Pause</code> <sup>3</sup>	BOOL	when set, this will inhibit the infrared illumination used for distance measurement (used to minimize crosstalk when using 2 or more devices in close proximity). If there is only one Swift-E in the application, it is recommended to keep this set to 0
<code>Web.Connect.Enable</code>	BOOL	this bit enables <b>Web Connect Edit</b> Mode even if the controller is in <b>RUN</b> mode. The intention of this function is to support in-line testing and debugging during device implementation. During normal operation, this bit should be set to 0, unless it is desired to receive VSZ data in free-running mode (not triggered)
<code>Reset.Trigger.Counter</code>	BOOL	when changed to 1, it will reset the trigger counter
<code>Clear</code>	BOOL	when set to 1 will clear all the input data (in case it is required to clear the data between measurements)

1. It is important to make sure that `Template.To.Use` is set PRIOR to setting `Trigger` to initiate a measurement.
2. When triggering, make sure that `Trigger` is pulsed to 1 for a duration longer than twice the device RPI (20ms by default). If not, some of the triggers might not reach the device. It is recommended to keep `Trigger` = 1 at least until `Status` ≠ 63 or `Trigger.Counter` has increased by 1.
3. For optimal measurement performance, it is critical that the device maintains a regular state of temperature. Therefore if `Illumination.Pause` is used to avoid crosstalk between Swift-E, it is recommended that all Swift-E devices have illumination activated in a regular cycle, thus allowing the internal temperature regulation to achieve a steady state. Care should be taken that measurements are consistent and repeatable when developing such complex applications.

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## 6 Specifications

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Parameter	Value
Sensing Area	640 × 480 individual distance points
Field-of-view	43° × 33° (H × V, measured in center)
Measurement Resolution	1 cm
Measurement Precision	±1 cm (typical at 2 m, varies with return signal level)
Illumination	7 × LEDs @ 850 nm
Operating Range	0.5 — 6 m (~1.5 to 20 ft)
Output Data	Height, Distance
Response Time <sup>1</sup>	~100 ms (trigger to data)
Protocol	EtherNet/IP™
Power	12 VDC / 30 W (typical), 60 W (peak)
Operating Temperature	-20 to 50 °C
Environmental Rating	IP20
Virtual Sensing Zones	Up to 64 virtual sensing zones can be created (application dependent) for every template
Number of Templates	Up to 255 different templates can be created

1. Response time is dependent on controller RPI. Response time will be longer if a **Web Connect** session is active, or if there are changes to acquisition parameters between trigger requests. See section 4.9.3 for details.



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## 7 Ordering Information

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Catalog Number	Description
OI-E1480	Odos Imaging Swift-E Reconfigurable 3D Sensor
1606-XLP90B	Allen-Bradley® 12 — 15 VDC Power supply - industrial grade (90 W)
889D-F4AC-x	DC Micro-Style (M12) 4-pin female cordset for use with industrial power supply (or similar)
1585J-xxxxx	Ethernet cable with RJ45 connector (shielded cable is strongly recommended)
OI-TMOUNT	Mounting plate with 1/4"-20 thread for standard tripod mount
OI-PS	12 VDC Power Supply (office grade), M12 Connector (does not include power cord)

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## 8 Document History

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Date	Version	Changelog
20 Jan 2020	000A	Initial Draft
20 Mar 2020	001A	First Release
11 May 2020	001B	Update to section 3.11.1 and correction to table 5.1.
06 Jul 2021	001C	Minor correction to table 3.3.

Manual Build: 371c50c663710ddeb7941377bc0360f6c6efaccd