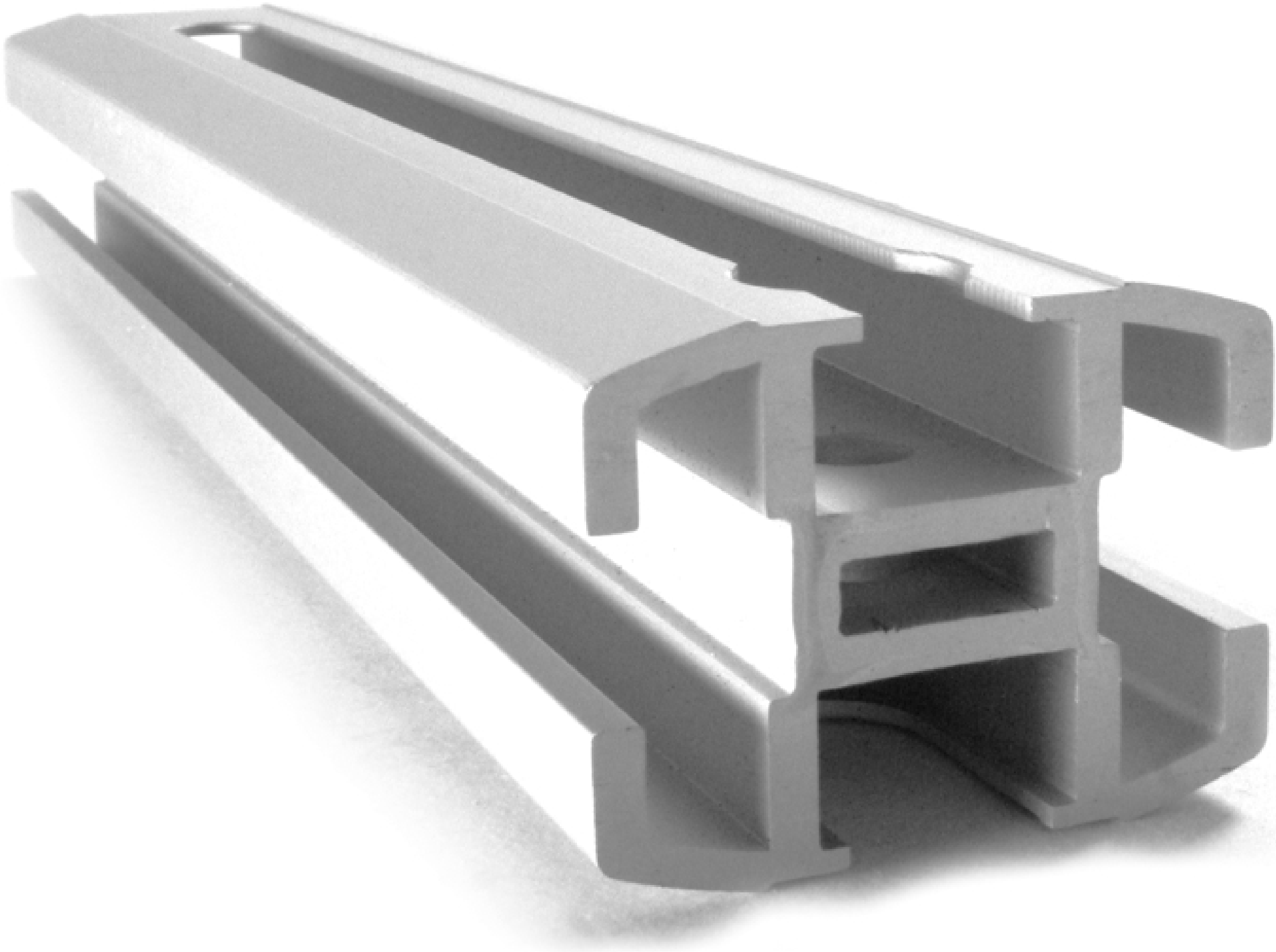
GOUDSMIT UK

Extruded Parts



Technology at work for you

Goudsmit UK is part of the Goudsmit Group of companies based in Eindhoven, the Netherlands. Founded in 1960 the group manufactures and supplies a range of products from components through to capital equipment. The group has subsidiary companies across Europe and into Asia.

Goudsmit UK was founded in 1998 and specialises in the design, industrialisation and manufacture of custom industrial components. The company can also design and sub-contract manufacture entire products and offers a comprehensive and global logistics service.

TS16949 and ISO9001 qualified the company works in a wide range of market segments including Automotive, Oil and Gas, Aerospace, Medical Devices and Green Technology.

Logistics

Designing, industrialising and manufacturing components are only some of the issues which face us and our clients. Just as important is getting the correct number of components to the correct place at the right time. To do this we have a refined and complex logistics network which operates throughout the globe. Key capabilities of this network are:

- Demand planning system to predict and manufacture client requirements
- Frame contracts with multiple drops spanning up to 2 years
- Warehouses in Holland / USA / UK to allow ex stock delivery
- Buffer stock held locally to offer 3 day delivery
- Consignment stock capabilities
- JIT delivery for automotive volumes
- KANBAN delivery for regular use items
- Global tracking system to monitor orders and parts through production and shipping

We have adapted our logistics network to match the dispersed and global nature of our clients operations and can offer whatever service our clients require.

For further information please refer to our logistics brochure.

Quality Assurance

What our clients want are parts which are correct first time and every time. We endeavour to provide this and our QA aim is zero defects on deliveries and continual improvement in all our processes. In order to achieve this we have become TS16949 and ISO9001 certified and are constantly tightening our processes and QA controls to better control our final product. A short summary of the QA tools and documentation we use and can provide is shown below:

- Samples with ISIR submission
- Design and Process FMEA
- PPAP on pre-production parts
- APQP
- Inspection reports with all deliveries
- Hardness testing
- Tensile strength tests
- Environmental testing

We are happy to provide any custom QA structure our clients require right up to zero defect by measurement.

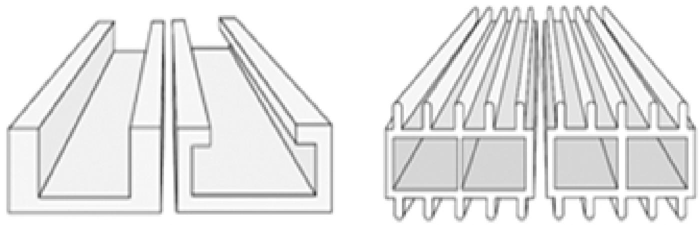
For further information please refer to our Quality Assurance brochure.

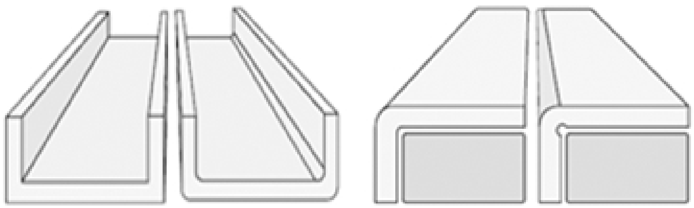
Extrusions & Design

Very often with aluminium extrusions, designers look at the required functionality of a part without taking into account if it can be made or not. This can be a critical error leading to unstable dies and parts that cannot be extruded to drawing. Good design will avoid such an issue and will result in a better quality part. Although not exhaustive, the design guide below shows the basics of how aluminium extrusions should be designed.

UNIFORM WALL THICKNESS

It is acceptable to have a range of wall thicknesses within a single profile, however a profile with uniform wall thickness is easier to extrude. Keeping the internal and external walls the same thickness decreases die stress and improves productivity.



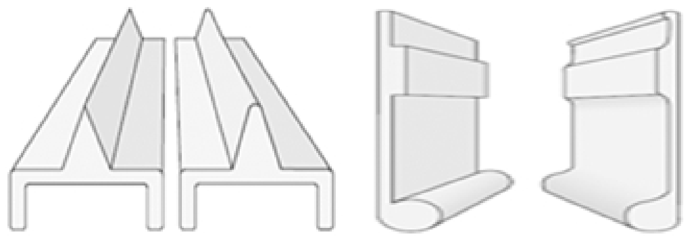


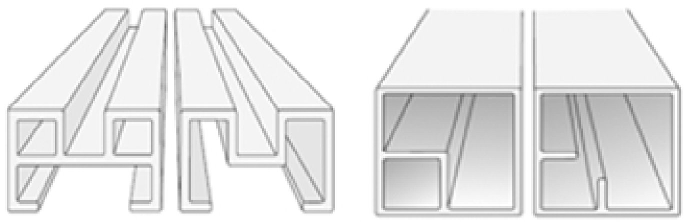
SOFT LINES

The extrusion process cannot achieve razor-sharp corners without additional fabrication. Corners should be rounded. A radius of 0.5mm to 1mm is often sufficient. Sharp corners internally can be accommodated using a small radius.

SMOOTHING

As far as possible sharp tips should be avoided. The tip can easily become wavy and uneven. Tips should therefore also be rounded. Smoothing profiles, especially those with uneven wall thickness, will reduce visible unevenness in the part.



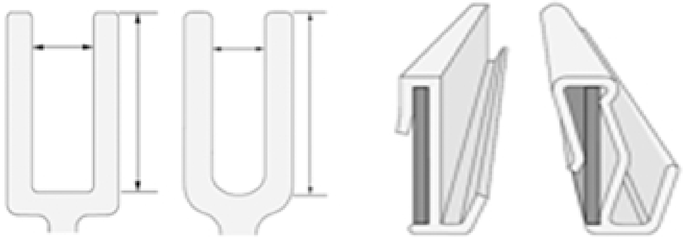


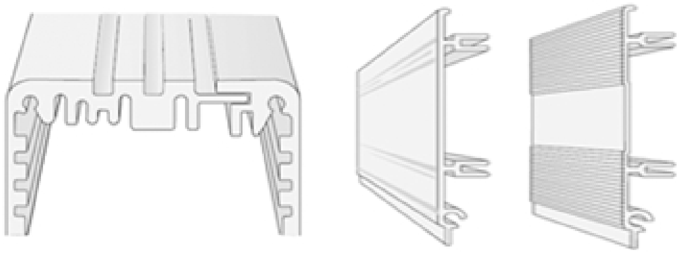
SOLID PROFILES IF POSSIBLE

Solid profiles reduce die costs and are often easier to produce. Efforts should be made to minimise the number of cavities and minimise small, detailed cavities.

POCKETS OR CHANNELS

For profiles with pockets or channels, there is a basic rule that the width to height ratio should be approximately 1:3 to ensure die strength with slot widths >2mm. Clever design can offer the same functionality but increase the success rate of an extruded profile.





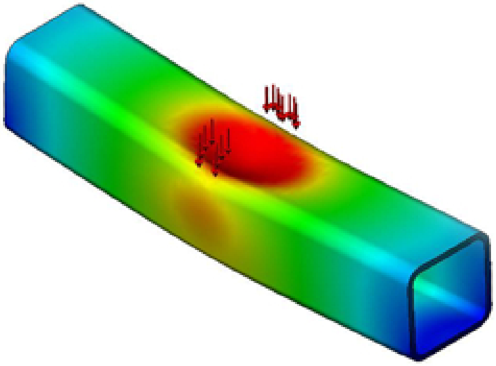
DECORATION

Decoration will mask imperfections and protect against damage during handling and machining.
A decorative pattern can make a plain aluminium surface more attractive. It will also disguise internal features such as screw ports or arms.

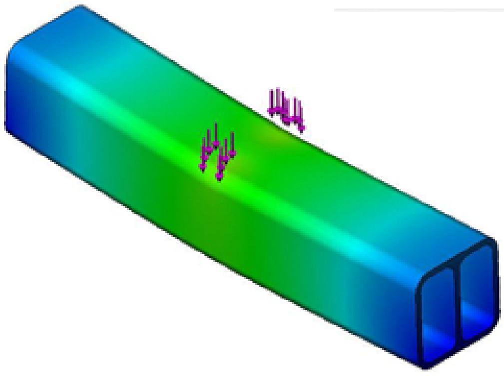
FEA Analysis

Finite element analysis is of no use in designing the extrusion cross section as the task requires the experience and skill of the designer to produce a form which can be readily and repeatedly extruded. Where it is extremely useful is in judging how an extruded form will behave when it is loaded in an application. Over the last 10 years we have used this capability repeatedly in order to assist clients in minimising their material content, and ensuring that the form once employed in the application will work below the maximum yield strength. A simple example is as shown below:

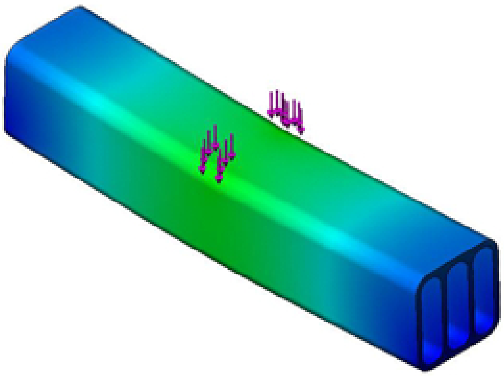
A client uses a solid aluminium bar which is loaded in the centre. The bar does not deform, however it is expensive and the client wants to save money.



The initial suggestion from the client is to use a hollow section. Normally the only way to test this would be to manufacture a die, extrude the section and then run a test. With finite element we can predict what will happen. In this case the materials maximum yield strength is surpassed and it will deform elastically. The solution would fail with either the section being very badly bent or indeed folding in two completely.



Looking at the design a decision is reached to add an internal strengthening rib. This has the effect of distributing the load through the section and ensures the maximum yield strength is not surpassed. The extruded section would bend but not break. The tool is a little more complex to make, but still fairly simple.



A decision is made to try and improve on the slight bend the extrusion now exhibits. A second internal rib is added, however this only marginally improves the load bearing capability of the extruded section. Given the added complexity to the tool it is decided not to pursue this option and the single rib is the preferred design choice.

There are other factors which could have been changed in this analysis. For example, we could have altered the wall thickness of the extrusion. Similarly, different alloys could be used with higher yield strengths and different temper cycles employed. FEA analysis would also allow us to model such conditions. Should you require any further assistance or support on FEA analysis please contact us on 02890 271001.

Production & Alloys

PRODUCTION

Goudsmit UK use what is known as the direct extrusion process. Cylindrical aluminium alloy billets are heated to a temperature between 450°C and 500°C before being loaded into a container and the billet squeezed through a die using ram pressures of up to 600MPa. The die is supported by a series of back dies and bolsters so that the main press load is transferred to a front platen.

On leaving the die the temperature of the section is more than 500°C. With heat treatable alloys the quenching or solution heat treatment takes place in the production line. This is done using a water bath with an approximate temperature drop of 250°C across the quench box. To avoid distortion care has to be exercised in handling the extruded sections.

After extrusion, the section is guided down the table by a puller on to a slatted moving belt. Pullers are based on linear motor systems and operate on tables up to 30 metres long. On completion of an extruded length, the section is sheared at the press end and lifted from the slatted table. It is then transferred by a walking beam or multi-belt transfer table to the stretcher bay where it is given a controlled stretch to straighten and remove minor misalignments. The section is then taken and cut to length on high speed tungsten carbide tipped saws.

If the material is required in the solution heat treated condition T4 it is released at this stage. If the full strength aged material T6 is required, it is given a precipitation treatment before release. In the case of the T5 temper, there is limited cooling at the press exit and the material goes directly to precipitation.

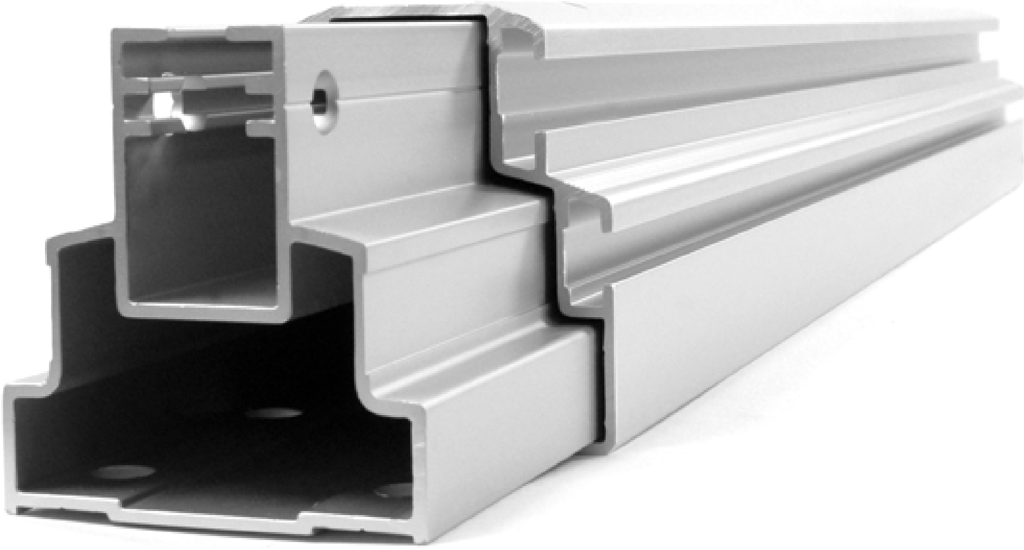
ALLOYS

Most of the extrusion produced by Goudsmit UK is 6000 series which combines the aluminium with magnesium and silicon. However, what matters more is the ease of extrusion.

- The 6060 alloy offers medium strength and is easy to extrude even for complicated cross-sections. This is the most used extrusion alloy. It has good formability during bending in the T4 condition and typical applications are extrusions for windows and doors, lighting, awnings, handrails and furniture. This material is highly suitable for anodising, both for decorative and protective reasons.
- The 6101 alloy offers virtually the same production possibilities as the 6060. It is especially suitable for electrical applications where fairly high strength is required.
- The 6063 alloy has slightly higher strength than the 6060, but is also marginally more difficult to extrude, especially if the cross-section is complicated. Applications are for the most part the same as the 6060 alloy. This material is well suited for anodising, both for decorative and protective purposes.
- The 6005A alloy has higher strength than 6063 but is slightly harder to extrude. It is suitable for anodising for protective purposes, but the quality of the surface makes decorative finishing more difficult.
- The 6082 alloy has high strength and is suitable for extrusion of cross-sections that are not too complicated. Typical applications include load carrying structures in the ship, offshore, transport and building industries such as platforms, bridges, stairs, scaffolds and handrails. The material is suitable for anodising for protective purposes.

Please see our website www.goudsmit.co.uk for alloy properties.

Machining & Finishing



FINISHING

Finishing falls into the following categories; surface texture, surface finish/colour, painting and any printing or marking.

- The surface texture of an extrusion can be altered by bead blasting, sand blasting, grinding, rumbling in aggregate or full polishing. Each method will provide a different texture and the finish is normally driven by the needs of the application.

- The surface finish can be altered by anodising, painting or powder coating, although aluminium extrusions lend themselves to an array of finishing technologies from chromate conversions to polished chrome. Anodising is the most common finish. An electrolytic process, the aluminium is oxidised in sulphuric acid solution and then sealed to prevent any subsequent corrosion. Dye can be used during this process to give a range of colours, plus a matt or shiny finish can be achieved using different processing chemicals. Both durable and decorative, anodising is the most popular finish for extrusions.

- Paint can also be applied to the extrusion. Careful preparation of the aluminium extrusion is required with some chemical pre-treatment to prevent corrosion plus the application of priming coats. For a more durable finish powder coats can be used.

A full range of Pantone colours can be supplied for both wet paint and powder coat finishes.

Finally, the parts can be marked by either screen printing or tampon printing. This allows for a high degree of customisation and the permanent application of product data and client logos.

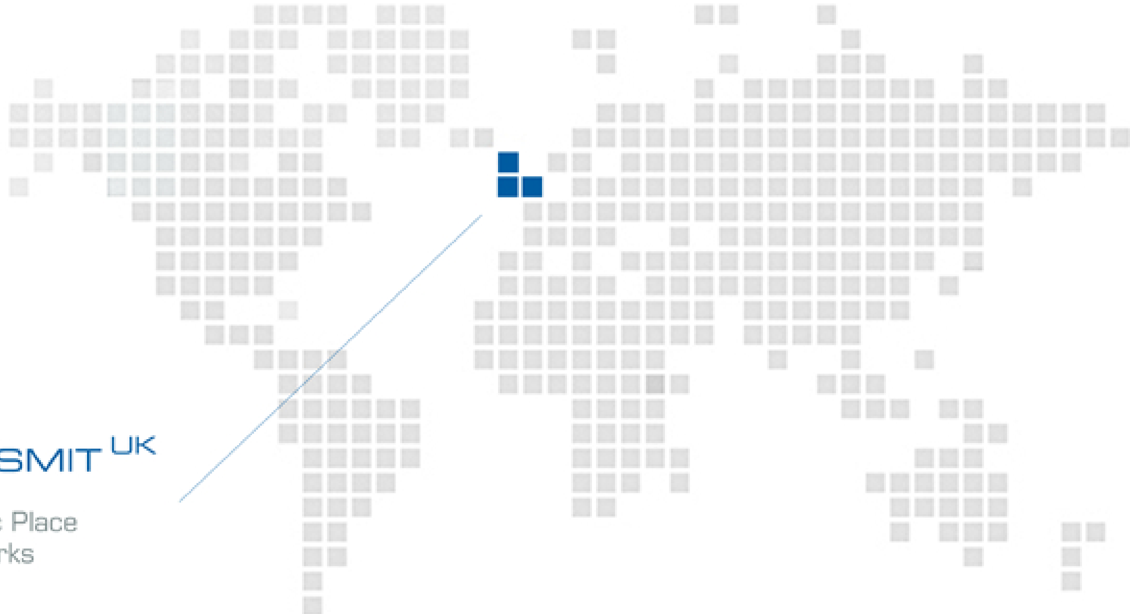
MACHINING

Almost all of the extrusions made by Goudsmit UK are in someway modified or post machined. Indeed bespoke extrusions are often made as a starting point for a complex component that will be milled or turned to produce a final component. The following post machining procedures are frequently carried out:

- Drill and tap of holes
- Milling of slots
- Pressing in of inserts
- Turning groves and more complex forms
- Inserting plastic mouldings to form telescopic slides

Worldwide Service

Goudsmit UK is part of the Goudsmit Group of companies. With two production facilities in China, one in the Czech Republic and two in Holland, the company has the reach to supply from Asia to Europe and on into the USA



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