**Mitutoyo**

# Linear Gage Counter EH Series

**EH-101P**
**EH-102P**
**EH-102Z**
**EH-102S**
**EH-102D**

## User's Manual
### - Instructions for use -

Read this User's Manual thoroughly before operating the instrument. After reading, retain it close at hand for future reference.
This English language version of the User's Manual contains the original instructions.

## ■Product names and model numbers

| Product name | Model number |
|---|---|
| Linear Gage Counter<br>EH Series | EH-101P<br>EH-102P<br>EH-102Z<br>EH-102S<br>EH-102D |

## ■Notice regarding this document

- Mitutoyo Corporation assumes no responsibilities for any damage to the instrument, caused by its use not conforming to the procedure described in this document.
- Upon loan or transfer of this instrument, be sure to attach this document to the product.
- In the event of loss or damage to this document, immediately contact a Mitutoyo sales office or your dealer.
- Before operation of the product, thoroughly read this document to comprehend its contents.
- Particularly, for full understanding of information, carefully read "Safety Precautions" and "Precautions for Use" at the outset of this manual before using the product.
- The contents in this document are based on the information current as of December, 2020.
- No part or whole of this document may be transmitted or reproduced by any means without prior written permission of Mitutoyo Corporation.
- Some screen displays in this document may be highlighted, simplified or partially omitted for convenience of explanation. In addition, some of them may differ from actual ones to the extent that no user will misunderstand the functions and operations.
- The corporation, organization and product names that appear in this manual are their trademarks or registered trademarks.

# CONVENTIONS USED IN THIS DOCUMENT

Conventions used in Mitutoyo's User's Manual are roughly divided into three types (safety reminders, prohibited and mandatory actions, and referential information and locations). Moreover, these conventions include general warnings and specific warnings. Specific warning symbols are provided with concrete pictograms inside of them.

## ■ Safety reminder conventions and wording warning against potential hazards

| | |
|---|---|
| **⚠ DANGER** | Indicates an immediately hazardous situation which, if not avoided, will result in serious injury or death. |
| **⚠ WARNING** | Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death. |
| **⚠ CAUTION** | Indicates a potentially hazardous situation which, if not avoided, may result in minor injury. |
| **NOTICE** | Indicates a potentially hazardous situation which, if not avoided, may result in property damage. |
| ⚡ | Alerts the user to a specific hazardous situation that means "Caution, risk of electric shock". |

## ■ Conventions and wording indicating prohibited and mandatory actions

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

## ■ Conventions and wording indicating referential information or referential locations

**Tips**    Indicates referential information such as that for when the operating methods and procedures which are printed in these sentences are to be applied to specific conditions.

📖    Indicates referential locations if there is information that should be referred to in this document or an extraneous manual.

Example: For details about xxx, see 📖 "1.3 Part Names and Functions" (page 2).

# Safety Precautions

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

⚠ **WARNING**

Do not remove the cover or disassemble the product. Otherwise you may be subject to electric shock, and there is a risk of breakage or fire due to a short circuit caused by metallic powders that have gotten inside the product.

# Precautions for Use

## ■ Product applications and handling

### ● This product is a Counter.

Do not use this product for any purposes other than as a Counter.

### ● This is an industrial product.

Do not use this product for any purposes other than industrial applications.

### ● This product is precision equipment.

Handle this product with care. Be careful not to apply excessive shock or force to any of the parts during operation.

## ■ Installation environment

This product is designed for indoor use. To ensure optimal performance for this precision equipment, take the following conditions into account when installing this product.

- Vibration
  Install this product in an environment where it will be subject to minimal vibration. Using this product in a place with significant vibration for an extended period of time may result in malfunction of the precision components. If using this product in a place with significant vibration is unavoidable, lay a vibration-proof rubber sheet, etc., under this product in order to reduce the vibration.

- Dust
  Dust in the installation site negatively affects the electrical components in the Display. Install this product in an environment where it will be subject to minimal dust.

- Sunlight
  If this product is exposed to direct sunlight, the heat will cause deformations in the main body, negatively affecting its operation. If installing this product in an environment that is exposed to direct sunlight, such as near a window, is unavoidable, protect it from the sunlight by curtaining it off, etc.

- Ambient temperature, humidity
  Use this product in a place where the ambient temperature is within the range of 0°C to 40 °C. Avoid using it in a place that is subject to sudden changes in temperature or humidity.

When using this product in the following environments, take necessary shielding measures.

- In locations subject to electric noise, such as from static electricity
- In locations subject to strong electric fields
- In locations near power supply lines/power lines
- In locations where it may directly exposed to chips, cutting fluids, water, etc.
- In locations that may be exposed to radiation
- In locations that may be exposed to corrosive gas

## ■ Maintenance

Gently wipe dirt off of the product with a soft, tightly woven cloth. If dirt is difficult to remove, wipe the dirt off with a cloth soaked in a neutral detergent, and then gently wipe the product with a dry cloth or a cloth that is tightly wrung after being soaked in water. Do not use organic solvents such as thinner or benzine.

## ■ Power source

- Turn off the power switch after use.
- Use only a power source for this product that is rated at 12 V to 24 V and an output current of 1 A or more. Never use this power source with other electric equipment that runs at a high voltage and/or large current.
- Do not connect the AC adapter to a high-current power used by machine tools or large CNC measuring instrument.

## Electromagnetic Compatibility (EMC)

This product complies with the EMC Directive. Note that, in environments where electromagnetic interference exceeds the EMC requirements defined in this directive, appropriate countermeasures are required to ensure product performance.

# Export Control Compliance

This product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of the Export Trade Control Order or under Category 16 of the Appended Table of Foreign Exchange Control Order, based on the Foreign Exchange and Foreign Trade Act of Japan.

If you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-provision of the technology (including program), you are obligated to observe the regulations of your country.

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

# Notes on Export to EU Member Countries

When you intend export of this product to any of the EU member countries, you may be required to provide Instruction Manual in English and EU Declaration of Conformity in English (under certain circumstances, Instruction Manual in the destination country's official language and EU Declaration of Conformity in the destination country's official language). For detailed information, please contact Mitutoyo in advance.

# Disposal of Products outside the European Union and Other European Countries

Please follow the official instruction in each community and country.

# Disposal of Old Electrical & Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems)

This symbol on the product or on its packaging is based on the WEEE Directive (Directive on Waste Electrical and Electronic Equipment), which is a regulation in EU member countries, and indicates that this product shall not be treated as household waste.

To reduce environmental impact and minimize the volume of landfill, please cooperate in reuse and recycling.

For information on how to dispose of the product, please contact your dealer or the nearest Mitutoyo sales office.

# China RoHS Compliance Information

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

产品中有害物质的名称及含量

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

本表格依据 SJ/T 11364 的规定编制。

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

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

环保使用期限标识是根据《电器电子产品有害物质限制使用管理办法》以及《电子电气产品有害物质限制使用标识要求(SJ/T11364−2014)》制定的,适用于中国境内销售的电子电气产品的标识。

电器电子产品只要按照安全及使用说明内容在正常使用情况下,从生产日期算起,在此期限内产品中含有的有毒有害物质不致发生外泄或突变,不致对环境造成严重污染或对其人身、财产造成严重损害。

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

另外,此期限不同于质量／功能的保证期限。

# Warranty

In the event that this product should prove defective in workmanship or material, within one year from the date of original purchase for use, it will be repaired or replaced, at Mitutoyo's option, free of charge upon its prepaid return to Mitutoyo, without prejudice to the provisions of the Mitutoyo Software End User License Agreement.

If this product fails or is damaged for any of the following reasons, it will be subject to a repair charge, even if it is still under warranty.

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

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

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

You assume all responsibility for all results arising out of its selection of this product to achieve its intended results.

# Disclaimer

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SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL, OR PUNITIVE
DAMAGES HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY
ARISING OUT OF THE USE OF OR INABILITY TO USE THIS PRODUCT EVEN IF
MITUTOYO OR ITS AFFILIATED AND RELATED COMPANIES AND/OR SUPPLIERS
HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

If, notwithstanding the foregoing, Mitutoyo is found to be liable to you for any damage or
loss which arises out of or is in any way connected with use of this product by you, in no
event shall Mitutoyo's and/or its affiliated and related companies' and suppliers' liability to
you, whether in contract, tort (including negligence), or otherwise, exceed the price paid by
you for the product only.

The foregoing limitations shall apply even if the above-stated warranty fails of its essential
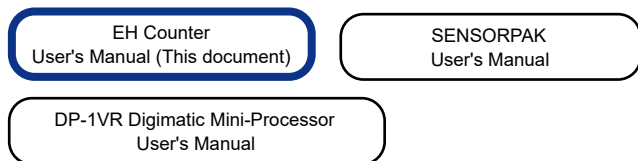purpose.
BECAUSE SOME COUNTRIES, STATES OR JURISDICTIONS DO NOT ALLOW
THE EXCLUSION OR THE LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR
INCIDENTAL DAMAGES, IN SUCH COUNTRIES, STATES OR JURISDICTIONS,
MITUTOYO'S LIABILITY SHALL BE LIMITED TO THE EXTENT PERMITTED BY LAW.

# About This Document

## ■ Positioning of this document in document map

In addition to this document, a User's Manual for SENSORPAK that is installed and used on a PC, and a User's Manual for each Linear Gage that is connected to and used with this product are available.

### ● Manuals for Counters

EH Counter
User's Manual (This document)

SENSORPAK
User's Manual

DP-1VR Digimatic Mini-Processor
User's Manual

### ● Manuals for Linear Gages

LGK
User's Manual

LGF (Standard)
User's Manual

LGF (Origin mark)
User's Manual

LGB
User's Manual

LGB2
User's Manual

LG-1100
User's Manual

LGM
User's Manual

LGS
User's Manual

LGD
User's Manual
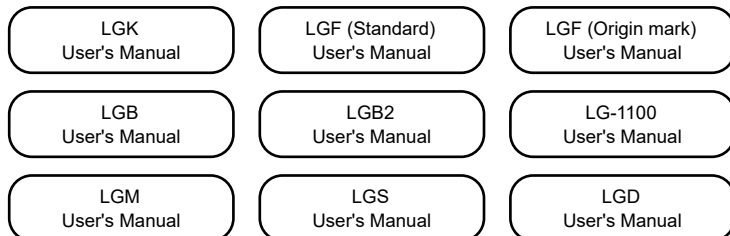
## ■ Intended readers and purpose of this document

### ● Intended readers

This manual is intended for beginners of the EH-series counters.

Readers are assumed to be familiar with the basic operations of a PC and Windows.

They are also assumed to be able to understand instructions by reading technical drawings.

### ● Purpose

The purpose of this document is to help you understand how to use EH-series counters.

## ■ How to read this document

### ● When you do not know the appropriate operation while using this product

Look for the page with the desired operation in the table of contents.

### ● To measure

The setup of this product and the settings of parameters are required in advance.

See the following pages for basic measurements, such as height measurement.

📖 "1 Overview" (page 1) to 📖 "3.2 Basic Parameters" (page 12)

In addition to the pages above, see the following pages for applied measurements, such as thickness measurement using 2-axis models.

📖 "3.3 Advanced Parameters" (page 14) to 📖 "3.5 CEL-Specific Parameters" (page 21)

### ● Operation key names

Operation key names are written side-by-side in the following way when an operation key name differs between 1-axis models and 2-axis models: [Key name for 2-axis models]/[Key name for 1-axis models].

### ● Terms and definitions

- INPUT A/INPUT B: Linear Gages connected to the Linear Gage input connectors A/B
- Internal counter (CEL): The 4 internal counters that 2-axis models have (CEL1 to CEL4)
- BANK: On 2-axis models, a display capable of being switched between 2 types (BANK1 and BANK2). BANK1 displays CEL1 and CEL2, BANK2 displays CEL3 and CEL4.
- UNIT: The 6 counting methods that can be displayed on each CEL

#### Tips

For details about BANK, CEL, and UNIT, see 📖 "3.4.1 Internal Structure of the Counter" (page 17).

# Contents

# 1 Overview

This section describes the features and part names of this product.

## 1.1 Major Functions

This product is a Counter that displays the counter values from connected Mitutoyo Linear Gages.

In addition, the following functions are available.

● Functions common to 2-axis models and 1-axis models

- Zero Setting, Preset, Tolerance Judgment
- Communication with a PC or external devices via RS-232C, USB, or I/O connector
- Simple printing by connecting to a Mitutoyo Digimatic Mini-Processor
- Multi-point measurement by connecting up to 10 Mitutoyo Counters that have the RS LINK function

● Functions unique to 2-axis models

- 2-axis independent Counter display, and a Sum/Difference calculation display between the 2 axes

## 1.2 Supported Linear Gages

The following table shows the Linear Gages supported by this product and their features:

| Model No. | Number of axes | Supported Linear Gages | Feature |
|-----------|----------------|------------------------|---------|
| EH-102P | 2 axes | LGF-L-B, LGK, LGB, LGB2, LG, LGM, etc. | • Differential square-wave output type<br>• High resolution down to 0.1 μm<br>• High-speed response of 1.5 m/s (LGF) |
| EH-101P | 1 axis | | |
| EH-102Z | 2 axes | LGF-ZL-B, etc. | • Scale reference-point signal output type (The origin can be restored even if the power switch is turned off) |
| EH-102S | | LGB-S, LGB2-S, etc. | • Sine-wave output type<br>• Resolution can be set according to the Counter |
| EH-102D | | LGD, LGS-1012P, etc.<br>(ID and SD are also supported) | • Digimatic output type<br>• ABS function (no need for master setting) |

# 1.3 Part Names and Functions

## 1.3.1 Front Side of the Main Body

EH-102P/EH-102Z/EH-102S/EH-102D
(2-axis model)

EH-101P
(1-axis model)
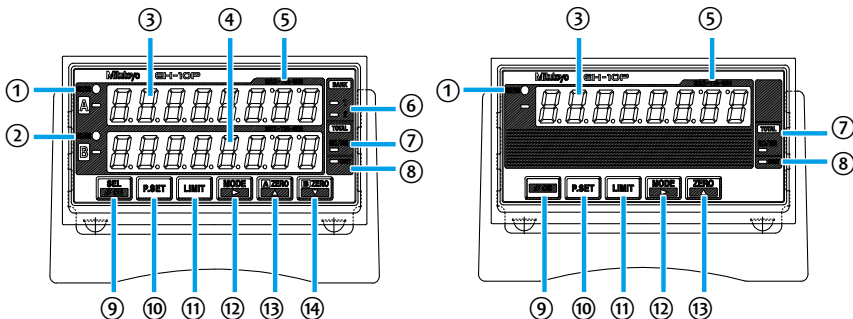


| Symbol | Name | Description |
|--------|------|-------------|
| ① | Tolerance judgment indicator A | Indicates the tolerance judgment result of the Linear Gage (INPUT A) connected to the Linear Gage input connector A by color. |
| ② | Tolerance judgment indicator B | Indicates the tolerance judgment result of the Linear Gage (INPUT B) connected to the Linear Gage input connector B by color. |
| ③ | Display A | Displays the counter value from INPUT A. |
| ④ | Display B | Displays the counter value from INPUT B. |
| ⑤ | Peak mode indicator | Indicates the Peak-mode type. |
| ⑥ | BANK indicator | Indicates the currently selected BANK number. For details about BANK, see 📖 "4.2 Switching the Displayed BANK (2-Axis Models Only)" (page 25). |
| ⑦ | Total Judgment indicator | Indicates the result of the total tolerance judgment by color. |

| Symbol | Name | Description |
|--------|------|-------------|
| ⑧ | UNIT indicator | • Blinks while a HOLD signal is being input when the I/O connector is connected.<br>• Lights when an E unit has been selected for the corresponding parameter. |
| ⑨ | [SEL]/[CE] key | • Cancels an operation or an error.<br>• Selects Display A or B. |
| ⑩ | [P.SET] key | Sets a Preset value.<br><br>**Tips**<br>When setting parameters, this selects the parameter number. |
| ⑪ | [LIMIT] key | Sets the tolerance value. |
| ⑫ | [MODE] key | Sets Peak mode.<br><br>**Tips**<br>When setting the tolerance, Preset, or optional constant value, this moves the current input digit from left to right. |
| ⑬ | [A_ZERO]/[ZERO] key | Sets the current value in Display A to 0.<br><br>**Tips**<br>• When setting a parameter, this advances the set value.<br>• When setting the tolerance, Preset, or optional constant value, this increases the value of the selected digit. |
| ⑭ | [B_ZERO] key | Sets the current value in Display B to 0.<br><br>**Tips**<br>When setting the tolerance, Preset, or optional constant value, this decreases the value of the selected digit. |

## 1.3.2　Rear Side of the Main Body
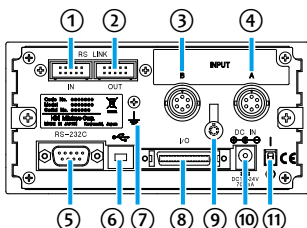
EH-102P (2-axis model)　　　　　　EH-101P (1-axis model)
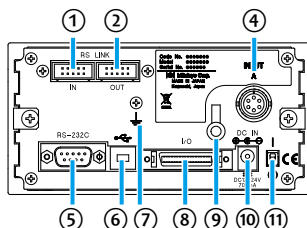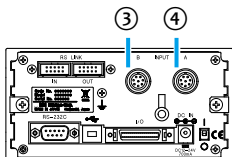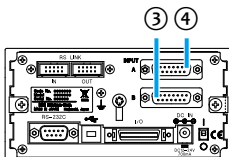


EH-102Z　　　　　　EH-102S　　　　　　EH-102D
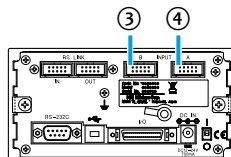


### Tips
The shape and position of the Linear Gage input connectors differ by model.

| Symbol | Name | Description |
|---|---|---|
| ① | RS_LINK connector (IN) | For connecting an RS LINK connection cable. Also used for the SENSORPAK dongle. |
| ② | RS_LINK connector (OUT) | For connecting an RS LINK connection cable. Also used for Digimatic output. |
| ③ | Linear Gage input connector B | For connecting a Linear Gage. The Linear Gage connected to this is referred to as INPUT B. |
| ④ | Linear Gage input connector A | For connecting a Linear Gage. The Linear Gage connected to this is referred to as INPUT A. |
| ⑤ | RS-232C connector | For connecting an RS-232C connecting cable. |
| ⑥ | USB connector | For connecting a USB connecting cable. |
| ⑦ | Grounding terminal | For connecting a grounding wire. |
| ⑧ | I/O connector | For connecting an I/O connecting cable. |
| ⑨ | Cable clamp | For securing the power cable. |
| ⑩ | DC jack | For connecting the AC adapter. |
| ⑪ | Power switch | For turning the power on and off. |

# 1.4    Operation Flow

The basic operation flow is explained below.
Do not omit the operations enclosed with a solid line. Perform the operations enclosed with a dashed line as necessary.

**Prep**

| Setup | 📖 "2 Setup" (page 7) |

| Set basic parameters | 📖 "3.2 Basic Parameters" (page 12) |

| Set advanced parameters | 📖 "3.3 Advanced Parameters" (page 14) |

**Measure**

| Prepare the workpiece (Prepare the master workpiece as necessary) | |

| Set the tolerance | 📖 "4.6 Tolerance Value Setting" (page 29) |

| Set the optional constant | 📖 "4.7 Optional Constant Value Setting" (page 32) |

| Zero setting/Preset | 📖 "4.3 Zero Setting" (page 26)<br>📖 "4.4 Preset" (page 27) |

| Normal measurement/Peak mode measurement | 📖 "4.5 Peak Mode Setting" (page 28) |

**Output**

| Result output | 📖 "5 External Input/Output Function" (page 35) |

**MEMO**

# 2    Setup

## 2.1    Unpacking

When unpacking for the first time, check that the following components are contained in the box.

| Name | Q'ty | Name | Q'ty |
|---|---|---|---|
| Linear Gage Counter (this product) | 1 | Stand | 1 |
| Washer (plain washer round, nominal diameter: 4) | 6 | Rubber foot | 4 |
| User's Manual (this document) | 1 | DC plug (MP-121M) | 1 |
| AC adapter | 1 | Warranty | 1 |
| AC cable | 1 | | |

### Tips

An AC adapter and AC cable are not supplied with code No. 542-07x-1.

## 2.2    Mounting

### 2.2.1    Mounting on a Panel

#### ■ Dimensions for the mounting holes in the panel

| Width (mm) | Height (mm) | Panel thickness (mm) |
|---|---|---|
| 138.5 to 139 | 68.3 to 68.7 | 1.0 to 3.2 |

#### ■ Panel mounting procedure

**1** Loosen the fixing bracket mounting screws (see the following figure), and then remove the fixing brackets.

**2** Insert the Counter main body from the front side of the panel.

**3** From the back of the panel, reattach the fixing brackets that you removed in step **1** to the Counter and secure them.

#### Tips

Refer to the table below and select the number of washers to use according to the thickness of the panel.

| Panel thickness (mm) | Number of washers |
|---|---|
| 1.0 to 1.3 | 0 |
| 1.4 to 1.7 | 1 |
| 1.8 to 2.5 | 2 |
| 2.5 to 3.2 | 3 |



Front side

Fixing brackets

Fixing bracket mounting screws

Washers

Rear side

*No. 99MBC109B*
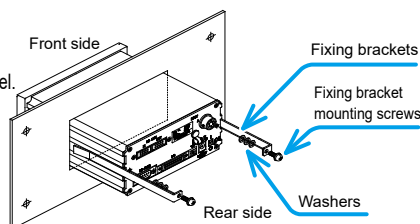
## 2.2.2    Placing on a Desk

### ■ Placing the Counter flat on a desk

Attach the supplied rubber feet (4 pieces) to the points marked by circles in the figure below to prevent slipping and to minimize vibration.

#### Tips

This product cannot be mounted in a panel with the rubber feet attached.
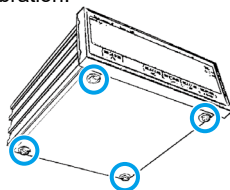
### ■ Placing the Counter at an incline

Using the fixing brackets, attach the supplied stand to the Counter. The procedure for attaching the supplied fixing brackets is the same as for mounting on a panel. Use 6 washers. "2.2.1 Mounting on a Panel" (page 7)

Fixing brackets

Stand (standard accessory)
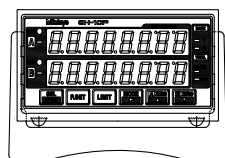
Rubber foot
(standard accessory)
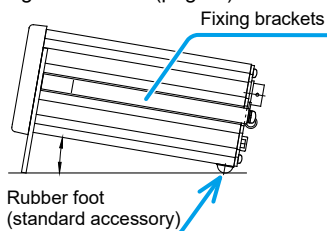
# 2.3    Connections

## 2.3.1    Power Source

Use the supplied AC adapter and the supplied AC cable. If you will not use the supplied AC adapter, prepare a DC power source (voltage: 12 V to 24 V, output current: 1 A or more) for each Counter. Solder the power cable to the terminals of the supplied DC plug as shown in the figure below.

#### Tips

If you use a commercial power source, use a power cable with a length of 30 m or shorter. Avoid outdoor wiring.

- V

+ V
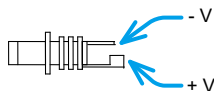
**NOTICE**

Never use this power source with other electric equipment that runs at a high voltage and/or large current.

## 2.3.2    Connecting Cables for External Equipment

You must supply USB, RS-232C, and I/O connector connecting cables for connecting external equipment.

Use a Mitutoyo-approved connecting cable for RS LINK connections.

### Tips

- For details about USB connecting cables, see 📖 "5.2 USB Communication Function" (page 35).

- For details about RS-232C connecting cables, see 📖 "5.3 RS-232C Communication Function" (page 36).

- For details about I/O connecting cables, see 📖 "5.5 I/O Connector Terminal Function" (page 42).

- For details about RS LINK, see 📖 "5.4 RS LINK Function" (page 40).

## 2.3.3    Connection Procedure

**NOTICE**

- Always turn off the power switch of this product while making connections.

- Do not run the power cable and Linear Gage connecting cable through a cable duct together with other power lines.

- Secure the power cable and connecting cables for external equipment to your equipment with a cable tie, cable holder, etc.

Be sure to connect this product to ground. If this product is not grounded, it will be more susceptible to electrical noise.

Make connections as shown in the figure below.
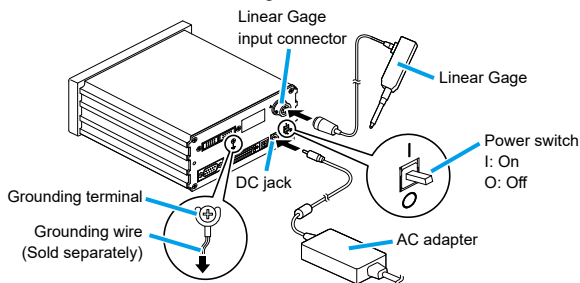
# 2.4    Operation Check

Check the cable connections with the following procedure to confirm that the connections are correct.

**1** Turn on the power switch.

» The Counter enters the stand-by state.

**2** Press [SEL]/[CE].

» The Counter changes to the Counter display.

### Tips

EH-102Z will enter the origin-detection waiting state. To change to the Counter display, push in the contact point of the Linear Gage to make it pass over the origin.

**3** Check that the counter value is shown on the Display.

**4** Check that the counter value on the Counter changes by moving the contact point of the Linear Gage up and down.

# 3   Setting Parameters

The settings of the Linear Gage that you will use, the display of the Counter, and external output are specified by setting parameters. Set parameters before you begin measuring.

2-axis models have 4 internal counters that are referred to as "CEL", and depending on the Display mode setting, 6 types of counter values can be specified for each CEL separately. For details, see 📖 "3.4 Details of Display Mode (2-axis Models Only)" (page 17).

## 3.1   Procedure for Setting Parameters

Parameters are set in Parameter mode. As an example, the procedure for using the Linear Gage with a resolution of 5 µm for EH-102P is explained.

**1** Turn on the power switch.

» The Counter enters the stand-by state.

**2** Press and hold [P.SET], and then press [A_ZERO]/[ZERO].

» The Counter enters Parameter mode.

Parameter number                    Set value

**3** Press [P.SET] repeatedly to advance the parameter number to 12.

» The current value of parameter number 12 of INPUT A will be displayed.
(Parameter number 12 sets the resolution.)

Parameter number    INPUT    Set value
number

**4** Repeatedly press [A_ZERO]/[ZERO] to set the set value to 1 (resolution: 5 µm).

» The value of INPUT A will be set to 1 (the Linear Gage resolution of INPUT A will be set to 5 µm).

Parameter number    INPUT    Set value
number

*11*

**5** Press [P.SET].

» The current value of parameter number 12 of INPUT B will be displayed.

### Tips

For 1-axis models, the parameter number will advance. Proceed to step **8**.

**6** Repeatedly press [A_ZERO]/[ZERO] to set the set value to 1 (resolution: 5 µm).

» The value of INPUT B will be set to 1 (the Linear Gage resolution of INPUT B will be set to 5 µm).

Parameter number    INPUT number    Set value
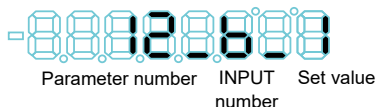
**7** Press [P.SET].

» The set value will be applied.

**8** Press and hold [P.SET], and then press [A_ZERO]/[ZERO].

» The Counter will return to the stand-by state.

# 3.2 Basic Parameters

This section explains the basic parameters related to measuring. Be sure to set these settings before measuring.

### Tips

• Correct measurement results may not be obtained if the settings are incorrect.
• The circles in the Counter model columns in the following table indicate whether a parameter number that is displayed on the Counter is valid or invalid (●: valid, ○: invalid).

| No. | Setting item | Description/Allowable values (the values in bold indicate the default value) | Counter model | | | |
|---|---|---|---|---|---|---|
| | | | **P** | **Z** | **S** | **D** |
| 00 | Parameter mode | Used for setting/saving/loading parameters or setting the optional constant value.<br><br>**0: Parameter setting**<br>1: CEL-specific parameter setting<br>2: Constant value setting<br>3: Save parameters<br>4: Load parameters | ● | ● | ● | ● |

| No. | Setting item | Description/Allowable values (the values in bold indicate the default value) | Counter model | | | |
|-----|--------------|------------------------------------------------------------------------------|---|---|---|---|
| | | | P | Z | S | D |
| 05 | Origin detection function | Selects whether the origin is restored when a Linear Gage with an origin point mark is connected.<br><br>**0: Disabled**　　　　　1: Enabled | ○ | ● | ○ | |
| 09 | Unit system selection | The unit for displayed values can be set to "mm" or "E units". E=1/25.4 mm. After the unit is set, the default value will not be restored even if the parameters are re-initialized.<br><br>**0: mm**<br>1: E 5/100,000 reading<br>2: E 1/10,000 reading<br>3: mm (E 1/10,000 reading when connecting. EH-D only) | ● | ● | ● | ● |
| 10 | Linear Gage output signal pitch*1 | Sets the signal pitch when connected to Linear Gages that output sine-waves. It can be set per axis.<br><br>0: 20 μm　　　　　　　1: 4 μm<br>**2: 0.25 μm** | | | | ● |
| 11 | Counter direction | Sets whether the numeral will increase or decrease when the spindle of the Linear Gage is pushed in. It can be set per axis.<br><br>**0: + direction**　　　　　1: - direction | ● | ● | ● | ● |
| 12 | Linear Gage resolution*1 | Sets the resolution of the Linear Gage that is to be connected to. It can be set per axis.<br><br>EH-P/Z　　　　EH-S*2　　　　　EH-D*3<br>0: 10 μm　　　0: 10 μm　　　　0: INC<br>1: 5 μm　　　　1: 5 μm　　　　**1: ABS**<br>**2: 1 μm**　　　2: 1 μm<br>3: 0.5 μm　　　3: 0.5 μm<br>4: 0.1 μm　　　4: 0.1 μm<br>5: 0.1 μm　　　5: 0.05 μm<br>(exclusive for　**6: 0.01 μm**<br>　542-711-1 and　7: 0.005 μm<br>　542-712-1)　　8: 0.001 μm | ● | ● | ● | ● |

*1 The Preset value and tolerance value that had been set will be cleared if the setting is changed.

*2 The setting range depends on the value set for parameter number 10.
　Parameter number 10 = 0: setting range 0 to 4
　Parameter number 10 = 1: setting range 2 to 6
　Parameter number 10 = 2: setting range 4 to 8

*3 Select "0: INC" when the Linear Gage that is to be connected to is an INC model. "0: INC" or "1: ABS" can be selected when the Linear Gage is an ABS model.
　When "0: INC" is selected:
　Match the counter value of both the Linear Gage and the Counter when starting up the Counter. Perform Zero setting, etc., on the Linear Gage side when performing measurement with the values matched.
　When "1: ABS" is selected:
　The Counter memorizes the origin (0 point) that was set at Counter startup. The origin that was memorized will be valid even if the Counter is re-started.

*13*

# 3.3    Advanced Parameters

This section explains the parameters related to the display, functions, and external output of the Counter. Configure the settings appropriate to your application.

## Tips

The circles in the Counter model columns in the following table indicate whether a parameter number that is displayed on the Counter is valid or invalid (●: valid, ○: invalid).

| No. | Setting item | Description/Allowable values (the values in bold indicate the default value) | P | Z | S | D |
|-----|--------------|------------------------------------------------------------------------------|---|---|---|---|
| 01 | Parameter initial-ization | If you set the value of this parameter to 1, the set values for all parameters, except for the unit setting, can be reset to their default values (initialized). Once this setting has been enabled, this parameter is reset so its set value is 0 (do not initialize). **0: Do not initialize**    1: Initialize | ● | ● | ● | ● |
| 02 | Key protect | Key operations can be disabled to prevent operation errors. **0: Key operation enabled**   1: Key operation disabled | ● | ● | ● | ● |
| 06 | Display mode selection*1 (2-axis models only) | Selects the UNIT (counting method) that is assigned to each CEL. The UNIT to be set can be selected as desired. For details, see 📖 "3.4.2 Details of Display Mode Selection (Parameter Number 06)" (page 18). | ● | ● | ● | ● |
| 07 | Display at startup | Selects stand-by state or Counter display (origin detection wait state for EH-102Z) to display at startup. EH-P/S/D                       EH-Z **0: [--------] display**      **0: [--------] display** 1: 0.000                              1: Origin detection wait state | ● | ● | ● | ● |
| 13 | μ decimal point display (2-axis models only) | If enabled, the decimal point will be displayed at the μm position. This is available if the Linear Gage reso-lution is 0.05 μm or less. Example: 0.001.00 (1 μm) **0: Not displayed**       1: Displayed | ● | ● | ● | ● |
| 14 | Sum/Difference calculation | Specifies the calculation method when Sum/Differ-ence calculation measurement (UNIT C) is selected in parameter number 06. For 1-axis models, this is not available. **0: A + B**                     1: A - B | ● | ● | ● | ● |

| No. | Setting item | Description/Allowable values (the values in bold indicate the default value) | Counter model P | Z | S | D |
|-----|--------------|------------------------------------------------------------------------------|-----------------|---|---|---|
| 15 | Smoothing | Averages the counter value and then displays it. (This reduces fluctuation of the lowest-order digit.) You can specify the number of measurements to average.<br><br>**0: None**<br>1: Display the average of 16 measurements<br>2: Display the average of 32 measurements | ● | ● | ● | ○ |
| 16 | Peak value Preset | Sets whether to perform presetting based on the peak value during Peak mode.<br><br>**0: Disabled**　　　　　　1: Enabled | ● | ● | ● | ● |
| 18 | Speed sampling cycle (EH-102P/Z/S only) | In Display mode selection, selects the sampling cycle when Speed display is selected.<br><br>**0: 0 ms**　　　　　　　　1: 50 ms<br>2: 100 ms | ● | ● | ● | |
| 19 | Digimatic input WAIT | Sets the wait time for the Digimatic input signal. Change this when the Counter cannot read the input signals from a Digimatic device.<br><br>**0: No WAIT**　　　　　　1: 100 ms WAIT<br>2: 200 ms WAIT | | | | ● |
| 20 | Tolerance output/ BCD output switchover*1 | Switches between tolerance judgment result output and BCD output.<br><br>**0: 3-step tolerance**　　　1: 5-step tolerance<br>2: BCD output | ● | ● | ● | ● |
| 21 | BCD output logic*1 | Selects whether to use positive logic (0) or negative logic (1) for BCD output.<br><br>**0: DATA [L] (sign H)**　　1: DATA [H] (sign L) | ● | ● | ● | ● |
| 24 | RS-232C/USB/ Digimatic output switchover*2 | Selects which output terminal to use.<br><br>**0: RS-232C**　　　　　　1: USB<br>2: Digimatic | ● | ● | ● | ● |
| 25 | Data transfer speed*2 | Selects the data transfer speed for RS-232C.<br><br>0: 4800 bps　　　　　　**1: 9600 bps**<br>2: 19200 bps | ● | ● | ● | ● |
| 26 | Parity check*2 | Selects the parity check method for RS-232C.<br><br>0: None　　　　　　　　1: Odd numbered<br>**2: Even numbered** | ● | ● | ● | ● |
| 27 | Data bit*2 | Selects the length of the data bit for RS-232C.<br><br>**0: 7 bit**　　　　　　　1: 8 bit | ● | ● | ● | ● |
| 28 | Output trigger*2 | Selects the output trigger method for RS-232C.<br><br>**0: RS-232C command (normal state)**<br>1: RS-232C command (with channel synchronization function)<br>2: HOLD trigger | ● | ● | ● | ● |

*15*

| No. | Setting item | Description/Allowable values (the values in bold indicate the default value) | Counter model | | | |
|---|---|---|---|---|---|---|
| | | | P | Z | S | D |
| 30 | Analog output range | Selects the range (resolution range) of the measurement of the analog output. <br><br>**0: 1999 to -1999**          1: 19990 to -19990 <br>2: 199900 to -199900 | ● | ● | ● | ● |
| 31 | Origin detection direction | When a Linear Gage with an origin mark is connected, selects the direction of the spindle of the Linear Gage for origin detection. It can be set per axis. <br><br>**0: + direction**          1: - direction | ○ | ● | | |
| 32 | Origin re-detection*3 | When a Linear Gage with an origin mark is connected, sets whether to wait for the origin to be detected without turning off the power in the case of an abnormal stop. <br><br>**0: Disabled**          1: Enabled | ○ | ● | | |
| 33 | Origin initialization (when the power switch is on) | When a Linear Gage with an origin mark is connected, initializes the origin when the power is on. After the initialization, the set value will be returned to 0 (do not initialize). <br><br>**0: Do not initialize**          1: Initialize | ○ | ● | | |

*1 The Preset value and tolerance value that had been set will be cleared if the setting is changed.

*2 Turn off the power switch after changing the setting. The setting will be applied when you turn on the power switch again.

*3 When the setting is enabled, the Counter will wait for the origin re-detection when the HOLD signal is raised. If the HOLD signal is input again during origin re-detection, the origin re-detection function will be canceled (except during error detection).

# 3.4 Details of Display Mode (2-axis Models Only)

## 3.4.1 Internal Structure of the Counter

2-axis models have 4 internal counters referred to as CEL (CEL1 to 4).

The counter values of CEL1 and CEL2 will be displayed as BANK1, and the counter values of CEL3 and CEL4 will be displayed as BANK2.

There are 6 types of counting methods (UNIT A to F). You can select which UNIT will be displayed in each CEL according to the Display mode setting.

### Tips

- For details about BANK, see 📖 "4.2 Switching the Displayed BANK (2-Axis Models Only)" (page 25).

- For details about Display mode selection, see 📖 "3.4.2 Details of Display Mode Selection (Parameter Number 06)" (page 18).

The relationships between BANK, CEL, and UNIT in the Counter are shown in the following figure.

The following figure shows an example of the Display mode set to Sum/Difference calculation measurement (A - B).
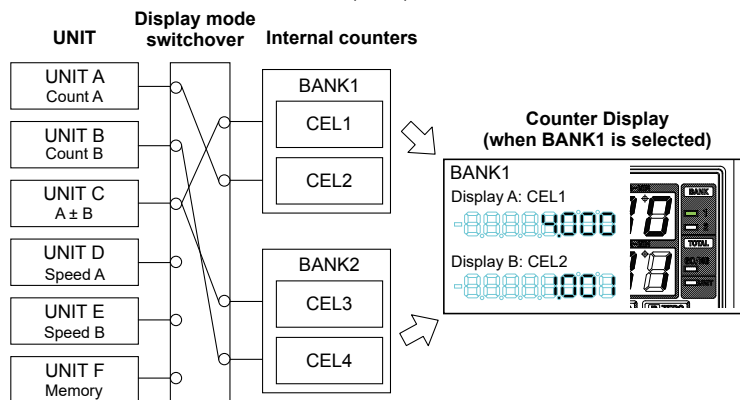
## 3.4.2 Details of Display Mode Selection (Parameter Number 06)

On 2-axis models, Display mode can be selected by setting parameter number 06 as follows:

| Set value | Display mode | BANK1 | | BANK2 | |
|---|---|---|---|---|---|
| | | CEL1 | CEL2 | CEL3 | CEL4 |
| 0 (Default value) | Coordinate display | UNIT A (Count A) | UNIT B (Count B) | UNIT A (Count A) | UNIT B (Count B) |
| 1 | Sum/Difference calculation display | UNIT C (A ± B) | UNIT A (Count A) | UNIT C (A ± B) | UNIT B (Count B) |
| 2 | Dual display | UNIT A (Count A) | UNIT A (Count A) | UNIT B (Count B) | UNIT B (Count B) |
| 3 | Memory display | UNIT A (Count A) | UNIT F (Memory) | UNIT B (Count B) | UNIT F (Memory) |
| 4 | Speed display | UNIT A (Count A) | UNIT D (Speed A) | UNIT B (Count B) | UNIT E (Speed B) |
| 5 | Optional display (1 CEL) | UNIT A to F | - | - | - |
| 6 | Optional display (2 CELs) | UNIT A to F | UNIT A to F | - | - |
| 7 | Optional display (4 CELs) | UNIT A to F | UNIT A to F | UNIT A to F | UNIT A to F |

### Tips

The Display mode also controls the number of output data for the external output function (Digimatic output and RS-232C output).

When setting up the system using the external output function, pay attention to the number of output data.

e.g. Selecting the setup value 1: Two selected BANK data are output with the Digimatic output; four data items are output by the displayed data output (GA00CRLF) with the RS-232C output.

Selecting the setup value 5: One selected BANK data is output with the Digimatic output; one data item is output by the displayed data output (GA00CRLF) with the RS-232C output.

### ■ Display mode types

### ● Coordinate display (set value: 0)

Displays 2 sets of coordinates using the BANK function.

### Tips

- The origin and tolerance can be set separately for INPUT A and INPUT B.
- For details about BANK switchover, see 📖 "4.2 Switching the Displayed BANK (2-Axis Models Only)" (page 25).

● Sum/Difference calculation display (set value: 1)

Displays the Sum/Difference calculation for thickness or step measurement.

### Tips

- Set sum (A + B) or difference (A - B) by parameter number 14.
- Connect Linear Gages that have the same resolution to INPUT A and INPUT B.

● Dual display (set value: 2)

In Peak mode measurement, the peak value and the counter value of one Linear Gage are displayed simultaneously. The peak value is displayed on Display A, and the counter value is displayed on Display B.
You can switch between INPUT A and INPUT B using the BANK function.

### Tips

- For details about peak value switchover, see 📖 "4.5.1 Procedure for Switching Peak Mode" (page 28).
- For details about BANK switchover, see 📖 "4.2 Switching the Displayed BANK (2-Axis Models Only)" (page 25).

● Memory display (set value: 3)

Saves the current value on Display A in Display B. In addition to the most recently saved data, the maximum value and the minimum value from past data can also be read out. The saved data will not cleared even if the power switch is turned off.

### Tips

- For details about the procedures for saving, reading out, and clearing memory, see 📖 "4.8 Registering, Reading Out, and Clearing the Memory" (page 34).
- The memory unit is shared between BANK1 and BANK2. Connect Linear Gages that have the same resolution.
- The B_HOLD signal can be used to write to or clear the memory externally.

● Speed display (set value: 4) (EH-102P/EH-102Z/EH-102S only)

Displays the moving speed of the Linear Gage's spindle simply.
In addition to the current speed, it displays the maximum speed when the maximum value (MAX) is selected in Peak mode.

### Tips

- Specify the speed sampling cycle by parameter number 18.
- The value is displayed in mm/sec. The display of the last 1 to 3 digits may be fixed depending on the speed sampling cycle.
- The maximum speed in the reverse direction is displayed when the minimum value (MIN) is selected in Peak mode.
- This type is not applicable to feedback control.

## ■ UNIT types (counting methods)

| UNIT | Description |
|---|---|
| UNIT A/B<br>(Count A/Count B) | The current value of INPUT A or INPUT B |
| UNIT C<br>(A ± B) | Sum or difference of the current values of INPUT A and INPUT B |
| UNIT D/E<br>(Speed A/Speed B) | The moving speed of the spindle of the Linear Gage for INPUT A or INPUT B |
| UNIT F<br>(Memory) | Memory storage of the current value of INPUT A or INPUT B |

# 3.5 CEL-Specific Parameters

Each parameter shown below is set separately for each CEL.

For examples of setting CEL-specific parameters, see 📖 "4.7 Optional Constant Value Setting" (page 32).

## Tips

- To set CEL-specific parameters, set 1 as the value for parameter 00. The parameter number will switch to parameter number 40 for 2-axis models, and to parameter number 41 for 1-axis models.
- The circles in the Counter model columns in the following table indicate whether a parameter number that is displayed on the Counter is valid or invalid (●: valid, ○: invalid).

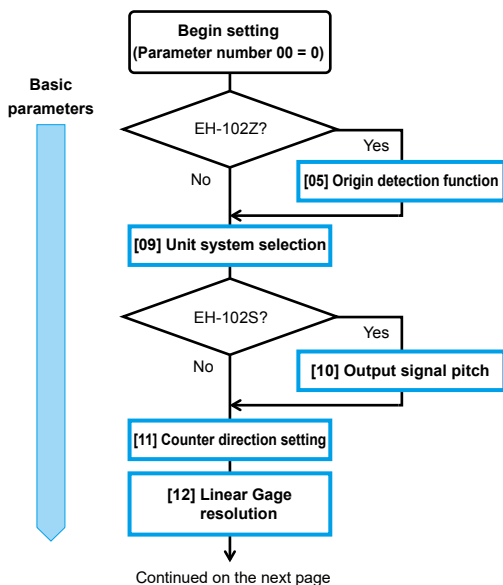| No. | Setting item | Description/Allowable values (the values in bold indicate the default value) | P | Z | S | D |
|-----|-------------|------------------------------------------------------------------------------|---|---|---|---|
| 40 | Individual CEL display*1 (2-axis models only) | Selects the UNIT (counting method) to be displayed for each CEL when Display mode is set to "Option". <br><br>0: UNIT A (Count A) <br>1: UNIT B (Count B) <br>2: UNIT C (A ± B) <br>3: UNIT D (Speed A) (except for EH-D) <br>4: UNIT E (Speed B) (except for EH-D) <br>5: UNIT F (memory) | ● | ● | ● | ● |
| 41 | Calculation with a constant | Sets whether to multiply the internal counter value by a predetermined value, by an arbitrary value, or to not multiply it. The value obtained by multiplying the internal counter value by the set constant value will be displayed as the measurement result. <br><br>**0: Do not calculate**     1: 1/2 times <br>2: 2 times     3: 10 times <br>4: Arbitrary value | ● | ● | ● | ● |
| 42 | Hide the lowest-order digit | Hides the lowest-order digit. However, the lowest-order digit will be included in RS-232C output and in printouts. <br><br>**0: Display all digits**     1: Hide the lowest-order digit | ● | ● | ● | ● |

*1 The Preset value and tolerance value that had been set will be cleared if this setting is changed.

# 3.6    Overview of Setting Parameters

This section gives an overview of setting parameters.

## Tips

- The following figure does not show the steps for setting parameters.
- When setting parameters, each time you press [P.SET], the parameter number will advance from 00. When the number advances to the last number, it then returns to 00.
- When 1 (CEL-specific parameters setting) is selected as the set value for parameter number 00, the parameter number will switch to parameter number 40 for 2-axis models, and to parameter number 41 for 1-axis models. When the parameter number advances to 42, it will return to 40 for 2-axis models, and to 41 for 1-axis models.
- Be sure to set the parameters enclosed within a solid line. Perform the parameter settings enclosed with a dashed line as necessary.

```
                    ┌─────────────────────┐
                    │   Begin setting     │
                    │(Parameter number 00 = 0)│
                    └─────────────────────┘
  Basic                       │
parameters                    ▼
                         ◇ EH-102Z? ◇─────── Yes ──┐
                            │                       ▼
                            No          ┌──────────────────────────┐
                            │           │[05] Origin detection function│
                            │           └──────────────────────────┘
                            ▼◄──────────────────────┘
                  ┌──────────────────────┐
                  │[09] Unit system selection│
                  └──────────────────────┘
                            │
                            ▼
                         ◇ EH-102S? ◇─────── Yes ──┐
                            │                       ▼
                            No          ┌──────────────────────┐
                            │           │[10] Output signal pitch│
                            │           └──────────────────────┘
                            ▼◄──────────────────────┘
                  ┌────────────────────────┐
                  │[11] Counter direction setting│
                  └────────────────────────┘
                            │
                            ▼
                  ┌──────────────────────┐
                  │  [12] Linear Gage    │
                  │     resolution       │
                  └──────────────────────┘
                            │
                            ▼
                  Continued on the next page
```
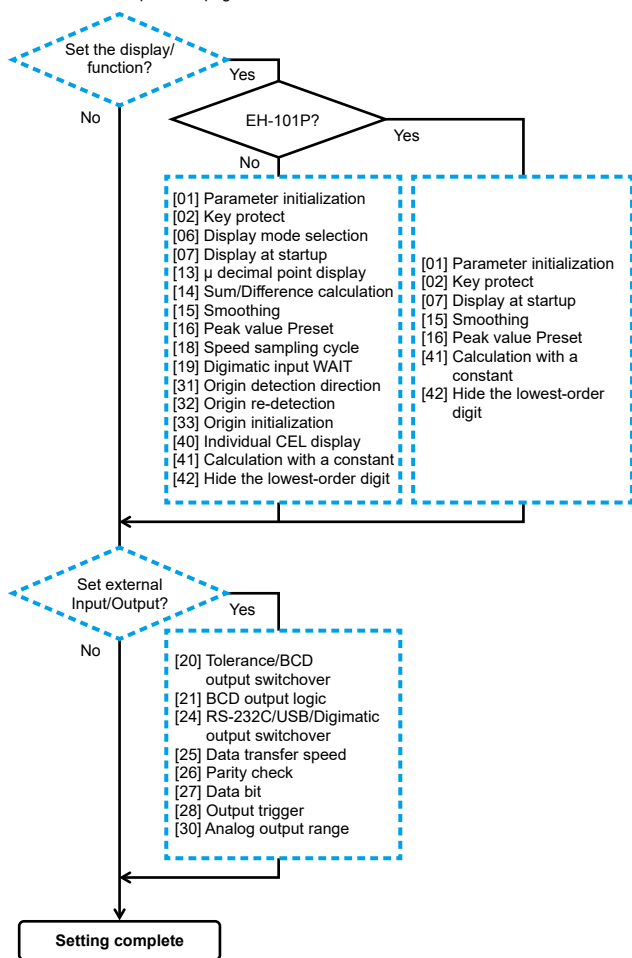
For details about basic parameters, see 📖 "3.2 Basic Parameters" (page 12).

Continued from the previous page

**Advanced/
CEL-specific
parameters**

Set the display/
function?

Yes

No

EH-101P?

Yes

No

[01] Parameter initialization
[02] Key protect
[06] Display mode selection
[07] Display at startup
[13] μ decimal point display
[14] Sum/Difference calculation
[15] Smoothing
[16] Peak value Preset
[18] Speed sampling cycle
[19] Digimatic input WAIT
[31] Origin detection direction
[32] Origin re-detection
[33] Origin initialization
[40] Individual CEL display
[41] Calculation with a constant
[42] Hide the lowest-order digit

[01] Parameter initialization
[02] Key protect
[07] Display at startup
[15] Smoothing
[16] Peak value Preset
[41] Calculation with a
constant
[42] Hide the lowest-order
digit

Set external
Input/Output?

Yes

No

[20] Tolerance/BCD
output switchover
[21] BCD output logic
[24] RS-232C/USB/Digimatic
output switchover
[25] Data transfer speed
[26] Parity check
[27] Data bit
[28] Output trigger
[30] Analog output range

**Setting complete**

For details about advanced parameters, see 📖 "3.3 Advanced Parameters"
(page 14).

For details about CEL-specific parameters, see 📖 "3.5 CEL-Specific
Parameters" (page 21).

**MEMO**

# 4    Basic Operations

## 4.1    Switching Between Display A and B (2-Axis Models Only)

You can select Display A (upper row) or Display B (lower row). For BANK1, Display A is selected to display CEL1 and Display B is selected to display CEL2. For BANK2, Display A is selected to display CEL3 and Display B is selected to display CEL4. For details about CEL, see 📖"3.4.1 Internal Structure of the Counter" (page 17).
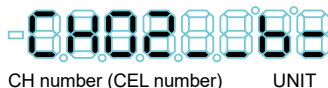
This section explains how to select Display A or B.

**1** Press and hold [SEL].

» The selected Display will blink (the example on the right shows the Display when Display A is assigned to UNIT A (Count A), Display B is assigned to UNIT B (Count B).

**Display A (upper row display): CEL1**

CH number (CEL number)          UNIT

**Display B (lower row display): CEL2**

CH number (CEL number)          UNIT

### Tips

• When calculation with a constant is set, the LED in the right-most digit will be [=], as shown in Display B.

• For EH-102D, all decimal points blink for about 8 seconds when an error is canceled.

**2** Perform step **1** again if the Display is not configured as you want.

## 4.2    Switching the Displayed BANK (2-Axis Models Only)

2-axis models have 4 internal counters that are referred to as "CEL" (CEL1 to 4). CEL1 and CEL2 will be displayed as BANK1, and CEL3 and CEL4 will be displayed as BANK2. The displayed BANK can be switched as necessary. For details about CEL, see 📖"3.4.1 Internal Structure of the Counter" (page 17). This section explains how to switch the displayed BANK.

**1** Press and hold [P.SET], and then press [MODE].

» The displayed BANK will be switched.

Display A: CEL1

Display B: CEL2

Display A: CEL3

Display B: CEL4
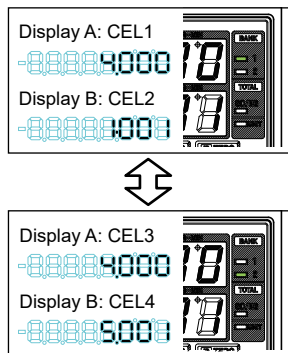
### Tips

The displayed BANK can also be switched by an external signal.

# 4.3 Zero Setting

The current value of the Counter can be set to 0 at any point within the Linear Gage measuring range. Zero setting can be performed separately for each CEL. This section explains how to perform Zero setting.

**1** If Peak mode measurement has been set, switch to normal measurement.

» The counter value will be displayed. (The figure on the right shows a counter value of 1.000.)

### Tips

For details about switching between Peak mode measurement and normal measurement, see 📖 "4.5 Peak Mode Setting" (page 28).

**2** Select the BANK for which you want to perform Zero setting.

### Tips

For details, see 📖 "4.2 Switching the Displayed BANK (2-Axis Models Only)" (page 25).

**3** Press [A_ZERO]/[ZERO] or [B_ZERO].

» The counter value will change to 0.

» The maximum and minimum values that were set in Peak mode will be cleared (MAX = MIN = current value, TIR = 0).

# 4.4　Preset

The current value of the Counter can be set to an arbitrary value at any point within the Linear Gage measuring range.

As an example, the procedure for presetting the datum to 10.000 mm is explained.

**1** Press and hold [SEL]. (For 1-axis models, proceed to step **2** .)

» The selected Display will blink.

### Tips

Each time you press [SEL], the blinking switches between Display A and Display B.
📖 "4.1 Switching Between Display A and B (2-Axis Models Only)" (page 25)

**2** Press [P.SET].

» The previous Preset value will be displayed (when the previous value is 10.000).

**3** Press [MODE].

» The input digit will shift to the right.

**4** Press [A_ZERO]/[ZERO] or [B_ZERO].

» The Preset value will be modified.

**5** Repeat steps **3** and **4** until you have set the desired Preset value.

**6** Press [P.SET].

» The Counter will return to the Counter display.

### Tips

To cancel the input, press [SEL]/[CE]. The Counter will return to the Counter display.

# 4.5    Peak Mode Setting

The maximum value, the minimum value, and TIR value are constantly calculated in the Counter. By switching the mode, you can display the counter value according to the intended application.

| Mode | Description |
|------|-------------|
| Normal measurement | Counts the movement (displacement) of the contact point of the Linear Gage, and then displays the counter value successively. |
| Max. hold measurement | Displays the maximum value (MAX) measured during the measurement. The display will not change until a new maximum value is measured. |
| Min. hold measurement | Displays the minimum value (MIN) measured during the measurement. The display will not change until a new minimum value is measured. |
| TIR measurement | Displays TIR value during the measurement = TIR (maximum value - minimum value). The display will not change until either a new maximum value or minimum value is measured. |

## 4.5.1    Procedure for Switching Peak Mode

This section explains how to switch Peak mode.

**1** Press and hold [SEL]. (For 1-axis models, proceed to step **2**.)

» The selected Display will blink.

### Tips

Each time you press [SEL], the blinking switches between Display A and Display B.
📖 "4.1 Switching Between Display A and B (2-Axis Models Only)" (page 25)

**2** Repeatedly press [MODE] until the desired mode is displayed.

» The mode will switch as follows:

| **Normal measurement** | **Maximum value** Hold measurement | **Minimum value** Hold measurement | **TIR measurement** |
|:---:|:---:|:---:|:---:|



## 4.5.2    Procedure for Clearing the Peak Value

This section explains how to clear the peak value in Peak mode.

**1** Press and hold [SEL]. (For 1-axis models, proceed to step **2**.)
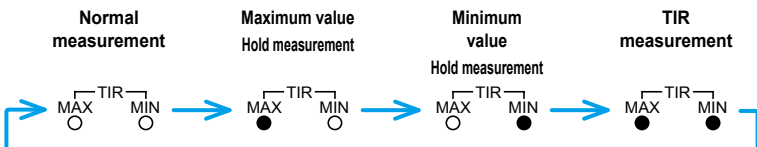
» The selected Display will blink.

### Tips

Each time you press [SEL], the blinking switches between Display A and Display B.
📖 "4.1 Switching Between Display A and B (2-Axis Models Only)" (page 25)

**2** Press [MODE].

» Peak mode will be set.

**3** Press [A_ZERO]/[ZERO] or [B_ZERO].

» The peak value will be cleared (MAX = MIN = current value, TIR = 0).

### Tips

• If the same UNIT (counting method) has been assigned to more than 1 CEL, the peak value of all of the CELs that are assigned the same UNIT (counting method) will be cleared when the peak value of one of the CELs is cleared.

• For details about the relationship between BANK, CEL, and UNIT, see 📖 "3.4.1 Internal Structure of the Counter" (page 17).

# 4.6    Tolerance Value Setting

There are 2 settings for the tolerance value: 3-step and 5-step.
The tolerance values can be set separately for each CEL.

### Tips

• Set the value of parameter number 20 to 0 (3-step tolerance) or 1 (5-step tolerance) in advance.

• For details about I/O output, see 📖 "5.5 I/O Connector Terminal Function" (page 42).

## 4.6.1    3-Step Tolerance Value Setting (3-Step Tolerance Zone Selection)

With S1 and S4 set as the tolerance values, the 3-step tolerance judgment will be performed as follows:

| Judgment conditions | Tolerance judgment indicator | I/O output (PIN number) |
|---|---|---|
| Measurement result < S1 | Amber indicator on | AL1 (3) / BL1 (11) |
| S1 ≤ measurement result ≤ S4 | Green indicator on | AL3 (5) / BL3 (13) |
| S4 < measurement result | Red indicator on | AL5 (7) / BL5 (15) |

This section explains how to set the 3-step tolerance value.

**1** Press and hold [SEL]. (For 1-axis models, proceed to step **2**.)

» The selected Display will blink.

### Tips

Each time you press [SEL], the blinking switches between Display A and Display B.
📖 "4.1 Switching Between Display A and B (2-Axis Models Only)" (page 25)

**2** Press [LIMIT].

> » The Tolerance judgment indicator will light in amber. (Tolerance value S1 will be selected.)

**3** Press [MODE].

> » The input digit will shift to the right.

$$-8008.000$$

**4** Press [A_ZERO]/[ZERO] or [B_ZERO].

> » The tolerance value will be modified.

**5** Repeat steps **3** and **4** until you have set the desired tolerance value.

**6** Press [LIMIT].

> » Tolerance value S1 will be applied.
> » The Tolerance judgment indicator will light in red. (Tolerance value S4 will be selected.)

**7** Set the tolerance value S4 in the same steps as in **3** to **5**.

**8** Press [LIMIT].

> » The tolerance value S4 will be applied, and the Counter will return to the Counter display.

### Tips

An error will occur unless S1 ≤ S4. Press [SEL]/[CE] to redo the input from S1.

## 4.6.2　5-Step Tolerance Value Setting (5-Step Tolerance Zone Selection)

With S1 to S4 set as the tolerance values, the 5-step tolerance judgment will be performed as follows:

| Judgment conditions | Tolerance judgment indicator | I/O output (PIN number) |
|---|---|---|
| Measurement result < S1 | Amber indicator on | AL1 (3) / BL1 (11) |
| S1 ≤ measurement result < S2 | Amber indicator blinks | AL2 (4) / BL2 (12) |
| S2 ≤ measurement result ≤ S3 | Green indicator on | AL3 (5) / BL3 (13) |
| S3 < measurement result ≤ S4 | Red indicator blinks | AL4 (6) / BL4 (14) |
| S4 < measurement result | Red indicator on | AL5 (7) / BL5 (15) |

This section explains how to set the 5-step tolerance value.

**1** Press and hold [SEL]. (For 1-axis models, proceed to step **2**.)

> » The selected Display will blink.

### Tips

Each time you press [SEL], the blinking switches between Display A and Display B.
📖"4.1 Switching Between Display A and B (2-Axis Models Only)" (page 25)

**2** Press [LIMIT].

» The Tolerance judgment indicator will light in amber. (Tolerance value S1 will be selected.)

### Tips

Tolerance values are set in the order S1, S2, S3, S4. The Tolerance judgment indicator displays as follows. (The tolerance value to be set will be selected.)

| Tolerance value | Tolerance judgment indicator | Tolerance value | Tolerance judgment indicator |
|---|---|---|---|
| S1 | Amber indicator on | S2 | Amber indicator blinks |
| S3 | Red indicator blinks | S4 | Red indicator on |

**3** Press [MODE].

» The input digit will shift to the right.

**4** Press [A_ZERO]/[ZERO] or [B_ZERO].

» The tolerance value will be modified.

**5** Repeat steps **3** and **4** until you have set the desired tolerance value.

**6** Press [LIMIT].

» Tolerance value S1 will be applied.
» The color of the Tolerance judgment indicator will change to the color of the tolerance value that is to be set next.

**7** Set the tolerance value in order for S2, S3, and S4 as explained in steps **3** to **6**.

» The tolerance values S2, S3, and S4 will be applied, and the Counter will return to the Counter display.

### Tips

An error will occur unless S1 < S2 < S3 < S4 or S1 = S2 = S3 = S4.

# 4.7    Optional Constant Value Setting

You can specify an internal counter (CEL1 to CEL4) to which a multiplication factor is applied and set the factor for the internal counter value.

If this function is used, the accuracy cannot be guaranteed.

### Tips

For EH-101P, there is only 1 internal counter (CEL).

## 4.7.1    Procedure for Specifying an Internal Counter

This procedure explains how to specify the internal counter (CEL1 to CEL4) to which a multiplication factor is applied.

**1** Press and hold [P.SET], and then press [A_ZERO]/[ZERO].

» The Counter enters Parameter mode.

**2** Press [A_ZERO]/[ZERO] once to set parameter number 00 to 1.

» The display appears as to the right.

**3** Press [P.SET].

» The parameter number will switch to 40.

### Tips

For 1-axis models, the parameter number will switch to 41. Proceed to step **5**.

**4** Repeatedly press [P.SET] to advance the parameter number to 41.

» The set value of parameter number 41 for CEL1 will be displayed.

Parameter number        CEL        Set value
number

### Tips

To specify another CEL, repeatedly press [P.SET]. The CEL number will advance.

**5** Repeatedly press [A_ZERO]/[ZERO] to set the set value to 4.

» The value will be set to 4. (The Constant value will be set to "Option".)

**6** Press and hold [P.SET], and then press [A_ZERO]/[ZERO].

» The Counter will return to the stand-by state.

## 4.7.2    Procedure for Setting the Desired Multiplication Factor

This section explains how to set the desired multiplication factor for the selected internal counter.

**1** Press and hold [P.SET], and then press [A_ZERO]/[ZERO].

» The Counter enters Parameter mode.

**2** Press [A_ZERO] / [ZERO] 2 times to set the parameter number 00 to 2.

» The display appears as to the right.

**3** Press [P.SET].

» The previous set value will be displayed in Display A, and the CEL number will be displayed in Display B. (The set value of CEL1 will be displayed as to the right.)

Display A

Display B

**4** Press [MODE].

» The input digit will shift to the right.

**5** Press [A_ZERO]/[ZERO] or [B_ZERO].

» The multiplication factor will be modified.

**6** Repeat steps **4** and **5** until you have set the desired multiplication factor.

### Tips

The setting range is ±9.99999.

**7** Press [P.SET].

» The multiplication factor for CEL1 is applied.
» The set value of the next CEL will be displayed.

**8** Set the desired multiplication factor in order for CEL2, CEL3, and CEL4 in as explained in **4** to **7**.

» The multiplication factors for CEL2, CEL3, CEL4 will be applied, and the Counter will return to the Counter display.

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# 4.8 Registering, Reading Out, and Clearing the Memory

The following procedures explain how to register, read out, and clear the memory.

### Tips

- This operation is available when the set value for parameter number 06 is 3 (memory display).
- When BANK1 is selected, the current value of INPUT A will be displayed on Display A. When BANK2 is selected, the current value of INPUT B will be displayed on Display A. For details about BANK switchover, see 📖 "4.2 Switching the Displayed BANK (2-Axis Models Only)" (page 25).

● Procedure to register the memory

**1** Press [B_ZERO].

 » The current value in Display A is stored in Display B.

● Procedure to read out the stored data

**1** Press and hold [SEL] to select Display B.

### Tips

For details, see 📖 "4.1 Switching Between Display A and B (2-Axis Models Only)" (page 25).

**2** Press [MODE] (switch to Peak mode).

 » Each time you press [MODE], the displayed memory value will cycle through maximum value → minimum value → TIR value.

● Procedure to clear the memory

**1** Press and hold [SEL] to select Display B.

### Tips

For details, see 📖 "4.1 Switching Between Display A and B (2-Axis Models Only)" (page 25).

**2** Press [P.SET].

 » The value in memory (maximum value/minimum value/TIR value) will be cleared, and then the current value in Display A will be displayed.

# 5     External Input/Output Function

This product is equipped with the following interfaces that enable the connection of external equipment.

| Interface | Parameter setting (No. 24) | Connectable equipment | Functions |
|-----------|---------------------------|----------------------|-----------|
| Digimatic output | 2 | Digimatic Mini-Processor (DP-1VR) | • Printing the measurement data, statistical calculation results, etc. |
| USB | 1 | PC (for SENSORPAK) | • Data output to a PC |
| RS-232C | 0 | PC, PLC | • Data output to a PC, PLC<br>• Control from external system |
| I/O connector | - | Equipment such as a switch or control unit | • Data output to PLC<br>• External control of Counter |

### Tips

PLC: programmable logic controller

## 5.1     Digimatic Output Function

You can print the measurement data by connecting to a Digimatic Mini-Processor (DP-1VR), which is sold separately. When connecting, connect the Digimatic cable to the RS_LINK connector (OUT) of the Counter.

### Tips

• A maximum of 6 digits can be printed. When Counter displays the value in 7 or 8 digits, the last 6 digits will be printed. For example, when "12.34567 mm", which has 7 digits, is output, it will be printed as "2.34567 mm".

• Set the DP-1VR to compatible mode. For details about the setting method and operations, see the User's Manual for DP-1VR.

## 5.2     USB Communication Function

By installing SENSORPAK (Mitutoyo product) on a PC, you can load measurement data from a Counter to the PC by connecting the Counter to the PC with a USB connecting cable (A-B type). A USB connecting cable is not supplied. You must provide one.

### Tips

• The USB port for communication with SENSORPAK.

• For details about SENSORPAK, see the SENSORPAK User's Manual.

# 5.3   RS-232C Communication Function

By connecting to a PC or PLC via RS-232C, you can load measurement data and manipulate various settings of the Counter through remote operation.
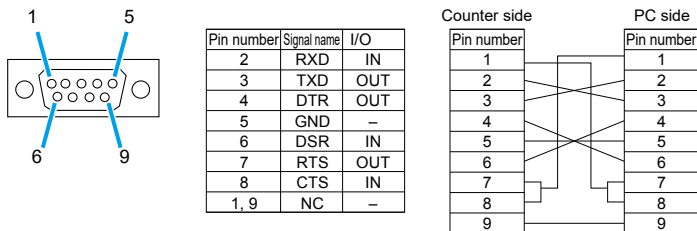
You can also save and load parameters.

## 5.3.1   Connections

### ■ Compatible plug and pin assignment

Compatible plug: D-sub 9-pin (female), inch screw type

Cable: A commercial RS-232C cross-type cable

| Pin number | Signal name | I/O |
|---|---|---|
| 2 | RXD | IN |
| 3 | TXD | OUT |
| 4 | DTR | OUT |
| 5 | GND | – |
| 6 | DSR | IN |
| 7 | RTS | OUT |
| 8 | CTS | IN |
| 1, 9 | NC | – |

Counter side / PC side

| Pin number | Pin number |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |

### ■ Communication specification (conforming to EIA RS-232C)

| Item | Description |
|---|---|
| Home position | DTE (Data Terminal Equipment), use a cross-type cable. |
| Communication method | Half-duplex, non-procedural mode |
| Data transfer speed | 4800 bps/9600 bps/19200 bps |
| Bit configuration | Start bit: 1<br>Data bits: 7 bits/8 bits (ASCII code, upper-case characters)<br>Parity: None/Even parity/Odd parity<br>Stop bit: 2 |

### Tips

- Set communication conditions using parameters.
  For details, see 📖 "3.3 Advanced Parameters" (page 14).
- Use commercial terminal software for communication with a PC.

## 5.3.2　Communication Commands

This section explains the command format from a PC or PLC, output from the Counter, and operation details.

| Command format | Corresponding output | Operation details | Notes |
|---|---|---|---|
| GA**CRLF | G#**, +01234.567CRLF | Outputs "Display value" | See *1 |
| CN**CRLF | CH**CRLF | Switches the display to "Current value" | See *2 |
| CX**CRLF | CH**CRLF | Switches the display to "Maximum value" | See *2 |
| CM**CRLF | CH**CRLF | Switches the display to "Minimum value" | See *2 |
| CW**CRLF | CH**CRLF | Switches the display to "TIR" | See *2 |
| CR**CRLF | CH**CRLF | Zero setting | |
| CL**CRLF | CH**CRLF | Clears the peak value | |
| CP**,+01234567CRLF | CH**CRLF | Inputs the Preset value | See *3 |
| CD**,+01234567CRLF | CH**CRLF | Inputs tolerance value S1 | See *3 |
| CE**,+01234567CRLF | CH**CRLF | Inputs tolerance value S2 | See *3 |
| CF**,+01234567CRLF | CH**CRLF | Inputs tolerance value S3 | See *3 |
| CG**,+01234567CRLF | CH**CRLF | Inputs tolerance value S4 | See *3 |
| CS**CRLF | CH**CRLF | Clear error | |
| CK**CRLF | CH**,%CRLF | Checks the HOLD status | See *4, *5 |

*1 "**" denotes an RS-232C Linear Gage channel number (01 to 99) ("00" means all channels). Channels 01 to 04 correspond to CEL1 to CEL4, respectively.
   A "#" after "G" in the output data denotes the type of data (N: Current value, X: Maximum value, M: Minimum value, W: TIR).

*2 If Peak mode is switched using an RS command, data will not be backed up in internal memory.

*3 For the Preset value and tolerance value, enter a value consisting of a +/- sign and an 8-digit of numeric value without a decimal point.
   Perform the tolerance setting in the order CD command → CG command for 3-step tolerance, and in the order CD command → CE command → CF command → CG command for 5-step tolerance.
   An error will be output in the following cases. In this case, redo the settings from the CD command.
   ・If the order of the tolerance values is incorrect
   ・If the step count and sent data are different
   ・If incorrect data is sent

*4 The response output from the CK command ("%") shows the HOLD status.
   %=0: Normal status/1: HOLD status

*5 If parameter number 28 is 1 (channel synchronization), all Counters that are connected via RS LINK when the CK command is sent will switch to the HOLD state.
   The HOLD state will be canceled by reading out data with the GA command.
   The CK command is valid only with channel number 1 (CK01CRLF).

**Tips**

- CRLF means CR (carriage return) plus LF (line feed).
- The output when an error occurs is "CH**,Error$$CRLF". $$ is the error code. For details, see 📖 "6.2.1 List of Error Codes" (page 50).
- After you have received a response output corresponding to the command, send the next command. If there is no response from your command, clear the communication buffer, wait 1 second or more, and then send the command again.
- The RS communication function will be suspended during key operation (e.g., setting parameters, the Preset value, or tolerance values). Command and data output operations will resume when the Counter returns to a state where counting is possible.
- To cancel the stand-by state, use "CS00CRLF" (all channels specified).

# 5.3.3    Saving and Loading Parameters

The set parameter data can be output to a PC and then saved to a text file. The data saved to a PC can also be loaded.

This section explains how to store parameters.

**Tips**

To communicate with a PC, you must have appropriate communication software on the PC. Use commercial terminal software.

## ■ Saving parameters

**1** Press and hold [P.SET], and then press [A_ZERO]/[ZERO].

» The Counter enters Parameter mode.

**2** Press [A_ZERO]/[ZERO] 3 times to set the parameter number 00 to 3.

**3** Press [P.SET].

» The display to the right appears for 1 second, and then the data is output to the PC.

» After the data is transmitted, the Counter returns to the stand-by state.

**Tips**

- Transmission conditions (fixed): 9600 bps, 7-bit data, even parity, 2-bit stop bits
- Connect the Counter to the PC one-to-one (LINK connection not permitted).
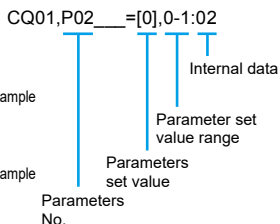
● Example of external output of parameters

An example of the output of parameters is shown below.

### Tips

The set values for the parameters in the table below are set by the user.

```
CQ01,**EH-S [200]**:00
CQ01,P02___=[0],0-1:02
CQ01,P05___=[0],0-1:03
          ┊
CQ01,P10_A_=[0],0-1:36    } Per-axis
CQ01,P10_B_=[0],0-1:37    } parameter example

CQ01,P40_1_=[0],0-4:42    } Per-CEL
CQ02,P40_2_=[0],0-4:43    } parameter example
CQ03,P40_3_=[0],0-4:44
CQ04,P40_4_=[0],0-4:45
          ┊
CQ01,*parameter END*:FF
```

CQ01,P02___=[0],0-1:02

Internal data

Parameter set value range

Parameters set value

Parameters No.

## ■ Loading parameters

This section explains how to read parameters.

**1** Press and hold [P.SET], and then press [A_ZERO]/[ZERO].

» The Counter enters Parameter mode.

**2** Press [A_ZERO]/[ZERO] 4 times to set the parameter number 00 to 4.

**3** Press [P.SET].

» The display appears as to the right.

**4** Send the parameter file from the PC.

» If it is successfully received, the display to the right will appear.

**5** Press [P.SET].

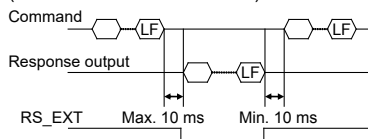» The Counter will return to the stand-by state.

### Tips

After loading the parameters, turn off the power switch once, and then turn it on again.

## 5.3.4    Timing Chart

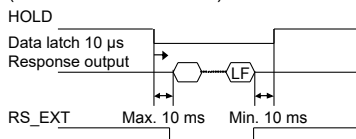**RS-232C command input and response output**

(Parameter number 28: 0 or 1)

Command



Response output

RS_EXT          Max. 10 ms          Min. 10 ms

**HOLD input and response output**

(Parameter number 28: 2)

HOLD

Data latch 10 µs
Response output

RS_EXT          Max. 10 ms          Min. 10 ms

### Tips

- RS output will be suspended during command operation.
- While the HOLD trigger is selected, the RS-232C commands are disabled.
- When connected via RS LINK, RS_EXT of the last Counter is active.
- For EH-102D, the time up to the data latch depends on the type of the Linear Gage.

# 5.4    RS LINK Function

With PC (including SENSORPAK) or PLC control, you can control a maximum of 10 Counters using the RS LINK function.

## 5.4.1    Connections

Connect between IN and OUT of the RS_LINK connectors as shown in the following figure.
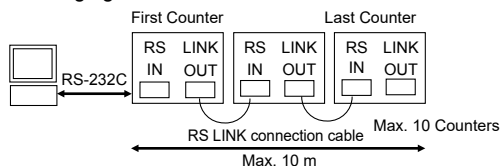


### Tips

- When using SENSORPAK, you can connect to a PC using USB 2.0.
- Do not connect anything to the RS_LINK connector (IN) of the first Counter or to the RS_LINK connector (OUT) of the last Counter.
- When the power switch is turned on and the settings are initialized, the channel number of the Linear Gages will be automatically assigned 01, 02, and 03 from the first Counter in the order in which they are connected.
- Contact Mitutoyo if you wish you connect 10 or more Counters or use a total cable length of 10 m or more.
- For about the RS LINK connection cable, see 📖 "7.3 Option" (page 54).

*40*

■ Precautions for startup

- Either turn on the power switch of all Counters simultaneously or turn on the power switch of each Counter sequentially, beginning with the first Counter.
- After startup, [- - - - -] will blink, and then, after the initial settings have completed, the Counter enters the stand-by state, where [- - - - -] is displayed. This state can be canceled using [SEL]/[CE], an external HOLD signal, or an RS command.

### Tips

For details, see 📖 "6.2.1 List of Error Codes" (page 50).

- Parameters relating to RS-232C (No. 25 to 28) can be modified only on the first Counter. If you modify a parameter, reset the power switch of all connected Counters.

## 5.4.2    RS-232C Data Output Duration

The maximum output duration of the command to output all data (GA00CRLF) can be calculated with the following formula:

Maximum output duration [ms] = Number of connected Counters × 5 + Number of connection channels × 17 (8.5) + 6 (3)

### Tips

Transmission rate is 9600bps. The values enclosed in ( ) show the case of 19200 bps.

Calculation example:

1 EH-102 + 1 Linear Gage channel = Max. 28 (16.5) ms
10 EH-102 + 20 Linear Gage channels = Max. 396 (223) ms

### Tips

Processing time of the PC is not included.

# 5.5 I/O Connector Terminal Function

Through the I/O connector, the signal of tolerance judgment results, measurement data, etc can be output to an external device. You can also switch the displayed BANK, switch Peak mode, activate the Preset function, clear the peak value, etc., by an external signal input.
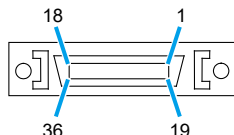
## 5.5.1 Connections

### ■ Compatible plug and pin assignment

Compatible plug:

- Option No. 02ADB440 (plug and cover set)
- Commercial plug 10136-3000PE (3M), cover 10336-52A0-008 (3M)
- Commercial plug DX40M-36P (HIROSE), cover DX30M-36-CV (HIROSE)

Cable: Use shielded wires and limit the connecting cable length to 3 m or less.



| Pin number | I/O | Tolerance judgment output mode | | BCD output mode | |
|---|---|---|---|---|---|
| | | Name | Functions | Name | Functions |
| 1, 2 | - | COM | Internally connected to GND | COM | Internally connected to GND |
| 3 | O | AL1 | INPUT A: Tolerance judgment result output for Display A<br>• Relevant terminal output: "L"<br>• Output on error:<br>AL1, AL5: "L"<br>AL2, AL3, AL4: "H" | A_bit0 | INPUT A: Data for Display A |
| 4 | O | AL2 | | A_bit1 | |
| 5 | O | AL3 | | A_bit2 | |
| 6 | O | AL4 | | A_bit3 | |
| 7 | O | AL5 | | A_SIGN | |
| 8 | I/O | ALLGO | Total tolerance judgment result output<br>GO (OK): "H"<br>NG: "L" | READY | Data valid: "L" |
| 9 | O | RS_EXT | RS output in process: "L" | | |
| 10 | O | NOMAL | Output when counting is possible: "L", Output on error: "H" | | |
| 11 | O | BL1 | INPUT B: Tolerance judgment result output for Display B<br>• Relevant terminal output: "L"<br>• Output on error:<br>BL1, BL5: "L"<br>BL2, BL3, BL4: "H" | B_bit0 | INPUT B: Data for Display B |
| 12 | O | BL2 | | B_bit1 | |
| 13 | O | BL3 | | B_bit2 | |
| 14 | O | BL4 | | B_bit3 | |
| 15 | O | BL5 | | B_SIGN | |
| 16 to 21 | - | - | Not connected | | |
| 22 | O | A_ANG | INPUT A analog output | | |

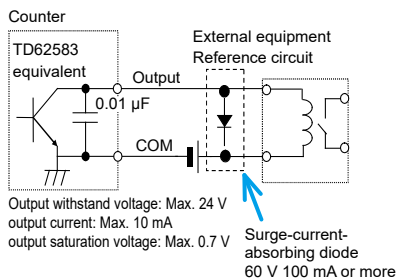| Pin number | I/O | Tolerance judgment output mode | | BCD output mode | |
|---|---|---|---|---|---|
| | | Name | Functions | Name | Functions |
| 23 | O | B_ANG | INPUT B analog output | | |
| 24 | - | AGND | GND for analog | | |
| 25 | I | SET1 | Input the set value with SET in advance, then assign with MODE, DISP. | | |
| 26 | I | SET2 | | | |
| 27 | I | SET3 | | | |
| 28 | I | DISP | Specify BANK for display: In combination with SET | | |
| 29 | I | MODE | Peak switchover: In combination with SET | | |
| 30 | I | BCDCK | Specify BCD output: In combination with SET | | |
| 31 | I | EXTTRG | USB trigger | | |
| 32 | I | A_HOLD | INPUT A HOLD (Display A: HOLD) | | |
| | | | During input, the decimal point will blink. | | |
| 33 | I | B_HOLD | INPUT B HOLD (Display B: HOLD) | | |
| | | | During input, the decimal point will blink. | | |
| 34 | I | HOLD | HOLD/Error cancel input | | |
| | | | During input, the UNIT Indicator will blink. | | |
| 35 | I | PA | INPUT A: Display A Preset/Peak clear (in Peak, HOLD mode) | | |
| 36 | I | PB | INPUT B: Display B Preset/Peak clear (in Peak, HOLD mode) | | |

## Tips

- The functions with "INPUT B" written in function field are available for 2-axis models only.
- "I/O" refers to the first letters of "Input/Output" respectively. Refer to the input circuit for "I", and the output circuit for "O".
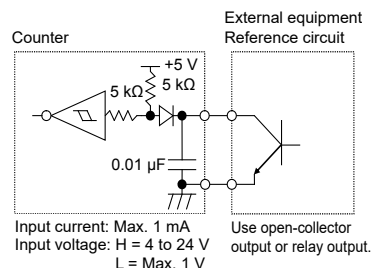
## ■ Input/Output circuit

### Output circuit

Transistor is on when the output is "L" (open collector).

Counter

TD62583 equivalent

Output

0.01 µF

COM

External equipment Reference circuit

Output withstand voltage: Max. 24 V
output current: Max. 10 mA
output saturation voltage: Max. 0.7 V

Surge-current-absorbing diode
60 V 100 mA or more

### Input circuit

Input is valid when the input voltage is "L".

Counter

+5 V

5 kΩ    5 kΩ

0.01 µF

External equipment Reference circuit

Input current: Max. 1 mA
Input voltage: H = 4 to 24 V
L = Max. 1 V

Use open-collector output or relay output.

**NOTICE**

When using relays, incorporate a surge-current-absorbing diode or a protective circuit. If no protection is incorporated, the IC in the Counter may be damaged.

*43*

# 5.5.2    Output Function

## ■Output of total tolerance judgment result

On 2-axis models, you can output the Total Judgment result of both INPUT A and INPUT B and the Total Judgment result of multiple Counters when multiple Counters are connected.
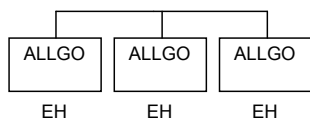


| Judgment | Total Judgment indicator | External output ALL_GO |
|---|---|---|
| All Counters OK | Green | H |
| All or some Counters NG | Amber | L |
| Error | Red | L |

### Tips

- To enable this function, select 0 or 1 as the set value of parameter number 20.
- For the Total Judgment across multiple Counters, wire the number 8 pins (ALLGO: total tolerance judgment result output) together.
- For USB output, the Total Judgment indicator lights in amber in normal conditions and in red when an error has occurred. Perform the total tolerance judgment with SENSORPAK (optional software).
- For BCD output, the Total Judgment indicator lights in amber in normal conditions and in red when an error has occurred.
- For details about the timing chart, see 📖 "5.5.4 Timing Chart" (page 46).

## ■BCD output

Outputs measurement data in BCD format. Measurement data from INPUT A and INPUT B is output simultaneously in 4-bit units beginning with the last digit. An overview of the data format is as follows.
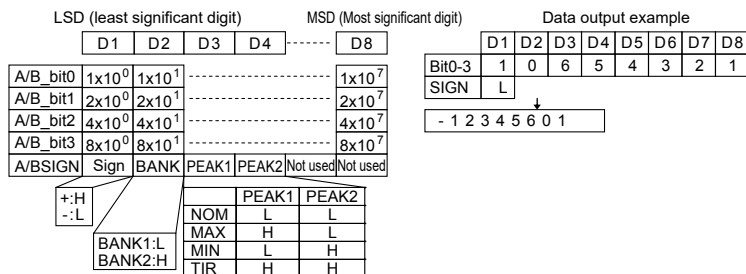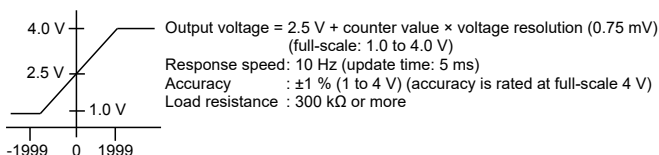
### Tips

- To enable this function, select the set value 2 (BCD output) of parameter number 20 (tolerance/BCD output mode switching).
- It is possible to invert the SIGN/BANK/PEAK/DATA output logic by setting parameter number 21 (logic selection) to 1 (H).
- For details about the timing chart, see 📖 "5.5.4 Timing Chart" (page 46).

## ■ Analog output

Movement of the spindle of a Linear Gage can be monitored as linear voltage by measuring the voltage between terminals with a pen recorder or oscilloscope.

INPUT A: Pin numbers 22–24

INPUT B: Pin numbers 23–24

Output voltage = 2.5 V + counter value × voltage resolution (0.75 mV)
(full-scale: 1.0 to 4.0 V)
Response speed: 10 Hz (update time: 5 ms)
Accuracy       : ±1 % (1 to 4 V) (accuracy is rated at full-scale 4 V)
Load resistance : 300 kΩ or more

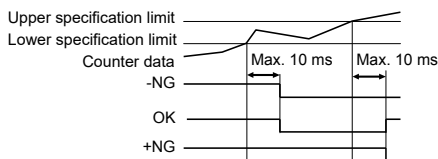| parameters | Measurement range [mm] (range resolution [mm]) | | |
|---|---|---|---|
| No. 30 | 10 μm gage | 1 μm gage | 0.1 μm gage |
| 0 | ±19.99 (0.01) | ±1.999 (0.001) | ±0.1999 (0.0001) |
| 1 | ±199.90 (0.1) | ±19.990 (0.01) | ±1.9990 (0.001) |
| 2 | ±1999.00 (1) | ±199.900 (0.1) | ±19.9900 (0.01) |

# 5.5.3    Input Function

With an external signal input, you can switch the BANK, switch Peak mode, activate the Preset function, clear the peak value, set the memory, and clear the memory. You can also activate a HOLD on the counter values of INPUT A and INPUT B either separately or simultaneously.

### Tips

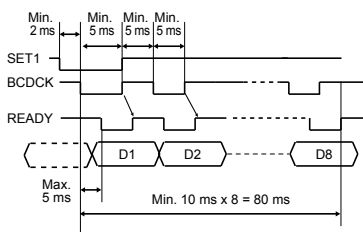For details about the timing chart, see 📖 "5.5.4 Timing Chart" (page 46).

# 5.5.4    Timing Chart

## ■Tolerance judgment result output

Upper specification limit
Lower specification limit
Counter data
Max. 10 ms    Max. 10 ms
-NG
OK
+NG

### Tips

- After acquiring the counter data, there is a maximum 10 ms delay before the tolerance judgment result is output.
- For EH-102D, the length of time until the tolerance judgment result is output after the counter data enters in the Specification range depends on the connected equipment, such as the Linear Gage.

## ■BCD output

Min. 2 ms    Min. 5 ms    Min. 5 ms    Min. 5 ms
SET1
BCDCK
READY
D1    D2    D8
Max. 5 ms
Min. 10 ms x 8 = 80 ms

### Tips

- "SET1" and "BCDCK" (BCD clock) denote input signals, and "READY" denotes the output signal.
- The BCD data (D1, D2 in the figure above) will be modified at the fall of the BCD clock while SET1 is input. When the BCD data is accepted, the READY signal falls. The time to accept the data after the fall of the BCD clock is 5 ms maximum. The READY signal rises together with the BCD clock.

# ■ External signal input
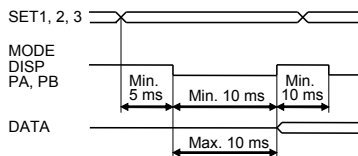


Refer to the following table to set the SET signal.

After setting, leave a gap of 5 ms or more, and then input the input signal of the function to change for at least 10 ms.

The data will be modified within 10 ms after the fall of the input is confirmed.

**DISP (pin number 28):**
**Switching the displayed BANK**

|       | SET3 | SET2 | SET1 |
|-------|------|------|------|
| BANK1 | H    | H    | H    |
| BANK2 | H    | H    | L    |

**PA/PB (pin numbers 35, 36):**
**Preset, Peak clear**

|            | SET3 | SET2 | SET1 |
|------------|------|------|------|
| Preset     | H    | H    | H    |
| Peak clear | H    | H    | L    |

**MODE (pin number 29):**
**Switching Peak**

|       | SET3 | SET2 | SET1 |
|-------|------|------|------|
| NOMAL | H/L  | H    | H    |
| MAX   | H/L  | H    | L    |
| MIN   | H/L  | L    | H    |
| TIR   | H/L  | L    | L    |

**A/B_HOLD (pin numbers 32, 33):**
**Setting/Clearing memory**

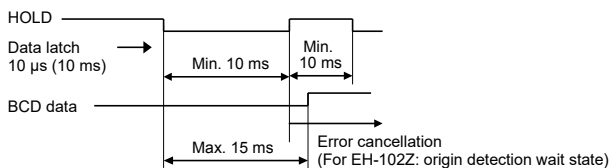|                 | SET3 | SET2 | SET1 |
|-----------------|------|------|------|
| Setting memory  | H    | H    | H    |
| Clearing memory | H    | H    | L    |

## Tips

- During Peak mode, the peak value will be cleared when you input the PA/PB signal while HOLD is being input.
- When switching Peak, SET3 is: H for channel 1, L for channel 2.
- A/B_HOLD signal is available when the relevant channel is UNIT F (memory unit).

# ■ HOLD/Error reset



HOLD

Data latch
10 μs (10 ms)

Min. 10 ms

Min.
10 ms

BCD data

Max. 15 ms

Error cancellation
(For EH-102Z: origin detection wait state)

## Tips

• The data latch function and error cancellation function are assigned to the HOLD signal.

• The data latch function will be executed 10 μs (or 10 ms when the HOLD input is active axis by axis) after the fall of the HOLD signal. The error cancellation will be executed with the rising HOLD signal.

• When outputting BCD data, start the data output within 15 ms after the data latch.

• For EH-102D, the length of time until the data latch depends on the connected equipment, such as a Linear Gage.

• During HOLD input, the UNIT indicator will blink.

# 6 Troubleshooting

## 6.1 Troubleshooting

When the Counter does not operate as expected, refer to the cause of the trouble and the solutions shown below:

| Problem | Cause | Solution |
|---------|-------|----------|
| The counter value is incorrect (not counting). | Parameters are not correctly set for the type of the Linear Gage, etc. | Set correct parameters. For details, see 📖 "3.2 Basic Parameters" (page 12). |
| | Peak mode (MAX or MIN is lit) is active. | Cancel Peak mode. For details, see 📖 "4.5.1 Procedure for Switching Peak Mode" (page 28). |
| | The HOLD signal (UNIT is blinking) is being input. | Check the external input. |
| | Calculation with a constant function is set. | Cancel calculation with a constant function. (Set parameter number 41 to 0.) |
| Cannot execute Zero setting. | Peak mode is active. | Cancel Peak mode. For details, see 📖 "4.5.1 Procedure for Switching Peak Mode" (page 28). |
| Cannot establish RS-232C communication. | The RS-232C connecting cable is not properly connected. | Check the cable connection. |
| | RS-232C mode is not active. | Activate RS-232C mode. (Set parameter number 24 to 0.) |
| | The command or HOLD trigger setting is not appropriate. | Check the command or HOLD trigger setting (parameter number 28). |
| | The communication conditions are not set correctly. | Check the settings of the communication conditions. For details, see 📖 "3.3 Advanced Parameters" (page 14). |

# 6.2    Error Messages

## 6.2.1    List of Error Codes

| Display/ Total tolerance indicator | RS-232C output | NOM signal | Tolerance/ BCD | Cause | Solution/ Error cancellation method |
|---|---|---|---|---|---|
| Error 10 Red indicator on | Error_10 | H | L1 = L L5 = L FFFF10 | Abnormal power voltage | Connect to the specified voltage. |
| | | | | | Automatic cancellation |
| [----] blinks — | — | H | L1 = H L5 = H — | RS link is in its initial setting state | Re-check the RS LINK connection cable connection. |
| | | | | | Automatic cancellation, or turn on the power switch again. |
| [--------] Red indicator on | Error_15 | H | L1 = L L5 = L FFFF15 | In stand-by state after power- on or a power interruption | Re-check the power if a power interruption has occurred. • [SEL]/[CE] • CS00CRLF (RS) • HOLD input (I/O) |
| Error 20 Red indicator on | Error_20 | H | L1 = L L5 = L FFFF20 | Excess speed | Revise the measurement conditions. • [SEL]/[CE] • CS00CRLF (RS) • HOLD input (I/O) |
| Error 30 Red indicator on | Error_30 | H | L1 = L L5 = L FFFF30 | Counter value is 8 digits or more | Modify the Preset value. • [SEL]/[CE] • CS00CRLF (RS) • HOLD input (I/O) |
| Error 40 Red indicator on | Error_40 | H | L1 = L L5 = L FFFF40 | Linear Gage malfunction or excess speed | • Check the Linear Gage connection. • Revise the measurement conditions. • [SEL]/[CE] • CS00CRLF (RS) • HOLD input (I/O) |
| Counter value — | Error_50 | L | Counter value status Counter value status | RS communication setting malfunction | Set the RS communication conditions again. |
| | | | | | Automatic cancellation |
| Counter value — | Error_52 | L | Counter value status Counter value status | RS command malfunction | Revise the RS command. |
| | | | | | Automatic cancellation |

| Display/ Total tolerance indicator | RS-232C output | NOM signal | Tolerance/ BCD | Cause | Solution/ Error cancellation method |
|---|---|---|---|---|---|
| Error 55 Red indicator on | — | H | L1 = L L5 = L FFFF55 | RS LINK malfunction, HOLD trigger malfunction | Check the unit's connection status, I/O connector connection circuit, and power, etc. Turn on the power switch again. |
| Error 70 Red indicator on | Error_70 | H | L1 = L L5 = L FFFF70 | Wrong resolution for calculation axis | Revise the measurement conditions. Automatic cancellation |
| Error 80 Red indicator on | Error_80 | H | L1 = L L5 = L FFFF80 | Peak detection error (Excess speed) | Revise the measurement conditions. • [SEL]/[CE] • CS00CRLF (RS) • HOLD input (I/O) |
| Error 90 — | Error_90 | L | Counter value status Counter value status | Tolerance value setting error | Input the tolerance value again. [SEL]/[CE] |
| Error 95 — | Normal output | L | Counter value status Counter value status | Key protect | Cancel the key protection parameters. Automatic cancellation |

## Tips

- In the "Solution/Error cancellation method" column, "RS" denotes an RS232C command and "I/O" denotes an external HOLD signal.
- The error output format of RS-232C is "CH**,Error$$CRLF".
- "Error 40" (Linear Gage malfunction) is displayed even when no Linear Gage is connected.
- "Error 90" and "Error 95" are displayed when a tolerance value setting error occurs due to a key operation.
- "Error_90" in the RS-232C output means that a tolerance value setting error has occurred due to an RS command.
- If an error occurs while you are setting parameters, the Preset value, or the tolerance value, the error will be displayed after you return to the counter state. However, the error signal will be output immediately to any external output.

## 6.2.2    Error Cancellation Method

The 3 main error cancellation methods are explained below, but the appropriate method differs depending on the cause.

• Automatic cancellation
• Press [SEL]/[CE].
• Input an external HOLD signal.

### Tips

For details about error messages, see 📖 "6.2.1 List of Error Codes" (page 50).

# 7    Specifications

## 7.1    Basic Specifications

| Code No. | 542-075 | 542-071 | 542-073 | 542-074 | 542-072 |
|---|---|---|---|---|---|
| Model No. | EH-101P | EH-102P | EH-102Z | EH-102S | EH-102D |
| Number of display axis | 1 axis | 2 axes | | | |
| Display | Minus (-) sign and 8 numeric digits (green LED) | | | | |
| Minimum reading | 0.01/0.005/0.001/0.0005/0.0001 mm (selection by parameter) | | | 0.01/0.001 µm | Set automatically according to the gage |
| Maximum input frequency | 2.5 MHz (2-phase square wave) | | | 1 MHz (2-phase sine-wave) | |
| Power source voltage | Supplied AC adapter or DC +12 V to 24 V | | | | |
| Power consumption | Max. 8.4 W (Max. 700 mA); Guarantee a minimum power supply of 1 A per unit from the commercial power supply. | | | | |
| Operating temperature (humidity) range | 0°C to 40°C (20% RH to 80% RH, without condensation) | | | | |
| Storage temperature (humidity) range | -10°C to 50°C (20% RH to 80% RH, without condensation) | | | | |
| External dimensions | 144 (W) × 72 (H) × 156.7 (D) mm | | | | |
| Mass | Approx. 760 g | Approx. 800 g | Approx. 800 g | Approx. 900 g | Approx. 800 g |
| CE marking | EMC directive: EN 61326-1<br>    Immunity test requirement: Clause 6.2 Table 2<br>    Emission limit: Class B<br>RoHS directive: EN IEC 63000 | | | | |
| Functions | Zero setting, Preset, Measurement mode switching (maximum value, minimum value, TIR value), Tolerance judgment output (3-step/5-step switchable), Constant factor scaling display | | | | |
| | | Calculation between axes (sum, difference) | | | |
| Interface | RS-232C / USB / Digimatic / I/O | | | | |

## 7.2 External Dimensions Drawing (For All Models)



Unit: mm
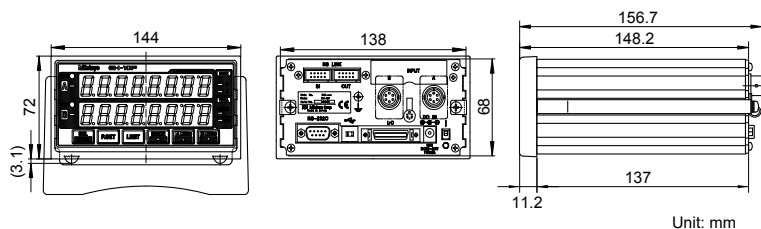
## 7.3 Option

| Part No. | Name |
|----------|------|
| 02ADB440 | I/O output connector (with cover) |
| 02ADD950 | RS LINK connection cable (0.5 m) |
| 936937 | RS LINK connection cable (1 m) |
| 965014 | RS LINK connection cable (2 m) |
| 02NGB072 | SENSORPAK/E (software for PC) |
| 02NGB073 | SENSORPAK/E (software for PC) with I/O connecting cable |

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