



Rail Industry Solutions

Tailored solutions
for sustainable rail
infrastructure

For Welding **Professionals**



Contents

Our company	3
Applications	4
Welding consumables	7
Cored wire productivity in rail repair	10
Welding Alloys machines	12
Our expertise & support	14
Quality & innovation	16
Our global footprint	17



Our company

Welding Alloys is a global leader in the production of advanced welding consumables and automated welding equipment for hardfacing, cladding, joining and repair.

We also offer industry-leading engineered wear services in our workshops or in situ, as well as a wide range of wear plates, pipes and components.

Our customer promises define the standard of reliability, expertise and partnership that customers can expect from Welding Alloys. They reflect what matters most and guide how we deliver value in every interaction.

- **Supply you can count on:**
When your operation depends on it, we deliver the right product, service and support on time and to specification.
- **Technical expertise that really works:**
We don't just supply products, we solve problems. Deep metallurgical, wear protection and application expertise, proven in your conditions.

- **Your partner for the long run:**
We build lasting partnerships, earned over time through the problems we solve together and the support that continues long after delivery.

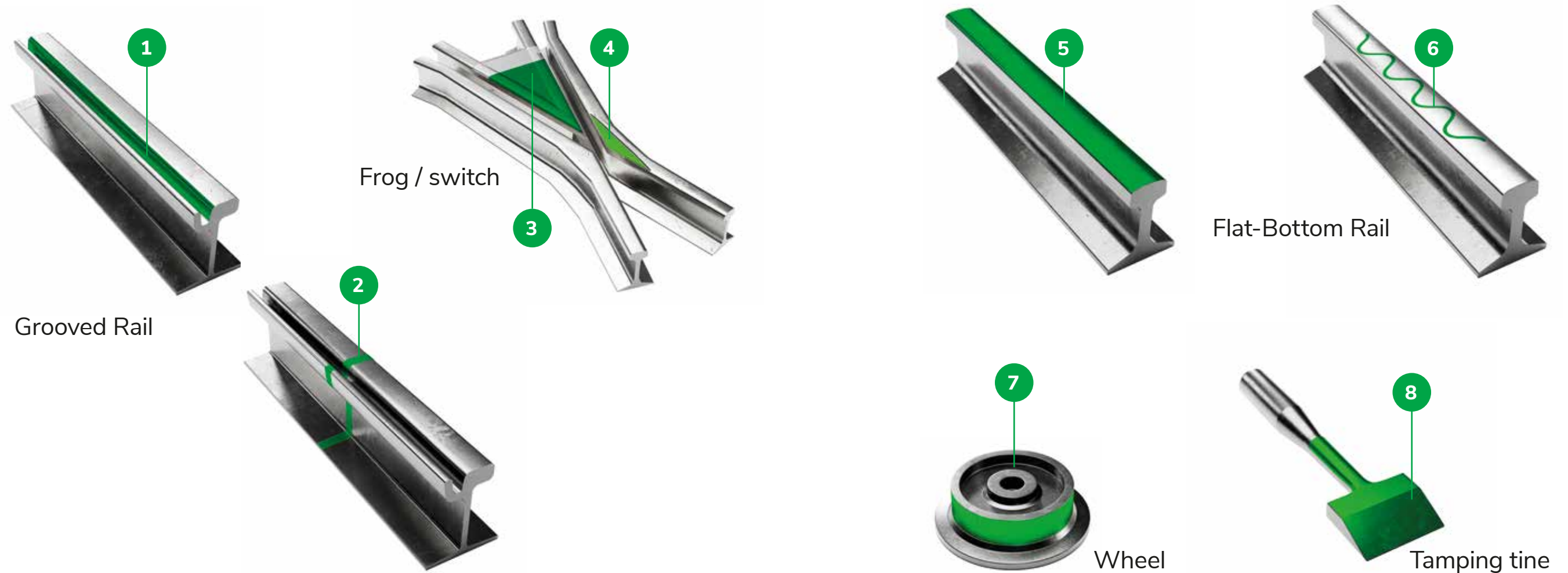
For several decades, the Welding Alloys name has been synonymous with excellence in research and development (R&D), resulting in a steady stream of innovative products and advanced technical solutions and services.

Welding Alloys is a participating member of the United Nations Global Compact and supports all principles relating to the environment, labour, human rights, and anti-corruption. As part of our continued commitment towards sustainability, we continue to improve our products and processes in order to reduce the negative impact on both the welder and the environment.



Applications

Solutions for railway and light-rail repair and maintenance



1. Gauge corner

2. Rail butt weld

3. Frog hardfacing

4. Cast repair

5. Rail head

6. Top rail overlaying

7. Wheel hardfacing

8. Tamping tine



HARDFACE 19 9 6 can be applied manually for local repairs using the -O (self-shielded) version or, for larger areas, automatically at a high deposition rate using the -S (submerged arc) version to restore gauge corners, particularly on curved sections where wear is most severe.



TRI S RW-O is a specialised wire designed for rail assembly in outdoor conditions. Its tailored slag system helps prevent slag entrapment.



HARDFACE APRAIL-O is an austenitic chromium-manganese steel offering a high work-hardening rate, making it suitable for heavily loaded components such as frogs and switches.



ROBODUR M 13Mn-G is well suited to repairing casting defects in manganese steel components such as frogs. The deposit has a similar colour to the base metal.



HARDFACE TLN-O is a low-alloy steel used to repair and rebuild rail head profiles. The weld deposit has a hardness comparable to that of the original rail.



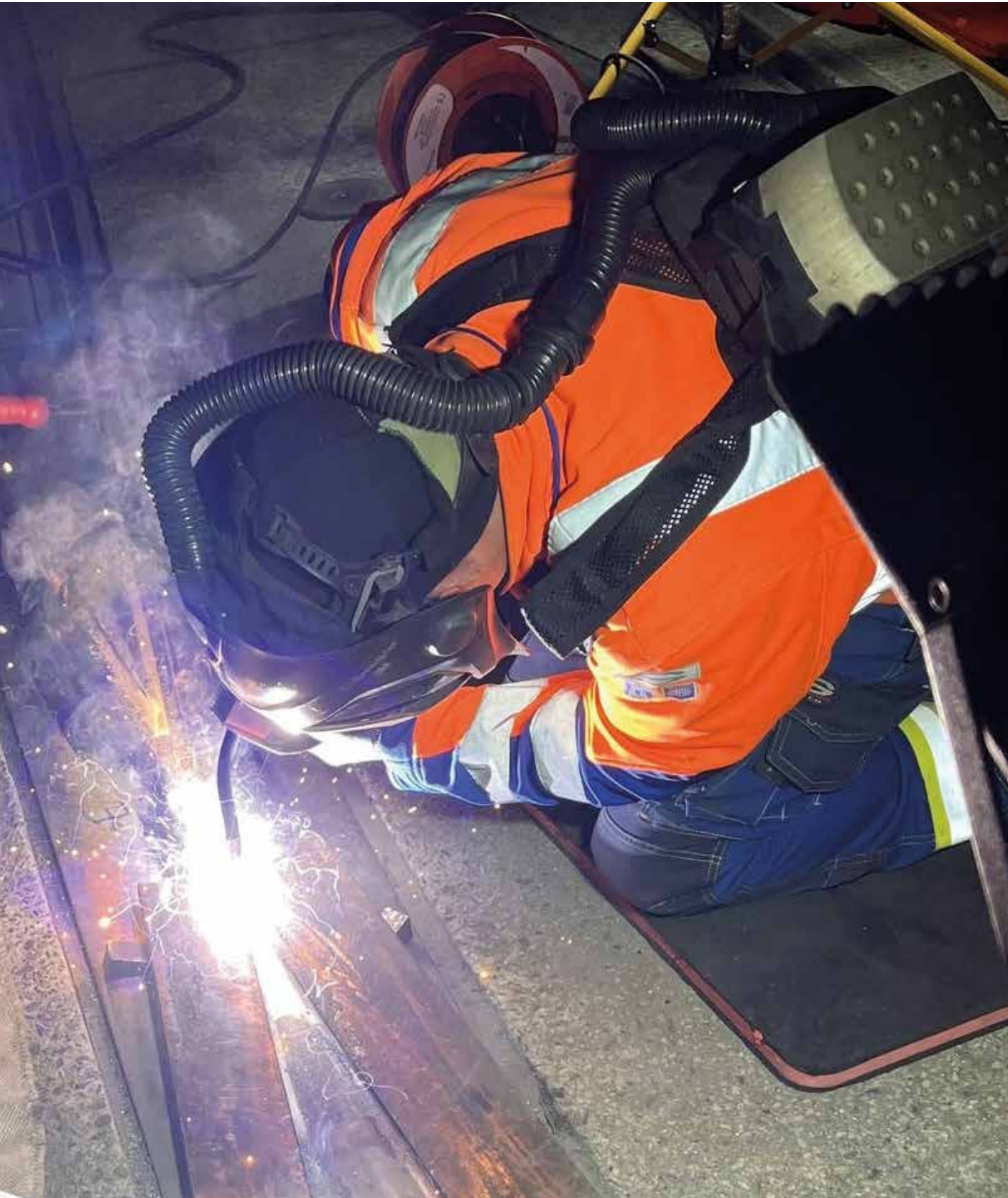
TRI S 370L-O is an over-alloyed austenitic stainless steel that produces a corrosion-resistant deposit in a single layer. It is designed to provide good electrical contact with the rail.



HARDFACE 350-S provides resistance to metal-to-metal contact and fretting, making it suitable for the repair of railway wheels.



ROBODUR K 600 is a martensitic steel offering good resistance to impact and abrasion, making it well suited to the repair of tamping tines. For more severe abrasive conditions, HARDFACE TIC-O provides a solution with greater wear resistance.



Frog repair by manual welding with HARDFACE 19 9 6-O

Welding consumables

Welding Alloys manufactures a range of advanced welding wires designed for railway repair and maintenance applications. Our consumables are developed to withstand the wear and mechanical stresses experienced by rails and track components, including fretting, abrasion and heavy loads.

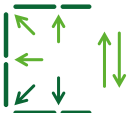
Rail repairs are often carried out during short night-time maintenance windows, where productivity, reliability and repeatable weld quality are essential. Our consumables are manufactured under controlled conditions, with careful inspection and chemical composition control to ensure consistent weldability and performance.

Our range helps maintenance teams restore rail profiles, rebuild worn components and improve wear resistance, supporting longer service life in railway environments.

Low-alloy steel consumables
Used to rebuild rail profiles and restore geometry, with mechanical properties similar to the original material. Suitable only for low- & medium-alloy steels.

Austenitic chromium-manganese consumables
Designed to work harden under service loads, improving hardness and wear resistance during use. These deposits offer good dilution tolerance and crack resistance.

Austenitic manganese steel consumables
Used where a high work-hardening capability is required. These materials must be welded using low heat input and controlled interpass temperatures to avoid embrittlement.

Product	HARDFACE-O	HARDFACE-S	TRI S	ROBODUR
Welding process	FCAW-S	SAW	FCAW-S	GMAW
Wire type	Flux cored	Metal cored	Flux cored	Metal cored
Slag	Yes	Yes	Yes	No slag
Shielding gas/Flux	Self-shielded	WAF 325	Self-shielded	M21: Ar + 15-25% CO ₂
Welding positions				 *

*Out-of-position welding also possible using short-circuit or pulsed-arc transfer modes

Welding consumables for railway applications

Product	Welding process	Standard diameters [mm]	Classification/ standard	Hardness (as welded)	Hardness (work hardened)	Typical chemical composition (%)						Description and applications
						C	Mn	Si	Cr	Ni	Other	
LOW ALLOY STEELS												
HARDFACE TLN	-O	1.2 - 1.6	EN 14700: T Z Fe1	350 HV	-	0.14	1.1	0.4	1.1	2.2	Mo: 0.4	Bainitic steel deposit containing Ni, providing a good combination of strength, toughness and wear resistance. Easy slag removal. Applications: build-up of rail heads, rail ends, switch points and pearlitic steel crossings.
WORK HARDENING MANGANESE STEELS												
HARDFACE 19 9 6	-O	1.2 - 1.6	EN 14700: T Fe10	180 HB	45 - 50 HRC	0.1	6.0	0.5	19.0	9.0	-	Crack-resistant type 307 austenitic stainless steel weld deposit that work hardens depending on the level of impact. Good impact and corrosion resistance. Applications: gauge corners, rail heads, grooves and crossings.
	-S	2.0 - 3.2										
HARDFACE RAILMAGNET	-S	3.2	EN 14700: T Z Fe10	180 HB	40 - 45 HRC	0.06	6.0	1.0	23.5	-	-	Crack-resistant stainless steel weld deposit specifically designed to restore the rail's magnetic properties where non-magnetic 307-type consumables have previously been used in unsuitable locations. Restores up to 70% of the original rail magnetic response. Applications: gauge corners, rail heads, grooves, crossings.
TRI S RW	-O	1.6 - 2.0	ISO 17633-A: T Z 19 9 Mn U NO 3 EN 14700: T Fe10	180 HB	45 - 50 HRC	0.1	6.5	1.0	19.0	9.0	-	Special type 307 austenitic stainless steel wire developed for joining grooved rails. The weld shows excellent soundness, meets side-bend test requirements and provides good tensile properties: Rm = 710 MPa and A ₅ = 40%. The slag is designed to reduce the risk of entrapment and is easy to remove. Application: grooved rail butt welding.
TRI S 370L	-O	1.6	EN 14700: T Z Fe10 EN ISO 17633: T Z 27 10 Mn U NO 3	200 HB	-	0.02	6.5	0.7	27.0	9.5	-	Over-alloyed wire designed to compensate for dilution with a carbon steel substrate and produce an austenitic stainless steel deposit in a single layer. Good corrosion resistance helps maintain electrical conductivity. Easy slag removal. Application: rail heads.
HARDFACE APRAIL	-O	1.2 - 1.6	EN 14700: T Fe9	210 HB	45 - 55 HRC	0.4	16.0	0.6	14.0	1.4	-	Non-magnetic austenitic deposit with high resistance to impact and pressure. High work hardening rate. Designed for components exposed to high impact or heavy loads. Applications: repair work on railway frogs and crossings.
ROBODUR M 13Mn	-G	1.2 - 1.6	EN 14700: T Fe9	200 HB	44 - 48 HRC	1.0	14.0	1.0	0.5	-	-	Manganese austenitic steel deposit similar to Hadfield steel. Resistant to heavy loads and high impact. Designed for rebuilding 14% manganese steel castings, with a colour similar to the base material. Applications: repair of cast crossings made of manganese steel.

Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

Cored wire productivity in rail repair

Reducing the carbon footprint of rail infrastructure requires cost-effective and sustainable maintenance methods. Weld restoration of worn embedded grooved rails can extend track service life and provide significant savings compared with rail replacement.

Repairs can be carried out in situ, reducing disruption, maintenance time and the environmental impact associated with removing and replacing worn rails.

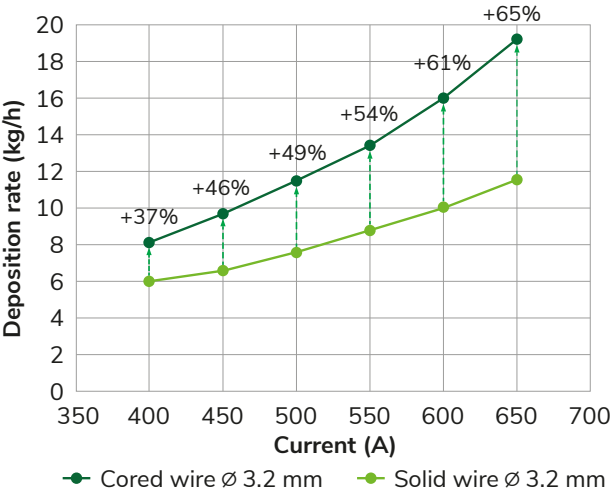
Manual rail repair: FCAW cored wire vs SMAW stick electrodes
Coated electrodes require frequent stops to replace the electrode. Cored wire can be used in semi-automatic or automatic welding processes, reducing the number of starts and stops and helping to improve repair consistency.

- Key advantages:
- Higher deposition rates: typically 4–8 kg/h for FCAW vs. around 1–3 kg/h for SMAW.
 - Continuous wire feeding: fewer stops for electrode replacement and more productive arc time.
 - Higher deposition efficiency: less consumable waste compared with stick electrodes.
 - Reduced repair time: particularly valuable during short railway and tramway maintenance windows.
 - Easy transition for welders: familiar manual welding approach with increased productivity.

Automatic rail repair: SAW cored wire vs solid wire
When switching from solid wire to cored wire, the wire feed speed must be adjusted. In a cored wire, the welding current is carried mainly through the outer metallic sheath, making it easier to melt than a solid wire at a similar welding current. This results in a higher deposition rate during welding.

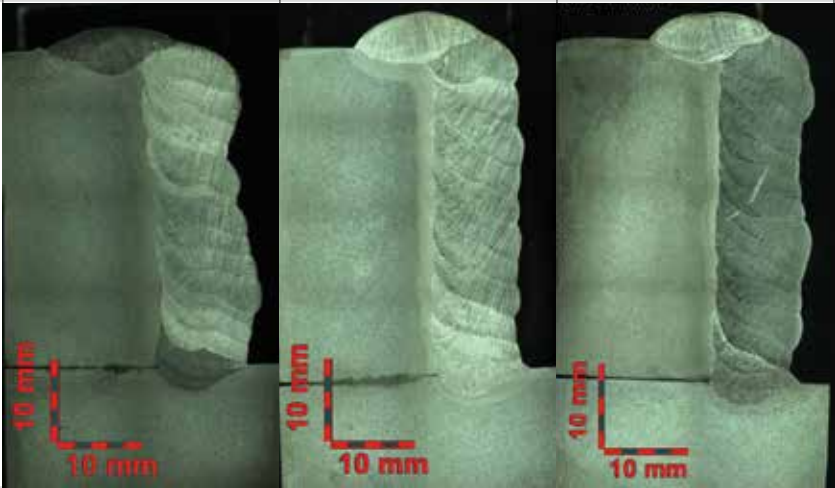
The weld bead profile is also different, with lower penetration and approximately 25% less dilution.

To take full advantage of the higher deposition rate, travel speed can be increased. This improves productivity while reducing heat input and the size of the heat-affected zone, helping to reduce the rail's susceptibility to cracking.



Productivity gains in submerged arc welding with cored wire
To demonstrate these benefits, test coupons were welded to simulate gauge corner restoration.

- Test No. 1: Solid wire**
Test No. 2: Cored wire (with higher wire feed speed) 
Test No. 3: Cored wire (with higher wire feed speed and travel speed) 

Welding Coupon	No. 1	No. 2	No. 3
Wire type and diameter (mm)	Solid Ø 3.2	Cored Ø 3.2	Cored Ø 3.2
Voltage (V)	30		
Wire feed speed (m/min)	1.5	2.9	2.9
Travel speed (cm/min)	50	50	70
Contact tip to work distance (mm)	30		
Current (A)	400		
Heat input (kJ/cm)	14.4	14.4	10.3
Deposition rate (kg/h)	6.0	8.2	8.2
Macrographs			
Number of passes	16	12	16

Test No. 2 clearly shows that cored wire improves productivity by reducing the time required to complete the repair. Fewer weld beads are needed.

Test No. 3 also demonstrates increased productivity, with the faster travel speed helping to reduce heat input and limit the heat-affected zone.

Compared to solid wire, cored wire:

- Increases deposition rate and productivity by 35–65%.
- Reduces dilution by 25%.



Welding Alloys machines

Gauge Corner Restoration (GCR)

Machine

The GCR Machine is an automated solution designed for the restoration of worn gauge corners on tramway and light-rail networks. Particularly suited to long repair sections and curves, it uses the submerged arc welding process to combine high deposition rates with a stable and protected welding arc. Its lightweight, mobile design makes it easy to deploy during short maintenance shifts and in urban environments.

Key advantages

- Dedicated solution: Designed specifically for gauge corner restoration.
- High productivity: Automated submerged arc welding for high deposition rates.
- Easy to deploy: Lightweight design with a wheelbarrow-style chassis for quick transport on and off the track.
- Automatic tracking: Follows the rail to maintain consistent welding along curves and long sections.
- Suitable for urban work: The flux conceals the welding arc, making the process suitable for night-time operations in populated areas.

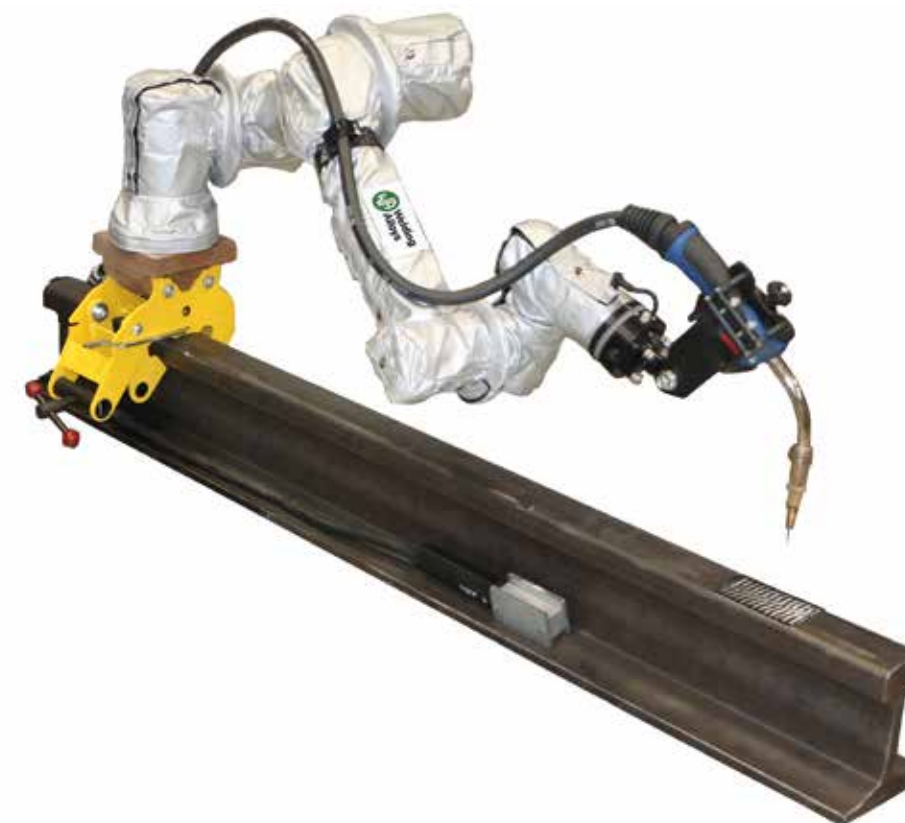


Flex-e-bot

The Flex-e-bot brings the flexibility of collaborative robotics directly to rail maintenance. Lightweight and easy to move from one repair area to another, it requires no complex robot programming and can be quickly set up by the operator. Rather than replacing the welder, it takes over repetitive and physically demanding welding operations, allowing skilled welders to focus on the tasks where their expertise brings the most value.

Key advantages

- Highly flexible: Easily moved and adapted to different rail repair applications.
- Easy to use: No complex robot programming required.
- Consistent quality: Maintains constant travel speed, torch position and welding parameters.
- Better working conditions: Reduces the welder's exposure to the arc, heat and fumes and avoids prolonged bent-over welding positions.
- Keeps the welder in control: Automates repetitive welding while keeping skilled operators focused on preparation, supervision and critical tasks.



Our expertise & support

Welding Alloys supports customers throughout their projects, from defining the initial requirements and preparing tender submissions to application support and welder qualification. Through our network of subsidiaries and local technical experts, we provide practical assistance tailored to each project and application.

Wire development

Our expertise in cored wire design and manufacturing enables us to adapt consumables to specific rail applications. Support can include welding trials, parameter optimisation and procedure qualification, helping customers achieve the required mechanical properties and consistent weld quality.

Training and qualification

We train welders and operators in the correct use of our welding consumables and welding systems for a range of rail applications. Training covers application techniques, recommended parameters and best practices, helping welders and operators develop the knowledge and practical skills required to achieve consistent results and complete the relevant qualification process.

On-site support

Our local experts can provide on-site technical support during trials, qualification and implementation, as well as help resolve application difficulties. With an understanding of the constraints associated with railway maintenance and on-site operations, our teams offer practical guidance to help customers apply our consumables effectively and reliably.



On-site job support to repair a switch section with HARDFACE 19 9 6-0



On-site training on the use of the GCR machine



Qualification training for rail butt welding using TRI S RW-0

Quality & innovation



Watch the video

Since 1966, innovation has been central to Welding Alloys. Our R&D teams develop application-specific consumables and adapt wire formulations and slag systems in response to evolving industry requirements.

We maintain full control over design, development and manufacture of our cored wires. All wires are produced on our own equipment at Welding Alloys facilities worldwide, with laboratory testing, chemical composition control and quality checks carried out throughout production.

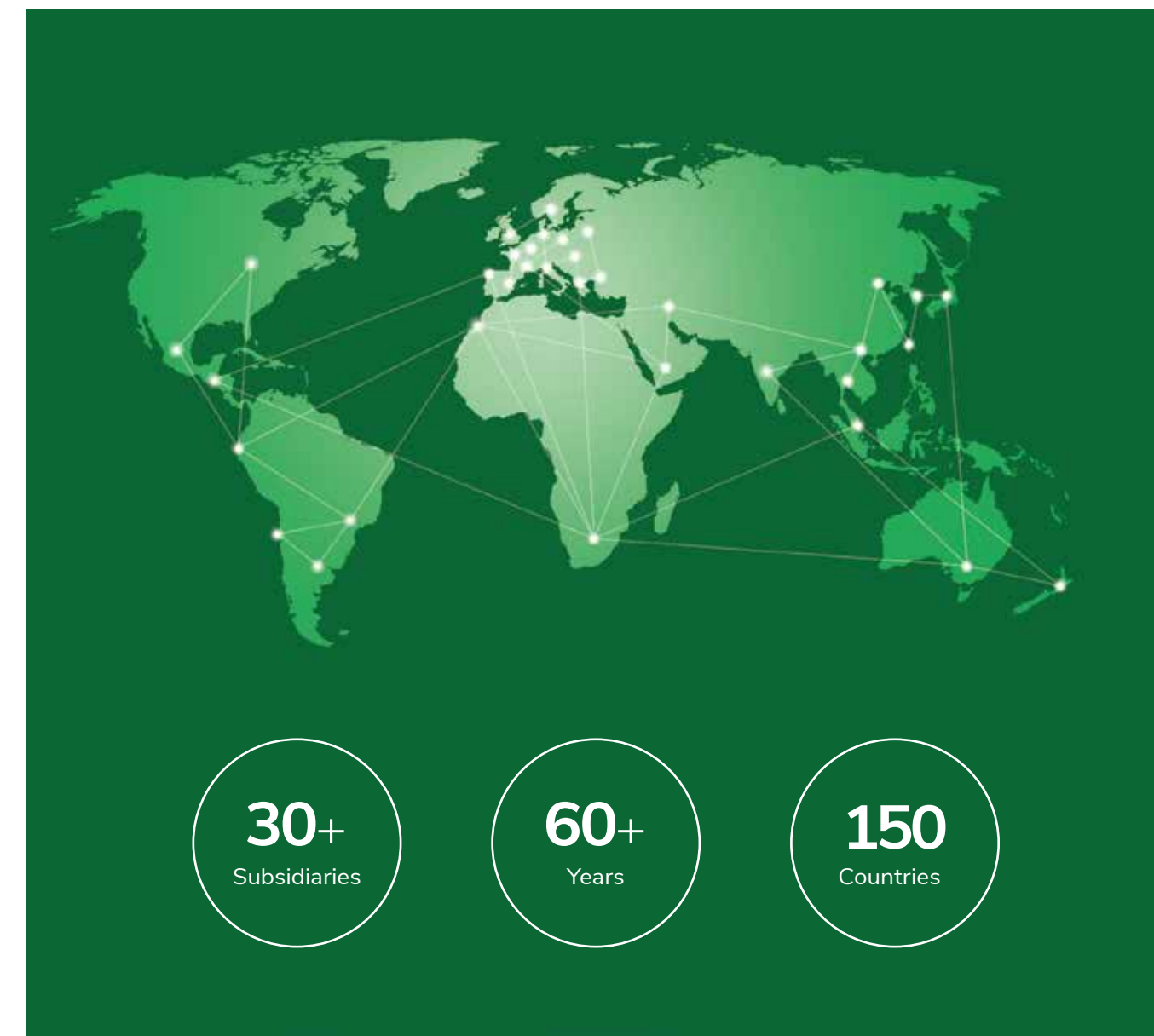
Our product range also includes wires compatible with advanced repair processes such as Wire Laser Additive Manufacturing (WLAM). HARDFACE AP-G, for example, can be used with WLAM to rebuild worn railway components, including crossing frogs.

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.



Find your nearest subsidiary



30+
Subsidiaries

60+
Years

150
Countries



www.welding-alloys.com
contactus@welding-alloys.com



Visit website