

Line Laser Sensor SurfaceMeasure

SurfaceMeasure1008S



Instruction Manual - Instructions for use -

- Conventions Used in This Document 3
Mitutoyo Software End User License Agreement 4
Labels on Product 9
Safety Precautions 10
Precautions for Use 14
Electromagnetic Compatibility (EMC) 15
Export Control Compliance 15
Notes on Export to European Countries 15
Disposal of Products outside the European Countries 16
Disposal of Old Electrical & Electronic Equipment 16
(Warranty) (Applicable in the European Countries with Separate Collection Systems) 16
Warranty 16
Disclaimer 17
1 Overview 18
2 Getting Started 19
3 Troubleshooting 27
4 Specifications 29

Read this document thoroughly before operating the product. After reading, retain it close at hand for future reference. This English language version of the document contains the original instructions.

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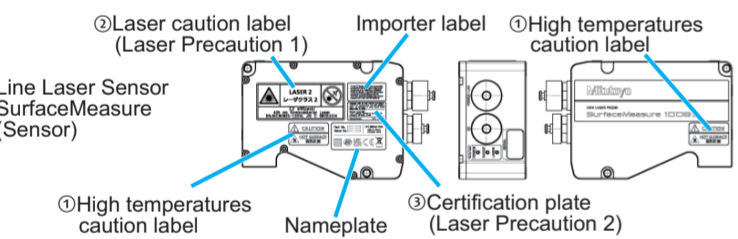
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Labels on Product

Product safety labels

This product has been designed and manufactured with human safety as a priority. In order to use it more safely, product safety labels have been applied to the main body and all peripheral devices. This section explains the meaning and the contents of each safety label on the product. Before operating this product, be sure to carefully read this section to use this product safely and for a long time.

Locations of labels



Label details and precautions

Table with 2 columns: Product safety labels and Notes. Details include High temperatures caution label, Laser Caution label, and Certification plate with corresponding notes on high-temperature caution and laser beam safety.

Handling, Cleaning, and Maintenance

IMPORTANT Dirty or damaged sensor windows (emitter or camera) can affect accuracy. Use caution when handling the sensor or cleaning the sensor's windows. Keep sensor windows clean. Use dry, clean air to remove dust or other dirt particles. If dirt remains, clean the windows carefully with a soft, lint-free cloth and non-streaking glass cleaner or volatility alcohol. Ensure that no residue is left on the windows after cleaning. Turn off lasers when not in use. Mitutoyo uses semiconductor lasers in SurfaceMeasure1008S. To maximize the lifespan of the sensor, turn off the laser when not in use. Avoid excessive modifications to files stored on the sensor. Sensor settings are stored in flash memory inside the sensor. Flash memory has an expected lifetime of 100,000 writes. To maximize lifetime, avoid frequent or unnecessary file save operations.

Environment and Lighting

IMPORTANT Avoid strong ambient light sources. The imager used in this product is highly sensitive to ambient light. Do not operate this device near windows or lighting fixtures that could influence measurement or data acquisition. If the unit must be installed in an environment with high ambient light levels, a lighting shield or similar device may need to be installed to prevent light from affecting measurement.

IMPORTANT Ensure that ambient conditions are within specifications. Sensors are suitable for operation between 0-40° C and 25-85% relative humidity (non-condensing). Measurement error due to temperature is limited to 0.015% of full scale per degree C. The storage temperature is -30-70° C. The Master network controllers are similarly rated for operation between -0-50° C.

IMPORTANT The sensor must be heat-sunk through the frame it is mounted to. When a sensor is properly heat sunk, the difference between ambient temperature and the temperature reported in the sensor's health channel is less than 15° C.

IMPORTANT Sensors are high-accuracy devices, and the temperature of all of its components must therefore be in equilibrium. When the sensor is powered up, a warm-up time of at least ninety minutes is required to reach a consistent spread of temperature in the sensor.

Product names and model numbers covered in this document

Table with 2 columns: Product name and Model number. Entry: Line Laser Sensor SurfaceMeasure, SurfaceMeasure 1008S

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Safety Precautions

Read these "Safety Precautions" thoroughly before operating the product to use it properly. These safety precautions include such information as to prevent injury to the operator and other persons, damage to property and product defects. Be sure to observe these precautions carefully.

Precautions for this product

- WARNING: Removing the covers or disassembling this product will cause electric shock or burns, and in a worse case it may result in serious injury or death.
CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
If the product is going to be used in the following places, adequately implement shielding countermeasures.
In conjunction with the causes of injuries, if the product is used beyond the conditions that are indicated in the specifications, its functions and performance can no longer be guaranteed.
Where noise is generated due to static electricity, etc.
Where there is strong electrical field intensity
Where power cables and power transmission lines are running through nearby
Where there are risks of radiation being irradiated
Where there are risks of being exposed to corrosive gases, etc.

NOTICE

To ensure reliable operation and to prevent damage to sensors, avoid installing the sensor in locations that are humid, dusty, or poorly ventilated; with a high temperature, such as places exposed to direct sunlight; where there are flammable or corrosive gases; where the unit may be directly subjected to harsh vibration or impact; where water, oil, or chemicals may splash onto the unit; where static electricity is easily generated.

Precautions for Use

- Use and handling of the product
Use this product only by connecting to instruments which support this product. Do not use this product for instruments which does not support this product. For measuring instruments supported by this product, contact the agent where you purchased the product or a Mitutoyo sales office.
This product is for industrial usage. Do not use this product for purposes other than for industrial usage.
The product is a precision instrument. Do not subject the product to drastic shocks such as dropping it, or exert excessive force upon it. Do not disassemble or modify the product. If the product is used beyond the conditions indicated in the specifications ("4 Specifications" on page 29 and "Users' Manual "14 Specifications"), be aware that the functions and performance cannot be guaranteed.

Environment for placement
For usage environment explanations, see "Environment and Lighting" on page 13.

Safety reminders conventions warning against potential hazards

Table defining warning symbols: DANGER (high risk), WARNING (medium risk), CAUTION (low risk), and NOTICE (situations where failure could result in property damage, specifically Electricity).

Conventions indicating prohibited and mandatory actions

Table defining action symbols: Prohibited (no), Mandatory (up arrow), and Grounding (down arrow).

Conventions indicating referential information or reference location

Table defining information symbols: IMPORTANT (must be known), Tips (further information), and Reference location (information referred to in manual).

Other conventions

Table defining other symbols: Round brackets (paraphrase), Double quotation marks (highlighted phrase), and Square brackets (menu items).

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CAUTION

This product uses a visible light laser beam. Any procedures other than the procedures described herein may result in hazardous radiation exposure. As for the laser product safety standards, this product conforms to the following standards.

Table with 2 columns: Applicable standards and Laser class. Includes EN/IEC 60825-1:2014, JIS C 6802:2014, Class 2 laser product.

Class 2 laser product: This product is a laser product which emits visible light in the 400 nm to 700 nm wavelength spectrum, and it is dangerous if you intentionally look into the laser beam. Even if the beam hits your skin, it will not particularly be a problem. Protective equipment such as protective eyewear, etc., is not necessary, but if protective eyewear is purchased for use, refer to the wavelengths contained in Users' Manual "Specifications". Laser Safety: SurfaceMeasure1008S is referred to as components, indicating that they are sold only to qualified customers for incorporation into their own equipment.

- Absolutely do not peel off the following laser class label which is applied to the main unit of the Line Laser Probe SurfaceMeasure for precautions.
Locations of labels" on page 9
Do not look into the laser emitter. Absolutely do not look into it even if the beam is not emitted.
Do not look directly at the laser beam with optical equipment (things which converge light such as magnifying glasses, etc.). In addition, do not allow the light reflected from the flat surfaces to enter into your eyes, when measuring flat surfaces such as mirror surface. Even if the beam hits your skin, it will not particularly be a problem.

Electromagnetic Compatibility (EMC)

This product complies with the EMC Directive and the UK Electromagnetic Compatibility Regulations; however, if this receives electromagnetic interference that exceeds these requirements, it will be out of warranty and require appropriate measures. This product is an industrial product, and is not intended to be used in residential environment. If this product is used in residential environment, this product may cause electromagnetic interference with other instruments. In such a case, it is required to take appropriate measures for preventing such electromagnetic interference.

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This product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of Export Trade Control Order or under Category 16 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan. If you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-providing of the technology (including Programs), you shall observe the regulations of your country.

Also, if an option is added or modified to add a function to this product, this product may fall under the category of List-Control Goods, List-Control Technology (including Programs) under Category 1 - 15 of Appended Table 1 of Export Trade Control Order or under Category 1 - 15 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan. In that case, if you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-providing of the technology (including Programs), you shall observe the regulations of your country. Please contact Mitutoyo in advance.

Notes on Export to European Countries

When you intend exporting of this product to any of the European countries, it may be required to provide User's Manual(s) in English and Declaration of Conformity in English (in some cases, the official language of the country to be exported). For detailed information, please contact Mitutoyo in advance.

Table defining symbols: Square brackets (menu items), numbered links (order and contents), and action symbol (action result).

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The governing language of this EULA shall be English. English version will prevail to the extent that there is any inconsistency between English version and any version translated into another language.

Electrical Safety

- WARNING: Failure to follow the guidelines described in this section may result in electrical shock or equipment damage.
Sensors should be connected to earth ground. All sensors should be connected to earth ground through their housing. All sensors should be mounted on an earth grounded frame using electrically conductive hardware to ensure the housing of the sensor is connected to earth ground. Use a multi-meter to check the continuity between the sensor connector and earth ground to ensure a proper connection.
Minimize voltage potential between system ground and sensor ground. Care should be taken to minimize the voltage potential between system ground (ground reference for I/O signals) and sensor ground. This voltage potential can be determined by measuring the voltage between Analog\_out and system ground. The maximum permissible voltage potential is 12 V but should be kept below 10 V to avoid damage to the serial and encoder connections.
For a description of the connector pins, see Users' Manual "14.2.2 SurfaceMeasure1008S I/O Connector".
Use a suitable power supply. The power supply used with sensors should be an isolated supply with inrush current protection or be able to handle a high capacitive load. Verify the voltage input requirements for your sensor in the sensor's specifications; for specifications, see Users' Manual "14.2 Sensor Connectors".
Use care when handling powered devices. Wires connecting to the sensor should not be handled while the sensor is powered. Doing so may cause electrical shock to the user or damage to the equipment.

Heat Warning

- CAUTION: If a sensor is not adequately heat-sunk, the housing may get hot enough to cause injury.
Sensors should be properly heat-sunk. To avoid injury and to ensure that a sensor functions properly, mount the sensor to a thermally conductive material for good heat-sinking. See also, "Environment and Lighting" on page 13.

Disposal of Products outside the European Countries

Please follow the official instruction in each community and country.

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Countries with Separate Collection Systems)

This symbol on the product or on its packaging is based on WEEE Directive (Direct on Waste Electrical and Electronic Equipment), and this symbol indicates that this product shall not be treated as household waste. To reduce the environmental impact and minimize the volume of landfills, please cooperate in reuse and recycle. For how to dispose of the product, please contact the agent where you purchased the product or a Mitutoyo sales office.

Warranty

This product has been manufactured under strict quality management, but should it develop problems within one year of the date of purchase in normal use, repair shall be performed free of charge. Please contact the agent where you purchased the product or Mitutoyo sales representative (Users' Manual "SERVICE NETWORK"). This warranty, however, shall not affect any provisions of the Mitutoyo Software End User License Agreement. If this product fails or is damaged for any of the following reasons, it will be subject to a repair charge, even if it is still under warranty.

- Failure or damage owing to fair wear and tear
Failure or damage owing to inappropriate handling, maintenance or repair, or to unauthorized modification
Failure or damage owing to transport, dropping, or relocation of the product after purchase
Failure or damage owing to fire, salt, gas, abnormal voltage, lightning surge, or natural disaster
Failure or damage owing to use in combination with hardware or software other than those designated or permitted by Mitutoyo
Failure or damage owing to use in ultra-hazardous activities

This warranty is effective only where the product is properly installed and operated in conformance with the instructions in this document within the original country of the installation.

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You assume responsibility for all results due to the selection of this product to achieve your intended results.

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## 1 Overview

The Line Laser Sensor SurfaceMeasure1008S is a laser sensor system that uses a line laser to enable non-contact form measurement. The Line Laser Sensor SurfaceMeasure1008S (hereinafter referred to as the sensor, or sensor's main unit) is mounted onto various transport devices and industrial robots for use.

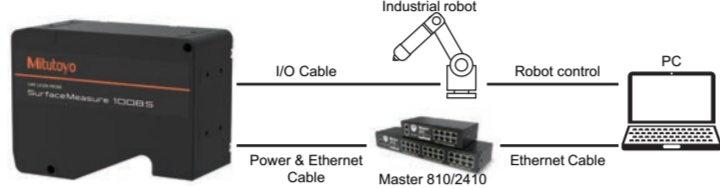
The mounted sensor irradiates the target to be measured with a laser beam, detects the reflected light, and measures the form of the targets in a non-contact manner.

The product has the following features.

- Enables high-precision non-contact form measuring.
- Enables data acquisition in various applications, and can be used as a simple measuring tool.  
Application examples: total inspections, 3D data acquisition applications
- Enables measuring via high environmental resistance (IP67) even in poor environmental conditions.
- Enables various kinds of measuring, and GO/NG judgment via the advanced processing functions built into the sensor's main unit.
- Enables setups of the sensor using Internet browsers.
- Enables data check and analysis off line using the supplied emulator.
- Enables supporting various input and output devices using the supplied software development kit (SDK).

In addition, multiple sensors can be connected to configure a measuring system by using the Master810/2410 network controller.

Example of a system configuration whereby the sensor main unit or body and Master network controller are used.

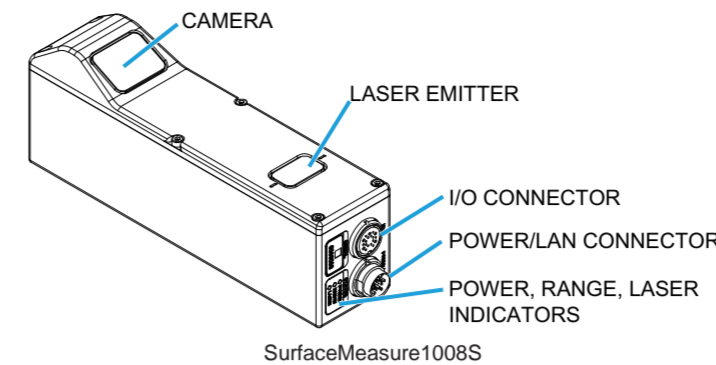


17

## 2 Getting Started

### 2.1 Hardware Overview

The following sections describe SurfaceMeasure1008S and its associated hardware.



Item	Description
Camera	Observes laser light reflected from target surfaces.
Laser Emitter	Emits structured light for laser profiling.
I/O Connector	Accepts input and output signals.
Power / LAN Connector	Accepts power and laser safety signals and connects to 1000 Mbit/s Ethernet network.
Power Indicator	Illuminates when power is applied (blue).
Range Indicator	Illuminates when camera detects laser light and is within the sensor's measurement range (green).
Laser Indicator	Illuminates when laser safety input is active (amber).

### IMPORTANT

The SurfaceMeasure 1008 S sensor is a precision device. The temperature of all of its components must be in equilibrium. After powering on the sensor, it should take at least an hour to warm up before the temperature inside the sensor stabilizes.

### 2.3.2 Grounding

- WARNING** Make sure that the sensor system components are properly grounded. There is a risk of electric shock.

### ■ Grounding SurfaceMeasure1008S

This product should be grounded to the earth/chassis through their housings and through the grounding shield of the Power I/O cordset. Sensors have been designed to provide adequate grounding through their mounting screws. Always check grounding with a multi-meter to ensure electrical continuity between the mounting frame and the sensor's connectors.

#### Tips

The frame that the sensor is mounted to must be connected to earth ground.

### ■ Recommended practices for cordsets

If you need to minimize interference with other equipment, you can ground the Power & Ethernet or the Power & Ethernet to Master cordset by terminating the shield of the cordset before the split. The most effective grounding method is to use a 360-degree clamp.

For more instructions, see Users' Manual "2.4.4 Grounding".

## 2.3 Installation

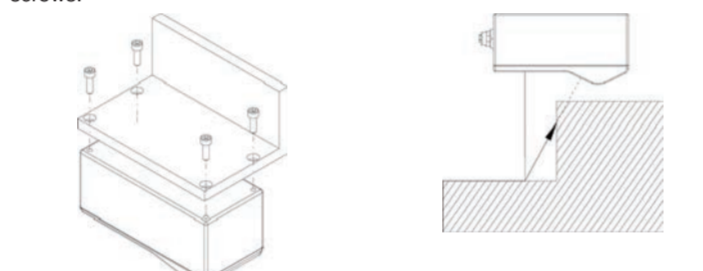
### 2.3.1 Mounting

Sensors should be mounted using a model-dependent number of screws. Some models also provide the option to mount using bolts in through-body holes. Refer to the dimension drawings of the sensors in Users' Manual "14 Specifications" for the appropriate screw diameter, pitch, and length, and bolt hole diameter.

#### NOTICE

Proper care should be taken in order to ensure that the internal threads are not damaged from cross-threading or improper insertion of screws.

Sensors should not be installed near objects that might occlude a camera's view of the projected light.



Sensors should not be installed near surfaces that might create unanticipated laser reflections.

#### IMPORTANT

The sensor must be heat sunk through the frame it is mounted to. If the heat dissipation is obstructed, that might cause malfunctions. When a sensor is properly heat sunk, the difference between ambient temperature and the temperature reported in the sensor's health channel is less than 15° C.

21

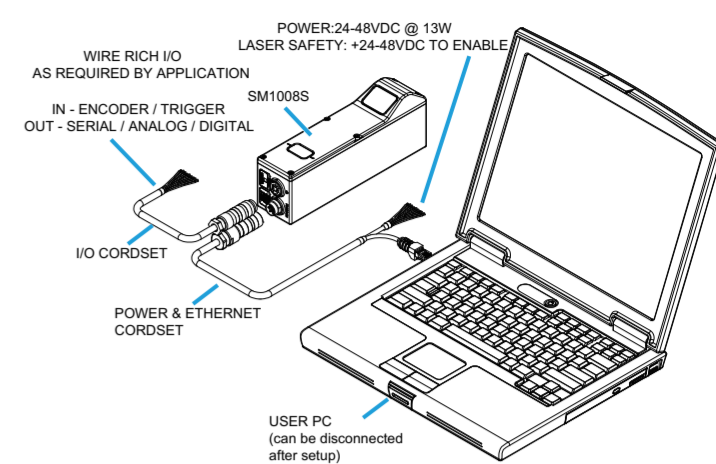
18

## 2.2 System Overview

The SurfaceMeasure1008S can be configured into systems according to the various measuring environments (situations). Sensors can be connected in the forms of standalone devices, dual-sensor systems, or multi-sensor systems.

### 2.2.1 Standalone System

Standalone systems are typically used when only a single sensor is required. The device can be connected to a computer's Ethernet port for setup and can also be connected to devices such as encoders, photocells, or PLCs.



### 2.4 Network Setup

The sensor is set by connecting with a web browser.

#### Tips

DHCP is not recommended for sensors. If you choose to use DHCP, the DHCP server should try to preserve IP addresses. Ideally, you should use static IP address assignment (by MAC address) to do this.

#### Tips

The following sections refer to using the sensor's web interface. For important information on browser compatibility, see Users' Manual "4.1 Browser Compatibility and Performance".

### 2.4.1 Client Setup

To connect to a sensor from a client PC, you must ensure the client's network card is properly configured. Sensors are shipped with the following default network configuration:

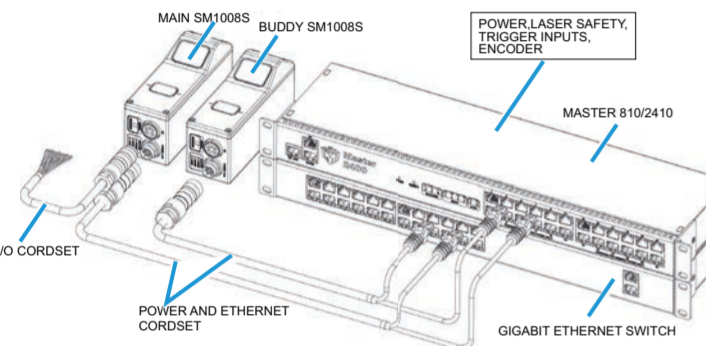
Setting	Default
DHCP	Disabled
IP Address	192.168.1.10
Subnet Mask	255.255.255.0
Gateway	0.0.0.0

#### Tips

All sensors are configured to 192.168.1.10 as the default IP address. For a dual-sensor system, the Main and Buddy sensors must be assigned unique addresses before they can be used on the same network.

### 2.2.2 Dual-Sensor System

In a dual-sensor system, the two sensors work in tandem to acquire measuring data, and the combined results are output. The main sensor is called the Control sensor, and the other sensor is called the Buddy sensor. The sensors' software recognizes three installation orientations: Opposite, Wide, and Reverse. A Master network controller (excluding Master 100) must be used to connect two sensors in a dual-sensor system. Power and Ethernet to Master cordsets are used to connect sensors to the Master.



### 2.2.3 Accessories

In this product, the following accessories are included. If there is a shortage, see Users' Manual "SERVICE NETWORK", and contact Mitutoyo, or the agent where you purchased the product.

Name	Part Number	Amount
Calibration Disk	02AQL299	1
Instruction Manual [Japanese Version]	99MCA914J	1
Instruction Manual [English Version]	99MCA914A	1
USB memory for electronic file distribution	02AQL350	1
- User's Manual [Japanese Version]	99MCA912J	-
- User's Manual [English Version]	99MCA912A	-

22

19

- 1 Connect cables and apply power.
- 2 Change the client PC's network settings.

#### Windows 7

- 1 Open the Control Panel, select [Network and Sharing Center], and then click [Change Adapter Settings].
- 2 Right-click the network connection you want to modify, and then click [Properties].
- 3 On the [Networking] tab, click [Internet Protocol Version 4 (TCP/IPv4)], and then click [Properties].
- 4 Select the [Use the following IP address] option.
- 5 Enter IP Address "192.168.1.5" and Subnet Mask "255.255.255.0", then click [OK].

#### Mac OS X v10.6

- 1 Open the Network pane in [System Preferences] and select [Ethernet].
- 2 Set [Configure] to [Manually].
- 3 Enter IP Address "192.168.1.5" and Subnet Mask "255.255.255.0", then click [Apply].

23

- 4 Ensure that Replay mode is off (the slider is set to the left).



- 5 Ensure that the Laser Safety Switch is enabled or the Laser Safety input is high.

- 6 Go to the [Scan] page.

- 7 Observe the profile in the data viewer

- 8 Press the [Start] button or the [Snapshot] on the [Toolbar] to start the sensor.

- » The [Start] button is used to run sensors continuously.

- The [Snapshot] button is used to trigger the capture of a single frame.

- 9 Move a target into the sensor's projected light.

- » If a target object is within the sensor's measurement range, the data viewer will display scan data, and the sensor's range indicator will illuminate.

### 2.4.3 Web interface basic screen

This shows the web interface basic screen used on the PC and the name of each section.

The setting menus (Measuring, Analysis, Conditions, etc.) Measuring/playback menu



Data viewer (Camera image and measuring points display section) Status Bar Detailed measuring conditions Setting area

24

25

## 3 Troubleshooting

Review the guidance in this chapter if you are experiencing difficulty with a sensor system.

If the problem that you are experiencing is not described in this section, see "Precautions for Use" on page 14.

If the problem is still unresolved, see Users' Manual "SERVICE NETWORK", and contact Mitutoyo, or the agent where you purchased the product.

### ■ Mechanical/Environmental

#### ● The sensor is warm.

- It is normal for a sensor to be warm when powered on. A sensor is typically 15° C warmer than the ambient temperature.

### ■ Connection

#### ● When attempting to connect to the sensor with a web browser, the sensor is not found (page does not load).

- Verify that the sensor is powered on and connected to the client computer network. The Power Indicator LED should illuminate when the sensor is powered.
- Check that the client computer's network settings are properly configured.
- Use the Sensor Recovery tool to verify that the sensor has the correct network settings. See Users' Manual "12.1 Sensor Discovery Tool" for more information.

#### ● When attempting to log in, the password is not accepted.

- Use the Sensor Recovery tool. See Users' Manual "12.1 Sensor Discovery Tool" for steps to reset the password.

### ■ Data Acquisition

#### ● The sensor emits laser light, but the Range Indicator LED does not illuminate and/or points are not displayed in the Data Viewer.

- Verify that the measurement target is within the sensor's field of view and measurement range. See Users' Manual "14 Specifications" to review the measurement specifications for your sensor model.
- Check that the exposure time is set to a reasonable level. See Users' Manual "4.4.4 Sensor" > "Exposure" for more information on configuring exposure time.

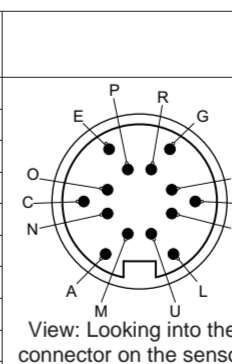
### ■ Performance

#### ● The sensor CPU level is near 100%.

- Consider reducing the speed. If you are using a time or encoder trigger source, see Users' Manual "4.4.3 Triggers" for information on reducing the speed. If you are using an external input or software trigger, consider reducing the rate at which you apply triggers.
- Consider reducing the resolution. See Users' Manual "4.4.4 Sensor" > "Spacing" for more information on configuring resolution.
- Review the measurements that you have programmed and eliminate any unnecessary measurements.

## 4.2 SurfaceMeasure1008S Power/LAN Connector

Function	Pin	Lead Color on Cordsets
GND_24~48V	L	Orange/Red
GND_24~48V	L	Orange/Black
DC_24~48V	A	Green/Red
DC_24~48V	A	Green/Black
Safety-	G	Blue/Black
Safety+	J	Blue/Red
Sync+ (*)	E	Brown/Red
Sync- (*)	C	Brown/Black
Ethernet MX1+	M	White/Orange
Ethernet MX1-	N	Orange
Ethernet MX2+	O	White/Green
Ethernet MX2-	P	Green
Ethernet MX3-	S	White/Blue
Ethernet MX3+	R	Blue
Ethernet MX4+	T	White/Brown
Ethernet MX4-	U	Brown

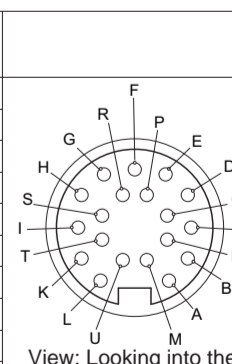


Two wires are connected to the ground and power pins.

\*: The Sync leads are not connected in the open wire versions of the Power/LAN cordsets.

## 4.3 SurfaceMeasure1008S I/O Connector

Function	Pin	Lead Color on Cordset
Trigger_in+	D	Blue / Red
Trigger_in-	H	Blue / Black
Out_1+ (Digital Output 0)	N	Brown / Red
Out_1- (Digital Output 0)	O	Brown / Black
Out_2+ (Digital Output 1)	T	Green / Red
Out_2- (Digital Output 1)	S	Green / Black
Encoder_A+	M	Pink / Red
Encoder_A-	U	Pink / Black
Encoder_B+	I	Yellow / Red
Encoder_B-	K	Yellow / Black
Encoder_Z+	A	White / Red
Encoder_Z-	L	White / Black
Serial_out+	B	Purple / Red
Serial_out-	C	Purple / Black
Serial_out2+	E	Red
Serial_out2-	G	Black
Analog_out+ (Reserved on SurfaceMeasure1008S)	P	Gray / Red
Analog_out- (Reserved on SurfaceMeasure1008S)	F	Gray / Black & Orange / Black
Reserved	R	Orange / Red (not connected)



## 4 Specifications

### 4.1 Sensors

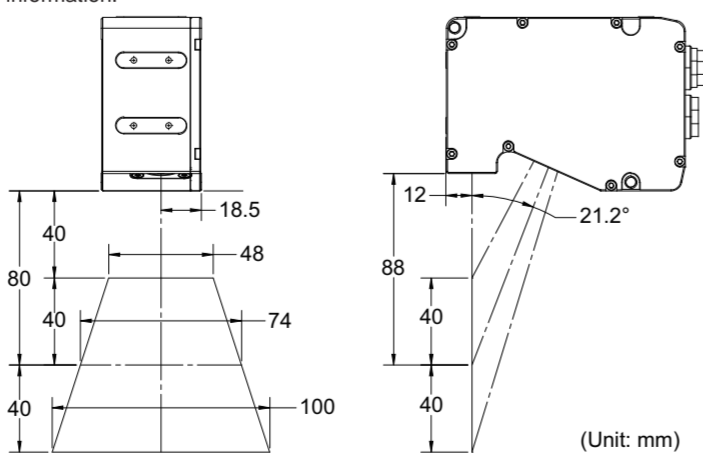
Model number	SurfaceMeasure1008S
Data Points / Profile	1920
Resolution X (Profile Data Interval) (μm)	28.0~54.0
Linearity Z (+/- % of MR)	0.01
Repeatability Z (μm)	0.5
Clearance Distance (CD) (mm)	40
Measurement Range (MR) (mm)	80
Field of View (FOV) (mm)	48~100(diffuse)
Scan Rate	2 kHz to 10 kHz
Laser Classes	2 (blue, 405 nm)
Interface	Gigabit Ethernet
Inputs	Differential Encoder, Laser Safety Enable, Trigger
Outputs	2x Digital output, RS-485 Serial (115 kBaud)
Housing	Gasketed aluminum enclosure, IP67
Input Voltage (Power)	+24 to +48 VDC (15 W); Ripple +/- 10%
Operating Temp.	0 to 40° C
Storage Temp.	-30 to 70° C
Dimensions (mm)	46x80x110
Weight (kg)	0.65

Point of the sensor's housing, not the laser window. Specifications stated are based on standard laser classes. Linearity Z and Repeatability Z may vary for other laser classes.

All specification measurements are performed on Mitutoyo's standard calibration target (a diffuse, painted white surface).

- Linearity Z is the worst case difference in average height measured, compared to the actual position over the measurement range.
- Resolution X is the distance between data points along the laser line.
- Repeatability Z is measured with a flat target at the middle of the measurement range. It is the 95% confidence variation of the average height over 4096 frames. Height values are averaged over the full FOV.

See Users' Manual "3.1.2 Resolution and Accuracy" for more information.



29

30

28

29