GD&T Symbols and Guidelines Cheat Sheet

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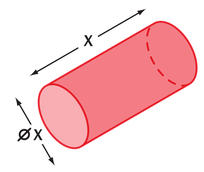
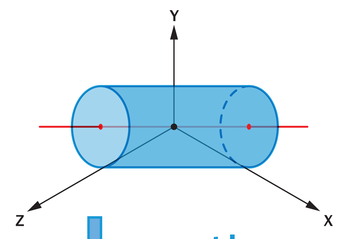
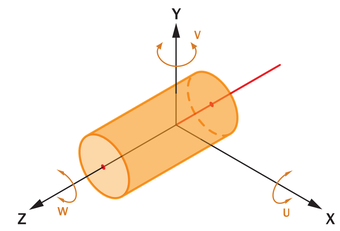
The 4 Fundamental Elements of GD&T:



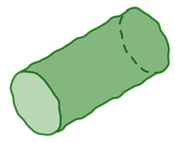
Size



Location



Orientation



Form

All drawings made in first angle projection

	SYMBOL	NAME	ON DRAWING	TOLERANCE ZONE	GAUGING	SURFACES	FEATURES OF SIZE
FORM	—	Straightness (Surface)	0.03	Two parallel lines 0.03 apart		F	F (Derived Median Line and Plane)
	— Ⓜ	Straightness (Derived Median Line w/ Ⓜ)	Ø 10±0.050; Ø 0.03 Ⓜ	Cylindrical Tolerance Zone 0.03 when Part Ø = 10.05; 0.13 when Part Ø = 9.95	Cylinder Gauge ID = Ⓜ + ; Gauge ID = 10.08		
	▱	Flatness (Surface)	0.03	Two parallel planes 0.03 apart			
	▱ Ⓜ	Flatness (Derived Median Plane w/ Ⓜ)	10±0.05; 0.03 Ⓜ	Planar Tolerance Zone Two parallel planes 0.03 apart	Gauge spacing at Virtual Condition Ⓜ + ▱ = 10.08		
	○	Circularity	0.03	Two concentric circles 0.03 apart			
	⌭	Cylindricity	0.03	Two concentric cylinders 0.03 apart			
ORIENTATION	//	Parallelism	// 0.03 A	Two parallel planes 0.03 apart parallel to datum; Datum A	Flat datum block (Datum A); Gauge kept parallel to datum	OF	O
	⊥	Perpendicularity (Feature)	⊥ 0.03 A	Two parallel planes 0.03 apart; Datum A	Flat datum block (Datum A); Gauge kept perpendicular to datum		
	⊥ Ⓜ	Perpendicularity (Feature of Size w/ Ⓜ)	Ø 10±0.05; ⊥ Ø 0.03 Ⓜ A	Axis Tolerance Zone at Ⓜ; Datum A	Gauge pin inserted perpendicular to datum; Pin Gauge OD = Ⓜ − ⊥; Pin Gauge Ø = 9.92 (9.95 - 0.03); Multiple datums may be used to specify Perpendicularity		
	∠	Angularity	∠ 0.03 A; 60°	Two parallel planes 0.03 apart; Datum A	Gauge Block; 60°		
PROFILE	⌒	Profile of a line	⌒ 0.03 A B; Basic dimensions (not shown) are required to define the True Profile when datums are used.	Uniform Linear Boundary About True Profile 0.03 apart; Datum A; Datum B	Gauge must follow true profile. Profile is usually measured with a CMM.	SLOF	
	⌓	Profile of a surface	⌓ 0.03 A B; Basic dimensions (not shown) are required to define the True Profile when datums are used.	Uniform Surface Boundary About True Profile 0.03 apart; Datum A; Datum B	Gauge must follow true profile. Profile is usually measured with a CMM.		
LOCATION	⌖	Position	Ø 10±0.05; ⌖ Ø 0.03 A B C	Part (actual) position; True center; Ø 0.03	Measure X and Y location and compare to the true position. $2X\sqrt{(\text{Actual X}-\text{True X})^2+(\text{Actual Y}-\text{True Y})^2}$ This formula must be less than the Ø True Position tolerance; Actual Y; True Y; True X; Actual X	None	LO
	⌖ Ⓜ	Position (Maximum Material Condition)	Ø 10±0.05; ⌖ Ø 0.03 Ⓜ A B C	Actual Pin Position; True position; Tolerance Zone of Hole Gauge; Part; Datum A; Datum B; Datum C; Gauge; Gauge Hole Ø = Virtual Condition (Largest Pin Size [MMC] + Position Tol.); FUNCTIONAL GAUGING; For an External Feature; For an Internal Feature	Part; Tolerance Zone of Pin Gauge; True position; Actual Hole Position; Datum A; Datum B; Datum C; Gauge; Gauge Pin Ø = Virtual Condition (Smallest Hole Size [MMC] - Position Tol.)		
	◎	Concentricity	◎ Ø 0.03 A; Diameter Symbol is required	Measured axis; Datum axis; Datum A; Tolerance Zone	The following is usually done with a CMM: 1. Determine Datum axis 2. Measure referenced surface 3. Determine if central axis falls in TZ	Distribution/ Evenness of Form Only	LOF (Derived Median Points)
	⌯	Symmetry	⌯ 0.03 A	Two parallel planes 0.03 apart	Datum A Plane; The following is usually done with a CMM: 1. Determine Datum plane 2. Measure both surfaces of features 3. Determine if midpoints fall in TZ		
RUNOUT	↗	Runout	↗ 0.03 A	Datum A Fixed axially + Rotated	Datum A Fixed + Rotated; Can also be used on flat surfaces perpendicular to the datum axis	LOF	
	⌰	Total Runout	⌰ 0.03 A	Datum A Fixed axially + Rotated	Datum A Fixed + Rotated; Can also be used on flat surfaces perpendicular to the datum axis		

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