

MDI-3100

This document provides instructions for installing the MDI-3100 imager scan engine.

## Integration Guide

All information subject to change without notice.

## Document History

Model Number:	<b>MDI-3100</b>	Specification Number:	<b>TS12030</b>
Edition:	<b>1.1</b>	Original Spec Number:	<b>TS11039</b>
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**Revision History**

Specification No. : TS12030  
Product name : MDI-3100

Edition	Date	Page	Section	Description of Changes
First	2012/07/17	-	-	Initial release

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## 1. Abstract

This guide provides instructions for installing the MDI-3100-SR/HD (hereafter called “scan engine”). In order to maximize its performance and prevent troubles from happening, read this integration guide carefully and design your integration devices in accordance with it.

- [Exit Window Material and Placement](#) : Layout design to prevent the LED illumination from reflecting off the exit window
- [Exit Window Size](#) : Ensuring clearance for optical path of imaging and LED illumination
- [Installation](#) : Detailed installation instructions

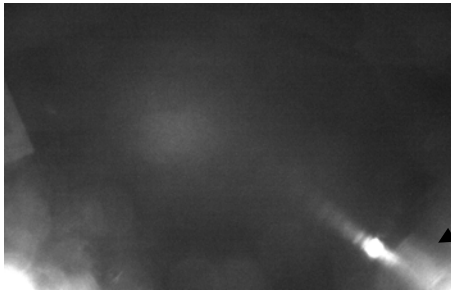
This integration guide is for the following models:

- MDI-3100-SR : Standard range model
- MDI-3100-HD : High density model

\* The conditions described herein are ‘recommended’ conditions. Therefore, make sure to check the images with image-capturing tools or the like.

## 2. Exit Window Material and Placement

Reflection of the LED illumination from the exit window can occur depending on the window material and placement. This chapter describes the material and the distance and inclination limitations for the exit window.



LED illumination reflecting off  
the exit window

The chapter contains:

[2.1. Exit Window Material](#)

[2.2. Exit Window Placement](#)

## 2.1. Exit Window Material

The following items are recommended for selecting the exit window to prevent the reflection of the LED illumination from the exit window and the degradation of image contrast by scratches and dirt.

- For the best optical quality, use an acrylic material (cast or extruded) for the exit window.
- Select a high-quality achromatic acrylic material with a smooth, flat surface and no scratches or dents.
- It is recommended that the acrylic material is 1 mm thick and has an anti-reflective (AR) coating applied to both sides of the exit window.
- It is recommended to apply an anti-scratch coating to the surface of the exit window to protect it from scratches during operation.
- Hard coated acrylic sheets are readily available. Such a coating greatly enhances anti-scratch properties without degrading the optical characteristics of the acrylic material.
- To protect the exit window from dust, stains, and scratches during assembly, a protective sheet was attached. This should be removed before operation.
- After removing the protective sheet, use an ion-blower or other method to remove any dust that may have been attracted by static electricity.

Recommended acrylic material:

Nitto Jushi Kogyo Co., Ltd. : "Clarex Precision Thin Sheet"

MITSUBISHI RAYON CO., LTD. : "Shinkolite"

## 2.2. Exit Window Placement

The exit window must be positioned to accommodate the limitations of distance and inclination in order to prevent the LED illumination from reflecting off the window. Design the layout within the range specified in the following diagram and associated table.

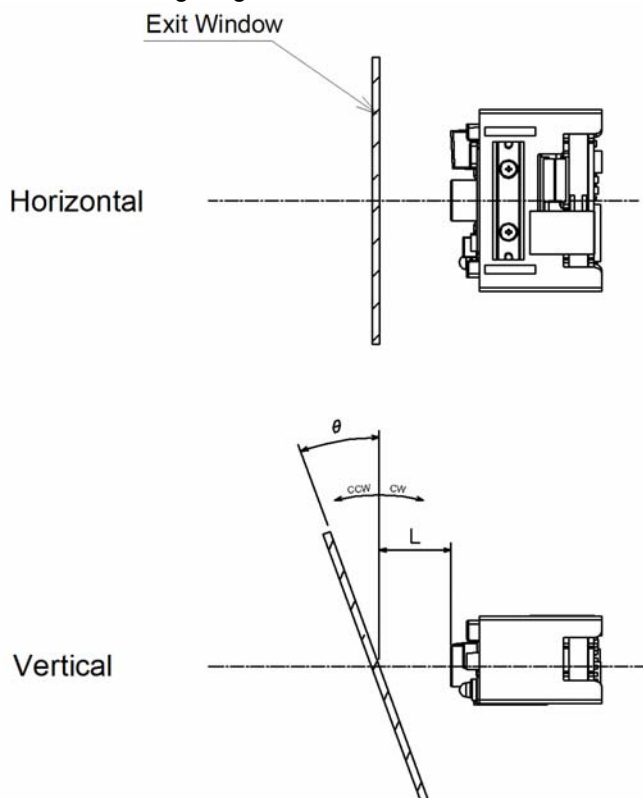


Figure 1: Exit Window Placement

The following shows the recommended mounting position of the window with 'both sides AR coated' and 'non AR coated'.

<Measurement conditions>

Window : 1 mm acrylic sheet

Conditions : Visually check reflections when taking images with the scan engine in a darkroom with no light source and no reflection object around.

[Both sides AR coated]

L	[mm]	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
$\theta_{CW}$	[deg]	0°	≥0°	≥0°	≥25° ≤5°	≥30°	-	-	-	-	-	-	-	-	-
$\theta_{CCW}$	[deg]	0°	≥0°	≥0°	≥0°	≥5°	≥10°	≥10°	≥20°	≥20°	≥20°	≥20°	≥20°	≥20°	≥20°

[Non AR coated]

L	[mm]	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
$\theta_{CW}$	[deg]	0°	0°	-	-	-	-	-	-	-	-	-	-	-	-
$\theta_{CCW}$	[deg]	0°	≥0°	≥10°	≥15°	≥20°	≥20°	-	-	-	-	-	-	-	-

\* L = 1 mm,  $\theta = 0^\circ$  (recommended)

\* 1 mm or more clearance between the scan engine and the exit wind (recommended) due to the dimensional tolerance of mounting holes

\* Use of AR coating (recommended). Under the above conditions the external light is not factored in.

\* Confirm that there is no reflection of the LED illumination from the window by acquiring images from the scan engine.



### 3. Exit Window Size

Vignetting (brightness variations) in the LED illumination and the captured image can occur depending on the size and position of the exit window. Additionally, specular reflection can occur in scanned image depending on how the media is presented to the scanner. This chapter describes the distance and inclination limitations for the exit window to avoid those incidences.

The chapter contains:

[3.1. Window Size and Optical Path Clearance](#)

[3.2. Optical Path](#)

[3.3. Field of View](#)

[3.4. Scanned Media and Placement](#)

### 3.1. Window Size and Optical Path Clearance

With respect to the optical path depicted below, provide an exit window with sufficient clearance.

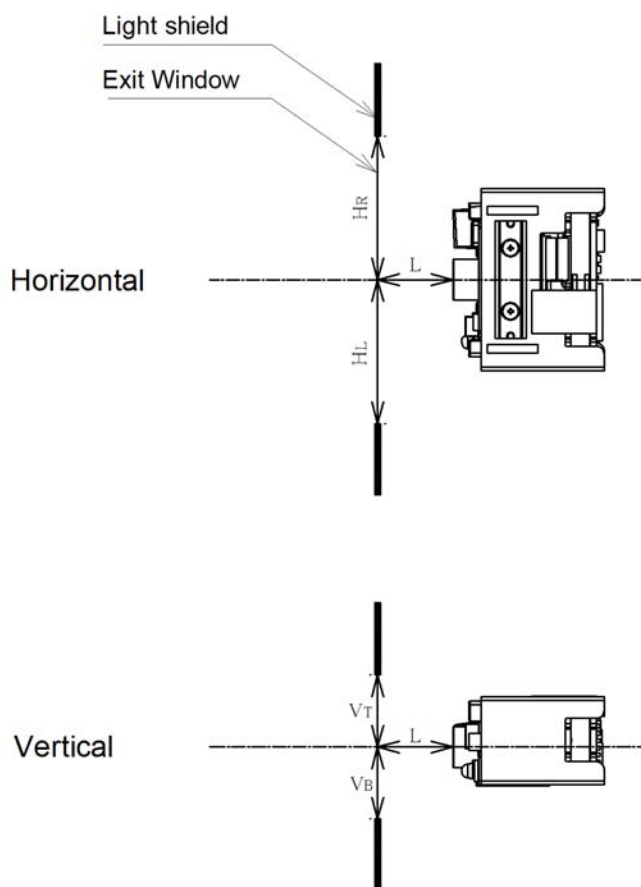


Figure 2: Window Size and Optical Path Clearance

The following tables show the conditions of the horizontal and vertical optical path clearance.

[Horizontal]

L	[mm]	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
H <sub>R</sub>	[mm]	≥11.0	≥11.5	≥12.0	≥12.5	≥13.0	≥13.5	≥14.0	≥14.5	≥15.0	≥16.0	≥17.0	≥18.0	≥19.0	≥20.0
H <sub>L</sub>	[mm]	≥11.0	≥11.5	≥12.0	≥12.5	≥13.0	≥13.5	≥14.0	≥14.5	≥15.0	≥16.0	≥17.0	≥18.0	≥19.0	≥20.0

[Vertical]

L	[mm]	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
H <sub>R</sub>	[mm]	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.5	≥3.8	≥4.1
H <sub>L</sub>	[mm]	≥5.4	≥5.4	≥5.4	≥5.4	≥5.4	≥5.4	≥5.4	≥5.4	≥5.5	≥5.8	≥6.1	≥6.4	≥6.7	≥7.0

- \* The vignetting is caused by insufficient exit window size and an illumination shape is decided depending on the window frame. Confirm them visually and by acquiring images from the scan engine in the design phase.

### 3.2. Optical Path

Install the window with sufficient clearance for the field of view, LED illumination and LED aiming. With respect to the optical path depicted below, provide an exit window with sufficient clearance.

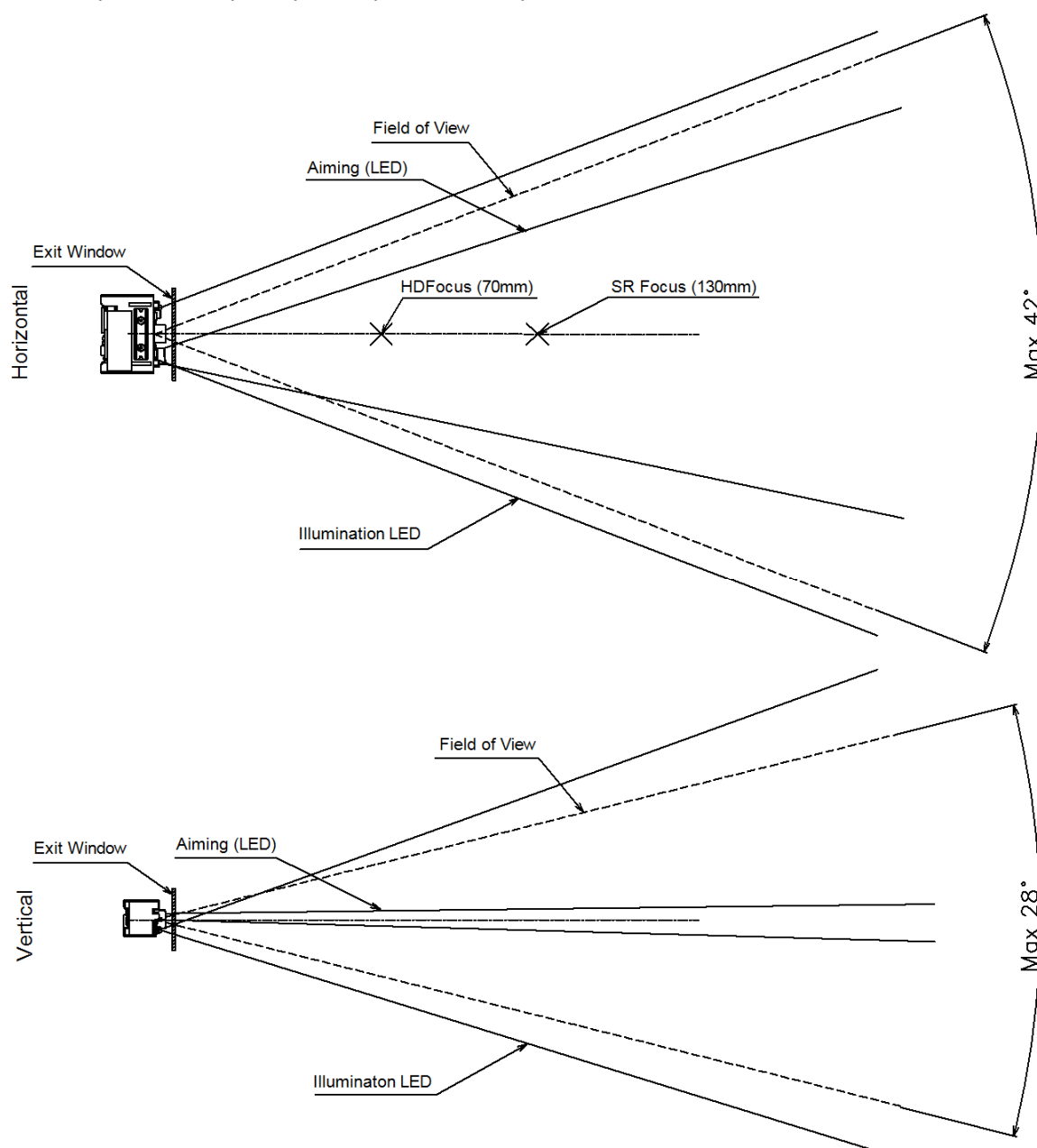


Figure 3: MDI-3100 Optical Path

- \* Refer to 3D drawings for details of the configuration of scan engine and the optical path.
- \* It is recommended to verify the details of optical path with an actual device.

### 3.3. Field of View

Install a frame with sufficient clearance for the field of view

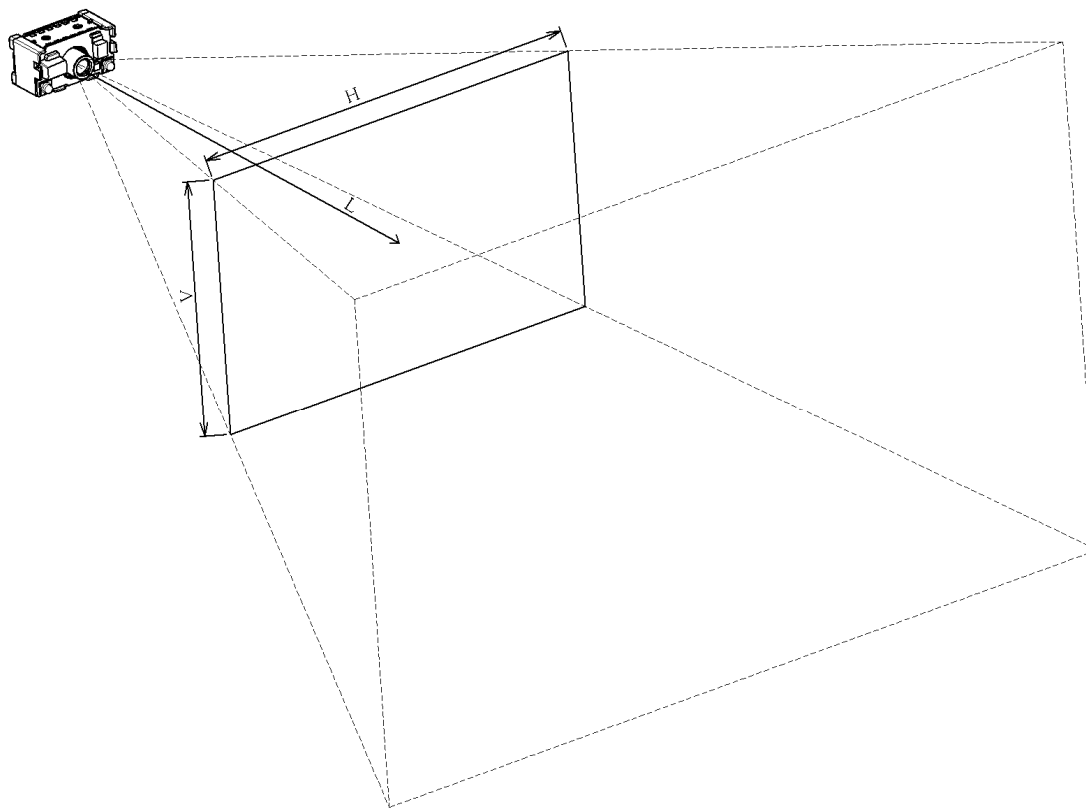


Figure 4: MDI-3100 Field of View

[Field of View]

L	[mm]	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
H <sub>R</sub>	[mm]	10.5	18.5	25.5	34	41	48	55	63	70	78	86	93	101	108
H <sub>L</sub>	[mm]	7.5	12	16	21	26	31	35.5	40	45.5	50	55	59.5	65	69.5

- \* L :Distance from front edge of the scan engine , H :Horizontal FOV , V :Vertical FOV
- \* The table above shows the field of depth. Therefore, install the frame and place the scanned object with sufficient clearances.

### 3.4. Scanned Media and Placement

When an object is being scanned, there are conditions where specular reflection of the LED illumination and intense ambient light can occur easily.

**Glossy label:**

Specular reflection of the LED illumination from the scan engine can occur under certain conditions.



**Solution:**

Specular reflection does not occur when an angle is created between the scan engine and the target label as shown in the figure below. The conditions for the occurrence of specular reflection depend on the distance  $L$  and the inclination angle  $\theta$ . The recommended inclination angle is about 15 degrees. Note that when the angle becomes bigger, it will be difficult to read the target label.

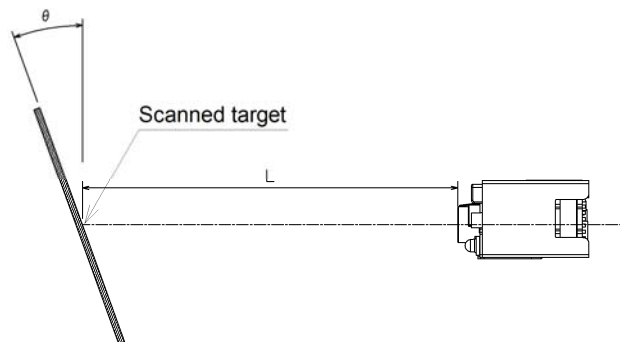


Figure 5: Inclination of Scanned Target

**Code displayed on LCD:**

Specular reflection of intense ambient light (fluorescent light, window light etc.) occurs on the LCD glass surface.



**Solution:**

It is recommended to have a structure for blocking the intense ambient light around the scanning position.

## 4. Installation

This chapter describes the major focus points to consider when incorporating the scan engine into your device.

The chapter contains:

[4.1. Installation Conditions](#)

[4.2. Cable and Connector](#)

[4.3. Handling Requirements](#)

## 4.1. Installation Conditions

The installation conditions of the scan engine are as shown below.

- When installing a camera module, use the screw holes on the bottom surface.
- Do not screw down further than the specified depth.
- When installing a camera module, only the bottom surface of the camera module should be attached to a chassis for installation.
- Keep enough clearance to avoid damage to the camera module in case the host device is dropped and damaged.
- Shock / impact resistance of the camera module to the acceleration applied via the bottom surface is guaranteed. In case of direct shock, the camera module will almost certainly be damaged since it consists of precise optical elements.
- Use the mounting hole with screw clamp to install the decoder board.
- The size of the screw head must not exceed the diameter of the mounting land ( $\phi 3.8$ ).

<MDI-3100 Installation Conditions>

Recommended screw : D2 B tight

Tightening torque : 5N<sub>cm</sub> or less

Valid screw depth : Within 4.5 mm from the mounting surface of the scan engine

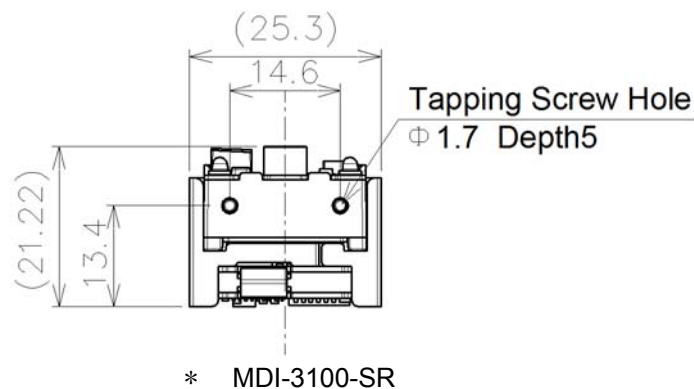


Figure 6: Mounting Holes

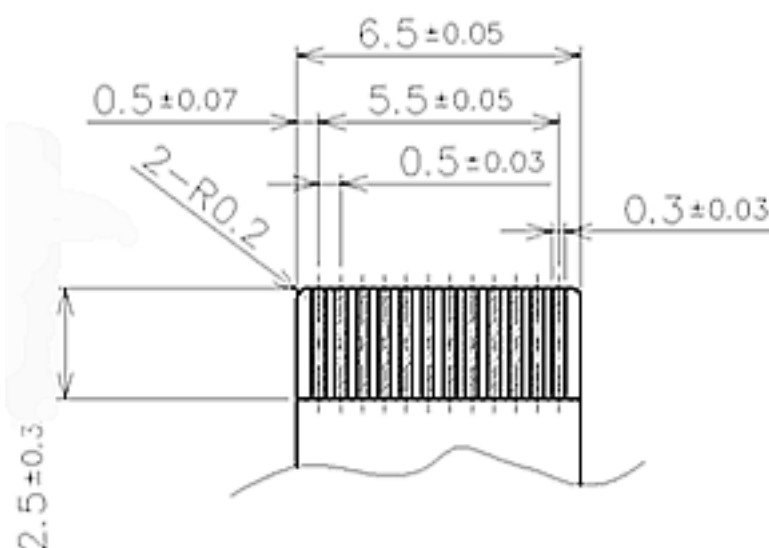
## 4.2. Cable and Connector

The following shows the cable and the connector to connect the scan engine and the host.

Recommended connector : IRISO 9681-12 (12pin)  
Recommended cable length : 50 mm (max)



Figure 7: FFC



FFC specified thickness:  $0.3 \pm 0.03$

Figure 8: FFC Terminal

- \* When using the FPC, it is recommended to use “polyimide and thermoset adhesive” as material for the reinforcing film.
- \* When using the FPC, verify the thickness and the dimensional tolerance of the FPC is correct.



### 4.3. Handling Requirements

The recommended handling conditions for incorporating the scan engine into your device are as shown below.

- Use anti-static measures such as a grounding strap before handling the scan engine in order to avoid damage to the electronic components from electrostatic discharge.
- Hold the scan engine only by the case. Do not touch the circuit board or the front side of the scan engine when handling it.
- Do not touch the electronic components or the terminals on the circuit board.
- Installation in a clean environment is recommended in order to protect the imaging lens from dust.
- Operators should wear gloves to avoid contaminating the optical elements.
- Do not drop the MDI-3100.

## 5. Mechanical Drawings

### 5.1. MDI-3100-SR (Standard Range Focus)

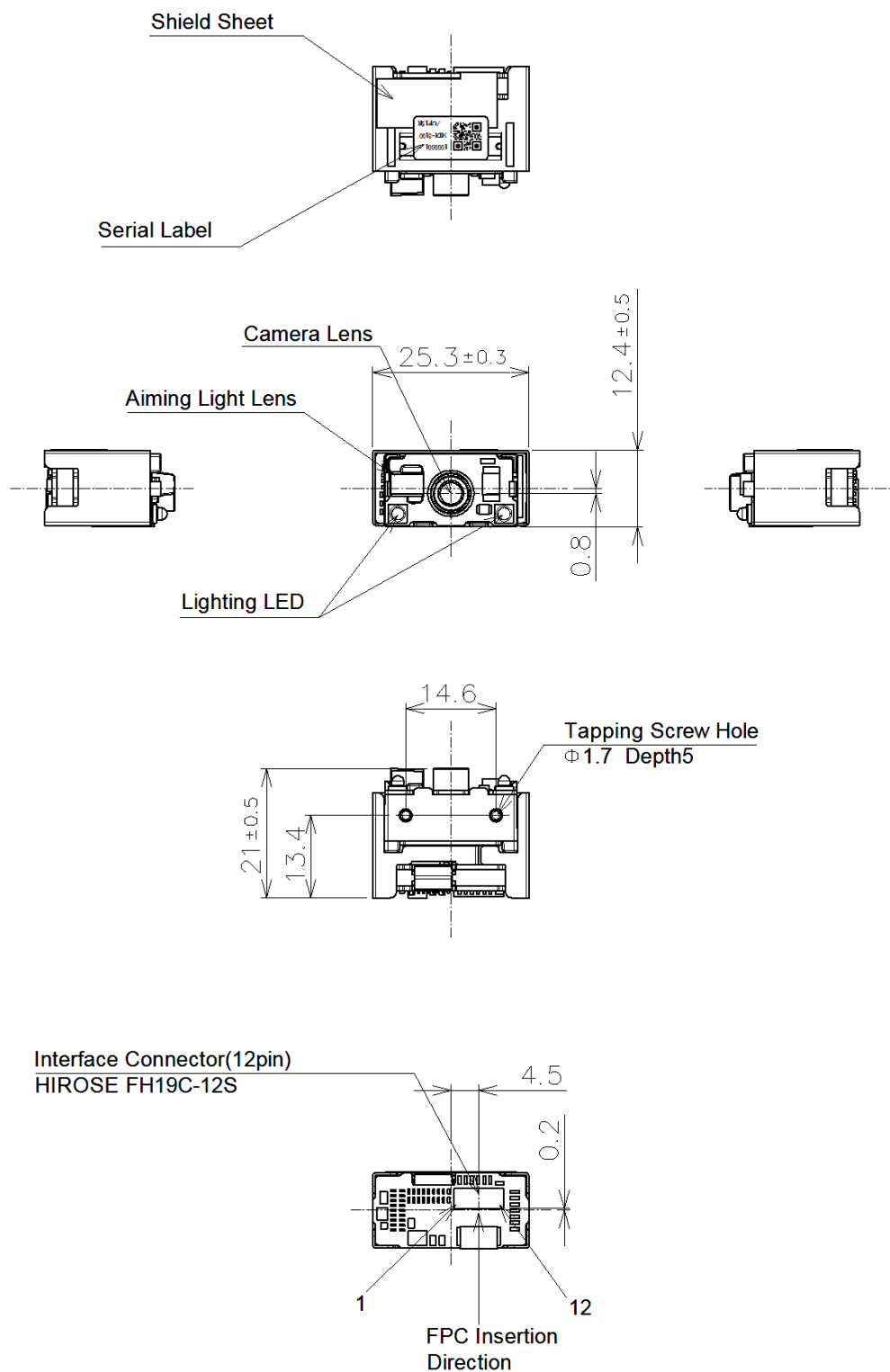


Figure 9: MDI-3100-SR

\* The depth of the HD model is 0.2 mm deeper in size than that of the SR model.

## 5.2. MDI-3100-HD (High Density Focus)

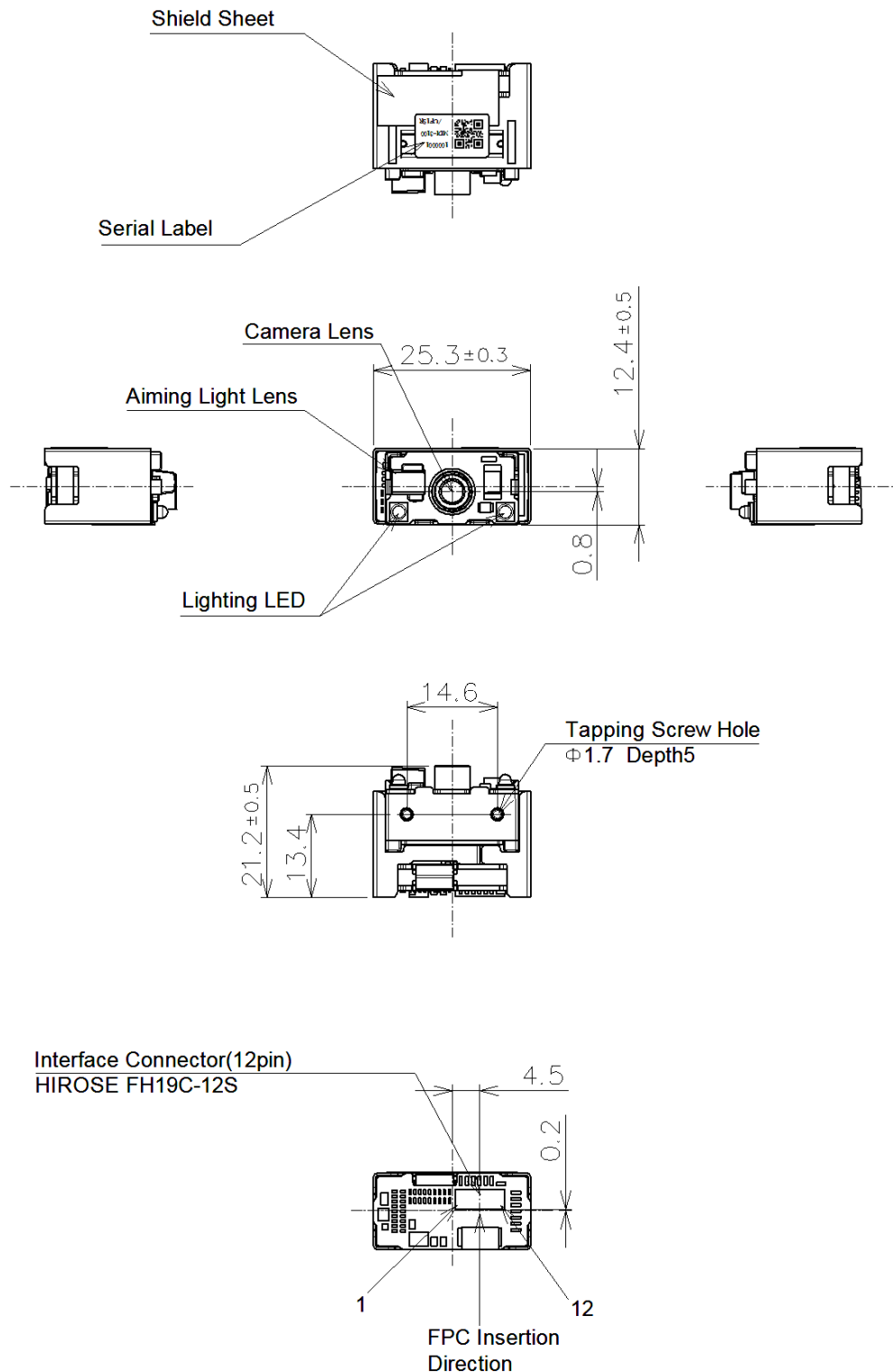


Figure 10: MDI-3100-HD

\* The depth of the HD model is 0.2 mm deeper in size than that of the SR model.