

Scale Units
Page 419



Linear Scale
Page 427



NC-Scales
Page 440



Horizontal ABSOLUTE Scale Coolant Proof IP66

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)	71,00
05CZA625	Digimatic cable with data switch (2 m)	80,00
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	6,00

Series 572 - Horizontal

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

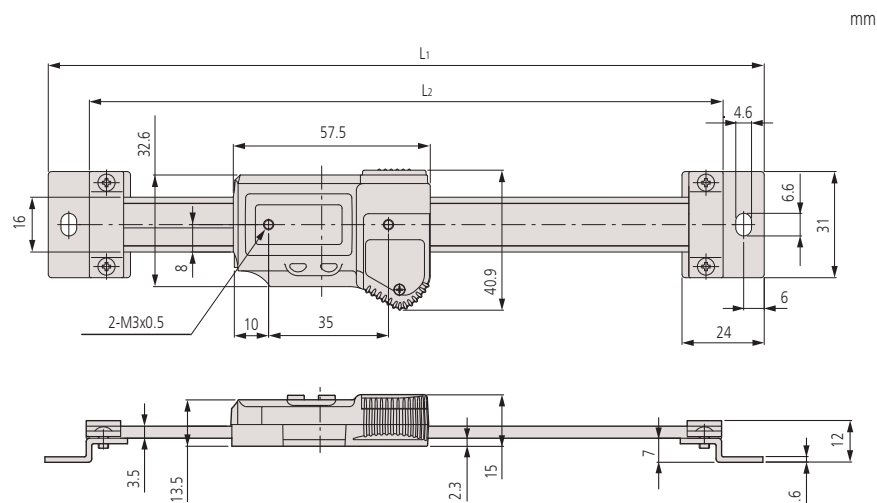
- Specially designed output cables are developed to maintain the water resistant structure.
- You will have no overspeed error since the ABSOLUTE scale does not depend on counting scale graduations.
- Once an absolute zero (origin) point is set, the Digimatic Scale Unit shows the absolute distance from this point when it is powered on, rather than „0“.



572-601

Metric

No.	Range	Accuracy	L1 [mm]	L2 [mm]	Mass [g]	Price [€]
572-600	0-100 mm	0,03 mm	209	185	390	260,00
572-601	0-150 mm	0,03 mm	259	235	410	276,00
572-602	0-200 mm	0,03 mm	311	287	430	328,00



Horizontal ABSOLUTE Scale Standard

Series 572

This unit has an ABSOLUTE capacitive-type scale.

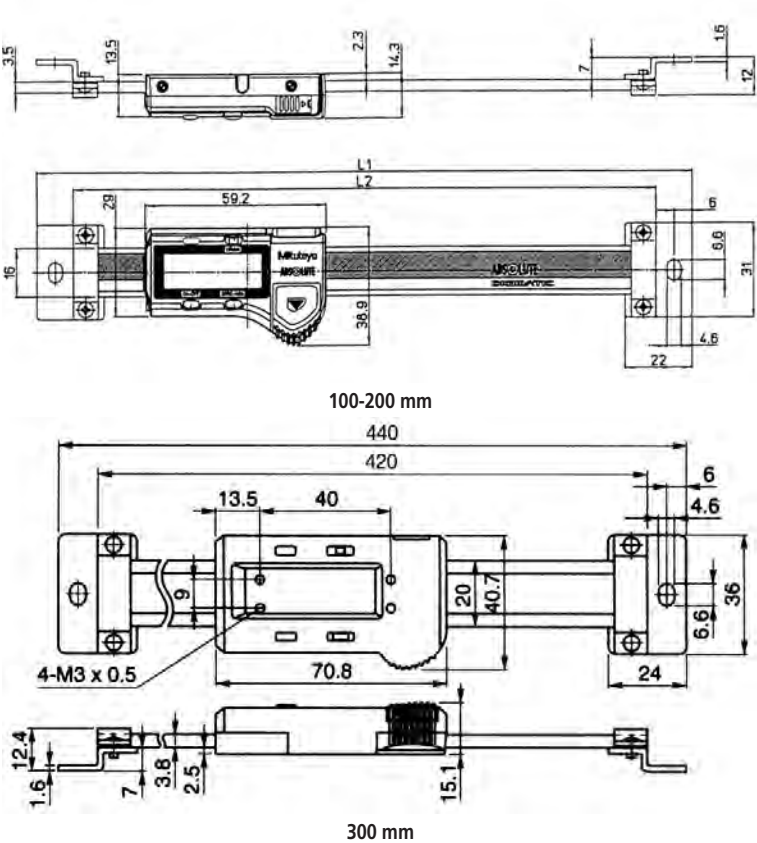
- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- You can make the highest precision measurements even at the highest drive speed.
- The display has large characters, making it easy to read.



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	228,00
572-201-20	0-150 mm	0,03 mm	259	235	250	239,00
572-202-20	0-200 mm	0,03 mm	311	287	270	276,00
572-203-10	0-300 mm	0,04 mm	444	420	370	478,00



ABSOLUTE®

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)	44,00
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	6,00

Horizontal ABSOLUTE Scale Measurement Direction Switching

ABSOLUTE®

Series 572

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

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

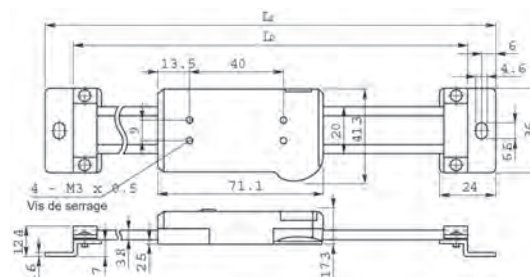
Consumable spares

No.	Description	Price €
938882	Battery SR44	6,00

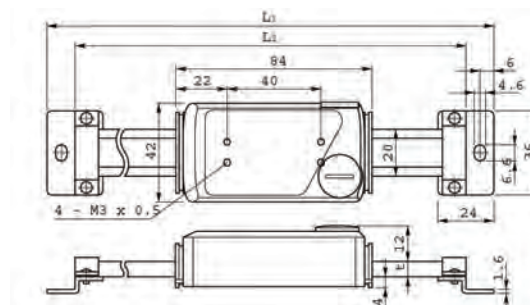
Metric

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	419,00
572-461	0-150 mm	0,03 mm	294	270	280	488,00
572-462	0-200 mm	0,03 mm	344	320	310	541,00
572-463	0-300 mm	0,04 mm	444	420	370	615,00
572-464	0-450 mm	0,04 mm	594	570	760	695,00
572-465	0-600 mm	0,05 mm	774	750	900	806,00
572-466	0-800 mm	0,06 mm	974	950	1710	1342,00
572-467	0-1000 mm	0,07 mm	1174	1150	2040	1507,00



100-300 mm



450-1000 mm

Horizontal ABSOLUTE Scale Diameter Function

Series 572

- 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.

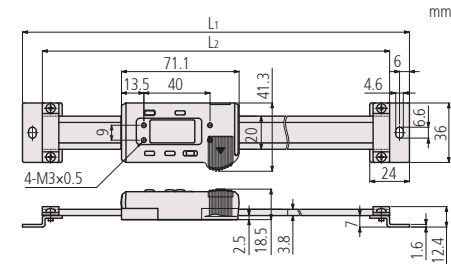
ABSOLUTE®



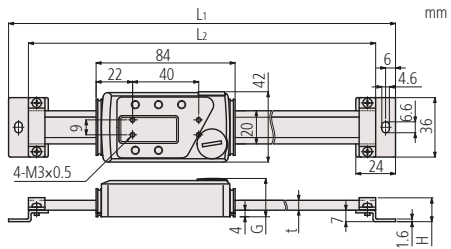
572-483-10

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	419,00
572-481-10	0-150 mm	0,03 mm	294	270		280	488,00
572-482-10	0-200 mm	0,03 mm	344	320		310	541,00
572-483-10	0-300 mm	0,04 mm	444	420		370	615,00
572-484-10	0-450 mm	0,04 mm	594	570	6	760	695,00
572-485-10	0-600 mm	0,05 mm	774	750	6	900	806,00
572-486-10	0-800 mm	0,06 mm	974	950	10	1710	1342,00
572-487-10	0-1000 mm	0,07 mm	1174	1150	10	2040	1507,00



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 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	6,00

Vertical ABSOLUTE Scale Standard

ABSOLUTE®

Series 572

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

Specifications

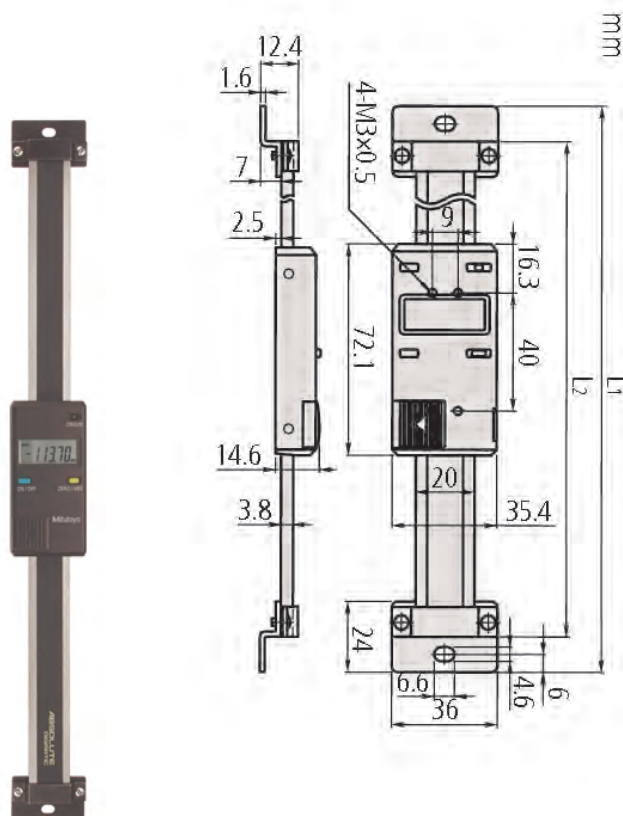
Accuracy	Refer to the list of specifications. (excluding quantizing error)
Max. response speed	Unlimited
Digital step	0,01 mm
Delivered	One battery

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)	44,00
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	6,00



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	286,00
572-301-10	0-150 mm	0,03 mm	294	270	280	297,00
572-302-10	0-200 mm	0,03 mm	344	320	310	308,00
572-303-10	0-300 mm	0,04 mm	444	420	370	493,00



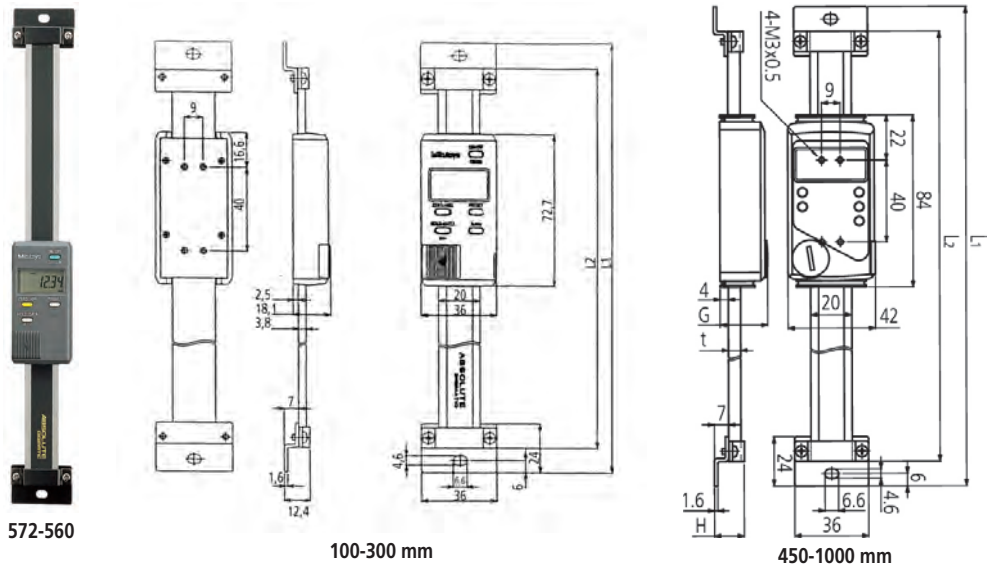
Vertical ABSOLUTE Scale Measurement Direction Switching

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.
- The display has large characters, making it easy to read.
- Measurement direction switching function is included.



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	419,00
572-561	0-150 mm	0,03 mm	294	270			280	488,00
572-562	0-200 mm	0,03 mm	344	320			310	541,00
572-563	0-300 mm	0,04 mm	444	420			370	615,00
572-564	0-450 mm	0,04 mm	594	570	23,2	6	760	695,00
572-565	0-600 mm	0,05 mm	774	750	23,2	6	900	806,00
572-566	0-800 mm	0,06 mm	974	950	27,2	10	1710	1342,00
572-567	0-1000 mm	0,07 mm	1174	1150	27,2	10	2040	1507,00



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	6,00

Vertical ABSOLUTE Scale Diameter Function

ABSOLUTE®

Series 572

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.

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

Specifications

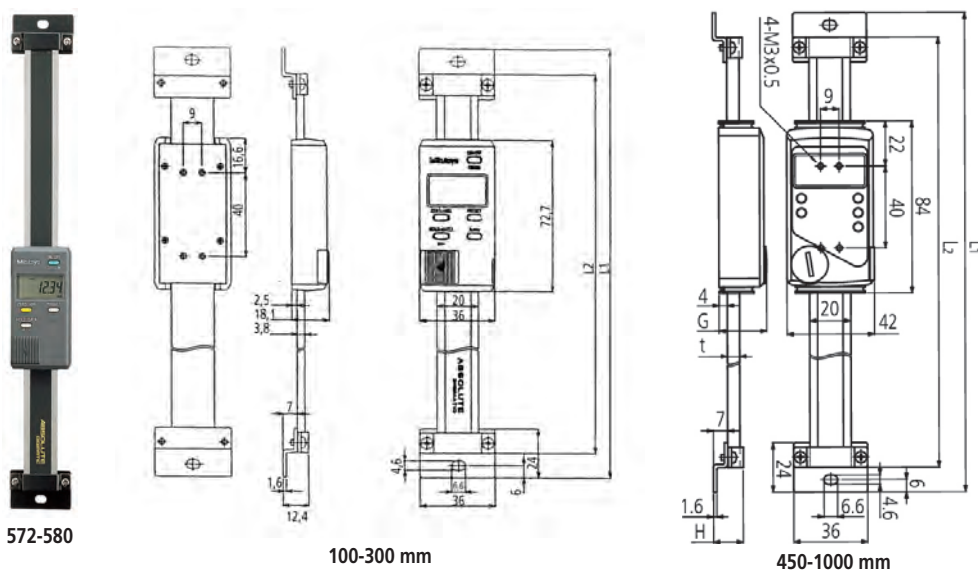
Accuracy	Refer to the list of specifications (excluding quantizing error)
Digital step	0,01 mm
Max. drive speed	Unlimited
Delivered	One battery

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	6,00



572-580

100-300 mm

450-1000 mm

Metric

No.	Range	Accuracy	L1 [mm]	L2 [mm]	H [mm]	G [mm]	t [mm]	Mass [g]	Price [€]
572-580-10	0-100 mm	0,03 mm	244	220				250	419,00
572-581-10	0-150 mm	0,03 mm	294	270				280	488,00
572-582-10	0-200 mm	0,03 mm	344	320				310	541,00
572-583-10	0-300 mm	0,04 mm	444	420				370	615,00
572-584-10	0-450 mm	0,04 mm	594	570	14,6	23,2	6	760	695,00
572-585-10	0-600 mm	0,05 mm	774	750	14,6	23,2	6	900	806,00
572-586-10	0-800 mm	0,06 mm	974	950	18,6	27,2	10	1710	1342,00
572-587-10	0-1000 mm	0,07 mm	1174	1150	18,6	27,2	10	2040	1507,00



DRO Scale Unit Selection Guide



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]	±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]
* Excluding quantizing error of ±1 count					
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)×10 ⁻⁶ /°C		
Power supply	5V±5% DC		5V±5% DC		
Max. current consumption	70mA	70mA*1 (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

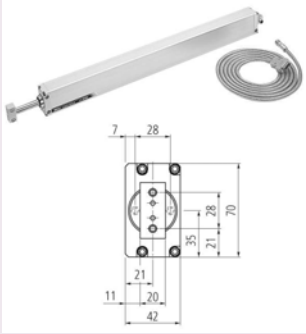
*1: (5+5L/1000)μm for models over 1020mm effective length *2: not available for AT116 *3: 50m/min. for models over 3250mm effective length *4: 140mA for models over 3250mm effective length
*5: vinyl-coated type (single cable and stainless cable are available on request) *6: AT103 0.3m AT116: Without head cable



AT 116
Economy and Slim Type



AT 112-F
Super Slim Type



AT 181
Plunger Type

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

Specifications

Effective range (L0)	100-3000 mm
Accuracy	(5+5L/1000) µm 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
Dust/water protection level	IP53
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%

Optional accessories

No.	Description	Price €
09AAA033A	Extension cable (2 m)	197,00
09AAA033B	Extension cable (5 m)	271,00
09AAA033C	Extension cable (7 m)	313,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00



Extension cable

Legend

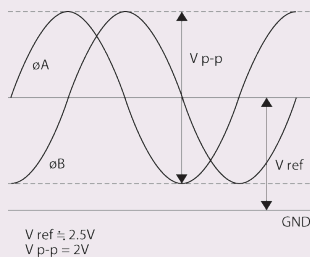
L0 Effective range

L1 Travel range

L2 Bore centre distance

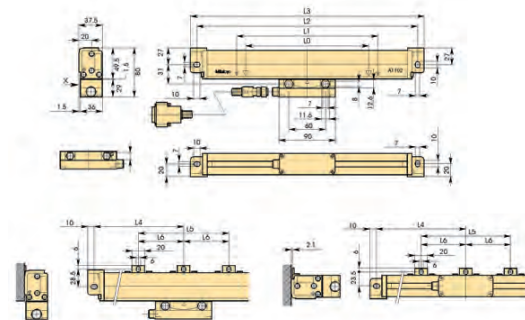
L3 Total length

L4-L6 Support bracket position



Output waveform

No.	Cable length [m]	Effective range	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	Mass [kg]	Price [€]
539-111-30	3	100 mm	120	248	268				1,5	377,00
539-112-30	3	150 mm	170	298	318					387,00
539-113-30	3	200 mm	220	348	368					398,00
539-114-30	3	250 mm	270	398	418					409,00
539-115-30	3	300 mm	330	458	478					424,00
539-116-30	3	350 mm	380	508	528					435,00
539-117-30	3	400 mm	430	558	578					446,00
539-118-30	3	450 mm	480	608	628					461,00
539-119-30	3	500 mm	540	668	688					472,00
539-121-30	3	600 mm	650	778	798				2,6	493,00
539-123-30	3	700 mm	760	888	908				2,8	515,00
539-124-30	3	750 mm	810	938	958				2,9	541,00
539-125-30	3	800 mm	860	988	1008				3	562,00
539-126-30	3	900 mm	960	1088	1108				3,3	584,00
539-127-30	5	1000 mm	1060	1188	1208	594			3,7	605,00
539-128-30	5	1100 mm	1160	1288	1308	644			4	626,00
539-129-30	5	1200 mm	1260	1388	1408	694			4,2	647,00
539-130-30	5	1300 mm	1360	1488	1508	744			4,4	679,00
539-131-30	5	1400 mm	1460	1588	1608	794			4,6	700,00
539-132-30	5	1500 mm	1560	1688	1708	844			4,8	721,00
539-133-30	5	1600 mm	1690	1818	1838		610		5,1	1135,00
539-134-30	5	1700 mm	1790	1918	1938		650		5,3	1199,00
539-135-30	5	1800 mm	1890	2018	2038		670		5,5	1273,00
539-136-30	5	2000 mm	2100	2228	2248		740		6	1358,00
539-137-30	5	2200 mm	2300	2428	2448		800		6,4	1448,00
539-138-30	7	2400 mm	2500	2628	2648	1314	1300	650	7,1	1544,00
539-139-30	7	2500 mm	2600	2728	2748	1364	1340	670	7,3	1639,00
539-140-30	7	2600 mm	2700	2828	2848	1414	1400	700	7,5	1735,00
539-141-30	7	2800 mm	2900	3028	3048	1514	1500	750	7,9	1825,00
539-142-30	7	3000 mm	3100	3228	3248	1614	1600	800	8,3	1920,00



DRO LINEAR SCALES AT103

Series 539 - Incremental sealed Standard - Long stroke 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 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	3523,00
539-144-30	10	3500 mm	3600	3720	160	3400	850	11,4	3735,00
539-145-30	10	3750 mm	3850	3970	125	3720	930	12	3947,00
539-146-30	10	4000 mm	4100	4220	110	4000	1000	12,6	4159,00
539-147-30	10	4250 mm	4350	4470	135	4200	1050	13,2	4371,00
539-148-30	10	4500 mm	4600	4720	160	4400	1100	13,8	4584,00
539-149-30	15	4750 mm	4850	4970	85	4800	800	15,2	4796,00
539-150-30	15	5000 mm	5100	5220	120	4980	830	15,8	5008,00
539-151-30	15	5250 mm	5350	5470	125	5220	870	16,4	5220,00
539-152-30	15	5500 mm	5600	5720	130	5460	910	17	5432,00
539-153-30	15	5750 mm	5850	5970	135	5700	950	17,6	5644,00
539-154-30	15	6000 mm	6100	6220	110	6000	1000	18,2	5857,00



Specifications

Effective range (L0)	3250-6000 mm
Accuracy	(5+8L/1000) µm 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
Dust/water protection level	IP53
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%

Optional accessories

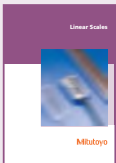
No.	Description	Price €
09AAA033A	Extension cable (2 m)	197,00
09AAA033B	Extension cable (5 m)	271,00
09AAA033C	Extension cable (7 m)	313,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00



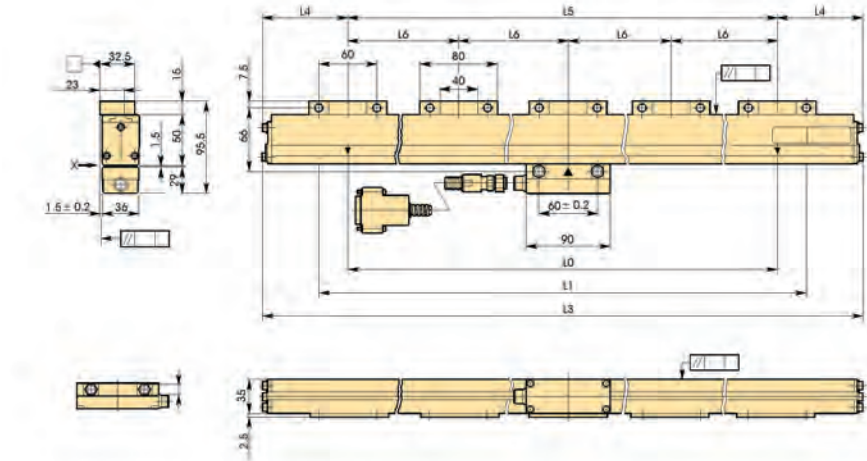
Extension cable

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.



DRO LINEAR SCALES AT103 - High Accuracy

Specifications

Effective range (L0)	100-2000 mm
Accuracy	(3+3L/1000) µm L = Effective range (mm)
Scale reference points	every 50 mm
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Dust/water protection level	IP53
Signal period	20 µm
Operation temperature	0°C to 45°C
Max. drive speed	up to 120 m/min.
Power supply	5V DC ± 10%

Optional accessories

No.	Description	Price €
09AAA033A	Extension cable (2 m)	197,00
09AAA033B	Extension cable (5 m)	271,00
09AAA033C	Extension cable (7 m)	313,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00



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.

Series 539 - Incremental sealed Standard type

This linear scale gives you enhanced vibration resistance and durability.

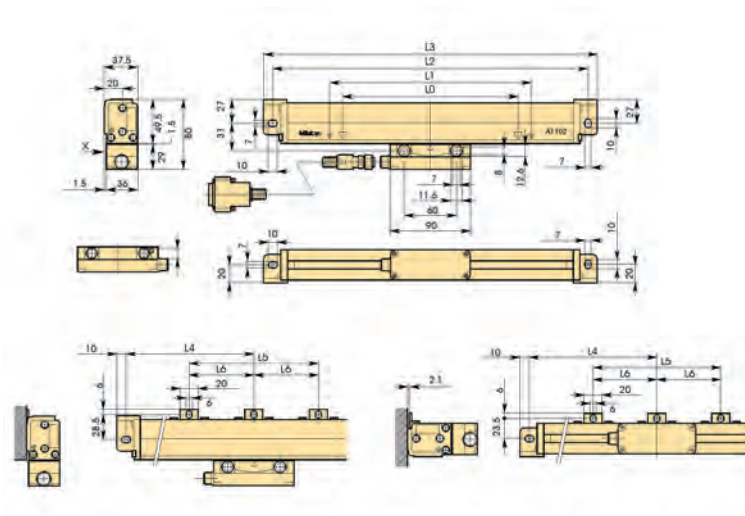
This version of the AT103 offers you the following benefits:

- 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	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	Mass [kg]	Price [€]
539-111-40	3	100 mm	120	248	268			1,5	490,00
539-112-40	3	150 mm	170	298	318				504,00
539-113-40	3	200 mm	220	348	368				518,00
539-114-40	3	250 mm	270	398	418				531,00
539-115-40	3	300 mm	330	458	478				552,00
539-116-40	3	350 mm	380	508	528				565,00
539-117-40	3	400 mm	430	558	578				579,00
539-118-40	3	450 mm	480	608	628				600,00
539-119-40	3	500 mm	540	668	688				614,00
539-121-40	3	600 mm	650	778	798			2,6	642,00
539-123-40	3	700 mm	760	888	908			2,8	670,00
539-124-40	3	750 mm	810	938	958			2,9	703,00
539-125-40	3	800 mm	860	988	1008			3	731,00
539-126-40	3	900 mm	960	1088	1108			3,3	758,00
539-127-40	5	1000 mm	1060	1188	1208	594		3,7	786,00
539-128-40	5	1100 mm	1160	1288	1308	644		4	814,00
539-129-40	5	1200 mm	1260	1388	1408	694		4,2	842,00
539-130-40	5	1300 mm	1360	1488	1508	744		4,4	883,00
539-131-40	5	1400 mm	1460	1588	1608	794		4,6	911,00
539-132-40	5	1500 mm	1560	1688	1708	844		4,8	938,00
539-133-40	5	1600 mm	1690	1818	1838		610	5,1	1475,00
539-134-40	5	1700 mm	1790	1918	1938		650	5,3	1559,00
539-135-40	5	1800 mm	1890	2018	2038		670	5,5	1655,00
539-136-40	5	2000 mm	2100	2228	2248		740	6	1766,00



Series 539 - Incremental Sealed Slim Line type

-
- A long, thin, yellow and black industrial cable, likely a fiber optic or data cable, with a coiled section and a connector. The cable is shown against a white background.

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	488,00
539-202-30	3,5	150 mm	170	308	292	326					509,00
539-203-30	3,5	200 mm	220	358	342	376					530,00
539-204-30	3,5	250 mm	270	408	392	426					552,00
539-205-30	3,5	300 mm	330	468	452	486					573,00
539-206-30	3,5	350 mm	380	518	502	536					605,00
539-207-30	3,5	400 mm	430	568	552	586					637,00
539-208-30	3,5	450 mm	480	618	602	636					668,00
539-209-30	3,5	500 mm	540	678	662	696	339	331			721,00
539-211-30	3,5	600 mm	640	778	762	796	389	381		1,3	775,00
539-213-30	3,5	700 mm	740	878	862	896	439	431		1,3	827,00
539-214-30	3,5	750 mm	780	918	902	936	459	451		1,4	881,00
539-215-30	3,5	800 mm	840	978	962	996	489	481		1,4	933,00
539-216-30	3,5	900 mm	940	1078	1062	1096	539	531		1,4	987,00
539-217-30	5	1000 mm	1040	1178	1162	1196	589	581		1,9	1039,00
539-218-30	5	1100 mm	1140	1278	1262	1296			430	1,9	1103,00
539-219-30	5	1200 mm	1240	1378	1362	1396			460	2	1167,00
539-220-30	5	1300 mm	1340	1478	1462	1496			490	2,2	1231,00
539-221-30	5	1400 mm	1440	1578	1562	1596			530	2,2	1295,00
539-222-30	5	1500 mm	1540	1678	1662	1696			560	2,2	1358,00



Effective range (L0)	100-1500 mm
Accuracy	(5+5L/1000) μm 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
Dust/water protection level	IP53
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%

No.	Description	Price €
09AAA033A	Extension cable (2 m)	197,00
09AAA033B	Extension cable (5 m)	271,00
09AAA033C	Extension cable (7 m)	313,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00

- 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 SCALES AT113 - High Accuracy

Specifications

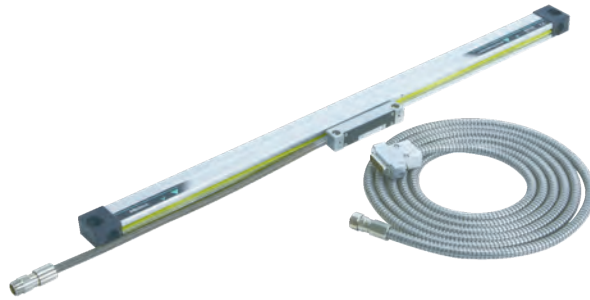
Effective range (L0)	100-1500 mm
Accuracy	(3+3L/1000) µm L = Effective range (mm)
Max. drive speed	120 m/min
Signal period	20 µm
Scale reference points	every 50 mm
Dust/water protection level	IP53
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%

Optional accessories

No.	Description	Price €
09AAA033A	Extension cable (2 m)	197,00
09AAA033B	Extension cable (5 m)	271,00
09AAA033C	Extension cable (7 m)	313,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00

Series 539 - Incremental Sealed Slim Line type

- 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 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	541,00
539-202-40	3,5	150 mm	170	308	292	326					562,00
539-203-40	3,5	200 mm	220	358	342	376					584,00
539-204-40	3,5	250 mm	270	408	392	426					605,00
539-205-40	3,5	300 mm	330	468	452	486					626,00
539-206-40	3,5	350 mm	380	518	502	536					658,00
539-207-40	3,5	400 mm	430	568	552	586					690,00
539-208-40	3,5	450 mm	480	618	602	636					721,00
539-209-40	3,5	500 mm	540	678	662	696	339	331			775,00
539-211-40	3,5	600 mm	640	778	762	796	389	381		1,3	881,00
539-213-40	3,5	700 mm	740	878	862	896	439	431		1,3	933,00
539-214-40	3,5	750 mm	780	918	902	936	459	451		1,4	987,00
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	1093,00
539-217-40	5	1000 mm	1040	1178	1162	1196	589	581		1,9	1145,00
539-218-40	5	1100 mm	1140	1278	1262	1296			430	1,9	1209,00
539-219-40	5	1200 mm	1240	1378	1362	1396			460	2	1273,00
539-220-40	5	1300 mm	1340	1478	1462	1496			530	2,2	1337,00
539-221-40	5	1400 mm	1440	1578	1562	1596			530	2,2	1401,00
539-222-40	5	1500 mm	1540	1678	1662	1696			560	2,2	1464,00

Legend

L0 Effective range

L1 Travel range

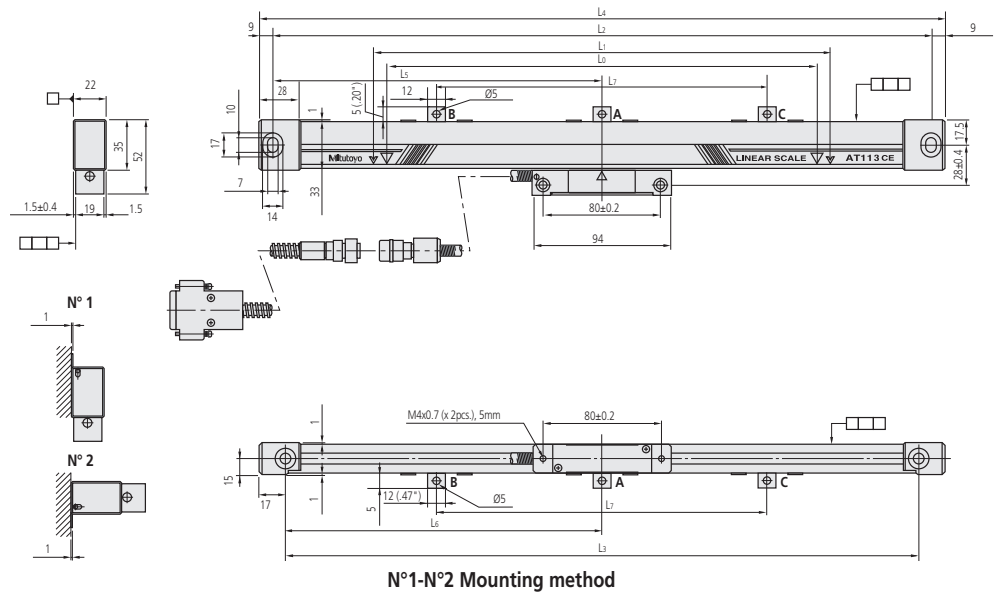
L2-L3 Mount interval

L4 Overall length

L5-L7 Support bracket position



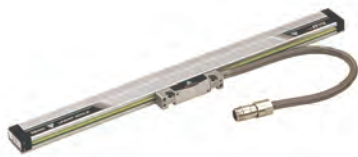
Refer to the DRO System leaflet for more details.



DRO LINEAR SCALE AT112 - High Accuracy

Series 539 - Super Slim

- Extra-slim construction
- 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

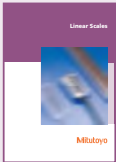
Effective range (L0)	50-1020 mm
Accuracy	$(3+3L/1000) \mu m$ L = Effective range (mm)
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Max. drive speed	up to 72 m/min
Signal period	20 μm
Scale reference points	every 50 mm
Dust/water protection level	IP53
Operation temperature	0°C to 45°C
Power supply	5V DC $\pm 10\%$
Delivered	Mounting set

High accuracy

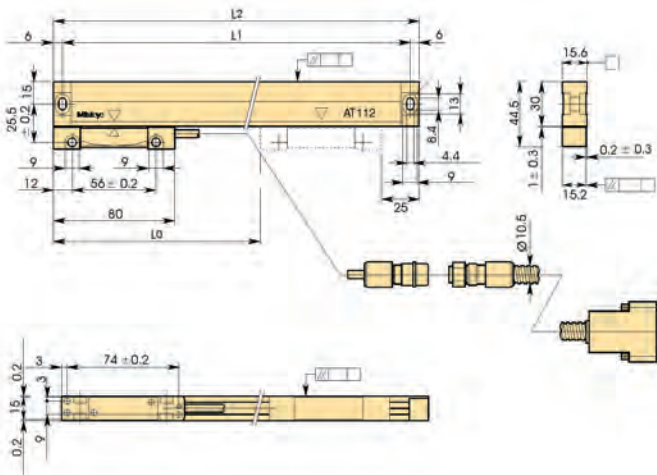
No.	Cable length [m]	Effective range	L ¹ [mm]	L ² [mm]	Mass [kg]	Price [€]
539-251-10	3	50 mm	143	155	0,72	610,00
539-252-10	3	70 mm	163	175	0,74	610,00
539-253-10	3	120 mm	213	225	0,8	610,00
539-254-10	3	170 mm	263	275	0,85	658,00
539-255-10	3	220 mm	313	325	0,9	658,00
539-256-10	3	270 mm	363	375	0,95	658,00
539-257-10	3	320 mm	413	425	1	679,00
539-258-10	3	370 mm	463	475	1,05	700,00
539-259-10	3	420 mm	513	525	1,1	727,00
539-260-10	3	470 mm	563	575	1,15	764,00
539-261-10	3	520 mm	613	625	1,2	801,00
539-262-10	3	570 mm	663	675	1,25	838,00
539-263-10	3	620 mm	713	725	1,3	881,00
539-264-10	3	670 mm	763	775	1,35	923,00
539-265-10	3	720 mm	813	825	1,4	965,00
539-266-10	3	770 mm	863	875	1,45	1008,00
539-267-10	3	820 mm	913	925	1,5	1061,00
539-268-10	3	920 mm	1013	1025	1,56	1135,00
539-269-10	3	1020 mm	1113	1125	1,62	1209,00

Optional accessories

No.	Description	Price €
09AAA033A	Extension cable (2 m)	197,00
09AAA033B	Extension cable (5 m)	271,00
09AAA033C	Extension cable (7 m)	313,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00



Refer to the DRO System leaflet for more details.



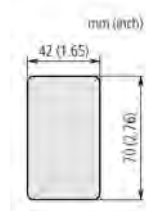
Legend
L0 Effective range
L1 Mount interval
L2 Overall length

DRO LINEAR SCALES AT181 Plunger Type

Series 539 - Incremental Sealed Plunger type



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



Specifications

Effective range (L0)	100-600 mm
Accuracy	Standard type ($5+5L/1000$) μm
	High-accuracy type ($3+3L/1000$) μm
	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
Dust/water protection level	IP54
Operation temperature	0°C to 45°C
Power supply	5V DC \pm 10%

Optional accessories

No.	Description	Price €
09AAA033A	Extension cable (2 m)	197,00
09AAA033B	Extension cable (5 m)	271,00
09AAA033C	Extension cable (7 m)	313,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00



Refer to the DRO System leaflet for more details.

High accuracy

No.	Cable length [m]	Effective range	L ¹ [mm]	L ² [mm]	L ³ [mm]	Mass [kg]	Price [€]
539-301-10	3	100 mm	130	255	270	1,7	1305,00
539-302-10	3	150 mm	180	305	320	1,9	1347,00
539-303-10	3	200 mm	230	355	370	2,1	1389,00
539-304-10	3	250 mm	280	405	420	2,3	1433,00
539-305-10	3	300 mm	330	455	470	2,5	1475,00
539-306-10	3	350 mm	380	505	520	2,7	1522,00
539-307-10	3	400 mm	430	555	570	2,9	1570,00
539-308-10	3	450 mm	480	605	620	3,1	1618,00
539-309-10	3	500 mm	530	655	670	3,3	1666,00
539-310-10	3	550 mm	580	705	720	3,5	1713,00
539-311-10	3	600 mm	630	755	770	3,7	1761,00

Standard accuracy

No.	Cable length [m]	Effective range	L ¹ [mm]	L ² [mm]	L ³ [mm]	Mass [kg]	Price [€]
539-301	3	100 mm	130	255	270	1,7	1199,00
539-302	3	150 mm	180	305	320	1,9	1241,00
539-303	3	200 mm	230	355	370	2,1	1283,00
539-304	3	250 mm	280	405	420	2,3	1327,00
539-305	3	300 mm	330	455	470	2,5	1369,00
539-306	3	350 mm	380	505	520	2,7	1416,00
539-307	3	400 mm	430	555	570	2,9	1464,00
539-308	3	450 mm	480	605	620	3,1	1512,00
539-309	3	500 mm	530	655	670	3,3	1559,00
539-310	3	550 mm	580	705	720	3,5	1607,00
539-311	3	600 mm	630	755	770	3,7	1655,00

DRO LINEAR SCALES AT116

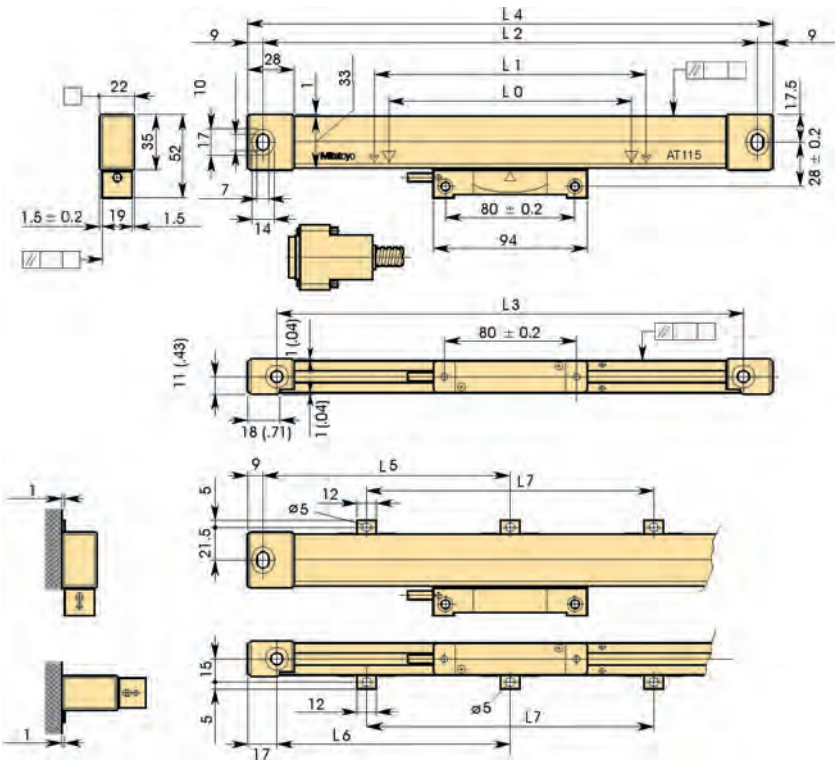
Series 539 - Economy & Slim Type

- Suitable for milling machines, XY tables, jigs, etc.
- 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



539-271-30

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 [g]	Price [€]
539-271-30	3,5	100 mm	120	258	242	276				550	414,00
539-272-30	3,5	150 mm	170	308	292		326			600	419,00
539-273-30	3,5	200 mm	220	358	342	376				700	424,00
539-274-30	3,5	250 mm	270	408	392	426				800	430,00
539-275-30	3,5	300 mm	330	468	452	486				900	435,00
539-276-30	3,5	350 mm	380	518	502	536				1000	440,00
539-277-30	3,5	400 mm	430	568	552	586				1050	478,00
539-278-30	3,5	450 mm	480	618	602	636				1150	488,00
539-279-30	3,5	500 mm	540	678	662	696	339	331		1250	499,00
539-281-30	3,5	600 mm	640	778	762	796	389	381		1450	509,00
539-283-30	3,5	700 mm	740	878	862	896	439	431		1600	520,00
539-284-30	3,5	750 mm	780	918	902	936	459	451		1700	530,00
539-285-30	3,5	800 mm	840	978	962	996	489	481		1800	541,00
539-286-30	3,5	900 mm	940	1078	1062	1096	539	531		1950	552,00
539-287-30	5	1000 mm	1040	1178	1162	1196	589	581		2350	578,00
539-288-30	5	1100 mm	1140	1278	1262	1296			430	2500	605,00
539-289-30	5	1200 mm	1240	1378	1362	1396			460	2700	637,00
539-290-30	5	1300 mm	1340	1478	1462	1496			490	2850	679,00
539-291-30	5	1400 mm	1440	1578	1562	1596			530	3050	721,00
539-292-30	5	1500 mm	1540	1678	1662	1696			560	3250	764,00

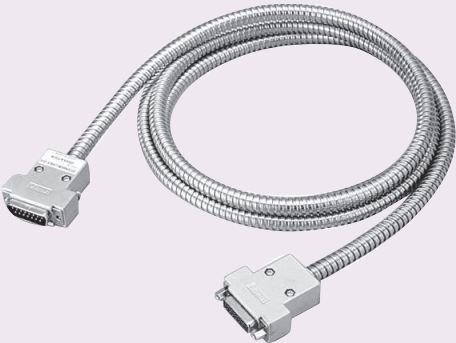


Specifications

Effective range (L0)	100-1500 mm
Accuracy	(5+5L/1000) µm 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
Dust/water protection level	IP53
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%

Optional accessories

No.	Description	Price €
09AAA720A	Extension cable (2 m)	165,00
09AAA720B	Extension cable (5 m)	239,00
09AAA720C	Extension cable (7 m)	286,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00



Extension cable

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 ABS LINEAR SCALES AT715

Specifications

Effective range (L0)	100-3000 mm
Accuracy	100 to 500 mm $\pm 5 \mu\text{m}$ 600 to 1800 mm $\pm 7 \mu\text{m}$ 2000 to 3000 mm $\pm 10 \mu\text{m}$
Max. drive speed	50 m/min
Signal period	20 μm
Measuring method	Electromagnetic induction system
Operation temperature	0-45 °C
Power supply	5V DC $\pm 10\%$

Optional accessories

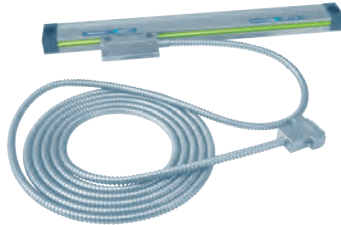
No.	Description	Price €
09AAB674A	Extension cable (2 m)	175,00
09AAB674B	Extension cable (5 m)	249,00
09AAB674C	Extension cable (7 m)	303,00
174-173D	KA-Counter 2 Axis	530,00
174-175D	KA-Counter 3 axes	639,00
174-147D	KLD200 Counter 4-step limit signal output	2544,00

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.



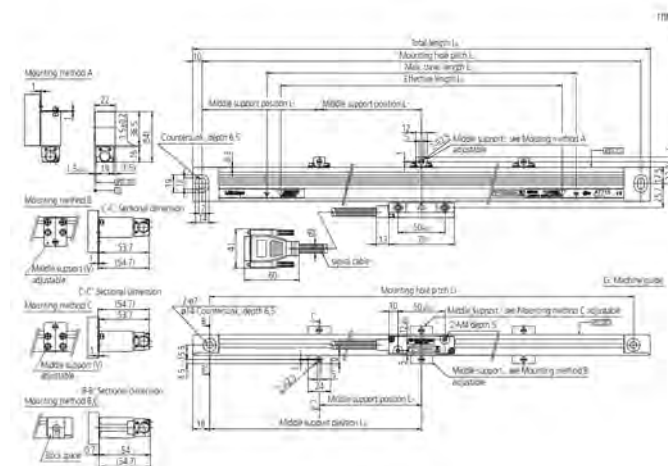
No.	Cable length [m]	Effective range	L ¹ [mm]	L ² [mm]	L ³ [mm]	L ⁴ [mm]	L ⁵ [mm]	L ⁶ [mm]	L ⁷ [mm]	L ⁸ [mm]	Price [€]
539-801	3,5	100 mm	120	258	242	278					329,00
539-802	3,5	150 mm	170	308	292	328					334,00
539-803	3,5	200 mm	220	358	342	378					340,00
539-804	3,5	250 mm	270	408	392	428					345,00
539-805	3,5	300 mm	330	468	452	488					350,00
539-806	3,5	350 mm	380	518	502	538					355,00
539-807	3,5	400 mm	430	568	552	588					392,00
539-808	3,5	450 mm	480	618	602	638					398,00
539-809	3,5	500 mm	540	678	662	698	339	331			403,00
539-811	3,5	600 mm	640	778	762	798	389	381			409,00
539-813	3,5	700 mm	740	878	862	898	439	431			414,00
539-814	3,5	750 mm	780	918	902	938	459	451			419,00
539-815	3,5	800 mm	840	978	962	998	489	481			430,00
539-816	3,5	900 mm	940	1078	1062	1098	539	531			440,00
539-817	5	1000 mm	1040	1178	1162	1198	589	581			461,00
539-818	5	1100 mm	1140	1278	1262	1298	624	616	430		488,00
539-819	5	1200 mm	1240	1378	1362	1398	659	651	460		515,00
539-820	5	1300 mm	1340	1478	1462	1498	694	686	490		541,00
539-821	5	1400 mm	1440	1578	1562	1598	724	716	530		573,00
539-822	5	1500 mm	1540	1678	1662	1698	759	751	560		610,00
539-823	5	1600 mm	1640	1778	1762	1798	789	781	590	215	647,00
539-824	5	1700 mm	1740	1878	1862	1898	819	811	620	230	690,00
539-825	5	1800 mm	1840	1978	1962	1998	849	841	650	280	743,00
539-860	7	2000 mm	2040	2178	2162	2198	939	931	750		955,00
539-861	7	2200 mm	2240	2378	2362	2398	969	961	780		1061,00
539-862	7	2400 mm	2440	2578	2562	2598	1009	1001	810		1167,00
539-863	7	2500 mm	2540	2678	2662	2698	1029	1021	830		1221,00
539-864	7	2600 mm	2640	2778	2762	2798	1049	1041	850		1273,00
539-865	7	2800 mm	2840	2978	2962	2998	1089	1081	880		1379,00
539-866	7	3000 mm	3040	3178	3162	3198	1119	1111	910		1485,00

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

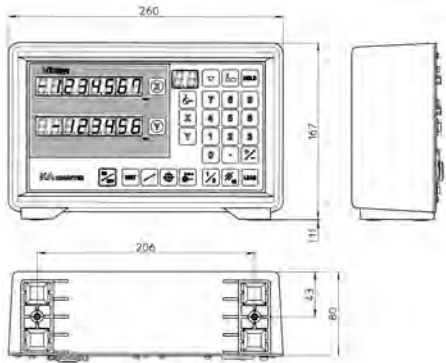
Series 174 - DRO counter for Linear Scales

- 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.



174-175

No.	Axes	Price [€]
174-173D	2	530,00
174-175D	3	639,00



Functions	Series 174 - DRO counter for Linear Scales
ABS/INC mode	●
PRESET	●
Diameter display	●
Counting direction switchable	●
Selectable resolution	●
mm / inch switching	●
Zero approach machining	●
Pitch circle	●
Hole sequence processing	●
Scale reference points	●
Tool specification	●
Macro function keys for lathes, milling and surface grinding machines	●
Programming function	●
Addition of values from 2 axes (not available on 2 axes counter)	●
Addition/subtraction	●
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)	●

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

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	116,00
06ACF941	Connecting line serial interface-Computer-Case/Footswitch 965004	185,00
09CAB217	RS-232 C interface	217,00
937326	External load box 1 axis	
937327	External load box 2 axis	281,00
937328	External load box 3 axis	321,00
936551	External "Null Box" 1 axis	212,00
936552	External "Null Box" 2 axis	222,00
936553	External "Null Box" 3 axis	234,00
938140	Touch signal probe ø 20	435,00
935094	Touch signal probe ø 32	

DRO KLD200 Counter

Specifications

Digital step	0,001 mm (Indication range: -9999,999 mm to +99999,999 mm) 0,005 mm (Indication range: -9999,995 mm to +99999,995 mm)
Scale input ports	1
Power supply	100-120V/200-240V AC 50/60 Hz
Display	9-Digit LED and a negative (-) sign

Optional accessories

No.	Description	Price €
965004	Foot switch	116,00
937326	External load box 1 axis	
936551	External "Null Box" 1 axis	212,00
938140	Touch signal probe ø 20	435,00
935094	Touch signal probe ø 32	

Series 174

The KLD200 Counter is a single axis linear scale display unit with limit signal output.

The KLD200 offers you the following benefits:

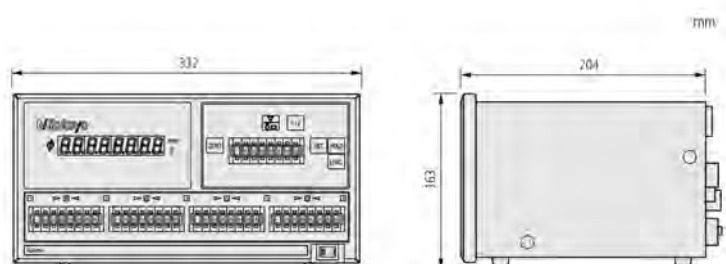
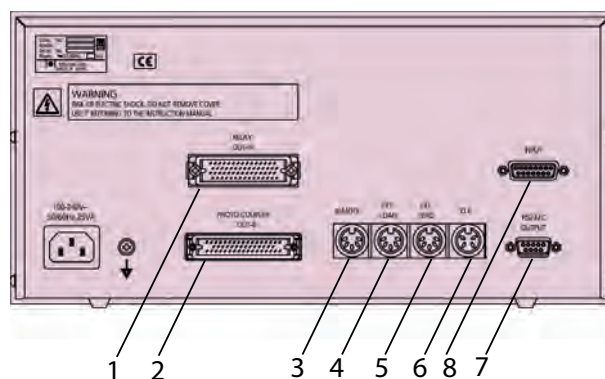
- The counter is designed to signal when a linear scale displacement value and a preset limit value coincide.
- You have a choice of two types of limit settings (2 step and 4 step).
- Ideal for controlling vertical positioning on an EDM or a grinding machine.
- You can connect it to a computer or a sequencer 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	2544,00
174-146D	3	2-step limit signal output	2318,00

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. Input Linear Scale Signal



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

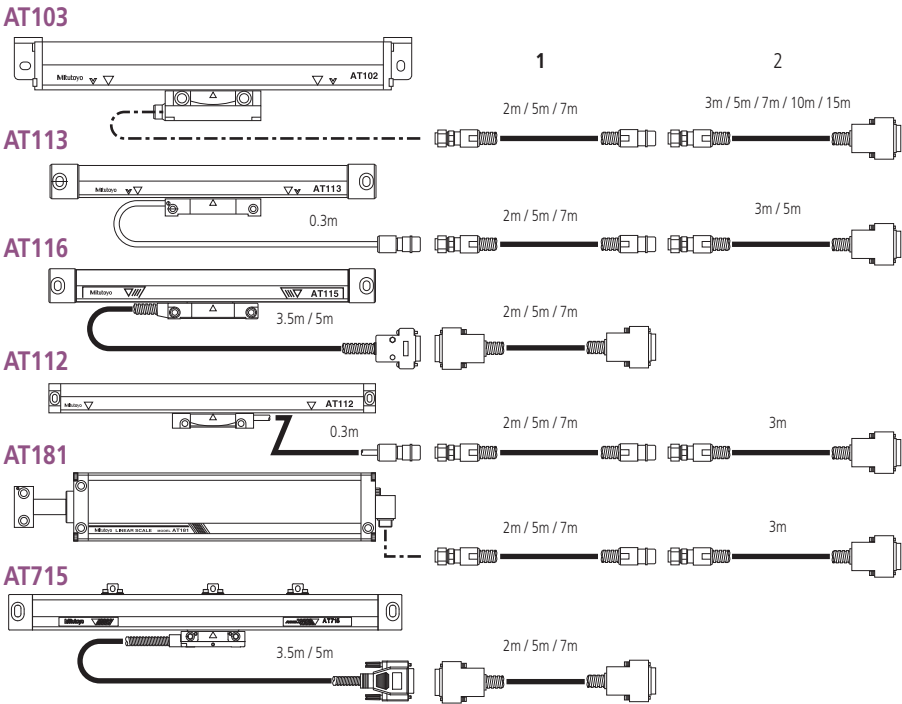
No.	Shaft ø [mm]	Connecting cable [m]	Ball ø	Price [€]
938140	20	3	10 ±0,002 mm	435,00
935094	32	3	10 ±0,002 mm	

Optional accessories

No.	Description	Price €
935203	Extension cable	27,00

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	
	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	2000mm/s	250ns
							8	2.5μm	2000mm/s	500ns
							4	5μm	2000mm/s	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	—
	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 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

CNC LINEAR SCALES AT211

Series 539 - Sealed incremental type - Slim & High Speed Type



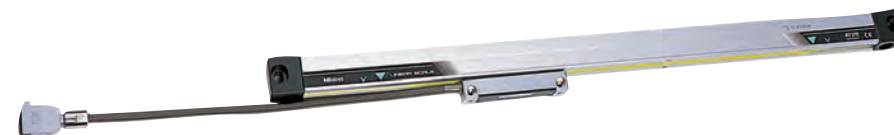
This sealed-type linear scale gives you high resolution and high accuracy.

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 - 6000 mm
Accuracy	100 to 1500 mm (3+3L/1000) μ m 1600 to 3000 mm (5+5L/1000) μ m 3250 to 6000 mm (5+8L/1000) μ m 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) Differential line driver
Resolution [μ m]	0,1; 0,5; 1
Power supply	5V DC \pm 10%

Specifications

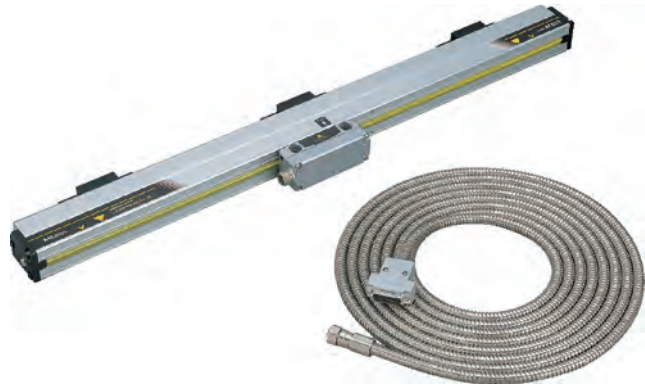
Effective range (L0)	100 - 1500 mm
Accuracy	100 to 1500 mm (3+3L/1000) μ m (standard type) (2+2L/1000) μ m (high-accuracy type) 500 to 1500 mm (3+3L/1000) μ m L = Effective range (mm)
Max. drive speed	up to 120 m/min
Signal period	20 μ m
Resolution [μ m]	0,1; 0,5; 1 μ m
Output waveform	Two 90° phase-shifted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

CNC ABS LINEAR SCALES AT300

Series 539 - Sealed Absolute type - Standard dimension

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



Specifications

Effective range (L0)	100 - 3000 mm
Accuracy	100 to 1500 mm (3+3L/1000) µm 1600 to 3000 mm (5+5L/1000) µm 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

CNC ABS LINEAR SCALES AT500

Series 539 - Sealed Absolute type - Slim line

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 Mitsubishi® 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



Specifications

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



Refer to the NC Linear Scale brochure for more details

No.	Effective range (L0)
AT500	S model 100 - 2200 mm
	H model 100 - 1000 mm
	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:

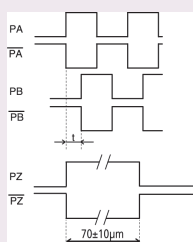
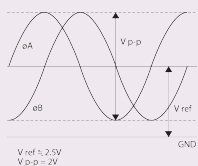
- It Includes an LED alarm enabling you to detect overspeed and sinusoidal signal anomalies.
- Installation dimensions are available from Mitutoyo – please contact.



ST24

Specifications

Effective range (L0)	10 - 3000 mm
Accuracy	10 - 300 mm $\pm 1 \mu\text{m}$ 350 - 500 mm $\pm 2 \mu\text{m}$ 600 - 1000 mm $\pm 3 \mu\text{m}$ 1100 - 3000 mm $\pm 3 \mu\text{m/m}$
Max. drive speed	Up to 1200 mm/sec
Scale reference points	10 - 80 mm Scale center point 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) Two 90° phase-shifted square-wave signals (RS422) Line driver
Signal period	10 μm
Power supply	5V DC $\pm 10\%$



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:

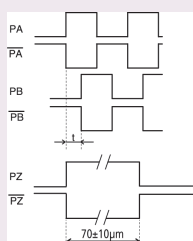
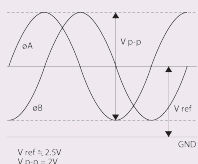
- High reliability with stable signal output.
- Outputs two-phase sinusoidal signal (signal pitch 4 μm) and two-phase square-wave signal simultaneously.
- Outputs two-phase sinusoidal signal (signal pitch 4 μm) and two-phase square-wave signal simultaneously.
- You are provided with a compact interface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



ST36

Specifications

Effective range (L0)	10 - 3000 mm
Accuracy	10 - 300 mm $\pm 0,5 \mu\text{m}$ 350 - 500 mm $\pm 1 \mu\text{m}$ 600 - 1000 mm $\pm 2 \mu\text{m}$ 1100 - 3000 mm $\pm 2 \mu\text{m/m}$
Max. drive speed	1200 mm/sec
Signal period	8 μm
Scale reference points	10 - 75 mm Center point scale 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) Two 90° phase-shifted square-wave signals (Model B and C) RS422 Line Driver
Power supply	5V DC $\pm 10\%$



CNC LINEAR SCALES ST422

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.

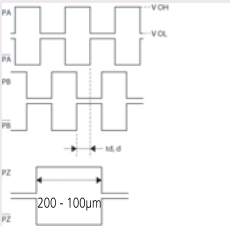
The ST422 offers you the following benefits:

- 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.

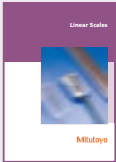
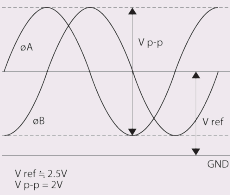


ST422

Specifications	
Effective range (L0)	10 - 3000 mm
Accuracy	10 - 300 mm $\pm 1 \mu\text{m}$ 350 - 500 mm $\pm 2 \mu\text{m}$ 600 - 1000 mm $\pm 3 \mu\text{m}$ 1100 - 3000 mm $\pm 3 \mu\text{m}$
Max. drive speed	up to 5000 mm/sec
Scale reference points	10 - 75 mm Center point scale 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) Two 90° phase-shifted square-wave signals (RS422) Line driver
Power supply	5V DC $\pm 10\%$



Two 90° phase-shifted square waves signals



Refer to the NC Linear Scale brochure for more details

CNC LINEAR SCALES ST700



Refer to the Linear Scale ST700 brochure for more details

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.



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

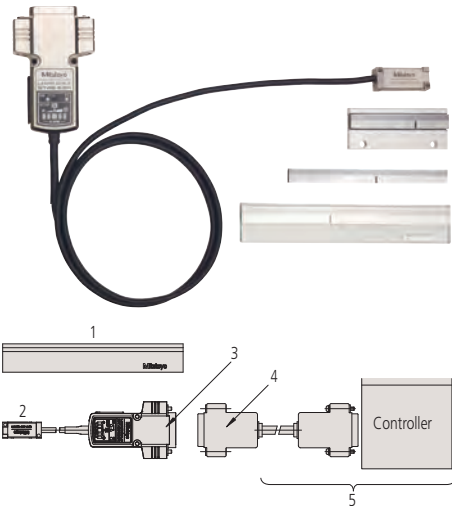
CNC Linear Scale ST46-EZA

Series 579 - Open scales with Sine & Square Wave Output

Compact Type - Incremental Reflective Glass scale

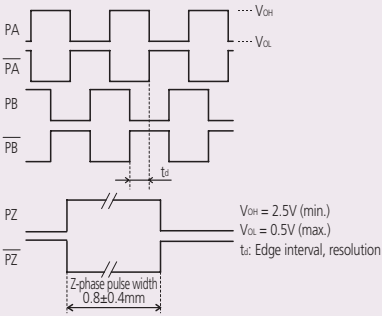
- Grating pitch 20
- Signal period 20
- Zero not coded
- Expansion factor $(8 \pm 1) \times 10^6/k-1$
- Maximum response speed 2,6 m/s (At sine wave amplitude -3B)
- Includes LED alarm for detection for overspeed
- Can be used for Metal Tape Scale Manufacture
- Self Diagnosis Function with USB Connector

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

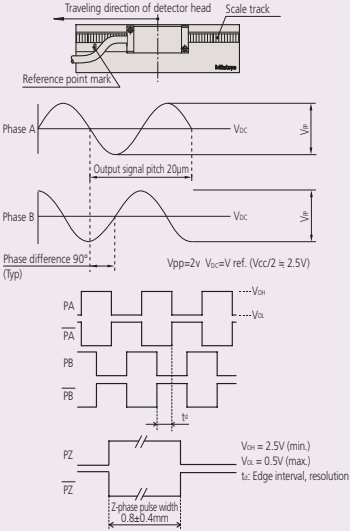


1: Main scale; 2: Detector unit; 3: Output connector (included); 4: Feedback cable; 5: To be supplied by customer (feedback cable/controller)

Specifications	
Effective range	10 to 3000 mm
Maximum response speed	2,6 m/s (at sine wave amplitude -3dB)
Internal expansion coefficient	$(8 \pm 1) \times 10^{-6}^{\circ}\text{C}$
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)
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 \pm 5%



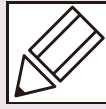
Output Signal Type B



Output Signal Type C



Brochure on request



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.

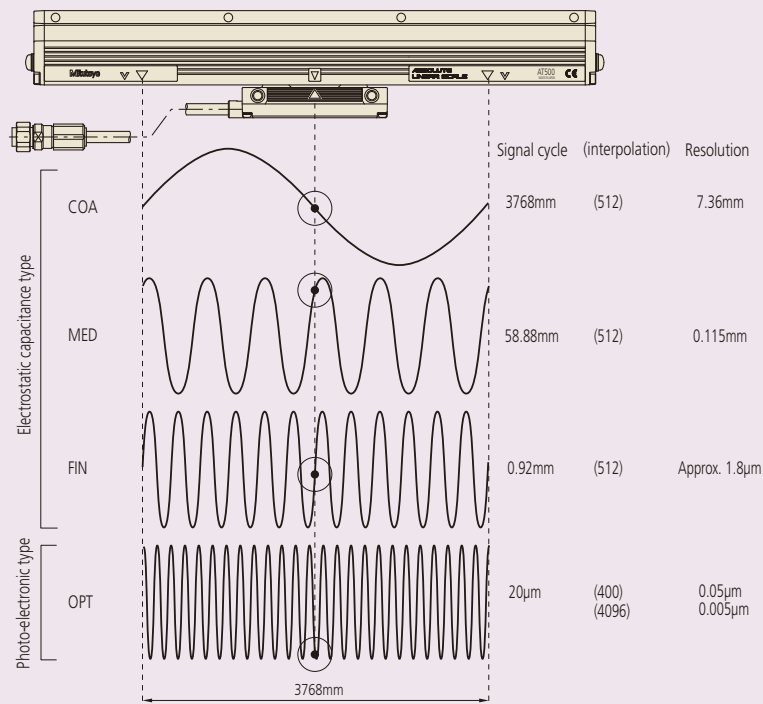
■ Accuracy

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)

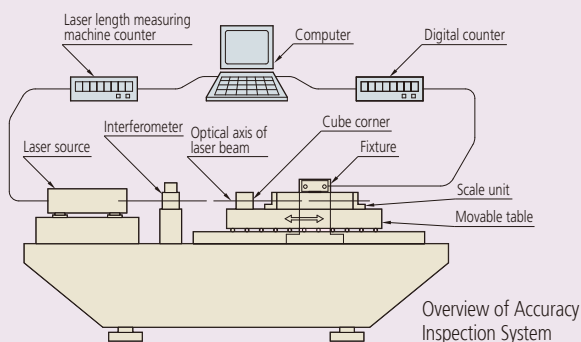


Upon supply of power to a linear scale, position readings from three capacitance-type sub-scales (COArse, MEDium and FINE) and one from a photoelectric sub-scale (OPTical) are taken. These sub-scales use such a combination of pitches, and are so positioned relative to each other, that the readings at 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.



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

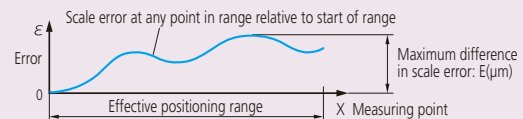
$$\text{Error} = \text{Value indicated by the linear scale} - \text{corresponding value of laser inspection system}$$

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

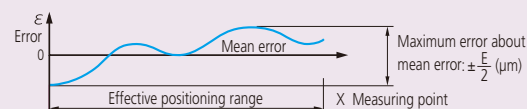
This method simply specifies the maximum error minus the minimum error from the accuracy graph, as shown below. It is of the form: $E = (\pm L)\mu\text{m}$. L is the effective measuring range (mm), and \pm and L are factors specified for each model.

For example, if a particular type of scale has an accuracy specification of $(3 + \frac{3L}{1000})\mu\text{m}$ 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: $e = \pm \frac{E}{2} (\mu\text{m})$. 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.