Mitutoyo

Mitutoyo Quality

Sensor Systems

Linear Displacement Sensors
LINEAR GAGE

Catalog No. E13007(4)

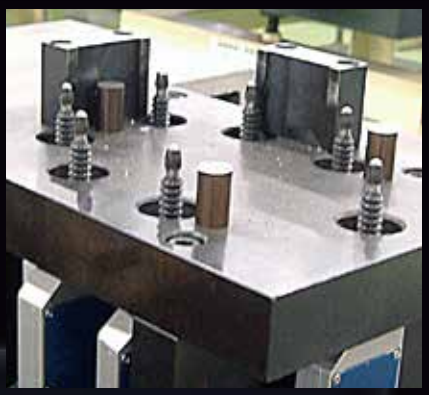
LINEAR GAGE

Mitutoyo Precision Gage Heads

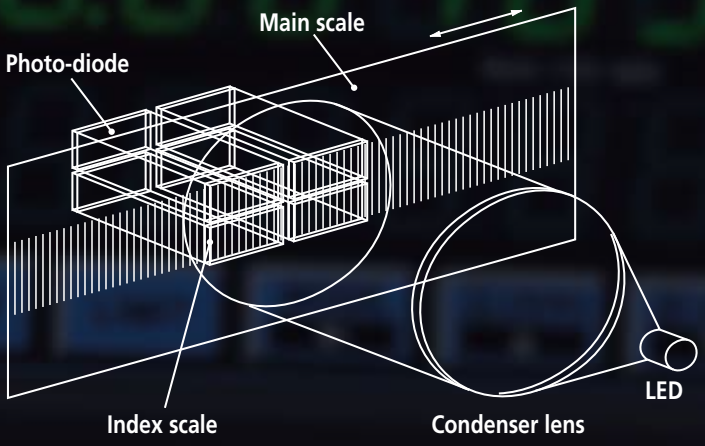
Full Lineup of Gage Heads from Ultra-high Precision to Excellent Cost-performance Types

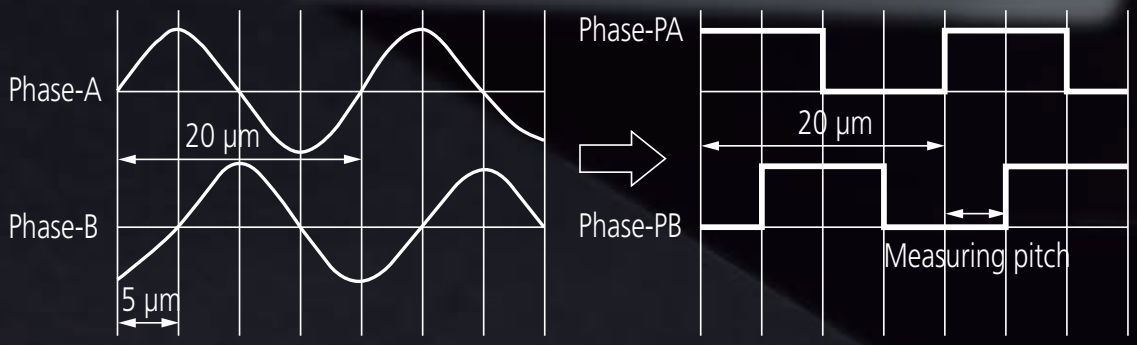
Measurement principle

Transmission-type photoelectric linear encoders



The gage heads mainly use transmission-type photoelectric linear encoders, the principle of which is shown below. In this type, the light source (LED) and the detector element (photodiode) face each other with the main scale and index scale (20 µm pitch) positioned between them. As the scale moves with respect to the detector, the intensity of the light passing through the window in the index scale varies constantly. At this time, two synchronized sine-wave signals having a relative 90-degree phase difference are output. These signals are then amplified and split electrically (with additional waveforms inserted) and output as 0.1 µm, 0.5 µm, 1 µm or 5 µm square-wave signals.

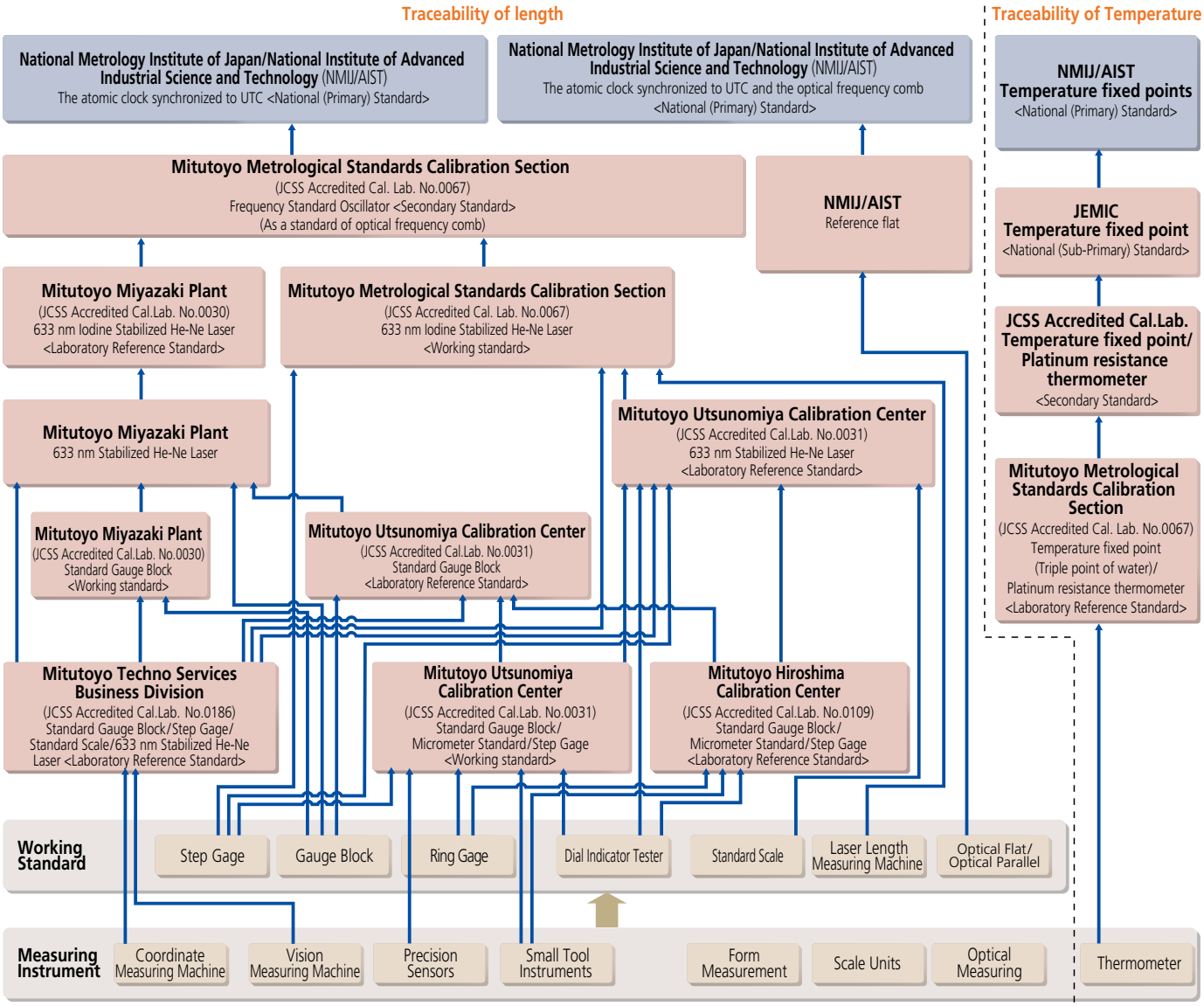




Mitutoyo

Traceability of Mitutoyo Standards

As of September 2018



Note: This is a simplified diagram of Mitutoyo's traceability system. Detailed traceability charts are published for each product.
(As of September 2018)

INDEX

About CAD data provided from website

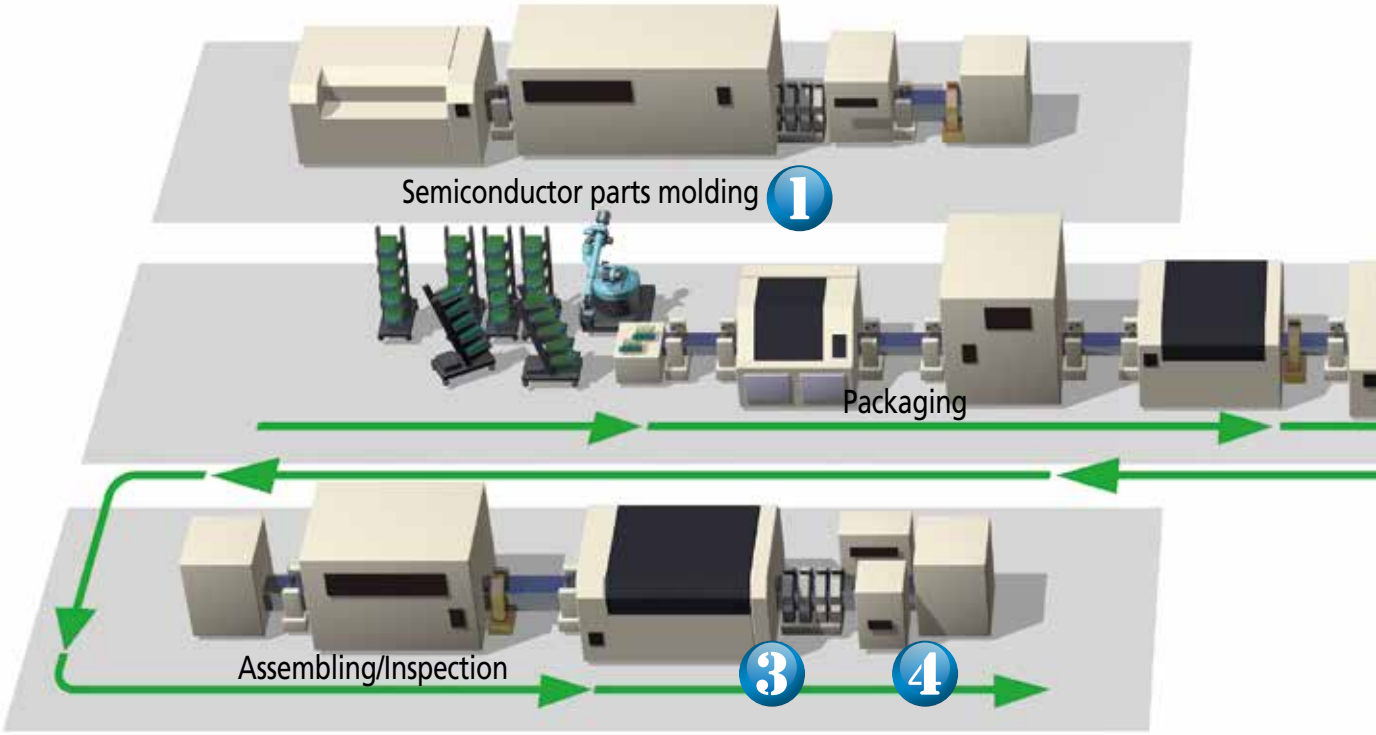
If required, customers can download 2D/3D CAD data for Mitutoyo measurement equipment from the Mitutoyo website for the purpose of using in customers' design work.

- Mitutoyo website

www.mitutoyo.co.jp

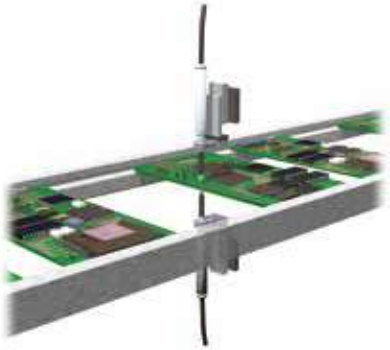
Applications

Precision Parts Manufacturing

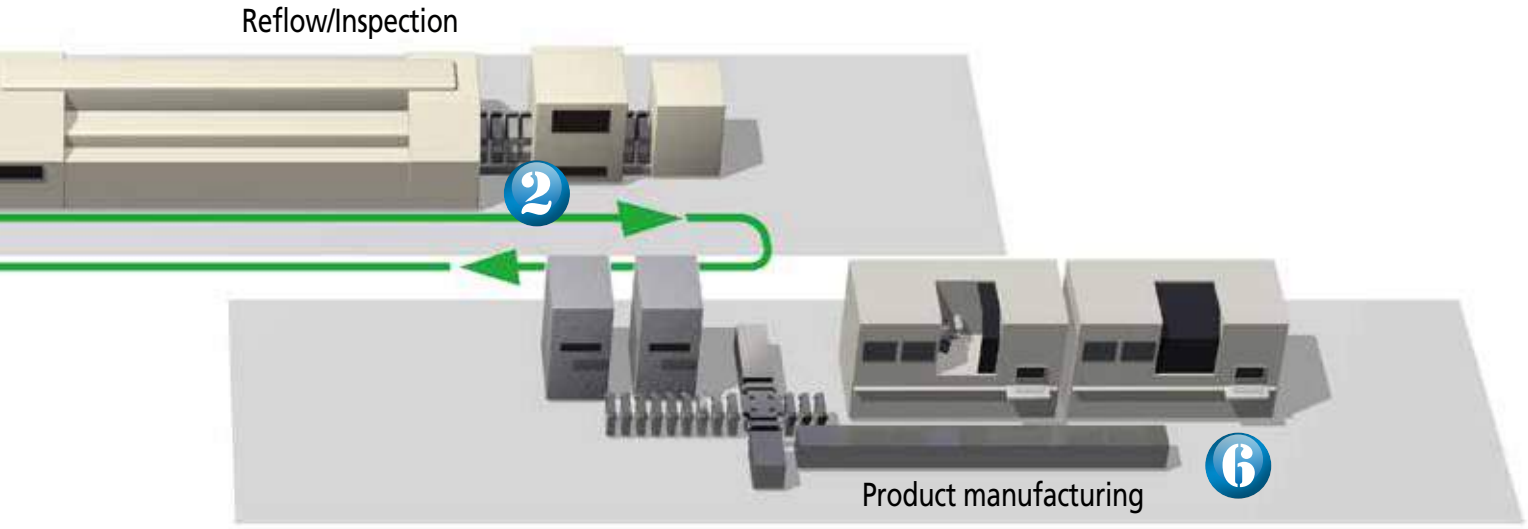


1 Roll gap measurement

2 PCB thickness measurement



3 Chip parallelism measurement



4 Seating check

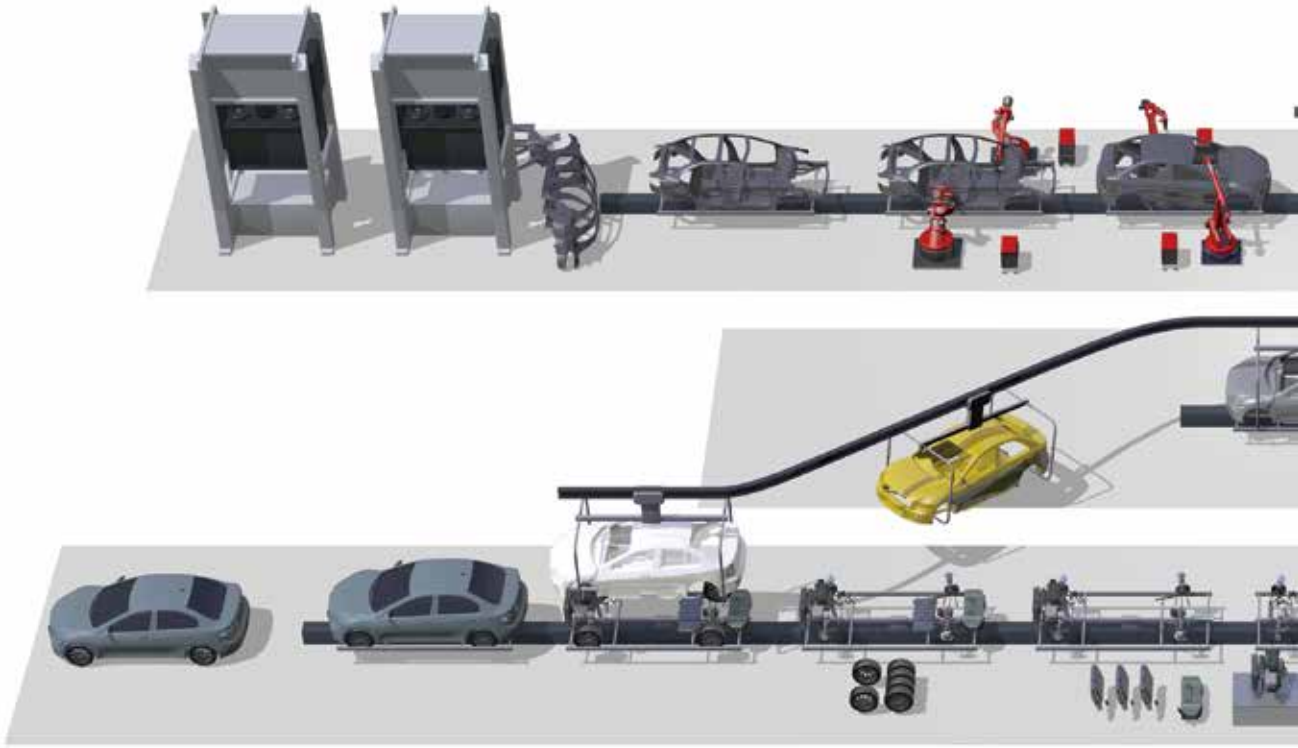
6 FPD board multipoint measurement

5 Measurement of crimping height

7 Parallelism measurement of copying machine parts

Applications

Automobile Manufacturing Process

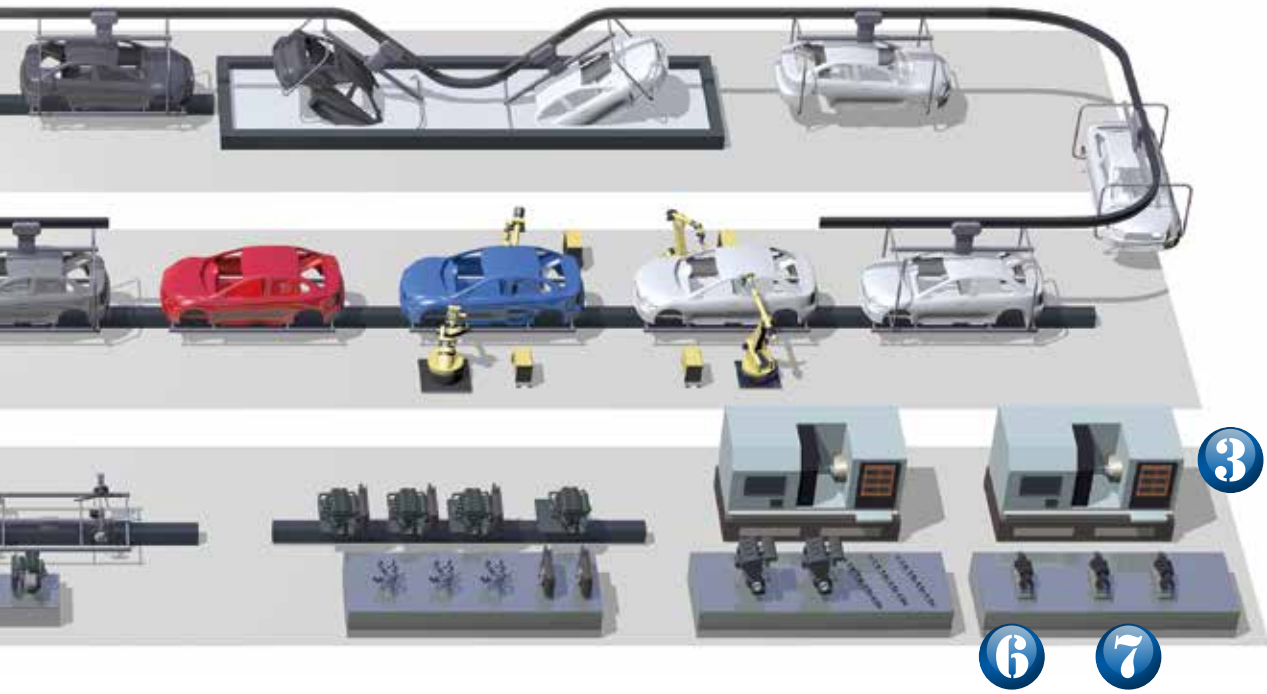


1 Cam-lift measurement

2 Brake disk multipoint measurement

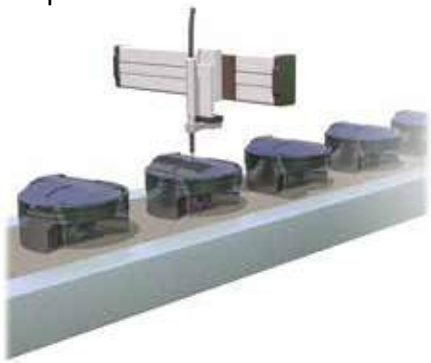
5 Flatness measurement

6 Workpiece height detection



3 Machine device tool length measurement

4 Workpiece discrimination

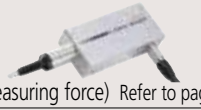
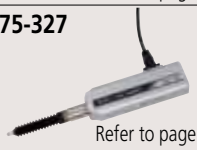


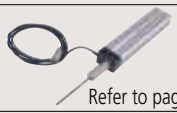
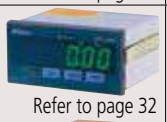
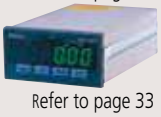
7 Workpiece runout measurement

8 Inspection fixture

Mitutoyo

Gage Heads/Display Units

	Resolution \ Measuring range		Gage Heads				
				5 mm/0.2 in	10 mm/0.4 in	25 mm/0.1 in	
Incremental	0.000005 mm (0.005 µm)		**LGH** series Refer to page 22		**542-720**  **542-721** (Low measuring force) Refer to page 22		
	0.00001 mm (0.01 µm)		**LGH** series Refer to page 22		**542-715**  **542-716** (Low measuring force) Refer to page 22		
	0.0001 mm (0.1 µm)		**LGB2** series (nut clamp) Refer to page 14 **LGK** series Refer to page 12 **LGF** series Refer to page 16	**542-246** Refer to page 14	**542-158** **542-181**  Refer to page 12,16	**542-182**  Refer to page 16	
			LG series Long Stroke series Refer to page 19				
	0.0005 mm (0.5 µm)		**LGK** series Refer to page 12 **LGF** series Refer to page 16		**542-171** **542-157**  Refer to page 12,16	**542-172**  Refer to page 16	
	0.001 mm (1 µm)	Phase-A/B	**LGK** series Refer to page 12 **LGF** series Refer to page 16		**542-156** **542-161**  Refer to page 12,16	**542-162**  Refer to page 16	
			Long Stroke series Refer to page 19				
			LGB2 series (nut clamp) Refer to page 14	**542-244** Refer to page 14	**542-262** **542-262H** (High accuracy) **542-264** (Low measuring force) **542-270** (Air drive) Refer to page 14		
	0.0005 mm (0.5 µm)	Phase-A/B/Z (With origin point mark)	**LGF-Z** series Series with reference point mark Refer to page 18		**542-174**  Refer to page 18	**542-175**  Refer to page 18	
	0.001 mm (1 µm)		**LGF-Z** series Series with reference point mark Refer to page 18		**542-164**  Refer to page 18	**542-165**  Refer to page 18	
Absolute	0.01 mm (10 µm)	Digimatic	**LGD** series ABSOLUTE™ Refer to page 20		**575-326**  Refer to page 20	**575-327**  Refer to page 20	
			LGS-1012P series ABSOLUTE™ Refer to page 21		**575-303**  Refer to page 21		

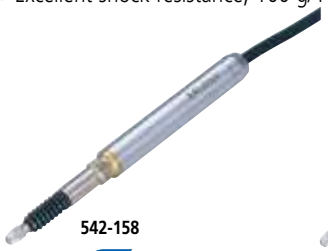
Gage Heads			Display unit		
	50 mm/2 in	100 mm/4 in	Point measurement	Calculation measurement (addition and subtraction)	Multi-point measurement
			Dedicated counter (sold in sets with Gage Head)  SENSORPAK		
			EG Counter 542-015  Refer to page 33		
		542-312 542-316  Refer to page 19			
	542-173  Refer to page 16		**EB Counter 542-092-2**  Refer to page 35	**EH Counter 542-071**  SENSORPAK Refer to page 39	**EV Counter 542-063**  SENSORPAK Refer to page 45
	542-163  Refer to page 16				
		542-332 542-336  Refer to page 19		SENSORPAK : Compatible with Measurement data loading software SENSORPAK. Refer to page 52 for details. 	
			EH Counter 542-075  SENSORPAK Refer to page 39		
	542-176  Refer to page 18		**EG Counter 542-017**  Refer to page 33	**EH Counter 542-073**  SENSORPAK Refer to page 39	**EV Counter 542-067**  SENSORPAK Refer to page 45
	542-166  Refer to page 18		**EB Counter 542-094-2**  Refer to page 35		
	575-328  Refer to page 20		**EC Counter 542-007**  Refer to page 32	**EH Counter 542-072**  SENSORPAK Refer to page 39	**EV Counter 542-064**  SENSORPAK Refer to page 45
			EG Counter 542-016  Refer to page 33		
			EB Counter 542-093-2  Refer to page 35		

Measurement data loading software for EH, EV, VL
SENSORPAK

LGK

Phase-A/B

- Compact model offers the vibration/shock resistance of the proven **LGF** series. Cross-sectional area is approx 1/5 compared to 542-181.
- Resolution of each model can be selected from 0.1 µm, 0.5 µm, or 1 µm.
- Excellent sliding durability improved to remain serviceable for at least 15 million cycles (in-house testing).
- Excellent shock resistance, 100 g/11 ms (IEC 60068-2-27)



542-158

IP66

542-157

IP66

542-156

IP66

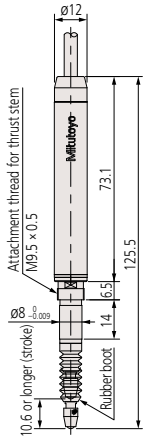
SPECIFICATIONS

Order No.		542-158	542-157	542-156
Measuring range		10 mm (0.4 in)		
Resolution		0.1 µm	0.5 µm	1 µm
Measuring accuracy (20 °C)		(0.8+L/50) µm (L=mm)	(1.5+L/50) µm (L=mm)	
Quantizing error		±1 count		
Measuring force	Contact point downwards	0.8 N or less		
	Contact point horizontal	0.75 N or less		
	Contact point upwards	0.7 N or less		
Position detection method		Photoelectric linear encode		
Response speed		400 mm/s	1500 mm/s	
Output signal		90° phase difference, differential square wave (RS-422A equivalent), minimum edge intervals: 200 ns for 0.1 µm model, 200 ns for 0.5 µm model, 400 ns for 1 µm model		
Output signal pitch		0.4 µm	2 µm	4 µm
Mass		Approx. 175 g		
Dust/water resistance		Equivalent to IP66 (only gage head)		
Contact point		ø3 mm carbide-tipped (fixing screw: M2.5 (P=0.45) x 5), standard contact point **901312**		
Stem		ø8 mm		
Bearing		Linear ball type		
Output cable length		2 m (directly from casing)		
Connector		Plug: RM12BPE-6PH (HIROSE), Compatible receptacle: RM12BRD-6S (HIROSE)		
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)		
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)		
Standard Accessories		Wrench for contact point: **538610**		

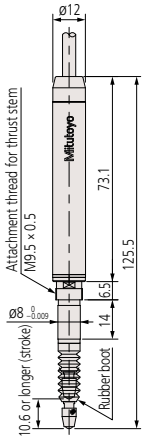
DIMENSIONS

Unit: mm

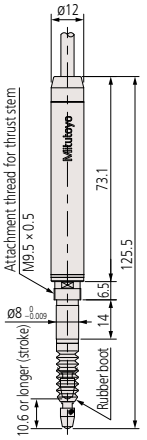
542-158



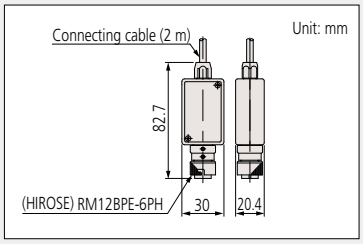
542-157



542-156



Connector



Optional Accessories

Air drive unit: 02ADE230

- Rubber boot (spare): **238772**
- Thrust stem set: **02ADB680**
  - Thrust stem: **02ADB681**
  - Clamp nut: **02ADB682**
- Spanner Wrench: **02ADB683**

Thrust stem set/Spanner Wrench

- Extension cable
  5 m: **902434**
  10 m: **902433**
  20 m: **902432**

Connectable up to 3 pieces, 20 m at maximum.

Custom order example

- Measuring force change
- Cable length change
- Connector change

SERIES 542 — Slim Type

LGB

Phase-A/B

- Compact form (ø8 mm straight stem) is an optimal choice as a built-in type gage.
- The spindle guide uses high-precision linear ball bearings for extremely smooth movement and exceptional durability.
- Nut clamp type is also available (LGB2: refer to page 14).

542-204

IP54

542-222/No.542-222H
542-224

IP54

542-230

IP54

SPECIFICATIONS

Type		L-shaped	Straight		Low measuring force	Air-driven contact point*1
Order No.		**542-204**	**542-222**	**542-222H**	**542-224**	**542-230*2**
Measuring range		5 mm (0.2 in)	10 mm (0.4 in)			
Resolution		1 µm				
Measuring accuracy (20 °C)		2 µm		1 µm	2 µm	
Quantizing error		±1 count				
Response speed		900 mm/s				
Measuring force*3	Contact point downwards	0.65 N or less	0.8 N or less		0.6 N or less	0.8 N or less
	Contact point horizontal	0.6 N or less	0.75 N or less		0.55 N or less	0.75 N or less
	Contact point upwards	0.55 N or less	0.7 N or less		0.5 N or less	0.7 N or less
Protection Level		Equivalent to IP54 (only gage head)				
Mass		145 g	140 g			165 g
Contact point		ø3 mm carbide-tipped (fixing screw: M2.5 (P=0.45) x 5), standard contact point **901312**				
Stem		ø8 mm				
Bearing		Linear ball type				
Output cable length		2 m (directly from casing)				
Connector		Plug: RM12BPE-6PH (HIROSE), Compatible receptacle: RM12BRD-6S (HIROSE)				
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)				
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)				
Standard Accessories		Wrench for contact point: **538610**				

*1: Required air pressure: 0.3 to 0.4 MPa
*2: Spindle extends when air is supplied.
*3: Measuring force at full retraction of the spindle

Optional Accessories

- Rubber boot (spare)
For 5 mm range models: **238773**
For 10 mm range models: **238772**

- Extension cable
5 m: **902434**
10 m: **902433**
20 m: **902432**
Connectable up to 3 pieces, 20 m at maximum.

Custom order example

- Measuring force change
- Cable length change (less than 2 m)
- Connector change

LGB2

Phase-A/B

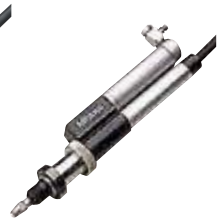
- Slim design, nut clamp type (Stem is ø9.5 mm)
- The spindle guide uses high-precision linear ball bearings for extremely smooth movement and exceptional durability.

542-244

IP54

542-262/542-262H
542-264

IP54



542-270

IP54

542-246

IP54

SPECIFICATIONS

Type		L-shaped		Straight		Low measuring force	Air-driven contact point*1
Order No.		**542-246**	**542-244**	**542-262**	**542-262H**	**542-264**	**542-270*2**
Measuring range		5 mm (0.2 in)		10 mm (0.4 in)			
Resolution		0.1 µm	1 µm				
Measuring accuracy (20 °C)		0.8 µm	2 µm		1 µm	2 µm	
Quantizing error		±1 count					
Response speed		380 mm/s	900 mm/s				
Measuring force	Contact point downwards	0.65 N or less		0.8 N or less		0.6 N or less	0.8 N or less
	Contact point horizontal	0.6 N or less		0.75 N or less		0.55 N or less	0.75 N or less
	Contact point upwards	0.55 N or less		0.7 N or less		0.5 N or less	0.7 N or less
Mass		160 g		155 g			
Contact point		ø3 mm carbide-tipped (fixing screw: M2.5 (P=0.45) x 5), standard contact point **901312**					
Stem		ø9.5 mm					
Bearing		Linear ball type					
Output cable length		2 m (directly from casing)					
Connector		Plug: RM12BPE-6PH (HIROSE), Compatible receptacle: RM12BRD-6S (HIROSE)					
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)					
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)					
Standard Accessories		Wrench for contact point: **538610**					

*1: Required air pressure: 0.3 to 0.4 MPa
*2: Spindle extends when air is supplied.

Example of slim gage head low measuring force (made to order)

- Low measuring force, suitable for measurement of soft-material workpieces (consult us for other measuring forces).

Type		L-shaped model	Air-driven contact point model
Measuring range		5 mm	10 mm
Resolution		1 µm	1 µm
Measuring force*	Contact point downwards	0.5 N or less	0.6 N or less
	Contact point horizontal	0.45 N or less	0.55 N or less
	Contact point upwards	0.4 N or less	0.5 N or less

* Measuring force at full retraction of the spindle

Depending on the operating method, the spindle forward speed of the low measuring force model may become slow compared to the standard model. Please check if this restriction is compatible with the application. Please contact Mitutoyo to verify the application.

Optional Accessories

- Rubber boot

For 5 mm range models: **238773**
For 10 mm range models: **238772**

- Extension cable

5 m: **902434**
10 m: **902433**
20 m: **902432**
Connectable up to 3 pieces, 20 m at maximum.

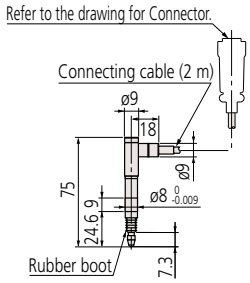
Custom order example

- Measuring force change
- Cable length change (less than 2 m)
- Connector change

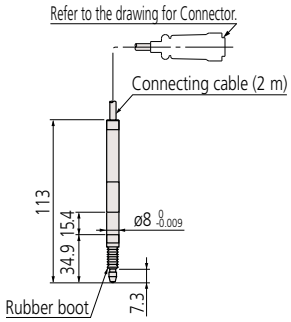
DIMENSIONS

Unit: mm

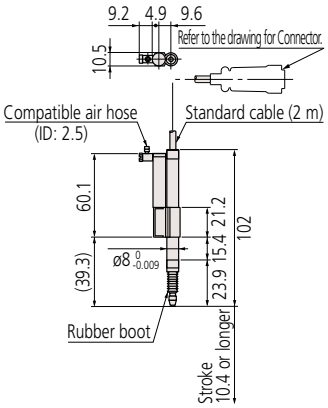
542-204



542-222/542-222H
542-224

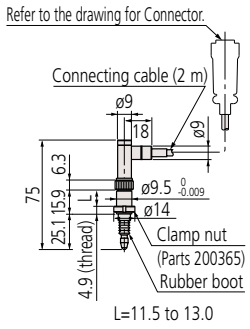


542-230



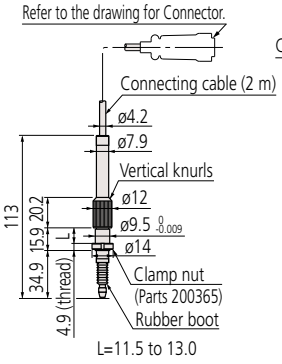
Spindle extends when air is supplied.

542-244



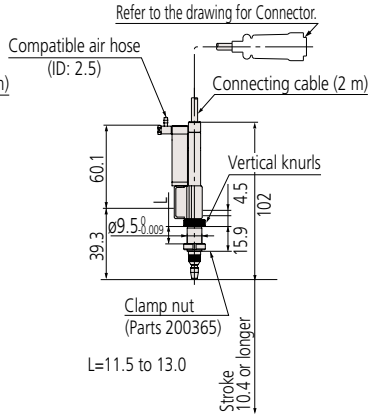
L=11.5 to 13.0

542-262/542-262H
542-264



L=11.5 to 13.0

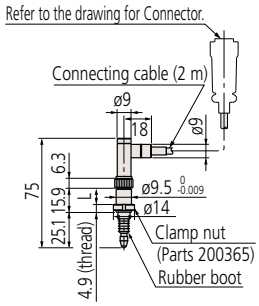
542-270



L=11.5 to 13.0

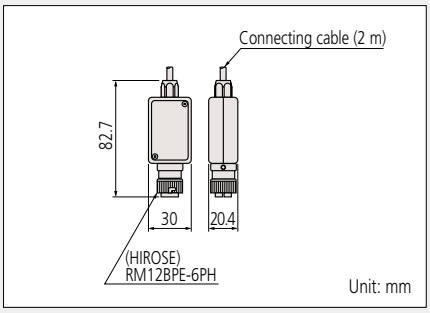
Spindle extends when air is supplied.

542-246



L=11.5 to 13.0

Connector



LGF

Phase-A/B

- Excellent vibration/shock resistance due to the design of the spindle guide.
- Sliding durability improved to remain serviceable for at least 15 million cycles (in-house testing).
- Shock resistance, 100 g/11 ms (IEC 60068-2-27)
- The LGF-Z series, which is equipped with a reference point mark on the linear encoder, and includes a 0.1 µm resolution type is also available.

542-171, -161

IP66

542-172, -162

IP66

542-173, -163

IP66

542-181

IP66

542-182

IP66

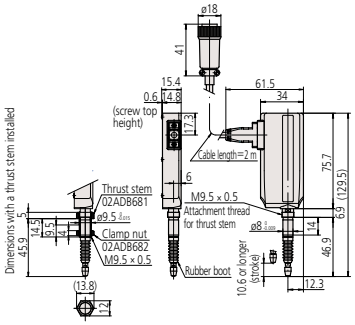
SPECIFICATIONS

Order No.		542-171	542-161	542-172	542-162	542-173	542-163	542-181	542-182
Measuring range		10 mm (0.4 in)		25 mm (1 in)		50 mm (2 in)		10 mm (0.4 in)	25 mm (1 in)
Resolution		0.5 µm	1 µm	0.5 µm	1 µm	0.5 µm	1 µm	0.1 µm	
Measuring accuracy (20 ℃) L=arbitrary measuring length (mm)		(1.5+L/50) µm						(0.8+L/50) µm	
Quantizing error		±1 count							
Measuring force	Contact point downwards	1.2 N or less		4.6 N or less		5.7 or less		1.2 N or less	4.6 N or less
	Contact point horizontal	1.1 N or less		4.3 N or less		5.3 or less		1.1 N or less	4.3 N or less
	Contact point upwards	1.0 N or less		4.0 N or less		4.9 or less		1.0 N or less	4.0 N or less
Position detection method		Photoelectric linear encode							
Response speed		1500 mm/s						400 mm/s	
Output signal		90° phase difference, differential square wave (RS-422A equivalent), minimum edge intervals: 500 ns for 1 µm model, 250 ns for 0.5 µm model, 200 ns for 0.1 µm model							
Output signal pitch		2 µm	4 µm	2 µm	4 µm	2 µm	4 µm	0.4 µm	
Mass		Approx. 260 g		Approx. 300 g		Approx. 400 g		Approx. 310 g	Approx. 350 g
Dust/water resistance		Equivalent to IP66 (only gage head)							
Contact point		ø3 mm carbide-tipped (fixing screw: M2.5 (P=0.45) x 5), standard contact point **901312**							
Stem		ø8 mm		ø15 mm				ø8 mm	ø15 mm
Bearing		Linear ball type							
Output cable length		2 m (directly from casing)							
Connector		Plug: RM12BPE-6PH (HIROSE), Compatible receptacle: RM12BRD-6S (HIROSE)							
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)							
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)							
Standard Accessories		Wrench for contact point: **538610**		Wrench for contact point: **210187**				Wrench for contact point: **538610**	Wrench for contact point: **210187**

DIMENSIONS

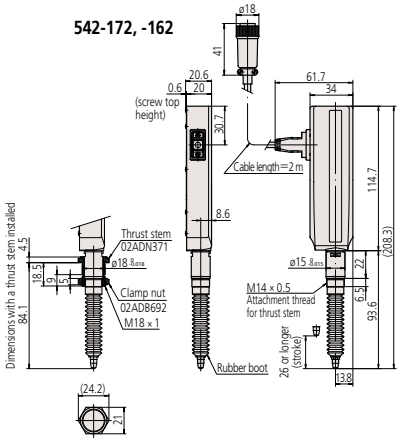
Unit: mm

542-171, -161



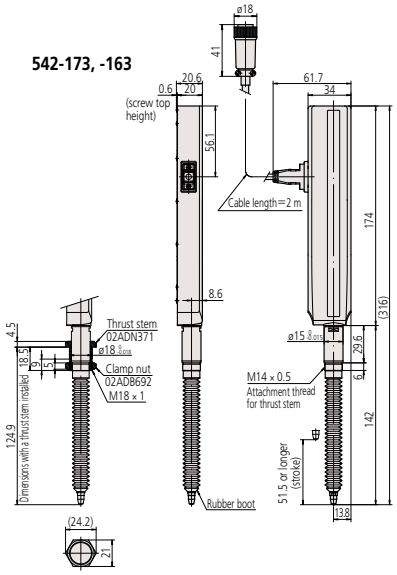
With thrust stem set (optional accessory)

542-172, -162



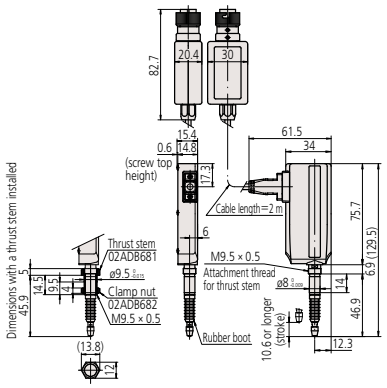
With thrust stem set (optional accessory)

542-173, -163



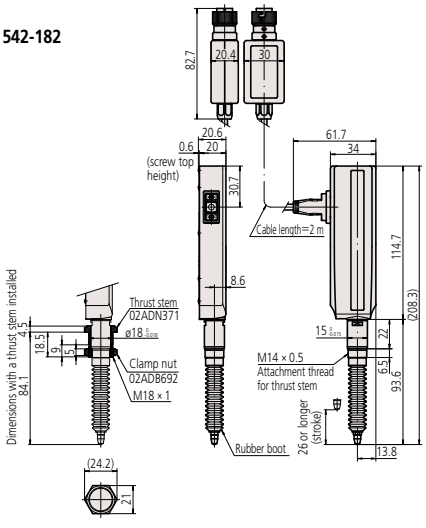
With thrust stem set (optional accessory)

542-181



With thrust stem set (optional accessory)

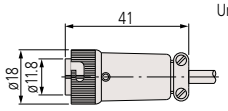
542-182



With thrust stem set (optional accessory)

Connector (Excluding 542-181 and 542-182)

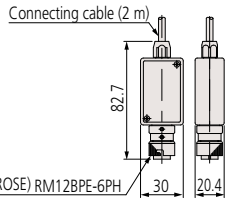
Unit: mm



(HIROSE) RM12BPE-6PH

Connector (542-181, -182)

Unit: mm



Optional Accessories

Air drive unit

For 10 mm range models: **02ADE230**
For 25 mm range models: **02ADE250**
For 50 mm range models: **02ADE270**

LGK attaching example

- Rubber boot (spare)

For 10 mm range models: **238772**
For 25 mm range models: **962504**
For 50 mm range models: **962505**

- Thrust stem set

For 10 mm range models: **02ADB680**
For 25/50 mm range models: **02ADN370**

Thrust stem set/Spanner Wrench

- Spanner Wrench

For 10 mm range models: **02ADB683**
For 25/50 mm range models: **02ADB693**

- Extension cable

5 m: **902434**
10 m: **902433**
20 m: **902432**

Connectable up to 3 pieces, 20 m at maximum.

Custom order example

- Measuring force change
- Cable length change (up to 2 m)
- Connector change

SERIES 542 — with Origin Point Mark

LGF-Z

Phase-A/B/Z
With origin point mark

- **LGF** series with reference point signal output function. The master setting is incorporated in the unit and is easy to operate. The origin point can be easily detected even if a fault, such as an over-speed error, occurs.
- Sliding durability improved to remain serviceable for at least 15 million cycles (in-house testing).
- Shock resistance, 100 g/11 ms (IEC 60068-2-27)
- Resolutions are available in 0.5 µm and 1 µm.

542-174, -164

IP66

542-175, -165

IP66

542-176, -166

IP66

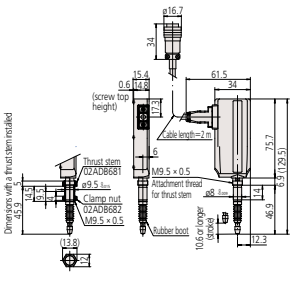
SPECIFICATIONS

Order No.		542-174	542-164	542-175	542-165	542-176	542-166
Measuring range		10 mm (0.4 in)		25 mm (1 in)		50 mm (2 in)	
Resolution		0.5 µm	1 µm	0.5 µm	1 µm	0.5 µm	1 µm
Measuring accuracy (20 °C)		(1.5+L/50) µm L=arbitrary measuring length (mm)					
Quantizing error		±1 count					
Measuring force	Contact point downwards	1.2 N or less		4.6 N or less		5.7 or less	
	Contact point horizontal	1.1 N or less		4.3 N or less		5.3 or less	
	Contact point upwards	1.0 N or less		4.0 N or less		4.9 or less	
Position detection method		Photoelectric linear encoder					
Reference mark position		3 mm from contact point tip (lowest rest point)		5 mm from contact point tip (lowest rest point)			
Reference mark repeatability (20 °C): σ		σ ≤0.5 µm (at a constant reference point passing speed less than 300 mm/s in the same direction)					
Response speed		1500 mm/s					
Output signal		90° phase difference, differential square wave (RS-422A equivalent), minimum edge intervals: 250 ns for 0.5 µm model, 500 ns for 1 µm model					
Output square wave pitch		2 µm	4 µm	2 µm	4 µm	2 µm	4 µm
Mass		Approx. 260 g		Approx. 300 g		Approx. 400 g	
Contact point		ø3 mm carbide-tipped (fixing screw: M2.5 (P=0.45) x 5), standard contact point **901312**					
Stem		ø8 mm		ø15 mm			
Bearing		Linear ball type					
Output cable length		2 m (directly extended from the main unit)					
Connector		Plug: PRC05-P8M (TAJIMI), Compatible receptacle: PRC05-R8F (TAJIMI)					
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)					
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)					
Standard Accessories		Wrench for contact point: **538610**		Wrench for contact point: **210187**			

DIMENSIONS

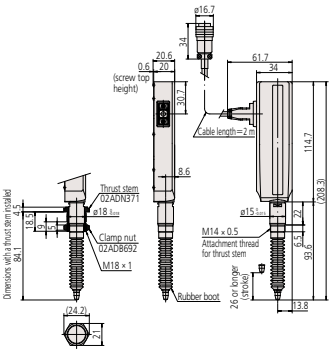
Unit: mm

542-174, -164



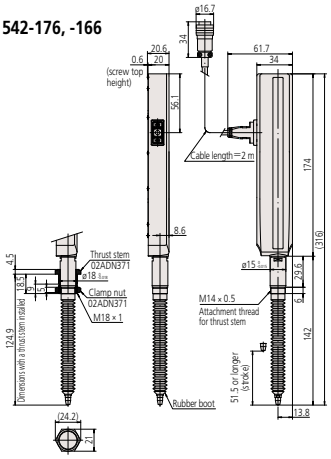
With thrust stem set (optional accessory)

542-175, -165



With thrust stem set (optional accessory)

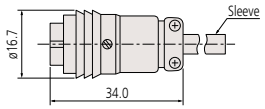
542-176, -166



With thrust stem set (optional accessory)

Connector

Unit: mm



(TAJIMI) PRC05-P8M

Optional Accessories

Air drive unit

For 10 mm range models: **02ADE230**
For 25 mm range models: **02ADE250**
For 50 mm range models: **02ADE270**

LGK mounting example

- Rubber boot (spare)

For 10 mm range models: **238772**
For 25 mm range models: **962504**
For 50 mm range models: **962505**

- Thrust stem set

External dimensions are given in the dimensional drawing of the product.

For 10 mm range models: **02ADB680**
For 25/50 mm range models: **02ADN370**

Thrust stem set/Spanner Wrench

- Spanner Wrench

For 10 mm range models: **02ADB683**
For 25/50 mm range models: **02ADB693**

- Extension cable

5 m: **02ADF260**
10 m: **02ADF280**
20 m: **02ADF300**

Connectable up to 3 pieces, 20 m at maximum.

Custom order example

- Measuring force change
- Cable length change (up to 2 m)
- Connector change

SERIES 542 — Long Stroke Type

LG

Phase-A/B

- This is a long stroke linear gage offering a measuring range of 100 mm.
- The resolution of each model can be selected to be 0.1 µm or 1 µm.
- Three versions are available; standard spar type, low measuring force type, and rubber boot type (made to order).

542-312

IP54

SPECIFICATIONS

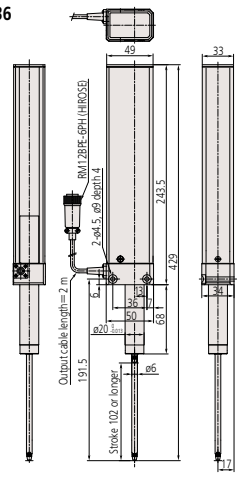
Type		Standard spar type	Low measuring force	Rubber boot type	Standard spar type	Low measuring force	Rubber boot type
Order No.		**542-312**	**542-316**	**542-314**	**542-332**	**542-336**	**542-334**
Measuring range		100 mm					
Resolution		0.1 µm			1 µm		
Measuring accuracy (20 °C)		(2+L/100) µm≤2.5 µm L=arbitrary measuring length (mm)			(2.5+L/100) µm≤3 µm L=arbitrary measuring length (mm)		
Quantizing error		±1count					
Measuring force*	Contact point downwards	8.0 N or less	3.0 N or less	8.0 N or less	8.0 N or less	3.0 N or less	8.0 N or less
	Contact point horizontal	6.5 N or less	Not applicable	6.5 N or less	6.5 N or less	Not applicable	6.5 N or less
	Contact point upwards	5.0 N or less	Not applicable	5.0 N or less	5.0 N or less	Not applicable	5.0 N or less
Position detection method		Photoelectric linear encoder					
Response speed		Approx. 400 mm/s			Approx. 800 mm/s		
Output signal		90° phase difference, differential squarewave (RS-422A equivalent)					
Mass (including cables)		Approx. 750 g		Approx. 780 g	Approx. 750 g		Approx. 780 g
Contact point		ø3 mm carbide-tipped (fixing screw: M2.5(P=0.45) x 5), standard contact point **901312**					
Stem		ø20					
Shock resistance		60 g (in-house testing)					
Cable length		2 m (directly extended from the gage unit)					
Dust/water resistance		Equivalent to IP54		Equivalent to IP66	Equivalent to IP54		Equivalent to IP66
Spindle sealing method		Scraper type		Rubber boot type	Scraper type		Rubber boot type
Input/output connector		For calculation: RM12BPE-6PH (HIROSE), Compatible receptacle: RM12BRD-6S (HIROSE)					
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)					
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)					
Standard Accessories		Wrench for contact point: **210187** Hexagon socket head cap screw, M4 x 0.7 x 35, 2 pcs. (for gage fixing) Round flat washer, nominal 4, 2 pcs. (for gage fixing) Lifting lever: **137693** Fixing holder: **02ADG181** (for fixing lifting lever)					

* Measuring force at full retraction of the spindle

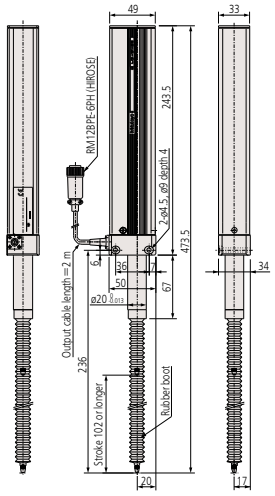
DIMENSIONS

Unit: mm

542-312, -316, -332, -336

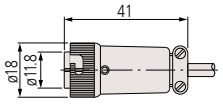


542-314, -334



Connector

Unit: mm



(HIROSE) RM12BPE-6PH

Lifting lever attachment

Optional Accessories

- Rubber boot (spare): **02ADA004**
- Extension cable
  5 m: **902434**
  10 m: **902433**
  20 m: **902432**

Connectable up to 3 pieces, 20 m at maximum.

Custom order example

- Measuring force change
- Cable length change
- Connector change

LGD

Digimatic ABSOLUTE™

- Absolute position detection makes it possible to maintain the reference point even when the power is switched off.
- Excellent protection against dust and splashing water (IP66) on the factory floor.
- Low-profile design allows narrow-space installation.
- The spindle guide uses high-precision linear ball bearings for extremely smooth movement and exceptional durability.
- Sliding durability improved to remain serviceable for at least 15 million cycles (in-house testing).
- Shock resistance, 100 g/11 ms (IEC 60068-2-27)

575-326 IP66

575-327 IP66

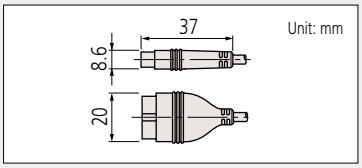
575-328 IP66

SPECIFICATIONS

Order No.*1		575-326	575-326-5	575-327	575-327-5	575-328	575-328-5
Measuring range		10 mm		25 mm		50 mm	
Resolution		10 µm					
Measuring accuracy (20 °C)		20 µm				30 µm	
Quantizing error		±1 count					
Measuring force	Contact point downwards	1.2 N or less		4.6 N or less		5.7 N or less	
	Contact point horizontal	1.1 N or less		4.3 N or less		5.3 N or less	
	Contact point upwards	1.0 N or less		4.0 N or less		4.9 N or less	
Position detection method		ABSOLUTE electrostatic capacitance type linear encoder					
Response speed		Unlimited (not applicable to scanning measurement)					
Output		Digimatic code					
External input		Reference-setting signal (Absolute reference position*2 can be changed externally.)					
Mass*3		Approx. 260 g		Approx. 300 g		Approx. 400 g	
Contact point		ø3 mm carbide tipped (fixing screw: M2.5 (P=0.45) × 5), standard contact point: **901312**					
Stem		ø8 mm		ø15 mm			
Bearing		Linear ball type					
Output cable length (directly extended from the main unit)		2 m	5 m	2 m	5 m	2 m	5 m
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)					
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)					

*1: The last digit of the Code No. represents a special cable length in meters.
*2: The absolute reference point is near the lowest rest point at shipment.
*3: Mass including 2 m cable.

Connector



Optional Accessories

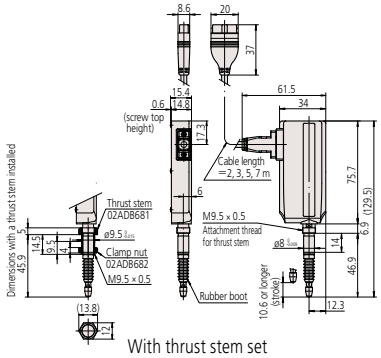
- **Air drive unit**
  For 10 mm range models: **02ADE230**
  For 25 mm range models: **02ADE250**
  For 50 mm range models: **02ADE270**
  Required air pressure: 0.2 to 0.4 MPa
  Spindle extends when air is supplied.
- **Rubber boot (spare)**
  For 10 mm range models: **238772**
  For 25 mm range models: **962504**
  For 50 mm range models: **962505**
- **Extension cable**
  SPC cable extension adapter: **02ADF640**
  Extension cable (0.5 m): **02ADD950**
  Extension cable (1 m): **936937**
  Extension cable (2 m): **965014**
  When connecting an extension cable, an SPC cable extension adapter is required.
- **Thrust stem set***
  For 10 mm range models: **02ADB680**
  Thrust stem: **02ADB681**
  Clamp nut: **02ADB682**
  For 25/50 mm range models: **02ADN370**
  Thrust stem: **02ADN371**
  Clamp nut: **02ADB692**
  External dimensions are described in the dimensional drawing of the product.
- **Special spanner**
  For 10 mm range models: **02ADB683**
  For 25/50 mm range models: **02ADB693**

* The thrust stem set is a combination of thrust stem and a clamp nut. A special spanner is required for tightening. If using multiple gages, a thrust stem set for each gage and one special spanner are required.

DIMENSIONS

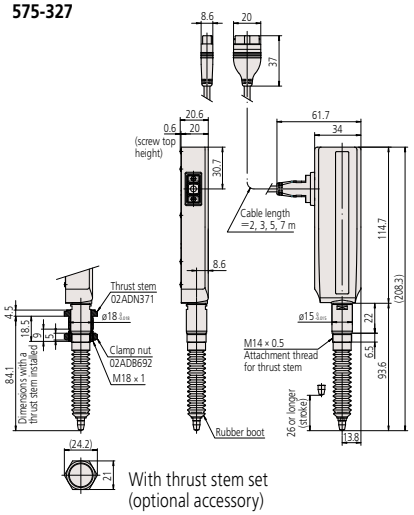
Unit: mm

575-326



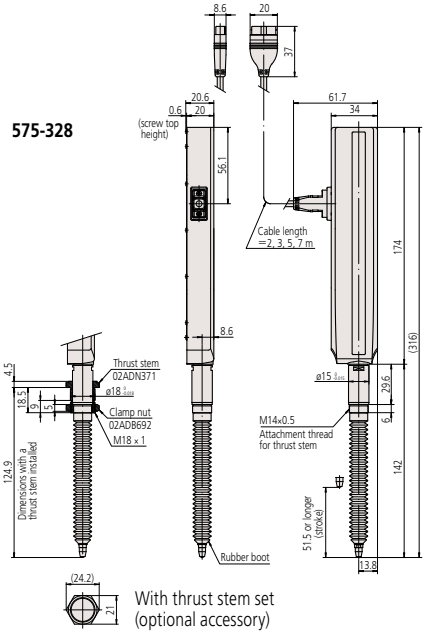
With thrust stem set (optional accessory)

575-327



With thrust stem set (optional accessory)

575-328



With thrust stem set (optional accessory)

SERIES 575 — 0.01 mm Resolution Type

LGS-1012P

Digimatic

ABSOLUTE™

- ABSOLUTE electrostatic capacitance type encoder makes it possible to maintain the reference point even when the power is switched off.
- Excellent protection against dust and splashing water (IP66) on the factory floor.

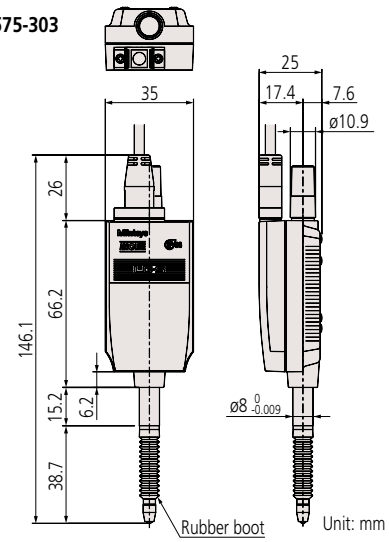
SPECIFICATIONS

Order No.		575-303
Measuring range		12.7 mm
Resolution		10 µm
Measuring accuracy (20 °C)		15 µm
Quantizing error		±1 count
Measuring force	Contact point downwards	2.0 N or less
	Contact point horizontal	1.8 N or less
	Contact point upwards	1.6 N or less
Position detection method		ABSOLUTE electrostatic capacitance type linear encoder
Response speed		Unlimited (not applicable to scanning measurement)
Output		Digimatic output
Mass		Approx. 190 g
Contact point		ø3 mm carbide-tipped (fixing screw: M2.5 (P=0.45) x 5), standard contact point: **901312**
Stem dia.		ø8 mm
Bearing		Plain type
Output cable length		2 m (directly extended from the main unit)
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)
Storage temperature (humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)

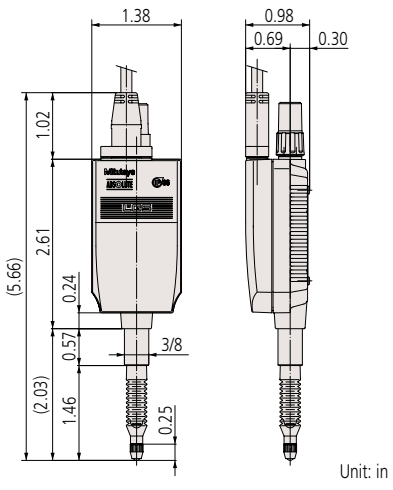
Order No.		575-313
Measuring range		0.5 in
Resolution		0.0005 in
Measuring accuracy (20 °C)		0.0008 in
Quantizing error		±1 count
Measuring force	Contact point downwards	2 N or less
	Contact point horizontal	1.8 N or less
	Contact point upwards	1.6 N or less
Position detection method		ABSOLUTE electrostatic capacitance type linear encoder
Response speed		Unlimited (not applicable to scanning measurement)
Output		Digimatic code
Mass		Approx. 190 g
Contact point		ø3 mm carbide tipped (fixing screw: 4-48 UNF), standard contact point: **21BZB005**
Stem		ø9.52=3/8 in DIA
Bearing		Plain type
Output cable length		2 m (directly extended from the main unit)
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)
Storage temperature(humidity) ranges		–10 to 60 °C (RH 20 to 80 %, non-condensing)

DIMENSIONS

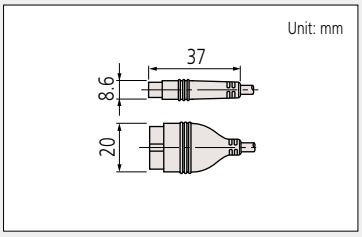
575-303



575-313



Connector



Optional Accessories

- Rubber boot (spare): **238774**
- Air drive unit (metric): **903594**
- SPC cable extension adapter: **02ADF640**
- Extension cable for Digimatic gages (0.5 m): **02ADD950**
- Extension cable for Digimatic gages (1 m): **936937**
- Extension cable for Digimatic gages (2 m): **965014**

Custom order example

- Measuring force change
- Cable length change
- Connector change

LGH

- This series has achieved the outstanding accuracy of 0.2 µm combined with a resolution of 0.01/0.005 µm (according to model), practically equivalent to that of a laser interferometer, and a wide measuring range of 10 mm.
- A compact body design makes a significant contribution to a downsizing of this gage itself, which is best suited for calibration/evaluation of master gages as well as measurement of high-precision parts and as a length measuring sensor incorporated into high-precision positioning/control units.
- A low measuring force model is available for those applications where measurement of easily deformed or damaged workpieces is required.
- Every LGH series gage is bundled with a dedicated counter.

- This model is equipped with a newly developed photoelectric reflection-type linear encoder, achieving an excellent resolution of 0.01 µm, a measuring accuracy of 0.2 µm and a measuring range of 10 mm at a low price.
- The response speed has improved 2.8 times that of conventional products, achieving compatibility between high accuracy and high speed.

Gage head 542-715

- This model is equipped with a newly developed ultra-high precision transmission type linear encoder, achieving the outstanding resolution of 0.005 µm (5 nm).
- A measuring accuracy of 0.1 µm has been attained over the wide measuring rangeof 10 mm. This series is most suited for calibration/evaluation of master gages where its wide measuring range is a great advantage.

Gage head 542-720

Dedicated counter

APPLICATIONS

Master gage calibration/evaluation

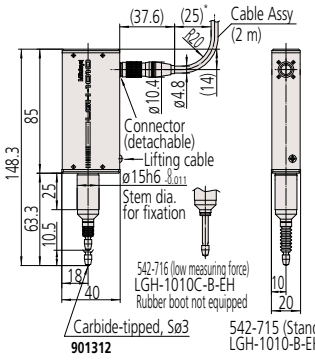
Inspection of high-precision parts

Needle contact-point mounting example

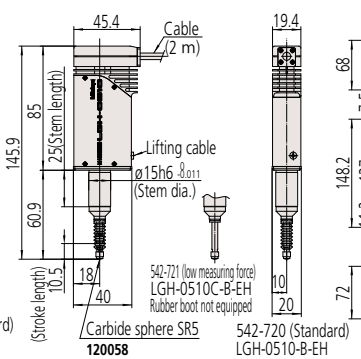
DIMENSIONS

Unit: mm

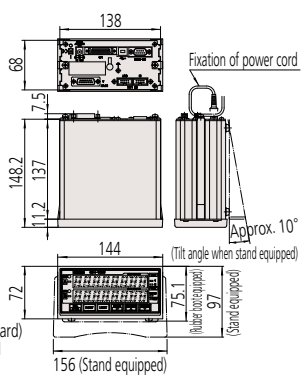
542-716



542-721



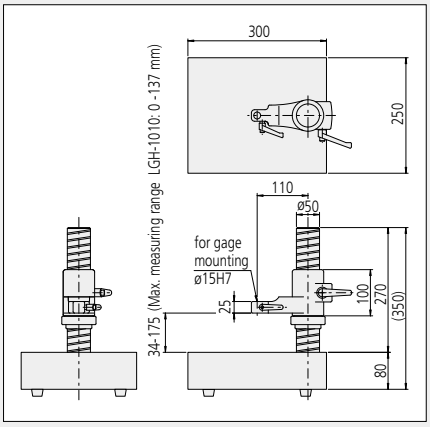
Dedicated counter (set)



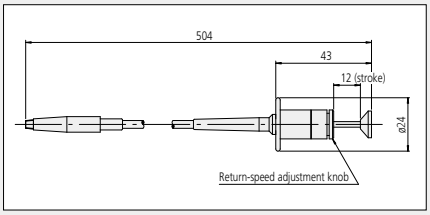
* Minimum bending radius or minimum dressed dimension

Optional Accessories

Measuring stand: 971750



- Release with damper: **971753**



- I/O output connector: **02ADB440**

- SENSORPAK

- Rubber boot: **238752**
  (Spare for **542-715** and **542-720**)

SPECIFICATIONS

Type		Resolution 0.01 µm/Accuracy 0.2 µm model	
Order No.		**542-715 (Standard)**	**542-716 (Low measuring force)**
Measuring range		10 mm	
Resolution		0.01 µm (0.05 µm, 0.1 µm, 0.5 µm, 1 µm can be selected from the counter)	
Measuring accuracy (20 °C)*1		0.2 µm	
Repeatability (20 °C)*1		0.1 µm (2σ)	
Retrace error (20 °C)*1		0.1 µm	
Measuring force	Contact point downwards	0.65 N or less	Approx. 0.12 N
	Contact point horizontal	0.55 N or less	Not applicable
	Contact point upwards	0.45 N or less	Not applicable
Position detection method		Photoelectric reflection type linear encoder	
Detectable operation speed		In normal measurement: 700 mm/sec; for peak detection: 120 mm/sec	
Mass of gage head		Approx. 370 g	
Contact point		Carbide tipped, Sø3 mm (M2.5 (P=0.45) x 5 mm), standard contact point **901312**	
Stem		ø15 mm	
Bearing		Linear ball type	
Output cable length		Approx. 2 m	
Operating temperature/ humidity ranges		0 to 40 °C (Reference temperature 20 °C)/20 to 80 %RH (non-condensing)	
Storage temperature/humidity ranges		–10 to 60 °C/20 to 80 %RH (non-condensing)	
Counter Specifications			
Display range		±999.99999 mm	
Functions		Zero-set, preset, direction switch, tolerance judgment (3 steps/5 steps), RS-RINK	
Peak hold function		Yes	
Interface		RS-232C, USB (only for SENSORPAK) , Digimatic (Printer: DP-1VA LOGGER)*3, I/O Connector	
External output		• RS-232C: counting data • Digimatic output: counting data*3 • I/O connector: counting data (simplified BCD), tolerance judgment result, simplified analog output	
External control		Zero-set, preset, data hold, peak measurement mode selection, peak clear	
Power supply		Suppplied AC Adapter, or +12 to 24 V DC, max 700 mA	
Power consumption		8.4 W (MAX 700 mA), Ensure at least 1 A power supply per unit.	
Mass of counter		Approx. 900 g (AC Adapter excluded)	
Standard accessories		Wrench for contact point, rubber boot, stand, washer (for counter), AC Adapter, AC cord, DC plug, user's manual, inspection certificate	

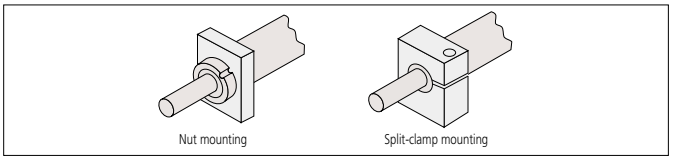
Type		Resolution 0.005 µm/Accuracy 0.1 µm model	
Order No.		**542-720 (Standard)**	**542-721 (Low measuring force)**
Measuring range		10 mm	
Resolution		0.005 µm (0.01 µm, 0.05 µm, 0.1 µm can be selected from the counter)	
Measuring accuracy (20 °C)*1		0.1 µm	
Repeatability (20 °C)*1		0.02 µm (2σ)	
Retrace error (20 °C)*1		0.05 µm	
Measuring force	Contact point downwards	0.65 N or less	Approx. 0.1 N
	Contact point horizontal	0.55 N or less	Not applicable
	Contact point upwards	0.45 N or less	Not applicable
Position detection method		Ultra-high accuracy transmission type linear encoder	
Detectable operation speed		In normal measurement: 250 mm/sec	
Mass of gage head		Approx. 370 g	
Contact point		Carbide sphere SR5 (M2.5 (P=0.45) x 5 mm), standard contact point **120058**	
Stem		ø15 mm	
Bearing		Linear ball type	
Output cable length		Approx. 2 m	
Operating temperature/ humidity ranges		15 to 25 °C (Reference temperature 20 °C)/30 to 60 %RH (non-condensing)	
Storage/humidity ranges		–10 to 60 °C/20 to 80 % (non-condensing)*2	
Counter Specifications			
Display range		±99.999995 mm	
Functions		Zero-set, preset, direction switch, tolerance judgment (3 steps/5 steps), RS-RINK	
Peak hold function		No	
Interface		RS-232C, USB (only for SENSORPAK), Digimatic (Printer: DP-1VA LOGGER)*3, I/O Connector	
External control		• RS-232C: counting data • Digimatic output: counting data*3 • I/O connector: counting data (simplified BCD), tolerance judgment result, simplified analog output	
External control		Zero-set, preset, data hold	
Power supply		Suppplied AC Adapter, or +12 to 24 V DC, max. 700 mA	
Power consumption		8.4 W, max 700 mA; ensure at least 1 A power supply per unit.	
Mass of counter		Approx. 900 g (AC Adapter excluded)	
Standard accessories		Wrench for contact point, rubber boot, stand, washer (for counter), AC Adapter, AC cord, DC plug, user's manual, inspection certificate	

*1: Applies when used with counter (excluding quantizing error).
*2: The storage temperature/humidity ranges after unpacking are the same as the operating temperature/humidity ranges.
*3: Digimatic output shall be up to 6 digits of data. For data of 7 digits or more, all digits will not be output to the display.

Gage Head Mounting Fixtures

■ Plain Stem and Stem with Clamp Nut

The stem used to mount a linear gage head is classified as a "plain type" or "clamp nut type" as illustrated below. The clamp nut stem allows fast and secure clamping of the linear gage head. The plain stem has the advantage of wider application and slight positional adjustment in the axial direction on final installation, although it does requires a split-fixture clamping arrangement or adhesive fixing. However, take care so as not to exert excessive force on the stem.



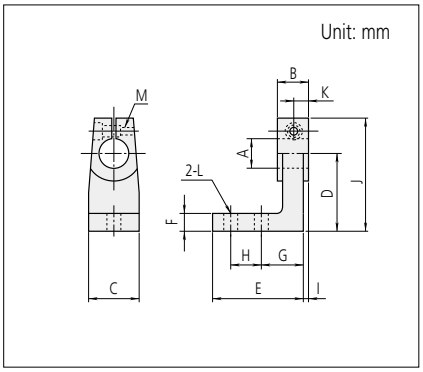
Split-clamp mounting fixtures

● To mount a gage head with an 8 mm diameter stem, use a 9.5 mm diameter stem bushing.

546288 ø9.5 x 15

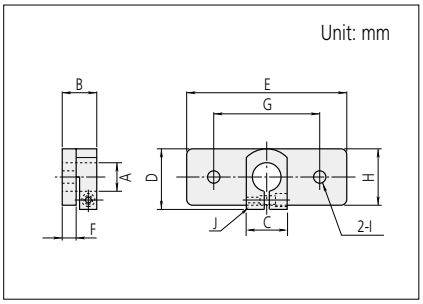
546343 ø9.5 x 8.5

Unit: mm



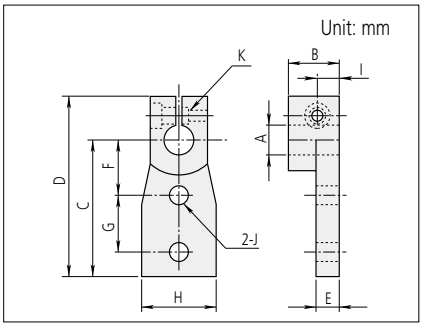
	A-2	B-2
Order No.	303560	303569
A	ø9.5	ø9.5
B	9	14.5
C	15	20
D	20	30
E	23	35
F	5	7
G	11	16
H	8	12
I	1.5	3.25
J	32.5	42.5
K	4.5	7.25
L	ø3.4	ø4.5
M	M3 x 0.5	M3 x 0.5

Unit: mm



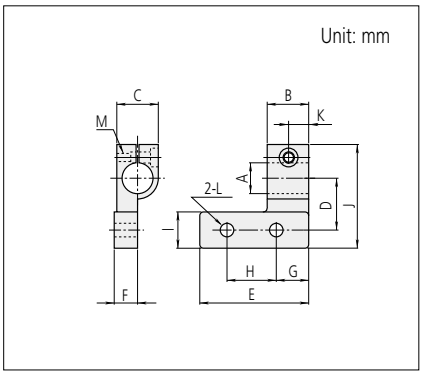
	A-4	B-4
Order No.	303562	303571
A	ø9.5	ø9.5
B	9	14.5
C	15	15
D	20	22.5
E	40	60
F	3	5
G	30	40
H	15	20
I	ø3.4	ø4.5
J	M3 x 0.5	M3 x 0.5

Unit: mm



	A-6	B-6
Order No.	303564	303573
A	ø9.5	ø9.5
B	9	14.5
C	30	40
D	42.5	52.5
E	4	6
F	15	18
G	10	15
H	15	20
I	4.5	7.25
J	ø3.4	ø4.5
K	M3 x 0.5	M3 x 0.5

Unit: mm

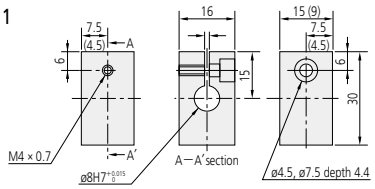


	A-8	B-8
Order No.	303566	303575
A	ø9.5	ø9.5
B	9	14.5
C	15	15
D	15	20
E	25	40
F	8.5	8.5
G	7.5	10
H	10	20
I	10	15
J	32.5	40
K	4.5	7.25
L	ø3.4	ø4.5
M	M3 x 0.5	M3 x 0.5

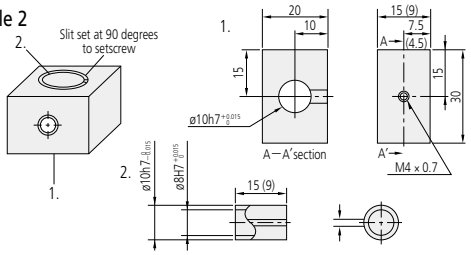
■ Example of plain-stem mounting

● The recommended clamping torque is 0.4 to 0.5 Nm (LGB-0105L: 0.2 to 0.3 Nm). Overly tightening the stem will prevent smooth movement of the spindle.

Example 1 Unit: mm



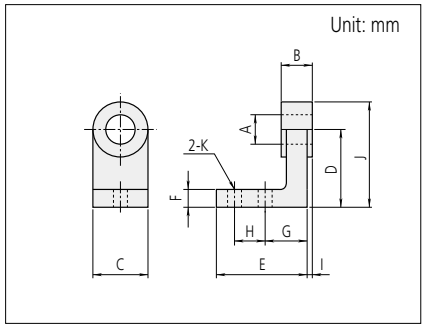
Example 2 Unit: mm



Clamp nut type stem fixtures

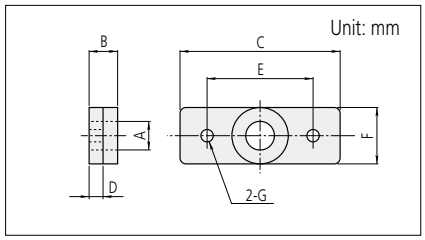
● The clamp nut type linear gages can use the following as they are.

Unit: mm



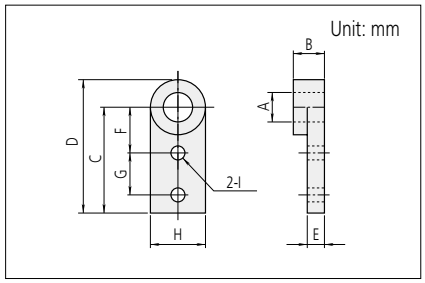
	B-1
Order No.	303568
A	ø9.5
B	11.5
C	20
D	30
E	35
F	7
G	16
H	12
I	1.75
J	40
K	ø4.5

Unit: mm



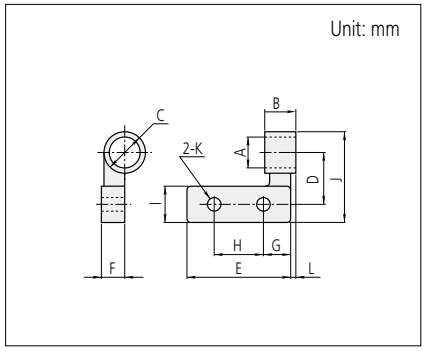
	B-3
Order No.	303570
A	ø9.5
B	11.5
C	60
D	5.5
E	40
F	20
G	ø4.5

Unit: mm



	B-3
Order No.	303572
A	ø9.5
B	11.5
C	40
D	50
E	6.5
F	18
G	15
H	20
I	ø4.5

Unit: mm



	B-7
Order No.	303574
A	ø9.5
B	11.5
C	ø15
D	20
E	40
F	8.5
G	10
H	20
I	15
J	35
K	ø4.5
L	1.25

Gage Head Mounting Fixtures

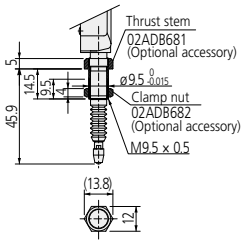
■ Mounting with a thrust stem

A thrust stem is available as an option for the **LGF**, **LGK**, and **LGD** gage heads. Installing a thrust stem on the stem allows direct mounting, simply by drilling a hole in a section of suitable thickness on the fixture.

For 10 mm **LGD/LGF/LGK**

Components Thrust stem: **02ADB681**
Clamp nut: **02ADB682**
Wrench: **02ADB683**

Unit: mm



* A mounting section with a thickness of 6 through 10.5 mm is suitable.

With the use of a thrust stem and clamp nut, a gage fixture can be arranged simply by drilling a 9.5 mm dia. hole. A gage can be secured firmly with ease with this arrangement.

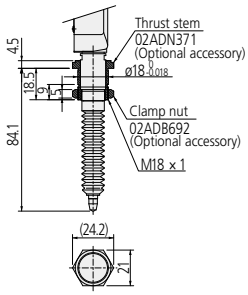
■ IMPORTANT
In attaching a thrust stem, be sure to fix the stem first with a dedicated wrench (02ADB683). An excessive force applied between the gage main body and stem may cause damage to the gage.

■ NOTE
Both the dedicated wrench (02ADB683) and M9.5 x 0.5 threaded section are for mounting a thrust stem. Do not use them for any purpose other than mounting a thrust stem.

For 25 mm **LGD/LGF**

Components Thrust stem: **02ADN371**
Clamp nut: **02ADB692**
Wrench: **02ADB693**

Unit: mm



* A mounting section with a thickness of 10 through 12 mm is suitable.

With the use of a thrust stem and clamp nut, a gage fixture can be arranged simply by drilling an 18 mm dia. hole. A gage can be secured firmly with ease with this arrangement.

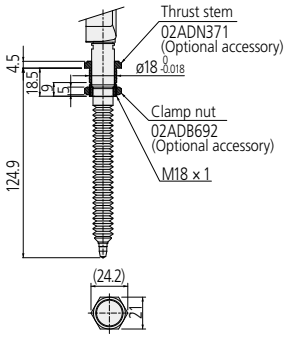
■ IMPORTANT
In attaching a thrust stem, be sure to fix the stem first with a dedicated wrench (02ADB693). An excessive force applied between the gage main body and stem may cause damage to a gage.

■ NOTE
Both the dedicated wrench (02ADB693) and M18 x 1 threaded section are for mounting a thrust stem. Do not use them for any purpose other than mounting a thrust stem.

For 50 mm **LGD/LGF**

Components Thrust stem: **02ADN371**
Clamp nut: **02ADB692**
Wrench: **02ADB693**

Unit: mm



* A mounting section with a thickness of 10 through 12 mm is suitable.

With the use of a thrust stem and clamp nut, a gage fixture can be arranged simply by drilling an 18 mm dia. hole. A gage can be secured firmly with ease with this arrangement.

■ IMPORTANT
In attaching a thrust stem, be sure to fix the stem first with a dedicated wrench (02ADB693). An excessive force applied between the gage main body and stem may cause damage to a gage.

■ NOTE
Both the dedicated wrench (02ADB693) and M18 x 1 threaded section are for mounting a thrust stem. Do not use them for other purpose than mounting a thrust stem.

SPECIFICATIONS

Compatible gage		**LGD/LGF/LGK** 10 mm	**LGD/LGF** 25/50 mm
Part No.	Thrust stem set*	02ADB680	02ADN370
	Thrust stem	(02ADB681)	(02ADN371)
	Clamp Nut	(02ADB682)	(02ADB692)
	Wrench	02ADB683	02ADB693
Gage mounting hole diameter (nominal)		ø9.5 mm	ø18 mm
Recommended plate thickness (mounting section)		6 to 10.5 mm	10 to 12 mm

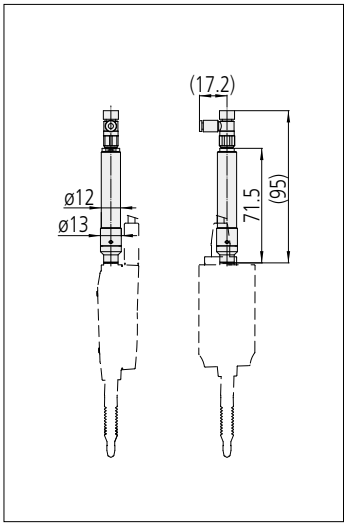
* A thrust stem set is comprised of a thrust stem and clamp nut. A dedicated wrench is required for tightening.

Optional Accessories
Air Drive Unit

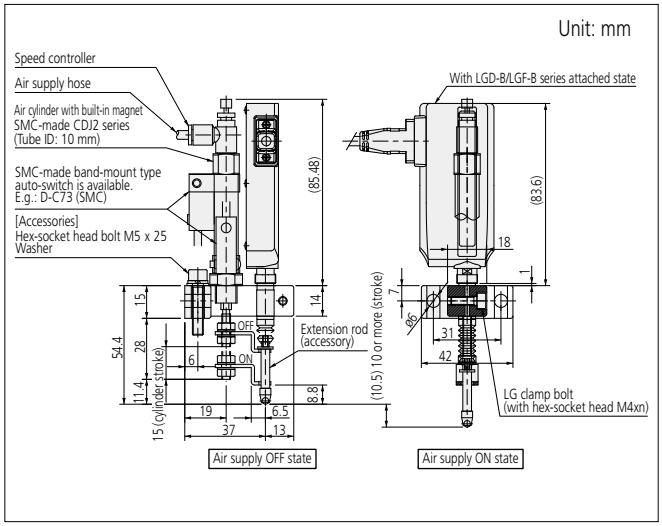
- Advances or retracts the spindle of a gage head by using a pneumatic cylinder.
- Automatic measurement is possible by using a solenoid valve.

For LGS: 903594 (mm), 903598 (in)

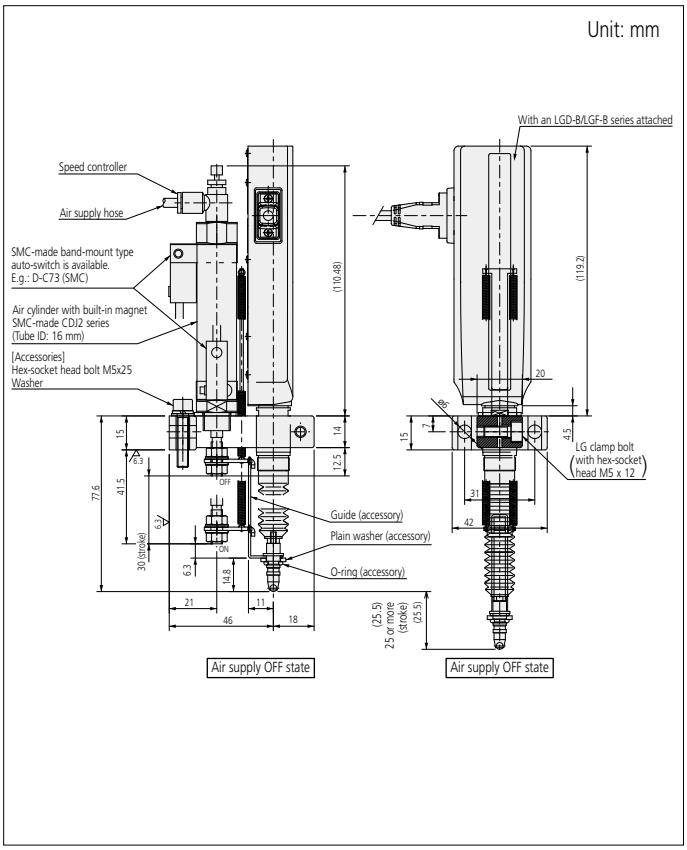
Air lifting unit LGS



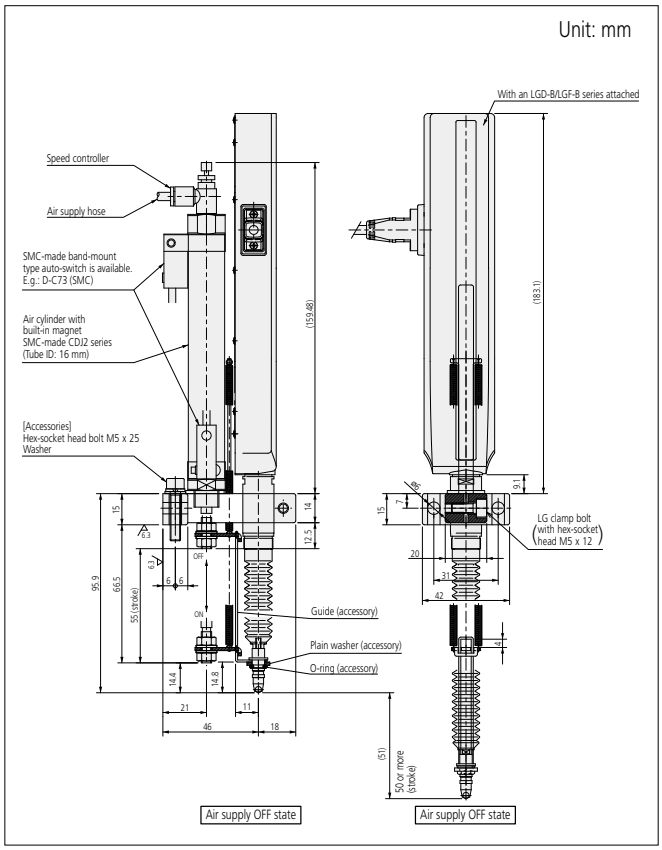
For 10 mm LGD/LGF/LGK: 02ADE230



For 25 mm LGD/LGF: 02ADE250



For 50 mm LGD/LGF: 02ADE270



SPECIFICATIONS

Order No.	903594	903598	02ADE230	02ADE250	02ADE270
Stroke	10 mm	0.4 in	10 mm	25 mm	50 mm
Compatible gage head	**LGS-1012P**		**LGD**, **LGK** (10 mm only), **LGF** series		
Air supply	0.5 MPa		0.2 to 0.4 MPa		
Mass	60 g		150 g	250 g	300 g

Optional Accessories

Spare rubber boot

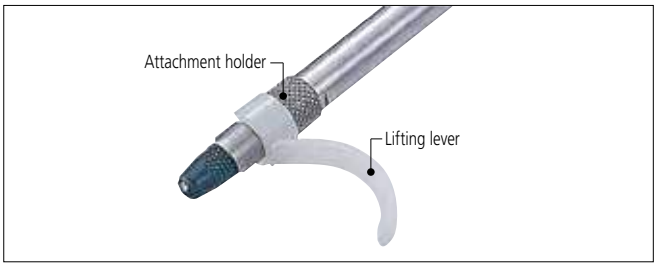
Protects the spindle bearing of a gage head from dust.

SPECIFICATIONS

Order No.	Compatible Gage head
238773	**LGB**, **LGB2** (for 5 mm range models)
238772	**LGB**, **LGB2**, **LGD**, **LGF**, **LGK** (for 10 mm range models)
962504	**LGD**, **LGF** (for 25 mm range models)
962505	**LGD**, **LGF** (for 50 mm range models)
238774	**LGS-1012P**

Attachment holder for lifting lever

This holder is attached between the spindle and the contact point for fixing the lifting lever.



SPECIFICATIONS

Order No.	
02ADG181	Attachment holder
137693	Lifting lever

Extension signal cable

The distance between a gage head* and display unit can be extended up to 20 m by using these cables (max. 3 cables).

* Not available for LGF with Origin Point Mark, LGS, LGD models, and Laser Hologage.

SPECIFICATIONS

Order No.	Cable length
902434	5 m
902433	10 m
902432	20 m

Extension signal cable for gage head with Origin Point Mark

A signal cable from the head to the receiver circuitry can be extended.
Maximum number of connectable cables is limited to 3, and the maximum total extension length is limited to 20 m.

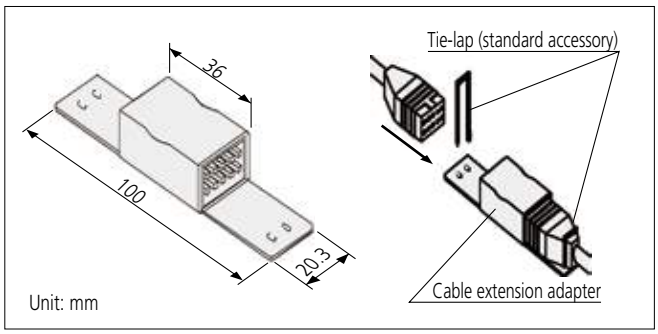
SPECIFICATIONS

Order No.	Cable length
02ADF260	5 m
02ADF280	10 m
02ADF300	20 m

Digimatic cable extension adapter: 02ADF640

This adapter can be used when the LGS or LGD gage head is to be connected to a display unit where the provided cable length is not sufficient for this connection.
02ADF640 Mass: 15 g

Note:
- Available for LGS-1012P and LGD.
- Available for EC101D, EG101D, EB-11D, EH-102D and EV-16D.
- Do not join more than one piece of this product together for use.



Extension cable for Digimatic gages

Order No.	Cable length
936937	1 m
965014	2 m

Optional Accessories

Measuring stand

Granite comparator stand
BSG-30HX 215-156-10

Base material	Granite
Base size (mm)	W 250 x D 300 x H 95
Base flatness	3.5 µm
Fine adjustment	Square thread
Stem size (mm)	ø20, ø9.53, ø8 with bush

LGF, LGD 25 mm/50 mm. When using the stand at 25 mm/50 mm stroke, separately obtain a ø15 bushing.

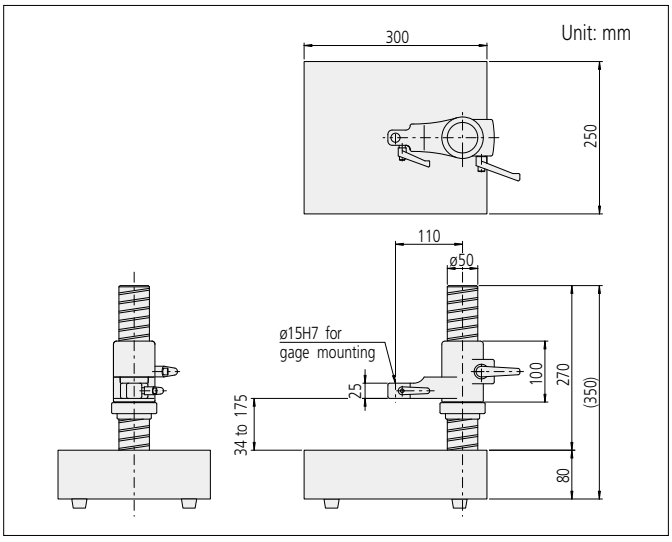
Comparator stand
BSC-30HX 215-505-10

Base material	Hardened steel,Grooved measuring stage
Base size (mm)	W 179 x D 255 x H 89 (Measuring stage □150 x H25)
Base flatness	2.3 µm
Fine adjustment	Square thread
Stem size (mm)	ø20, ø9.53, ø8 with bush

LGF, LGD 25 mm/50 mm. When using the stand at 25 mm/50 mm stroke, separately obtain a ø15 bushing.

Measuring stand for Laser Hologage
971750

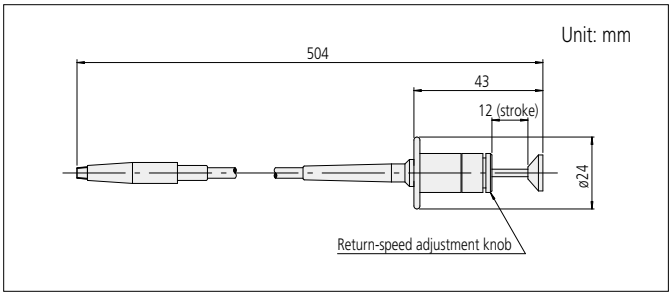
This **LGH** stand greatly helps the gage to achieve high accuracy.
Mass: 23 kg



Release with damper

Spindle-lift release for the Laser Hologage. A sudden drop of the spindle is prevented by the return-speed adjustment knob.

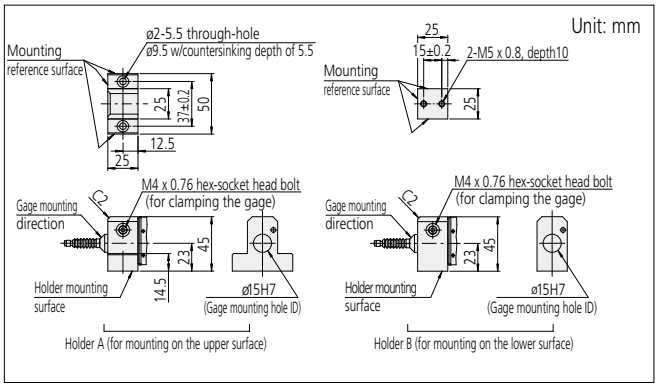
971753 Mass: 50 g



Mounting holder A, B

Useful when the Laser Hologage is mounted on an alternate fixture rather than the regular measuring stand.

Holder A **971751** Mass: 250 g
Holder B **971752** Mass: 180 g



Differential square-wave

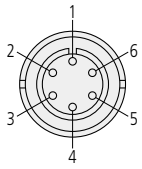
Model (Resolution)	LGB (0.1 µm)	LGK/LGF (0.1 µm)	LGK/LGF (0.5 µm)	LG/LGB/LGF (1 µm)	LGF (5 µm)	LGF with reference point mark (0.5 µm)	LGF with reference point mark (1 µm)
Power supply	+5 V (120 mA), power supply ripple voltage 200 mV p-p max.						
Output signal	90° phase difference, differential square wave (RS-422A equivalent)						
Signal pitch	0.4 µm		2 µm	4 µm	20 µm	2 µm	4 µm
Minimum edge interval	250 nsec	200 nsec	250 nsec	500 nsec	1000 nsec	250 nsec	500 nsec
Output signal level	+5 V (4.8 to 5.2 V, 80 mA) øA, $\overline{øA}$, øB, $\overline{øB}$: TTL output, line driver output, AM26LS31 or equivalent					+5 V (4.8 to 5.2 V, 120 mA) øA, $\overline{øA}$, øB, $\overline{øB}$, $\overline{øZ}$: TTL, line driver, AM26LS31 or equivalent	
Plug type	RM12BPE-6PH (HIROSE)					PRC05-P8M (TAJIMI)	
Compatible socket	RM12BRD-6S (HIROSE)					PRC05-P8M (TAJIMI)	
Recommended receiver	Differential input, line receiver, AM26LS32						
Gage connecting cable length	2 m; directly connected to the gage						
Extension cable length	Max. 20 m (extension cables of 5, 10 and 20 m in length are available)						
Error output*	See the "Timing chart (occurrence of error)" below						

* With an **LGF** gage, a seventh signal line may be provided to output the error alarm. (Factory option).

Output pin assignment

1) Output plug RM12BPE-6PH (HIROSE)

2) Pin assignment

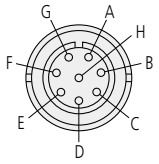


Pin No.	Assignment
1	+5 V
2	øA
3	øB
4	$\overline{øA}$
5	GND
6	$\overline{øB}$

Note: Power supply (120 mA) to a sensor (gage head)
Power supply ripple voltage: 200 mV p-p or less

1) Output plug PRC05-P8M (TAJIMI)

2) Pin assignment

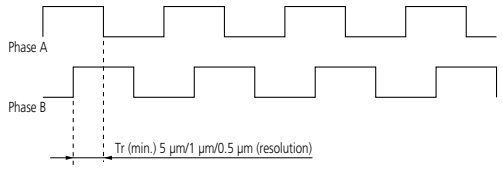


Pin No.	Assignment
A	+5 V
B	GND
C	øA
D	$\overline{øA}$
E	øB
F	$\overline{øB}$
G	$\overline{øZ}$
H	N.C.

Note: Power supply (120 mA) to a sensor (gage head)
Power supply ripple voltage: 200 mV p-p or less

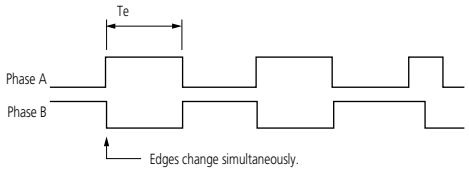
Timing chart (normal)

1) Real-time pulse output (Phase-A wave advances when the spindle is retracted.)



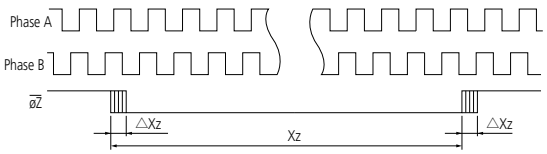
1. Output condition: Spindle speed≤250 mm/s*2
2. Minimum edge-to-edge interval=Tr
3. Output delay time*1: Max. 1 µs

Timing chart (occurrence of error)



1. Output condition: Gage heads will identify an error under the following conditions and produce an output as described above.
   - Gage response speed*3 < Spindle speed
   - At a disturbance such as interference, vibration, etc.
2. Minimum width of output pulses=Te

LGF origin point mark applied Timing chart (normal)



△ Xz: Repeatability of origin point position (edge reproducibility) =±0.5 µm
(at a scale travel speed less than 300 mm/sec in the same direction)
Xz: Pulse width of origin point signals = Approx. 40 to 60 µm (reference)

øZ with origin point signals is only output.

■ Minimum edge-to-edge interval/pulse width under each condition

Model	Resolution	Tr Tr (real-time output)	Te Te (error output)
LGB	5 µm 1 µm	0.4 µs	0.4 µs
LGF			
LGK			
LG		0.2 µs	0.2 µs
LGF	0.5 µm	0.2 µs	0.4 µs
LGK			
LGB	0.1 µm		
LGF			
LGK			
LG			

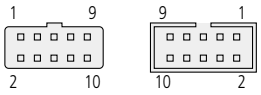
* 1: Output delay time: Time until the counting pulse catches up to the spindle position.
* 2: The actual limit of real-time pulse output will be depreciated to this value. This is because actual detection signals unavoidably contain acceleration components in association with the spindle motion as well as error components from a little noise included in the signal itself. As a result, some burst pulses at a speed below the ideal conditions (i.e. ideal signal form at constant speed) may be generated.
* 3: Gage respond speed: Refer to the specifications section in the User's Manual.

[IMPORTANT]

- Since any output during an error condition cannot be used as the attribute data, it is necessary to detect the error condition at the reception circuitry side.
- It is recommended to design user circuitry based on an IC chip that is capable of counting at 5 Mcps (equivalent to square wave of 1.25 MHz) or greater.

Digimatic code

1. Pin assignments and signals



• Compatible socket:
Sumitomo 3M: V Low-Proheader
Model: 7610-5002XX or equivalent

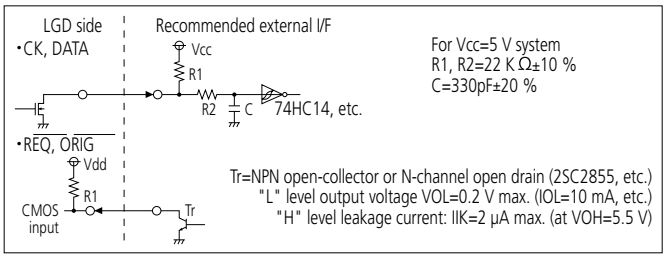
Pin No.	Signal	I/O	Description
1	ND	—	Signal ground
2	DATA	Output	Measurement data-output terminal
3	CK	Output	Synchronized clock-output terminal
4*1	N.C.	—	Not used
5	$\overline{REQ}$	Input	Input for data transmission request from external device
6*1	$\overline{ORIG}$	Input	Input for absolute-origin setting signal
7*1	N.C.	—	Not used
8*1	N.C.	—	Not used
9*1	+5V	—	Power supply (+5V±10 %)*2
10*1	GND (F.G.)	—	Frame ground

*1: LGD, LGS uses a unique specification.
All others use the common Digimatic output specification (10-pin, square).
*2: Current consumption of LGD, LGS: Idd=20 mA max.

2. I/O electrical specifications

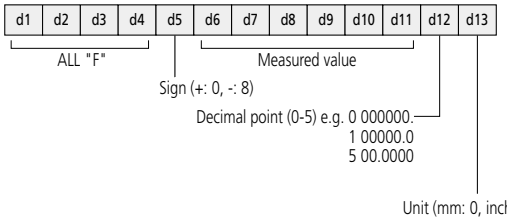
● Output terminal format: CK, DATA
N-channel open drain
Maximum output current:
400 µA max. (when Vol=0.4 V)
Output withstand voltage: -0.3 V to 7 V

● Input terminal format: $\overline{REQ}$, $\overline{ORIG}$
Pull-up CMOS input
Internal power supply voltage: Vdd= 1.35 to 1.65 V
Pull-up resistance: R1=10 to 100 KΩ
"H" level input voltage: VIH=1.1 V min.
"L" level input voltage: VIL=0.3 V max.



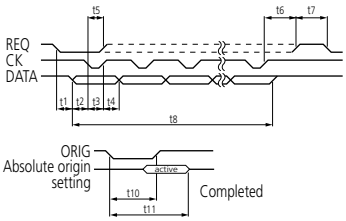
Note: Since the power supply voltages are different between the gage side and the external device side, be sure to use an open collector or open drain circuit. Do not use CMOS output or similar.

3. Data format



● Data is output as 13-digit (52-bit) based on 4 bits=1 digit.
● Data is output in order from d1 to d13. Each digit is output in the order of LSB to MSB.

4. Timing chart



Standard (for reference)

Symbol	min.	max.
t1	0	2sec
t2	15 µs	—
t3	100 µs	—
t4	100 µs	—
t5	0	—
t6	—	—
t7	—	—
t8	—	—

LGD

Symbol	min.	max.
t1*	30 µs	95 ms
t2	15 µs	—
t3	100 µs	—
t4	100 µs	—
t5	0 µs	—
t6*	—	100 µs
t7*	100 µs	—
t8*	—	30 ms

Symbol	min.	max.
t10*	1.5 s	—
t11*	—	4 s

LGS

Symbol	min.	max.
t1*	160 µs	85 ms
t2	150 µs	180 µs
t3	150 µs	180 µs
t4	300 µs	330 µs
t5	0 µs	—
t6*	—	100 µs
t7*	100 µs	—
t8*	—	—

Note 1: The specifications indicated by an asterisk (*) are applicable only to LGD, LGS. All other Digimatic output specifications are common to all models.
Note 2: Read data only when CK is at the "L" level.
Note 3: Do not input REQ signal (fixed at "H") while the absolute origin is being set (during t11).
Note 4: If t5, t6 and t7 are satisfied and REQ is continuously input, an output is obtained from LGD, LGS at intervals of approximately 95 ms.
Note 5: Start inputting ORIG and REQ after two or three seconds have elapsed (the estimated time required for internal circuit/sensor to stabilize) following power-on.

Q Question

What is the absolute position origin point?

A Answer

The absolute position origin point is known as the origin point (0 point) that will never vanish even when power is turned off. The LGS and LGD series are equipped with the absolute scale (electrostatic capacitance type ABS scale) that can set the absolute position origin point, thus always outputting the contact point position in reference to the last origin point when power is turned on again. This removes the necessity for adjustment with the master every time power is turned on and contributes significantly to automation of measurement.

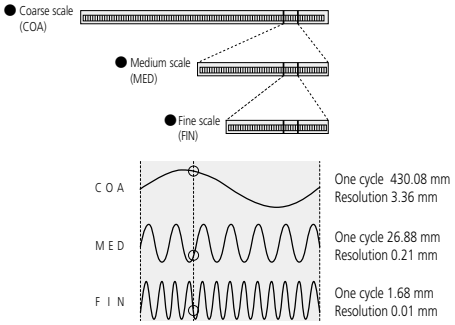
Absolute Scale Device (Electrostatic capacitance type ABS scale device)

● Patent registered (Japan, USA, UK, Switzerland, Germany, Sweden)

● An absolute address is applied to individual absolute scales inside the main scale just like rail ties are numbered. A measured value is displayed by reading this absolute address from a slider position.

ABSOLUTE™

● The system uses 3 scales with a different wavelength while applying an absolute address on each scale.



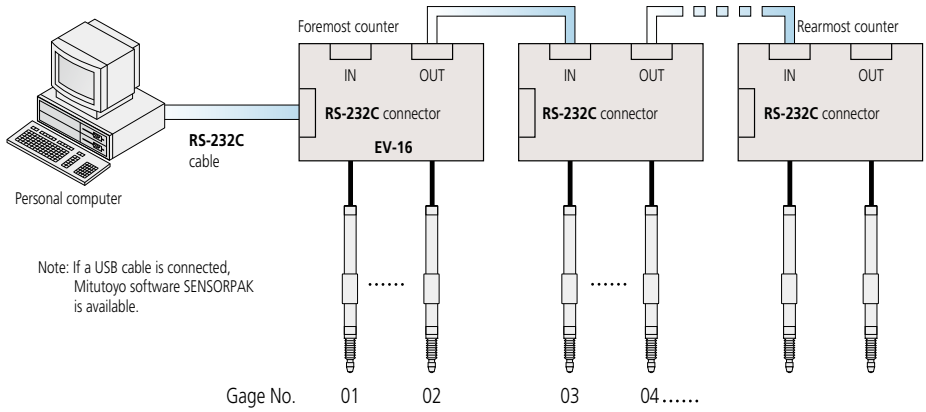
Connecting linear gages to counters/Comparative table of counter functions

Display unit	EC Counter	EG Counter			EB Counter			EH Counter				EV Counter		
	EC-101D	EG-101P	EG-101Z	EG-101D	EB-11P	EB-11Z	EB-11D	EH-101P	EH-102P	EH-102Z	EH-102D	EV-16P	EV-16D	EV-16Z
Applicable gages	Digimatic	Phase-A/B	Phase-A/B/Z (Bi-directional)	Digimatic	Phase-A/B	Phase-A/B/Z (Bi-directional)	Digimatic	Phase-A/B	Phase-A/B	Phase-A/B/Z (Bi-directional)	Digimatic	Phase-A/B	Digimatic	Phase-A/B/Z (Bi-directional)
0.01 µm Laser Hologage														
0.1 µm LG/LGM		√			√			√	√			√*1		
0.1 µm LGK/LGB/LGF		√			√			√	√			√*1		
0.5 µm LGK/LGF		√			√			√	√			√		
0.5 µm LGF with Origin Point Mark			√			√				√				√
1 µm LGF with Origin Point Mark			√			√				√				√
1 µm LG/LGM		√			√			√	√			√		
1 µm LGK/LGB/LGF		√			√			√	√			√		
5 µm LGF		√			√			√	√			√		
0.01 mm LGD/LGS	√			√			√				√		√	
Functions														
Number of connectable gages	1	1	1	1	1	1	1	1	2	2	2	6	6	6
Display	√	√	√	√	√	√	√	√	√	√	√	*1	*1	*1
Zero set	√	√	√	√	√	√	√	√	√	√	√	*1	*1	*1
Presetting	√	√	√	√	√	√	√	√	√	√	√	*1	*1	*1
Direction switch	√	√	√	√	√	√	√	√	√	√	√	√	√	√
GO/NG indication	√	√	√	√	√	√	√	√	√	√	√	√	√	√
GO/NG output	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5-stage tolerance display/output		√	√	√	√	√	√	√	√	√	√			
3-stage tolerance display/output	√	√	√	√	√	√	√	√	√	√	√	√	√	√
mm/inch switch	√	√	√	√	√	√	√	√	√	√	√	√	√	√
ABS gage zero set	√			√			√				√		√	√
ABS/INC gage changeover	√			√			√				√		√	√
Peak (max/min) hold		√	√	√	√	√	√	√	√	√	√	√	√	√
Run out (TIR) measurement		√	√	√	√	√	√	√	√	√	√	√	√	√
Double count	√	√	√	√				√	√	√	√			
Sum/difference calculation								√	√	√	√			
Lower digit blank-out								√	√	√	√			
External zero set	*2	*2	*2	*2	*2	*2	*2	√	√	√	√	√	√	√
External preset	√	√	√	√	√	√	√	√	√	√	√	√	√	√
External hold	√	√	√	√	√	√	√	√	√	√	√	√	√	√
External tolerance set (when a PC is used)								√	√	√	√	√	√	√
External tolerance memory switch (when I/O is used)		√	√	√	√	√	√	√	√	√	√	√	√	√
External peak-hold cancel		√	√	√	√	√	√	√	√	√	√	√	√	√
Inter-axial calculation function												√	√	√
Output														
Power-supply voltage error	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Overspeed error	√	√	√		√	√	√	√	√	√	√	√	√	√
Overflow error	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Gage error	√	√	√	√	√	√	√	√	√	√	√	√	√	
Tolerance setting error	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Communication error								√	√	√	√	√	√	√
Parallel BCD output		√	√	√								√	√	√
Serial BCD output					√	√	√							
Simple BCD output								√	√	√	√			
Simple analog output					√	√	√	√	√	√	√			
Tolerance judgment output	*3	√	√	√	√	√	√	√	√	√	√	√	√	√
Limit output					√	√	√							
Segment output												√	√	√
RS-232C output								*3	*3	*3	*3	√	√	√
Digimatic output	*5				√	√	√	*4	*4	*4	*4			
USB output for SESORPAK								√	√	√	√			
RS link								*3	*3	*3	*3	√	√	√
RS link (maximum number of gages)								10	20	20	20	60	60	60

*1: When an optional D-EV is connected. *2: Enabled by setting "0" via external presetting. *3: Switchable between the Digimatic output.
*4: Switchable between the RS-232C output. *5: Switchable between the tolerance judgment output.

RS Link function

It is possible to connect a maximum of 10 counter units together to carry a maximum of 60 channels of multi-point measurement at a time.
For this connection use the dedicated RS link connection; **02ADD950** (0.5 m), **936937** (1 m) or **965014** (2 m) (The sum of length of **RS** link connection cable permitted for the entire system is 10 m or less.)



SENSORPAK

Measurement data loading software for EH, EV, VL

MeasurLink® ENABLED
Data Management Software by Mitutoyo

- This software transfers measurement data to a personal computer from linear gage counters (**EH, EV**) with RS-232C output, linear gage counters (**EH**) with USB output, or the Litematic display (**VL**).
- Maximum 60 channels of measuring points can be processed.
- Arithmetical calculation and maximum width calculation using the measurement data.
- Export of measurement data into MS-Excel.
- Various graphic functions (numeric value display, meter display, bar-graph display, overall judgment display)

EC Counter – Panel mount, Single function Type

For Digimatic output gage head

EC-101D (542-007*)

GO/NG judgment output or Digimatic output (selectable) type

Features

- Employs the DIN size (96 x 48 mm) and mount-on-panel configuration, which greatly facilitates incorporation into a system.
- Can either produce tolerance judgment output or Digimatic output.

Functions

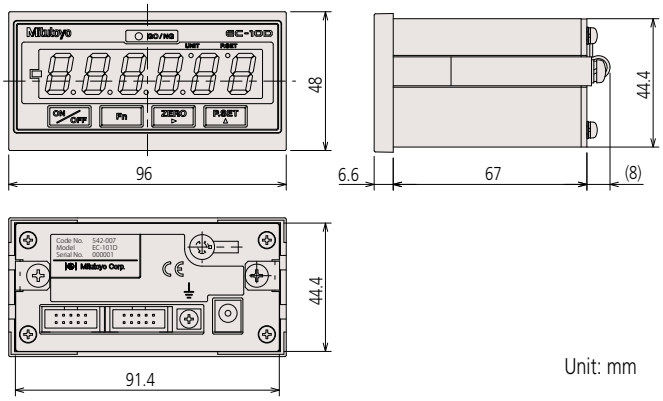
- Preset
- Tolerance judgment (3 steps)

SPECIFICATIONS

Order No.		542-007*
Model		EC-101D
Resolution		0.01 mm (±9999.99)/0.0005 in (±99.9995 in)/0.001 in (±999.999 in) 0.001 mm (±9999.999)/0.00005 in (±9.99995 in)/ 0.0001 in (±99.999 in) [Automatic setting by gage]
Display		Sign plus 6 digits (Green LED)
Tolerance judgment display		LED display (3 steps: Amber, Green, Red)
External output (switching type)	Tolerance judgment output	–NG, OK, +NG (open-collector)
	Data output	Digimatic output
Control input		External PRESET, external HOLD
Power supply	Voltage	Supplied AC adapter, or 9 to 12V DC
	Consumption	4.8 W (max. 400 mA) Ensure at least 1 A is available per unit.
Operation/storage temperature range		Operation: 0 to 40 °C/Storage: –10 to 50 °C
External dimensions		96 (W) x 48 (H) x 84.6 (D) mm
AC adapter		AC adapter: (Japan/North America) **06AEG302JA**/(EU) **06AEG302D**/ (UK) **06AEG302E**/(Korea) **06AEG302K**/(China) **06AEG302DC**
Applicable head		**LGD, LGS, ID**
Mass		220 g
Optional accessories		Connecting cable for digimatic mini-processor **936937** (1 m), **965014** (2 m) DC plug PJ-2 **214938** I/O cable (2 m): **C162-155**

* To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE.

DIMENSIONS

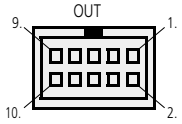


Unit: mm

Input/output specifications

1) Compatible plug: MIL type connector FAS-10-17 (YAMAICHI), XG4M-1030-T (OMRON)

2) Pin assignment



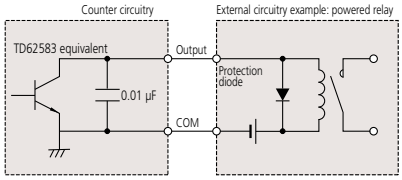
Pin No.	I/O	Description	Function	Optional I/O cable color
1		COM	Connected to the internal GND	Amber/black
2	O	+NG	Tolerance output: The relevant output terminal falls to L. At an error display [+NG=-NG=L]	Amber/red
3	O	GO		Yellow/black
4	O	-NG		Yellow/red
5	I	HOLD	HOLD input	Bright green/black
6	I	P.SET	PRESET input (to cancel the error)	Bright green/red
10		F.G	Shield	White/red
			Other than the above listed shall be unconnected.	

Note 1: Output from each pin in the Digimatic output mode may differ from those which are described in the table above.

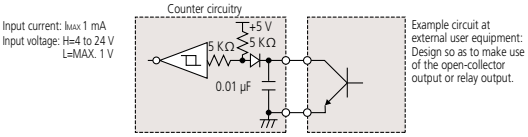
Note 2: One end of the I/O cable (2 m, optional) consists of separate wires for connection as appropriate. The cable's F.G wire (with solderless terminal, green) should be connected to the grounding terminal of the main unit.

3) I/O circuit

1. Output circuit (-NG, GO, +NG)
Transistor is "ON" when the open-collector output is "L".

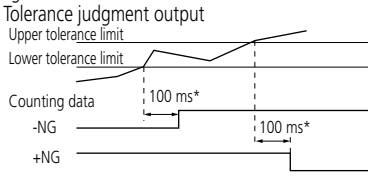


2. Input circuit (PSET, HOLD)
Input is valid when the line is "L".



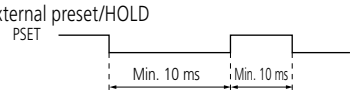
4) Timing chart

1. Tolerance judgment output



* Varies depending on the gage.

2. External preset/HOLD



* Input is active when L1="H", 0="L".

5) Optional I/O cable (2 m)
C162-155

Digimatic Mini-processor
DP-1VA LOGGER
264-505

EG Counter – Panel mount, Single function Type

For differential square-wave output gage head	For differential square-wave output gage head with Origin Point Mark	For Digimatic code output gage head
EG-101P (542-015) BCD output/GO/NG judgment output type	**EG-101Z (542-017)** BCD output/GO/NG judgment output type	**EG-101D (542-016)** BCD output/GO/NG judgment output type
		

Features

- Possible to produce 3-step/5-step x 3 kinds of tolerance output and BCD output.
- Smoothing function can reduce fluctuation of display digits.
- Employs the DIN size (96 x 48 mm) and mount-on-panel configuration, which greatly facilitates incorporation into a system.

Functions

- Preset
- Direction switch
- Tolerance judgment (3/5-step, 3 kinds)
- Peak (max., min., runout) measurement
- Constant number
- Smoothing
- Error display/output
- Key protection

SPECIFICATIONS

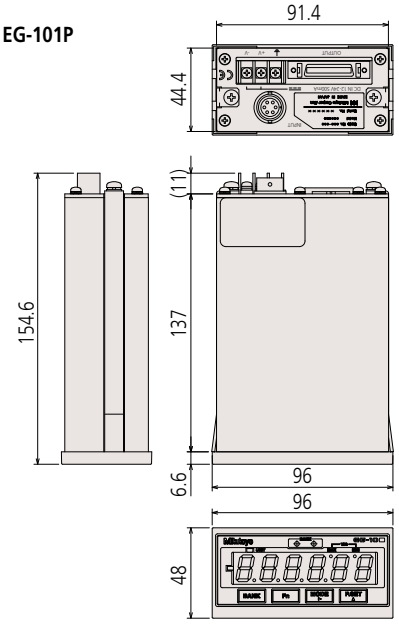
Order No.		542-015	542-017	542-016
Quantizing error		±1 count		
Maximum input frequency		1.25 MHz, response speed depends on gage specification.		—
Resolution		0.01 mm (±9999.99 mm)/0.0005 in (±99.9995 in)/0.001 in (±999.999 in) 0.005 mm (±9999.995 mm)/0.00005 in (±9.99995 in)/0.0001 in (±99.999 in) 0.001 mm (±999.999 mm)/0.00005 in (±9.99995 in)/0.0001 in (±99.999 in) 0.0005 mm (±99.9995 mm)/0.000005 in (±0.999995 in)/0.00001 in (±9.99999 in) 0.0001 mm (±99.9999 mm)/0.000005 in (±0.999995 in)/0.00001 in (±9.99999 in)		0.01 mm (±9999.99 mm)/0.0005 in (±99.9995 in)/ 0.001 in (±999.999 in) 0.001 mm (±999.999 mm)/ 0.00005 in (±9.99995 in)/0.0001 in (±99.999 in) [Automatic setting by gage]
Tolerance judgment display		LED display (3 steps: Amber, Green, Red/5 steps: Amber, Amber flashing, Green, Red flashing, Red)		
Tolerance judgment output		L1 to L5 (Open-collector/Switchover between L1 to L5 and BCD output with parameter)		
Control output		Normal operation signal (NOM): open-collector		
BCD output		Open-collector/Switchover between 6-digit (positive/negative-true logic) and tolerance judgment output with parameter		
Control input		Presetting, display hold, peak value clear, tolerance judgment BANK switch		
Power supply	Voltage	12 to 24 V DC		
	Consumption	6 W or less (500 mA max.) Ensure at least 1 A is available per unit.		
Operating temperature range		0 to 40 °C (RH 20 to 80 %, non-condensing)		
Storage temperature range		–10 to 50 °C (RH 20 to 80 %, non-condensing)		
External dimensions		96 (W) x 48 (H) x 156 (D) mm		
Optional Accessories		**02ADB440** I/O output connector (with cover) **357651** AC adapter **02ZAA000** AC cable* **02ADD930** Terminal connecting cable*		
Applicable gage head		**LG, LGB, LGF, LGK, or LGF** with reference point mark excluding origin point mark	**LGF** with reference point mark	**LGD**, **LGS**, **ID**, **SD**
Mass		Approx. 400 g		

* Required when using AC adapter.

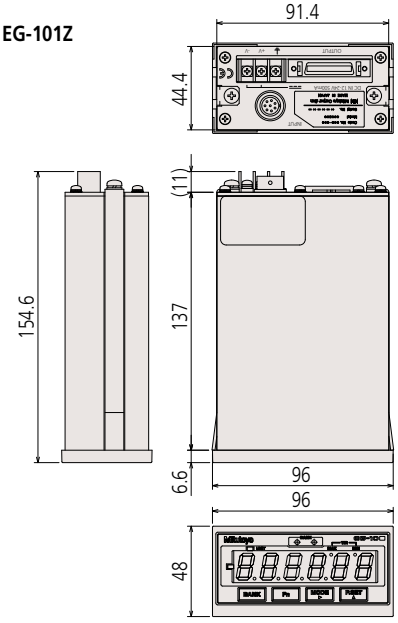
DIMENSIONS

Unit: mm

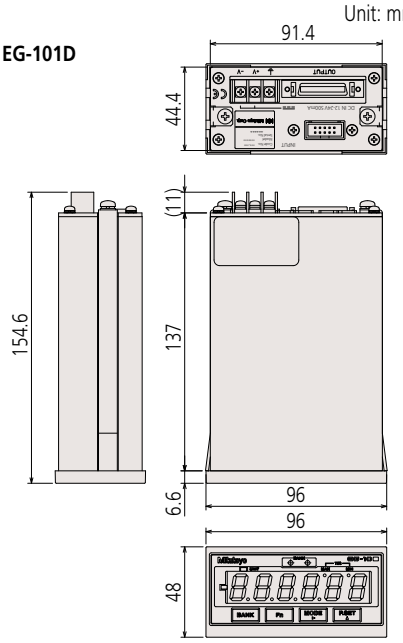
EG-101P



EG-101Z

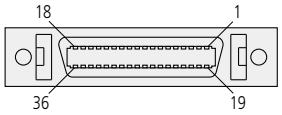


EG-101D



Input/output specifications

1) Compatible plug: 02ADB440 (with cover)
2) Pin assignment



Compatible plug:
Plug : 10136-3000PE (3M)
Cover: 10136-52A0-008 (3M)
Plug : DX40M-36P (HIROSE)
Cover: DX30M-36-CV (HIROSE)

1. In tolerance judgment mode

Pin No.	I/O	Description	Function
1, 2		COM	Connected to the internal GND
3	O	L1	Tolerance output: The relevant output terminal falls to L. At an error display [L1=L5=L]
4	O	L2	
5	O	L3	
6	O	L4	
7	O	L5	
10	O	NOM	Normal output
27	I	SET1	BANK, Peak mode setting: Enter the setting value with SET. Determines
28	I	SET2	the mode and bank to be used with MODE and BANK, respectively.
29	I	MODE	Determining the change of peak value: Combined operation with SET
34	I	HOLD	HOLD input
35	I	PSET	At normal measurement: Preset At peak value measurement: Peak clear
36	I	BANK	Determining the change of BANK: Combined operation with SET
		NC	Other than the above listed shall be unconnected.

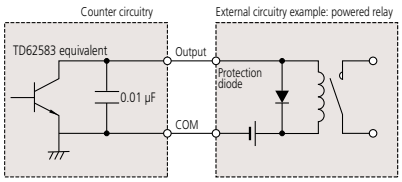
2. In BCD output mode

Pin No.	I/O	Description	Pin No.	I/O	Description	Pin No.	I/O	Description
1		COM	13	O	4×10^2	25	O	4×10^5
2		COM	14	O	8×10^2	26	O	8×10^5
3	O	1×10^0	15	O	1×10^3	27	I	SET1
4	O	2×10^0	16	O	2×10^3	28	I	SET2
5	O	4×10^0	17	O	4×10^3	29	I	MODE
6	O	8×10^0	18	O	8×10^3	30	—	NC
7	O	1×10^1	19	O	1×10^4	31	O	SIGN
8	O	2×10^1	20	O	2×10^4	32	O	NOM
9	O	4×10^1	21	O	4×10^4	33	O	READY
10	O	8×10^1	22	O	8×10^4	34	I	HOLD
11	O	1×10^2	23	O	1×10^5	35	I	PSET
12	O	2×10^2	24	O	2×10^5	36	I	INH

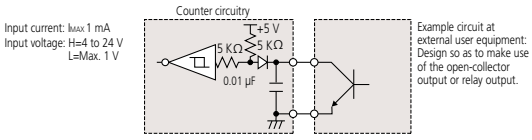
* Pin Nos. 3 to 26, and 31 can be logically inverted via the corresponding parameter.
* SIGN: Represents the sign of counting value as either "H" for positive value or "L" for negative value.
* READY: It will be "L" during the output data determination.
* INH: During input operation each output from Pin No. 3 to 26, and 31 will be "H".
* External output terminal is valid at "L".
* NOM, HOLD, and PSET function in the same way as in the tolerance judgment mode.
* External input uses negative true logic as "L" corresponding to "Valid".

3) I/O circuit

1. Output circuit (NOM, L1 to L5)
Transistor is "ON" when the open-collector output is "L".

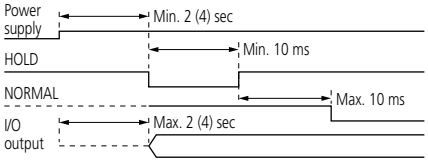


2. Input circuit (SET, MODE, BANK, PSET, HOLD)



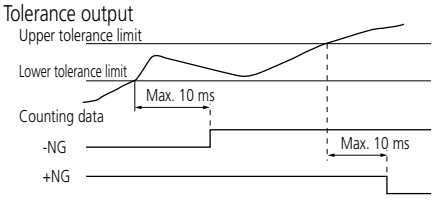
4) Timing chart

1. Power ON characteristics



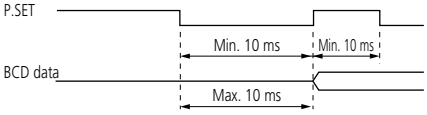
* ( ) represents EG-D.

2. Tolerance output

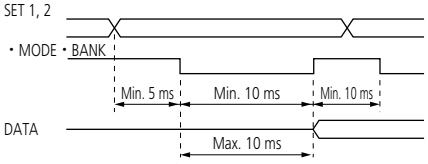


* EG-D Counter depends on the gage.

3. External preset/Peak clear



4. Peak mode/BANK specification



* Input is active in the case of L1="H", 0="L"

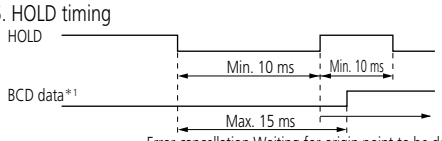
BANK Selectable

	SET2	SET1
BANK0	0	0
BANK1	0	1
BANK2	1	0
BANK3	1	1

MODE Selectable

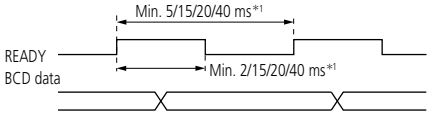
	SET2	SET1
NOMAL	0	0
MAX	0	1
MIN	1	0
TIR	1	1

5. HOLD timing



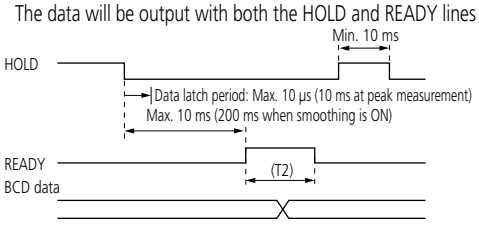
Error cancellation Waiting for origin point to be detected*2
*1: With the serial BCD unit in the command made (Pin No. 35=0)
*2: (Only for EG-Z) Resetting of origin point (Pin No. 42=1)

6. Interval mode
The data will be continuously output according to the internal timing of the counter.

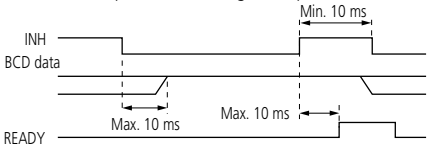


*1: Depends on the setting of parameter No. 23.

7. Command mode
The data will be output with both the HOLD and READY lines being synchronized.

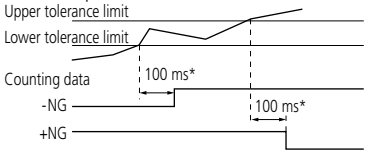


8. INH input
BCD data output is OFF during the input of INH.



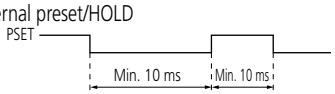
5) Timing chart

1. Tolerance output



* Depends on the gage head (the values show those for LGD).

2. External preset/HOLD



* Input is active when L1="H", 0="L"

EB Counter – Panel mount, Multi- function Type

EB-11P (542-092-2)
For differential square-wave output gage head

EB-11Z (542-094-2)
For differential square-wave output gage head with Origin Point Mark

EB-11D (542-093-2)
For Digimatic code output gage head

Features

- Possible to produce 3-step/5-step x 7 kinds of tolerance output and limit value output independently for each of 7 channels.
- Provided with serial BCD output capability, which makes the connection to a programmable controller or personal computer, etc., possible with the minimum cabling requirement.*1
- Possible to perform dynamic measurement with the simplified analog output.*2
- Employs the DIN size (96 x 48mm) and mount-on-panel configuration, which greatly facilitates incorporation into a system.

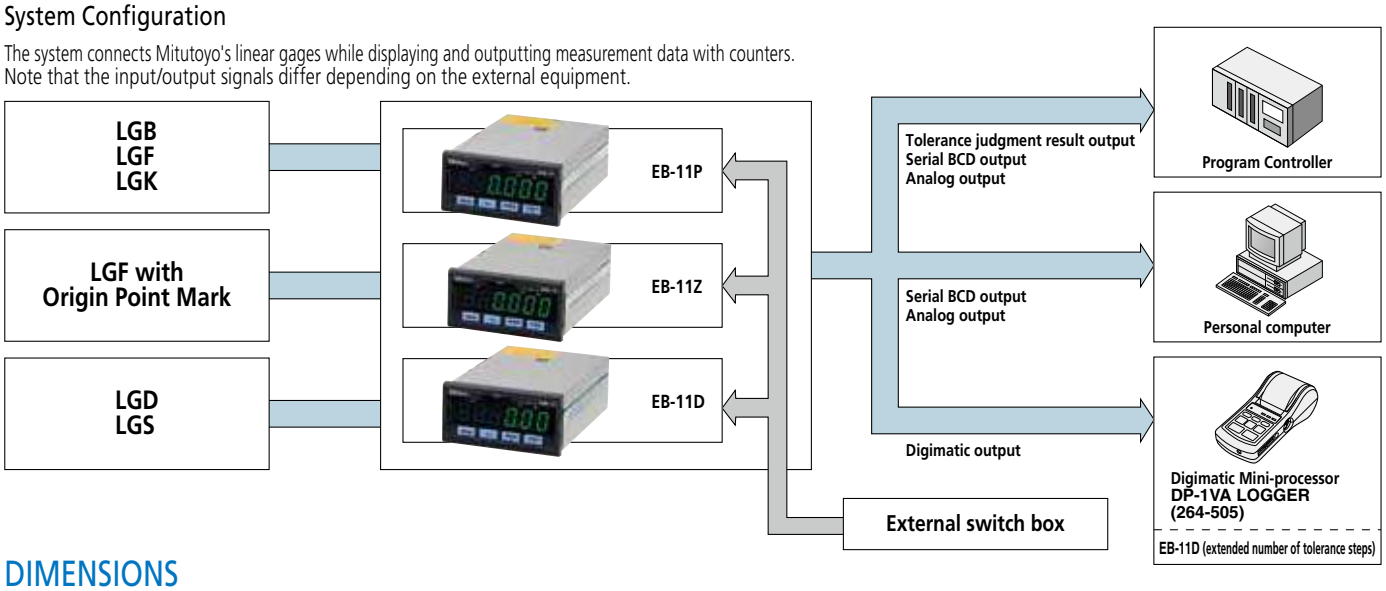
*1: Patent registered (Japan)
*2: Patent registered (Japan, USA, UK), Patent pending (Germany)

Functions

- Preset
- Tolerance judgment output (3/5-step, 7 kinds)
- Limit value output (2 kinds independently for each of the 7 channels)
- Peak (max., min., runout) measurement
- Choice of data output (Serial BCD, Simplified analog, Digimatic)
- Error display/output
- Key protection

System Configuration

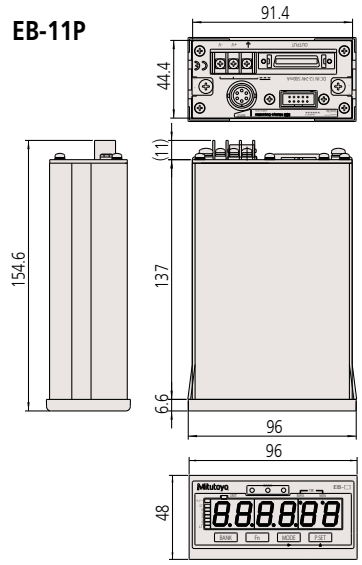
The system connects Mitutoyo's linear gages while displaying and outputting measurement data with counters.
Note that the input/output signals differ depending on the external equipment.



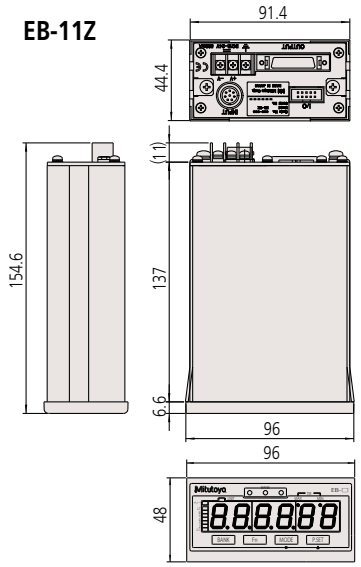
DIMENSIONS

Unit: mm

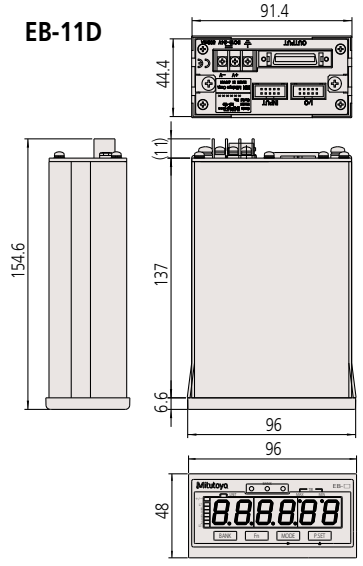
EB-11P



EB-11Z



EB-11D



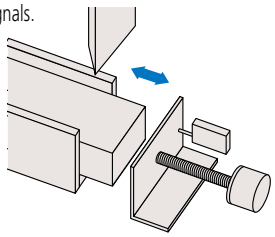
Powerful tolerance judgment function

Keeps up to seven 3-step/5-step tolerance limits in memory.

It is possible to switch these tolerance limits with an appropriate button operation or external signal.

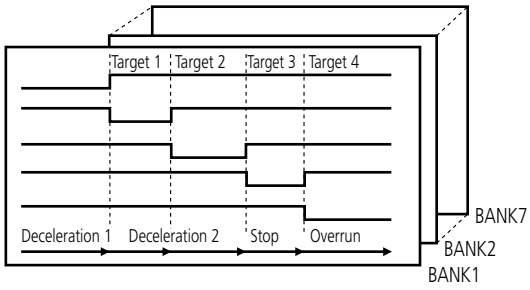
● Stop position adjustment

Adjust the stop position depending on the workpiece type. For this control use the tolerance judgment signals.



● Indicator display/output where 3 steps of tolerance limit are set

Condition	GO/NG indicator	LIMIT indicator and I/O output
Measured value < S1	Amber ON	L1
S1 ≤ measured value ≤ S4	Green ON	L3
S4 ≤ measured value	Red ON	L5



● Indicator display/output where 5 steps of tolerance limit are set

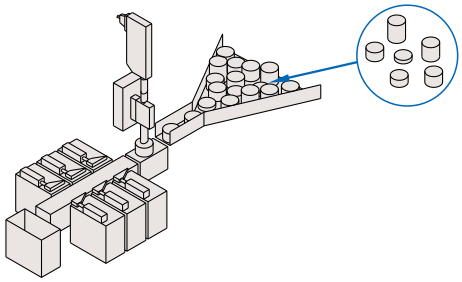
Condition	GO/NG indicator	LIMIT indicator and I/O output
Measured value < S1	Amber ON	L1
S1 ≤ measured value ≤ S2	Amber flash	L2
S2 ≤ measured value ≤ S3	Green ON	L3
S3 ≤ measured value ≤ S4	Red flash	L4
S4 ≤ measured value	Red ON	L5

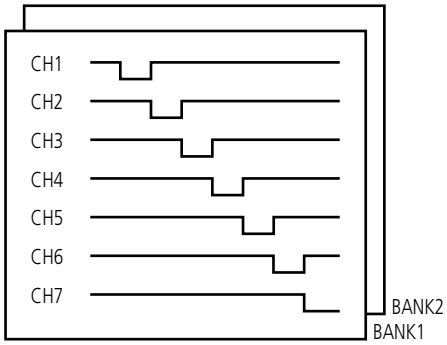
Possible to selectively keep two of the limit values for 7 channels.

It is possible to switch these tolerance limits with an appropriate button operation or external signal.

● Sorting workpieces by value

It is possible to sort workpieces according to user-defined value ranges.





SPECIFICATIONS

Order No.		542-092-2	542-094-2	542-093-2
Model No.		EB-11P	EB-11Z	EB-11D
Quantizing error		±1 count		
Maximum input frequency		1.25 MHz (2-phase square wave), response speed depends on gage specification.		Response speed depends on gage specification.
Display	Resolution [mm] Values in parentheses show the maximum display range.	0.01 (±9999.99)/0.005 (±999.995)/0.001 (±999.999)/ 0.0005 (±99.9995)/0.0001 (±99.9999) 〔Parameter setting formula〕		0.01 (±9999.99)/ 0.001 (±999.999)
	Tolerance judgment display	LED display (3 steps: Amber, Green, Red/5 steps: Amber, Amber flashing, Green, Red flashing, Red)		
Input/output	Tolerance judgment output	L1 to L5, open-collector		
	Control output	Normal operation signal (NOM), open-collector		
	Control input	Presetting, display hold, peak value clear, tolerance judgment BANK switch, open-collector or no-voltage contact signal (with/without contact point)		
Interface	Serial BCD	Bit serial format, open-collector		
	Analog output	2.5 V + Counting value x Voltage resolution (25 mV/2.5 mV): Full-scale 0 to 5 V		
	Digimatic input/output	■ Connecting to the external switch box **(02ADF180)** makes it easy to enter tolerance limits and preset values. Note: This function is not available when the gage is connected to **DP-1VA**, Digimatic Mini-Processor. ■ It can only be connected to **DP-1VA** Digimatic Mini-Processor **(264-505)**. ■ Number of tolerance steps can be expanded by assembling **EB-D** counters.		
Power supply	Voltage	12 - 24 V DC		
	Consumption	6 W or less (50 mA max.) Ensure at least 1 A is available per unit.		
Operating temperature range		0 to 40 °C (RH 20 to 80 %, non-condensing)/–10 to 50 °C (RH 20 to 80 %, non-condensing)		
External dimensions		96 (W) x 48 (H) x 156 (D) mm		
Applicable gage head		**LG**, **LGB**, **LGF**, **LGK** (**LGF** Models with reference point mark, sine wave output type are excluded.)	**LGF** with reference point mark	**LGD**, **LGS-1012P**, **ID**
Optional Accessories		**02ADB440** I/O output connector (with cover) **357651** AC adapter **02ZAA000** AC cable* **02ADD930** Terminal connecting cable*		
Mass		Approx. 400 g	Approx. 400 g	Approx. 400 g

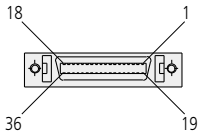
* Required when using an AC adapter.

Input/output specifications

■ I/O connector pin assignment

1) Suitable plug: **02ADB440** (with cover)

2) Pin assignment



Socket:
10236-52A2
(3M) equivalent

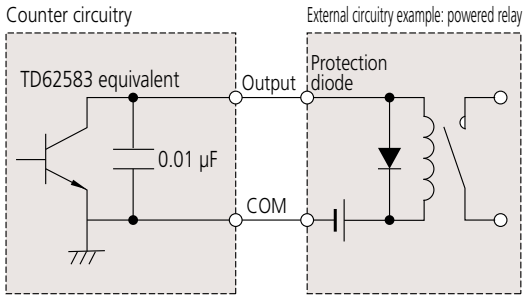
Suitable plug
10136-3000VE (3M: Plug)
10336-52A0-008 (3M: Cover)
DX40M-36P (HIROSE: Plug)
DX30M-36-CV (HIROSE: Cover)

Pin No.	Description	I/O	Function
1	COM	—	Common terminal for input/output circuit (to be connected to the internal GND)
2	COM	—	
3	L1	OUT	Tolerance judgment result output • At an error AL1, AL5=Output of "L" AL2, AL3, AL4=Output of "H"
4	L2	OUT	
5	L3	OUT	
6	L4	OUT	
7	L5	OUT	
8	L6	OUT	
9	L7	OUT	
10	NOM	OUT	Outputs "L" where counting is possible.
21	BCD_CK	OUT	Serial BCD output
22	BCD_ST	OUT	
23	BCD_DT	OUT	
24	ANALG	OUT	Analog output
25	ANGND	OUT	
26	AREG	IN	Analog range changeover: Enter in combination with SET
27	SET1	IN	BANK: Sets the PSET tolerance to the specified bank. MODE: NOM, MAX, MIN, TIR settings AREG: Analog range specification
28	SET2	IN	
29	SET3	IN	
30	MODE	IN	Peak changeover: Enter in combination with SET.
32	BANK	IN	BANK changeover: Enter in combination with SET.
34	HOLD	IN	• The display value is held during input. • Data output proceeds while the serial BCD interface is used. • When an error has occurred, the error will be cleared at the rise of this signal.
35	PSET	IN	• Perform presetting. • Peak clear: When entered during the peak mode, it serves as peak clear.
11 - 20, 31, 33, 36	N.C.	—	Unconnected terminal

3) I/O circuit

1. Output circuit

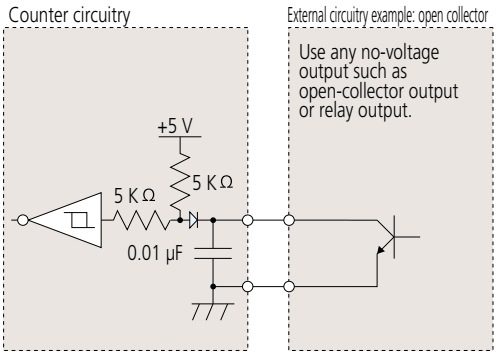
Transistor is "ON" when the open-collector output is "L".



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

2. Input circuit

Input becomes effective upon operation of "L".



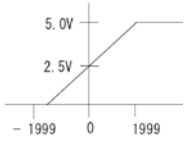
Input current: IMAX 1 mA
Input voltage: H=4 to 24 V
L=Max. 1 V

Output saturation voltage:
Max. 0.7 V or less

Simple Analog Output

■ Output waveforms can be monitored with an analog recorder connected.

1) Output specifications



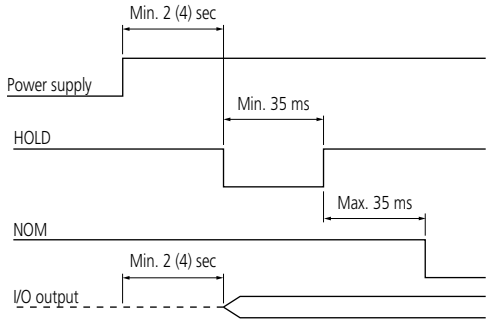
Output voltage=2.5 V + (counter value) x (voltage resolution
25 mV/2.5 mV)
Range: 0-5 V
Response speed: 10 Hz (updating at 5 ms)
Accuracy : ±5 % (0-5 V)
±0.5 % (2.5 V±200 mA, after offset adjustment)
Accuracy is rated at 5 V level
Load resistance : 300 KΩ or more

2) Measuring range

SET			Measuring range (mm)/Resolution (mm)					Voltage [mV]
3	2	1	10 µm gage	5 µm gage	1 µm gage	0.5 µm gage	0.1 µm gage	
H	H	H	±0.99 (0.01)	±0.095 (0.005)	±0.099 (0.001)	±0.0095 (0.0005)	±0.0099 (0.0001)	25
H	H	L	±9.99 (0.01)	±9.995 (0.005)	±0.999 (0.001)	±0.0995 (0.005)	±0.0999 (0.0001)	2.5
H	L	H	±99.90 (0.1)	±9.950 (0.05)	±9.990 (0.01)	±0.9950 (0.005)	±0.9990 (0.001)	
H	L	L	±999.00 (1)	±99.500 (0.5)	±99.900 (0.1)	±9.9500 (0.05)	±9.9900 (0.01)	
L	H	H	±9990.00 (10)	±995.00 (5)	±999.00 (1)	±99.5000 (0.5)	±99.9000 (0.1)	

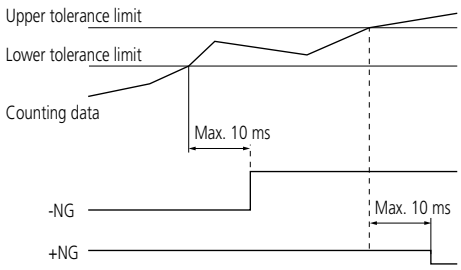
3) Timing chart

1. Power ON characteristics

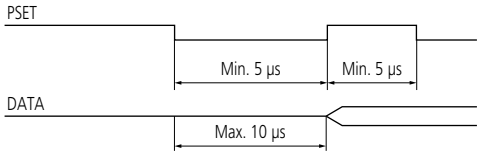


* ( ) respresents EB-D.

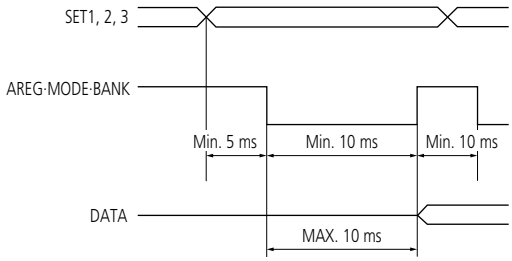
2. Tolerance judgment result output period



3. External preset/Peak clear



4. Peak mode/BANK specification



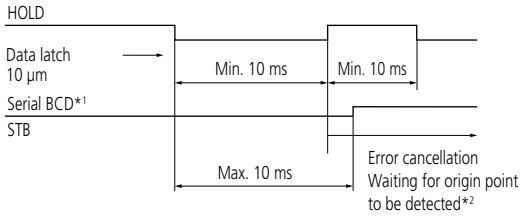
Peak mode setting

	SET 3	SET 2	SET 1
Current value	H	H	H
MAX	H	H	L
MIN	H	L	H
TIR	H	L	L

BANK setting

	SET 3	SET 2	SET 1
BANK 0	H	H	H
BANK 1	H	H	L
BANK 2	H	L	H
BANK 3	H	L	L
BANK 4	L	H	H
BANK 5	L	H	L
BANK 6	L	L	H
BANK 7	L	L	L

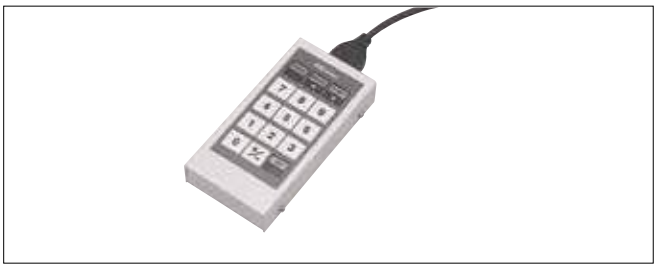
5. HOLD timing



*1: With the serial BCD unit in the command mode (PNo.35=0)
*2: (Only for EB-11Z) Resetting of origin point (PNo.42=1)

■ External switch box (optional)

Makes it easy to enter tolerance settings and preset values.
02ADF180 (with a 2 m cable)



EH Counter - Panel mount, Multi-function Type with RS-232C Communication Functions

EH-101P
(542-075)
For differential square-wave output gage head (single axis)

EH-102P
(542-071)
For differential square-wave output gage heads (2 axes)

EH-102Z
(542-073)
For differential square-wave output gage heads with Origin Point Mark (2 axes)

EH-102D
(542-072)
For Digimatic code output gage heads (2 axes)

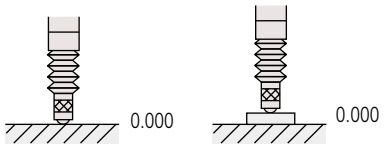
Features

- 1-axis display type, and 2-axis independent display type or 2-axis type that can display sum/difference calculation results are available.
- Multi-functional counter with functions of zero-set, preset, and tolerance judgment
- Equipped with an RS-232C interface as standard. This allows data transfer to a personal computer, etc.
- A multi-point measuring system can easily be built up with the built-in networking function (RS link). (Max. 10 points)
- Employs the DIN size (144 x 72 mm) and mount-on-panel configuration, which greatly facilitates incorporation into a system.

Functions

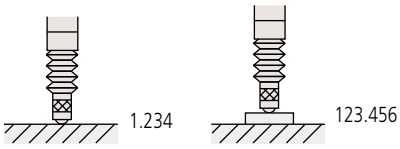
Zero-set

Sets the displayed value to 0 at any position of the spindle.



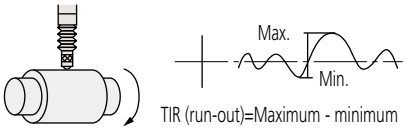
Preset

Presets the display at any value. Counting begins at the preset value.



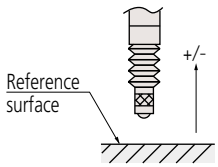
Peak hold/TIR measurement

Allows switching to the measurement mode for maximum value, minimum value, and run out value (maximum - minimum), in addition to the normal measurement mode.



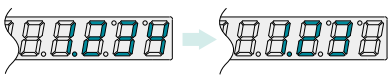
Direction switch

Selects the counting direction of (+) or (-), whichever is convenient with a given direction of spindle movement.



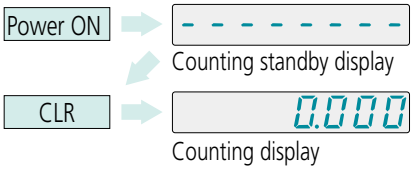
Minimum reading digit change

To improve visualization of measurement data, the least significant digit can be extinguished. (However, the display via RS-232C and printing to a printer are performed down to the least significant digit.)



Counting standby (to prevent malfunction at start-up)

This prevents malfunction due to power interruption, etc.



Tolerance judgment indication/output

Sets two (or four) desired tolerances for three (or five) stages. Judgment results can be output to an external device.

Sum/difference calculation

Enables measurement of thickness or step height using two gages.

Communication via RS-232C interface

RS-232C allows communication with a personal computer. It allows not only the reading of measured values but also data transmission to the counter and remote operations, such as when changing various settings.

External control

Zero set, preset and display hold can be controlled from the I/O terminals.

Error message display

The counter displays an error message when a gage-head over-speed or breakage situation occurs. It outputs the error signal from the I/O terminal.

Digimatic output

Digimatic-Mini processor DP-1VA.
(RS-232C function is not available when the gage is connected to DP-1VA).

SPECIFICATIONS

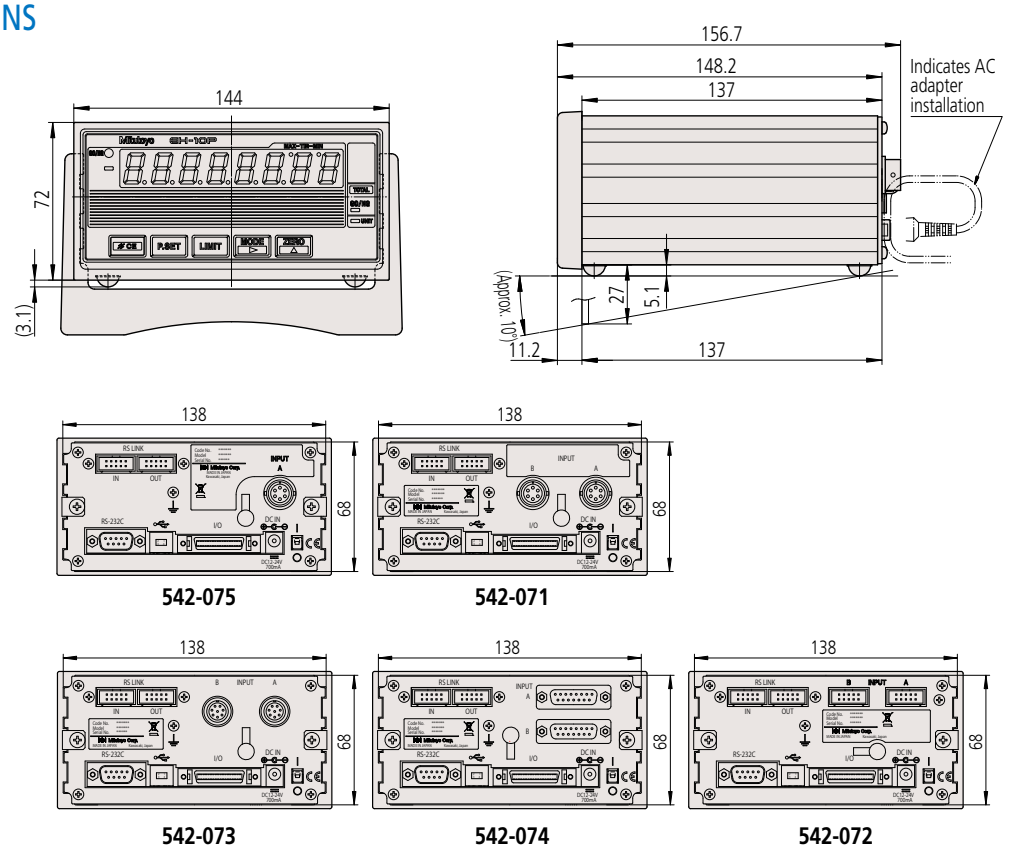
1-axis input type and 2-axis input type counters are available.

Order No.		542-075*	542-071*	542-073*	542-072*
Model		EH-101P	EH-102P	EH-102Z	EH-102D
Number of axes to be displayed		1 axis	2 axes		
Quantizing error		±1 count			
Maximum input frequency		2.5 MHz (2-phase square wave)			—
Resolution Values in parentheses show the maximum display range.		0.01 mm/0.005 mm/0.001 mm /0.0005 mm/0.0001 mm 0.0005 in/0.00005 in/0.00005 in/0.000005 in /0.000005 in (selection by the parameter)			Automatic setting by gage
Tolerance judgment display		LED display (3 steps: Amber, Green, Red/5 steps: Amber, Amber flashing, Green, Red flashing, Red)			
Interface		RS-232C/USB/parameter selection via digimatic (only DP-1VA, digimatic mini-processor can be connected) (USB used only with SENSORPAK.) Selection by parameter from 3-step, 5-step, or digit BCD Total tolerance judgment output (when tolerance function is enabled) Analog output (1 V-4 V)			
Input/output	Control output	Open-collector			
	Control input	Display BANK switching, peak mode, presetting, display hold, hold per axis: open-collector			
Power supply	Voltage	Supplied AC adapter (Jack input)			
	Consumption	8.4 W (max. 700 mA) Ensure at least 1 A is available per unit.			
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)			
Storage temperature (humidity) ranges		–10 to 50 °C (RH 20 to 80 %, non-condensing)			
External dimensions		144 (W) x 72 (H) x 156.7 (D) mm			
Optional Accessories		I/O output connector (with cover): **02ADB440**			
AC adapter/AC cable		AC adapter: **357651**/AC cable: **02ZAA000**, AC cable (Japan): **02ZAA000***, AC cable (USA): **02ZAA010***, AC cable (EU): **02ZAA020***, AC cable (UK): **02ZAA030***, AC cable (China): **02ZAA040***, AC cable (Korea): **02ZAA050***			
Applicable gage head		**LG**, **LGB**, **LGF**, **LGK** (**LGF** with reference point mark)		**LGF** with reference point mark	**LGD**, **LGS**, **ID**
Mass		Approx. 760 g	Approx. 800 g	Approx. 800 g	Approx. 800 g

* To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE. For those models of the Order No. with Suffix "1", an AC adapter is not supplied as a standard accessory.

DIMENSIONS

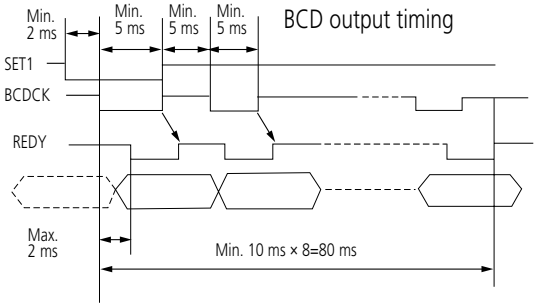
Unit: mm



BCD Output

■ Simultaneously outputs at channels [A] and [B] in groups of 4 bits.

1) Timing chart



2) Data format

LSD (Least significant digit) MSD (Most significant digit)

	D1	D2	D3	D4		D8
A/B_bit0	1 x 10^0	1 x 10^0	·····			1 x 10^7
A/B_bit1	2 x 10^0	2 x 10^0	·····			2 x 10^7
A/B_bit2	4 x 10^0	4 x 10^0	·····			4 x 10^7
A/B_bit3	8 x 10^0	8 x 10^0	·····			8 x 10^7
A/B_SIGN	SIGN	BANK	PEAK1	PEAK2		

+: H
-: L

BANK1: L
BANK2: H

	PEAK1	PEAK2
NOM	L	L
MAX	H	L
MIN	L	H
TIR	H	H

Data output example

	D1	D2	D3	D4	D5	D6	D7	D8
Bits 0-3	1	0	6	5	4	3	2	1
SIGN	L							

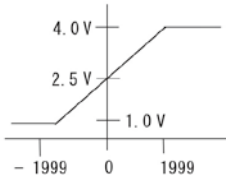
- 1 2 3 4 5 6 0 1

* Negative logic output is possible for SIGN, BANK, PEAK, DATA (PNo.21=1).

Simple analog output

■ Monitoring of output waveforms is possible with an analog recorder connected.

1) Output specification



Output voltage=2.5 V + [counter value] x [voltage resolution] (0.75 mV)
Range: 1.0-4.0 V
Response speed: 10 Hz (updating at 5 ms)
Accuracy : ±1 % (0.5-4.5 V)
Accuracy is rated at 4 V level
Load resistance : 300 KΩ or more

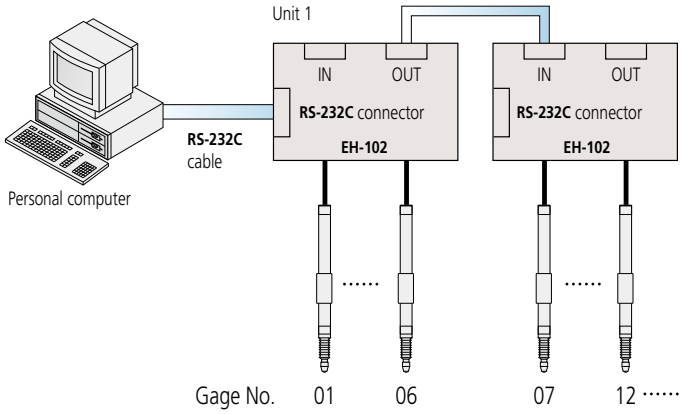
2) Measuring range

Parameter No.30	Measuring range (mm)/Resolution (mm)		
	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)

RS Link* Function

It is possible to connect a maximum of 10 counter units together to carry a maximum of 20 channels of multi-point measurement at a time.
For this connection use a dedicated RS link cable; **02ADD950** (0.5 m), **936937** (1 m) or **965014** (2 m) (The maximum total length of RS link cables permitted for the entire system is 10 m.)

* Patent registered (Japan, U.S.), Patent pending (E.U.)



RS-232C Communication Functions

Makes it possible not only to log measured values but also make various remote settings including the zero-setting of a counter, etc. To communicate data with a PC, terminal software is needed that should be provided by the customer.

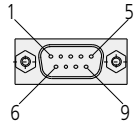
Command format	Corresponding output	Function
GA**CRLF	G#**, +01234.567CRLF	Outputs the [Displayed value] through RS-232C
CN**CRLF	CH**CRLF	Switches the display to the [Current value]
CX**CRLF	CH**CRLF	Switches the display to the [Maximum value]
CM**CRLF	CH**CRLF	Switches the display to the [Minimum value]
CW**CRLF	CH**CRLF	Switches the display to the [TIR (runout)]
CR**CRLF	CH**CRLF	Zeroset
CL**CRLF	CH**CRLF	Clears the peak value
CP**, +01234567CRLF	CH**CRLF	Inputs the preset value
CD**, +01234567CRLF	CH**CRLF	Inputs tolerance value S1
CE**, +01234567CRLF	CH**CRLF	Inputs tolerance value S2
CF**, +01234567CRLF	CH**CRLF	Inputs tolerance value S3
CG**, +01234567CRLF	CH**CRLF	Inputs tolerance value S4
CS**CRLF	CH**CRLF	Cancels the error
CK**CRLF	CH**,$CRLF ($=0 or 1)	Checks the HOLD status

**: denotes a gage channel number between 01 and 99 ("00" means all channels).
#: denotes the type of data [N: Current value, X: Maximum value, M: Minimum value, W: TIR (runout)].
CRLF: CR (carriage return), LF (line feed).
Note 1: For presetting and tolerance limit setting, enter each value consisting of a sign and 8 digits of numeric value without a decimal point.
Note 2: Perform the tolerance limit setting in the order of CD and CG for the case of 3-step tolerance judgment, and in the order of CD, CE, CF, and CG for the case of 5-step tolerance judgment.
Note 3: The RS communication function will be suspended during key operation (e.g. setting parameters, preset values, or tolerance limits). It automatically resumes the command and data output operation when the gage is recovered to such a condition that the counting is possible.
Note 4: For canceling the counting-standby state, use CS00CRLF (specification of all channels).

■ RS-232C specifications

1) Compatible plug: D-sub9 pin (female), inch thread specification

2) Pin assignment



Receptacle
D-sub9 pin (male)
inch thread specification

Pin No.	Description	I/O	Function
2	RXD	IN	Receive data
3	TXD	OUT	Send data
4	DTR	OUT	Data terminal ready
5	GND	—	Ground
6	DSR	IN	Data set ready
7	RTS	OUT	Request to send
8	CTS	IN	Clear to send
1, 9	N.C.	—	Connection impossible

3) Communication specifications (conforming to EIA RS-232C)

Home position	DTE (Data Terminal Equipment) Use a cross-type cable.
Communication method	Half-duplex, teletype protocol
Data transfer rate	4800, 9600, 19200 bps
Bit configuration	Start bit: 1 Data bits: (7, 8) ASCII, upper-case characters Number of parity bits: None, even, odd Number of stop bits: 2
Setting the communication conditions	Set via parameters.

Standard Accessories

Part No.	Part name	No. of pcs
—	Washer (small-round, plain washer: nominal 4)	6
357651	AC adapter	1
02ZAA000	AC cord	1
—	DC plug	1
214938	Stand	1
—	Rubber foot (SJ-5303: 3M)	4
99MBC018J	User's Guide	1

* To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE. For those models of the Order No. with Suffix "1", an AC adapter is not supplied as a standard accessory.

Optional Accessories

■ I/O connector

Plus for external I/O receptacle
02ADB440 (with cover)

■ Connecting cable for Digimatic Mini-processor

Outputs measurement data from a counter to Digimatic mini processor DP-1VA.
936937 (1 m)
965014 (2 m)

■ Connecting cable for "RS link"

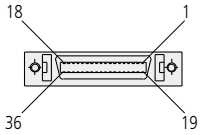
This cable is to serially connect a counter during use of "RS link".
02ADD950 (0.5 m)
936937 (1 m)
965014 (2 m)

Input/output specifications

■ I/O connector pin assignment

1) Suitable plug: **02ADB440** (with cover) Optional accessory

2) Pin assignment



Socket:
10236-52A2
(3M) equivalent

Suitable plug

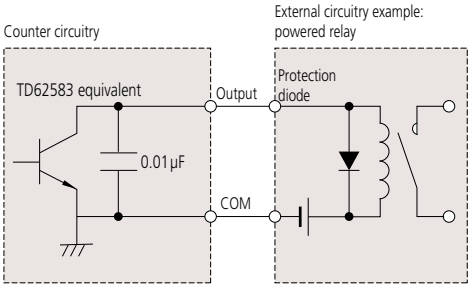
10136-3000PE	(3M: Plug)
10336-52A0-008	(3M: Cover)
DX40M-36P	(HIROSE: Plug)
DX30M-36-CV	(HIROSE: Cover)

			Tolerance judgment output mode	BCD output mode	
Pin No.	I/O	Description	Function	Description	Function
1, 2	—	COM	Internally connected to GND	COM	Internally connected to GND
3	O	AL1	[A] Upper row tolerance · Output "L" only for output-relevant terminal · When any error is displayed, AL1, AL5="L" AL2, AL3, AL4="H"	A_bit0 A_bit1 A_bit2 A_bit3 A_SIGN	[A] Upper row data
4	O	AL2			
5	O	AL3			
6	O	AL4			
7	O	AL5			
8	I/O	ALLGO	Total tolerance result output "H"=OK "L"=NG	REDY	"L"=data is valid
9	O	RS_EXT			
10	O	NOM	Normal output "L"=Normal output, "H"=abnormal output		
11	O	BL1	[B] Lower row tolerance · Output "L" only for output-relevant terminal · When any error is displayed, BL1, BL5="L" BL2, BL3, BL4="H" [2-axis model]	B_bit1 B_bit2 B_bit3 B_SIGN	B_Bit0 [B] Lower row data [2-axis model]
12	O	BL2			
13	O	BL3			
14	O	BL4			
15	O	BL5			
16 to 21			Not connected		
22	I	A_ANG	A-ch analog output		
23	I	B_ANG	B-ch analog output [2-axis model]		
24	I	AGND	Analog GND		
25	I	SET1	Enter the setting value with SET in advance, and determine it with MODE and DISP		
26	I	SET2			
27	I	SET3			
28	I	DISP	Specifies the BANK to be displayed: Combined operation with SET		
29	I	MODE	Switching of peak value: Combined operation with SET		
30	I	BCDCK	Specifies the BCD output: Combined operation with SET		
31	I	EXTTRG	USB trigger		
32	I	A_HOLD	[A] ch HOLD (Upper row display HOLD)*1		
33	I	B_HOLD	[B] ch HOLD (Lower row display HOLD)*1 [2-axis model]		
34	I	HOLD	HOLD/Error canceling error input*2		
35	I	PA	[A] Upper row preset/Peak clear (in the peak HOLD mode)		
36	I	PB	[B] Lower row preset/Peak clear (in the peak HOLD mode) [2-axis model]		

*1: During input the decimal point will be flashing.
*2: During input the UNIT indicator will be flashing.

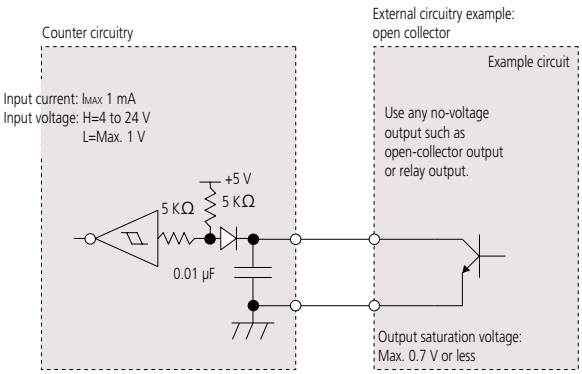
3) I/O circuit

1. Output circuit:
NOM, AL1 to AL5, BL1 to BL5 Transistor is "ON" to drive the line to "L" (open-collector output).



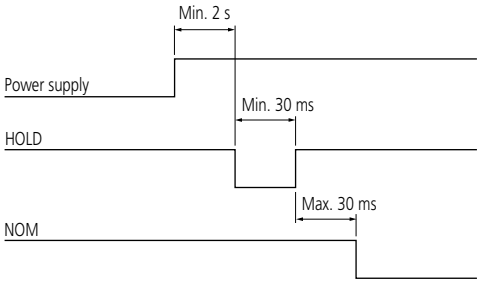
Supply voltage: Max. 24 V
Output current: Max. 10 mA
Output saturation voltage: Max. 0.7 V

2. Input circuit:
PA, PB (only with 542-062), HOLD Input is valid when the line is "L".



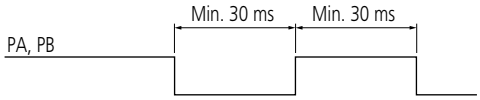
4) Timing chart

1. Power ON characteristics



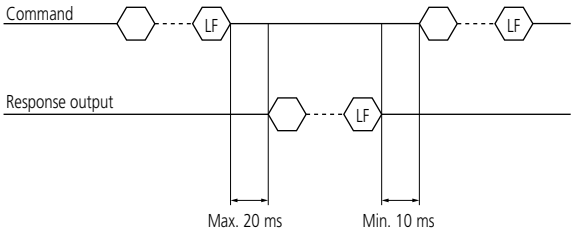
Note: With the RS link established the reference counter will be the one that was powered on last.

3. External preset (PA, PB) input



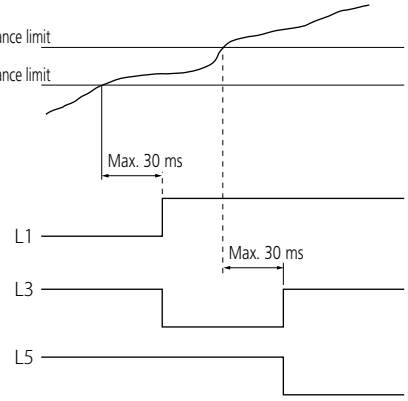
Note: Excluding the period during key input, RS-232C communication or Digimatic processing.

5. RS-232C command input and response output

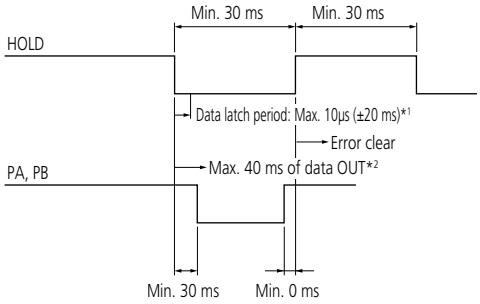


Note: Excluding the period during key input, RS-232C communication or Digimatic processing.

2. Tolerance judgment result output period



4. Peak clear input
(After inputting HOLD, or simultaneous input with the preset value)



*1: ( ) represents the case either in peak mode or in such a mode that an input of HOLD triggers RS-232C output.
*2: Case in such a the mode that input of HOLD triggers RS-232C output.
Note: The PRESET indicator will be flashing during the input operation of HOLD.

D-EV Display Unit
Display unit for the EV counter

D-EV 02ADD400


- This single unit enables external display and setting operation of one EV counter.
- Required when a linear gage with a resolution of 0.1 μm is used.
- Using this display allows various settings for the EV counter to be made without the need for a personal computer or other equipment. Reduction in adjustment time is achieved.
- Able to display each axis measurement value and GO/NG judgment result, total GO/NG judgment result for all axes, setting details, and errors.
- Allows error message display upon occurrence of an error: Enables an early settlement of the problem.

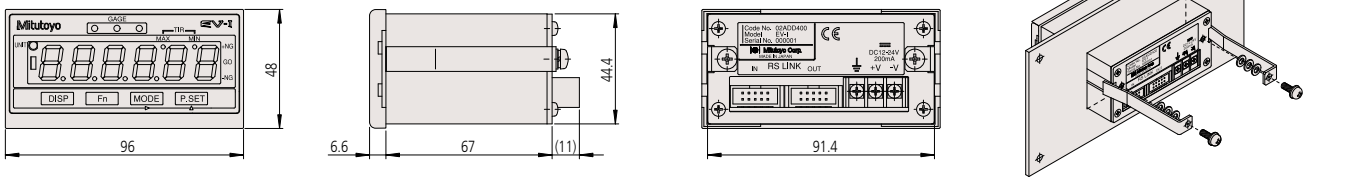
SPECIFICATIONS

Item	Description
Number of digits	Sign plus 6 digits (8 digits internal to EV counter)
LED display	Channel display (also for judgment result display): 3 (3-color LED) Measurement mode display (current data, maximum value, minimum value, runout): 2 Status display: 1 (2 colors)
Operation switches	4
Function of operation switch	Channel switching, measurement mode switching (current data, maximum value, minimum value, runout), parameter setting, presetting, tolerance setting
Input/output	RS Link connectors: 1 each for IN, OUT
Error message	Overspeed, gage error etc.
Power supply	Terminal block (M3 screw), 12 - 24 V DC, 200 mA
Operating temperature (humidity) ranges	0 to 40 °C (RH 20 to 80 %, non-condensing)
Storage temperature (humidity) ranges	–10 to 50 °C (RH 20 to 80 %, non-condensing)
External dimensions	96 (W) x 48 (H) x 84.6 (D) mm
Optional Accessories	Connecting cable for RS link 0.5 m: **02ADD950***1, Connecting cable for RS link 1 m: **936937***1, Connecting cable for RS link 2 m: **965014***1, Terminal connecting cable: **02ADD930***2, AC adapter: **37651**, AC cable: **02ZAA000***2

*1: Required when connecting with **EV-16P/D/Z**.
*2: Required when using AC adapter.

DIMENSIONS

Unit: mm



Counter Specifications

EV Counter – 6-channel, No-display type

EV-16P (542-063) For differential square-wave output gage heads (6 axes)	EV-16Z (542-067) For differential square-wave output gage heads with Origin Point Mark (6 axes)	EV-16D (542-064) For Digimatic code output gage heads (6 axes)
		

Features

- Able to connect up to 10 EV counters to one personal computer using the RS link function to facilitate the configuration of a multi-point measurement system comprising a maximum of 60 gages.*1
- A range of output modes to choose from; I/O output for tolerance judgment and segment output, BCD data output and RS-232 output are available
- Allows peak measurement, differential measurement, etc., in addition to normal measurement.*2

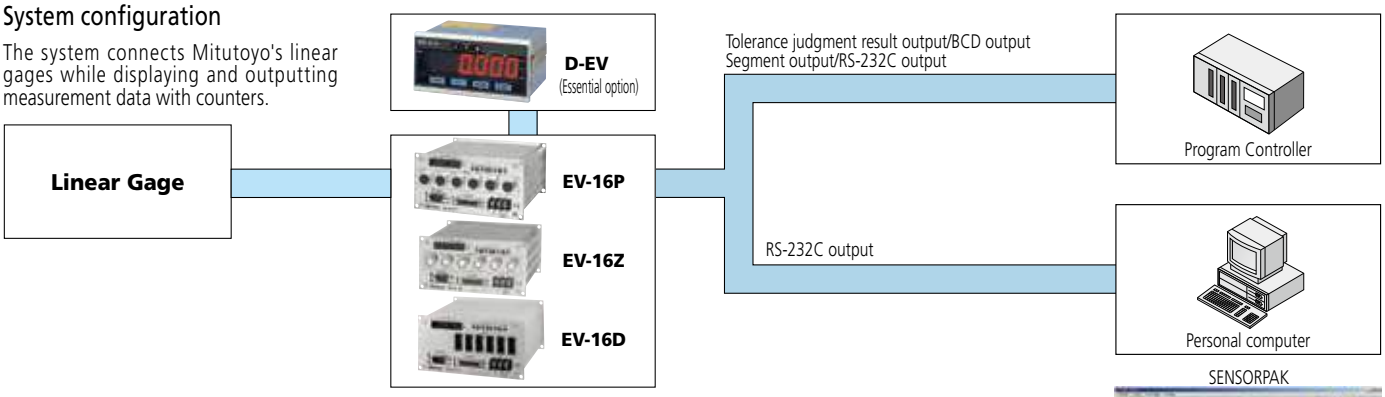
*1: Patent registered (Japan, U.S.), Patent pending (E.U.)
*2: The differential measurement function is available only for linear gages with the same resolution.

Functions

- External control (Zero-set, Preset etc.)
- Direction switch
- Error display
- Tolerance judgment output
- Choice of data output (RS-232C, BCD, Segment)
- Maximum value, minimum value and runout. Differential measurement between two gages: addition, averaging, maximum value, minimum value, and maximum width.

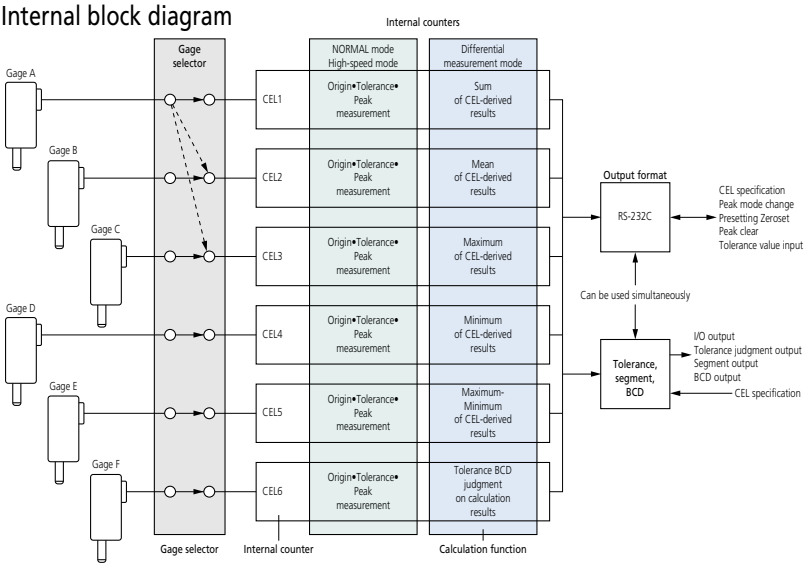
System configuration

The system connects Mitutoyo's linear gages while displaying and outputting measurement data with counters.



SENSORPAK

Internal block diagram



Gage selector

It is possible to assign gage signals one-to-one or one-to-many to the internal counters through parameter settings. This allows the user to set more than one origin point and/or tolerance limit on one gage head.

Internal counters

Using the 6 internal counters (CEL1-CEL6) it is possible to perform origin setting, peak measurement, and tolerance limit setting.

Calculation function

Each of the internal counters is assigned a unique calculation function so that various kinds of calculation can be made between the internal counters specified with the parameters.

Output function

The output format can be selected from among RS-232C, BCD, tolerance judgment result and segment output. The objective CEL of the output can be selected with an appropriate RS-232C command or SET signal.

SPECIFICATIONS

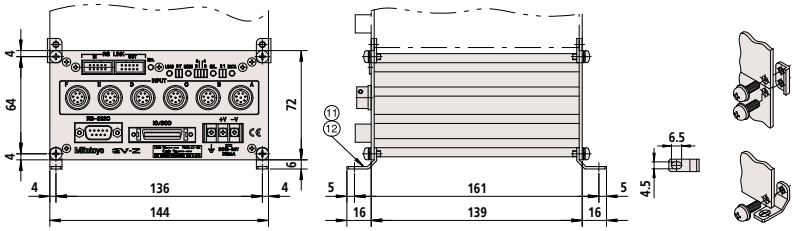
Order No.		542-063	542-067	542-064
Model No.		EV-16P	EV-16Z	EV-16D
Number of input channels		6		
Maximum input frequency		1.25 MHz (2-phase square wave), response speed depends on gage specification. Max. counting speed: 5 MHz	1.25 MHz (2-phase square wave), response speed depends on gage specification. Max. counting speed: 5 MHz	1.25 MHz (2-phase square wave), response speed depends on gage specification. Max. counting speed: 5 MHz
Quantizing error		±1 count		
Resolution		10 µm (±999999.99 mm)/0.0005 in (±9999.9995 in) 5 µm (±999999.995 mm)/0.00005 in (±999.99995 in) 0.5 µm (±9999.9995 mm)/0.000005 in (±99.999995 in)*1 [Parameter set]	10 µm (±999999.99 mm)/0.0005 in (±9999.9995 in) 5 µm (±999999.995 mm)/0.00005 in (±999.99995 in) 1 µm (±99999.999 mm)/0.00005 in (±999.99995 in) 0.5 µm (±9999.9995 mm)/0.000005 in (±99.999995 in) [Parameter set]	Depends on gage specification.
LED display		8 digits for parameter display (displays settings), 1 for error display		
Error message		Overspeed, gage error etc.		
External display		Dedicated external display unit D-EV (optional) can be connected		
Number of input switches		4		
Function of input switches		Measurement mode switching, parameter setting		
Input/output	Tolerance judgment output	1 to 6 channels (L1, L2, L3), open-collector		
	BCD output	Parallel BCD output (positive/negative-true logic), open-collector		
	Segment output	Function to set on only the terminals corresponding to the counting values, open-collector		
	Control output	Open-collector		
	Control input	Output channel designation (segment, in the BCD mode), presetting, peak value clear, range changeover (at segment output), holding counting value open-collector or no-voltage contact signal (with/without contact point)		
Interface	RS-232C	Measurement data output and control input EIA RS-232C-compatible Use cross cables for home position, DTE (terminal definition).		
	RS link	Max. connecting unit: 10 Connecting cable length: Max. 10 m (sum of link cable length) Data transfer time: 1 sec./60 ch (when transmission rate is 19200 bps)		
Power supply	Voltage	12 - 24 V DC, terminal block (M3 screw)		
	Consumption	8.4 W or less (700 mA max.) Ensure at least 1 A is available per unit.		
Operating temperature (humidity) ranges		0 to 40 °C (RH 20 to 80 %, non-condensing)		
Storage temperature (humidity) ranges		–10 to 50 °C (RH 20 to 80 %, non-condensing)		
External dimensions		144 (W) x 72 (H) x 139 (D) mm		
Mass		Approx. 910 g	Approx. 910 g	Approx. 830 g
Standard Accessories		Fixing foot (4), connecting bracket (4), fixing screw M4 x 12 (8)		
Optional Accessories		Output connector : **02ADB440** ID-EV External display unit : **02ADD400** Connecting cable for RS link 0.5 m: **02ADD950** Connecting cable for RS link 1 m: **936937** Connecting cable for RS link 2 m: **965014** Terminal block connecting cable: **02ADD930***2 AC adapter : **357651***2 AC cable : **02ZAA000**		
Applicable gage head		**LG, LGB, LGF, LGK** Models with reference point mark, sine wave output type are excluded.	**LGF** with reference point mark	**LGD, LGS**

*1: Available when using D-EV. *2: Required when using an AC adapter.

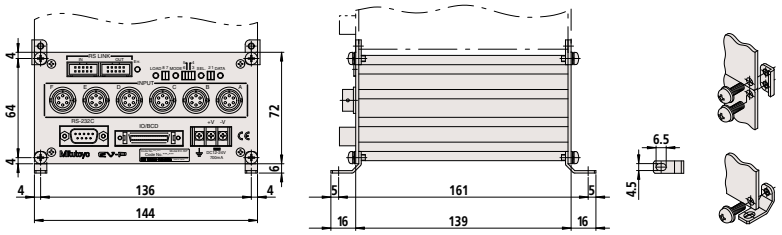
DIMENSIONS

Unit: mm

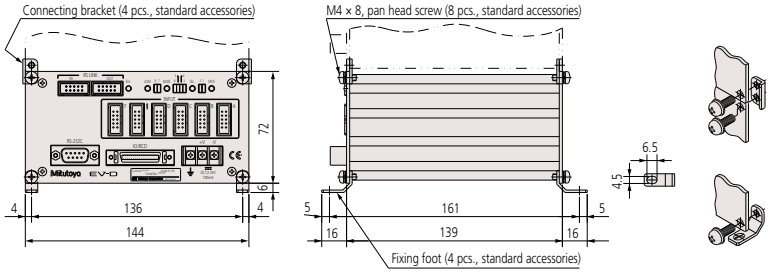
EV-16P

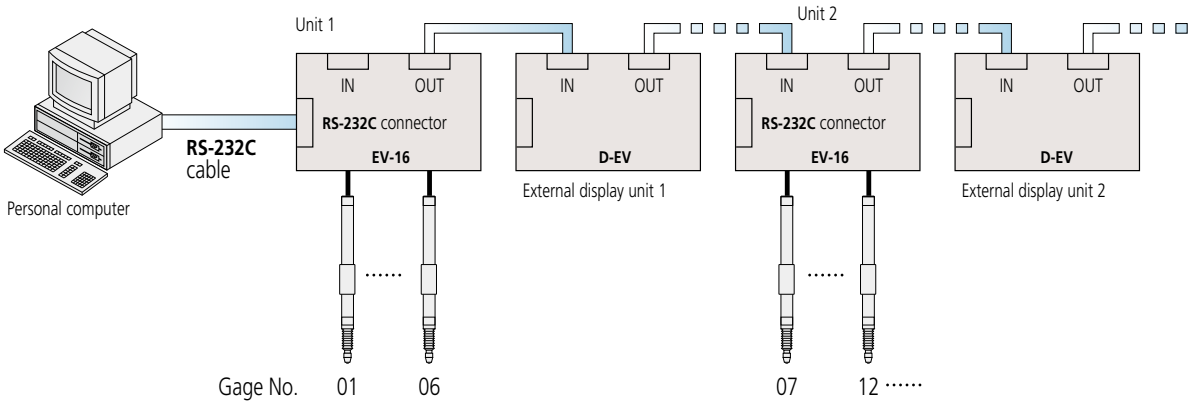


EV-16Z



EV-16D





RS-232C Communication Functions

Makes it possible not only to log measured values but also make various remote settings including the zero-setting of a counter, etc.

To communicate data with a PC, terminal software is needed that should be provided by the customer.

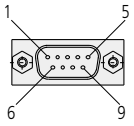
Command format	Corresponding output	Function
GA**CRLF	G#**, +01234.567CRLF	Outputs the [Displayed value] through RS-232C
CN**CRLF	CH**CRLF	Switches the display to the [Current value]
CX**CRLF	CH**CRLF	Switches the display to the [Maximum value]
CM**CRLF	CH**CRLF	Switches the display to the [Minimum value]
CW**CRLF	CH**CRLF	Switches the display to the [TIR (runout)]
CR**CRLF	CH**CRLF	Zeroset
CL**CRLF	CH**CRLF	Clears the peak value
CP**, +01234567CRLF	CH**CRLF	Inputs the preset value and performs presetting
CD**, +01234567CRLF	CH**CRLF	Inputs lower tolerance value
CG**, +01234567CRLF	CH**CRLF	Inputs upper tolerance value
CS**CRLF	CH**CRLF	Cancels the error
CK**CRLF	CH**, $CRLF ($=0 or 1)	Confirms the HOLD state
CT**CRLF	CH**,+01234.567CRLF	Outputs the [Displayed value] through RS-232C

**: denotes a gage channel number between 01 and 99 ("00" means all channels).
#: denotes the type of data [N: Current value, X: Maximum value, M: Minimum value, W: TIR (runout)].
CRLF: CR (carriage return), LF (line feed).
Note 1: For presetting and tolerance limit setting, enter each value consisting of a sign and 8 digits of numeric value without a decimal point.
Note 2: Perform the tolerance limit setting in the order of CD and CG
Note 3: Data request for calculation values cannot be specified to all channels of an EV counter.
Note 4: The RS communication function will be suspended during key operation (e.g. setting parameters, preset values, or tolerance limits). It automatically resumes the command and data output operation when the gage is recovered to such a condition that counting is possible.
Note 5: For canceling the counting-standby state, use CS00CRLF (specification of all channels).

■ RS-232C specifications

1) Compatible plug:
D-sub 9-pin (female),
inch thread specification

2) Pin assignment



Receptacle
D-sub 9-pin
(male), inch thread
specification

Pin No.	Description	I/O	Contents (application)
2	RXD	IN	Receive data
3	TXD	OUT	Send data
4	DTR	OUT	Data terminal ready
5	GND	—	Ground
6	DSR	IN	Data set ready
7	RTS	OUT	Request to send
8	CTS	IN	Clear to send
1, 9	N.C.	—	Connection impossible

3) Communication specifications
(conforming to EIA RS-232C)

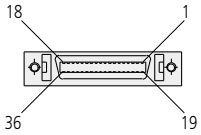
Home position	DTE (Data Terminal Equipment) Use a cross-type cable
Communication method	Half-duplex, teletype protocol
Data transfer rate	4800, 9600, 19200 bps
Bit configuration	Start bit: 1 Data bits: (7, 8) ASCII, upper-case characters Number of parity bits: None, even, odd Number of stop bits: 2
Setting the communication conditions	Set via parameters

Input/output specifications

■ I/O connector pin assignment

1) Compatible plug: **02ADB440** (with cover) Optional accessory

2) Pin assignment



Socket:
10236-52A2 (3M)
equivalent

Compatible plug

10136-3000PE	(3M: Plug)
10336-52A0-008	(3M: Cover)
DX40M-36P	(HIROSE: Plug)
DX30M-36-CV	(HIROSE: Cover)

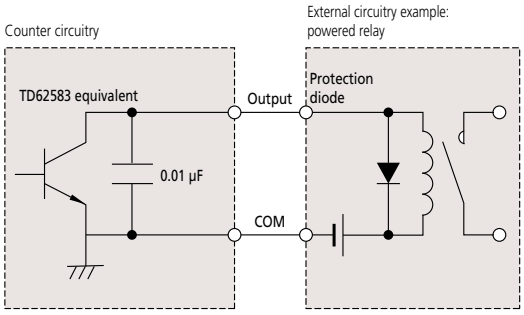
■ Output functions

Select either "Tolerance judgment result output", "Segment output", or "BCD output" depending on the application needs.

	Tolerance judgment result output			Segment output			BCD output		
Pin No.	Description	Function	I/O	Description	Function	I/O	Description	Function	I/O
1	COM	Common terminal for I/O circuit (to be connected to the internal GND)	—	COM	Common terminal for I/O circuit (to be connected to the internal GND)	—	COM	Common terminal for I/O circuit (to be connected to the internal GND)	—
2	COM		—	COM		—	COM		—
3	CEL1_-NG	Tolerance judgment result output pin (1CH)	O	-OVER	- over-range	O	1×10^0	BCD output will be made through the specified channel.	O
4	CEL1_GO		O	-L10	With the specified channel ranges, make output from ±10 divisions.	O	2×10^0		O
5	CEL1_+NG		O	-L9		O	4×10^0		O
6	CEL1_NOM	Outputs "L" where counting is possible	O	-L8		O	8×10^0		O
7	CEL2_-NG	Tolerance judgment result output pin (2CH)	O	-L7		O	1×10^1		O
8	CEL2_GO		O	-L6		O	2×10^1		O
9	CEL2_+NG		O	-L5		O	4×10^1		O
10	CEL2_-NOM	Outputs "L" where counting is possible	O	-L4		O	8×10^1		O
11	CEL3_-NG	Tolerance judgment result output pin (3CH)	O	-L3		O	1×10^2		O
12	CEL3_-GO		O	-L2		O	2×10^2		O
13	CEL3_+NG		O	-L1		O	4×10^2		O
14	CEL3_NOM	Outputs "L" where counting is possible	O	L0		O	8×10^2		O
15	CEL4_-NG	Tolerance judgment result output pin (4CH)	O	+L1		O	1×10^3		O
16	CEL4_GO		O	+L2		O	2×10^3		O
17	CEL4_+NG		O	+L3		O	4×10^3		O
18	CEL4_NOM	Outputs "L" where counting is possible	O	+L4		O	8×10^3		O
19	CEL5_-NG	Tolerance judgment result output pin (5CH)	O	+L5		O	1×10^4		O
20	CEL5_GO		O	+L6		O	2×10^4		O
21	CEL5_+NG		O	+L7		O	4×10^4		O
22	CEL5_NOM	Outputs "L" where counting is possible	O	+L8		O	8×10^4		O
23	CEL6_-NG	Tolerance judgment result output pin (6CH)	O	+L9		O	1×10^5		O
24	CEL6_GO		O	+L10		O	2×10^5		O
25	CEL6_+NG		O	+OVER	+ over-range	O	4×10^5		O
26	CEL6_NOM	Outputs "L" where counting is possible	O	NOM (ANG)	Outputs "L" where counting is possible	O	8×10^5		O
27	EXTEND	Output "L" while the RS command is processed	O	EXTEND	Output "L" while the RS command is processed	O	SIGN	Sign of the counting value (+="H", -="L")	O
28	READY	Data confirmation signal	O	READY	Data confirmation signal	O	READY	Data confirmation signal	O
29	START	First CEL identification signal	O	START	First CEL identification signal	O	START	First CEL identification signal	O
30	NORMAL	Normal signal	O	NORMAL	Normal signal	O	NORMAL	Normal signal	O
31	P.SET	Preset	I	P.SET	Preset	I	P.SET	Preset	I
32	OUTCEL	Set the objective CEL of output	I	OUTCEL	Set the objective CEL of output.	I	OUTCEL	Set the objective CEL of output	I
33	SET1	CEL specification data or segment range data	I	SET1	CEL specification data or segment range data	I	SET1	CEL specification data or segment range data	I
34	SET2	CEL specification data or segment range data	I	SET2	CEL specification data or segment range data	I	SET2	CEL specification data or segment range data	I
35	SET3	CEL specification data or segment range data	I	SET3	CEL specification data or segment range data	I	SET3	CEL specification data or segment range data	I
36	HOLD	Hold/Peak clear	I	HOLD	Hold/Peak clear	I	HOLD	Hold/Peak clear	I

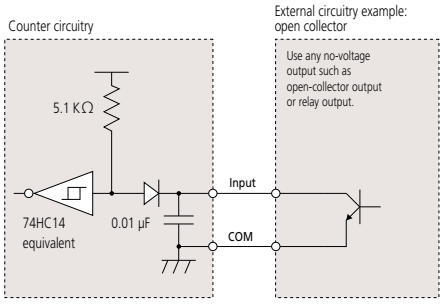
3) I/O circuit

1. Output circuit: Tolerance judgment result output, NOM, segment output, etc.Transistor is "ON" to drive the line to "L" (open-collector output).



Supply voltage: 24 V max
Output current: 10 mA max
Output saturation voltage: 0.7 V max

2. Input circuit: P.SET, HOLD, SET, etc. Input is valid when the line is "L".

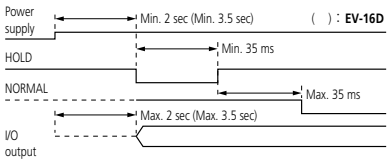


Input current: Max. 1 mA
Output saturation voltage: Max. 0.7 V or less

4) Timing chart

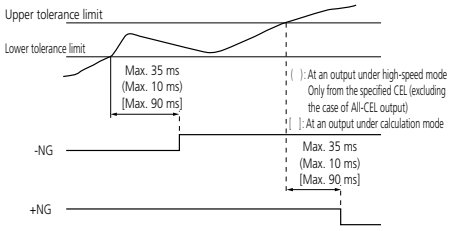
1. Power ON characteristics

Where the RS link is established, the reference counter shall be the one that was powered last.



2. Tolerance judgment result output period

All CELs will not output simultaneously.



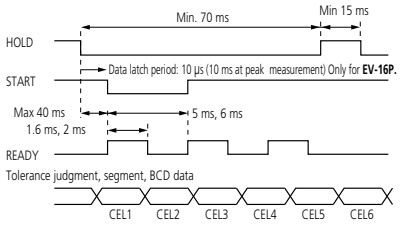
Note: The output period in the case of ED-V counter depends on the gage unit being connected.

3. Data output

There are two data output methods; Command mode and Interval mode. Either of them can be set via the I/O output mode parameters.

1) Command mode (All-CEL output)

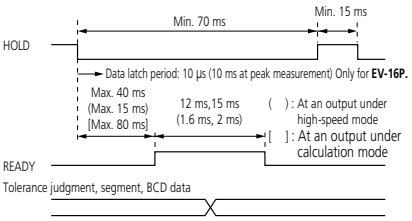
All-CEL data output (specified with SET1 through SET3) while the HOLD and READY lines are synchronously controlled.



Note: During HOLD input the UNIT LED (D-EV) will be flashing.

2) Command mode (Individual CEL output)

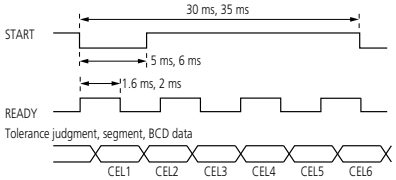
Individual CEL data output (specified with SET1 through SET3) can be performed while the HOLD and READY lines are synchronously controlled.



Note: When it is required to operate in the high-speed mode or All-CEL output mode, always use equipment whose input response time is 1 ms or less.

3) Interval mode (All-CEL output)

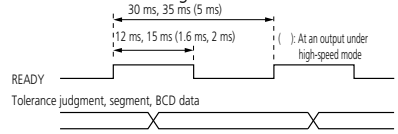
All-CEL data (specified with SET1 through SET3) will be sequentially output according to the counter's internal timing.



Note: When it is required to operate in the high-speed mode or All-CEL output mode, always use equipment whose input response time is 1 ms or less.

4) Interval mode (Individual CEL output)

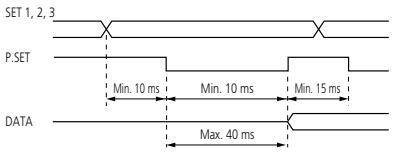
Individual CEL data (specified with SET1 through SET3) will be sequentially output according to the counter's internal timing.



Note: The data update time in the case of 542-064 depends on the type of gage being connected. In addition, the same data may be output over multiple cycles.

4. External presetting

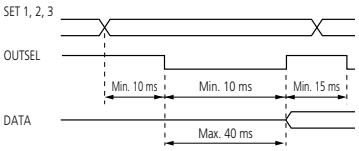
Takes the current value of CEL (which has been specified with SET1 through SET3) as the preset value.



If presetting is executed, the peak value up until then will be cleared. (Max=Min=Current value, TIR=0)

5. Specification of objective CEL of output/ Specification of calculation method

Assigns the CEL that has been specified with SET1 through SET3 to the data output CEL.

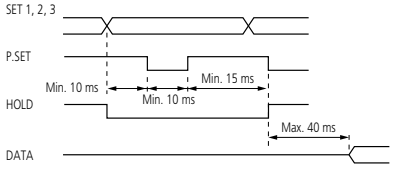


Input with SET3 through SET1 during segment output. This usually operates as the range specification data. (This acts as CEL specification when OUTCEL is input.)

- NORMAL, High-speed mode: Specification of the output CEL
- Differential calculation mode: Specification of the calculation method

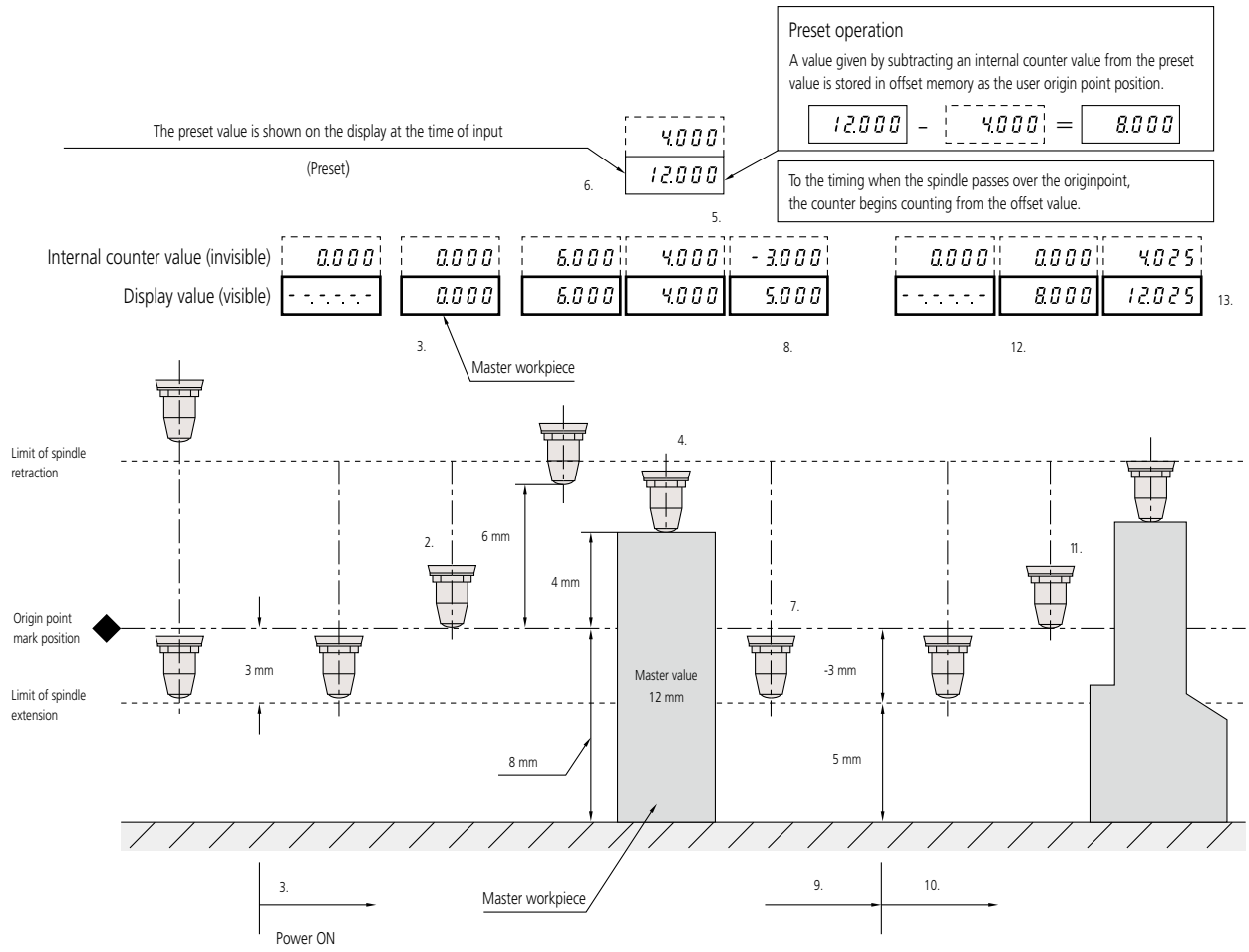
6. Peak clear

Clears the peak value. (Max.=Min.=Current value,TIR: 0)



Note: Peak clear takes effect only in the peak mode. (In the case of a current value, this has the same effect as a presetting operation.)

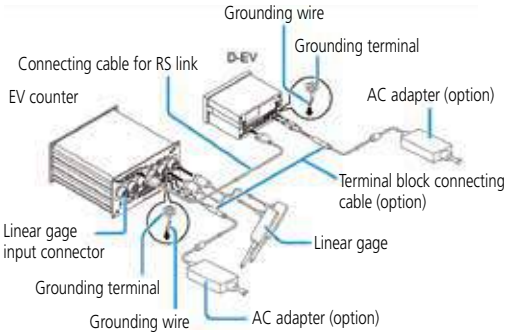
Origin Point Mark Detection (EG-101Z, EB-11Z, EH-102Z, EV-16Z)



Note: The example linear gage used in the above explanation is LGF-0510 (110) ZL. This linear gage has its origin point marked at a position approximately 3 mm from the limit of the spindle extension. In the case of 25/50 mm-stroke types the origin point mark is positioned approximately 5 mm from the spindle extension limit.

Origin Point Mark Detection Procedure

1. Turn the display unit connected to the gage head to ON. (The offset register is set to zero at this stage.)
2. Displace the gage head spindle approximately more than 3 mm from the spindle extension limit position to make it pass over the origin point mark.
3. The display unit will automatically read the origin point and zero-set itself.
4. Bring the gage head contact point into contact with the master gage as shown.
5. The display unit indicates the displacement from the origin point position. (Offset register still contains zero.)
6. Input the preset value (the calibrated size of the master gage, 12.000).
7. Remove the master gage so that the spindle extends to its limit.
8. The display unit displays position of the contact point relative to the datum surface.
9. Turn OFF the display unit.
10. Turn ON the display unit.
11. Displace the gage head spindle approximately more than 3mm from the spindle extension limit position to make it pass over the origin point mark.
12. The display unit will automatically read the origin point and the displayed value will effectively start from the stored offset register value (0.000 + 8.000=8.000).
13. The contact tip can now be brought into contact with the workpiece to make the measurement and the display will indicate the workpiece size (4.025 + 8.000=12.025).



Input/output connector

02ADB440 (with cover)

This plug fits the I/O output socket on EG/EB/EH/EV counters.

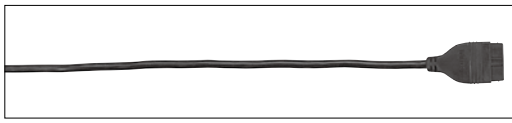
RS Link Connecting cable for Digimatic Mini-processor

Order No.	Cable length
02ADD950	0.5 m
936937	1 m
965014	2 m

Used to interconnect EH/EV counters comprising an RS link.

Used to output the measurement data from EC/EB/EH counters to Digimatic mini-processor DP-1VA.

* Data output from an EH counter is selectable from between RS-232C and Digimatic. This setting is made with an internal parameter.



Terminal connecting cable	AC adapter	AC cable
02ADD930	**357651**	(Japan): **02ZAA000*** (USA): **02ZAA010*** (EU): **02ZAA020*** (UK): **02ZAA030*** (China): **02ZAA040*** (Korea): **02ZAA050***

* To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE. For those models of the Order No. with Suffix "1", an AC adapter is not supplied as a standard accessory.

Connect the AC adapter to the power terminal on the EG/EB/EH/EV counter. Connect the terminal block connecting cable when supplying power to an EG/EB/EV counter.
Use the AC cord to connect the AC adapter to a power outlet.

Connector compatibility

● The connectors listed below are compatible with the specific models of counter shown for measurement, data output, and external control purposes.

Counter	Counter Order No.	Description	Connector Order No.
EC-101D	**542-007**	GO/NG judgment output	**C162-155**
EG-101P	**542-015**	BCD output, GO/NG judgment output	**02ADB440**
EG-101Z	**542-017**	BCD output, GO/NG judgment output	
EG-101D	**542-016**	BCD output, GO/NG judgment output	
EB-11P	**542-092-2**	GO/NG judgment output, serial BCD output, simple analog output	
EB-11Z	**542-094-2**	GO/NG judgment output, serial BCD output, simple analog output	
EB-11D	**542-093-2**	GO/NG judgment output, serial BCD output, simple analog output	
EH-101P	**542-075**	Remote input, GO/NG judgment output	**02ADB440**
		RS-232C output	—
EH-102P	**542-071**	Remote input, GO/NG judgment output	**02ADB440**
		RS-232C output	—
EH-102Z	**542-073**	Remote input, GO/NG judgment output	**02ADB440**
		RS-232C output	—
EH-102S	**542-074**	Remote input, GO/NG judgment output	**02ADB440**
		RS-232C output	—
EH-102D	**542-072**	Remote input, GO/NG judgment output	**02ADB440**
		RS-232C output	—
EV-16P	**542-063**	Remote input, GO/NG judgment output Segment output, BCD output	**02ADB440**
		RS-232C output	—
EV-16D	**542-064**	Remote input, GO/NG judgment output Segment output, BCD output	**2ADB440**
		RS-232C output	—
EV-16Z	**542-067**	Remote input, GO/NG judgment output Segment output, BCD output	**02ADB440**
		RS-232C output	—

SENSORPAK

Measurement data loading software for EH, EV, VL

MeasurLink® ENABLED
Data Management Software by Mitutoyo

- This software facilitates loading measurement data onto a personal computer from a linear gage counter with RS-232C output (**EH**, **EV**), with USB output (**EH**), or from a Litematic display (**VL**).
- 60 channels (max.) of measurement data can be processed.
- Arithmetical calculations and maximum width calculations can be performed using the measurement data.
- Exporting measurement data into MS-Excel format is supported.
- Real time graphical display by means of bar-graph or meter is provided.

Measurement screen 1

Meter screen 2

Chart screen 3

SPECIFICATIONS

Order No.		02NGB072
Product configuration		Program disk (CD), license key, operation manual
Compatible devices		Mitutoyo RS_LINK compatible devices • LGH Series (USB, RS-232C) • EH counter (USB, RS-232C) • EV counter (RS-232C) • Litematic VL (RS-232C)
Connecting cable		A cable should be prepared to the following specifications: Accessory •RS-232C connection: I/O cable (**21HZA137**)*1 Commercial product • USB connection: USB cable (type A - type B) • RS-232C connection: RS-232C cross cable*1
Number of connectable gages		Max. 60 units (when 10 units of EV counter for linear gage are connected via RS-Link)
Functions	Display*2	Display format: counting, bar graph, indicator, chart, and table Display cycle: 1 s (when 60 gage units are connected, 1-window display, and no Excel output)
	Calculation	Calculation (up to 30 items) between designated gages is available. Calculation items: Sum, difference, total, average, maximum, minimum, range (maximum–minimum), calculation with a constant
	Tolerance judgment	Per item: Displays the result in colors (3-step tolerance: red/green/red; 5-step tolerance: red/yellow/green/yellow/red) Total judgment: Displays in colors (red/green) by monitoring the multiple gages and calculation result
	Recording*2	Items: channel values, calculation result, tolerance judgment, total tolerance judgment, timestamp Max. number of records: 60000 for software recording (with 6 gages connected); up to 9000 (with 60 gages connected) Output function: Direct output to Excel, CSV file output (compatible with MeasurLink) Recording trigger: key, timer, external TRG
	Input/output*3	Input: TRG for recoderding (HOLD) Output: Total tolerance judgment result
System environment		DOS/V compatible PC environment CPU: Pentium4 2 GHz or more, Memory: 2 GB or more, Hard disk: 2 GB or more free space OS: Windows 7 (32 bit/64 bit), Windows 8.1 (32 bit/64 bit), Windows 10 (64 bit)

*1: If the PC is not equipped with an RS-232C port, please contact the nearest Mitutoyo sales office/service center.
*2: Display cycle and the maximum number of records differ depending on the environment (specification of PC, number of connected gages, display format and communication setting).
*3: With use of the I/O cable (accessory). When an I/O cable is not used, the I/O connector of connector of the counter alternatively functions.
(Refer to the user's manual of the counter in use.)

Examples of Connections between Various Counters and Digimatic Instruments

ABS Digimatic Indicator

ABSOLUTE™

Multi-function type with Digimatic output

ID-F*1
ID-H

Standard/General-purpose type with Digimatic output

ID-CX*1
ID-S
ID-U

Digimatic output

Panel-mounting, Single function type
EC-101D

3-step limit output
Digimatic output

Panel-mounting, Single function type
EG-101D

BCD output
(3/5 steps, 3 kinds)

Panel-mounting, Multi-function type
EB-11D

Serial BCD output or limit output
Limit output
Digimatic output

Panel-mounting, Multi-function type
EH-102D

Digimatic output
RS-232C
USB*2

Six input counter
EV-16D

3-step limit/
BCD/segment
RS-232C

RS Link

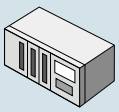
Max. 10 counter units (Max. 60 channels)

Display unit for EV-160
D-EV


Six input counter
EV-16D


Input tool

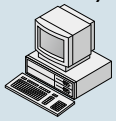
RS-232C
USB

Programmable Controller/ Sequencer (outside device)


GO/NG judgment output

Digimatic Mini-processor
DP-1VA LOGGER*1
(No. 264-505)


3-step limit/
BCD/segment

Personal computer (outside device)


*1: For details, refer to Catalog No.13.
*2: This link is only supported by Mitutoyo software SENSORPAK.

Input tool

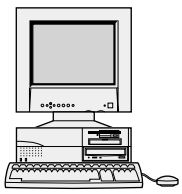
By just connecting the input tool to the keyboard connector on a PC, measurement data from a counting device can be imported as-is to spreadsheet software such as Excel.

Mounting example


ABS Digimatic indicator
ID-CX


Measuring instrument with Digimatic output to counters such as EC, ED

Input tool

Linear Gage Accessories (Option)

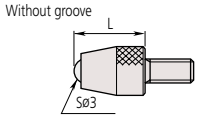
Optional gage head accessories

■ Various Contact Points/Extension Rods (Interchangeable dial indicator contact points are also available.)

- All threads of interchangeable contact points are M2.5 (P=0.45) × 5mm.
- If any contact point is replaced with another, firmly attach it so that it cannot become loosened during use. (Recommended tightening torque=50 N·cm)
- A carbide contact point is particularly good at resisting to abrasion.

■ ø3 mm Ball Points

Standard contact point.

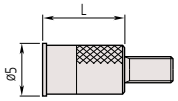


Unit: mm

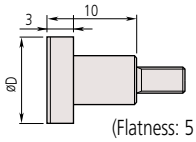
L (mm) \ Material		Carbide	Carbide	Plastic
7.3	Order No.	**901312**	**120047**	**901994**
14	Order No.	**21JAA225**	—	—
15	Order No.	**120049**	**120051**	—
17	Order No.	**21JAA224**	—	—
20	Order No.	**137391**	**137392**	—
22	Order No.	**21JAA226**	—	—
25	Order No.	**120053**	**120055**	—
30	Order No.	**21AAA252**	**21AAA253**	—

■ Flat Points

Convenient to use if the feature to be measured is convex.



(Flatness: 3 µm)



(Flatness: 5 µm)

Unit: mm

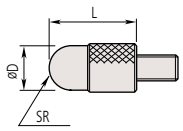
L	Order No.
8	**131365**
10	**21AAA340**

D	Order No.
10	**101117**
15	**21AAA341**
20	**21AAA342**
25	**21AAA343**
30	**21AAA344**

Note: If perpendicularity to the stem and parallelism with the reference plane are required using a flat contact point, extra adjustment in conjunction with the linear gage is necessary. Consult with Mitutoyo as a custom-made option.

■ Shell Type Points

Contact point with a large radius. Optimal for use on flat surfaces.

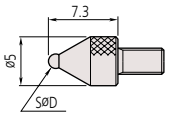


Unit: mm
Material: Hardened steel

øD	SR	L	Order No.
5	2.5	5	**101386**
		10	**101118**
		15	**137393**
		20	**101387**
		25	**101388**
		30	**21AAA254**

■ Ball Points

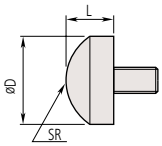
Convenient to measure a depressed feature on a workpiece.



Unit: mm
Material: Hardened steel

SøD	Spherical tip material	Order No.
1	Carbide	**21AAA349**
1.5		**21AAA350**
1.8	Hardened steel	**101122**
2.5	Carbide	**21AAA351**
4		**21AAA352**

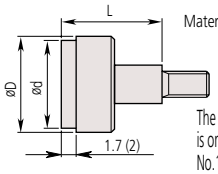
■ Spherical Points



Unit: mm
Material: Hardened steel

L \ D	ø5.5	ø8	ø10
SR	5	5	7
1.5 Order No.	**111460**	—	—
2.5 Order No.	—	**125258**	**101119**

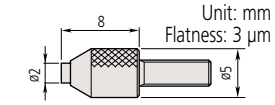
■ Flat Points (Carbide)



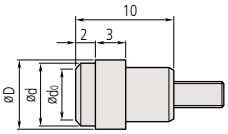
Material: Carbide

The dimension in parentheses is only applied to Part No.120042.

ød	D	L	Flatness	Order No.
4.3	5.2	5	3 µm	**120041**
6.5	7	10		**120042**
9.5	10.5			**120043**
15	17		5 µm	**21AAA345**
20	22			**21AAA346**
25	27			**21AAA347**
30	32			**21AAA348**



120056



øDo	ød	øD	Order No.
3	6.4	7	**137255**
4.5	8	9	**137399**

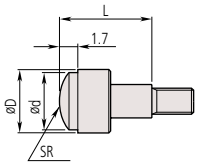
(Flatness: 3 µm)

Unit: mm
Flatness: 3 µm

Note: If perpendicularity to the stem and parallelism with the reference plane are required using a flat contact point, extra adjustment in conjunction with the linear gage is necessary. Consult with Mitutoyo as a custom-made option.

■ Spherical Points (Carbide)

* Diameter d is available up to ø40 as a custom order.



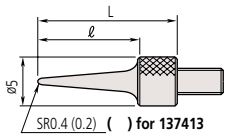
Unit: mm
Material: Carbide
(spherical tip surface only)

L \ D		ø5.2	ø7.5	ø10.5
SR		5	7	10
5	Order No.	**120058**	—	—
10	Order No.	—	**120059**	**120060**

■ Needle Points

Suitable for probing the bottom of a groove or hole.

Unit: mm
Material: Hardened steel

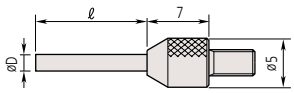


* Contact Mitutoyo to inquire about specifications such as tip SR: 0.2 or more and l: up to 40.

Order No.	ℓ	L
101121	11	15
137413	13	17
21AAA255	21	25
21AAA256	31	35

■ Needle Points (Carbide)

Unit: mm
Material: Carbide



D \ ℓ		3	5	8	10	13
ø0.45	Order No.	**120066**	**21AAA329**	—	—	—
ø1	Order No.	**120065**	**21AAA330**	**21AAA331**	**21AAA332**	—
ø1.5	Order No.	—	**21AAA335**	—	**21AAA336**	**120064**
ø2	Order No.	—	—	**137257**	—	—

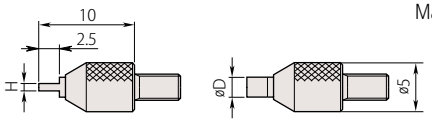
D \ ℓ		18	20	28	40
ø1	Order No.	—	**21AAA333**	—	**21AAA334**
ø1.5	Order No.	—	**21AAA337**	—	**21AAA338**
ø2	Order No.	**21AAA257**	—	**21AAA258**	**21AAA339**

* A different specification is available as a custom order.

■ Blade Points (Carbide)

Convenient for cylinder measurement, etc.

Unit: mm
Material: Carbide



D \ H		0.4	0.6	1
ø2	Order No.	**120061**	**120062**	—
ø4	Order No.	—	—	**120063**

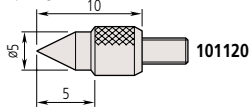
Note: If perpendicularity to the stem, parallelism with the reference plane, and different contact point orientation are required using a blade contact point, extra adjustment in conjunction with the linear gage is necessary. Consult with Mitutoyo as a custom-made option.

■ Conical Points

Used for positioning the measurement point. Since it can damage a workpiece easily, it is not suitable for use on soft materials.

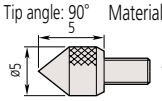
Unit: mm
Material: Hardened steel

Tip angle: 60°



101120

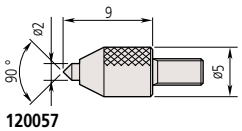
Tip angle: 90°



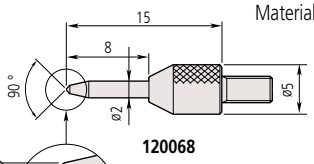
101385

■ 90° Conical Points (Carbide)

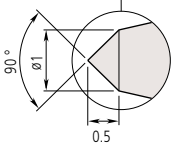
Unit: mm
Material: Carbide



120057



120068

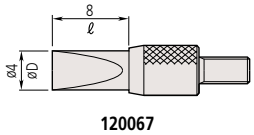


Note: Angles other than 90° are available as a custom order.

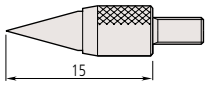
■ Knife Edge Point (Carbide)

Suitable for measuring narrow groove diameter, etc.

Unit: mm
Material: Carbide



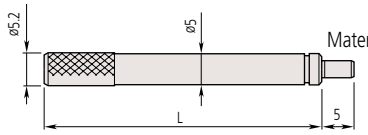
120067



* Diameter D more than ø0.5 and length/ between 5 and 40 are available as a custom order.

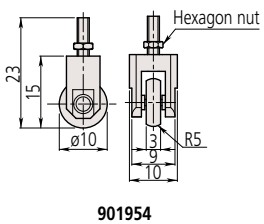
■ Extension Rods

Unit: mm
Material: Stainless steel



L	Order No.	L	Order No.
10	**303611**	55	**21AAA259G**
15	**21AAA259A**	60	**304146**
20	**303612**	65	**21AAA259H**
25	**21AAA259B**	70	**21AAA259J**
30	**303613**	75	**21AAA259L**
35	**21AAA259C**	80	**21AAA259M**
40	**21AAA259D**	90	**304147**
45	**21AAA259E**	100	**303614**
50	**21AAA259F**		

■ Roller Points



901954

Unit: mm
Roller part material: Hardened steel
Roller run-out: 10 µm

Note 1: A different øD is available as a custom order.
Note 2: A high-accuracy type with a roller run-out of 5 µm is available. (Custom-made option)

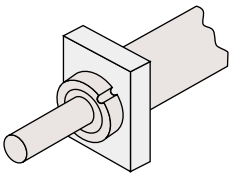
QUICK GUIDE TO INSTUMENTATION TERMINOLOGY

Linear gage systems

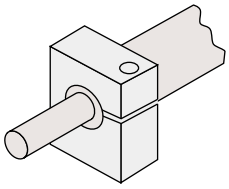
Gage head

■ Nut and split-clamp stem mounting

Gage heads are mounted on a fixture or stand using the precision-machined cylindrical stem. Stems can be any one of several standard diameters and are either just plain or with a fixing thread at one end or the other. All gages can be mounted using the split-clamp method which is suitable for a range of applications, especially where small axial adjustments may be required. However, care is needed to avoid over-tightening the clamp, which could interfere with the spindle movement. Those stems with a thread at the spindle end can also be mounted just by using a nut to clamp them into a hole in a fixture. They can also use a "thrust stem" (see page 25) that is clamped into a larger hole in a fixture and into which the gage is screwed. Stems with a thread at the body end can also use this method of mounting.



Nut mounting



Split-clamp mounting

■ Measuring force

A force is produced when a workpiece is brought into contact with the tip of a linear gage head and forces the spindle to retract against the action of the return spring. This is known as the measuring force and is specified in newtons (symbol N). As this force is spring-generated it increases with spindle retraction.

■ Comparison measurement

When a measurement is required that is beyond the measuring range of a particular gage head, so that an 'absolute' measurement is impossible, a calibrated master gage (e.g. gage blocks) or master workpiece can be used to subtract the greater part of the distance involved so that the head only has to measure the difference between the workpiece and the master. This 'comparing' of the size of a workpiece with that of a master gives rise to the term 'comparison measurement'. (See page 59 for a detailed description.)

■ IP Codes

IP54

Type of protection	Level	Degree of protection
Protection of the human body and protection against foreign objects	5: Protected against dust	Ingress of dust is not totally prevented, but dust that does penetrate must not interfere with satisfactory operation of the apparatus or impair safety
Protection against water	4: Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects

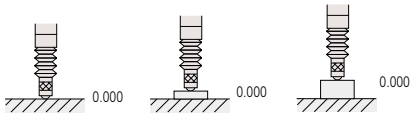
IP66

Type	Level	Protection guarantee
Protection of the human body and protection against foreign objects	6: Dust-proof	No ingress of dust allowed
Protection against water	6: Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects

Display unit

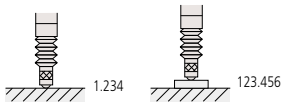
■ Zero-set

Sets the displayed value to 0 at any position of the spindle.



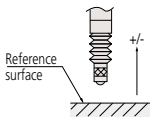
■ Preset

Presets the display at any value. Counting begins at the preset value.



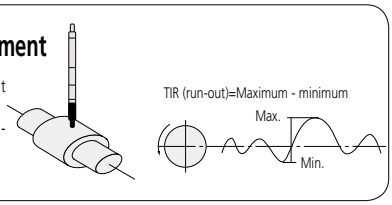
■ Direction switch

Selects the counting direction of (+) or (-), whichever is convenient with a given direction of spindle movement.



■ Peak hold/TIR measurement

Allows switching to the measurement mode for maximum value, minimum value, and run out value (maximum - minimum), in addition to the normal measurement mode.



■ Tolerance judgment indication/output

Sets two (or four) desired tolerances for three (or five) stages. Judgment results can be output to an external device.

■ Open collector output

This method allows direct derivation of GO/NG judgment output from the collector circuit of a power transistor to drive a load.

■ Digimatic output

Data can be output to various printers and statistical processing devices, such as DP-1VA and MUX-10LF, using the Digimatic code (SPC) output format.

■ BCD output

The displayed value can be output in Binary Coded Decimal format.

■ Communication via RS-232C interface

RS-232C allows communication with a personal computer. It allows not only the reading of measured values but also data transmission to the counter and remote operations, such as when changing various settings.

Before using the gage head

■ Avoid installing the gage in locations where:

- The gage will be exposed to direct sunlight, or where the ambient temperature may drop below 0°C or exceed 40 °C.
- The relative humidity may drop below 20 %RH or exceed 80 %RH, or where a sudden change in temperature may cause condensation.
- The gage would be subject to corrosive gas, or where combustible materials are placed nearby.
- The gage is subject to air containing significant amounts of dust, salt or iron powder.
- The gage is subject to direct vibration or shock.
- The gage may come in contact with splashed water, oil or chemicals. (The gage system components are not designed for protection against water, oil or chemical attack, except for the gage unit.)
- Electronic noise is likely to affect the gage.

■ Conformance to EU Directive

- EMC Directive: EN61326-1

■ Preventing electrical interference

- Bundling the sensor cable with high-voltage lines or power lines may cause the gage to malfunction. The sensor cable run should be completely separate.

■ Power supply to the display unit

- If a generic switching regulator is used, provide grounding via the frame's ground terminal or ground terminal of the power supply.
- If a malfunction occurs due to superimposed noise on the power-supply line, use a DC-regulated power supply that incorporates an isolation transformer.

■ About grounding

- Avoid sharing the frame ground (F.G.) terminal of this unit with the high-power line groundingbut separately connect it to Class 3 Grounding.

Handling precautions

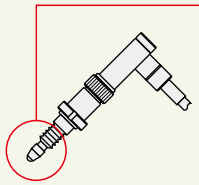
- This product is a precision measuring instrument. Avoid dropping or otherwise subjecting it to impact.
- The spindle of the gage head is connected to the body via a spring. Be careful not to pull the spindle in the extending direction or rotate it with force. Doing so may cause permanent distortion and damage to the spring.
- The gage is shipped with a standard contact point (901312) installed on the spindle. This contact point can be replaced with a different type that best suits the shape of the workpiece feature to be measured. (See page 54, 55.)

  When installing or removing a contact point, locate the key wrench provided in the wrench groove in order to keep the spindle from rotating. Then grip the contact point with pliers to install or remove it. When gripping the contact point with pliers, insert a piece of felt or other soft packing between the jaws and the point to protect it from damage.

Precautions when mounting the gage head

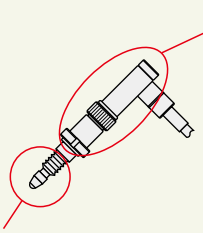
The following illustrate important points to which customers should pay attention. Refer to these when using gage heads and counters.

■ All series of linear gages



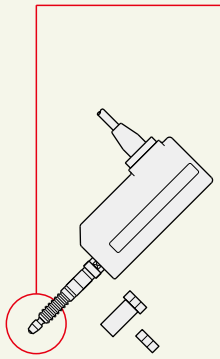
The contact point is interchangeable according to the application. When installing or removing a contact point, locate the key wrench provided in the wrench groove in order to keep the spindle from rotating. Then grip the contact point with pliers to install or remove it. When gripping the contact point with pliers, insert a piece of felt or other soft packing between the jaws and the point to protect it from damage.

■ LGB2 models



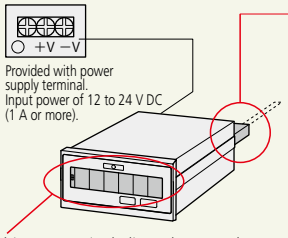
To mount the gage in the mounting hole, fasten the clamp nut with the standard-supplied wrench while holding the knurled part in the middle of the main unit by hand. Take care not to hold the cable receptacle on the main unit, otherwise the gage may be damaged due to strain caused by twisting.

■ LGK, LGF and LGD models



If the thrust stem is retrofitted, the gage can be fixed more steadily and easily only by drilling a ø9.5 hole on a plate with a thickness of about 10 mm. To mount the thrust stem, fit the special wrench (option) in the wrench groove in the middle of the main unit, and then fasten the clamp nut with the standard-supplied wrench while holding the knurled part by hand. Take care not to hold the cable receptacle on the main unit, otherwise the gage may be damaged due to torque caused by twisting.

■ EC, EG, EB and EV counters



Only the optional I/O output connector **02ADB440** is available from Mitutoyo. This is because the number of pins and length of cable varies with application requirements and accordingly wiring is better left for customer's arrangement.

This counter is dedicated to panel-mount application and is not suited for direct bench-mount application. Choose an EH counter for bench-mount or carry-on application.

Precautions when mounting the gage head

Applies to all linear gages

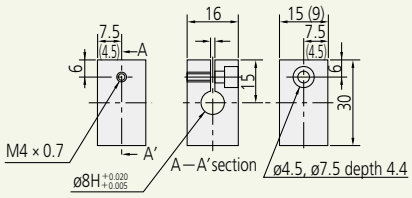
■ Mounting the gage head

- Mount the gage on a fixture or stand by using its stem only.
- Be careful not to over-tighten the stem. Doing so may cause problems in gage operation.
- Never fasten the gage by the method of clamping with a screw directly in contact with the stem.
- Mount the gage in such a way that its stem is in line with the direction of measurement required. If installed at an angle to this direction, measurement errors will occur.
- Be careful not to exert force on the gage via the cables. Exercise due care especially when using an extension cable.

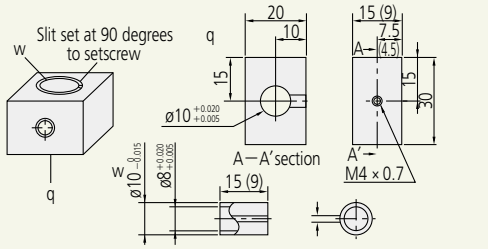
■ Examples of the plain-stem mount

- The recommended clamping torque is 0.4 to 0.5 Nm. Over-tightening the stem clamp will prevent smooth movement of the spindle. Ensure the spindle can move freely after clamping.

Example 1 Unit: mm



Example 2 Unit: mm



■ Replacing the contact point

- Fit the supplied key wrench in the wrench groove so as not to rotate the spindle, and then attach or detach the contact point while gripping it with pliers. Before gripping the contact point with pliers, apply a soft cloth such as felt to protect the contact point from damage.
- If a torque is applied to the the spindle, the gage may be damaged. Replace the contact point with due caution after securing the spindle firmly with the key wrench.

■ About dust/water protection

The protection level of all slim type linear gages is equivalent to IP54 (DIN 40050-1/IEC529 Standards).

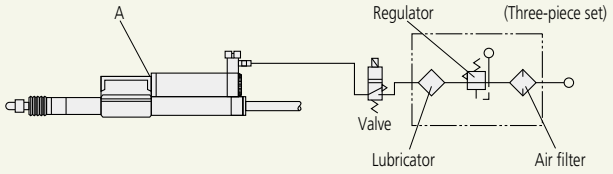
- The preamplifiers and counters are not designed to be dust-or water-proof. Install them in places where they will not come into direct contact with dust, water or oil.
- When an extension cable is used, seal the preamplifier connection and connectors completely, making sure no portion is left exposed.
- If the cable cover is damaged, water or other liquids may enter the gage due to capillary effect, causing gage failure. If the cable cover becomes damaged it should be repaired or replaced immediately.
- Handle the gage with due caution to make sure that the rubber boot will not be damaged by scuffing, etc. If the rubber boot is damaged, the gage can no longer be protected from dust or water ingress. When damage is found, repair or replace the boots immediately.
- The rubber material used for the boots and seals does not provide complete protection against coolants and chemicals, which are becoming increasingly complex in composition. If rubber parts are found to have deteriorated significantly, contact your nearest Mitutoyo office.
- The gage must not be disassembled, since it will break the seals of various components. Never attempt to disassemble the gage. Doing so will prevent the gage from functioning to its original specifications.

Precautions when mounting the gage head

Air drive model

- Service air pressure: 0.3 to 0.4 MPa
- Lubricating oil: Turbine oil class 1 (ISO VG32)
- Caution: Holding the air cylinder section while mounting gage will exert force on section A, causing a gage failure. For the same reason it is essential not to apply force to section A when connecting an air hose to the gage head.

Example of air piping



LGB2 Type

■ Mounting the gage

Insert the linear gage in the gage mounting hole (recommended: ø9.5, H6) and clamp the gage with the supplied clamp nut. Use the supplied wrench at that time.

- Avoid over-tightening the stem part as this may raise a problem during mounting.

Note 1 Use any available mounting fixtures shown on page 24. If clients manufacture their own fixtures, Mitutoyo recommends 11.5 mm for dimension B.

Note 2 Linear gage heads have been used in an extremely wide range of fields. When gage heads are actually mounted on a machine, however, fixtures are often manufactured at high cost. To eliminate such waste, Mitutoyo's linear gage head mounting fixtures have been manufactured in due consideration of every possible mounting method from design and working respects. Cast iron (FC45, nickel plating) is used for these fixtures.

LGD/LGF/LGK Type

■ Example of using optional accessories

If the thrust stem and clamp nut are used, the gage can be fixed more steadily and easily only by drilling a ø9.5 hole on a suitable gage mounting fixture.

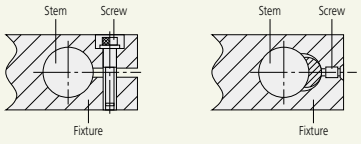
Note 1 Refer to page 25.

Laser Hologage

■ Mounting the gage

A Laser Hologage can be mounted by inserting its stem in the mounting hole of a dedicated stand or other equipment.

Recommended mounting hole diameter in fixture: **15 mm** $^{+0.024}_{+0.006}$



- The mounting hole shall be machined parallel with the direction of measurement. Cosine-effect measurement error will occur if the gage is misaligned with this direction.
- Excessive force in tightening the stem will affect smooth spindle motion and should be avoided.
- In applications where a Laser Hologage is subject to movement, ensure that the mounting is designed to avoid the cable being dragged when in motion.

■ Precautions for measurement:

- To help ensure accuracy, allow 30 minutes warm-up time for the system after powering ON.
- Allow sufficient time for temperature stabilization for both the gage and workpieces to be measured.
- Thoroughly clean the contact point and all surfaces to be measured before measurement to avoid accuracy degradation due to dust or grease.
- Be aware of possible overspeed errors if the contact point is allowed to drop significantly from surface to surface on the workpiece. Appropriate measuring procedures should always be used with due consideration for the part features.

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Coordinate Measuring Machines

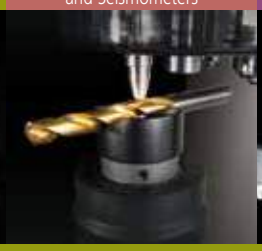
Vision Measuring Systems

Form Measurement

Optical Measuring

Sensor Systems

Test Equipment and Seismometers



Digital Scale and DRO Systems

Small Tool Instruments and Data Management

Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

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