



Plain Cylindrical Gages

Plain cylindrical gages include ring, plug and pin gages, plus discs. All tolerances are in accordance with the Gage Maker's Tolerance chart (below). In general plug, disc and ring gages are typically used in go/no go applications to measure the state of a production piece, not its size. Pin gages are typically used to measure size, not state. Applicable standards are:

1. ANSI/ASME B89.1.5-1998 (R2009), Measurement of Plain External Diameters for Use as Master Discs or Cylindrical Plug Gages
2. ANSI/ASME B89.1.6- 2002 (R2012), Measurement of Qualified Plain Internal Diameters for Use as Master Rings and Ring Gages

The ANSI/ASME standards do not dictate a contact force requirement when measuring pins, plugs and discs. For contact-based measuring instruments, Pratt & Whitney recommends that the contact force is the lowest force possible for which repeatable readings are assured. Other items to take into consideration:

1. Use a soak plate
2. Keep gages and masters close together
3. Allow enough "soak time" for gages to acclimate (2-24 hours, depending on gage size)
4. Measure gages quickly
5. Sandwich readings (master, gage1, gage2 . . . , master)
6. Use gloves or tongs to handle gages
7. Shield instrument from any noticeable drafts and/or vents
8. Master using the same material as the measured gages

Typical measurements for rings, plugs and discs are taken at three heights on one axis and repeated again on a second axis perpendicular to the first for a total of six measurements. These measurements are taken at distances 1/16 inch (0.063 inch) from the bottom and the top surface plus one at midpoint. Axes are usually called *0-degree* and *90-degree* whereas positions are named *position 1* (bottom), *position 2* (mid-height) and *position 3* (top). Rings smaller than 0.150-inch typically require only two readings per axis in the center height region. Occasionally different positional terminology is used but a good certificate of calibration should make clear—usually with a diagram—its meaning.

Gagemaker's Tolerance Chart							
(English, Total tolerance)							
Size Range (Inches)		Tolerance by Class (μ-inches)					
>	≤	XXX	XX	X	Y	Z	ZZ
0.010	0.825	10	20	40	70	100	200
0.825	1.510	15	30	60	90	120	240
1.510	2.510	20	40	80	120	160	320
2.510	4.510	25	50	100	150	200	400
4.510	6.510	33	65	130	190	250	500
6.510	9.010	40	80	160	240	320	640
9.010	12.010	50	100	200	300	400	800
12.010	15.010	75	150	300	450	600	1,200
15.010	18.010	100	200	400	600	800	1,600
18.010	21.010	125	250	500	750	1,000	2,000

Pratt & Whitney offers a number of machines suitable for calibrating plugs, pins and discs:

1. Labmaster Universal (Model 175, 1000M, 1000A)
2. Laser Measuring Machine
3. Labmicrometer (Model 900, 1600)
4. Digital Measuring Machine
5. Universal Supermicrometer (Model 501, 504)
6. External Supermicrometer (Model B, C, PC)