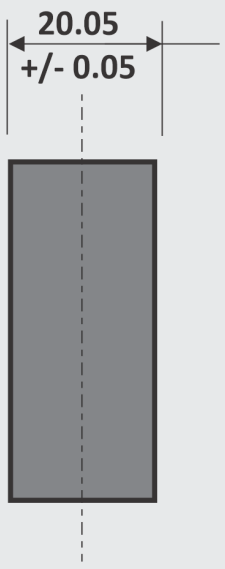
METROLOGY MATTERS

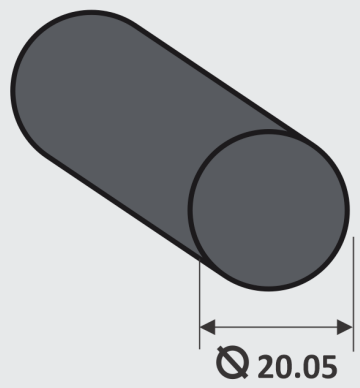
SIZE STANDARDS MATTER

ASME Y14.5 M 2018 Rules for Size

This on the drawing:

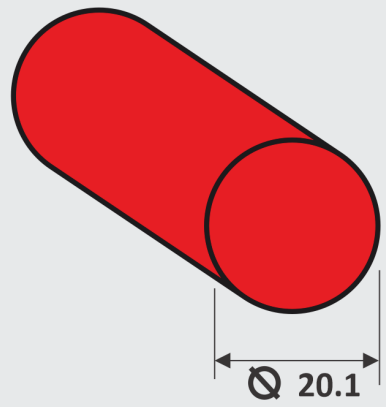


Would guide us to making a part aimed at its nominal dimension



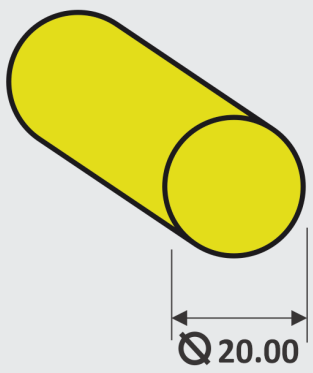
Which has perfect straightness & roundness, otherwise known as perfect cylindrical form

And if we keep perfect cylindrical form and the part is made at its largest allowed size we get this:



Also known as perfect form at maximum material condition (MMC)

And if we keep perfect cylindrical form and the part is made at its smallest allowed size we get this:

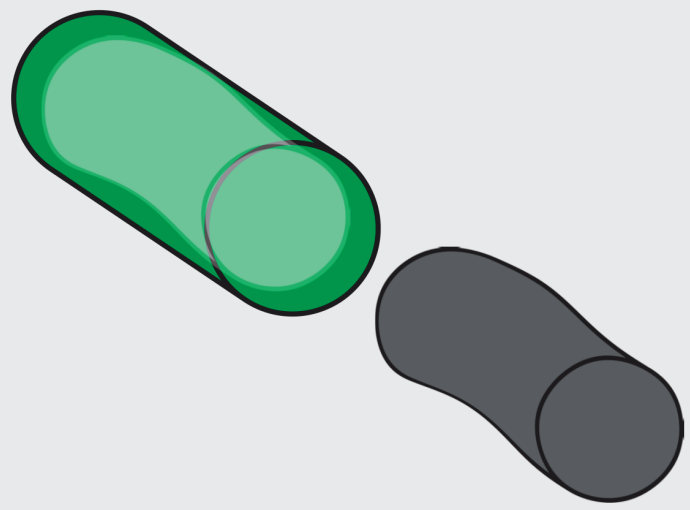


Also known as perfect form at least material condition (LMC)

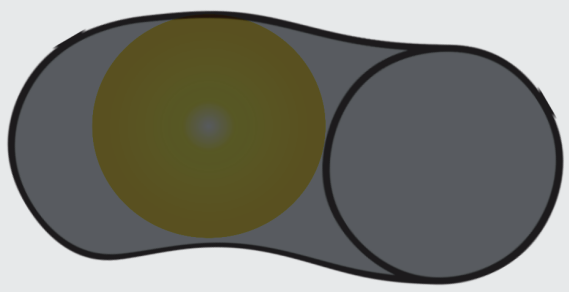
The green cylinder below represents a ring gage made at the pin's MMC condition of Ø 20.1

If the pin slides through the ring gage we know that the part did not violate the perfect form boundary at MMC

On a CMM, instead of a ring gage, the actual mating envelope is the smallest circumscribed cylinder. Circumscribed refers to a shape surrounding another shape. Inscribed refers to a shape inside another shape.



And if we were to roll a perfect sphere through our actual part, the "Actual Local Size" (ALS) of our part / pin would be the largest inscribed sphere as it rolls / is swept through the part.

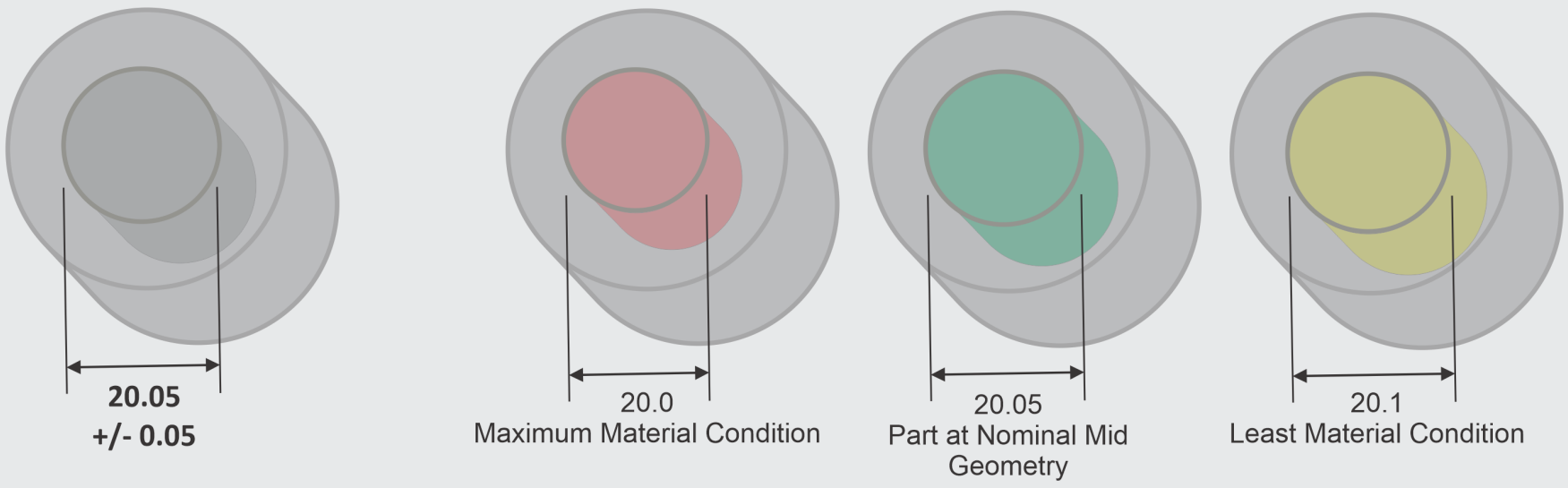


A compliant part passes both the "Actual Mating Envelope" and the "Actual Local Size" tests.

This part now meets a specification for size and form

Per the ASME standard, specifications for size always include form unless specifically noted otherwise

The example above is a pin. If it were a bore, the MMC and LMC boundaries would be reversed and the actual local size would be the smallest circumscribed sphere that could roll or be swept through the bore



Metrology Matters is a project of these organizations to provide basic metrology fundamentals to manufacturing.

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