

Electric Micrometer Amplifier

**ELEMETRON**      **DTM-EA**  
**DTM-EA/H**  
**DTM-ED**

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**Operation Manual**    8th Edition

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## Precautions

- Read the Instruction Manual before use. Store the Instruction Manual at hand for reference when necessary.
- The Instruction Manual may be subjected to partial change without prior notice.
- No part of the Instruction Manual may be reprinted without permission.
- Contact us if you have any questions or if you find clerical errors or omissions in the Instruction Manual.

### ■ Safety precautions

What should be observed to prevent possible danger to the user or any other person or damage to property is indicated below.

- The levels of danger or damage caused by misoperation without observing the instructions are defined as follows:



#### **Warning**

Indicates that erroneous use without observing this instruction could lead to “death or a severe injury”.



#### **Caution**

Indicates that erroneous use without observing this instruction could lead to “an injury or damage to property”.



This symbol is an icon to “call attention” for the user.



This symbol is an icon to indicate “information” such as procedures.

### ■ Handling precautions

The product is a precision device. Observe the following for correct use of the product.

Any fault/trouble in the product that springs from a handling error is not included in the scope of guarantee by CITIZEN SEIMITSU CO., LTD.



- Never maintain, disassemble or repair the product unless instructed by the Instruction Manual.
- Any damage caused by erroneous operation or handling of the device by the user or use environment is not within our responsibilities.
- Never attempt to make operations not described in the Instruction Manual in order to avoid an accident or a fault.
- Data is fundamentally volatile and cannot be stored or saved for a prolonged period or permanently. Note that we have no liability for data losses due to failure, repair or inspection or resulting lost profits.



## Caution

- Touch a metal nearby (such as a door knob or aluminum sash) by the hand to dissipate static electricity built up on your body surface or clothes before starting installation. Otherwise built-up static electricity could damage the device.
- Avoid touching the product with wet hands. Such an attempt could lead to an electric shock.
- Avoid modifying or repairing the product. Such an attempt could lead to a fault.
- Avoid wiping the surface of the product with thinner or benzine. Such an attempt could lead to a fault or damage.
- Avoid using or storing the product in the following environments:
  - A magnetic field, static electricity or vibrations  
A fault, damage or an injury could result.
  - Unstable inclined surface  
The device could be turned over or drop to cause an injury or a fault.
  - Humidity of 85% or above, or with dewing  
A fault could result.
  - Place near fire or where heat is confined  
A fault or deformation could result.
  - Direct sunlight  
A fault or deformation could result.
  - Leakage of current or water  
A fault or an electric shock could result.
  - Other places that could damage the product

## ■ Precautions on installation

 <b>Warning</b>	<ul style="list-style-type: none"><li>● Turn OFF the product and peripheral devices and remove cables before starting work. An attempt to perform installation/removal without following the above procedure could lead to an electric shock.</li></ul> 
	<ul style="list-style-type: none"><li>● Pay attention to the symbol  to prevent injury or damage to property with a sheet metal or edge part of a substrate.</li></ul>



## Caution

- Read through a corresponding manual and follow the procedure specified by the manufacturer before handing the product or peripheral devices.

# 1. Introduction

The Electric Micrometer series is a highly sensitive electric measuring device that employs a differential transformer in conjunction with detectors to enable high-precision measurement of microscopic displacement measurement and measurement that requires a low measuring force.

The detectors have been adjusted before shipment so as to offer compatibility.

# 2. Specifications

## 2.1 System Configuration

This series has the following configuration to offer mutual compatibility.

Electric Micrometer main unit

DTM-EA(H)	Analog indication, analog output, 3 ranged
DTM-ED	Digital display, analog output, 2 ranges

Detector

DTH-P**	Plunger-type detector
DTH-L**	Lever-type detector

## 2.2 Specifications of DTM-EA and DTM-EA/H

Item		Specifications
Sensitivity selection (3 ranges)	HIGH	DTM-EA $\pm 5 \mu\text{m}$ (Graduation: $0.2 \mu\text{m}$ ) DTM-EA/H $\pm 2.5 \mu\text{m}$ (Graduation: $0.1 \mu\text{m}$ )
	MED	$\pm 25 \mu\text{m}$ (Graduation: $1 \mu\text{m}$ )
	LOW	$\pm 125 \mu\text{m}$ (Graduation: $5 \mu\text{m}$ )
Indication error	HIGH	Within $\pm 1$ graduation
	MED, LOW	Within $\pm 1/2$ graduation
Zero point adjusting range		$\pm 50 \mu\text{m}$ or more
Response speed		(Pointer) Approx. 0.5 sec/full scale
Analog output		DC $\pm 1$ V/full scale
Power supply		AC100V – 240V $\pm 10\%$ 50/60Hz, Approx. 4 VA
Mass		Approx. 1.1 kg
Accuracy guaranteed temperature range		24°C $\pm 5^\circ\text{C}$
Operating temperature range		0°C - 50°C
Outside dimensions		Refer to external appearance view.

## 2.3 Specifications of DTM-ED

Item		Specifications
Sensitivity selection (2 ranges)	HIGH	$\pm 199.9 \mu\text{m}$ (Resolution: $0.1 \mu\text{m}$ )
	LOW	$\pm 1999 \mu\text{m}$ (Resolution: $1 \mu\text{m}$ )
Displacement due to sensitivity selection		Within the resolution
Indication error *1		$\pm 1\%$ reading $\pm 1$ digit
Zero point adjusting range		$\pm 50 \mu\text{m}$ or more
Display		LED display: 3 digits + polarity (–)
Response speed		Approx. 400 ms (max)
Analog output *2		DC $\pm 1$ V/full scale
Power supply		AC100V – 240V $\pm 10\%$ 50/60Hz, Approx. 5 VA
Mass		Approx. 1.0 kg
Accuracy guaranteed temperature range		24°C $\pm 5^\circ\text{C}$
Operating temperature range		0°C - 50°C
Outside dimensions		Refer to external appearance view.

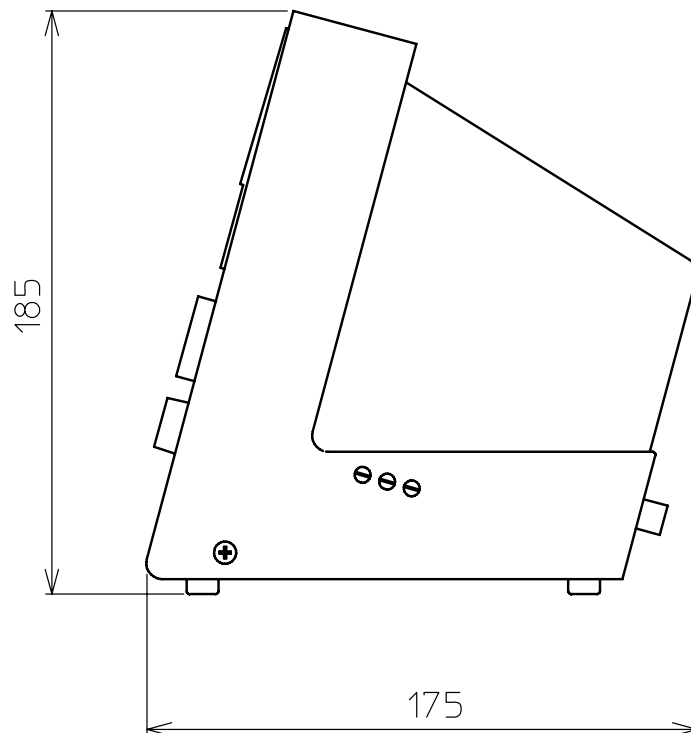
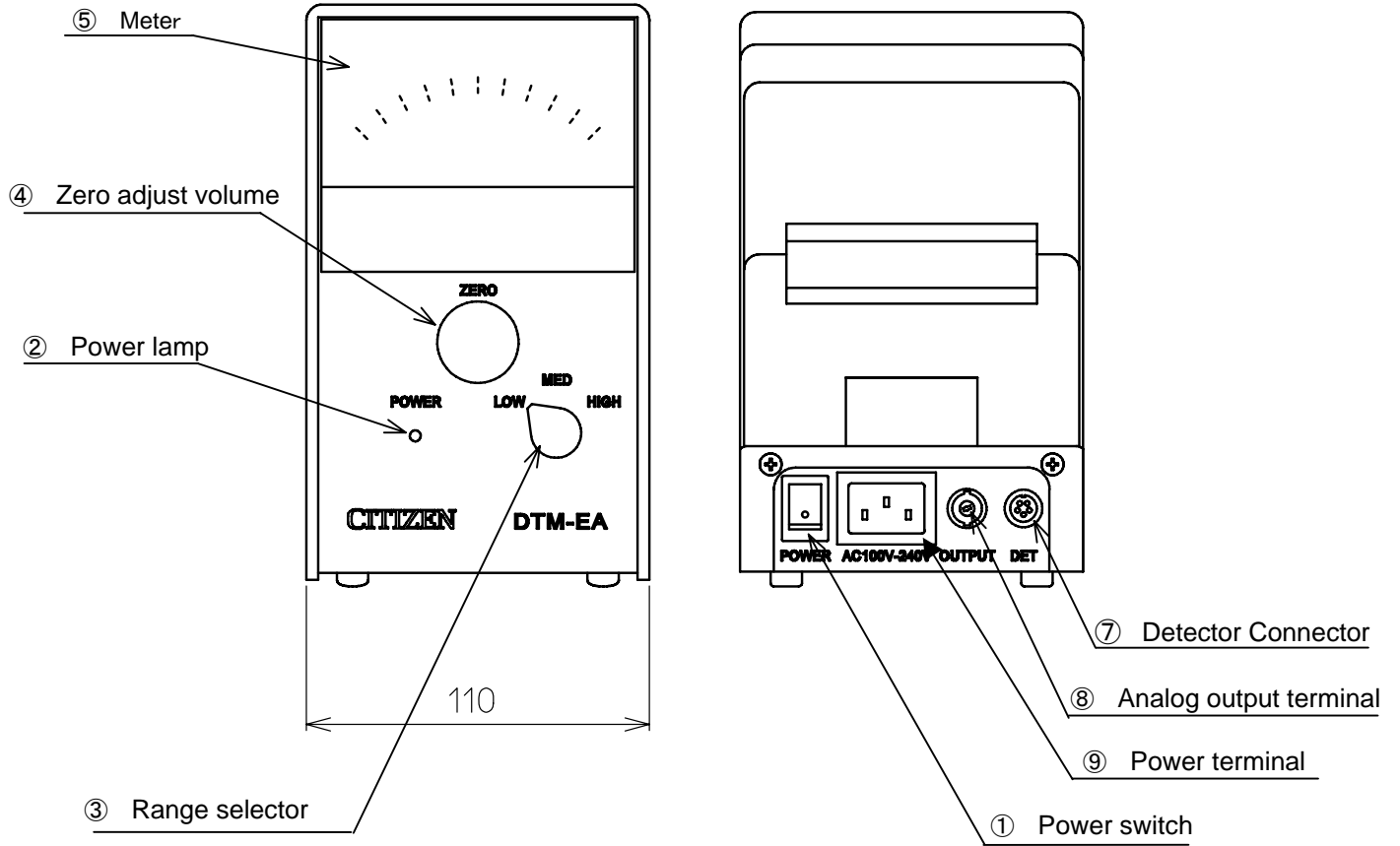
\*1 Note that the assurance differs depending on display selection and indication error.

Performance assurance range:  $\pm 99.9 \mu\text{m}$  when selected HIGH and  $\pm 999 \mu\text{m}$  when selected LOW.

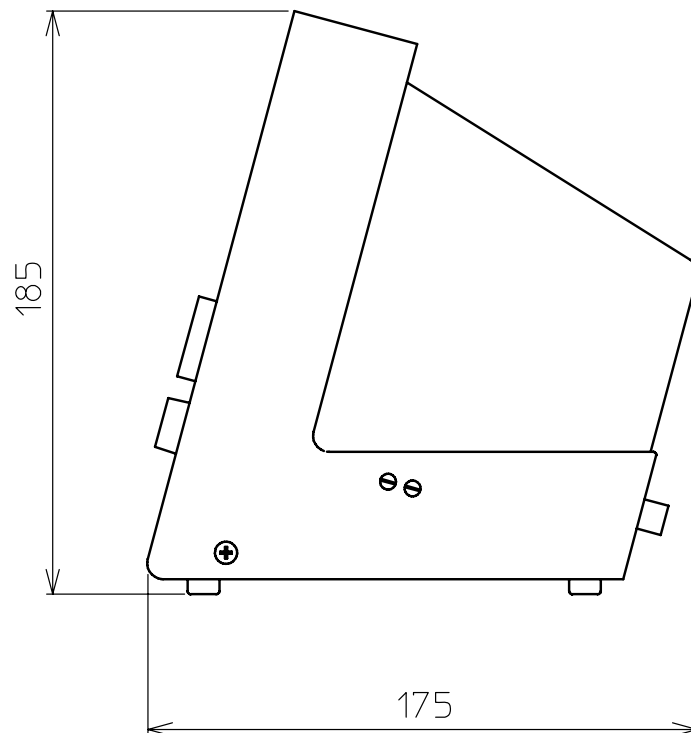
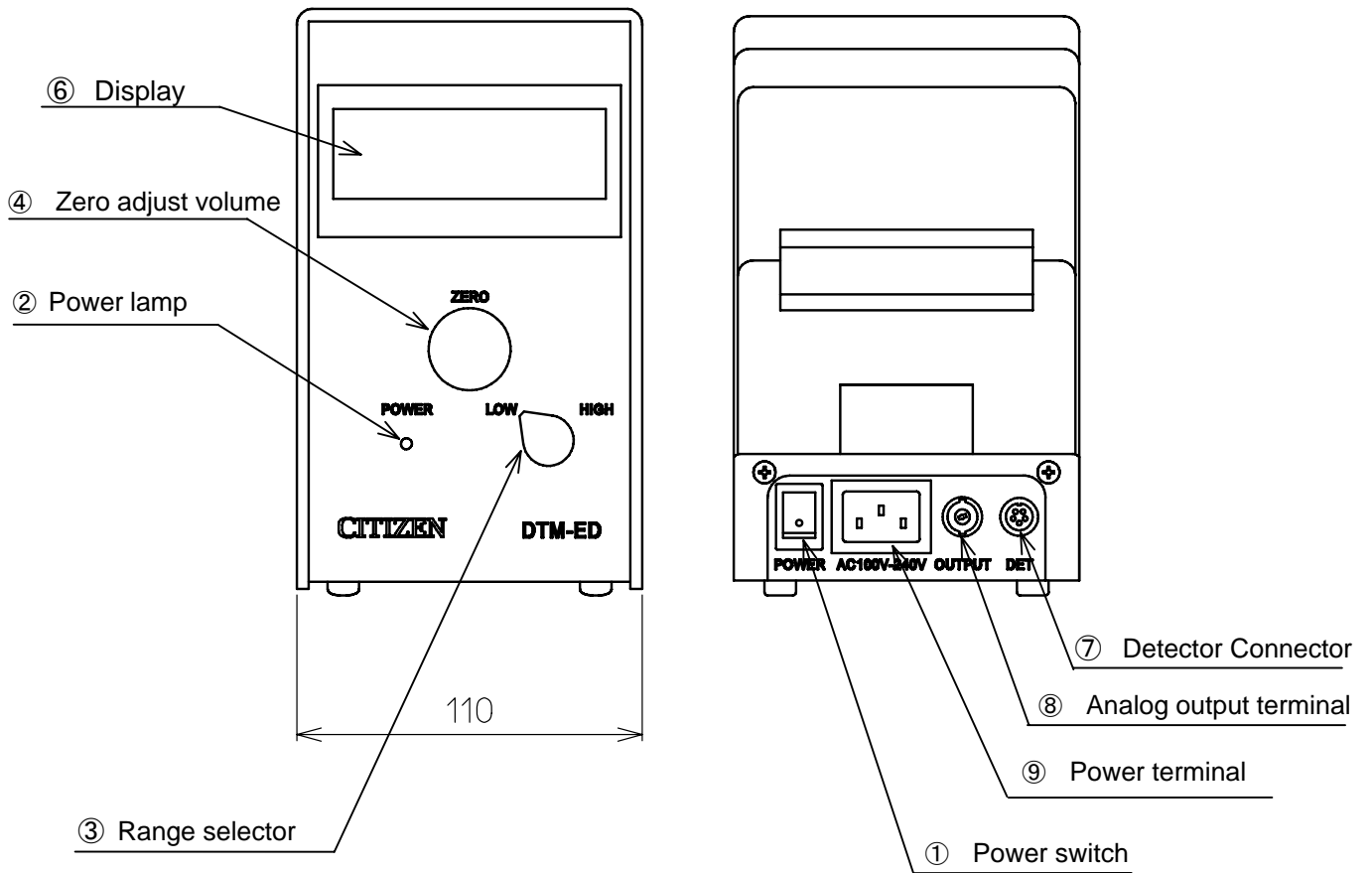
\*2 DC $\pm 1$ V is the output at  $\pm 100.0 \mu\text{m}$  when selected HIGH and  $\pm 1000 \mu\text{m}$  when selected LOW.

### 3. Handling Method

#### 3.1 Exterior Features of DTM-EA and DTM-EA/H



### 3.2 Exterior Features of DTM-ED





### 3.3 Part names and functions

① Power switch

Used to switch the power supply ON and OFF.

② Power lamp

This is the indicator lamp for the power supply. It is lit when the power is ON.

③ Range selector

This is the switch for selecting the sensitivity. Select HIGH, (MED), or LOW.

④ Zero adjust volume

Used to adjust the zero of the detector.

⑤ Meter (DTM-EA, DTM-EA/H)

Displays a measurement value.

⑥ Display (DTM-ED)

Displays a measurement value.

If the measuring range is exceeded, -1 or 1 is displayed.

Note that the display can indicate beyond the guaranteed sensitivity range.

(See section 2.3 “Specifications of DTM-ED”.)

The range is exceeded beyond 199.9 in the HIGH range, and beyond 1999 in the LOW range.

⑦ Detector connector

Connects to a detector.

⑧ Analog output terminal

Outputs DC voltage of  $\pm 1$  V over the full scale.

⑨ Power terminal

Connect the power cable. Plug into a power outlet supplying AC100V  $\pm 10\%$ , 50/60 Hz.

This instrument will work with a power supply in the range AC100V to 240V $\pm 10\%$ , but the power cable supplied cannot be used with a power supply other than that specified above, or outside Japan. Consult Citizen for use with other power supplies.

### 3.4 Preparations for Measurement

- 1) Plug the AC cord into a power outlet.
- 2) Connect the detector to the detector connector on the rear side.
- 3) Mount and clamp the detector on the measurement base.
- 4) Set the range selector to LOW.
- 5) Set the zero adjust volume to roughly the central position.
- 6) Turn the power switch ON.
- 7) Adjust the mounting position of the detector, and set it when the meter's pointer is roughly in the center of the scale (for DTM-ED, close to the zero of the display).
- 8) Leave the measurement unit in this state for about 15 minutes until the measurement unit is in the steady state.

### 3.5 Accuracy Check

- 1) Bring the cleaned block gauge onto the surface of the measurement base.
- 2) Bring the detector into contact with the face of the block gauge, and achieve correct alignment with the zero position by shifting the mounting position and turning the zero adjust volume.
- 3) Mount an appropriate block gauge and check that the amount of displacement is correctly displayed.



Perform accuracy check before using this product. If the instrument is inaccurate, either calibrate it by following the instruction is 5. "Sensitivity Calibration" or tell your nearest dealer.

### 3.6 Measurement

- 1) Set the range selector to LOW.
- 2) Set the zero adjust volume to roughly the central position.
- 3) Mount and clamp the detector on the measurement base.
- 4) Adjust the mounting position of the detector, and set it when the meter's pointer is roughly in the center of the scale (for DTM-ED, close to the zero of the display).
- 5) Set the range selector to the required range.
- 6) Use the zero adjust volume to accurately align the meter's pointer with the center of the scale (for DTM-ED, the zero on the display).

Measurement can be performed by following the procedure above.

### 3.7 How to Use Analog Output

To record measured values or control other devices, use the analog output terminal on the rear side of the main unit. As an analog output, a full scale DC voltage of  $\pm 1$  V is obtained in full scale. Connect a load of 10 K $\Omega$  or more.

## 4. Handling Precautions

### 4.1 Handling Precautions

- 1) This product is a precision measurement device. Perform **accuracy and operation check** before use to check that the product is functioning correctly. (Refer to 3.5 Accuracy Check)
- 2) The accuracy guaranteed temperature range of this product is **24°C  $\pm$ 5°C**.  
Use the product under the environmental conditions within this temperature range.
- 3) Never remove the screws of the box provided in an intermediate position of the cord of a detector.
- 4) Avoid using the product under high humidity or excessive vibrations. Avoid direct sunlight.
- 5) Turn ON the power. **Wait for about 15 minutes** and start measurement with the measurement device in the steady state.
- 6) Never give impact on the Electric Micrometer main unit and a detector.
- 7) Use the power supply of **AC100V - 240V  $\pm$ 10 %, 50/60Hz**.
- 8) Avoid using the product near a **noise source**. Use a shielded wire for an external signal line.
- 9) Perform **routine maintenance** of the product.
- 10) In case an a phenomenon suspected as an abnormality has occurred, or in case a trouble has occurred, **stop using the product** and call your nearest dealer.
- 11) If anything is unclear in the Instruction Manual, call your nearest dealer.

## 4.2 Calibration of Lever-type Tester

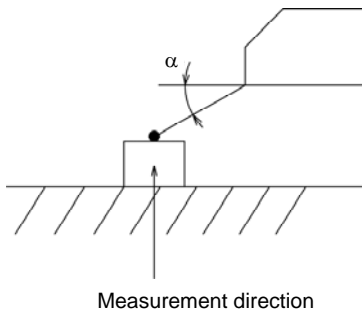


Using a lever-type test with the measurement feeder tilted excessively may cause an error due to the mounting angle.

Perform correction if you have no choice than use the product in the above fashion.

- 1) When the measurement direction is at an angle with the direction of the feeler

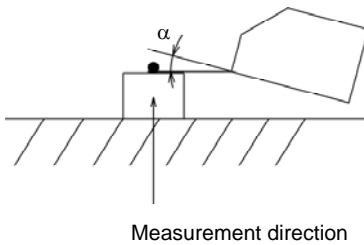
$$\text{True value} = \text{Measurement value} \times A_1$$



Mounting angle $\alpha$	Correction factor $A_1$
10°	0.99
20°	0.95
30°	0.87
40°	0.80
50°	0.70
60°	0.58

- 2) When the measurement direction is perpendicular to the direction of the feeler

$$\text{True value} = \text{Measurement value} \times A_2$$



Mounting angle $\alpha$	Correction factor $A_2$
10°	1.00
20°	0.99
30°	0.98
40°	0.97
50°	0.96
60°	0.93

## 5. Sensitivity Calibration

This procedure can be used to calibrate sensitivity even when measuring outside the range in which accuracy is guaranteed, or when the instrument is inaccurate in an accuracy check.

### 5.1 Calibration device and tools used

- 1) Block gauge (JIS B7506) class 0 or 1
  - ┌ 1.001 – 1.009 (0.001)
  - └ 1.01 – 1.49 (0.01)
- 2) Stand V-1 or V-2 (made by Citizen)
- 3) Screwdriver Philips, -2 mm

### 5.2 Notes on calibration

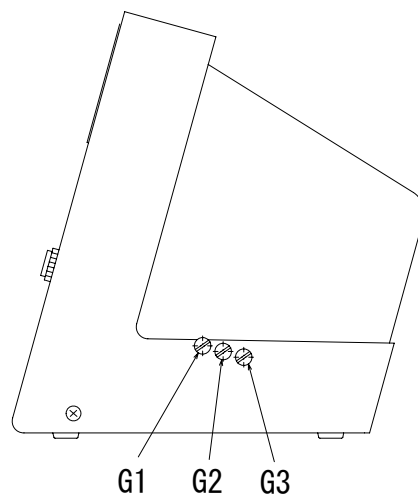
- 1) Carry out calibration under the following ambient conditions.

**Temperature** 24°C

**Humidity** 75% max.

- 2) Use a power supply of **AC100V - 240V±10 %, 50/60Hz**.
- 3) For both the electric micrometer and the detector, start calibration after **15 minutes**, when the measuring instrument has reached a stable state.
- 4) Carry out the calibration in a location where there is no vibration, dust, noise or other problem.
- 5) **Do not touch** any adjust volume other than the one at the specified location. (G1, G2, G3)
- 6) Clean the block gauge and measuring table with great care.
- 7) Check that the pointer returns to zero correctly when the power switch is turned OFF. If it is displaced, adjust it with the meter's pointer adjusting screw.

### 5.3 Position of the calibration volume



## 5.4 Method for calibration

- 1) Set the range selector to LOW.
- 2) Set a cleaned block gauge “A” on the measuring table so that it is in close contact with its surface.
- 3) Bring the contact point into contact with “A”, and achieve correct alignment with the zero position by shifting the mounting position or turning the zero adjust volume.
- 4) Remove “A” and insert another block gauge “B”. (B must be larger than A.)

$$\text{True value} = B - A$$

- 5) Adjust the specified volume with a flathead screwdriver so that the indicated value becomes the true value.  
(See the table below.)
- 6) Adjust the other range by following the instructions above. For each of the ranges it is best to perform calibration at the (+) full scale output.

Volume	DTM-EA	DTM-EA/H	DTM-ED
G1	HIGH ( $\pm 5 \mu\text{m}$ )	HIGH ( $\pm 2.5 \mu\text{m}$ )	
G2	MED ( $\pm 25 \mu\text{m}$ )	MED ( $\pm 25 \mu\text{m}$ )	HIGH ( $\pm 99.9 \mu\text{m}$ )
G3	LOW ( $\pm 125 \mu\text{m}$ )	LOW ( $\pm 125 \mu\text{m}$ )	MED ( $\pm 999 \mu\text{m}$ )

## 6. Standard Accessories

DTM main unit	× 1
Instruction Manual	× 1
Certificate	× 1
Power cable	× 1
Conversion adapter	× 1

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