ALUMINIUM PLATE PRODUCT GUIDE
**Blackburns Aluminium Plate...**

Blackburns Metals Limited have been supplying industry with metal products such as Aluminium, Stainless Steel, Brass, Copper and other non-ferrous semi-finished products for over thirty years, building a reputation for quality and service with its many customers in diverse market sectors.

So why not join our existing customers who enjoy the benefits of our nationwide distribution network for your supply of Aluminium Plate.

If you require any further information, a quotation or technical advice, please contact your local Blackburns service centre.

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**Contents**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>2</td>
</tr>
<tr>
<td>GENERAL ENGINEERING PLATE</td>
<td>4</td>
</tr>
<tr>
<td>PERFORMANCE CAST BLOCK</td>
<td>5</td>
</tr>
<tr>
<td>ALUMEC® MOULD PLATE</td>
<td>6</td>
</tr>
<tr>
<td>HIGH PERFORMANCE MOULD MATERIALS</td>
<td>7</td>
</tr>
<tr>
<td>TECHNICAL DATA</td>
<td>8</td>
</tr>
<tr>
<td>MIC6® - PRECISION MACHINED CAST ALUMINIUM PLATE</td>
<td>12</td>
</tr>
<tr>
<td>MIC6® - STOCK THICKNESS RANGE</td>
<td>13</td>
</tr>
<tr>
<td>MIC6® - STABILITY</td>
<td>14</td>
</tr>
<tr>
<td>MACHINING MIC6®</td>
<td>15</td>
</tr>
<tr>
<td>WORKING WITH MIC6®</td>
<td>18</td>
</tr>
<tr>
<td>MIC6® SPECIFICATIONS</td>
<td>20</td>
</tr>
</tbody>
</table>

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**Contact your local Blackburns today...**

(see back cover for locations and contact details)
Leading Aluminium Plate Specialists...

Blackburns Metals Limited is one of the UK’s leading aluminium plate specialists. From our Plate Centre in Kingswinford, West Midlands we distribute countrywide, directly and through our network of strategically located Service Centres.

With a full range of state of the art equipment Blackburns handle aluminium plate sizes up to 2 metres wide and 4 metres in length and up to a thickness of 400mm in-house. We are a customer focused business and offer material to suit individual needs and requirements on time.

Our range of market-leading products cover most industry requirements. We hold in stock a comprehensive range of general engineering 5083 and 6082 rolled plate in both metric and imperial sizes as well a high performance range for critical component parts, mould making and high precision applications.

Blackburns Metals is a strong believer in developing World-Class partnerships. Through this strategy we feature in our product range internationally recognised market leading names such as MIC6® precision cast tooling plate, Alumec 79® and Alumec 89® for mould making and high performance component manufacture. Alumec 100® is also available on request.
Aluminium Plate  INTRODUCTION
General Engineering Plate

We hold in stock for general applications a comprehensive range of plate in both metric and imperial sizes to cover a multitude of applications.

Stock Alloys

5083 ‘0’ condition from 3mm up to 152.4mm - 6"
6082 T6 from 3mm to 8mm and from 6” - 152.4mm up to 12” - 305mm
6082 T651 from 3/8” - 9.53mm up to 5” - 127mm

The largest plate size held in stock is 4000mm x 2000mm although larger sizes are available to order. Also processed in-house are circles and rings up to 6” thick and from 150mm Ø up to 1250mm Ø.

Standard Processing Tolerances

+/- 0.5mm (customer specific tolerances available on request)

All materials supplied carry comprehensive certification and conform to EN 485-1, 2, 3 and 4.
Performance Cast Block

Blackburns offer a range of thick cast block from 100mm to 1000mm thick and a plate size of up to 2500mm x 4100mm for the manufacture of very large moulds and parts. The delivered finish is band saw cut all surfaces.

High Performance 5080R is manufactured from cast aluminium blocks with fine-grain structure and low porosity. After casting a heat treatment process over an extended period is performed. The resultant quality is a stress relieved and homogeneous metal.

Applications

- Mould making
- Prototype tools
- Vacuum Technology
- Cryogenic
- Index tables
- General Engineering

Contact your local Blackburns today...
(see back cover for locations and contact details)
Mould Plate

Alumec® is renowned the world over for its high performance and excellence. When you need to be sure that product performance is unquestioned, there is no better alternative. Blackburns supply Alumec® 79, 89 and 100 (available on request) for both mould making and critical component manufacture.

Resistance to deformation across the thickness range

Alumec® offers significant advantages to 7075. It has excellent through plate characteristics and is ideal for critical applications.

Alumec 79®
- Excellent Strength
- Mechanical Properties more consistent than 7075
- Easily repair welded
- Variety of applications

Alumec 89®
- Very high strength levels
- Excellent through thickness consistency
- For more demanding applications
- Up to 305mm

Alumec 100®
- Stress corrosion resistant
- Excellent Toughness
- Hugely versatile
- Excellent corrosion resistance

Contact your local Blackburns today...
(see back cover for locations and contact details)
High Performance Mould Materials

Overview

- Mould weight is significantly reduced due to density being one third that of steel. Moulds are easier to handle and exert less strain on processing machinery.
- High metal removal weights are possible due to excellent machinability. Moulds can typically be made in one third the time taken for steel.
- Polishing is quick and easy. High standards of microstructural integrity mean high quality mirror finishes can be obtained enabling Alumec® products to be used in optically critical applications.
- Thermal conductivity is typically four to five times that of steel. Simpler cooling circuits may be designed or cycle times reduced. Temperature differences throughout the mould are minimised so reducing moulded part distortion.
- Easy surface to treat. Processes such as chemical nickel, hard chrome and hard anodising can provide enhanced surface properties.
- Easy to spark and wire erode. Metal removal rates are at least four times that of steel.
- Easy to photo-etch, Response is even and uniform throughout enabling parts to be easily matched.

Alumec 79®

- Excellent strength, machinability and stability during machining.
- Strength levels do not reduce as rapidly as in 7075-T651, especially in thick sectors.
- Through thickness hardness consistency is better than 7075-T651.
- Easily repair welded.
- Available as plate up to 305mm thick.
- Used in a wide variety of applications, including injection and blow moulding.

Alumec 89®

- Higher strength levels and better through thickness hardness consistency than Alumec 79®.
- Used in more demanding applications where greater performance is required, especially increased wear resistance and superior polishability.
- Available as plate up to 480mm thick.
- Used extensively in injection and blow moulding.

Alumec 100®

- Derived from advanced aerospace technology.
- Improved Toughness.
- Plate thickness up to 305mm.
## Aluminium Plate Technical Data

### Typical Mechanical Properties - Plate (LT test direction)*

<table>
<thead>
<tr>
<th>Thickness Range (mm)</th>
<th>Tensile Strength (MPa)</th>
<th>0.2% Proof Stress (MPa)</th>
<th>Elongation (%)</th>
<th>Brinell Hardness</th>
<th>Rockwell B</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 6.35 - 25</td>
<td>545</td>
<td>600</td>
<td>485</td>
<td>555</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 25 - 50</td>
<td>535</td>
<td>590</td>
<td>470</td>
<td>545</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 50 - 75</td>
<td>520</td>
<td>580</td>
<td>455</td>
<td>530</td>
<td>9.5</td>
</tr>
<tr>
<td>&gt; 75 - 100</td>
<td>500</td>
<td>570</td>
<td>430</td>
<td>520</td>
<td>9</td>
</tr>
<tr>
<td>&gt; 100 - 125</td>
<td>480</td>
<td>560</td>
<td>400</td>
<td>515</td>
<td>8.5</td>
</tr>
<tr>
<td>&gt; 125 - 167</td>
<td>465</td>
<td>550</td>
<td>375</td>
<td>500</td>
<td>8</td>
</tr>
<tr>
<td>&gt; 167 - 205</td>
<td>435</td>
<td>510</td>
<td>340</td>
<td>450</td>
<td>7.5</td>
</tr>
<tr>
<td>&gt; 205 - 305</td>
<td>410</td>
<td>460</td>
<td>310</td>
<td>400</td>
<td>7.5</td>
</tr>
</tbody>
</table>

* Longitudinal tensile properties for round bar will typically be 20% higher than figures quoted above for the same thickness/diameter

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**Key:**
- Alumec 79® (Gauges >167mm are cold compressed)
- Alumec 89® (Gauges >167mm are cold compressed)

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**Effect of temperature on 0.2% proof stress - measured at the exposed temperature**

**Effect of temperature on 0.2% proof stress - measured after cooling to room temp**

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**Typical through thickness hardness**

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**Typical 0.2% proof stress comparison 150mm thick plate**

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**Typical tensile property comparison Alumec 89® / Alumec 79® / 7075-T651 at varying plate thickness (LT test direction)**

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**Typical 0.2% proof stress comparison 150mm thick plate**
**Typical Physical Properties - Alumec 89®**

- **Thermal conductivity (at 25°C)**: 165 W/m°C
- **Young’s modulus**: 71 GPa
- **Coefficient of linear expansion**: 23 × 10⁻⁶ per °C
- **Compression modulus**: 73 Pa
- **Relative density**: 165 W/m°C
- **Rigidity modulus**: 27 GPa
- **Specific heat capacity**: 165 W/m°C
- **Ultimate shear stress**: 320 MPa

**Machinability Data**

Machinability factors (K) (in³ removed per minute per horsepower at cutter)

*Source: Tool & Manufacturing Engineers Handbook*

<table>
<thead>
<tr>
<th>Source</th>
<th>Aluminium Alloys, Magnesium Alloys</th>
<th>Forged and Steel Alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronze, Brass</td>
<td>2.5 - 4.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Soft</td>
<td>1.7 - 2.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Medium</td>
<td>1.0 - 1.4</td>
<td>0.84</td>
</tr>
<tr>
<td>Hard</td>
<td>0.9</td>
<td>0.505</td>
</tr>
<tr>
<td>Forged and Alloy Steel</td>
<td>0.63 - 0.87</td>
<td>0.75</td>
</tr>
</tbody>
</table>

**Process Values**

<table>
<thead>
<tr>
<th><strong>HIGH SPEED STEEL</strong></th>
<th>Toolsteel P20 / Alumec®</th>
<th><strong>UNCOATED CARBIDE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cut Depth mm</strong></td>
<td>Speed m/min Feed mm/rev</td>
<td>Tool Material ISO</td>
</tr>
<tr>
<td>TUNING</td>
<td>1 1</td>
<td>44 305 0.18 0.18</td>
</tr>
<tr>
<td></td>
<td>8 8</td>
<td>29 245 0.50 0.75</td>
</tr>
<tr>
<td>BORING</td>
<td>0.25 0.251</td>
<td>43 305 0.075 0.075</td>
</tr>
<tr>
<td></td>
<td>2.50 2.50</td>
<td>23 215 0.030 0.030</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FACE MILLING</strong></th>
<th><strong>HIGH SPEED STEEL</strong></th>
<th>Toolsteel P20 / Alumec®</th>
<th><strong>UNCOATED CARBIDE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cut Depth mm</strong></td>
<td>Speed m/mm Feed/tooth</td>
<td>Tool Material ISO</td>
<td></td>
</tr>
<tr>
<td>TUNING</td>
<td>1 1</td>
<td>50 365 0.15 0.25</td>
<td>150 610 170 max 0.20 0.25</td>
</tr>
<tr>
<td></td>
<td>8 8</td>
<td>30 280 0.36 0.50</td>
<td>81 365 100 max 0.40 0.65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>END MILLING</strong></th>
<th><strong>HIGH SPEED STEEL</strong></th>
<th>Toolsteel P20 / Alumec®</th>
<th><strong>UNCOATED CARBIDE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Radial Cut Depth mm</strong></td>
<td>Speed m/min Feed mm/tooth</td>
<td>Tool Material ISO</td>
<td></td>
</tr>
<tr>
<td>TUNING</td>
<td>0.50 0.50</td>
<td>37 245 0.025 0.102</td>
<td>160 395 0.025 0.130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.75 0.180</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.075 0.180</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** www.blackburnsmetals.com
Lubrication

Special lubricants are not required for Alumec® products. Soluble oils and straight oils are perfectly satisfactory and give excellent results. pH levels should be maintained at 6.0 - 8.0. Chlorinated biocides should be avoided.

Electric Discharge Machining (EDM)

Machine settings are similar to those used for steel, but may need more power to stabilise. Metal removal rates are 3 to 4 times that of steel necessitating good flushing to avoid arcing. Copper electrodes give best results and show less wear. Roughing electrodes are rarely required.

<table>
<thead>
<tr>
<th>REAMING</th>
<th>HIGH SPEED STEEL</th>
<th>UNCOATED CARBIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Roughing Speed mm</td>
<td>Tool Material ISO</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Toolsteel P20</td>
<td>20</td>
<td>0.10</td>
</tr>
<tr>
<td>Alumec®</td>
<td>150</td>
<td>0.18</td>
</tr>
<tr>
<td>Toolsteel P20</td>
<td>24</td>
<td>0.10</td>
</tr>
<tr>
<td>Alumec®</td>
<td>305</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Based on 4 flutes for 3mm and 8 flutes for 25mm and 50mm

Contact your local Blackburns today...
(see back cover for locations and contact details)
MIC6® is unique...

MIC6® is the most advanced machined cast tooling plate available today. Virtually stress free achieving the ultimate shape stability time after time.

It is the only precision milled plate cast to near net thickness, guaranteeing virtually zero stress.

MIC6® is a cast aluminium plate finished to close tolerance in all dimensions and thermally stabilised. All other machined cast plates are bandsaw cut from block.
MIC6® Precision Machined

The Ultimate Industry Standard for...

- Flatness
- Dimensional Stability
- Tolerance control during machining

MIC6® is the most advanced machined cast tooling plate available today. Virtually stress free achieving the ultimate shape stability time after time. It is the only precision milled plate cast to near net thickness, guaranteeing virtually zero stress.

MIC6® is a unique cast aluminium plate finished to close tolerance in all dimensions and thermally stabilised. All other machined cast plates are bandsaw cut from block. The inherent characteristics of this product lend themselves to a wide range of uses in many industries.

Stock Thickness Range

<table>
<thead>
<tr>
<th>METRIC</th>
<th>8mm</th>
<th>10mm</th>
<th>12mm</th>
<th>15mm</th>
<th>16mm</th>
<th>20mm</th>
<th>25mm</th>
<th>30mm</th>
<th>35mm</th>
<th>40mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPERIAL</td>
<td>1/4&quot;</td>
<td>3/8&quot;</td>
<td>1/2&quot;</td>
<td>1/8&quot;</td>
<td>1/4&quot;</td>
<td>1&quot;</td>
<td>1/2&quot;</td>
<td>1/4&quot;</td>
<td>1&quot;</td>
<td>2&quot;</td>
</tr>
</tbody>
</table>

Standard Processing Tolerances

+/- 0.5mm (customer specific tolerances available on request)

All materials supplied carry comprehensive certification and conform to EN 485-1, 2, 3 and 4.
Stability is the defining characteristic of MIC6® Precision Machined Cast Aluminium Plate

Only MIC6® is cast to near net thickness with a stress-relieved, granular structure to virtually eliminate distortion from machining and end use temperature fluctuations.

Manufacture of MIC6®, the most advanced process in the cast plate industry, promotes consistency between plates and reduces the risk of disrupting material stability by entrapped stress. This allows for downstream processing with precise control of tolerances and dimensionality. Fully stress-relieved, MIC6® is a free cutting aluminium alloy with excellent machining characteristics, producing small, uniform chips in a variety of high speed operations.

When critical applications demand superior performance, plates claiming to be ‘good enough’ just aren’t. Only MIC6® customers can perform extensive machining routines without the risk of distortion, often exceeding the product accuracy requirements of the most demanding end uses.
Machining MIC6®

General Recommendations

- Use machines capable of operating at high speeds with minimum vibration or backlash.
- Use high speeds & feeds for rough cuts, high speeds & lower feeds for better finish cuts.
- Use the following cutting fluids to prevent aluminium from sticking to tool surfaces and for heat removal:
  - Water-soluble oils for most machining routines
  - Cutting oil with additives for horizontal milling, turning and tapping requirements

  Commercial wax sticks and paraffin have been used for some sawing and other special situations.
- Use sharp tools with larger or positive rake angles. The tool surfaces should be smooth and free of marks or scratches. Allow ample clearance.

Horizontal Milling

Grooving, straddle-milling, edging and single tooth fly-cutting can be done efficiently with this method if proper cutting tools are employed. Climb-cutting gives a smoother finish with better tolerance control provided backlash is minimal. Employ high peripheral speeds to reduce any tendency toward gumming and loading - sometimes this means the highest speed possible from a machine.

Vertical Milling

When large surfaces are to be milled, this method is preferred due to greater chip clearance and accessibility to the work piece. Facing and fly-cutters are used for surfacing, while end and shell mills are used to contour and create cavities. Fly-cutting angles for top and side tools are similar to those used in lathe turning. Facing, circular, spiral and helical cutters should have undercut teeth to provide essential top rake.

Shaping and Planing

This method produces a rough torn surface due to the slow speed on tool travel over the work piece. A fair finish can be achieved with an extreme rake angle to give sufficient shearing action to the tool edge.

Circular Sawing

Peripheral blade speeds of approximately 15,000 feet per minute (4575 m/min) are recommended. Blades should have carbide teeth with up to a 45 degree rake angle. Such blades are usually manufactured with chip breaker teeth or alternating slide rake teeth - one tooth cuts one side and the next tooth cuts the other side.
Band Sawing

Only high speed saws with a blade speed of 3,000 to 6,000 feet per minute (915 to 1830 m/min) should be used. They should be of tempered steel with a 15 degree minimum top rake and 4 to 8 teeth per inch (160 to 320 per meter). Proper support for the plate being cut is mandatory and will help maintain flatness tolerances during sawing.

Drilling

The recommended drills for cast plate should have more twists per inch than ordinary drills. The flutes of these drills should be highly polished. Cutting compound should be used.

Turning

Lathes capable of turning the stock at 5,000 to 9,000 surface feet per minute (1525 to 2745 m/min) should be used. Use carbide tipped tools with a 40 degree top rake and 18 degree side rake angle. Feed should not exceed .020 inches (0.5mm) per revolution.

Tapping

Hand or machine taps will produce smooth and accurate threads in MIC6® cast plate. For a full thread, the tap drill should be of slightly less diameter than that used for steel. Rounded or trapezoidal threads are recommended - thread length should be 20% longer than for steel. Inserts will prolong the thread life.

Surface Exposure

As machined MIC6® parts have successfully performed over decades of service without evidence of corrosion or abnormal surface oxidation. Exterior and other environments that are high in moisture tend to induce the development of surface staining and pitting. Marine exposures should be avoided.

Thermal Cycles

MIC6® can be repetitively cycled through a thermal exposure without affecting or altering the physical properties of the plate. Thermal treatments during each cycle can range from 250 to 600°F (120 to 315°C). Full support under the plate during the thermal cycle is recommended - the thinner the plate, the more important this consideration becomes.
When parts must work every time, demand no less than MIC6® for these critical applications:

- Aircraft Tooling
- Automotive Tooling
- Base Plates, Side Plates and Indexing Tables
- CNC Routing Tables
- Checking Fixtures, Gauges and Templates
- Chip Printers
- Circuit Printers
- Dielectrics
- Document Sorting Equipment
- Electronics
- Food Machinery: Side Frames and Functional Components
- Foundry Patterns
- Heating and Cooling Platens
- Medical Instrumentation: Internal Functional Components
- Packaging Machinery and Moulds
- Pharmaceutical Machinery
- Plastic Components Manufacturing: Temperature Control Manifolds
- Printing Machinery
- Robotics
- Vacuum Chambers for Computer Chips
- Vacuum Chucks
Working with MIC6®

Anodising

MIC6® has been satisfactorily anodised for thousands of end uses, providing good performance and a uniform coating depth across the entire surface with either conventional or hard coat anodising treatments. Both are applied after the machining routine for improved corrosion protection, wear resistance and/or as a colour enhancement.

A non-etching type cleaner is recommended. Strong caustic based or aggressive cleaners that etch tend to preferentially attack the cast grain structure and thereby overly roughen the surface. With a non-etching cleaner, the smooth machined surface is better maintained for the subsequent anodising.

A natural, darker grey colour occurs as a result of anodising. Since MIC6® is a casting, variations in the shade and texture of the gray appearance can occur within a given plate or from plate to plate. However, when typical applications involve only one piece of MIC6®, any piece to piece variation is not of concern.

When a black dye treatment has been used, the colour developed has been a deep black tone, satisfying the requirements of most end users. This colour tone has proven consistent from piece to piece and lot to lot.

For conventional anodising, a 15% by weight sulphuric acid solution, current density of 12 amps per square foot (1.2 A/dm²) and a bath temperature of 70 to 90°F (20 to 32°C) is suggested. Once the anodising has been completed, the surfaces should be rinsed - when organic dyes are used, good rinsing practices become critical. If all the sulphuric acid from the anodising bath is not rinsed prior to the dye treatment, white spots can occur. Although these occurrences are rare, a neutralising solution of 5% ammonium oxalate or sodium bicarbonate applied for 5 to 10 minutes has proven effective in their elimination. If sulphuric acid from the anodising bath becomes entrapped in any voids, it can bleed after the dye treatment and oxidise the dye, causing a lighter colour spot.

For hard coat anodising, a variety of proprietary processes are in use. In general, the bath operating temperatures are 32 to 50°F (0 to 10°C), and the current densities are 20 to 36 amps per square foot (2.0 to 3.6 A/dm²). The combination of the lower bath temperature and the higher current density produces a thicker coating that has improved wear resistance. Excessive operating temperatures should be avoided when conducting these hard coat anodised treatments as they can affect the quality and thickness of the coating. It is suggested that a test piece be evaluated when considering a given hard coat process.
Welding

MIC6® components can be successfully welded utilising the fusion based Gas Metal Arc Welding (GMAW or Mig), Gas Tungsten Arc Welding (GTAW or Tig) and solid state based Friction Stir Welding (FSW) processes. GMAW is used most often and GTAW has some limited applications. Argon, Helium or a mixture of the two are the only recommended shielding gases for welding MIC6®.

Because MIC6® has a high thermal conductivity, it is recommended to be welded ‘hot and fast’, meaning the welding current should be set at a level that provides adequate heat input while maintaining a moderate welding speed. Specific parameters can be found in welding handbooks such as ‘Welding Aluminium - Theory and Practice’ from The Aluminium Association.

Aluminium filler alloys 4043, 4145 and 5356 are all acceptable for use when welding MIC6®. Filler alloy 4145 (10% Si, 4% Cu) offers the best weld ability and freedom from cracking with 4043 (5% Si) being a good second choice - both would be recommended if the service temperature of the welded assembly is above 150°F (66°C). Under some conditions (e.g. high parts restraint), filler alloy 5356 may cause some cracking in the Fusion Zone and Heat Affected Zone (HAZ) of MIC6® parts. In addition, the welds deposited with this filler alloy can be sensitised to stress corrosion cracking at high temperatures and should be used only in service applications below 150°F (66°C). When testing under tension traverse to the welds, 0.5 in. thick weldments, produced with the 4145 and 5356 filler wires, generally break in the HAZ with joint efficiencies that can be as high as 96%.

In general, it is recommended to weld the MIC6® at interpass temperatures not exceeding 150°F (66°C). If a pre-heat is required, the temperature should be limited to 250°F (120°C).

SURFACE PREPARATION

Pre-weld cleaning and oxide removal are important to the successful welding of MIC6®. Residual machining lubricants and moisture will produce porosity in welds.

Prior to welding, solvent clean and dry the areas to be welded of surface contaminants. Aluminium’s natural oxide melts at 3700°F (2035°C) while aluminium melts at approximately 1200°F (650°C). This oxide can act as a barrier to adequate fusion between the weld and base metal. Usually a light brushing with a clean stainless steel brush, after the surface has been cleaned of contaminants, will remove the oxide film.

For applications where fillet welds are used, no weld joint edge preparation is necessary. For butt joint applications, weld joint edge preparation is required, such as a single V or double V bevel (depending on the thickness being welded).

As with all welded assemblies, it is strongly recommended that the welding procedure used be tested and qualified on joint mockup(s) prior to introduction and in-service use.

Painting

MIC6® can be either painted or powder coated. The plate surfaces should be cleaned to remove any residual machining lubricant or oil - both water-based and solvent-based cleaners have proven effective. Once cleaned, there are several different approaches to further surface preparation.

A chemical conversion coating in combination with a primer coat has shown to provide the best surface protection and resistance to abrasion. In some applications, primer coats have been applied directly to the plate surface - in other cases, even the primer coat has been omitted. A light anodise has also been used on a limited basis for surface preparation prior to a coating application.

A surface that is free of moisture is the key to success with any coating method. Unless the surface is dry, entrapped moisture from micro shrinkage could contribute to flaws in the final coating.
MIC6® Specifications

Typical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Typical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENSILE STRENGTH</td>
<td>24 ksi / 166 MPa</td>
</tr>
<tr>
<td>YIELD STRENGTH</td>
<td>15 ksi / 105 MPa</td>
</tr>
<tr>
<td>PERCENT OF ELONGATION</td>
<td>3%</td>
</tr>
<tr>
<td>BRINELL</td>
<td>65</td>
</tr>
<tr>
<td>COEFFICIENT OF THERMAL EXPANSION (average)</td>
<td></td>
</tr>
<tr>
<td>68 to 212 °F (20 to 100 °C):</td>
<td>13.1 x 10-6 in/in ·°F</td>
</tr>
<tr>
<td></td>
<td>23.6 x 10-6 m/m · K</td>
</tr>
<tr>
<td>68 to 392 °F (20 to 200 °C):</td>
<td>13.6 x 10-6 in/in ·°F</td>
</tr>
<tr>
<td></td>
<td>24.5 x 10-6 m/m · K</td>
</tr>
<tr>
<td>THERMAL CONDUCTIVITY</td>
<td>0.34 cal/cm · s · °C</td>
</tr>
<tr>
<td></td>
<td>142 W/m · K</td>
</tr>
<tr>
<td></td>
<td>82 Btu/ft · h · °F</td>
</tr>
<tr>
<td>ELECTRICAL CONDUCTIVITY, IACS</td>
<td>36%</td>
</tr>
<tr>
<td>MODULUS OF ELASTICITY</td>
<td>10.3 x 106 psi / 71,000 MPa</td>
</tr>
</tbody>
</table>

Mill Sizes

<table>
<thead>
<tr>
<th>Standard Thicknesses</th>
<th>1/4”- 4”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 - 100mm</td>
</tr>
<tr>
<td>Standard Widths</td>
<td>48.5” &amp; 60.5”</td>
</tr>
<tr>
<td></td>
<td>1232 &amp; 1537mm</td>
</tr>
<tr>
<td>Standard Lengths</td>
<td>96.5”, 120.5” &amp; 144.5”</td>
</tr>
<tr>
<td></td>
<td>2451, 3061 &amp; 3670mm</td>
</tr>
</tbody>
</table>

Non-standard thicknesses, widths and lengths may be available upon request.

Tolerances

<table>
<thead>
<tr>
<th>Surface</th>
<th>Each side is machined to a maximum 20 microinch or 0.50 micron smoothness.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Condition</td>
<td>Width: Milled or Saw Cut</td>
</tr>
<tr>
<td></td>
<td>Length: Saw Cut</td>
</tr>
<tr>
<td>Mill Plate</td>
<td>Length tolerance: +1/2” -0. / +13mm -0.</td>
</tr>
<tr>
<td></td>
<td>Width tolerance: +1/4” -0. / +7mm -0.</td>
</tr>
<tr>
<td>Thickness Tolerance</td>
<td>The tolerance for any thickness is ±.005” /±.127mm</td>
</tr>
<tr>
<td>Flatness Tolerance</td>
<td>Specified plate thickness maximum variation:</td>
</tr>
<tr>
<td></td>
<td>3/4” and over: .005”</td>
</tr>
<tr>
<td></td>
<td>19mm and over: .127mm</td>
</tr>
<tr>
<td></td>
<td>1/4” to 5/8”: .015”</td>
</tr>
<tr>
<td></td>
<td>6mm and over: .381mm</td>
</tr>
</tbody>
</table>

Flatness tolerances at the mill are measured using a laser system and/or granite flatness table. The tolerances apply to both standard mill origin plate and to cut blanks when proper cutting techniques and equipment are used.
Blackburns Products & Services

ALUMINIUM
- Angles
- Channels
- Circles
- Coils & Blanks
- Flat Bar
- Fluted Edges & Nosings
- Gutters & Cope
- I-Beams
- Patterned Sheet
- Plate
- Rectangular Tube
- Round Bar
- Round Tube
- Shate
- Sheet
- Square Bar
- Special Extrusions
- Tee & Zed Sections
- Wallboard Sections
- Welding Wire

STAINLESS STEEL
- Circle Polished
- Coil
- Flanges
- High Purity Tube & Fittings
- Hygienic Tube & Fittings
- Mirror Sheet
- Oval & Seamless Tube
- Pipe
- Plate
- Screwed & Socket Weld Fittings
- Section
- Sheet
- Steel Color®
- Structural & Decorative Tube
- Treadplate

BRASS
- Angle
- Flat Bar
- Hexagon
- Plate
- Rod
- Sheet
- Square
- Tube

BRONZE
- Drawn Rod
- Hexagon
- Hollow Bar
- Plate
- Rod
- Sheet

PLATE
- Aluminium Plate 5083
- Aluminium Plate 6082
- Alumec 79-89-100
- 5083 Cast Plate
- Mic6®

COIL PROCESSING
- Aluminium Precision Blanks
- Aluminium Slit Coil
- Stainless Steel Precision Blanks
- Stainless Steel Slit Coil

FABRICATION PROCESSING
- Bench Tooling
- Bending
- Blanking
- Guillotining
- Mitre Cutting
- Plastic Coating
- Pressing
- Punching
- Sawing
- Shearing
- Slitting
- Tapping & Drilling

ARCHITECTURAL PRODUCTS / SURFACE DESIGN
- Anodised Sheet
- Composite Panel
- Handrail System
- Mirror Sheet
- Patterned Sheet
- Steel Color®

HANDRAIL SYSTEM
- Accessories
- Crossbar Holders
- End Caps
- Fittings & Woodline Fittings
- Floor & Side Mounting
- Glass Clamps
- Handrail Brackets / Holders
- Slotted Tube
- Tubes & Bars

SIGNS & SIGN COMPONENTS
- A-Cast® Acrylic Sheet
- Alochromed & Painted Sheet
- Aluminium Circles & Triangles
- Aluminium Composite Panel
- Aluminium Round & Square Posts
- Aluminium Sheet (mill finish & powder coated)
- Aluminium Sign Rails
- Aluminium Tee Sections
- Clip Sections
- Filon GRP Panel
- Finials
- Fluted Panel (BFP)
- Foamed PVC & Celuka Sheet
- Fret Work & Bespoke Signs
- Mirror Sheet
- Planking Systems
- Plastisol Coated Sheet
- Polycarbonate Sheet
- Stainless Steel Banding Systems
- Steel Color®
- Steel Round & Square Posts
- Street Furniture
- Tray Signs & Sign Kits
- VuPlex® Spray Cleaner

MARINE PRODUCTS
- Aluminium Composite Panel
- Aluminium Extrusions
- Aluminium Plate & Sheet
- Aluminium Tubes
- Duplex Bar & Tube
- Honeycomb Composite
- Marine Glazing
- Stainless Steel Handrail
- Stainless Steel Plate
- Stainless Steel Sheet
- Stainless Steel Tubes
- VuPlex® Spray Cleaner
- Yellow Metals

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