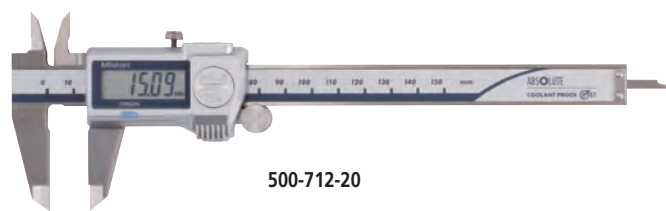


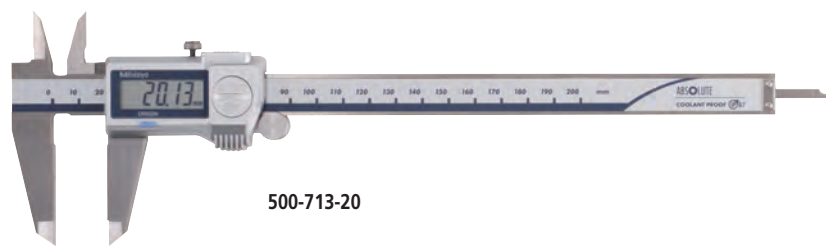
Calipers

ABSOLUTE Coolant Proof Caliper
SERIES 500 — with Dust/Water Protection Conforming to IP67 Level

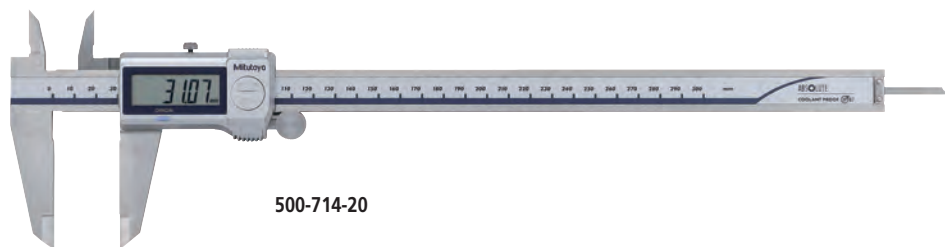
- Can be used in workshop conditions exposed to coolant, water, dust or oil. 100% air-leak test ensures every caliper conforms to IP67.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin.
- Easy to use — advanced ergonomic design uses only 1 button.
- Battery cap does not require a screw driver for battery replacement.
- Can be integrated into statistical process control and measurement systems. (Refer to page A-3.)



500-712-20



500-713-20



500-714-20

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE^{fit}

ABSOLUTE[™]



Functions

Origin-set
Data output
Note: See SPECIFICATIONS for items without SPC data output.
Automatic power on/off
Alarm

Optional Accessories

(Note: Usable only for models with SPC data output. Refer to page A-21 for details.)

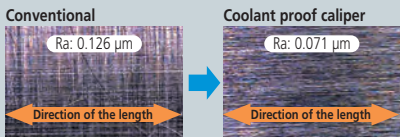
Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)* ¹
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)* ¹
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	U-WAVE-T* ²
02AZD880G	Buzzer	U-WAVE-T* ²
264-620	IP67	U-WAVE-TC* ²
264-621	Buzzer	U-WAVE-TC* ²
264-624	IP67	U- WAVE-TCB Transmitter* ²
264-625	Buzzer	U- WAVE-TCB Transmitter* ²
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

*1 Cannot be used for other than water resistant type Digital calipers with external output function.

*2 IP67 model is water/dust-proofed suitable for the factory floor. Buzzer type is not water/dust-proofed.

Smooth slider movement makes for comfortable operation.

High quality guide surface finish for smooth slider movement



LCD



Remarkably easy to read display

IP67 protection level



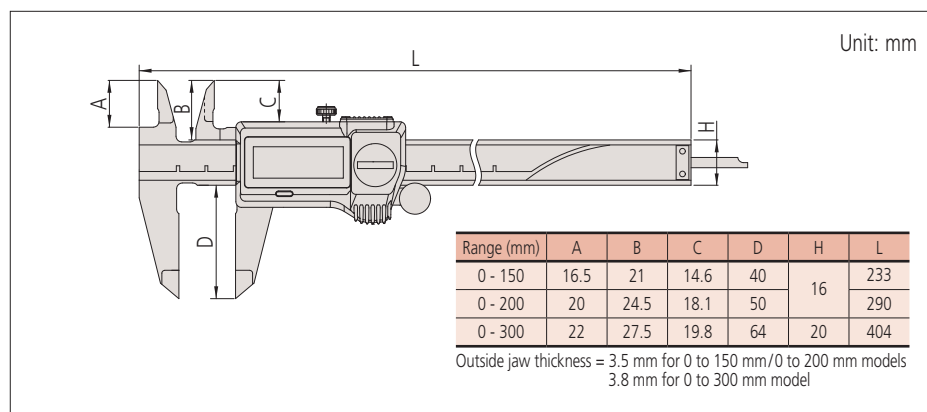
SPECIFICATIONS

Metric							
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*1		Measurement data output port	Mass (g)	Thumb roller
			EMPE	SMPE			
500-702-20*3	0 - 150	0.01	±0.02	±0.04	—	168	✓
500-703-20*3	0 - 200					198	
500-706-20*3	0 - 150					168	
500-707-20*3	0 - 200					198	
500-716-20	0 - 150				✓	168	—
500-717-20	0 - 200					198	
500-712-20	0 - 150					168	
500-713-20	0 - 200					198	
500-719-20	0 - 150					168	✓
500-721-20	0 - 150					168	
500-722-20	0 - 200					198	
500-723-20	0 - 150					168	
500-724-20	0 - 200					198	—
500-714-20	0 - 300		±0.03	±0.05	✓	350	
500-718-20					—	345	
500-704-20*3					—	350	
500-708-20*3					—	345	

Inch/Metric								
Order No.	Range	Resolution	Maximum permissible error*1		Measurement data output port	Mass (g)	Thumb roller	Remarks
			EMPE	SMPE				
500-731-20*3	0-6 in/0-150 mm	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	±0.002 in/ ±0.04 mm	—	168	✓	Carbide-tipped jaws for outside measurement
500-732-20*3	0-8 in/0-200 mm					198		
500-733-20*3	0-6 in/0-150 mm					168		
500-734-20*3	0-8 in/0-200 mm					198		
500-735-20	0-6 in/0-150 mm				✓	168	—	Carbide-tipped jaws for outside measurement
500-736-20	0-8 in/0-200 mm					198		
500-737-20	0-6 in/0-150 mm					168		
500-738-20	0-8 in/0-200 mm					198		
500-752-20*3	0-6 in/0-150 mm				—	168	—	—
500-753-20*3	0-8 in/0-200 mm					198		
500-762-20	0-6 in/0-150 mm					168		
500-763-20	0-8 in/0-200 mm					198		
500-768-20*3	0-6 in/0-150 mm				✓	168	Depth bar ø1.9 mm	
500-769-20					—	168		
500-764-20	0-12 in/0-300 mm		±0.0015 in/ ±0.03 mm	±0.0025 in/ ±0.05 mm	✓	350	✓	—
500-754-20*3					—	350		

- Dust/Water protection level: IP67 (IEC60529)*2
 - Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Scale type: ABSOLUTE electromagnetic induction linear encoder
 - Battery life: Approx. 5 years under normal use
 - Max. response speed: Unlimited
- *1 Partial Surface Contact Error, $EMPE$ and Shift Error, $SMPE$ are terms (notations) used in ISO 13385-1:2019.
 *2 Although these models are IP67 rated, care should be taken to dry tool after use.
 *3 Without SPC data output.

DIMENSIONS



Calipers

ABSOLUTE Digimatic Caliper
SERIES 500 — with exclusive ABSOLUTE Encoder Technology

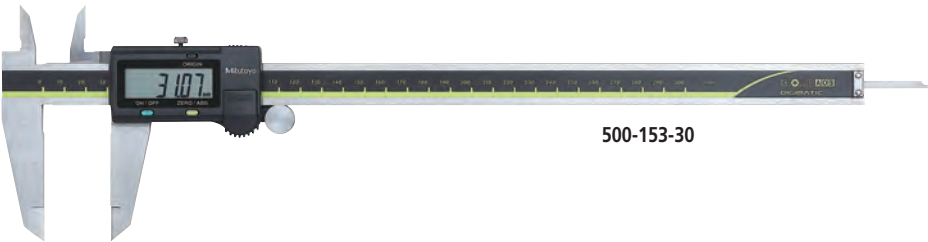
- The ZERO/ABS button allows the display to be Zero-Set at any slider position along the scale. In addition, no overspeed-errors will occur.
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grinding stones, etc.
- Allows integration into statistical process control and measurement systems for models with measurement data output connector. (Refer to page A-3.)



500-151-30



500-182-30



500-153-30

SPECIFICATIONS

Metric										
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2		Mass (g)	Depth bar	Fine adjustment	Remarks		
			EMPE	SMPE						
500-150-30	0 - 100	0.01	±0.02	±0.04	143	ø1.9 mm rod	with thumb roller	—		
500-180-30*1							—			
500-151-30							—			
500-154-30	0 - 150				168	Blade	with thumb roller	Carbide-tipped jaws for outside measurement		
500-155-30								Carbide-tipped jaws for outside and inside measurement		
500-158-30										
500-181-30*1								—		
500-152-30								—		
500-156-30	0 - 200				198	Blade	with thumb roller			Carbide-tipped jaws for outside measurement
500-157-30										Carbide-tipped jaws for outside and inside measurement
500-182-30*1										—
500-153-30										with thumb roller
500-153-30	0 - 300		±0.03	±0.05	350		with thumb roller	—		

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Battery life: Approx. 5 years under normal use
- Max. response speed: Unlimited
- *1 Without SPC data output
- *2 Partial Surface Contact Error, E_{MPE} and Shift Error, S_{MPE} are terms (notations) used in ISO 13385-1:2019.



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Functions

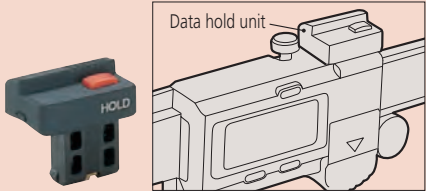
- Absolute measurement
- Incremental measurement
- Low-voltage alert
- Data output
- Note: See SPECIFICATIONS for excluded items.
- Data hold

Optional Accessories

(Note: Usable only for models with SPC data output. Refer to page A-21 for details.)

Order No.	Type	Description
959149	C	Connecting cables for IT/DP/MUX (1 m)
959150	C	Connecting cables for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD790C	C	Connecting cables for U-WAVE-T (160 mm)
02AZE140C	C	Connecting cables for U-WAVE-T For foot switch
264-621	Buzzer	U-WAVE-TC
264-625	Buzzer	U-WAVE-TCB
02AZF300	Buzzer	Connecting unit for U-WAVE-TC/TCB

• Data hold unit

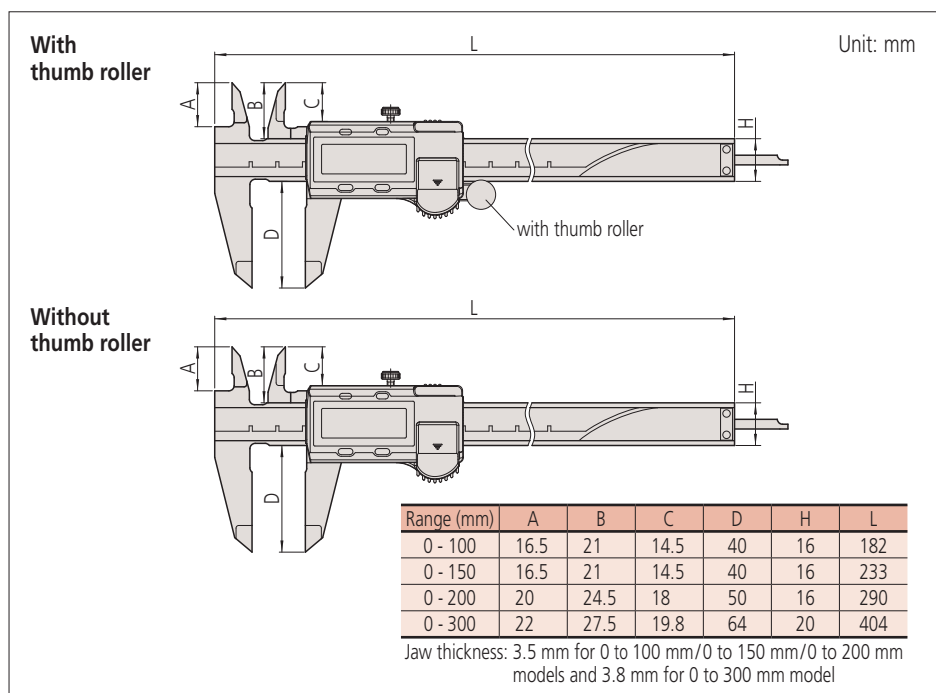


959143

Inch / Metric		Resolution	Maximum permissible error*2		Mass (g)	Depth bar	Fine adjustment	Remarks						
Order No.	Range		E _{TMPE}	S _{TMPE}										
500-170-30	0 - 4 in/	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	±0.002 in/ ±0.04 mm	143	∅0.075 inch rod	with thumb roller	—						
500-195-30*1	0 - 100 mm				168	∅0.075 inch rod		Carbide-tipped jaws for outside measurement						
500-171-30	0 - 6 in/ 0 - 150 mm								Carbide-tipped jaws for outside and inside measurement					
500-174-30										Blade	—			
500-175-30												∅0.075 inch rod	Carbide-tipped jaws for outside measurement	
500-178-30														—
500-196-30*1														
500-159-30*1					Carbide-tipped jaws for outside and inside measurement									
500-160-30*1	—													
500-172-30						Carbide-tipped jaws for outside measurement								
500-176-30								Carbide-tipped jaws for outside and inside measurement						
500-177-30					—									
500-197-30*1	Carbide-tipped jaws for outside measurement													
500-163-30*1			Carbide-tipped jaws for outside and inside measurement											
500-164-30*1				—										
500-173-30					Carbide-tipped jaws for outside measurement									
500-167-30	Carbide-tipped jaws for outside and inside measurement													
500-168-30			—											
500-193-30*1				Carbide-tipped jaws for outside measurement										
500-165-30*1					Carbide-tipped jaws for outside and inside measurement									
500-166-30*1	—													
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- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Battery life: Approx. 5 years under normal use
- Max. response speed: Unlimited
- *1 Without SPC data output
- *2 Partial Surface Contact Error, $EMPE$ and Shift Error, $SMPE$ are terms (notations) used in ISO 13385-1:2019.

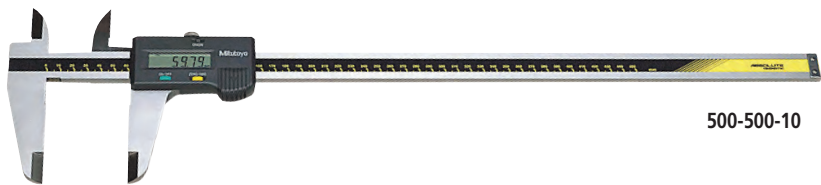
DIMENSIONS



Calipers

Long ABSOLUTE Digimatic Caliper
SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

- Long Digital caliper incorporating an ABSOLUTE scale and available with a measuring range from 450 mm to 1000 mm.
- Allows integration into statistical process control and measurement systems for models with measurement data output connector. (Refer to page A-3.)



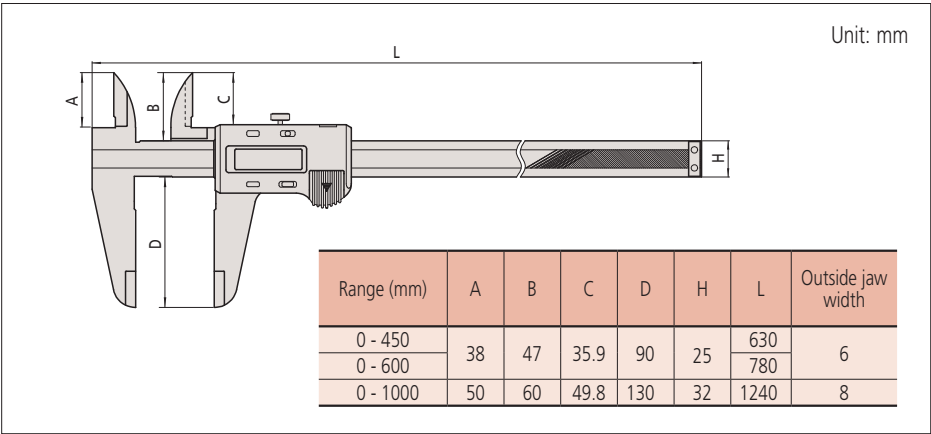
500-500-10

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Maximum permissible error (mm)*		Resolution (mm)	Mass (g)
		EMPE	SMPE		
500-500-10	0 - 450	±0.05	±0.07	0.01	1170
500-501-10	0 - 600	±0.05	±0.07		1350
500-502-10	0 - 1000	±0.07	±0.09		3300
Inch / Metric					
Order No.	Range	Maximum permissible error*		Resolution	Mass (g)
		EMPE	SMPE		
500-505-10	0 - 18 in/0 - 450 mm	±0.002 in/±0.05 mm	±0.003 in/±0.07 mm	0.0005 in/0.01 mm	1170
500-506-10	0 - 24 in/0 - 600 mm				1350
500-507-10	0 - 40 in/0 - 1000 mm				3300

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 3.5 years under normal use
- Max. response speed: Unlimited
- * Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS



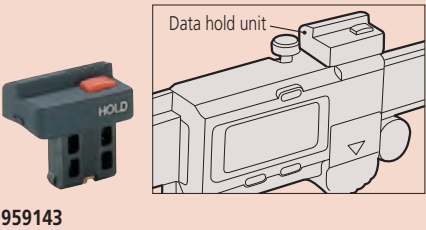
MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

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Optional Accessories

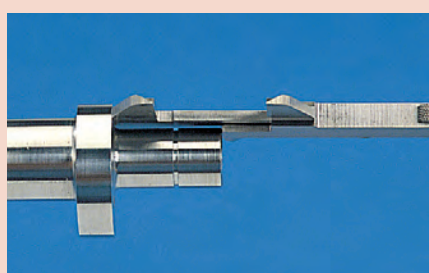
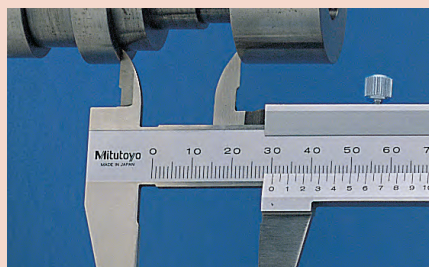
Order No.	Type	Description
959149	C	Connecting cables for IT/DP/MUX (1 m)
959150	C	Connecting cables for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD790C	C	Connecting cables for U-WAVE-T (160 mm)
02AZE140C	C	Connecting cables for U-WAVE-T

• Data hold unit

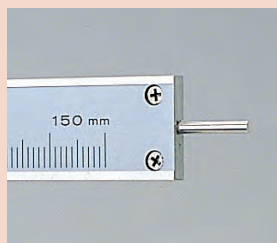


959143

Measurement example



Round depth bar type



530-102

Carbide-tipped jaws for outside measurement



530-320

Vernier Caliper SERIES 530 — Standard model

- Stepped graduation face prevents dust ingress between the main scale and slider.
- The small vernier face angle (14°) provides easy reading.
- Can measure steps, since the end faces of the beam and slider are the zero reference point (measuring face). Standard calipers allow four types of measurement, i.e. outside, inside, depth, and step.
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grinding stones, etc.



530-101

SPECIFICATIONS

Metric					
Order No.	Range (mm)	Maximum permissible error (mm)*1 • EMPE (outside measurement) • SMPE (inside measurement)	Depth bar	Graduation (mm)	Remarks
530-101	0 - 150	±0.05	Blade	0.05	—
530-122	0 - 150	±0.03		0.02	High accuracy model
530-108	0 - 200	±0.05		0.05	—
530-123	0 - 200	±0.03		0.02	High accuracy model
530-109	0 - 300	±0.08		0.05	—
530-124	0 - 300	±0.04		0.02	High accuracy model

Order No.	Range (mm)	Maximum permissible error (mm)*2		Depth bar	Graduation (mm)	Remarks
		EMPE	SMPE			
530-100	0 - 100	±0.05	±0.07	ø1.9 mm rod	0.05	—
530-102	0 - 150	±0.05	±0.07			—
530-320		±0.05	±0.07	Blade		Carbide-tipped jaws for outside measurement
530-335		±0.05	±0.07			Carbide-tipped jaws for outside and inside measurement
530-321		0 - 200	±0.05			±0.07
530-322	0 - 300	±0.08	±0.10			Carbide-tipped jaws for outside measurement
530-501	0 - 600	±0.10	±0.12	—		—
530-502	0 - 1000	±0.15	±0.17			

Metric/Inch		with metric/inch double scale				
Order No.	Range	Maximum permissible error		Depth bar	Graduation	Remarks
		EMPE	SMPE			
530-104	0 - 150 mm/ 0 - 6 in	±0.05 mm/ ±0.5/128 in	±0.07 mm/ ±0.5/128 in	Blade	0.05 mm (1/128 in)	—
530-316					Clamping screw below the slider	
530-312	0.02 mm (0.001 in)				High accuracy model: ±0.03 mm	
530-114	0 - 200 mm/ 0 - 8 in				0.05 mm (1/128 in)	—
530-118					0.02 mm (0.001 in)	High accuracy model: ±0.03 mm
530-115		0.05 mm (1/128 in)	—			
530-119	0 - 300 mm/ 0 - 12 in	±0.08 mm/ ±0.5/128 in	±0.010 mm/ ±0.5/128 in	0.02 mm (0.001 in)	High accuracy model: ±0.04 mm	

Inch		with inch/inch double scale				
Order No.	Range (in)	Maximum permissible error (in)		Depth bar	Graduation (in)	Remarks
		E_{MPE}	S_{MPE}			
530-105	0 - 6	±0.5/128	±0.5/128	Blade	0.001	—
530-116	0 - 8	±0.5/128	±0.5/128			

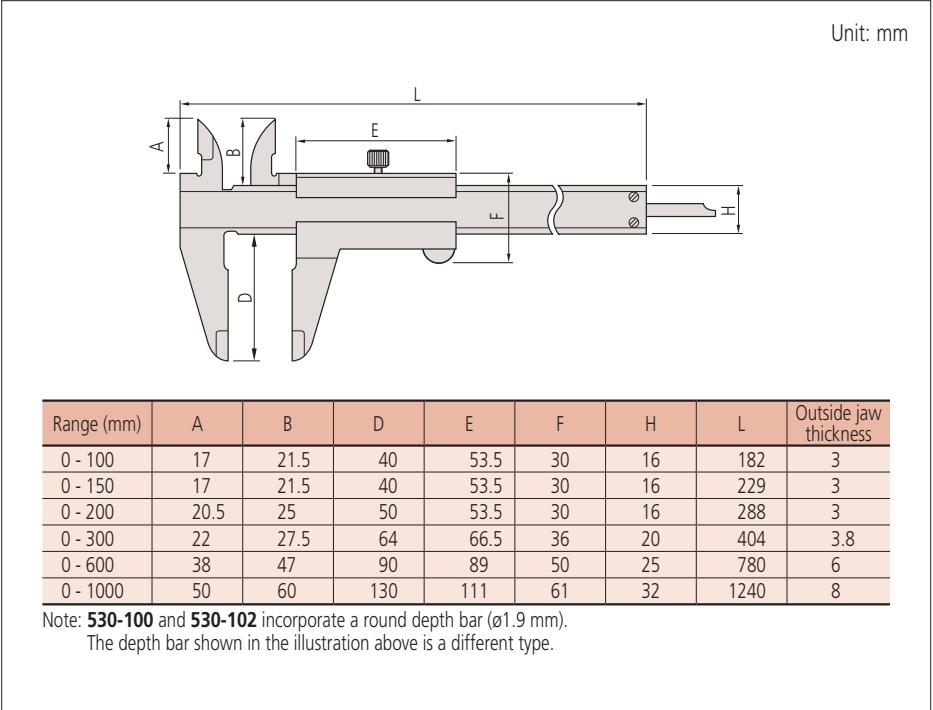
*1 Partial Measuring Face Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in JIS B 7507: 2016, revised based on ISO 13385-1: 2011. Refer to page D-45 for details.

*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

Calipers

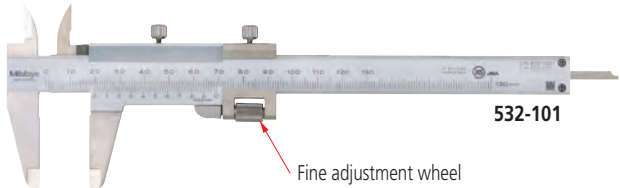
Vernier Caliper
SERIES 530 — Standard model

DIMENSIONS



Vernier Caliper
SERIES 532 — with fine adjustment

- Fine-adjustment aids slider positioning.
- Allows step measurement.

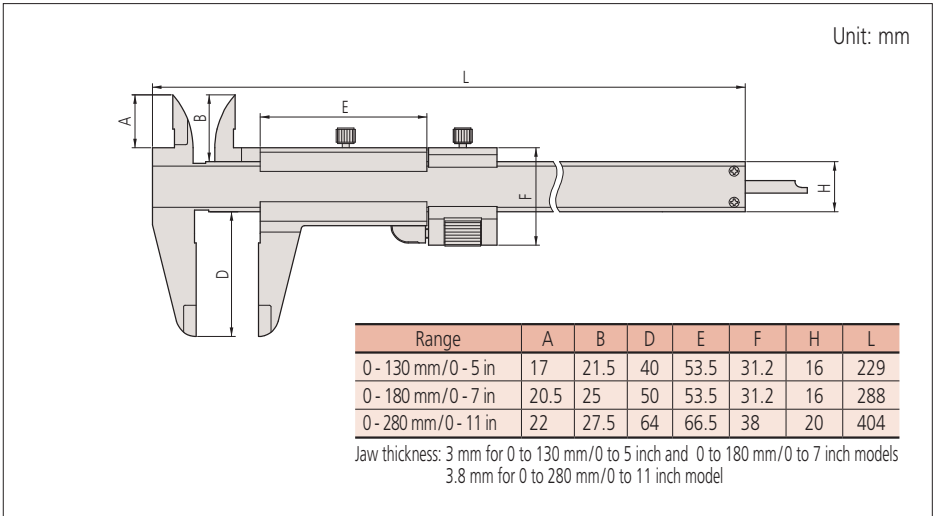


SPECIFICATIONS

Metric						
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)* • EMPE (outside measurement) • SMPE (inside measurement)	Depth bar	Remarks	
532-101	0 - 130	0.02	±0.03	Blade	with fine adjustment	
532-102	0 - 180		±0.03			
532-103	0 - 280		±0.04			
Metric/Inch with metric/inch double scale						
Order No.	Range	Graduation	Maximum permissible error*		Depth bar	Remarks
			EMPE	SMPE		
532-119	0 - 130 mm/0 - 5 in	0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.0015 in	Blade	with fine adjustment
532-120	0 - 180 mm/0 - 7 in		±0.03 mm/0.001 in	±0.05 mm/0.0015 in		
532-121	0 - 280 mm/0 - 11 in		±0.04 mm/0.0015 in	±0.06 mm/0.0020 in		

* Partial Measuring Face Contact Error, *E*_{MPE} and Shift Error, *S*_{MPE} are terms (notations) used in JIS B 7507: 2016, revised based on ISO 13385-1: 2011. The measurement method is the same as before. Refer to page D-45 for details.

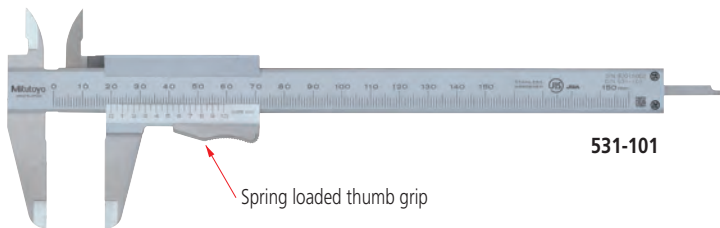
DIMENSIONS



Calipers

Vernier Caliper
SERIES 531 — with thumb grip

- The slider moves only when the spring-loaded thumb grip is depressed.
- Allows step measurement.



SPECIFICATIONS

Metric						
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)* • E_{MPE} (outside measurement) • S_{MPE} (inside measurement)		Depth bar	Remarks
531-101	0 - 150	0.05	±0.05		Blade	—
531-102	0 - 200					
531-103	0 - 300		±0.08			
Metric/Inch with metric/inch double scale						
Order No.	Range	Graduation	Maximum permissible error*		Depth bar	Remarks
			E_{MPE}	S_{MPE}		
531-122	0 - 150 mm/0 - 6 in	0.05 mm (1/128 in)	±0.05 mm/±0.5/128 in	±0.07 mm/±0.5/128 in	Blade	with inch/mm conversion label
531-128		0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.0015 in		High accuracy model
531-108	0 - 200 mm/0 - 8 in	0.05 mm (1/128 in)	±0.05 mm/±0.5/128 in	±0.07 mm/±0.5/128 in		—
531-129		0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.0015 in		High accuracy model
531-109	0 - 300 mm/0 - 12 in	0.05 mm (1/128 in)	±0.08 mm/±0.5/128 in	±0.10 mm/±0.5/128 in		—
531-112		0.02 mm (0.001 in)	±0.04 mm/0.0015 in	±0.06 mm/0.0020 in		High accuracy model

* Partial Measuring Face Contact Error, *EMPE* and Shift Error, *SMPE* are terms (notations) used in JIS B 7507: 2016, revised based on ISO 13385-1: 2011. The measurement method is the same as before. Refer to page D-45 for details.

DIMENSIONS

Unit: mm

Range	A	B	D	H	L
0 - 150 mm/0 - 6 in	17	21.5	40	16	229
0 - 200 mm/0 - 8 in	20.5	25	50	16	288
0 - 300 mm/0 - 12 in	22	27.5	64	20	404

Jaw thickness: 3 mm for 0 to 150 mm/0 to 6 inch and 0 to 200 mm/0 to 8 inch models
3.8 mm for 0 to 300 mm/0 to 12 inch model

Measurement example



Optional Accessories

Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)* ¹
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)* ¹
959149	C	Connecting cables for IT/DP/MUX (1 m)* ²
959150	C	Connecting cables for IT/DP/MUX (2 m)* ²
06AFM380A	A	USB Input Tool Direct (2 m)* ¹
06AFM380C	C	USB Input Tool Direct (2 m)* ²
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)* ¹
02AZD790C	C	Connecting cables for U-WAVE-T (160 mm)* ²
02AZE140A	A	Connecting cables for U-WAVE-T* ¹ For foot switch
02AZE140C	C	Connecting cables for U-WAVE-T* ² For foot switch
264-620	IP67	U-WAVE-TC* ¹
264-621	Buzzer	U-WAVE-TC* ¹
264-624	IP67	U- WAVE-TCB Transmitter* ¹
264-625	Buzzer	U- WAVE-TCB Transmitter* ¹
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB* ¹

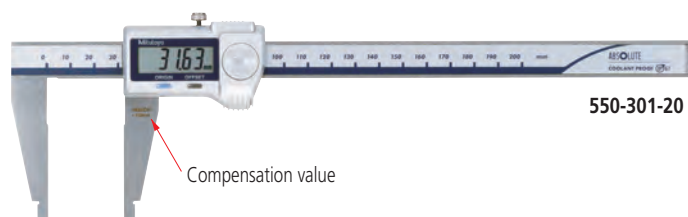
*1 For IP67 models (up to 300 mm)

*2 For series 550-2XX and 550-22X.

ABSOLUTE Digimatic Caliper SERIES 550 — with Nib Style Jaws

- Ideal for inside diameter measurement by the rounded faces of the jaws.
- Allows integration into statistical process control and measurement systems for models with measurement data output connector. (Refer to page A-3.)
- ID measurement value: displayed value + (a compensation value displayed on

the main unit). OFFSET switch allows to input a compensation value so that the measurement value can be read directly (Order No. 550-301-20, 550-331-20, 550-311-20 and 550-341-20). Preset function allows to set a desired starting point (550-331-20 and 550-341-20).



SPECIFICATIONS

Metric					
Order No.	Range (mm)* ¹	Resolution (mm)	Maximum permissible error (mm)* ²		Remarks
550-301-20	0 - 200 (10.1 - 210)	0.01	±0.03	±0.03	IP67, with offset
550-331-20	0 - 300 (10.1 - 310)		±0.04	±0.04	IP67, with offset/preset function for easy inside measurement
550-203-10	0 - 450 (20.1 - 470)		±0.05	±0.05	—
550-205-10	0 - 600 (20.1 - 620)		±0.05	±0.05	—
550-207-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07	—

Inch / Metric					
Order No.	Range* ¹	Resolution	Maximum permissible error* ²		Remarks
550-311-20	0 - 8 in/0 - 200 mm (0.404 - 8.4 in/10.26 - 210.16 mm)	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	±0.0015 in/ ±0.03 mm	IP67, with offset
550-341-20	0 - 12 in/0 - 300 mm (0.404 - 12.4 in/10.26 - 310.16 mm)		±0.002 in/ ±0.04 mm	±0.002 in/ ±0.04 mm	IP67, with offset/preset function for easy inside measurement
550-223-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)		±0.002 in/ ±0.05 mm	±0.002 in/ ±0.05 mm	—
550-225-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		±0.002 in/ ±0.05 mm	±0.002 in/ ±0.05 mm	—
550-227-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	—

• Battery: SR44 (1 pc.), 938882, for initial operational checks (standard accessory)

• Scale type: ABSOLUTE electromagnetic induction linear encoder

• Max. response speed: Unlimited

*1 (): Inside measurement

*2 Partial Surface Contact Error, $EMPE$ and Shift Error, $SMPE$ are terms (notations) used in ISO 13385-1:2019.

Note: Series 550 is not equipped with a depth bar.

DIMENSIONS

Unit: mm

Range (mm)	D	G	S	W	H	t	R
0 - 200 (0 - 8 in)*	60	5 (5.08)*	8	76	16	3	5 (5.08)*
0 - 300 (0 - 12 in)*	75		12	95	20	3.8	
0 - 450 (0 - 18 in)*	100	10 (6.35)*	18	125	25	6	10 (6.35)*
0 - 600 (0 - 24 in)*	140	10 (12.7)*	24	172	32	8	10 (12.7)*

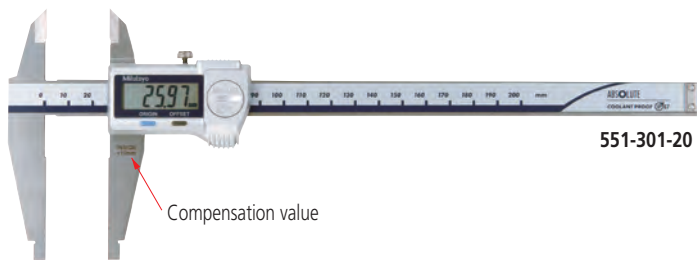
* Inch model

* Inch model

Calipers

ABSOLUTE Digimatic Caliper
SERIES 551 — with Nib Style and Standard Jaws

- Incorporates an Absolute measurement system. No need to reset the origin after switching on. (Refer to page D-3 and D-5 for details on the Absolute function.)
- **SERIES 551:** IP67 Absolute Digimatic Caliper. (Rustproofing shall be applied after use if caliper was in contact with coolant.)
- ID measurement value: displayed value + (a compensation value displayed on the main unit). OFFSET switch allows to input a compensation value so that the measurement value can be read directly (**Order No. 551-301-20, 551-331-20, 551-311-20 and 551-341-20**). Preset function allows to set a desired starting point (**Order No. 551-331-20 and 551-341-20**).
- Tips of the outside measurement jaw are relieved for easy measurement of thin parts.



SPECIFICATIONS

Metric					
Order No.	Range (mm)* ¹	Resolution (mm)	Maximum permissible error (mm)* ²		Remarks
551-301-20	0 - 200 (10.1 - 210)	0.01	EMPE	SMPE	IP67, with offset
551-331-20	0 - 300 (10.1 - 310)		±0.03	±0.03	
551-204-10	0 - 500 (20.1 - 520)		±0.04	±0.04	IP67, with offset/preset function for easy inside measurement
551-206-10	0 - 750 (20.1 - 770)		±0.06	±0.06	
551-207-10	0 - 1000 (20.1 - 1020)		±0.06	±0.06	

Inch / Metric					
Order No.	Range* ¹	Resolution	Maximum permissible error* ²		Remarks
551-311-20	0 - 8 in/0 - 200 mm (0.404 - 8.4 in/10.26 - 210.16 mm)	0.0005 in/ 0.01 mm	EMPE	SMPE	IP67, with offset
551-341-20	0 - 12 in/0 - 300 mm (0.404 - 12.4 in/10.26 - 310.16 mm)		±0.0015 in/ ±0.03 mm	±0.0015 in/ ±0.03 mm	
551-224-10	0 - 20 in/0 - 500 mm (0.504 - 20.5 in/12.8 - 512.7 mm)		±0.002 in/ ±0.04 mm	±0.002 in/ ±0.04 mm	IP67, with offset/preset function for easy inside measurement
551-226-10	0 - 30 in/0 - 750 mm (0.504 - 30.5 in/12.8 - 762.7 mm)		±0.0025 in/ ±0.06 mm	±0.0025 in/ ±0.06 mm	
551-227-10	0 - 40 in/0 - 1000 mm (1.004 - 40.1 in/25.5 - 1025.4 mm)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Scale type: ABSOLUTE electromagnetic induction linear encoder
 - Max. response speed: Unlimited
 - *1 (): Inside measurement
 - *2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.
- Note: **Series 551** is not equipped with a depth bar.

DIMENSIONS

Unit: mm

Range (mm)	B	C	D	G	S	H	t	R
0 - 200 (0 - 8 in)*	30	23.6	60	5 (5.08)*	8	16	3	5 (5.08)*
0 - 300 (0 - 12 in)*	40	32.2	90		10	20	3.8	
0 - 500 (0 - 20 in)*	56	44.9	150	10 (6.35)*	18	25	6	10 (6.35)*
0 - 750 (0 - 30 in)*	56			10 (12.7)*	20	32	8	10 (12.7)*
0 - 1000 (0 - 40 in)*	56	43.8						

* Inch model

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

U-WAVE[®] fit

ABSOLUTE[™]

IP67

TÜV Rheinland
CERTIFIED

Dust- and
Water-
Protected

Measurement example



Optional Accessories

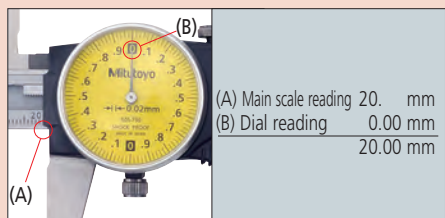
Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)* ¹
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)* ¹
959149	C	Connecting cables for IT/DP/MUX (1 m)* ²
959150	C	Connecting cables for IT/DP/MUX (2 m)* ²
06AFM380A	A	USB Input Tool Direct (2 m)* ¹
06AFM380C	C	USB Input Tool Direct (2 m)* ²
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)* ¹
02AZD790C	C	Connecting cables for U-WAVE-T (160 mm)* ²
02AZE140A	A	Connecting cables for U-WAVE-T* ¹ For foot switch
02AZE140C	C	Connecting cables for U-WAVE-T* ² For foot switch
264-620	IP67	U-WAVE-TC* ¹
264-621	Buzzer	U-WAVE-TC* ¹
264-624	IP67	U-WAVE-TCB Transmitter* ¹
264-625	Buzzer	U-WAVE-TCB Transmitter* ¹
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB* ¹

*1 For IP67 models (up to 300 mm)
*2 For series 551-2XX and 551-22X.

Calipers



Reading



Dial Caliper
SERIES 505

- Newly designed dial movement for ultra-smooth sliding.
- Easy-to-read yellow dial.
- Large finger-rest aids ease-of-use.
- Jaw tips are relieved for easy measurement of thin parts.



SPECIFICATIONS

Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
505-730	0 - 150	0.02, 2/rev	±0.03	±0.05	—
505-734			±0.03	±0.05	Carbide-tipped jaws for outside measurement
505-735			±0.03	±0.05	Carbide-tipped jaws for outside and inside measurement
505-731	0 - 200	0.01, 1/rev	±0.03	±0.05	—
505-745	0 - 300		±0.04	±0.06	
505-732*1	0 - 150		±0.02	±0.04	
505-733*1	0 - 200		±0.03	±0.05	

Order No.	Range (in)	Graduation (in)	Maximum permissible error (in)*2		Remarks
			EMPE	SMPE	
505-740J	0 - 6	0.001, 0.2/rev	±0.001	±0.002	—
505-742J*1			±0.001	±0.002	—
505-742-56J		0.001, 0.1/rev	±0.001	±0.002	—
505-742-51J			±0.001	±0.002	—
505-736*1			±0.001	±0.002	Carbide-tipped jaws for outside measurement
505-738*1			±0.001	±0.002	Carbide-tipped jaws for outside and inside measurement
505-744	0 - 8	0.001, 0.2/rev	±0.001	±0.002	Carbide-tipped jaws for outside measurement
505-741J			±0.002	±0.0025	—
505-743J*1		0.001, 0.1/rev	±0.002	±0.0025	—
505-737*1			±0.002	±0.0025	Carbide-tipped jaws for outside measurement
505-739*1		0.001, 0.2/rev	±0.002	±0.0025	Carbide-tipped jaws for outside and inside measurement
505-749			±0.002	±0.0025	—
505-746*1	0 - 12	0.001, 0.1/rev	±0.002	±0.0025	Carbide-tipped jaws for outside measurement
505-750		0.001, 0.2/rev	±0.002	±0.0025	
505-747*1			±0.002	±0.0025	
505-748*1		0.001, 0.1/rev	±0.002	±0.0025	

*1 Silver cover type
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS

Unit: mm

Range (mm)	A	B	D	E	H	L
0 - 150	16.5	21	40	57.2	16	231
0 - 200	20	24.5	50			288
0 - 300	22	27.5	64	70.2	20	404

Outside jaw thickness: 3.5 mm
(505-745: 3.8 mm)

Calipers

ABSOLUTE Coolant Proof Carbon Fiber Caliper
SERIES 552 — with Standard jaws

- IP66 Absolute Digital Caliper (Refer to page D-5 for details on the Absolute function.)
- Lightweight Digimatic Calipers that employ CFRP (Carbon Fiber Reinforced Plastics) in the beam.



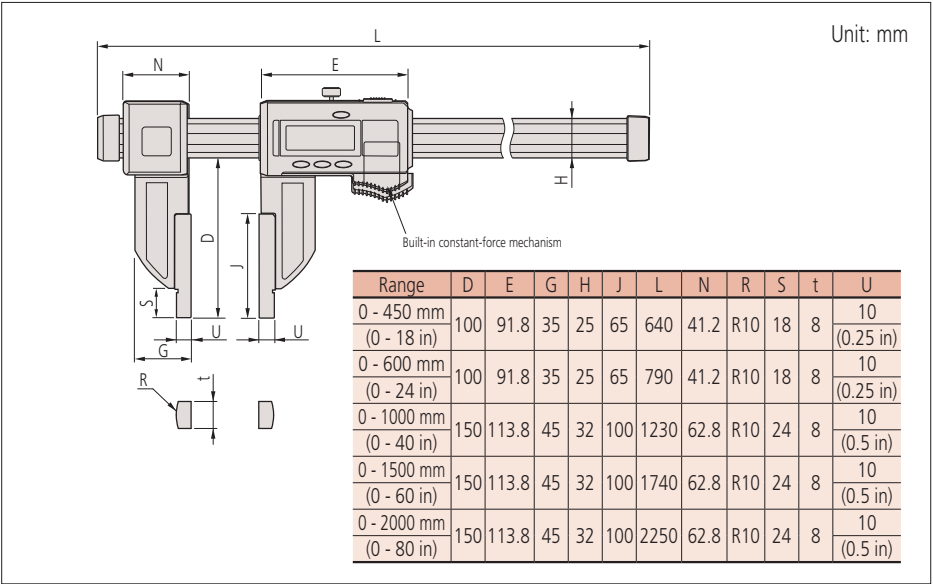
SPECIFICATIONS

Metric	Order No.	Range (mm)* ¹	Resolution (mm)	Maximum permissible error (mm)* ²	
				<i>EMPE</i>	<i>SMPE</i>
	552-302-10	0 - 450 (20.1 - 470)	0.01	±0.04	±0.04
	552-303-10	0 - 600 (20.1 - 620)		±0.04	±0.04
	552-304-10	0 - 1000 (20.1 - 1020)		±0.05	±0.05
	552-305-10	0 - 1500 (20.1 - 1520)		±0.09	±0.09
	552-306-10	0 - 2000 (20.1 - 2020)		±0.12	±0.12

Inch / Metric	Order No.	Range* ¹	Resolution	Maximum permissible error* ²	
				<i>EMPE</i>	<i>SMPE</i>
	552-312-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7mm)	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	±0.002 in/±0.04 mm
	552-313-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)			
	552-314-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.002 in/±0.05 mm	±0.002 in/±0.05 mm
	552-315-10	0 - 60 in/0 - 1500 mm (1.004 - 61 in/25.5 - 1525.4 mm)		±0.004 in/±0.09 mm	±0.004 in/±0.09 mm
	552-316-10	0 - 80 in/0 - 2000 mm (1.004 - 81 in/25.5 - 2025.4 mm)		±0.005 in/±0.12 mm	±0.005 in/±0.12 mm

- Dust/Water protection level: IP66 (IEC60529)*³
 - Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 5,000 hours in continuous use
 - Max. response speed: Unlimited
 - Material of jaws: Stainless Steel Hardened
- *1 (): Dimension in inside measurement
*2 Partial Surface Contact Error, *EMPE* and Shift Error, *SMPE* are terms (notations) used in ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.
- Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page D-45 for details.

DIMENSIONS



Measurement example



Functions

- Zero-setting
 - Data hold
 - Offsetting
 - Presetting
 - Data output
 - Low-power and low-voltage alert
 - Counting value composition error
 - Automatic power on/off, inch/mm reading (inch/mm models)
- LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

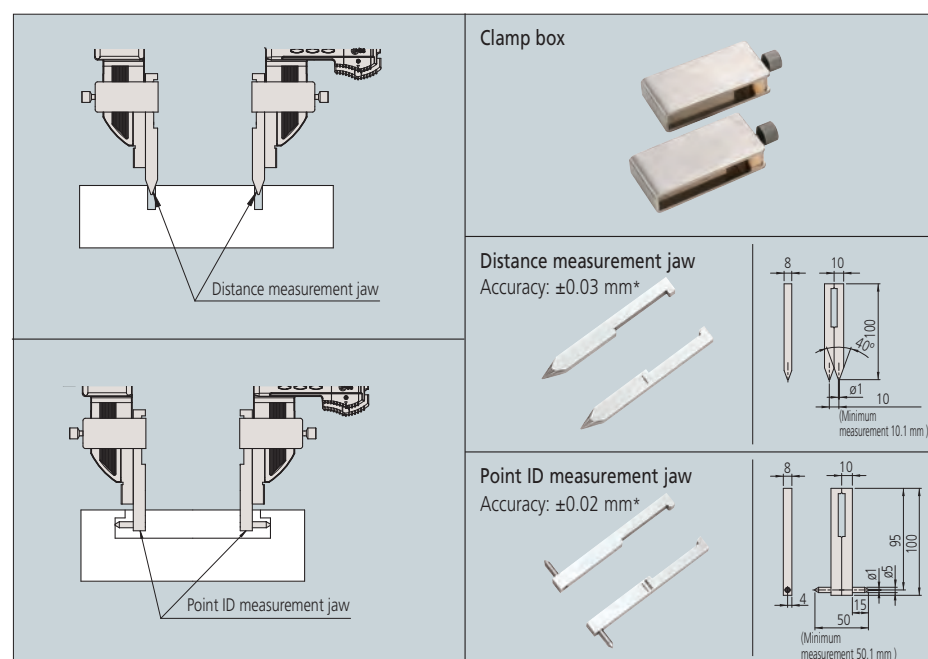
Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch

Calipers

Optional accessories

Metric		
	552-302-10, 552-155-10, 552-303-10 and 552-156-10	552-304-10, 552-305-10 and 552-306-10
Clamp box (1 pair)	914053	914054
Distance measurement jaw (1 pair)	914055	
Point ID measurement jaw (1 pair)	914057	

Inch / Metric		
	552-312-10, 552-165-10, 552-313-10 and 552-166-10	552-314-10, 552-315-10 and 552-316-10
Clamp box (1 pair)	914053	914054
Distance measurement jaw (1 pair)	914056	
Point ID measurement jaw (1 pair)	914058	



* Accuracies shown in the diagrams are of each accessory and accuracy resulting in mounting them on the main body is not guaranteed.

Calipers

ABSOLUTE Coolant Proof Carbon Fiber Caliper
SERIES 552 — with Long Jaws

- IP66 Absolute Digital Caliper (Refer to page D-5 for details on the Absolute function.)
- Lightweight Digimatic Calipers that employ CFRP (Carbon Fiber Reinforced Plastics) in the beam.



SPECIFICATIONS

Metric				
Order No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
552-150-10	0 - 450 (20.1 - 470)	0.01	±0.06	±0.06
552-151-10	0 - 600 (20.1 - 620)		±0.06	±0.06
552-152-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07
552-153-10	0 - 1500 (20.1 - 1520)		±0.11	±0.11
552-154-10	0 - 2000 (20.1 - 2020)		±0.14	±0.14

Inch / Metric				
Order No.	Range*1	Resolution	Maximum permissible error*2	
			EMPE	SMPE
552-160-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)	0.0005 in/0.01 mm	±0.0025 in/±0.06 mm	±0.0025 in/±0.06 mm
552-161-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)		±0.003 in/±0.07 mm	±0.003 in/±0.07 mm
552-162-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.0045 in/±0.11 mm	±0.0045 in/±0.11 mm
552-163-10	0 - 60 in/0 - 1500 mm (1.004 - 61 in/25.5 - 1525.4 mm)		±0.0055 in/±0.14 mm	±0.0055 in/±0.14 mm
552-164-10	0 - 80 in/0 - 2000 mm (1.004 - 81 in/25.5 - 2025.4 mm)		±0.0055 in/±0.14 mm	±0.0055 in/±0.14 mm

- Dust/Water protection level: IP66 (IEC 60529)*3
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5,000 hours in continuous use
- Max. response speed: Unlimited
- Material of jaws: Stainless Steel Hardened

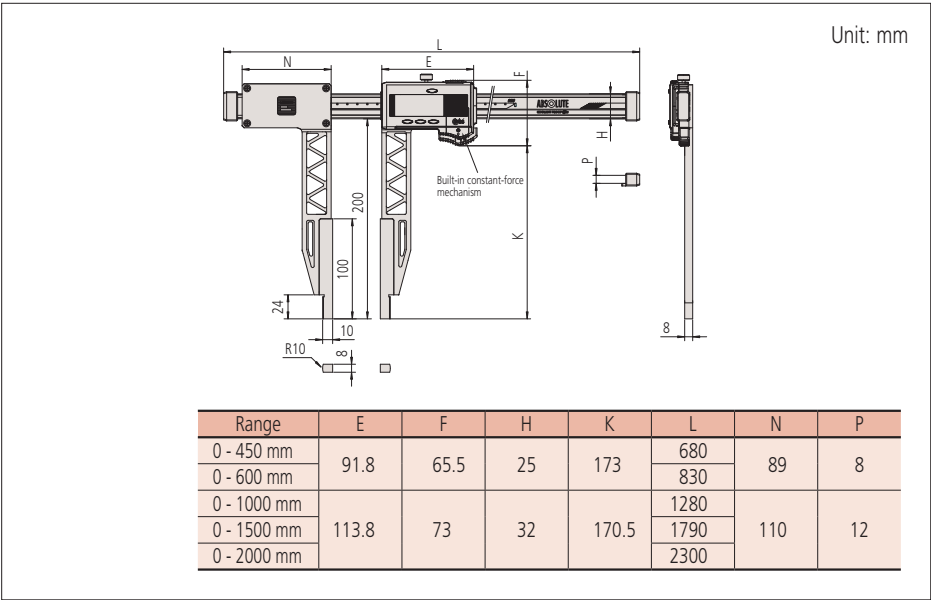
*1 (): Dimension in inside measurement

*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page D-45 for details.

DIMENSIONS



MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

ABSOLUTE[™]



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Water-
Protected
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Measurement example



Functions

- Zero-setting
- Data hold
- Offsetting
- Presetting
- Data output
- Low-power and low-voltage alert
- Counting value composition error
- Automatic power on/off, inch/mm reading (inch/mm models)

Optional Accessories

Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch

ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Ceramic Jaws

- IP66 Absolute Digital Caliper (Refer to page D-5 for details on the Absolute function.)
- Lightweight Digimatic Calipers that employ CFRP (Carbon Fiber Reinforced Plastics) in the beam.
- The measuring faces (jaws) are made from zirconia, which is a ceramic material. This makes it possible to measure weakly magnetic workpieces; however, measurement of strongly magnetic workpieces may not be possible, as metal parts are used for the caliper's main body.



552-156-10

Functions

- Zero-setting
- Data hold
- Offsetting
- Presetting
- Data output
- Low-power and low-voltage alert
- Counting value composition error
- Automatic power on/off, inch/mm reading (inch/mm models)

LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch

SPECIFICATIONS

Metric				
Order No.	Range (mm)* ¹	Resolution (mm)	Maximum permissible error (mm)* ²	
			EMPE	SMPE
552-155-10	0 - 450 (20.1 - 470)	0.01	±0.04	±0.04
552-156-10	0 - 600 (20.1 - 620)		±0.04	±0.04
Inch / Metric				
Order No.	Range* ¹	Resolution	Maximum permissible error* ²	
			EMPE	SMPE
552-165-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	±0.002 in/±0.04 mm
552-166-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)			

- Dust/Water protection level: IP66 (IEC 60529)*³
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5,000 hours in continuous use
- Max. response speed: Unlimited
- Material of jaws: Zirconia

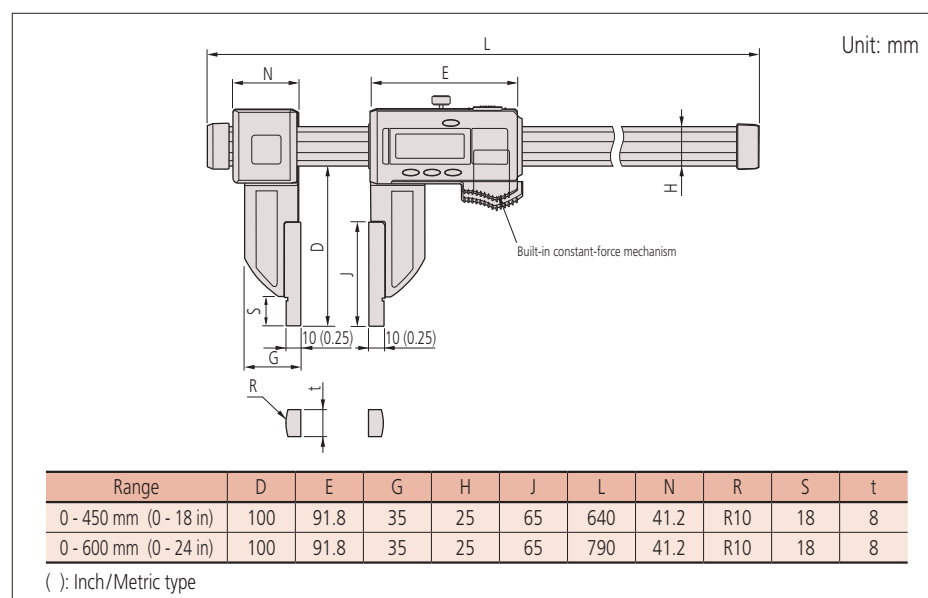
*1 (): Dimension in inside measurement

*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page D-45 for details.

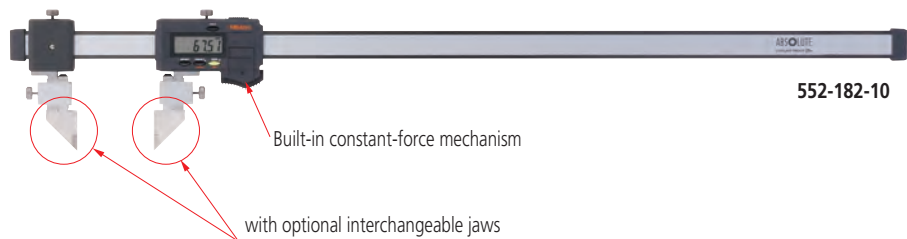
DIMENSIONS



Calipers

ABSOLUTE Coolant Proof Carbon Fiber Caliper
SERIES 552 — with Interchangeable Jaws

- IP66 Absolute Digital Caliper (Refer to page D-5 for a description of Absolute measurement.)
- The range of applications can be expanded by using interchangeable jaws (optional).



SPECIFICATIONS

Metric				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)* ¹	
			EMPE	SMPE
552-181-10	0 - 450	0.01	±0.04	
552-182-10	0 - 600		±0.05	
552-183-10	0 - 1000			
552-184-10	0 - 1500			
552-185-10	0 - 2000			
Inch / Metric				
Order No.	Range	Resolution	Maximum permissible error* ¹	
			EMPE	SMPE
552-191-10	0 - 18 in/ 0 - 450 mm	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	
552-192-10	0 - 24 in/ 0 - 600 mm		±0.002 in/±0.05 mm	
552-193-10	0 - 40 in/ 0 - 1000 mm			
552-194-10	0 - 60 in/ 0 - 1500 mm			
552-195-10	0 - 80 in/ 0 - 2000 mm			

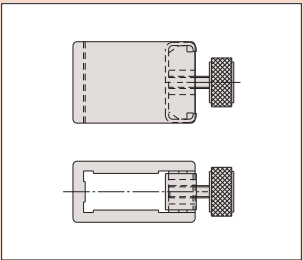
- Dust/Water protection level: IP66 (IEC 60529)*2
 - Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Battery life: Approx. 5,000 hours in continuous use
 - Max. response speed: Unlimited
- *1 Partial Surface Contact Error, *EMPE* and Shift Error, *SMPE* are terms (notations) used in ISO 13385-1:2019.
- *2 Rustproofing shall be applied after use if caliper was in contact with coolant.
- Note1: The Maximum permissible error (MPE) values described above were measured using a dedicated outside measurement inspection tool.
- Note2: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page D-45 for details.



Functions

- Zero-setting
 - Data hold
 - Offsetting
 - Presetting
 - Data output
 - Low-power and low-voltage alert
 - Counting value composition error
 - Automatic power on/off, inch/mm reading (inch/mm models)
- LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Standard Accessories (2 pcs.)



Jaw clamps: 05GZA033

Optional Accessories

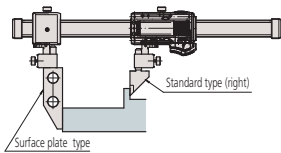
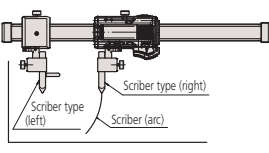
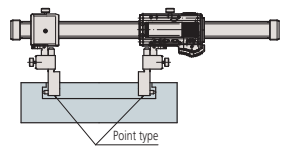
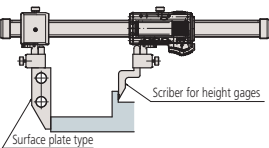
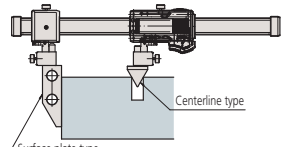
Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch

Calipers

Optional accessories

Interchangeable jaws

Typical applications

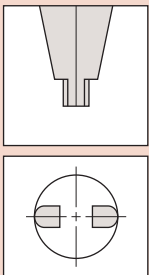
<p>Surface plate type + Standard type</p>  <p>Standard type (right)</p> <p>Surface plate type</p>	<p>Scriber type</p>  <p>Scriber type (left)</p> <p>Scriber type (right)</p> <p>Scriber (arc)</p>
<p>Point type</p>  <p>Point type</p>	<p>Surface plate type + Scriber for height gages</p>  <p>Scriber for height gages</p> <p>Surface plate type</p>
<p>Surface plate type + Centerline type</p>  <p>Centerline type</p> <p>Surface plate type</p>	<p>The above combinations are examples only. Contact us for advice on accuracy when using a contact point in a combination other than as shown above.</p>

D

Vernier Caliper
SERIES 160 — with Nib Style Jaws and Fine Adjustment

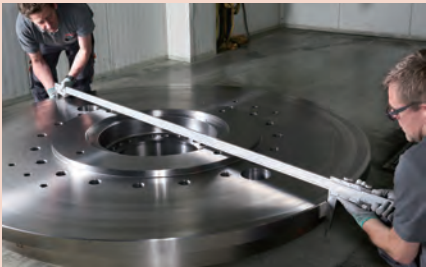
- Inside and outside measurements can be read directly from the upper and lower vernier scales.
- The jaws have radiused measuring faces for accurate inside diameter (ID) measurement.
- With fine adjustment
(Order No. 160-127/128/101/104).

Measurement example

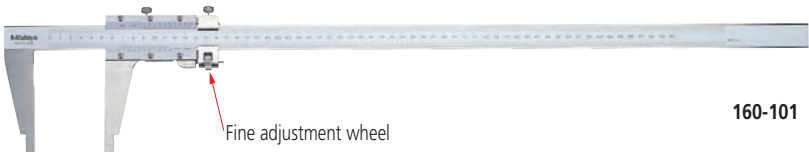


Radiused jaws for accurate ID measurement

Measurement example



160-131



160-101

Fine adjustment wheel

SPECIFICATIONS

Metric		with inside measurement vernier scale			
Order No.	Range (mm)*1	Minimum reading (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
160-130	0 (20.1) - 450	0.05	±0.10	±0.10	without fine adjustment
160-131	0 (20.1) - 600		±0.10	±0.10	
160-132	0 (20.1) - 1000		±0.15	±0.15	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

Metric		with inside measurement vernier scale			
Order No.	Range (mm)*1	Minimum reading (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
160-127	0 (10.1) - 300	0.02	±0.04	±0.04	with fine adjustment
160-128	0 (20.1) - 450		±0.05	±0.05	
160-101	0 (20.1) - 600		±0.05	±0.05	
160-104	0 (20.1) - 1000		±0.07	±0.07	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

Metric/Inch		with metric/inch double scale			
Order No.	Range*1	Minimum reading	Maximum permissible error*2		Remarks
			EMPE	SMPE	
160-150	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.02 mm/ 0.001 in	±0.04 mm/ ±0.0015 in	±0.04 mm/ ±0.0015 in	+10 mm/0.394 in to reading in inside measurement
160-151	0 - 450 mm/0 - 18 in (20.1 - 450 mm/0.791 - 18 in)		±0.05 mm/ ±0.002 in	±0.05 mm/ ±0.002 in	+20 mm/0.787 in to reading in inside measurement
160-153	0 - 600 mm/0 - 24 in (20.1 - 600 mm/0.791 - 24 in)		±0.07 mm/ ±0.003 in	±0.07 mm/ ±0.003 in	
160-155	0 - 1000 mm/0 - 40 in (20.1 - 1000 mm/0.791 - 24 in)		±0.07 mm/ ±0.003 in	±0.07 mm/ ±0.003 in	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

Calipers

Vernier Caliper
SERIES 160 — with Nib Style Jaws and Fine Adjustment

Inch		with inside measurement vernier scale			
Order No.	Range (in)* ¹	Minimum reading (in)	Maximum permissible error (in)* ²		Remarks
			EMPE	SMPE	
160-124	0 (0.304) - 12	0.001	±0.0015	±0.0015	—
160-116	0 (0.504) - 18		±0.002	±0.002	
160-102	0 (0.504) - 24		±0.002	±0.002	
160-105	0 (1.004) - 40		±0.003	±0.003	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

Inch / Metric		with inch/metric double scale			
Order No.	Range* ¹	Minimum reading	Maximum permissible error* ²		Remarks
			EMPE	SMPE	
160-125	0 - 12 in/0 - 300 mm (0.304 - 12 in/7.72 - 300 mm)	0.001 in/ 0.02 mm	±0.0015 in/ ±0.04 mm	±0.0015 in/ ±0.04 mm	+0.3 in/7.62 mm to reading in inside measurement
160-119	0 - 18 in/0 - 450 mm (0.504 - 18 in/12.8 - 450 mm)		±0.002 in/ ±0.05 mm	±0.002 in/ ±0.05 mm	+0.5 in/12.7 mm to reading in inside measurement
160-103	0 - 24 in/0 - 600 mm (0.504 - 24 in/12.8 - 600 mm)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	+1 in/25.4 mm to reading in inside measurement
160-106	0 - 40 in/0 - 1000 mm (1.004 - 40 in/25.5 - 1000 mm)				

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS

D

Unit: mm

Range	D	E	F	H	L	M	R	S	t
0 - 300 mm/0 - 12 in	75	103	38	20	445	10	R5	12	3.8
0 - 450 mm*	100	89	—	25	630	14.8	R10	18	6
0 - 450 mm/0 - 18 in		112	51				R10		6
0 - 600 mm*	100	89	—	25	780	14.8	R10	18	6
0 - 600 mm/0 - 24 in		112	51				R10		6
0 - 1000 mm*	140	111	—	32	1240	17	R10	24	8
0 - 1000 mm/0 - 40 in		150	62.5				R10		8

* Without fine adjustment

Long Jaw Vernier Caliper
SERIES 534

- Long jaws for measuring hard-to-reach workpiece features.
- Inside and outside measurements can be read directly from the upper and lower vernier scales.
- Inside measurement is possible upwards from the minimum inside measuring length (jaws closed).



SPECIFICATIONS

Metric		with inside measurement vernier scale			
Order No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
534-109	0 (10.1) - 300	0.05	±0.07	±0.07	without fine adjustment
534-110	0 (20.1) - 500		±0.13	±0.13	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

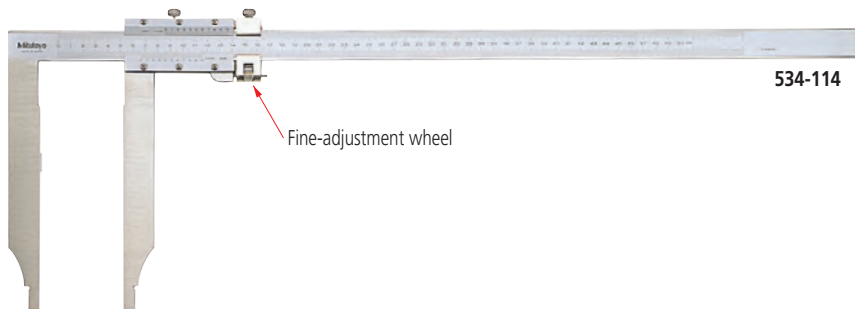
Metric/Inch		with metric/inch double scale			
Order No.	Range* ¹	Graduation	Maximum permissible error* ²		Remarks
			EMPE	SMPE	
534-101	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.05 mm/ 1/128 in	±0.07 mm/ ±0.5/128 in	±0.07 mm/ ±0.5/128 in	+10 mm/0.394 in to reading in inside measurement without fine adjustment
534-105	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.02 mm/ 0.001 in	±0.04 mm/ ±0.002 in	±0.04 mm/ ±0.002 in	
534-102	0 - 500 mm/0 - 20 in (20.1 - 500 mm/0.791 - 20 in)	0.05 mm/ 1/128 in	±0.13 mm/ ±0.5/128 in	±0.13 mm/ ±0.5/128 in	+20 mm/0.787 in to reading in inside measurement without fine adjustment
534-106		0.02 mm/ 0.001 in	±0.06 mm/ ±0.003 in	±0.06 mm/ ±0.003 in	
534-103	0 - 750 mm/0 - 30 in (20.1 - 750 mm/0.791 - 30 in)	0.05 mm/ 1/128 in	±0.16 mm/ ±1/128 in	±0.16 mm/ ±1/128 in	
534-107		0.02 mm/ 0.001 in	±0.08 mm/ ±0.004 in	±0.08 mm/ ±0.004 in	
534-104	0 - 1000 mm/0 - 40 in (20.1 - 1000 mm/0.791 - 40 in)	0.05 mm/ 1/128 in	±0.2 mm/ ±1/128 in	±0.2 mm/ ±1/128 in	
534-108		0.02 mm/ 0.001 in	±0.1 mm/ ±0.004 in	±0.1 mm/ ±0.004 in	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.
Note: For external dimensions, refer to page D-25.

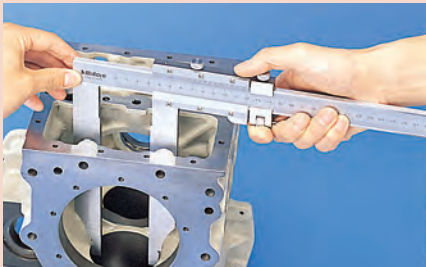
Calipers

Long Jaw Vernier Caliper
SERIES 534

- Long jaws for measuring hard-to-reach workpiece features.
- Inside and outside measurements can be read directly from the upper and lower vernier scales.
- The fine-adjustment wheel enables precise feed and adjustment.
- Inside measurement is possible upwards from the minimum inside measuring length (jaws closed).



Measurement example



SPECIFICATIONS

Metric with inside measurement vernier scale					
Order No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
534-113	0 (10.1) - 300	0.02	<i>E</i> _{MPE}	<i>S</i> _{MPE}	with fine adjustment
534-114	0 (20.1) - 500		±0.04	±0.04	
534-115	0 (20.1) - 750		±0.06	±0.06	
534-116	0 (20.1) - 1000		±0.08	±0.08	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, *E*_{MPE} and Shift Error, *S*_{MPE} are terms (notations) used in ISO 13385-1:2019.

Inch with inside measurement vernier scale					
Order No.	Range (in)*1	Graduation (in)	Maximum permissible error (in)*2		Remarks
534-117	0 (0.304) - 12	0.001	<i>E</i> _{MPE}	<i>S</i> _{MPE}	with fine adjustment
534-118	0 (0.804) - 20		±0.002	±0.002	
534-119	0 (0.804) - 30		±0.003	±0.003	
534-120	0 (0.804) - 40		±0.004	±0.004	

*1 (): Minimum dimension in ID measurement
*2 Partial Surface Contact Error, *E*_{MPE} and Shift Error, *S*_{MPE} are terms (notations) used in ISO 13385-1:2019.

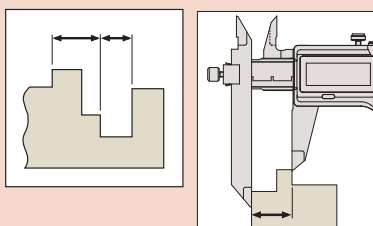
DIMENSIONS

Unit: mm

Range	D	E	F	H	L	M	R	S	t	
0 - 300 mm / 0 - 12 in	90	103	38	20	445	7	R5	12	3.8	
0 - 500 mm / 0 - 20 in	200	112	51	25	682	12	R10	18.5	6	
0 - 750 mm*		150	—	32	995		R10		8	
0 - 750 mm / 0 - 30 in			62.5		1230		R10		8	
0 - 1000 mm*			—				R10		8	
0 - 1000 mm / 0 - 40 in			62.5				R10		8	

* Without fine adjustment

Measurement example



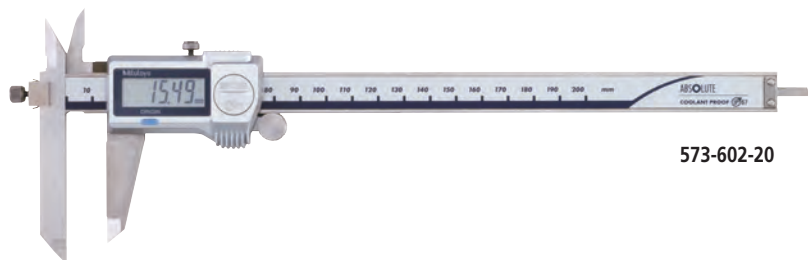
Optional Accessories

Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U- WAVE-TCB Transmitter
264-625	Buzzer	U- WAVE-TCB Transmitter
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Calipers

Offset Caliper SERIES 573 — ABSOLUTE Digimatic type

- The beam-mounted jaw can be adjusted to facilitate measurement of stepped sections and hard-to-get-at workpiece features.



573-602-20

SPECIFICATIONS

Metric Digimatic model				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-601-20	0 - 150	0.01	±0.02	±0.04
573-611-20*1	0 - 150		±0.02	±0.04
573-602-20	0 - 200		±0.02	±0.04
573-612-20*1	0 - 200		±0.02	±0.04
573-604-20	0 - 300		±0.03	±0.05
573-614-20*1	0 - 300		±0.03	±0.05

Inch / Metric Digimatic model				
Order No.	Range	Resolution	Maximum permissible error*2	
			EMPE	SMPE
573-701-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-702-20	0 - 8 in/0 - 200 mm		±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-704-20	0 - 12 in/0 - 300 mm		±0.0015 in/±0.03 mm	±0.0025 in/±0.05 mm

- Dust/Water protection level: IP67 (IEC 60529)*3
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5 years under normal use
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited

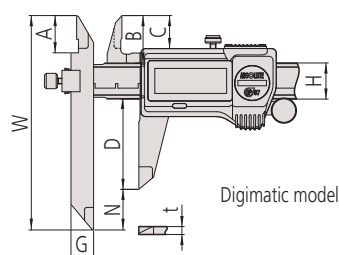
*1 Without thumb roller

*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

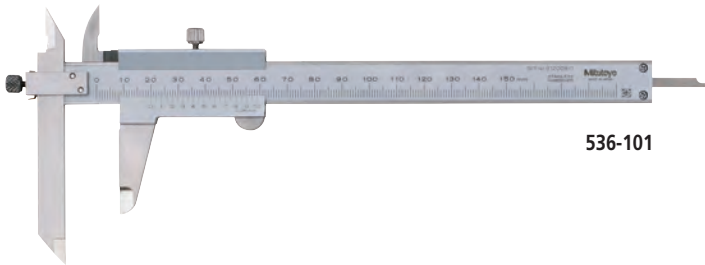
Unit: mm



Order No.	Model	Range (mm)	A	B	C	D	G	H	N	W	t
573-601-20	Digimatic model	0 - 150	16.5	21	14.6	40	10	16	(18)	95	3.5
573-602-20		0 - 200	20	24.5	18.1	50			(4)		
573-604-20		0 - 300	22	27.5	19.8	64			(23.5)		

Calipers

Offset Caliper
SERIES 536 — Vernier type



536-101

SPECIFICATIONS

Metric		Analog model		
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			<i>E</i> _{MPE}	<i>S</i> _{MPE}
536-101	0 - 150	0.05	±0.05	±0.07
536-102	0 - 200		±0.05	±0.07
536-103	0 - 300		±0.08	±0.10

* Partial Surface Contact Error, *E*_{MPE} and Shift Error, *S*_{MPE} are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS

Unit: mm

Order No.	Model	Range (mm)	A	B	C	D	G	H	N	W	t
536-101	Analog model	0 - 150	17	21.5	17	40	10	16	(18) (4)	95	3
536-102		0 - 200	20.5	25	20.5	50					
536-103		0 - 300	22	27.5	22	64	15	20	(23.5)	135	3.8



Calipers

Offset Centerline Caliper
SERIES 536 — Vernier type



SPECIFICATIONS

Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			<i>E</i> _{MPE}	<i>S</i> _{MPE}
536-105	10.1 - 150	0.05		±0.05
536-106	10.1 - 200			±0.05
536-107	10.1 - 300			±0.08

* Partial Surface Contact Error, *E*_{MPE} and Shift Error, *S*_{MPE} are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS

Unit: mm

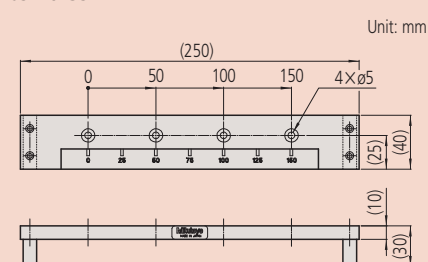
Analog model

Range (mm)	H	W	t	Applicable hole
10 - 150	16	75	3	ø1.5 - ø9.5 mm
10 - 200				
10 - 300	20	100	3.8	

Optional Accessories

Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch

Inspection equipment for center-to-center type*



* Inspection equipment for Edge-to-center type is available by special order.

Calipers

ABSOLUTE Back-Jaw Centerline Caliper SERIES 573 — Center-to-Center & Edge-to-Center Types

- Specially designed to measure hole Center-to-Center and Edge-to-Center distances. Provided with jaws on the back of the slider, measurements can be read easily from above.
- Direct reading of pitch measurements is available due to the offset value setting function.

Edge-to-center distance type



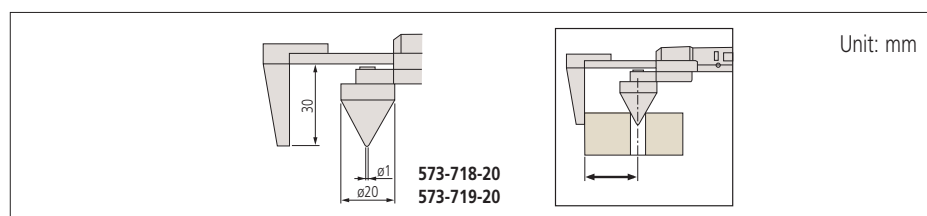
573-718-20

SPECIFICATIONS

Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-718-20*1	10.1 - 200	0.01		±0.10
573-719-20*1	10.1 - 300			±0.15

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited
- *1 Applicable hole diameter: $\phi 1.5$ - $\phi 19.5$ mm
- *2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS



Center-to-center distance type



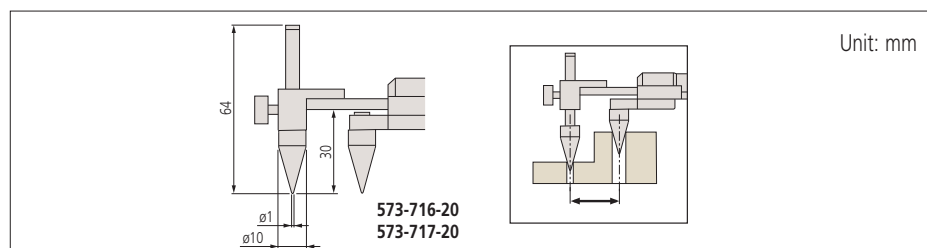
573-716-20

SPECIFICATIONS

Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-716-20*1	10.1 - 200	0.01		±0.10
573-717-20*1	10.1 - 300			±0.15

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited
- *1 Applicable hole diameter: $\phi 1.5$ - $\phi 19.5$ mm
- *2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

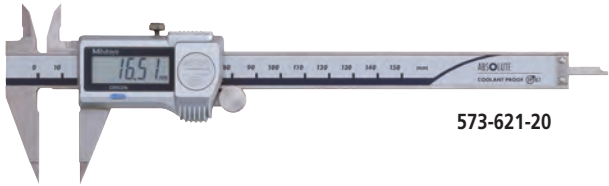
DIMENSIONS



Calipers

Point Caliper
SERIES 573, 536 — ABSOLUTE Digimatic and vernier types

- Narrow-tip jaws fit into very small grooves and tracks.
- Allows step measurement.
- Digimatic models are IP67 Absolute type. Slider action is smooth, firm and comfortable.



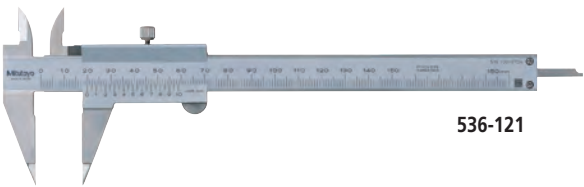
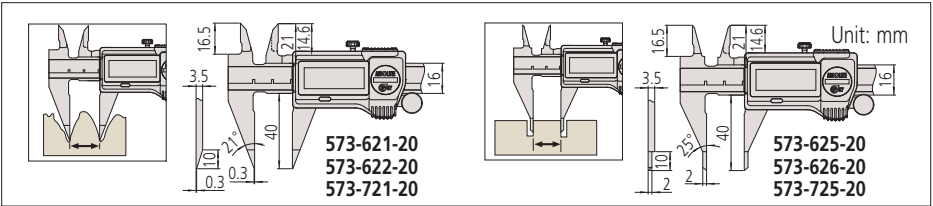
SPECIFICATIONS

Metric Digimatic model				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
573-621-20	0 - 150	0.01	EMPE ±0.02	SMPE ±0.04
573-625-20	0 - 150		EMPE ±0.02	SMPE ±0.04
573-622-20*1	0 - 150		EMPE ±0.02	SMPE ±0.04
573-626-20*1	0 - 150		EMPE ±0.02	SMPE ±0.04

Inch/Metric Digimatic model				
Order No.	Range	Resolution	Maximum permissible error*2	
573-721-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	EMPE ±0.001 in/±0.02 mm	SMPE ±0.002 in/±0.04 mm
573-725-20				

- Dust/Water protection level: IP67 (IEC 60529)*3
 - Battery: SR44 (1 pc.), 938882, for initial operational checks (standard accessory)
 - Battery life: Approx. 5 years under normal use
 - Scale type: ABSOLUTE electromagnetic induction linear encoder
 - Max. response speed: Unlimited
 - With depth bar
- *1 Without thumb roller
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

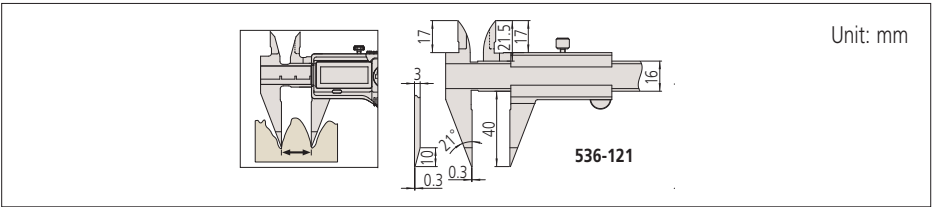


SPECIFICATIONS

Metric Analog model				
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
536-121	0 - 150	0.05	EMPE ±0.05	SMPE ±0.07

- With depth bar
- * Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS



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ABSOLUTE[™]

Applicable models: series 573

IP67

TÜV Rheinland CERTIFIED

Dust- and Water-Protected www.tuv.com ID 1000045042

Measurement example



Optional Accessories (for series 573)

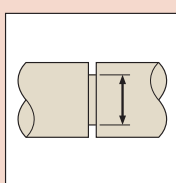
Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U- WAVE-TCB Transmitter
264-625	Buzzer	U- WAVE-TCB Transmitter
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

ABSOLUTETM

Applicable models: series 573



Measurement example



Optional Accessories (for series 573)

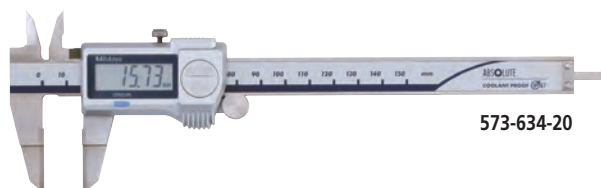
Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U- WAVE-TCB Transmitter
264-625	Buzzer	U- WAVE-TCB Transmitter
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Calipers

Blade Type Caliper

SERIES 573, 536 — ABSOLUTE Digimatic and vernier types

- The thin blade-type jaws fit into very small grooves.
- The outside measuring faces are carbide tipped.
- Allows step measurement.
- Digimatic models are IP67 Absolute type. Slider action is smooth, firm and comfortable.



573-634-20

SPECIFICATIONS

Metric Digimatic model

Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			EMPE	SMPE
573-634-20	0 - 150	0.01	±0.02	±0.04
573-635-20*1	0 - 150		±0.02	±0.04

Inch / Metric Digimatic model

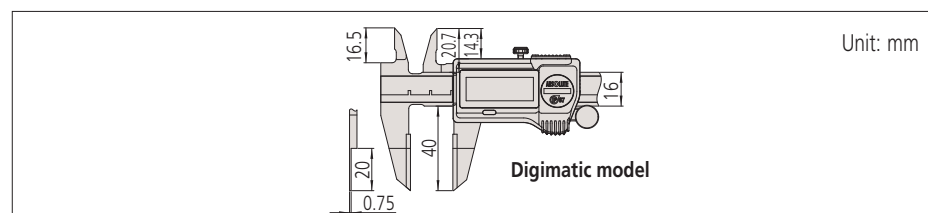
Order No.	Range	Resolution	Maximum permissible error*2	
			EMPE	SMPE
573-734-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm

- Dust/Water protection level: IP67 (IEC 60529)*3
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5 years under normal use
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited
- *1 Without thumb roller

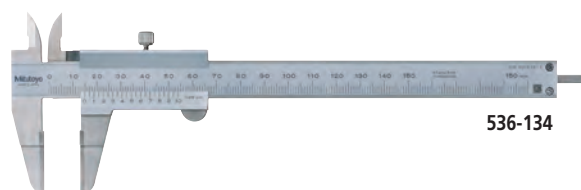
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS



Digimatic model



536-134

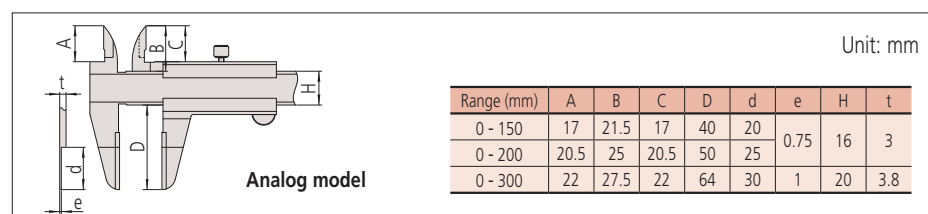
SPECIFICATIONS

Metric Analog model

Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			EMPE	SMPE
536-134	0 - 150	0.05	±0.05	±0.07
536-135	0 - 200		±0.05	±0.07
536-136	0 - 300		±0.08	±0.10

* Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS



Analog model

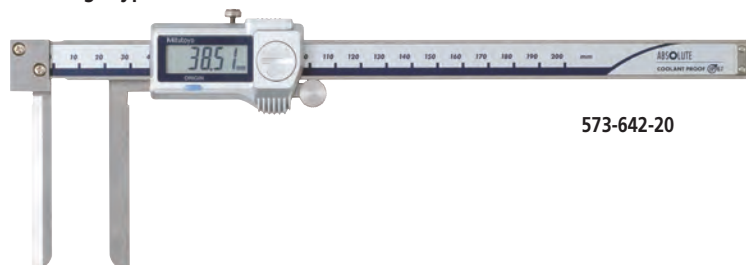
Range (mm)	A	B	C	D	d	e	H	t
0 - 150	17	21.5	17	40	20	0.75	16	3
0 - 200	20.5	25	20.5	50	25			
0 - 300	22	27.5	22	64	30	1	20	3.8

Calipers

ABSOLUTE Inside Caliper SERIES 573 — Knife-edge/Inside Groove/Point Jaw Type

- Dedicated caliper for inside measurement.
- Digimatic models are IP67 Absolute type. Slider action is smooth, firm and comfortable.

Knife-edge type



573-642-20

Inside groove type



573-645-20

Point jaw type



573-646-20

SPECIFICATIONS

Metric		Digimatic model			
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*3		Remarks
			EMPE	SMPE	
573-642-20	10 - 200	0.01		±0.05	Knife-edge type, Measurable min.
573-643-20*1	10 - 200			±0.05	Knife-edge type, Measurable min.
573-645-20*2	10.1 - 160			±0.05	Inside groove type, Measurable min.
573-647-20*1	10.1 - 160			±0.05	Inside groove type, Measurable min.
573-646-20*2	20.1 - 170			±0.03	Point jaw type, Measurable min.
573-648-20*1	20.1 - 170			±0.03	Point jaw type, Measurable min.

Inch / Metric		Digimatic model			
Order No.	Range	Resolution	Maximum permissible error*3		Remarks
			EMPE	SMPE	
573-742-20	0.4 - 8 in/ 10 - 200 mm	0.0005 in/ 0.01 mm		±0.002 in/ ±0.05 mm	Knife-edge type, Measurable min.
573-745-20*2	0.404 - 6.4 in/ 10.26 - 160.16 mm			±0.002 in/ ±0.05 mm	Inside groove type, Measurable min.
573-746-20*2	0.804 - 6.8 in/ 20.42 - 170.32 mm			±0.0015 in/ ±0.03 mm	Point jaw type, Measurable min.

- Dust/Water protection level: IP67 (IEC 60529)*4
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5 years under normal use
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited
- *1 Without thumb roller
- *2 Includes the offsetting function, which indicates the actual measurement value.
- *3 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.
- *4 Rustproofing shall be applied after use if caliper was in contact with coolant.

Mitutoyo

D-33

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IP67

TÜV Rheinland
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Dust- and
Water-
Protected
www.tuv.com
ID 000045042

Measurement example



Optional Accessories

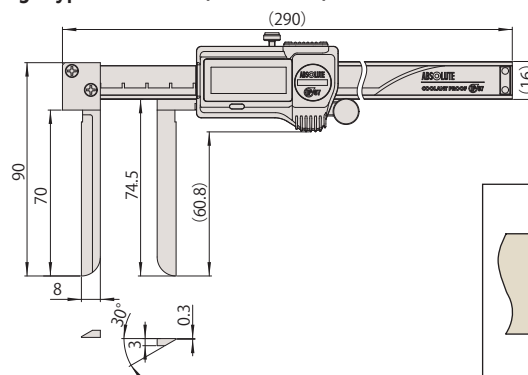
Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U- WAVE-TCB Transmitter
264-625	Buzzer	U- WAVE-TCB Transmitter
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Note: U-WAVE-TC/TCB cannot be used with Knife-edge Type (573-642-20, 573-643-20 and 573-742-20).

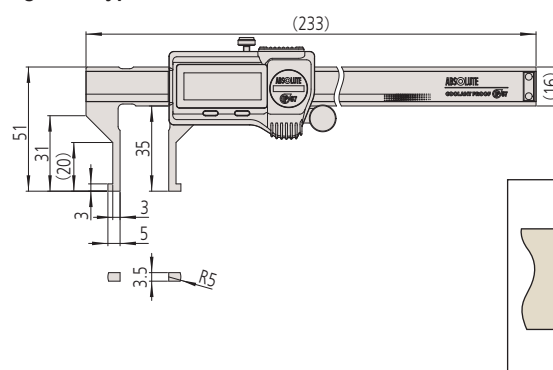
DIMENSIONS

Unit: mm

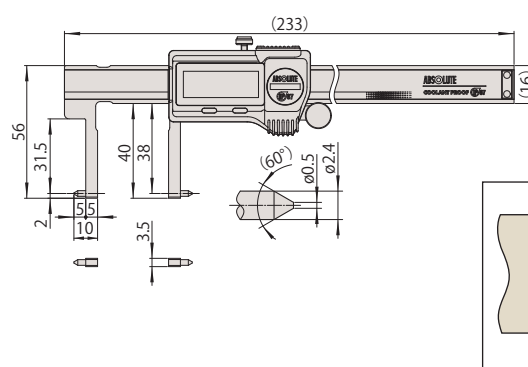
Knife-edge type: 573-642-20, 573-643-20, 573-742-20



Inside groove type: 573-645-20, 573-647-20, 573-745-20



Point jaw type: 573-646-20, 573-648-20, 573-746-20



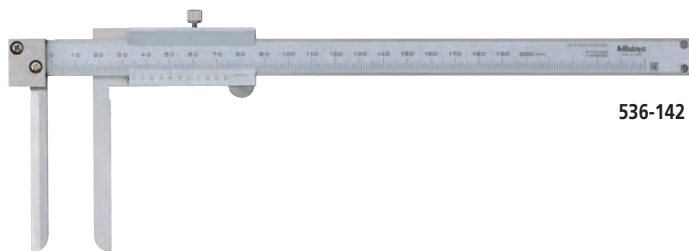
D

Calipers

ABSOLUTE Inside Caliper
SERIES 536 — Knife-edge/Inside Groove/Point Jaw Type

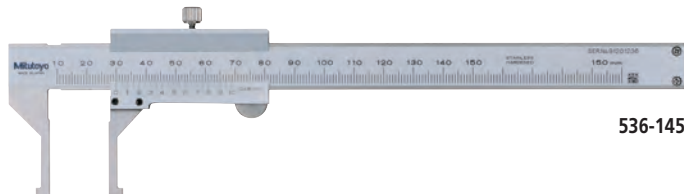
- Dedicated caliper for inside measurement.

Knife-edge type



536-142

Inside groove type



536-145

Point jaw type



536-146

SPECIFICATIONS

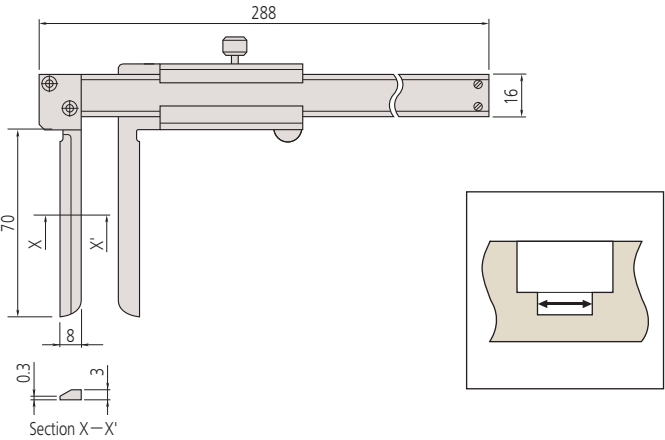
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Remarks
			EMPE	SMPE	
536-142	10 - 200	0.05	<div></div>	±0.12	Knife-edge type, Measurable min.
536-145	10.1 - 150			±0.05	Inside groove type, Measurable min.
536-146	20.1 - 150			±0.05	Point jaw type, Measurable min.
536-147	30.1 - 300			±0.08	Point jaw type, Measurable min.
536-148	70.1 - 450			±0.10	Point jaw type, Measurable min.
536-149	70.1 - 600			±0.12	Point jaw type, Measurable min.

* Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

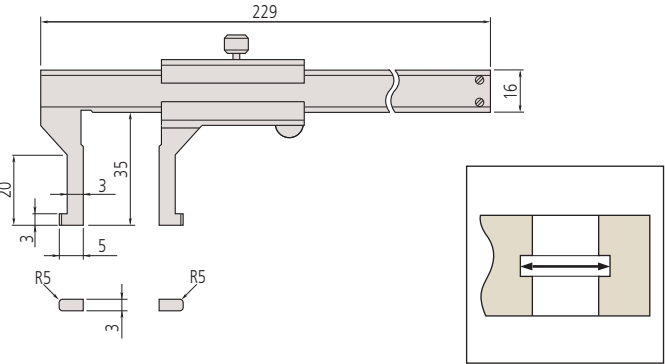
DIMENSIONS

Knife-edge type: 536-142

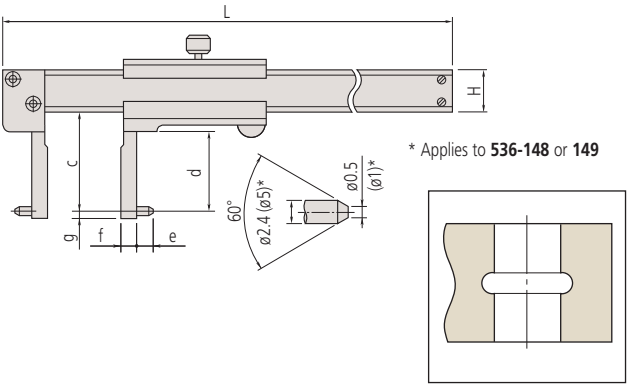
Unit: mm



Inside groove type: 536-145



Point jaw type: 536-146, 147, 148, 149



Range (mm)	c	d	e	f	g	H	L
150	38	31	5	5	2	16	229
300	98	89	5	10	2	20	403
450	145	136	10	25	5	25	610
600	145	136	10	25	5	25	750

Note: Models with a measuring range of more than 300 mm have slightly different appearance. For details, contact our Customer Support Center.

Calipers

Neck Caliper
SERIES 573, 536 — ABSOLUTE Digimatic and vernier types

- Can measure wall thickness inside bores and recesses.
- Digimatic models are an IP67 Absolute type. Slider action is smooth, firm and comfortable.



SPECIFICATIONS

Metric					Digimatic model				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*3		Order No.	Range	Resolution	Maximum permissible error*3	
			EMPE	SMPE				EMPE	SMPE
573-651-20	0 - 150	0.01	±0.03		573-751-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	
573-652-20*1	0 - 150		±0.03		573-752-20*1	0 - 6 in/ 0 - 150 mm	±0.0015 in/ ±0.03 mm		
573-653-20*2	0 - 150		±0.03						
573-654-20*1*2	0 - 150		±0.03						

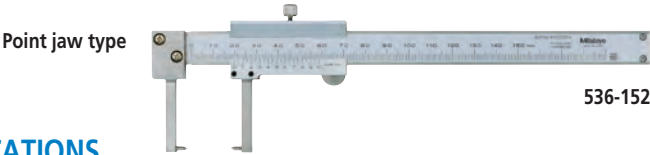
- Dust/Water protection level: IP67 (IEC 60529)*4
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5 years under normal use
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited
- *1 Point jaw type
- *2 Without thumb roller
- *3 Partial Surface Contact Error, *EMPE* and Shift Error, *SMPE* are terms (notations) used in ISO 13385-1:2019.
- *4 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

573-651-20, 573-653-20*, 573-751-20
* Without thumb roller
Jaw thickness: 3.5 mm

Point jaw type
573-652-20, 573-654-20*, 573-752-20
* Without thumb roller

Unit: mm



SPECIFICATIONS

Metric Analog model				
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*1	
536-151	0 - 150	0.05	EMPE	SMPE
536-152*2	0 - 150	0.05	±0.05	±0.05

- *1 Partial Surface Contact Error, *EMPE* and Shift Error, *SMPE* are terms (notations) used in ISO 13385-1:2019.
- *2 Point jaw type

DIMENSIONS

536-151
Jaw thickness: 3 mm

Point jaw type
536-152

Unit: mm



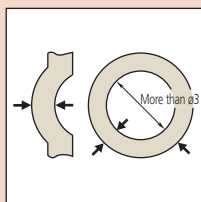
Measurement example



Optional Accessories (for series 573)

Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U- WAVE-TCB Transmitter
264-625	Buzzer	U- WAVE-TCB Transmitter
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Measurement example



Optional Accessories (for series 573)

Order No.	Type	Description
05CZA624	A	Connecting cables for IT/DP/MUX (1 m)
05CZA625	A	Connecting cables for IT/DP/MUX (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD790A	A	Connecting cables for U-WAVE-T (160 mm)
02AZE140A	A	Connecting cables for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U- WAVE-TCB Transmitter
264-625	Buzzer	U- WAVE-TCB Transmitter
02AZF310	IP67	Connecting unit for U-WAVE-TC/TCB

Calipers

Tube Thickness Caliper SERIES 573, 536 — ABSOLUTE Digimatic and vernier types

- The beam-mounted jaw is a round bar that facilitates measurements of tube wall thickness.
- Digimatic models are IP67 Absolute type. Slider action is smooth, firm and comfortable.
- Allows integration into statistical process control and measurement systems for models with measurement data output connector. (Refer to page A-3.)



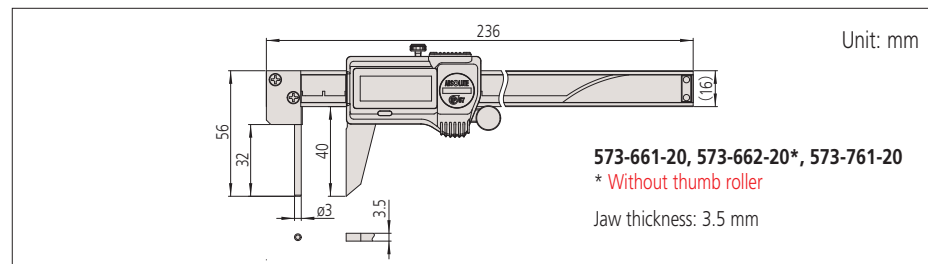
573-661-20

SPECIFICATIONS

Metric Digimatic model					Inch / Metric Digimatic model				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2		Order No.	Range	Resolution	Maximum permissible error*2	
573-661-20	0 - 150	0.01	EMPE	SMPE	573-761-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	EMPE	SMPE
573-662-20*1	0 - 150		±0.05	±0.05				±0.002 in/ ±0.05 mm	±0.05 mm

- Dust/Water protection level: IP67 (IEC 60529)*3
- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Battery life: Approx. 5 years under normal use
- Scale type: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited
- *1 Without thumb roller
- *2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.
- *3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

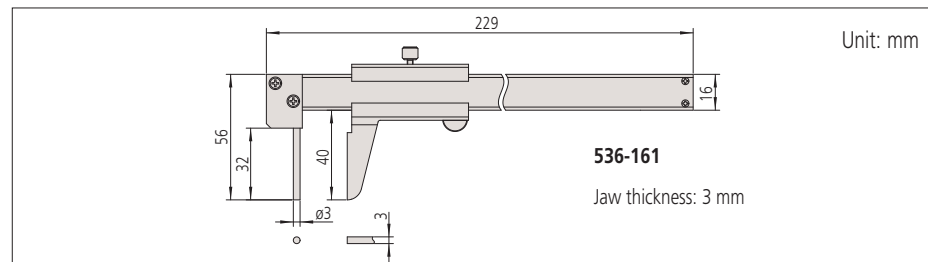


SPECIFICATIONS

Metric Analog model				
Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
536-161	0 - 150	0.05	EMPE	SMPE
			±0.05	

* Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

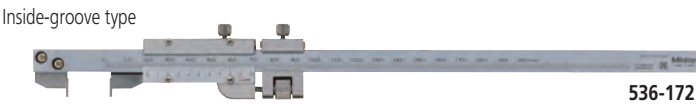
DIMENSIONS



Calipers

Hook Type Vernier Caliper
SERIES 536

- Allows measurement of stepped inside diameter section of cylinders.
- 536-172 is equipped with a fine-adjustment wheel to enable precise feed and adjustment.

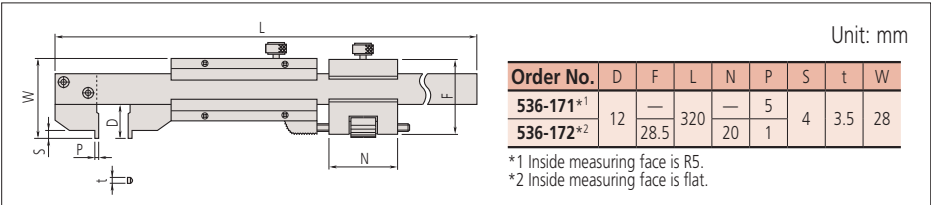


SPECIFICATIONS

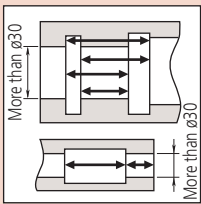
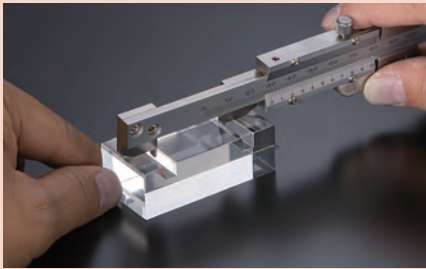
Order No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			EMPE	SMPE	
536-171	0 - 200 (10.1 - 200)	0.02	±0.03	±0.03	—
536-172	0 - 200 (2.1 - 200)		±0.03	±0.03	with fine adjustment

*1 (): Dimension in inside measurement
*2 Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS

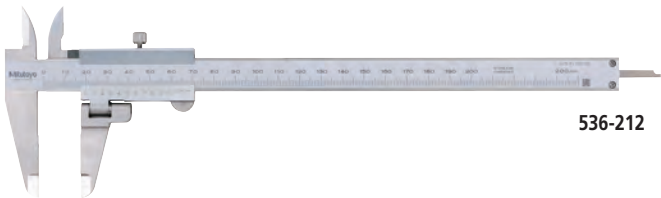


Measurement example



Swivel Vernier Caliper
SERIES 536 — Moving Jaw type

- The moving jaw can be rotated to measure sectioned shafts.
- Allows step measurement.

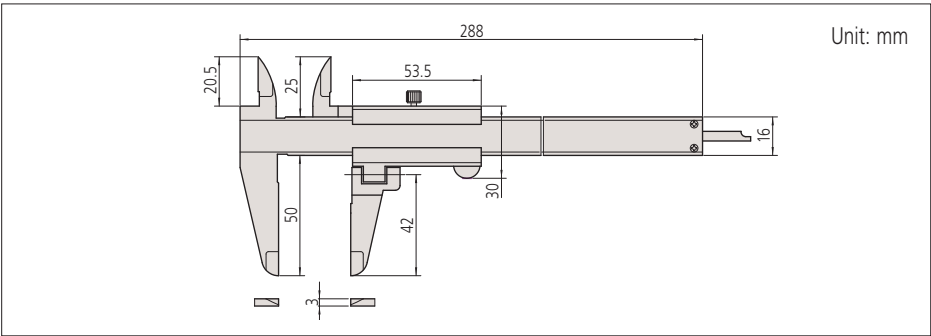


SPECIFICATIONS

Order No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Remarks
			EMPE	SMPE	
536-212	0 - 200	0.05	±0.05	±0.07	with depth bar

* Partial Surface Contact Error, EMPE and Shift Error, SMPE are terms (notations) used in ISO 13385-1:2019.

DIMENSIONS



Measurement example



Measurement example



Technical Explanation

Measurement procedure



A consistently low measuring force can be guaranteed by only taking measurements when the pointer is between the two fiducial lines.

Optional Accessories

Order No.	Type	Description
959149	C	Connecting cables for IT/DP/MUX (1 m)
959150	C	Connecting cables for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD790C	C	Connecting cables for U-WAVE-T (160 mm)
02AZE140C	C	Connecting cables for U-WAVE-T For foot switch
264-620	IP67	U-WAVE-TC
264-621	Buzzer	U-WAVE-TC
264-624	IP67	U-WAVE-TCB Transmitter
264-625	Buzzer	U-WAVE-TCB Transmitter
02AZF300	Buzzer	Connecting unit for U-WAVE-TC/TCB

Calipers

ABSOLUTE Low Force Caliper SERIES 573

- An ABSOLUTE electromagnetic induction linear encoder system is incorporated.
- Enables accurate measurement of plastic parts and other workpieces that are difficult to measure with conventional calipers due to deformation.
- Allows fine feeding easily by using thumb roller.
- Displacement of main scale jaw is 0.3 mm.
- Measuring force: 0.5 N to 1.0 N



573-191-30

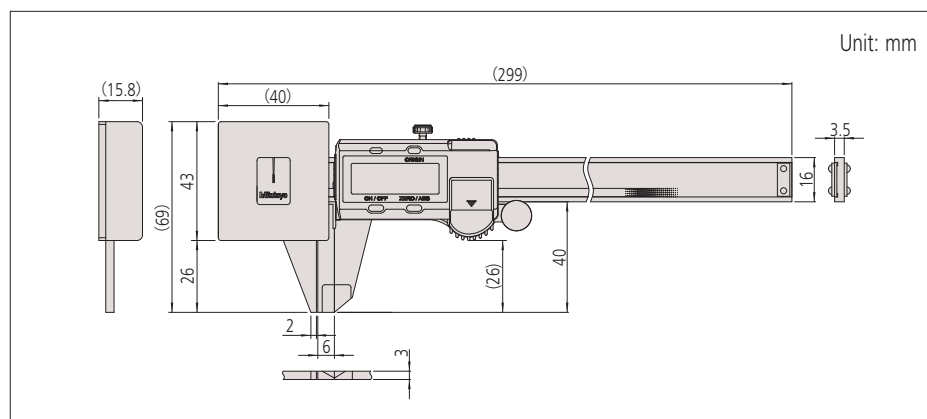
SPECIFICATIONS

Metric				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
573-191-30	0 - 180	0.01	± 0.05	

Inch / Metric				
Order No.	Range	Resolution	Maximum permissible error*	
			E_{MPE}	S_{MPE}
573-291-30	0 - 7 in / 0 - 180 mm	0.0005 in / 0.01 mm	± 0.002 in / ± 0.05 mm	

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
 - Scale type: ABSOLUTE electromagnetic inductive linear encoder
 - Max. response speed: Unlimited
- * Partial Surface Contact Error, E_{MPE} and Shift Error, S_{MPE} are terms (notations) used in ISO 13385-1:2019.
Note: Dedicated for outside measurement (depth bar is not fitted).

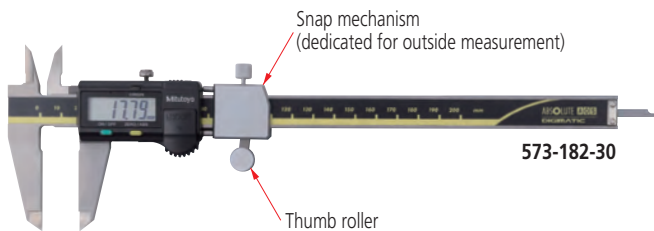
DIMENSIONS



Calipers

ABSOLUTE Snap Caliper
SERIES 573

- An ABSOLUTE electromagnetic induction linear encoder system is incorporated.
- Snap mechanism allows continuous and easy measurement without moving the slider by using the lever.
- Displacement of snap part is 2 mm.
- Measuring force: 7 N to 14 N

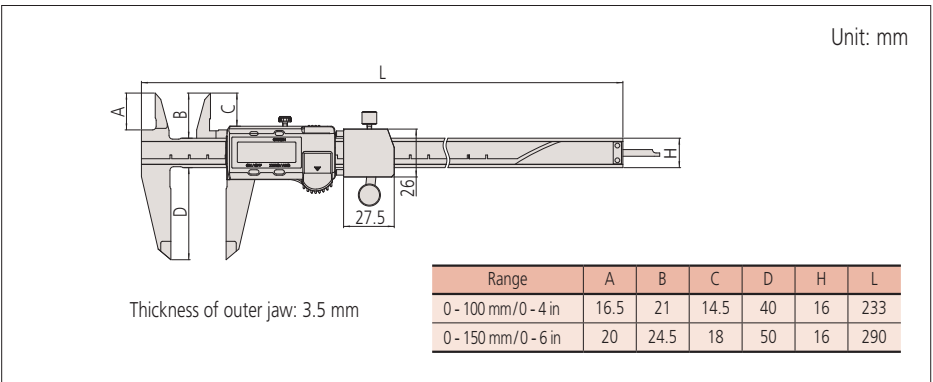


SPECIFICATIONS

Metric				
Order No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*	
			EMPE	SMPE
573-181-30	0 - 100	0.01	±0.02	±0.04
573-182-30	0 - 150			
Inch / Metric				
Order No.	Range	Resolution	Maximum permissible error*	
			EMPE	SMPE
573-281-30	0 - 4 in/0 - 100 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-282-30	0 - 6 in/0 - 150 mm			

- Battery: SR44 (1 pc.), **938882**, for initial operational checks (standard accessory)
- Scale type: ABSOLUTE electromagnetic inductive linear encoder
- Max. response speed: Unlimited
- * Partial Surface Contact Error, *EMPE* and Shift Error, *SMPE* are terms (notations) used in ISO 13385-1:2019.

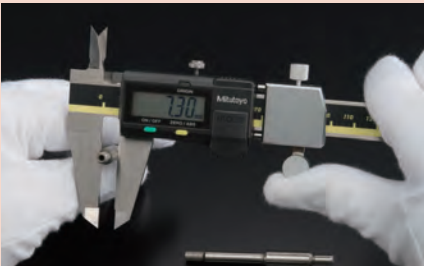
DIMENSIONS



MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

ABSOLUTE[™]

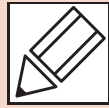
Measurement example



Optional Accessories

Order No.	Type	Description
959149	C	Connecting cables for IT/DP/MUX (1 m)
959150	C	Connecting cables for IT/DP/MUX (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD790C	C	Connecting cables for U-WAVE-T (160 mm)
02AZE140C	C	Connecting cables for U-WAVE-T For foot switch

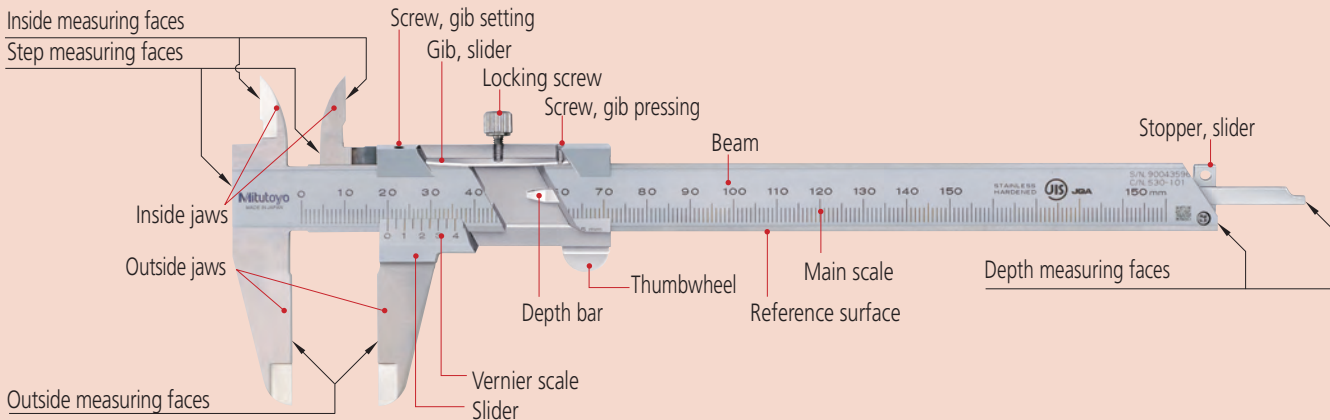
Quick Guide to Precision Measuring Instruments



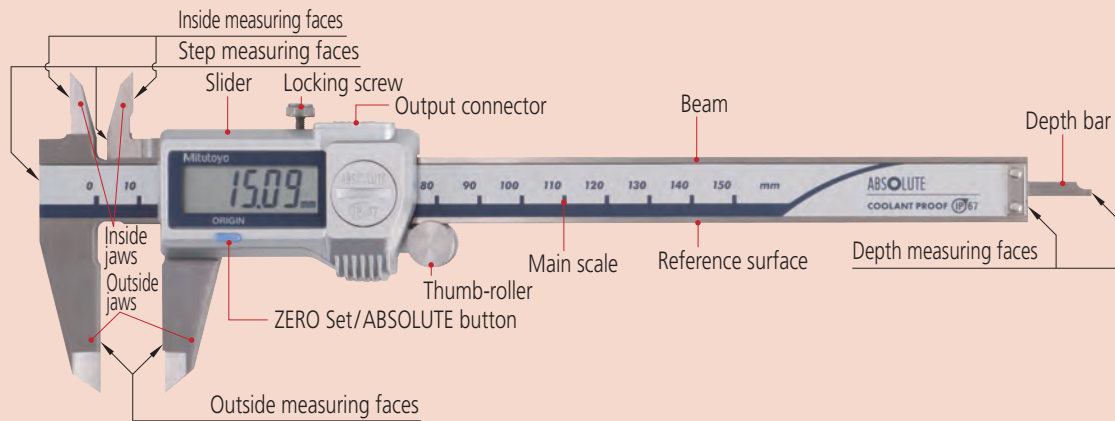
Calipers

Nomenclature

Vernier Caliper

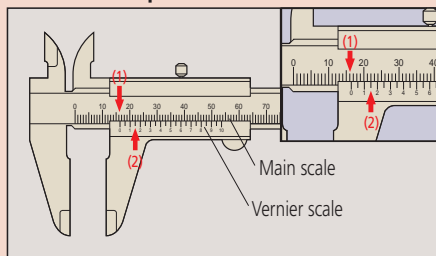


Absolute Digimatic Caliper



How to Read the Scale

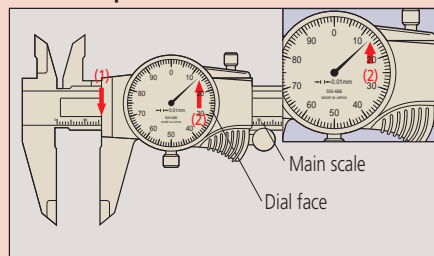
• Vernier Calipers



Graduation 0.05 mm

(1) Main scale	16 mm
(2) Vernier	0.15 mm
Reading	16.15 mm

• Dial Calipers



Graduation 0.01 mm

(1) Main scale	16 mm
(2) Dial face	0.13 mm
Reading	16.13 mm

Note: Above left, 0.15 mm (2) is read at the position where a main scale graduation line corresponds with a vernier graduation line.

Measurement examples

1. Outside measurement



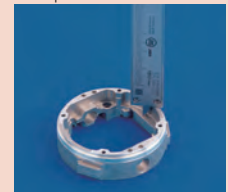
2. Inside measurement



3. Step measurement

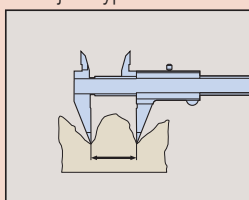


4. Depth measurement



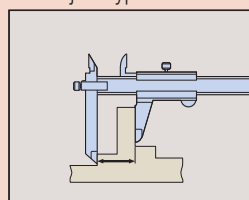
Special Purpose Caliper Applications

Point jaw type



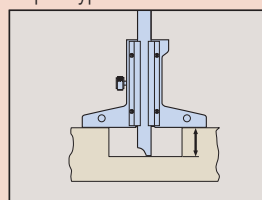
For uneven surface measurement

Offset jaw type



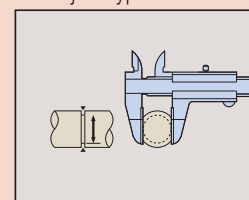
For stepped feature measurement

Depth type



For depth measurement

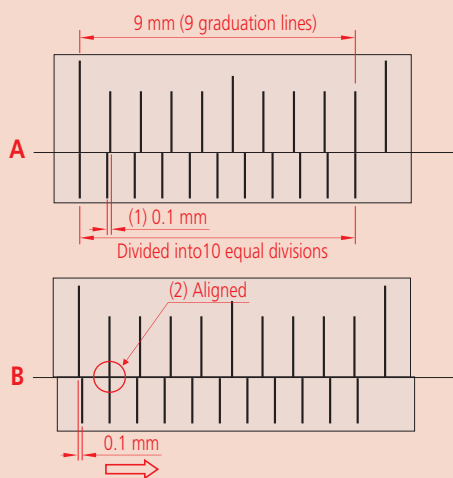
Blade jaw type



For diameter of narrow groove measurement

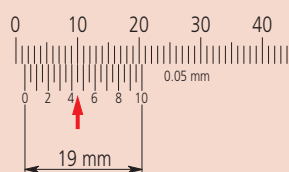
Vernier scale

This is a short auxiliary scale that enables accurate interpolation between the divisions of a longer scale without using mechanical magnification. The principle of operation is that each vernier scale division is slightly smaller than a main scale division, so that successive vernier graduations successively coincide with main scale graduations as one is moved relative to the other. Specifically, n divisions on a vernier scale are the same length as $n-1$ divisions on the main scale it works with, and n defines the division (or interpolation) ratio. Although n may be any number, in practice it is typically 10, 20, 25, etc., so that the division is a useful decimal fraction. The example below is for $n = 10$. The main scale is graduated in mm, and so the vernier scale is 9 mm (10 divisions) long, the same as 9 mm (9 divisions) on the main scale. This produces a difference in length of 0.1 mm (1) as shown in figure A (the 1st vernier graduation is aligned with the first main scale graduation). If the vernier scale is slid 0.1 mm to the right as shown in figure B, the 2nd graduation line on the vernier scale moves into alignment with the 2nd line on the main scale (2), and so enables easy reading of the 0.1 mm displacement.



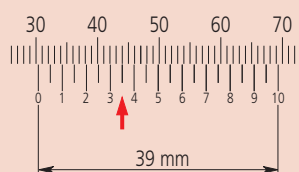
Some early calipers divided 19 divisions on the main scale by 20 vernier divisions to provide 0.05 mm resolution. However, the closely spaced lines proved difficult to read and so, since the 1970s, a long vernier scale that uses 39 main scale divisions to spread the lines is generally used instead, as shown below.

• 19 mm Vernier scale



Scale reading 1.45 mm

• 39 mm vernier scale (long vernier scale)



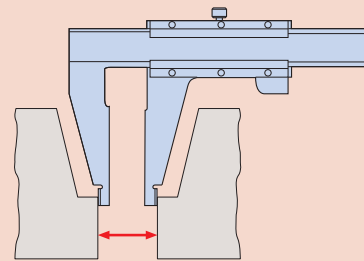
Scale reading 30.35 mm

Calipers were made that gave an even finer resolution of 0.02 mm. These required a 49-division vernier scale dividing 50 main scale divisions. However, they were difficult to read and are now hard to find since Digital calipers with an easily read display and resolution of 0.01 mm appeared.

About Long Calipers

Steel rules are commonly used to roughly measure large workpieces but if a little more accuracy is needed then a long caliper is suitable for the job. A long caliper is very convenient for its user friendliness but does require some care in use. In the first place it is important to realize there is no relationship between resolution and accuracy. For details, refer to the values in our catalog. Resolution is constant whereas the accuracy obtainable varies dramatically according to how the caliper is used.

The measuring method with this instrument is a concern since distortion of the main beam causes a large amount of the measurement error, so accuracy will vary greatly depending on the method used for supporting the caliper at the time. Also, be careful not to use too much measuring force when using the outside measuring faces as they are furthest away from the main beam so errors will be at a maximum here. This precaution is also necessary when using the tips of the outside measuring faces of a long-jaw caliper.

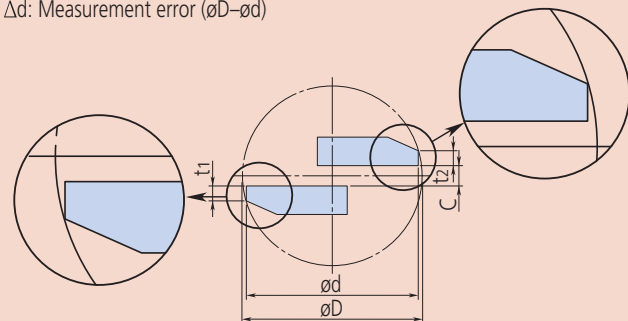


Small hole measurement with an M-type caliper

A structural error d occurs when you measure the internal diameter of a small hole.

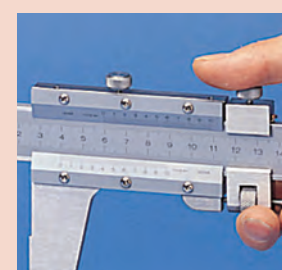
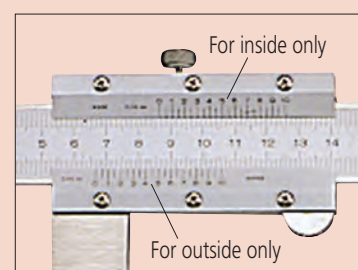
ϕD : True internal diameter
 ϕd : Measured diameter
 t_1, t_2 : Thickness of the inside jaw
 C : Distance between the inside jaws
 Δd : Measurement error ($\phi D - \phi d$)

True internal diameter (ϕD : 5 mm) Unit: mm			
$t_1 + t_2 + C$	0.3	0.5	0.7
Δd	0.009	0.026	0.047



Inside Measurement with a CM-type Caliper

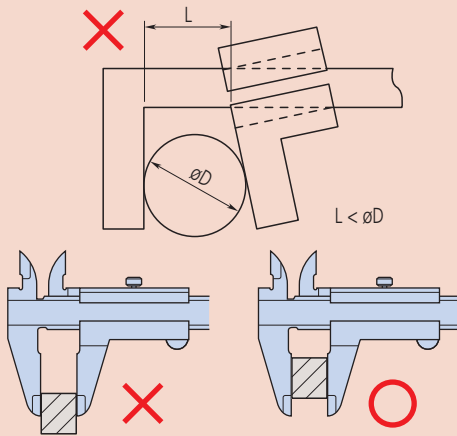
Because the inside measuring faces of a CM-type caliper are at the tips of the jaws the measuring face parallelism is heavily affected by measuring force, and this becomes a large factor in the measurement accuracy attainable. In contrast to an M-type caliper, a CM-type caliper cannot measure a very small hole diameter because it is limited to the size of the stepped jaws, although normally this is no inconvenience as it would be unusual to have to measure a very small hole with this type of caliper. Of course, the radius of curvature on the inside measuring faces is always small enough to allow correct hole diameter measurements right down to the lowest limit (jaw closure). Mitutoyo CM-type calipers are provided with an extra scale on the slider for inside measurements so they can be read directly without the need for calculation, just as for an outside measurement. This useful feature eliminates the possibility of error that occurs when having to add the inside-jaw-thickness correction on a single-scale caliper.



General notes on use of the caliper

1. Potential causes of error

A variety of factors can cause errors when measuring with a caliper. Major factors include parallax effects, excessive measuring force due to the fact that a caliper does not conform to Abbe's Principle, differential thermal expansion due to a temperature difference between the caliper and workpiece, and the effect of the thickness of the knife-edge jaws and the clearance between these jaws during measurement of the diameter of a small hole. Although there are also other error factors such as graduation accuracy, reference edge straightness, main scale flatness on the main blade, and squareness of the jaws, these factors are included within the E_{MPE} error tolerances. Therefore, these factors do not cause problems as long as the caliper satisfies the E_{MPE} error tolerances. Handling notes have been added to the JIS so that consumers can appreciate the error factors caused by the structure of the caliper before use. These notes relate to the measuring force and stipulate that "as the caliper does not have a constant-force device, you must measure a workpiece with an appropriate even measuring force. Take extra care when you measure it with the root or tip of the jaw because a large error could occur in such cases."



2. Inside measurement

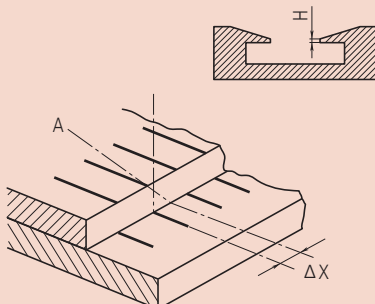
Insert the inside jaw as deeply as possible before measurement.
Read the maximum indicated value during inside measurement.
Read the minimum indicated value during groove width measurement.

3. Depth measurement

Read the minimum indicated value during depth measurement.

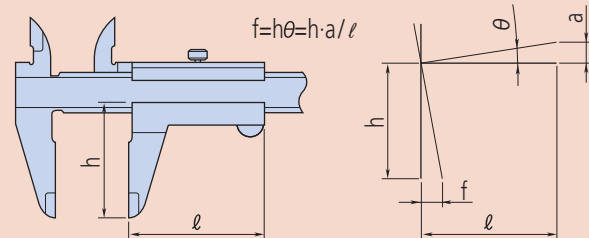
4. Parallax error when reading the scales

Look straight at the vernier graduation line when checking the alignment of vernier graduation lines to the main scale graduation lines.
If you look at a vernier graduation line from an oblique direction (A), the apparent alignment position is distorted by ΔX as shown in the figure below due to a parallax effect caused by the step height (H) between the planes of the vernier graduations and the main scale graduations, resulting in a reading error of the measured value. To avoid this error, the JIS stipulates that the step height should be no more than 0.3 mm.



5. Moving Jaw Tilt Error

If the moving jaw becomes tilted out of parallel with the fixed jaw, either through excessive force being used on the slider or lack of straightness in the reference edge of the beam, a measurement error will occur as shown in the figure. This error may be substantial due to the fact that a caliper does not conform to Abbe's Principle.



Example: Assume that the error slope of the jaws due to tilt of the slider is 0.01 mm in 50 mm and the outside measuring jaws are 40 mm deep, then the error (at the jaw tip) is calculated as $(40/50) \times 0.01 \text{ mm} = 0.008 \text{ mm}$.
If the guide face is worn then an error may be present even using the correct measuring force.

6. Relationship between measurement and temperature

The main scale of a caliper is engraved (or mounted on) stainless steel, and although the linear thermal expansion coefficient is equal to that of the most common workpiece material, steel, i.e. $(10.2 \pm 1) \times 10^{-6}/\text{K}$, note that other workpiece materials, the room temperature and the workpiece temperature may affect measurement accuracy.

7. Handling

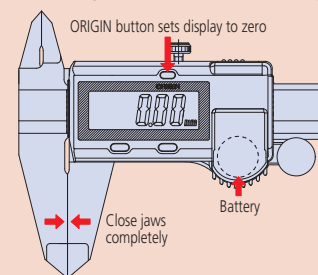
Caliper jaws are sharp, and therefore the instrument must be handled with care to avoid personal injury.
Avoid damaging the scale of a digital caliper and do not engrave an identification number or other information on it with an electric marker pen.
Avoid damaging a caliper by subjecting it to impact with hard objects or by dropping it on a bench or the floor.

8. Maintenance of beam sliding surfaces and measuring faces

Wipe away dust and dirt from the sliding surfaces and measuring faces with a dry soft cloth before using the caliper.

9. Checking and setting the origin before use

Clean the measuring surfaces by gripping a sheet of clean paper between the outside jaws and then slowly pulling it out. Close the jaws and ensure that the vernier scale (or display) reads zero before using the caliper. When using a Digimatic caliper, reset the origin (ORIGIN button) after replacing the battery.



10. Handling after use

After using the caliper, completely wipe off any water and oil. Then, lightly apply anti-corrosion oil and let it dry before storage.
Wipe off water from a waterproof caliper as well because it may also rust.

11. Notes on storage

Avoid direct sunlight, high temperatures, low temperatures, and high humidity during storage.
If a digital caliper will not be used for more than three months, remove the battery before storage.
Do not leave the jaws of a caliper completely closed during storage.

Performance evaluation method for the caliper

JIS B 7507 was revised and issued in 2016 as the Japanese Industrial Standards of the caliper, and the "Instrumental error" indicating the indication error of the caliper has been changed to "Maximum permissible error (MPE) of indication".

The "Instrumental error" of the conventional JIS adopts acceptance criteria that the specification range (precision specification) equals acceptance range, and the OK/NG judgment does not include measurement uncertainty. (Fig. 1) The "Maximum permissible error (MPE) of indication" of the new JIS adopts the basic concept of the OK/NG judgment taking into account the uncertainty adopted in the ISO standard (ISO 14253-1).

The verification of conformity and nonconformity to the specifications is clearly stipulated to use the internationally recognized acceptance criteria (simple acceptance) when the specification range equals the acceptance range, and it is accepted that the specification range equals the acceptance range if a given condition considering uncertainty is met.

In this case, the internationally recognized acceptance criterion is ISO/TR 14253-6: 2012. (Fig. 2)

The following describes the standard inspection method including the revised content of JIS 2016.

Fig. 1 Conventional JIS Instrumental error
JIS B 7507-1993

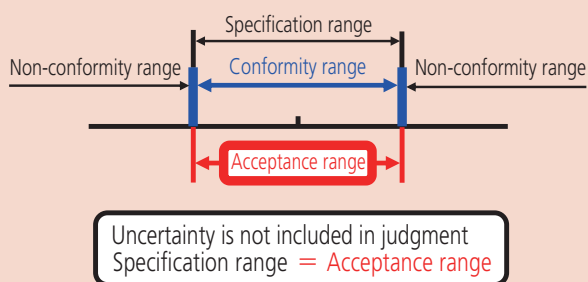
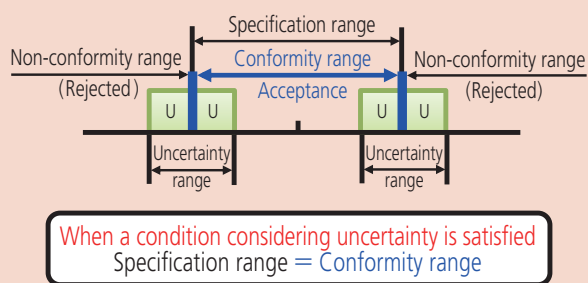


Fig. 2 New JIS Maximum permissible error (MPE)
JIS B 7507: 2016 (ISO/TR 14253-6: 2012)



Maximum permissible error of partial measuring surface contact error E_{MPE} [JIS B 7507: 2016]

The partial measuring surface contact error of a caliper is an indication error applied to outside measurement.

Table 1 shows the Maximum permissible error E_{MPE} for various measuring ranges and graduation/resolution of a caliper.

The value can be obtained by inserting a gauge block (or an equivalent standard) between the outside measuring surfaces (Fig. 3), measuring it at arbitrary positions between the jaws and then subtracting the dimension of the gage from the maximum or minimum indicated value.

Scale Shift Error S_{MPE} [JIS B 7507: 2016]

The scale shift error in a caliper is an indication error of the inside measurement, depth measurement, etc., if measuring surfaces other than the outside measuring surfaces are used.

The Maximum permissible error S_{MPE} of the indication value for inside measurement is given in Table 1. The Maximum permissible error S_{MPE} of depth measurement is obtained by adding 0.02 mm to a value in Table 1. The indication error for inside measurement can be obtained by using gauge blocks (or equivalent standards) and standard jaws from an accessory set to form accurate inside dimensions for calibration (Fig. 4), with the error being given by the indicated value minus the gauge block size.

Table 1: Maximum permissible error E_{MPE} of partial measuring surface contact error in a conventional caliper

Unit: mm

Measurement range	Scale interval, graduation or resolution	
	0.05	0.02
50 or less	± 0.05	± 0.02
Over 50, 100 or less	± 0.06	± 0.03
Over 100, 200 or less	± 0.07	
Over 200, 300 or less	± 0.08	± 0.04

Note: E_{MPE} includes the measurement error arising from the straightness, flatness and parallelism of the measuring surfaces.

Fig. 3: Determining partial measuring surface contact error

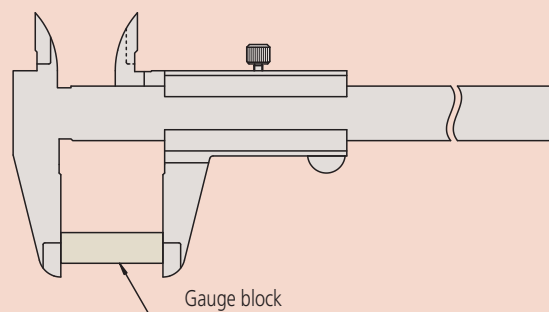
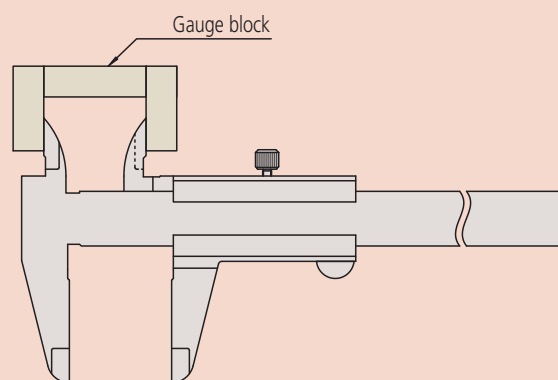


Fig. 4: Determining scale shift error



The "Instrumental error" indicating the indication error of JIS has been changed to "Maximum permissible error (MPE) of indication" for the following three models:

- Vernier Caliper SERIES 530 — Standard model described on page D-8 (530-101 530-108 530-109)
- Vernier Caliper SERIES 532 — with fine adjustment described on page D-10 (All models)
- Vernier Caliper SERIES 531 — with thumb grip described on page D-11 (All models)

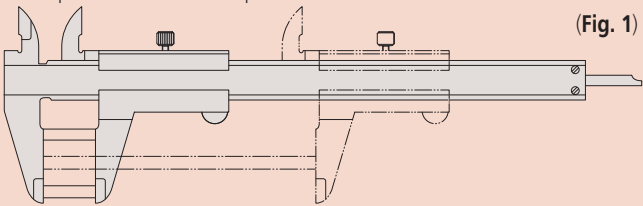
Support for ISO 13385-1:2019

The ISO standard for calipers, ISO 13385-1, was revised and published as ISO 13385-1:2019 in August 2019. The major point of this revision is that it more specifically quantifies the notation and the inspection methods, etc. related to caliper accuracy. This quantification does not affect the quality of calipers manufactured in the past, as they were measured and inspected in an agreed, standardized way in line with certain methods and criteria. The following paragraphs explain points and changes in the revised ISO 13385-1:2019.

Partial surface contact error $E_{(MPE)}$

The partial surface contact error of a caliper is an indication error applied to outside measurement.
The ISO-2019 standard quantifies for each measuring range the testing method and criteria, such as test points, number of tests, and testing arrangement that were previously left to the manufacturers' own criteria. (Fig. 1, Table 1)

Ex.) For a caliper with a measuring range of 150 mm, the revised standard requires five or more test points.



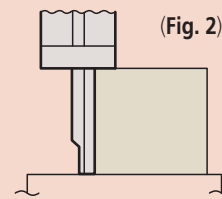
Number of partial surface contact error test points (Table 1)

Measuring range (mm)	Minimum number of test points
150	5
300	6
1000	7
1000 or more	8

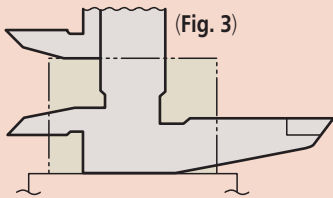
Furthermore, the revised standards require testing in 90% or more points within the product measuring range as well as testing at the root and tip of the jaw at the maximum/minimum point. Therefore, it is important to conduct tests following the newly defined standard.
The following is an example of measurement for a 150 mm caliper. To comply with the ISO-2019 standard, the minimum number of test points is five for a 150 mm caliper. (Table 1)
Five or more test points are necessary to comply with the ISO-2019 standard. These include testing at the maximum and minimum point, as well as at the root and tip of the measuring unit. These test points must add up to a total of five.

Shift Error $S_{(MPE)}$

The Shift Error for calipers is the error of indication for areas other than the outside measuring face. In the ISO-2019 standard, all measurement errors (inside, depth, step, and I.D. measurement error) other than the outside measurement error ($E_{(MPE)}$) are Scale Shift Errors ($S_{(MPE)}$). Test points and their number were newly quantified as the type of errors included in the Scale Shift Error were better specified. (Fig. 2, 3, Table 3)



Scale Shift Error measurement example-
depth measurement



Scale Shift Error measurement example-
step measurement

Ex.) Step and depth measurement
[ISO 13385-1:2019] (Table 3)

Test numbering	Test point	Reference standard
1	Less than 50 mm	Gauge block

For example, for depth measurement or step measurement, the standard specifically requires one or more test points at less than 50 mm and a testing arrangement using gauge blocks. (See Table 3)

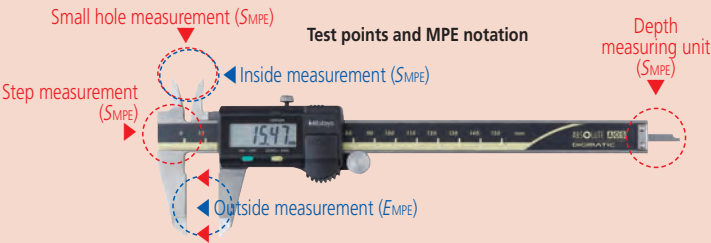
D

Accuracy notation change (Regarding MPE notation)

The “instrumental error” used until now will change to “MPE (E_{MPE}/S_{MPE})”. Scale Shift Error (S_{MPE}) will describe the permissible error including those for depth and step.(Table 4)

Standards	E_{MPE}	S_{MPE}			
	Outside measurement	Inside measurement	Depth measurement	Step measurement	I.D. measurement
ISO13385-1:2019	Accuracy notation for outside measurement	Permissible values including those for all measurements: inside, depth, step, etc.			
ISO13385-1:2011 (JISB7507:2016)	Accuracy notation for outside measurement	Inside measurement E_{MPE}	Depth, step, $= E_{MPE} + 0.02\text{ mm}$		

Maximum permissible error includes the repeatability and quantizing error.



Ex.) 200 mm caliper (Table 4-1)
Accuracy ±0.02 mm (conventional notation)

Breakdown	Outside measurement	±0.02
	Inside measurement	±0.02

For depth and step measurement, add 0.02 mm to the outside measurement value.

S_{MPE} is described for measurements other than the outside measurement, but the maximum permissible error for inside measurement remains the same as before.
The permissible values for measurements other than the outside measurement (inside, depth, step, and inside diameter measurement) must be described as S_{MPE} in line with the ISO-2019 standard. Since the permissible values for depth and step measurement are larger than those for inside measurement, this could give an impression that accuracy has suffered. However, this is simply due to the change of notation in accordance with the ISO-2019 standard; neither has the accuracy of the inside measurement deteriorated nor has the product performance changed. (Table 6-1, 6-2)

(Table 6-1) Unit: mm

Measured length	Scale interval, graduation or resolution	
	0.05	0.02 or 0.01
50 or less	±0.05	±0.02
Over 50, 100 or less	±0.06	±0.03
Over 100, 200 or less	±0.07	
Over 200, 300 or less	±0.08	

Note: E_{MPE} includes the measurement error arising from straightness, flatness and parallelism of the measuring surface.

Maximum permissible error E_{MPE} of Partial surface contact error in JIS B 7507

Ex.) Permissible values for a 200 mm caliper

Measured length (mm)	Maximum permissible error (MPE)	
	E_{MPE} (mm)	S_{MPE} (mm)
$0 \leq L \leq 50$	±0.02	±0.04
$50 \leq L \leq 100$	±0.02	±0.04
$100 \leq L \leq 150$	±0.02	±0.04
$150 \leq L \leq 200$	±0.02	±0.04

Ex.) Breakdown of S_{MPE}

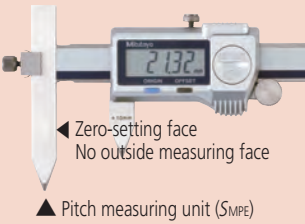
Inside measurement	Step measurement	Depth measurement	I.D. measurement
±0.02	±0.04	±0.04	+0.01 -0.03

Accuracy notation change (for custom products)

The ISO-2019 standard stipulates the accuracy notation for compliant products. However, nothing is stipulated for custom products that are not compliant with said standard (such as calipers with dedicated measuring faces), so for these products the notation of accuracy is left to the discretion of each manufacturer. Mitutoyo, with many custom calipers, describes MPE for all of its calipers based on the following line of thinking. For example, MPE is “Scale Shift Error (S_{MPE})” for “calipers whose measuring face is other than the zero-setting face = calipers with exclusive measuring method” such as centerline calipers, inside calipers, etc. (Fig. 5, Table 7)
Accuracy is described using S_{MPE} measured not using the number of test points stipulated in the ISO-2019 standard, but rather with the same number of test points and testing method as before.

(Fig. 5) Non-ISO model (Ex.)

573-605-20



(Table 7-1)

Maximum permissible error (MPE)	
E_{MPE} (mm)	S_{MPE} (mm)
—	±0.04

Number of test points: 3

573-646-20



(Table 7-2)

Maximum permissible error (MPE)	
E_{MPE} (mm)	S_{MPE} (mm)
—	±0.03

Number of test points: 3

Appendix: List of maximum permissible errors (MPE) for typical products

The following list shows MPE for ISO-compliant models. (Table 8)

Series 500			Series 505 (0.01 mm)			Series 505 (0.02 mm)		
Maximum permissible errors			Maximum permissible errors			Maximum permissible errors		
Measured length	E_{MPE} (mm)	S_{MPE} (mm)	Measured length	E_{MPE} (mm)	S_{MPE} (mm)	Measured length	E_{MPE} (mm)	S_{MPE} (mm)
$0 \leq L \leq 50$	± 0.02	± 0.04	$0 \leq L \leq 50$	± 0.02	± 0.04	$0 \leq L \leq 50$	± 0.02	± 0.04
$50 \leq L \leq 100$	± 0.02	± 0.04	$50 \leq L \leq 100$	± 0.02	± 0.04	$50 \leq L \leq 100$	± 0.03	± 0.05
$100 \leq L \leq 150$	± 0.02	± 0.04	$100 \leq L \leq 150$	± 0.02	± 0.04	$100 \leq L \leq 150$	± 0.03	± 0.05
$150 \leq L \leq 200$	± 0.02	± 0.04	$150 \leq L \leq 200$	± 0.03	± 0.05	$150 \leq L \leq 200$	± 0.03	± 0.05
$200 \leq L \leq 300$	± 0.03	± 0.05	$200 \leq L \leq 300$	—	—	$200 \leq L \leq 300$	± 0.04	± 0.06
$300 \leq L \leq 400$	± 0.04	± 0.06	$300 \leq L \leq 400$	—	—	$300 \leq L \leq 400$	—	—
$400 \leq L \leq 500$	± 0.05	± 0.07	$400 \leq L \leq 500$	—	—	$400 \leq L \leq 500$	—	—
$500 \leq L \leq 600$	± 0.05	± 0.07	$500 \leq L \leq 600$	—	—	$500 \leq L \leq 600$	—	—
$600 \leq L \leq 700$	± 0.06	± 0.08	$600 \leq L \leq 700$	—	—	$600 \leq L \leq 700$	—	—
$700 \leq L \leq 800$	± 0.06	± 0.08	$700 \leq L \leq 800$	—	—	$700 \leq L \leq 800$	—	—
$800 \leq L \leq 900$	± 0.07	± 0.09	$800 \leq L \leq 900$	—	—	$800 \leq L \leq 900$	—	—
$900 \leq L \leq 1000$	± 0.07	± 0.09	$900 \leq L \leq 1000$	—	—	$900 \leq L \leq 1000$	—	—

The reference point (0) is at 10.1 mm for **Series 550** and **551**.

Series 550			Series 551			Series 530		
Maximum permissible errors			Maximum permissible errors			Maximum permissible errors		
Measured length	E_{MPE} (mm)	S_{MPE} (mm)	Measured length	E_{MPE} (mm)	S_{MPE} (mm)	Measured length	E_{MPE} (mm)	S_{MPE} (mm)
$10.1 (0) \leq L \leq 50$	± 0.02	± 0.02	$10.1 (0) \leq L \leq 50$	± 0.02	± 0.02	$0 \leq L \leq 50$	± 0.05	± 0.07
$50 \leq L \leq 100$	± 0.03	± 0.03	$50 \leq L \leq 100$	± 0.03	± 0.03	$50 \leq L \leq 100$	± 0.05	± 0.07
$100 \leq L \leq 200$	± 0.03	± 0.03	$100 \leq L \leq 200$	± 0.03	± 0.03	$100 \leq L \leq 150$	± 0.05	± 0.07
$200 \leq L \leq 300$	± 0.04	± 0.04	$200 \leq L \leq 300$	± 0.04	± 0.04	$150 \leq L \leq 200$	± 0.05	± 0.07
$300 \leq L \leq 400$	± 0.04	± 0.04	$300 \leq L \leq 400$	± 0.04	± 0.04	$200 \leq L \leq 300$	± 0.08	± 0.10
$400 \leq L \leq 450$	± 0.05	± 0.05	$400 \leq L \leq 500$	± 0.06	± 0.06	$300 \leq L \leq 400$	± 0.09	± 0.11
$450 \leq L \leq 500$	± 0.05	± 0.05	$500 \leq L \leq 600$	± 0.06	± 0.06	$400 \leq L \leq 500$	± 0.10	± 0.12
$500 \leq L \leq 600$	± 0.05	± 0.05	$600 \leq L \leq 700$	± 0.06	± 0.06	$500 \leq L \leq 600$	± 0.10	± 0.12
$600 \leq L \leq 700$	± 0.06	± 0.06	$700 \leq L \leq 750$	± 0.06	± 0.06	$600 \leq L \leq 700$	± 0.12	± 0.14
$700 \leq L \leq 800$	± 0.06	± 0.06	$750 \leq L \leq 800$	± 0.06	± 0.06	$700 \leq L \leq 800$	± 0.13	± 0.15
$800 \leq L \leq 900$	± 0.07	± 0.07	$800 \leq L \leq 900$	± 0.07	± 0.07	$800 \leq L \leq 900$	± 0.14	± 0.16
$900 \leq L \leq 1000$	± 0.07	± 0.07	$900 \leq L \leq 1000$	± 0.07	± 0.07	$900 \leq L \leq 1000$	± 0.15	± 0.17

The minimum inside measurement size is 20.1 mm for **550-203**, **205**, and **207**.

The minimum inside measurement size is 20.1 mm for **551-204**, **206**, and **207**.

Note: Excludes JIS products