Welding Alloys

# Composite Wear Plates

## Workshop Processing & Handling Guide

For Welding **Professionals**

# Contents



**This brochure is a guide to the installation of products produced and supplied by Welding Alloys. Should you have any further questions relating to this or any other product please contact your sales representative.**

# Introduction & product overview

Welding Alloys is proud to be a trusted supplier of advanced wear protection solutions, whether you are already working with our products or exploring how they can enhance your operations.

Backed by decades of research, field testing, and technical innovation, our composite wear plates are designed to meet the demanding requirements of industries including mining, railways, petrochemical, forestry, offshore, and steel production. The solutions described in this manual are the result of continuous development, ensuring world-class performance in high-wear environments.

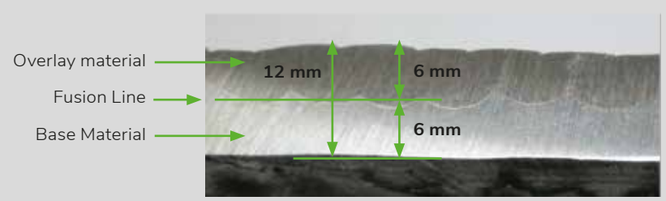
As a result of our commitment to the industry and years of development, the products you ordered are of outstanding quality and are among the most competitive wear protection products on the world market today. All Welding Alloys composite wear plates consist of a mild steel or stainless steel base material with a welded wear resistant overlay.

Due to the innovation, durability and performance driven aspects of our products, some factors need to be kept in mind when working with Welding Alloys composite wear plates. The remainder of this document will give the user some insight into our products and their processing capability to ensure they are utilised to their full potential.

Please follow all workshop safety procedures when cutting, forming, and handling WA wear plates.

**Understanding your product**

WA Integra™ composite wear plates are available in various standard thickness configurations ranging from 4 mm to 28 mm total thickness and are designated by two figures, separated by a plus (+) sign. i.e. Hard*plate*™ 100S (6+6) indicates a 6 mm base material with a 6 mm wear protection welded onto it. For any non-standard products, please consult with your local Welding Alloys representative.




Hard*plate*™ 100S (6+6)

# Product description and dimensions

| Table 1: Your sales representative has identified the product/s you received. | | | |
|---|---|---|---|
| Hardplate™ 100S | Hardplate™ 300S | Hardplate™ 600S | Hardplate™ FlowMax |
| Hardlite™ | Tuffplate™ S | 3D-Carb | Hardplate™ FlowMax Plus |

| Table 2: Standard Wear Plate Sizes | | |
|---|---|---|
| Type | Base plate | Welded area |
| **Hardplate™** | 1500 x 3000 mm<br>2000 x 3000 mm | 1400 x 2900 mm*<br>1900 x 2900 mm* |
| **Tuffplate™** | 1500 x 3000 mm<br>2000 x 3000 mm | 1400 x 2900 mm*<br>1900 x 2900 mm* |
| **Hardlite™** | 1000 x 2000 mm | 950 x 1950 mm* |
| **Hardplate™ FlowMax** | 3000 x 1000 mm<br>3000 x 600 mm | 3000 x 1000 mm*<br>3000 x 600 mm* |
| **Hardplate™ FlowMax Plus** | 3000 x 600 mm | 3000 x 600 mm* |

*Dimensions may vary slightly depending on the production facility. For any other dimensions, please contact your local Welding Alloys representative.

| Table 3: Standard Wear Plate Thicknesses | | | |
|---|---|---|---|
| Type | Base plate | Hardfacing | Weight (kg/m$^2$) |
| **Hardplate™** | 5 to 16 mm | 3 to 12 mm | 63 to 220 |
| **Tuffplate™** | 8 to 12 mm | 4 to 8 mm | 93 to 154 |
| **Hardlite™** | 2 or 3 mm | 2 or 3 mm | 31 to 46 |
| **Hardplate™ FlowMax** | 5 to 13 mm | 5 to 25 mm | 78 to 295 |
| **Hardplate™ FlowMax Plus** | 10 to 13 mm | 10 to 25 mm | 157 to 295 |

For any other thickness, please contact your local Welding Alloys representative.

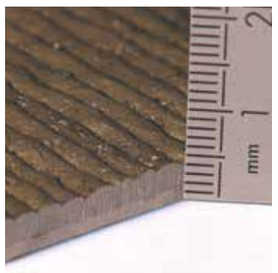
Our standard backing material is construction steel equivalent to ISO 10025 : S 235. Other materials are available on request, such as wear resistant steels, stainless steels and heat resistant steels. Please contact your WA Sales Representative for more information.

**Hardplate™ 100S**
A versatile chromium carbide overlay onto a mild steel base plate ranging in various thickness configurations. This product is extensively used in high abrasion, low-to-moderate impact areas, such as mill shell liners, dump truck bin liners, skid protection on loader buckets and grinding components. It provides excellent protection in areas of mineral abrasion and abrasion under pressure in temperatures of up to 300°C. A network of fine cracks is normal due to natural stress relieving in a very hard matrix. Hardness ranges from HRC 62–64 in a 3-layer deposit.

**Hardplate™ 300S**
A chromium + niobium carbide product with increased toughness designed to withstand severe abrasion conditions up to 450°C with low-to-moderate impact such as dragline buckets, coke hammers, rippers, sizing screens and crushing equipment. The deposit contains hard complex carbides in a tough matrix and performs exceptionally well in both fine and coarse abrasion conditions under heavy wear by earth, sand or other abrasives. A network of fine cracks is normal due to natural stress relieving in a very hard matrix. Hardness ranges from HRC 62–64 in a 3-layer deposit.

**Hardplate™ 600S**
A highly-alloyed chromium cast iron product with a high concentration of complex carbides resulting in superior wear resistance compared to other products on the market. The outstanding wear properties of Hardplate™ 600S is stable at temperatures of up to 700°C. It is typically used for crushing, riddling, blast furnace hoppers & throats, ovens and hot extractor fans. A network of fine cracks is normal due to natural stress relieving in a very hard matrix. Hardness ranges from HRC 62–64 in a 3-layer deposit.

**Hardplate™ FlowMax & Hardplate™ FlowMax Plus**
Two smooth, wear resistant plates welded through a process that ensures minimal crack formation, designed to provide better sliding properties than standard wear plates. Fine chromium carbide particles are uniformly dispersed in a ductile matrix to improve through thickness wear resistance. The smooth surface provides a low coefficient of friction, which reduces material build-up by up to 75% in areas that are cold or use naturally sticky materials. For areas where extreme impact occurs we have developed Hardplate™ FlowMax Plus which comprises chromium and complex carbides uniformly dispersed in a tough ductile matrix.



**Tuff*plate*™ S**
A martensitic product for use in severe abrasion and heavy impact applications. The weld deposit contains finely dispersed titanium carbide precipitates at hardness as high as 3200 on the Vickers scale embedded in a high chromium martensitic tool steel matrix. Tuff*plate*™ S is designed for excellent resistance to heavy impact, gouging and grinding abrasion in applications such as augers, scraper blades, mixer tyres, brick dies, tampers, earthmoving equipment, crushing equipment, mining equipment, shovel buckets, slurry pipes and dump truck bin bottom liners. A network of fine cracks is normal due to natural stress relieving, but not as severe as the case is with the range of Hard*plate*™ products. Hardness range from HRC 52 - 55 in a 3-layer deposit. Tuff*plate*™ S can be applied in temperatures of up to 200°C.

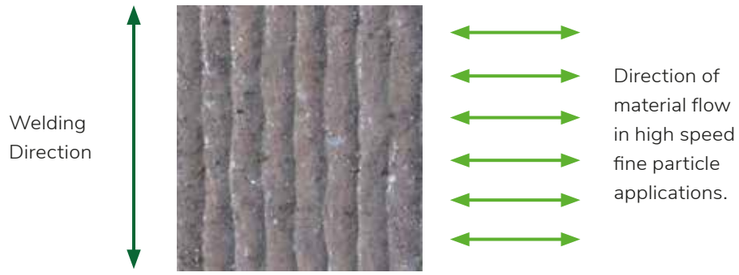
**3D-*Carb*™**
A proprietary product specifically designed to customer needs and individual wear phenomenon. This product provides outstanding protection against impact and Welding Alloys have seen life extensions of 5-times the original product in crush deck applications. 3D-*Carb* is an application and design-specific product and is not intended for subsequent processing by means of rolling, bending, welding etc. It is manufactured by Welding Alloys to suit and fit the application it is intended for in the as-delivered condition. Please contact your sales representative for further information.

**Hard*lite*™**
Similar properties as Hard*plate*™ 100S, but with a much thinner and lightweight design. Refined welding techniques ensure near-full chemistry and full hardness after only one layer of welding. This product is used when weight is of critical importance. Due to its thin design (4 - 6mm total thickness) it is not to be used in impact areas. The hardness of Hard*lite*™ ranges from HRC 64 - 66.



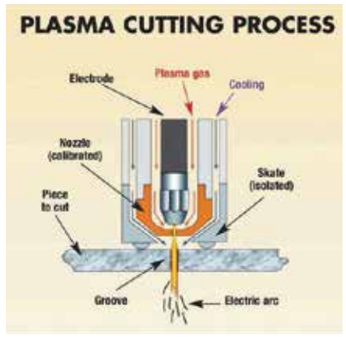
# Direction of plate installation

**Welding Direction**
In high-velocity applications involving fine abrasive particles, such as fan blades, fan casings, and pneumatic transport piping, the welding direction should be oriented perpendicular to the flow of abrasive material. This configuration minimises erosive wear, which is caused by the impact of particles against surfaces, leading to material removal through repeated deformation and cutting actions. Conversely, aligning the welds parallel to the flow can result in preferential wear in lower-lying areas, such as the valleys between weld beads, due to the natural tendency of particles to follow paths of least resistance. This phenomenon is particularly pronounced when handling smaller particles, like sand and dust, which can more easily navigate into these depressions and exacerbate wear. Therefore, careful consideration of welding orientation is essential to enhance the durability and performance of components exposed to abrasive flows.

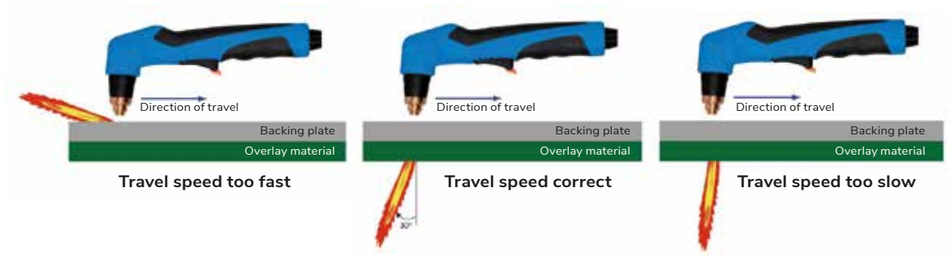


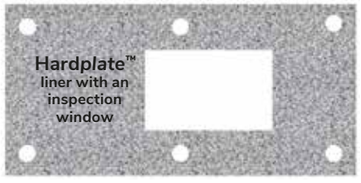

# Cutting

In the field of thermal cutting, the most economical process to be used to cut Welding Alloys composite wear plates is manual or automatic plasma equipment. For Hard*lite*™, depending on the length and complexity of the cut, a portable angle grinder may be sufficient for effective cutting.




**Plasma Principal**
Plasma systems use the principle of a concentrated electric arc forming a plasma beam that melts the material at very high temperatures. Besides plasma cutting, Laser and waterjet cutting may also be used for more accurate and precise dimensions. These processes are however not as cost effective.




When cutting Welding Alloys composite wear plates, it is advisable to first cut all inner shapes before cutting the outside shape. Refer to the illustration above. The product to be cut is a liner plate with an inspection window and six bolt holes. Best practice is to first cut the inspection window and bolt holes, before cutting the liner itself.

**Recommendations**

- Use a tool rest or support guide during manual plasma cutting, especially for long or straight cuts, to improve accuracy and reduce operator fatigue.
- When possible, pierce from the hardfaced side of the plate. This helps with easier slag removal (flash), although it is more demanding on plasma equipment and may reduce nozzle life.
- Always de-burr edges before and after cutting to prevent injury and ensure proper fit-up during installation.
- Do not mix offcuts of hardfaced plates with standard construction steel, as they have different material properties and recycling requirements.



# Forming

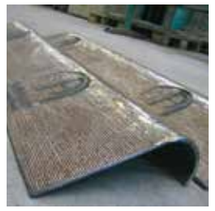
Due to their rigidity, Welding Alloys composite wear plates should be pre-formed under controlled workshop conditions for optimal accuracy and product integrity. Least problematic practice is to form plates perpendicular to the weld direction and with hardfacing on the inside.

Some applications however require hardfacing on the outside. Forming plates to facilitate this, is possible, but cracking and spalling could occur if it is not done with caution. Rolling pipe with hardfacing on the outside is more easily done by welding a pipe of the correct diameter with hardfacing, rather than rolling it from plate.

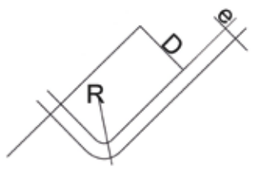
Table 4: Minimum bend radius*

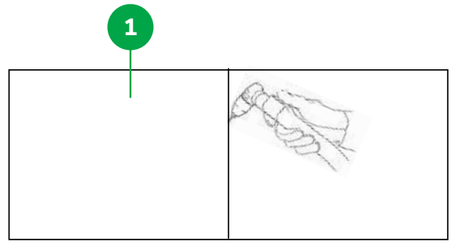
| Type | Thickness | Hardfacing on the inside (mm) | Hardfacing on the outside (mm) |
|---|---|---|---|
| **Hardplate™ and Tuffplate™** | 5 + 3 | 125 | 300 |
| | 6 + 4 | 125 | 300 |
| | 8 + 5 | 125 | 300 |
| | 12 + 8 | 250 | 500 |
| | 15 + 5 | 250 | 500 |
| **Hardlite™** | 2 + 2 | 100 | 750 |
| | 2 + 3 | 100 | 750 |
| | 3 + 2 | 100 | 750 |
| **Hardplate™ FlowMax** | 5 + 5 | 150 | 300 |
| | 6 + 6 | 180 | 360 |
| | 8 + 8 | 240 | 480 |
| | 10 + 10 | 300 | 600 |
| | 12 + 12 | 360 | 720 |
| | 13 + 17 | 450 | 900 |
| | 13 + 20 | 495 | 990 |
| **Hardplate™ FlowMax Plus** | 10 + 10 | 300 | 600 |
| | 12 + 12 | 360 | 720 |
| | 13 + 17 | 450 | 900 |
| | 13 + 20 | 495 | 990 |

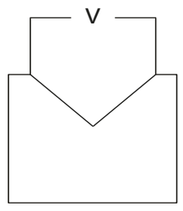
*These radii are suitable for plate bending and forming.
It is not recommended to roll plate (13 + 17) and (13 + 20), and care should be taken when rolling (12 + 12) due to high risk of increased cracking, spalling and base material tears.

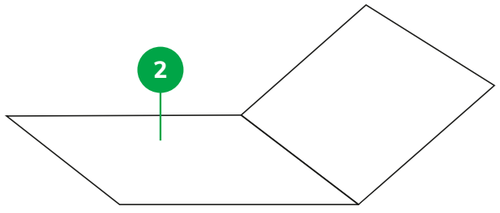


# Bending & rolling




Stretching

Referring to the sketches above, the following methods can be used to successfully create a bend in a WA Composite Wear Plate.

**Method 1:** Making a perforated cut along the proposed bend line 1 with a plasma torch in order to bend the plate through the required angle 2.

**Method 2:** Removing the hardfacing alongside the proposed bend line by means of gouging to ease bending. After bending, the hardfacing in the gouged area should be rewelded using an appropriate Welding Alloys hardfacing consumable. Information regarding this can be obtained from your local Welding Alloys representative.

**Method 3:** Cutting the part in two following the proposed bend line, and welding it in position using the correct method. Please refer to the following section on Fixing and Assembly.

Pre-forming is best done in a workshop using a conventional brake press which will pre-stretch the sides of the plate to ease rolling.

After pre-forming, rolling is much easier. Please note that due to the very high hardness of Welding Alloys composite wear plates, they will damage the surface of rollers. To protect the rollers, a sacrificial plate can be inserted on top of the hardfaced surface during rolling.

Due to the high hardness and presence of chromium and complex carbides, equipment used to form, bend and roll Hard*plate*™ will experience surface damage in the process. e.g., gouge marks on rollers.



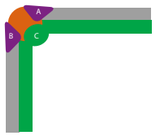
# Fixing & assembly

Please also refer to the following section on the joining of Welding Alloys wear liners to various other products by means of welding and fasteners. Various methods exist, such as:

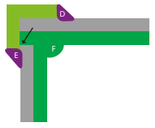
- All-round full length fillet welds
- All-round interrupted fillet welds
- Plug welds
- Welded studs with nuts
- Welded sockets or nuts with bolts
- Countersunk inserts with CSK bolts & nuts

| Table 5: Colour code legend |
|---|
| Wear Plate - Base material |
| Wear Plate - Hardfaced layer |
| Joining welds |
| Filler (i.e. mild steel round bar) |
| Structural steel angle iron |
| Backing structure |

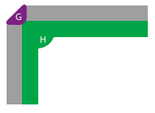
Please see Table 6 for more detail



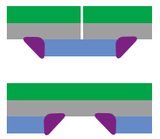

**Note 1:** Due to its design, this configuration has limited structural strength. Once the joint shown by welds A & B is complete, the inside corner shall be capped using an appropriate Welding Alloys Hardfacing consumable, as shown by weld C.




**Note 2:** To ensure a crack-free joint, weld E shall not come into contact with the hardfacing material shown in the area of the arrow. Once the joint shown by welds D & E is complete, the inside corner shall be capped using an appropriate Welding Alloys Hardfacing consumable, as shown by weld F.

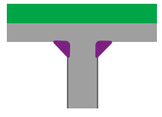



**Note 3:** Due to a high risk of hardface contamination of the weld metal, weld G shall be done using a 307 Stainless steel consumable such as TRI S 307-O or HARDFACE 19 9 6-O. After completing the joint (weld G), cap the inside corner using an appropriate Welding Alloys Hardfacing consumable, shown by weld H.

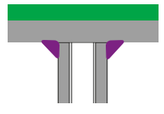


**Note 4:** None of these welds pose any risk of hardface contamination and can therefore be welded using a general purpose carbon steel consumable such as SPEEDARC T 11.

**Note 5:** During welding of inserts, it is important not to get the weld metal contaminated with hardface material. If this happens, the weld will be brittle and will break during installation and fastening of the bolt. If there is a chance of hardface contamination, welding shall be done using an appropriate welding consumable such as TRI S 307-O or HARDFACE 19 9 6-O.



**Note 6:** Attachment of studs by conventional stud welding methods or by means of the MIG / MAG or TIG process. There is no risk of hardface contamination during stud welding.



**Note 7:** Attachment of threaded sockets and nuts by means of the MIG / MAG or TIG process. There is no risk of hardface contamination during socket welding.

Joining by other welding techniques, processes, and configurations is possible depending on application, installation area, liner thickness, and accessibility. In all cases, structural welds must be performed on the base material of the wear plate Only.

Welding directly on the hardfaced surface will result in low-strength joints, severe cracking, and potential equipment damage due to weld failure.

The only acceptable welding on the hardfaced surface is capping, done using a Welding Alloys hardfacing consumable (e.g., HARDFACE HC-O) to protect exposed bolt heads, weld joints, and fitment gaps from wear.

**Key Guideline**
Avoid contamination of weld joints by the hardfaced overlay. Even small amounts of hardfacing material in the weld metal can lead to brittle joints and failure.

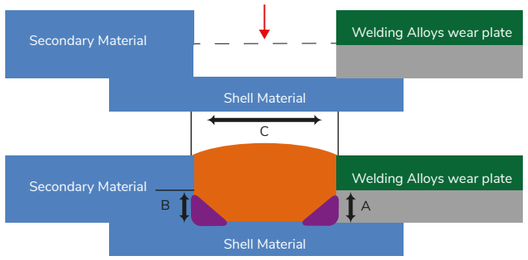
**Recommended practice**
Use Welding Alloys consumables (see Table 6) that tolerate minor contamination only when necessary — always aim to avoid contamination entirely. Once the joint is completed, the remainder of the gap should be filled with the relevant hardfacing consumable to maintain wear protection.

**Examples**
Use HARDFACE L-O when less cracking is required in non-critical wear zones (note: lower wear resistance than HARDFACE HC-O). After welding, run a capping weld (seal pass) along the joint line on the hardfaced surface to restore full protection.

**When joining WA wear plates to**
- Quenched & tempered steels
- Structural steel
- Stainless steel

Weld is joined up to the interface between the base plate and overlay. Fill the rest of the gap with:
HARDFACE HC-O
HARDFACE L-O
HARDFACE CNV-O

Refer to Table 8 for guidance on which capping material suits which plate.




| Table 6: Joining consumables |
|---|
| WA TRI S 307-O |
| WA HARDFACE 19 9 6-O |
| WA TRI S 309L-O |
| WA TRI S 312-O |
| WA HARDFACE AP-O |
| WA HARDFACE NM-O |

| Table 7: Colour code legend | |
|---|---|
| | Wear Plate - Base material |
| | Wear Plate - Hardfaced layer |
| | Joining welds |
| | Hardface Capping |
| | Shell & Secondary material |

| Table 8: Typical capping materials | |
|---|---|
| Hardplate™ 100S | HARDFACE HC-O |
| Hardlite™ | HARDFACE HC-O |
| Hardplate™ 300S | HARDFACE CN-O |
| Hardplate™ 600S | HARDFACE CNV-O |
| Tuffplate™ S | HARDFACE TIC-O |



| Table 9: Typical joint dimensions | | |
|---|---|---|
| Backing Plate Thickness A (mm) | Fillet Weld Leg Length B (mm) Maximum | Approximate Gap C (mm) |
| 6 | 4 | 12 |
| 8 | 6 | 16 |
| 10 | 8 | 20 |
| 12 | 10 | 24 |

# Materials handling

Welding Alloys composite wear resistant plates can be handled with hoists, forklifts, lifting clamps, plate grabs and other handling grips (see the pictures below). Due to the microstructure of these wear plates, magnetic lifting devices are not recommended as they may slip or become detached from the plates. When plate grips are used, care should be taken to ensure that the devices do not slip on the hardfacing side of the plate.

# Quality & innovation

Welding Alloys has a wealth of experience and expertise in the design and manufacture of flux and metal cored welding wires. We have globally located R&D teams capable of designing a large range of hardfacing and cladding cored wires, based on a culture of continuous development and innovation. For more than five decades, innovation has played a key role at Welding Alloys.

We partner with customers globally to develop new opportunities and unique solutions for a range of applications and welding processes. Our R&D and technical teams remain at the heart of the business, able to solve the most complex industrial wear protection challenges.

We have total control over design, development and production. Our wires are produced using our own manufacturing equipment, which is installed in our production plants worldwide. This means we can ensure the highest quality is maintained throughout the manufacturing process. We pride ourselves on our stringent quality control measures. Regular laboratory tests and quality checks are carried out at various stages of production.

Welding Alloys backs its products and services with teams of technical experts active in 150 countries across the world who work closely with customers to deliver best-in-class solutions to every major industrial sector.


**Innovation is at the core of everything we do, we never stop learning.**



# Our global footprint

Our specialists and industry experts are active in 150 countries across the world and have an in-depth understanding of the operating conditions and customer requirements across a wide range of sectors.

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