COMPLETE TECHNICAL GUIDE / ENGLISH

Welding and subassemblies

Clear drawings for laser, MIG/MAG and TIG welding



Illustrative process image.

Information for design and quotation
Technical explanations, tables, diagrams and practical examples. Preliminary recommendations are checked for the project material, tooling and geometry. Tolerances and the final manufacturing route are confirmed in the quote.

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Contents

What to send to the workshop 3
Joint gap and access 4
Distortion and tolerances 5
Laser, MIG/MAG and TIG: process selection 6
Butt, lap and T-joints 7
Defining the weld on a drawing 8
Joint gap, fit-up and part preparation 9
Fixtures, tack welding and weld sequence 10
Materials and finishing after welding 11
Inspection: dimensions, appearance and leak-tightness 12
Example subassembly quotation request 13
Assembly acceptance 14

How to use this guide
Consult the geometry chapters before finalising the drawing. Check tables and examples, then use the quotation checklist. Example numbers illustrate calculations; they do not implicitly represent guaranteed capacities or tolerances.

What to send to the workshop

Assembly definition

Send the STEP model, assembly drawing and parts list. Specify materials, thicknesses, quantity and functional surfaces. Number subassemblies for clear identification.

Weld definition

State joint type, position, size and weld lengths. If using symbols, identify the drawing standard. “Fully welded” does not adequately define functional requirements.

Process selection

Laser, MIG/MAG and TIG have different requirements for joint gap, access and material. Selection is confirmed after reviewing geometry and appearance, strength or leak-tightness requirements.

Joint gap and access

Part fit-up

Control gap, flatness and edge positioning. Do not transfer MIG/MAG joint-gap tolerances to laser welding. For laser welding, fit-up must be assessed for the actual configuration.

Access for manufacturing

Leave space for the welding head and fixtures. A weld drawn inside a closed corner may be inaccessible; check assembly sequence before finalising parts.

Clean surfaces

State whether material is galvanised, painted or oiled. Preparation and restoration of protection around the joint are established in the quote; the final finish follows the necessary operations.

Distortion and tolerances

Welds sized for function

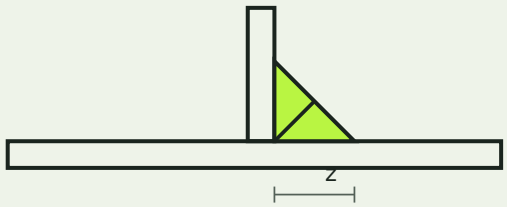
Excess deposited metal can increase shrinkage and distortion. Weld sizing belongs to the design; the workshop does not arbitrarily reduce specified welds.

Positioning and sequence

Fixtures and a balanced sequence can control distortion. Dimension reference points and final dimensions after welding. Provide allowance where subsequent machining is needed.

Sealing and verification

For containers or leak-tight assemblies, specify medium, pressure and verification method. Agree inspection and documentation requirements before production; they cannot be assumed from the model.



a: throat thickness

z: weld leg length

T-joint - idealised section

Illustrative diagram; not to scale. This is not a manufacturing drawing.

Laser, MIG/MAG and TIG: process selection

Selection starts with function

The process is selected for material, thickness, joint, access, productivity and final requirements. A process name does not guarantee penetration, strength, leak-tightness or appearance. Load-bearing or sealed parts need design and verification requirements defined before production.

Laser

Energy is concentrated in a small area, but the result depends on edge fit-up, joint position, material and configuration. Filler use or other operating modes change process requirements. Do not copy a joint gap from arc welding to laser welding without assessment.

MIG/MAG and TIG

MIG/MAG uses a continuous wire electrode and shielding gas; gas type and filler are selected for the material. TIG uses a non-consumable electrode and can include separate filler. Productivity and weld-pool control differ. The workshop proposes the appropriate route, while the drawing defines the required result.

Process	Important checks
Laser	Gap, positioning, access, penetration and appearance
MIG/MAG	Gap, filler, access, spatter and distortion
TIG	Access, preparation, filler, shielding and time

Butt, lap and T-joints

Butt joint

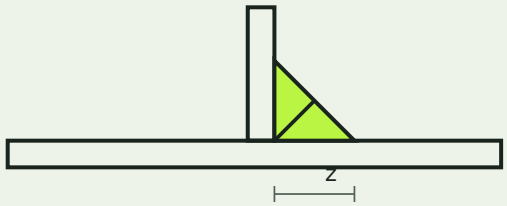
Align the ends and define gap and preparation according to process and thickness. If full penetration is required, state and verify it. Drawing a line between two parts does not automatically define a fully penetrated joint.

Lap and T-joints

For a lap joint, contact length, access and any gap matter. In a T-joint, effective weld thickness and length define the weld requirement. Do not size a weld from a rendering. Identify whether it is single-sided, double-sided or limited to particular segments.

Closed corners

On enclosures, head access and assembly order are decisive. Check access to the root and feasibility of later finishing. For a sealed product, the weld path must be continuous where necessary, with the verification method explicitly agreed.



a: throat thickness

z: weld leg length

T-joint - idealised section

Illustrative diagram; not to scale. This is not a manufacturing drawing.

Defining the weld on a drawing

Dimensions and symbols

For a fillet weld, throat thickness a and leg length z are different dimensions. For an idealised 90° section with equal legs, a ≈ z/√2. State the correct symbol and size, position, length and any pitch; the workshop checks interpretation before production.

Length, continuity and side

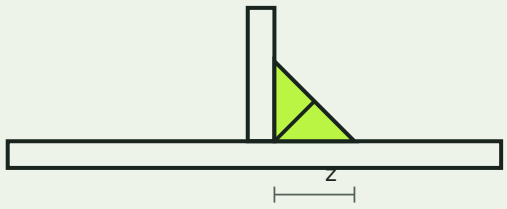
Identify exactly the welded areas, application side and any interruptions. “30 mm weld” may mean one segment, rather than the entire edge. For intermittent welding, define segment count or pitch and location; do not leave this to interpretation of a photograph.

Functional requirement

State whether the weld serves positioning, strength, sealing or appearance. A weld ground flush can have a different final section from an exposed weld. Material removal after welding must be approved for the function and design.

EXAMPLE / APPLICATION

Geometric example: for an idealised leg length z = 4 mm, a ≈ 2.83 mm. This is a geometric relationship, not a strength calculation or a weld recommendation for every part.



a: throat thickness

z: weld leg length

T-joint - idealised section

Illustrative diagram; not to scale. This is not a manufacturing drawing.

Joint gap, fit-up and part preparation

Flatness and alignment

Edges must allow repeatable positioning. Check cutting and bending deviations, stock distortion and fixture contact. Forcing nonconforming parts together can introduce stresses and hide a dimensional problem that reappears after release.

Preparation and contamination

Removal of oxides, grease, paint or coatings is determined for the material and process. State whether material is galvanised or has unknown protection. The prepared area must permit welding and finish restoration; a painted surface is not assumed ready for welding.

Gap is a process condition

Opening, angle and bevel are selected for the joint, thickness and procedure. We do not publish a universal maximum gap for LaserMet. If a part needs laser welding, discuss the model and fit-up tolerances before manufacturing all production parts.

Problem	Possible consequence
Variable gap	Uneven penetration / appearance
Misaligned edges	Changed position and section
Contaminated surface	Affected quality and finish
Forced fit in fixture	Stress and springback after release

Fixtures, tack welding and weld sequence

Positioning in a fixture

Establish datums determining final geometry and head access. Supports must allow handling and any necessary movement. A fixture improves repeatability but cannot compensate without limit for parts that do not match the drawing.

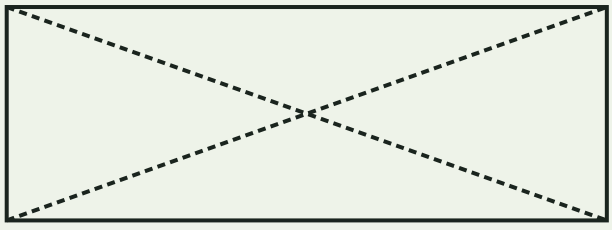
Tack welding

Tacks hold position before the final weld and form part of the manufacturing plan. Their location and integration into the final weld are established technically. Visible tacks that need removal or finishing must be included in appearance requirements.

Sequence and distortion

Heat and shrinkage can alter angles and dimensions. Segment sequence, alternating areas and fixtures are selected for the actual geometry. For a long or thin-sheet part, a trial is useful to check geometry after cooling and release.

EXAMPLE / APPLICATION
For a rectangular frame, check datums, sides and diagonals after tack welding and after final welding. Side tolerances alone do not verify squareness and flatness.



Check sides, diagonals and flatness

Identify datums in the drawing

Illustrative diagram; not to scale. This is not a manufacturing drawing.

Materials and finishing after welding

Steel

Material and condition affect preparation, filler and any process measures. High-strength steels or material combinations need separate assessment. This quotation guide does not replace selection of a suitable welding procedure.

Stainless steel and aluminium

Specify grade, condition and surface requirements. For stainless steel, describe the difference between exposed welds, ground welds and restored brushed surfaces. For aluminium, alloy and temper are essential; compatibility and results are checked for the project.

Finishing and machining

Grinding can change weld section and edges. Precision bores or surfaces may be machined after welding where function requires it. Plan final coating after welding and preparation; substrate roughness and marks may remain visible unless corrected.

Requirement	Necessary detail
Exposed weld	Accepted appearance and visible face
Ground flush	Permitted areas and final geometry
Brushed stainless steel	Direction and restoration method
Precision surface	Machining before / after welding

Inspection: dimensions, appearance and leak-tightness

Dimensional inspection

Define final dimensions after cooling, measurement datums, flatness and relationships between parts. Frame diagonals and hole alignment can be critical. For an enclosure, cover position and gasket plane may matter more than overall external dimensions.

Weld quality

External appearance alone does not prove penetration or absence of internal defects. If special inspection, acceptance levels or qualification documents are needed, request them before quotation and obtain explicit confirmation. A faster process does not remove verification needs.

Leak-tightness

State medium, pressure or vacuum, duration and test method where defined by the design. Review the requirement with the technical lead. Visual inspection or a simple test is not equivalent to every pressure-vessel requirement.

Check	Purpose
Dimensional	Geometry and assembly
Visual	Appearance and visible defects
Requested special inspection	Characteristics agreed for the design
Leak test	Specific function and acceptance criterion

Example subassembly quotation request

Define the deliverable

Instead of “welded frame”, supply assembly code, drawing, parts list, materials and revisions. State whether LaserMet supplies the complete subassembly or welds customer-supplied parts. Identify included cutting, bending, drilling and coating operations.

Assembly requirements

State hole positions, seating plane, contact points and permissible distortion. Include mating parts if available to check screw access and function. A rendering helps orientation, but a dimensioned drawing remains necessary.

Production and acceptance

Separate the prototype from annual production and delivery batches. A fixture can have a setup cost and offer production benefits. After prototype approval, retain the same requirements and documents for the batch; any part change needs a new revision.

EXAMPLE / APPLICATION
AS-205 rev. C | 10 assemblies | list of 6 parts | material for each part | welds defined in PDF | two surfaces machined after welding | finish and packaging stated | mounting-hole verification.

Assembly acceptance

Checklist

Assembly drawing; parts and revisions; materials; weld definitions; final dimensions; appearance; finish; inspection requirements and requested documents.

Function and appearance

A surface ground flush has different requirements from an exposed weld. Identify visible areas and where the design permits weld-metal removal.

Cost and repeatability

Use parts that locate easily, reduce reorientation operations and discuss a production fixture. An accepted prototype helps establish criteria before the batch.