

DRO Linear Scales and Counters
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NC Linear Scales
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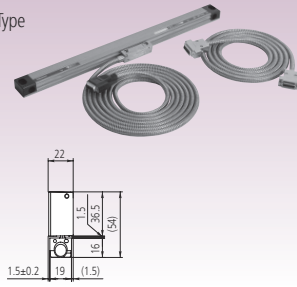


Scale Units
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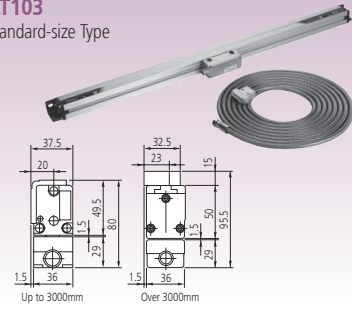


DRO Linear Scales Selection Guide

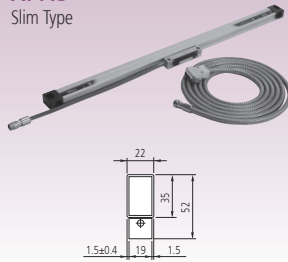
AT715
Absolute Type



AT103
Standard-size Type



AT113
Slim Type



Specifications

Model	AT715	AT103	AT113
Measurement method	Electromagnetic induction system	Photoelectric (transparent linear encoder)	
Light source	—	LED	
Receptor	—	Phototransistor	
Output wave form	—	2-phase sine curves with a phase difference of 90°	
Effective length (for high accuracy type)	100 - 3000mm	1600 - 6000mm (1600 - 2000mm)	100 - 1500mm (100 - 1500mm)
Accuracy* [high accuracy type]	±5μm (Effective length: 100 - 500mm) ±7μm (Effective length: 600 - 1800mm) ±10μm (Effective length: 2000 - 3000mm)	(5+5L _e /1000)μm* ¹ [(3+3L _e /1000)μm]	(5+5L _e /1000)μm [(3+3L _e /1000)μm]
* Excluding quantizing error of ±1 count			
Maximum response speed	50m/min.	120m/min.* ³	120m/min.
Scale reference point	—	At every 50mm interval	
Linear expansion coefficient	—	(8±1)×10 ⁻⁶ /°C	
Power supply	5V±5% DC	5V±5% DC	
Max. current consumption	70mA	70mA* ⁴ (60mA: AT113)	
Operating temperature		0°C to 45°C	
Storage temperature		-20°C to 70°C	
Relative humidity		20 - 80%RH	
Head Cable length	—	—	* ⁶
Sliding force	5N or less	5N or less	
Single cable* ⁵	Standard accessory (refer to individual specifications for the length)		
Dust/water protection level	IP67	IP53	

*1: (5+8L_e/1000)μm for models over 3250mm effective length

*5: Vinyl-coated type single cable and extension cable are available on request.

*3: 50m/min. for models over 3250mm effective length

*6: AT103:0.3m

*4: 140mA for models over 3250mm effective length

DRO Linear Scales AT103

Sealed incremental - full size housing

These linear scales offer : Sturdy construction-high resistance to vibration-protection rating are similar in upright and reclining position

- 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.

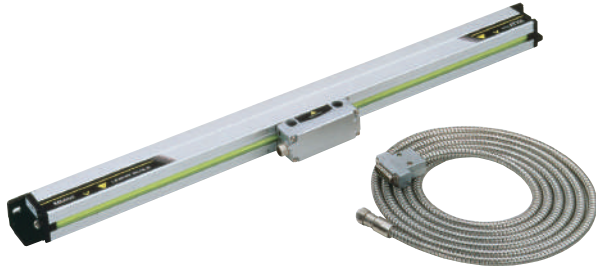


Specifications

Accuracy	(5+5L/1000) μ m L = Effective length (mm)
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Operation temperature	0°C to 45°C
Power supply	5V DC \pm 10%
Cross section	80 x 37,5mm / 95,5 x 37,5mm
Max. drive speed	120 m/min.
Signal period	20 μ m
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213



539-133-30

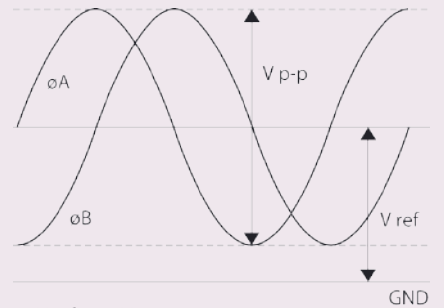
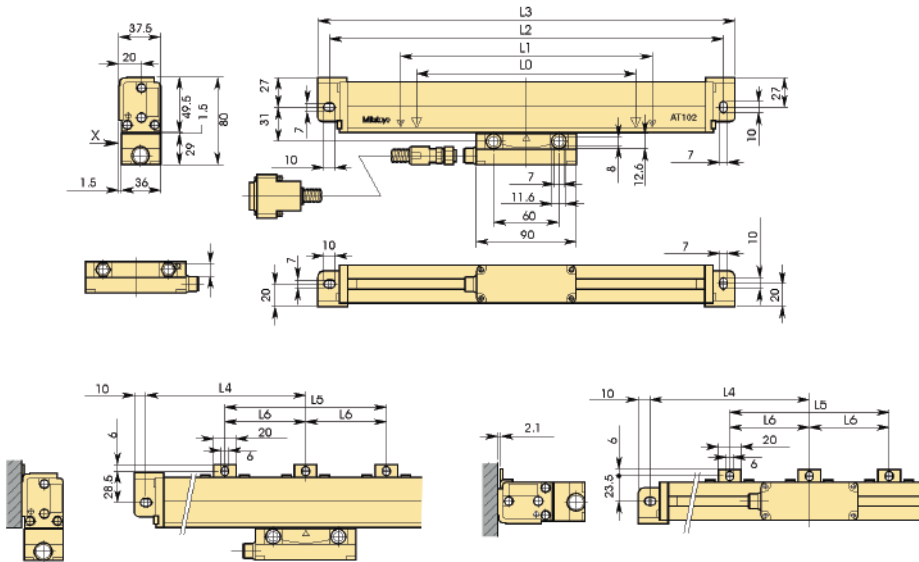
No.	Cable length [m]	Effective Length	L ⁰ [mm]	L ¹ [mm]	L ² [mm]	L ³ [mm]	L ⁴ [mm]	L ⁵ [mm]	L ⁶ [mm]	Mass [kg]
539-133-30	5	1600 mm	1600	1690	1818	1838		610		5,1
539-134-30	5	1700 mm	1700	1790	1918	1938		650		5,3
539-135-30	5	1800 mm	1800	1890	2018	2038		670		5,5
539-136-30	5	2000 mm	2000	2100	2228	2248		740		6
539-137-30	5	2200 mm	2200	2300	2428	2448		800		6,4
539-138-30	7	2400 mm	2400	2500	2628	2648	1314	1300	650	7,1
539-139-30	7	2500 mm	2500	2600	2728	2748	1364	1340	670	7,3
539-140-30	7	2600 mm	2600	2700	2828	2848	1414	1400	700	7,5
539-141-30	7	2800 mm	2800	2900	3028	3048	1514	1500	750	7,9
539-142-30	7	3000 mm	3000	3100	3228	3248	1614	1600	800	8,3



Extension cable

Legend

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



V ref \approx 2.5V
V p-p = 2V
Output waveform

DRO Linear Scales AT103



Specifications

Accuracy	(5+8L/1000) μ m L = Effective length (mm)
Output waveform	Two 90° phased-shifted sinusoidal signals (2Vpp)
Operation temperature	0°C to 45°C
Power supply	5V DC \pm 10%
Cross section	80 x 37,5mm / 95,5 x 37,5mm
Max. drive speed	50 m/min.
Signal period	20 μ m
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213



Extension cable

Legend

L0 Effective length

L1 Travel range

L2 Bore centre distance

L3 Total length

L4-L6 Support bracket position

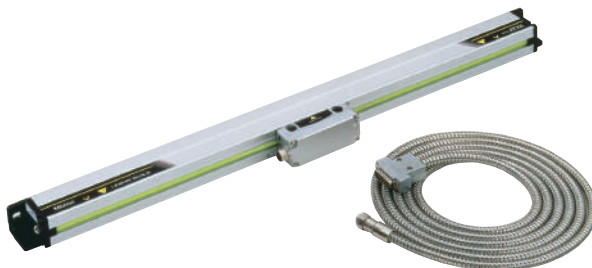


Please refer to the DRO leaflet for more details.

Sealed incremental - full size housing -larger measuring length

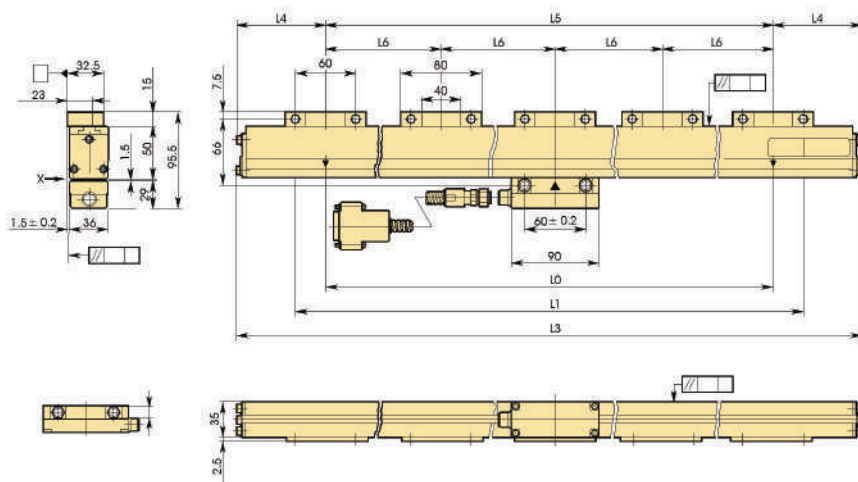
These linear scales offer : Sturdy construction-high resistance to vibration-protection rating are similar in upright and reclining position

- 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.



539-143-30

No.	Cable length [m]	Effective Length	L ⁰ [mm]	L ¹ [mm]	L ³ [mm]	L ⁴ [mm]	L ⁵ [mm]	L ⁶ [mm]	Mass [kg]
539-143-30	10	3250 mm	3250	3350	3470	135	3200	800	10,8
539-144-30	10	3500 mm	3500	3600	3720	160	3400	850	11,4
539-145-30	10	3750 mm	3750	3850	3970	125	3720	930	12
539-146-30	10	4000 mm	4000	4100	4220	110	4000	1000	12,6
539-147-30	10	4250 mm	4250	4350	4470	135	4200	1050	13,2
539-148-30	10	4500 mm	4500	4600	4720	160	4400	1100	13,8
539-149-30	15	4750 mm	4750	4850	4970	85	4800	800	15,2
539-150-30	15	5000 mm	5000	5100	5220	120	4980	830	15,8
539-151-30	15	5250 mm	5250	5350	5470	125	5220	870	16,4
539-152-30	15	5500 mm	5500	5600	5720	130	5460	910	17
539-153-30	15	5750 mm	5750	5850	5970	135	5700	950	17,6
539-154-30	15	6000 mm	6000	6100	6220	110	6000	1000	18,2



DRO Linear Scales AT103 - High Accuracy

Sealed incremental - full size housing - with very high repeatability

These linear scales offer : Sturdy construction-high resistance to vibration-protection rating are similar in upright and reclining position

- 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.

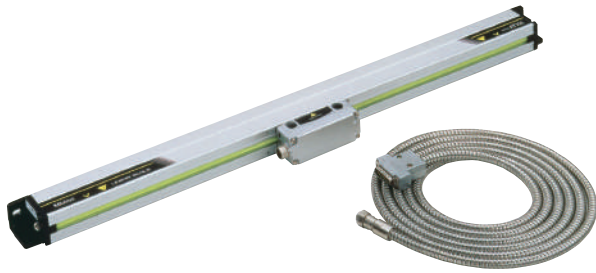


Specifications

Accuracy	(3+3L/1000) μm L = Effective length (mm)
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Cross section	80 x 37,5mm / 95,5 x 37,5mm
Max. drive speed	up to 120 m/min.
Signal period	20 μm
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

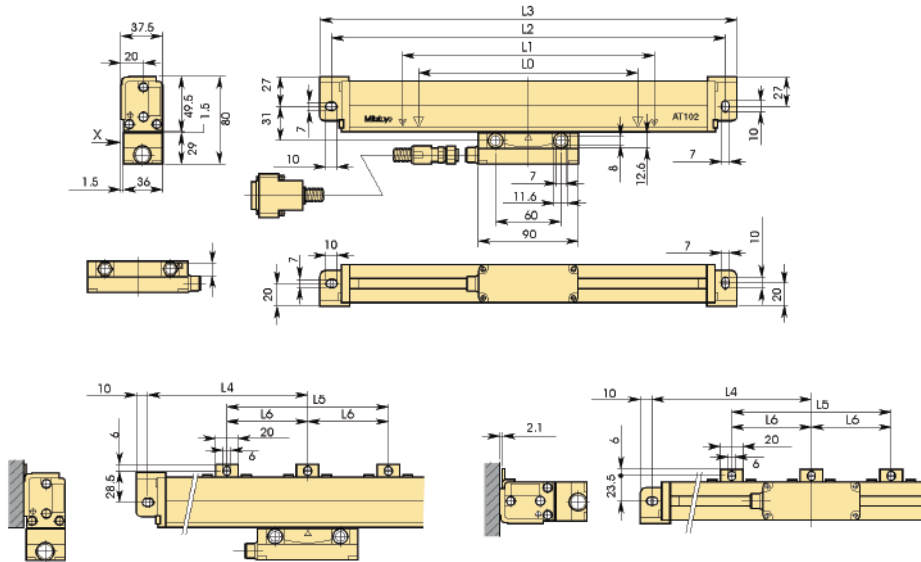


539-133-40

No.	Cable length [m]	Effective Length	L ⁰ [mm]	L ¹ [mm]	L ² [mm]	L ³ [mm]	L ⁵ [mm]	Mass [kg]
539-133-40	5	1600 mm	1600	1690	1818	1838	610	5,1
539-134-40	5	1700 mm	1700	1790	1918	1938	650	5,3
539-135-40	5	1800 mm	1800	1890	2018	2038	670	5,5
539-136-40	5	2000 mm	2000	2100	2228	2248	740	6



Extension cable



Legend

- L⁰ Effective length
- 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

Sealed incremental - slimline scale housing

These linear scales are built for limited installation space

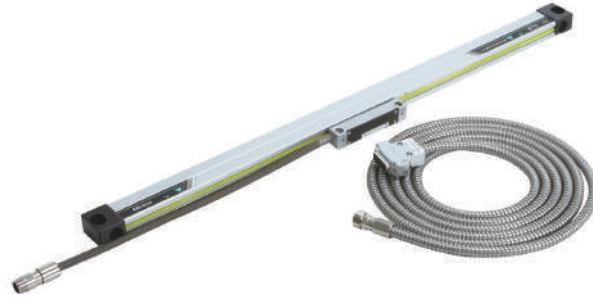
- Glass scale - Zero not coded
- Expansion factor $(8 \pm 1) \times 10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter

Specifications

Accuracy	$(5+5L/1000) \mu m$ L = Effective length (mm)
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Operation temperature	0°C to 45°C
Power supply	5V DC \pm 10%
Cross section	52 x 22mm
Max. drive speed	120 m/min
Signal period	20 μm
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213



539-201-30

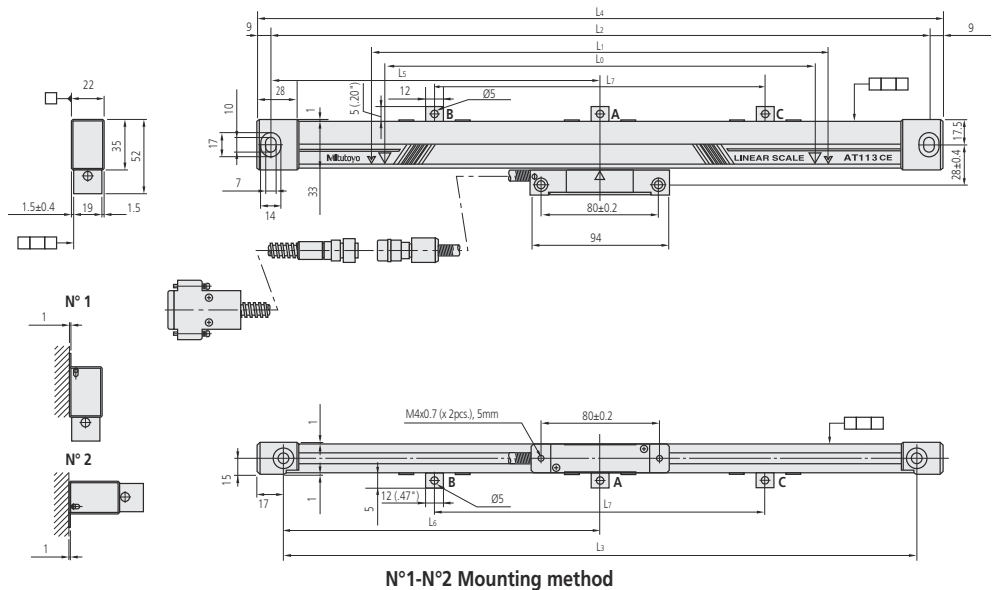
No.	Cable length [m]	Effective Length	L ⁰ [mm]	L ¹ [mm]	L ² [mm]	L ³ [mm]	L ⁴ [mm]	L ⁵ [mm]	L ⁶ [mm]	L ⁷ [mm]	Mass [kg]
539-201-30	3,5	100 mm	100	120	258	242	276				0,9
539-202-30	3,5	150 mm	150	170	308	292	326				0,905
539-203-30	3,5	200 mm	200	220	358	342	376				0,943
539-204-30	3,5	250 mm	250	270	408	392	426				0,981
539-205-30	3,5	300 mm	300	330	468	452	486				1,027
539-206-30	3,5	350 mm	350	380	518	502	536				1,064
539-207-30	3,5	400 mm	400	430	568	552	586				1,102
539-208-30	3,5	450 mm	450	480	618	602	636				1,14
539-209-30	3,5	500 mm	500	540	678	662	696	339	331		1,86
539-211-30	3,5	600 mm	600	640	778	762	796	389	381		1,3
539-213-30	3,5	700 mm	700	740	878	862	896	439	431		1,3
539-215-30	3,5	800 mm	800	840	978	962	996	489	481		1,4
539-216-30	3,5	900 mm	900	940	1078	1062	1096	539	531		1,4
539-217-30	5	1000 mm	1000	1040	1178	1162	1196	589	581		1,9
539-218-30	5	1100 mm	1100	1140	1278	1262	1296			430	1,9
539-219-30	5	1200 mm	1200	1240	1378	1362	1396			460	2
539-220-30	5	1300 mm	1300	1340	1478	1462	1496			490	2,2
539-221-30	5	1400 mm	1400	1440	1578	1562	1596			530	2,2
539-222-30	5	1500 mm	1500	1540	1678	1662	1696			560	2,2

Legend

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



Refer to the DRO System leaflet for more details.



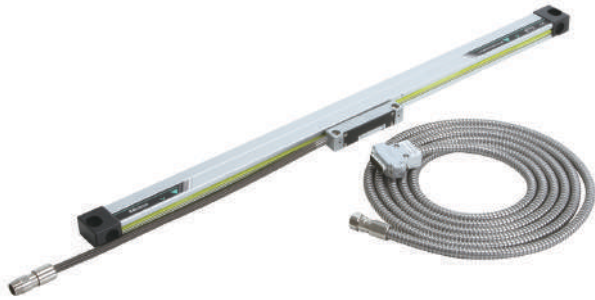
N°1-N°2 Mounting method

DRO Linear Scales AT113 - High Accuracy

Sealed incremental - slimline housing - with very high repeatability

These linear scales are built for limited installation space

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



539-201-40

No.	Cable length [m]	Effective Length	L ⁰ [mm]	L ¹ [mm]	L ² [mm]	L ³ [mm]	L ⁴ [mm]	L ⁵ [mm]	L ⁶ [mm]	L ⁷ [mm]	Mass [kg]
539-201-40	3,5	100 mm	100	120	258	242	276				0,9
539-202-40	3,5	150 mm	150	170	308	292	326				0,905
539-203-40	3,5	200 mm	200	220	358	342	376				0,943
539-204-40	3,5	250 mm	250	270	408	392	426				0,981
539-205-40	3,5	300 mm	300	330	468	452	486				1,027
539-206-40	3,5	350mm	350	380	518	502	536				1,064
539-207-40	3,5	400 mm	400	430	568	552	586				1,102
539-208-40	3,5	450 mm	450	480	618	602	636				1,14
539-209-40	3,5	500 mm	500	540	678	662	696	339	331		1,86
539-211-40	3,5	600 mm	600	640	778	762	796	389	381		1,3
539-213-40	3,5	700 mm	700	740	878	862	896	439	431		1,3
539-214-40	3,5	750 mm	750	780	918	902	936	459	451		1,4
539-216-40	3,5	900 mm	900	940	1078	1062	1096	539	531		1,4
539-217-40	5	1000 mm	1000	1040	1178	1162	1196	589	581		1,9
539-218-40	5	1100 mm	1100	1140	1278	1262	1296		430		1,9
539-219-40	5	1200 mm	1200	1240	1378	1362	1396		460		2
539-220-40	5	1300 mm	1300	1340	1478	1462	1496		530		2,2
539-221-40	5	1400 mm	1400	1440	1578	1562	1596		530		2,2
539-222-40	5	1500 mm	1500	1540	1678	1662	1696		560		2,2

Specifications

Accuracy	$(3+3L/1000) \mu\text{m}$ L = Effective length (mm)
Operation temperature	0°C to 45°C
Power supply	5V DC \pm 10%
Cross section	52 x 22mm
Max. drive speed	120 m/min
Signal period	20 μs
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

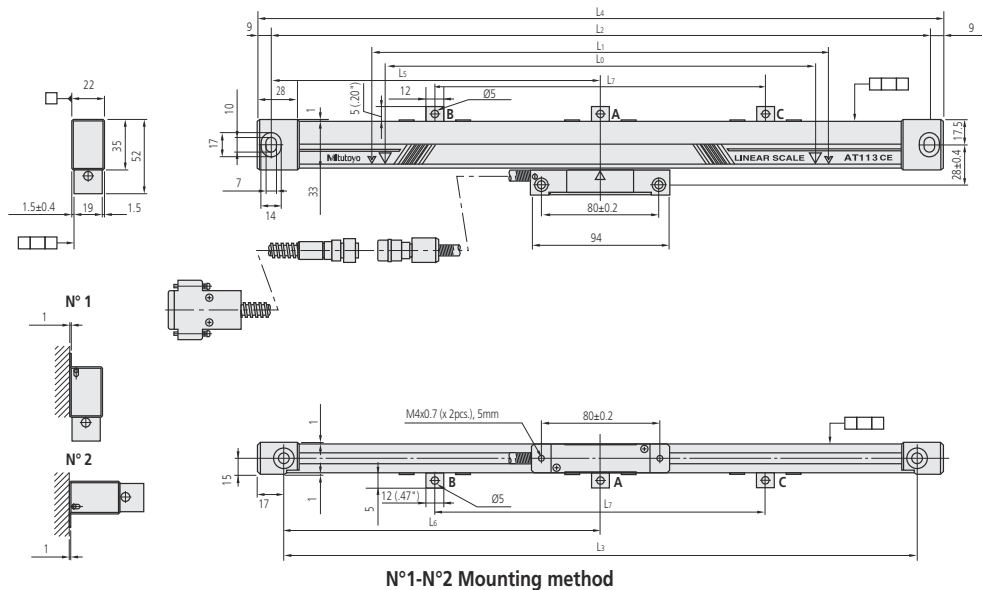
No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

Legend

- L0 Effective length
- 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 ABS Linear Scales AT715

Sealed Absolute - IP 67 protection - medium scale housing - specific for new and old manual machine

This linear scale is based on electro magnetic induction principle thus offering you high environment protection IP level, in the mean time reference point is not necessary after each power on.

Only compatible with KA series display units.



Specifications

Measuring method	Electromagnetic induction system
Accuracy	100 to 500 mm $\pm 5 \mu\text{m}$; 600 to 1800 mm $\pm 7 \mu\text{m}$; 2000 to 3000 mm $\pm 10 \mu\text{m}$
Operation temperature	0-45 °C
Power supply	5V DC $\pm 10\%$
Cross section	54 x 22mm
Max. drive speed	50 m/min
Signal period	20 μm

Optional accessories

No.	Description
09AAB674A	Extension Cable 2m, for AT715
09AAB674B	Extension Cable 5m, for AT715
09AAB674C	Extension Cable 7m, for AT715
174-185D	Linear Scale Counter KA-213
174-183D	Linear Scale Counter KA-212



539-807N

No.	Cable length [m]	Effective Length	L ¹ [mm]	L ² [mm]	L ³ [mm]	L ⁴ [mm]	L ⁵ [mm]	L ⁶ [mm]	L ⁷ [mm]	L ⁸ [mm]	Mass [kg]
539-801N	3,5	100 mm	120	258	242	278					0,7
539-802N	3,5	150 mm	170	308	292	328					0,75
539-803N	3,5	200 mm	220	358	342	378					0,8
539-804N	3,5	250 mm	270	408	392	428					0,85
539-805N	3,5	300 mm	330	468	452	488					0,9
539-806N	3,5	350 mm	380	518	502	538					0,95
539-807N	3,5	400 mm	430	568	552	588					1
539-808N	3,5	450 mm	480	618	602	638					1,05
539-809N	3,5	500 mm	540	678	662	698	339	331			1,1
539-811N	3,5	600 mm	640	778	762	798	389	381			1,2
539-813N	3,5	700 mm	740	878	862	898	439	431			1,3
539-814N	3,5	750 mm	780	918	902	938	459	451			1,35
539-815N	3,5	800 mm	840	978	962	998	489	481			1,4
539-816N	3,5	900 mm	940	1078	1062	1098	539	531			1,5
539-817N	5	1000 mm	1040	1178	1162	1198	589	581			1,65
539-818N	5	1100 mm	1140	1278	1262	1298	639	631	430		1,75
539-819N	5	1200 mm	1240	1378	1362	1398	689	681	460		1,85
539-820N	5	1300 mm	1340	1478	1462	1498	739	731	490		1,95
539-821N	5	1400 mm	1440	1578	1562	1598	789	781	520		2,05
539-822N	5	1500 mm	1540	1678	1662	1698	839	831	550		2,15
539-823N	5	1600 mm	1640	1778	1762	1798	889	881	580	215	2,25
539-824N	5	1700 mm	1740	1878	1862	1898	939	931	610	230	2,35
539-825N	5	1800 mm	1840	1978	1962	1998	989	981	640	280	2,45
539-860N	5	2000 mm	2040	2178	2162	2198	1089	1081	740		
539-861N	5	2200 mm	2240	2378	2362	2398	1189	1181	840		2,85
539-862N	7	2400 mm	2440	2578	2562	2598	1289	1281	940	520	3,05
539-863N	7	2500 mm	2540	2678	2662	2698	1339	1331	970	540	3,15
539-864N	7	2600 mm	2640	2778	2762	2798	1389	1381	1000	560	3,25
539-865N	7	2800 mm	2840	2978	2962	2998	1489	1481	1100	500	3,45
539-866N	7	3000 mm	3040	3178	3162	3198	1589	1581	1200	530	3,65

2 m extension cable is attached to eff. length ≥ 2400 mm

Legend

L0 Effective length

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-200 Counter

DRO counter for Linear Scales

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

- Can be used as a "standard counter" or a "lathe counter" by modifying parameters.
- Downsizing, weight saving and multiple function have been realized.
- Sub display for easy operation.
- Text data can be output using the optional USB interface.
- The optional external interface RS-232C enables connection to a PC and a printer.



174-183D



174-185D

No.	Axes	Mass
174-183D	2	1.25 kg
174-185D	3	1.33 kg

Functions	DRO counter for Linear Scales
Diameter display	●
1/2 calculation	●
mm/inch conversion	●
Bolt-hole circle machining	●
Scale reference points	●
Linearity error compensation	●
Zero approach function (Incremental mode)	●
Addition of 2-scale data	●
Coordinate system switching	●
Error message	●
Lower digit blanking out	●
Measurement direction setting	●
Memory backup	●
Pitch machining	●
Resolution setting	●
Smoothing	●

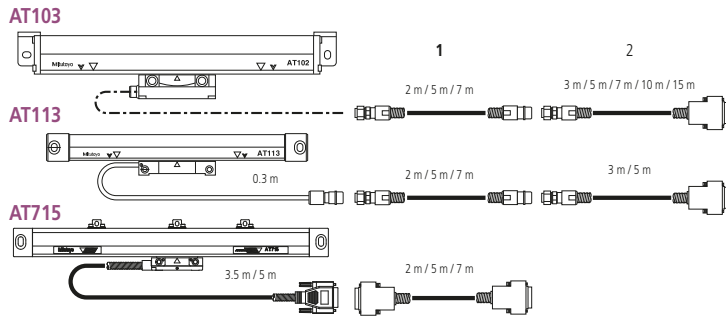
Specifications

Display	7-segment, 8-digit + sign + 8-character alphabet LED display
Resolution	With AT100 Series: 0,05 - 0,0001 mm With AT715: 0,01 - 0,001 mm
Dimensions (WxDxH)	300 x 70 x 167 mm
Operation temperature	0°C to 45°C
Macro functions	Rectangular drilling and round milling newly added
Main features	Feed speed display; taper machining function; tool data; multipoint compensation; scale check function; calculation function
Output (optional)	RS-232C / USB

Optional accessories

No.	Description
06ACB393	Adapter C KA - LGF (OP)
06ACB913	Adapter A KA - LGF
06ACF941	Load/Zero Cable f. KA
06AET993	USB/RS 232 C code out unit
09EAA094	RS-232C Cable, DP1-VR/-VA to KA-Counter, 1m, 25 Pin Connector
63AAA108	RS-232C Signal Cable, D-Sub-25-D-Sub-9, 2m
936553	Remote Switch
937179T	Footswitch for SPC
937328	Extern load box
965004	RS 232 C Extern Load Switch

DRO Extension cables selection guide



Overview of NC Linear Scales System

	Model	Reference point	Absolute function	Output signal cycle of sinusoidal signal (μm)	Signal unit	No. of divisions	Resolution (μm)	Maximum response speed*1 (mm/s)	Minimum edge interval*2 (ns)	
Separate Type Linear Scales	ST36B ST36C (ST36A) (ST36D)	Yes	—	4	— (PSU-200)	400 200 80	0.01 0.02 0.05	70 150 360	125	
	ST46-EZA	Yes	—	20	—	40	0.1	720	100	
						400	0.05	450		
						200	0.1	900		
	ABS ST700	—	Yes	—	—	—	40	0.5	2600	—
							20	1	2600	
							4	5	2600	
	Assembly Type Linear Scales	ABS ST1300	—	Yes	—	—	—	0.001	8000*3	—
		AT113	Yes	—	20	PSU-200	200	0.1	800	125
							100	0.2	1600	
80							0.25	2000		
40							0.5			
20							1			
10							2			
8							2.5			
4		5								
AT211		Yes	—	20	—	200	0.1	710	125	
	100					0.2	1400			
	40					0.5	2000			
	20					1				
	8					2.5				
4	5									
ABS AT1100	—	Yes	—	—	—	—	0.05	3000	—	
ABS AT1300	—	Yes	—	—	—	—	0.001	3000	—	
							0.01			
							0.05			

*1 Maximum response speed of pulse output type uses the logical value (IC specification) with a margin of about 10%, and is limited depending on the scale response speed and resolution.

*2 For information on minimum edge interval, see "Explanation of Terms" on page 74.

The guaranteed value for minimum edge interval is +0%, -10%.

For some models, values other than shown above can also be selected.

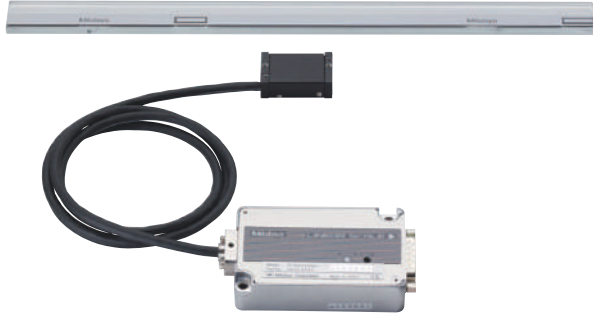
*3 It depends on the interface.

NC Linear Scales ST36

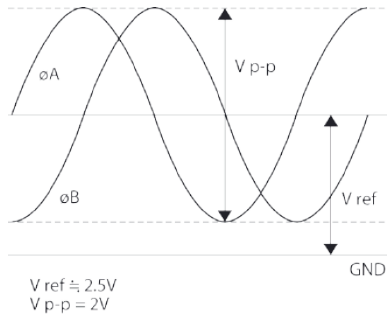
Open scales with Sine & Square-Wave Output

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

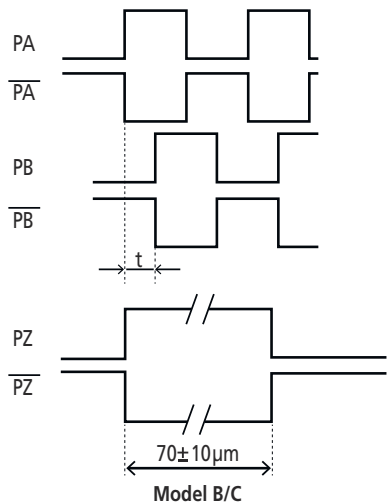
- High reliability with stable signal output.
- Outputs two-phase sinusoidal signal (signal pitch 4 μ m) and two-phase square-wave signal simultaneously.
- Outputs two-phase sinusoidal signal (signal pitch 4 μ m) and two-phase square-wave signal simultaneously.
- You are provided with a compact interface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



ST36



Model A/C



Model B/C

Specifications

Accuracy	10 - 300 mm $\pm 0,5 \mu m$ 350 - 500 mm $\pm 1 \mu m$ 600 - 1000 mm $\pm 2 \mu m$ 1100 - 3000 mm $\pm 2 \mu m/m$
Output waveform	Two 90° phase-shifted sinusoidal signals 2Vpp (Model A and C) Two 90° phase-shifted square-wave signals (Model B and C) RS422 Line Driver
Scale reference points	10 -75 mm Center point scale 100 - 3000 mm every 50 mm
Max. drive speed	1200 mm/sec
Power supply	5V DC $\pm 10\%$
Signal period	8 μm
Cross section	22 x 14,9 mm
Resolution	0,01; 0,02; 0,05; 0,1 μm
Signal period	4 μm



Refer to the NC System leaflet for more details

NC Linear Scales ST46-EZA

Specifications

Effective range	10 to 3000 mm
Output signal	Type B: 2-phase square wave signals, reference point pulse, external reset input 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)
Operating temperature / humidity	0 to 40°C, 20 to 80% RH (no condensation)
Storage temperature / humidity	-20 to 60°C, 20 to 80% RH (no condensation)
Power supply voltage	5VDC \pm 5%
Cross section	12,5 x 12,1mm / 17,1 x 14mm / 20 x 9,33mm (depends on the type)
Maximum response speed	2,6 m/s (at sine wave amplitude -3dB)
Internal expansion coefficient	(8 \pm 1) x 10 ⁻⁶ °C
Scale specifications	Grating pitch 20 μ m, Material: metal tape (Glas on request)

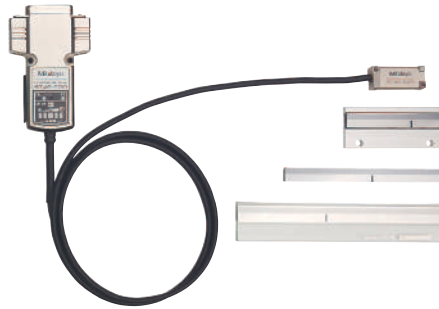


Refer to the NC System leaflet for more details

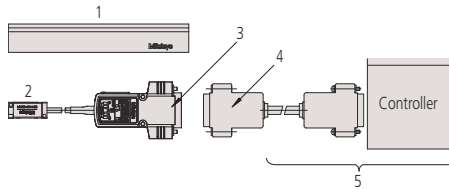
Fotoelectric metal tape linear scales

- Grating pitch 20 μ m
- Zero reference not coded
- Output signal sinusoidal 2Vpp or square wave signal(RS 422) sticky or double sided tape version
- LED display function anomalie

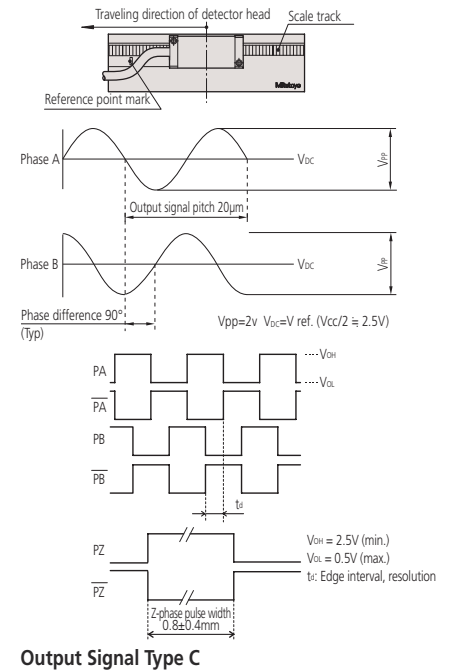
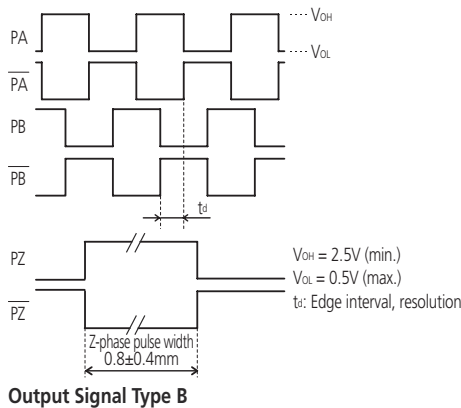
No.	Detection Method
ST46EZA Type B	Reflective photoelectric linear encoder
ST46EZA Type C	Reflective photoelectric linear encoder



ST46-EZA



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



NC Linear Scales ABS ST700

Electromagnetic induction Absolute Scale

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.



Specifications

Detection Method	Electromagnetic induction
Effective Length	100mm - 3000 mm (3200mm - 6000mm optional)
Accuracy	(5+5L/1000)µm
Response speed	5000 mm/s
Applicable Interfaces	Fanuc, Mitsubishi, Yaskawa, Panasonic, Mitutoyo
Cross section	28 x 18,6mm
Resolution	0,1 µm



Refer to the NC System leaflet for more details

NC Linear Scales ABS ST1300

High-speed, high-resolution Absolute Tape Scales

Long, fast and diverse connectivity

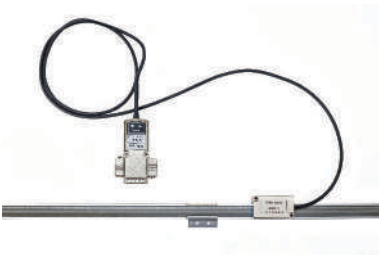
- Realizes a 12m maximum effective length, 8-m/s max. response speed and 1nm minimum resolution.
- Extensive interface compatibility. See specifications below for details.
- Outstanding robustness against contamination compared to earlier photoelectric types achieved using a new detection principle.
- Choice between double-sided tape, fixed-ends and center mounting methods
- Signal validation program facilitates mounting adjustment and maintenance



Double-ended mounting type



Double-sided tape mounting type



Center mounting type

Specifications

Max. response speed	8 m/s (Varies according to the interface)
Detection Method	Optical
Maximum effective range	12 m (depending on mounting type)
Accuracy	10 µm/m (± 5µm)
Cross section	22 x 30,1 or 22 x 25,45 mm (depending on mounting type)
Min. resolution	1 nm / 10 nm
Scale specifications	Metal tape
Applicable Interfaces	FANUC, Mitsubishi, Yaskawa, Panasonic, Mitutoyo



Refer to the NC System leaflet for more details

NC Linear Scales AT211

Specifications

Accuracy	100 to 1500 mm (3+3L/1000) μm (standard type) (2+2L/1000) μm (high-accuracy type) 500 to 1500 mm (3+3L/1000) μm L = Effective range (mm)
Output waveform	Two 90° phase-shifted quadrature signals (RS422) Differential line driver
Power supply voltage	5V DC \pm 10%
Cross section	58 x 20mm / 52 x 22mm
Max. drive speed	up to 120 m/min
Resolution	0,1; 0,5; 1 μm
Signal period	20 μm



Refer to the NC System leaflet for more details

Sealed incremental - slimline size housing - high traverse speed-with very high repeatability

IP53

- 20 μm grating pitch-output signal square wave (RS 422)
- suggested resolution 1 - 0,5 μm
- high traverse speed
- Accuracy - standard version: from 100 up to 1500 mm \pm 3 μm
- Accuracy - high repeatability from 100 up to 500 mm \pm 2 μm
- Protection from IP 53 up to IP 64 (pressure device connection)



AT211A



AT211B

NC Linear Scales ABS AT1100

Electromagnetic induction Absolute Scale

- New design to avoid infiltration of coolant and dust using a rubber highly resistant to coolant attack for highest reliability
- Widest sensor-to-scale air gap for electromagnetic induction scales of 0,4 mm - 4 times wider than conventional optical or electromagnetic encoder
- Increased air gap reduces the likelihood of failure due to the accumulation of contaminants and is one of the world's largest to be found in a machine tool scale
- De facto standard frame multipoint mounting method has been adopted to provide high resistance to vibration and shock
- 6 times higher accuracy than previous scales due to improved signal processing technology
- Compatible with the high-speed serial interface from leading machine-tool companies, allowing direct connection to an NC controller



NC Linear Scales ABS AT1300

Absolute Scale Unit (Slim Type)

- High-rigidity (S-type) and high-accuracy (H-type) version available
- Outstanding resistance to contamination compared to conventional optical types by using a new detection principle
- Features a new coolant-proof design incorporating a high-performance rubber seal to provide higher reliability in the harsh factory environment.
- Delivers high accuracy and the outstanding resolution of 0,001 μm , the best-in-class in absolute scales.
- Allows space-saving design thanks to a slim form. (AT500-S and AT500-H are compatible with each other in installation.)
- Supports the interfaces of various manufacturers allowing a variety of system configurations



S-Type



H-Type

ABSOLUTE®

Specifications

Detection Method	Electromagnetic induction
Maximum effective range	3040 mm
Accuracy	3+5L/1000) μm L= 140 to 2040 mm (5+5L/1000) μm L= 2240 to 3040 mm
Cross section	85 x 37mm
Response speed	3 m/s
Resolution	0.05 μm
Compatible interface	FANUC, Mitsubishi, Siemens, Mitutoyo



Refer to the NC System leaflet for more details

ABSOLUTE®

Specifications

Detection Method	Optical, Transmission double telecentric
Maximum effective range	100 to 2200 mm S-Type/ 100 to 1000mm H-Type
Cross section	66 x 23 mm / 24 x 65 mm
Response speed	3000 mm/s
Resolution	0,001/0,01/0,05 μm
Compatible interface	Fanuc, Mitsubishi, Mitutoyo



Refer to the NC System leaflet for more details

Horizontal ABSOLUTE Scale Coolant Proof IP66



Functions	
ORIGIN (ABS-Zero)	●
Low voltage alarm	●
Data output	●

Specifications

Repeatability	0,01 mm
Max. response speed	Unlimited

Optional accessories

No.	Description
02AZD790A	U-WAVE-T Connection Cable A, with Data Button IP Caliper Type
05CZA624	Digimatic Cable with Data Button IP Type, 1 m, Caliper Type
05CZA625	Digimatic Cable with Data Button IP Type, 2 m, Caliper Type
06AFM380A	USB Input Tool Direct (Digimatic USB), Digi/Digi2, With Data Button IP Caliper Type

Consumable spares

No.	Description
938882	Battery SR44 1,5 V

You can use this scale unit in adverse environments with water and cutting oil due to its 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“.



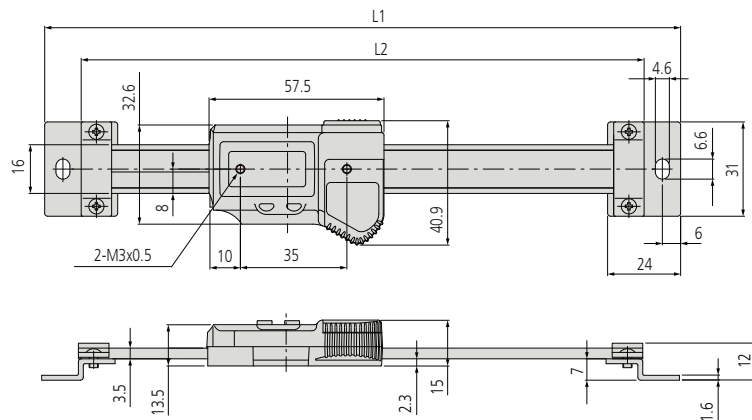
572-600



572-601

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	Mass [kg]
572-600	0 - 100	0,03 mm	209	185	0,39
572-601	0 - 150	0,03 mm	259	235	0,41
572-602	0 - 200	0,03 mm	311	287	0,43



Horizontal ABSOLUTE Scale Standard

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.

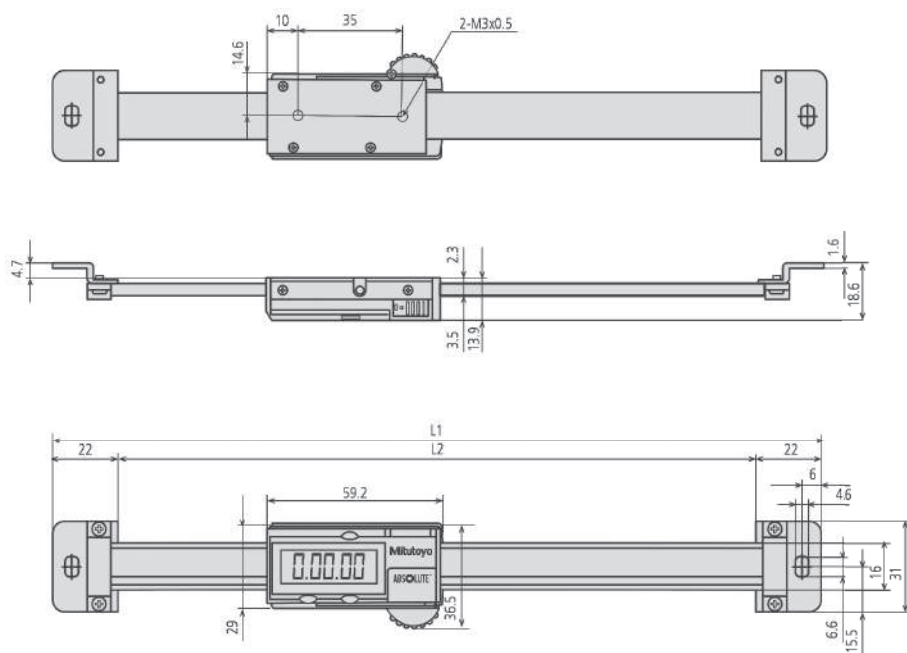
ABSOLUTE®



572-202-30

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	Mass [kg]
572-200-30	0 - 100	0,03 mm	209	185	0,23
572-201-30	0 - 150	0,03 mm	259	235	0,25
572-202-30	0 - 200	0,03 mm	311	287	0,27
572-203-10	0 - 300	0,04 mm	444	420	0,37



100-200 mm

Functions	
ON/OFF	●
Low voltage alarm	●
Data output	●
ORIGIN	●

Specifications

Max. response speed | Unlimited

Optional accessories

No.	Description
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
959143	Data Hold Unit
959149	Digimatic Cable, Straight, Data Button, 1 m
959150	Digimatic Cable, Straight, Data Button, 2 m

Consumable spares

No.	Description
938882	Battery SR44 1,5 V

Horizontal ABSOLUTE Scale Measurement Direction Switching

ABSOLUTE®

Functions	
ON/OFF	●
DATA (output with cable) / HOLD (display value)	●
Low voltage alarm	●
Data output	●
ORIGIN	●

Specifications

Max. response speed Unlimited

Optional accessories

No.	Description
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m

Consumable spares

No.	Description
938882	Battery SR44 1,5 V

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.

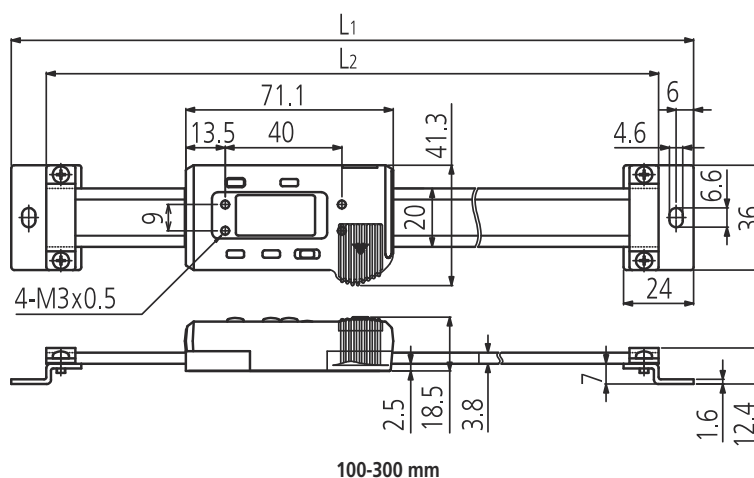


572-461

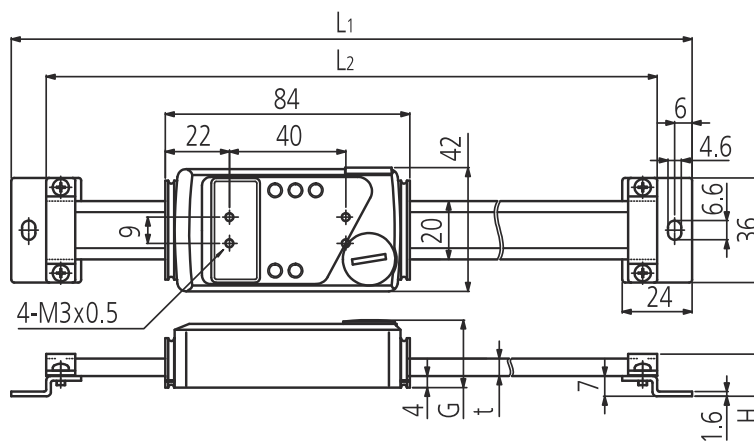
Metric

Without diameter function, with reversible counting direction

No.	Range [mm]	Accuracy	t [mm]	L1 [mm]	L2 [mm]	H [mm]	Mass [kg]
572-460	0 - 100	0,03 mm		244	220		0,25
572-461	0 - 150	0,03 mm		294	270		0,28
572-462	0 - 200	0,03 mm		344	320		0,31
572-463	0 - 300	0,04 mm		444	420		0,37
572-464	0 - 450	0,04 mm	6	594	570	14,6	0,76
572-465	0 - 600	0,05 mm	6	774	750	14,6	0,9
572-466	0 - 800	0,06 mm	10	974	950	18,6	1,71
572-467	0 - 1000	0,07 mm	10	1174	1150	18,6	2,04



100-300 mm



450-1000 mm

Horizontal ABSOLUTE Scale Diameter Function

ABSOLUTE®

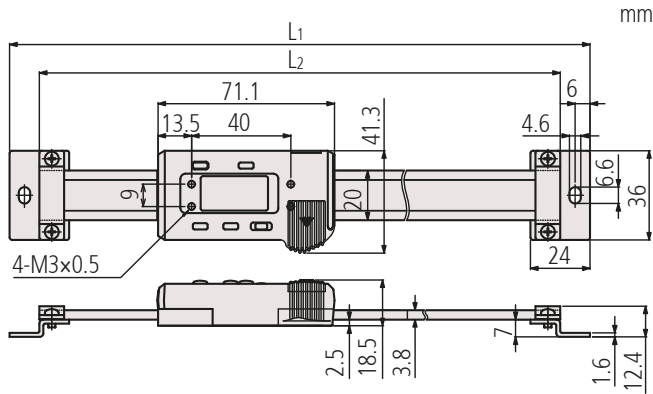
- The ZERO point is set only once and is stored as the ABSOLUTE ZERO point until the next battery replacement
- You can make the highest precision measurements even at the highest drive speed.



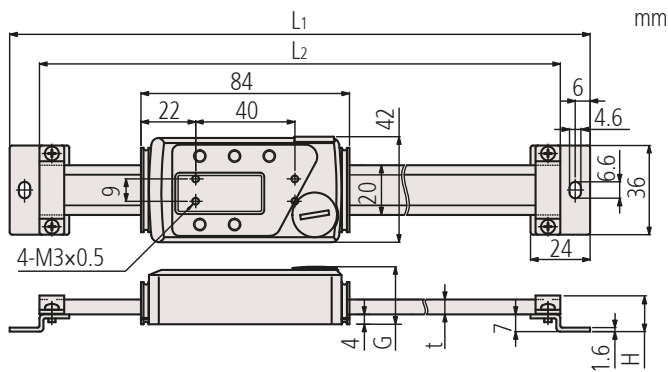
572-483-10

Metric Horizontal multi-function type with diameter displaying function

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	H [mm]	t [mm]	Mass [kg]
572-480-10	0 - 100	0,03 mm	244	220			0,25
572-481-10	0 - 150	0,03 mm	294	270			0,28
572-482-10	0 - 200	0,03 mm	344	320			0,31
572-483-10	0 - 300	0,04 mm	444	420			0,37
572-484-10	0 - 450	0,04 mm	594	570	14,6	6	0,76
572-485-10	0 - 600	0,05 mm	774	750	14,6	6	0,9
572-486-10	0 - 800	0,06 mm	974	950	18,6	10	1,71
572-487-10	0 - 1000	0,07 mm	1174	1150	17,8	10	2,04



100-300 mm



450-1000 mm

Functions	
ON/OFF	●
DATA (output with cable) / HOLD (display value)	●
Low voltage alarm	●
Data output	●
Diameter function	●
ORIGIN	●

Specifications

Max response speed Unlimited

Optional accessories

No.	Description
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m

Consumable spares

No.	Description
938882	Battery SR44 1,5 V

Vertical ABSOLUTE Scale Standard

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.

Functions	
ON/OFF	●
Low voltage alarm	●
Data output	●
ORIGIN	●

Specifications

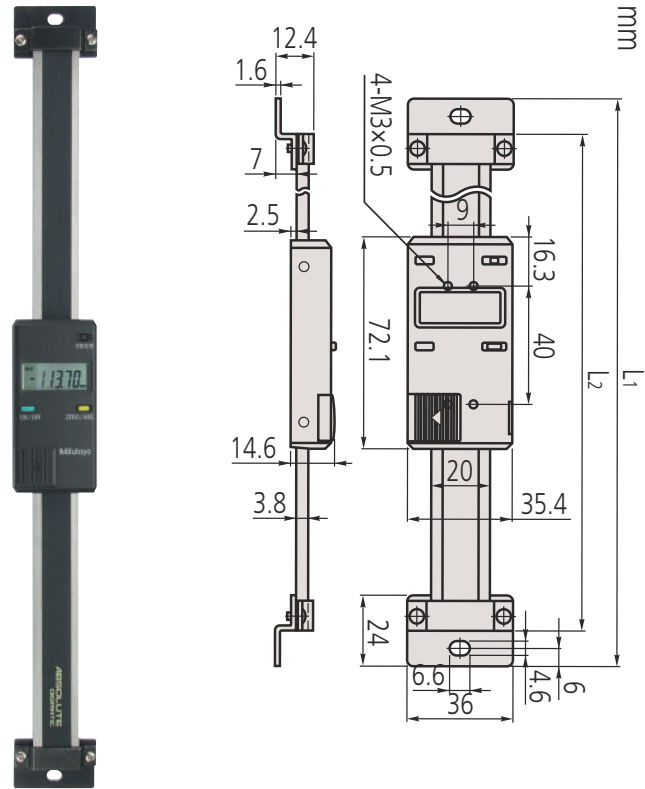
Max. response speed Unlimited

Optional accessories

No.	Description
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
959143	Data Hold Unit
959149	Digimatic Cable, Straight, Data Button, 1 m
959150	Digimatic Cable, Straight, Data Button, 2 m

Consumable spares

No.	Description
938882	Battery SR44 1,5 V



572-302-10

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	Mass [kg]
572-300-10	0 - 100	0,03 mm	244	220	0,25
572-301-10	0 - 150	0,03 mm	294	270	0,28
572-302-10	0 - 200	0,03 mm	344	320	0,31
572-303-10	0 - 300	0,04 mm	444	420	0,37

Vertical ABSOLUTE Scale Measurement Direction Switching

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.

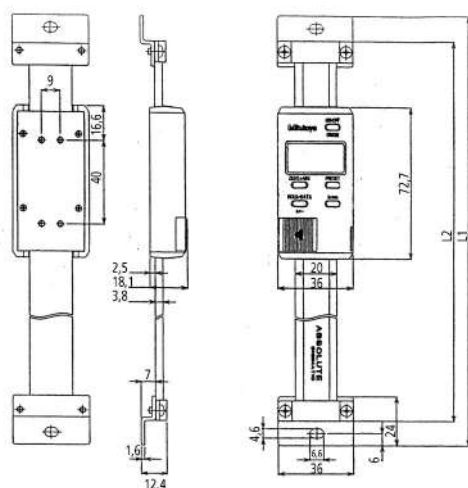
ABSOLUTE®



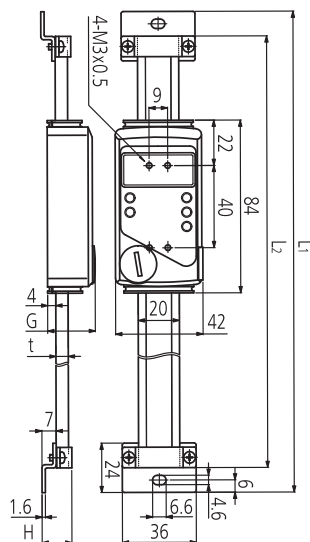
572-560

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	H [mm]	t [mm]	Mass [kg]
572-560	0 - 100	0,03 mm	244	220			0,25
572-561	0 - 150	0,03 mm	294	270			0,28
572-562	0 - 200	0,03 mm	344	320			0,31
572-563	0 - 300	0,04 mm	444	420			0,37
572-564	0 - 450	0,04 mm	594	570	14,6	6	0,76
572-565	0 - 600	0,05 mm	774	750	14,6	6	0,9
572-566	0 - 800	0,06 mm	974	950	18,6	10	1,71
572-567	0 - 1000	0,07 mm	1174	1150	18,6	10	2,04



100-300 mm



450-1000 mm

Functions	
ORIGIN (ABS-Zero)	●
ON/OFF	●
DATA (output with cable) / HOLD (display value)	●
Data output	●

Specifications

Max. response speed | Unlimited

Optional accessories

No.	Description
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m

Consumable spares

No.	Description
938882	Battery SR44 1,5 V

Vertical ABSOLUTE Scale Diameter Function

ABSOLUTE®

Functions	
ON/OFF	●
DATA (output with cable) / HOLD (display value)	●
Low voltage alarm	●
Data output	●
Diameter function	●
ORIGIN	●

Specifications

Max. drive speed Unlimited

Optional accessories

No.	Description
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m

Consumable spares

No.	Description
938882	Battery SR44 1,5 V

This unit has an ABSOLUTE capacitive-type scale.

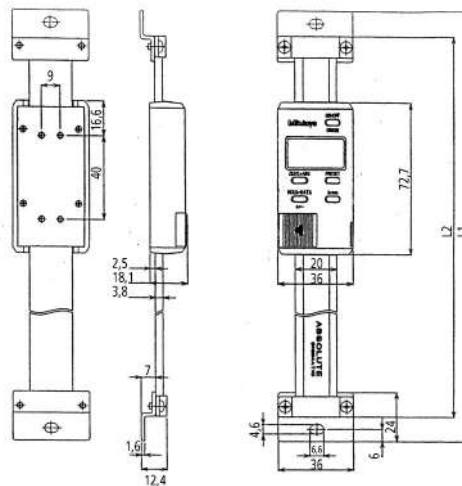
- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- The display has large characters, making it easy to read.
- Diameter measurement function is included.



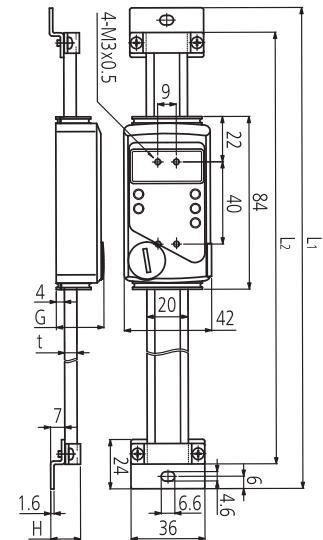
572-580

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	H [mm]	t [mm]	Mass [kg]
572-580-10	0 - 100	0,03 mm	244	220			0,25
572-581-10	0 - 150	0,03 mm	294	270			0,28
572-582-10	0 - 200	0,03 mm	344	320			0,31
572-583-10	0 - 300	0,04 mm	444	420			0,37
572-584-10	0 - 450	0,04 mm	594	570	14,6	6	0,76
572-585-10	0 - 600	0,05 mm	774	750	14,6	6	0,9
572-586-10	0 - 800	0,06 mm	974	950	18,6	10	1,71
572-587-10	0 - 1000	0,07 mm	1174	1150	18,6	10	2,04



100-300 mm



450-1000 mm