

## Electronic Micrometer Mu-Checker



# Mitutoyo Electronic Micrometers Adaptable Suited to a Wide Application Range from a Production Line!

A low-measuring-force sensor enables even a soft workpiece to be measured without significant deformation.



Standard type measuring force: 0.2N (No. 519-521)



Low-force type measuring force: 0.02N (No. 519-522)

Compact models are best suited for in-line use.



No. 519-346



No. 519-347

Analog and digital indicator units are both equipped with a Zero-setting function.



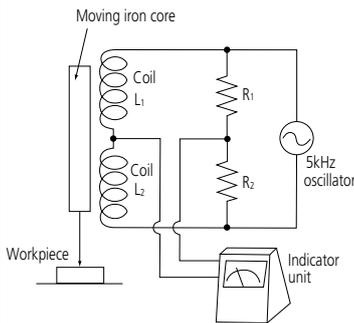
No. 519-551



No. 519-561

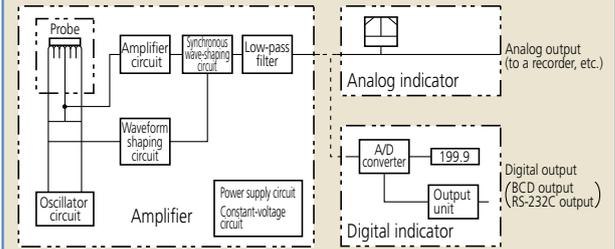
# to Customer Demands the Inspection Room to Building into

## Measurement Principle



This instrument uses a differential inductance displacement sensor energized by a 5kHz AC exciting voltage applied across two identical series-connected coils, L1 and L2. An iron core connected to the stylus moves close to both cores and varies the impedance of each coil depending on its position, and the voltage at the junction between the coils varies as the impedance difference. Two resistors, R1 and R2, form a bridge circuit with the coils and the bridge output voltage drives electronic amplification and conditioning circuits to provide a voltage signal proportional to displacement of the stylus.

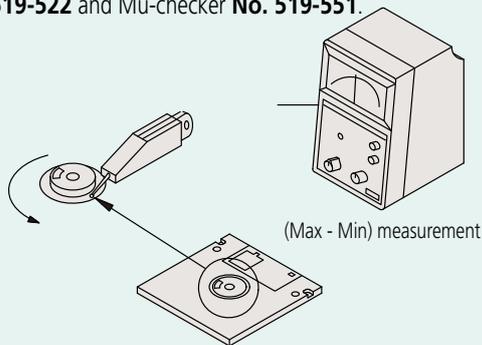
## Mu-checker Block Diagram



# Applications

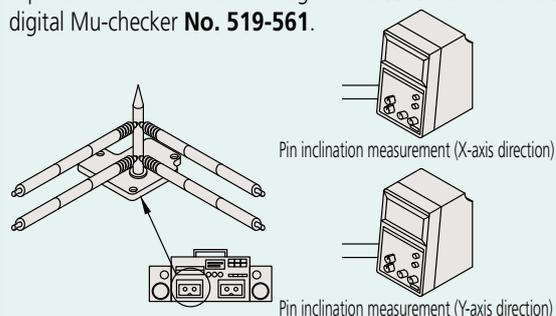
## Measuring floppy disk core runout

The distortion of a metallic core is measured with lever head **No. 519-522** and Mu-checker **No. 519-551**.



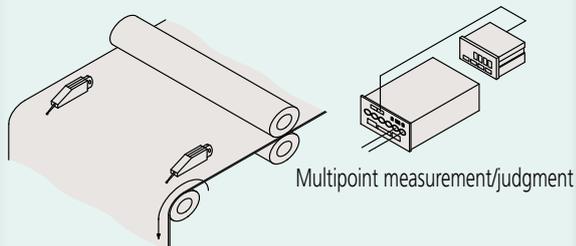
## Measuring the inclination of a capstan pin

The inclination of a capstan pin for winding up a cassette tape is measured with cartridge head **No. 519-385** and digital Mu-checker **No. 519-561**.



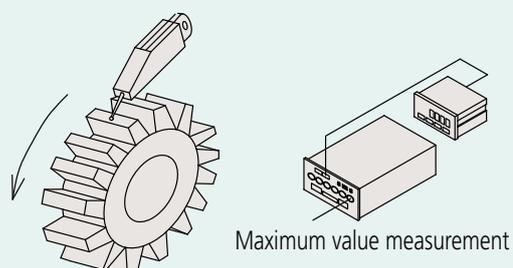
## Measuring the thickness of rolled sheet

The thickness of a rolled sheet material is measured with lever head **No. 519-521** and Mu-checker counter **EV-16A**.



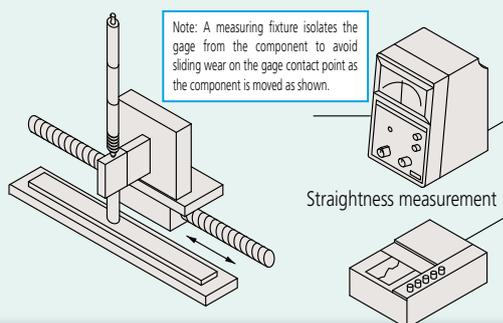
## Measuring the maximum runout of a gear

The maximum runout of a gear is measured with lever head **No. 519-521** and Mu-checker counter **EV-16A**.



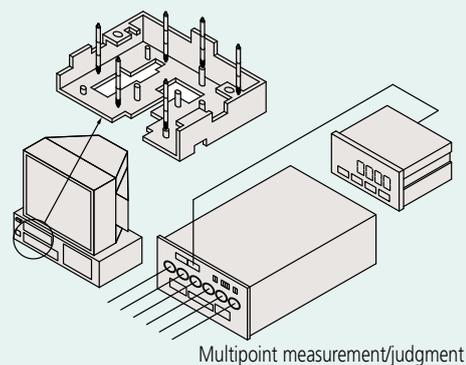
## Measuring straightness of sheet metal

The straightness of a component is measured with cartridge head **No. 519-385** and Mu-checker **No. 519-551**. The result of each measurement is also plotted out to an external recorder connected to the Mu-checker.



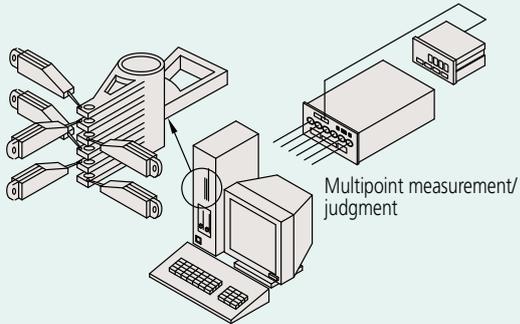
## Multipoint measurement on a VTR chassis

A VTR chassis is measured at multiple points with cartridge head **No. 519-385** and Mu-checker counter **EV-16A**.



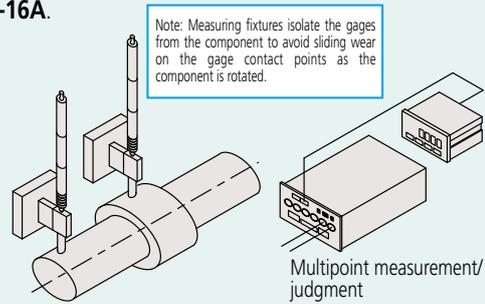
### Measuring the pitch of HDD head components

The pitch of HDD detector head components is measured with lever head **No. 519-521** and Mu-checker counter **EV-16A**.



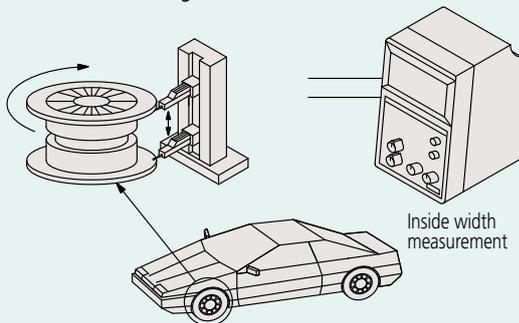
### Measuring the concentricity of a shaft

The concentricity and runout of a shaft are measured with cartridge head **No. 519-385** and Mu-checker counter **EV-16A**.



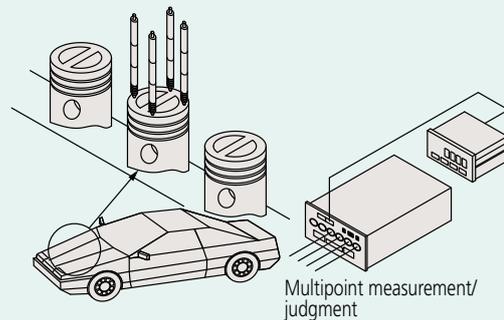
### Measuring the inside width of a wheel

The inside width of a car wheel is measured with lever head **No. 519-521** and digital Mu-checker **No. 519-561**.



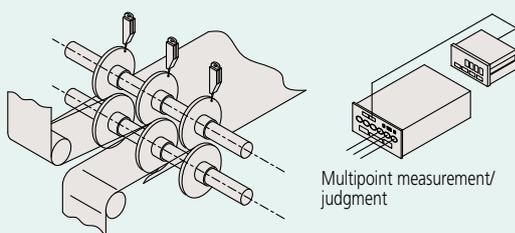
### Measuring the height of a piston head

The height of a piston head is measured with cartridge head **No. 519-385** and Mu-checker counter **EV-16A**.



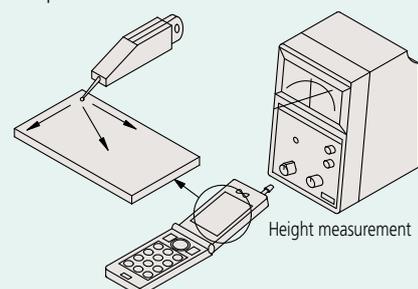
### Measuring the pitch and runout of slitter blades

The pitch and runout of slitter blades are measured with lever head **No. 519-521** and Mu-checker counter **EV-16A**.



### Measuring the warp on an LCD panel

The warp of an LCD panel is measured with lever head **No. 519-522** and Mu-checker **No. 519-551**. This lever head with a low measuring force allows measurement without scratching the a workpiece.



# Mu-Checker System Diagram



Lever Head  
No. 519-327  
±0.5mm P8



Lever Head  
No. 519-521  
±0.5mm P8



Lever Head  
No. 519-522  
±0.5mm P8



Lever Head  
No. 519-326  
±0.5mm P8



Cartridge Head  
No. 519-331  
±0.5mm P10



Cartridge Head  
No. 519-346  
±0.25mm P10



Cartridge Head  
No. 519-347  
±0.5mm P10



Cartridge Head  
No. 519-385  
±1.5mm P10



Cartridge Head  
No. 519-341  
±2.5mm P10



Cartridge Head  
No. 519-348  
±1.0mm P10



Standard type  
Mu-Checker  
No. 519-551 P14



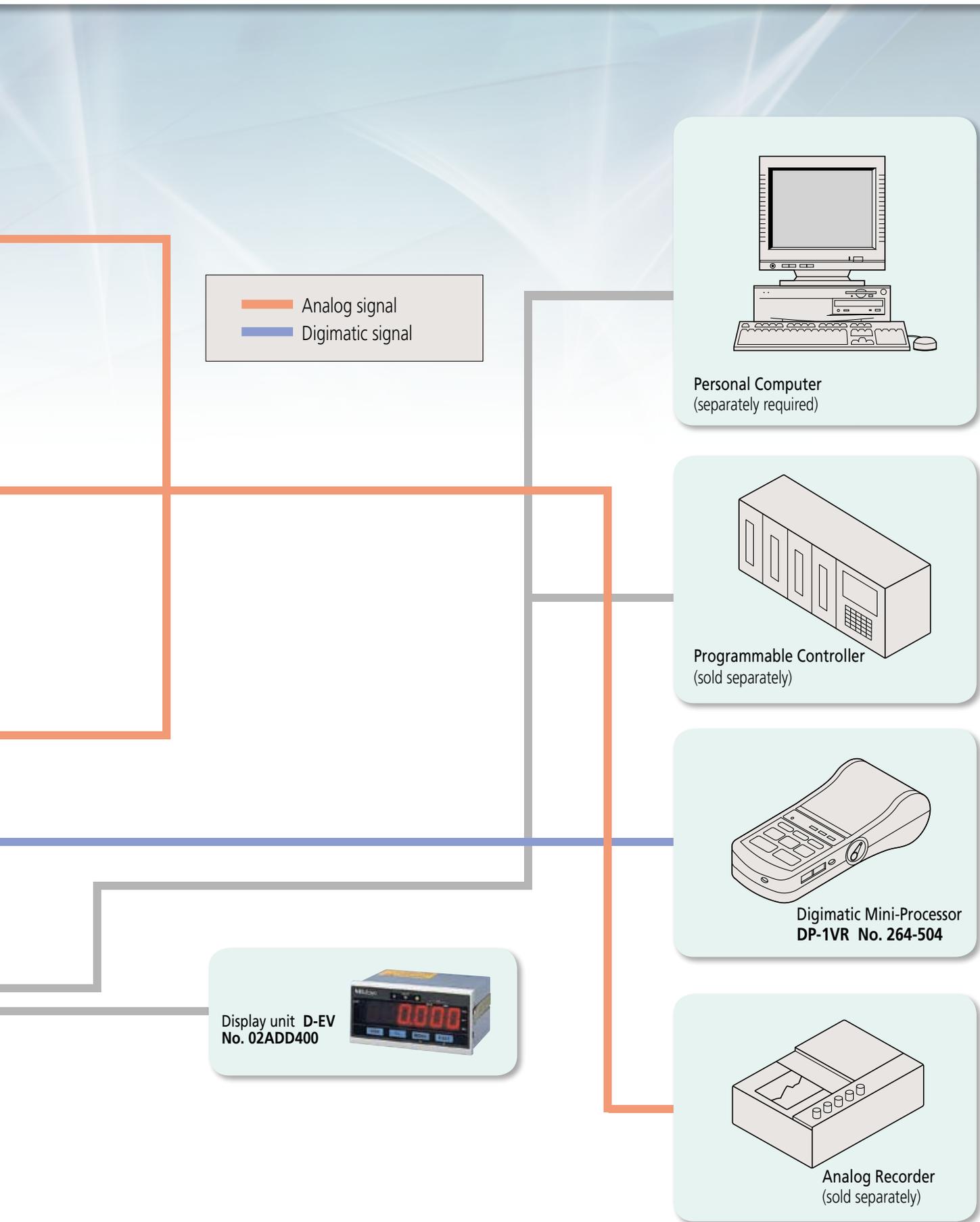
Differential type  
Mu-Checker  
No. 519-553 P14



Digital differential type  
Mu-Checker  
No. 519-561  
(with Digimatic output) P15



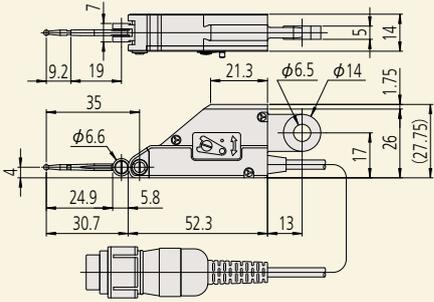
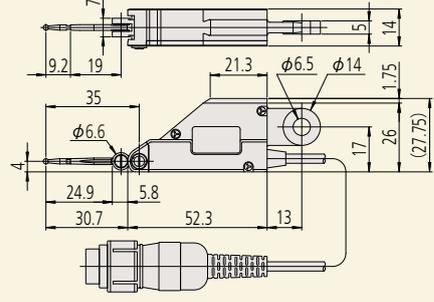
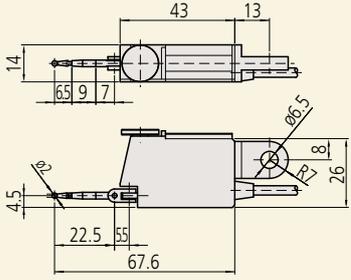
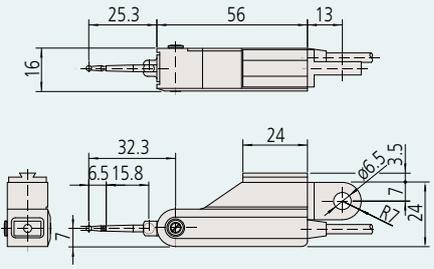
Mu-Checker Counter  
EV-16A  
No. 519-355 P16



# Probes

**Lever Head Type** This type allows multipoint measurement of small parts, flatness and straightness measurement on an XY table, etc. and runout measurement of shafts.

## Specifications

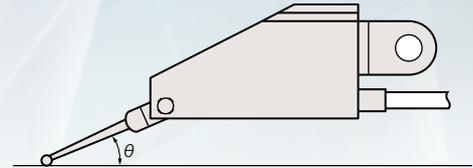
Order No.		External dimensions [mm]	Measuring range [mm]	Stylus stroke [mm]
No. 519-521				
No. 519-522			±0.5	±0.6
No. 519-326				
No. 519-327			±0.5	±0.65

Measuring force	Linearity [%]	Bearing unit structure	Remarks/ Interchangeable stylus
Approx. 0.2N	±0.3	Pivot bearing type	Measuring direction changed with the forward reverse lever <b>No. 520940</b> (ø1) <b>No. 520939</b> (ø2) <b>No. 520938</b> (ø3)
Approx. 0.02N		Pivot bearing type	Low measuring force <b>No. 520940</b> (ø1) <b>No. 520939</b> (ø2) <b>No. 520938</b> (ø3)
Approx. 0.15N		Parallel leaf spring type	The measuring force is adjustable with the upper dial. No need for displayed value correction when stylus makes an angle with surface <b>No. 102824</b> (ø1) <b>No. 102832</b> (ø2) <b>No. 102826</b> (ø3) Note: Only the ø2 stylus tip is a standard accessory.
Approx. 0.15N	±0.5	Pivot bearing type	No need for change of measuring direction due to no-clutch type <b>No. 102824</b> (ø1) <b>No. 102832</b> (ø2) <b>No. 102826</b> (ø3) Note: Only the ø2 stylus tip is a standard accessory.

### Note on stylus angle

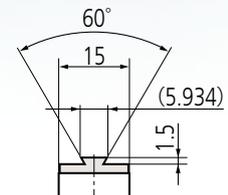
If the stylus of a pivot bearing type probe (No. 519-521, No. 519-522, or No. 519-327) makes an angle with a workpiece surface, as in the figure, calibration should be performed for accurate measurement. Alternatively, the displayed value may be corrected by multiplying it by the appropriate correction factor as given in the table.

Angle $\theta$	Correction factor
0°	1.00
10°	0.98
20°	0.94
30°	0.87
40°	0.77
50°	0.64
60°	0.50



Display value x Correction factor = Corrected value

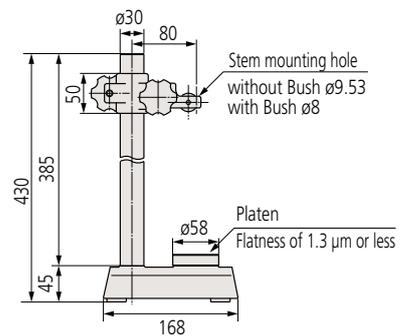
### Dimensions of Dovetail Plate on probe body



### Transfer Stand



No. 519-109-10  
(with a serrated platen)



### Major Specifications

Order No.	Effective transfer range [mm]	Fine adjustment range [mm]	Mounting hole [mm]
<b>519-109-10</b>	0-320	1	ø9.53, ø8 with Bush

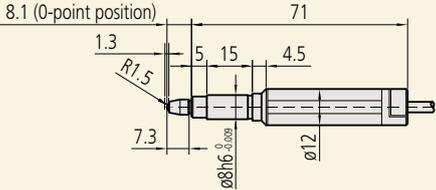
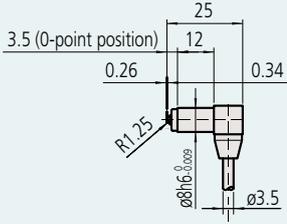
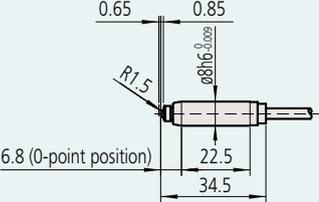
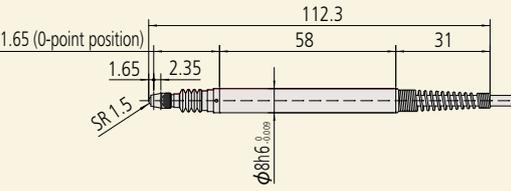
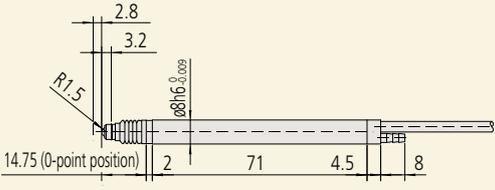
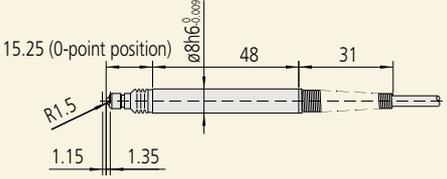
### Lever Head Mounting Brackets (Option)

<b>Stem</b>  <b>No. 902802</b>  <b>No. 902803</b>  <b>No. 902804</b>  <b>No. 902805</b>	<b>Clamp</b>  <b>No. 902053</b>  <b>No. 900320</b>	 <b>No. 902053</b>
<b>Holder</b>  <b>No. 900209</b>  <b>No. 900211</b>		

## Cartridge Head Type

A cartridge head type is easily built-in to the equipment due to its slim and compact shape. This type of sensor is optimal for an automatic measuring machine.

### Specifications

Order No.		External dimensions [mm]	Measuring range [mm]
No. 519-331			±0.5
No. 519-346			±0.25
No. 519-347			±0.5
No. 519-385			±1.5
No. 519-341			±2.5
No. 519-348			±1.0

### Common Specifications

Connection method \_\_\_\_\_ Half-bridge type  
 Exciting voltage \_\_\_\_\_ 3.0VRMS  
 Exciting frequency \_\_\_\_\_ 5kHz  
 Exciting waveform \_\_\_\_\_ Sinusoidal

Cord length \_\_\_\_\_ 2m  
 Cord thickness \_\_\_\_\_ ø4mm  
 Connector type \_\_\_\_\_ Mas-5100 (DIN5P)

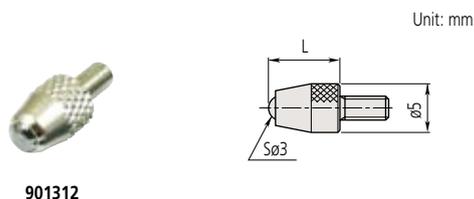
	Maximum stylus stroke [mm]	Measuring force	Linearity [%] *	Dust-proof rubber boot	Bearing unit structure	Remarks/Interchangeable stylus	
	±0.65	0.25N	±0.5	No	Plain type	Low measuring force	Accepts interchangeable styli for dial indicators M2.5x5
	+0.34 -0.26	0.7N	±0.3	No	Linear ball bearing type	Compact type Suitable for inside-diameter measurement	Dedicated stylus used Non-interchangeable
	+0.85 -0.65	0.7N	±0.3	Yes	Linear ball bearing type	Compact type	
	+2.35 -1.65	0.7N	±0.3	Yes	Linear ball bearing type	Standard type with cable strain-relief	Accepts interchangeable styli for dial indicators M2.5x5
	+3.2 -2.8	0.9N	±0.5	Yes	Linear ball bearing type	Standard type	
	+1.35 -1.15	0.7N	±0.3	Yes	Linear ball bearing type	Standard type with cable strain-relief	

\* Indicates a value with respect to that at full scale.

## Styli/Extension Rods (interchangeable styli for dial indicators are usable)

- All threaded portions are M2.5x0.45 x 5mm.
- Carbide styli are resistance to abrasion.
- When exchanging a stylus, firmly tighten the screw so it will not loosen during use.  
(Recommended tightening torque: 5N·cm)

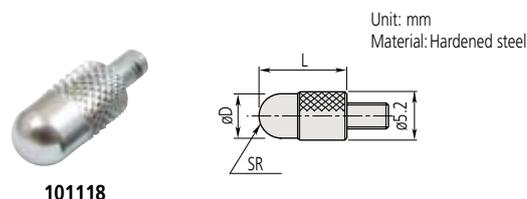
### ■ Ball point



901312

### ■ Shell type point

Provided with a large spherical point. This stylus is convenient for plane measurement.



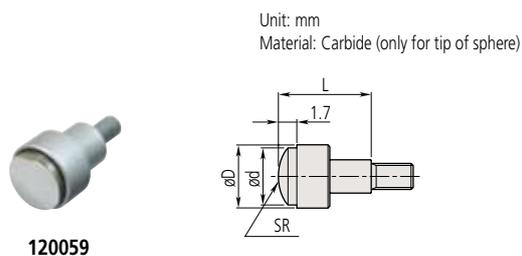
101118

Note: Please consult Mitutoyo for a request with a shell type point with  $\phi D$  of 1 or more (SR of 0.5 or more) specification.

L	Ball material		
	Carbide	Ruby	Nylon
7.3	Order No. <b>901312</b>	Order No. <b>120047</b>	Order No. <b>901994</b>
14	Order No. <b>21JAA225</b>	—	—
15	Order No. <b>120049</b>	Order No. <b>120051</b>	—
17	Order No. <b>21JAA224</b>	—	—
20	Order No. <b>137391</b>	Order No. <b>137392</b>	—
22	Order No. <b>21JAA226</b>	—	—
25	Order No. <b>120053</b>	Order No. <b>120055</b>	—
30	Order No. <b>21AAA252</b>	Order No. <b>21AAA253</b>	—

Order No.	$\phi D$	SR	L
<b>101386</b>	5	2.5	5
<b>101118</b>			10
<b>137393</b>			15
<b>101387</b>			20
<b>101388</b>			25
<b>21AAA254</b>			30

### ■ Spherical point (Carbide)

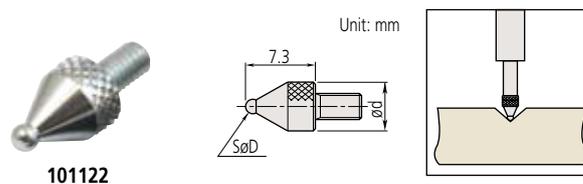


120059

Order No.	$\phi D$	$\phi d$	SR	L
<b>120058</b>	5.2	4.3	5	5
<b>120059</b>	7.5	6.5	7	10
<b>120060</b>	10.5	9.5	10	10

### ■ Ball point

Convenient for measuring an indentation.



101122

Order No.	SφD	$\phi d$
<b>21AAA349</b>	1	5
<b>21AAA350</b>	1.5	
<b>101122</b>	1.8	
<b>21AAA351</b>	2.5	
<b>21AAA352</b>	4	

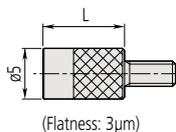
\* Please consult Mitutoyo for a request with a tip ball of  $\phi 0.5$  to 10 specification.

### Flat point

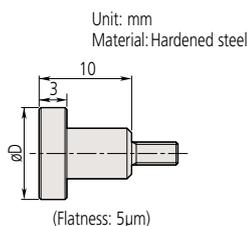
Convenient for measuring a workpiece with a spherical measuring surface.



131365



101117



Order No.	L
13165	8
21AAA340	10

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

Note: A flat point diameter (øD) of up to 50 is available by special order.

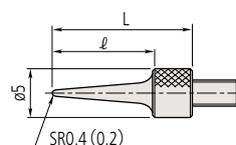
Note: If a probe using the flat point stylus requires squareness to the stem and parallelism with the reference plane, these must be adjusted including the cartridge head before use. Please consult Mitutoyo for special orders.

### Needle point

Convenient for measuring the bottom face of a groove or hole.



101121



Unit: mm  
Material: Hardened steel

No.101121  
Dimension in ( ) only applies to 137413.

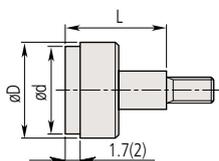
Note: A needle point with SR of 0.2 and ℓ of up to 20 is available by special order.

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

### Flat point (Carbide)



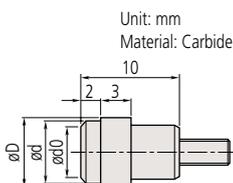
120043



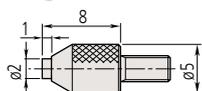
Note: Dimension in ( ) only applies to 120042



137255



120056



No.120056 (Flatness: 3µm)

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

d <sub>0</sub>	ø3	ø4.5
d	ø6.4	ø8
D	ø7	ø9
Order No.	137255	137399

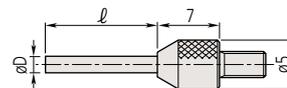
(Flatness: 3µm)

### Needle point (Carbide)

Unit: mm  
Material: Carbide  
Flatness: 3µm



137257



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	13	18	20	28	40
ø0.45	Order No.				
ø1	Order No.		21AAA333		21AAA334
ø1.5	Order No. 120064		21AAA337		21AAA338
ø2	Order No.	21AAA257		21AAA258	21AAA339

Note: Consult Mitutoyo for the specifications of products with øD of more than 0.45/ℓ of up to 5 and øD of more than 1/ℓ of up to 40.

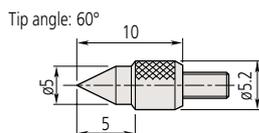
## ■ Conical point

Used for positioning a measuring point accurately. The stylus is not suitable for measuring a soft workpiece since its tip easily scratches the workpiece.

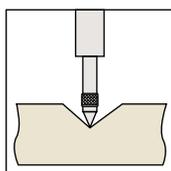
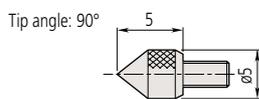
Unit: mm  
Material: Hardened steel



101120



101385



\* A tip angle of 20° or more are available by special order.

## ■ Conical point (Carbide)

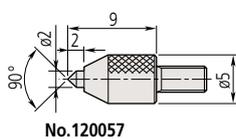


120057

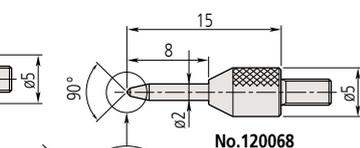


120068

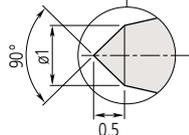
Unit: mm  
Material: Carbide



No. 120057



No. 120068



\* A tip angle of 30° or more are available by special order.

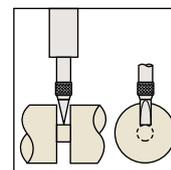
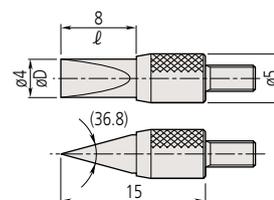
## ■ Knife-edge point (Carbide)

Convenient for measuring a narrow groove diameter.

Unit: mm  
Material: Carbide



120067



Note: A knife edge point with  $\phi D$  of 0.5 or more,  $l$  of 5 to 40, and angle of 20° or more is available by special order.

Note: If a probe using the knife-edge point stylus requires squareness to the stem, parallelism with the reference plane, these must be adjusted including the cartridge head before use. Please consult Mitutoyo for special orders.

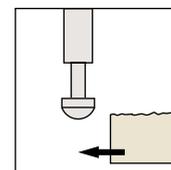
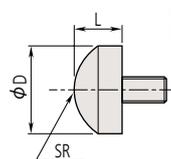
## ■ Spherical point

Convenient for sliding a workpiece under the point from the side since it has a large spherical face.



101119

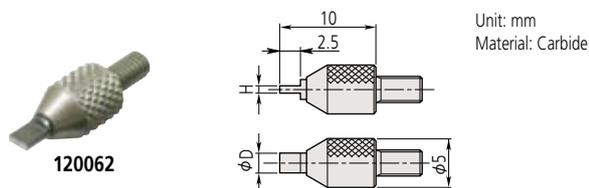
Unit: mm  
Material: Hardened steel



Order No.	$\phi D$	SR	L
111460	5.5	5	3
125258	7.9	5	5
101119	10	7	5

### Blade point (Carbide)

Convenient for measuring a cylindrical workpiece.



Unit: mm  
Material: Carbide

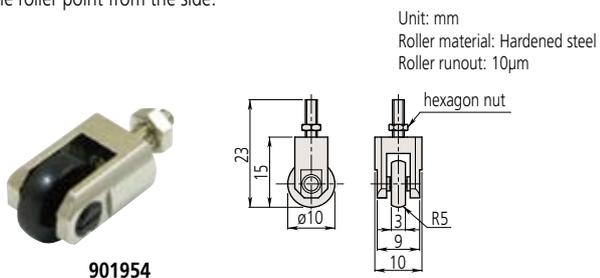
Note: A blade point with H of 0.4 or more and D of  $\phi 0.5$  or more is available by special order.

L	D	D		
		0.4	0.6	1
$\phi 2$	Order No.	<b>120061</b>	<b>120062</b>	-
$\phi 4$	Order No.	-	-	<b>120063</b>

Note: If a probe using the blade point stylus requires squareness to the stem and parallelism with the reference plane, these must be adjusted including the cartridge head before use. Please consult Mitutoyo for special orders.

### Roller point

Convenient for measuring a moving workpiece such as rolled strip. The stylus is also convenient for sliding a workpiece under the roller point from the side.



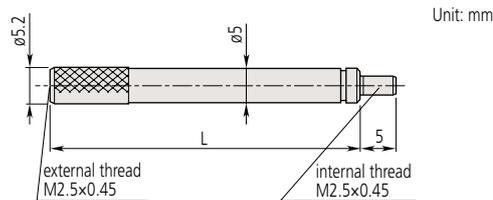
Unit: mm  
Roller material: Hardened steel  
Roller runout: 10 $\mu$ m

Note: Please consult Mitutoyo for a request with a desired roller diameter.  
Note: A high-accuracy type stylus with a roller runout of 5 $\mu$ m is also available. (special order)

### Extension Rod



303613



Unit: mm

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

# Mu-checkers

- Zero-setting can be performed with a single touch of a button. A Mu-checker can be combined with peripheral devices because zero-setting is enabled with an external signal input.

## Analog Type

- Easy to read, highly responsive



Standard type analog Mu-Checker  
(for general measurement)  
**No. 519-551**

Differential type analog Mu-Checker  
(for step and sheet thickness measurement)  
**No. 519-553**

### Common Specifications

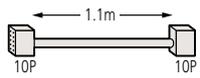
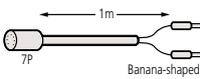
Indication accuracy	±1%/± full scale
Analog output accuracy	±0.1%± within full scale (excluding the probe)
Analog output	±1V/± full scale
Meter indication response	Approx. 0.3s
Zero-setting enabled zone	1/3 scale or less (CMP mode)
Zero point thermal coefficient	100ppm/°C or less
Sensitivity thermal coefficient	100ppm/°C or less
Power consumption	5VA or less
Operating temperature range (°C)	0 to 40
Storage temperature range (°C)	-10 to 50
Power supply	100, 120, 220, 240VAC
External dimensions (mm)	134 (W) × 210 (H) × 183 (D)
Measuring range (μm)	±1500, 500, 150, 50, 15, 5
Minimum reading (μm)	50, 10, 5, 1, 0.5, 0.1

### Individual Specifications

Order No.	519-551	519-553
Calculation mode	±A ±B ±A±B	Yes — Yes
Tolerance judgment	—	—
Tolerance judgment output	—	—
Tolerance judgment output mode	—	—
Number of connectable probes	1	2
Mass	1.7kg	1.8kg

Note: 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, F for SAA, K for KC, C and No suffix are required for PSE.

### • Special Options

	Description/Illustration	Analog type	Digital type	EV-16A
Digimatic mini processor <b>No. 264-504</b>	<b>DP-1VR</b>		○	
DP-1VR connecting cable <b>No. 936937</b>			○	
Analog output cord A <b>No. 934795</b>		○	○	
External output connector <b>No. 529035</b>	Analog, limit output (7P)	○	○	
Extension cord A <b>No. 934386</b>	Extension cord (5m) to enable probe and indicator to be separated	○	○	○

Note: Items marked with ○ are optional accessories.

## Digital Type

- Easy-to-read, digital readout
- A measurement data output function is standard, allowing connection to various processors.

Differential type digital Mu-Checker  
(for step and sheet thickness measurement)  
No. 519-561



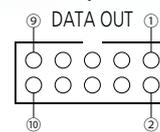
## Specifications

Order No.	519-561
Readout range (mm)	High: $\pm 2.000$ Low: $\pm 0.2000$
Resolution (mm)	On High range: 0.001 On Low range: 0.0001
Calculation mode	$\pm A$ , $\pm B$ , $\pm A \pm B$
Measurement mode	ABS/CMP
Zero-setting enabled zone LL: 1/3 scale or less, H: Full scale	60
Indication accuracy	3 LSD*1
Operating temperature range (°C)	0 to 40
Storage temperature range (°C)	-10 to 50
Analog output	$\pm 1V/\pm FS$
Analog output accuracy	$\pm 0.1\%$ or less
Digital output	Digimatic code format
Digital output mode	1 ch
Power consumption	5VA or less
External dimensions (mm)	134 (W) $\times$ 183 (H) $\times$ 210 (D)
Power supply	100, 120, 220, 240VAC Depends on the AC adapter used.

Note: 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, F for SAA, K for KC, C and No suffix are required for PSE.

\*1 Not including quantizing error of  $\pm 1$  LSD

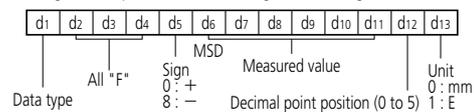
## • Digital Output Connector



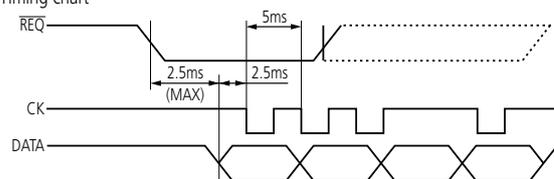
PIN No.	Signal
1	GND
2	DATA
3	CK
4	NC
5	REQ
6	NC

### (1) Digimatic code format

A data string for each measurement consists of 13 digits (d1 to d13), assigning 4 bits to 1 digit. data strings are output as 1 set according to the timing.

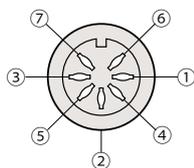


### (2) Timing chart



## Analog Output Connector Pin Assignment and Interface

### Analog output connector



Pin No.	Signal name
①	+NG output
②	HOLD input (tolerance judgment result hold)
③	Analog output $\pm 1V$
④	0V (logic GND)
⑤	0V (analog GND)
⑥	-NG output
⑦	ZERO SET

### Applicable plug: No. 529035 (Option)

Signal name	Mu-checker I/O interface	Driving circuit and recommended load	Timing
Analog output		 300K $\Omega$ or more	
ZEROSSET	 25C1815Y	 For a relay For a transistor	 230ms MAX Zero-setting is enabled within 230ms.
HOLD	 CMOS		 1 $\mu$ s or less
$\pm$ NG output		 +V +V +V +V Relay 30mA $\sim$ 50mA MAX+V 35V MAX	

## ● Mu-Checker Counter EV-16A



### Features

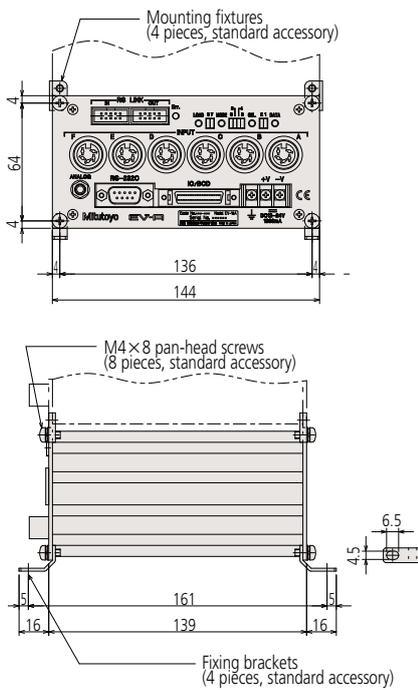
- The EV-16A allows 6 probes to be connected into one unit simultaneously. The use of the RS link enables easy construction of a multi-point measuring system that allows a maximum of 10 units (60 probes).
- I/O outputs such as RS-232C, BCD, tolerance judgment and segment are selectable.
- Peak measurement and arithmetic operation between axes (in the same unit) are also possible in addition to normal measurement for each axis.

### Major Functions

- External control (zero-setting, presetting, etc.)
- Direction switching
- Error messaging
- Tolerance judgment output
- Various data output (RS-232C, BCD, segment)
- Peak measurement (maximum value, minimum value, runout) and arithmetic operation (addition, average, maximum value, minimum value, maximum width) between axes

### External dimensions

Unit: mm



### Specifications

Order No.	519-355	
Model No.	EV-16A	
Number of input probes	6 axes	
Quantizing error	±1 LSD	
Resolution [mm] ( ): Max. counting range	0.001 (±2.000mm), 0.0001 (±0.200mm)	
LED display	Parameter display: 8 digits (setting display), error message: 1 digit	
Error message	Power supply voltage error, probe malfunction, etc.	
External display	Dedicated external display unit: D-EV (special option) connectable	
Number of input switches	4	
Input switch function	Measurement mode selection, parameter setting	
Input/Output	Tolerance judgment output	1 to 6 axes (L1, L2, L3), open collector
	BCD output	BCD parallel output (positive-true logic/negative logic, open collector)
	Segment output	Function to turn output ON only for the terminal corresponding to the count value, open collector
	Control output	Normal operation signal (Normal), open collector
	Control input	Output channel designation (upon segment output or in the BCD mode), presetting, peak clear, range selection (upon segment output), count value hold, open-collector or no-voltage contact signal (contact/noncontact)
Interface	RS-232C	Measured data output and control input, compatible with EIA RS-232C Home position DTE (terminal definition): Use a crossover cable.
	RS link	Maximum number of connectable units: 10
		Connecting cable length: Up to 10m (total length of all linked cables) Data transmission time: 1.1 sec/60CH (at a baud rate of 19200bps)
Rating	Power supply voltage	Terminal board (M3 screws), +12 to 24VDC
	Consumption current	1A
Operating temperature (humidity) range	0 to 40°C (20 to 80%RH, non condensing)	
Storage temperature (humidity) range	-10 to 50°C (20 to 80%RH, non condensing)	
External dimensions	144 (W) × 72 (H) × 139 (D) mm	
Mass	Approx. 1000g	
Standard accessories	Fixing bracket (4), mounting fixture (4), mounting screw M4×8 (8)	
Optional accessories (custom-ordered)	I/O output connector (No. 02ADB440) D-EV external unit (No. 02ADD400) RS-link connecting cable 0.5m (No. 02ADD950) RS-link connecting cable 1m (No. 936937) RS-link connecting cable 2m (No. 965014) Calibration meter (No. 519-030)	
Applicable probes	Lever head, cartridge head	

\*1. To calibrate the EV-16A properly, be sure to purchase dedicated display unit D-EV. When multiple units of EV-16A units are to be used, at least one D-EV unit is required.

\*2. As a power supply is not supplied as standard, an appropriate power supply with a current capacity of 1A or more must be provided for each EV-16A.

## Display unit for the EV counter

### Display Unit D-EV

- This display unit allows an EV-16A to be set up without using a PC.
- **D-EV** can display each axis measurement value, go/no go judgment results, setting data, go/no go judgment bars of all axes and error messages.

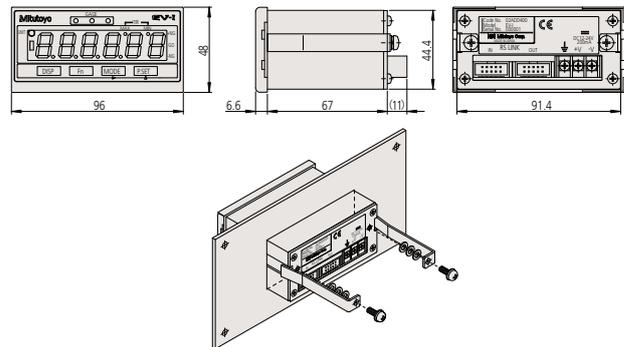


### Specifications

Connecting condition	Allows external display and setting control of one EV-16A unit.
Number of displayed digits	Sign + 6 digits (EV16-A processes 8-digit data internally)
LED display	Channel display (shared with judgment result display): 3 digits (3 color LEDs) Measurement mode (current value, maximum value, minimum value, runout) display: 2 digits Status display: 1 digit (2 colors)
Operation switch	4
Operation switch function	Channel selection, measurement mode selection (current value, maximum value, minimum value, runout), parameter setting, presetting and tolerance limit setting
Input/output	RS-link connector IN, OUT each 1
Error message	Power supply voltage error, probe malfunction, etc.
Power supply	Terminal board (M3 screws), + 12 to 24VDC, 200mA
Operating temperature (humidity) range	0 to 40°C (20 to 80%RH, non condensing)
Storage temperature (humidity) range	-10 to 50°C (20 to 80%RH, non condensing)
External dimensions	96 (W) x 48 (H) x 84.6 (D) mm
Option	RS-link connecting cable 0.5m: No. 02ADD950 *1 RS-link connecting cable 1m: No. 936937 *1 RS-link connecting cable 2m: No. 965014 *1 Terminal board connecting cable: No. 02ADD930 *2 AC adapter: No. 02ADN460/AC cord: No. 02ZAA000

### External dimensions

Unit: mm



\*1: Required for connecting with an EV-16A.

\*2: Connected to the terminal board when using the AC adapter.

### I/O connector

**No. 02ADB440** (with cover)  
Receptacle to fit the I/O output plug of the **EV-16A**



### RS-link connecting cable

Order No.	Cable length
<b>02ADD950</b>	0.5m
<b>936937</b>	1m
<b>965014</b>	2m

This cable is used to connect the EH/EV counters and the RS unit.

### Terminal board connecting cable

**No. 02ADD930**

### AC adapter

**No. 02ADN460**

### AC cord

**No. 02ZAA000**

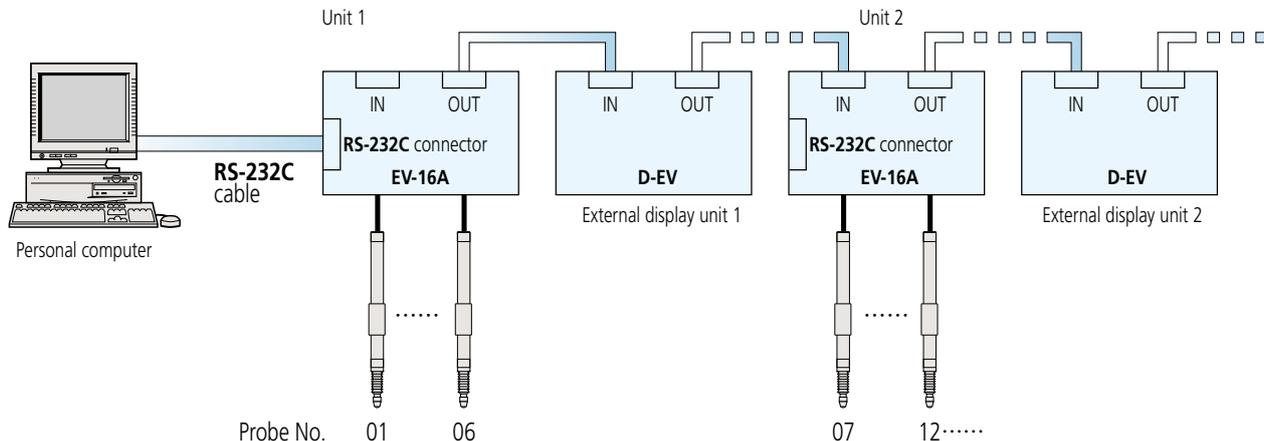


This AC adapter is used to connect to the power supply terminal of the **EV-16A** and display unit **D-EV**. This terminal board connecting cable is used to supply power to the **EV-16A** and display unit **D-EV**.



## RS Link Function

This function allows up to 10 **EV-16A** units to connect with each other, thus enabling multipoint measurement of up to 60 channels. The dedicated RS-link connecting cable **No. 02ADD950** (0.5m), **No. 936937** (1m) or **No. 965014** (2m) is used for connection. (The total length of RS-link connecting cables is limited to a maximum of 10m over the entire system.)



## RS-232C Communication Function

This function enables remote operation of measurement data entry and various settings such as zero-setting for the **EV-16A**.

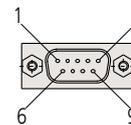
Command format	Corresponding output	Operation details
GA * * CRLF	G# * *, +01234.567CRLF	Output of [display value] via RS-232C
CN * * CRLF	CH * * CRLF	Switching display to [current value]
CX * * CRLF	CH * * CRLF	Switching display to [maximum value]
CM * * CRLF	CH * * CRLF	Switching display to [minimum value]
CW * * CRLF	CH * * CRLF	Switching display to [TIR (runout)]
CR * * CRLF	CH * * CRLF	Zero-setting
CL * * CRLF	CH * * CRLF	Clear of peak value
CP * *, +01234567CRLF	CH * * CRLF	Input of preset value and execution of presetting
CD * *, +01234567CRLF	CH * * CRLF	Input of lower tolerance limit
CG * *, +01234567CRLF	CH * * CRLF	Input of upper tolerance limit
CS * * CRLF	CH * * CRLF	Cancel of error
CK * * CRLF	CH * *, \$CRLF (\$=0 or 1)	Verification of HOLD status
CT ¥ ¥ CRLF	CH ¥ ¥, +01234.567CRLF	Output of [calculation value] via RS-232C

- Note 1: " \* \* " indicates a probe channel number between 01 and 60 (all channels for 00).  
 Note 2: "#" indicates a type of data [N: current value, X: maximum value, M: minimum value, W: TIR (runout)].  
 Note 3: CRLF means carriage return (CR) and line feed (LF).  
 Note 4: Input presetting and tolerance setting values with a sign and 8-digit numerical value without placing a decimal point.  
 Note 5: Set a tolerance limit in order of command CD and CG.  
 Note 6: Upon data request of a calculation value, all channels cannot be specified.  
 Note 7: The RS communication function is temporarily stopped during key operation (for setting of a parameter, preset value or tolerance limit) and then executes command and data output when the count enabled status is restored.  
 Note 8: Execute cancellation of the count standby status with CS00CRLF (all-channel designation).

## RS-232C Specifications

(1) Suitable plug: D-sub 9-pin (female), inch screw

(2) Pin assignment



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

Pin No.	Signal name	IN/OUT	Description (use)
2	RXD	IN	Receive data
3	TXD	OUT	Transmit 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.	—	No connection

(3) Communication specification (compatible with EIA RS-232C)

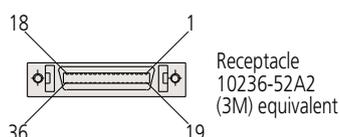
Home position	DTE (terminal definition), A crossover cable must be used.
Communication method	Half-duplex, nonprocedural
Baud rate	4800, 9600, 19200bps
	Start bit: 1
	Data bit: 7 & 8, ASCII, upper case
Bit configuration	Parity bit: none, even number, odd number
	Stop bit: 2
Communication condition setting	Setting with a parameter

# I/O Specifications

## I/O connector terminal specifications

(1) Suitable plug: **No.02ADB440** (with cover) optional accessory

(2) Pin assignment



### Suitable plug (Commercial items)

- 10136-3000VE (3M: cover)
- 10336-52A0-008 (3M: cover)
- DX40M-36P (Hirose: plug)
- DX30M-36-CV (Hirose: cover)

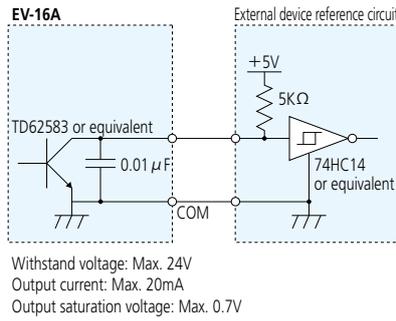
## Each output function

Select one of the outputs from tolerance judgment, segment output, or BCD data output that suits your needs.

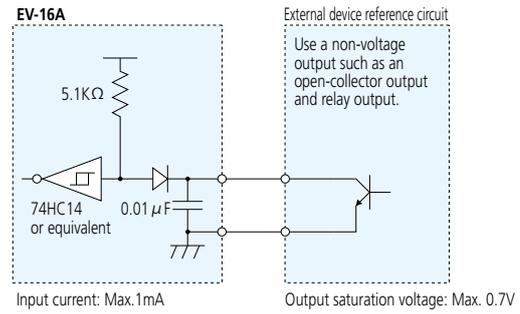
Pin No.	Tolerance output			Segment output			BCD output		
	Name	Functional description	IN/OUT	Name	Functional description	IN/OUT	Name	Functional description	IN/OUT
1	COM	Common terminal of I/O circuit (connected to internal GND)	—	COM	Common terminal of I/O circuit (connected to internal GND)	—	COM	Common terminal of I/O circuit (connected to internal GND)	—
2	COM		—	COM		—	COM		
3	CEL1_-NG	Tolerance judgment output terminal (1CH)	OUT	-OVER	To be output if the measured value exceeds the measurement range.	OUT	1×10 <sup>0</sup>	BCD output data	OUT
4	CEL1_GO		OUT	-L10		Segment output data 21 pins numbered from -L10 to +L10 are used for this segment output.	OUT		2×10 <sup>0</sup>
5	CEL1_+NG	OUT	-L9	OUT	4×10 <sup>0</sup>		OUT		
6	CEL1_NOM	"L" if counting is permitted.	OUT	-L8	OUT		8×10 <sup>0</sup>		OUT
7	CEL2_-NG	Tolerance judgment output terminal (2CH)	OUT	-L7	OUT		1×10 <sup>1</sup>		OUT
8	CEL2_GO		OUT	-L6	OUT		2×10 <sup>1</sup>		OUT
9	CEL2_+NG	OUT	-L5	OUT	4×10 <sup>1</sup>		OUT		
10	CEL2_-NOM	"L" if counting is permitted.	OUT	-L4	OUT		8×10 <sup>1</sup>		OUT
11	CEL3_-NG	Tolerance judgment output terminal (3CH)	OUT	-L3	OUT		1×10 <sup>2</sup>		OUT
12	CEL3_GO		OUT	-L2	OUT		2×10 <sup>2</sup>		OUT
13	CEL3_+NG	OUT	-L1	OUT	4×10 <sup>2</sup>		OUT		
14	CEL3_NOM	"L" if counting is permitted.	OUT	L0	OUT		8×10 <sup>2</sup>		OUT
15	CEL4_-NG	Tolerance judgment output terminal (4CH)	OUT	+L1	OUT		1×10 <sup>3</sup>		OUT
16	CEL4_GO		OUT	+L2	OUT		2×10 <sup>3</sup>		OUT
17	CEL4_+NG	OUT	+L3	OUT	4×10 <sup>3</sup>		OUT		
18	CEL4_NOM	"L" if counting is permitted.	OUT	+L4	OUT		8×10 <sup>3</sup>		OUT
19	CEL5_-NG	Tolerance judgment output terminal (5CH)	OUT	+L5	OUT		1×10 <sup>4</sup>		OUT
20	CEL5_GO		OUT	+L6	OUT		2×10 <sup>4</sup>		OUT
21	CEL5_+NG	OUT	+L7	OUT	4×10 <sup>4</sup>		OUT		
22	CEL5_NOM	"L" if counting is permitted.	OUT	+L8	OUT		8×10 <sup>4</sup>		OUT
23	CEL6_-NG	Tolerance judgment output terminal (6CH)	OUT	+L9	OUT		1×10 <sup>5</sup>		OUT
24	CEL6_GO		OUT	+L10	OUT		2×10 <sup>5</sup>	OUT	
25	CEL6_+NG	OUT	+OVER	To be output if the measured value exceeds the measurement range.	OUT	4×10 <sup>5</sup>	OUT		
26	CEL6_NOM	"L" if counting is permitted.	OUT	NOM (ANG)	"L" if counting is permitted.	OUT	8×10 <sup>5</sup>	OUT	
27	EXTEND	L:Execution of an RS-232C command is being performed.	OUT	EXTEND	L:Execution of an RS-232C command is being performed.	OUT	SIGN	Sign of count value ("H" for "+" and "L" for "-")	OUT
28	READY	Signal for data confirmation	OUT	READY	Signal for data confirmation	OUT	READY	Signal for data confirmation	OUT
29	START	Signal for head CEL identification	OUT	START	Signal for head CEL identification	OUT	START	Signal for head CEL identification	OUT
30	NORMAL	Normal signal	OUT	NORMAL	Normal signal	OUT	NORMAL	Normal signal	OUT
31	P.SET	Preset	IN	P.SET	Preset	IN	P.SET	Preset	IN
32	OUTCEL	Sets the output CEL	IN	OUTCEL	Sets the output CEL	IN	OUTCEL	Sets the output CEL	IN
33	SET1	Specifies CEL or range data of segment	IN	SET1	Specifies CEL or range data of segment	IN	SET1	Specifies CEL or range data of segment	IN
34	SET2		IN	SET2		IN	SET2		
35	SET3		IN	SET3		IN	SET3		
36	HOLD	The display value is held during input. The error is cleared at the rise of this signal.	IN	HOLD	The display value is held during input. The error is cleared at the rise of this signal.	IN	HOLD	The display value is held during input. The error is cleared at the rise of this signal.	IN

### (3) I/O circuitry

(1) Output circuitry: Output of tolerance judgment, NOM (nominal), segment, etc.  
The transistor turns "ON" at input 'low'. (Open Collector output).



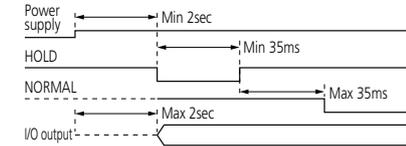
(2) Input circuitry: Input of P.SET, HOLD, SET, etc.  
An input is effective at 'low'.



### (4) Timing chart

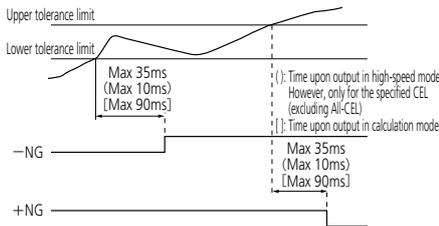
(1) Power-ON characteristic

In the RS LINK connection mode, the time when the **EV-16A** is initially turned on becomes the reference.



(2) Tolerance judgment result output time

Each CEL output is not concurrent.

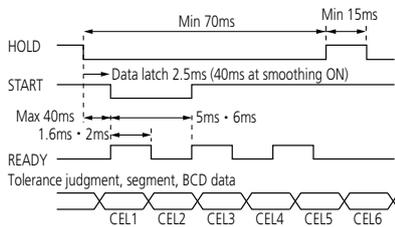


(3) Data output

Data output is provided with two methods, command mode and interval mode which can be set with each I/O output mode parameter.

1) Command mode (All-CEL output)

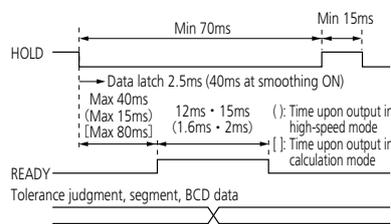
This mode allows data output of All-CEL (specified with SET1 to SET3) under the concurrent control of HOLD and READY.



Note: UNIT LED (on D-EV) blinks during HOLD input.

2) Command mode (Discrete CEL output)

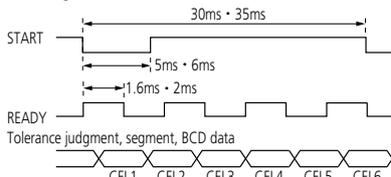
This mode allows data output of discrete CEL (specified with one of SET1 to SET3) under the concurrent control of HOLD and READY.



Note: If using the high-speed mode or all-CEL output, use a device with an input response time of 1ms or less.

3) Interval mode (All-CEL output)

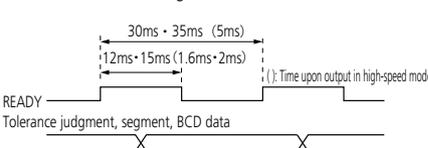
This mode allows continuous data output of All-CEL (specified with SET1 to SET3) at the internal timing of the **EV-16A**.



Note: If using the high-speed mode or all-CEL output, use a device with an input response time of 1ms or less.

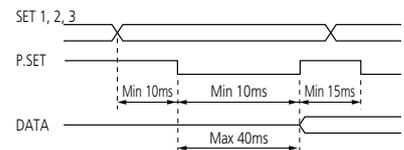
4) Interval mode (Discrete CEL output)

This mode allows continuous data output of discrete CEL (specified with one of SET1 to SET3) at the internal timing of the **EV-16A**.



### (4) External presetting

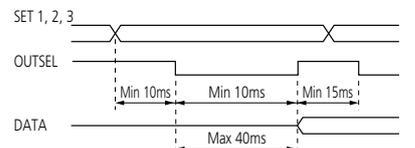
Assume that the current value of a CEL specified from among SET1 to SET3 is equal to a preset value.



When presetting is executed, the peak value is cleared. (Max. = Min. = Current value, TIR = 0)

### (5) Output CEL designation/calculation method selection

Designate a CEL specified from among SET1 to SET3 as a data output CEL.



Input of SET1 from SET3 at the time of segment output SET1 to SET3 normally operate as range specification data. (This data operates as designation of an output CEL upon input of OUTCEL.)

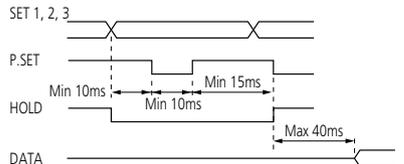
Data operation differs depending on the setting from among I/O function selection parameters.

- NORMAL, high-speed mode: Output CEL designation
- Calculation mode: Calculation method selection

### (6) Peak clear

This function clears a peak value.

(Max. = Min. = Current value, TIR = 0)

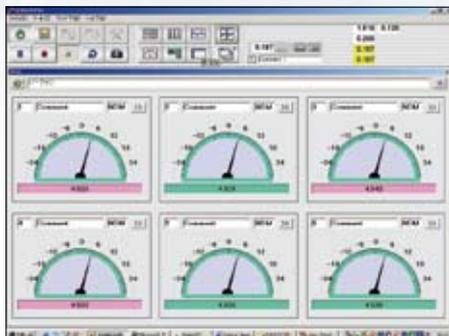


Note: Peak clear is executed only in the Peak mode. (Presetting is executed when the current value is selected.)

# SENSORPAK (Data Import Software for EV Counter)



Measurement screen



Meter screen

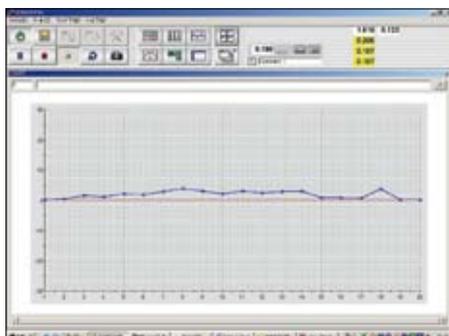
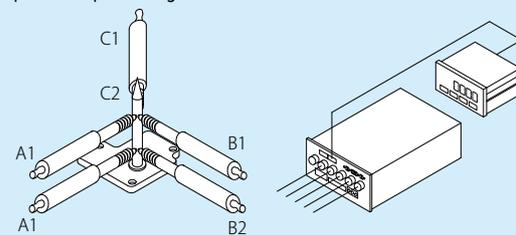


Chart screen

- This software imports measurement data from a 6-channel input type EV-16A to a PC.
- Measurement points can be processed up to 60 channels.
- Arithmetic operation and maximum width calculation from measurement data are also enabled.
- Measurement data can be transferred to MS-Excel.
- Analog display with aids such as bar-graph meters can be displayed in real time.

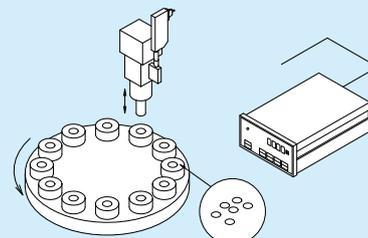
## Real-time Display of Measurement Data

A vertical pin is measured from 3 directions to determine the reference position and pin inclination. A real-time display of measured data also allows installation of a part while positioning it.



## Monitoring the Feedback State of Measurement Data

The feedback state of press working data can be monitored. This allows verification of time series data.



## SPECIFICATIONS

Order No.	02NGB072 (Software only)	02NGB073 (Software plus I/O cable)
Display function	Display type: Counter, bar graph, meter, chart (capable of simultaneous display) Tolerance judgment result: Color display (green/red) Connectable gages: max. 60 gages	
Calculation functions	Calculation items: Sum, difference, total, average, maximum, minimum, range (maximum–minimum), calculation with a constant Connectable gages: Max. 30 calculation functions (between two gages)	
Total tolerance judgment	Go/no go judgment (by specifying gages to be used for total tolerance judgment) Go/no go signal output with optional I/O cable	
Input function	Trigger function: by means of key, timer or external TRG (with optional I/O cable) Data input frequency: Max. 9999 times (with 60 gages connected) to 60000 times (with 6 gages connected)	
Output function	Direct output to EXCEL spreadsheet, CSV file output (compatible with MeasurLink)	
Connectable items	Various Mitutoyo counters (those compatible with RS Link)	
System Environments	Recommendation: PC/AT compatible machine, CPU: Clock 2GHz or more, Memory: 2GB or more Disk: 2GB or more OS: Windows 7/8.1 (32bit/64bit)	

Currently supported languages: English, German, French, Spanish  
User's manual: English

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

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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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