WIZ-PARTS

FABRICATION WELDING DESIGN GUIDE

v1.0 September 2024

What Is Welding?

Welding is a fundamental process in metal fabrication that involves joining two or more metal parts by melting their edges and fusing them together, often with the addition of a filler material. This process creates a strong, permanent bond that is essential for constructing structures and components that would not be possible to produce as a single part. Welding is employed across various industries such as automotive, aerospace, and manufacturing, due to its ability to produce durable and reliable joints.

Contents

MIG Welding

MIG (Metal Inert Gas) is a popular welding process that uses a continuous wire electrode fed through a welding torch to join metals. The process is shielded by an inert gas, typically argon or a mix of gases, which protects the weld from contamination.

Benefits of MIG Welding

Speed and Efficiency: The continuous wire feed and automatic process allow for faster welding compared to other methods, increasing productivity.

High-Quality Welds: The inert gas shield reduces contamination and oxidation, resulting in clean, strong welds with minimal defects.

Minimal Cleanup: MIG welding produces less spatter and slag, reducing the need for extensive post-weld cleanup and finishing.

TIG Welding

TIG (Tungsten Inert Gas) welding is a precision welding process that uses a non-consumable tungsten electrode to produce the weld. An inert gas, usually argon or helium, shields the weld area from atmospheric contamination.

Benefits of TIG Welding

Precision and Control: TIG welding allows for precise control over the welding process, making it ideal for detailed and intricate welds on thin materials.

Versatility: TIG welding can be used on a wide variety of metals, including steel, stainless steel and aluminum, making it suitable for diverse applications.

Superior Aesthetics: The precise nature of TIG welding results in visually appealing welds, often used where weld appearance is critical.

Fibre Laser Welding

Fiber laser welding is an advanced welding process that uses a high-powered laser beam to join metals with precision. The laser is delivered through a fiber optic cable, allowing for highly accurate and controlled welding with minimal heat input.

Benefits of Fiber Laser Welding

Precision and Accuracy: The focused laser beam allows for extremely precise welding, making it ideal for detailed work and complex geometries.

Strong, Clean Welds: The concentrated energy reduces heat-affected zones, resulting in strong welds with minimal distortion and clean edges.

Minimal Heat Input: Lower heat generation reduces the risk of warping and thermal damage, preserving the integrity of the welded materials and requiring minimal clean-up.

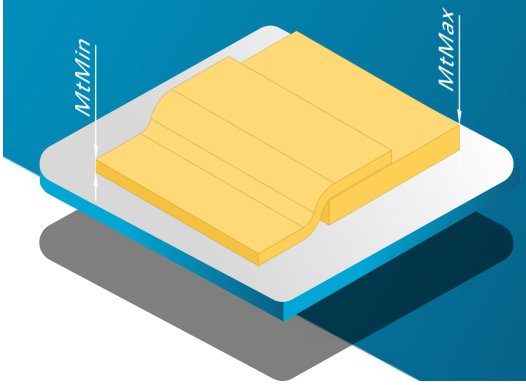
Selecting The Right Welding Process

Selecting the right welding process is essential for ensuring material compatibility, achieving desired weld quality, meeting application requirements, enhancing efficiency, managing costs and adapting to environmental conditions. This careful selection process ensures the success and reliability of welding projects across various industries.

	MIG Welding	TIG Welding	Laser Welding
Aluminium	x	✓	✓
Mild Steel	✓	✓	✓
Stainless Steel	x	✓	✓
Material Thickness	2 - 10mm	1- 6mm	1 - 6mm
Process Speed	Fast	Slow	Very Fast
Weld Appearance	Good	Excellent	Excellent
Cost	£	£££	££

Avoid Dissimilar Materials

It is recommended that all components to be welded are of the same material. It is possible to weld parts of different profile but the same material, i.e. welding aluminium tube to aluminium plate.



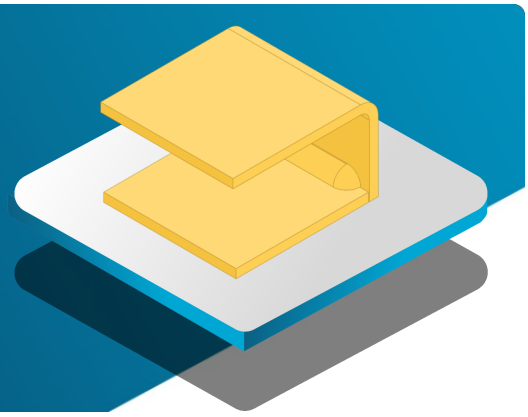
Avoid Dissimilar Thicknesses

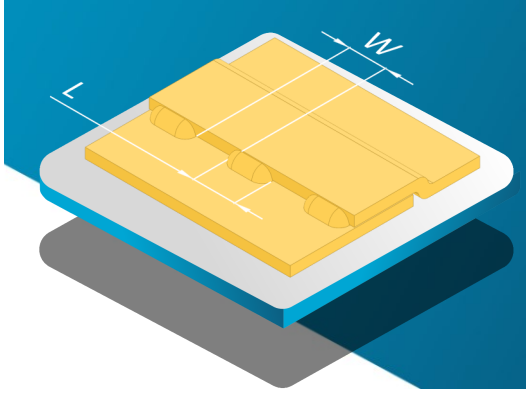
It is recommended to avoid welding materials of dissimilar thicknesses wherever possible. The material thickness of the thinner part (MtMin) should be equal to or greater than 50% of the material thickness of the thicker part (MtMax).

MtMin ≥ 0.5 x MtMax

Consider Torch Access

It is important to consider access for the welding torch in all locations you require to be welded. It is recommended to avoid welding inside edges wherever possible and limit the length of overhangs or add access holes in hard to reach areas.





Avoid Long Welds

It is recommended to keep the maximum weld length (L) to between four and eight times the material thickness (Mt) and equal to the gap width (W) between welds.

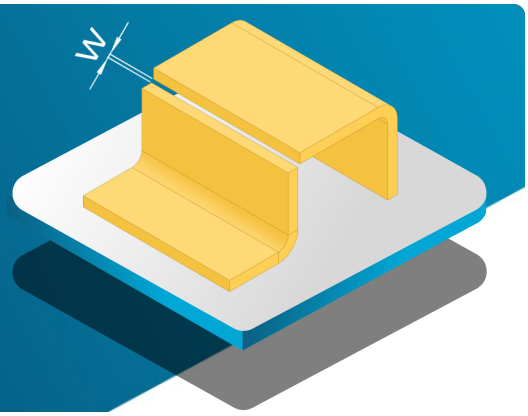
4x Mt ≤ L ≥ 8 x Mt

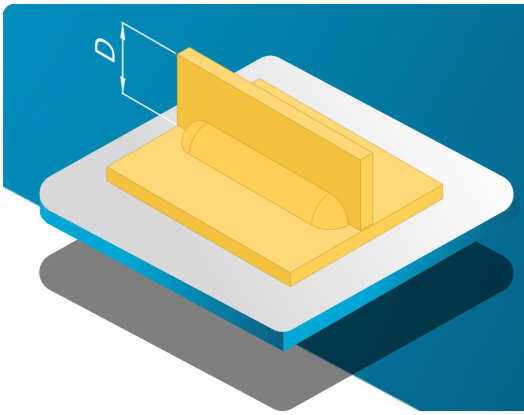
L = W

Keep Gaps Small

Where it is required to fill in a gap with weld, ensure that the gap width (W) is less than or equal to 50% of the material thickness (Mt).

W ≥ 0.5 x Mt





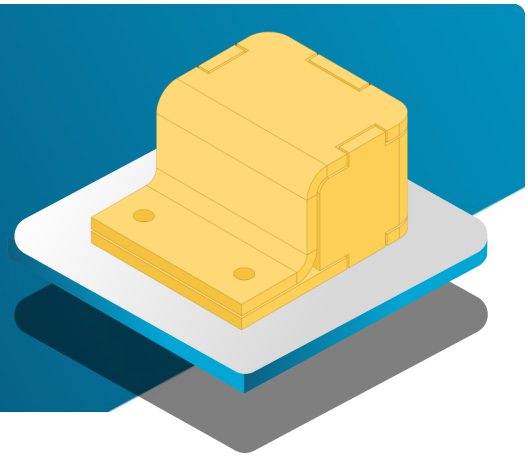
Consider Flange Lengths

It is recommended that all welded flanges have a depth (D) equal to or greater than four times the material thickness (Mt) to eliminate the risk of material distortion.

D ≥ 4 x Mt

Add Fixturing Features

When creating a welded assembly, it is recommended to add features such as holes or tabs which can be used to reference critical parts together. This ensure the best possible accuracy in the assembly and can be used to minimise heat distortion.



And Remember to Make Sure Your Files Are in the Correct Format!

2D CAD Files

.DXF

.DWG

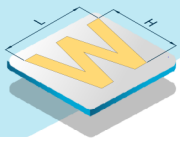
3D CAD Files

.STEP .IGES

.X_T .SLDPRT

2D Drawings

.PDF



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