



MDI-3000

This document provides instructions for installing the MDI-3000 imager scan engine.

Integration Guide

All information subject to change without notice.

Document History

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1. Abstract

This guide provides instructions for installing the MDI-3000-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

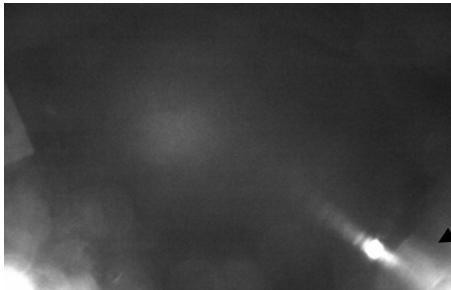
This integration guide is for the following models:

- MDI-3000-SR : Standard range model
- MDI-3000-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 have 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.

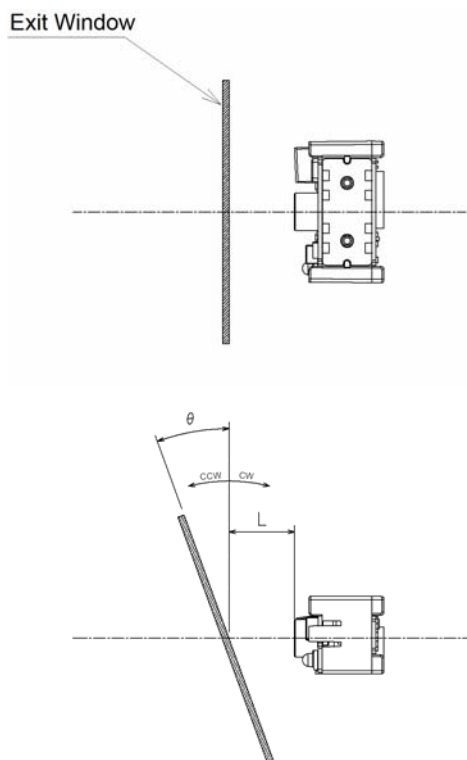


Figure 1: Exit Window Placement

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
θ_{CW}	[deg]	0°	$\geq 0^\circ$	$\geq 0^\circ$	$\geq 25^\circ$ $\leq 5^\circ$	$\geq 30^\circ$	-	-	-	-	-	-	-	-	-
θ_{CCW}	[deg]	0°	$\geq 0^\circ$	$\geq 0^\circ$	$\geq 0^\circ$	$\geq 5^\circ$	$\geq 10^\circ$	$\geq 10^\circ$	$\geq 20^\circ$	$\geq 20^\circ$	$\geq 20^\circ$	$\geq 20^\circ$	$\geq 20^\circ$	$\geq 20^\circ$	$\geq 20^\circ$

[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
θ_{CW}	[deg]	0°	0°	-	-	-	-	-	-	-	-	-	-	-	-
θ_{CCW}	[deg]	0°	$\geq 0^\circ$	$\geq 10^\circ$	$\geq 15^\circ$	$\geq 20^\circ$	$\geq 20^\circ$	-	-	-	-	-	-	-	-

- * 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](#)

3.1. Window Size and Optical Path Clearance

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

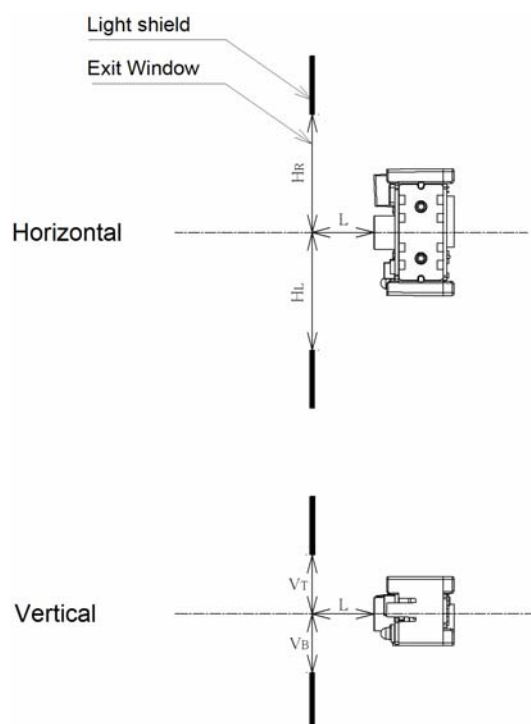


Figure 2: Window Size and Optical Path Clearance

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 _R	[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 _L	[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 _R	[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 _L	[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.

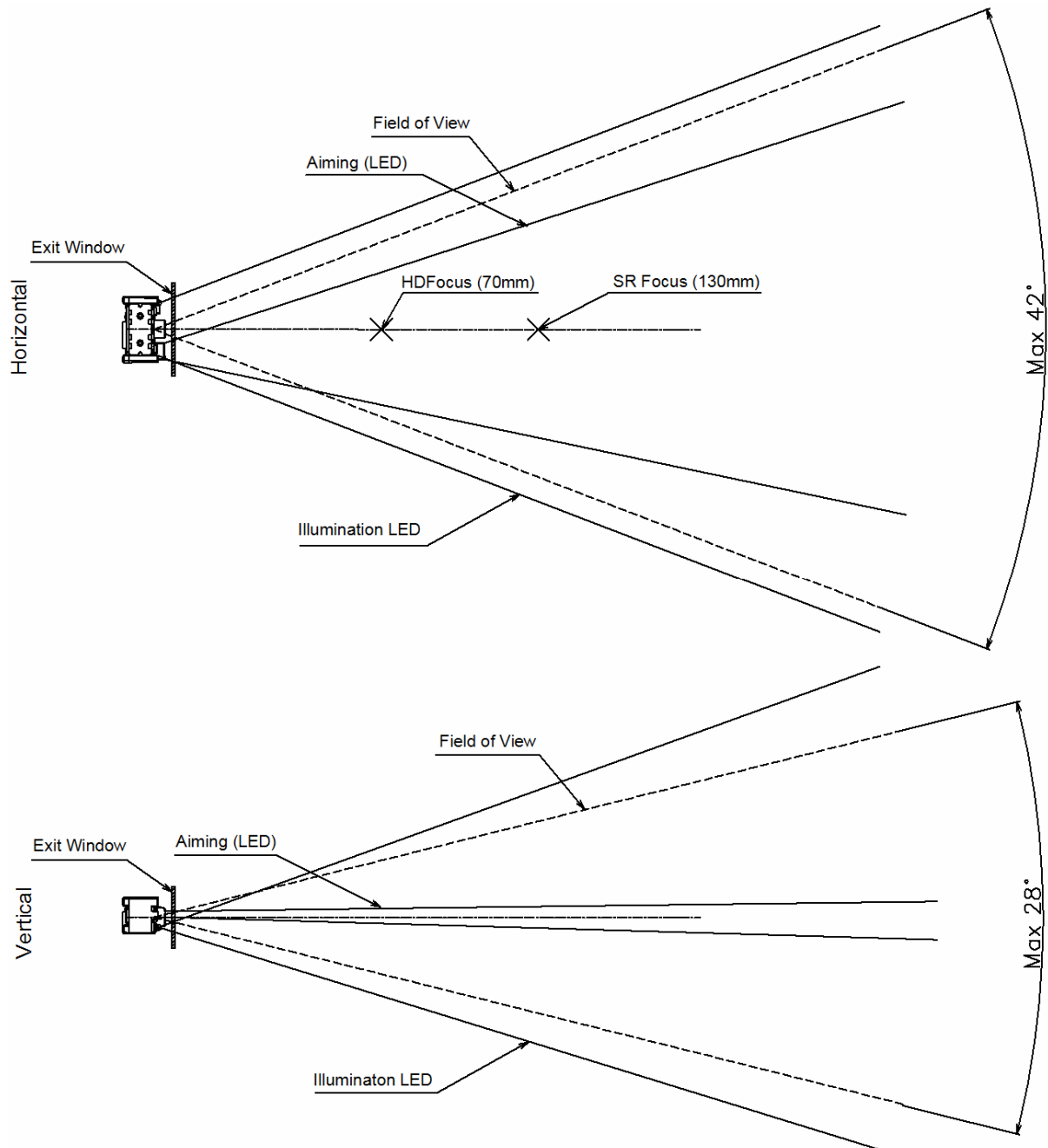


Figure 3: MDI-3100 Optical Path

- * 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

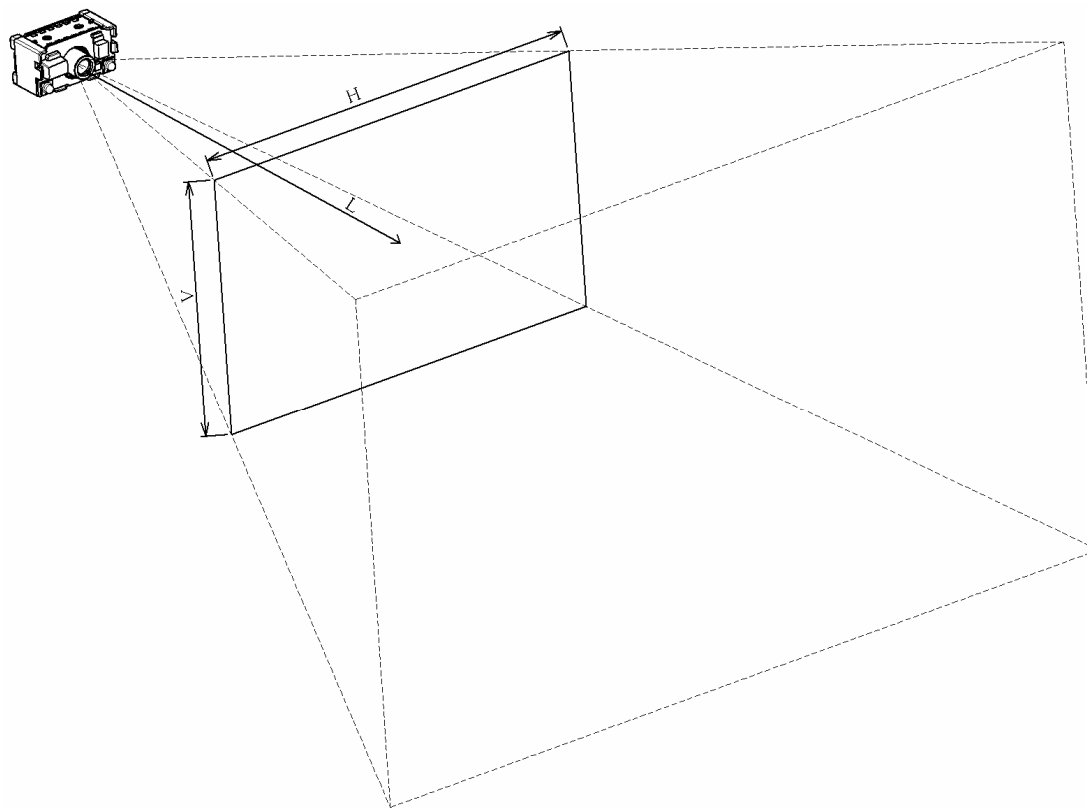


Figure 4: MDI-3100 Field of View

[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 _R	[mm]	10.5	18.5	25.5	34	41	48	55	63	70	78	86	93	101	108
H _L	[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.

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.

4.1.1. MSI-3100 Installation

- Lay out the camera and the decoder board to align the center of connector.
- When installing the camera module, use the following crew holes.
- When installing a camera, do not screw down further than the specified depth.
- 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.

<MSI-3100 Camera Installation Conditions>

Recommended screw : D2 B tight

Tightening torque : 5N_{cm} or less

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

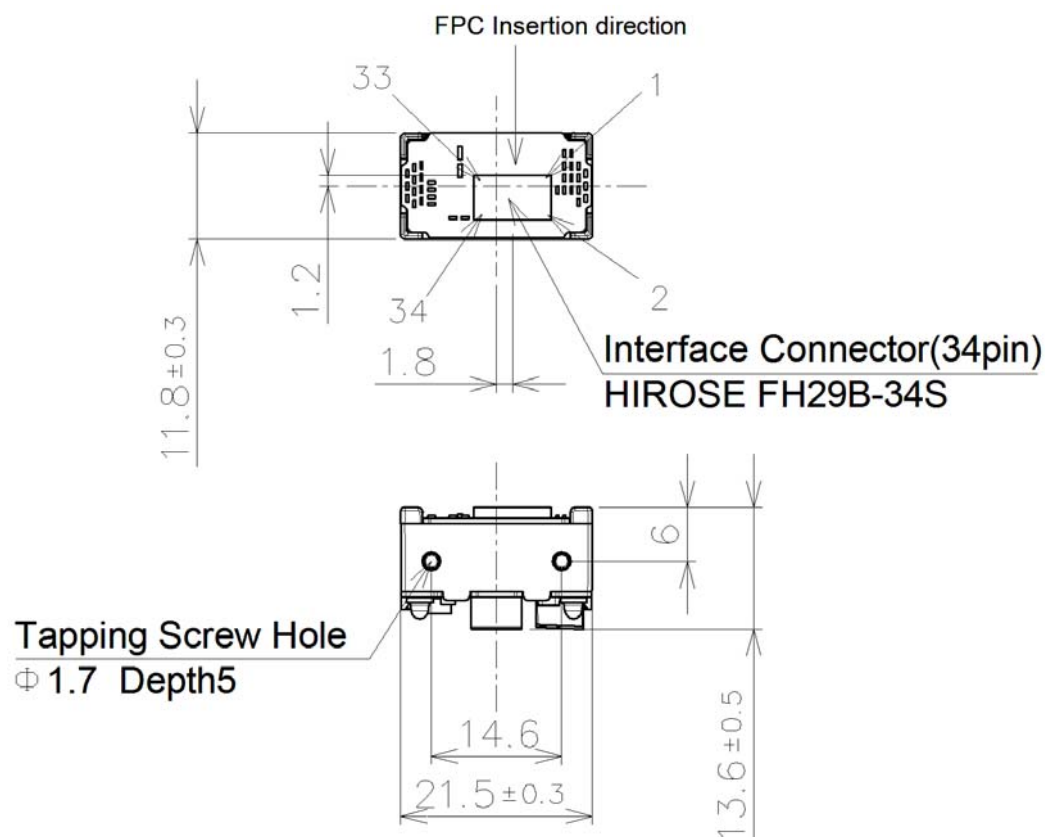


Figure 5: Camera Mounting Holes

4.1.2. DBM-3000 Installation

- Lay out the camera and the decoder board to align the center of connector.
- 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 ($\phi 4.5$).
- 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.

<DBM-3000 Decoder module Installation Conditions>

Recommended screw : M2.0x0.4 (Do not use a countersunk screw)
Tightening torque : 20N_{cm} or less

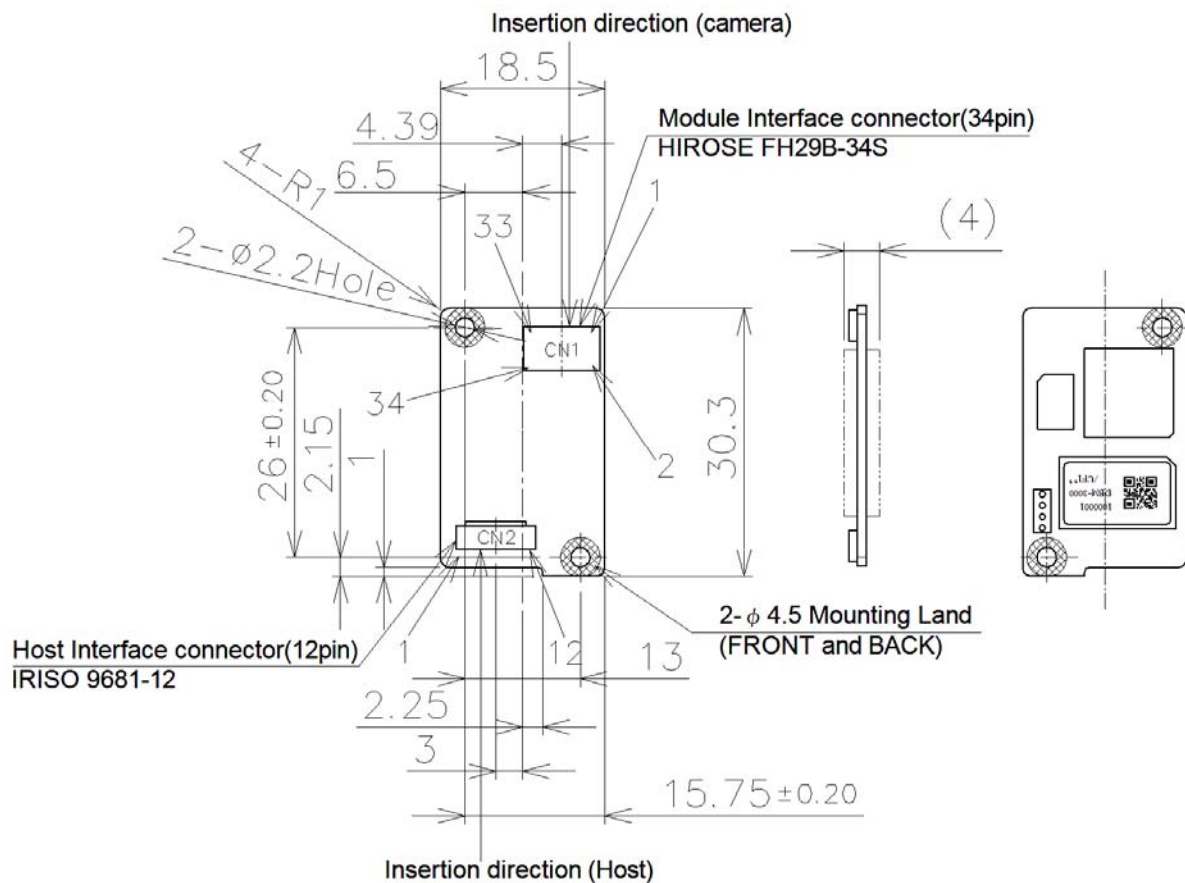


Figure 6: Decoder Board Mounting Holes

4.1.3. FPC Installation

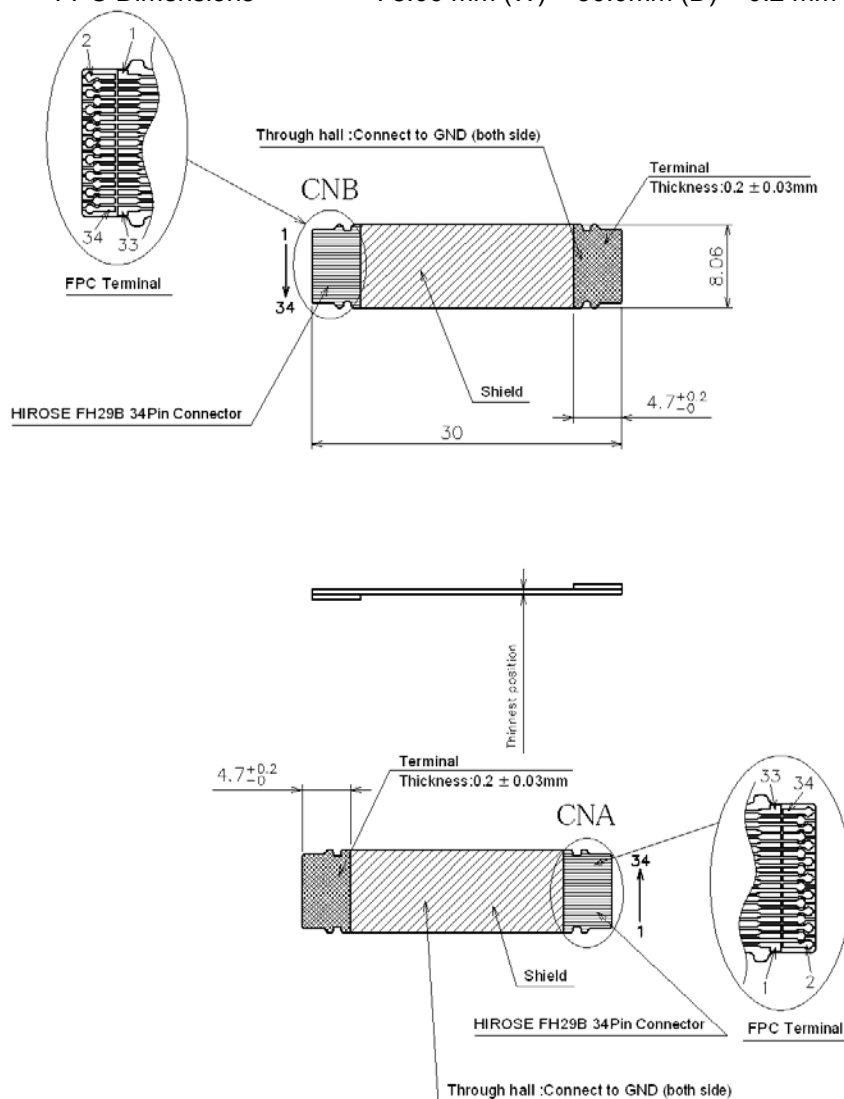
- Do not bend the FPC abruptly.
- When inserting or coupling FPC, check the locked condition.
- Be careful not to apply a load to the FPC after FPC mounting.

<FPC Installation Conditions>

The connector of the decoder side is the same as the camera side.

Connector : HIROSE FH29B-34S-0.2SHW(05)

FPC Dimensions : 8.06 mm (W) × 30.0mm (D) × 0.2 mm (H)



Connection table

CNA		CNB
34	max	33
33	max	34
32	max	31
31	max	32
30	max	29
29	max	30
28	max	27
27	max	28
26	max	25
25	max	26
24	max	23
23	max	24
22	max	21
21	max	22
20	max	19
19	max	20
18	max	17
17	max	18
16	max	15
15	max	16
14	max	13
13	max	14
12	max	11
11	max	12
10	max	9
9	max	10
8	max	7
7	max	8
6	max	5
5	max	6
4	max	3
3	max	4
2	max	1
1	max	2
PIN No.	Width (mm)	PIN No.

Figure 7: Decoder Board Mounting Holes

* The connection terminal "CNA" and "CNB" of the FPC are symmetric.

* These drawings are subject to change. For details, please obtain the most recent drawings from the connector manufacturer (Hirose)

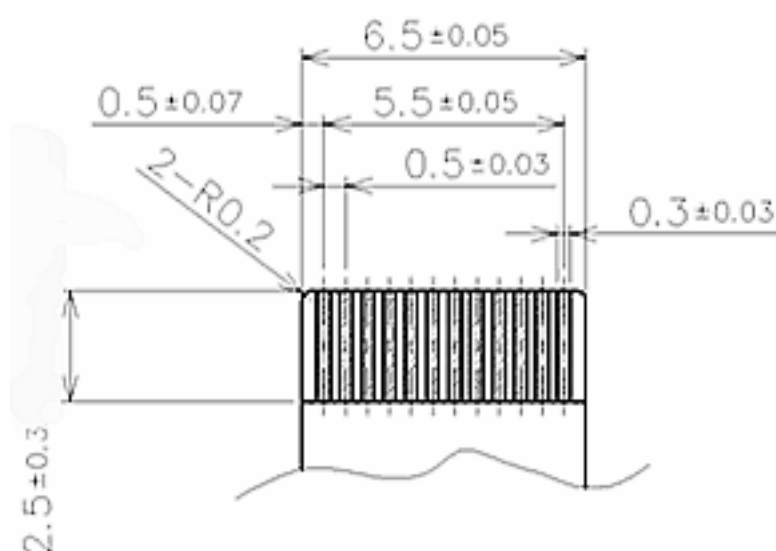
4.2. Cable and Connector

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 8: FFC



FFC specified thickness: 0.3 ± 0.03

Figure 9: 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, make sure the thickness and the dimensional tolerance of the FPC.

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-3000.

5. Mechanical Drawings

5.1. MSI-3100-SR (Standard Range Focus)

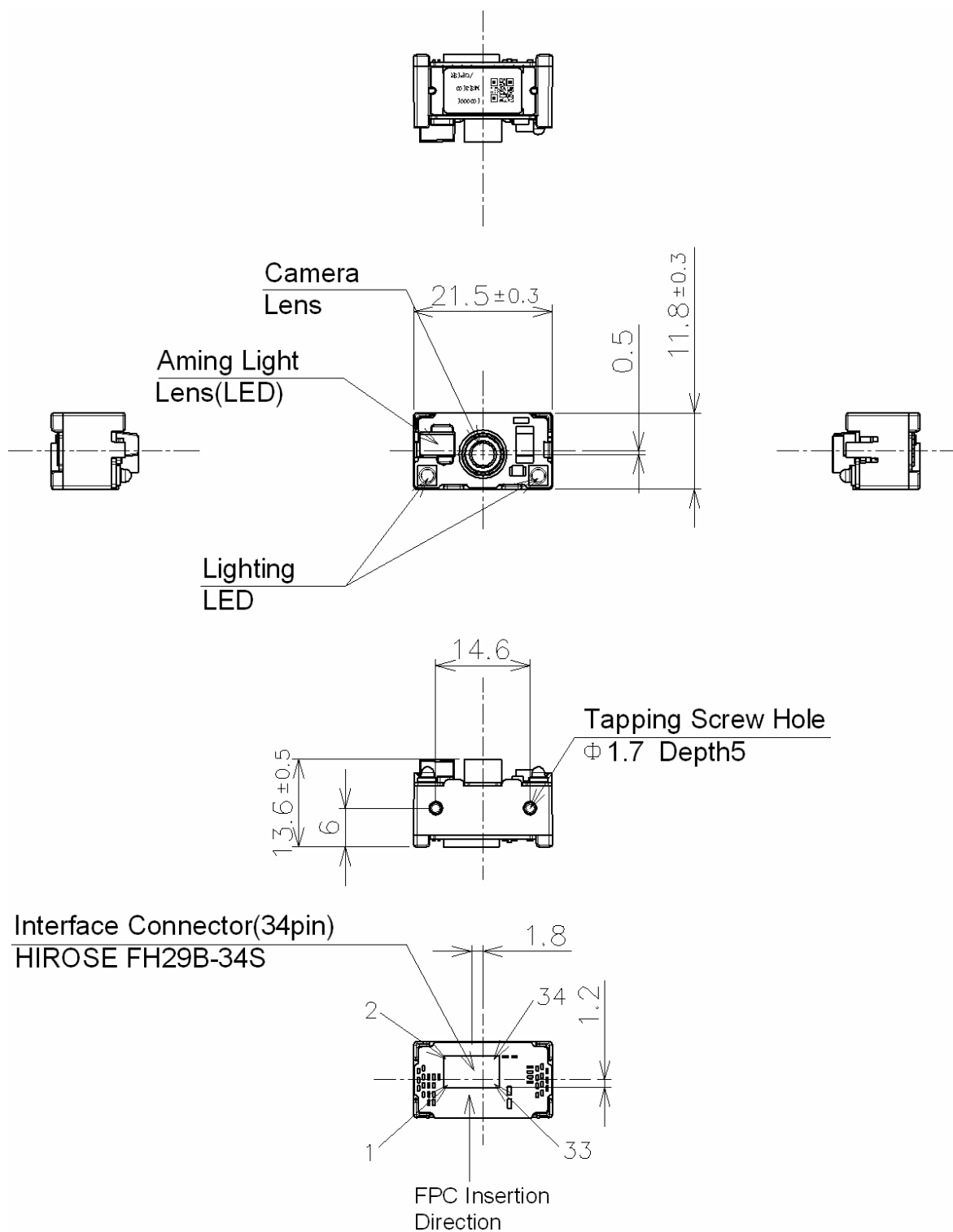


Figure 10: MSI-3100-SR

* 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)

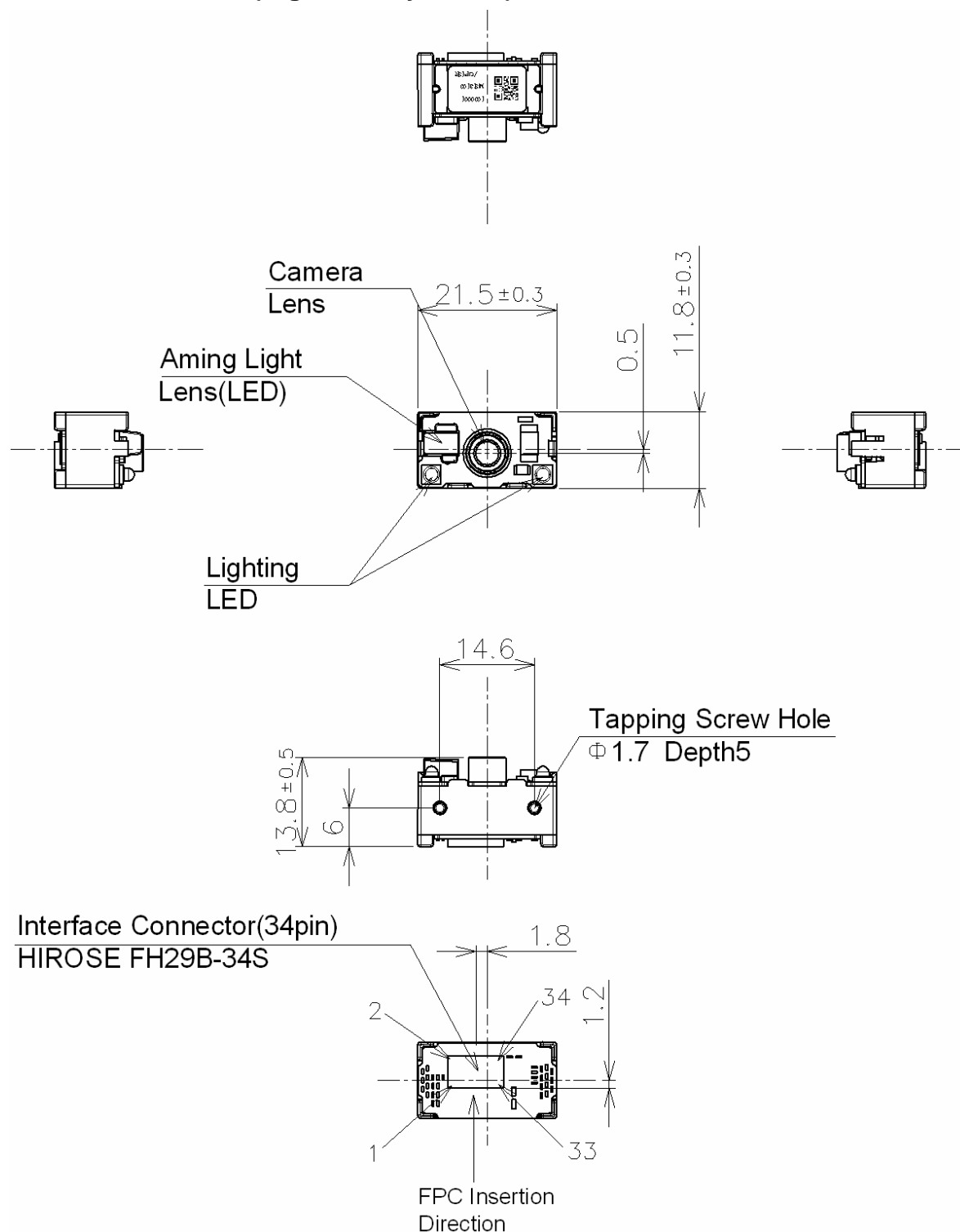


Figure 11: MSI-3100-HD

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

5.3. DBM-3000

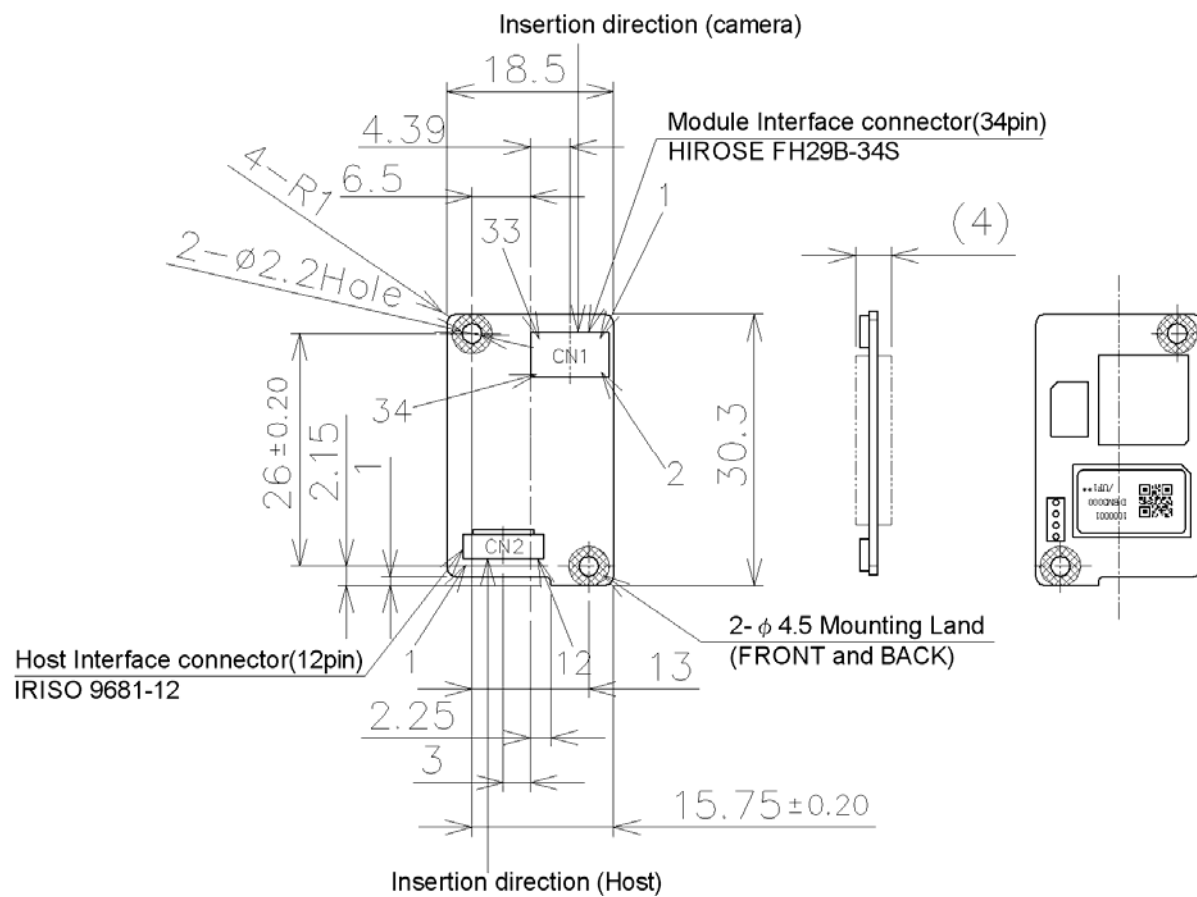


Figure 12: MSI-3100-HD