

- ▶ MotoMini (<https://youtu.be/7zCXxjmAciE>)
- ▶ Kuka Titan (<https://youtu.be/gqZNzUQoSMA>)
- ▶ Assembly Line Robots (https://youtu.be/P7fi4hP_y80)
- ▶ Palletization (<https://youtu.be/oXiIPEDNTF8>)
- ▶ Delta Robots (https://youtu.be/QFZMhsVn_CE)
- ▶ Machine Tending (https://youtu.be/gkm_uMQ8NbM)
- ▶ Cobot (<https://youtu.be/I0VEhX29Bto>)

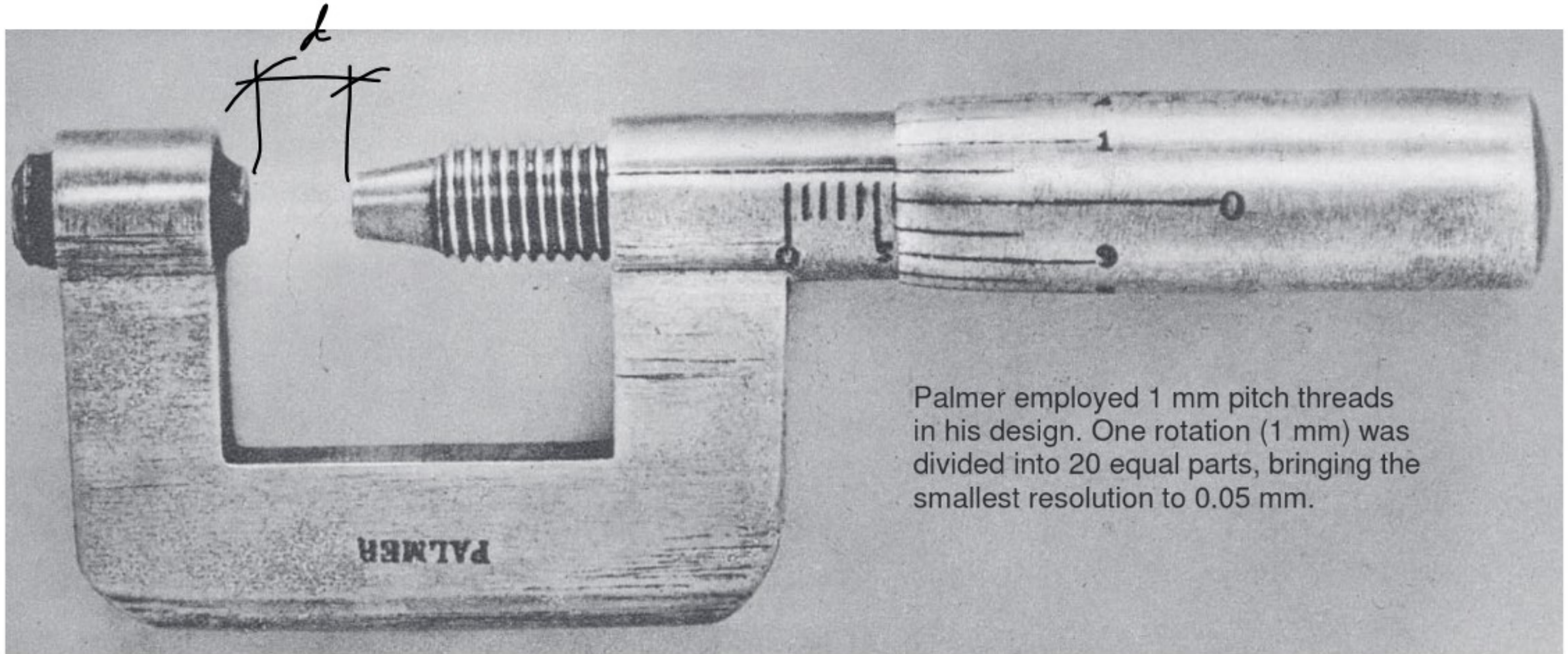
Metrology

Standards

Meter

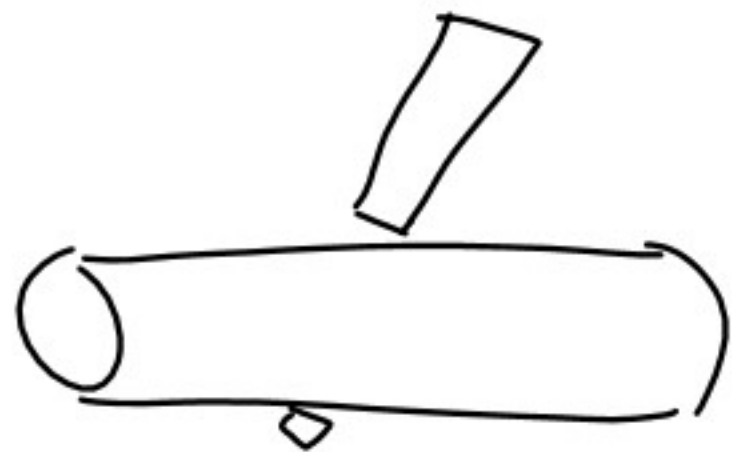
Defined as n wavelengths of Helium Neon Laser $\lambda = 633 \text{ nm}$

Micrometer



Micrometer

Accuracy $0.0001''$ to $0.00005'' = 50 \mu\text{in}$



Range $\sim 1\text{in}$

1

1= 1 inch is divided into 40 equal parts, one line on the sleeve representing .025 in.
2= Thimble is divided into 25 equal parts, one line on the thimble representing .001 in.



2

$.575 + .014 = .589$



3

$.375 + .024 = .399$



4

$.275 + .019 = .294$



5



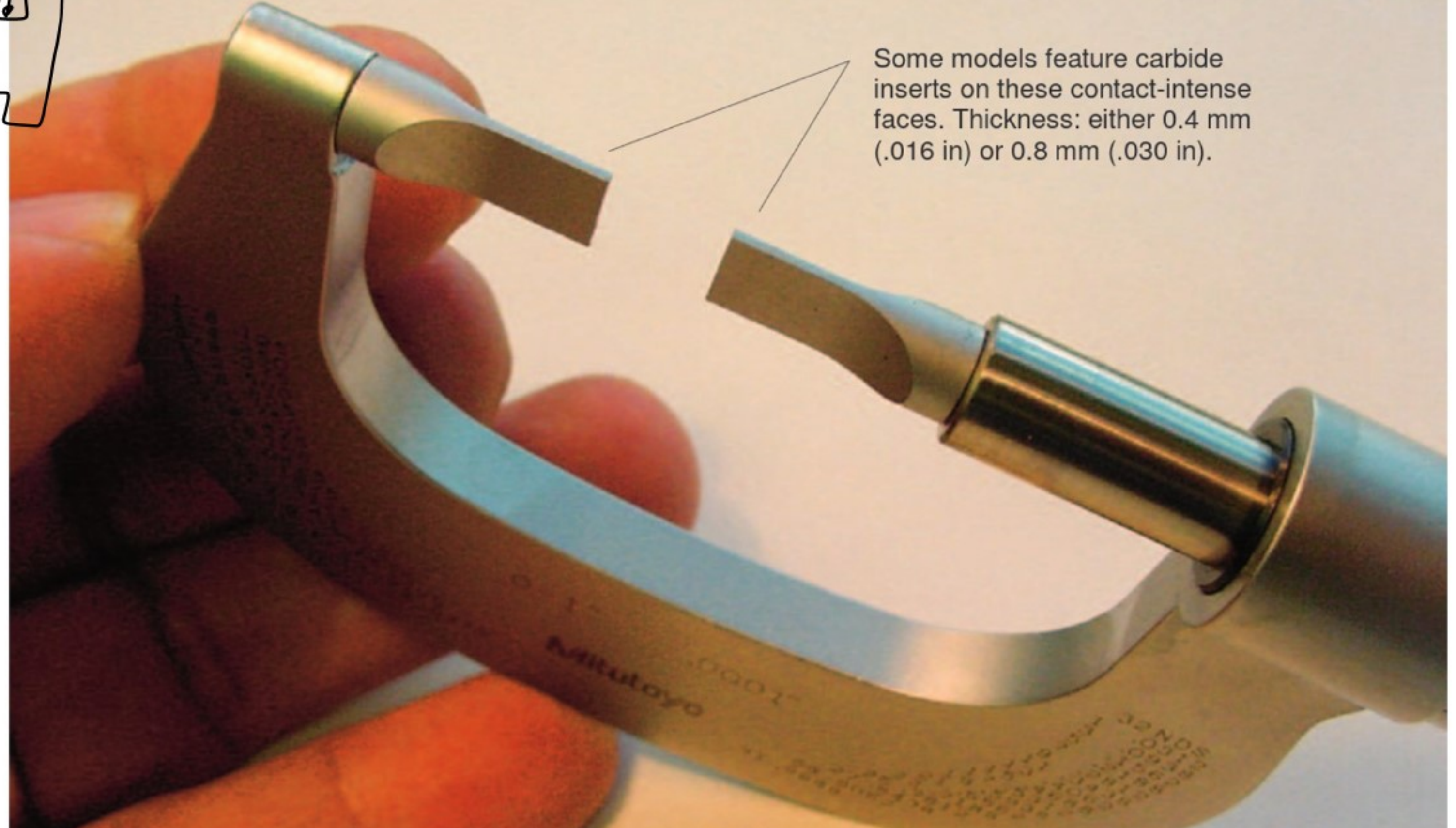
6

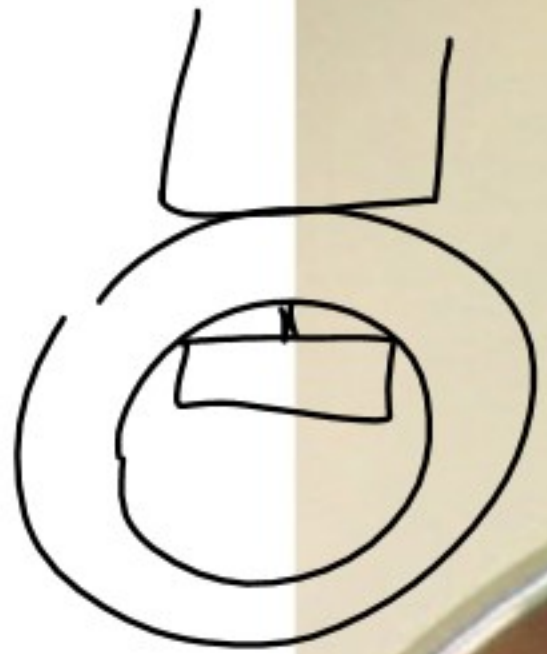


Blade Micrometer



Some models feature carbide inserts on these contact-intense faces. Thickness: either 0.4 mm (.016 in) or 0.8 mm (.030 in).

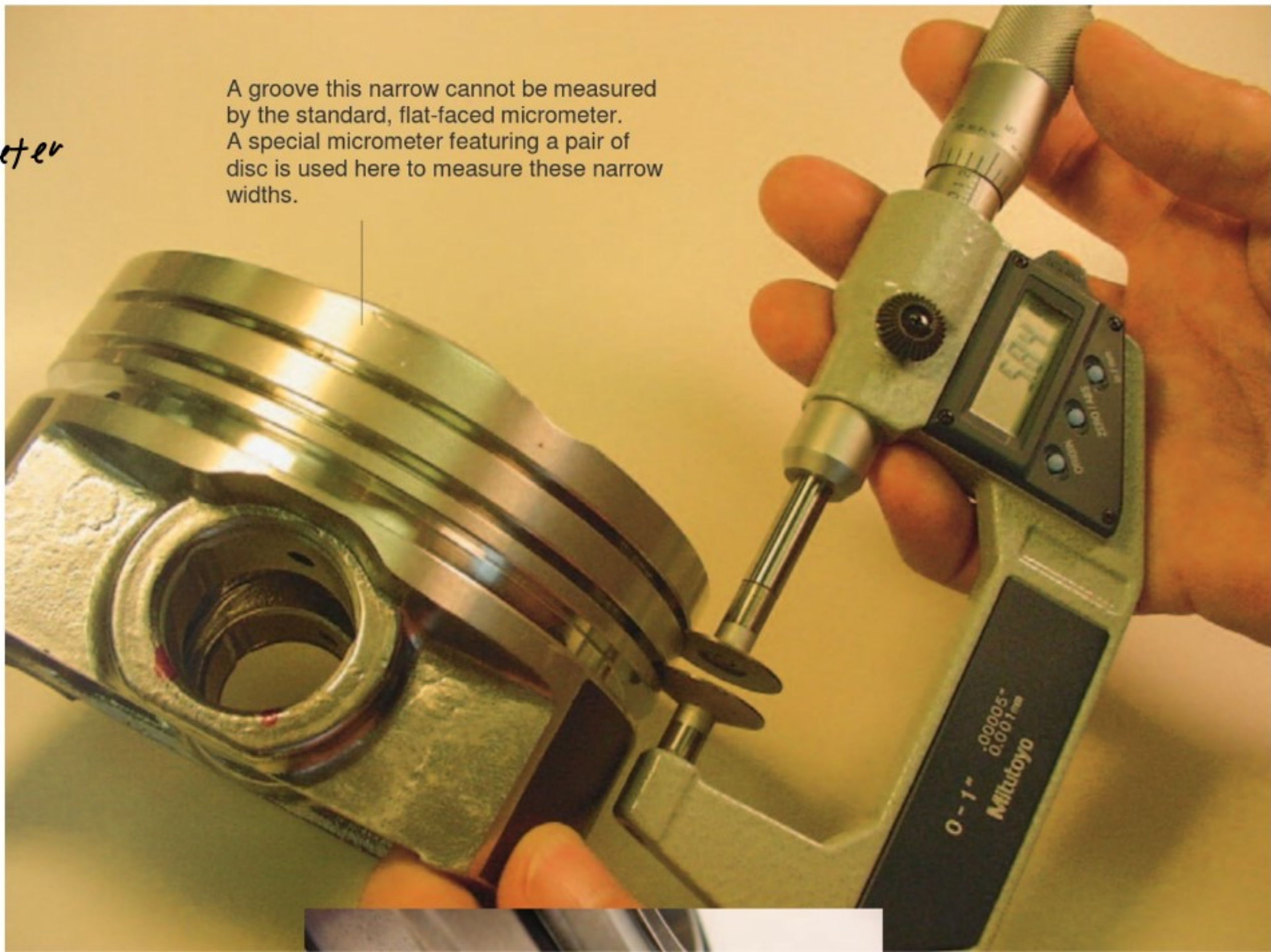




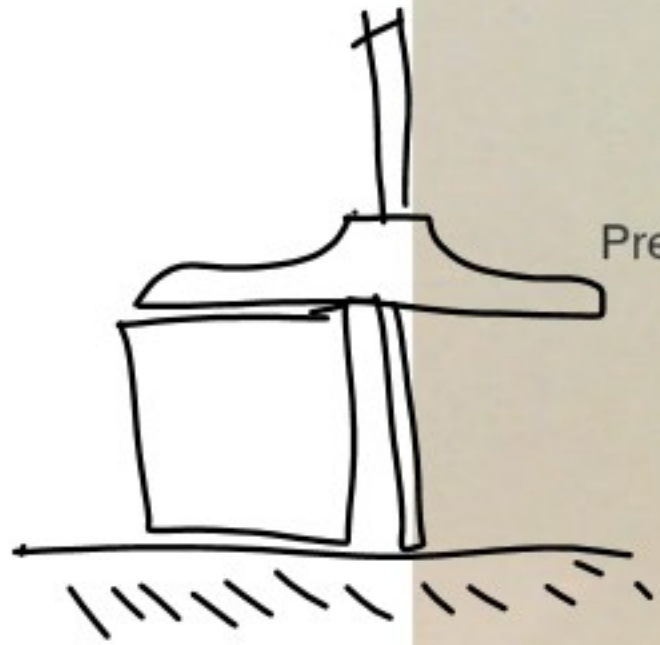
Having a small ball, SØ 4.7 (.187 in) on the anvil, this special micrometer is designed to measure wall and tube thickness up to 25 mm (1 in).

Disc
Micrometer

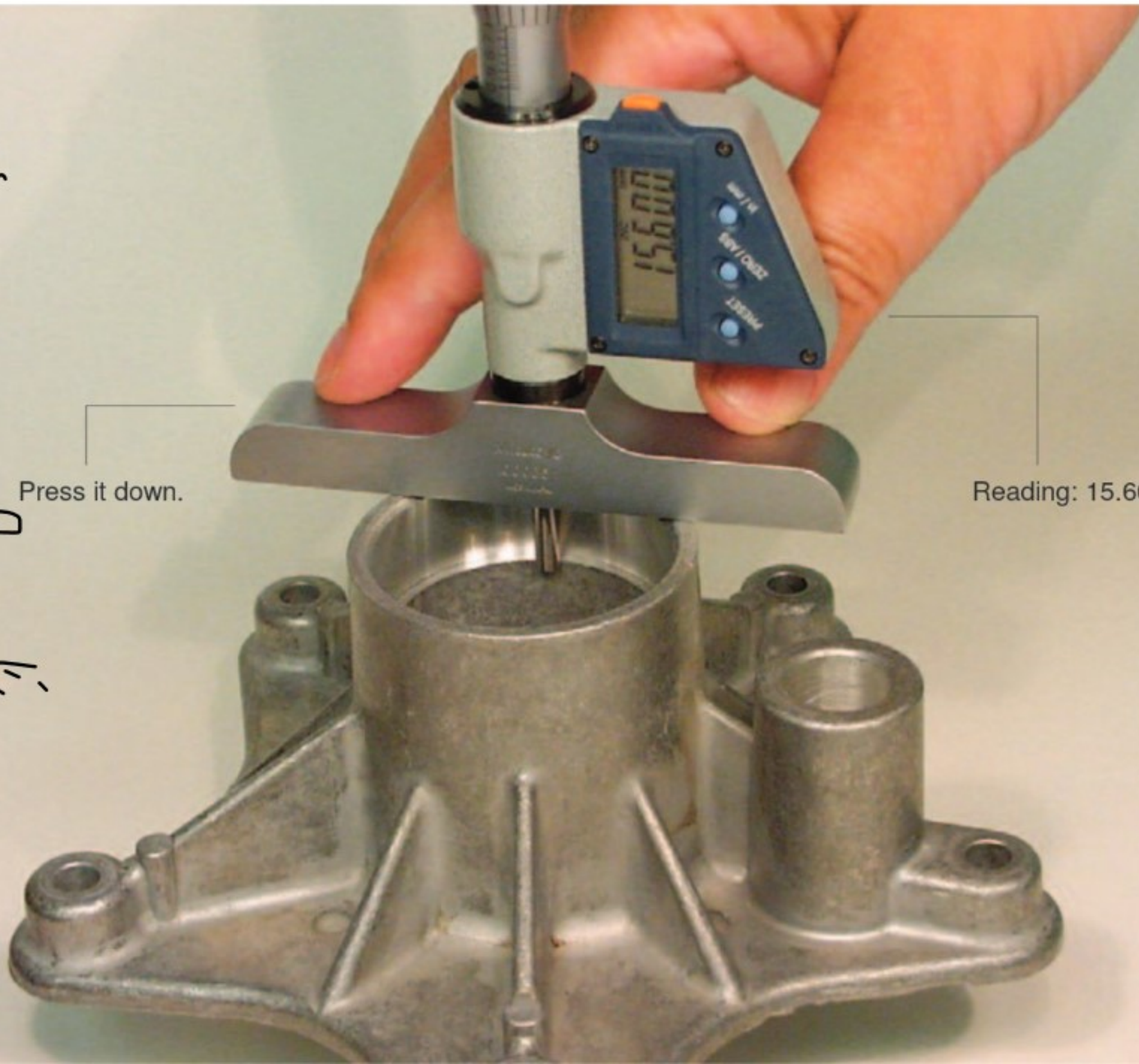
A groove this narrow cannot be measured by the standard, flat-faced micrometer. A special micrometer featuring a pair of disc is used here to measure these narrow widths.



Depth
Micrometer



Press it down.

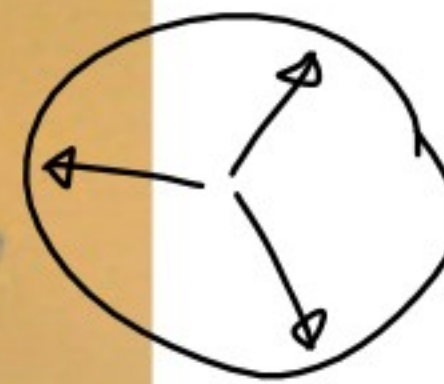
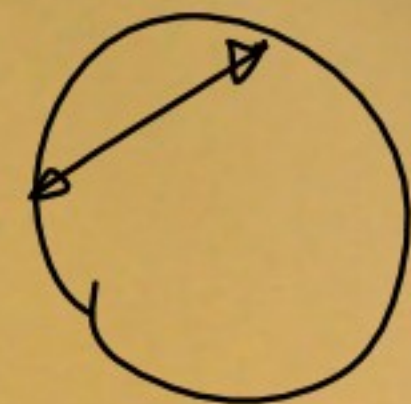
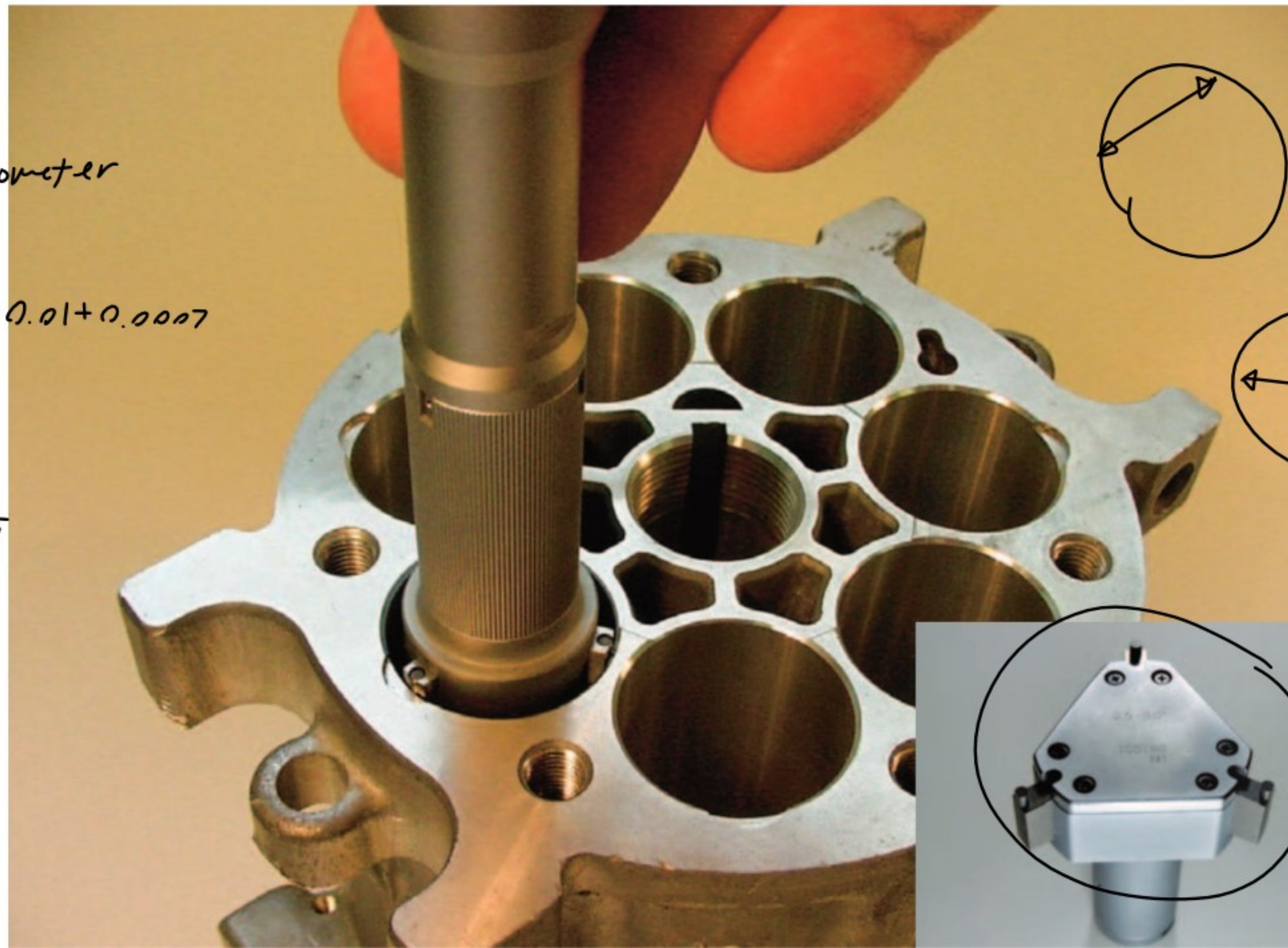


Reading: 15.600 mm

Bore
Micrometer

$$0.175 + 0.01 + 0.0007$$

$$\begin{array}{r} 0.175 \\ 0.01 \\ 0.0007 \\ \hline 0.1857 \end{array}$$



Calipers

Fast

Universal

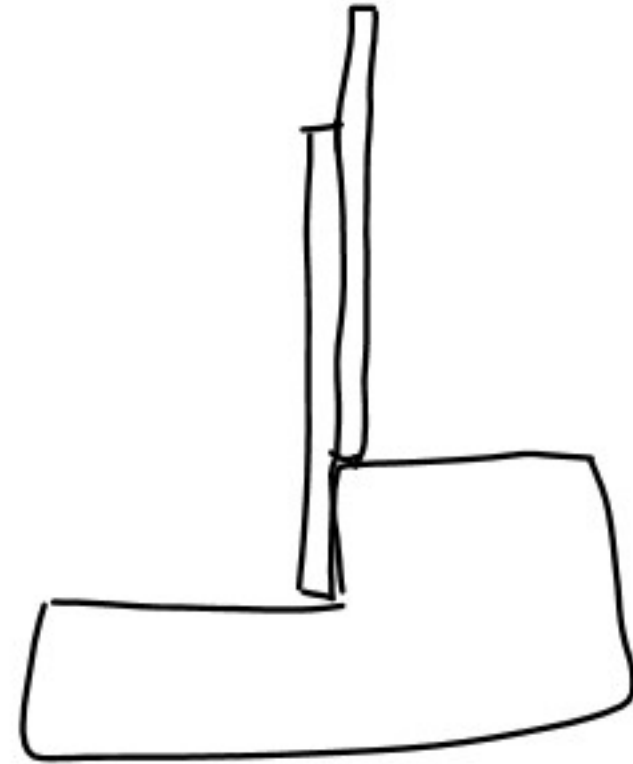
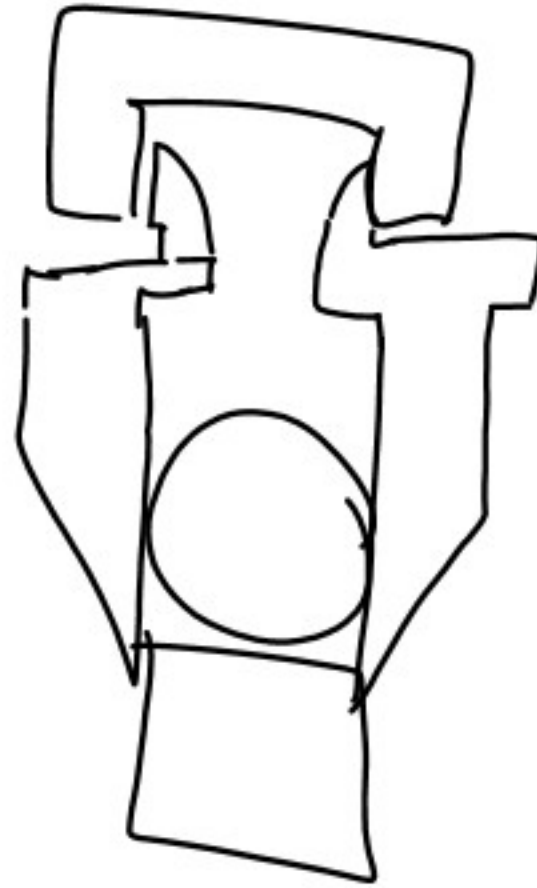
Digital

Cheap

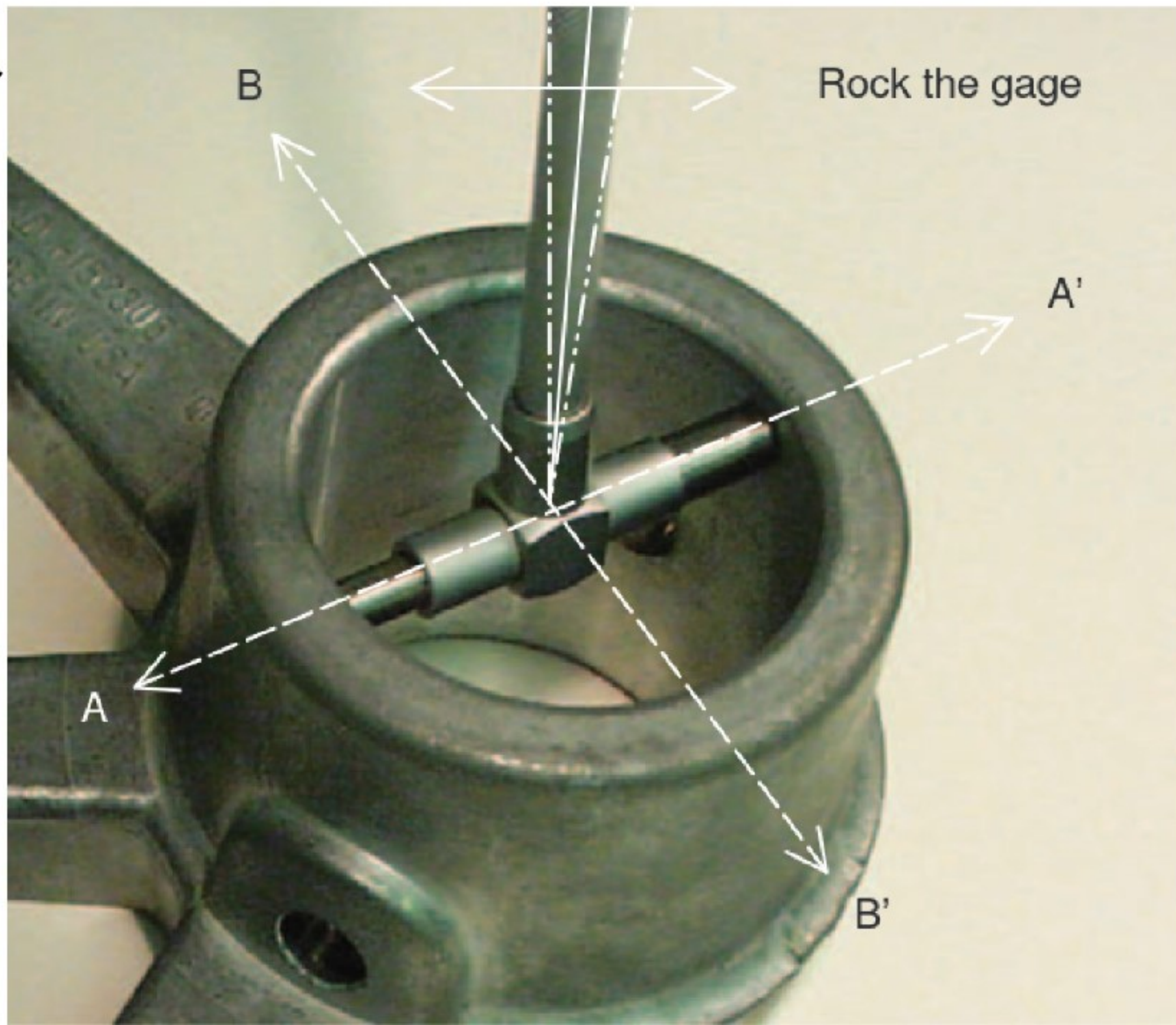
Accuracy 0.001"

Flexible

Range



Telescoping
Gauges



Gauge Blocks

Grades

AS 1 general use

0 }
00 } inspection
K } calibration

Lapped Finish

Wringing (stick together)

1.01 - 1.09 mm step 0.01

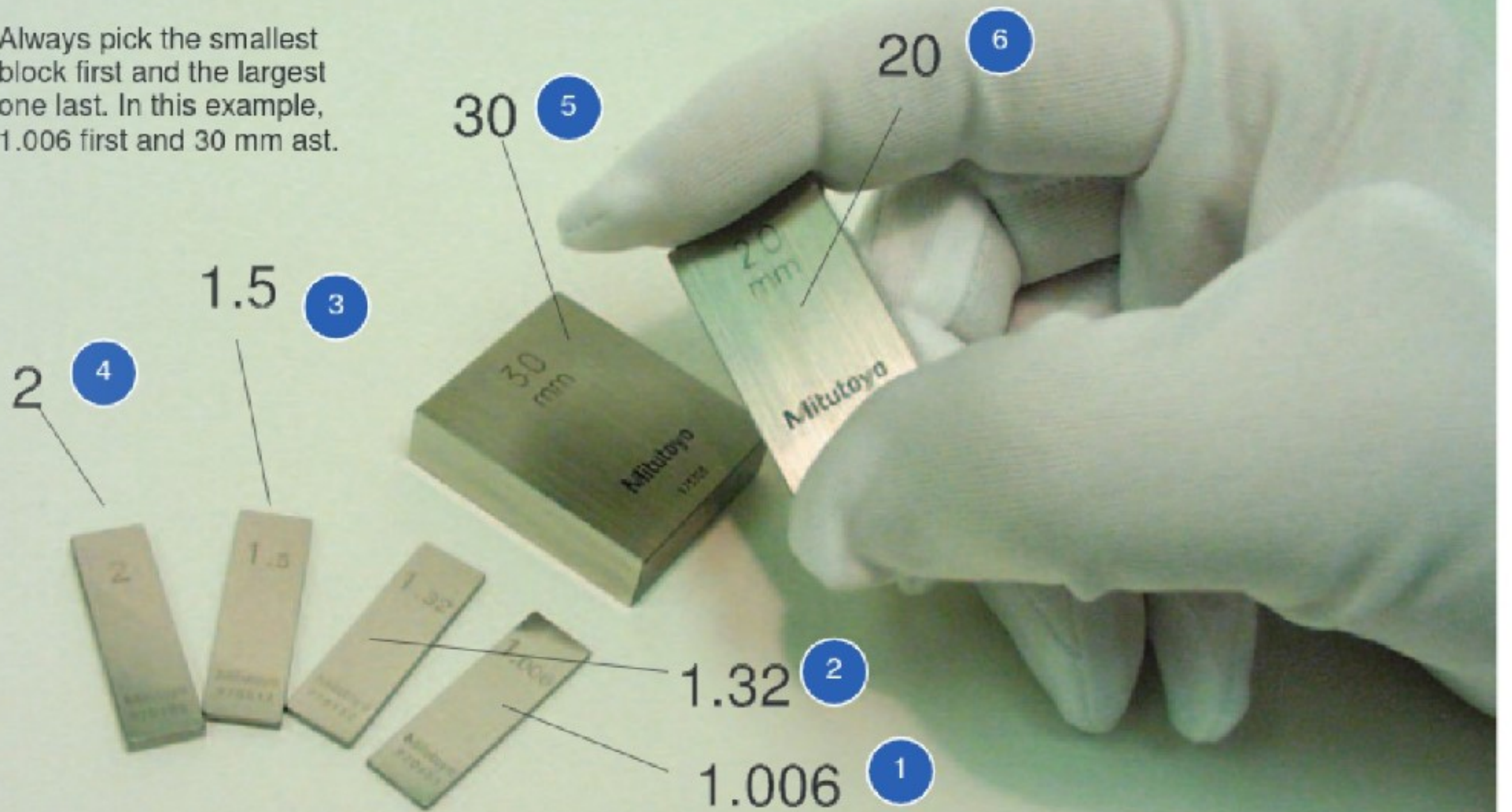
1.1 - 1.9 mm step 0.1

1 - 29 mm step 1

25 - 100 mm step 25

1 μ m film

Always pick the smallest block first and the largest one last. In this example, 1.006 first and 30 mm ast.





The contact point is bent upward relative to the test indicator. No matter how large this angle is, it does not affect the reading, nor cause any cosine error. It is the angle in yellow line θ that should be kept low, preferably within 15° .

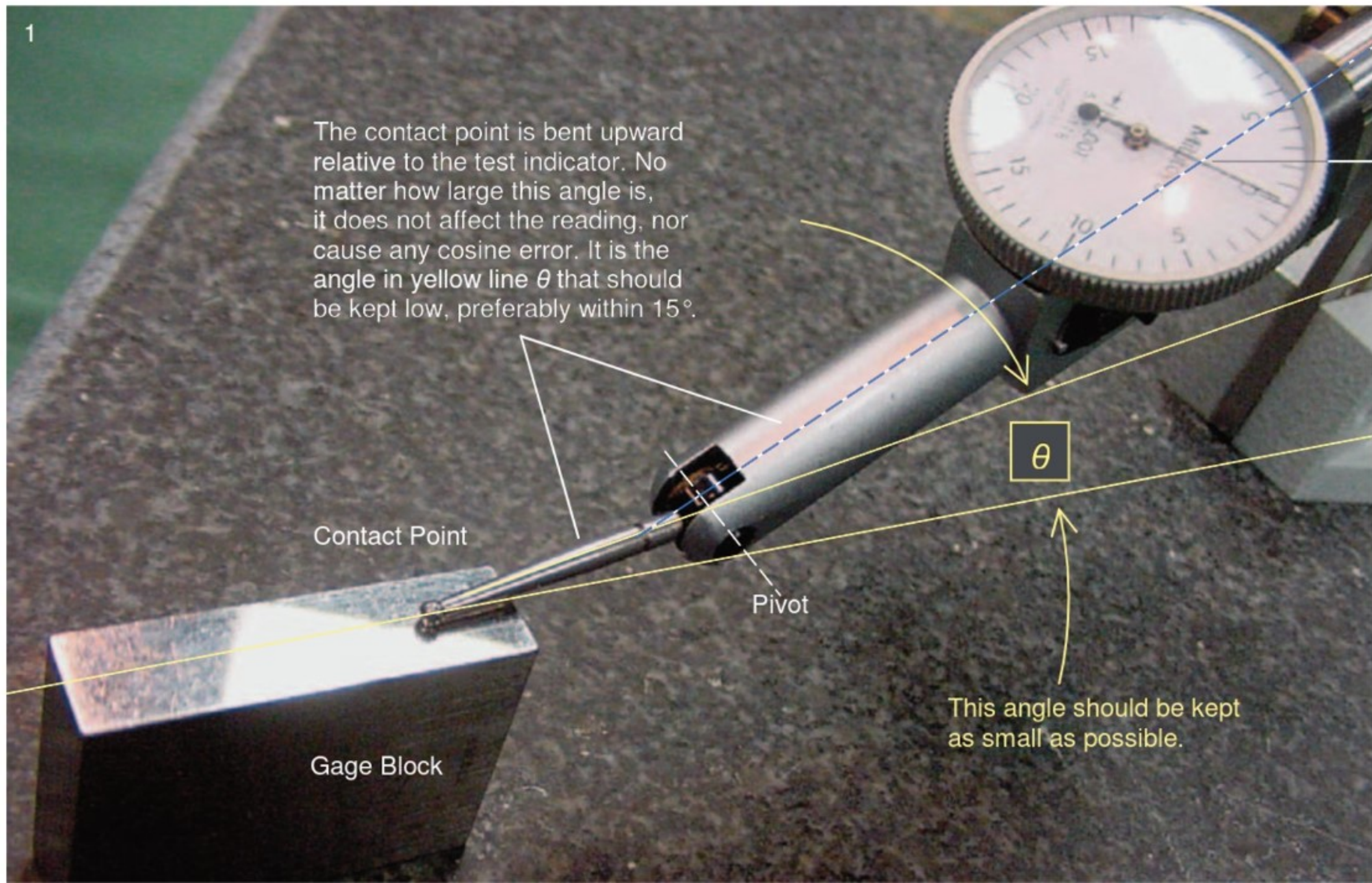
Contact Point

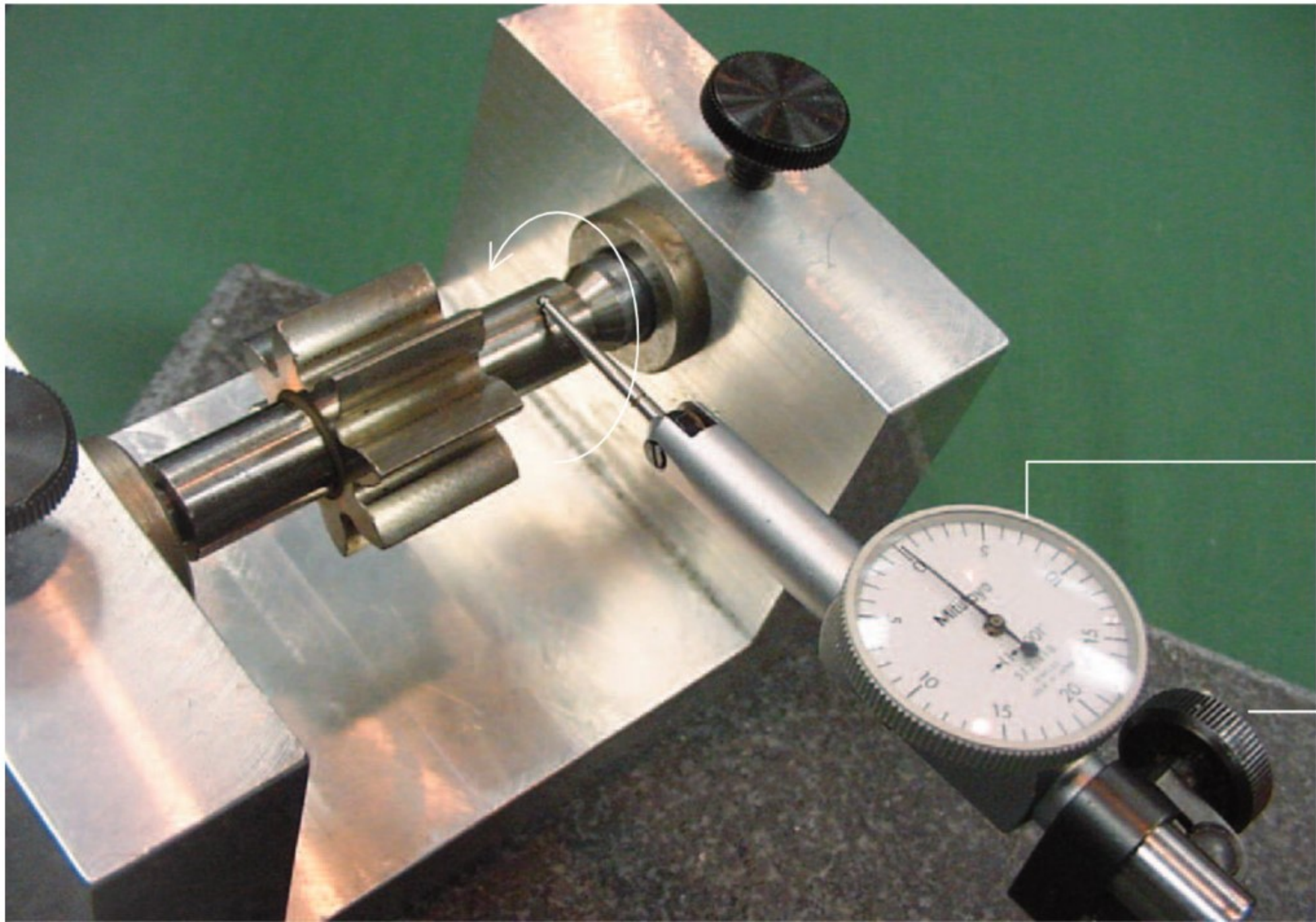
Pivot

Gage Block

θ

This angle should be kept as small as possible.







The "Go" ball will go into the bore much easier and smoother than the "Go" plug gage of the same size.

Ø 6.00 mm

"Go"



Ø 6.02 mm

"No-Go"