KEYENCE

633GB

Ethernet (TCP/IP)
Compatible Network Unit

DL-EN1

User's Manual

Read this manual before using the product in order to achieve maximum performance.
Keep this manual in a safe place for future reference.

Introduction

This manual describes the basic operations and hardware functions of the DL-EN1. Read the manual carefully to ensure safe performance and function of the DL-EN1.
Keep this manual in a safe place for future reference.
Ensure that the end user of this product receives this manual.

■ Symbols

The following symbols alert you to matters concerning the prevention of injury and product damage.

DANGER	**It indicates a hazardous situation which, if not avoided, will result in death or serious injury.**
WARNING	**It indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
CAUTION	**It indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**
NOTICE	**It indicates a situation which, if not avoided, could result in product damage as well as property damage.**

Important **It indicates cautions and limitations that must be followed during operation.**

Point **It indicates additional information on proper operation.**

Reference It indicates tips for better understanding or useful information.

It indicates reference pages.

Safety Information for DL-EN1

General Precautions

- Before and while operating this product, confirm its performance and functions operate correctly.
- Implement sufficient safety measures to prevent human and property damage in case this product fails.
- Be aware that the product functions and performance are not warranted if the product is used outside the range of stated specifications or is modified by the customer.
- Combining this product with other equipment requires sufficient consideration because the proper functions and performance may not be met depending on the environment.
- Do not use this product for the purpose of protecting a human body or a part of the human body.
- This product is not intended for use as an explosion-proof product. Do not use this product in hazardous locations and/or in a potentially explosive atmosphere.
- Do not expose equipment, including peripherals, to rapid temperature changes. Equipment failure may result from condensation build up.

Precautions for Use

CAUTION	• **To avoid injury or failure, turn off the power immediately in the following cases.** **- Water or foreign matter enters the main unit.** **- The case is broken, for example if it is dropped.** **- Smoke or unusual smell is emitted from the product.** • **Use the correct power voltage. Failure to observe may result in injury, or failure.** • **Do not disassemble or modify this product. Failure to observe may result in injury.**

NOTICE	**Do not turn off the power while you are setting any item. Doing this may cause loss of data settings.**

Equipment Environment

For safe, trouble-free operation of this product, the product must not be installed in the following environments:

- Humid, dusty, or poorly ventilated.
- Exposed to direct sunlight or heat source.
- Exposed to corrosive or flammable gases.
- Exposed directly to vibration or shock.
- Exposed to water, oil, or chemical splashes.
- Exposed to static electricity.

Noise Protection

If this product is installed in a location near an electrical noise source, e.g., a power source or high-voltage line, it may malfunction or fail because of noise. Take protective measures, such as using a noise filter or running the cables separately.

About the Power Supply

- Noise superimposed on the power supply may result in malfunction. Use a stabilized DC power supply configured with an isolation transformer.
- When using a commercially available switching regulator, be sure to ground the frame ground terminal.

Precautions on Regulations and Standards

n UL Certification

This product is an UL/C-UL Listed product.

- UL File No. E207185
- Category NRAQ, NRAQ7

Be sure to consider the following specifications when using this product as an UL/C-UL Listed Product.

- Use this product under pollution degree 2.
- For wiring to the power supply connector, use a power supply with Class 2 output defined in NFPA70 (NEC: National Electric Code).
- This product is an open type device. Therefore, it must be installed in an enclosure with an IP 54 or higher rating. (e.g. Industrial control panel)

n CE Marking

Keyence Corporation has confirmed that this product complies with the essential requirements of the applicable EC Directive, based on the following specifications. Be sure to consider the following specifications when using this product in a member state of European Union.

● EMC Directive (2004/108/EC)

EMI : EN55011, Class A

EMS : EN61000-6-2

- Use an STP (shielded twisted pair) cable for connection to the network.

These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive.

Manual Organization

1	Before Using	This chapter provides an overview of the DL-EN1 and describes its part names and functions.
2	Connection and Configuration	This chapter describes the procedures from installing the DL-EN1 and sensor amplifiers to configuring communication.
3	List of commands supported by the DL-EN1	
4	List of commands supported by the GT2 Series	
5	List of commands supported by the GT Series	
6	List of commands supported by the IL Series	
7	List of commands supported by the IG Series	
8	List of commands supported by the IB Series	
9	List of commands supported by the SK Series	
10	Appendix	

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Before Using

1

This chapter provides an overview of the DL-EN1 and describes its part names and functions.

Connectable Sensor Amplifiers

■ Number of Connectable Sensor Amplifiers

Name	Type of amplifier	Main unit	Expansion unit	Max. connectable number
High-accuracy Digital Contact Sensor GT2 Series*1	DIN-rail mount type	GT2-71(M)(C)N GT2-71(M)(C)P	GT2-72(C)N GT2-72(C)P	15 units (Main: 1, Expansion: 14)
	Panel mount type	GT2-75N GT2-75P	GT2-76N GT2-76P	15 units (Main: 1, Expansion: 14)
	Large display type	GT2-100N GT2-100P	-	1 unit*2 (Main: 1)
General Purpose Digital Contact Sensor GT-70A Series*1	DIN-rail mount type	GT-71A GT-71AP	GT-72A GT-72AP	10 units (Main: 1, Expansion: 9)
	Panel mount type	GT-75A GT-75AP	GT-76A GT-76AP	10 units (Main: 1, Expansion: 9)
Multi-Purpose CCD Laser Micrometer IG Series*1	DIN-rail mount type	IG-1000	IG-1050	4 units (Main: 1, Expansion: 3)
	Panel mount type	IG-1500	IG-1550	4 units (Main: 1, Expansion: 3)
CMOS Laser Application Sensor IL Series*1	DIN-rail mount type	IL-1000	IL-1050	8 units (Main: 1, Expansion: 7)
	Panel mount type	IL-1000	IL-1050	8 units (Main: 1, Expansion: 7)
Thrubeam Laser Detection Sensor IB Series	DIN-rail mount type	IB-1000	IB-1050	4 units (Main: 1, Expansion: 3)
	Panel mount type	IB-1500	IB-1550	4 units (Main: 1, Expansion: 3)
Static Sensor SK-1000 Series	DIN-rail mount type	SK-1000	SK-1050	8 units (Main: 1, Expansion: 7)

*1 The GT-70A Series, GT-2 Series, IG Series, IL Series and IB Series can be connected solely.
In addition, two or more models can be used together.
The maximum connectable numbers for each model are as follows.

- When connecting 1 model only

Model	Maximum connectable number (DL not included)
GT-70A Series	10 units
GT2 Series	15 units
IG Series	4 units

Model	Maximum connectable number (DL not included)
IL Series	8 units
IB Series	4 units
SK-1000 Series	8 units

- When connecting 2 models together

Model	Amplifier used together	Maximum connectable number (DL not included)
GT-70A Series	GT2 Series	10 units
	IG Series	6 units
	IL Series	8 units
	IB Series	6 units
GT2 Series	IG Series	6 units
	IL Series	6 units
	IB Series	6 units
IG Series	IL Series	6 units
	IB Series	6 units
IL Series	IB Series	6 units

- When connecting 3 or more models together

Model	Amplifier used together 1	Amplifier used together 2	Maximum connectable number (DL not included)
GT-70A Series	GT2 Series	IL Series	8 units
Other combinations			6 units

When using 2 or more models together, the total connection number for each model must be the maximum connectable number or less for connecting one model only.

(Example) When IB Series and IG Series are used together, sum of the 2 models must be 6 units or less. In addition, the number of IB Series and IG Series must be 4 or less respectively.
(Connectable) IB Series 4 units, IG Series 2 units, Total 6 units
(Not connectable) IB Series 5 units, IG Series 1 units, Total 6 units

*2 As for the large display type, GT2-100 Series, up to 11 units of the sensor head can be connected to 1 amplifier by adding the expansion board to the main unit. GT2-100 Series cannot be used with other models.

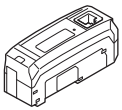
1-2 Checking the Package Contents

Before using the DL-EN1, make sure that the following equipment and accessories are included in the package. We have thoroughly inspected the package contents before shipment.
However, in the event of defective or broken items, contact your nearest KEYENCE office.

Package Contents

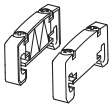
■ Package contents

DL-EN1 main unit x 1



Expansion connector sticker x 1

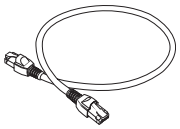
End unit x 2
OP-26751



Instruction manual x 1

■ List of Optional Parts

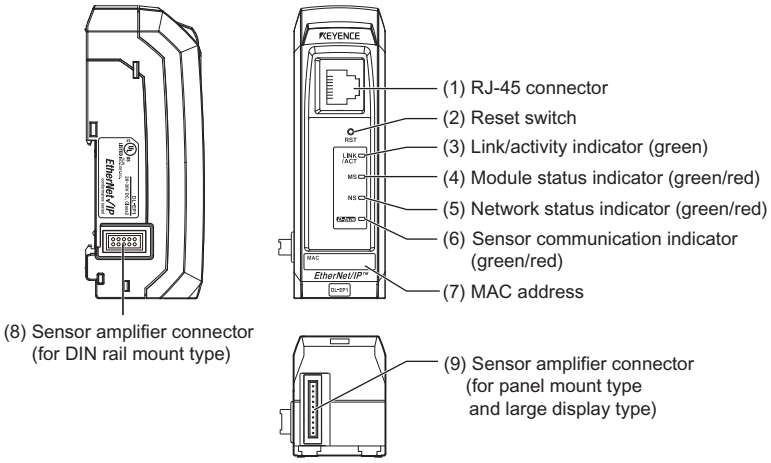
- STP (shielded twisted pair) cable
  (Category 5e, straight)
  - OP-51504 (0.2m)
  - OP-51505 (0.5m)
  - OP-51506 (1m)
  - OP-51507 (3m)
  - OP-51508 (5m)



* The working ambient temperature of the above cables are 0 to 50°C.

1-3 Names and Functions of Each Part

This section describes the part names and functions of the DL-EN1.



Name	Description
(1) RJ-45 connector	Attach the network cable to this connector.
(2) Reset switch	When held down for three seconds or longer, the DL-EN1 settings will be reset to the default settings.
(3) Link/activity indicator	Normal: Green LED lights up or blinks For details, refer to 🕮 "Troubleshooting".
(4) Module status indicator	Normal: Green LED lights up For details, refer to 🕮 "Troubleshooting".
(5) Network status indicator	Normal: Green LED lights up For details, refer to 🕮 "Troubleshooting".
(6) Sensor communication indicator	Indicates the status of communication between the DL-EN1 and sensor amplifiers. Normal: Green LED lights up For details, refer to 🕮 "Troubleshooting".
(7) MAC address	MAC address for this DL-EN1
(8) Sensor amplifier connector (for DIN rail mount type)	Attach the sensor amplifier to this connector. When not using this connector, remove it and replace with the protective sticker.
(9) Sensor amplifier connector (for panel mount/large display type)	Attach the sensor amplifier to this connector. A protective seal is attached when shipped from the factory. The optional expansion cable (OP-35361) is used for this connection.

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Connection and Configuration

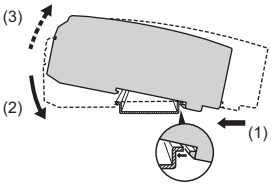
2

This section describes procedures from installing the DL-EN1 and sensor amplifiers to configuring communication.

Mounting and connection to Sensor Amplifiers

■ Mounting the DL-EN1 on the DIN rail

1 **Align the claw on the bottom of the DL-EN1 with the DIN rail. While pushing the amplifier in the direction of arrow (1), press down in the direction of arrow (2).**



2 **To remove the DL-EN1, raise the amplifier in the direction of arrow (3) while pushing the DL-EN1 in the direction of arrow (1).**

■ Connecting the DL-EN1 to sensor amplifiers

The EtherNet/IP Compatible Network Unit DL-EN1 must be connected to sensor amplifiers before it can function.

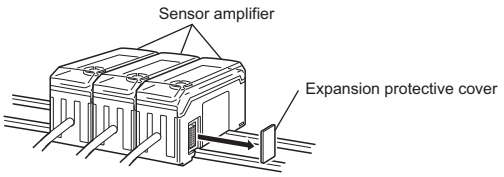
The connecting procedure varies with the mounting type of the sensor amplifiers to be connected.

NOTICE	**Make sure that the sensor amplifiers are turned off before connecting the DL-EN1. Connecting the DL-EN1 to the sensor amplifiers when they are turned on may damage the DL-EN1.**

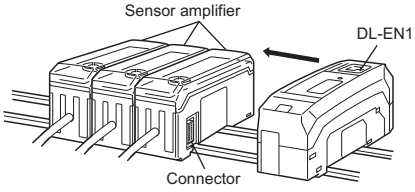
Point For the instructions on connecting additional sensor amplifiers, refer to the instruction manual of each sensor amplifier.

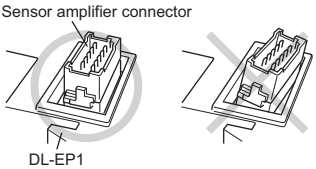
● Connecting to sensor amplifiers of the DIN rail mount type

1 **Remove the expansion protective cover from the sensor amplifier to be connected.**

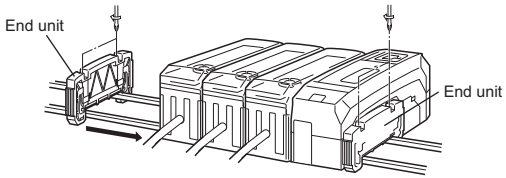


2 **Mount the DL-EN1 on the DIN rail and connect it to the sensor amplifier.**
Connect the DL-EN1 to the sensor amplifier connector with no space between them.



NOTICE	**See the figure shown below and make sure that the sensor amplifier connector (for DIN rail mount type) is not askew on the side face of the DL-EN1. Connecting the DL-EN1 to the sensor amplifier with the connector being askew may damage the DL-EN1.** 

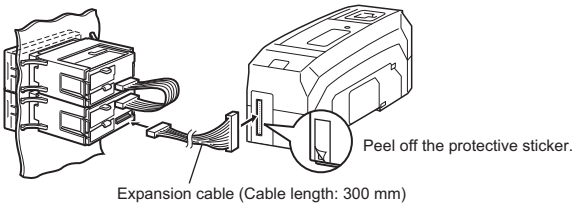
3 **Mount the supplied end units (OP-26751: a set of two pieces) on the outer ends of the amplifier and the DL-EN1. Then, fix the end units with the screws on the top of each end unit (2 points x 2 units). (Tightening torque: 0.6 N•m or less)**
Mount the end units in the same way as the DL-EN1.



NOTICE	**Press the DL-EN1 into full engagement with the sensor amplifier. Energizing the DL-EN1 when not inserted fully may damage the DE-EP1.**

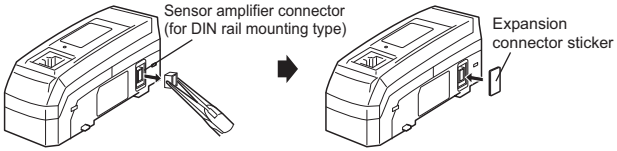
● **Connecting to sensor amplifiers of panel mount type**

1 **Connect the sensor amplifier and the DL-EN1 with the optional expansion cable (OP-35361).**



NOTICE	• **Turn off the power supply and connect the expansion cable securely. Energizing the DL-EN1 when not inserted fully may damage the DL-EN1.** • **Attaching or detaching the cable when the power supply is on may damage the DL-EN1.**

2 **Remove the sensor amplifier connector (for DIN rail mount type) from the DL-EN1 using pliers. Then, attach the expansion connector sticker supplied with the DL-EN1. Then, attach the expansion connector sticker supplied with the DL-EN1.**



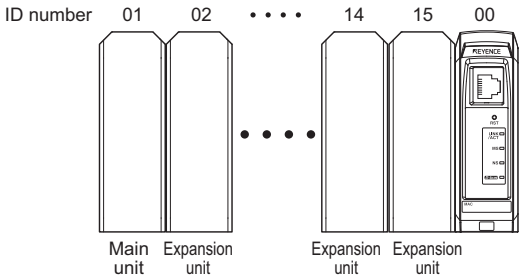
Assigning ID Numbers

Several sensor amplifiers can be connected to the DL-EN1. ID numbers for data identification are assigned to each sensor amplifier.
The method for assigning ID numbers is as follows:

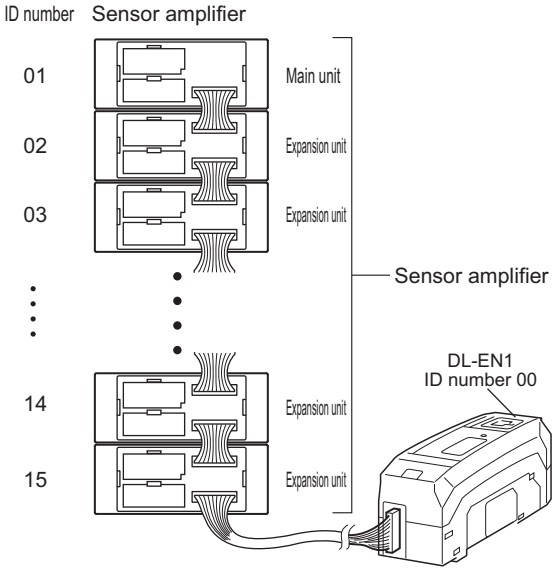
- ID numbers are assigned in order, starting from the sensor amplifier that is the main unit. (Optional numbers cannot be assigned.)
- 0 is assigned as the ID number of the DL-EN1.

Point	• You cannot change the ID numbers assigned to the sensor amplifiers. • In this manual, ID number 00 to ID number 15 are denoted as ID00 to ID15, respectively.

■ **For DIN rail mount type**

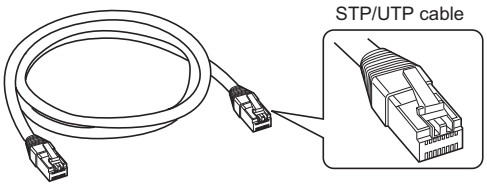


■ **For panel mount type**



Connecting a communication cable

When the system (network) is configured with 100BASE-TX, use a Category 5 or higher STP or UTP cable. Do not use a Category 3 or Category 4 UTP cable.



Point

- Use a STP/UTP straight cable when connecting the DL-EN1 to an Ethernet switch.
- Use a STP/UTP cross cable when directly connecting the DL-EN1 to a PC.
- Do not use the STP/UTP cross cable incorrectly because it is difficult to distinguish this cable from the STP/UTP straight cable in appearance.

■ DL-EN1 connector port

The DL-EN1 connector port accepts an RJ-45 8-pole modular connector (ISO8877 compliant) used with 100BASE-TX and complies with the IEEE802.3 Standards.

Precautions for connecting a STP/UTP cable to the DL-EN1 connector port

Take care not to apply a load to the DL-EN1 connector port when connecting the STP/UTP cable to the DL-EN1.

NOTICE	**The cable may be bent and used when installed. Bending the cable at a sharp angle may cut the wires in the cable or the cable may be disconnected during use. Install or lay the cable to be used with attention to the recommended bending radius R of the cable.**

The following describes how to connect the DL-EN1 to the RJ-45 connector.

1 **Turn off the power supply.**

2 **Connect one modular jack of the STP/UTP cable to the 100BASE port of the Ethernet switch to be used.**

Insert the modular jack until a "click" is heard. The modular jack and connector will lock.

Point

- Keep the length of the STP/UTP cable to be used 100 m or less.
- Carefully check the state of connector (port) on the Ethernet switch before connecting the DL-EN1. There are various Ethernet switches. Some Ethernet switches have a different shape connector (AUI connector or BNC connector, etc.) from the RJ-45, while some have connectors used to connect Ethernet switches together (cascade ports).

3 **Connect the modular jack on the other end of the STP/UTP cable to the DL-EN1 connector port.**

Insert the jack until a "click" is heard. The modular jack and connector will lock.

DL-EN1 Settings

The following describes how to set communication with the DL-EN1.

■ Setting the IP address

Set the IP address with the DL-EN1 wired and with the power supplied.
By default, the IP address is not set. However, you can use the BOOTP client function to set the IP address via Ethernet.

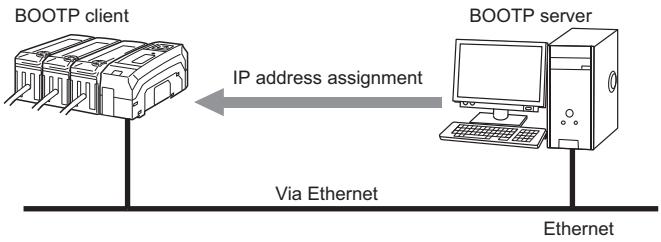
The following methods are available for setting the IP address.

- Use the IP address setting tool (this tool can be downloaded from the Keyence web site http://www.keyence.com).
- Use an IP address setting tool from other sources.
  Refer to the manuals provided by the respective sources.

Reference

What is BOOTP?

BOOTP is the abbreviation of BOOT strap Protocol. This protocol is used by the client device in the TCP/IP network to make the network settings assigned from the server.
If there is a BOOTP server in the same network as the device running as the BOOTP client, an IP address is assigned to the device connected as the BOOTP client.



Format

Send the "command format" in ASCII code from an external device.
For details on the parameters used with the command format, refer to "Command and Response Parameters".

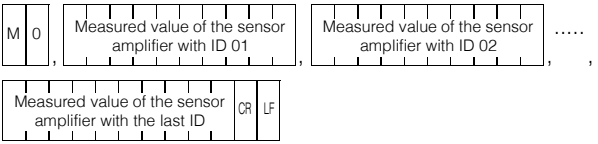
The following four types of command formats are available.

(1)	M0 command	The measured values of all the connected sensor amplifiers are read.
(2)	MS command	The measured values and output statuses of all the connected sensor amplifiers are read.
(3)	SR command	The data of the specified connected sensor amplifier is read.
(4)	SW command	Data is written to the specified connected sensor amplifier.
(5)	FR command	The decimal position of the specified connected sensor amplifier is read.

(1) M0 command

Command format

Response format

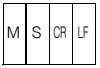


Reference

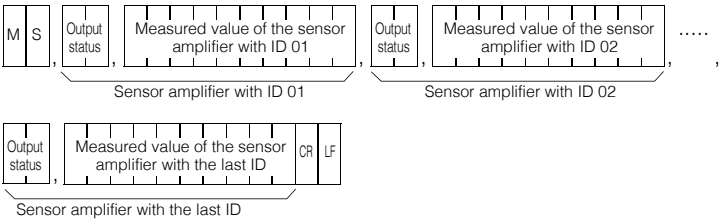
The measured value is fixed to a positive or negative sign and the measured value represented as nine characters.
Example: When two sensors are connected to the DL-EN1 and the obtained measured values are 12.345 and -56.789
The measured value response from the first sensor is "+000012345," and the measured value response from the second sensor is "-000056789."
If an error occurs on a sensor, the value "+100000000" is output.
When a sensor over range has occurred (the sensor amplifier displays FFFF), "+099999999" is output.
When a sensor under range has occurred (the sensor amplifier displays -FFFF), "-099999999" is output.
When a sensor's value is invalid (the sensor amplifier displays ----), "-099999998" is output.

(2) MS command

Command format



Response format



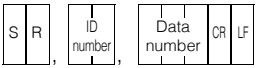
Reference The relationship between the response and the output status is shown below.

All OFF	00
HIGH	01
LOW	02
Error	03
GO	04
HH*1	08
LL*1	16

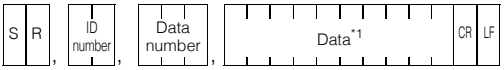
*1 Only when the obtained sensor is a GT2 Series unit and five outputs have been set.

(3) SR command

Command format



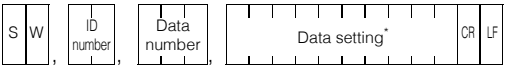
Response format



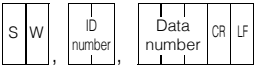
* The data is fixed to a positive or negative sign and the data represented as nine characters.

(4) SW command

Command format



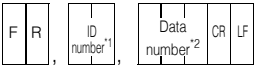
Response format



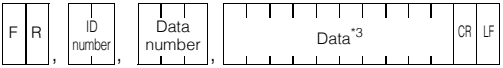
* The data setting is fixed to a positive or negative sign and the setting value represented as nine characters.

(5) FR command

Command format



Response format

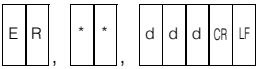


*1 This is only valid as a command sent to the connected sensor amplifiers. Therefore, the specified ID number must be a value of 1 or higher.

*2 Use the data number to specify the data number whose sensor amplifier measured value will be read.
Example) For the GT2 Series, the data number is 037.

*3 The data is fixed to a positive or negative sign and the data is represented as nine characters.
Example) For the GT2 Series, the data is "+000000004".

(6) Error format



**: This varies depending on the sent command.
M0, MS, SR, SW or FR is inserted here.

ddd	Cause and actions
009	The written data is outside of the valid range. The sensor does not support writing to the specified ID or data number.
012	This is a state in which the operation command cannot be executed. The sensor does not support writing to the specified ID or data number.
014	This address is write-protected or is in a state in which it cannot be written to. The sensor does not support writing to the specified ID or data number.
016	This data number is read-protected or is in a state in which it cannot be read.
020	The data number is outside of the valid range.
022	The ID is outside of the valid range.

ddd	Cause and actions
031	The sensor does not support reading from or writing to the specified ID or data number. Writing is not possible in the current mode. The device is currently initializing the communication.
254	This is the system error state. Wait for the length of time required to start the device. Wait for a response. Check for errors in the connectors such as the D-bus connector. Restart the DL-EN1. If the error still occurs, contact your nearest KEYENCE office.
255	The command format is not correct.

List of commands supported by the DL-EN1

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The ID of the DL-EN1 is 00.

Data number	Name	Description	Attribute
000	Status	Indicates the status of this unit and connected sensor amplifier. Bit 0: DL-EN1 Error Status Bit 1 to bit 13: Reserved for system Bit14: Warning Status Bit15: Error Status	R
001	Sensor Error Status	Indicates the error status of the connected sensor amplifiers. If an error occurs, the bit of the corresponding ID number of amplifier is turned to ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
002	Warning Status	(This is only valid when the IB Series is connected. The value is always 0 when using other sensor amplifiers.)	R
003	Reserved for system		
004	Current Value 0 Property	Indicates the status of current value 0 of each amplifier. If the current value 0 is “Over Range (FFFF)", “Under Range (-FFFF)", or "Invalid (----)", the bit corresponding to the ID number is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
005 to 007	Reserved for system		
008	Error ID Number	Indicates the ID number of the unit having error. Parameter range: 0 to 15 (initial value: 0)	R
009	Error Code*4	Indicates the error code that is happening. Parameter range: 0 to 65535 (initial value: 0)	R
010	Warning ID Number	Indicates the ID number of the unit on which a warning has occurred. Parameter range: 0 to 15 (initial value: 0)	
011	Warning Code*5	Indicates the code of the warning that is happening. Parameter range: 0 to 65535 (initial value: 0)	
012 to 015	Reserved for system		
016	Output1 (HIGH)	Indicates the HIGH output (output 1) status of each amplifier. When HIGH is output, the bit corresponding to the ID number of the sensor amplifier is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
017	Output2 (LOW)	Indicates the LOW output (output 2) status of each amplifier. When LOW is output, the bit corresponding to the ID number of the sensor amplifier is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
018	Output3 (GO)	Indicates the GO output (output 3) status of each amplifier. When GO is output, the bit corresponding to the ID number of the sensor amplifier is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
019	Output4*1 (HH)	Indicates the status of HH output (output 4) *1 of each amplifier. When HH is output, the bit corresponding to the ID number of the sensor amplifier is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R

Data number	Name	Description	Attribute
020	Output5*1 (LL)	Indicates the status of LL output (output 5) *1 of each amplifier. When LL is output, the bit corresponding to the ID number of the sensor amplifier is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
021 to 037	Reserved for system		
038	Current Value 0 Invalid	When the current value 0 of each amplifier is invalid, the bit of corresponding ID number is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
039	Current Value 0 Under Range	When the current value 0 of each amplifier is less than the lower limit of the detection range, the bit of the corresponding ID number is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
040	Current Value 0 Over Range	When the current value 0 of each amplifier is higher than the upper limit of the detection range, the bit of corresponding ID number is turned ON. Bit 0 to bit 14: ID number 1 to ID number 15 Bit15: Reserved for system	R
041 to 043	Reserved for system		
044	Current Value 0 (ID Number 1)*3	Indicates the current value 0 of the sensor of ID number 1. Parameter range: -999999999 to +999999999 (initial value: 0)	R
045 to 057	:		
058	Current Value 0 (ID Number 15)*3	Indicates the current value 0 of the sensor ID number 15. Parameter range: -999999999 to +999999999 (initial value: 0)	R
059 to 075	Reserved for system		
076	Sensor Status Mask Setting	Set up the condition to determine if the sensor error or warning is a recoverable DL-EN1 error (MS LED blinks in red). If mask is selected, MS LED does not blink in red when a sensor error or warning occurs. Parameter range: 0 to 1 (initial value: 0) 0: Not mask 1: Mask	R/W
077	Sensor Connected Number*2	Indicates the number of connected sensor amplifiers. Parameter range: 0 to 15 (initial value: 0)	R
078 to 099	Reserved for system		
668	Error Code (ID number 00)	Indicates the error code of ID number 0. Parameter range: 0 to 65535 (initial value: 0)	R
669 to 682	:		
683	Error Code (ID number 15)	Indicates the error code of ID number 15. Parameter range: 0 to 65535 (initial value: 0)	R
684 to 1179	Reserved for system		

*1 The meaning varies depending on the connected sensor amplifiers.

Series	Output4	Output5
GT2 Series	HH output	LL output
GT Series	Not assigned	Not assigned
IL Series	Alarm output	Not assigned
IG Series	Edge check output	Not assigned
IB Series	Check output	Not assigned
SK Series	Alarm output	Not assigned

*2 This attribute cannot be used in the GT2-100 Series. The initial value of the effective ID is read irrespective of the effective ID setting.

*3 If this value is Current Value Over Range (FFFF), +099999999 is stored.
If this value is Current Value Under Range (-FFFF), -099999999 is stored.
If this value is Current Value Invalid (----), -099999998 is stored.
If this value is Error, +100000000 is stored.

*4 Error code list
The following error codes may occur in the DL-EN1 and sensor amplifiers.

● **DL-EN1**

Error ID Number	Code	Description	Cause	Actions
0	0	No error	-	-
	51	Unassigned ID error	The main unit assigned no ID within 10 seconds after the DL-EN1 had been started.	• Check if the number of connected sensor amplifiers exceeds the maximum number of sensor amplifiers that can be connected to the main unit. "Connectable Sensor Amplifiers" (Page 1-2) • Check the connection with the sensor amplifiers and then turn the power on again. If this error cannot be recovered, contact your nearest KEYENCE office.
	52	Start-time communication error	Communication between sensor amplifiers ended abnormally before ID assignment completion.	Check the connection with the sensor amplifiers and then turn the power on again. If this error cannot be recovered, contact your nearest KEYENCE office.
	53	Unsupported sensor amplifier connection error	A sensor amplifier not supported by the DL-EN1 is connected.	Check the model of the connected sensor amplifier and remove the sensor amplifier if it is not supported by the DL-EN1.
	54	Mixed model error	Sensor amplifiers outside the specifications have a mixed connection.	Check if the models are mixable.
	55	Start-time communication error	ID number assignment is successful but communication failed during the subsequent initial communication.	Check the connection with the sensor amplifiers and then turn the power on again. If this error cannot be recovered, contact your nearest KEYENCE office.

Error ID Number	Code	Description	Cause	Actions
0	56	Current limitation error	The number of connected sensor amplifiers exceeds the allowable range.	Use sensor amplifiers within the allowable range.
	57	Communication error between sensor amplifiers	An error occurred during communication between sensor amplifiers.	Check if there is a noise source around the DL-EN1. If the sensor communication indicator is flashing red, turn the power on again.
	70	IP address duplicate error	The IP address is the same as another device.	Check the IP address setting.
	100	System error	The IP address is incorrect.	Contact your nearest KEYENCE office.
	101	System error	A default gateway setting error occurred.	
	102	System error	An attempt to read data in EEPROM such as the MAC address has failed.	
	103	System error	An attempt to start the protocol stack has failed.	
	104	System error	An attempt to access FlashROM has failed.	
	150	System error	The number of held IDs is incorrect.	
	151	System error	The number of sensors is incorrect.	
	152	System error	An initial read error occurred.	

● GT2 Series

Error ID Number	Code	Description	Cause	Actions
01H to 0FH (Each ID number)	01H	Sensor amplifier error 1 of each ID number	Overcurrent error (ErC)	Refer to the GT2 Series User's Manual.
	02H	Sensor amplifier error 2 of each ID number	Head error (ErH)	
	03H	Sensor amplifier error 3 of each ID number	EEPROM error (ErE)	
	04H	Sensor amplifier error 4 of each ID number	Jam check error (Er.ChK)	
	05H	Sensor amplifier error 5 of each ID number	Self-timing delay error (Er.dLY)	
	06H	Sensor amplifier error 6 of each ID number	Number-of-units error (Er.Unit)	

Error ID Number	Code	Description	Cause	Actions
01H to 0FH (Each ID number)	07H	Sensor amplifier error 7 of each ID number	Calculation error(Er.CAL)	Refer to the GT2 Series User's Manual.
	08H	Sensor amplifier error 8 of each ID number	Calculation-only mode error (Er.noH)	

● GT-70A Series

Error ID Number	Code	Description	Cause	Actions
01H to 0FH (Each ID number)	01H	Sensor amplifier error 1 of each ID number	Overcurrent error (ErC)	Refer to the GT-70A Series User's Manual.
	02H	Sensor amplifier error 2 of each ID number	Head error (ErH)	
	03H	Sensor amplifier error 3 of each ID number	EEPROM error (ErE)	
	04H	Sensor amplifier error 4 of each ID number	Jam check error (Er.ChK)	
	05H	Sensor amplifier error 5 of each ID number	Self-timing delay error (Er.dLY)	
	06H	Sensor amplifier error 6 of each ID number	Number-of-units error (Er.Unit)	
	07H	Sensor amplifier error 7 of each ID number	Calculation error(Er.CAL)	

● IL Series

Error ID Number	Code	Description	Cause	Actions
01H to 08H (Each ID number)	01H	Sensor amplifier error 1 of each ID number	Overcurrent error	Refer to the IL Series User's Manual.
	02H	Sensor amplifier error 1 of each ID number	EEPROM error	
	03H	Sensor amplifier error 3 of each ID number	Sensor head error	
	04H to 07H	Sensor amplifier error 4 to 7 of each ID number	(Unassigned)	

Error ID Number	Code	Description	Cause	Actions
01H to 08H (Each ID number)	08H	Sensor amplifier error 8 of each ID number	Spot light laser error	Refer to the IL Series User's Manual.
	09H	Sensor amplifier error 9 of each ID number	Incompatible model error	
	0AH to 0BH	Sensor amplifier error 10 to 11 of each ID number	(Unassigned)	
	0CH	Sensor amplifier error 12 of each ID number	Amplifier communication error	
	0DH	Sensor amplifier error 13 of each ID number	Number-of-units error	
	0EH	Sensor amplifier error 14 of each ID number	Calculation error	
	0FH to 10H	Sensor amplifier error 15 to 16 of each ID number	(Unassigned)	

● IG Series

Error ID Number	Code	Description	Cause	Actions
01H to 0AH (Each ID number)	01H	Sensor amplifier error 1 of each ID number	Overcurrent error	Refer to the IG Series User's Manual.
	02H	Sensor amplifier error 2 of each ID number	EEPROM error	
	03H	Sensor amplifier error 3 of each ID number	Head error	
	04H	Sensor amplifier error 4 of each ID number	T/R reverse connection error	
	05H	Sensor amplifier error 5 of each ID number	Receiver EEPROM error	
	06H	Sensor amplifier error 6 of each ID number	Receiver error	
	07H	Sensor amplifier error 7 of each ID number	Transmitter error	

Error ID Number	Code	Description	Cause	Actions
01H to 0AH (Each ID number)	08H	Sensor amplifier error 8 of each ID number	Transmitter laser error	Refer to the IG Series User's Manual.
	09H	Sensor amplifier error 9 of each ID number	Model mismatch error	
	0AH	Sensor amplifier error 10 of each ID number	Head error (Standard Waveform)	
	0BH	Sensor amplifier error 11 of each ID number	Standard waveform error 1-4	
	0CH	Sensor amplifier error 12 of each ID number	Communication error	
	0DH	Sensor amplifier error 13 of each ID number	Additional setting error	
	0EH	Sensor amplifier error 14 of each ID number	Calculation error	

● IB Series

Error ID Number	Code	Description	Cause	Actions
01H to 04H (Each ID number)	01H	Sensor amplifier error 1 of each ID number	Overcurrent error (ErC)	Refer to the IB Series User's Manual.
	02H	Sensor amplifier error 2 of each ID number	EEPROM error (ErE)	
	03H	Sensor amplifier error 3 of each ID number	Head error (transmitter/ receiver) (ErH/tr)	
	04H	Sensor amplifier error 4 of each ID number	T/R reverse connection error (alternate flashing of ErH/tr and ErH/rt)	
	05H	Sensor amplifier error 5 of each ID number	Transmitter internal error (ErH/t. int)	
	06H	Sensor amplifier error 6 of each ID number	Receiver error (ErH/r)	
	07H	Sensor amplifier error 7 of each ID number	Transmitter error (ErH/t)	
	08H	Sensor amplifier error 8 of each ID number	Transmitter laser error (ErH/ LASEr)	

Error ID Number	Code	Description	Cause	Actions
01H to 04H (Each ID number)	09H	Sensor amplifier error 9 of each ID number	Model mismatch error (ErH/RAnGE)	Refer to the IB Series User's Manual.
	0AH	Sensor amplifier error 10 of each ID number	Ref. light quantity registration error (ErG/dArk, ErG/inF)	
	0BH	Sensor amplifier error 11 of each ID number	Adjust error (Er.AdJ/dArk, Er.AdJ/ovEr, Er.AdJ/inF)	
	0CH	Sensor amplifier error 12 of each ID number	Communication error between sensor amplifiers (Er.coM)	

● SK-1000 Series

Error ID Number	Code	Description	Cause	Actions
01H to 08H (Each ID number)	01H	Sensor amplifier error 1 of each ID number	Overcurrent error	Refer to the SK-1000 Series Instruction Manual.
	02H	Sensor amplifier error 1 of each ID number	EEPROM error	
	03H	Sensor amplifier error 3 of each ID number	Sensor head error	
	04H to 07H	Sensor amplifier error 4 to 7 of each ID number	(Unassigned)	
	08H	Sensor amplifier error 8 of each ID number	Head temperature/humidity error	
	09H	Sensor amplifier error 9 of each ID number	(Unassigned)	
	0AH to 0BH	Sensor amplifier error 10 to 11 of each ID number	(Unassigned)	
	0CH	Sensor amplifier error 12 of each ID number	Amplifier communication error	
	0DH	Sensor amplifier error 13 of each ID number	(Unassigned)	
	0EH	Sensor amplifier error 14 of each ID number	(Unassigned)	
	0FH to 10H	Sensor amplifier error 15 to 16 of each ID number	(Unassigned)	

*5 List of warning codes
The warning codes that can occur on this unit and on the sensor amplifiers are shown below.

● **IB Series**

Warning ID number (HEX)	Code	Description	Cause	Actions
01H to 04H (Each ID number)	01H	Sensor amplifier warning 1 for each ID number	Check output state	Refer to the IB Series User's Manual.

List of commands supported by the GT2 Series

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* During writing, data numbers 001 to 005 are executed as "+000000001".

Data number	Name	Description	Attribute
001	Perform preset request	Executes preset.	W
002	Perform preset reset request	Executes preset reset.	W
003	Reset request	Executes reset.	W
004	Error clear request	Executes error clear.	W
005	Initial reset request	Resets the value to the initial value.	W
032	Reserved for system		
033	Sensor amplifier error state	Indicates the error status of the sensor amplifier. bit0: Overcurrent error (ErC) bit1: Head error (ErH) bit2: EEPROM error (ErE) bit3: Jam check error (Er.chK) bit4: Self-timing delay (Er.dLY) bit5: Number-of-units error (Er.Unit) bit6: Calculation error(Er.CAL) bit7: Calculation-only mode error (Er.noH)	R
034 to 035	Reserved for system		
036	Control output	Indicates the control output status. Parameter range: 00H to 1FH (initial value: 00H) bit0: HIGH output bit1: LOW output bit2: GO output bit3: HH output*1 bit4: LL output*1	R
037	Comparator value (P.V. Value)*2, *3, *4	Indicates the comparator value (P.V. value). Parameter range: -199.9999 to 199.9999	R
038	Raw value (R.V. Value)*2, *4, *5	Indicates the raw value (R.V. value). Parameter range: -199.9999 to 199.9999	R
039	Peak value during sampling *2, *3, *4, *6	Indicates the peak-hold value in peak-to-peak mode. Parameter range: -199.9999 to 199.9999	R
040	Bottom value during sampling *2, *3, *4, *6	Indicates the bottom-hold value in peak-to-peak mode. Parameter range: -199.9999 to 199.9999	R
041	Calculation display value*2, *4, *7	Indicates the calculation display value. Parameter range: -199.9999 to 199.9999	R
042 to 064	Reserved for system		
065	Bank 0 HIGH setting	Indicates the bank 0 HIGH setting. Parameter range: -199.9999 to 199.9999 (initial value: 5.0000)	R/W
066	Bank 0 LOW setting	Indicates the bank 0 LOW setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
067	Bank 0 preset value	Indicates the bank 0 preset value. Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R/W

Data number	Name	Description	Attribute
068	Bank 0 HH setting*1	Indicates the bank 0 HH setting. Parameter range: -199.9999 to 199.9999 (initial value: 7.0000)	R/W
069	Bank 0 LL setting*1	Indicates the bank 0 LL setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
070	Bank 1 HIGH setting	Indicates the bank 1 HIGH setting. Parameter range: -199.9999 to 199.9999 (initial value: 5.0000)	R/W
071	Bank 1 LOW setting	Indicates the bank 1 LOW setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
072	Bank 1 preset value	Indicates the bank 1 preset value. Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R/W
073	Bank 1 HH setting*1	Indicates the bank 1 HH setting. Parameter range: -199.9999 to 199.9999 (initial value: 7.0000)	R/W
074	Bank 1 LL setting*1	Indicates the bank 1 LL setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
075	Bank 2 HIGH setting	Indicates the bank 2 HIGH setting. Parameter range: -199.9999 to 199.9999 (initial value: 5.0000)	R/W
076	Bank 2 LOW setting	Indicates the bank 2 LOW setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
077	Bank 2 preset value	Indicates the bank 2 preset value. Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R/W
078	Bank 2 HH setting*1	Indicates the bank 2 HH setting. Parameter range: -199.9999 to 199.9999 (initial value: 7.0000)	R/W
079	Bank 2 LL setting*1	Indicates the bank 2 LL setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
080	Bank 3 HIGH setting	Indicates the bank 3 HIGH setting. Parameter range: -199.9999 to 199.9999 (initial value: 5.0000)	R/W
081	Bank 3 LOW setting	Indicates the bank 3 LOW setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
082	Bank 3 preset value	Indicates the bank 3 preset value. Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R/W
083	Bank 3 HH setting*1	Indicates the bank 3 HH setting. Parameter range: -199.9999 to 199.9999 (initial value: 7.0000)	R/W
084	Bank 3 LL setting*1	Indicates the bank 3 LL setting. Parameter range: -199.9999 to 199.9999 (initial value: 1.0000)	R/W
085 to 096	Reserved for system		

Data number	Name	Description	Attribute
097	Key lock*8	Sets key lock. Parameter range: 0 to 2 (initial value: 0) 0: Unlock 1: Full key lock 2: Key lock	R/W
098	Bank switching State*9	Indicates the bank switching. Parameter range: 0 to 3 (initial value: 0)	R/W
099	Timing status*10	Indicates the timing status. Parameter range: 0 to 1 (initial value: 0) For R (read) 0: The timing input is OFF or measurement is in progress in self-timing mode. 1: The timing input is ON or measurement is not in progress in self-timing mode. For W (write) 0: Change was made during measurement. 1: Change was made during non-measurement.	R/W
100 to 102	Reserved for system		
103	Bar display mode*11	Indicates bar display mode. Parameter range: 0 to 1 (initial value: 0) 0: Bar display mode *11 1: OK/NG display mode	R/W
104 to 128	Reserved for system		
129	Calculation mode and Setting*12, *19	Indicates calculation mode/calculation setting. Parameter range: 0 to 27 (initial value: 0) Tenth place (calculation mode) 0: Does not use the calculation function. 1: Uses the calculation function. 2: Calculation-only mode Unit digit (calculation setting) 0: Maximum value 1: Minimum value 2: Flatness 3: Average 4: Reference difference 5: Twist 6: Warpage 7: Thickness (If the calculation function is not used, the values written into the calculation setting are invalid.)	R/W
130	Detection mode	Indicates detection mode. Parameter range: 0 to 4 (initial value: 0) 0: Standard 1: NG hold 2: Peak hold 3: Bottom hold 4: Peak-to-peak	R/W
131	Hold update method	Indicates the hold update method. Parameter range: 0 to 1 (initial value: 0) 0: Timing 1: Regular update	R/W

Data number	Name	Description	Attribute
132	Response time*13	Indicates the response time. Parameter range: 0 to 5 (initial value: 3) 0: hSP (3.0) 1: 5 ms 2: 10 ms 3: 100 ms 4: 500 ms 5: 1000 ms	R/W
133	Timing type*14	Indicates the timing type. Parameter range: 0 to 2 (initial value: 0) 0: External timing input 1: Rising edge self-timing 2: Falling edge self-timing	R/W
134	Self-timing level	Indicates the self timing level. Parameter range: 199.9999 -199.9999 to 199.9999 (initial value: 0.5000)	R/W
135	Self-timing delay type	Indicates the self-timing delay type. Parameter range: 0 to 1 (initial value: 0) 0: Static hold 1: Delay timer	R/W
136	User-specified delay time	Indicates the user-specified delay time. Parameter range: 0 to 9999 (initial value: 1000)	R/W
137	Static hold determination	Indicates the static hold delay stable determination. Parameter range: 0 to 1 (initial value: 0) 0: Default 1: User	R/W
138	Static hold stable range	Indicates the static hold delay stable range. Parameter range: 0.0000 to 199.9999 (initial value: 0.0100)	R/W
139	Measurement direction	Indicates the measurement increase/decrease direction. Parameter range: 0 to 1 (initial value: 0) 0: Normal 1: Reversed	R/W
140	Multiplier	Indicates the multiplier. Parameter range: 0.1 to 100.0 (Initial value: 1.0)	R/W
141	Output mode	Indicates output mode. Parameter range: 0 to 1 (initial value: 0) 0: N.O. 1: N.C.	R/W
142	Display resolution	Indicates the display resolution. Parameter range: 0 to 3 (initial value: 0) 0: 0.0001 1: 0.001 2: 0.01 3: ___0.1	R/W
143	Hysteresis	Indicates the hysteresis. Parameter range: 0.0000 to 199.9999 (Initial value: 0.0030)	R/W
144	Simultaneous input setting*12	Indicates the simultaneous input setting. Parameter range: 0 to 1 (initial value: 0) 0: Individual input 1: Simultaneous input	R/W

Data number	Name	Description	Attribute
145	Special output setting*1, *15	Indicates the special output setting. Parameter range: 0 to 5 (initial value: 0) 0: Not used 1: 5-output 2: Limit output 3: Limit output user setting 4: All GO 5: All limit output	R/W
146	Limit output HH position*1	Indicates the limit output HH position. Parameter range: -199.9999 to 199.9999 (initial value: 0.5000)	R/W
147	Limit output LL position*1	Indicates the limit output LL position. Parameter range: -199.9999 to 199.9999 (initial value: 0.5000)	R/W
148	Select preset data	Indicates the select preset data. Parameter range: 0 to 1 (initial value: 0) 0: R.V. value 1: P.V. value	R/W
149	Preset memory	Indicates the preset memory. Parameter range: 0 to 1 (initial value: 0) 0: YES 1: NO	R/W
150	Preset point	Indicates the preset point. Parameter range: 0 to 1 (initial value: 0) 0: Common to all banks 1: Save for each bank	R/W
151	Power-saving function (ECO)	Indicates the power-saving function (ECO). Parameter range: 0 to 2 (initial value: 0) 0: OFF 1: HALF 2: ALL	R/W
152	Jam detection function	Indicates the jam detection function. Parameter range: 0 to 2 (initial value: 0) 0: OFF 1: ON 2: USER	R/W
153	Jam detection position	Indicates the jam detection position. Parameter range: -199.9999 to 199.9999 (initial value: 0.5000)	R/W
154	Batch setting*16	Indicates the batch setting. (GT2-100* only) Parameter range: 0 to 1 (initial value: 0) 0: Individual 1: Batch	R/W
155	Analog Range setting*17	Indicates the analog range setting. Parameter range: 0 to 1 (initial value: 0) 0: Default 1: Free range setting	R/W
156	Free range setting (Hi)*17	Indicates the free range setting (Hi). Parameter range: -199.9999 to 199.9999 (initial value: 12.0000)	R/W
157	Free range setting (Lo)*17	Indicates the free range setting (Lo). Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R/W
158 to 160	Reserved for system		

Data number	Name	Description	Attribute
161	R.V. (base of calc.) ID1*4, *18	Indicates the R.V. value of main unit (ID number 1) on which the calculation result was based. Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R
162 to 174	:		
175	R.V. (base of calc.) ID15*4, *18	Indicates the R.V. value of expansion unit (ID number 15) on which the calculation result was based. Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R
176 to 192	Reserved for system		
193	Product code	Indicates the product code. Parameter range: GT2-7*(main unit) : 4006 GT2-7*(expansion unit) : 4007 GT2-71MC* : 4008 GT2-100*(main unit) : 4010 GT2-100*(expansion unit) : 4011	R
194	Revision	Indicates the revision. Parameter range: 0101H to FFFFH	R
195 to 199	Reserved for system		
200	Product name	Indicates the product name. Parameter range: GT2-7*(main unit) : "GT2-71*/75*" GT2-7*(expansion unit) : "GT2-72*/76*" GT2-71MC* : "GT2-71MC*" GT2-100*(main unit) : "GT2-100*" GT2-100*(expansion unit) : "GT2-100*"	R
201 to 214	Reserved for system		
215	Series code	Indicates the series code. Parameter range: GT2-7*(main unit) : 4006 GT2-7*(expansion unit) : 4007 GT2-71MC* : 4008 GT2-100*(main unit) : 4010 GT2-100*(expansion unit) : 4011	R
216	Series version	Indicates the series version. Parameter range: 1	R
217	Device type	Indicates the device type. Parameter range: 0	R
218 to 223	Reserved for system		

1 When GT2-71MC is used, these cannot be read and written.
*2 Use these in combination with the comparator value property (Current Value n Over Range, Current Value n Under Range, Current Value n Invalid).
*3 If the calculation function is used and the calculation setting is other than standard difference display, a read error occurs in the expansion unit.
*4 If this value is Current Value Over Range (FFFF), +009999999 is stored.
If this value is Current Value Under Range (-FFFF), -009999999 is stored.
If this value is Current Value Invalid (----), -009999998 is stored.
If this value is Error, +010000000 is stored.
*5 For calculation-only mode, a read error occurs in the main unit.

*6 If the sensor amplifier detection mode is other than peak-to-peak mode, a read error occurs.
Using this for discriminating the outer diameter of a cylinder makes it possible to read the peak and bottom values during the measurement period.

*7 If the calculation function is not used, a read error occurs. If this value is other than standard difference display, a read error occurs in the expansion unit. If this value is standard difference display, a read error occurs in the main unit.

8 If the key lock function is being used in the main unit when simultaneous input is set, a write error occurs in the expansion unit. If GT2-100 is being used, a write error occurs in other than ID01 (main unit).

*9 If the key lock function is being used, a write error occurs.

*10 If self-timing is selected, a write error occurs. If simultaneous input is set, a write error occurs in the main unit.

11 If the GT2-100 is being used, a write error occurs in other than ID01 (main unit).

*12 Read and write are enabled only for the main unit (ID01)

*13 If calculation is performed, the expansion unit operates for the response time set in the main unit.

*14 The main unit for which peak-to-peak mode, NG hold mode, or calculation-only mode is set operates according to the external timing without reference to the timing type setting.

*15 If an unselectable setting is set, a write error occurs. Unselectable settings are saved in EEPROM but not reflected in operation.

*16 Available only for GT2-100 series. Not available for GT2-70 series.
This parameter can be read/written only when GT2-100* is used as a main unit (ID:01) and cannot be read/written to units other than the main unit (ID:01).
For details on batch setting, refer to the 📖 GT2-100 series User's Manual.

17 If other than the GT2-71 is used, a read error occurs during reading and a write error occurs during writing.

*18 If the calculation function is not used, a read error occurs.
If a standard difference display is set for the main unit, a read error occurs. If a standard difference display is set for the expansion unit, a read error occurs in parameters for units other than the main unit (ID01) and the local unit. If other than the standard difference display is set for the expansion unit, a read error occurs.
If detection mode is peak-to-peak mode, a read error occurs.

*19 If the calculation mode and calculation setting that cannot be set within the current number of connected sensor amplifiers are written, a write error occurs.

Reference If the calculation function is used, the sensor amplifiers can hold only the calculated P.V. values. Reading this value makes it possible to read the R.V. values of each sensor amplifier on which the held calculation results were based. Therefore, the R.V. values of each sensor amplifiers on which the held calculation results were based can be read without being affected by communication response delay.

List of commands supported by the GT Series

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* During writing, data numbers 001 to 005 are executed as "+000000001".

Data number	Name	Description	Attribute
001	Perform preset request	Executes preset.	W
002	Perform preset reset request	Executes preset reset.	W
003	Reset request	Executes reset.	W
004	Error clear request	Clears the jam check error (Er.Chk) and selftiming delay error (Er.dLY).	W
005	Initial reset request	Restores all the settings* to the default settings. • The span adjustment results set in proofreading setting are not initialized.	W
032	Reserved for system		
033	Sensor amplifier error state*1	Indicates the error status of the sensor amplifier. bit0: Overcurrent error (ErC) bit1: Head error (ErH) bit2: EEPROM error (ErE) bit3: Jam check error (Er.chK) bit4: Self-timing delay (Er.dLY) bit5: Number-of-units error (Er.Unit) bit6: Calculation error(Er.CAL)	R
034 to 035	Reserved for system		
036	Control output*2	Indicates the control output status. bit0: HIGH output bit1: LOW output bit2: GO output	R
037	Comparator value (P.V. Value)*3, *4, *5	Indicates the comparator value (P.V. value). Parameter range: -99.9999 to 999.9999	R
038	Raw value (R.V. Value)*3, *4	Indicates the raw value (R.V. value). Parameter range: -99.9999 to 999.9999	R
039	Peak value during sampling *3, *4, *5, *6, *7	Indicates the peak value during sampling. Parameter range: -99.999 to 999.999	R
040	Bottom value during sampling *3, *4, *5, *6, *7	Indicates the bottom value during sampling. Parameter range: -99.999 to 999.999	R
041	Calculation display value*3, *4, *8	Indicates the calculation display value. Parameter range: -99.999 to 999.999	R
042 to 064	Reserved for system		
065	Bank 0 HIGH setting	Indicates the bank 0 HIGH setting. Parameter range: -99.999 to 999.999 (initial value: 5,000)	R/W
066	Bank 0 LOW setting	Indicates the bank 0 LOW setting. Parameter range: -99.999 to 999.999 (initial value: 2,000)	R/W
067	Bank 0 preset value	Indicates the bank 0 preset value. Parameter range: -99.999 to 999.999 (initial value: 0.000)	R/W
068	Bank 1 HIGH setting	Indicates the bank 1 HIGH setting. Parameter range: -99.999 to 999.999 (initial value: 5,000)	R/W

Data number	Name	Description	Attribute
069	Bank 1 LOW setting	Indicates the bank 1 LOW setting. Parameter range: -99.999 to 999.999 (initial value: 2,000)	R/W
070	Bank 1 preset value	Indicates the bank 1 preset value. Parameter range: -99.999 to 999.999 (initial value: 0.000)	R/W
071	Bank 2 HIGH setting	Indicates the bank 2 HIGH setting. Parameter range: -99.999 to 999.999 (initial value: 5,000)	R/W
072	Bank 2 LOW setting	Indicates the bank 2 LOW setting. Parameter range: -99.999 to 999.999 (initial value: 2,000)	R/W
073	Bank 2 preset value	Indicates the bank 2 preset value. Parameter range: -99.999 to 999.999 (initial value: 0.000)	R/W
074	Bank 3 HIGH setting	Indicates the bank 3 HIGH setting. Parameter range: -99.999 to 999.999 (initial value: 5,000)	R/W
075	Bank 3 LOW setting	Indicates the bank 3 LOW setting. Parameter range: -99.999 to 999.999 (initial value: 2,000)	R/W
076	Bank 3 preset value	Indicates the bank 3 preset value. Parameter range: -99.999 to 999.999 (initial value: 0.000)	R/W
077 to 096	Reserved for system		
097	Key lock	Sets key lock. Parameter range: 0 to 1 (initial value: 0) 0: Unlock 1: Key lock	R/W
098	Bank switching state*9	Reads the currently operating bank. Parameter range: 0 to 3 (currently operating bank)	R
		Rewrites the operating bank. Parameter range: 0 to 3 (initial value: 0) 0: Rewrites the operating bank with bank 0. 1: Rewrites the operating bank with bank 1. 2: Rewrites the operating bank with bank 2. 3: Rewrites the operating bank with bank 3.	W
099	Timing status*10	Reads the timing status. Parameter range: 0 to 1 0: The timing input is OFF or measurement is in progress in self-timing mode. 1: The timing input is ON or measurement is not in progress in self-timing mode.	R
		Writes the timing status. Parameter range: 0 to 1 0: Change was made during measurement. 1: Change was made during non-measurement.	W
100 to 102	Reserved for system		
103	Bar display mode	Indicates bar display mode. Parameter range: 0 to 1 (initial value: 0) 0: Bar display mode 1: OK/NG display mode	R/W
104 to 128	Reserved for system		

Data number	Name	Description	Attribute
129	Calculation mode and Setting[*11, *12]	Indicates calculation mode. Parameter range: 0 to 8 (initial value: 0) 0: OFF 1: Maximum value 2: Minimum value 3: Flatness 4: Mean 5: Standard difference 6: Torsion 7: Warp 8: Thickness	R/W
130	Detection mode	Indicates detection mode. Parameter range: 0 to 4 (initial value: 0) 0: Standard 1: NG hold 2: Peak hold 3: Bottom hold 4: Peak-to-peak	R/W
131	Reserved for system		
132	Response time[*13]	Indicates the response time. Parameter range: 0 to 6 (initial value: 3) 0: HSP (1.5) 1: 5 ms 2: 10 ms 3: 100 ms 4: 500 ms 5: 1000 ms 6: 5000 ms	R/W
133	Timing type[*14]	Indicates the timing type. Parameter range: 0 to 2 (initial value: 0) 0: External timing input 1: Rising edge self-timing 2: Falling edge self-timing	R/W
134	Self-timing level	Indicates the self timing level. Parameter range: 199.9999 -99.999 to 999.999 (initial value: 0.500)	R/W
135	Self-timing delay type	Indicates the self-timing delay type. Parameter range: 0 to 1 (initial value: 0) 0: Static hold 1: Delay timer	R/W
136	User-specified delay time	Indicates the user-specified delay time. Parameter range: 0 to 9999 (initial value: 1000)	R/W
137	Delay stable determination	Sets the static hold delay stable determination. Parameter range: 0 to 1 (initial value: 0) 0: Default 1: User	R/W
138	Delay stable range	Sets the static hold delay stable range. Parameter range: 0.000 to 999.999 (initial value: 0.010)	R/W
139	Measurement direction	Sets the measurement increase/decrease direction. Parameter range: 0 to 1 (initial value: 0) 0: Normal 1: Reversed	R/W

Data number	Name	Description	Attribute
140	Multiplier	Indicates the multiplier. Parameter range: 0.1 to 100.0 (Initial value: 1.0)	R/W
141	Output mode	Indicates output mode. Parameter range: 0 to 1 (initial value: 0) 0: N.O. 1: N.C.	R/W
142	Display resolution	Sets the display resolution. Parameter range: 0 to 3 (initial value: 0) 0:0.001 1:0.01 2:0.1 3:1	R/W
143	Hysteresis	Sets the hysteresis. Parameter range: 0.000 to 999.999 (initial value: 0.003)	R/W
144	Input (purple wire) func. 1	Sets input (purple wire) func. 1. Parameter range: 0 to 1 (initial value: 0) 0: Bank A 1: Reset	R/W
145	Input (pink/purple wire) func. 2	Sets input (pink/purple wire) func. 2. Parameter range: 0 to 1 (initial value: 0) 0: Timing input 1: Bank B	R/W
146 to 148	Reserved for system		
149	Store preset value	Set up store preset value. Parameter range: 0 to 1 (initial value: 0) 0:YES 1:NO	R/W
150	Reserved for system		
151	Power save (eco) function	Set up power save (eco) function. Parameter range: 0 to 2 (initial value: 0) 0:OFF 1:HALF 2:ALL	R/W
152	Core alarm	Set up core alarm. Parameter range: 0 to 2 (initial value: 0) 0:OFF 1:ON 2:USER	R/W
153	Check point setting	Set up check point setting. Parameter range: -99.999 to 999.999 (initial value: 0.500)	R/W
154	Display filter function	Set up display filter function. Parameter range: 0 to 1 (initial value: 0) 0:ON 1:OFF	R/W
155 to 160	Reserved for system		
161	R.V. (base of calc.) ID1*4, *15	Indicates the R.V. value of main unit (ID number 1) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R

Data number	Name	Description	Attribute
162	R.V. (base of calc.) ID2*4, *15	Indicates the R.V. value of expansion unit (ID number 2) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
163	R.V. (base of calc.) ID3*4, *15	Indicates the R.V. value of expansion unit (ID number 3) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
164	R.V. (base of calc.) ID4*4, *15	Indicates the R.V. value of expansion unit (ID number 4) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
165	R.V. (base of calc.) ID5*4, *15	Indicates the R.V. value of expansion unit (ID number 5) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
166	R.V. (base of calc.) ID6*4, *15	Indicates the R.V. value of expansion unit (ID number 6) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
167	R.V. (base of calc.) ID7*4, *15	Indicates the R.V. value of expansion unit (ID number 7) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
168	R.V. (base of calc.) ID8*4, *15	Indicates the R.V. value of expansion unit (ID number 8) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
169	R.V. (base of calc.) ID9*4, *15	Indicates the R.V. value of expansion unit (ID number 9) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
170	R.V. (base of calc.) ID10*4, *15	Indicates the R.V. value of expansion unit (ID number 10) on which the calculation result was based. Parameter range: -999.999 to 1000.000	R
171 to 192	Reserved for system		
193	Product code	Indicates the product code. Parameter range: Main unit : 4000 Expansion unit : 4001	R
194	Revision	Indicates the revision. Parameter range: 0101H to FFFFH	R
195 to 199	Reserved for system		
200	Product name	Indicates the product name. Parameter range: Main unit : "GT-71A*/75A* " Expansion unit : "GT-72A*/76A* "	R
201 to 214	Reserved for system		
215	Series code	Indicates the series code. Parameter range: Main unit : 4000 Expansion unit : 4001	R
216	Series version	Indicates the series version. Parameter range: 1	R

Data number	Name	Description	Attribute
217	Device type	Indicates the device type. Parameter range: 0	R
218 to 223	Reserved for system		

*1 You can check the error contents of the sensor amplifier according to the ON/OFF status of each bit.
OFF(0): No error occurred. ON(1): An error occurred.
Two or more errors may simultaneously occur. For details on each error, refer to "GT-70A Series User's Manual".

*2 You can check the detailed output status according to the ON/OFF status of each bit.

*3 Use this attribute in combination with the comparator value property or comparator value information (invalid/over/under).

*4 If this value is Current Value Over Range (FFFF), +000999999 is stored.
If this value is Current Value Under Range (-FFFF), -000999999 is stored.
If this value is Current Value Invalid (----), -000999998 is stored.
If this value is Error, +001000000 is stored.

*5 If this value is other than standard difference display, a read error occurs in the expansion unit. For calculation-only mode, a read error occurs in the main unit.

*6 If the sensor amplifier detection mode is other than peak-to-peak mode, a read error occurs.

*7 Using this for discriminating the outer diameter of a cylinder makes it possible to read the peak and bottom values during the measurement period.

*8 If the calculation function is not used, a read error occurs.

*9 If the key lock function is being used, a write error occurs.

*10 The timing status can be written only when the sensor amplifier setting satisfies the following two conditions:
- The external timing function is selected as the timing type.
- Bank switching B (bank B) is selected as Input (pink/purple wire) func. 2.

*11 Read and write are enabled only for the main unit (ID01)

*12 If the settings cannot be used with the current number of sensor amplifiers, a write error occurs.

*13 If calculation is performed, the expansion unit operates for the response time set in the main unit.

*14 The main unit for which peak-to-peak mode, NG hold mode, or calculation-only mode is set operates according to the external timing without reference to the timing type setting.

*15 This attribute can be used only when the calculation function is used.
If the calculation setting is other than standard difference display, this attribute is valid only for the main unit (ID01). Message communication reads the R.V. value of each of the expansion units (ID02 to ID10) used for calculation from the main unit.
If the calculation setting is standard difference display, this attribute is valid only for expansion units. Message communication reads the R.V. value of each expansion unit and the R.V. value of the main unit.

Reference

If the calculation function is used, the sensor amplifiers can hold only the calculated P.V. values. Check the R.V. value of each sensor amplifier on which the calculation results were based using R.V. (base of calc.).

List of commands supported by the IL Series

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* During writing, data numbers 001 to 028 are executed as "+000000001".

Data number	Name	Description	Attribute
001	Zero shift execution request	Executes zero shift. Turning off the power to the sensor amplifier after executing zero shift restores the state that existed before the zero shift function was used. To retain the shifted state after turning off the power, turn on the zero shift value memory function.	W
002	Zero shift reset execution request	Resets the zero shift value.	W
003	Reset request	Executes resetting.	W
005	Initial reset request	Initializes all settings, except for sensor amplifier calibration and system parameters. Once an initial reset request is executed, all parameters are stored into the nonvolatile memory (EEPROM) in approximately three seconds. When completed, the setting/status command parameter "EEPROM write result" flips to "successfully completed (1)". After the completion, "EEPROM write result" of data number 053 changes to Normal termination (1).	W
006	System parameter set request	Changes the system parameters (the polarity of the judgment and alarm outputs and the analog output setting) to the values written in "System parameter settings" of data number 105. To set the system parameters, confirm that the change is proper according to the connected devices and wiring. A wrong change may damage the sensor amplifier or the connected equipment.	W
014	Tolerance tuning request	Executes tolerance tuning. Use "Tolerance tuning - tolerance setting range" of data number 106 to set the tolerance setting range.	W
015	Two-point tuning HIGH side 1st point confirmation operation request	Executes two-point tuning. For the operating procedure, refer to the “IL Series User's Manual”.	W
016	Two-point tuning HIGH side 2nd point confirmation operation request (Determine HIGH setting value.)		
017	Two-point tuning LOW side 1st point confirmation operation request		
018	Two-point tuning LOW side 2nd point confirmation operation request (Determine LOW setting value.)		

Data number	Name	Description	Attribute
019	Calibration SET1 Confirmation operation request	Executes calibration. Set the R.V. value to be displayed using "Calibration function SET1" and "Calibration function SET2" of data number 108 and 109. For the operating procedure, refer to the “IL Series User's Manual”.	W
020	Calibration SET2 Confirmation operation request (Perform calibration.)		
021	Calculated value two-point calibration SET1 Confirmation operation request	Executes calculated value two-point calibration (main unit only). Set the R.V. value to be displayed using "Calculated value two-point calibration function SET1" and "Calculated value two-point calibration function SET2" of data number 111 and 112. For the operating procedure, refer to the “IL Series User's Manual”.	W
022	Calculated value two-point calibration SET2 Confirmation operation request (Perform calculated value two-point calibration.)		
023	Calculated value three-point calibration SET1 Confirmation operation request	Executes calculated value three-point calibration (main unit only). Set the R.V. value to be displayed using "Calculated value three-point calibration function SET1" and "Calculated value three-point calibration function SET3" of data number 113 and 114. For the operating procedure, refer to the “IL Series User's Manual”.	W
024	Calculated value three-point calibration SET2 Confirmation operation request		
025	Calculated three-point calibration SET3 Confirmation operation request (Perform calculated three-point calibration.)		
026	One-point tuning request for diff. count filter	Executes one-point tuning for diff. count filter. For the operating procedure, refer to the “IL Series User's Manual”.	W
027	Two-point tuning 1st point confirmation operation request for diff. count filter	Executes two-point tuning for diff. count filter. For the operating procedure, refer to the “IL Series User's Manual”.	
028	Two-point tuning 2nd point confirmation operation request for diff. count filter (Determine HIGH and LOW setting value.)		

Data number	Name	Description	Attribute
032	Reserved for system		
033	Sensor amplifier error*1	Indicates the error status of the sensor amplifier. When an error occurs, the corresponding bit turns on. bit0: Overcurrent error bit1: EEPROM error bit2: Head error bit7: Spot light laser error bit8: Incompatible model error bit11: Amplifier communication error bit12: Number-of-units error bit13: Calculation error Other than above: Fixed to 0	R
034 to 035	Reserved for system		
036	Judgment output/ Alarm output	Indicates the output status of the sensor. When an output is on, the corresponding bit turns on. Bit0:HIGH judgment output Bit1:LOW judgment output Bit2:GO judgment output Bit3:Alarm output	R
037	Judgment value (P.V. Value)*2,	Indicates the judgment value (P.V. value). Parameter range: -99.999 to +99.999	R
038	Internal measurement value (R.V. value)*2	Indicates the internal measurement value (R.V. value). Parameter range:-99.999 to +99.999	R
039	Peak hold value during hold period*2	• In the mode other than the sample hold mode Indicates the peak-hold value during the sampling period. Parameter range: -99.999 to +99.999 • In the sample hold mode Parameter range: -99.998	R
040	Bottom hold value during hold period*2	• In the mode other than the sample hold mode Indicates the bottom-hold value during the sampling period. Parameter range: -99.999 to +99.999 • In the sample hold mode Parameter range: -99.998	R
041	Calculation value (CALC value)*2	Indicates calculation value (CALC value). Parameter range: -99.999 to +99.999	R
042	Analog output value	Indicates the current analog output value. (main unit only) Parameter range: Voltage: -5.000 to +5.000 (+5.500 for error) 4 to 20 mA: +4.00 to +20.00 (+3.00 for error) OFF: Fixed to 0	R
043	Bank status	Indicates the currently active bank No. Use this value to check the number of the bank where the sensor amplifier is actually operating. Parameter range: 0 to 3 0: Bank 0 1: Bank 1 2: Bank 2 3: Bank 3	R
044	Timing status	Indicates the currently active timing status. Use this value to check the timing status where the sensor amplifier is actually operating. Parameter range: 0 to 1 0: During Sampling 1: Not during sampling	R
045 to 049	Reserved for system		

Data number	Name	Description	Attribute
050	Laser emission stop status	Indicates the currently active laser emission stop status. Use this value to check the laser emission stop status where the sensor amplifier is actually operating. Parameter range: 0 to 1 0:Laser emitting 1:Laser stopped (Emission stop input ON/Laser error/ Sensor head error)	R
051	Abnormal setting*3	Indicates an abnormal setting status. Parameter range: 0 to 1 0:Normal setting 1:Abnormal setting	R
052	External input status	Indicates the external input status. When the external input line of the sensor amplifier is ON, the corresponding bit is set to ON. This operation is enabled even when "Not used" is selected for the function setting of external inputs 1 through 4. Bit0:External input 1 Bit1:External input 2 Bit2:External input 3 Bit3:External input 4	R
053	EEPROM write result*4	Indicates the result of writing to EEPROM. Parameter range: 0 to 2 0:Writing 1:Normal termination 2:Abnormal termination	R
054	Zero shift/Zero shift reset result*5	Indicates the result of zero shift or zero shift reset. Parameter range: 0 to 2 0:Executing 1:Normal termination 2:Abnormal termination	R
055	Reset request result	Indicates the result of reset. Parameter range: 0 to 2 0:Executing 1:Normal termination 2:Abnormal termination	R
056	Current system parameters*6	Indicates the current status of the system parameters. Use this value to check the system parameters where the sensor amplifier is actually operating. The corresponding bit turns on according to the current status. bit 0: 0:NPN 1:PNP bits 1, 2 and 3 (For main unit only. Fixed to 000 for expansion unit) 000: Analog output OFF 001: 0 to 5 V 010: -5 to +5 V 011: 1 to 5 V 100: 4 to 20 mA	R
057 to 059	Reserved for system		
060	Tuning result*7	Indicates the result of tuning. Parameter range: 0 to 2 0:Executing 1:Normal termination 2:Abnormal termination	R
061	Calibration result	Indicates the result of calibration. Parameter range: 0 to 2 0:Executing 1:Normal termination 2:Abnormal termination	R
062 to 064	Reserved for system		

Data number	Name	Description	Attribute
065	HIGH setting value (BANK 0)*2	Set up setting value of HIGH side (BANK 0). Parameter range: -99.999 to +99.999 (initial value: +5.000)	R/W
066	LOW setting value (BANK 0)*2	Set up setting value of LOW side (BANK 0). Parameter range: -99.999 to +99.999 (initial value: -5.000)	R/W
067	Shift target value (BANK 0)*2	Set up target value of shift (BANK 0). Parameter range: -99.999 to +99.999 (initial value: 0)	R/W
068	Analog output - upper limit value (BANK 0)*2, *9	Set up upper limit of analog output (BANK 0). (Main unit only) Parameter range: (Main unit only) -99.999 to +99.999 (initial value: +10.000)	R/W
069	Analog output - lower limit value (BANK 0)*2, *9	Set up lower limit of analog output (BANK 0). (Main unit only) Parameter range: -99.999 to +99.999 (initial value: 1.0000)	R/W
070	HIGH setting value*2	Set up setting value of HIGH side (BANK 1). Parameter range: -99.999 to +99.999 (initial value: +5.000)	R/W
071	LOW setting value (BANK 1)*2	Set up setting value of LOW side (BANK 1). Parameter range: -99.999 to +99.999 (initial value: -5.000)	R/W
072	Shift target value (BANK 1)*2	Set up target value of shift (BANK 1). Parameter range: -99.999 to +99.999 (initial value: 0)	R/W
073	Analog output - upper limit value (BANK 1) *2, *9	Set up upper limit of analog output (BANK 1). (Main unit only) Parameter range: -99.999 to +99.999 (initial value: +10.000)	R/W
074	Analog output - lower limit value (BANK 1) *2, *9	Set up lower limit of analog output (BANK 1). (Main unit only) Parameter range: -99.999 to +99.999 (initial value: -10.000)	R/W
075	HIGH setting value (BANK 2)*2	Set up setting value of HIGH side (BANK 2). Parameter range: -99.999 to +99.999 (initial value: +5.000)	R/W
076	LOW setting value (BANK 2)*2	Set up setting value of LOW side (BANK 2). Parameter range: -99.999 to +99.999 (initial value: -5.000)	R/W
077	Shift target value (BANK 2)*2	Set up target value of shift (BANK 2). Parameter range: -99.999 to +99.999 (initial value: 0)	R/W
078	Analog output - upper limit value (BANK 2)*2, *9	Set up upper limit of analog output (BANK 2). (Main unit only) Parameter range: -99.999 to +99.999 (initial value: +10.000)	R/W
079	Analog output - lower limit value (BANK 2)*2, *9	Set up lower limit of analog output (BANK 2) (Main unit only) Parameter range: -99.999 to +99.999 (initial value: -10.000)	R/W
080	HIGH setting value (BANK 3)*2	Set up setting value of HIGH side (BANK 3). Parameter range: -99.999 to +99.999 (initial value: +5.000)	R/W
081	LOW setting value (BANK 3)*2	Set up setting value of LOW side (BANK 3). Parameter range: -99.999 to +99.999 (initial value: -5.000)	R/W
082	Shift target value (BANK 3)*2	Set up target value of shift (BANK 3). Parameter range: -99.999 to +99.999 (initial value: 0)	R/W
083	Analog output - upper limit value (BANK 3) *2, *9	Set up upper limit of analog output (BANK 3). (Main unit only) Parameter range: -99.999 to +99.999 (initial value: +10.000)	R/W

Data number	Name	Description	Attribute
084	Analog output - lower limit value (BANK 3) *2, *9	Set up lower limit of analog output (BANK 3). (Main unit only) Parameter range: -99.999 to +99.999 (initial value: -10.000)	R/W
085 to 096	Reserved for system		
097	Key lock function	Sets key lock. Parameter range: 0 to 1 (initial value: 0) 0: Unlock 1: Key lock	R/W
098	Bank function	For read: Reads the current value. Use the "Bank status" of data number 043 to check the bank No. for which the sensor amplifier is operating. Parameter range: 0 to 3 (initial value: 0) For write: To use this value to change the bank No., set the "Bank switching method" of data number 150 to "Button". The change is disabled when "External input" is set. Parameter range: 0 to 3 0: Switches to bank 0. 1: Switches to bank 1. 2: Switches to bank 2. 3: Switches to bank 3.	R/W
099	Timing input*8	Set up status of timing input. Use the "Timing status" of data number 044 to check the timing input status under which the sensor amplifier is operating. The sensor amplifier operates according to the OR of this input and the external input cable. Parameter range: 0 to 1 (initial value: 0) 0:Timing input OFF 1:Timing input ON	R/W
100	Laser emission on stop input*8	Set up status of laser emission stop input. Use the "Laser emission stop status" of data number 050 to check the laser emission stop status under which the sensor amplifier is operating. The sensor amplifier operates according to the OR of this input and the external input cable. Parameter range: 0 to 1 (initial value: 0) 0:Emission stop input OFF 1:Emission stop input ON	R/W
101 to 103	Reserved for system		
104	Sub display's screen	Set up sub display's screen. Parameter range: 0 to 5 (initial value: 0) 0: R.V. value screen 1: Analog value screen 2: HI setting value screen 3: LO setting value screen 4: Zero shift value screen 5: CALC value screen	R/W

Data number	Name	Description	Attribute
105	System parameter settings *6	Set up system parameter. To reflect the setting, you need to execute the "System parameter set request" of data number 006 after writing the setting. Use the "Current system parameters" of data number 056 to check the system parameter with which the sensor amplifier is operating. bit 0: 0: NPN 1: PNP bits 1, 2 and 3 (For main unit only. Fixed to 000 for expansion unit) 000: Analog output OFF 001: 0 to 5V 010: -5 to 5V 011: 1 to 5V 100: 4 to 20mA	R/W
106	Tolerance tuning - tolerance setting range	Set up setting range for tolerance tuning. Parameter range: 0.000 to 99.999	R/W
107	Calibration function	Set up calibration function. Parameter range: 0 to 1 (initial value: 0) 0:Initial state 1:User setting	R/W
108	Calibration function SET1 *2	Set up target value of 1st point for calibration. Parameter range: -99.999 to 99.999 (initial value: 0.000)	R/W
109	Calibration function SET2 *2	Set up target value of 2nd point for calibration. Parameter range: -99.999 to 99.999 (initial value: +5.000)	R/W
110	Calculated value calibration function *9	Set up calculated value calibration function. (Main unit only) Parameter range: 0 to 2 (initial value: 0) 0:Initial state 1:Calculated 2-p calibration 2:Calculated 3-p calibration	R/W
111	Calculated value two-point calibration function SET1 *2, *9	Set up target value of 1st point for calculated value two-point calibration. (Main unit only) Parameter range: -99.999 to 99.999 (initial value: +5.000)	R/W
112	Calculated value two-point calibration function SET2 *2, *9	Calculated value two-point calibration function SET2 (Main unit only) Parameter range: -99.999 to 99.999 (initial value: +10.000)	R/W
113	Calculated value three-point calibration function SET1 *2, *9	Set up target value of 1st point for calculated value three-point calibration. (Main unit only) Parameter range: -99.999 to 99.999 (initial value: +5.000)	R/W
114	Calculated value three-point calibration function SET3 *2, *9	Set up target value of 3rd point for calculated value three-point calibration. (Main unit only) Parameter range: -99.999 to 99.999 (initial value: +10.000)	R/W
115 to 128	Reserved for system		
129	Calculation function *9	Set up calculation function. Parameter range: 0 to 2 (initial value: 0) 0: OFF 1: Addition mode 2: Subtraction mode	R/W
130	Reserved for system		

Data number	Name	Description	Attribute
131	Measurement direction	Set up measurement direction. Parameter range: 0 to 1 (initial value: 0) 0:n or 1: rEv	R/W
132	Sampling cycle	Set up sampling cycle. Parameter range: 0 to 4 (initial value: 0) 0:dEFLt 1: 0.33 ms 2: 1 ms 3: 2 ms 4: 5 ms	R/W
133	Averaging/Diff. count filter/High-pass filter	Set up averaging/diff. count filter/high-pass filter. Parameter range: 0 to 14 (initial value: 4) 0: 1 time 1: 2 times 2: 4 times 3: 8 times 4: 16 times 5: 32 times 6: 64 times 7: 128 times 8: 256 times 9: 512 times 10: 1024 times 11: 2048 times 12: 4096 times 13: Diff. count filter 14: High-pass filter	R/W
134	Output mode	Set up output mode. Parameter range: 0 to 1 (initial value: 0) 0: N.O. 1: N.C.	R/W
135	Reserved for system		
136	Hold function setting	Set up hold function. Parameter range: 0 to 5 (initial value: 0) 0:Sample hold 1:Peak hold 2:Bottom hold 3:Peak-to-peak hold 4:Auto peak hold 5:Auto bottom hold	R/W
137	Auto peak hold or auto bottom hold trigger level*2	Set up Auto-peak hold or Auto bottom hold trigger level. Parameter range: -99.999 to +99.999 (initial value: +1.000)	R/W
138	Timing input setting	Set up timing input. Parameter range: 0 to 1 (initial value: 0) 0:Level 1:Edge	R/W
139	Delay timer	Set up delay timer. Parameter range: 0 to 3 (initial value: 0) 0:OFF 1:On delay 2:Off delay 3:One-shot	R/W
140	Timer duration	Set up timer duration (unit: ms). Parameter range: 5 to 9999 (Initial value: 60)	R/W
141	Hysteresis*2	Set up hysteresis. Parameter range: 0.000 to 99.999	R/W

Data number	Name	Description	Attribute
142	Analog output scaling*9	Set up analog output scaling. (Main unit only) Parameter range: 0 to 1 (initial value: 0) 0:Initial state 1:Free range 2:Bank	R/W
143	Analog output - upper limit value*2, *9	Set up upper limit of analog output. Parameter range: -99.999 to 99.999 (Initial value: +10.000)	R/W
144	Analog output - lower limit value*2, *9	Set up lower limit of analog output. Parameter range: -99.999 to 99.999 (initial value: -10.000)	R/W
145	External input*10	Set up whether to change the function assigned to external input 1/2/3/4 from the initial state. Parameter range: 0 to 1 (initial value: 0) 0:Initial state 1:User setting	R/W
146	External input 1*10	Set up function to be assigned to external input 1. Parameter range: 0 to 4 (initial value: 0) 0:Zero shift input 1:Bank A input 2:Bank B input 3:Laser emission stop input 4:Not used	R/W
147	External input 2*10	Set up function to be assigned to external input 2. Parameter range: 0 to 4 (initial value: 0) 0:Reset input 1:Bank A input 2:Bank B input 3:Laser emission stop input 4:Not used	R/W
148	External input 3*10	Set up function to be assigned to external input 3. Parameter range: 0 to 4 (initial value: 0) 0:Timing input 1:Bank A input 2:Bank B input 3:Laser emission stop input 4:Not used	R/W
149	External input 4*10	Set up function to be assigned to external input 4. Parameter range: 0 to 3 (initial value: 0) 0:Not used 1:Bank A input 2:Bank B input 3:Laser emission stop input	R/W
150	Bank switching method	Set up method for switching the Bank. Parameter range: 0 to 1 (initial value: 0) 0:Button 1:External input	R/W
151	Reserved for system		
152	Zero shift value memory function	Set up whether to save the zero-shift state. Parameter range: 0 to 1 (initial value: 0) 0: OFF 1: ON	R/W
153	Mutual interference prevention function*9	Set up mutual interference prevention function. Parameter range: 0 to 1 (initial value: 0) 0:Interference prevention OFF 1:Interference prevention ON	R/W
154	Display digit	Set up display digit. (initial value: 0) 0:Initial state 2:0.001 3:0.01 4:0.1 5:1	R/W

Data number	Name	Description	Attribute
155	Power saving function	Set up power saving mode. Parameter range: 0 to 2 (initial value: 0) 0:OFF 1:Half 2:All	R/W
156	Head display mode	Set up head display mode. Parameter range: 0 to 2 (initial value: 0) 0:Initial state 1:OK/NG display 2:OFF	R/W
157	Display color	Set up display color of the amplifier. Parameter range: 0 to 2 (initial value: 0) 0:GO Green 1:GO Red 2:Always Red	R/W
158	Timer duration of diff. count filter	Set up timer duration of diff. count filter (unit: ms). Parameter range: 2 to 9999 (initial value: 10)	R/W
159	Cutoff frequency of high-pass filter	Set up cutoff frequency of high-pass filter. Parameter range: 0 to 9 (initial value: 10) 0: 0.1Hz 1: 0.2Hz 2: 0.5Hz 3: 1Hz 4: 2Hz 5: 5Hz 6: 10Hz 7: 20Hz 8: 50Hz 9: 100Hz	R/W
160	Reserved for system		
161	Alarm setting	Set up alarm setting. Parameter range: 0 to 2 (initial value: 0) 0:Initial state 1:Clamp 2:User setting	R
162	Alarm count	Set up alarm count. Parameter range: 2 to 1000 (initial value: 7)	R
166 to 192	Reserved for system		
193	Product code	Indicates the product code. Main unit : 4022 Expansion unit : 4023	R
194	Revision	Indicates the revision. The higher-order bytes in the lower-order word indicate the major revision and the lower-order bytes indicate the minor revision. Parameter range: 0101H	R
195	Connected sensor head	Indicates model of sensor head connected to the amplifier. 0:Not connected 1:IL-030 2:IL-065 3:IL-100 4:IL-300 5:IL-600 106:IL-S025 107:IL-S065 208:IL-S100 311:IL-2000	R
196 to 198	Reserved for system		

Data number	Name	Description	Attribute
200	Product name	Indicates the product name. Main unit : "IL-1000/1500" Expansion unit : "IL-1050/1550"	R
204 to 214	Reserved for system		
215	Series code	Indicates the series code. Main unit : 4022 Expansion unit : 4023	R
216	Series version	Indicates the series version. Parameter range: 1	R
217	Device type	Indicates the device type. Parameter range: 0	R
219 to 223	Reserved for system		

*1 The on/off status of the bits indicates the type of error occurred in the sensor amplifier.
OFF (0): No error, ON (1): Error occurred
More than one error may occur simultaneously. For details of the errors, refer to "IL Series User's Manual".

*2 When using the IL-300/IL-600, -999.99 to +999.99, and when using the IL-2000, -9999.9 to +9999.9.
If this value is Current Value Over Range (FFFF), +000099999 is stored.
If this value is Current Value Under Range (-FFFF), -000099999 is stored.
If this value is Current Value Invalid (----), -000099998 is stored.
If this value is Error, +000100000 is stored.

*3 The abnormal setting (1) indicates that the executed writing was an attempt to set a prohibited combination of functions. For details of such functions, refer to "IL Series User's Manual".

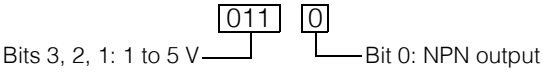
*4 The results of the "Initial reset request" and "System parameter set request" operation commands are also included in this item.

*5 The result of "Zero shift execution request" or "Zero shift reset execution request", whichever requested last, will be read.

*6 By reading "Current system parameters", you can check the system parameters of the sensor amplifier. The system parameters refer to the polarity of the judgment and alarm outputs and the analog output setting. Specify the system parameters to be set when "System parameter set request" is executed in an operation command.
A value to be read or written is specified as on/off status of the bits representing the value converted into binary.

Bit	Setting
0	0: NPN output 1: PNP output
3, 2, 1	000: Analog output OFF 001: 0 to 5 V 010: -5 to +5 V 011: 1 to 5 V 100: 4 to 20 mA (Fixed to 000 for expansion unit)

Reference When the read data is "6":
The decimal number "6" is represented in binary as "0110".



As a result, the sensor amplifier of the read data is set to "NPN output" and "analog output of 1 to 5 V".

*7 The result of the item will be read among "Tolerance tuning request", "Two-point tuning HIGH side 2nd point confirmation operation request", "Two-point tuning LOW side 2nd point confirmation operation request", "One-point tuning request for diff. count filter", and "Two-point tuning 2nd point confirmation operation request for diff. count filter", whichever requested last in the operation command.

*8 Operates as "off" only when input off (0) is written and the external input is wired to be off.

*9 When a value is written to an expansion unit, a writing error occurs.

*10 To reflect the settings written for the function selection of external inputs 1 to 4 (data numbers 146 to 149) to the sensor amplifier, you need to set the external input setting (data number 145) to 1 (User setting) or to operate the sensor amplifier's button to set the external input to "User setting".

MEMO

List of commands supported by the IG Series

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* During writing, data numbers 001 to 020 are executed as "+000000001".

Data number	Name	Description	Attribute
001	Zero shift execution request	Executes zero shift. Turning off the sensor amplifier after executing zero shift restores the state before the zero shift function is used. If the shift state is retained even after the sensor amplifier is turned off, set the saving zero shift value function to ON.	W
002	Zero shift reset execution request	Resets the zero shift value.	W
003	Reset request	Executes reset.	W
005	Initial reset request	Initializes all the settings other than the calibration, standard waveform registration, and system parameters of the sensor amplifier. All parameters are stored in nonvolatile memory (EEPROM) approx. 3 seconds after the initial reset request is executed. After the initial reset request has been executed, "EEPROM write result" of data number 053 becomes normal end (1).	W
006	System parameter set request	Changes the contents of the system parameter (judgement output, edge check output polarity, and analog output) to the contents written in "system parameter" of the setting/status command parameter. Change the contents tailored to the connected devices and wiring. If the contents are changed by mistake, the devices connected to the sensor amplifier may go down.	W
010	Standard waveform registration request	Registers the standard waveform. Turning off the sensor amplifier after registering the standard waveform restores the state before the standard waveform is registered. If the standard waveform registration is retained even after the sensor amplifier is turned off, set the saving standard waveform to ON.	W
014	Tolerance tuning request	Executes tolerance tuning. Use "Tolerance setting range" of data number 106 to set the tolerance setting range.	W
015	Two-point tuning HIGH side 1st point confirmation operation request	Executes two-point tuning. For details on the two-point tuning execution procedure, refer to "IG Series User's Manual".	W
016	Two-point tuning HIGH side 2nd point confirmation operation request (determine HIGH setting value.)		W
017	Two-point tuning LOW side 1st point confirmation operation request		W
018	Two-point tuning LOW side 2nd point confirmation operation request (determine LOW setting value)		W

Data number	Name	Description	Attribute
019	Calibration SET 1 confirmation operation request	Executes calibration. Set the R.V. value to be displayed using "Calibration function SET1" and "Calibration function SET2" of data number 108 and 109. For the operating procedure, refer to the “IG Series User's Manual”.	W
020	Calibration SET 2 confirmation operation request (Perform calibration.)		W
032	Reserved for system		
033	Sensor amplifier error state*1	Indicates the error status of the sensor amplifier. Bit0 : Overcurrent error Bit1 : EEPROM error Bit2 : Head error Bit3 : T/R reverse connection error Bit4 : Receiver EEPROM error Bit5 : Receiver error Bit6 : Transmitter error Bit7 : Transmitter laser error Bit8 : Model mismatch error Bit9 : Head error (standard waveform) Bit10 : Standard waveform error 1-4 Bit11 : Communication error Bit12 : Additional setting error Bit13 : Calculation error	R
034 to 035	Reserved for system		
036	Judgment / Edge check output*2	Indicates the judgement/edge check output. Parameter range: 00H to 0FH Bit0: HIGH judgement output Bit1: LOW judgement output Bit2: GO judgement output Bit3: Edge check output	R
037	P.V. value*3, *4, *5	Indicates the comparator value (P.V. value). Parameter range: -199.9999 to 199.9999 (initial value: 0.0000)	R
038	R.V. value*4, *5	Indicates R.V. value. Parameter range: -99.999 to 100,000	R
039	Peak hold value *4, *5, *6 *25	Indicates the peak hold value. Parameter range: -99.999 to 100,000	R
040	Bottom hold value *4, *5, *6 *25	Indicates the bottom hold value. Parameter range: -99.999 to 100,000	R
041	Calculation value (CALC value) *4, *5, *7	Indicates the calculation value (CALC value). Parameter range: -99.999 to 100,000	R
042	Analog output value*7, *8, *9	Indicates the analog output value. Parameter range: -5.000 to +5,000	R
043 to 044	Reserved for system		
045	Number of edges*10	Indicates the number of edges. Parameter range: 0 to 99	R
046	Optical axis alignment state	Indicates the optical axis alignment state. Parameter range: 0 to 1 0: Optical axis alignment NG 1: Optical axis alignment OK	R
047 to 050	Reserved for system		

Data number	Name	Description	Attribute
051	Abnormal setting*11	Indicates the abnormal setting. Parameter range: 0 to 1 0: Normal setting 1: Abnormal setting	R
052	Reserved for system		
053	EEPROM writing result*12	Indicates the EEPROM writing result. Parameter range: 0 to 2 0: Writing 1: Normal end 2: Writing failure	R
054	Zero shift execution result*13	Indicates the zero shift and zero shift reset execution result. Parameter range: 0 to 2 0: Executing 1: Normal end 2: Execution impossible	R
055	Reset request result	Indicates the reset request results. Parameter range: 0 to 2 0: Executing 1: Normal end 2: Execution impossible	R
056	System parameter current state*14	Indicates the system parameter current state. Parameter range: Main unit : 0 to 9 (initial value: 0) Expansion unit : 0 to 1 (initial value: 0)	R
057	Reserved for system		
058	Waveform registration result	Indicates the waveform registration result. Parameter range: 0 to 7 0: Executing request 1: Normal end 2: Standard waveform error 1 3: Standard waveform error 2 4: Standard waveform error 3 5: Receiver EEPROM error 6: Standard waveform error 4 7: Errors other than the above	R
059	Reserved for system		
060	Tolerance/2point turning result*15	Indicates the tolerance/2point tuning result. Parameter range: 0 to 2 0: Executing request 1: Normal end 2: Execution impossible	R
061	Calibration execution result*16	Indicates the calibration execution result. Parameter range: 0 to 4 0: Executing 1: Normal end 2: Span value abnormal termination 3: Offset abnormal termination 4: Span value/Offset value abnormal	R
062 to 064	Reserved for system		
065	HIGH setting value (BANK 0)*17	Indicates the HIGH setting value (BANK 0). Parameter range: -99.999 to 99.999 (initial value: 8,000)	R/W

Data number	Name	Description	Attribute
066	LOW setting value (BANK 0)*17	Indicates the LOW setting value (BANK 0). Parameter range: -99.999 to 99.999 (initial value: 2,000)	R/W
067	Shift target value (BANK 0)*17	Indicates the shift target value (BANK 0). Parameter range: -99.999 to 99.999 (initial value: 0.000)	R/W
068	Sensitivity setting (BANK 0)	Indicates the sensitivity setting (BANK 0). Parameter range: 0 to 3 (initial value: 1) 0: Low sensitivity mode 1: Standard mode 2: High sensitivity mode 3: User	R/W
069	User binarize level (BANK 0)	Indicates the user binarize level (BANK 0). Parameter range: 10 to 90 (initial value: 25)	R/W
070	User filter value (BANK 0)	Indicates the user filter value (BANK 0). Parameter range: 3 to 50 (initial value: 9)	R/W
071	HIGH setting value (BANK 1)*17	Indicates the HIGH setting value (BANK 1). Parameter range: -99.999 to 99.999 (initial value: 8,000)	R/W
072	LOW setting value (BANK 1)*17	Indicates the LOW setting value (BANK 1). Parameter range: -99.999 to 99.999 (initial value: 2,000)	R/W
073	Shift target value (BANK 1)*17	Indicates the shift target value (BANK 1). Parameter range: -99.999 to 99.999 (initial value: 0.000)	R/W
074	Sensitivity setting (BANK 1)	Indicates the sensitivity setting (BANK 1). Parameter range: 0 to 3 (initial value: 1) 0: Low sensitivity mode 1: Standard mode 2: High sensitivity mode 3: User	R/W
075	User binarize level (BANK 1)	Indicates the user binarize level (BANK 1). Parameter range: 10 to 90 (initial value: 25)	R/W
076	User filter value (BANK 1)	Indicates the user filter value (BANK 1). Parameter range: 3 to 50 (initial value: 9)	R/W
077	HIGH setting value (BANK 2)*17	Indicates the HIGH setting value (BANK 2). Parameter range: -99.999 to 99.999 (initial value: 8,000)	R/W
078	LOW setting value (BANK 2)*17	Indicates the LOW setting value (BANK 2). Parameter range: -99.999 to 99.999 (initial value: 2,000)	R/W
079	Shift target value (BANK 2)*17	Indicates the shift target value (BANK 2). Parameter range: -99.999 to 99.999 (initial value: 0.000)	R/W
080	Sensitivity setting (BANK 2)	Indicates the sensitivity setting (BANK 2). Parameter range: 0 to 3 (initial value: 1) 0: Low sensitivity mode 1: Standard mode 2: High sensitivity mode 3: User	R/W
081	User binarize level (BANK 2)	Indicates the user binarize level (BANK 2). Parameter range: 10 to 90 (initial value: 25)	R/W

Data number	Name	Description	Attribute
082	User filter value (BANK 2)	Indicates the user filter value (BANK 2). Parameter range: 3 to 50 (initial value: 9)	R/W
083	HIGH setting value (BANK 3)*17	Indicates the HIGH setting value (BANK 3). Parameter range: -99.999 to 99.999 (initial value: 8,000)	R/W
084	LOW setting value (BANK 3)*17	Indicates the LOW setting value (BANK 3). Parameter range: -99.999 to 99.999 (initial value: 2,000)	R/W
085	Shift target value (BANK 3)*17	Indicates the shift target value (BANK 3). Parameter range: -99.999 to 99.999 (initial value:0.000)	R/W
086	Sensitivity setting (BANK 3)	Indicates the sensitivity setting (BANK 3). Parameter range: 0 to 3 (initial value: 1) 0: Low sensitivity mode 1: Standard mode 2: High sensitivity mode 3: User	R/W
087	User binarize level (BANK 3)	Indicates the user binarize level (BANK 3). Parameter range: 10 to 90 (initial value: 25)	R/W
088	User filter value (BANK 3)	Indicates the user filter value (BANK 3). Parameter range: 3 to 50 (initial value: 9)	R/W
089 to 096	Reserved for system		
097	Key lock	Indicates the key lock. Parameter range: 0 to 1 (initial value: 0) 0: Not key locked state 1: Key locked state	R/W
098	Bank function*18	Reads the currently operating bank. Parameter range: 0 to 3 (currently operating bank)	R
		Rewrites the operating bank. Parameter range: 0 to 3 0: Rewrites the operating bank with bank 0. 1: Rewrites the operating bank with bank 1. 2: Rewrites the operating bank with bank 2. 3: Rewrites the operating bank with bank 3.	W
099	Timing input request*19	Indicates the timing input request. Parameter range: 0 to 1 (initial value: 0) 0: Timing input OFF 1: Timing input ON	R/W
100	Laser emission stop request*19	Indicates the laser emission stop request. Parameter range: 0 to 1 (initial value: 0) 0: Laser emission 1: Laser emission stop	R/W
101 to 103	Reserved for system		
104	Sub display's screen*20	Indicates the sub display's screen. Parameter range: 0 to 5 (initial value: 0) 0: R.V. value screen 1: Analog output screen 2: HIGH setting value screen 3: LOW setting value screen 4: Shift target value screen 5: Calculated value display screen	R/W

Data number	Name	Description	Attribute
105	System parameter *14, *21	Indicates the system parameter. Parameter range: Main unit : 0 to 9 (initial value: 0) Expansion unit : 0 to 1 (initial value: 0)	R/W
106	Tolerance setting width*22	Indicates the tolerance setting width. Parameter range: 0.000 to 99.999 (initial value: 0.100)	R/W
107	Calibration function	Indicates the calibration function. Parameter range: 0 to 1 (initial value: 0) 0: Standard 1: User setting	R/W
108	Calibration function SET1	Indicates the calibration function SET1. Parameter range: -99.999 to 99.999 (initial value: 0.000)	R/W
109	Calibration function SET2	Indicates the calibration function SET2. Parameter range: -99.999 to 99.999 (initial value: 5,000)	R/W
110 to 115	Reserved for system		
116	Edge number 1 (BANK 0)*23	Indicates specified edges interval measurement mode: Edge number 1 (BANK 0). Parameter range: -100 to 100 (initial value: 1)	R/W
117	Edge number 2 (BANK 0)*23	Indicates specified edges interval measurement mode: Edge number 2 (BANK 0). Parameter range: -100 to 100 (initial value: 2)	R/W
118	Number of the pins (BANK 0)	Indicates pin interval judgment mode or pin diameter judgment mode: Number of the pins (BANK 0). Parameter range: 2 to 14 (initial value: 2)	R/W
119	Edge number 1 (BANK 1)*23	Indicates specified edges interval measurement mode: Edge number 1 (BANK 1). Parameter range: -100 to 100 (initial value: 1)	R/W
120	Edge number 2 (BANK 1)*23	Indicates specified edges interval measurement mode: Edge number 2 (BANK 1). Parameter range: -100 to 100 (initial value: 2)	R/W
121	Number of the pins (BANK 1)	Indicates pin interval judgment mode or pin diameter judgment mode: Number of the pins (BANK 1). Parameter range: 2 to 14 (initial value: 2)	R/W
122	Edge number 1 (BANK 2)*23	Indicates specified edges interval measurement mode: Edge number 1 (BANK 2). Parameter range: -100 to 100 (initial value: 1)	R/W
123	Edge number 2 (BANK 2)*23	Indicates specified edges interval measurement mode: Edge number 2 (BANK 2). Parameter range: -100 to 100 (initial value: 2)	R/W
124	Number of the pins (BANK 2)	Indicates pin interval judgment mode or pin diameter judgment mode: Number of the pins (BANK 2). Parameter range: 2 to 14 (initial value: 2)	R/W
125	Edge number 1 (BANK 3)*23	Indicates specified edges interval measurement mode: Edge number 1 (BANK 3). Parameter range: -100 to 100 (initial value: 1)	R/W
126	Edge number 2 (BANK 3)*23	Indicates specified edges interval measurement mode: Edge number 2 (BANK 3). Parameter range: -100 to 100 (initial value: 2)	R/W

Data number	Name	Description	Attribute
127	Number of the pins (BANK 3)	Indicates pin interval judgment mode or pin diameter judgment mode: Number of the pins (BANK 3). Parameter range: 2 to 14 (initial value: 2)	R/W
128	Reserved for system		
129	Calculation function*7	Indicates the calculation function. Parameter range: 0 to 3 (initial value: 0) 0: 0: Not use. 1: Addition mode 2: Subtraction mode 3: 2 heads mode	R/W
130	Measurement mode	Indicates measurement mode. Parameter range: 0 to 7 (initial value: 0) 0: Edge control/positioning 1: Outer diameter/width 2: Inner diameter/opening 3: Glass edge 4: Pin position 5: Pin interval 6: Pin diameter 7: Specified edges interval	R/W
131	Measurement direction	Indicates the measurement direction. Parameter range: 0 to 1 (initial value: 0) 0: Top 1: Bottom	R/W
132	Reserved for system		
133	Averaging*24	Indicates averaging. Parameter range: 0 to 13 (initial value: 5) 0: hsp 1: 1 2: 2 3: 4 4: 8 5: 16 6: 32 7: 64 8: 128 9: 256 10: 512 11: 1024 12: 2048 13: 4096	R/W
134	Output mode	Indicates output mode. Parameter range: 0 to 1 (initial value: 0) 0: N.O. 1: N.C.	R/W
135	Reserved for system		
136	Hold function setting	Indicates the hold function setting. Parameter range: 0 to 5 (initial value: 0) 0: Sample hold 1: Peak hold 2: Bottom hold 3: Peak-to-peak hold 4: Auto peak hold 5: Auto bottom hold	R/W

Data number	Name	Description	Attribute
137	Auto hold trigger level	Indicates auto peak hold or auto bottom hold trigger level. Parameter range: -99.999 to 99.999 (initial value: 0.100)	R/W
138	Timing input	Indicates timing input. Parameter range: 0 to 1 (initial value: 0) 0: Level 1: Edge	R/W
139	Delay timer	Indicates the delay timer. Parameter range: 0 to 3 (initial value: 0) 0: Delay timer off 1: On delay timer 2: Off delay timer 3: One shot timer	R/W
140	Timer value	Indicates the timing value. (The unit is ms.) Parameter range: 1 to 9999 (initial value: 60)	R/W
141	Hysteresis*22	Indicates the hysteresis. Parameter range: 0 to 99.999 (initial value: 0.020)	R/W
142	Analog output scaling*7	Indicates the analog output scaling. Parameter range: 0 to 1 (initial value: 0) 0: Initial state 1: Free range	R/W
143	Analog output upper limit*7	Indicates the analog output upper limit. Parameter range: -99.999 to 99.999 (initial value: 10,000)	R/W
144	Analog output lower limit*7	Indicates the analog output lower limit. Parameter range: -99.999 to 99.999 (initial value: 0.000)	R/W
145	External input*25	Indicates external input. Parameter range: 0 to 1 (initial value: 0) 0: Initial state 1: User setting	R/W
146	External input 1*25	Indicates external input 1. Parameter range: 0 to 4 (initial value: 0) 0: Zero shift input 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W
147	External input 2*25	Indicates external input 2. Parameter range: 0 to 4 (initial value: 0) 0: Reset input 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W
148	External input 3*25	Indicates external input 3. Parameter range: 0 to 4 (initial value: 0) 0: Timing input 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W

Data number	Name	Description	Attribute
149	External input 4[*25]	Indicates external input 4. Parameter range: 0 to 4 (initial value: 4) 0: Gain input (standard waveform input) 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W
150	Reserved for system		
151	Saving the standard waveform	Indicates saving the standard waveform function. Parameter range: 0 to 1 (initial value: 0) 0: OFF 1: ON	R/W
152	Saving zero shift value function	Indicates the saving zero shift value function. Parameter range: 0 to 1 (initial value: 0) 0: OFF 1: ON	R/W
153	Interference prevention[*7]	Indicates the interference prevention function. Parameter range: 0 to 1 (initial value: 0) 0: OFF 1: ON	R/W
154	Display digit[*27]	Indicates the display digit. Parameter range: 1 to 4 (initial value: 2) 1: 0.001 2: 0.01 3: 0.1 4: 1	R/W
155	Power save function	Indicates the power save function. Parameter range: 0 to 2 (initial value: 0) 0: OFF 1: Half 2: All	R/W
156	Position monitor	Indicates the position monitor. Parameter range: 0 to 3 (initial value: 0) 0: Initial state 1: OK/NG display mode 2: Red OFF 3: OFF	R/W
157	Display color	Indicates the display color. Parameter range: 0 to 2 (initial value: 0) 0: GO green 1: GO red 2: Always red	R/W
158	Edge check function	Indicates the edge check function. Parameter range: 0 to 2 (initial value: 0) 0: OFF 1: Setting A 2: Setting B	R/W
159	Edge check func. number of edges	Indicates the edge check function number of edges. Parameter range: 0 to 99 (initial value: 1)	R/W
160	Reserved for system		
161	P.V. of pin diameter/ interval 1 [*4, *27]	Indicates P.V. of pin diameter 1 or pin interval 1. Parameter range: -99.999 to 100,000	R

Data number	Name	Description	Attribute
162	P.V. of pin diameter/ interval 2 *4, *27	Indicates P.V. of pin diameter 2 or pin interval 2. Parameter range: -99.999 to 100,000	R
163	P.V. of pin diameter/ interval 3 *4, *27	Indicates P.V. of pin diameter 3 or pin interval 3. Parameter range: -99.999 to 100,000	R
164	P.V. of pin diameter/ interval 4 *4, *27	Indicates P.V. of pin diameter 4 or pin interval 4. Parameter range: -99.999 to 100,000	R
165	P.V. of pin diameter/ interval 5 *4, *27	Indicates P.V. of pin diameter 5 or pin interval 5. Parameter range: -99.999 to 100,000	R
166	P.V. of pin diameter/ interval 6 *4, *27	Indicates P.V. of pin diameter 6 or pin interval 6. Parameter range: -99.999 to 100,000	R
167	P.V. of pin diameter/ interval 7 *4, *27	Indicates P.V. of pin diameter 7 or pin interval 7. Parameter range: -99.999 to 100,000	R
168	P.V. of pin diameter/ interval 8 *4, *27	Indicates P.V. of pin diameter 8 or pin interval 8. Parameter range: -99.999 to 100,000	R
169	P.V. of pin diameter/ interval 9 *4, *27	Indicates P.V. of pin diameter 9 or pin interval 9. Parameter range: -99.999 to 100,000	R
170	P.V. of pin diameter/ interval 10 *4, *27	Indicates P.V. of pin diameter 10 or pin interval 10. Parameter range: -99.999 to 100,000	R
171	P.V. of pin diameter/ interval 11 *4, *27	Indicates P.V. of pin diameter 11 or pin interval 11. Parameter range: -99.999 to 100,000	R
172	P.V. of pin diameter/ interval 12 *4, *27	Indicates P.V. of pin diameter 12 or pin interval 12. Parameter range: -99.999 to 100,000	R
173	P.V. of pin diameter/ interval 13 *4, *27	Indicates P.V. of pin diameter 13 or pin interval 13. Parameter range: -99.999 to 100,000	R
174	R.V. of pin diameter 14*4, *27	Indicates the comparator value (P.V. value) of pin diameter 14. Parameter range: -99.999 to 100,000	R
175	R.V. of pin diameter/ interval 1 *4, *27	Indicates R.V. of pin diameter 1 or pin interval 1. Parameter range: -99.999 to 100,000	R
176	R.V. of pin diameter/ interval 2 *4, *27	Indicates R.V. of pin diameter 2 or pin interval 2. Parameter range: -99.999 to 100,000	R
177	R.V. of pin diameter/ interval 3 *4, *27	Indicates R.V. of pin diameter 3 or pin interval 3. Parameter range: -99.999 to 100,000	R
178	R.V. of pin diameter/ interval 4 *4, *27	Indicates R.V. of pin diameter 4 or pin interval 4. Parameter range: -99.999 to 100,000	R
179	R.V. of pin diameter/ interval 5 *4, *27	Indicates R.V. of pin diameter 5 or pin interval 5. Parameter range: -99.999 to 100,000	R

Data number	Name	Description	Attribute
180	R.V. of pin diameter/ interval 6 *4, *27	Indicates R.V. of pin diameter 6 or pin interval 6. Parameter range: -99.999 to 100,000	R
181	R.V. of pin diameter/ interval 7 *4, *27	Indicates R.V. of pin diameter 7 or pin interval 7. Parameter range: -99.999 to 100,000	R
182	R.V. of pin diameter/ interval 8 *4, *27	Indicates R.V. of pin diameter 8 or pin interval 8. Parameter range: -99.999 to 100,000	R
183	R.V. of pin diameter/ interval 9 *4, *27	Indicates R.V. of pin diameter 9 or pin interval 9. Parameter range: -99.999 to 100,000	R
184	R.V. of pin diameter/ interval 10 *4, *27	Indicates R.V. of pin diameter 10 or pin interval 10. Parameter range: -99.999 to 100,000	R
185	R.V. of pin diameter/ interval 11 *4, *27	Indicates R.V. of pin diameter 11 or pin interval 11. Parameter range: -99.999 to 100,000	R
186	R.V. of pin diameter/ interval 12 *4, *27	Indicates R.V. of pin diameter 12 or pin interval 12. Parameter range: -99.999 to 100,000	R
187	R.V. of pin diameter/ interval 13 *4, *27	Indicates R.V. of pin diameter 13 or pin interval 13. Parameter range: -99.999 to 100,000	R
188	R.V. of pin diameter 14 *4, *27	Indicates R.V. of pin diameter 14. Parameter range: -99.999 to 100,000	R
189 to 192	Reserved for system		
193	Product code	Indicates the product code. Parameter range: Main unit : 4016 Expansion unit : 4017	R
194	Revision	Indicates the revision. Parameter range:0101H to FFFFH (initial value: 0101H)	R
195	T connector sensor head	Indicates the T connector sensor head. Parameter range: 0 to 9 (initial value: 0) 0: IG-028 transmitter 1: IG-010 transmitter 9: Detection impossible	R
196	R connector sensor head	Indicates the R connector sensor head. Parameter range: 0 to 9 (initial value: 0) 0: IG-028 transmitter 1: IG-010 transmitter 9: Detection impossible	R
197 to 199	Reserved for system		
200	Product name	Indicates the product name. Main unit : "IG-1000/1500" Expansion unit : "IG-1050/1550"	R
201 to 214	Reserved for system		
215	Series code	Indicates the series code. Main unit : 4016 Expansion unit : 4017	R
216	Series version	Indicates the series version. Parameter range: 1	R

Data number	Name	Description	Attribute
217	Device type	Indicates the device type. Parameter range: 0	R
218 to 223	Reserved for system		

*1 You can check the error contents of the sensor amplifier according to the ON/OFF status of each bit.
OFF(0): No error occurred. ON(1): An error occurred.
Two or more errors may simultaneously occur. For details on each error, refer to "IG Series User's Manual".

*2 You can check the detailed output status according to the ON/OFF status of each bit.

*3 Use this attribute in combination with the comparator value property or comparator value information (invalid/over/under).

*4 If this value is Over Range (FFFF), +000099999 is stored.
If this value is Under Range (-FFFF), -000099999 is stored.
If this value is Invalid "----", -000099998 is stored.
If this value is Error, +000100000 is stored.

*5 If data is read from the main unit for which the calculation function is set to 2 heads mode, the read range varies with -999.99 to +999.99.

*6 This attribute can be used only when the detection mode of the sensor amplifier is peak-to-peak hold.
Using this for discriminating the outer diameter of a cylinder makes it possible to read the peak and bottom values during the measurement period.

*7 If this attribute is used in the expansion unit, a read error occurs.

*8 If the sensor amplifier is in Error Status, the analog voltage output becomes +5.500 and the analog current output becomes +3.00.

*9 If the analog output is OFF in the main unit, a read error occurs.

*10 If the number of edges is greater than or equal to 100, 99 is read.

*11 If a write for which a combination of inhibited functions is set is executed, abnormal setting (1) occurs. For details on each error, refer to "IG Series User's Manual".
(Example) If settings for using the calculation function are changed when measurement mode is pin interval or pin diameter

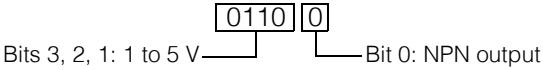
*12 The results of "initial reset request" and "system parameter set request" for the operation command are also included in this item.

*13 The execution result for the lastly requested item of "zero shift execution request" or "zero shift request execution request" is read.

*14 You can check the system parameter of the sensor amplifier by reading "system parameter current state". The system parameter sets a judgement output, edge check output polarity, and analog output.
Designate the system parameter set when the operation command executes "system parameter set request" as "system parameter".
A read or write value is designated by ON/OFF of each of the bits to be converted to a binary number.

Bit	Setting
0	0: NPN output 1: PNP output
3, 2, 1	000: Analog output OFF 001: 0 to 5V 010: -5 to +5V 011: 1 to 5V 100: 4 to 20mA (Fixed to 000 for expansion unit)

Reference When the read data is "6":
"6" is converted to "0110" in binary representation.



For this reason, the sensor amplifier that read data is set to "NPN output" and "analog output 1 to 5 V".

*15 Of "tolerance tuning request", "two-point tuning HIGH side 2nd point confirmation", and "two-point tuning LOW side 2nd point confirmation" for the operation command, the execution result for the lastly requested item is read.

*16 If calibration is executed when measurement mode is pin interval or pin diameter, the calibration execution result becomes "span value/offset value abnormal".

*17 If data is read from the main unit for which the calculation function is set to 2 heads mode, the read range varies with -999.99 to +999.99. Also, if calculation function mode is changed to 2 heads mode from modes other than 2 heads mode, these setting values change to 10 times. Therefore, pay attention to the decimal position.

*18 If the sensor amplifier is in the key locked state, data cannot be written. If an attempt is made to write data, a write error occurs.

*19 This attribute operates as OFF only when timing input OFF(0) is written and external input is OFF in wiring.

*20 If an attempt is made to write 1 or 5, a write error occurs in the expansion unit.

*21 This is reflected in operation when the system parameter set request is executed.

*22 If data is read from the main unit for which the calculation function is set to 2 heads mode, the read range varies with 0.00 to 99.99.

*23 For -100, "bottom" is set. For +100, "top" is set.
If an attempt is made to write 0, a write error occurs.

*24 If "pin interval" or "pin diameter" is set as measurement mode, hsp(0) and 512(10) to 4096(13) cannot be written. If hsp(0) is written, 1(1) is written. If 512(10) to 4096(13) are written, 256(9) is written.
When using the calculation function, do not write any data to the expansion unit 1. Changing averaging of the main unit that is using the calculation function automatically changes averaging of the expansion unit 1.

*25 To reflect the written settings in the sensor amplifier, you must write user setting (1) in "external input" or set external input setting to "user setting" in button operation of the sensor amplifier.

*26 If the calculation function is set to 2 heads mode, the valid value range is 2 to 4 (if 1 is written, a setting error occurs).

*27 If measurement mode is pin interval, the pin interval is read. If measurement mode is pin diameter, the pin diameter is read.
Pin diameter (interval) 1 represents the first pin diameter (interval) counted from the top side.
If this data is read when measurement mode is other than pin interval or pin diameter, a read error occurs.

*28 If this value is read during sample hold, a read error occurs.

MEMO

List of commands supported by the IB Series

8

8-1 List of commands supported by the IB Series

* During writing, data numbers 001 to 027 are executed as "+000000001".

Data number	Name	Description	Attribute
001	Zero shift request	Executes zero shift. Turning off the sensor amplifier after executing zero shift restores the state before the zero shift function is used. If the shift state is retained even after the sensor amplifier is turned off, set the saving zero shift value function to ON.	W
002	Zero shift reset request	Resets the zero shift value.	W
003	Resets request	Executes reset	W
004	Error clear request	Clears the ref. light quantity registration error [ErG] and adjust error [ErAdJ].	W
005	Initial reset request	Initializes all the settings other than the calibration, ref. light quantity registration, and system parameters of the sensor amplifier. All parameters are stored in nonvolatile memory (EEPROM) approx. 3 minutes after the initial reset request is executed. After the initial reset request has been executed, "EEPROM write result" of data number 053 becomes normal end (1).	W
006	System parameter set request	Changes the contents of the system parameter (settings of judgement output, check output polarity, and analog output) to the contents written in "system parameter" of data number 105. When executing the system parameter set, change the contents tailored to the connected devices and wiring. If the contents are changed by mistake, the devices connected to the sensor amplifier may go down.	W
010	Ref. light registration request	Registers the ref. light quantity.	W
011	Adjust request	Executes the adjust function. Turning off the sensor amplifier after executing the adjust function restores the state before the adjust function is executed. If the adjust value is retained even after the sensor amplifier is turned off, set the adjust status storage function to ON.	W
012	Adjust reset request	Initializes the adjust value.	W
014	Tolerance tuning request	Executes tolerance tuning. Use "Tolerance tuning - tolerance setting range" of data number 106 to set the tolerance setting range.	W

Data number	Name	Description	Attribute
015	2-point tuning HIGH side 1st req	Executes 2-point tuning. For details on the two-point tuning execution procedure, refer to "IB Series User's Manual".	W
016	2-point tuning HIGH side 2nd req (Determine HIGH setting value.)		W
017	2-point tuning LOW side 1st req		W
018	2-point tuning LOW side 2nd req (Determine LOW setting value)		W
019	Measured correction 1st req (SET1 confirmation operation)	Executes measured correction. Use the "Measured Correction/Theoretical Correction 1st Point Target Value" and the "Measured Correction/ Theoretical Correction 2nd Point Target Value" of data numbers 108 and 109 to set the R.V. value that you want to display. For details on the measured correction execution procedure, refer to "IB Series User's Manual".*2, *4	W
020	Measured correction 2nd req (SET2 confirmation operation)		W
026	Logical correction 1st req (SET1 confirmation operation)	Executes logical correction. Use the "logical correction 1st point measurement value" and the "logical correction 2nd point measurement value" of data numbers 115 and 116 to set the R.V. value that you want to correct.	W
027	Logical correction 2nd req (SET2 confirmation operation)	Use the "Measured Correction/Theoretical Correction 1st Point Target Value" and the "Measured Correction/ Theoretical Correction 2nd Point Target Value" of data numbers 108 and 109 to set the R.V. value that you want to display. For details on the measured correction execution procedure, refer to "IB Series User's Manual".*3, *4	W
032	Reserved for system		
033	Error status *1	Reads the error status. If an error occurs, the corresponding bit is set to ON. Bit 0: Overcurrent error (ErC) Bit 1: EEPROM error (ErE) Bit 2: Head error (transmitter/receiver) ErH/t r Bit 3: T/R reverse connection error (alternate flashing of ErH/rt and ErH/tr) Bit 4: Transmitter internal error (ErH/t.int Bit 5: Receiver error (ErH/r Bit 6: Transmitter error (ErH/t Bit 7: Transmitter laser error ErH/LASEr Bit 8: Model mismatch error rH/rAnGE Bit 9: Ref. light quantity registration error (rG/dArK, ErG/inF) Bit 10: Adjust error (Er. AdJ/dArK, Er. AdJ/ovEr, Er. AdJ/inF) Bit 11: Communication error between sensor amplifiers Er.coM	R

Data number	Name	Description	Attribute
034	Warning Status (Check Output State)	Reads the warning status. If a warning occurs, the corresponding bit is set to ON. Bit 0: 1 when the sensor amplifier is in the check output state (check output is ON when N.O. and OFF when N.C.)	R
035	Warning function operating state (Check Output Function Operation Status)	Reads the warning function operation status. If the warning function is in operation, the corresponding bit is set to ON. Bit 0: 1 when the check output function is ON	R
036	Judgement output/Check output	Reads the sensor output status. If the output is ON, the corresponding bit is set to ON. Bit 0: HIGH Bit 1: LOW Bit 2: GO Bit 3: Check output	R
037	Judgment value (P.V.)*2	Read the comparator value (P.V.). When measurement mode is % mode: -999.99 to +999.99 When measurement mode is dimension mode: -99.999 to +99.999	R
038	Internal measurement value (R.V.)*2	Read the R.V. value. When measurement mode is % mode: -999.99 to +999.99 When measurement mode is dimension mode: -99.999 to +99.999	R
039	Peak-hold value in hold mode*2	• When the hold function is other than sample hold Reads the peak hold value during sampling. When measurement mode is % mode: -999.99 to +999.99 When measurement mode is dimension mode: -99.999 to +99.999 • When the hold function is sample hold When measurement mode is % mode: -999.98 When measurement mode is dimension mode: -99.998	R
040	Bottom-hold value in hold mode*2	• When the hold function is other than sample hold Reads the bottom-hold value during sampling. When measurement mode is % mode: -999.99 to +999.99 When measurement mode is dimension mode: -99.999 to +99.999 • When the hold function is sample hold When measurement mode is % mode: -999.98 When measurement mode is dimension mode: -99.998	R
041	Reserved for system		
042	Analog output value	Reads the current analog output value. (Main unit only) Parameter range: Voltage: -5.000 to +5.000 (when an error occurs: +5.500) 4 to 20 mA:+4.00 to +20.00 (when an error occurs: +3.00) OFF: Fixed at 0	R
043	Bank status	Reads the number of the currently operating bank. Use this value to check the number of the bank where the sensor amplifier is actually operating. Parameter range: 0 to 3 0: Bank 0 1: Bank 1 2: Bank 2 3: Bank 3	R

Data number	Name	Description	Attribute
044	Timing status	Reads the timing status of the operating sensor amplifier. Use this value to check the timing status where the sensor amplifier is actually operating. Parameter range: 0 to 1 0: Sampling now in progress 1: Sampling not in progress	R
045 to 049	Reserved for system		
050	Laser emission stop status	Reads the transmission stop status of the actually operating sensor amplifier. Use this value to check the transmission stop status where the sensor amplifier is actually operating. Parameter range: 0 to 1 0: Transmission now in progress 1: Transmission stop now in progress (transmission stop input ON/laser errpr/head error)	R
051	Abnormal setting*3	Reads the abnormal setting status. Parameter range: 0 to 1 0: Normal setting 1: Abnormal setting	R
052	External input status	Reads the external input setting status. When the external input line of the sensor amplifier is ON, the corresponding bit is set to ON. The external input operates even if "Not use" is selected in External Input 1-4 Function Selection. Bit 0: External input 1 Bit 1: External input 2 Bit 2: External input 3 Bit 3: External input 4	R
053	EEPROM writing result*4	Reads the EEPROM writing result. Parameter range: 0 to 2 0: Writing now 1: Normal end 2: Abnormal end	R
054	Zero shift execution result*5	Reads the execution result of the zero shift or zero shift reset. Parameter range: 0 to 2 0: Zero shift or zero shift reset execution now in progress 1: Normal end 2: Abnormal end (SHiFt Err)	R
055	Reset execution result	Reads the reset execution result. Parameter range: 0 to 2 0: Reset execution now in progress 1: Normal end 2: Abnormal end	R
056	System parameter current state*6	Reads the system parameter current state. Use this value to check the system parameter where the sensor amplifier is actually operating. The bit corresponding to the current state is set to ON. Bit0: 0:NPN 1:PNP Bits 1 to 3 (main unit only. The expansion unit is fixed at 000.) 000: OFF 001: 0 to 5 V 010: -5 to 5 V 011: 1 to 5 V 100: 4 to 20 mA	R

Data number	Name	Description	Attribute
057	Reserved for system		
058	Ref. light registration result	Reads the Ref. light registration result. Parameter range: 0 to 3 0: Ref. light registration now in progress 1: Normal end 2: Insufficient light reception error 3: Interfering light error	R
059	Adjust result	Reads the adjust/adjust reset execution result. Parameter range: 0 to 4 0: Adjust/adjust reset execution now in progress 1: Normal end 2: Insufficient light quantity error 3: Interfering light error 4: Light quantity excess error	R
060	Tuning result*7	Reads the execution result of tolerance/two-point tuning. Parameter range: 0 to 2 0: Tolerance/two-point tuning execution now in progress 1: Normal end 2: Abnormal end	R
061	Correction result*8	Reads the execution result of measured correction/ theoretical correction. Parameter range: 0 to 2 0: Measured correction/theoretical correction execution now in progress 1: Normal end 2: Abnormal end	R
062 to 064	Reserved for system		
065	HIGH setting value (BANK 0)	Sets the HIGH setting value (BANK 0). When measurement mode is % mode: -999.99 to +999.99 (initial value: 20.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 2,000)	R/W
066	LOW setting value (BANK 0)	Sets the LOW setting value (BANK 0). When measurement mode is % mode: -999.99 to +999.99 (initial value: 10.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 1,000)	R/W
067	Shift target value (BANK 0)	Sets the shift target value (BANK 0). When measurement mode is % mode: -999.99 to +999.99 (initial value: 0.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 0.000)	R/W
068	HIGH setting value (BANK 1)	Sets the HIGH setting value (BANK 1). When measurement mode is % mode: -999.99 to +999.99 (initial value: 20.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 2,000)	R/W
069	LOW setting value (BANK 1)	Sets the LOW setting value (BANK 1). When measurement mode is % mode: -999.99 to +999.99 (initial value: 10.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 1,000)	R/W

Data number	Name	Description	Attribute
070	Shift target value (BANK 1)	Sets the shift target value (BANK 1). When measurement mode is % mode: -999.99 to +999.99 (initial value: 0.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 0.000)	R/W
071	HIGH setting value (BANK 2)	Sets the HIGH setting value (BANK 2). When measurement mode is % mode: -999.99 to +999.99 (initial value: 20.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 2,000)	R/W
072	LOW setting value (BANK 2)	Sets the LOW setting value (BANK 2). When measurement mode is % mode: -999.99 to +999.99 (initial value: 10.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 1,000)	R/W
073	Shift target value (BANK 2)	Sets the shift target value (BANK 2). When measurement mode is % mode: -999.99 to +999.99 (initial value: 0.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 0.000)	R/W
074	HIGH setting value (BANK 3)	Sets the HIGH setting value (BANK 3). When measurement mode is % mode: -999.99 to +999.99 (initial value: 20.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 2,000)	R/W
075	LOW setting value (BANK 3)	Sets the LOW setting value (BANK 3). When measurement mode is % mode: -999.99 to +999.99 (initial value: 10.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 1,000)	R/W
076	Shift target value (BANK 3)	Sets the shift target value (BANK 3). When measurement mode is % mode: -999.99 to +999.99 (initial value: 0.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 0.000)	R/W
077 to 096	Reserved for system		
097	Key lock setting	Sets key lock. Parameter range: 0 to 1 (initial value: 0) 0: Unlock 1: Key lock	R/W
098	Bank setting	Reads the current value. Use the "bank status" of data number 043 to check the number of the bank where the sensor amplifier is operating. Parameter range: 0 to 3	R
		Changes the operating bank. To change the bank number using this value, set the "bank switching method" of data number 150 to "button". For "external input", this attribute is invalid. Parameter range: 0 to 3 0: Rewrites the operating bank with bank 0. 1: Rewrites the operating bank with bank 1. 2: Rewrites the operating bank with bank 2. 3: Rewrites the operating bank with bank 3.	W

Data number	Name	Description	Attribute
099	Timing input*9	Sets the timing input. Use the "Timing status" of data number 044 to check the timing input status under which the sensor amplifier is operating. The sensor amplifier operates according to the OR of this input and the external input cable. Parameter range: 0 to 1 (initial value: 0) 0: Timing input OFF 1: Timing input ON	R/W
100	Laser emission stop input*9	Sets the laser emission stop input status. Check the emission stop input status of the operating sensor amplifier from the "transmission stop status" of data number 050. The sensor amplifier operates according to the OR of this input and the external input cable. Parameter range: 0 to 1 (initial value: 0) 0: Emission stop input OFF 1: Emission stop input ON	R/W
101 to 103	Reserved for system		
104	Sub display's screen	Sets the sub display's screen. Parameter range: 0 to 4 (initial value: 0) 0: r.v value 1: Analog value 2: HI setting value 3: LO setting value 4: Zero shift value	R/W
105	System parameter*6	Sets the system parameter. To reflect the setting, you need to execute the "System parameter set request" of data number 006 after writing the setting. Use the "Current system parameters" of data number 056 to check the system parameter with which the sensor amplifier is operating. Bit0: 0:NPN 1:PNP Bits 1 to 3 (main unit only. The expansion unit is fixed at 000.) 000: OFF 001: 0 to 5 V 010: 5 to 5 V 011: -1 to 5 V 100: 4 to 20 mA	R/W
106	Tol. tuning setting width	Sets the tolerance setting width. When measurement mode is % mode: 0.00 to 999.99 (initial value: 10.00) When measurement mode is dimension mode: 0.000 to 99.999 (initial value: 1,000)	R/W
107	Calibration function*10, *11	Sets the correction method. Parameter range: 0 to 2 (initial value: 0) 0: No correction 1: Measured correction 2: Theoretical correction (% mode only)	R/W

Data number	Name	Description	Attribute
108	Meas./Logical correct target 1*10, *11, *12	Sets the 1st-point target value of the measured correction or logical correction. When measurement mode is % mode: -999.99 to +999.99 (initial value: 0.00) When measurement mode is dimension mode: -99.999 to +99.999 (measured correction only) (initial value: 0.000)	R/W
109	Meas./Logical correct target 2*10, *11, *12	Sets the 2nd-point target value of the measured correction or logical correction. When measurement mode is % mode: -999.99 to +999.99 (initial value: 100.00) When measurement mode is dimension mode: -99.999 to +99.999 (measured correction only) (initial value: 10.000)	R/W
110 to 114	Reserved for system		
115	Logical correction measured 1*11, *12	Sets the logical correction 1st-point measurement value. When measurement mode is % mode: -999.99 to +999.99 (initial value: 0.00) When measurement mode is dimension mode: Unusable	R/W
116	Logical correction measured 2*11, *12	Sets the logical correction 2nd-point measurement value. When measurement mode is % mode: -999.99 to +999.99 (initial value: 100.00) When measurement mode is dimension mode: Unusable	R/W
117 to 129	Reserved for system		
130	Measurement mode15	Sets measurement mode. Parameter range: 0 to 1 (initial value: 0) 0: % mode 1: Dimension mode	R/W
131	Received/ Blocked light mode	Sets light entrance/light shading amount mode. Parameter range: 0 to 1 (initial value: 0) 0: Light entrance amount display 1: Light shading amount display	R/W
132	Reserved for system		
133	Averaging/High-pass filter	Sets the averaging/high-path filter. Parameter range: 0 to 19 (initial value: 5) 0 : 1 times 1 : Twice 2 : 4 times 3 : 8 times 4 : 16 times 5 : 64 times 6 : 256 times 7 : 1024 times 8 : 4096 times 9 : 16384 times 10 : 0.1Hz 11 : 0.2Hz 12 : 0.5Hz 13 : 1Hz 14 : 2Hz 15 : 5Hz 16 : 10Hz 17 : 20Hz 18 : 50Hz 19 : 100Hz	R/W

Data number	Name	Description	Attribute
134	Output mode	Sets output mode. Parameter range: 0 to 1 (initial value: 0) 0: N.O. 1: N.C.	R/W
135	Reserved for system		
136	Hold function setting	Sets the hold function. Parameter range: 0 to 5 (initial value: 0) 0: Sample hold 1: Peak hold 2: Bottom hold 3: Peak-to-peak hold 4: Auto peak hold 5: Auto bottom hold	R/W
137	Auto hold trigger level	Sets the auto peak hold trigger level or auto bottom hold trigger level. When measurement mode is % mode: -999.99 to +999.99 (initial value: 90.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 9,000)	R/W
138	Timing input setting	Sets the timing input. Parameter range: 0 to 1 (initial value: 0) 0: Level 1: Edge	R/W
139	Delay timer	Sets the delay timer. Parameter range: 0 to 3 (initial value: 0) 0: OFF 1: On delay 2: Off delay 3: One shot	R/W
140	Timer duration	Sets the timer duration. Parameter range: 1 to 9999 (initial value: 60) 1 to 9999	R/W
141	Hysteresis	Sets the hysteresis. When measurement mode is % mode: 0.00 to 999.99 (initial value: 0.00) When measurement mode is dimension mode: 0 to 99.999 (initial value: 0)	R/W
142	Analog output scaling*13	Sets the analog output scaling. (Main unit only) Parameter range: 0 to 1 (initial value: 0) 0: Initial state 1: Free range	R/W
143	Analog output upper limit*13	Sets the analog output upper limit. (Main unit only) When measurement mode is % mode: -999.99 to +999.99 (initial value: 100.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 10,000)	R/W
144	Analog output lower limit*13	Sets the analog output lower limit. (Main unit only) When measurement mode is % mode: -999.99 to +999.99 (initial value: 0.00) When measurement mode is dimension mode: -99.999 to +99.999 (initial value: 0)	R/W
145	External input setting *14	Sets whether to change external input 1 to 4 function assignment from the initial state. Parameter range: 0 to 1 (initial value: 0) 0: Initial setting 1: User setting	R/W

Data number	Name	Description	Attribute
146	Ext. IN1 function selection*14	Sets the function to be assigned to external input 1. Parameter range: 0 to 4 (initial value: 0) 0: Zero shift input 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W
147	Ext. IN2 function selection*14	Sets the function to be assigned to external input 2. Parameter range: 0 to 4 (initial value: 0) 0: Reset input 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W
148	Ext. IN3 function selection*14	Sets the function to be assigned to external input 3. Parameter range: 0 to 4 (initial value: 0) 0: Timing input 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W
149	Ext. IN4 function selection*14	Sets the function to be assigned to external input 4. Parameter range: 0 to 4 (initial value: 4) 0: Adjust input 1: Bank A input 2: Bank B input 3: Laser emission stop input 4: Not use	R/W
150	Bank switching method	Sets the bank switching method. Parameter range: 0 to 1 (initial value: 0) 0: Button 1: External Input	R/W
151	Reserved for system		
152	Save zero-shift state	Sets whether to store the zero shift status. Parameter range: 0 to 1 (initial value: 0) 0: OFF 1: ON	R/W
153	Reserved for system		
154	Display digit	Sets the display resolution. When measurement mode is % mode: 0: Initial setting (dEFLt) (initial value) 1: (Reserved for system) 2: (Reserved for system) 3: 0.01 4: 0.1 5: 1 When measurement mode is dimension mode: 0: Initial setting (dEFLt) (initial value) 1: (Reserved for system) 2: 0.001 3: 0.01 4: 0.1 5: 1	R/W

Data number	Name	Description	Attribute
155	Power save function	Sets the power saving function. Parameter range: 0 to 2 (initial value: 0) 0: OFF 1: Half 2: All	R/W
156	Reserved for system		
157	Judgment indicator color	Sets the display colors of judgement output indicators. Parameter range: 0 to 3 (initial value: 0) 0: Only GO is green (initial status) 1: Only GO is red 2: All P.V. values are green 3: All P.V. values are red	R/W
158	P.V. value display color	Sets P.V. value display colors. Parameter range: 0 to 3 (initial value: 0) 0: Green when GO (initial status) 1: Red when GO 2: All P.V. values are green 3: All P.V. values are red	R/W
159 to 160	Reserved for system		
161	Save adjust state	Sets whether to store the adjust status. Parameter range: 0 to 1 (initial value: 0) 0:OFF 1:ON	R/W
162	Adjust level	Sets an adjust level. Parameter range: 1 to 30 (initial value: 20)	R/W
163	Auto adjust function	Sets whether to enable the auto adjust function. Parameter range: 0 to 1 (initial value: 0) 0: Disable 1: Enable	R/W
164	Auto adjust level	Sets an auto adjust level. 0.50 to 20.00 (initial value: 3.00)	R/W
165	Check output function	Sets whether to enable the check output function. Parameter range: 0 to 1 (initial value: 0) 0: OFF 1: ON	R/W
166	Check output light level	Sets the light quantity level of the check output function. Parameter range: 1 to 30 (initial value: 10)	R/W
167	Error output mode	Sets error output mode. Parameter range: 0 to 1 (initial value: 0) 0: Normal mode (initial status) 1: Compatibility mode	R/W
168	Hysteresis for trigger level	Sets the trigger level hysteresis. Parameter range: 0 to 1 (initial value: 0) 0: Initial state 1: User setting	R/W
169	Hys. set value for trigger level	Sets the hysteresis setting value for trigger level. When measurement mode is % mode: 0.00 to 999.99 (initial value: 1.00) When measurement mode is dimension mode: 0.000 to 99.999 (initial value: 0.100)	R/W
170 to 192	Reserved for system		
193	Product code	Indicates the product code. Main unit: 4020 Expansion unit: 4021	R

Data number	Name	Description	Attribute
194	Revision	Indicates the revision. Parameter range: 0101H	R
195	Transmission Side Head Model	Indicates the model of the head connected to the sensor head connector (transmission side). Parameter range: 0 to 4 0: No head is connected or the R head is connected. 1: IB-01 2: IB-05 3: IB-10 4: IB-30	R
196	Light Receiving Side Head Model	Indicates the model of the head connected to the sensor head connector (light receiving side). Parameter range: 0 to 4 0: No head is connected or the T head is connected. 1: IB-01 2: IB-05 3: IB-10 4: IB-30	R
197 to 199	Reserved for system		
200	Product name	Indicates the sensor product name. Main unit: "IB-1000/1500" Expansion unit: "IB-1050/1550"	R
201 to 214	Reserved for system		
215	Series code	Indicates the series code. Main unit: 4020 Expansion unit: 4021	R
216	Series version	Indicates the series version. Parameter range: 1	R
217	Device type	Indicates the device type. Parameter range: 0	R
218 to 223	Reserved for system		

*1 You can check the error contents of the sensor amplifier according to the ON/OFF status of each bit.
OFF(0): No error occurred. ON(1): An error occurred.
Two or more errors may simultaneously occur. For details on each error, refer to "IB Series User's Manual".

*2 If the read data is any of the following, the meaning of this attribute differs from the meaning of the comparator value.
If this value is Current Value Over Range (FFFF), +000099999 is stored.
If this value is Current Value Under Range (-FFFF), -000099999 is stored.
If this value is Current Value Invalid (----), -000099998 is stored.
If this value is Error, +000100000 is stored.

*3 If a write for which a combination of inhibited functions is set is executed, abnormal setting (1) occurs. For details on each function, refer to "IB Series User's Manual".

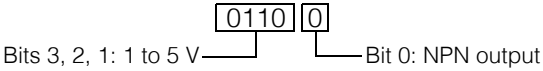
*4 The results of "initial reset request" and "system parameter set request" for the operation command are also included in this item.

*5 The execution result for the lastly requested item of "zero shift execution request" or "zero shift request execution request" is read.

*6 You can check the system parameter of the sensor amplifier by reading "system parameter current state". The system parameter sets a judgement output, check output polarity, and analog output.
Designate the system parameter set when the operation command executes "system parameter set request" as "system parameter".
A read or write value is designated by ON/OFF of each of the bits to be converted to a binary number.

Bit	Setting
0	0: NPN output 1: PNP output
3, 2, 1	000: Analog output OFF 001: 0 to 5V 010: -5 to +5V 011: 1 to 5V 100: 4 to 20mA (Fixed to 000 for expansion unit)

Reference When the read data is "6":
"6" is converted to "0110" in binary representation.



For this reason, the sensor amplifier that read data is set to "NPN output" and "analog output 1 to 5 V".

*7 Of "tolerance tuning request", "2-point tuning HIGH side 2nd", and "2-point tuning LOW side 2nd" for the operation command, the execution result for the lastly requested item is read.

*8 The execution result for the lastly requested item of "measured correction" or "logical correction" is read.
In the following cases, the execution result becomes "2: Abnormal end".
- The setting value is out of the parameter range.
- The 2nd-point correction execution is requested without the 1st-point correction execution requested.
- Correction execution is requested when calibration function setting is "0: Initial setting".
- Logical correction execution is requested when calibration function is setting is "1: Measured correction".
- Measured correction execution is requested when calibration function setting is "2: Logical correction".
- Logical correction execution is requested when measurement mode is dimension mode.

*9 Operates as "off" only when input off (0) is written and the external input is wired to be off.

*10 To execute measured correction, set the calibration function (data number 107) to "1. Measured correction".
When executing measured correction, set the measured correction/ theoretical correction 1st-point target value (data number 108) and the

measured correction/theoretical correction 2nd-point target value (data number 109), and then execute the measured correction execution request (data number 019 and 020).

*11 To execute measured correction, set the calibration function (data number 107) to "2. Measured correction".
When executing measured correction, set the measured correction/ theoretical correction 1st-point target value (data number 108) and the measured correction/theoretical correction 2nd-point target value (data number 109), theoretical correction 1st measurement value (data number 115), and theoretical correction 2nd measurement value (data number 116) and then execute the theoretical correction execution request (operation command (data number 026 and 027).

*12 Executing other settings in the middle of the 1st- or 2nd-point target or measurement value makes it impossible to complete calibration setting. Be sure to set the 1st- and 2nd-point target or measurement values continuously.

*13 If an attempt is made to write data to the expansion unit, a write error occurs.

*14 To reflect the settings written in external input 1 to 4 function selection (data number 146 to 149) in the sensor amplifier, you must set external input setting (data number 145) to 1 (user setting) or set external input setting to "user setting" in button operation of the sensor amplifier.

*15 When a write is executed, the data communication time between the DL-EP1 and sensor amplifier becomes approx. 1 second.

MEMO

List of commands supported by the SK Series

9

* During writing, data numbers 001 to 006 are executed as "+000000001".

Data number	Name	Description	Attribute
001	Zero shift execution request	Executes zero shift. Turning off the power to the sensor amplifier after executing zero shift restores the state that existed before the zero shift function was used. To retain the shifted state after turning off the power, turn on the zero shift value memory function.	W
002	Zero shift reset execution request	Resets the zero shift value.	W
003	Reset request	Executes resetting.	W
005	Initial reset request	Initializes all settings, except for sensor amplifier system parameters. Once an initial reset request is executed, all parameters are stored into the nonvolatile memory (EEPROM) in approximately three seconds. When completed, the setting/status command parameter "EEPROM write result" flips to "successfully completed (1)". After the completion, "EEPROM write result" of data number 053 changes to Normal termination (1).	W
006	System parameter set request	Changes the system parameters (the polarity of the judgment and alarm outputs and the analog output setting) to the values written in "System parameter settings" of data number 105. To set the system parameters, confirm that the change is proper according to the connected devices and wiring. A wrong change may damage the sensor amplifier or the connected equipment.	W
032	Reserved for system		
033	Sensor amplifier error[*1]	Indicates the error status of the sensor amplifier. When an error occurs, the corresponding bit turns on. bit0: Overcurrent error bit1: EEPROM error bit2: Head error bit7: Head temperature/humidity error bit11: Amplifier communication error Other than above: Fixed to 0	R
034 to 035	Reserved for system		
036	Judgment output/ Alarm output	Indicates the output status of the sensor. When an output is on, the corresponding bit turns on. Bit0:HI judgment output Bit1:LO judgment output Bit2:GO judgment output Bit3:Alarm output	R
037	Judgment value (P.V. Value)	Indicates the judgment value (P.V. value). Parameter range: -99.999 to +99.999	R
038	Internal measurement value (R.V. value)	Indicates the internal measurement value (R.V. value). Parameter range:-99.999 to +99.999	R
039	Peak hold value during hold period	• In the mode other than the sample hold mode Indicates the peak-hold value during the sampling period. Parameter range: -99.999 to +99.999 • In the sample hold mode Parameter range: -99.998	R

Data number	Name	Description	Attribute
040	Bottom hold value during hold period	• In the mode other than the sample hold mode Indicates the bottom-hold value during the sampling period. Parameter range: -99.999 to +99.999 • In the sample hold mode Parameter range: -99.998	R
041 to 042	Reserved for system		
043	Bank status	Indicates the currently active bank No. Use this value to check the number of the bank where the sensor amplifier is actually operating. Parameter range: 0 to 3 0: Bank 0 1: Bank 1 2: Bank 2 3: Bank 3	R
044	Timing status	Indicates the currently active timing status. Use this value to check the timing status where the sensor amplifier is actually operating. Parameter range: 0 to 1 0: During Sampling 1: Not during sampling	R
045	Temperature*2	Indicates the current temperature. Parameter range: -999.9 to +999.9	R
046	Humidity*3	Indicates the current humidity. Parameter range: 0.0 to 100.0	R
047 to 050	Reserved for system		
051	Abnormal setting*4	Indicates the abnormal setting state. Parameter range: 0 to 1 0:Normal setting 1:Abnormal setting	R
052	External input status	Indicates the external input status. When the external input line of the sensor amplifier is ON, the corresponding bit is set to ON. This operation is enabled even when "Not used" is selected for the function setting of external inputs 1 through 4. Bit0:External input 1 Bit1:External input 2 Bit2:External input 3 Bit3:External input 4	R
053	EEPROM write result*5	Indicates the result of writing to EEPROM. Parameter range: 0 to 2 0:Writing 1:Normal termination 2:Abnormal termination	R
054	Zero shift/Zero shift reset result*6	Indicates the result of zero shift or zero shift reset. Parameter range: 0 to 2 0:Executing 1:Normal termination 2:Abnormal termination	R
055	Reset request result	Indicates the result of reset. Parameter range: 0 to 2 0:Executing 1:Normal termination 2:Abnormal termination	R

Data number	Name	Description	Attribute
056	Current system parameters *7	Indicates the current status of the system parameters. Use this value to check the system parameters where the sensor amplifier is actually operating. The corresponding bit turns on according to the current status. bit 0: 0:NPN 1:PNP bits 1, 2 and 3 (For main unit only. Fixed to 000 for expansion unit) 000: Analog output OFF 001: 0 to 5 V 010: -5 to +5 V 011: 1 to 5 V 100: 4 to 20 mA	R
057 to 064	Reserved for system		
065	HI setting value (BANK 0)	Set up setting value of HI side (BANK 0). Parameter range: -99.999 to +99.999 (initial value: +1.000)	R/W
066	LO setting value (BANK 0)	Set up setting value of LO side (BANK 0). Parameter range: -99.999 to +99.999 (initial value: -1.000)	R/W
067 to 069	Reserved for system		
070	HI setting value (BANK 1)	Set up setting value of HI side (BANK 1). Parameter range: -99.999 to +99.999 (initial value: +1.000)	R/W
071	LO setting value (BANK 1)	Set up setting value of LO side (BANK 1). Parameter range: -99.999 to +99.999 (initial value: -1.000)	R/W
072 to 074	Reserved for system		
075	HI setting value (BANK 2)	Set up setting value of HI side (BANK 2). Parameter range: -99.999 to +99.999 (initial value: +1.000)	R/W
076	LO setting value (BANK 2)	Set up setting value of LO side (BANK 2). Parameter range: -99.999 to +99.999 (initial value: -1.000)	R/W
077 to 079	Reserved for system		
080	HI setting value (BANK 3)	Set up setting value of HI side (BANK 3). Parameter range: -99.999 to +99.999 (initial value: +1.000)	R/W
081	LO setting value (BANK 3)	Set up setting value of LO side (BANK 3). Parameter range: -99.999 to +99.999 (initial value: -1.000)	R/W
082 to 096	Reserved for system		
097	Key lock function	Sets key lock. Parameter range: 0 to 1 (initial value: 0) 0: Unlock 2: Key lock	R/W

Data number	Name	Description	Attribute
098	Bank function	For read: Reads the current value. Use the "bank status" of data number 043 to check the number of the bank where the sensor amplifier is operating. Parameter range: 0 to 3 (initial value: 0) For write: To change the bank number using this value, set the "bank switching method" of data number 150 to "button". The change is disabled when "External input" is set. Parameter range: 0 to 3 0: Switches to bank 0. 1: Switches to bank 1. 2: Switches to bank 2. 3: Switches to bank 3.	R/W
099	Timing input*8	Set up status of timing input. Use the "Timing status" of data number 044 to check the timing input status under which the sensor amplifier is operating. The sensor amplifier operates according to the OR of this input and the external input cable. Parameter range: 0 to 1 (initial value: 0) 0:Timing input OFF 1:Timing input ON	R/W
100 to 103	Reserved for system		
104	Sub display's screen	Set up sub display's screen. Parameter range: 0 to 5 (initial value: 0) 0: Temperature and humidity 1: Temperature 2: Humidity 3: HI setting value 4: LO setting value 5: RV	R/W
105	System parameter settings*7	Set up system parameter. To reflect the setting, you need to execute the "System parameter set request" of data number 006 after writing the setting. Use the "Current system parameters" of data number 056 to check the system parameter with which the sensor amplifier is operating. bit 0: 0: NPN 1: PNP bits 1, 2 and 3 (For main unit only. Fixed to 000 for expansion unit) 000: Analog output OFF 001: 0 to 5V 010: -5 to 5V 011: 1 to 5V 100: 4 to 20mA	R/W
106 to 129	Reserved for system		
130	Range setting	Set up measurement range. Parameter range: 0 to 2 (initial value: 0) 0: NEAR 1: FAR 2: Ib	R/W
131 to 132	Reserved for system		

Data number	Name	Description	Attribute
133	Averaging	Set up averaging/diff. count filter/high-pass filter. Parameter range: 0 to 8 (initial value: 5) 0: 1 time 1: 2 times 2: 4 times 3: 8 times 4: 16 times 5: 64 times 6: 256 times 7: 1024 times 8: 4096 times 9: 16384 times	R/W
134	Output mode	Set up output mode. Parameter range: 0 to 1 (initial value: 0) 0: N.O. 1: N.C.	R/W
135	Reserved for system		
136	Hold function setting	Set up hold function. Parameter range: 0 to 5 (initial value: 0) 0:Sample hold 1:Peak hold 2:Bottom hold 3:Absolute value hold 4:Auto peak hold 5:Auto bottom hold 6:Auto absolute value hold	R/W
137	Reserved for system		
138	Timing input setting	Set up timing input. Parameter range: 0 to 1 (initial value: 0) 0:Level 1:Edge	R/W
139 to 140	Reserved for system		
141	Hysteresis	Set up hysteresis. Parameter range: 0.000 to 99.999 (initial value: 0.100)	R/W
142	Analog output scaling*9	Set the analog output scaling. (For main unit only.) Parameter range: 0 to 1 (initial value: 0) 0: Initial state 1: Free range	R/W
143	Analog output upper limit*9	Set the analog output upper limit. (For main unit only.) Parameter range: -99.999 to 99.999 (initial value: +10.000)	R/W
144	Analog output lower limit*9	Set the analog output lower limit. (For main unit only.) Parameter range: -99.999 to 99.999 (initial value: -10.000)	R/W
145	External input*10	Set up whether to change the function assigned to external input 1/2/3/4 from the initial state. Parameter range: 0 to 1 (initial value: 0) 0:Initial state 1:User setting	R/W
146	External input 1 *10	Set up function to be assigned to external input 1. Parameter range: 0 to 3 (initial value: 0) 0:Zero shift input 1:Bank A input 2:Bank B input 3:Not used	R/W

Data number	Name	Description	Attribute
147	External input 2 *10	Set up function to be assigned to external input 2. Parameter range: 0 to 3 (initial value: 0) 0:Reset input 1:Bank A input 2:Bank B input 3:Not used	R/W
148	External input 3 *10	Set up function to be assigned to external input 3. Parameter range: 0 to 3 (initial value: 0) 0:Timing input 1:Bank A input 2:Bank B input 3:Not used	R/W
149	External input 4 *10	Set up function to be assigned to external input 4. Parameter range: 0 to 2 (initial value: 0) 0:Bank A input 1:Bank B input 2:Not used	R/W
150	Bank switching method	Set up method for switching the Bank. Parameter range: 0 to 1 (initial value: 0) 0:Button 1:External input	R/W
151	Reserved for system		
152	Zero shift value memory function	Set up whether to save the zero-shift state. Parameter range: 0 to 1 (initial value: 0) 0: OFF 1: ON	R/W
153	Reserved for system		
154	Display digit	Set up display digit. (initial value: 0) 0:Initial state 1:0.001 2:0.01 3:0.1 4:1	R/W
155 to 160	Reserved for system		
161	Distance correction method	Set the distance correction method. Parameter range: 0 to 1 (initial value: 0) 0: Initial state 1: User setting	R/W
162	Near-side distance correction amount	Set the near-side distance correction amount. Parameter range: 5 to 50 (initial value: 25)	R/W
163	Far-side distance correction amount	Set the far-side distance correction amount. Parameter range: 60 to 120 (initial value: 100)	R/W
164	Area scaling	Set the area scaling. Parameter range: 0.10 to 1.50 (initial value: 1.00)	R/W
165 to 192	Reserved for system		
193	Product code	Indicates the product code. Main unit : 4024 Expansion unit : 4025	R
194	Revision	Indicates the revision. The higher-order bytes in the lower-order word indicate the major revision and the lower-order bytes indicate the minor revision. Parameter range: 0101H	R

Data number	Name	Description	Attribute
195	Connected sensor head	Indicates model of sensor head connected to the amplifier. 0:Not connected 1:The head is connected	R
196 to 199	Reserved for system		
200	Product name	Indicates the product name. Main unit : "SK-1000" Expansion unit : "SK-1050"	R
201 to 214	Reserved for system		
215	Series code	Indicates the series code. Main unit : 4024 Expansion unit : 4025	R
216	Series version	Indicates the series version. Parameter range: 1	R
217	Device type	Indicates the device type. Parameter range: 0	R
220 to 223	Reserved for system		

*1 The on/off status of the bits indicates the type of error occurred in the sensor amplifier.
OFF (0): No error, ON (1): Error occurred
More than one error may occur simultaneously. For details of the errors, refer to “SK-1000 Series Instruction Manual”.

*2 This is -000009998 when the temperature is not acquired correctly.

*3 This is +000009998 when the humidity is not acquired correctly.

*4 If a prohibited combination of functions is written, an "abnormal setting (1)" will result. For details on each function, see the "SK-1000 Series Instruction Manual."

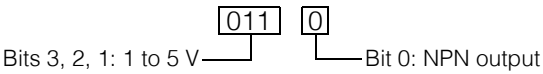
*5 The results of the "Initial reset request" and "System parameter set request" operation commands are also included in this item.

*6 The result of "Zero shift execution request" or "Zero shift reset execution request", whichever requested last, will be read.

*7 By reading "Current system parameters", you can check the system parameters of the sensor amplifier. The system parameters refer to the polarity of the judgment and alarm outputs and the analog output setting. Specify the system parameters to be set when "System parameter set request" is executed in an operation command.
A value to be read or written is specified as on/off status of the bits representing the value converted into binary.

Bit	Setting
0	0: NPN output 1: PNP output
3, 2, 1	000: Analog output OFF 001: 0 to 5 V 010: -5 to +5 V 011: 1 to 5 V 100: 4 to 20 mA (Fixed to 000 for expansion unit)

Reference When the read data is "6":
The decimal number "6" is represented in binary as "0110".



As a result, the sensor amplifier of the read data is set to "NPN output" and "analog output of 1 to 5 V".

*8 Operates as "off" only when input off (0) is written and the external input is wired to be off.

*9 When a value is written to an expansion unit, a writing error occurs.

*10 To reflect the settings written for the function selection of external inputs 1 to 4 (data numbers 146 to 149) to the sensor amplifier, you need to set the external input setting (data number 145) to 1 (User setting) or to operate the sensor amplifier's button to set the external input to "User setting".

MEMO

Appendix

A-1 Specifications

The specifications of the DL-EN1 are as follows:

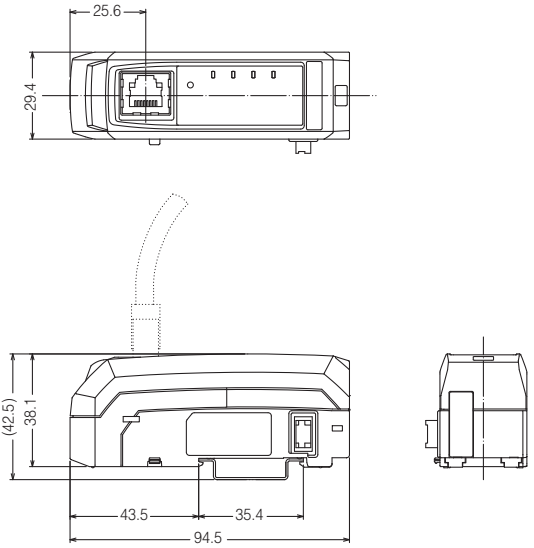
Product name		Ethernet TCP/IP Compatible Network Unit
Model		DL-EN1
Ethernet Specifications	Compliant standards	IEEE802.3u (100BASE-TX)
	Transmission rate	100Mbps (100BASE-TX)
	Transmission medium	STP cable or Category 5 or higher UTP cable (100BASE-TX)
	Maximum cable length	100 m (Distance between DL-EN1 and Ethernet switch)
Performance specifications	Socket communication, no-protocol commands, ASCII	TCP socket 1
		Port number can be set between 1 and 65535 8500: Reserved for the system Initial value: 64000
Sensor connection specifications	Connectable sensors	Sensor amplifiers with D-bus support *1
	Number of connectable sensor units	15 units max *2
Indicator lamps		Link/activity indicator (LINK/ACT): Green LED Module status indicator (MS): 2-color (green/red) LED Network status indicator (NS): 2-color (green/red) LED Sensor communication indicator (N-bus): 2-color (green/red) LED
Power voltage		20 to 30 VDC ±10%, including ripple (p-p)10% (supplied from the connected sensor amplifiers)
Power consumption		1500 mW or less (at 30 V 50 mA max)
Environmental resistance	Operating surrounding air temperature	-20 to 55 °C (no freezing)
	Operating surrounding air humidity	35 to 85% RH (no condensation)
	Vibration resistance	10 to 55 Hz compound amplitude 1.5 mm, 2 hours each in X, Y, Z directions
	Pollution degree	2
Materials		Main unit case: Polycarbonate
Weight		Approx. 70 g

*1 "D-bus" is the name of KEYENCE's wiring-saving system for sensor amplifiers.

*2 Varies with the sensor amplifiers connected.

A-2 Dimensions

(Unit : mm)



A-3 Data Processing Time

This unit uses Ethernet (TCP/IP) communication, so the communication time depends on the network status.
Test the unit in the actual operating environment before using the unit.
The delay time until this unit can output the data detected by the sensor is shown below.
(1) sensor amplifier response time + (2) data processing time of this unit

(1) sensor amplifier response time
Refer to the manual of each sensor amplifier.

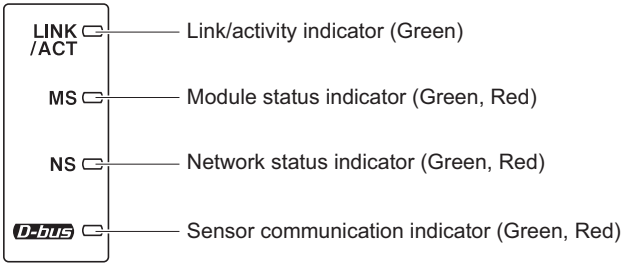
(2) data processing time of this unit

Unit [ms]

Number of amplifiers*1	When not using the calculation function*2	When using the calculation function*3
1	7.8	11.3
2	9.8	14.3
3	13.8	20.3
4	15.8	23.3
5	19.8	29.3
6	21.8	32.3
7	25.8	38.3
8	27.8	41.3
9	31.8	47.3
10	33.8	50.3
11	37.8	56.3
12	39.8	59.3
13	43.8	65.3
14	45.8	68.3
15	49.8	74.3

*1 The upper limit on the number of connectable amplifiers varies depending on the model.
*2 50 ms is added when the sensor amplifier being used is the GT2-100.
*3 75 ms is added when the sensor amplifier being used is the GT2-100.
The IB Series does not have a calculation function.

The indicator LEDs on the DL-EN1 can be used to determine the causes of errors.



■ Link/activity indicator (LINK/ACT)

This indicator indicates whether the DL-EN1 is communicating correctly.

LED Status		Condition	Corrective Action
Green	Solid	The DL-EN1 is normally linked.	-
	Flashing	The DL-EN1 is normally linked and is now exchanging data.	-
Not lit		Power is not supplied to the DL-EN1. The DL-EN1 is not linked.	• Check if the power supply is correctly connected. • Check if the DL-EN1 is correctly connected to the sensor amplifier. • Check if the IP address is correct. • Check if the power supply of the connected device or Ethernet switch is correctly connected. • Check if the cable is correctly connected.

■ Module status indicator (MS)

This indicator indicates whether the DL-EN1 is operating normally.

LED Status		Condition	Corrective Action
Green	Solid	The DL-EN1 is normally operating.	-
Red	Solid	A system error may have occurred in the DL-EN1.	Contact your nearest KEYENCE office.
	Flashing	One or more of the connector sensors are in the error or warning status*.	One or more of the connector sensors are in the error or warning status*.
		The number of connected sensor may have exceed the maximum number of connectable units.	Check if the number of connected sensors is less than or equal to the maximum number of connectable units.
		The IP address may be duplicated.	Check if the IP address is duplicated.
Not lit		Power is not supplied to the DL-EN1.	• Check if the power supply is correctly connected. • Check if the DL-EN1 is correctly connected to the sensor amplifier.

* The setting can be changed so that the red LED does not flash.

■ Network status indicator (NS)

This indicator indicates whether the DL-EN1 is communicating correctly through the TCP/IP interface.

LED Status		Condition	Corrective Action
Green	Solid	One or more connections are normally established.	If multiple connections are used, the DL-EN1 may be unable to communicate with EtherNet/IP even if the green LED is solid.
	Flashing	No connection is established.	Check if the DL-EN1 is registered in the scanner.
Red	Solid	A duplicated IP address was detected.	Check if the IP address setting is duplicated with the IP address setting of the scanner or other adaptors.
Not lit		Power is not supplied to the DL-EN1.	• Check if the power supply is correctly connected. • Check if the DL-EN1 is correctly connected to the sensor amplifier.
		The IP address is not assigned.	Set the IP address.

■ Sensor communication indicator (D-bus)

This indicator indicates whether the DL-EN1 is communicating correctly with the sensor amplifier.
If an error occurs, you can identify the cause of the error by reading the error code.

LED Status	Condition	Corrective Action
Solid green	The DL-EN1 is communicating correctly with the sensor amplifier.	-
Flashing green	After power-on, the DL-EN1 is now starting up.	After it has started up, the DL-EN1 automatically shifts to the normal status.
Solid red	The DL-EN1 could not communicate with the sensor amplifier during its start-up. (Error ID number/code: 00/052 or 00/055)	• Check if the DL-EN1 is correctly connected to the sensor amplifier and turn on the power again. • Check if an unsupported sensor amplifier is connected to the DL-EN1 and turn on the power again. • Check if the number of connected sensor amplifiers exceeds the maximum number of connectable units. • Check if there is an electrical noise source around the DL-EN1. If the error cannot be recovered after checking the above, contact your nearest Keyence office.
	An attempt to assign an ID number has failed. (Error ID number/code: 00/051)	
	The DL-EN1 could not communicate continuously with the sensor amplifier for one second or longer. (Error ID number/code: 00/057)	
	A system error may have occurred in the DL-EN1.	
Flashing red Repetition of 4 consecutive flashes)	A current limitation error occurred. (Error ID number/code: 00/056)	Check the sensor amplifier configuration.
	An unsupported sensor amplifier was connected. (Error ID number/code: 00/053)	
	Unconnectable models are mixed. (Error ID number/code: 00/054)	
Flashing red (Flashing at fixed intervals)	Sometimes the DL-EN1 cannot temporarily communicate with the sensor amplifier. (Error ID number/code: 00/057)	Check if there is an electrical noise source around the DL-EN1. (The error is automatically reset if the cause is removed.)
Not lit	Power is not supplied to the DL-EN1.	• Check if the DL-EN1 is correctly connected to the sensor amplifier. • Check if the power supply is correctly connected.

A-5 Index

Revision History

Print date	Revision no.	Description
August, 2016	Initial release	

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