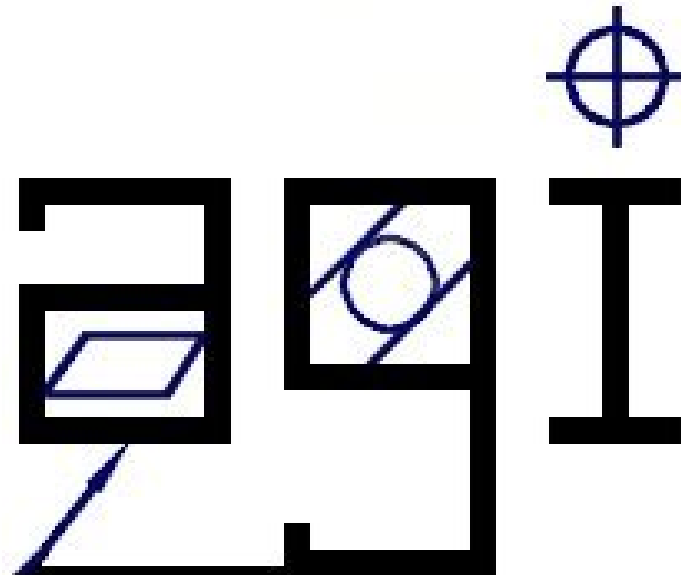




Applied Geometrics Inc.



Mission Statement:

Applied Geometrics, Inc. is committed to train manufacturing industry's personnel how to realize a higher return on investment by utilizing a standardized, concise, internationally accepted language of engineering expression.

AGI specializes in teaching and consulting GD&T and related topics.

Contact information:

Applied Geometrics, Inc.

Don Tworek • 7408 W. Argyle • Harwood Hts., IL 60706 • (708) 867-5927

Also in Illinois: Jaime Dadez • 1409 S. Chicago Ave. • Freeport, IL 60706 • (815) 238-0830

In Michigan: Mark Foster • 497 Lyon Blvd. • South Lyon, MI 48178-1235 • (866) 702-7655

Visit us at our web site, <http://www.GDandT.com>

Geometric Dimensioning and Tolerancing



A Means of Dimensioning and Tolerancing a Part With Respect to **RELATIONSHIP** and **FUNCTION.**

HOW DOES A PART FIT AND FUNCTION IN ITS ASSEMBLY.

RELATIONSHIP: How parts relate to each other. Do they interfere? Will they assemble? Are they too loose?

ASSEMBLE-ABILITY: - (Will the parts go together?)

FUNCTION: Definition of Performance - (Will the parts do what they are supposed to do once they are assembled?)

WHERE DO TOLERANCES COME FROM AND HOW CAN THEY BE COMMUNICATED?

Pull them out of thin air? Cut and paste?

Are these tolerances functional? How are they communicated?

WHEN GD&T IS APPLIED AND INTERPRETED PROPERLY (PER AN ACCEPTED STANDARD) IT COMMUNICATES THE RELATIONSHIP AND FUNCTION OF THE PART.

WHY IS THIS IMPORTANT?

To insure consistent results.

THE MILITARY DISCOVERED THAT THEY HAD SOME PROBLEMS WITH THE SIMPLEST DRAWING IN THE WORLD.

When Should You Use GD&T?



- When part features are critical to **INTERCHANGEABILITY** or **FUNCTION**.
- When **FUNCTIONAL GAUGING** techniques are desirable.
- When **DATUM REFERENCES** are desirable to ensure consistency between design intent, manufacturing and inspection.
- When a **COMMON ENGINEERING LANGUAGE** is required.



FUNCTION AND INTERCHANGEABILITY:

SHOULD GD&T BE USED ONLY ON “TIGHT TOLERANCES”?

What about loose tolerances that do not matter? How much do they not matter?

If tolerances do not matter, then define just how much they “do not matter”.

Could this tolerance be +/- a foot? A mile??

Can all the features whose locations do not matter be in Pittsburgh?

FUNCTIONAL GAUGING:

In process inspection is great, but not always possible.

DATUM REFERENCES

Ensure consistency (in understanding) between design, manufacturing and inspection.

THE BIGGEST MISCINSEPTION is that the datums specified on the print mandate how the part must be held when it is manufactured. Should the way the fixture holds the part drive the functional datum reference selection?

DON'T LET THE TAIL WAG THE DOG!

GD&T IS A COMMON ENGINEERING LANGUAGE

GD&T is expressed and interpreted the same in design, manufacturing and inspection.

GD&T is accepted Internationally. It crosses language barriers.

Why Use GD&T??



- It saves money by providing manufacturing with the **MAXIMUM FUNCTIONAL TOLERANCES**.
- It ensures that **DESIGN REQUIREMENTS** are carried out.
- It ensures **INTERCHANGEABILITY** of mating parts at assembly.
- It provides a **COMMON LANGUAGE**.
- It **SAVES TIME** (ECN's, communication).
- Department of defense requires its use.

PROPER USE OF GD&T SAVES TIME AND MONEY!

MAXIMUM FUNCTIONAL PRODUCTION TOLERANCES ARE CALCULATED WHEN USING GD&T. (TIGHTER TOLERANCES = HIGHER COSTS!)

GD&T ENSURES THAT THE CALCULATED TOLERANCES WILL MEET THE DESIGN REQUIREMENTS.

FUNCTION: Definition - Performance - (Will the parts do what they are supposed to do once they are assembled?)

RELATIONSHIP: How parts relate to each other. Do they interfere? Are they too loose?



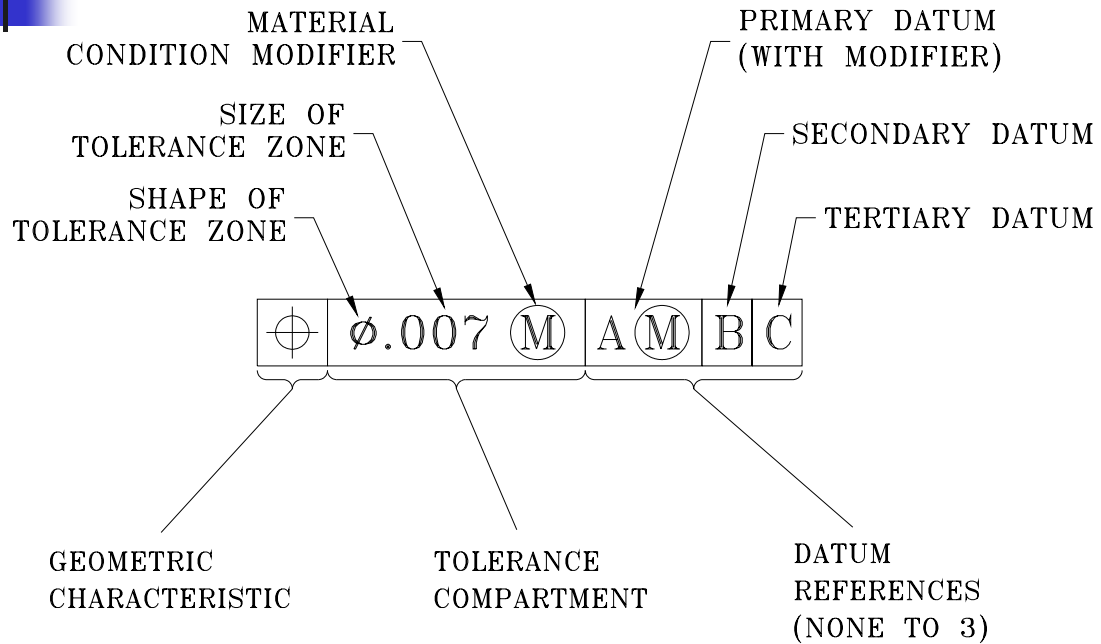
Unnecessarily Tight Tolerances Cost Money!

- Tolerances should be calculated.
- Tolerances should be as large as functionally possible.
- Tolerances should be communicated clearly and understandable.
- Tolerances should be able to be inspected consistently.

THE APPLICATION AND INTERPRETATION OF TOLERANCES SHOULD BE TAKEN VERY SERIOUSLY.

Tighter tolerances cost money because they demand more capable manufacturing and inspection processes, and create more scrap and rework, but sometimes we **NEED** to be willing to endure those extra costs in order to create parts that do what we want them to do.

Feature Control Frame



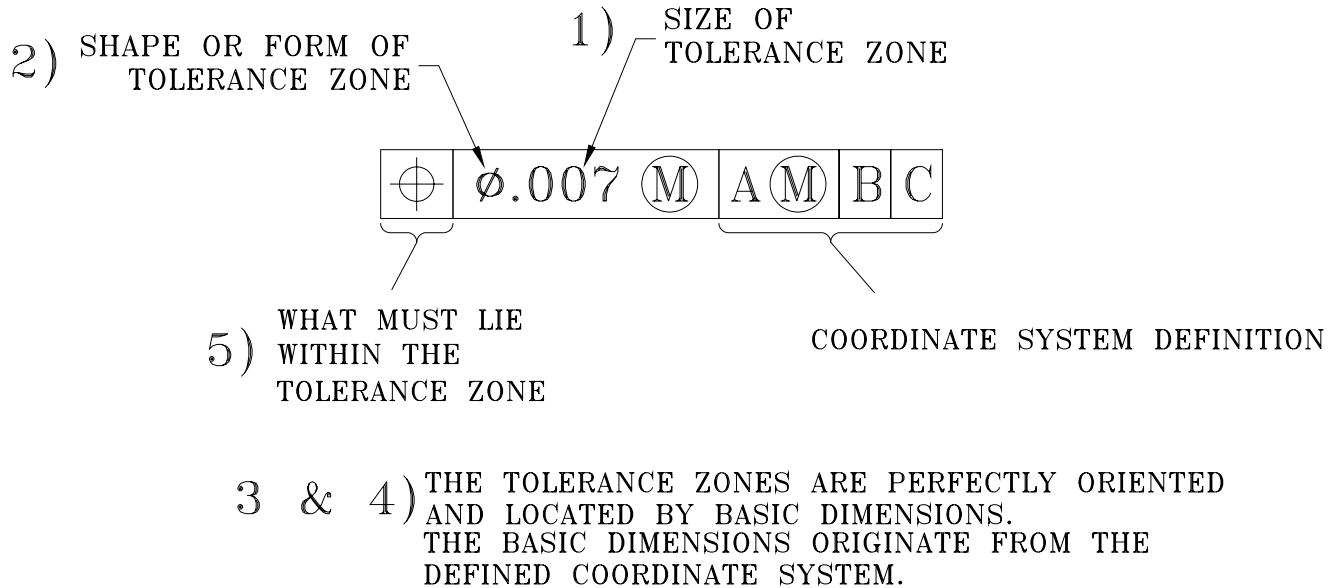
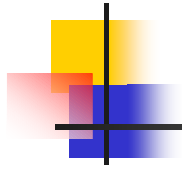
The “Feature Control Frame” is a fundamental GD&T “building block.”

What does it do?

Where would you look for the feature control frame?

What other information can I find in the feature control frame?

Decoding a Feature Control Frame



Each of the answers for five decoding questions can be found in the feature control frame, combined with the Basic dimensions, Datum Feature Symbols on the drawing and definitions in the Y14.5 standard.

Review

What is a feature control frame?

What does a feature control frame define?

What is the purpose of datums?

What are material condition modifiers?

What is Rule #1?

How do I know if that rule applies?

What is the procedure for decoding a feature control frame?