Map of the GD&T World
Based on *ASME Y14.5-2018*

Surfaces

2-D | **3-D**

3-D

FORM

tangent

(T) X

plane (only)

ORIENTATION

"EACH ELEMENT"
= 2-D

PROFILE

(U) unequal

↔ between
→ from-to
△ dynamic

(T)

⌀ all around   all over ⌀

RUNOUT

FREE STATE

(F)

🚫 Rule #1
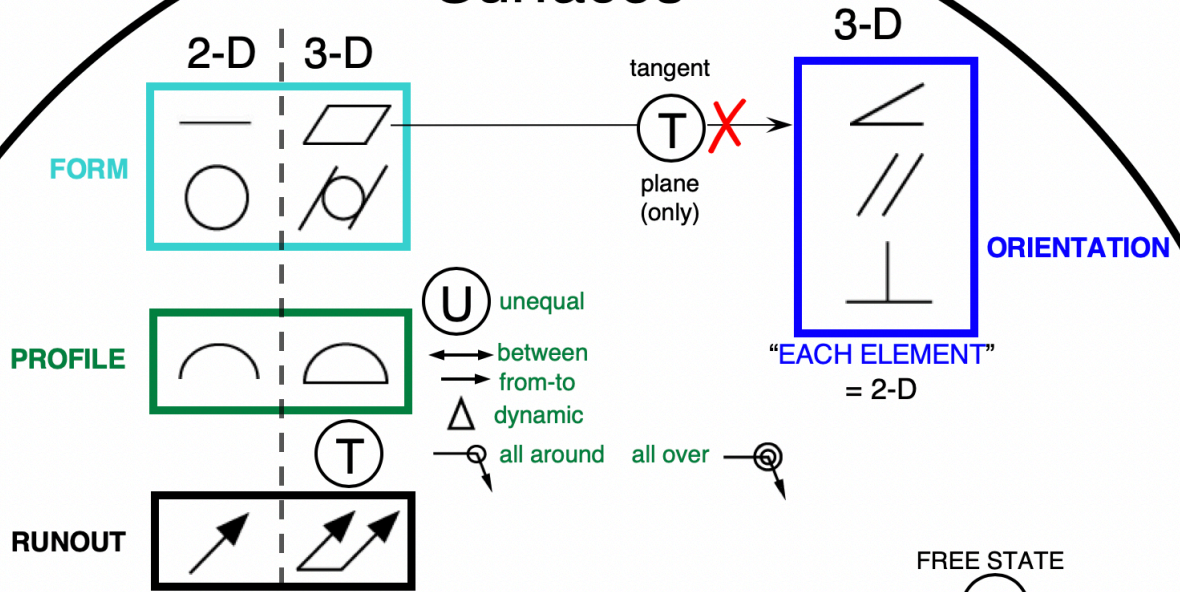
Features of Size (FOS)

	round ⌀	square	MMC	Ⓜ VC	LMC	Ⓛ VC
internal	hole, ID	keyway, slot	smallest size	MMC – geo tol	largest size	LMC + geo tol
external	shaft, boss, OD	key, tab, width	largest size	MMC + geo tol	smallest size	LMC – geo tol

(I)

🚫 Rule #1

LOCATION   **ORIENTATION**   **FORM**

⊕   ∠ ∥ ⊥   — ▱   =   🚫 Rule #1

(P) projected (borrowed) tol zone

(M) ← size-related modifiers → (L)

RFS
(Rule #2)
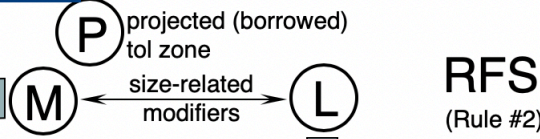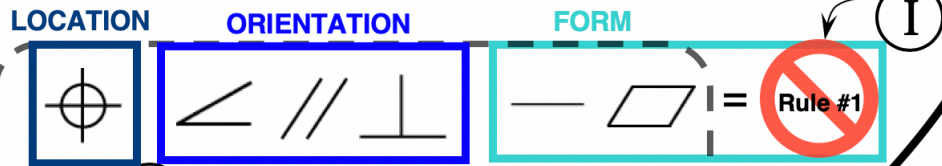
Things to think about when the tolerance is applied at MMC or the datum is referenced MMB

- Assembly
- Attribute gage
- Boundary
- Bonus
- Shift/MMB
- VC

- Conserving wall thickness
- Bonus
- Shift/LMB
- VC

- Symmetric
- Variable gage
- Tolerance zone diameter or planes
- No bonus
- No shift/RMB
- Varying AME

Things to think about when the tolerance is applied RFS or the datum is referenced RMB

www.gd-t.com/map-of-gdt

ASME Y14.5-2018 Control Category	Control Name	Control Symbol	Tolerance Zone Description	Control References Datum(s)?	Control applies to a surface? Modifiers?	Control applies to a FOS? Modifiers?
FORM	Straightness	—	2 parallel lines or a single cylinder	never	yes (cross sections)	yes Ⓜ Ⓛ
	Flatness	▱	2 parallel planes	never	yes	yes Ⓜ Ⓛ
	Circularity	○	2 coaxial circles	never	yes (cross sections)	no
	Cylindicity	⌭	2 coaxial cylinders	never	yes	no
PROFILE	Profile of a Line	⌒	2 offset line (shape) elements	optional	yes* (cross sections)	no
	Profile of a Surface	⌓	2 offset surfaces	optional	yes* Ⓣ	no
ORIENTATION	Angularity	∠	2 parallel lines, 2 parallel planes, or a single cylinder	always	yes Ⓣ	yes Ⓜ Ⓛ Ⓟ
	Parallelism	∥	2 parallel lines, 2 parallel planes, or a single cylinder	always	yes Ⓣ	yes Ⓜ Ⓛ Ⓟ
	Perpendicularity	⊥	2 parallel lines, 2 parallel planes, or a single cylinder	always	yes Ⓣ	yes Ⓜ Ⓛ Ⓟ
LOCATION	Position	⌖	2 parallel planes, a cylinder, sphere, or other shapes	(almost) always	no	yes Ⓜ Ⓛ Ⓟ
RUNOUT	Circular Runout	↗	2 coaxial circles (same plane or parallel planes)	always	yes	no
	Total Runout	↗↗	2 coaxial cylinders, or 2 parallel planes	always	yes Ⓣ	no

Acronyms	Tolerance Zone Modifiers	Datum Related	Other Symbols

Acronyms

AME actual mating envelope
BSC basic (true profile)
FCF feature control frame
FOS feature of size
IB/OB inner/outer boundary
ID/OD inner/outer diameter
INT/EXT internal/external (FOS)
LMB least material boundary
LMC least material condition
MMB maximum material boundary
MMC maximum material condition
RFS regardless of feature size
RMB regardless of mat'l boundary
TP/TPR true position/true profile
TZ tolerance zone
VC/RC virtual/resultant condit'n

Tolerance Zone Modifiers

Ⓜ = tolerance only applies at *MMC*
Ⓛ = tolerance only applies at *LMC*
Ⓟ = tolerance zone *projected* out of part
Ⓣ = *tangent plane* (only)
Ⓕ = *free state* (only) (exception to general restraint note)
Ⓘ = *independency* of size & form (rule #1 not applicable)
Ⓤ = *unequally* disposed profile* tolerance
△ = *dynamic* profile* (form only, not size)
= profile* tolerance goes *all around*
= profile* tolerance goes *all over*
X ◄►Y = profile* tolerance goes *between* X & Y
X ►Y = profile* tolerance goes *from* X to Y

Datum Related

►Ⓐ = datum feature
⊙C1 = datum target
✕ = datum target point
◄C1 = moveable datum target
▷ = datum translation
Ⓜ = datum is referenced *MMB*
Ⓛ = datum is referenced *LMB*

Other Symbols

↧ = depth
⌴ = counterbore
⊏SF⊐ = spot face
∨ = countersink
⟼ = dimension origin
R = radius
CR = controlled radius
SR = spherical radius
∅ = diameter
S∅ = spherical diameter
= conical taper
⟨CF⟩ = continuous feature
⟨ST⟩ = statistical tolerance

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