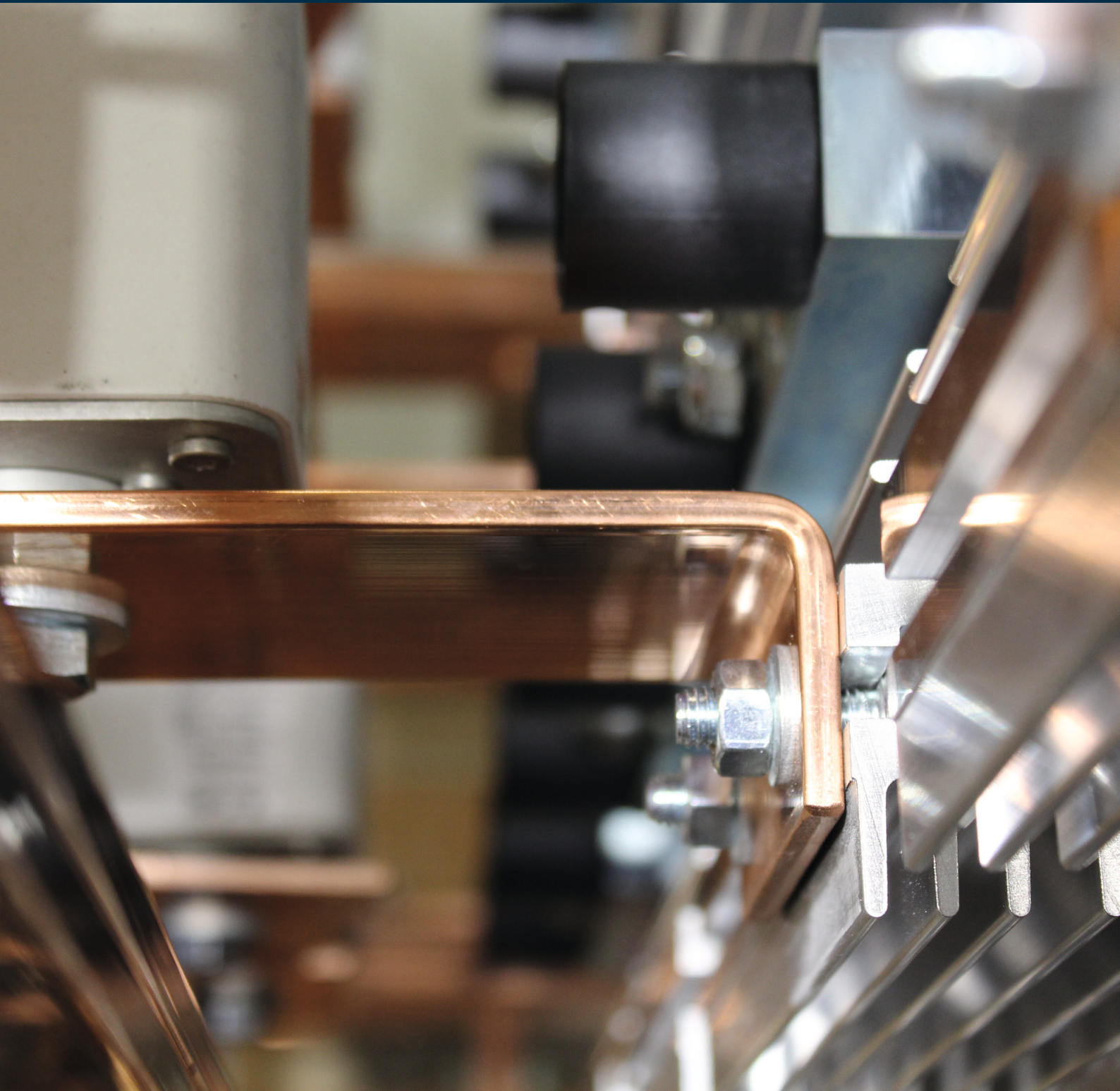


TracFeed[®] TRx

Diode rectifier



TracFeed® TRx

Diode rectifier



Clamping units on heat sink string

Uncompromisingly slimline

High efficiency and power density with minimal use of resources: with the TracFeed® TRx in the TracFeed® TRA (DC 750 V) and TracFeed® TRB (DC 1,500 V) styles, Rail Power Systems (RPS) offers a rectifier that optimally meets current market requirements. Railway operators can rely on the proven strengths of RPS rectifiers and benefit from a whole range of new advantages as well.

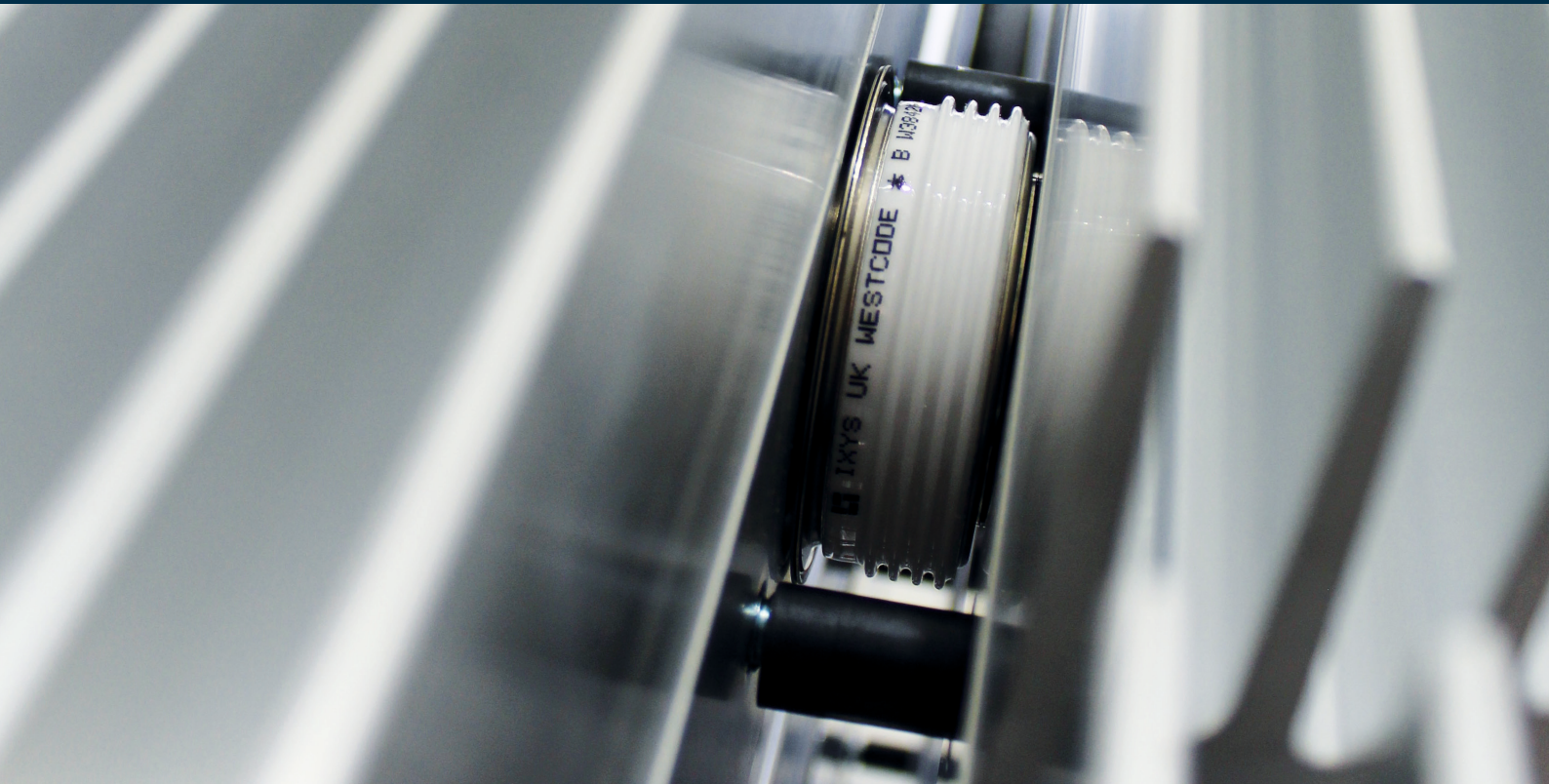
- **First-class design:**
optimum use of space thanks to PowerUnit configuration
- **Large heat sinks:**
high performance
- **High diode reverse voltage:**
greater operational safety
- **Extended modularity:**
perfectly adapted to requirements
- **High performance:**
state-of-the-art semiconductor technology
- **Best possible use of resources:**
minimised use of materials
- **Precise dimensioning:**
exactly the right output
- **Recyclable:**
more than 95 per cent can be recycled

Experience

With our 135-year history in the development of systems and solutions, products and components for railway energy supply, we have consistently been able to play a key role in shaping technological progress in the construction and expansion of railway infrastructure. The knowledge and expertise we have gained in the process remains the ideal prerequisite for helping to shape the future of global rail transportation. Be it as Allgemeine Elektrizitäts-Gesellschaft (AEG), ADtranz (AEG & ABB), Balfour Beatty Rail or – today – Rail Power Systems: our expertise is also our guarantee to you for the stability, efficiency and performance of your railway operation.

Foundation

Rectifiers with natural air cooling are a common feature of DC railway power supplies. To convert AC to DC voltages, the most common solution is to use power diodes in AC bridge circuits. Nominal DC voltages of up to 3.000 V can be realised in this way.



Diodes between heat sinks

Design

Rectifiers are typically installed in individual switch cabinets. In rectifiers from RPS, diodes and fuses are merged to form structural and electrical units (PowerUnits). The installations in RPS rectifier cabinets are always aligned in such a way that maintenance or repair work can be carried out easily from the front of the cabinet.

Typically, three-phase bridge circuits are fitted with a specific number of diodes connected in parallel, and these three-phase bridge circuits are in turn connected to a rectifier in parallel or in series. Parallel connections are used to increase current and series connections are used to increase voltage.

By selecting different transformer switching groups, 12- or 24-pulse operation with reduced mains feedback effects can be achieved for series or parallel connections of the singular units (PowerUnits or rectifiers).

The power connections can be installed in both the upper and lower sections of the rectifier cabinet, which ensures the greatest possible flexibility. The rectifiers can be connected or wired in different arrangements, thereby enabling straightforward, time-saving and cost-saving assembly.

Thanks to the rectifier's optimised design, we have reduced resource consumption and the number of components needed. At the same time, we improved the performance of the TracFeed® TRx generation of RPS rectifiers compared to their predecessor series TracFeed® GR.

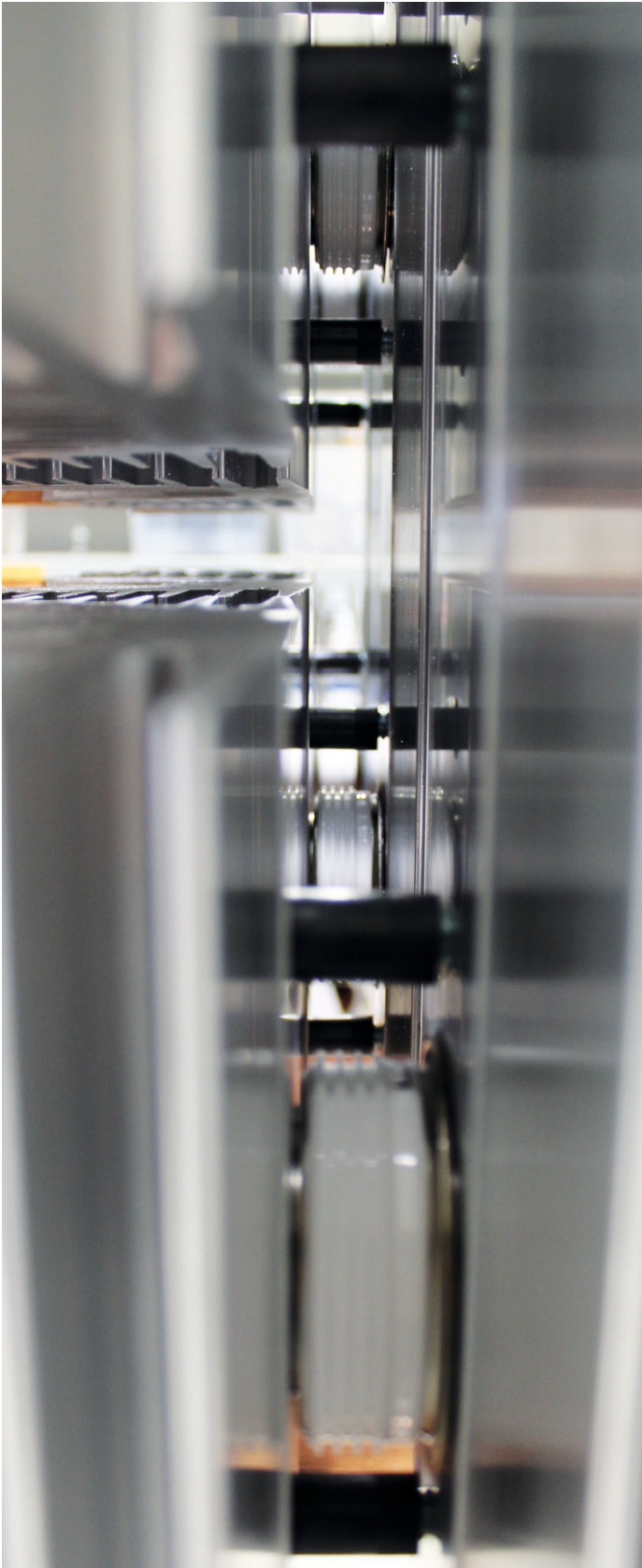
Extended modularity

- **Perfectly adapted to requirements:**
The rectifier system is designed as a modular system. The "PowerUnit configuration" is scalable and can be easily adapted to the relevant project requirements. The corresponding configuration is installed in the rectifier cabinet.



Project-specific special solution

Advantages of established design



First-class design

- **Optimum use of space thanks to PowerUnit configuration**

The new rectifier groups the diodes together connected in parallel on a string as a “PowerUnit” (TracFeed® PU). This configuration creates room for a whole range of improvements to the interior layout, but above all it saves a considerable amount of space.

Enlarged heat sinks

- **More power**

Despite “downsizing” the rectifier cabinets, it was possible to increase the volume of the heat sinks thanks to the innovative design. The larger heat sink surfaces enable better performance values, as higher currents can be conducted through the diodes as a result of the enhanced cooling effect.

High performance

- **Improved diode characteristics**

In the course of redeveloping the TracFeed® TRx, we did more than just optimise the heat sinks and thus make them more powerful: we also reduced the heat output by using a higher-performance diode with a better characteristic curve. This also had an influence on reducing the number of diodes and the high currents in our rectifier system.

High diode reverse voltage

- **Greater operational safety**

And another strength of RPS rectifiers: reverse voltages of 2.400 V are offered as standard for DC 750 V. This distinguishes RPS rectifiers from competitors on the market, where diodes with a reverse voltage of 2.200 V are offered as standard.

Higher diode reverse voltage

Best possible use of resources

- **Much less material**

By improving the rectifier design compared to its predecessor, fewer materials are now used. This new design has also made it possible to significantly reduce requirements, especially for copper.

Precise dimensioning

- **Exactly the right output**

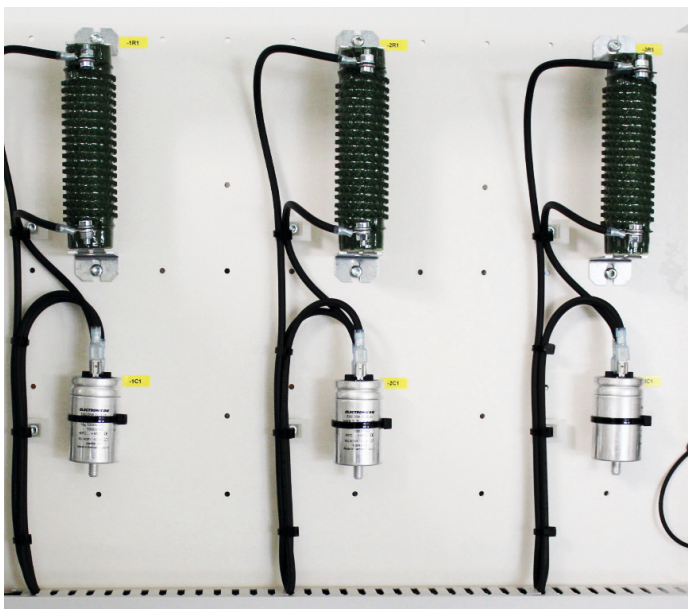
Another advantage of the rectifier: the TracFeed® TRx fits standard market requirements and makes it possible to implement suitable offers. It makes it possible to avoid excess dimensioning in many cases, certainly as far as demand is concerned. The resultant disadvantages of overdimensioning, including higher costs and increased space requirements, can thus be prevented.

Recyclable:

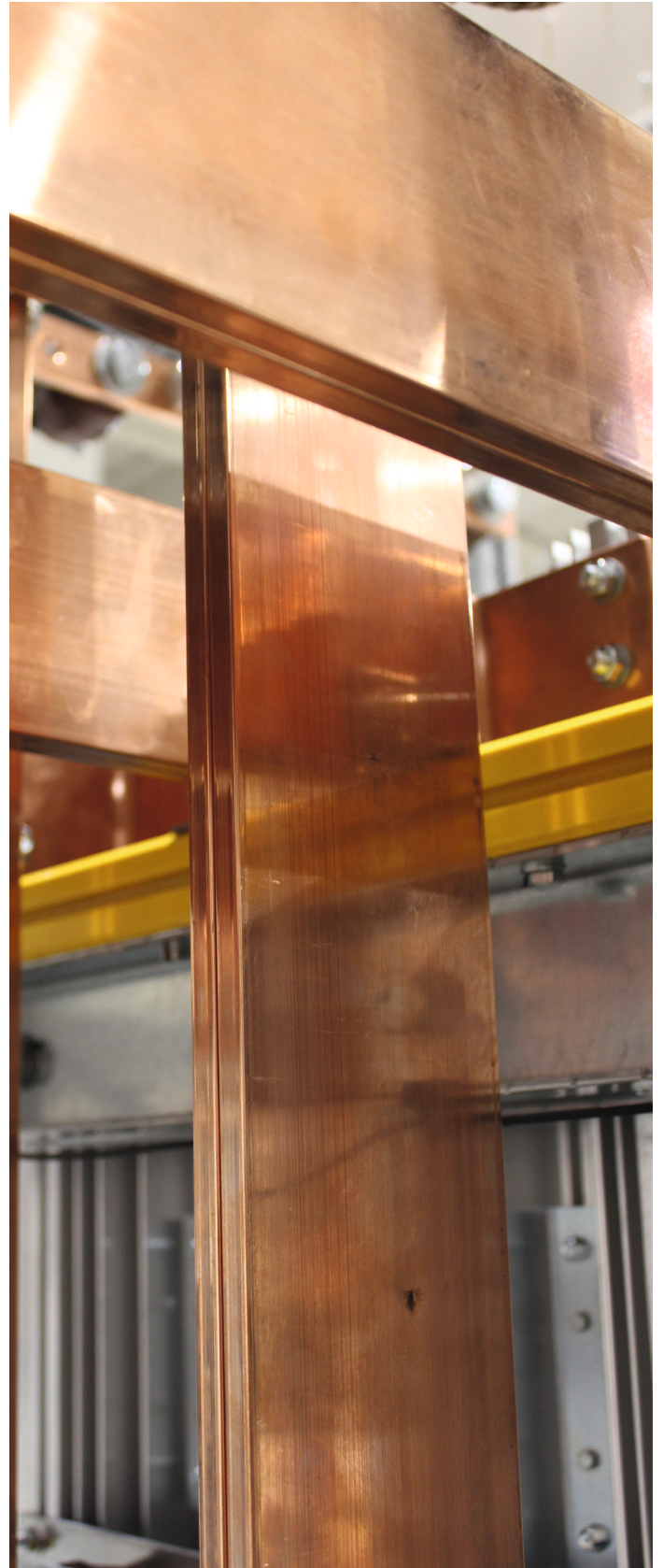
- **More than 95 per cent can be recycled**

In addition to comprehensive resource conservation, the RPS rectifiers offer a very high level of recyclability.

- > 95% fully recyclable - metals (steel, aluminium, copper)
- < 3% thermally recyclable (e.g. insulators)
- < 1.5% recyclable electronic scrap (diodes), capacitors, cables

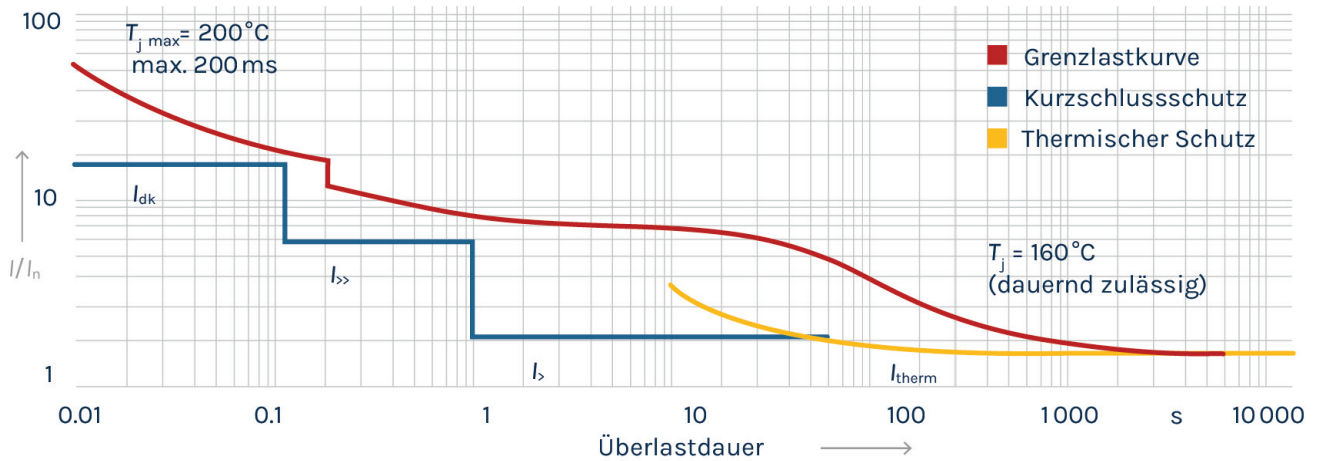


Rectifier damping



AC and DC connections

Limiting current characteristic curve with protection characteristic curve



Overload relative to rated current

The illustration depicts an example of the limiting current characteristic curve (load capacity limits of output current I_D to rated current I_{DB}) for the rectifier, giving due consideration to the in-line transformer and the feeding medium voltage network.

Nominal input voltage

Circuit no.	Transformer circuit on valve side	Valve circuit	p	q	Valve-side power factor I_V/I_d	$\frac{U_{di}}{U_{v0}}$	TracFeed® TRA DC 750 V	TracFeed® TRB DC 1 500 V
8			6	3	0.816 $\sqrt{\frac{2}{3}}$	1.35 $\frac{3\sqrt{2}}{\pi}$	Input: 555 V (U_{di}) Output: 750 V (U_{v0})	Input: 1 111 V (U_{di}) Output: 1 500 V (U_{v0})
9			12	3	0.408 $\frac{1}{\sqrt{6}}$	1.35 $\frac{3\sqrt{2}}{\pi}$	Input: 555 V (U_{di}) Output: 750 V (U_{v0})	Input: 1 111 V (U_{di}) Output: 1 500 V (U_{v0})

TracFeed® TRx-D

Retractable diode rectifier

100% easy maintenance

In addition to the stationary version of the TracFeed® TRx, it is also available as a retractable variant. Its design is based on the innovative concept of the stationary rectifier, but with the unique feature that the PowerUnits are installed on a switchgear truck. This ensures even easier access for maintenance work. It is the same height and the same depth as the stationary rectifier (H: 2,200 mm without ring line and without rain cover, D: 1,350 mm). Despite the switchgear truck integrated in the cubicle, we managed to keep the width down to 1,000 mm with the space-saving design.

Increased safety

The switchgear truck carrying the power module moves behind the sealed door between the service position and the disconnected position. Various optional interlocking possibilities are available to prevent incorrect manual operating actions. Tried-and-tested insertion contacts ensure secure switching from the disconnected position to the service position. The busbar and terminal compartment can be separated by a shutter for even better health and safety.

Potential savings

The disconnected position in the rectifier keeps the positive and negative poles of the rectifier separated from the operational busbar. This integrated separation function means there is no need for an incomer panel in the switchgear assembly. In addition, the overall system's availability can be increased by keeping an additional switchgear truck in stock in case of a fault.

Type-tested design

The retractable version of the rectifier is type-tested for 12-pulse operation and complies with the applicable standards. Thanks to the improved heat sink design and the increased performance of the PowerUnits, reliable and efficient operation is ensured.



3D model of the retractable rectifier with frame, switchgear truck and control compartment

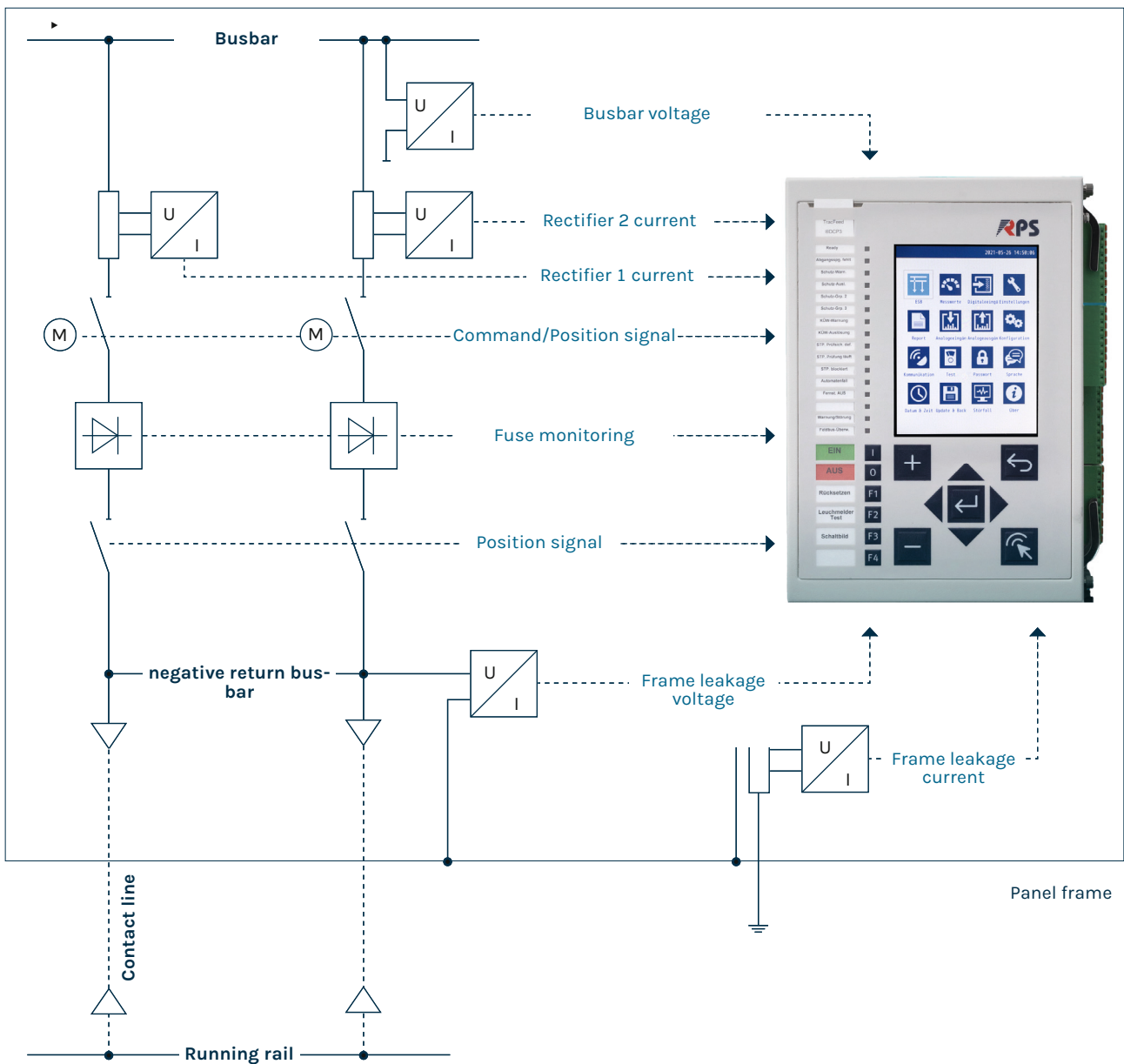
Multifunctional device TracFeed® DCP3 for protection and control in DC switchgear

The TracFeed® DCP3 is used in the third generation of the DCP device series of rectifiers and DC disconnecter panels.

The TracFeed® DCP3 is a powerful system platform that serves as a protection and control device for universal use in the field of DC railway energy supply.

Advantages:

TracFeed® DCP1x6 and TracFeed® DCP2 devices.
Communication as per IEC 61850



Overview of the switchgear in a DC switch disconnector panel



RPS/EN/432/0824

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The specifications set out in this document apply to conventional applications. They do not represent performance limits. This means that divergent specifications may be attained in specific applications. The contractually agreed specifications alone shall apply. We reserve the right to effect technical modifications.

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