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Basic 2D Engineering Drawing Checklist

It is said that 95% of errors in any human endeavor result from poor communication. In our business, the engineering drawing is our language of communication.

Even with the Solids CAD revolution currently making its mark in engineering, the good old 2D engineering drawing still remains the workhorse of the industry.

So, you can save your breath describing a widget over the phone. We need certain basic information in writing and pictures to give you the answers you need.

To us, the medium is less important than the quality of information conveyed. So whether it is presented as a pencil sketch on a scrap of paper, or as a sharp looking CAD printout, it still requires the following elements:

Essential:

1. A name for the component and/or project.

This gives us a common reference throughout all communications, ensuring we are talking about the same item. It also lends a personality to an otherwise innate object.

2. Multi-view (3rd angle) presentation

We have to see the component in every view (top, bottom, sides and ends). How many views depends on the details involved, but the minimum is usually two.

3. Dimensions

Dimensions include sizes, tolerances, identifying features, view names, thread types, material specs, finishes, heat-treatments, and general notes. Overall

dimensions are useful for ordering materials.

Choose sensible datum's that we can access while machining. These are usually edges, but if the part is symmetrical in an axis, then we prefer to use the centerline as the datum for that axis. Mixing edge & center datums is OK.

4. Tolerances

To an engineer, a dimensionally toleranced drawing is more real than the component itself. Tolerances effectively set the price of your component.

For example, a spherical bearing element and a child's rubber ball can have the same drawing, with a single dimension for the diameter. The bearing is made of high grade steel and has super tight dimensional tolerances for sphericity, surface finish, hardness and alloy ratios.

So, if you leave out the tolerances and material specs for the ball bearing, you could well be describing a rubber ball instead! i.e.,: tolerances still apply to non-critical parts.

Further, don't make your tolerances tighter than necessary. This can increase costs by forcing the use of expensive manufacturing processes. It also results in perfectly useable parts being rejected.

If you need advice on tolerances, contact us.

- Tight tolerances = higher costs
- Loose tolerances = lower costs
- Missing tolerances = undefined component

5. Material

Indicating alternative choices of material as well as your first choice can mean quicker delivery, especially if the material is hard to source.

6. Heat Treatment

This usually applies to steels for case, thru-hardening and annealing but also applies to aluminium age hardening and to other alloys for pre-machining treatment.

7. Finish & surface treatment

This can be neat machining to a certain surface finish as specified by your tolerances. There is polishing, sand blasting and bead blasting. Also, there are many forms of plating for protection, decoration & hard coating. If no finish is specified, then parts will be supplied neat.

8. Quantity required

The quantity of a run directly affects the per component price. Most components require an allowance for set-up, and many require fixtures.

If you are confident your components design is stable, then this is the moment to consider if you should make the manufacturing run longer to reduce long term costs.

If the design is likely to change, keep the quantity low.

Now we're really getting to like you:

9. Function of component.

Tell us the function, and we can make engineering decisions that can save you time & money. Having said this, a fully dimensioned & toleranced drawing should be all we need to manufacture your component, so if you wish to keep the function to yourself, give us a thorough drawing.

10. Drawing number.

This is for reference purposes. It is one step better than the component name because it is more exact. This can only work if your systems include a drawing number register

11. Cross sections in place of hidden detail.

Hidden detail gets very messy and over crowded. Cross sections 'cut' through the mess and greatly clarify a drawing, thus avoiding misunderstandings.

12. Parts Lists

Also known as bill of materials, these are useful for itemising during the quoting stage, and ensuring a well organised work-flow.

13. 3D isometric views.

A picture tells a thousand words. Isometric views enable a quicker interpretation of any drawings, allowing instant recognition of shape.

Best Mates:

14. Drawing version number & change history.

The version number ensures we machine to the latest specifications. The change history tells us what changes to look for, usually written as a list in the title block. The letter next to each change becomes the version, and the latest change letter is appended to the drawing number shown in the title block.

When issuing new drawings, please highlight the dimensions of the most recent changes.

15. Assembly drawings, especially cross sectioned.

An assembly drawing gives us freedom to make accurate engineering decisions. They show "inter-component relationships" which allow us to clearly see the

function of parts, and particularly allow us to judge likely tolerances. With these drawings, we are better able to work with you to ensure your assemblies work correctly, first time.

16. Exploded diagrams.

These are mainly for assembly or disassembly, and when labeled with part numbers associated with a bill of materials, communications are made considerably easier.