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GD&T- SYMBOLS-2020

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1. Which geometric characteristic does this figure represent?

A ALL Material Condition

B Position

C Datum

D Run-out

ⓘ A datum is theoretical exact plane, axis or point location that GD&T or dimensional tolerances are referenced to. You can think of them as an anchor for the entire part; where the other features are referenced from.

2. Which geometric characteristic does this figure represent?

A Circularity

B Concentricity

C Position

D Cylindricity

> (i) The True Position is the exact coordinate, or location defined by basic dimensions or other means that represents the nominal value. In other words the GD&T "Position" Tolerance is how far your features location can vary from its "True Position".

3. Which geometric characteristic does this figure represent?

A Circularity

B Concentricity

C Cylindricity

D Location

> (i) The circularity symbol is used to describe how close an object should be to a true circle. Sometimes called roundness, circularity is a 2-Dimensional tolerance that controls the overall form of a circle ensuring it is not too oblong, square, or out of round.

Roundness is independent of any datum feature and only is always less than the diameter dimensional tolerance of the part. Circularity essentially make a cross section of a cylindrical or round feature and determines if the circle formed in that cross section is round.

4. Which geometric characteristic does this figure represent?

A   Straightness

B   Symmetry

C   Profile of a line

D   Parallelism

(i) The normal form or Surface Parallelism is a tolerance that controls parallelism between two surfaces or features. The surface form is controlled similar to flatness with two parallel planes acting as its tolerance zone.

5. Which geometric characteristic does this figure represent?

A   Concentricity

B   Circularity

C   Cylindricity

D   Profile of a surface

(i)   The Cylindricity symbol is used to describe how close an object conforms to a true cylinder. Cylindricity is a 3-Dimensional tolerance that controls the overall form of a cylindrical feature to ensure that it is round enough and straight enough along its axis. Cylindricity is independent of any datum feature the tolerance needs to be less than the diameter dimensional tolerance of the part. Cylindricity essentially forms a perfect cylindrical boundary around the object that the entire 3-Dimensional part must lie in.

6. Which geometric characteristic does this figure represent?

A   Circularity

B   Concentricity

C   Profile of a surface

D   Runout

(i)   Profile of a surface describes a 3-Dimensional tolerance zone around a surface, usually which is an advanced curve or shape. If it is called out on a curved surface, like a fillet on a welded part, the entire surface where the radius is has to fall within the tolerance zone. Profile controls all the points along the surface within a tolerance range that directly mimics the designed profile. Any point on the surface would not be able to vary inside or outside by more than the surface profile tolerance. Usually when surface profile is required there are no tolerances on the

surface profile is required, there are no tolerances on the dimensions that describe the surface and use the GD&T callout to give the acceptable range.

7. Which geometric characteristic does this figure represent?

A Total Runout

B Runout

C Straightness

D Position

ⓘ Runout is how much one given reference feature or features vary with respect to another datum when the part is rotated 360° around the datum axis. It is essentially a control of a circular feature, and how much variation it has with the rotational axis. Runout can be called out on any feature that is rotated about an axis. It is essentially how much "wobble" occurs in the one part feature when referenced to another.

8. Which geometric characteristic does this figure represent?

A Cylintricity

B Circularity

C Concentricity

D Roundness

(i) Concentricity is a tolerance that controls the central axis of the referenced feature, to a datum axis. The axes for the datum and referenced feature are derived from the median points of the part or feature. Concentricity is a very complex feature because it relies on measurements from a derived axis as opposed tangible surface or feature.

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9. Which geometric characteristic does this figure represent?

A Symmetry

B Flatness

C Straightness

D Perpendicularity

(i) Perpendicularity in GD&T can mean two very different things depending which reference feature is called out. The normal form or Surface Perpendicularity is a tolerance that controls Perpendicularity between two 90° surfaces, or features. Surface Perpendicularity is controlled with two parallel planes acting as its tolerance zone. Axis Perpendicularity is a tolerance that controls how perpendicular a specific axis needs to be to a datum. Axis Perpendicularity is controlled by a cylinder around a theoretical perfectly parallel axis. Pay close attention if a hole or pin is referenced since axis perpendicularity is commonly called out on these features.

10. Which geometric characteristic does this figure represent?

A Runout

B Angularity

C Total Runout

D Position

ⓘ Total Runout is how much one entire feature or surface varies with respect to a datum when the part is rotated 360° around the datum axis. Total runout controls both the amount of variation in the surface as the part is rotated, but the amount of variation in the axial dimension. Both radial variation and axial variation are measured and held within the tolerance. Total Runout is usually called on a part that is rotated about an axis where the entire surface is critical to be in spec.

11. Which geometric characteristic does this figure represent?

A Marginal Material Condition

B More Material Condition

C   Maximum Material Condition

D   Minimum Material Condition

(i)   Maximum Material Condition or for short, MMC, is a feature of size symbol that describes the condition of a feature or part where the maximum amount of material (volume/size) exists within its dimensional tolerance. The callout also removes GD&T

Rule#2 which states that all geometry tolerances are controlled independently of the feature size.

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12. Which geometric characteristic does this figure represent?

A   Lower Material Condition

B   Least Material Condition

C   Last Material Condition

D   Angularity Material Condition

(i)   Least material condition is a feature of size symbol that describes a dimensional or size condition where the least amount of material (volume/size) exists within its dimensional tolerance. The callout also overrides GD&T Rule#2 or the Regardless of Feature Size rule.

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13. Which geometric characteristic does this figure represent?

A Circularity

B Profile of a Line

C Concentricity

D Cylindricity

ⓘ Profile of a line describes a tolerance zone around any line in any feature, usually of a curved shape. Profile of a line is a 2-Dimensional tolerance range that can be applied to any linear tolerance. If it is called out on a surface, like a radius on a part – profile of a line would specify how much that cross-section could vary from a true curved radius.

14. Which geometric characteristic does this figure represent?

A Circularity

B Angularity

C Concentricity

D Cylindricity

ⓘ Angularity is the symbol that describes the specific orientation of

i   Angularity is the symbol that describes the specific orientation of one feature to another at a referenced angle. It can reference a 2D line referenced to another 2D element, but more commonly it relates the orientation of one surface plane relative to another datum plane in a 3-Dimensional tolerance zone.

15. Which geometric characteristic does this figure represent?

A Symmetry

B Parallelism

C Straightness

D Flatness

i   It is a common symbol that references how flat a surface is regardless of any other datum's or features.

16. Which geometric characteristic does this figure represent?

A Symmetry

B Parallelism

C Straightness

D Flatness

(i) Symmetry is a 3-Dimensional tolerance that is used to ensure that two features on a part are uniform across a datum plane.
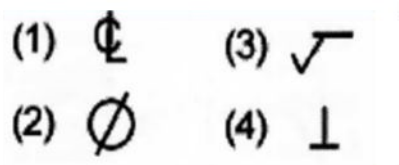
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17. Which geometric characteristic does this figure represent?

A Symmetry
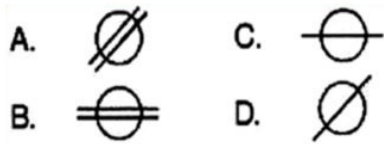
B Parallelism

C Straightness

D Flatness

(i) GD&T Flatness is very straight forward. It is a common symbol that references how flat a surface is regardless of any other datum's or features.

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18. A surface finish symbol is represented by

A (1)

B (2)

C (3)

D (4)

19. The symbolic representation for diameter is

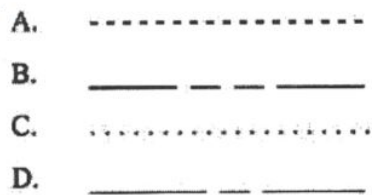A. ⌀   C. ⊖

B. ⊖   D. ⌀

A (A)

B (B)

C (C)

D (D)

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20. Which of the following is a center line?

A. – – – – – – – – – – – – – –

B. ——— — — ———

C. · · · · · · · · · · · · · · · · · ·

D. ——— — ———

A (A)

B (B)

C (C)

D (D)

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21. An angle is represented by

(1)]   (3) /

(2) ∠   (4) ∧

A (1)

B (2)

C (3)

D (4)

22. The geometric characteristics shown is

$$\boxed{\oplus \;|\; \text{Ø0.5}\,\text{Ⓜ}\;|\; A \;|\; B \;|\; C}$$

A Circularity

B Total Runout

C Cylindricity

D Position

23. Which of the following is the numerical value that defines the size and geometric characteristics of a feature?

A Tolerance

B Arrow

C Dimension

D Extension lines

24. In a dimension, the symbol "X" is used to indicate

A a less important feature in the design.

B a feature that can be deleted.

C the number of times a feature is to be repeated.

D None of the above

25. What are a tolerances?

A The total amount that a specific dimension is permitted to vary.

B The total amount is considered the difference between the maximum and minimum limits.

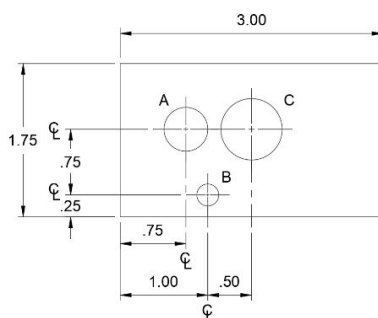**C** Both A and B

D Neither A nor B

26. Which of these symbols represent a center-line?

$$\text{\Large ₵} \quad \angle \quad \Omega \quad \neq \quad]$$
(1) (2) (3) (4) (5)

A (1)

B (2)

C (3)

D (4)

E (5)

27. The absolute coordinates of Hole "C" are ____ relative to the lower left corner.

A   X 1.50; Y 1.00

B   X 3.00; Y 2.00

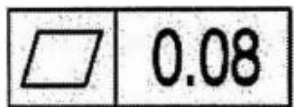**C**   X -1.00; Y -1.50

D   X -1.50; Y -1.00

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28. Which section type is shown in this image?

A   Offset

B   Removed

C   Revolved

D   Broken

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29. What is the characteristic form for the following symbol?

A   oblique

B   profile

C   straightness

D   flatness

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30. Straightness is a _____ control

A Form

B Location

C Orientation

D Runout

E Profile

31. The four fundamental elements of GD&T are Size, Location, Orientation, Form.

True

32. A datum is theoretical exact location plane, axis or point location that GD&T or dimensional tolerances are referenced to.

True

33. In GD&T, a feature control frame is required to describe the conditions and tolerances of a geometric control on a part's feature.

True

34. What Is GD&T?

A GD&T is a language used in design, manufacturing and quality inspection.

B GD&T combines a set of symbols, rules and principles to ensure that everyone is on the same page regarding how a feature or part is defined.

C When a design engineer hands off a drawing to a machinist, they need a common technical language for communicating exactly what must be done.

D GD&T is a system to regulate and determine that communication.

E All of the above

35. Which symbol does this figure represent?

A Depth

B Datum

C Countersink

D Counter bore

36. What does this symbol represent?

A   Countersink

B   Counterbore

C   Depth

D   Datum

37. What does this symbol represent?

A   Countersink

B   Counterbore

C   Depth

D   Datum

38. Maximum Material Condition or for short, MMC, is a feature of size symbol that describes the condition of a feature or part where the maximum amount of material (volume/size) exists within its dimensional tolerance.

True

39. In GD&T, a feature control frame is necessary to describe the conditions and tolerances of a geometric control on a part's feature.

True

Add a Question

Multiple Choice   **True / False**   **Short Answer**