# Scale Units and Linear Scales

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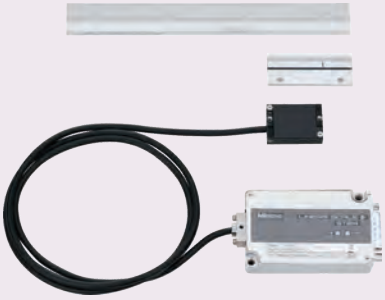

## 2D Image Correlation Encoder
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Mitutoyo

# Horizontal ABSOLUTE Scale Coolant Proof IP67

## Series 572 - Horizontal

You can use this scale unit in adverse environments with water and cutting oil due to it new detection method (electromagnetic induction).

- Specially designed output cables are developed to maintain the water resistant structure.
- You will have no overspeed error since the ABSOLUTE scale does not depend on counting scale graduations.
- Once an absolute zero (origin) point is set, the Digimatic Scale Unit shows the absolute distance from this point when it is powered on, rather than „0.00“.

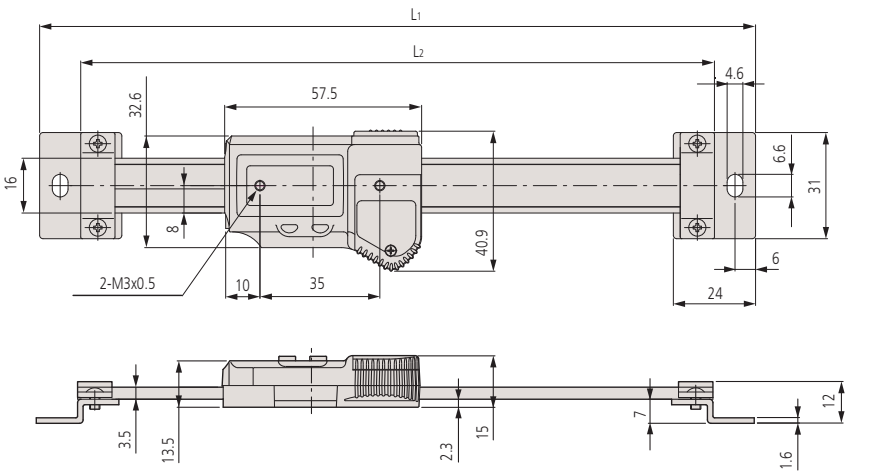
572-601

Metric

| No. | Range | Accuracy | L1 [mm] | L2 [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|
| **572-600** | 0-100 mm | 0,03 mm | 209 | 185 | 390 | **252.00** |
| **572-601** | 0-150 mm | 0,03 mm | 259 | 235 | 410 | **268.00** |
| **572-602** | 0-200 mm | 0,03 mm | 311 | 287 | 430 | **318.00** |

Also available! Inch/Metric Models

mm




| Functions | Series 572 - Horizontal |
|---|---|
| ORIGIN (ABS-Zero) | ● |
| Auto Power OFF after 20 min. non use | ● |
| Low voltage alarm | ● |
| Data output | ● |

### Specifications

| | |
|---|---|
| Accuracy | Refer to the list of specifications (excluding quantizing error) |
| Repeatability | 0.01 mm |
| Max. response speed | Unlimited |
| Digital step | 0,01 mm |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **05CZA624** | Digimatic cable with data switch (1 m) | 70.50 |
| **05CZA625** | Digimatic cable with data switch (2 m) | 79.50 |
| **02AZD790A** | Connecting cable U-Wave with data switch | 95.00 |
| **06ADV380A** | USB Input Tool Direct cable (2 m) | 115.00 |

### Consumable spares

| No. | Description | Price € |
|---|---|---|
| **938882** | Battery SR44 | 5.50 |

# Horizontal ABSOLUTE Scale Standard

| Functions | Series 572 |
|---|---|
| ON/OFF | ● |
| Low voltage alarm | ● |
| Data output | ● |
| Zero set | ● |
| ORIGIN | ● |

### Specifications

| | |
|---|---|
| Accuracy | Refer to the list of specifications (excluding quantizing error) |
| Max. response speed | Unlimited |
| Digital step | 0,01 mm |
| Delivered | One battery |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| 905338 | Digimatic cable (1 m) | 28.00 |
| 905409 | Digimatic cable (2 m) | 34.00 |
| 905689 | Digimatic cable (1 m) | 30.00 |
| 905690 | Digimatic cable (2m) | 36.00 |
| 905691 | Digimatic cable (1m) | 30.00 |
| 905692 | Digimatic cable (2m) | 36.00 |
| 905693 | Digimatic cable (1m) | 30.00 |
| 905694 | Digimatic cable (2 m) | 36.00 |
| 959143 | Data-hold unit | 25.00 |
| 959149 | Digimatic cable with data switch (1 m) | 38.00 |
| 959150 | Digimatic cable with data switch (2 m) | 43.50 |
| 02AZD790C | U-WAVE Data Cable with data switch | 90.00 |
| 06ADV380C | USB Input tool Direct cable with data switch (2 m) | 100.00 |

### Consumable spares

| No. | Description | Price € |
|---|---|---|
| 938882 | Battery SR44 | 5.50 |

## Series 572

ABSOLUTE®

This unit has an ABSOLUTE capacitive-type scale.

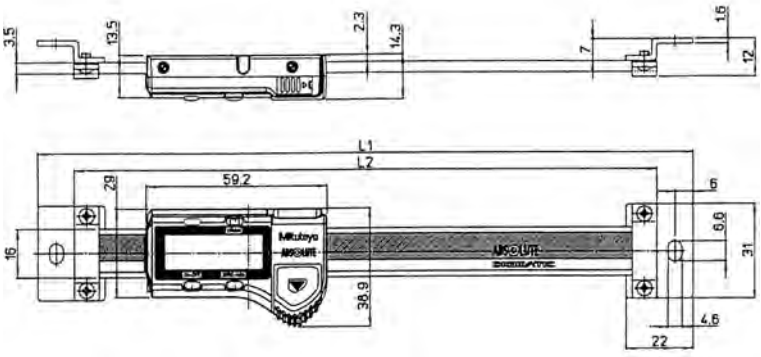
- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- You can make the highest precision measurements even at the highest drive speed.
- The display has large characters, making it easy to read.

572-202-20

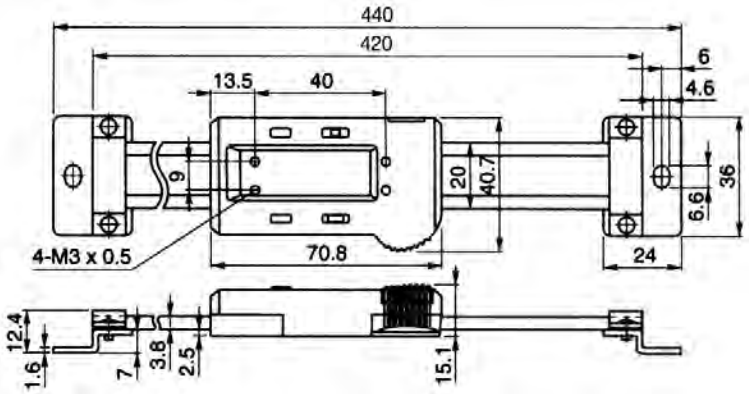
Metric

| No. | Range | Accuracy | L1 [mm] | L2 [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|
| 572-200-20 | 0-100 mm | 0,03 mm | 209 | 185 | 230 | **221.00** |
| 572-201-20 | 0-150 mm | 0,03 mm | 259 | 235 | 250 | **232.00** |
| 572-202-20 | 0-200 mm | 0,03 mm | 311 | 287 | 270 | **268.00** |
| 572-203-10 | 0-300 mm | 0,04 mm | 444 | 420 | 370 | **464.00** |

Also available! Inch/Metric Models




100-200 mm




300 mm

# Horizontal ABSOLUTE Scale Measurement Direction Switching

## Series 572

ABSOLUTE®

This unit has an ABSOLUTE capacitive-type scale.
It offers you the following benefits:

- The ZERO point is set only once and is stored as the ABSOLUTE ZERO point until the next battery replacement.
- You can make the highest precision measurements even at the highest drive speed.
- The display has large characters, making it easy to read.

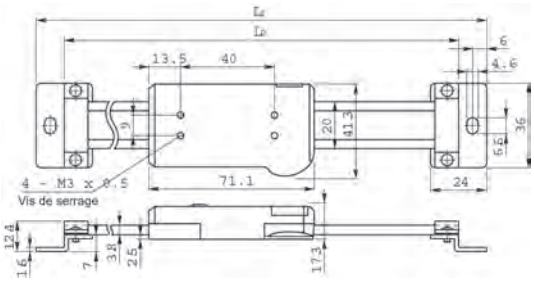

572-461

Metric

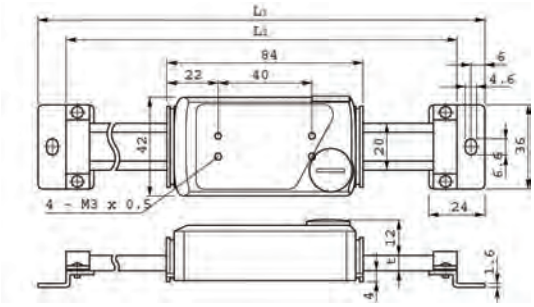
Without diameter function, with reversible counting direction

| No. | Range | Accuracy | L1 [mm] | L2 [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|
| **572-460** | 0-100 mm | 0,03 mm | 244 | 220 | 250 | **407.00** |
| **572-461** | 0-150 mm | 0,03 mm | 294 | 270 | 280 | **474.00** |
| **572-462** | 0-200 mm | 0,03 mm | 344 | 320 | 310 | **525.00** |
| **572-463** | 0-300 mm | 0,04 mm | 444 | 420 | 370 | **597.00** |
| **572-464** | 0-450 mm | 0,04 mm | 594 | 570 | 760 | **675.00** |
| **572-465** | 0-600 mm | 0,05 mm | 774 | 750 | 900 | **783.00** |
| **572-466** | 0-800 mm | 0,06 mm | 974 | 950 | 1710 | **1,303.00** |
| **572-467** | 0-1000 mm | 0,07 mm | 1174 | 1150 | 2040 | **1,463.00** |

Also available! Inch/Metric Models




100-300 mm




450-1000 mm

| Functions | Series 572 |
|---|---|
| ON/OFF | ● |
| DATA/HOLD | ● |
| Low voltage alarm | ● |
| Data output | ● |
| Zero set | ● |
| ORIGIN | ● |
| PRESET | ● |
| Counting direction switchable | ● |

### Specifications

| | |
|---|---|
| Accuracy | Refer to the list of specifications (excluding quantizing error) |
| Max. response speed | Unlimited |
| Digital step | 0,01 mm |
| Delivered | One battery |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **905338** | Digimatic cable (1 m) | 28.00 |
| **905409** | Digimatic cable (2 m) | 34.00 |
| **905689** | Digimatic cable (1 m) | 30.00 |
| **905690** | Digimatic cable (2m) | 36.00 |
| **905691** | Digimatic cable (1m) | 30.00 |
| **905692** | Digimatic cable (2m) | 36.00 |
| **905693** | Digimatic cable (1m) | 30.00 |
| **905694** | Digimatic cable (2 m) | 36.00 |
| **06ADV380C** | USB Input tool Direct cable with data switch (2 m) | 100.00 |
| **02AZD790C** | U-WAVE Data Cable with data switch | 90.00 |

### Consumable spares

| No. | Description | Price € |
|---|---|---|
| **938882** | Battery SR44 | 5.50 |

# Horizontal ABSOLUTE Scale Diameter Function

| Functions | Series 572 |
|---|---|
| ON/OFF | ● |
| DATA/HOLD | ● |
| Low voltage alarm | ● |
| Data output | ● |
| Zero set | ● |
| PRESET | ● |
| Diameter function | ● |
| ORIGIN | ● |

### Specifications

| | |
|---|---|
| Accuracy | Refer to the list of specifications (excluding quantizing error) |
| Digital step | 0,01 mm |
| Max response speed | Unlimited |
| Delivered | One battery |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **905338** | Digimatic cable (1 m) | 28.00 |
| **905409** | Digimatic cable (2 m) | 34.00 |
| **905689** | Digimatic cable (1 m) | 30.00 |
| **905690** | Digimatic cable (2m) | 36.00 |
| **905691** | Digimatic cable (1m) | 30.00 |
| **905692** | Digimatic cable (2m) | 36.00 |
| **905693** | Digimatic cable (1m) | 30.00 |
| **905694** | Digimatic cable (2 m) | 36.00 |
| **06ADV380C** | USB Input tool Direct cable with data switch (2 m) | 100.00 |
| **02AZD790C** | U-WAVE Data Cable with data switch | 90.00 |

### Consumable spares

| No. | Description | Price € |
|---|---|---|
| **938882** | Battery SR44 | 5.50 |

## Series 572

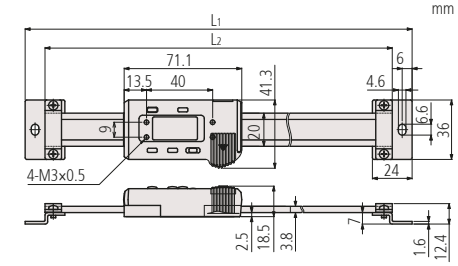
ABSOLUTE®

- The ZERO point is set only once and is stored as the ABSOLUTE ZERO point until the next battery replacement
- You can make the highest precision measurements even at the highest drive speed.

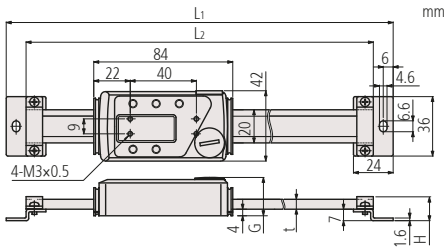
**572-483-10**

Metric — Horizontal multi-function type with diameter displaying function

| No. | Range | Accuracy | L1 [mm] | L2 [mm] | t [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|---|
| **572-480-10** | 0-100 mm | 0,03 mm | 244 | 220 | | 250 | **407.00** |
| **572-481-10** | 0-150 mm | 0,03 mm | 294 | 270 | | 280 | **474.00** |
| **572-482-10** | 0-200 mm | 0,03 mm | 344 | 320 | | 310 | **525.00** |
| **572-483-10** | 0-300 mm | 0,04 mm | 444 | 420 | | 370 | **597.00** |
| **572-484-10** | 0-450 mm | 0,04 mm | 594 | 570 | 6 | 760 | **675.00** |
| **572-485-10** | 0-600 mm | 0,05 mm | 774 | 750 | 6 | 900 | **783.00** |
| **572-486-10** | 0-800 mm | 0,06 mm | 974 | 950 | 10 | 1710 | **1,303.00** |
| **572-487-10** | 0-1000 mm | 0,07 mm | 1174 | 1150 | 10 | 2040 | **1,463.00** |




**100-300 mm**




**450-1000 mm**





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# Vertical ABSOLUTE Scale Standard

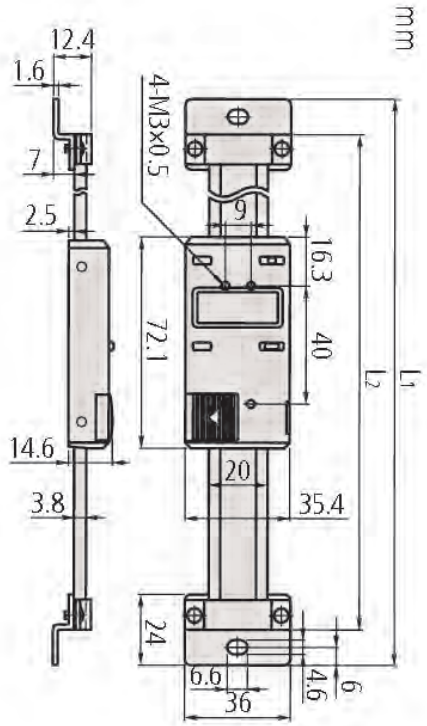
## Series 572

ABSOLUTE®

This unit has an ABSOLUTE capacitive-type scale.
It offers you the following benefits:

- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- You can make the highest precision measurements even at the highest drive speed.
- The display has large characters, making it easy to read.

572-302-10




Metric

| No. | Range | Accuracy | L1 [mm] | L2 [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|
| **572-300-10** | 0-100 mm | 0,03 mm | 244 | 220 | 250 | **278.00** |
| **572-301-10** | 0-150 mm | 0,03 mm | 294 | 270 | 280 | **288.00** |
| **572-302-10** | 0-200 mm | 0,03 mm | 344 | 320 | 310 | **299.00** |
| **572-303-10** | 0-300 mm | 0,04 mm | 444 | 420 | 370 | **479.00** |

Also available! Inch/Metric Models

| Functions | Series 572 |
|---|---|
| ON/OFF | ● |
| Low voltage alarm | ● |
| Data output | ● |
| Zero set | ● |
| PRESET | ● |
| Counting direction switchable | ● |
| ORIGIN | ● |

### Specifications

| | |
|---|---|
| Accuracy | Refer to the list of specifications. (excluding quantizing error) |
| Max. response speed | Unlimited |
| Digital step | 0,01 mm |
| Delivered | One battery |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **959143** | Data-hold unit | 25.00 |
| **905338** | Digimatic cable (1 m) | 28.00 |
| **905409** | Digimatic cable (2 m) | 34.00 |
| **959149** | Digimatic cable with data switch (1 m) | 38.00 |
| **959150** | Digimatic cable with data switch (2 m) | 43.50 |
| **905689** | Digimatic cable (1 m) | 30.00 |
| **905690** | Digimatic cable (2m) | 36.00 |
| **905691** | Digimatic cable (1m) | 30.00 |
| **905692** | Digimatic cable (2m) | 36.00 |
| **905693** | Digimatic cable (1m) | 30.00 |
| **905694** | Digimatic cable (2 m) | 36.00 |
| **06ADV380C** | USB Input tool Direct cable with data switch (2 m) | 100.00 |
| **02AZD790C** | U-WAVE Data Cable with data switch | 90.00 |

### Consumable spares

| No. | Description | Price € |
|---|---|---|
| **938882** | Battery SR44 | 5.50 |

# Vertical ABSOLUTE Scale Measurement Direction Switching

| Functions | Series 572 |
|---|---|
| ORIGIN (ABS-Zero) | ● |
| ON/OFF | ● |
| DATA/HOLD | ● |
| Data output | ● |
| Zero set | ● |
| PRESET | ● |
| Counting direction switchable | ● |

### Specifications

| | |
|---|---|
| Accuracy | Refer to the list of specifications (excluding quantizing error) |
| Max. response speed | Unlimited |
| Digital step | 0,01 mm |
| Delivered | One battery |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| 905338 | Digimatic cable (1 m) | 28.00 |
| 905409 | Digimatic cable (2 m) | 34.00 |
| 905689 | Digimatic cable (1 m) | 30.00 |
| 905690 | Digimatic cable (2m) | 36.00 |
| 905691 | Digimatic cable (1m) | 30.00 |
| 905692 | Digimatic cable (2m) | 36.00 |
| 905693 | Digimatic cable (1m) | 30.00 |
| 905694 | Digimatic cable (2 m) | 36.00 |
| 06ADV380C | USB Input tool Direct cable with data switch (2 m) | 100.00 |
| 02AZD790C | U-WAVE Data Cable with data switch | 90.00 |

### Consumable spares

| No. | Description | Price € |
|---|---|---|
| 938882 | Battery SR44 | 5.50 |

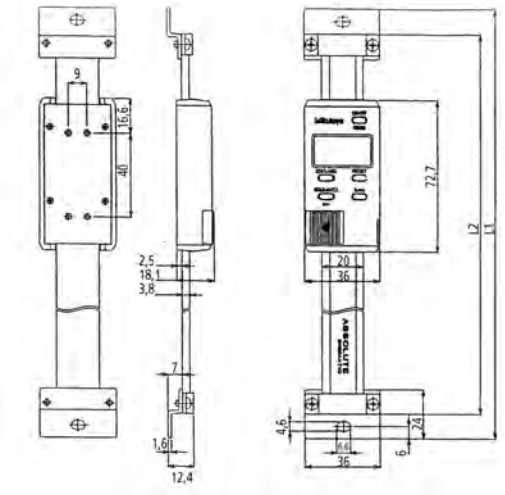
## Series 572

ABSOLUTE®

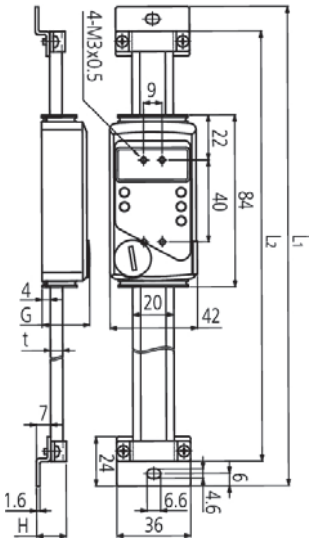
This unit has an ABSOLUTE capacitive-type scale.
It offers you the following benefits:

- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- The display has large characters, making it easy to read.
- Measurement direction switching function is included.

572-560



100-300 mm




450-1000 mm

Metric

| No. | Range | Accuracy | L1 [mm] | L2 [mm] | G [mm] | t [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|---|---|
| 572-560 | 0-100 mm | 0,03 mm | 244 | 220 | | | 250 | **407.00** |
| 572-561 | 0-150 mm | 0,03 mm | 294 | 270 | | | 280 | **474.00** |
| 572-562 | 0-200 mm | 0,03 mm | 344 | 320 | | | 310 | **525.00** |
| 572-563 | 0-300 mm | 0,04 mm | 444 | 420 | | | 370 | **597.00** |
| 572-564 | 0-450 mm | 0,04 mm | 594 | 570 | 23.2 | 6 | 760 | **675.00** |
| 572-565 | 0-600 mm | 0,05 mm | 774 | 750 | 23.2 | 6 | 900 | **783.00** |
| 572-566 | 0-800 mm | 0,06 mm | 974 | 950 | 27.2 | 10 | 1710 | **1,303.00** |
| 572-567 | 0-1000 mm | 0,07 mm | 1174 | 1150 | 27.2 | 10 | 2040 | **1,463.00** |



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# Vertical ABSOLUTE Scale Diameter Function

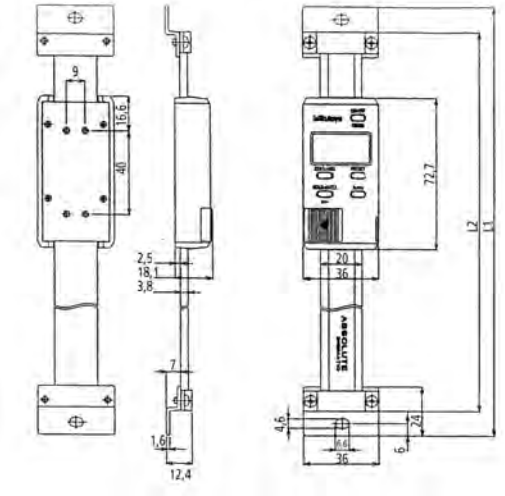
## Series 572

ABSOLUTE®

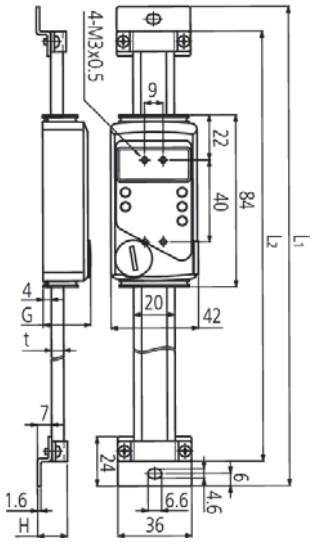
This unit has an ABSOLUTE capacitive-type scale.

- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- The display has large characters, making it easy to read.
- Diameter measurement function is included.

572-580



100-300 mm



450-1000 mm

| Functions | Series 572 |
|---|---|
| ON/OFF | ● |
| DATA/HOLD | ● |
| Low voltage alarm | ● |
| Data output | ● |
| Zero set | ● |
| PRESET | ● |
| Diameter function | ● |
| ORIGIN | ● |

### Specifications

| | |
|---|---|
| Accuracy | Refer to the list of specifications (excluding quantizing error) |
| Digital step | 0,01 mm |
| Max. drive speed | Unlimited |
| Delivered | One battery |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **905338** | Digimatic cable (1 m) | 28.00 |
| **905409** | Digimatic cable (2 m) | 34.00 |
| **905689** | Digimatic cable (1 m) | 30.00 |
| **905690** | Digimatic cable (2m) | 36.00 |
| **905691** | Digimatic cable (1m) | 30.00 |
| **905692** | Digimatic cable (2m) | 36.00 |
| **905693** | Digimatic cable (1m) | 30.00 |
| **905694** | Digimatic cable (2 m) | 36.00 |
| **06ADV380C** | USB Input tool Direct cable with data switch (2 m) | 100.00 |
| **02AZD790C** | U-WAVE Data Cable with data switch | 90.00 |

### Consumable spares

| No. | Description | Price € |
|---|---|---|
| **938882** | Battery SR44 | 5.50 |

Metric

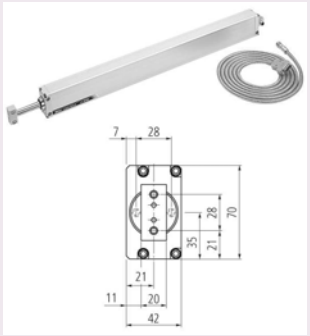
| No. | Range | Accuracy | L1 [mm] | L2 [mm] | G [mm] | H [mm] | t [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|
| **572-580-10** | 0-100 mm | 0,03 mm | 244 | 220 | | | | 250 | **407.00** |
| **572-581-10** | 0-150 mm | 0,03 mm | 294 | 270 | | | | 280 | **474.00** |
| **572-582-10** | 0-200 mm | 0,03 mm | 344 | 320 | | | | 310 | **525.00** |
| **572-583-10** | 0-300 mm | 0,04 mm | 444 | 420 | | | | 370 | **597.00** |
| **572-584-10** | 0-450 mm | 0,04 mm | 594 | 570 | 23.2 | 14.6 | 6 | 760 | **675.00** |
| **572-585-10** | 0-600 mm | 0,05 mm | 774 | 750 | 23.2 | 14.6 | 6 | 900 | **783.00** |
| **572-586-10** | 0-800 mm | 0,06 mm | 974 | 950 | 27.2 | 18.6 | 10 | 1710 | **1,303.00** |
| **572-587-10** | 0-1000 mm | 0,07 mm | 1174 | 1150 | 27.2 | 18.6 | 10 | 2040 | **1,463.00** |

Also available! Inch/Metric Models

# DRO Scale Unit Selection Guide

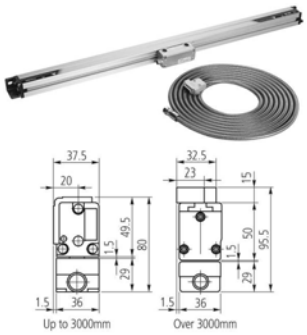

**AT 116**
**Economy and Slim Type**

**AT 112-F**
**Super Slim Type**




**AT 181**
**Plunger Type**


**AT 715**
**Absolute Type**




**AT 103**
**Standard-size Type**


**AT 113**
**Slim Type**

| Model | AT715 | AT103 | AT113, AT116 | AT112-F | AT181 |
|---|---|---|---|---|---|
| Measurement method | Electromagnetic induction system | Photoelectric (transparent linear encoder) | | | |
| Light source | — | LED | | | |
| Receptor | — | Phototransistor | | | Photodiode |
| Output wave form | — | 2-phase sine curves with a phase difference of 90° | | | |
| Effective length (for high accuracy type) | 100 - 3000mm | 100 - 6000mm (100 - 2000mm) | 100 - 1500mm (100 - 1500mm) | 50 - 1020mm (50 - 1020mm) | 100 - 600mm (100 - 600mm) |
| Accuracy* [high accuracy type] * Excluding quantizing error of ±1 count. | ±5μm (Effective length: 100 - 500mm) ±7μm (Effective length: 600 - 1800mm) ±10μm (Effective length: 2000 - 3000mm) | (5+5L/1000)μm*1 [(3+3L/1000)μm] | (5+5L/1000)μm [(3+3L/1000)μm*2] | (5+5L/1000)μm [(3+3L/1000)μm] | (5+5L/1000)μm [(3+3L/1000)μm] |
| Maximum response speed | 50m/min. | 120m/min.*3 | 120m/min. (50m/min.: AT116) | 50m/min. | 50m/min. |
| Scale reference point | Absolute system | At every 50mm interval | | | |
| Linear expansion coefficient | — | (8±1)x10⁻⁶/°C | | | |
| Power supply | 5V±5% DC | 5V±5% DC | | | |
| Max. current consumption | 70mA | 70mA*4 (60mA: AT113, AT116) | | | 70mA |
| Operating temperature | 0°C to 45°C | | | | |
| Storage temperature | -20°C to 70°C | | | | |
| Relative humidity | 20 - 80%RH | | | | |
| Head Cable length | — | — | *6 | 0.3m | — |
| Sliding force | 5N or less | 5N or less | | | 6N or less |
| Single cable*5 | Standard accessory (refer to individual specifications for the length) | | | | |
| Dust/water protection level | IP67 | IP53 | | | IP54 |

*1: (5+8L/1000)μm for models over 3250mm effective length *2: Not available for AT116 *3: 50m/min. for models over 3250mm effective length *4: 140mA for models over 3250mm effective length
*5: Vinyl-coated type (single cable and extension cable are available on request). *6: AT103 0.3m AT116 Without head cable





Mitutoyo

# DRO LINEAR SCALES AT103

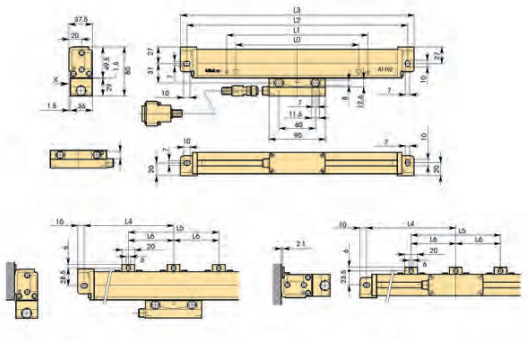
## Series 539 - Incremental sealed Standard type

This linear scale gives you enhanced vibration resistance and durability.
This version of the AT103 offers you the following benefits:

- The innovative rubber lips keep out contaminants when you are using the scale in a machine shop.
- An armoured signal cable is used to connect the scale unit to the DRO counter, so you can operate it safely even in hostile environments.
- The signal cable outlet can be positioned on either side of the slider so you can connect the signal cable from either direction.

539-133

| No. | Cable length [m] | Effective range | $L^1$ [mm] | $L^2$ [mm] | $L^3$ [mm] | $L^4$ [mm] | $L^5$ [mm] | $L^6$ [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|---|
| **539-111-30** | 3 | 100 mm | 120 | 248 | 268 | | | | 1.5 | **366.00** |
| **539-112-30** | 3 | 150 mm | 170 | 298 | 318 | | | | | **376.00** |
| **539-113-30** | 3 | 200 mm | 220 | 348 | 368 | | | | | **386.00** |
| **539-114-30** | 3 | 250 mm | 270 | 398 | 418 | | | | | **397.00** |
| **539-115-30** | 3 | 300 mm | 330 | 458 | 478 | | | | | **412.00** |
| **539-116-30** | 3 | 350 mm | 380 | 508 | 528 | | | | | **422.00** |
| **539-117-30** | 3 | 400 mm | 430 | 558 | 578 | | | | | **433.00** |
| **539-118-30** | 3 | 450 mm | 480 | 608 | 628 | | | | | **448.00** |
| **539-119-30** | 3 | 500 mm | 540 | 668 | 688 | | | | | **458.00** |
| **539-121-30** | 3 | 600 mm | 650 | 778 | 798 | | | | 2.6 | **479.00** |
| **539-123-30** | 3 | 700 mm | 760 | 888 | 908 | | | | 2.8 | **500.00** |
| **539-124-30** | 3 | 750 mm | 810 | 938 | 958 | | | | 2.9 | **525.00** |
| **539-125-30** | 3 | 800 mm | 860 | 988 | 1008 | | | | 3 | **546.00** |
| **539-126-30** | 3 | 900 mm | 960 | 1088 | 1108 | | | | 3.3 | **567.00** |
| **539-127-30** | 5 | 1000 mm | 1060 | 1188 | 1208 | 594 | | | 3.7 | **587.00** |
| **539-128-30** | 5 | 1100 mm | 1160 | 1288 | 1308 | 644 | | | 4 | **608.00** |
| **539-129-30** | 5 | 1200 mm | 1260 | 1388 | 1408 | 694 | | | 4.2 | **628.00** |
| **539-130-30** | 5 | 1300 mm | 1360 | 1488 | 1508 | 744 | | | 4.4 | **659.00** |
| **539-131-30** | 5 | 1400 mm | 1460 | 1588 | 1608 | 794 | | | 4.6 | **680.00** |
| **539-132-30** | 5 | 1500 mm | 1560 | 1688 | 1708 | 844 | | | 4.8 | **700.00** |
| **539-133-30** | 5 | 1600 mm | 1690 | 1818 | 1838 | | 610 | | 5.1 | **1,102.00** |
| **539-134-30** | 5 | 1700 mm | 1790 | 1918 | 1938 | | 650 | | 5.3 | **1,164.00** |
| **539-135-30** | 5 | 1800 mm | 1890 | 2018 | 2038 | | 670 | | 5.5 | **1,236.00** |
| **539-136-30** | 5 | 2000 mm | 2100 | 2228 | 2248 | | 740 | | 6 | **1,318.00** |
| **539-137-30** | 5 | 2200 mm | 2300 | 2428 | 2448 | | 800 | | 6.4 | **1,406.00** |
| **539-138-30** | 7 | 2400 mm | 2500 | 2628 | 2648 | 1314 | 1300 | 650 | 7.1 | **1,499.00** |
| **539-139-30** | 7 | 2500 mm | 2600 | 2728 | 2748 | 1364 | 1340 | 670 | 7.3 | **1,591.00** |
| **539-140-30** | 7 | 2600 mm | 2700 | 2828 | 2848 | 1414 | 1400 | 700 | 7.5 | **1,684.00** |
| **539-141-30** | 7 | 2800 mm | 2900 | 3028 | 3048 | 1514 | 1500 | 750 | 7.9 | **1,772.00** |
| **539-142-30** | 7 | 3000 mm | 3100 | 3228 | 3248 | 1614 | 1600 | 800 | 8.3 | **1,864.00** |



### Specifications

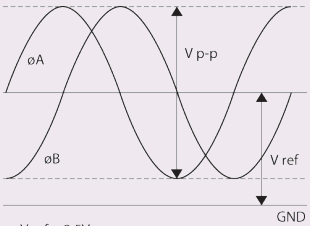
| | |
|---|---|
| Effective range (L0) | 100-3,000 mm |
| Accuracy | (5+5L/1000) µm<br>L = Effective range (mm) |
| Output waveform | Two 90° phase-shifted sinusoidal signals (2Vpp) |
| Max. drive speed | 120 m/min. |
| Signal period | 20 µm |
| Scale reference points | every 50 mm |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP53 |
| Power supply | 5V DC ± 10% |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **09AAA033A** | Extension cable (2 m) | 191.00 |
| **09AAA033B** | Extension cable (5 m) | 263.00 |
| **09AAA033C** | Extension cable (7 m) | 304.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

**Extension cable**

**Legend**
**L0 Effective range**
**L1 Travel range**
**L2 Bore centre distance**
**L3 Total length**
**L4-L6 Support bracket position**




V ref ≒ 2.5V
V p-p = 2V

**Output waveform**

# DRO LINEAR SCALES AT103

## Series 539 - Incremental sealed Standard - Long stroke type

IP53

This linear scale gives you enhanced vibration resistance and durability.
This version of the AT103 offers you the following benefits:

- The innovative rubber lips keep out contaminants when you are using the scale in a machine shop.
- An armoured signal cable is used to connect the scale unit to the DRO counter, so you can operate it safely even in harsh environments.
- The signal cable outlet can be positioned on either side of the slider, so you can connect the signal cable from either direction.

539-133

**Specifications**

| | |
|---|---|
| Effective range (L0) | 3,250-6,000 mm |
| Accuracy | (5+8L/1000) µm<br>L = Effective range (mm) |
| Output waveform | Two 90° phased-shifted sinusoidal signals (2Vpp) |
| Max. drive speed | 50 m/min. |
| Signal period | 20 µm |
| Scale reference points | every 50 mm |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP53 |
| Power supply | 5V DC ± 10% |

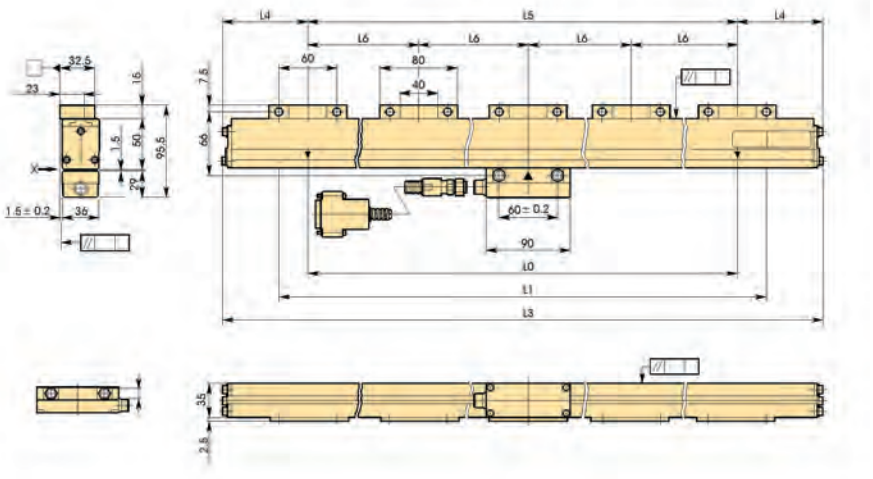
**Optional accessories**

| No. | Description | Price € |
|---|---|---|
| **09AAA033A** | Extension cable (2 m) | 191.00 |
| **09AAA033B** | Extension cable (5 m) | 263.00 |
| **09AAA033C** | Extension cable (7 m) | 304.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

**Extension cable**

| No. | Cable length [m] | Effective range | $L^1$ [mm] | $L^3$ [mm] | $L^4$ [mm] | $L^5$ [mm] | $L^6$ [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|
| **539-143-30** | 10 | 3250 mm | 3350 | 3470 | 135 | 3200 | 800 | 10.8 | **3,420.00** |
| **539-144-30** | 10 | 3500 mm | 3600 | 3720 | 160 | 3400 | 850 | 11.4 | **3,626.00** |
| **539-145-30** | 10 | 3750 mm | 3850 | 3970 | 125 | 3720 | 930 | 12 | **3,832.00** |
| **539-146-30** | 10 | 4000 mm | 4100 | 4220 | 110 | 4000 | 1000 | 12.6 | **4,038.00** |
| **539-147-30** | 10 | 4250 mm | 4350 | 4470 | 135 | 4200 | 1050 | 13.2 | **4,244.00** |
| **539-148-30** | 10 | 4500 mm | 4600 | 4720 | 160 | 4400 | 1100 | 13.8 | **4,450.00** |
| **539-149-30** | 15 | 4750 mm | 4850 | 4970 | 85 | 4800 | 800 | 15.2 | **4,656.00** |
| **539-150-30** | 15 | 5000 mm | 5100 | 5220 | 120 | 4980 | 830 | 15.8 | **4,862.00** |
| **539-151-30** | 15 | 5250 mm | 5350 | 5470 | 125 | 5220 | 870 | 16.4 | **5,068.00** |
| **539-152-30** | 15 | 5500 mm | 5600 | 5720 | 130 | 5460 | 910 | 17 | **5,274.00** |
| **539-153-30** | 15 | 5750 mm | 5850 | 5970 | 135 | 5700 | 950 | 17.6 | **5,480.00** |
| **539-154-30** | 15 | 6000 mm | 6100 | 6220 | 110 | 6000 | 1000 | 18.2 | **5,686.00** |

**Legend**
**L0 Effective range**
**L1 Travel range**
**L2 Bore centre distance**
**L3 Total length**
**L4-L6 Support bracket position**




**Please refer to the DRO leaflet for more details.**





Mitutoyo

# DRO LINEAR SCALES AT103 - High Accuracy

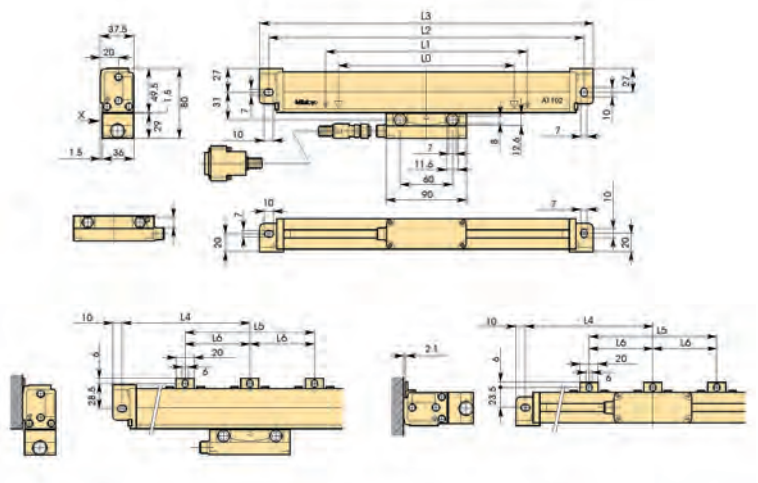
## Series 539 - Incremental sealed Standard type

This linear scale gives you enhanced vibration resistance and durability.
This version of the AT103 offers you the following benefits:

- The innovative rubber lips keep out contaminants when you are using the scale in a machine shop.
- An armoured signal cable is used to connect the scale unit to the DRO counter, so you can operate it safely even in harsh environments.
- The signal cable outlet can be positioned on either side of the slider so you can connect the signal cable from either direction.

539-133

| No. | Cable length [m] | Effective range | $L^1$ [mm] | $L^2$ [mm] | $L^3$ [mm] | $L^4$ [mm] | $L^5$ [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|
| **539-111-40** | 3 | 100 mm | 120 | 248 | 268 | | | 1.5 | **476.00** |
| **539-112-40** | 3 | 150 mm | 170 | 298 | 318 | | | | **489.00** |
| **539-113-40** | 3 | 200 mm | 220 | 348 | 368 | | | | **503.00** |
| **539-114-40** | 3 | 250 mm | 270 | 398 | 418 | | | | **516.00** |
| **539-115-40** | 3 | 300 mm | 330 | 458 | 478 | | | | **536.00** |
| **539-116-40** | 3 | 350 mm | 380 | 508 | 528 | | | | **549.00** |
| **539-117-40** | 3 | 400 mm | 430 | 558 | 578 | | | | **562.00** |
| **539-118-40** | 3 | 450 mm | 480 | 608 | 628 | | | | **583.00** |
| **539-119-40** | 3 | 500 mm | 540 | 668 | 688 | | | | **596.00** |
| **539-121-40** | 3 | 600 mm | 650 | 778 | 798 | | | 2.6 | **623.00** |
| **539-123-40** | 3 | 700 mm | 760 | 888 | 908 | | | 2.8 | **650.00** |
| **539-124-40** | 3 | 750 mm | 810 | 938 | 958 | | | 2.9 | **683.00** |
| **539-125-40** | 3 | 800 mm | 860 | 988 | 1008 | | | 3 | **710.00** |
| **539-126-40** | 3 | 900 mm | 960 | 1088 | 1108 | | | 3.3 | **736.00** |
| **539-127-40** | 5 | 1000 mm | 1060 | 1188 | 1208 | 594 | | 3.7 | **763.00** |
| **539-128-40** | 5 | 1100 mm | 1160 | 1288 | 1308 | 644 | | 4 | **790.00** |
| **539-129-40** | 5 | 1200 mm | 1260 | 1388 | 1408 | 694 | | 4.2 | **817.00** |
| **539-130-40** | 5 | 1300 mm | 1360 | 1488 | 1508 | 744 | | 4.4 | **857.00** |
| **539-131-40** | 5 | 1400 mm | 1460 | 1588 | 1608 | 794 | | 4.6 | **884.00** |
| **539-132-40** | 5 | 1500 mm | 1560 | 1688 | 1708 | 844 | | 4.8 | **911.00** |
| **539-133-40** | 5 | 1600 mm | 1690 | 1818 | 1838 | | 610 | 5.1 | **1,432.00** |
| **539-134-40** | 5 | 1700 mm | 1790 | 1918 | 1938 | | 650 | 5.3 | **1,514.00** |
| **539-135-40** | 5 | 1800 mm | 1890 | 2018 | 2038 | | 670 | 5.5 | **1,607.00** |
| **539-136-40** | 5 | 2000 mm | 2100 | 2228 | 2248 | | 740 | 6 | **1,715.00** |



### Specifications

| | |
|---|---|
| Effective range (L0) | 100-2,000 mm |
| Accuracy | (3+3L/1000) µm<br>L = Effective range (mm) |
| Scale reference points | every 50 mm |
| Output waveform | Two 90° phase-shifted sinusoidal signals (2Vpp) |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP53 |
| Signal period | 20 µm |
| Power supply | 5V DC ± 10% |
| Max. drive speed | up to 120 m/min. |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **09AAA033A** | Extension cable (2 m) | 191.00 |
| **09AAA033B** | Extension cable (5 m) | 263.00 |
| **09AAA033C** | Extension cable (7 m) | 304.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

**Extension cable**

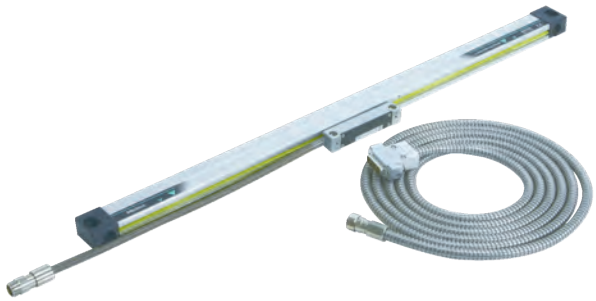
**Legend**
**L0 Effective range**
**L1 Travel range**
**L2-L3 Mount interval**
**L4 Overall length**
**L5-L6 Support bracket position**

**Refer to the DRO System leaflet for more details.**

# DRO LINEAR SCALES AT113

## Series 539 - Incremental Sealed Slim Line type

- Glass scale - Zero not coded
- Expansion factor (8 ± 1)x $10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter



539-201-30

### Specifications

| | |
|---|---|
| Effective range (L0) | 100-1,500 mm |
| Accuracy | (5+5L/1000) µm<br>L = Effective range (mm) |
| Output waveform | Two 90° phase-shfted sinusoidal signals (2Vpp) |
| Max. drive speed | 120 m/min |
| Signal period | 20 µm |
| Scale reference points | every 50 mm |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP53 |
| Power supply | 5V DC ± 10% |

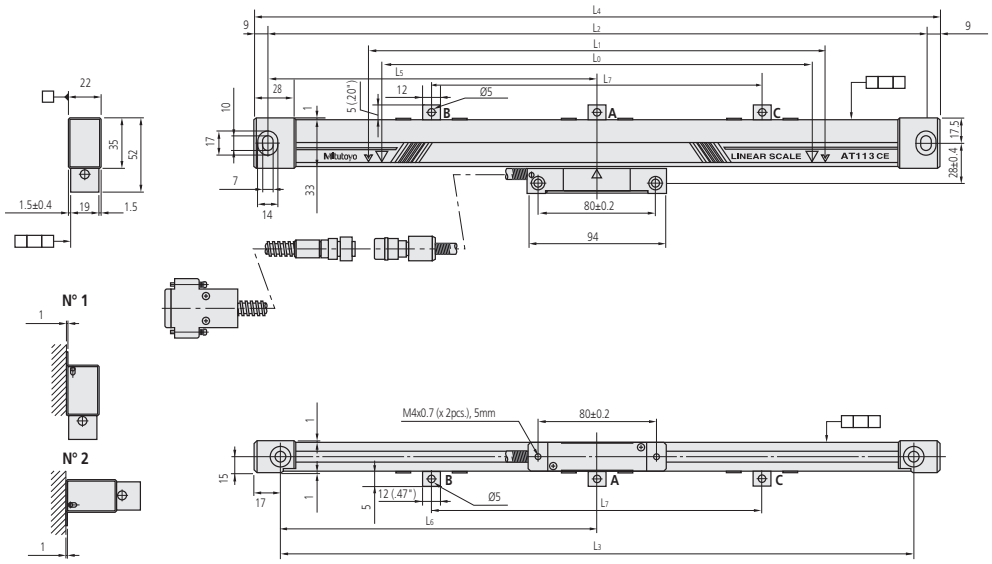
### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **09AAA033A** | Extension cable (2 m) | 191.00 |
| **09AAA033B** | Extension cable (5 m) | 263.00 |
| **09AAA033C** | Extension cable (7 m) | 304.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

| No. | Cable length [m] | Effective range | $L^1$ [mm] | $L^2$ [mm] | $L^3$ [mm] | $L^4$ [mm] | $L^5$ [mm] | $L^6$ [mm] | $L^7$ [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **539-201-30** | 3.5 | 100 mm | 120 | 258 | 242 | 276 | | | | 0.9 | **474.00** |
| **539-202-30** | 3.5 | 150 mm | 170 | 308 | 292 | 326 | | | | | **494.00** |
| **539-203-30** | 3.5 | 200 mm | 220 | 358 | 342 | 376 | | | | | **515.00** |
| **539-204-30** | 3.5 | 250 mm | 270 | 408 | 392 | 426 | | | | | **536.00** |
| **539-205-30** | 3.5 | 300 mm | 330 | 468 | 452 | 486 | | | | | **556.00** |
| **539-206-30** | 3.5 | 350 mm | 380 | 518 | 502 | 536 | | | | | **587.00** |
| **539-207-30** | 3.5 | 400 mm | 430 | 568 | 552 | 586 | | | | | **618.00** |
| **539-208-30** | 3.5 | 450 mm | 480 | 618 | 602 | 636 | | | | | **649.00** |
| **539-209-30** | 3.5 | 500 mm | 540 | 678 | 662 | 696 | 339 | 331 | | | **700.00** |
| **539-211-30** | 3.5 | 600 mm | 640 | 778 | 762 | 796 | 389 | 381 | | 1.3 | **752.00** |
| **539-213-30** | 3.5 | 700 mm | 740 | 878 | 862 | 896 | 439 | 431 | | 1.3 | **803.00** |
| **539-214-30** | 3.5 | 750 mm | 780 | 918 | 902 | 936 | 459 | 451 | | 1.4 | **855.00** |
| **539-215-30** | 3.5 | 800 mm | 840 | 978 | 962 | 996 | 489 | 481 | | 1.4 | **906.00** |
| **539-216-30** | 3.5 | 900 mm | 940 | 1078 | 1062 | 1096 | 539 | 531 | | 1.4 | **958.00** |
| **539-217-30** | 5 | 1000 mm | 1040 | 1178 | 1162 | 1196 | 589 | 581 | | 1.9 | **1,009.00** |
| **539-218-30** | 5 | 1100 mm | 1140 | 1278 | 1262 | 1296 | | | 430 | 1.9 | **1,071.00** |
| **539-219-30** | 5 | 1200 mm | 1240 | 1378 | 1362 | 1396 | | | 460 | 2 | **1,133.00** |
| **539-220-30** | 5 | 1300 mm | 1340 | 1478 | 1462 | 1496 | | | 490 | 2.2 | **1,195.00** |
| **539-221-30** | 5 | 1400 mm | 1440 | 1578 | 1562 | 1596 | | | 530 | 2.2 | **1,257.00** |
| **539-222-30** | 5 | 1500 mm | 1540 | 1678 | 1662 | 1696 | | | 560 | 2.2 | **1,318.00** |

Legend
L0 Effective range
L1 Travel range
L2-L3 Mount interval
L4 Overall length
L5-L7 Support bracket position

**Refer to the DRO System leaflet for more details.**

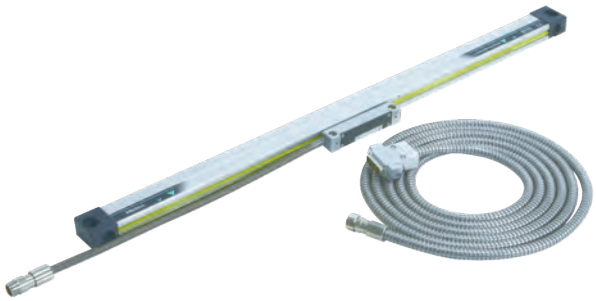



N°1-N°2 Mounting method

# DRO LINEAR SCALES AT113 - High Accuracy

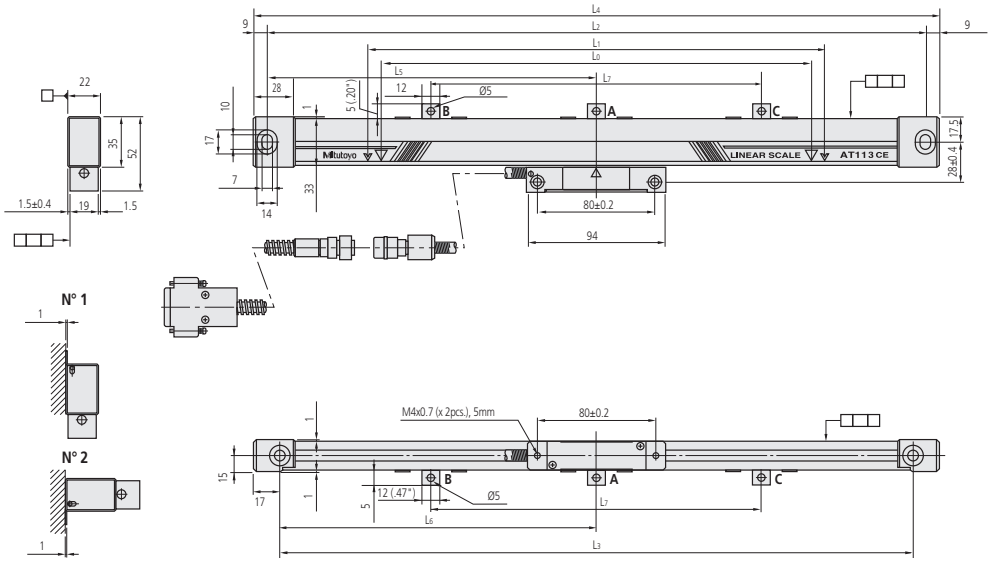
## Series 539 - Incremental Sealed Slim Line type

- Glass scale - Zero not coded
- Expansion factor (8 ± 1)x $10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter



539-201-40

| No. | Cable length [m] | Effective range | $L^1$ [mm] | $L^2$ [mm] | $L^3$ [mm] | $L^4$ [mm] | $L^5$ [mm] | $L^6$ [mm] | $L^7$ [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **539-201-40** | 3.5 | 100 mm | 120 | 258 | 242 | 276 | | | | 0.9 | **525.00** |
| **539-202-40** | 3.5 | 150 mm | 170 | 308 | 292 | 326 | | | | | **546.00** |
| **539-203-40** | 3.5 | 200 mm | 220 | 358 | 342 | 376 | | | | | **567.00** |
| **539-204-40** | 3.5 | 250 mm | 270 | 408 | 392 | 426 | | | | | **587.00** |
| **539-205-40** | 3.5 | 300 mm | 330 | 468 | 452 | 486 | | | | | **608.00** |
| **539-206-40** | 3.5 | 350mm | 380 | 518 | 502 | 536 | | | | | **639.00** |
| **539-207-40** | 3.5 | 400 mm | 430 | 568 | 552 | 586 | | | | | **670.00** |
| **539-208-40** | 3.5 | 450 mm | 480 | 618 | 602 | 636 | | | | | **700.00** |
| **539-209-40** | 3.5 | 500 mm | 540 | 678 | 662 | 696 | 339 | 331 | | | **752.00** |
| **539-211-40** | 3.5 | 600 mm | 640 | 778 | 762 | 796 | 389 | 381 | | 1.3 | **855.00** |
| **539-213-40** | 3.5 | 700 mm | 740 | 878 | 862 | 896 | 439 | 431 | | 1.3 | **906.00** |
| **539-214-40** | 3.5 | 750 mm | 780 | 918 | 902 | 936 | 459 | 451 | | 1.4 | **958.00** |
| **539-215-40** | 3.5 | 800 mm | 840 | 978 | 962 | 996 | 489 | 481 | | 1.4 | |
| **539-216-40** | 3.5 | 900 mm | 940 | 1078 | 1062 | 1096 | 539 | 531 | | 1.4 | **1,061.00** |
| **539-217-40** | 5 | 1000 mm | 1040 | 1178 | 1162 | 1196 | 589 | 581 | | 1.9 | **1,112.00** |
| **539-218-40** | 5 | 1100 mm | 1140 | 1278 | 1262 | 1296 | | | 430 | 1.9 | **1,174.00** |
| **539-219-40** | 5 | 1200 mm | 1240 | 1378 | 1362 | 1396 | | | 460 | 2 | **1,236.00** |
| **539-220-40** | 5 | 1300 mm | 1340 | 1478 | 1462 | 1496 | | | 530 | 2.2 | **1,298.00** |
| **539-221-40** | 5 | 1400 mm | 1440 | 1578 | 1562 | 1596 | | | 530 | 2.2 | **1,360.00** |
| **539-222-40** | 5 | 1500 mm | 1540 | 1678 | 1662 | 1696 | | | 560 | 2.2 | **1,421.00** |




N°1-N°2 Mounting method

### Specifications

| | |
|---|---|
| Effective range (L0) | 100-1,500 mm |
| Accuracy | (3+3L/1000) µm<br>L = Effective range (mm) |
| Max. drive speed | 120 m/min |
| Signal period | 20 µm |
| Scale reference points | every 50 mm |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP53 |
| Power supply | 5V DC ± 10% |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **09AAA033A** | Extension cable (2 m) | 191.00 |
| **09AAA033B** | Extension cable (5 m) | 263.00 |
| **09AAA033C** | Extension cable (7 m) | 304.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

Legend
L0 Effective range
L1 Travel range
L2-L3 Mount interval
L4 Overall length
L5-L7 Support bracket position

**Refer to the DRO System leaflet for more details.**

# DRO LINEAR SCALE AT112 - High Accuracy

## Series 539 - Super Slim

IP53

- Extra-slim construction
- Glass scale - Zero not coded
- Expansion factor (8 ± 1)x $10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter

### Specifications

| | |
|---|---|
| Effective range (L0) | 50-1,020 mm |
| Accuracy | (3+3L/1000) µm<br>L = Effective range (mm) |
| Output waveform | Two 90° phase-shifted sinusoidal signals (2Vpp) |
| Max. drive speed | up to 72 m/min |
| Signal period | 20 µm |
| Scale reference points | every 50 mm |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP53 |
| Power supply | 5V DC ± 10% |
| Delivered | Mounting set |

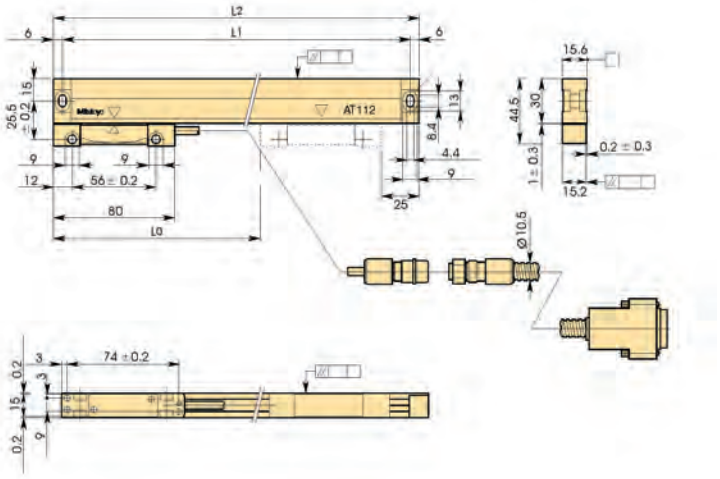
### Optional accessories

| No. | Description | Price € |
|---|---|---|
| 09AAA033A | Extension cable (2 m) | 191.00 |
| 09AAA033B | Extension cable (5 m) | 263.00 |
| 09AAA033C | Extension cable (7 m) | 304.00 |
| 174-173D | KA-Counter 2 Axis | 515.00 |
| 174-175D | KA-Counter 3 axes | 620.00 |
| 174-147D | KLD200 Counter 4-step limit signal output | 2,470.00 |

**Refer to the DRO System leaflet for more details.**

High accuracy

| No. | Cable length [m] | Effective range | L1 [mm] | L2 [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|
| 539-251-10 | 3 | 50 mm | 143 | 155 | 0.72 | **592.00** |
| 539-252-10 | 3 | 70 mm | 163 | 175 | 0.74 | **592.00** |
| 539-253-10 | 3 | 120 mm | 213 | 225 | 0.8 | **592.00** |
| 539-254-10 | 3 | 170 mm | 263 | 275 | 0.85 | **639.00** |
| 539-255-10 | 3 | 220 mm | 313 | 325 | 0.9 | **639.00** |
| 539-256-10 | 3 | 270 mm | 363 | 375 | 0.95 | **639.00** |
| 539-257-10 | 3 | 320 mm | 413 | 425 | 1 | **659.00** |
| 539-258-10 | 3 | 370 mm | 463 | 475 | 1.05 | **680.00** |
| 539-259-10 | 3 | 420 mm | 513 | 525 | 1.1 | **706.00** |
| 539-260-10 | 3 | 470 mm | 563 | 575 | 1.15 | **742.00** |
| 539-261-10 | 3 | 520 mm | 613 | 625 | 1.2 | **778.00** |
| 539-262-10 | 3 | 570 mm | 663 | 675 | 1.25 | **814.00** |
| 539-263-10 | 3 | 620 mm | 713 | 725 | 1.3 | **855.00** |
| 539-264-10 | 3 | 670 mm | 763 | 775 | 1.35 | **896.00** |
| 539-265-10 | 3 | 720 mm | 813 | 825 | 1.4 | **937.00** |
| 539-266-10 | 3 | 770 mm | 863 | 875 | 1.45 | **979.00** |
| 539-267-10 | 3 | 820 mm | 913 | 925 | 1.5 | **1,030.00** |
| 539-268-10 | 3 | 920 mm | 1013 | 1025 | 1.56 | **1,102.00** |
| 539-269-10 | 3 | 1020 mm | 1113 | 1125 | 1.62 | **1,174.00** |




**Legend**
**L0 Effective range**
**L1 Mount interval**
**L2 Overall length**





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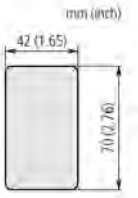
# DRO LINEAR SCALES AT181 Plunger Type

## Series 539 - Incremental Sealed Plunger type

- Specific type for bending presses and grinding machines
- Expansion factor 8 x $10^{-6}/K^{-1}$




High accuracy

| No. | Cable length [m] | Effective range | L1 [mm] | L2 [mm] | L3 [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|---|
| **539-301-10** | 3 | 100 mm | 130 | 255 | 270 | 1.7 | **1,267.00** |
| **539-302-10** | 3 | 150 mm | 180 | 305 | 320 | 1.9 | **1,308.00** |
| **539-303-10** | 3 | 200 mm | 230 | 355 | 370 | 2.1 | **1,349.00** |
| **539-304-10** | 3 | 250 mm | 280 | 405 | 420 | 2.3 | **1,391.00** |
| **539-305-10** | 3 | 300 mm | 330 | 455 | 470 | 2.5 | **1,432.00** |
| **539-306-10** | 3 | 350 mm | 380 | 505 | 520 | 2.7 | **1,478.00** |
| **539-307-10** | 3 | 400 mm | 430 | 555 | 570 | 2.9 | **1,524.00** |
| **539-308-10** | 3 | 450 mm | 480 | 605 | 620 | 3.1 | **1,571.00** |
| **539-309-10** | 3 | 500 mm | 530 | 655 | 670 | 3.3 | **1,617.00** |
| **539-310-10** | 3 | 550 mm | 580 | 705 | 720 | 3.5 | **1,663.00** |
| **539-311-10** | 3 | 600 mm | 630 | 755 | 770 | 3.7 | **1,710.00** |

Standard accuracy

| No. | Cable length [m] | Effective range | L1 [mm] | L2 [mm] | L3 [mm] | Mass [kg] | Price [€] |
|---|---|---|---|---|---|---|---|
| **539-301** | 3 | 100 mm | 130 | 255 | 270 | 1.7 | **1,164.00** |
| **539-302** | 3 | 150 mm | 180 | 305 | 320 | 1.9 | **1,205.00** |
| **539-303** | 3 | 200 mm | 230 | 355 | 370 | 2.1 | **1,246.00** |
| **539-304** | 3 | 250 mm | 280 | 405 | 420 | 2.3 | **1,288.00** |
| **539-305** | 3 | 300 mm | 330 | 455 | 470 | 2.5 | **1,329.00** |
| **539-306** | 3 | 350 mm | 380 | 505 | 520 | 2.7 | **1,375.00** |
| **539-307** | 3 | 400 mm | 430 | 555 | 570 | 2.9 | **1,421.00** |
| **539-308** | 3 | 450 mm | 480 | 605 | 620 | 3.1 | **1,468.00** |
| **539-309** | 3 | 500 mm | 530 | 655 | 670 | 3.3 | **1,514.00** |
| **539-310** | 3 | 550 mm | 580 | 705 | 720 | 3.5 | **1,560.00** |
| **539-311** | 3 | 600 mm | 630 | 755 | 770 | 3.7 | **1,607.00** |

### Specifications

| | |
|---|---|
| Effective range (L0) | 100-600 mm |
| Accuracy | Standard type (5+5L/1000) µm<br>High-accuracy type (3+3L/1000) µm<br>L = Effective range (mm) |
| Output waveform | Two 90° phase-shifted sinusoidal signals (2Vpp) |
| Max. drive speed | up to 50 m/min |
| Signal period | 20 µm |
| Scale reference points | every 50 mm |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP54 |
| Power supply | 5V DC ± 10% |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **09AAA033A** | Extension cable (2 m) | 191.00 |
| **09AAA033B** | Extension cable (5 m) | 263.00 |
| **09AAA033C** | Extension cable (7 m) | 304.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

**Refer to the DRO System leaflet for more details.**

# DRO LINEAR SCALES AT116

## Series 539 - Economy & Slim Type

IP53

- Suitable for milling machines, XY tables, jigs, etc.
- Glass scale - Zero not coded
- Expansion factor (8 ± 1)x $10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter

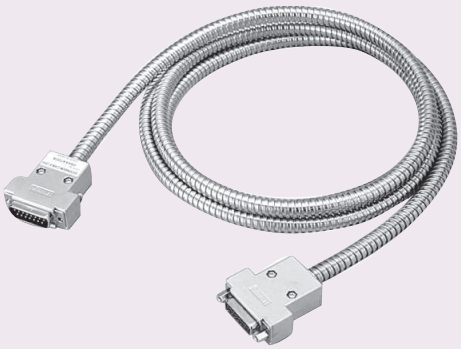
539-271-30

### Specifications

| | |
|---|---|
| Effective range (L0) | 100-1,500 mm |
| Accuracy | (5+5L/1000) µm<br>L = Effective range (mm) |
| Output waveform | Two 90° phase-shifted sinusoidal signals (2Vpp) |
| Max. drive speed | up to 50 m/min |
| Signal period | 20 µm |
| Scale reference points | every 50 mm |
| Operation temperature | 0°C to 45°C |
| Dust/water protection level | IP53 |
| Power supply | 5V DC ± 10% |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **09AAA720A** | Extension cable (2 m) | 160.00 |
| **09AAA720B** | Extension cable (5 m) | 232.00 |
| **09AAA720C** | Extension cable (7 m) | 278.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

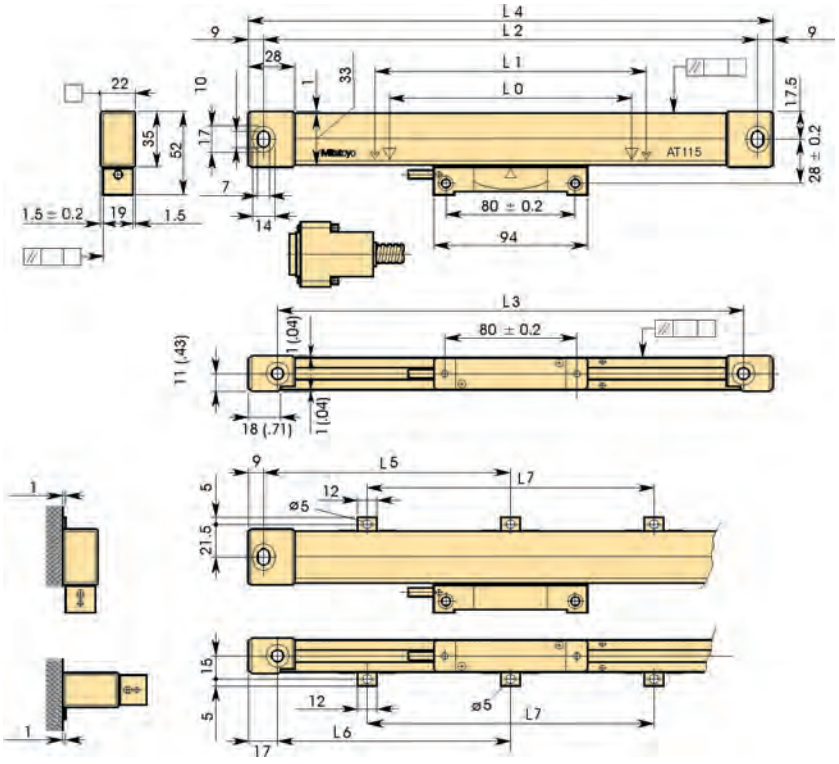


**Extension cable**

| No. | Cable length [m] | L1 [mm] | L2 [mm] | L3 [mm] | L4 [mm] | L5 [mm] | L6 [mm] | L7 [mm] | Mass [g] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|---|
| **539-271-30** | 3.5 | 120 | 258 | 242 | 276 | | | | 550 | **402.00** |
| **539-272-30** | 3.5 | 170 | 308 | 292 | | 326 | | | 600 | **407.00** |
| **539-273-30** | 3.5 | 220 | 358 | 342 | 376 | | | | 700 | **412.00** |
| **539-274-30** | 3.5 | 270 | 408 | 392 | 426 | | | | 800 | **417.00** |
| **539-275-30** | 3.5 | 330 | 468 | 452 | 486 | | | | 900 | **422.00** |
| **539-276-30** | 3.5 | 380 | 518 | 502 | 536 | | | | 1000 | **427.00** |
| **539-277-30** | 3.5 | 430 | 568 | 552 | 586 | | | | 1050 | **464.00** |
| **539-278-30** | 3.5 | 480 | 618 | 602 | 636 | | | | 1150 | **474.00** |
| **539-279-30** | 3.5 | 540 | 678 | 662 | 696 | 339 | 331 | | 1250 | **484.00** |
| **539-281-30** | 3.5 | 640 | 778 | 762 | 796 | 389 | 381 | | 1450 | **494.00** |
| **539-283-30** | 3.5 | 740 | 878 | 862 | 896 | 439 | 431 | | 1600 | **505.00** |
| **539-284-30** | 3.5 | 780 | 918 | 902 | 936 | 459 | 451 | | 1700 | **515.00** |
| **539-285-30** | 3.5 | 840 | 978 | 962 | 996 | 489 | 481 | | 1800 | **525.00** |
| **539-286-30** | 3.5 | 940 | 1078 | 1062 | 1096 | 539 | 531 | | 1950 | **536.00** |
| **539-287-30** | 5 | 1040 | 1178 | 1162 | 1196 | 589 | 581 | | 2350 | **561.00** |
| **539-288-30** | 5 | 1140 | 1278 | 1262 | 1296 | | | 430 | 2500 | **587.00** |
| **539-289-30** | 5 | 1240 | 1378 | 1362 | 1396 | | | 460 | 2700 | **618.00** |
| **539-290-30** | 5 | 1340 | 1478 | 1462 | 1496 | | | 490 | 2850 | **659.00** |
| **539-291-30** | 5 | 1440 | 1578 | 1562 | 1596 | | | 530 | 3050 | **700.00** |
| **539-292-30** | 5 | 1540 | 1678 | 1662 | 1696 | | | 560 | 3250 | **742.00** |

**Legend**
**L0 Effective range**
**L1 Travel range**
**L2-L3 Mount interval**
**L4 Overall length**
**L5-L7 Support bracket position**

**Refer to the DRO System leaflet for more details.**







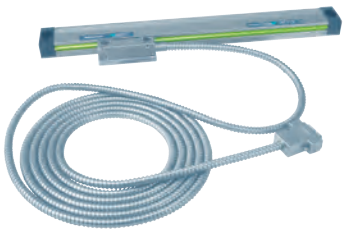

Mitutoyo

# DRO ABS LINEAR SCALES AT715

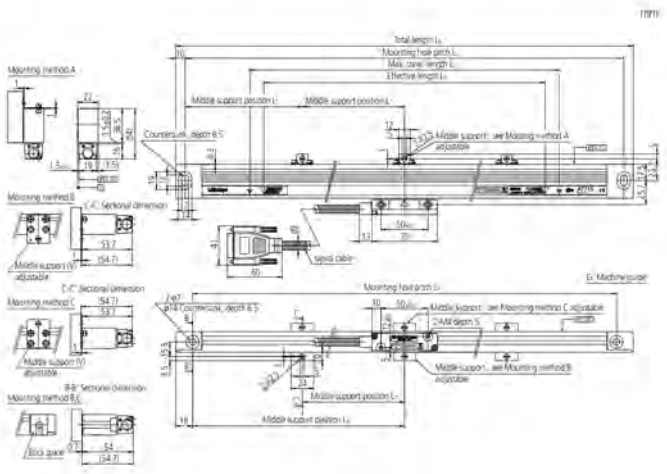
## Series 539 - Absolute IP67 Linear Scale

This linear scale is based on the ABSOLUTE electromagnetic induction principle, thus offering you increased environmental protection to IP67 level.
In addition:

- The AT715 detects and displays the absolute position, so you do not have to enter the reference point setting after each power on.



| No. | Cable length [m] | Effective range | L1 [mm] | L2 [mm] | L3 [mm] | L4 [mm] | L5 [mm] | L6 [mm] | L7 [mm] | L8 [mm] | Price [€] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **539-801** | 3.5 | 100 mm | 120 | 258 | 242 | 278 | | | | | **319.00** |
| **539-802** | 3.5 | 150 mm | 170 | 308 | 292 | 328 | | | | | **324.00** |
| **539-803** | 3.5 | 200 mm | 220 | 358 | 342 | 378 | | | | | **330.00** |
| **539-804** | 3.5 | 250 mm | 270 | 408 | 392 | 428 | | | | | **335.00** |
| **539-805** | 3.5 | 300 mm | 330 | 468 | 452 | 488 | | | | | **340.00** |
| **539-806** | 3.5 | 350 mm | 380 | 518 | 502 | 538 | | | | | **345.00** |
| **539-807** | 3.5 | 400 mm | 430 | 568 | 552 | 588 | | | | | **381.00** |
| **539-808** | 3.5 | 450 mm | 480 | 618 | 602 | 638 | | | | | **386.00** |
| **539-809** | 3.5 | 500 mm | 540 | 678 | 662 | 698 | 339 | 331 | | | **391.00** |
| **539-811** | 3.5 | 600 mm | 640 | 778 | 762 | 798 | 389 | 381 | | | **397.00** |
| **539-813** | 3.5 | 700 mm | 740 | 878 | 862 | 898 | 439 | 431 | | | **402.00** |
| **539-814** | 3.5 | 750 mm | 780 | 918 | 902 | 938 | 459 | 451 | | | **407.00** |
| **539-815** | 3.5 | 800 mm | 840 | 978 | 962 | 998 | 489 | 481 | | | **417.00** |
| **539-816** | 3.5 | 900 mm | 940 | 1078 | 1062 | 1098 | 539 | 531 | | | **427.00** |
| **539-817** | 5 | 1000 mm | 1040 | 1178 | 1162 | 1198 | 589 | 581 | | | **448.00** |
| **539-818** | 5 | 1100 mm | 1140 | 1278 | 1262 | 1298 | 424 | 416 | 430 | | **474.00** |
| **539-819** | 5 | 1200 mm | 1240 | 1378 | 1362 | 1398 | 459 | 451 | 460 | | **500.00** |
| **539-820** | 5 | 1300 mm | 1340 | 1478 | 1462 | 1498 | 494 | 486 | 490 | | **525.00** |
| **539-821** | 5 | 1400 mm | 1440 | 1578 | 1562 | 1598 | 524 | 516 | 530 | | **556.00** |
| **539-822** | 5 | 1500 mm | 1540 | 1678 | 1662 | 1698 | 559 | 551 | 560 | | **592.00** |
| **539-823** | 5 | 1600 mm | 1640 | 1778 | 1762 | 1798 | 459 | 451 | 430 | 215 | **628.00** |
| **539-824** | 5 | 1700 mm | 1740 | 1878 | 1862 | 1898 | 479 | 471 | 460 | 230 | **670.00** |
| **539-825** | 5 | 1800 mm | 1840 | 1978 | 1962 | 1998 | 459 | 451 | 530 | 280 | **721.00** |
| **539-860** | 7 | 2000 mm | 2040 | 2178 | 2162 | 2198 | 539 | 531 | 550 | | **927.00** |
| **539-861** | 7 | 2200 mm | 2240 | 2378 | 2362 | 2398 | 469 | 461 | 480 | | **1,030.00** |
| **539-862** | 7 | 2400 mm | 2440 | 2578 | 2562 | 2598 | 509 | 501 | 520 | | **1,133.00** |
| **539-863** | 7 | 2500 mm | 2540 | 2678 | 2662 | 2698 | 529 | 521 | 540 | | **1,185.00** |
| **539-864** | 7 | 2600 mm | 2640 | 2778 | 2762 | 2798 | 549 | 541 | 560 | | **1,236.00** |
| **539-865** | 7 | 2800 mm | 2840 | 2978 | 2962 | 2998 | 489 | 481 | 500 | | **1,339.00** |
| **539-866** | 7 | 3000 mm | 3040 | 3178 | 3162 | 3198 | 529 | 521 | 530 | | **1,442.00** |



### Specifications

| | |
|---|---|
| Effective range (L0) | 100-3,000 mm |
| Accuracy | 100 to 500 mm ±5 µm<br>600 to 1800 mm ±7 µm<br>2000 to 3000 mm ±10 µm |
| Max. drive speed | 50 m/min |
| Signal period | 20 µm |
| Measuring method | Electromagnetic induction system |
| Operation temperature | 0-45 °C |
| Power supply | 5V DC ± 10% |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **09AAB674A** | Extension cable (2 m) | 170.00 |
| **09AAB674B** | Extension cable (5 m) | 242.00 |
| **09AAB674C** | Extension cable (7 m) | 294.00 |
| **174-173D** | KA-Counter 2 Axis | 515.00 |
| **174-175D** | KA-Counter 3 axes | 620.00 |
| **174-147D** | KLD200 Counter 4-step limit signal output | 2,470.00 |

Legend
L0 Effective range
L1 Travel range
L2-L4 Mounting hole pitch
L5-L8 Middle support positions

**Refer to the DRO System leaflet for more details.**

# Universal DRO KA Counter

## Series 174 - DRO counter for Linear Scales

This counter displays length indication transmitted from a linear scale.
The KA-Counter offers you the following benefits:

- Easy to operate, multifunctional display unit for milling machines and lathes.
- You can connect the following linear scales to the counter: AT103/AT112/AT113/AT116/AT181/AT715.
- Easy to operate, multifunctional display unit for milling, grinding and lathes.
- You can connect the following old model linear scales to the counter: AT102/AT111/AT115.

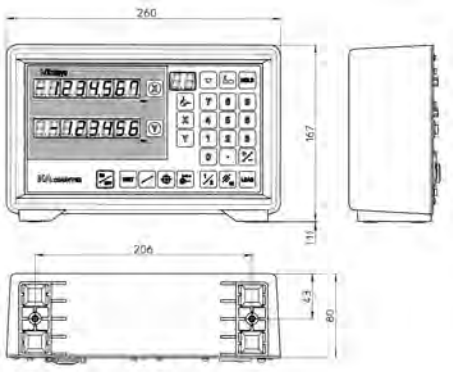
| Functions | Series 174 - DRO counter for Linear Scales |
|---|---|
| ABS/INC mode | ● |
| PRESET | ● |
| Counting direction switchable | ● |
| Diameter display | ● |
| Selectable resolution | ● |
| mm / inch switching | ● |
| Zero approach machining | ● |
| Pitch circle | ● |
| Hole sequence processing | ● |
| Scale reference points | ● |
| Tool specification | ● |
| Macro function keys for lathes, miling and surface grinding machines | ● |
| Programming function | ● |
| Addition of values from 2 axes (not available on 2 axes counter) | ● |
| Addition/substraction | ● |
| Linearity error compensation | ● |
| Lost motion compensation | ● |
| Blanking of unwanted trailing digits | ● |
| Storage of the last display value | ● |
| Copying of coordinate data | ● |
| Data transmission from DIGIMATIC measuring instruments | ● |
| ZERO/ABS (only with AT715) | ● |
| Zero approach function (absolute mode) | ● |
| Zero approach function (Incremental mode) | ● |


174-175

| No. | Axes | Price [€] |
|---|---|---|
| 174-173D | 2 | 515.00 |
| 174-175D | 3 | 620.00 |

### Specifications

| | |
|---|---|
| Display | 7 Digit, sign (-) |
| Dimensions (WxDxH) | 260 x 167 x 80 mm |
| Operation temperature | 0°C to 45°C |
| Power supply | 100-240V-AC 50/60 Hz |
| Mass | 1.25kg (2-axis), 1.33kg (3-axis) |




### Optional accessories

| No. | Description | Price € |
|---|---|---|
| 09EAA094 | RS-232C Data cable 1 m (25-pin) for connecting DP-1VR to Linear Scale KA counter | 314.00 |
| 965004 | Foot switch | 113.00 |
| 06ACF941 | Connecting line serial interface-Computer-Case/ Footswitch 965004 | 180.00 |
| 09CAB217 | RS-232 C interface | 211.00 |
| 937326 | External load box 1 axis | |
| 937327 | External load box 2 axis | |
| 937328 | External load box 3 axis | |
| 936551 | External "Null Box" 1 axis | 206.00 |
| 936552 | External "Null Box" 2 axis | |
| 936553 | External "Null Box" 3 axis | |
| 938140 | Touch signal probe ø 20 | 422.00 |
| 935094 | Touch signal probe ø 32 | |

# DRO KLD200 Counter

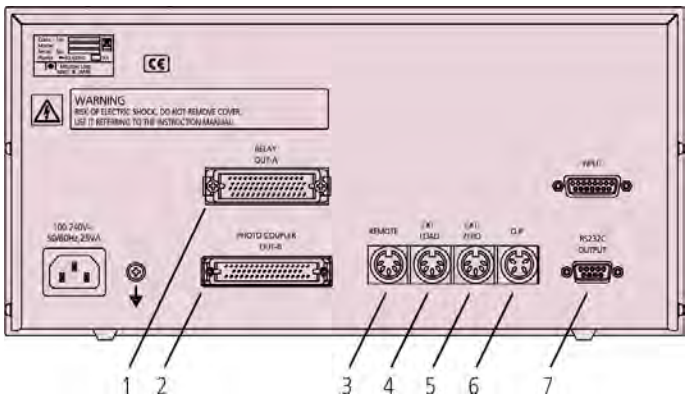
## Series 174

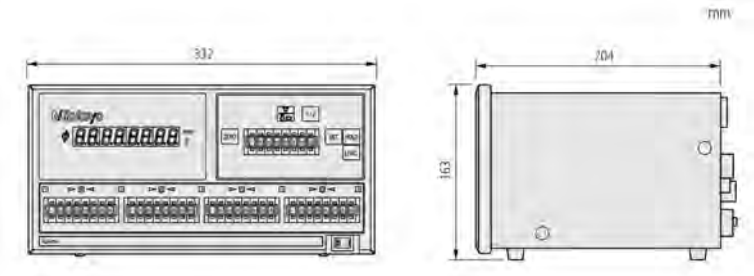
The KLD200 Counter is a single axis linear scale display unit with limit signal output.
The KLD200 offers you the following benefits:

- The counter is designed to signal when a linear scale displacement value and a preset limit value coincide.
- You have a choice of two types of limit settings (2 step and 4 step).
- Ideal for controlling vertical positioning on an EDM or a grinding machine.
- You can connect it to a computer or a sequencer via an RS-232C Interface or limit signal output (offered as standard).
- You can connect the following linear scales to the counter: AT103/AT112/AT113/AT116/AT181/AT715.


174-147

| No. | Mass [kg] | Description | Price [€] |
|---|---|---|---|
| **174-147D** | | 4-step limit signal output | **2,470.00** |
| **174-146D** | 3 | 2-step limit signal output | **2,250.00** |




### Specifications

| | |
|---|---|
| Digital step | 0,001 mm (Indication range: -9999.999 mm to +99999.999 mm)<br><br>0,005 mm (Indication range: -9999.995 mm to +99999.995 mm) |
| Display | 9-Digit LED and a negative (-) sign |
| Power supply | 100-120V/200-240V AC 50/60 Hz |
| Scale input ports | 1 |

### Optional accessories

| No. | Description | Price € |
|---|---|---|
| **965004** | Foot switch | 113.00 |
| **937326** | External load box 1 axis | |
| **936551** | External "Null Box" 1 axis | 206.00 |
| **938140** | Touch signal probe ø 20 | 422.00 |
| **935094** | Touch signal probe ø 32 | |

1. Relay signal output
2. Photocoupler signal output
3. Remote signal input
4. External load signal input
5. External zero-set signal input
6. Touch signal input
7. RS-232C interface
8. Relay signal output

Optional accessories

| No. | Description |
|---|---|
| 935203 | Extension cable |

# Touch Probe

## Series 174

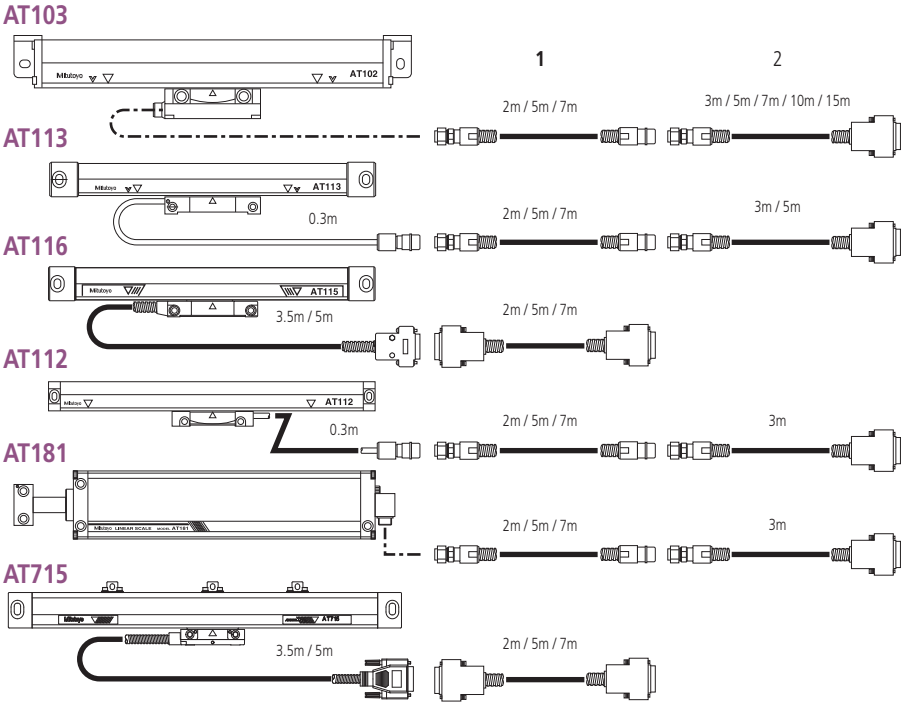
- For setting the origin (or datum) point on a machine tool.
- Holds the displayed value on contact with the workpiece.

938140

| No. | Shaft ø [mm] | Connecting cable [m] | Ball ø | Price [€] |
|---|---|---|---|---|
| **938140** | 20 | 3 | 10 ±0,002 mm | **422.00** |
| **935094** | 32 | 3 | 10 ±0,002 mm | |

# DRO Extension cables selection guide

## Series 0944




Extension cable selection guide

KA Counter

KLD Counter

# Overview of CNC Linear Scale System

| | Scale Name (code) | Reference point | ABSOLUTE function | Main scale grating pitch | Signal output pitch | Signal unit | No. of Division | Resolution | Maximum response speed | Minimum edge interval |
|---|---|---|---|---|---|---|---|---|---|---|
| Separate Type Linear Scales | **ST36B ST36C (ST36A) (ST36D)** | ○ | × | 8μm | 4μm | – (PSU-200) | 400 | 0.01μm | 70mm/s | 125ns |
| | | | | | | | 200 | 0.02μm | 150mm/s | |
| | | | | | | | 80 | 0.05μm | 260mm/s | |
| | | | | | | | 40 | 0.1μm | 720mm/s | |
| | **ST24B ST24C** | ○ | × | 20μm | 10μm | – | 200 | 0.05μm | 360mm/s | 125ns |
| | | | | | | | 100 | 0.1μm | 720mm/s | |
| | | | | | | | 20 | 0.5μm | 1200mm/s | 250ns |
| | | | | | | | 10 | 1μm | 1200mm/s | 500ns |
| | **ST46-EZA** | ○ | × | 20μm | 20μm | – | 400 | 0.05μm | 900mm/s | 50ns |
| | | | | | | | 200 | 0.1μm | 1800mm/s | |
| | | | | | | | 40 | 0.5μm | 2600mm/s | |
| | | | | | | | 20 | 1μm | 2600mm/s | |
| | **ST422** | ○ | × | 40μm | 40μm | – | 200 | 0.2μm | 1500mm/s | 125ns |
| | | | | | | | 80 | 0.5μm | 3600mm/s | |
| | | | | | | | 40 | 1μm | 5000mm/s | |
| | | | | | | | 8 | 5μm | 5000mm/s | 250ns |
| | **ABS ST700 Compact type** | – | ○ | 3.072mm | 3.072mm | – | 30720 | 0.1μm | 5000mm/s | – |
| Assembly Type Linear Scales | **AT402E** | ○ | △ | 20μm | 20μm | – | – | – | 2000mm/s | 1Vp-p differential sine wave |
| | **AT211** | ○ | × | 20μm | 20μm | – | 200 | 0.1μm | 710mm/s | 125ns |
| | | | | | | | 100 | 0.2μm | 1400mm/s | |
| | | | | | | | 40 | 0.5μm | 2000mm/s | |
| | | | | | | | 20 | 1μm | | 250ns |
| | | | | | | | 8 | 2.5μm | | 500ns |
| | | | | | | | 4 | 5μm | | 1000ns |
| | **AT203** | ○ | × | 20μm | 20μm | – | 200 | 0.1μm | 333mm/s | 250ns |
| | | | | | | | 40 | 0.5μm | 1833mm/s | |
| | | | | | | | 20 | 1μm | 2000mm/s | |
| | **ABS AT500** | – | ○ | 20μm | 20μm | – | 4096 | 0.005μm | 2500mm/s*1 | – |
| | | | | | | | 400 | 0.05μm | | |
| | **ABS AT300** | – | ○ | 20μm | 20μm | – | 400 | 0.05μm | 2000mm/s | – |

*1 Maximum response speed of H type with 0.005μm resolution is 1200mm/s.

# CNC LINEAR SCALES AT402E

## Series 539 - Sealed incremental type - Standard dimension

IP53

This linear scale gives you world-class vibration resistance (20 G) and shock resistance (40 G) when you use it with machine tools.

- The 1Vpp/20µm signal output gives you high connectivity with various machine controllers.
- The ABSOLUTE Interval Code saves you time and money.
- Suggested resolution 1 µm - 0,5 µm

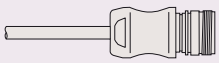
### Specifications

| | |
|---|---|
| Effective range (L0) | 140-3,040 mm |
| Accuracy | 140 to 540 mm ±2 µm<br>640 to 3040 mm ± 3 µm |
| Max. drive speed | over 120 m/min |
| Signal period | 20 µm |
| Output waveform | Two 90° phase-shifted sinusoidal signals (1 Vpp) Differential (RS-485) |
| Operation temperature | 0°C to 45°C |
| Power supply | 5V DC ± 10% |

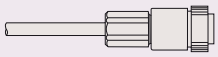
### Optional accessories

| No. | Description |
|---|---|
| 09AAC071A | Cable without connector (type A), (1 m) |
| 09AAC071B | Cable without connector (type A), (3 m) |
| 09AAC071C | Cable without connector (type A), (6 m) |
| 09AAC071D | Cable without connector (type A), (9 m) |
| 09AAC079A | Cable to Euro CNC (Type B), (1 m) |
| 09AAC079B | Cable to Euro CNC (Type B), (3 m) |
| 09AAC079C | Cable to Euro CNC (Type B), (6 m) |
| 09AAC079D | Cable to Euro CNC (Type B), (9 m) |
| 09AAC073A | Cable for Fanuc® CNC (Type C), (1m) |
| 09AAC073B | Cable for Fanuc® CNC (Type C), (3 m) |
| 09AAC073C | Cable for Fanuc® CNC (Type C), (6 m) |
| 09AAC073D | Cable for Fanuc® CNC (Type C), (9 m) |

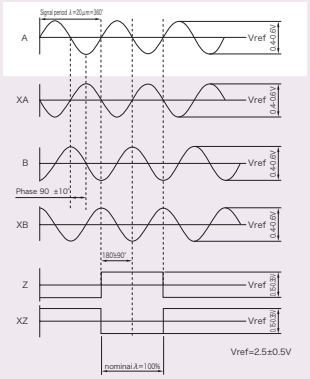
**Cable A : lead wires type**



**Cable B : connectable to Euro CNC (Siemens®, Heidenhain®)**



**Cable C : connectable to Fanuc® CNC**

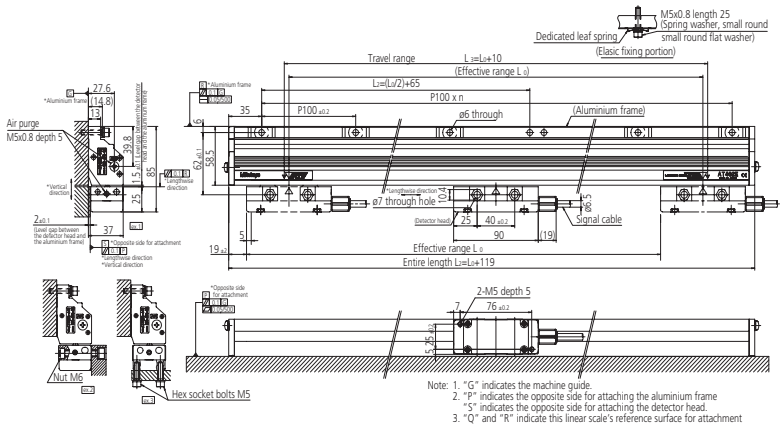



**Refer to the Linear Scale AT402E Brochure**

Without cable (-00)

| No. | Effective range | n (number of holes) | L1 [mm] | L2 [mm] | L3 [mm] | Price [€] |
|---|---|---|---|---|---|---|
| 539-371-00 | 140 mm | 2 | 259 | 135 | 150 | 577.00 |
| 539-373-00 | 240 mm | 3 | 359 | 185 | 250 | 597.00 |
| 539-374-00 | 340 mm | 4 | 459 | 235 | 350 | 618.00 |
| 539-375-00 | 440 mm | 5 | 559 | 285 | 450 | 649.00 |
| 539-376-00 | 540 mm | 6 | 659 | 335 | 550 | 700.00 |
| 539-377-00 | 640 mm | 7 | 759 | 385 | 650 | 803.00 |
| 539-378-00 | 740 mm | 8 | 859 | 435 | 750 | 906.00 |
| 539-379-00 | 840 mm | 9 | 959 | 485 | 850 | 1,009.00 |
| 539-380-00 | 940 mm | 10 | 1059 | 535 | 950 | 1,112.00 |
| 539-381-00 | 1040 mm | 11 | 1159 | 585 | 1050 | 1,215.00 |
| 539-382-00 | 1140 mm | 12 | 1259 | 635 | 1150 | 1,329.00 |
| 539-383-00 | 1240 mm | 13 | 1359 | 685 | 1250 | 1,442.00 |
| 539-384-00 | 1340 mm | 14 | 1459 | 735 | 1350 | 1,555.00 |
| 539-385-00 | 1440 mm | 15 | 1559 | 785 | 1450 | 1,669.00 |
| 539-386-00 | 1540 mm | 16 | 1659 | 835 | 1550 | 1,782.00 |
| 539-387-00 | 1640 mm | 17 | 1759 | 885 | 1650 | 1,895.00 |
| 539-388-00 | 1740 mm | 18 | 1859 | 935 | 1750 | 2,009.00 |
| 539-389-00 | 1840 mm | 19 | 1959 | 985 | 1850 | 2,122.00 |
| 539-390-00 | 2040 mm | 21 | 2159 | 1085 | 2050 | 2,235.00 |
| 539-391-00 | 2240 mm | 23 | 2359 | 1185 | 2250 | 2,348.00 |
| 539-392-00 | 2440 mm | 25 | 2559 | 1285 | 2450 | 2,462.00 |
| 539-393-00 | 2640 mm | 27 | 2759 | 1385 | 2650 | 2,575.00 |
| 539-394-00 | 2840 mm | 29 | 2959 | 1485 | 2850 | 2,688.00 |
| 539-395-00 | 3040 mm | 31 | 3159 | 1585 | 3050 | 2,802.00 |

mm




Note: 1. "G" indicates the machine guide.
2. "P" indicates the opposite side for attaching the aluminium frame
"S" indicates the opposite side for attaching the detector head.
3. "Q" and "R" indicate this linear scale's reference surface for attachment





Mitutoyo

# CNC LINEAR SCALES AT203

**Series 539 - Sealed incremental type - Standard dimension**

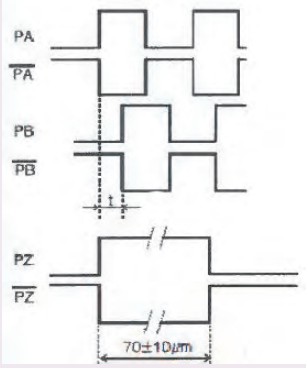
This sealed-type incremental linear scale is suitable for feedback systems in NC machine tools.
The AT203 offers you the following benefits:

- You can connect it directly with NC machine tools.
- Construction is identical to corresponding AT103 scales.


| No. | Effective range (L0) |
|---|---|
| AT 203 | 0-6000 mm |

**Specifications**

| | |
|---|---|
| Effective range (L0) | 100 - 6000 mm |
| Accuracy | 100 to 1500 mm (3+3L/1000) µm<br>1600 to 3000 mm (5+5L/1000) µm<br>3250 to 6000 mm (5+8L/1000) µm<br>L = Effective range (mm) |
| Max. drive speed | up to 120 m/min |
| Scale reference points | every 50 mm |
| Cable length | 5 m |
| Output waveform | Two 90° phase-shifted quadrature signals (RS422)<br>Differential line driver |
| Resolution [µm] | 0,1; 0,5; 1 |
| Power supply | 5V DC ± 10% |

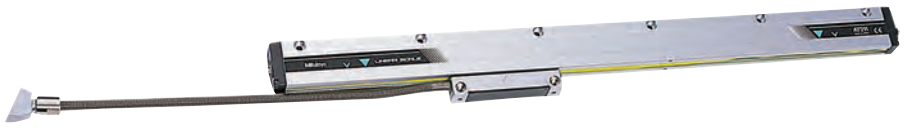



# CNC LINEAR SCALES AT211

**Series 539 - Sealed incremetal type - Slim & High Speed Type**

This sealed-type linear scale gives you high resolution and high accuracy.
The AT211A/B offers you the following benefits:

- Ideal for feedback control in positioning machines in semiconductor manufacturing systems, CNC machine tools, etc.
- You have a choice of two models: the AT211A, the multiple-point installation type designed for improved resistance against vibration and shock, and the AT211B, which attaches to a machine at each end only. The AT211B is compatible with the AT111 slim type in size.
- You can connect it directly with a machine controller via a quadrature signal output (conforming to RS-422A).
  Installation dimensions are available from Mitutoyo – please contact.

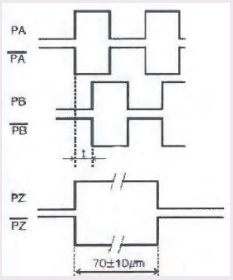


**AT211A**

**AT211B**

**Specifications**

| | |
|---|---|
| Effective range (L0) | 100 - 1500 mm |
| Accuracy | 100 to 1500 mm<br>(3+3L/1000) µm (standard type)<br>(2+2L/1000) µm (high-accuracy type)<br>500 to 1500 mm (3+3L/1000) µm<br>L = Effective range (mm) |
| Max. drive speed | up to 120 m/min |
| Signal period | 20 µm |
| Resolution [µm] | 0,1; 0,5; 1 µm |
| Output waveform | Two 90° phase-shifted quadrature signals (RS422)<br>Differential line driver |
| Power supply | 5V DC ± 10% |




**Refer to the NC Linear Scale brochure for more details**

# CNC ABS LINEAR SCALES AT300

**Specifications**

| | |
|---|---|
| Effective range (L0) | 100 - 3000 mm |
| Accuracy | 100 to 1500 mm<br>(3+3L/1000) µm<br>1600 to 3000 mm<br>(5+5L/1000) µm<br>L = Effective range (mm) |
| Max. drive speed | up to 120 m/min |
| Resolution [µm] | 0,05 µm |
| Signal period | 20 µm |
| Power supply | 5V DC ± 10% |

**Refer to the NC Linear Scale brochure for more details**

## Series 539 - Sealed Absolute type - Standard dimension

ABSOLUTE® IP53

This sealed-type, ABSOLUTE linear scale gives you very fine resolution up to 0,05µm.
The AT300 offers you the following benefits:

- You can connect it directly with NC machine tools.
- ABS AT303: Supports Mitutoyo standard serial interface.
- ABS AT343: Supports Mitsubishi® Electric high-speed serial interface.
- ABS AT353: Supports Fanuc® high-speed serial interface.
- Installation dimensions are available from Mitutoyo – please contact.

**AT300**

# CNC ABS LINEAR SCALES AT500

**Specifications**

| | |
|---|---|
| Accuracy | S model (3+3L/1000) µm<br>H model (2+2L/1000) µm<br>E model (2+2L/1000) µm<br>L = Effective range (mm) |
| Max. drive speed | S model 150 m/min.<br>H model 72 m/min<br>E model 72/150 m/min<br>0,05/0,005 µm |
| Resolution [µm] | AT5_5 model: 0,005 µm<br>AT5_3 model: 0,05 µm<br>AT5_ _E model : 0,05 /0,005µm |
| Signal period | 20 µm |
| Power supply | 5V DC ± 10% |

**Refer to the ABS Linear Scale AT500-S/H brochure for more details**

## Series 539 - Sealed Absolute type - Slim line

ABSOLUTE® IP53

This sealed-type, ABSOLUTE linear scale gives you very fine resolution up to 0,05µm.
The AT500 offers you the following benefits:

- You can connect it directly with NC machine tools.
- ABS AT505/AT503: Supports Mitutoyo standard serial interface.
- ABS AT545/AT543: Supports Mitsibishi® Electric high-speed serial interface.
- ABS AT555/AT553: Supports Fanuc® high-speed serial interface.
- You have a choice of two types:
  -SC model: high-rigidity type
  -HC model: high-accuracy type.
- Installation dimensions are available from Mitutoyo – please contact.

**AT553-HC**

**AT553-SC**

| No. | Effective range (L0) |
|---|---|
| AT500 | S model 100 - 2200 mm<br>H model 100 - 1000 mm<br>E model 100 - 1200 mm |

# CNC LINEAR SCALES ST24

**Series 579 - Open scales with Sine & Square-Wave Output**

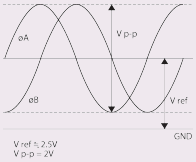
This standard-type linear scale gives you a maximum response speed of up to 1200mm/s
The AT500 offers you the following benefits:

- It Includes an LED alarm enabling you to detect overspeed and sinusoidal signal anomalies.
- Installation dimensions are available from Mitutoyo – please contact.

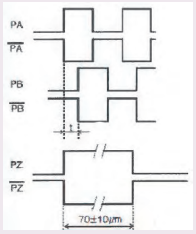
ST24

**Specifications**

| | |
|---|---|
| Effective range (L0) | 10 - 3000 mm |
| Accuracy | 10 - 300 mm ±1 µm<br>350 - 500 mm ±2 µm<br>600 - 1000 mm ±3 µm<br>1100 - 3000 mm ±3 µm/m |
| Max. drive speed | Up to 1200 mm/sec |
| Scale reference points | 10 - 80 mm Scale center point<br>100 - 3000 mm every 50 mm |
| Resolution [µm] | 0,05; 0,1; 0,5; 1 µm |
| Output waveform | Two 90° phase-shifted sinusoidal signals (2Vpp)<br>Two 90° phase-shifted square-wave signals (RS422) Line driver |
| Signal period | 10 µm |
| Power supply | 5V DC ± 10% |




**Model C**




**Model B/C**

# CNC LINEAR SCALES ST36

**Series 579 - Open scales with Sine & Square-Wave Output**

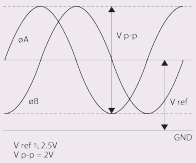
This is a high resolution, high accuracy, portable model designed for exposed installations.
The ST36 offers you the following benefits:

- High reliability with stable signal output.
- Outputs two-phase sinusoidal signal (signal pitch 4µm) and two-phase square-wave signal simultaneously.
- Outputs two-phase sinusoidal signal (signal pitch 4µm) and two-phase square-wave signal simultaneously.
- You are provided with a compact interface box as standard.
  Installation dimensions are available from Mitutoyo – please contact.

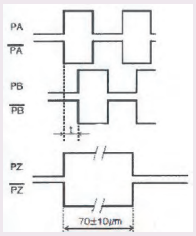
ST36

**Specifications**

| | |
|---|---|
| Effective range (L0) | 10 - 3000 mm |
| Accuracy | 10 - 300 mm ±0,5 µm<br>350 - 500 mm ±1 µm<br>600 - 1000 mm ±2 µm<br>1100 - 3000 mm ±2 µm/m |
| Max. drive speed | 1200 mm/sec |
| Signal period | 8 µm |
| Scale reference points | 10 -75 mm Center point scale<br>100 - 3000 mm every 50 mm |
| Signal period | 4 µm |
| Resolution [µm] | 0,01; 0,02; 0,05; 0,1 µm |
| Output waveform | Two 90° phase-shifted sinusoidal signals 2Vpp (Model A and C)<br>Two 90° phase-shifted square-wave signals (Model B and C) RS422 Line Driver |
| Power supply | 5V DC ± 10% |




**Model A/C**

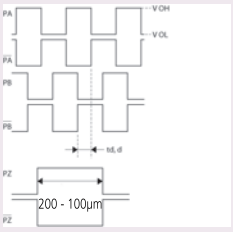


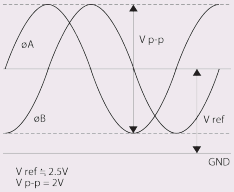

**Model B/C**

# CNC LINEAR SCALES ST422

**Specifications**

| | |
|---|---|
| Effective range (L0) | 10 - 3000 mm |
| Accuracy | 10 - 300 mm ±1 µm<br>350 - 500 mm ±2 µm<br>600 - 1000 mm ±3 µm<br>1100 - 3000 mm ±3 µm |
| Max. drive speed | up to 5000 mm/sec |
| Scale reference points | 10 - 75 mm Center point scale<br>100 - 3000 mm every 50 mm |
| Signal period | 40 µm |
| Resolution [µm] | 0,2; 0,5; 1; 5 µm |
| Output waveform | Two 90° phase-shifted sinusoidal signals (2Vpp)<br>Two 90° phase-shifted square-wave signals (RS422) Line driver |
| Power supply | 5V DC ± 10% |




**Two 90° phase-shifted square waves signals**

**Refer to the NC Linear Scale brochure for more details**

## Series 579 - Open scales with Sine & Square Wave Output

This compact-type, exposed-type incremental linear scale gives you a maximum response speed of 5000 mm/sec.

The ST422 offers you the following benefits:

- It is provided with alarm LED error indication with fault detection signal output for overspeed and sinusoidal signal anomalies.
- Installation dimensions are available from Mitutoyo – please contact.

**ST422**

# CNC LINEAR SCALES ST700

**Series 579 - Electromagnetic induction Absolute open scales- Compact Type**

ABSOLUTE scales have eliminated the need to re-establish the origin.
The ST700 offers you the following benefits:

- It is optimized for the control of linear motors.
- Optimized for high-speed, high-acceleration control.
- A non-contact detection system ensures a long service life for your product.
- Signal adjustment at installation is automatically performed with dedicated software.

**Refer to the Linear Scale ST700 brochure for more details**

| Applicable system | Resolution 0,1 µm<br>50 mm head |
|---|---|
| | **No.** |
| [Amplifiers supporting Mitutoyo ENSIS interface]<br>Nikki Denso Co., Ltd. VC Series<br>Servoland Corporation SVF Series<br>PMAC JAPAN Co., Ltd. controller | **ABS ST708A**<br>**ABS ST708AL** |
| FANUC® Ltd. FS-I Series control unit, Power Mate® i | **ABS ST758**<br>**ABS ST758L** |
| Mitsubishi® Electric Corporation<br>MR-J2S/MR-J3 Series | **ABS ST748A**<br>**ABS ST748AL** |
| Mitsubishi® Electric Corporation MELDAS® Series<br>Supported amplifier : MDS-Vn-V1/V2 | **ABS ST748**<br>**ABS ST748L** |
| Panasonic Matsushita® Electric Industrial Co, Ltd., Motor Company<br>MINAS® A4, A4P, A4N Series | **ABS ST778A**<br>**ABS ST778L** |
| Yaskawa® Electric Corporation ∑-III Series | **ABS ST788A**<br>**ABS ST788L** |

| Item \ Scale Type | | Scale base type | Glass scale type |
|---|---|---|---|
| Resolution | | 0.1µm (0.05µm: special order) | |
| Detection method | | Electromagnetic induction Absolute position detection method | |
| Shape | | Separate type scale | |
| Effective range (accuracy guarantee range) | | 100 to 3000mm / 3200 to 6000mm | 100 to 1100mm |
| Accuracy (20°C) | | (5+5L/1000) µm L: Effective range mm | (3+3L/1000) µm L: Effective range mm |
| Maximum feed speed | | 5 m/s | |
| Thermal expansion coefficient | | (12.0±1.5) ×10$^{-6}$/°C<br>(when attached to material equivalent to steel) | (8±1.0) ×10$^{-6}$/°C |
| Operating conditions | Temperature | 0 to 50°C | |
| | Humidity | 20 to 80%RH | |
| Storage conditions | Temperature | –20 to 70°C | |
| | Humidity | 20 to 80%RH | |
| Power supply voltage | | 5V±10% (at the detector head)<br>(Ripple and spike noise should not exceed 100mV) | |
| Current consumption | | 270mA (Max.) | |
| Vibration resistance | | 300m/s$^2$ (55 to 2000Hz) | 100m/s$^2$ (55 to 2000Hz) |
| Shock resistance | | 500m/s$^2$ (half-sine, 11ms) | 150m/s$^2$ (half-sine, 11ms) |
| Head cable | Length/cable diameter | 1m / ø3.8mm (high-flex cable) | |
| | Connector | 1) D-sub (15-pin pin type) connector (not waterproof)<br>2) D-sub (9-pin socket type) connector (not waterproof): for ST788A | |
| Maximum signal cable length | | Up to 29m (head cable length included) (Please consult the user's manual) | |
| Detector mounting | | 1 location each on top and sides | |
| Direction of cable outlet | | 4 sides (top, bottom, left, right) can be selected | |

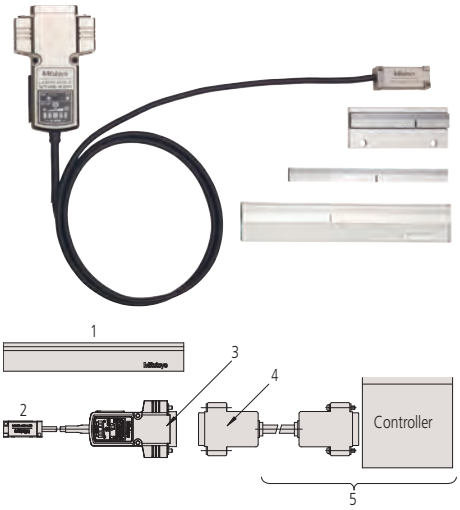
# CNC Linear Scale ST46-EZA

## Series 579 - Open scales with Sine & Square Wave Output

Compact Type - Incremental Reflective Glass scale

- Grating pitch 20
- Signal period 20
- Zero not coded
- Expansion factor (8 ± 1)x106/k-1
- Maximum response speed 2,6 m/s (At sine wave amplitude -3B)
- Includes LED alarm for detection for overspeed
- Can be used for Metal Tape Scale Manufacture
- Self Diagnosis Function with USB Connector

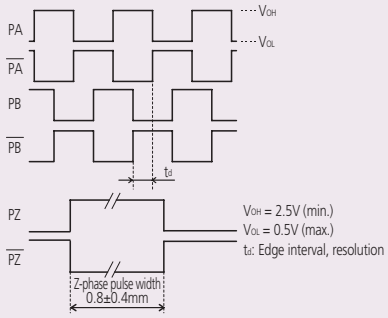
| No. | Detection Method |
|---|---|
| **ST46EZA Type B** | Reflective photoelectric linear encoder |
| **ST46EZA Type C** | Reflective photoelectric linear encoder |



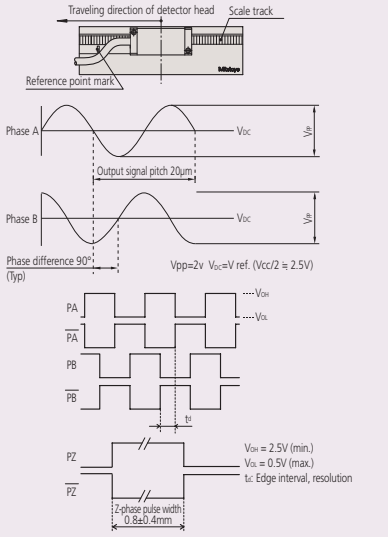

**1: Main scale; 2: Detector unit; 3: Output connector (included); 4: Feedback cable; 5: To be supplied by customer (feedback cable/controller)**

**Specifications**

| | |
|---|---|
| Effective range | 10 to 3000 mm |
| Maximum response speed | 2,6 m/s (at sine wave amplitude -3dB) |
| Internal expansion coefficient | (8±1) x 10-6°C |
| Output signal | Type B: 2-phase square wave signals, reference point pulse, external reset input<br>Type C: 2-phase square wave signals, reference point pulse, 2 phase sinusoidal signal |
| Scale reference point | With scale reference point (50 mm pitch, 10 to 80 mm: Center point) |
| Scale specifications | Grating pitch: 20 µm, Material: glass |
| Scale grating pitch | 20 µm |
| Storage temperature/ humidity | -20 to 60°C, 20 to 80% RH (no condensation) |
| Operating temperature/ humidity | 0 to 40°C, 20 to 80% RH (no condensation) |
| Maximum current consumption | 250mA |
| Power supply voltage | 5VDC±5% |




**Output Signal Type B**




**Output Signal Type C**

**Brochure on request**

# MICSYS-SA1

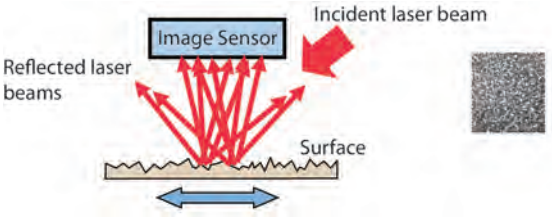
## Series 549

This high-accuracy non-contact 2D encoder uses image correlation.
The MICSYS-SA1 offers you the following benefits:

- Simultaneous XY position measurements.
- Nanometer resolution.
- You can align it easily.
- It allows you to carry out minute strain and deflection measurements.


549-701D

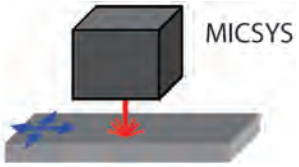
| No. |
|---|
| 549-701D |




Direction of movement (XY Plane)



Speckle Pattern




2 D displacement measurements in the XY plane

**Specifications**

| | |
|---|---|
| Effective range (L0) | ± 100 µm (2D) |
| Accuracy | ± 100 nm |
| Linearity (at 20°) | 80 nm |
| Repeatability (20°) | 5 nm |
| Digital step | 1 nm |
| Working distance | 10±0,2 mm (including thickness of standard target : 6,1 mm) |
| Data Update Period | 20Hz |
| Laser wavelength | 650 nm (Visible) Class 2 |
| Operating temperature and humidity | Detector: 15 - 25°C, I/F unit: 0-40°C, 20 - 80 % RH (Non-condesing) |
| Interface | RS-232C |
| Standard accessories | Standard target, Sample software for data correclation (on CD-ROM) |
| Power supply | AC100-240V 45W 50/60Hz |

**Refer to the Micsys brochure for more details**

## Tests for Evaluating Linear Scales

### 1. Testing within the service temperature range
Confirms that there is no performance abnormality of a unit within the service temperature range and that data output is according to the standard.

### 2. Temperature cycle (dynamic characteristics) test
Confirms that there is no performance abnormality of a unit during temperature cycling while operating and that data output is according to the standard.

### 3. Vibration test (Sweep test)
Confirms that there is no performance abnormality of a unit while subject to vibrations of a frequency ranging from 30Hz to 300Hz with a maximum acceleration of $3g_n$.

### 4. Vibration test (Acceleration test)
Confirms that there is no performance abnormality of a unit subject to vibrations at a specific, non-resonant frequency.

### 5. Package drop test
This test conforms to JISZ0200 (Heavy duty material drop test)

## Glossary

### Absolute system
A measurement mode in which every point measurement is made relative to a fixed origin point.

### Incremental system
A measurement mode in which every point measurement is made relative to a certain stored reference point.

### Origin offset
A function that enables the origin point of a coordinate system to be translated to another point offset from the fixed origin point. For this function to work, a system needs a permanently stored origin point.

### Restoring the origin point
A function that stops each axis of a machine accurately in position specific to the machine while slowing it with the aid of integrated limit switches.

### Sequence control
A type of control that sequentially performs control steps according to a prescribed order.

### Numerical control
A way of controlling the movements of a machine by encoded commands created and implemented with the aid of a computer (CNC). A sequence of commands typically forms a 'part program' that instructs a machine to perform a complete operation on a workpiece.

### Binary output
Refers to output of data in binary form (ones and zeros) that represent numbers as integer powers of 2.

### RS-232C
An interface standard that uses an asynchronous method of serial transmission of data over an unbalanced transmission line for data exchange between transmitters located relatively close to each other. It is a means of communication mainly used for connecting a personal computer with peripherals.

### Line driver output
This output features fast operating speeds of several tens to several hundreds of nanoseconds and a relatively long transmission distance of several hundreds of meters. A differential-voltmeter line driver (RS422A compatible) is used as an I/F to the NC controller in the linear scale system.

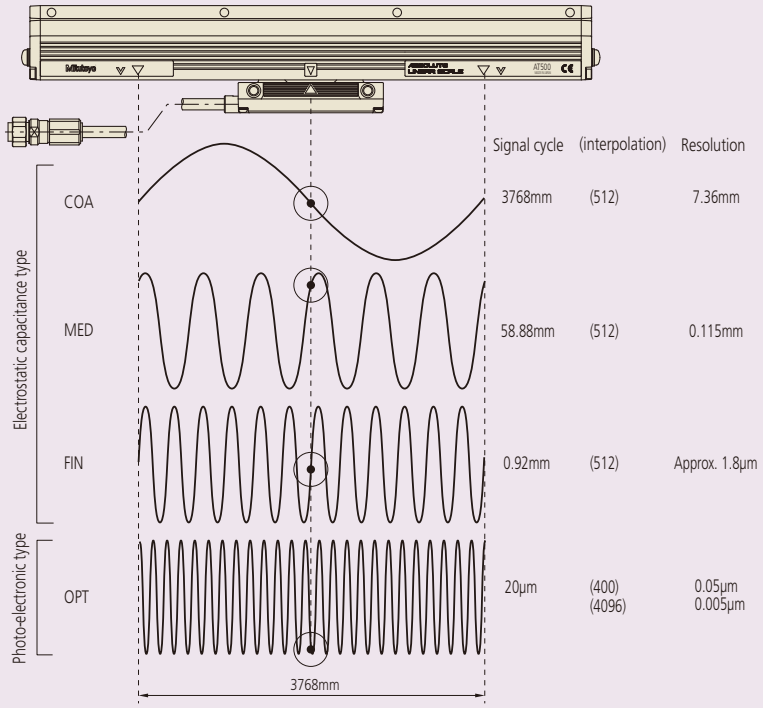
### BCD
A notation of expressing the numerals 0 through 9 for each digit of a decimal number by means of four-bit binary sequence. Data transmission is one-way output by means of TTL or open collector.

### RS-422
An interface standard that uses serial transmission of bits in differential form over a balanced transmission line. RS-422 is superior in its data transmission characteristics and in its capability of operating with only a single power supply of +5V.

### Accuracy
The accuracy specification of a scale is given in terms of the maximum error to be expected between the indicated and true positions at any point, within the range of that scale, at a temperature of 20°C. Since there is no international standard defined for scale units, each manufacturer has a specific way of specifying accuracy. The accuracy specifications given in our catalog have been determined using laser interferometry.

### Narrow range accuracy
Scale gratings on a scale unit normally adopt 20µm pitch though it varies according to the kind of scale. The narrow range accuracy refers to the accuracy determined by measuring one pitch of each grating at the limit of resolution (1µm for example).

## Principle of the Absolute Linear Scale (Example: AT300, 500-S/H)

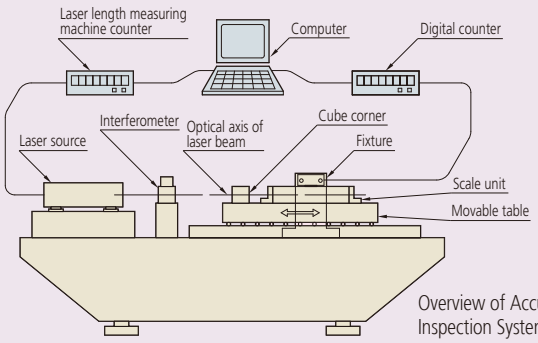



Upon supply of power to a linear scale, position readings from three capacitance-type sub-scales (COArse, MEDium and FINe) and one from a photoelectric sub-scale (OPTical) are taken. These sub-scales use such a combination of pitches, and are so positioned relative to each other, that the readings at any one position form a unique set and allow a microprocessor to calculate the position of the read head on the scale to a resolution of 0.05µm (0.005µm).

## Specifying Linear Scale Accuracy

### Positional Indication accuracy

The accuracy of a linear scale is determined by comparing the positional value indicated by the linear scale with the corresponding value from a laser length measuring machine at regular intervals using the accuracy inspection system as shown in the figure below. As the temperature of the inspection environment is 20˚C, the accuracy of the scale applies only in an environment at this temperature. Other inspection temperatures may be used to comply with internal standards.




Overview of Accuracy Inspection System

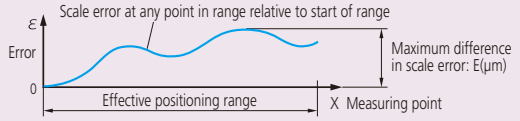
The accuracy of the scale at each point is defined in terms of an error value that is calculated using the following formula:

Error = Value indicated by the linear scale
□ corresponding value of laser inspection system

A graph in which the error at each point in the effective positioning range is plotted is called an accuracy diagram.
There are two methods used to specify the accuracy of a scale, unbalanced or balanced, described below.

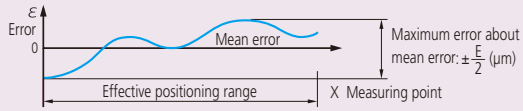
### (1) Unbalanced accuracy specification - maximum minus minimum error

This method simply specifies the maximum error minus the minimum error from the accuracy graph, as shown below. It is of the form: E = (□+□L)µm. L is the effective measuring range (mm), and □and □are factors specified for each model.
For example, if a particular type of scale has an accuracy specification of $(3+\frac{3L}{1000})$µm and an effective measuring range of 1000mm, E is 6µm.




### (2) Balanced accuracy specification - plus and minus about the mean error

This method specifies the maximum error relative to the mean error from the accuracy graph. It is of the form: $e = \pm\frac{E}{2}$ (µm). This is mainly used in separate-type (retrofit) scale unit specifications.

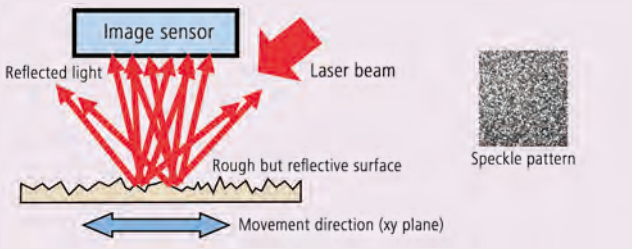



A linear scale detects displacement based on graduations of constant pitch. Two-phase sine wave signals with the same pitch as the graduations are obtained by detecting the graduations. Interpolating these signals in the electrical circuit makes it possible to read a value smaller than the graduations by generating pulse signals that correspond to the desired resolution. For example, if the graduation pitch is 20µm, interpolated values can generate a resolution of 1µm. The accuracy of this processing is not error-free and is called interpolation accuracy. The linear scale's overall positional accuracy specification depends both on the pitch error of the graduations and interpolation accuracy.

## Image correlation and the MICSYS two-dimensional encoder

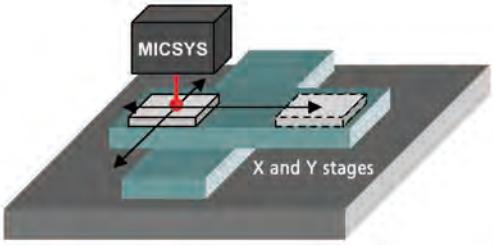
### Principle of measurement

When a rough-surfaced object is irradiated with a laser beam, reflected coherent light scattering from the surface creates visible interference in the form of a speckle pattern. As the object moves in the xy plane, the speckle pattern also moves in response. Displacement of the object can be calculated by comparing, through image correlation, the speckle images obtained before and after movement, and this is the principle used in the highly accurate MICSYS measuring system.

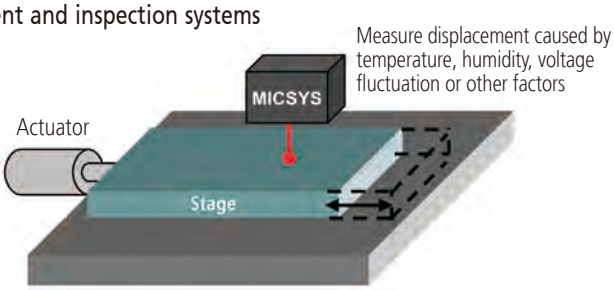



### Applications

1. Evaluation of stages used in manufacturing equipment and inspection systems

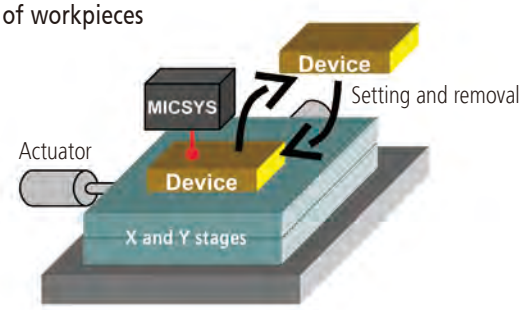



a) Evaluation of position repeatability

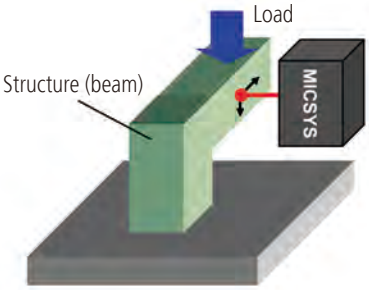



b) Evaluation of standstill stability and drift

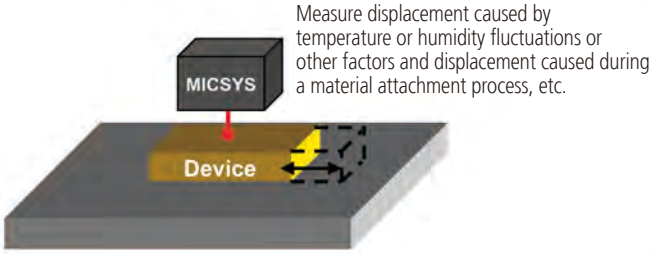
2. Highly accurate positioning of workpieces




3. Measurement of minute displacement




a) Measurement of minute displacement of a structure




b) Measurement of minute displacement of a workpiece