



**RESEARCH
& DEVELOPMENT**

QUALITY

SUSTAINABILITY

LEAPS AHEAD

Leadership rail fastening research and standards

 **PANDROL**
TRACK SYSTEMS

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Discover
the Pandrol
difference





The Pandrol Difference is our unique ability to innovate fastenings that perform better and last longer, in any environment. No other rail clip manufacturer can match the scope of our research and development facilities. Our R&D team's passion for discovery leads us to examine closer, and test further. Pandrol customers benefit from the most cost-effective and specialised solutions.

Innovation doesn't mean unproven. Pandrol has been the global leader in rail fastenings for more than 75 years. In 2015, more than 2 billion of our fastenings are at work on hundreds of railways in over 100 countries. Today's Pandrol products are an evolution of trusted technologies, which have safely carried the world's rail passengers and freight for decades.

Just like our customers, Pandrol's R&D operations are global in scale. Across five continents, the railways we help to build each have diverse requirements related to infrastructure, environmental conditions and local and international regulations. With a flagship research centre in the UK and laboratories at many of our local manufacturing facilities, Pandrol has the deepest understanding of these needs. Our R&D efforts have led to a broad range of specialised products and customisation processes that meet local needs more precisely and more efficiently.

Pandrol solutions are developed within our ISO 9001-certified quality management system, and we're committed to sustainable operations that benefit our customers, communities and the environment. Breakthrough material engineering and production methods give our customers the best value and safer railways.

For the most evolved rail fastening solutions, Pandrol is the provider.

PANDROL KNOWS MORE ABOUT WHAT MAKES RAIL FASTENINGS SAFE, RELIABLE AND DURABLE THAN ANYONE ELSE IN THE WORLD.

Pandrol is the global leader in rail fastening research. We've continually expanded and evolved our R&D facilities and team since the 1960s. Our investments in innovation have one purpose: to give our customers more value from rail fastenings.

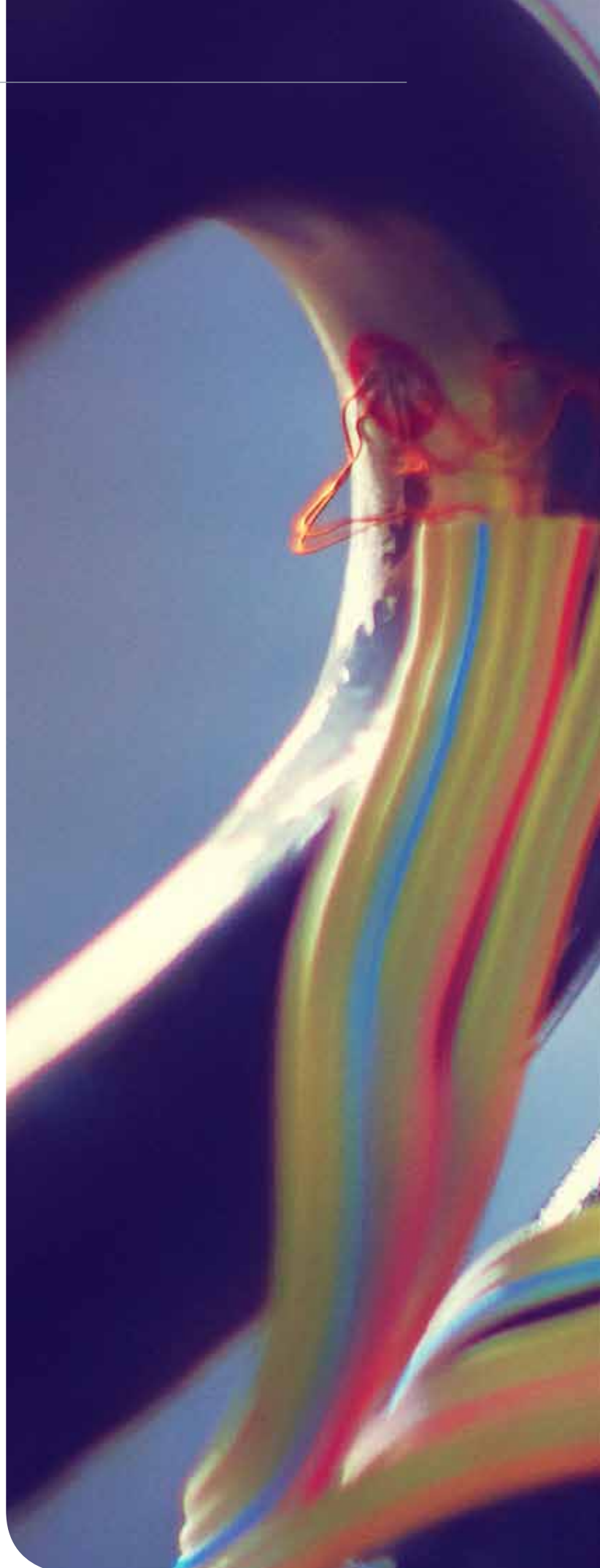
Today our team of designers and engineers spans the globe, where they meet customers, inspect track-work and gain first-hand insight into local conditions and project requirements.

Those insights feed back to our state-of-the-art UK laboratories. They are home to the most advanced research programmes, and the widest range of testing equipment in the industry. The Pandrol R&D Centre develops, improves and thoroughly tests products, to ensure they meet the most demanding specifications.

As well as our own purpose-built facilities, we collaborate with external laboratories to extend our technical capabilities and knowledge. Field-testing is carried out at track sites worldwide. And Pandrol coordinates with sleeper manufacturers, track machine developers and switch and crossing suppliers. Our solutions integrate perfectly with all kinds of railway system.

Pandrol engineers also attend to new customers at new product installations, to provide training as necessary and develop our understanding of future requirements.

Tougher, safer and easier to install. Thanks to our unmatched R&D cycle, Pandrol rail fastenings solve more of our customers' challenges every year. Product development is split into prototyping, materials research and testing phases.





The science that moves rail clips **forward**

RIGHT NOW, THE NEXT
GENERATION OF RAIL FASTENINGS
IS BEING DEVELOPED AT OUR
RESEARCH AND DEVELOPMENT
CENTRE IN THE UK.



Materials research

Our laboratory researches and tests both metallic and non-metallic materials. This gives Pandrol a forensic knowledge of our products. Only the safest and most durable materials make it to production.

The quality of every raw material is thoroughly evaluated, while corrosion-preventing coatings are pushed to the limit. If a material fails our thorough tests, we know exactly why at the prototype stage.

GOING ATOMIC

- Steel, cast iron and polymeric materials are assessed at an atomic level in our lab's materials section
- Scanning electron microscopy, energy dispersive x-ray facilities and polarised light microscopy reveal strengths and weaknesses
- Measuring microstructure, phases, crystallinity, surface condition and irregularities helps us select the best metals

TOUGH ENOUGH?

- A range of hardness testing machines aid us in developing tougher, longer-lasting materials
- Our lab contains Brinell (HBW), Vickers (HVN) and Rockwell-C (HRC) and micro-hardness (HVN) testing machines
- Fatigue testing machines run 24/7 to determine fatigue life of Pandrol rail clips.

WEATHERING THE STORM

- The lab's pH-neutral salt spray (NSS) chamber is used to corrosion-test protective coatings at various temperatures
- Coatings are evaluated to national and international standards including ISO 9227 and ASTM B117
- A QUV Accelerated Weathering Tester also tests paints and polymers to various international standards

Testing facilities

Pandrol rail fastenings are in service in almost every climate imaginable, from the arid deserts of the Middle East to the extreme cold of Canada. Track loadings vary from light passenger trains to the world's heaviest mineral railways. And the tracks themselves stretch from level plains to curved and steep mountain railways.

To ensure our products perform reliably and safely, whatever our customers' requirements, Pandrol carries out suites of tests to a huge range of national and international standards. Tests can be carried out on concrete, timber, steel bearers and sleepers, and slab track fastening systems. Our high frequency, electro-magnetically controlled actuators are able to simulate a wide range of railway loads. These include high speed, heavy haul, light metros and freight.

MEETING STANDARDS

- EN 13481 and EN 13146 series
- AREMA Chapter 30
- AS 1085
- Japanese RTRI standards
- And others as required

LOAD TESTING

- Servo and computer-controlled dynamic loading actuators are used to test durability of full assemblies and components
- Test loads can range from 25kN to 500kN, at various frequencies and angles, with up to three actuators working in synchronous combination
- Static and dynamic rail deflections are recorded using contact and non-contact displacement transducers.

ELECTRICAL RESISTANCE TESTING

A high-volume water spray rig tests sleeper and concrete slab electrical resistance.



RAIL AND BASEPLATE PAD TESTS

- Static stiffness – at temperatures from -40C to +40C using Zwick universal testing machine
- Impact attenuation – to CEN standards using custom rig based on Battelle Institute design
- Electrical volume resistivity – for pads and insulators
- Elastomer hardness – to Shore A&D and IRHD standards
- Compression set testing – at ambient and elevated temperatures
- Tensile testing – to determine material behaviour at performance limits

Prototyping

Pandrol utilises the latest 3D modelling tools, finite element analysis and rapid prototyping methods to design and create new products. In the hands of our highly experienced team, these methods lead to innovative solutions to technical challenges.

PROTOTYPING TOOLS

- CAD engineering and design workstations
- In-house finite element analysis software, used for calculating forces, stresses and vibrations of tracks and track components
- Turning, milling, sawing, grinding and drilling equipment
- Manual metal arc and MIG welders
- 75-tonne mechanical crank presses used in development of hot formed fastenings
- 100-tonne hydraulic press used for hot/cold forming pressed steel components
- Track data analysis and track dynamics analysis software
- 3D printer



QUALITY



For all the
world's quality
standards,
one Pandrol



Every Pandrol rail fastening must meet three sets of quality standards before it leaves the factory. Those of the customer, those of the relevant railway authorities, and those of Pandrol's own ISO 9001-certified quality systems.

That means the quality of our solutions is always tailored. When customers approach us with precise and demanding specifications, we match them against our wide range of highly evolved products. The Pandrol technical team customises products where necessary, to ensure they meet local and international standards. And our in-house testing machinery simulates the entire lifetime of the product, under even tougher workloads and environmental conditions than on the railway.

Our quality systems provide greater reliability and safety. Our rail fastenings work longer and need fewer replacements. So Pandrol customers benefit from the most cost-efficient solutions available.

ISO QUALITY THROUGH AND THROUGH

ISO 9001 quality management is a prerequisite for Pandrol operating companies. We use ISO 9001 quality management systems to continually monitor and manage quality across all of our operations, and to keep improving our operational performance and efficiency. Every Pandrol operating company is certified in ISO 9001 or working towards certification.

Our ISO 9001 certifications are assessed and audited by the internationally renowned British Standards Institute (BSI). All Pandrol locations are audited annually to maintain our quality standards.

PUT PANDROL UNDER THE MICROSCOPE

We want customers to have total confidence in our products, processes, supply chain and management. So we're completely transparent in how we manage them.

Pandrol has an open door policy, which invites customers to visit our manufacturing and testing facilities as well as those of our suppliers. Pandrol customers can conduct their own quality audits and factory approval tests (FATs), as well as witnessing their products being tested to required standards.

SHARING EXCELLENCE

Pandrol has a strong system of sharing knowledge between our individual companies based in ten countries around the world. Each of our companies is constantly learning from a huge range of diverse project requirements, issues encountered, and environmental conditions.

We share this knowledge through regular intercompany audits, to continually develop Pandrol best practice. Audits focus on identifying and understanding what is working well at each of our locations. The most effective methods and policies are introduced throughout the Group, to the benefit of all Pandrol customers.

Our sustainability policy is a set of guidelines that encapsulates our values and guides everything we do. So our customers can be assured that working with Pandrol means working sustainably.

Pandrol also enforces a strict ethics policy throughout all of our operating companies. It ensures we respect local and international laws, support universal human rights and strive to minimise impact on our surroundings. Partnering with Pandrol fits the goal of a brighter future.

REDUCING ENVIRONMENTAL IMPACT

Pandrol aims to become greener by the year. We benchmark all of our operations against certified ISO 14001 standards, to continually reduce carbon emissions and other kinds of pollution.

We've achieved many environmental targets already, and we're working on more.

- **Reduced transport waste and cost** – Pandrol maintains local presence near our customers and uses locally sourced materials where possible. In-house paint systems have saved over 100,000 transport miles.
- **Using less energy** – Efficient lighting at our plants has reduced power consumption by 15-20%. New variable speed machinery saves energy by matching power delivery with demand.
- **Minimising and recycling waste** – On-site baling in the UK has enabled the sale of polypropylene waste and cuts other disposal costs. UK waste and recycling streams are monitored for continuous improvement.

ENVIRONMENTALLY FRIENDLY, FINANCIALLY STABLE, AND COMMITTED TO THE COMMUNITIES WE WORK IN. THAT'S THE PANDROL WAY.

A DEPENDABLE INDUSTRY LEADER

Sustainability also means sustaining profits and our industry-leading position, so that we can continue to exceed customer expectations for years to come.

- **Innovating new products** – We're utilising emerging material science and production technologies to keep improving performance and cost-competitiveness for our customers.
- **Improving efficiency** – Pandrol strives to continuously improve methods within manufacturing productivity, procurement, logistics and supply chain management.

A POSITIVE PART OF THE COMMUNITY

Pandrol employs hundreds of staff in ten different countries. The Pandrol Way is to positively engage with those people and places, as an active contributor to local communities.

- **Kick-starting careers** – Pandrol recruits trainee designers and technicians in the local areas where we work. In the USA, we engage with local universities to develop engineering talent.
- **Building strong communities** – We aim to run safe, ethical and sustainable businesses that enhance their respective communities.
- **Looking after our people** – We provide safe working environments, treat employees fairly and ethically, and comply with regional labour legislation.

For a copy of the Pandrol Track Systems Sustainability brochure please visit [pandrol.com](https://www.pandrol.com) or contact info@pandrol.com



Greener. Stronger. Community Minded.



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