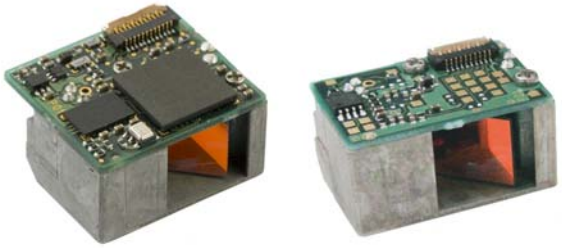
MSL/MDL 2001

Laser Scan Engine

OPTICON

Integration Guide



All information subject to change without notice.

Document History

Model Number:	MSL/MDL 2001	**Specification Number:**	TS06007
Edition:	1	**Original Spec. Number:**	TS05001
Date:	2011-06-12		

Limited Warranty and Disclaimers
PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLING AND OR USING THE PRODUCT.

Serial Number
A serial number appears on all Opticon products. This official registration number is directly related to the device purchased. Do not remove the serial number from your Opticon device. Removing the serial number voids the warranty.

Warranty
Unless otherwise agreed in a written contract, all Opticon products are warranted against defects in materials and workmanship for two years after purchase. Opticon will repair or, at its option, replace products that are defective in materials or workmanship with proper use during the warranty period. Opticon is not liable for damages caused by modifications made by a customer. In such cases, standard repair charges will apply. If a product is returned under warranty and no defect is found, standard repair charges will apply. Opticon assumes no liability for any direct, indirect, consequential or incidental damages arising out of use or inability to use both the hardware and software, even if Opticon has been informed about the possibility of such damages.

Packaging
The packing materials are recyclable. We recommend that you save all packing material to use should you need to transport your scanner or send it for service. Damage caused by improper packaging during shipment is not covered by the warranty.

Trademarks
Trademarks used are the property of their respective owners.

Opticon Inc. and Opticon Sensors Europe B.V. are wholly owned subsidiaries of OPTOELECTRONICS Co., Ltd., 5-3, Tsukagoshi 5-chome, Warabi-shi, Saitama, Japan 335-0002. TEL +81-(0) 48-446-1183; FAX +81-(0) 48-446-1180

SUPPORT

USA

Phone: 1.800.636.0090

Email: support@opticonusa.com

Web: www.opticonusa.com

Europe

Email: support@opticon.com

Web: www.opticon.com

Contents

Table of Figures

1. Introduction

The MSL/MDL 2001 series laser scan engine consists of precise optical elements and a scanning system. In order to maximize its performance and prevent problems, read this integration guide carefully and design your integration devices in accordance with it.

2. Integration Parameters

2.1. Exit Window Materials

Use an acrylic material for the exit window of the instrument you are integrating. Each MSL/MDL 2001-series scan engine has a coherent light source. Using birefringent material for an exit window may degrade the reading performance of MSL/MDL 2001 series scan engines due to optical interference. Acrylic material is the most suitable for an exit window because it has relatively low birefringence and a greater degree of transparency.

Select a high-quality acrylic material with a smooth, flat surface with no scratches or dents. Appropriate thickness is from 1 mm to 2 mm. To protect the exit window from dust, stains, and scratches during assembly, leave the protector sheet attached. When removing the protector sheet, static electricity may attract dust to it. Use an appropriate treatment, such as ion-blow or static removal.

To protect the exit window from scratches during actual operation, apply an anti-scratch coating on the surface. Coated acrylic plates are readily available as standard products. Such coatings greatly enhance the anti-scratch effects without degrading the optical properties of the acrylic material.

A colorless transparent acrylic plate is recommended. When using a colored exit window, confirm that its spectral property does not absorb the laser wavelength of the MSL/MDL 2001 (650 nm ±10 nm). Absorbent materials degrade the reading performance of MSL/MDL 2001-series scan engines. To minimize performance degradation due to Fresnel reflection, apply anti-reflective coating on an acrylic plate.

2.2. Window Size and Optical Path Clearances

With respect to the scanning beam and the detection area depicted below, provide an exit window with sufficient clearance. Create your design so there are no obstacles within an optical path area.

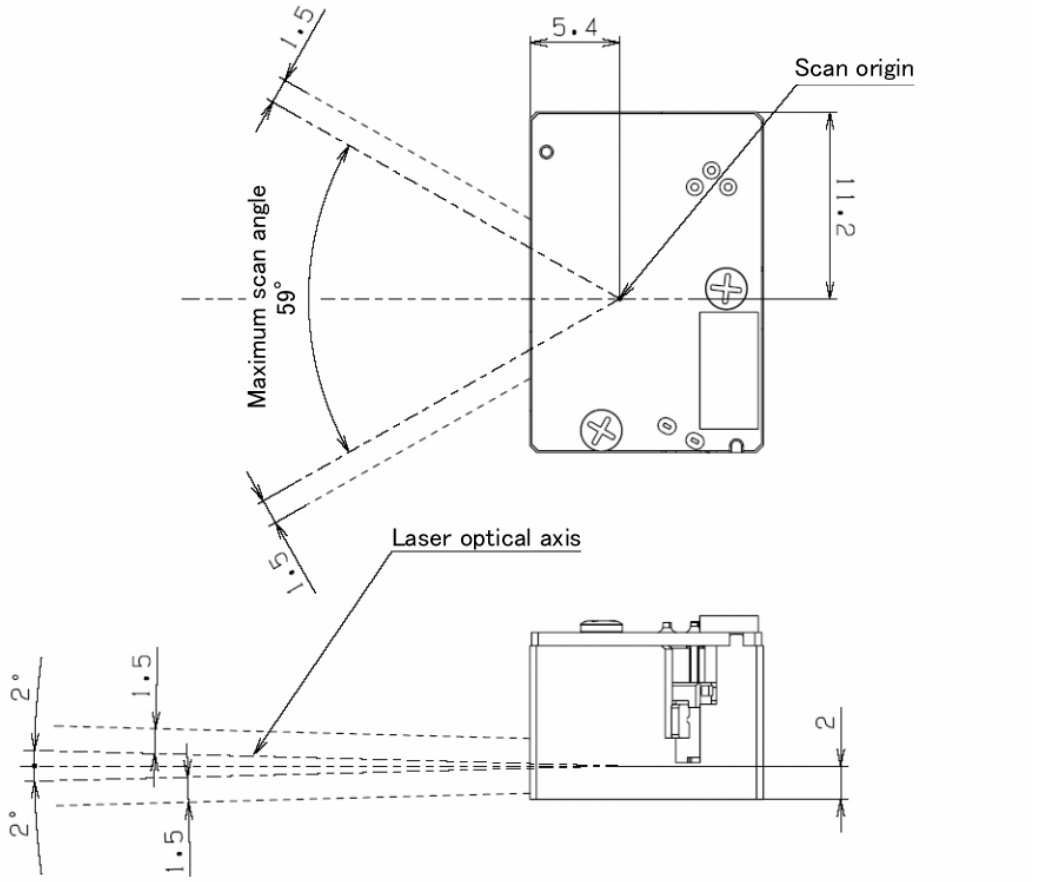


Figure 1: Optical path for scanning and necessary clearance

For the scanning plane, provide clearance at least 1.5 mm wider than the lines emanating from the scan origin at the scan angle: 59 degrees, as shown above.

For the optical axis, provide clearance at least 1.5 mm wider than the lines emanating at the maximum margin of error: 2.0 degrees.

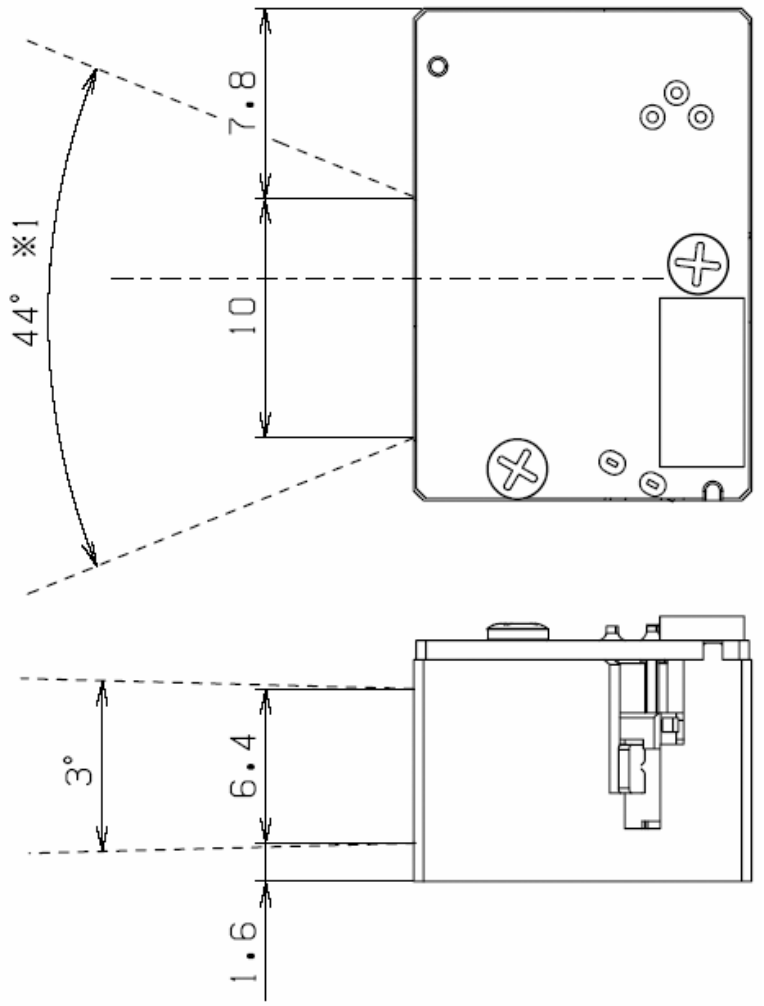


Figure 2: Optical path for detection and necessary clearance

Provide at least the clearance for the detecting range between the dotted lines shown above.

2.3. Window Position and Inclination

To prevent Fresnel reflection of a scanning beam from directly reflecting back into the engine, incline the exit window at the angle described as follows.

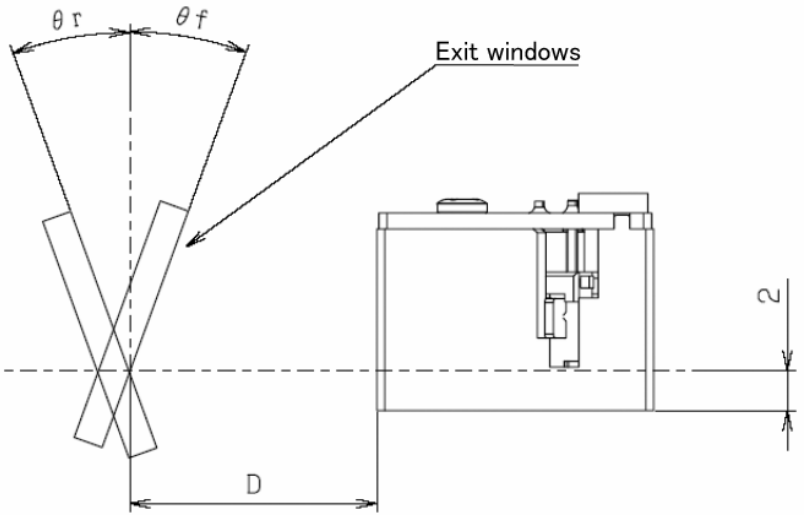


Figure 3: Window position and inclination

Distance to an Exit Window and Minimum Inclination (θf direction)

D (mm)	3.5	4	4.5	5	5.5	6	7	8	9	10 ~
θf (deg)	>22°	>20°	>18°	>16°	>15°	>14°	>13°	>12°	>11°	>10°

Distance to an Exit Window and Minimum Inclination (θr direction)

D (mm)	3	3.5	4	4.5	5	6	7	8	9	10
θf (deg)	>40°	>38°	>36°	>35°	>33°	>31°	>29°	>27°	>25°	>23°

*The maximum exit window inclination is 45 degrees in both directions, θf and θr.

Values of inclinations shown on the table above are the minimum values that satisfy immunity from Fresnal reflected beam reentering. Keep enough margin and design the integrated product so that it is not below the minimum angles in the table above, taking the error margin of the host instrument into account.

2.4. Treatment of Scanning Beam Reflection at Exit Window

Laser beams generated at an exit window may directly reflect back onto the scan engine and degrade the reading performance of MSL/MDL 2001 series scan engines if they also reflect on a chassis surface, as shown in Figure 4.

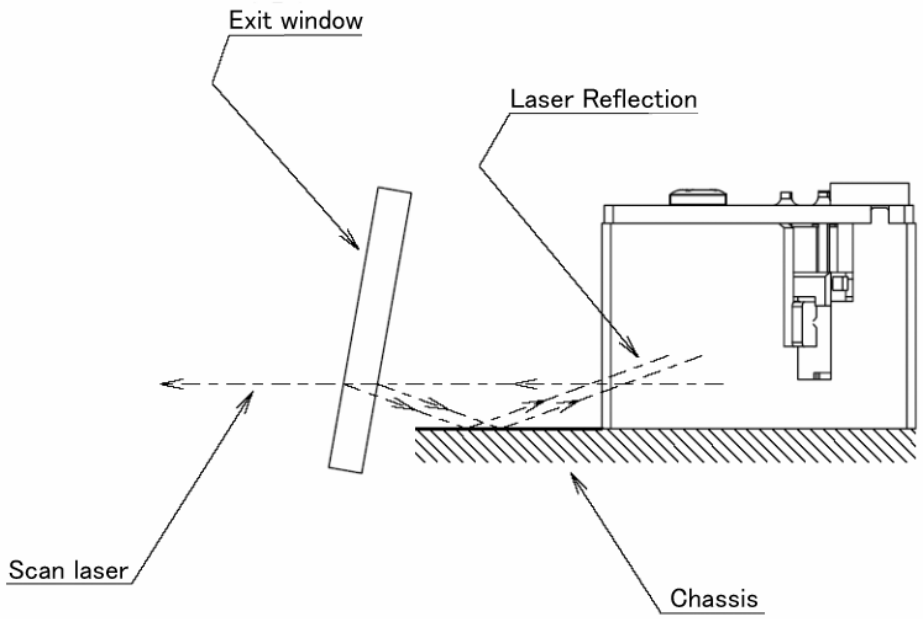


Figure 4: Reflected laser beams may affect performance

To avoid this problem, prevent the reflection of the laser beam. For instance, provide a chassis with enough inclination to deflect a reflected beam (see Figure 5). A black or navy blue chassis is recommended because those colors absorb reflected laser beams.

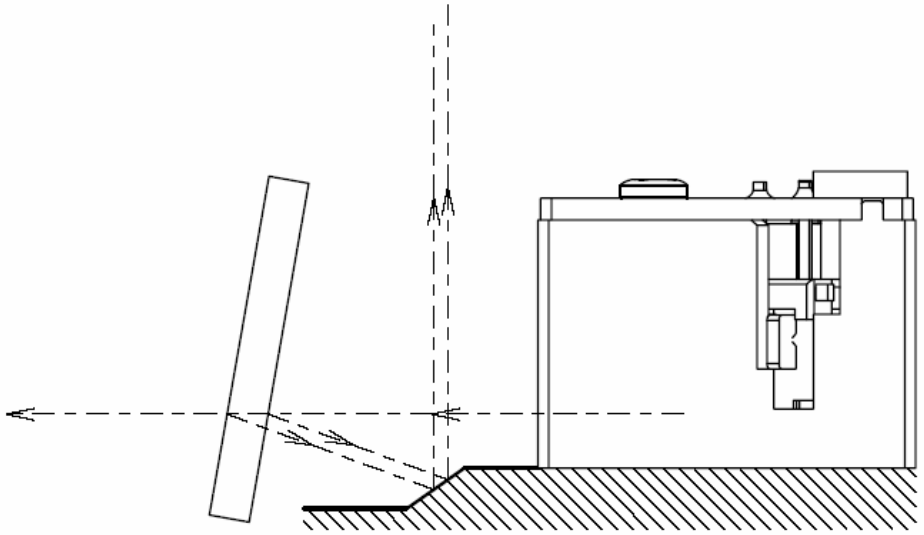


Figure 5: Use a chassis with sufficient inclination to deflect a reflected beam

3. Installation

When installing an MSL/MDL 2001-series scan engine, use the assigned screw holes on the bottom surface. Do not over-tighten the screws. Use non-magnetic or brass screws, since the MSL/MDL 2001's scan mirror is driven by electromagnetic force. Do not apply torque greater than 1.6 kgf/cm2 when tightening a screw.

There are also guide holes on the bottom surface. Using a chassis surface with corresponding projections improves alignment precision.

Only the bottom surface of the MSL/MDL 2001 series scan engine can be attached to a chassis for installation. Keep enough clearance so that your host instrument does not apply direct force to the MSL/MDL 2001, in case it is dropped or warped. The MSL/MDL 2001's anti-shock reliability is confirmed only when impulse (acceleration) is applied via the contact (bottom) surface. The MSL/MDL 2001 cannot withstand direct shock, since it consists of precise optical elements.

The MSL/MDL 2001's metal case is connected to its circuit ground (including interface). The metal case has to be grounded or insulated from the host instrument's circuit.

3.1. Magnetic Element Placement

The MSL/MDL 2001's scan mirror is driven by electromagnetic force. Placing magnetic materials, such as iron, and magnetic-field inducing materials around the MSL/MDL 2001 may affect the scan mirror's normal operation. More precisely, it may cause scan angle inconsistency, scan angle decrease, and irregular scan modes. In order to avoid such anomalies, design your host instrument carefully based on the following points.

1. Do not place magnetic materials within 5 mm of the edge of the MSL/MDL 2001.
2. If there is no other option than placing magnetic materials within the surrounding area, confirm in advance that the magnetic materials do not affect the scanning.
3. Do not apply any strong magnetic field to the MSL/MDL 2001, even for a short period of time.

4. Handling Requirements

4.1. Anti-static Measures

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. The MSL/MDL 1000 contains electrostatically sensitive devices, such as a laser diode and LSIs.

Hold the scan engine only by the metal case. Do not touch the circuit board or the front side of the scan engine when handling it. Do not touch the electronic elements or the terminals of the circuit board.

4.2. Clean Environment

Installation in a clean environment is recommended in order to protect the imaging lens from dust. Operators should wear a mask to avoid contaminating the optical elements. If dust clings to the scan mirror, gently blow it off with dry air. High-volume blowing may cause damage to the scan mirror. It is difficult to remove stains from the scan mirror; do not leave stains on the scan mirror when handling.

5. Mechanical Drawings

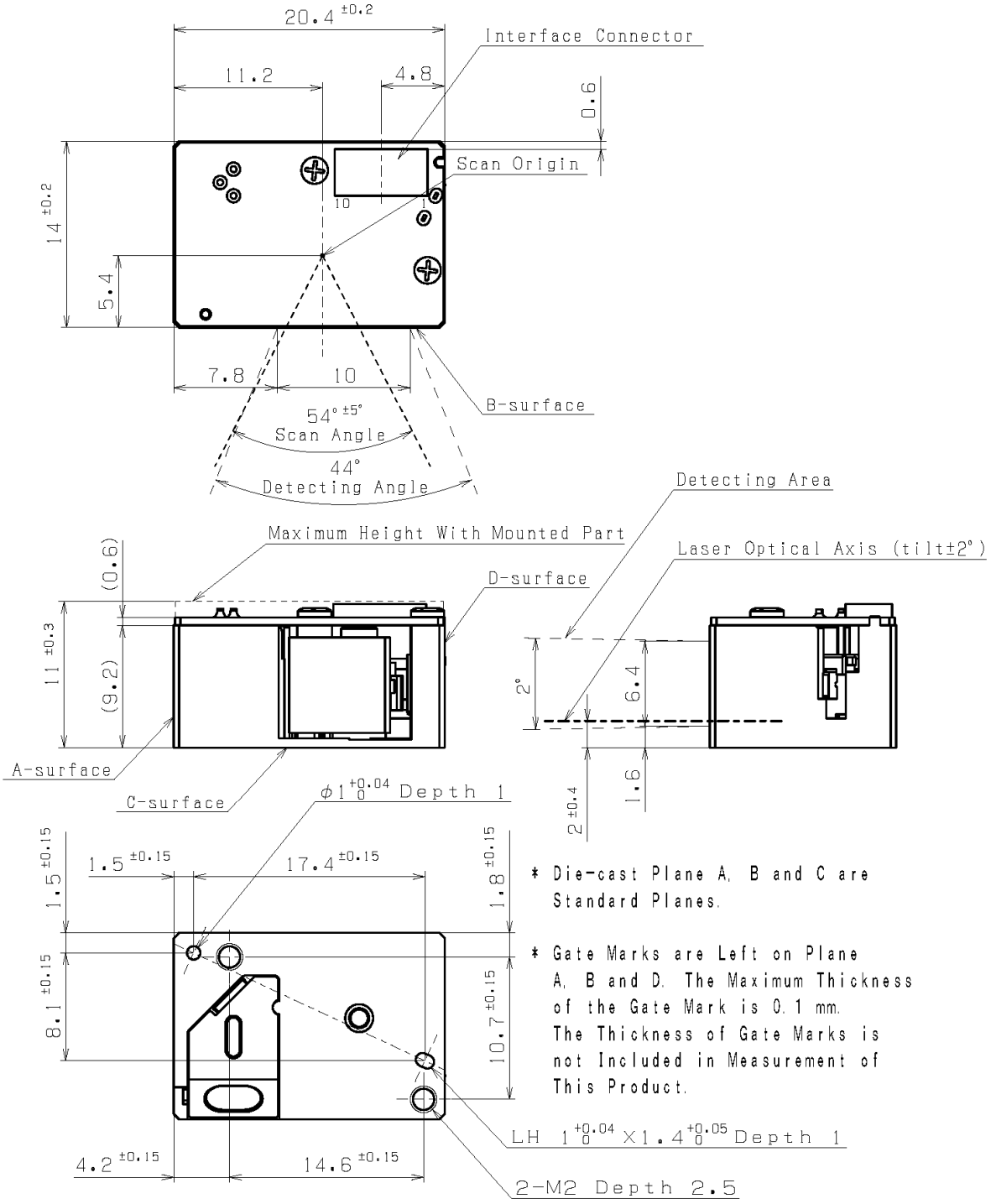


Figure 6: MSL 2001 outline drawing

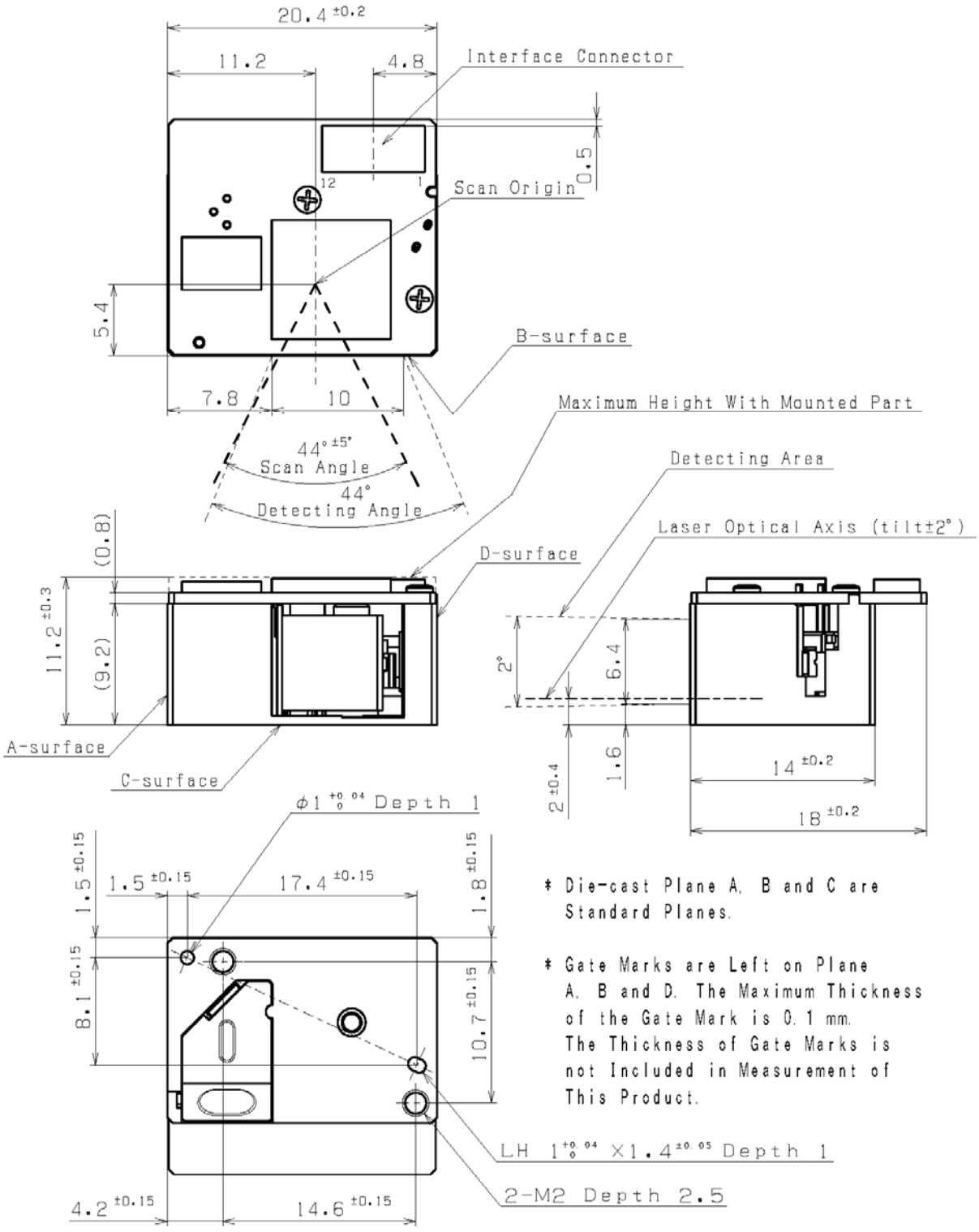


Figure 7: MDL 2001 outline drawing