Mitutoyo

IF Module for LSM Controller
<CC-Link IE TSN>

LSM-CC-A

User's Manual
- Instructions for use -

■ Product names and model numbers covered in this document

Product name	Model number
IF Module for LSM Controller <CC-Link IE TSN>	LSM-CC-A

■ Notice regarding this document

- Mitutoyo Corporation assumes no responsibilities for any damage to the product, caused by its use not conforming to the procedure described in this document.
- Upon loan or transfer of this product, be sure to attach this document to the product.
- In the event of loss or damage to this document, immediately contact the agent where you purchased the product or a Mitutoyo sales office.
- Read this document thoroughly before operating the product. In particular, be sure to fully understand "Safety Precautions" and "Precautions for Use".
- The contents of this document are based on information current as of June 2023.
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- Some screen displays in this document may be highlighted, simplified or partially omitted for convenience of explanation. In addition, some of them may differ from actual ones to the extent that no user will misunderstand the functions and operations.
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Conventions and Wording Used in This Document

■ Safety reminder conventions and wording warning against potential hazards

⚠ DANGER	Indicates a hazard with a high level of risk which, if not avoided, **will result in death or serious injury**.
⚠ WARNING	Indicates a hazard with a medium level of risk which, if not avoided, **could result in death or serious injury**.
⚠ CAUTION	Indicates a hazard with a low level of risk which, if not avoided, **could result in minor or moderate injury**.
NOTICE	Indicates a situation which, if not avoided, **may result in property damage**.
⚡	**Electricity** Alerts the user to a specific hazardous situation that means "Caution, risk of electric shock".
♨	**Hot surface** Alerts the user to a specific hazardous situation that means "Caution, risk of burns due to high temperature".
🔥	**Flammable material** Alerts the user to a specific hazardous situation that means "Caution, risk of igniting gas".
	Sharp element Alerts the user to a specific hazardous situation that means "Caution, risk of injury".
	Crushing of hands Alerts the user to a specific hazardous situation that means "Caution, risk of hand pinching".
	Optical radiation Alerts the user to a specific hazardous situation that means "Caution, risk of high-intensity light".

■ Conventions indicating prohibited and mandatory actions

🚫	Indicates concrete information about prohibited actions.
❗	Indicates concrete information about mandatory actions.
⏚	Indicates that grounding needs to be implemented.

■ Conventions and wording indicating referential information or reference location

Tips Indicates further information and details relevant for the operating methods and procedures that are explained in that section.

Indicates reference location if there is information that should be referred to in this document or an extraneous User's Manual.

Example: For details about XX, see 📖 "1.2 Features of This Product" on page 1 in "1 Introduction".

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

> **⚠CAUTION**
>
> To prevent electric shocks, strictly observe the following.
> Failure to observe these precautions could result in electric shocks or burns, or in some cases death.

> • When mounting external devices or optional accessories, turn off the power to the device.
> • Ensure that the product is properly grounded.
> • Halt the system in case of a malfunction.

> • Do not disassemble this product or remove its cover.
>   There is a risk of electric shock or burns, and in some cases, death or serious injury. In addition, there is a risk of accidents due to intrusion of material such as metal powder.
> • Do not touch the connection terminals with your hands or objects in order to prevent electric shocks due to connection faults.

> **NOTICE**
>
> Securely connect the connectors of the connecting cables for noise isolation.

Tips

Even if an error is displayed while measuring, it does not necessarily indicate a malfunction.
See 📖 "6 Troubleshooting" on page 39 to check the cause and solution.

Precautions for Use

■ Use and handling of the product

● Use this product only by connecting to measuring instruments which supports this product.

> 🚫 Do not use this product for measuring instruments which does not support this product.
> For measuring instruments supported by this product, see 📖 "1.3 LSM System Diagram" on page 2.

● This product is for industrial usage.

> 🚫 Do not use this product for purposes other than for industrial usage.

● This 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 (📖 "7 Specifications" on page 41), be aware that the functions and performance cannot be guaranteed.

■ Environment for placement

This product is a precision electronic instrument and is designed for indoor use. To obtain the highest accuracy, take into account the following conditions when installing the product. Mitutoyo assumes no responsibility for accidents or failures that result from disregarding the following items.

❗	Use the product in the following places.
	• Where there is minimal dust and grit
	  Dust or grit in the usage area will adversely affect the mechanical and electronic components inside the product.
	• Where there are minimal vibrations
	  If the product is going to be used in places where there are lots of vibrations, problems will be generated in the precision components being used, which will cause measuring performance to be impaired.
	  If use in a place with vibrations is inevitable, take measures to reduce vibrations, such as laying an anti-vibration rubber mat under the product.
	• Where the ambient temperature is from 0 °C through 50 °C
	• Where the humidity is from 20 % RH through 85 % RH (without condensation)
	• Where the altitude is 2000 m or lower
	  If the product is used in places where the altitude exceeds 2000 m, it will cause measuring performance to be impaired.

🚫	Do not use or store the product in the following places where the temperature and humidity drastically fluctuate, because the product's functions and measurement results will be adversely affected and it will cause malfunction. • Where exposed to direct sunlight If installing this product in a place exposed to direct sunlight, such as near a window, is inevitable, take measures to shade the product from the sun, such as using a curtain. • Where extremely hot or cold • Where there are risks of getting wet

Tips

This product does not conform to the International Protection standard (IP standard). Sensors (LSM-02-A and LSM-30-A) are IP67 rated.

■ Maintenance

For information on the care of this product, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

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.

Export Control Compliance

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.

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 (Directive 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.

China RoHS Compliance Information

This product meets China RoHS requirements. See the table below.

产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
本体	○	○	○	○	○	○
电气设备部分	×	○	○	○	○	○
配件	○	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

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产品使用后,要废弃在环保使用年限内或者刚到年限的产品,请根据国家标准采取适当的方法进行处置。

另外,此期限不同于质量/功能的保证期限。

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 (📖 "SERVICE NETWORK" on page App-1). 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.

EXCEPT AS SPECIFIED IN THIS WARRANTY, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES OF ANY NATURE WHATSOEVER INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT OR WARRANTY ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE, ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT ALLOWED BY APPLICABLE LAW.

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

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About This Document

■ Positioning of this document, document map

This describes the positioning of this document and its relationship with other installments.

Laser Scan Micrometer <Controller> User's Manual	Describes use of LSMPAK to set up and operate the controller of the Laser Scan Micrometer.
Laser Scan Micrometer <Sensor> User's Manual	Describes the sensor of the Laser Scan Micrometer, including how to connect it to the controller and its specifications.
IF Module for LSM Controller <CC-Link IE TSN> User's Manual (This document)	Describes the IF Module for LSM Controller <CC-Link IE TSN> which is attached to the controller of the Laser Scan Micrometer, including its attachment to the controller and specifications.

■ Intended readers and purpose of this document

● Intended readers

This document is intended for operators and administrators of the Laser Scan Micrometer.

The readers are assumed to have been familiar with basic operations on a PC and Windows.

They are also assumed to be able to understand individual instructions by reading the described drawings.

● Purpose

The purpose of this document is to help you to understand the functional overview of the product, the functions of each part, the non-contact type sensor using a laser beam, operation procedures, and maintenance details.

■ How to read this document

Indicates safety information.

Indicates an operating procedure to be performed or its outline.

■ Brackets, quotation marks and numbers (**1**, **1**)

The meanings of brackets, quotation marks and numbers to be used in this document are as follows.

( ): **Round brackets**	Represent a paraphrase of an immediately preceding phrase or a supplementary explanation.
" ": Double quotation marks	Represent a highlighted phrase. They also indicate an index where information to be referenced is described.
[ ]: Square brackets	Represent a menu name on the screen, screen name, dialog name, button, display item, tab name, or key on the keyboard. They also indicate an item to be purposely entered or selected by the customer.
1, **2**, **3**... **1, 2, 3**...	Indicates the order and the contents of tasks. (**1** : indicates main tasks, **1**: indicates detailed tasks)

Contents

1   Introduction

This product is an IF module that enables data communication using CC-Link IE TSN.

1.1   About CC-Link IE TSN

CC-Link IE TSN is an industrial Ethernet standard with publicly available specifications which is managed by the CLPA (CC-Link Partner Association).

CC-Link IE TSN enables control with assured real-time performance in cyclic communication and can be coexist with Ethernet on a network.

With CC-Link IE TSN, a device that manages a network, such as a PLC, and which controls other stations by cyclic transmission (cyclic communication) and transient transmission (asynchronous communication) is called a "master station," and devices that are capable of 1:n cyclic transmission and transient transmission with other stations are called "remote stations".

1.2   Features of This Product

This product connects to the LSM controller and is used together with the LSM controller and sensors connected to the controller to form an LSM system.

This product communicates as a CC-Link IE TSN remote station of Conformance Class A with a device (e.g., PLC) that serves as a CC-Link IE TSN master station.

Cyclic communication enables control and acquisition of measurement data from LSM sensors by a CC-Link IE TSN master station.

For details about cyclic communication, see 📖 "5.1 Communication Specification" on page 17.

For details about the controller, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

For details about the sensor, see 📖 "Laser Scan Micrometer <Sensor> User's Manual" (separate document).

1.3   LSM System Diagram

The following is an example of a system configuration with this product connected with the controller.

Sensor (LSM-02-A or LSM-30-A)
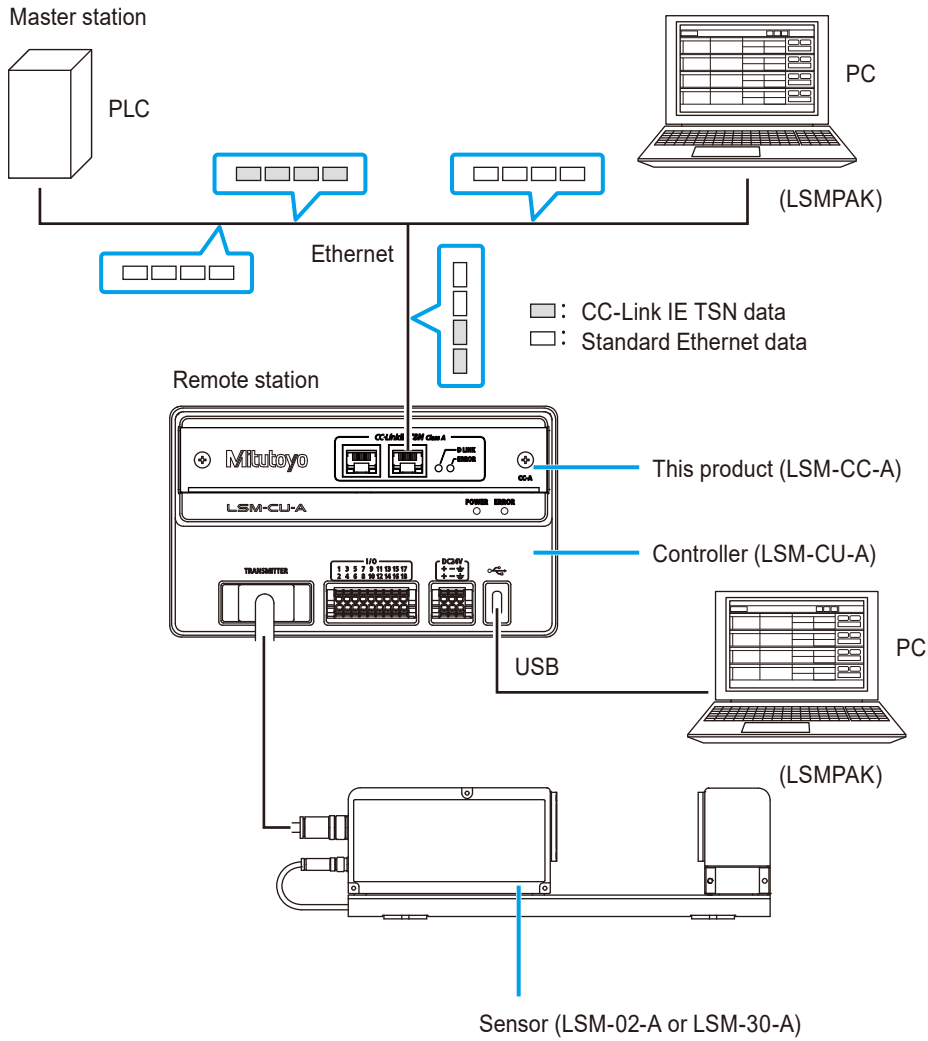
Devices required for system configuration

Device name	Remarks
This product	This product is an optional accessory for controller LSM-CU-A. It is used in combination with the controller. This product enables CC-Link IE TSN communication. For details, see 📖 "7.3 Measurement Configurations Usable with This Product" on page 43.
Controller	The controller LSM-CU-A controls the Laser Scan Micrometer. For details about the controller, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).
Sensor	This is the sensor unit of the Laser Scan Micrometer. LSM-02-A (0.005 mm–2 mm) or LSM-30-A (0.3 mm–30 mm) can be used. For details, see 📖 "Laser Scan Micrometer <Sensor> User's Manual" (separate document).
LSMPAK (PC)	This is software used for controlling the controller. It is installed for use on a personal computer. The personal computer on which LSMPAK is installed is connected to the controller through a USB or Ethernet connection. For details about the controller, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).
Master station (PLC, PC, etc.)	Master station is a device that communicates with this product, which is a remote station in CC-Link IE TSN communication. Typical master stations include devices such as PLCs.

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2 Unpacking and Checking

After unpacking this product, first check the following.

- No missing parts (including the product and all accessories)
- No damage was sustained during transit

We take all possible measures to ensure the quality of our products, but in the unlikely event that you discover a missing or damaged product, please contact your nearest Mitutoyo sales office.

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■ This product and included accessories

Part No.	Name	Quantity
02AGQ400	IF Module for LSM Controller <CC-Link IE TSN> (this product)	1
99MBC168B	Quick Start Manual	1
02NGA066	CD-ROM	1
02NGA076	LSM-CC-A device file	—
99MBC167J/A	User's Manual (PDF) (this document)	—
WA140	General product warranty (large)	1

MEMO

3 Part Names and Functions

This chapter describes the name and function of each part of this product.
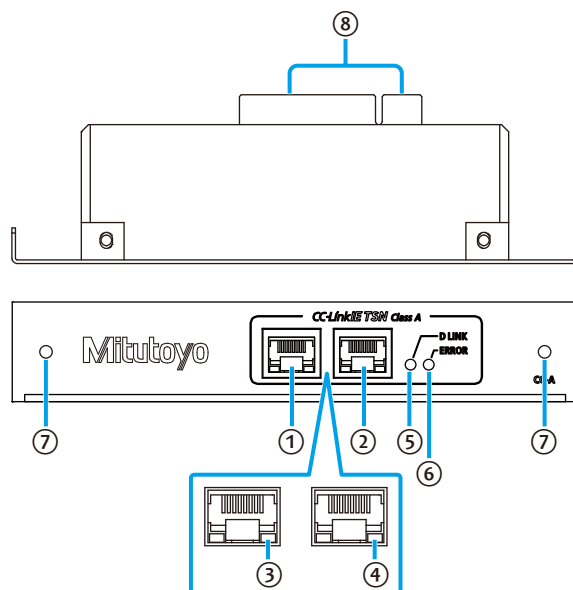
No.	Name	Function	Reference
①	RJ-45 connector (port 1)	These are Ethernet ports. Connect to them with communication cables (Ethernet cables).	5.2.1
②	RJ-45 connector (port 2)		
③	Link/activity LED (port 1)	Indicates the status of communications.	
④	Link/activity LED (port 2)		
⑤	D LINK indicator	Displays the data link (cyclic communication) status.	
⑥	ERROR indicator	Indicates the error status.	
⑦	Mounting hole	Used for mounting the controller.	4.2
⑧	Edge connector	Insert into the socket of the controller.	

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4 Setup

Use the following procedure to connect this product and the system devices and configure the settings.

4.1 Work Flow

This section describes the work flow.

Connection	Connecting to the controller	📖 "4.2 Connecting to the Controller" on page 10
	Connecting the communication cable	📖 "4.3 Connecting the Communication Cable" on page 12
Settings	IP address setting	📖 "■ IP address setting" on page 13
	Master station communication settings	📖 "■ Making CC-Link IE TSN communication settings from the master station" on page 15
Status indication	Display of product and network status	📖 "5.2 Status Indication" on page 35

4.2 Connecting to the Controller

Connect this product to the controller.

⚠ CAUTION

⚡ There is a risk of electric shock when working with the controller while it is supplied with power.

❗ Check that power is not supplied to the controller. If power is being supplied, turn off the power.

NOTICE

❗ Working while your body holds a static electric charge may damage internal circuits due to discharge. Discharge static electricity from the human body before working.

---

1 **Remove the front cover of the controller.**

1 Loosen the two screws on the cover and then remove them.

Tips

The removed screws are used to mount this product.
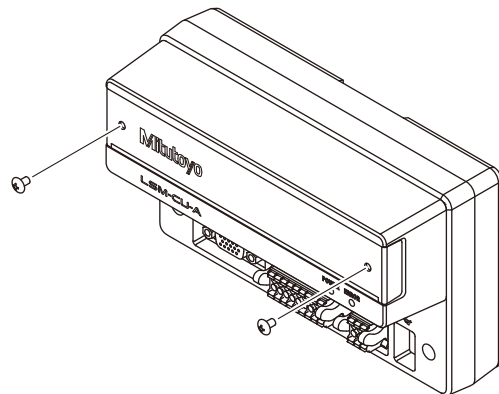
2 Remove the cover from the controller.
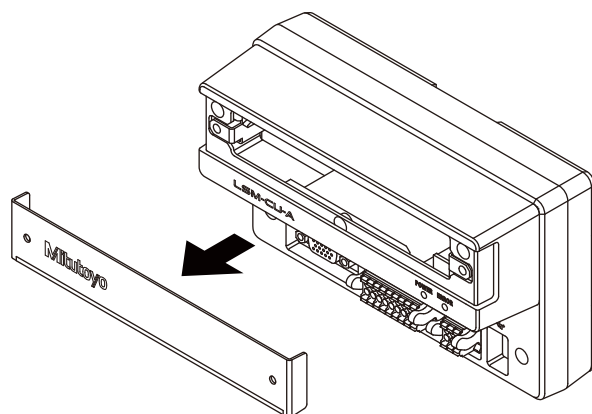
❗ Keep the removed cover and be careful not to lose it.

2 **Mount this product on the controller.**

1 Insert this product along the guides on either side of the controller.
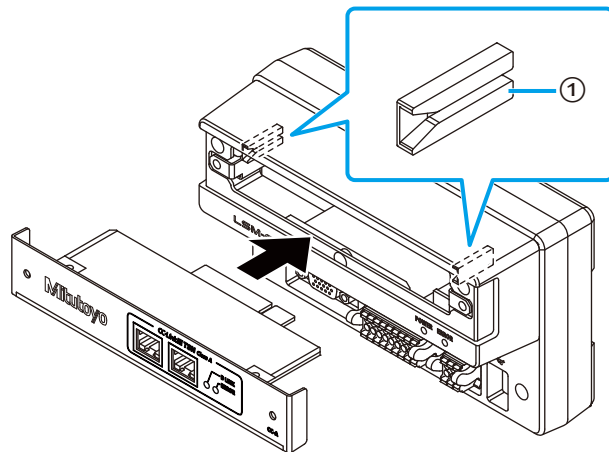
No.	Name
①	Guide

2 Insert the edge connector of this product into the socket of the controller.
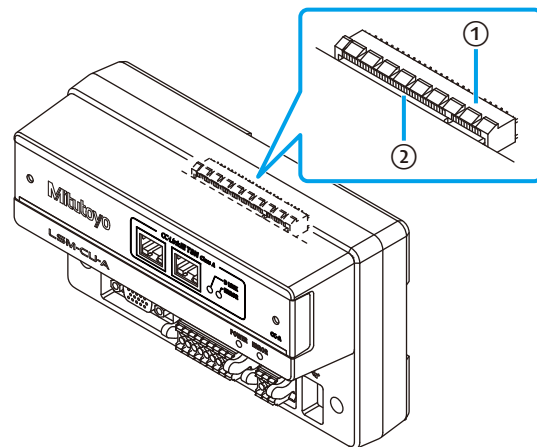
No.	Name
①	Socket
②	Edge connector

3 Fasten with the two screws removed in step **1** .
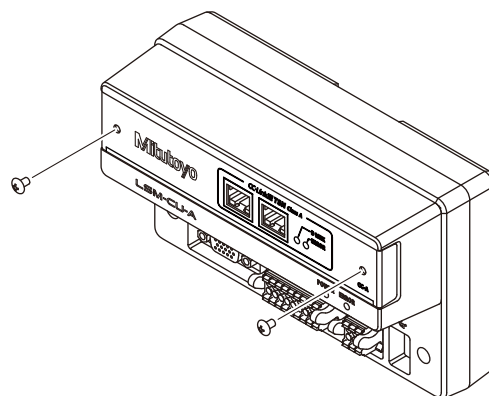
4.3   Connecting the Communication Cable

Connect the communication cable to this product.

4.3.1   How to Connect the Communication Cable

Tips

- Use an STP cable of Cat.5e or higher for the communication cable.
- This product is compatible with Auto MDI-X, which automatically detects whether the cable type is straight or cross for communication.
- This product does not support optical communication or single-pair Ethernet.
- Make sure that communication cable length does not exceed 30 m.

1 **Connect the communication cable to one of the RJ-45 connectors (port 1 or port 2) on this product.**
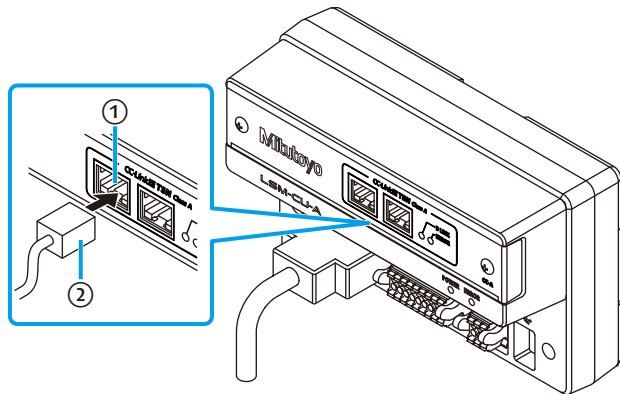
No.	Name
①	RJ-45 connector
②	Communication cable

2 **Connect the other end of the communication cable to the RJ-45 connector on the network side.**

4.4 Device Settings

This section describes the settings for network communication between this product and the master station.

■ IP address setting

IP address setting is required for network communication.

The IP address of this product is factory-set to 192.168.1.10.

The IP address can be changed in the following ways. Change the address according to the requirements of your network.

- Change by LSMPAK

● Procedure for confirming or changing the IP address with LSMPAK

For details about LSMPAK, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

1 **Connect the controller to the PC on which LSMPAK is installed with a USB cable.**

> **Tips**
> To change the IP address, connect the controller to the PC by USB.

2 **Double-click the LSMPAK icon on the desktop.**

» The home screen is displayed.

3 **Click [Connected Device].**

» The connected device screen is displayed.
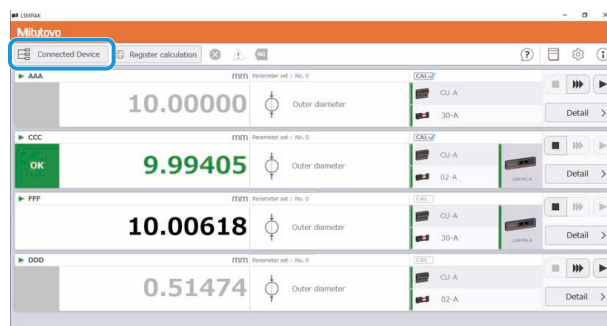
4 **Check the IP address from the serial number of the controller to which this product is connected.**

The serial number is affixed to the rear side of the controller.
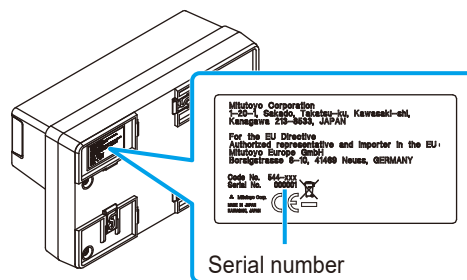
Serial number

5 **To change the IP address, click ✎ on the right side (with USB connection only).**

» The edit device information screen is displayed.

6 **Change the IP address.**

1 Enter the new address in the [IP address] field.

2 Click [Save].

■ Making CC-Link IE TSN communication settings from the master station

The settings required for CC-Link IE TSN communication with this product are made using the engineering tool for the master station. For information on how to operate the engineering tool, see the manual for the device to be used as the master station.

The general setup process to be performed on the master station is as follows.

● Registering the device profile

Register the device profile of this product to the master station.

Use the product's CSP+ (XML-based CC-Link Family System Profile) file to register device profiles. Use the CSP+ file stored on the included CD-ROM or download it from the Mitutoyo or CLPA (CC-Link Partner Association) web site.

Tips

Unzip 02NGA076_MITUTOYO_LSM-CC-A.zip and register the device profile as 0x3138_LSM-CC-A _***. zip.

If you register only the extracted CSP+ file, the icon will not be displayed on the engineering tool.

● Setting the connection

Set the connection type (point-to-point/multicast), send and receive data size, transmission interval, etc.

● Assigning device input/output data

Assign the data area to be sent/received by this product in the program variables using the engineering tool, etc.

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5   Communication Function

5.1   Communication Specification

5.1.1   CC-Link IE TSN Communication

The master station and this product communicate with each other using CC-Link IE TSN.

This section provides an overview of CC-Link IE TSN communication and details of the data used for communication.

■ Overview

The CC-Link IE TSN master station and this product conduct cyclic data communication at a fixed cycle, and output and input data are exchanged according to the communication cycle.

The communication cycle of this product can be set between 1 ms and 10 ms.
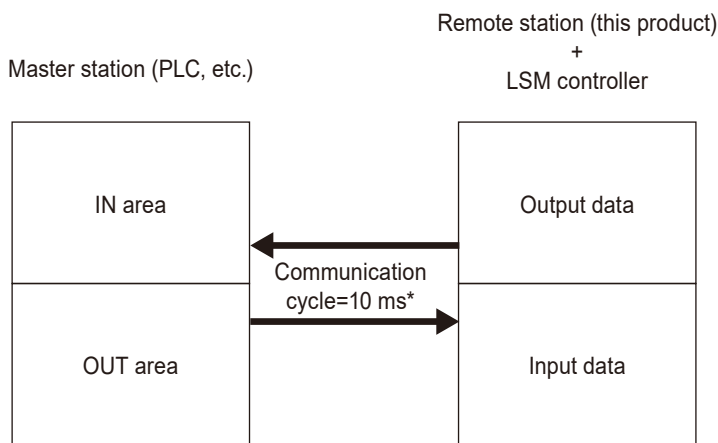
* The communication cycle can be set on an individual basis.

After establishing CC-Link IE TSN communication, the master station periodically inputs and outputs data to and from the remote station.

■ Details of data

● Output data from this product to the master station

This product has two output data structures: Basic (RX64 points, RWr12 points) and Advanced (RX64 points, RWr88 points).

With the Basic structure, data for a single measurement can be acquired from the master station in one communication cycle, while the Advanced structure can return data for 20 measurements in a single communication cycle.

This section shows an example in which the leading remote station output data is assigned to RX0 and RWr0.

Tips

If the communication cycle between this product and the master station is longer than the cycle for exchanging measurement data between the LSM controller and the product, measurement data may be lost on the master station side.

The cycle of measurement data exchange between the LSM controller and this product depends on the number of averaging setting of the LSM controller.

Select Basic or Advanced and set the communication cycle between this product and the master station according to the number of averaging setting of the LSM controller and the master station's capability.

You can switch between Basic and Advanced and set the communication cycle between this product and the master station using the master station's configuration software. Switching between Basic and Advanced is selected by the station-specific mode setting in the station information. For details, see the manual of the device to be used as the master station.
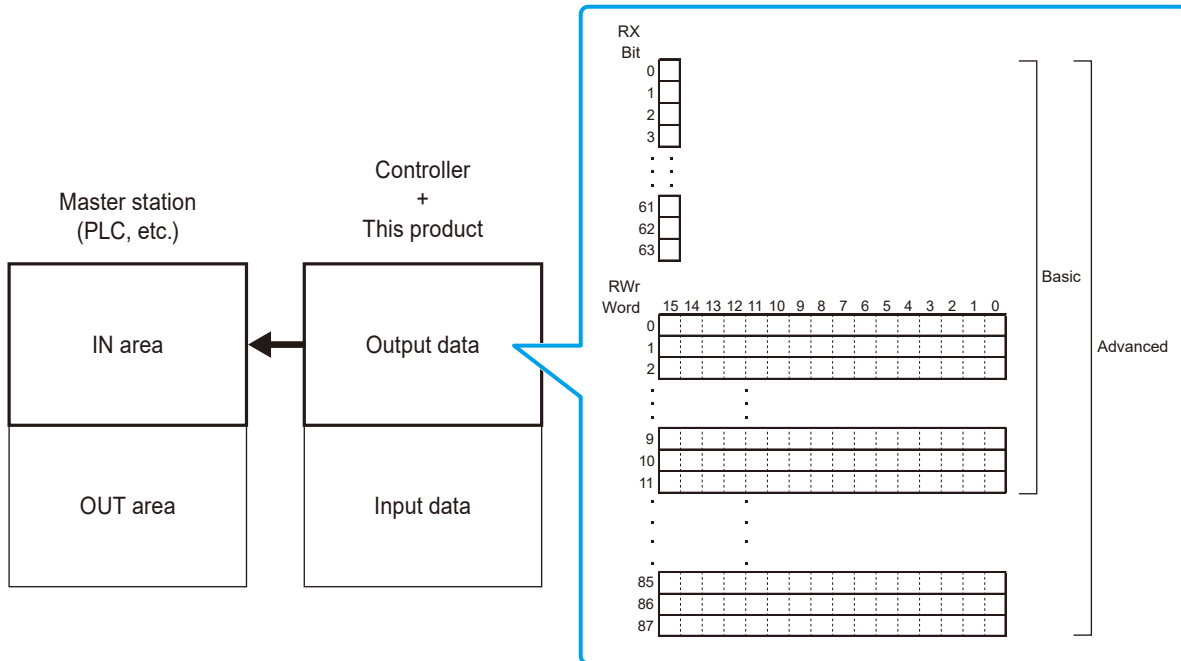
Bit area

Address	Field type	Description	Name	Current position display execution	Measure-ment execu-tion
RX0	Status bit 1*	Measuring	MEAS	✓ Error record	✓ Error status record
RX1		Two items measurement	SUB		
RX5		Automatic workpiece detection	AUTO_DET		
RX8		Preset state	PRST_NOW		
RX9		Offset state	OFST_NOW		
RXA		Calibrating	CAL_OK		
RX20	Status bit 2*	Outlier elimination	ABNML_DATA_OUT	✓ Status record	✓ Status record
RX21		Outlier elimination (all)	ABNML_DATA_OUT_ALL		
RX22		Waste removal	RMV_DUST		
RX23		Waste removal (overflow)	RMV_DUST_OVR		
RX24		Overflow data	OVR_DATA		
RX25		Statistics buffer overflow	STAT_OVF		
RX26		Calibration error	CAL_ER		
RX28		No workpiece	NO_WORK_PCS		
RX29		Ring buffer overflow	RING_OVF		
RX2A		Measurement interruption from outside	EXT_MEAS_STP		
RX2B		No measurement sampling	NO_SCAN_SIG		
RX2C		Edge not detected	NOEDG		
RX2D		Edge error	EDGER		
RX30		EEPROM load error	EPRM_ER		
RX31		Measurement unit EEPROM load error	MEPRM_ER		
RX32		FPGA config. error	FPGA_ER		
RX33		Amount of light memorize error	LIT_INT_ER		
RX34		LD overcurrent	LD_OC_ER		
RX35		Watchdog error	WDTO_ER		
RX37		Dirt detection	DIRT_ER		
RX38		Power supply error	PWR_ER		
RX3E		Invalid setting	STCFT		
RX3F		Total error	TOTAL_ER		

* To update the status, perform a measurement (RUN) or display current value (DPVAL) before referring to the status. Status information is not updated unless measurement (RUN) or current value display (DPVAL) is performed.

Word area

Address	Field type	Bit	Description	Name	Current position display execution	Measurement execution
RWr0	Not used	N/A	Not used	Reserved	-	✓
RWr1	I/O bit	N/A	I/O bit	Operation_control		
		15		N/A	N/A	N/A
		14		LT7	-	✓
		13		LT6	-	✓
		12	GO/NG judgment	LT5	-	✓
		11		LT4	-	✓
		10		LT3	-	✓
		9		LT2	-	✓
		8		LT1	-	✓
		7	LSM processing in progress	BUSY	-	✓
		6	N/A	N/A	N/A	N/A
		5	N/A	N/A	N/A	N/A
		4	N/A	N/A	N/A	N/A
		3	Next data available	NEXT	-	✓
		2	N/A	N/A	N/A	N/A
		1	Valid measurement data available	MDVLD	-	✓
		0	Valid display data available	DDVLD	✓	-
RWr2	I/O bit (echo back)	N/A	I/O bit (echo back)	Operation_Control_Echo		
		15	Endian switching	ENDN		
		14	N/A	N/A	N/A	N/A
		13	N/A	N/A	N/A	N/A
		12	Parameter setting change request	CHGPRM		
		11	Error clear request	CLRRQ		
		10	Preset request	PSTRQ		
		9	Data reception OK	RCVOK		
		8	Measured data request	DREQ		
		7	Reboot request	RBTRQ		
		6	N/A	N/A	N/A	N/A
		5	N/A	N/A	N/A	N/A
		4	N/A	N/A	N/A	N/A
		3	Stream measurement	STRM		
		2	Single measurement	SNGL		
		1	Measurement start	RUN		
		0	Current value display	DPVAL		

Address	Field type	Bit	Description	Name	Current position display execution	Measurement execution
RWr3	Functional control bits (echo back)	N/A	Functional control bits (echo back)	Program_Parameter_Set_Echo		
		15	N/A	N/A	N/A	N/A
		14	N/A	N/A	N/A	N/A
		13	N/A	N/A	N/A	N/A
		12	N/A	N/A	N/A	N/A
		11	N/A	N/A	N/A	N/A
		10	N/A	N/A	N/A	N/A
		9	N/A	N/A	N/A	N/A
		8	GO/NG judgment ON	TOLON		
		7:0	Parameter number	PRM[0-7]		
RWr4	Valid data quantity*	N/A	Valid data quantity	NODT	✓	✓
RWr5	Sequential number*	N/A	Sequential number	SEQNO		
RWr6 – RWr7	Data ①*	N/A	Data	DATA01	✓ Internal value ①: 4 bytes	✓ Measured value ①: 4 bytes
RWr8	Data ①*	N/A	GO/NG judgment information	TOL01	-	✓ GO/NG judgment result ①
RWr9	Data ①*	N/A	Status information	STS01	-	✓ Data status ①
RWrA – RWrB	Data ②*	N/A	Data	DATA02	✓ Internal value ②: 4 bytes	✓ Measured value ②: 4 bytes
RWrC	Data ②*	N/A	GO/NG judgment information	TOL02	-	✓ GO/NG judgment result ②
RWrD	Data ②*	N/A	Status information	STS02	-	✓ Data status ②
:	:	:	:	:	:	:
:	:	:	:	:	:	:
RWr52 – RWr53	Data ⑳*	N/A	Data	DATA20	✓ Internal value ⑳: 4 bytes	✓ Measured value ⑳: 4 bytes
RWr54	Data ⑳*	N/A	GO/NG judgment information	TOL20	-	✓ GO/NG judgment result ⑳
RWr55	Data ⑳*	N/A	Status information	STS20	-	✓ Data status ⑳

* Endian specification is available.

● Input data from the master station to this product

Data for RY32 points is received.

This section shows an example in which the leading remote station input data is assigned to RY0.
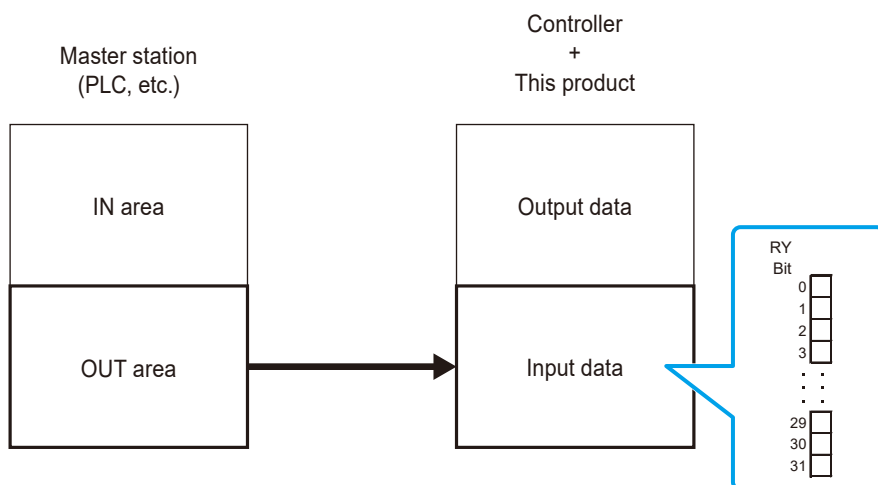
Address	Field type	Description	Name	Current position display execution	Measurement execution
RY0	I/O bit	Current value display	DPVAL	✓	-
RY1		Measurement start	RUN	-	✓
RY2		Single measurement	SNGL	-	✓
RY3		Stream measurement	STRM		
RY7		Reboot request	RBTRQ	✓	✓
RY8		Measured data request	DREQ	✓	✓
RY9		Data reception OK	RCVOK	✓	✓
RYA		Preset request	PSTRQ	✓	✓
RYB		Error clear request	CLRRQ	✓	✓
RYC		Parameter setting change request	CHGPG		
RYF		Endian request	ENDN	N/A	N/A
RY10 – RY17	Functional control bits	Parameter number	PRM[7-0]	N/A	N/A
RY18	Functional control bit	GO/NG judgment ON	TOLON	✓	✓

● Functions of definition bits

This product → Master station

Field name	Size	Description
AUTO_DET	1 bit	Auto Detect Automatic workpiece detection 1: ON 0: OFF
BUSY	1 bit	Busy Access under way between IF module and LSM controller 1: Access in progress 0: No access
CAL_ER	1 bit	Calibration Error Calibration error 1: Error occurred 0: Normal
CAL_OK	1 bit	Calibration Status Calibration status display 1: Calibration OK 0: Not calibrated
DAT01	4 bytes	Data storage area
DAT02	4 bytes	Measured value ① to ⑳ or indicated value ① to ⑳.
DAT03	4 bytes	
DAT04	4 bytes	
DAT05	4 bytes	
DAT06	4 bytes	
DAT07	4 bytes	
DAT08	4 bytes	
DAT09	4 bytes	
DAT10	4 bytes	
DAT11	4 bytes	
DAT12	4 bytes	
DAT13	4 bytes	
DAT14	4 bytes	
DAT15	4 bytes	
DAT16	4 bytes	
DAT17	4 bytes	
DAT18	4 bytes	
DAT19	4 bytes	
DAT20	4 bytes	
DDVLD	1 bit	Valid Display Value Display data availability indication 1: Display data available 0: Display data not available
DIRT_ER	1 bit	Dirt Error Sensor unit protective glass stain error

Field name	Size	Description
EDGER	1 bit	Edge Error Edge error (Occurs when, for example, an odd number of boundaries is detected on the measurement target.) 1: Error occurred 0: Normal
EPRM_ER	1 bit	EEPROM Error EEPROM load error 1: Error occurred 0: Normal
FPGA_ER	1 bit	FPGA Error FPGA configuration error 1: Error occurred 0: Normal
LD_OC_ER	1 bit	Laser Diode Over Current Error Measurement unit laser diode overcurrent error 1: Overcurrent detected 0: Normal
LIT_INT_ER	1 bit	Light Intensity Error Measurement unit laser diode brightness reduction error
LT1	1 bit	Limit1 to Limit7
LT2	1 bit	GO/NG judgment LT1 to LT7
LT3	1 bit	* Corresponds to R1 to R7 of the Multi-Limit Selection function.
LT4	1 bit	
LT5	1 bit	
LT6	1 bit	
LT7	1 bit	
MDVLD	1 bit	Valid Measurement Data Measurement data availability indication 1: Measurement data available 0: Measurement data not available
MEAS	1 bit	Measuring Measuring 1: Measuring 0: Idle
EPRM_ER	1 bit	Sensor EEPROM Error Measurement unit EEPROM load error 1: Error occurred 0: Normal
NEXT	1 bit	Next Data Next data availability indication 1: Next data available 0: Next data not available
NODT	2 bytes	Number of Valid Data Measurement data quantity indication

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Field name	Size	Description
NOEDG	1 bit	No Edge Edge not detected error (Unable to properly detect boundary on the measurement target.) 1: Error occurred 0: Normal
OFST_NOW	1 bit	Offset Offset state indication 1: Offset set 0: No offset
PRM[0:7]	8 bit	Parameter Number Echo Measurement parameter set number display (0x0 to 0xff) * Up to 20 parameter sets can be stored.
PST_NOW	1 bit	Preset Preset state indication 1: Preset set 0: No preset
SEQNO	2 bytes	Sequence Number Sequence number assigned to the measurement data. * This is a sequential number from 0 through 65535 that is incremented each time the IF module acquires data from the LSM controller. Numbering returns to 0 upon reaching 65535.
STCFT	1 bit	State Conflict Error Setting mismatch 1: Mismatch error 0: Normal * Raised upon incorrect bit operation.
STS01	2 bytes	STATUS ① to ⑳
STS02	2 bytes	0x0001: Outlier elimination
STS03	2 bytes	0x0002: Outlier elimination
STS04	2 bytes	0x0004: Dirt removal process applied
STS05	2 bytes	0x0008: Dirt removal process applied
STS06	2 bytes	0x0010: Overflow data
STS07	2 bytes	0x0020: Statistics buffer overflow
STS08	2 bytes	0x0040: Calibration error
STS09	2 bytes	0x0080: Outlier elimination CNT warning
STS10	2 bytes	0x0100: ERR-0 No workpiece
STS11	2 bytes	0x0200: Measurement ring buffer overflow
STS12	2 bytes	0x0800: ERR-8 No measurement sampling
STS13	2 bytes	0x1000: Edge not detected error (upon scan interrupt)
STS14	2 bytes	
STS15	2 bytes	
STS16	2 bytes	
STS17	2 bytes	
STS18	2 bytes	
STS19	2 bytes	
STS20	2 bytes	

Field name	Size	Description
TOL01	2 bytes	GO/NG judgment ① to ⑳
TOL02	2 bytes	1: Lower threshold exceeded (-NG)
TOL03	2 bytes	2: Within limits (GO)
TOL04	2 bytes	4: Upper threshold exceeded (+NG)
TOL05	2 bytes	* Threshold values are set from the LSM controller.
TOL06	2 bytes	For details about the controller, see 📖 "Laser Scan Micrometer <Control-
TOL07	2 bytes	ler> User's Manual" (separate document).
TOL08	2 bytes	
TOL09	2 bytes	
TOL10	2 bytes	
TOL11	2 bytes	
TOL12	2 bytes	
TOL13	2 bytes	
TOL14	2 bytes	
TOL15	2 bytes	
TOL16	2 bytes	
TOL17	2 bytes	
TOL18	2 bytes	
TOL19	2 bytes	
TOL20	2 bytes	
TOTAL_ER	1 bit	Total Error Error status indication (determined from R-IN) 1: Error occurred 0: No error * All error causes are ORed for display.
WDTO_ER	1 bit	Watch Dog Time Out Error Watchdog timeout error 1: WDT timeout occurred 0: Error did not occur

Master station → this product

Field name	Size	Description
CHGPRM	1 bit	Change Parameter Parameter setting change 1: Change request 0: No change request * Changed on transition from 0 → 1.
CLRRQ	1 bit	Clear Request Error status clear request 1: Clear request 0: No clear request * Cleared on transition from 0 → 1.
DPVAL	1 bit	Display Value Display value acquisition start 1: Start display value acquisition 0: Stop display value acquisition

Field name	Size	Description
DREQ	1 bit	Data Request Measured/displayed value data request 1: Data request 0: No data request
ENDN	1 bit	Endian Swap Endian selection 1: Big endian 0: Little endian
PRM[0:7]	8 bit	Parameter Number Specify parameter set numbers 0 to 19 (0x00 to 0xff)
PSTRQ	1 bit	Preset Request Preset request 1: Preset request 0: No preset request * Set on transition from 0 → 1.
RBTRQ	1 bit	Reboot Request Device reset request 1: Reset request 0: No reset request * Reset on transition from 0 → 1.
RCVOK	1 bit	Receive OK Measurement data reception complete
RUN	1 bit	Run Measurement start/stop 1: Measurement start 0: Measurement stop
SNGL	1 bit	Single Measurement Single measurement specification 1: Single measurement 0: Continuous-run measurement
STRM	1 bit	Stream Measurement Measurement data streaming acquisition 1: Streaming acquisition 0: Normal acquisition
TOLON	1 bit	Tolerance On GO/NG judgment ON/OFF 1: GO/NG judgment ON 0: GO/NG judgment OFF

■ Communication method

This section describes how communication works from the master station (PLC, etc.) to the remote station (this product).

● Idle value display
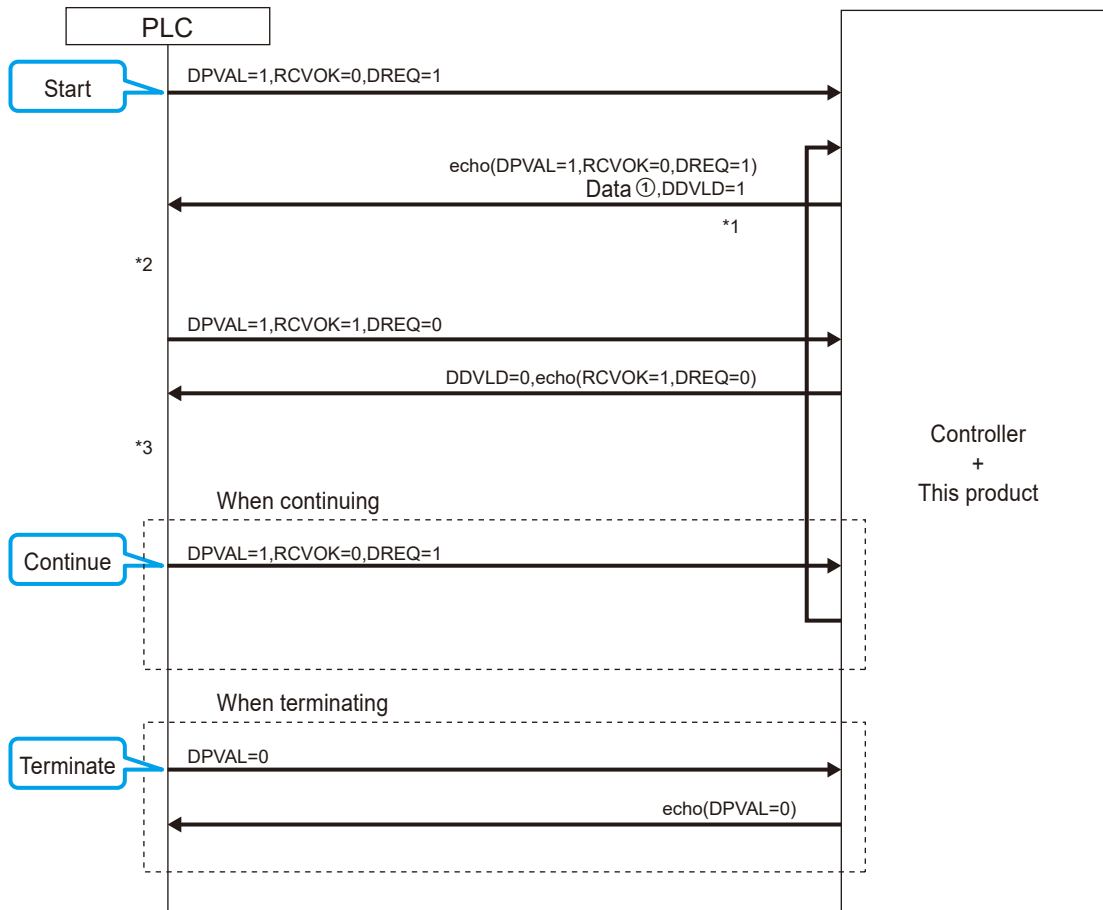
*1 Response (output data to IN area of the master station (PLC, etc.))
- Idle value ①: RWr6—RWr7 data ①
- Status record: RX20—RX3F
- Error record: RX0—RXA
- Valid data quantity: RWr4 (valid data quantity=1)

*2 Processing on PLC side
- Checks that DDVLD=1 was set.
- Reads the valid data quantity to check the data count.
- Reads in the number of pieces of data from data areas ① through ⑳ as written in the valid data quantity.
- Sets the data reception OK flag.
  RCVOK=1
  DREQ=0

*3 Processing on PLC side
After confirming DDVLD=0, sets RCVOK=0.

● Single measurement execution

*1 For single measurement: NEXT=0

*2 Response (output data to IN area of the master station (PLC, etc.))
- Status record: RX20—RX3F
- Error record: RX0—RXA
- Valid data quantity: RWr4
- Measured value ①: RWr6—RWr7
- GO/NG judgment result of measured value ①: RWr8
- Data status of measured value ①: RWr9
  (When two items measurement is performed, the acquired two items of data are stored in the data ① and ⑪ areas, respectively.)

  For details about two items measurement, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

*3 Processing on PLC side
- Checks that MDVLD=1 was set.
- Reads the valid data quantity to check the data count.
- Reads in the number of pieces of data from data areas ① through ⑳ as written in the valid data quantity.
  (When two items measurement is performed, the acquired two items of data are stored in the data ① to ⑩ and ⑪ to ⑳ areas, respectively.)

  For details about two items measurement, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).
- Sets the data reception OK flag.
  RCVOK=1
  DREQ=0

*4 Processing on PLC side
  After confirming MDVLD=0, sets RCVOK=0.

● Continuous measurement execution

There are two methods for acquiring measurement data: normal acquisition, and streaming acquisition.

Streaming acquisition allows measurement data acquisition at shorter intervals than normal acquisition.

Use of streaming acquisition is recommended if the number of averaging is set to less than 4 times by the LSM controller.

For details about the number of averaging, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

> **IMPORTANT**
> Communication handshaking between the PLC and LSM is omitted during streaming acquisition, so data is not assured. If you want to detect missing data, create a PLC program to check using sequence numbers.

With normal acquisition
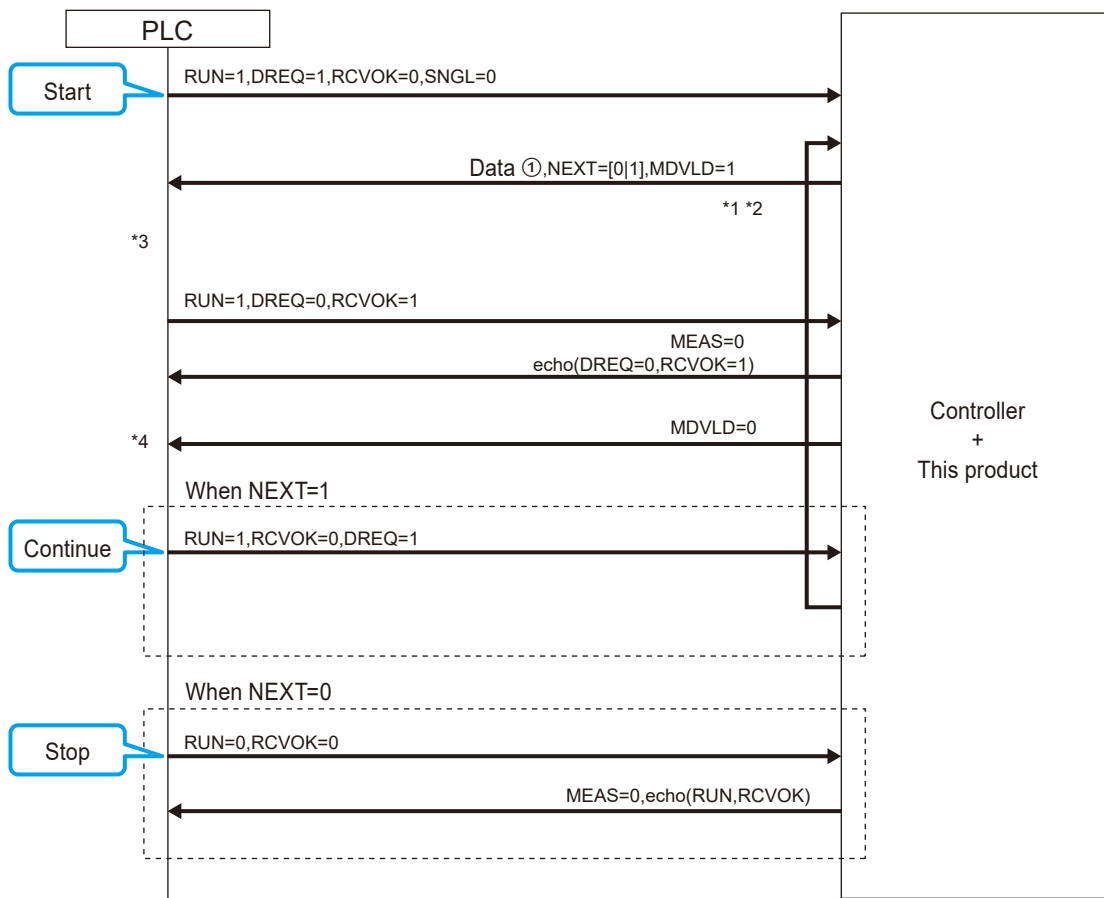
*1 NEXT=1 when the number of valid data is other than -1

*2 Response (output data to IN area of the master station (PLC, etc.))
- Status record: RX20—RX3F
- Error record: RX0—RXA
- Valid data quantity: RWr4
- Measured value ①: RWr6—RWr7
- GO/NG judgment result of measured value ①: RWr8
- Data status of measured value ①: RWr9
  (When two items measurement is performed, the acquired two items of data are stored in the data ① and ⑪ areas, respectively.)

  For details about two items measurement, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).
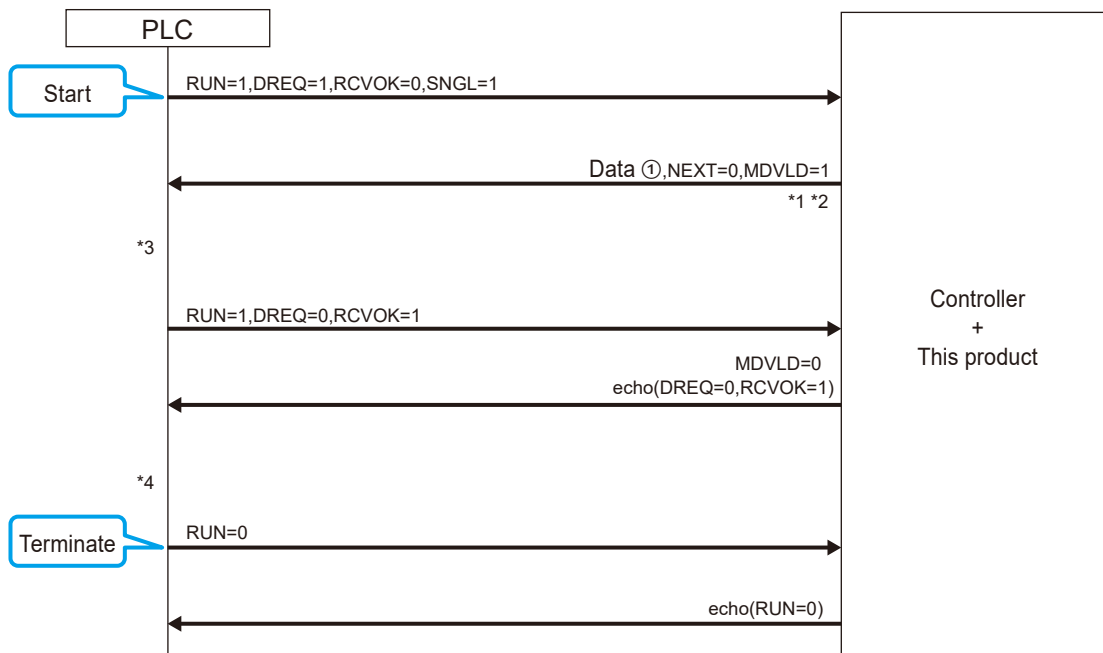
*3 Processing on PLC side
- Checks that MDVLD=1 was set.
- Reads the valid data quantity to check the data count.
- Reads in the number of pieces of data from data areas ① through ⑳ as written in the valid data quantity.
  (When two items measurement is performed, the acquired two items of data are stored in the data ① to ⑩ and ⑪ to ⑳ areas, respectively.)

  For details about two items measurement, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).
- Sets the data reception OK flag.
  RCVOK=1
  DREQ=0

*4 Processing on PLC side
  After confirming MDVLD=0, sets RCVOK=0.

With streaming acquisition
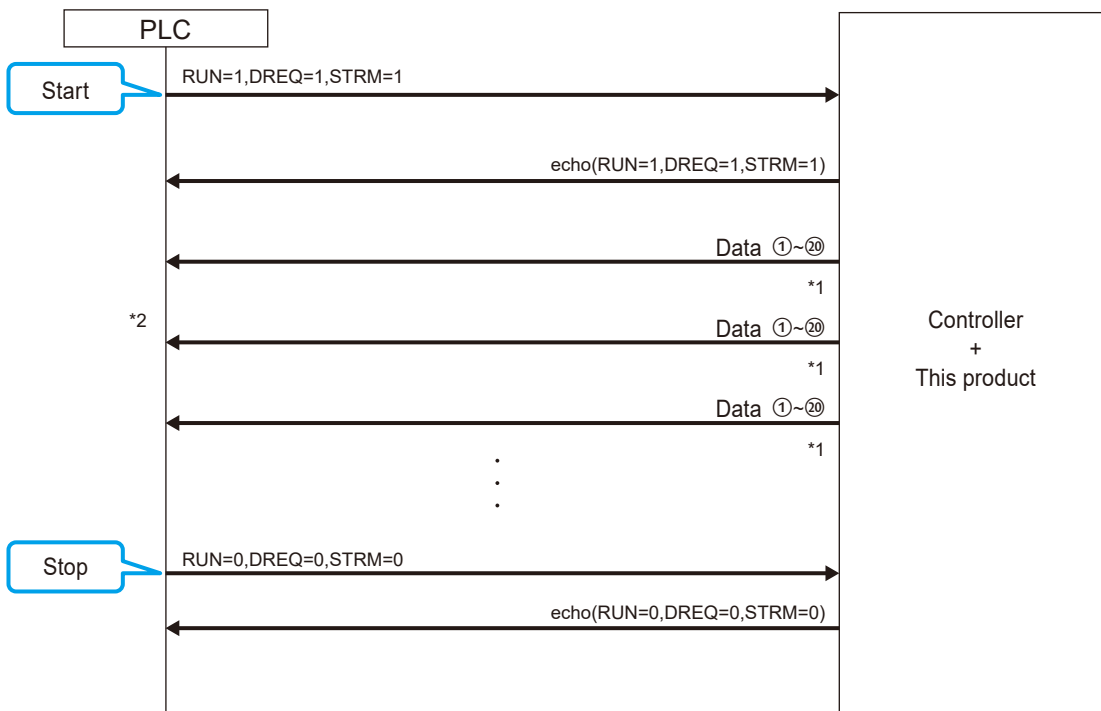
*1 Response (output data to IN area of the master station (PLC, etc.))
- Status record: RX20—RX3F
- Error record: RX0—RXA
- Valid data quantity: RWr4
- Measured value ①: RWr6—RWr7
- GO/NG judgment result of measured value ①: RWr8
- Data status of measured value ①: RWr9
  (When two items measurement is performed, the acquired two items of data are stored in the data ① and ⑪ areas, respectively.)

  For details about two items measurement, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

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*2 Processing on PLC side

Data is acquired by repeating the following steps.

Data is updated at the specified communication cycle, and SEQNO is incremented at each update.

• Check the sequence number (SEQNO) of the data.

• Reads the valid data quantity to check the data count.

• Reads in the number of pieces of data from data areas ① through ⑳ as written in the valid data quantity.

(When two items measurement is performed, the acquired two items of data are stored in the data ① to ⑩ and ⑪ to ⑳ areas, respectively.)

For details about two items measurement, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

● Reboot request
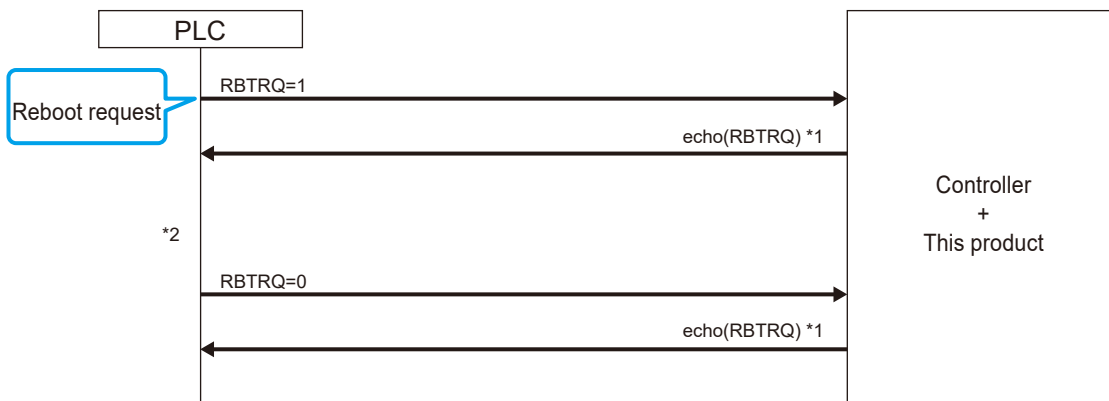
*1 Depending on the timing, this response may not be received by PLC. This is because when RBTRQ is issued, the device enters reboot operation and echo(RBTRQ) becomes 0.

*2 The RBTRQ bit should be held for at least one cycle of cyclic communication.

● Error clear request
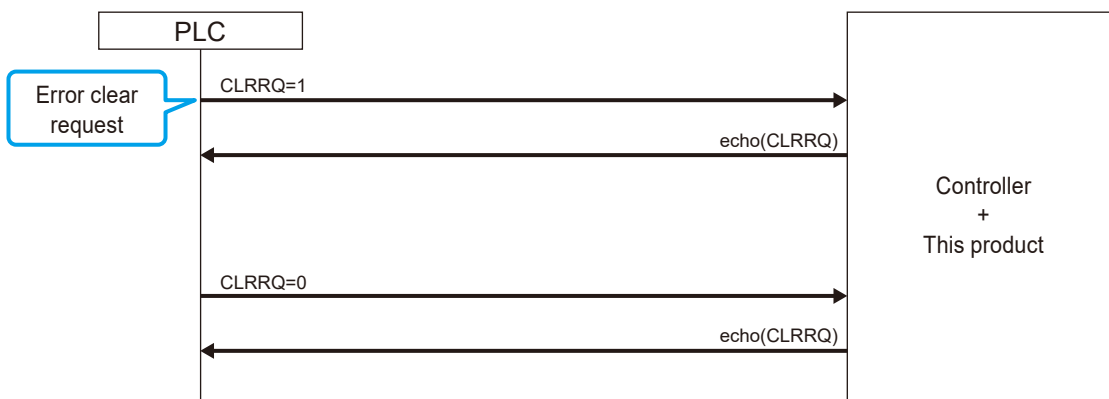
Tips

To update the error status after assertion of CLRRQ, set DPVAL ON and update the current value display.

● Preset request

```
                    ┌──────────────┐                        ┌──────────────────┐
                    │     PLC      │                        │                  │
┌──────────────┐    └──────┬───────┘     PSTRQ=1            │                  │
│Preset request│           │──────────────────────────────▶│                  │
│   (valid)    │           │                                │                  │
└──────────────┘           │◀──────────────────────────────│   Controller     │
                           │            echo(PSTRQ)         │       +          │
                           │                                │  This product    │
┌──────────────┐           │            PSTRQ=0             │                  │
│Preset request│           │──────────────────────────────▶│                  │
│  (invalid)   │           │                                │                  │
└──────────────┘           │◀──────────────────────────────│                  │
                           │            echo(PSTRQ)         │                  │
                           │                                └──────────────────┘
```

● Parameter setting configuration

```
                    ┌──────────────┐
                    │     PLC      │
┌──────────────────┐└──────┬───────┘
│   Specify the    │       │
│  parameter set   │       │
│  number to be    │       │
│  used in PRM     │       │
│     0–7.         │       │                                ┌──────────────────┐
└──────────────────┘       │                                │                  │
┌──────────────────┐       │            CHGPRM=1            │                  │
│Parameter setting │       │──────────────────────────────▶│                  │
│  configuration   │       │                                │                  │
└──────────────────┘       │◀──────────────────────────────│   Controller     │
                           │           echo(CHGPRM)         │       +          │
                           │                                │  This product    │
                           │            CHGPRM=0            │                  │
                           │──────────────────────────────▶│                  │
                           │                                │                  │
                           │◀──────────────────────────────│                  │
                           │           echo(CHGPRM)         └──────────────────┘
```

● GO/NG judgment setting

```
                    ┌──────────────┐                        ┌──────────────────┐
                    │     PLC      │                        │                  │
┌──────────────┐    └──────┬───────┘     TOLON=1            │                  │
│GO/NG judg-   │           │──────────────────────────────▶│                  │
│ment (valid)  │           │                                │                  │
└──────────────┘           │◀──────────────────────────────│   Controller     │
                           │            echo(TOLON)         │       +          │
                           │                                │  This product    │
┌──────────────┐           │            TOLON=0             │                  │
│GO/NG judg-   │           │──────────────────────────────▶│                  │
│ment (invalid)│           │                                │                  │
└──────────────┘           │◀──────────────────────────────│                  │
                           │            echo(TOLON)         └──────────────────┘
```
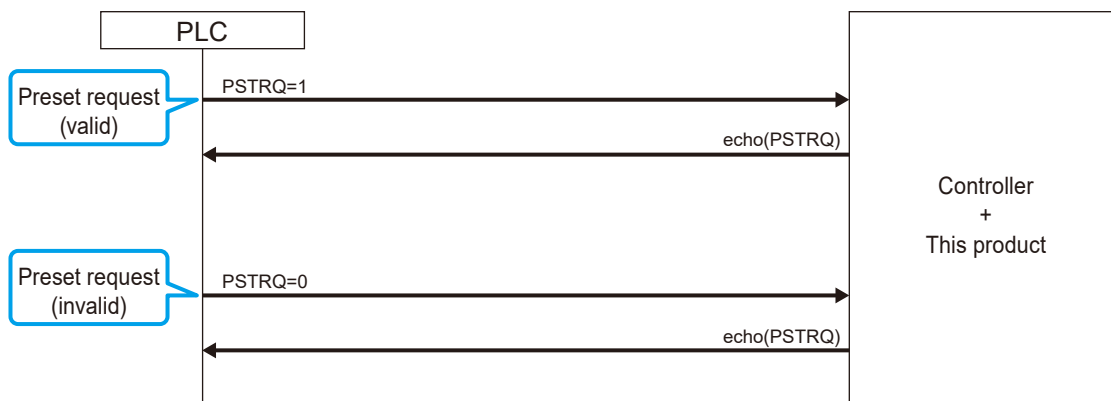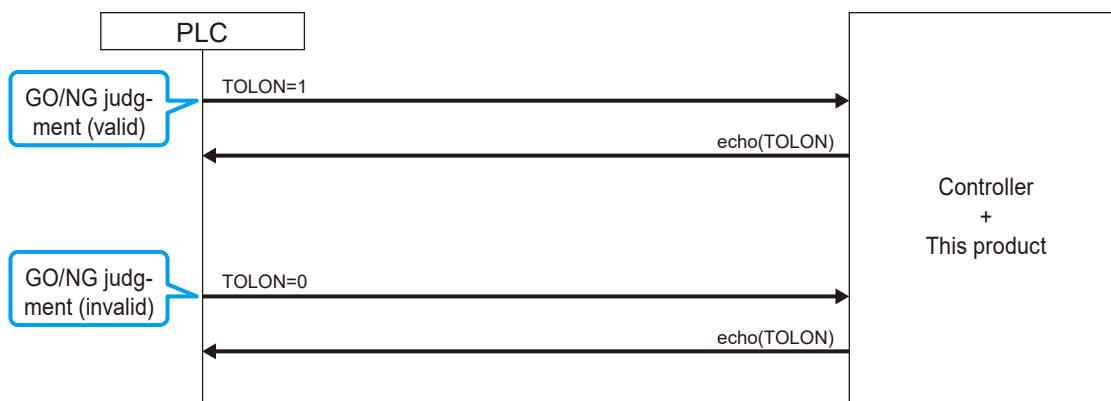
5.1.2   Duration of Data Processing

Time required from measurement execution to data processing by the master station (PLC, etc.) is shown below.

Maximum data processing time = ① + ② + ③

① Response time of the controller

② Transmission interval

③ Scanning time of the master station (PLC, etc.)

① For details about response time of the controller, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).
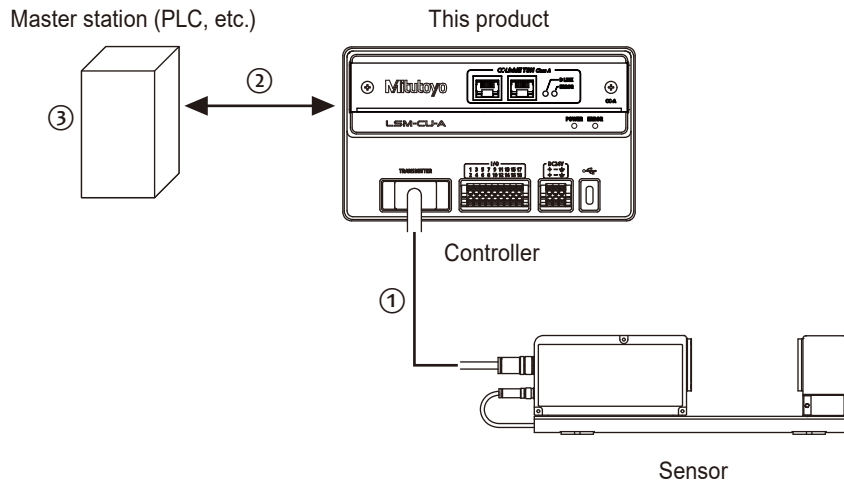
② The communication cycle is set by the configuration software on the master station side. The settable range is from 1 ms through 10 ms.

③ Program scan times of the master station vary according to device processing capacity and program size. Check specifications of the device used and program execution time.

Tips

If the master station's scan time is shorter than the communication cycle, data may not be acquired correctly.
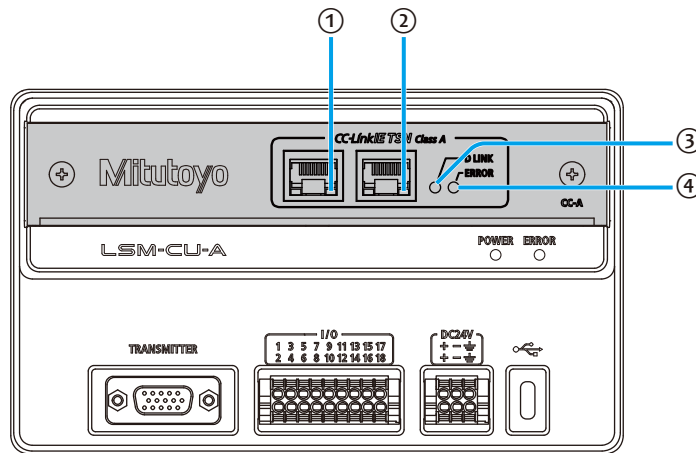
5.2 Status Indication

The status of the controller and network can be checked with the LEDs on this product or with LSMPAK.

For details about LSMPAK, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

5.2.1 LED Indicators on This Product

The LED indications of this product change according to the status of the controller and network.

No.	Name	Applica-tion	Indicator color		Description
①	Link/activity LED (port 1)	Ethernet	Off	▬	Communication is not available.
			Steady yellow	🟨	Lights when a link is established and flashes during transmission and reception.
②	Link/activity LED (port 2)	Ethernet	Off	▬	Communication is not available.
			Steady yellow	🟨	Lights when a link is established and flashes during transmission and reception.
③	D LINK	CC-Link IE TSN	For indicator colors and their meanings, see 📖 "■ LED indicator colors for CC-Link IE TSN" on page 36.		
④	ERROR	CC-Link IE TSN			

■ LED indicator colors for CC-Link IE TSN

D LINK and ERROR indicate the status by a combination of display colors.

LED illumination states are shown in the table in order of highest priority toward the top.

Indicator color				Description
Off	●	Off	●	Power is not being supplied to the product, or there is no connection to the master station (PLC, etc.).
Steady red	🔴	Steady red	🔴	Unrecoverable error occurred in this product. Replacement of this product may be required.
Off	●	Steady red	🔴	The IP address is duplicated, or an error occurred in this product.
Off	●	Flashing red	🔆	An error occurred with connection to the master station (data link error).
Flashing green	🔆	Off	●	Connection to the master station has been established, but cyclic communication is stopped.
Steady green	🟢	Off	●	Normal communication with the master station is possible (cyclic communication in progress).

5.2.2 LSMPAK Screen

When this product is operating normally, the status LED lights green. (Red: Error occurred, Gray: Not working)
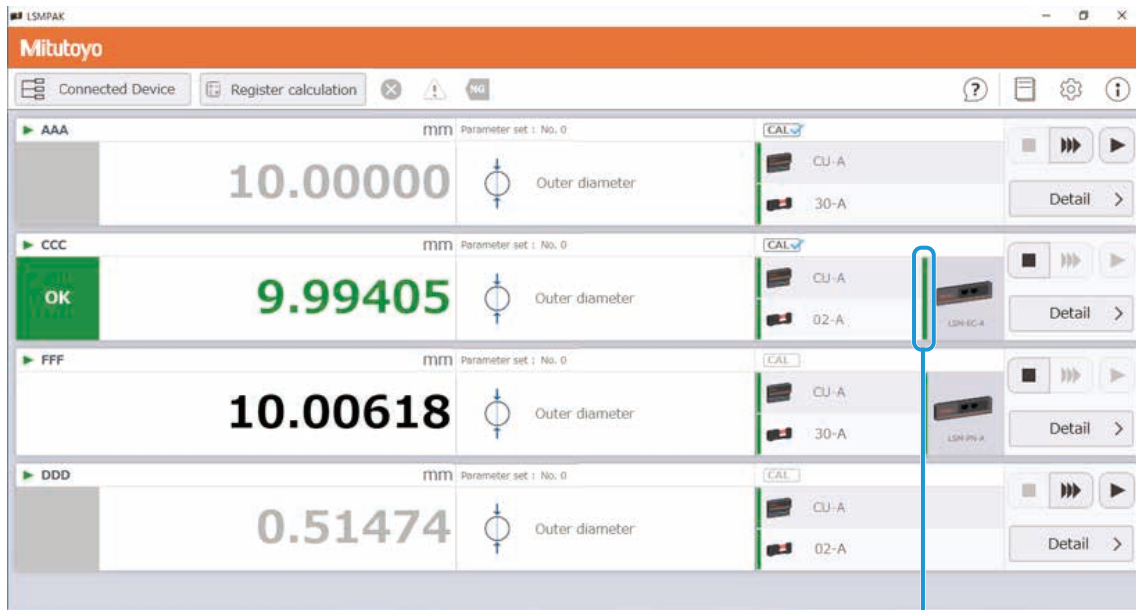
Status light

MEMO

6   Troubleshooting

If you cannot access the network, check the LED indicators.

For details about the LED indicators, see 📖 "5.2.1 LED Indicators on This Product" on page 35.
For details about LSMPAK error messages, see 📖 "Laser Scan Micrometer <Controller> User's Manual" (separate document).

Problem	Cause	Solution
Power does not go on.	This product is not properly inserted into the socket of LSM-CU-A.	Insert this product correctly into the LSM-CU-A. 📖 "4.2 Connecting to the Controller" on page 10
Communication not working.	The cable is not properly connected.	Check cable connections and verify that the link/activity LED is lit.
	The connected device is not turned on.	Make sure the connected device is turned on and that the link/activity LED is lit.
	Incorrect communication settings on current device or connected device.	Check the LED indicators on the device and make communication settings required to obtain a normal lighting pattern. For details on LED lighting patterns, see 📖 "5.2.1 LED Indicators on This Product" on page 35. For communication settings for the connected device, see the manual or other document related to that device.
Operation of this product is unstable. • Correct measurement values cannot be obtained. • Communication errors occur. • This product restarts.	This product is receiving electromagnetic interference that exceeds the requirements of the EMC Directive and the UK Electromagnetic Compatibility Regulations.	Eliminate the electromagnetic interference. This product resumes normal operation after the electromagnetic interference is eliminated.
Operation of other devices is unstable. This product is causing loss of specified functionality of other devices.	This product is being used in other than the intended operating environment. This product generates electromagnetic emissions in an industrial environment. This product is not intended for use outside of an industrial environment, and its use in residential areas or other environments may cause electromagnetic interference with other devices.	Implement countermeasures to prevent electromagnetic interference with other devices.

6

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7 Specifications

This chapter describes the specifications of this product.

7.1 Basic Specifications

Item	Specification		
Code No.	02AGQ390		
Model number	LSM-CC-A		
Interface	LED	D LINK	Dual Color LED1 (red/green)
		ERROR	Single Color LED (red)
	RJ45 connector	2 channels	
Operating environment	0 °C to 50 °C, 20 % RH to 85 % RH (non-condensing)		
Storage environment	-10 °C to 60 °C, 20 % RH to 85 % RH (non-condensing)		

CE marking/ UKCA marking	EMC Directive/Electromagnetic Compatibility Regulations: EN IEC 61326-1
	
	     Immunity test requirement: Clause 6.2 Table 2
	
	     Emission limit: Class A		

	RoHS Directive/The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations : EN IEC 63000		

7

7.2   Ethernet Communication Specifications

Item	Specification
Communication port	RJ45×2
Transmission speed	100 Mbps, full duplex
Cable used	STP communication cables of type Cat.5e or higher

7.2.1   CC-Link IE TSN Function

Function	Specification
CC-Link IE TSN	Remote station compliant with Conformance Class A
Minimum cycle time	1 msec

7.3 Measurement Configurations Usable with This Product

Using this device, multiple LSM controllers can be connected to a network.

Typical connection of multiple LSM controllers is shown below.

Networked LSM controllers can be managed from a PC using LSMPAK.
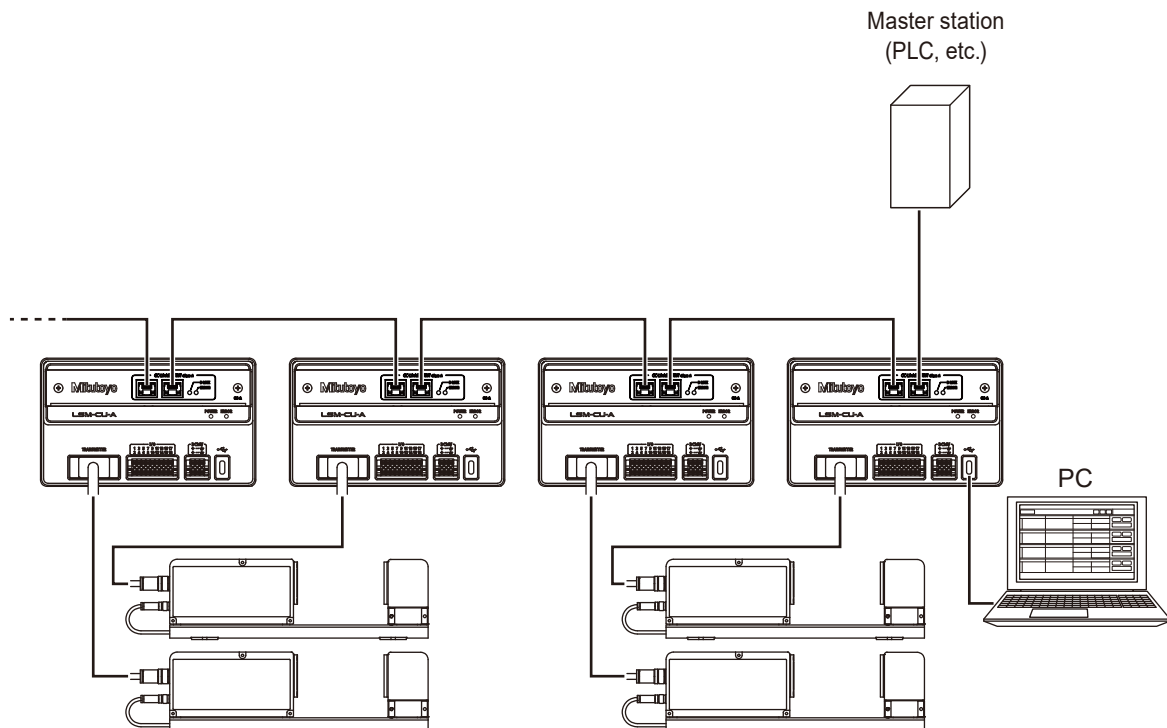
The maximum number of LSM controllers that can be managed using LSMPAK is eight.

> ❗ Duplicate IP addresses within the same network will result in incorrect communication.
> Please be careful to avoid setting duplicate IP addresses.

Tips

It does not matter whether you use port 1 or port 2 of this product to configure the network.

7.4   External Dimensions Drawing

Unit: mm

45
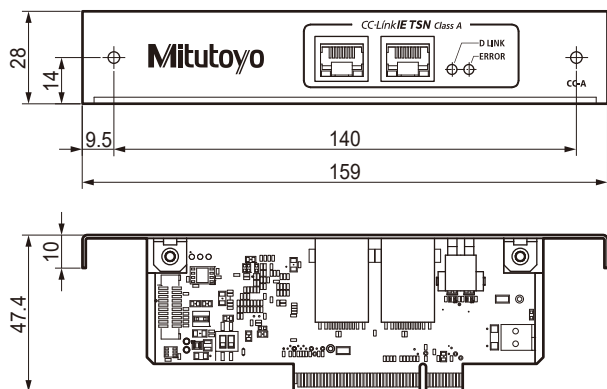
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