Designed to accurately capture positional coordinates along an axis

Linear Scale System Diagram





H-7



- A wide variety of measuring ranges are available in this standard type scale unit.
- Connectable to the KA-200 counter, KLD-200 counter, or PSU-200.



SPECIFICATIONS

Model	AT103
Effective range	100 to 6000 mm (42 models)
Accuracy (20 °C)	Effective range 100 to 3000: (5+5L₀/1000)µm Effective range 3250 to 6000: (5+8L₀/1000)µm
Output signal	Two 90° phase-shifted sinusoidal signals
Maximum response speed	120 m/min (50 m/min when the effective measuring length is 3250 to 6000 mm)
Signal output pitch	20 µm
Scale reference point	Output in 50 mm pitch
Operating temperature	0 to 45 °C

Note 1: High precision model **AT103F** (JIS Class 0, (3+3Lo/1000)µm) is also available to special order for the effective range of 100 to 2000 mm.

Note 2: Ultra-high precision model **AT1035** (2+2La/1000)µm is also available to special order for the effective range of 100 to 500 mm. Note 3: The indication accuracy does not include quantizing error. Lo: Effective range (mm)

AT103		Effective range*	Signal cable length
Order No.	Model	Lo (mm)	(m)
539-111-30	AT103-100	100 (4 in)	
539-112-30	AT103-150	150 (6 in)	7
539-113-30	AT103-200	200 (8 in)	7
539-114-30	AT103-250	250 (10 in)	7
539-115-30	AT103-300	300 (12 in)	
539-116-30	AT103-350	350 (14 in)	
539-117-30	AT103-400	400 (16 in)	
539-118-30	AT103-450	450 (18 in)	3
539-119-30	AT103-500	500 (20 in)	
539-121-30	AT103-600	600 (24 in)	
539-123-30	AT103-700	700 (28 in)	
539-124-30	AT103-750	750 (30 in)	
539-125-30	AT103-800	800 (32 in)	
539-126-30	AT103-900	900 (36 in)	
539-127-30	AT103-1000	1000 (40 in)	
539-128-30	AT103-1100	1100 (44 in)	
539-129-30	AT103-1200	1200 (48 in)	
539-130-30	AT103-1300	1300 (52 in)	
539-131-30	AT103-1400	1400 (56 in)	
539-132-30	AT103-1500	1500 (60 in)	5
539-133-30	AT103-1600	1600 (64 in)	
539-134-30	AT103-1700	1700 (68 in)	
539-135-30	AT103-1800	1800 (72 in)	
539-136-30	AT103-2000	2000 (80 in)	
539-137-30	AT103-2200	2200 (88 in)	
539-138-30	AT103-2400	2400 (96 in)	
539-139-30	AT103-2500	2500 (100 in)	_
539-140-30	AT103-2600	2600 (104 in)	7
539-141-30	AT103-2800	2800 (112 in)	_
539-142-30	AT103-3000	3000 (120 in)	
539-143-30	AT103-3250	3250 (130 in)	_
539-144-30	AT103-3500	3500 (140 in)	_
539-145-30	AT103-3750	3/50 (150 in)	- 10
539-146-30	AT103-4000	4000 (160 in)	_
539-147-30	AT103-4250	4250 (170 in)	_
539-148-30	AT103-4500	4500 (180 in)	
539-149-30	AT103-4/50	4/50 (190 in)	_
539-150-30	AT103-5000	5000 (200 in)	-
539-151-30	AT103-5250	5250 (210 in)	15
539-152-30	A1103-5500	5500 (220 in)	_
539-153-30	AT103-5/50	5750 (230 IN)	-
539-154-30	A1103-6000	6000 (240 in)	

H-8







Mitutoyo

Designed to accurately capture positional coordinates along an axis

Linear Scales AT113 SERIES 539 — Slim Type



SPECIFICATIONS

Model	AT113
Effective range	100 to 1500 mm (20 models)
Accuracy (20 °C)	(5+5L₀/1000)μm
Output signal	Two 90° phase-shifted sinusoidal signals
Maximum response speed	120 m/min
Signal output pitch	20 µm
Scale reference point	Output in 50 mm pitch
Operating temperature	0 to 45 °C

Note 1: High precision model **AT113F** (JIS Class 0, 3+3Lo/1000)µm is also available to special order. Note 2: Ultra-high precision model **AT113S** (2+2Lo/1000)µm is also available to special order for the effective range 100 to 500 mm. Note 3: The indication accuracy does not include quantizing error. Lo: Effective range (mm)

AT113		Effective range	Signal cable length
Order No.	Model	Lo (mm)	(m)
539-201-30	AT113-100	100 (4 in)	
539-202-30	AT113-150	150 (6 in)	
539-203-30	AT113-200	200 (8 in)	
539-204-30	AT113-250	250 (10 in)	
539-205-30	AT113-300	300 (12 in)	
539-206-30	AT113-350	350 (14 in)	
539-207-30	AT113-400	400 (16 in)	2
539-208-30	AT113-450	450 (18 in)	C
539-209-30	AT113-500	500 (20 in)	
539-211-30	AT113-600	600 (24 in)	
539-213-30	AT113-700	700 (28 in)	
539-214-30	AT113-750	750 (30 in)	
539-215-30	AT113-800	800 (32 in)	
539-216-30	AT113-900	900 (36 in)	
539-217-30	AT113-1000	1000 (40 in)	
539-218-30	AT113-1100	1100 (44 in)	
539-219-30	AT113-1200	1200 (48 in)	5
539-220-30	AT113-1300	1300 (52 in)	J
539-221-30	AT113-1400	1400 (56 in)	
539-222-30	AT113-1500	1500 (60 in)	



An inspection certificate is supplied as standard. Refer to page X for details.

- Slim type with unit sectional dimensions of 22×35 mm.
- Connectable to the KA-200 counter, KLD-200 counter, or PSU-200.



Mitutoyo

Refer to the Linear Scale DRO Systems Catalog (No. E13000) for more details.

Mitutoyo



- Super slim type with unit sectional dimensions of 15.4×30 mm.
- Connectable to the **KA-200** counter, KLD-200 counter, or PSU-200.

Linear Scales AT112-F SERIES 539 — Super Slim Type



SPECIFICATIONS

Model	AT112-F
Effective range	50 to 1020 mm (19 models)
Accuracy (20 °C)	(3+3L₀/1000)μm
Output signal	Two 90° phase-shifted sinusoidal signals
Maximum response speed	50 m/min
Signal output pitch	20 µm
Scale reference point	Output in 50 mm pitch*1
Operating temperature	0 to 45 °C

Note 1: Ultra-high precision model **AT112S** (2+2L₀/1000)µm is also available to special order for the effective range 50 to 320 mm. Note 2: The indication accuracy does not include quantizing error. Lo: Effective range (mm) *1: Models whose effective range is 50 mm or 70 mm: Center point Models whose effective range is 120 mm or more: 50 mm pitch starting at a point 35 mm from the "▼" mark on the left seen

from the front.

AT112-F		Effective range	Signal cable length
Order No.	Model	Lo (mm)	(m)
539-251-10	AT112-50F	50 (1.5 in)	
539-252-10	AT112-70F	70 (2.5 in)	
539-253-10	AT112-120F	120 (4.5 in)	
539-254-10	AT112-170F	170 (6.5 in)	
539-255-10	AT112-220F	220 (8.5 in)	
539-256-10	AT112-270F	270 (10.5 in)	
539-257-10	AT112-320F	320 (12.5 in)	
539-258-10	AT112-370F	370 (14.5 in)	
539-259-10	AT112-420F	420 (16.5 in)	
539-260-10	AT112-470F	470 (18.5 in)	3
539-261-10	AT112-520F	520 (20 in)	
539-262-10	AT112-570F	570 (22 in)	
539-263-10	AT112-620F	620 (24 in)	
539-264-10	AT112-670F	670 (26 in)	
539-265-10	AT112-720F	720 (28 in)	
539-266-10	AT112-770F	770 (30 in)	
539-267-10	AT112-820F	820 (32 in)	
539-268-10	AT112-920F	920 (36 in)	
539-269-10	AT112-1020F	1020 (40 in)	

H-10



Mitutoyo



Designed to accurately capture positional coordinates along an axis

Linear Scales AT402E SERIES 539 — General-purpose Type



SPECIFICATIONS

Model	AT402E
Effective range	140 to 3040 mm (24 models)
Accuracy (20 °C)	Effective range: 140 to 540 mm: ±2 μm Effective range: 640 to 940 mm: ±3 μm Effective range: 1040 to 3040 mm: ±3 μm/m
Output signal	Signal: 1 Vp-p differential sinusoidal signal Differential reference point pulse: Absolute Interval Code compatible
Maximum response speed	120 m/min (With sinusoidal signal amplitude of –3 dB)
Signal output pitch	20 μm
Operating temperature	0 to 45 °C
Cable configuration	Type A: 3 m flying lead cable Type B: 3 m cable with European CNC connectors Type C: 3 m cable with FANUC connectors

AT402E		Effective range	Signal cable length
Order No.*	Model	Lo (mm)	(m)
539-371- 🗆 🗆	AT402E-140	140 (5.6 in)	
539-373- 🗆 🗆	AT402E-240	240 (9.6 in)	
539-374- 🗌 🗌	AT402E-340	340 (13.6 in)	
539-375- 🗆 🗆	AT402E-440	440 (17.6 in)	
539-376- 🗆 🗆	AT402E-540	540 (21.6 in)	
539-377- 🗆 🗆	AT402E-640	640 (25.6 in)	
539-378- 🗆 🗆	AT402E-740	740 (29.6 in)	
539-379- 🗌 🗌	AT402E-840	840 (33.6 in)	
539-380- 🗆 🗆	AT402E-940	940 (37.6 in)	
539-381- 🗌 🗌	AT402E-1040	1040 (41.6 in)	
539-382- 🗆 🗆	AT402E-1140	1140 (45.6 in)	
539-383- 🗆 🗆	AT402E-1240	1240 (49.6 in)	2
539-384- 🗆 🗆	AT402E-1340	1340 (53.6 in)	, S
539-385- 🗆 🗆	AT402E-1440	1440 (57.6 in)	
539-386- 🗆 🗆	AT402E-1540	1540 (61.6 in)	
539-387- 🗆 🗆	AT402E-1640	1640 (65.6 in)	
539-388- 🗆 🗆	AT402E-1740	1740 (69.6 in)	
539-389- 🗆 🗆	AT402E-1840	1840 (73.6 in)	
539-390- 🗆 🗆	AT402E-2040	2040 (81.6 in)	
539-391- 🗌 🗌	AT402E-2240	2240 (89.6 in)	
539-392- 🗆 🗆	AT402E-2440	2440 (97.6 in)	
539-393- 🗆 🗆	AT402E-2640	2640 (105.6 in)	
539-394- 🗌 🗌	AT402E-2840	2840 (113.6 in)	
539-395- 🗌 🗌	AT402E-3040	3040 (121.6 in)	

* The suffix "

"
"
in the order numbers will be **01** for Type A, **02** for Type B, and **03** for Type C.



An inspection certificate is supplied as standard. Refer to page X for details.

- Ideal for machine tools for heavy cutting as well as linear motors.
- Has multi-point elastic fixing for excellent vibration resistance (200 m/s²), shock resistance (400 m/s²), and temperature characteristics.
- The Absolute Interval Code enables a simplified, low-cost ABS system.



Mitutoyo

Refer to the NC Linear Scale Systems Catalog (No. E13005) for more details.

Mitutoyo



- The travel length of the linear scale is output with 2-phase square-wave signals, which can be used as a feedback signal for NC machine tools.
- signal, which can be able as a signal signal, which can be able as a signal signal unit (PSU) is no longer needed, and the **AT203** can be directly connected to the NC machine tool.





SPECIFICATIONS

Model	AT203
Effective range	100 to 6000 mm (42 models)
Accuracy (20 °C)*	Effective range: 100 to 1500 mm (3+3L₀/1000)µm Effective range: 1600 to 3000 mm (5+5L₀/1000)µm Effective range: 3250 to 6000 mm (5+8L₀/1000)µm
Output signal	Two 90° phase-shifted square-wave signals
Maximum response speed	120 m/min (50 m/min when the effective range is 3250 to 6000 mm)
Resolution	0.1/0.5/1 μ m (Switchable by the DIP switches)
Scale reference point	Output in 50 mm pitch
Operating temperature	0 to 45 °C

* The indication accuracy does not include quantizing error. Lo: Effective range (mm)

AT	203	Effective range	Signal cable length
Order No.	Model	Lo (mm)	(m)
539-411-30	AT203-100	100 (4 in)	
539-412-30	AT203-150	150 (6 in)	_
539-413-30	AT203-200	200 (8 in)	_
539-414-30	AT203-250	250 (10 in)	
539-415-30	AT203-300	300 (12 in)	
539-416-30	AT203-350	350 (14 in)	
539-417-30	AT203-400	400 (16 in)	
539-418-30	AT203-450	450 (18 in)	
539-419-30	AT203-500	500 (20 in)	
539-421-30	AT203-600	600 (24 in)	
539-423-30	AT203-700	700 (28 in)	
539-424-30	AT203-750	750 (30 in)	
539-425-30	AT203-800	800 (32 in)	
539-426-30	AT203-900	900 (36 in)	
539-427-30	AT203-1000	1000 (40 in)	
539-428-30	AT203-1100	1100 (44 in)	
539-429-30	AT203-1200	1200 (48 in)	
539-430-30	AT203-1300	1300 (52 in)	
539-431-30	AT203-1400	1400 (56 in)	
539-432-30	AT203-1500	1500 (60 in)	
539-433-30	AT203-1600	1600 (64 in)	5
539-434-30	AT203-1700	1700 (68 in)	
539-435-30	AT203-1800	1800 (72 in)	
539-436-30	AT203-2000	2000 (80 in)	
539-437-30	AT203-2200	2200 (88 in)	
539-438-30	AT203-2400	2400 (96 in)	
539-439-30	AT203-2500	2500 (100 in)	
539-440-30	AT203-2600	2600 (104 in)	
539-441-30	AT203-2800	2800 (112 in)	
539-442-30	AT203-3000	3000 (120 in)	
539-443-30	AT203-3250	3250 (130 in)	
539-444-30	AT203-3500	3500 (140 in)	
539-445-30	AT203-3750	3750 (150 in)	
539-446-30	AT203-4000	4000 (160 in)	
539-447-30	AT203-4250	4250 (170 in)	
539-448-30	AT203-4500	4500 (180 in)	
539-449-30	AT203-4750	4750 (190 in)	
539-450-30	AT203-5000	5000 (200 in)	
539-451-30	AT203-5250	5250 (210 in)	
539-452-30	AT203-5500	5500 (220 in)	
539-453-30	AT203-5750	5750 (230 in)	
539-454-30	AT203-6000	6000 (240 in)	



Mitutoyo

Refer to the NC Linear Scale Systems Catalog (No. E13005) for more details.



Н

Designed to accurately capture positional coordinates along an axis

Linear Scales AT211-A(Multipoint mounting) AT211-B(Double-end mounting) SERIES 539 — Slim and high speed Type



Η

Common specification

Model	AT211		
Effective range*	100 to 1500 mm (20 models)		
Accuracy (20 °C)*	(3+3Lo/1000)µm Lo: effective range (mm)		
Accuracy (20°C)	(2+2L₀/1000)µm (L₀≤500 mm)		
Output signal	Two 90° phase-shifted square-wave signals		
Maximum response speed*	5.4 to 120 m/min (varies depending on the resolution or minimum edge interval)		
Resolution*	0.1/ 0.2/ 0.5/ 1.0/ 2.5/ 5.0 μm		
Scale reference point*	50 mm / Center point / Left-edge point / Right-edge point		
Operating temperature	0 to 45 °C		

* Desired specification is selectable.

Meaning of Model No.



H-13



Mitutoyo

Refer to the NC Linear Scale Systems Catalog (No. E13005) for more details.

An inspection certificate is supplied as standard. Refer to page X for details.

- This is a slim, sealed, 2-phase, squarewave scale that can be directly connected to a control unit.
- Scale alarm LED enables easy maintenance.
- A wide range of specifications to best suit your application.
- Suitable for the control of semiconductor manufacturing systems and NC machine tools.



ABSOLUTE (Refer to page H-26 for details.)



An inspection certificate is supplied as standard. Refer to page X for details.

- ABSOLUTE linear encoder incorporates both our unique electrostatic and photoelectric technology.
- Note: Refer to page H-26 "Quick Guide to Precision Measuring Instruments" for details of the principle of the absolute linear scale.
- Drastically reduced power consumption hence there are no backup batteries.
- Easy operation because no recalibration is required at startup or after a power failure.
- Suitable for position feedback in machinery requiring high accuracy, high-speed control.
- Improved environmental resistance against mechanical vibration and noise.

ABSOLUTE (Refer to page H-26 for details.)



An inspection certificate is supplied as standard. Refer to page X for details.

- Slim shape is suitable for space-saving designs.
- The high rigidity ABS AT500-S series has vibration resistance, shock resistance and temperature control, the ABS AT500-H series offers excellent temperature control and high accuracy.
- Scale alarm LED enables easy maintenance.
- Supports the interfaces of various manufacturers allowing a variety of system configurations.



Mitutoyo

Refer to the NC Linear Scale Systems Catalog (No. E13005) for more details.

Linear Scales ABS AT300 SERIES 539 — Standard Type



SPECIFICATIONS

	<u> </u>				
Model	ABS AT353	ABS AT343	ABS AT343A	ABS AT303	ABS AT303A
Applicable system	FANUC CORPORATION Serial ai Interface	Mitsubishi Electric Corporation MITSUBISHI CNC series	Mitsubishi Electric Corporation MELSERVO series	Amplifiers supp ENSIS in	orting Mitutoyo nterface
Resolution	0.05 μm				
Maximum response speed		120 m/min			
Effective range	100 to 3000 mm				
Accuracy (20 °C)*	(3+3L₀/1000)µm, (5+5L₀/1000)µm when the effective range is 1600 mm or more				

The indication accuracy does not include guantizing error. Lo: Effective range (mm) A wide variety of special orders are available.

Linear Scales ABS AT500-S/H SERIES 539 — Slim Type



High rigidity type High accuracy type -SC ABS AT ABS AT Model AT5_5/AT5_5A AT524 AT527 AT5_5/AT5_5A AT524 AT527 5/AT555A AT524 AT527 0.005 μm (20 μm/4096)*1 0.01 μm 0.001 μm 0.005 μm (20 μm/4096)*1 0.01 μm 0.001 μm 0.005 µm (20 µm/4096)*1 Resolution 0.01 µm 0.001 µm Maximum response speed 150 m/min (2.5 m/s) 72 m/min (1.2 m/s) Effective range 100 to 2200 mm 100 to 1000 mm 100 to 350 mm Accuracy (20°C)*2 (3+3Lo/1000)µm (2+2Lo/1000)µm Reference point of Edge of the effective measuring length expansion influenced Center of the effective measuring length HL: "+" side of the absolute value HR: "-" side of the absolute value by temperature fluctuations

*1: The exact value is 0.0048828125 μm since the 20 μm signal is divided by 4096.

*2: The indication accuracy does not include quantizing error. Lo: Effective range (mm)

H-14

Meaning of Model No.

AB	<u>S AT5</u>	
Resolution/Applie	Effective range	
Model	Applicable system	Ket
ABS AT553	FANUC CORPORATION	
ABS AT555	Serial α i Interface	
ABS AT543	Mitsubishi Electric Corporation	R. 1
ABS AT545	MITSUBISHI CNC series	* "
ABS AT543A	Mitsubishi Electric Corporation	L_ Tvn
ABS AT545A	MELSERVO series	— тур с. ц
ABS AT573A	Panasonic Corporation, Motor Business Unit MINAS series ^{*1}	H:
ABS AT503	Mitutoyo ENSIS	Not
ABS AT503A	Amplifiers supporting the interface*1	
ABS AT505	(Nikki Denso Co., Ltd., Servoland corporation,	ц т
ABS AT505A	PMAC Japan Co., Ltd.)	1
ABS AT524	Siemens AG	d
ABS AT527	DRIVE-CLiQ	
*ABS AT5 C Resolution	Transmission method nly for AT527 Nothing: Full duplex communication ly for AT524 AF24/527: DRIVE-CLiQ commu	ion Inication

*1: Please contact each manufacturer for details.

Reference point of expansion on the scale unit influenced by temperature fluctuation*

- C: Center of the effective range
- L: "+" side of the absolute value R: "-" side of the absolute value
- * "L" or "R" is marked only for the high accuracy type.
- Type of the scale unit
- S: High rigidity type
- H: High accuracy type
- Note: "Reference point of expansion"
 - The scale unit expands or contracts influenced by temperature fluctuation.
 - The mechanical reference point of expansion is defined
 - as the reference point.



Designed to accurately capture positional coordinates along an axis

Linear Scales ABS AT1100 Assembly Type Scale Unit for Absolute Systems





ABS AT1100

SPECIFICATIONS

Model	ABS AT11 3
Detection method	Electromagnetic induction
Mounting method	Frame multipoint
Effective range	140 to 3040 mm
Resolution	0.05 μm
Maximum response speed	3 m/sec
Indication accuracy (20 °C)	3+5L₀/1000 (µm) Effective length L₀= 140 to 2040mm 5+5L₀/1000 (µm) Effective length L₀= 2240 to 3040mm
Expansion coefficient	≈8x10 ⁻⁶ /K
Vibration resistance	≤196 m/s ² (20 G) (55 to 2000 Hz)
Shock resistance	343 m/s ² (35 G) Effective length Lo= 140 to 2040mm 294 m/s ² (30 G) (1/2 sin 11 ms) Effective length Lo=2240 to 3040mm
Power supply voltage	ABS AT1153/1143: DC5 V±10 % ABS AT1123: DC24 V (Conforming to DRIVE-CLiQ)
Maximum current consumption	AT1153: 300 mA (Max) AT1143: 290 mA (Max) AT1123: 140 mA (Max)
Operational temperature/humidity ranges	0 to 50°C / RH 20 to 80% (non-condensing)
Storage temperature/humidity ranges	-20 to 70°C / RH 20 to 80% (non-condensing)

ABSOUTF[™] (Refer to page H-26 for details.)



An inspection certificate is supplied as standard. Refer to page X for details.

- A coolant-proof design and dustresistant rubber material for excluding coolant are newly adopted, and higher reliability optimized for the harsh factory environment is provided.
- The 0.4 mm air gap between the sensors is approximately four times wider than the conventional optical or magnetic sensors. Therefore, the chance of foreign objects lodging in this gap is lower. This air gap is the world's largest in this class of scale used on machine tools.
- The *de facto* standard multi-point fixing method for the frame is adopted, resulting in high vibration/shock-resistance.
- A newly developed small sensor is mounted on the Mitutoyo original electromagnetic induction detection method.
- Due to an improvement of signal processing technique of the electromagnetic induction ABSOLUTE linear encoder, the repeatability is six times better than our conventional model.
- Being compatible with the high-speed serial interface of each company listed in the table below, a direct connection to the NC controller is possible.

Meaning of Model No.



Please contact each manufacturer for details of the applicable systems.





ABSOLUTE[™] (Refer to page H-26 for details.)



An inspection certificate is supplied as standard. Refer to page X for details.

- The electromagnetic induction principle adopted means these scales are unaffected by contamination on the sensors.
- Absolute scales have eliminated the need for origin restoration, also drastically reducing power consumption.



SPECIFICATIONS

Model	ABS AT715	
Detection method	Electromagne	etic induction
Minimum resolution	0.001 mm (Changeable by parameter on t	to 0.01 mm :he KA-200/KLD-200 counter)
Effective range	100 to 3	000 mm
Accuracy (20 °C)	±5 μm (Lo: 100 to 500 mm), ±7 μm (Lo: 600 to 1800 mm), ±10 μm (Lo: 2000 to 3000 mm) Lo: Effective range (mm)	
Maximum response speed	50 m/min	
Protection level	IP67	
Sliding force	5 N or less	
Signal cable	Standard Accessories Refer to the dimension table shown below for the length.	
	Length	Order No.
Extension cable (optional)	2 m 5 m 7 m	09AAB674A 09AAB674B 09AAB674C
Connectable counter	KA-200 Counter/	KID-200 Counter

AT	715	Effective range	Signal cable length
Order No.	Model	Lo (mm)	(m)
539-801	ABS AT715-100	100 (4 in)	
539-802	ABS AT715-150	150 (6 in)	
539-803	ABS AT715-200	200 (8 in)	
539-804	ABS AT715-250	250 (10 in)	
539-805	ABS AT715-300	300 (12 in)	
539-806	ABS AT715-350	350 (14 in)	
539-807	ABS AT715-400	400 (16 in)	ן אר
539-808	ABS AT715-450	450 (18 in)	3.5
539-809	ABS AT715-500	500 (20 in)	
539-811	ABS AT715-600	600 (24 in)	
539-813	ABS AT715-700	700 (28 in)	
539-814	ABS AT715-750	750 (30 in)	
539-815	ABS AT715-800	800 (32 in)	
539-816	ABS AT715-900	900 (36 in)	
539-817	ABS AT715-1000	1000 (40 in)	
539-818	ABS AT715-1100	1100 (44 in)	
539-819	ABS AT715-1200	1200 (48 in)	
539-820	ABS AT715-1300	1300 (52 in)	
539-821	ABS AT715-1400	1400 (56 in)	
539-822	ABS AT715-1500	1500 (60 in)	5
539-823	ABS AT715-1600	1600 (64 in)	
539-824	ABS AT715-1700	1700 (68 in)	
539-825	ABS AT715-1800	1800 (72 in)	
539-860	ABS AT715-2000	2000 (80 in)	
539-861	ABS AT715-2200	2200 (88 in)	
539-862	ABS AT715-2400	2400 (96 in)	
539-863	ABS AT715-2500	2500 (100 in)	
539-864	ABS AT715-2600	2600 (104 in)	7*1
539-865	ABS AT715-2800	2800 (112 in)	
539-866	ABS AT715-3000	3000 (120 in)	

*1: Combination of a 5 m signal cable and a 2 m extension cable





Mitutoyo

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Refer to the Linear Scale DRO Systems Catalog (No. E13000) for more details. Н

Designed to accurately capture positional coordinates along an axis

KA-200 Counter SERIES 174 — Standard Type



174-183 KA-212

> 174-147 KLD-214

SPECIFICATIONS

Order No.	174-183	174-185	
Model	KA-212	KA-213	
Number of axes to be displayed	2	3	
	(Changeable accordin	g to the parameter)	
Resolution	When AT100 is conne	ected: 0.05 to 0.0001 mm	
	When AT715 is connected: 0.01 to 0.001 mm		
Display/digit Main display: 9 digits including sign Sub display: 8 digits		igits including sign	
		igits	
Power supply voltage	100 to 240 V	AC, 50/60 Hz	
Dimensions	300(W)×70(D)×167(H) mm	
Output (optional)	RS-232C		
Mass	1.25 kg	1.3 kg	

: To denote your AC power cable add the following suffixes to the order No. :

A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE.

KLD-200 Counter SERIES 174 — Special Purpose Type with Limit Signal Output



• Counter designed to signal when a linear scale displacement value and a preset limit value coincide.

• The KA-200 Counter has a lathe function as well as standard functions

• Compact, light and multifunctional.

• The RS-232C interface enables

connection to a PC or printer.

(parameter selection).

Optional Accessories

• Code out unit: 06AET993

• Two types of limit settings are available: 2-step (**KLD-212**) and 4-step (**KLD-214**).

Optional Accessories

- External zero-set box (1 axis): 936551
- External load box (1 axis, for RS-232C output): 937326

SPECIFICATIONS

Order No.	174-146	174-147
Model	KLD-212	KLD-214
Number of axes to be displayed	· · · · · · · · · · · · · · · · · · ·	
Number of limit values to be set	2	4
Resolution	(Changeable according to the parameter) When AT100 series is connected: 0.05 to 0.0001 mm When AT715 is connected: 0.01 to 0.001 mm	
Output	RS-232C (provided as standard)	
Display	7-segment LCD/ 7 digit*1	
Power supply voltage	100 V to 240 V AC, 50/60 Hz	
Power consumption	25 VA	
Operating temperature/ humidity range	0 to 45 °C / 20 to 80 %	
Dimensions	332(W)×204(E	D)×163(H) mm
Mass	3.0 kg	3.1 kg

*1: Count range when the minimum reading is 0.001 mm: 99999.999 to –9999.999 Count range when the minimum reading is 0.005 mm: 99999.995 to –9999.995 : To denote your AC power cable add the following suffixes to the order No. :

A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE.

<text><text>

Mitutoyo

Linear scale counter

FUNCTIONS

	Туре	High performance	Limit signal output
Function		KA-200 Counter	KLD-200 Counter
Zero-setting	ZERO	•	•
Preset	P.SET	•	•
Resolution setting	0.000 5 / 0.1	•	•
Measurement direction setting	←	•	•
mm/inch conversion	mm/E	•	•
Diameter display	DIA	•	•
Scale reference point setting ⁻¹	SET	•	•
1/2 calculation	1/2	•	•
Coordinate system switching	\bigcirc ^{<i>N</i>}	•	_
Bolt-hole circle machining	\oplus	•-2	_
Pitch machining	-0-0-0-	•	—
Zero approach machining (INC mode)		•	—
Addition of 2-scale data	Z1+Z2	• ⁻³	—
Linearity error compensation	₩ ₩	•	•
Pitch error compensation		● ⁻¹	—
Smoothing	〕 1234 [®]	•	•
Memory backup	5678	•	•
Expansion/contraction coefficient setting	•	_	•
Lower digit blanking out	123 🐗	•	•
External zero-setting	ZERO SET IN PUT	▲-4	•
RS-232C interface unit	RS-232C OUTPUT	▲ ⁻⁴	•
USB output	USB	▲ ⁻⁵	—
Limit signal output	LIMIT OUTPUT	_	•
Error message	Error	•	•
●: Standard function, ▲: Optional func -1: Only available when connecting with -2: Not available in single-axis use -3: Only available for 3-axis model (KA-2 -4: Code out unit (06AET993) is require	tion, —: Not AT100 series 2 13) d.	available	

H-18

-5: Text can be output by interface unit and foot switch



Mitutoyo

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Refer to the Linear Scale DRO Systems Catalog (No. E13000) for more details.

Η

Designed to accurately capture positional coordinates along an axis

Linear Scales ST36 SERIES 579 — High Accuracy Type



SPECIFICATIONS

Model	ST36
Detection method	Reflective photoelectric linear encoder
Output signal	 ST36A: 2-phase sinusoidal signals ST36B: 2-phase square-wave signals, Alarm reset input ST36C: 2-phase square-wave signals, 2-phase sinusoidal signals ST36D: 1Vp-p differential sinusoidal signals
Main scale grating pitch	8 µm
Signal output pitch	4 µm
Effective range	10 to 3000 mm
Accuracy (20 °C)*1	±0.5 μm, ±1 μm, ±2 μm/m
Maximum response speed*2	1200 mm/s
Scale reference point	Center point (10 to 80 mm) 50 mm pitch (100 to 3000 mm)
Power supply voltage	DC5 V ±5 %
Operating temperature/ humidity range	0 to 40 °C / 20 to 80 % (non-condensing)
Storage temperature/ humidity range	-20 to 60 °C / 20 to 80 % (non-condensing)
Head cable length	1 m (high-flex connecting cable)

*1:	Effective range	Accuracy
	300 mm or less	±0.5 μm
	500 mm or less	±1 μm
	1000 mm or less	±2 μm
	3000 mm or less	±2 μm/m

*2: Maximum response speed when sinusoidal signals are output



An inspection certificate is supplied as standard. Refer to page X for details.

- \bullet Outputs 2-phase sinusoidal wave signals at 4 μm pitch.
- The maximum effective measuring length is 3000 mm when the resolution is 0.01/0.02/0.05/0.1 µm (2-phase square-wave is output).
- Compact detector head enables space saving design.
- Along with the output specifications of 2-phase sinusoidal wave and 2-phase square-wave, the output specification of 1Vp-p wave is also available.
- Equipped with the function to display signal errors on the LED.



Mitutoyo





- Includes an automatic adjusting function for the signal (EZA function) at the push of a button.
- Detector head mounting and signal adjustment possible without oscilloscope or PC.
- A setup indicator for checking signal strength is included.
- I/F circuit integrated in connector shell reduces volume to 60 % compared to conventional interface.
- Self-diagnosis function with USB connectivity facilitates signal strength checking and parameter setup.
- Glass and metal tape scales are available.
- The thickness of the detector head is only 7.5 mm. The metal tape scale type has a mounting surface area of 12.5 by 9.325 mm, allowing use in applications where a space-saving design is important.



Mitutoyo

Refer to the NC Linear Scale Systems Catalog (No. E13005) for more details.

Linear Scales ST46-EZA SERIES 579 — Compact Type





Metal Tape Scale Type





SPECIFICATIONS

Model	ST46	5-EZA
Detection method	Reflective photoele	ectric linear encoder
Scale type	Glass	Metal tape
Main scale grating pitch	20	μm
Output signal	Type B: 2-phase square-wave signals, refer Type C: 2-phase square-wave signals, refer	ence point pulse, external reset input. ence point pulse, 2-phase sinusoidal signals.
Effective range	10 to 3	000 mm
Accuracy (20 °C)	Effective range 10 to 300 mm: ±1 µm Effective range 350 to 500 mm: ±2 µm Effective range 600 to 1000 mm: ±3 µm Effective range 1100 to 3000 mm: ±3 µm/m	Effective range 10 to 1000 mm: $\pm 5 \mu$ m Effective range 1100 to 3000 mm: $\pm 5 \mu$ m/m (The above accuracy applies to individual scales. For double-end mounting designs, perform point-to-point correction after ensuring the metal tape is tensioned correctly.)
Maximum response speed	2.6 m/s (at the point where the sinusoidal signal amplitude has decreased by 3 dB)	
Scale reference point	50 mm pitch, 10 to 80 mm: Center point	
Power supply voltage	5 VD0	C±5 %
Operating temperature/humidity range	0 to 40 °C / RH 20 to 80 % (non-condensing)	
Storage temperature/humidity range	-20 to 60 °C / RH 20 to	80 % (non-condensing)
Head cable length	1m (high-flex connecting cable)	



Designed to accurately capture positional coordinates along an axis

Linear Scales ABS ST700 SERIES 579 — General-purpose Type



SPECIFICATIONS

Model	ABS ST700		
Scale type	Scale base	Glass scale	
Resolution	0.1 μm (0.05 μm	to special order)	
Detection method	Electromagnetic induct	ion ABS linear encoder	
Max. effective range	6000 mm	1100 mm	
Accuracy (20 °C)	5+(5L/1000)µm L: Effective range (mm)	3+(3L/1000)µm L: Effective range (mm)	
Maximum response speed	5 m/s		
Linear expansion coefficient	(12.0±1.5)×10 ⁻⁶ /K (When the material of the mounting components is steel or equivalent)		
Power supply voltage	5 V±10 % (at the detection head) (Ripple + spike noise component should be less than 100 mV)		
Maximum current consumption	220 mA		
Head cable length	1 m (high-flex connecting cable)		
Maximum cable length	29 m (including the head cable length)		
Operating temperature/ humidity range	0 to 50°C / RH 20 to 80% (non-condensing)		
Storage temperature/ humidity range	-20 to 70°C / RH 20 to 80% (non-condensing)		

Meaning of Model No.

Absolute type	Head cable
Series name	A: Scale base type direction C: Glass scale type R : Right side
ABS ST700 Compact-type series (Effective range \leq 3 m) ABS ST700 Compact-type series (3.2 m \leq Effective range \leq 6 m)	Effective range: 100 to 6000 mm
Interface specification*	Nothing: 100 to 3000 mm D: Lower sid L: 3200 to 6000 mm
0:Supports Mitutoyo ENSIS high-speed interface ABS ST708A, ST708AL 4:Supports Mitsubishi Electric Corporation, high-speed serial interface	Transmission method A: 2-wire system
ABS ST748, ST748AL, ABS ST748, ST748L 5: Supports FANUC CORPORATION, high-speed serial interface	Nothing: 4-wire system ————————————————————————————————————
ABS ST738, ST778AL ABS ST778A, ST778AL	al interface 8: Form: 50(W)×28(D)×11(H) mm Resolution: 0.1 μm
8:Supports YASKAWA Electric Corporation, high-speed serial inter ABS ST788A, ST788AL	face 9 . 0.05 µm resolution (to special order)

Available Interfaces FANUC CORPORATION, FS-i Series, Power Mate i Series Mitsubishi Electric Corporation, MELSERVO MR-J4/MR-J3 Series Mitsubishi Electric Corporation, CNC Series, MDS-D/MDS-DH Series YASKAWA Electric Corporation, Σ -VII Series Panasonic Corporation, Motor Business Unit, MINAS-A5, A5L, A5N, A5NL, MINAS-A4, A4P, A4N, A4NL Series Mitutoyo ENSIS*1 Nikki Denso Co., Ltd. VPH/VC II/VPS series Servoland Corporation SVF Series PMAC Japan Co., Ltd. Power-UMAC, Power-Clipper, Power-Brick series *1: ENSIS is a registered trademark of Mitutoyo Corporation.

H-21

Note: Be sure to contact each manufacturer for details of the applicable systems (availability of connection).







An inspection certificate is supplied as standard. Refer to page X for details.

- Absolute measurement with exposed scales
- Non-contact detection is optimal for high speed and high acceleration devices such as linear motors.
- Electromagnetic induction principle means scales are unaffected by water and oil contamination
- The detector head is approximately 1/3 the previous model size: 50 mm (W) \times 28 mm (D) × 11 mm (H)
- Cable outlets can be in four directions, with mounting holes on the top and sides
- Accuracy (5+5L/1000)µm, glass scale: (3+3L/1000)µm (previous models: (8+5L/1000)µm) L: Effective range (mm)
- Compatible with servo amplifiers from a range of companies (high-speed serial interfaces)



Mitutoyo

ABS**o**lute (Refer to page H-26 for details.)



An inspection certificate is supplied as standard. Refer to page X for details.

- Effective length: 12 m, Maximum response speed: 8 m/s, Resolution: 1 nm
- Various interfaces are supported.
- A new detection method has improved robustness in regards to contamination resistance and gap tolerance (in-house testing result).
- •There is a choice of mounting method: double-sided tape or double-end screw.
- Signal check program enables integrity check and maintenance.

Linear Scales ABS ST1300 **SERIES 579**

Double-end screw-mounting version



SPECIFICATIONS

Model	ABS ST1300	
Scale type	Double-end mounting	Double-sided tape mounting
Max. effective length	500 to 12000 mm	10 to 3000 mm
Resolution	0.001 µm/0.01 µm (switched at shipment)	
Detection method	Optical reflection type linear encoder	
Indication accuracy (20 °C)	\pm 5 µm (1 m or less), \pm 5 µm/m (1.1 m or more)	
Maximum response speed	8 m/s or less	
Expansion coefficient	10×10 ⁻⁶ /K	
Power supply	5 VDC ±10 %	
Maximum current consumption	270 mA (250 mA for Panasonic Corporation)	
Cable length	1 m (standard)	
Maximum cable length	29 m, 250 mA (depends on interface)	
Usable temperature/humidity range	0 to 50 °C / RH 20 to 80 % (non-condensing) Mounted to steel: 0 to 50 °C / RH 20 to 80 % (non-condensing) Mounted to another material: 10 to 40 °C / RH 20 to 80 % (non-condensing)	
Storage temperature/humidity range	-20 to 70 °C / RH 20 to 80 % (non-condensing)	

For details on specification, mounting procedure, and adjustments, refer to the corresponding catalog and operation manual.

ABS ST13 4 1 A - 1200 D

Meaning of Model No.

Absolute type

Series name Separate Type ABSOLUTE Linear Scale

Interface specification*

- 0: Supports Mitutoyo ENSIS high-speed interface
- AḃS ST130□Á
- 4: Supports Mitsubishi Electric Corporation, high-speed serial interface ABS ST134
- **5**: Supports FANUC CORPORATION, high-speed serial interface ABS ST135
- 7: Supports Panasonic Corporation, Motor Business Unit high-speed serial interface ABS ST137 A
- 8: Supports YASKAWA Electric Corporation, high-speed serial interface ABS ST138 A

*Available Interfaces

FANUC CORPORATION, Serial ai Interface
Mitsubishi Electric Corporation, MELSERVO MR-J4/MR-J3 Series
YASKAWA Electric Corporation, Σ-VII Series
Panasonic Corporation, Motor Business Unit, MINAS Series
Mitutoyo ENSIS*1
*1: ENSIS is a registered trademark of Mitutovo Corporation

H-22

Note: Be sure to contact each manufacturer for details of the applicable systems (availability of connection).

Scale mount D: Double-end mountingE: Double-sided tape mounting

Transmission method

1: Resolution 0.01 µm

2: Resolution 0.001 µm

Resolution

Effective range: 10 to 12000 mm

specification listed on the left

A: When 0, 4, 7, or 8 is selected in the interface

specification listed on the left

Nothing: When 5 is selected in the interface



Mitutoyo

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Designed to accurately capture positional coordinates along an axis

Pulse signal interface unit PSU-200 SERIES 539



SPECIFICATIONS

Order No.	539-005	
Model	PSU-200	
Number of axes	1	
Input	Input connector DA-155-N (JAE) or equivalent Input signal: 2-phase sinusoidal and the reference voltage, Reference point, Scale alarm	
Output	Output connector: MR-20RMA (HONDA TSUSHIN KOGYO CO., LTD.) Output signal: 2-phase square-wave signals (PA, PB), reference point (PZ), Alarm, Alarm reset, Photo-coupler	
Number of divisions	4, 8, 10, 20, 40, 80, 100, 200 (Selectable by switch)	
Function	Setting the number of divisions, setting the minimum edge interval, and maximum response speed. Detection of broken wires or short circuits and abnormalities (alarm), detection of signal errors (alarm). Power supply voltage low alarm (warning light only), switching between high-impedance mode and alarm signal output mode. Reference position detection light, hysteresis width settings (directly linked to No. of divisions), external alarm reset input (photocoupler)	
Power supply voltage	5 VDC±5 %	
Current consumption	200 mA	
Storage temperature range	–20 to 70 °C	
Operating temperature range	0 to 40 °C	
Dimensions	160(W)×100(D)×28(H) mm	
Mass	Approx. 620 g	

Serial signal interface unit PSU-251/252 SERIES 539



SPECIFICATIONS

Order No.	539-006	539-007		
Model	PSU-251	PSU-252		
Number of axes	1	1		
Input	2-phase sinusoidal signals and standard voltage, reference signal, scale alarm signal. Maximum input frequency: 500 kHz			
Output	Mitsubishi Electric Corporation MR-J4/MR-J3 series High-speed serial data*	Panasonic Corporation Motor Business Unit MINAS-A5, A5L, A5N, A5NL Series* MINAS-A4, A4P, A4N, A4NL Series*		
Number of divisions	400			
Function	Alarm detection: Broken wires, short circuits in the scale and abnormalities. Alarm output: Status data is output through serial communication and the PWR light blinks. Also, the PWR light turns on.			
Power supply voltage	Power supply from the servo amplifier: 5 VDC±5 % External power supply: 5 VDC±5 % Power supply is selected with the shorting link for the terminal block used to supply external power. To choose a servo amplifier or external power supply, please refer to the servo amplifier power specifications (in particular, the maximum supplied current) and the power supply specifications of the scale that is used.			
Current consumption	150 mA (not including the scale)			
Storage temperature range	–20 °C to 70 °C			
Operating temperature range	0 °C to 40 °C			

*Please contact each manufacturer for details of the applicable systems.



• The **PSU-200** splits the sinusoidal signal output by Mitutoyo linear scales into a minimum of four and a maximum of 200 divisions, and converts the signal to a square-wave signal so that NC feedback systems, measurement control devices, etc., can be used with linear scales in order to achieve highly accurate positioning.

- **PSU251** series is a serial signal interface unit for incremental linear scales.
- The interface outputs serial data equivalent to 400 divisions from the sinusoidal signal (according to EIA Standard **RS-422-A**)
- The PSU-251 can be connected to Mitsubishi Electric Corporation's MR-J4/MR-J3 series servo amplifier.
- Since this unit is connected to incremental linear scales, the reference point should be passed through to determine the absolute position.





- Applies the principle of image correlation of a speckle pattern to ultra-precise measurement.
- Simultaneous, non-contact measurement of XY position.
- Nanometer-resolution measurement.
- Suitable for specialized applications such as determining stage positioning repeatability.
- Capable of measuring very small deformation of parts.

2D Image Correlation Encoder MICSYS-SA1 SERIES 549



SPECIFICATIONS

Order No.	549-701	
Model	MICSYS-SA1	
Detection method	Laser speckle image correlation	
Effective range	±100 μm (2D)	
Resolution	1 nm	
Accuracy (20 °C)	±100 nm	
Data update frequency	20 Hz	
Standard accessories	Standard target, Sample software for data correlation (on CD-ROM)	



Mitutoyo

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Refer to the MICSYS Catalog (No. E13001) for more details.

Mitutoyo