

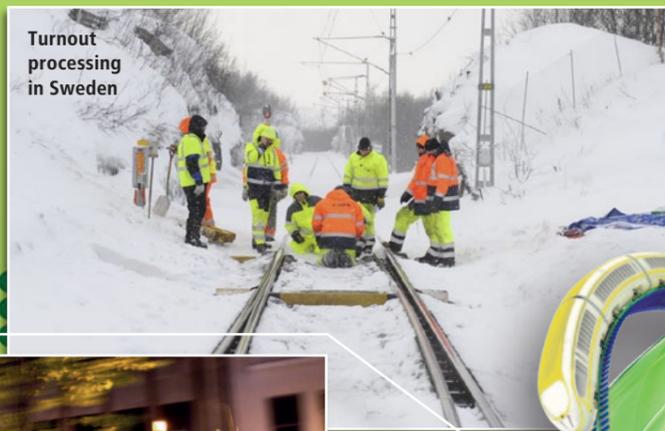


Discover easy maintenance.

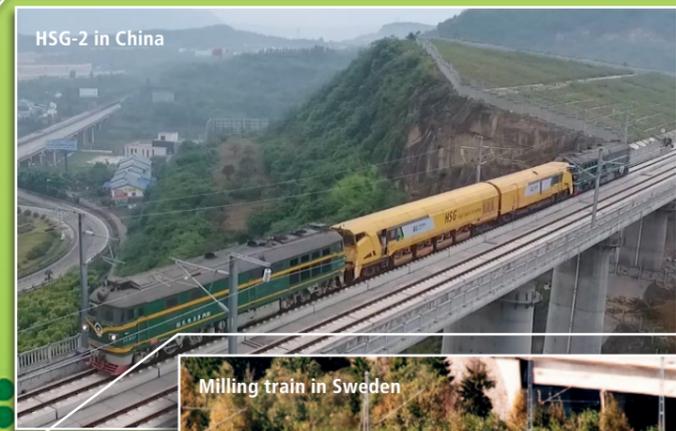
An innovative portfolio that sets new standards.

In demand worldwide!

Rail and turnout maintenance by Vossloh



Turnout processing in Sweden



HSG-2 in China



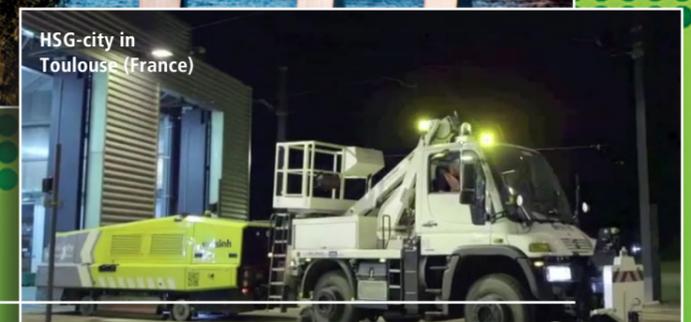
HSG-city in Dusseldorf



Milling train in Sweden



HPM Milling Train in Germany



HSG-city in Toulouse (France)



HSG-city in Berlin



System Flexis in Nuremberg



HSG-2 in the Gotthard tunnel (Switzerland)



HSG-city in Harbin (China)



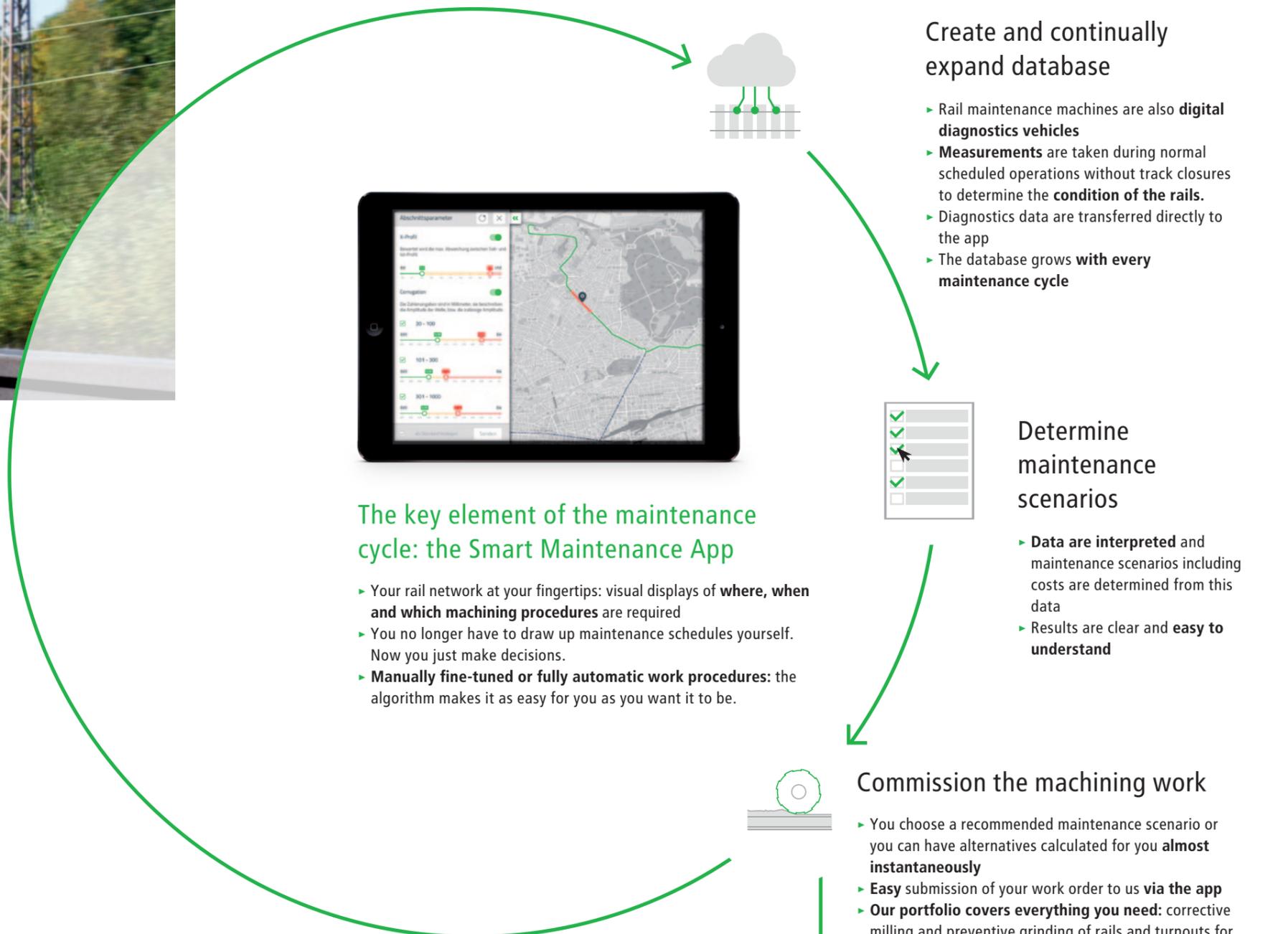
Maintenance is this easy

The right solution for every line

Whether you operate a light rail network, heavy goods freight route or a high-speed passenger line, we offer intelligent and coordinated solutions for the maintenance of your rails and turnouts.

With everything from comprehensive rail status analyses to app-based smart maintenance planning and innovative machines for preventive and corrective rail machining, our technology sets new standards for operating speeds and quality of work.

We make maintenance easy. For safe, durable, quiet rails and turnouts.



Create and continually expand database

- ▶ Rail maintenance machines are also **digital diagnostics vehicles**
- ▶ **Measurements** are taken during normal scheduled operations without track closures to determine the **condition of the rails**.
- ▶ Diagnostics data are transferred directly to the app
- ▶ The database grows **with every maintenance cycle**

The key element of the maintenance cycle: the Smart Maintenance App

- ▶ Your rail network at your fingertips: visual displays of **where, when and which machining procedures** are required
- ▶ You no longer have to draw up maintenance schedules yourself. Now you just make decisions.
- ▶ **Manually fine-tuned or fully automatic work procedures:** the algorithm makes it as easy for you as you want it to be.

Determine maintenance scenarios

- ▶ **Data are interpreted** and maintenance scenarios including costs are determined from this data
- ▶ Results are clear and **easy to understand**

Commission the machining work

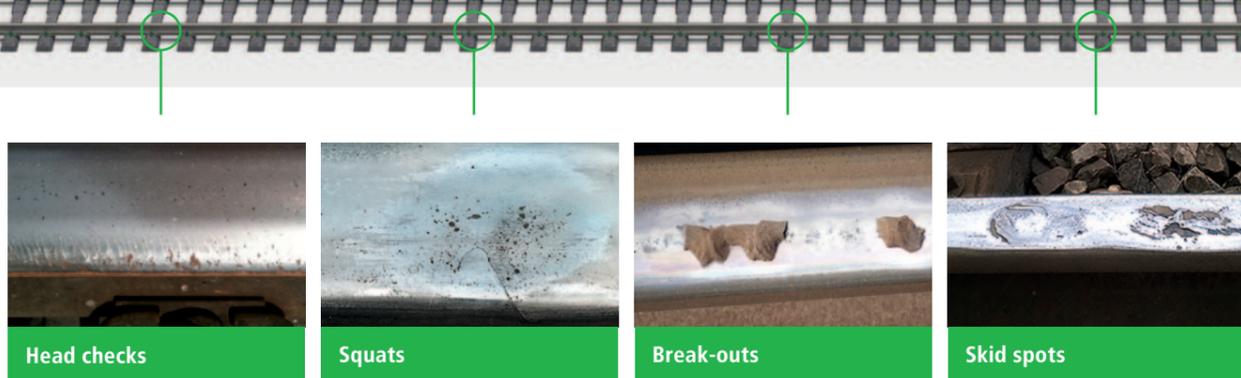
- ▶ You choose a recommended maintenance scenario or you can have alternatives calculated for you **almost instantaneously**
- ▶ **Easy** submission of your work order to us **via the app**
- ▶ **Our portfolio covers everything you need:** corrective milling and preventive grinding of rails and turnouts for both mainline track and light rail networks.

Our fleet:



The perfect strategy for all types of rail defects

We create the best possible combination of corrective and preventive methods to increase the availability of your lines and significantly reduce life cycle costs.



Head checks are minute cracks caused by rolling contact fatigue. They can propagate deeper into the rail's interior and ultimately cause rail material to break away.

Squats are depressions with a V-shaped or semicircular crack that opens towards the running edge. They can be caused by lateral compression of the metal, pre-existing damage or grinding errors.

Break-outs are symptomatic of advanced-stage or untreated rail damage, e.g. head checks where the material is so badly damaged that pieces break out.

Skid spots are instances of localized hardening of the rail material that result from friction between the rails and the spinning wheels of accelerating traction vehicles.

Corrective milling – You've never seen rail damage removed this fast before.

Rail condition and depth of defect permitting, the Linsinger-built rail-milling machine and the road-rail milling truck can machine the entire profile in a single pass. We also provide two innovative machines – high performance milling (HPM) and multi-purpose milling (MPM) – for correcting aggravated rail defects. The plant's advanced machining precision and efficiency allow us to reprofile track in a single sweep and achieve almost as-new results.

- ▶ World's cleanest procedure: dust-free, spark-free
- ▶ Effective correction of rail defects
- ▶ Extends life span of rails



Rail-milling train



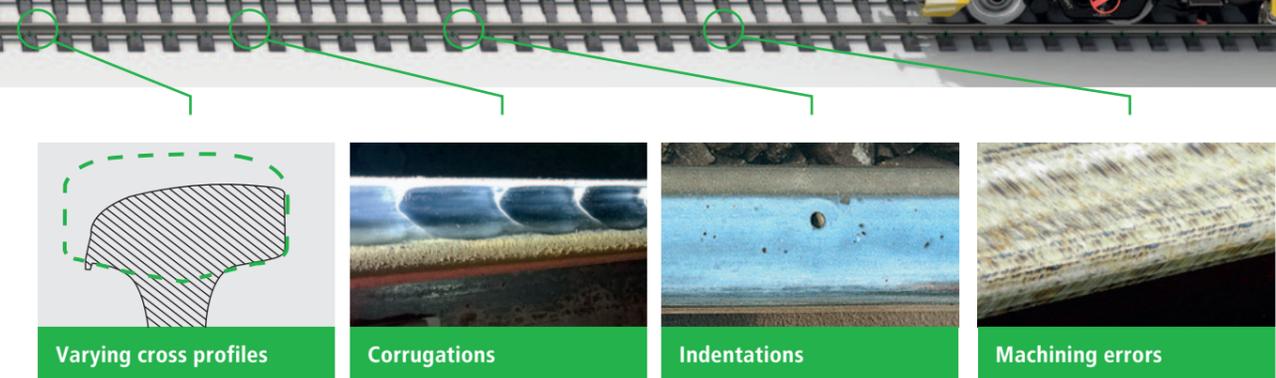
Road-rail milling truck



MPM



HPM



Varying cross profiles are caused by wear. They impair the wheel-rail contact and prevent vehicles from running smoothly.

Corrugations include short and long pitch corrugations, slip waves and cross-profile defects caused by wheel-rail contact, especially in bends. Also caused by incorrect machining.

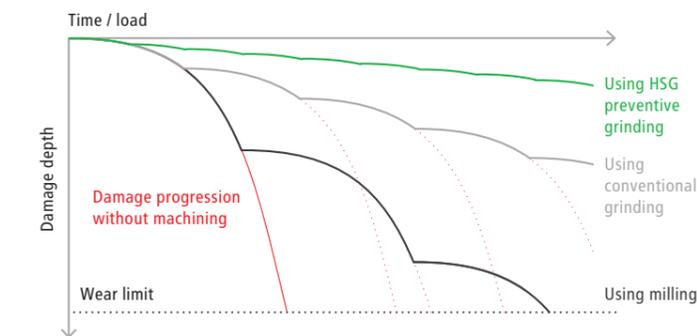
Indentations result from hard foreign objects on the rail or in the wheel being run over. They can initiate cracking.

Machining errors such as bluing of the metal result from grinding "aggressively" by using actively-driven grinding stones at increased grinding pressures and rotation speeds.

Preventive grinding – You've never been so sure that you'll never see rail damage again.

With High Speed Grinding (HSG), we have developed a unique preventive and acoustic grinding procedure that can be carried out during scheduled railway operations and without track closures. Our HSG-2 train and the HSG-city machine are equipped with special, passively-driven grinding stones that rotate with the vehicle's forward motion. Rail defects are thus prevented before they can even form.

- ▶ Fastest method worldwide: grinds without track closures
- ▶ Effective prevention of rail damage
- ▶ Extends the rail's service life by up to 100 %
- ▶ Reduces rail noise by up to 10 decibels



HSG-2



HSG-city



Flexis System

High Speed Grinding inside the timetable



QUICK. SMART. SOLID.

HSG-2 Top Features

-  Standard gauge mainline
-  80 km/h operating speed
-  No track closures
-  60 km Non-stop grinding
-  +100% Rail life extended by up to 100 %
-  Reduces noise by 3 to 10 decibels

HSG-2 Preventive rail maintenance for mainline tracks

Specially designed for use on mainline rail routes, High Speed Grinding (HSG) doesn't just remove minor and median rail defects; it prevents new defects from forming and extends the rail's service life by up to 100%. Thanks to high operating speeds of up to 80 km/h, the HSG-2 is extremely flexible and can be scheduled to slot into any timetable without any track closures or track preparations whatsoever. The HSG-2's revolutionary technology allows up to 60 km of track to be ground non-stop. It produces virtually no sparks or dust during the operation and effectively reduces the noise emitted by rail traffic by 3 to 10 decibels.

HSG-2 Facts

- ▶ Grinding wheels: 96 in use at any one time
- ▶ Operating speed: 60 – 80 km/h
- ▶ Transit speed: up to 120 km/h
- ▶ Output per shift: up to 250 km
- ▶ Rail roughness: $Ra \leq 10 \mu m$
- ▶ Suitable for use in tunnels
- ▶ Process parameter documentation
- ▶ Removal of corrugations and slip waves
- ▶ Recommended for machining "Specially Monitored Tracks", e.g. in residential areas
- ▶ Officially recommended by the Chinese ministry responsible for the maintenance of high-speed rail lines

HSG-city grinding machine Preventive rail maintenance on short-haul routes

HSG-city is currently the fastest light-rail and short-haul grinding machine on the market. With variable operating speeds of between 8 and 60 km/h, it can be scheduled to fit in with any timetable and requires no track closures or preparation work at all. High Speed Grinding (HSG) doesn't just remove minor and medium rail damage and reliably prevent new defects from forming; it also effectively reduces noise emissions produced by rail traffic by up to 10 decibels. The machine itself is also comparatively quiet, which significantly reduces disruptions for nearby residents when machining work is being carried out. The HSG-city's compact shape means it works well in tunnels and is compatible with any clearance gauge. The machine is ideal for many kinds of traction vehicles as it can be used when travelling forwards or backwards.

HSG-city Facts

- ▶ Grinding wheels: 24 in use at any one time
- ▶ Operating speed: 8–60 km/h
- ▶ Non-stop grinding: 30 km
- ▶ Rail roughness: $Ra \leq 10 \mu m$
- ▶ Suitable for use in tunnels
- ▶ Process parameter documentation
- ▶ HSG-city controlled remotely from traction vehicle
- ▶ External traction, pulled or pushed, thanks to low design height
- ▶ Works in either direction
- ▶ Fits inside any structure gauge (including London Tube or "Berlin klein")

HSG-city Top Features

-  Light rail and short-haul
-  60 km/h Operating speeds of up to 60 km/h
-  No track closures
-  Suitable for tunnels
-  +100% Rail life extended by up to 100 %
-  Reduces noise by up to 10 dB



FAST. FLEXIBLE. QUIET.

Milling: remove deep rail damage



Milling train Top Features

- 
Standard-gauge mainline
- 
Exact reprofiling
- 
No dust and no sparks
- 
High removal rate possible per pass
- 
Reduces noise

Rail-milling train SF03 W-FFS

Complete machining of profile in a single pass

Rail condition and depth of defect permitting, this Linsinger-built rail-milling machine can machine the entire profile in a single pass. The train can be configured on a modular basis and is also ideal for high-speed sections of a rail network. As well as correcting rail-head defects in cross and longitudinal profiles, adjusting track lines and modifying rail profiles, the rail-milling train minimises wear and tear and reduces noise levels in sensitive areas. The integrated grinding technology also fine-grinds the rail and in so doing further extends the rail's service life. Realignment is also possible. Due to the low levels of dust and sparks produced the SF03 W-FFS is very environmentally friendly.

Rail-milling train Facts

- ▶ Number of passes: 1
- ▶ Feed rate: 7-20 m/min
- ▶ Machining depth on the running surface: 0.3–1.8 mm
- ▶ Machining depth on the gauge corner: max. 5 mm
- ▶ Cross profile tolerance: ± 0.3 mm
- ▶ Longitudinal profile tolerance: up to ± 0.01 mm
- ▶ Rail profile: As per customer specifications
- ▶ Weight incl. fuel and swarf: max. 120 t
- ▶ Max. speed (self-propelled & towed): 100 km/h
- ▶ Noise level: < 78 dB (A)
- ▶ Roughness: 3–5 μm

HPM Top Features

- 
Standard-gauge mainline
- 
Exact reprofiling
- 
No dust and no sparks
- 
Operating speeds of up to 2 km/h
- 
High removal rate possible per pass

HPM milling train

Reprofiles badly damaged rails

High-caliber performance on light-rail lines, heavy goods freight lines and high-speed passenger lines thanks to the most advanced technology available. HPM is effective at removing even the most severe defects from the rail head's cross-sectional and longitudinal profiles, as well as deformations and damage caused by material fatigue. At 1,400 mm in diameter, the milling wheel is more than twice the size of a standard milling wheel, which ensures less residual ripple after machining, a very high-quality surface, faster operating speeds and a higher material removal rate. A single pass reprofiles the rail and then gives it an exact finish that reinstates the rail to near-new condition. The innovative face-milling technology for the finishing produces neither dust nor sparks, which, when combined with its efficient extraction system, makes HPM milling practically emission-free.

HPM Facts

- ▶ Max. material removal per pass:
 - on the running surface: up to 3 mm
 - on the running edge: up to 9 mm
- ▶ Max. feed rate / operating speed:
 - to remove 0.5 mm: 2,000 m/h
 - to remove 1.0 mm: 1,200 – 1,500 m/h
- ▶ Roughness Ra: ≤ 6 μm
- ▶ Bunker capacity: 14 m³ (sufficient for up to 2 shifts)
- ▶ Fire hazard: none
- ▶ Suitable for use in tunnels: yes (no dust and no sparks)
- ▶ Energy concept: diesel-electric
- ▶ Diameter of the main milling wheel: 1,400 mm
- ▶ Number of main milling wheels: 1
- ▶ Finishing system: face milling
- ▶ Service life of cutters: 5,000 m on average
- ▶ Change profiles during machining procedure: possible
- ▶ Tool changing: semi-automatic from inside the machine
- ▶ Preparation/removal of rail switching equipment: not required
- ▶ Optional installation of integrated measuring systems: yes
- ▶ Loading gauge: W6a (English gauge)

- MPM**
Top Features
-  Standard-gauge mainline
 -  Light rail and short-haul
 -  Exact reprofiling
 -  No dust and no sparks
 -  Flexible deployment
 -  Suitable for tunnels
 -  Turnouts and rails



Rail-milling truck SF02 W-FS

Transport lorry and milling machine in one

This Linsinger-built SF02 W-FS rail-milling truck is extremely versatile as it can be used on roads. High degree of mobility, easy to mount and dismount from track, very short set-up times: the convenient road-rail design simplifies logistics, making the milling truck the perfect solution for tram-track assignments and small jobs within larger projects. Track switching equipment is not required. Rail condition and depth of defect permitting, the SF02 W-FS can machine the entire profile in a single pass. As well as correcting rail-head defects in cross and longitudinal profiles the truck also reduces noise levels in sensitive areas. Adjustments to track gauge can be made at any time. The integrated grinding technology also fine-grinds the rail and in so doing further extends the rail's service life. Realignments and point adjustments are also possible. Due to the low levels of dust and sparks produced the SF02 W-FS is very environmentally friendly.

- Rail-milling truck Facts**
- ▶ Minimum number of passes: 1
 - ▶ Feed rate: 6–15 m/min
 - ▶ Machining depth on the running surface: 0.3–0.9 mm
 - ▶ Machining depth on the gauge corner: max. 5 mm
 - ▶ Adjustable track gauge
 - ▶ Cross profile tolerance: ± 0.3 mm
 - ▶ Longitudinal profile tolerance: up to ± 0.01 mm
 - ▶ Rail profile: As per customer specifications
 - ▶ Points adjustment possible
 - ▶ Transportation speed (by rail): 45 km/h
 - ▶ Transportation speed (by road): 80 km/h
 - ▶ Noise level: < 80 dB (A)
 - ▶ Roughness: 3–5 μm

- Milling truck Top Features**
-  Standard-gauge mainline
 -  Light rail and short-haul
 -  Exact reprofiling
 -  No dust and no sparks
 -  High removal rate possible per pass

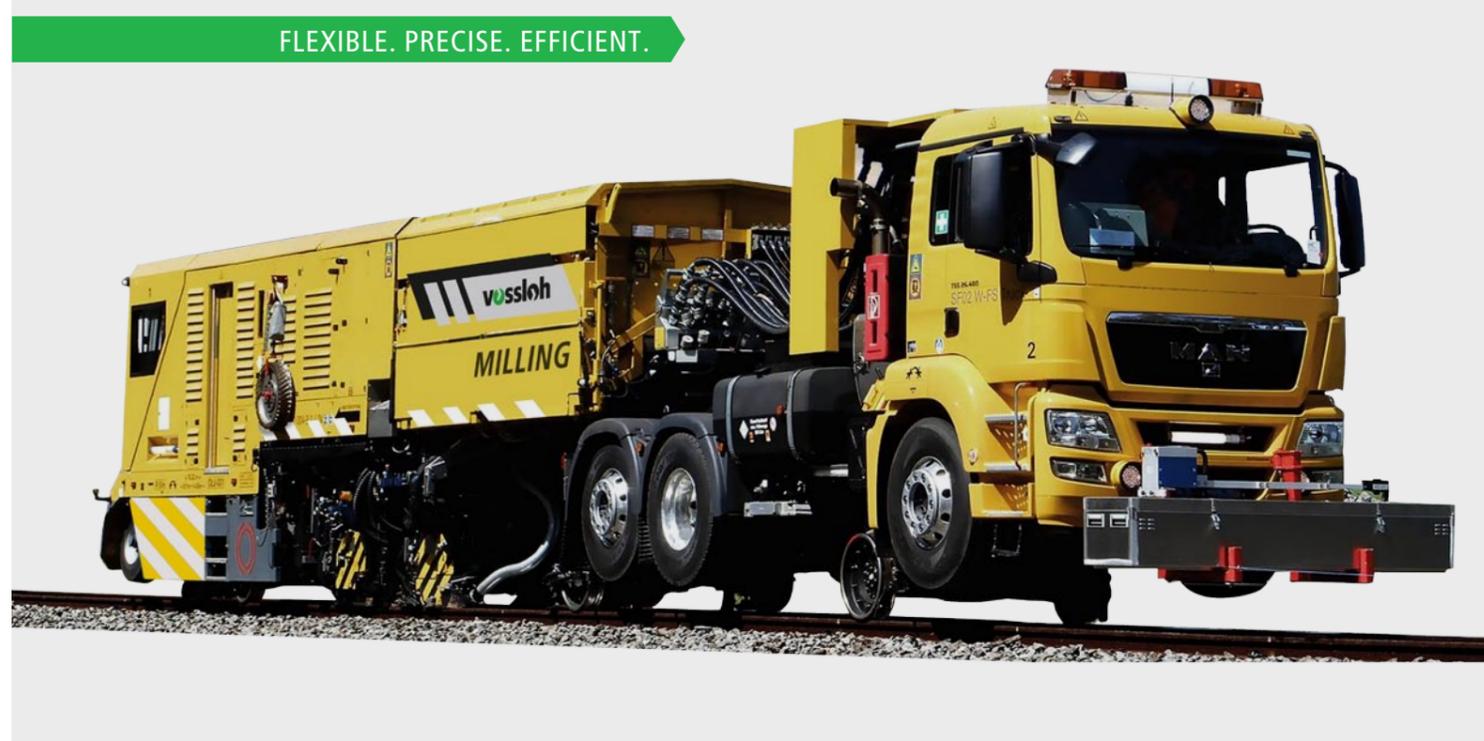
MPM milling machine

Reprofiles rails and turnouts on short-haul routes and in tight spaces

Small and flexible, the Multi Purpose Milling Machine (MPM) was designed to rectify serious damage to rail and turnout hotspots in commuter and urban transit systems, and especially in tunnels. Highly efficient, MPM removes as much as 2 mm of material per machining run. The machine's compact size and light weight make it compatible with virtually every structure clearance

gauge and also easy to transport. It fits into a standard container (TEU-compatible) and can be towed to a deployment location on a flat wagon or delivered there by truck. The MPM can operate on either ballasted or slab tracks and on either Vignole or grooved rails, and can be adjusted for use on all of the common track gauges.

- MPM Facts**
- ▶ Adjustable wheel gauge: 1000 – 1668 mm
 - ▶ Suitable for use in tunnels: yes (no dust, sparks or exhaust fumes)
 - ▶ Milling wheel diameter: 360 mm
 - ▶ Tool change: manual
 - ▶ Max. material removed per pass: 2 mm
 - ▶ Preparation / removal of trackside equipment: not required
 - ▶ Operating speed: approx. 180 m/h, max. 270 m/h
 -
 - ▶ Fire risk: none



Flexis System

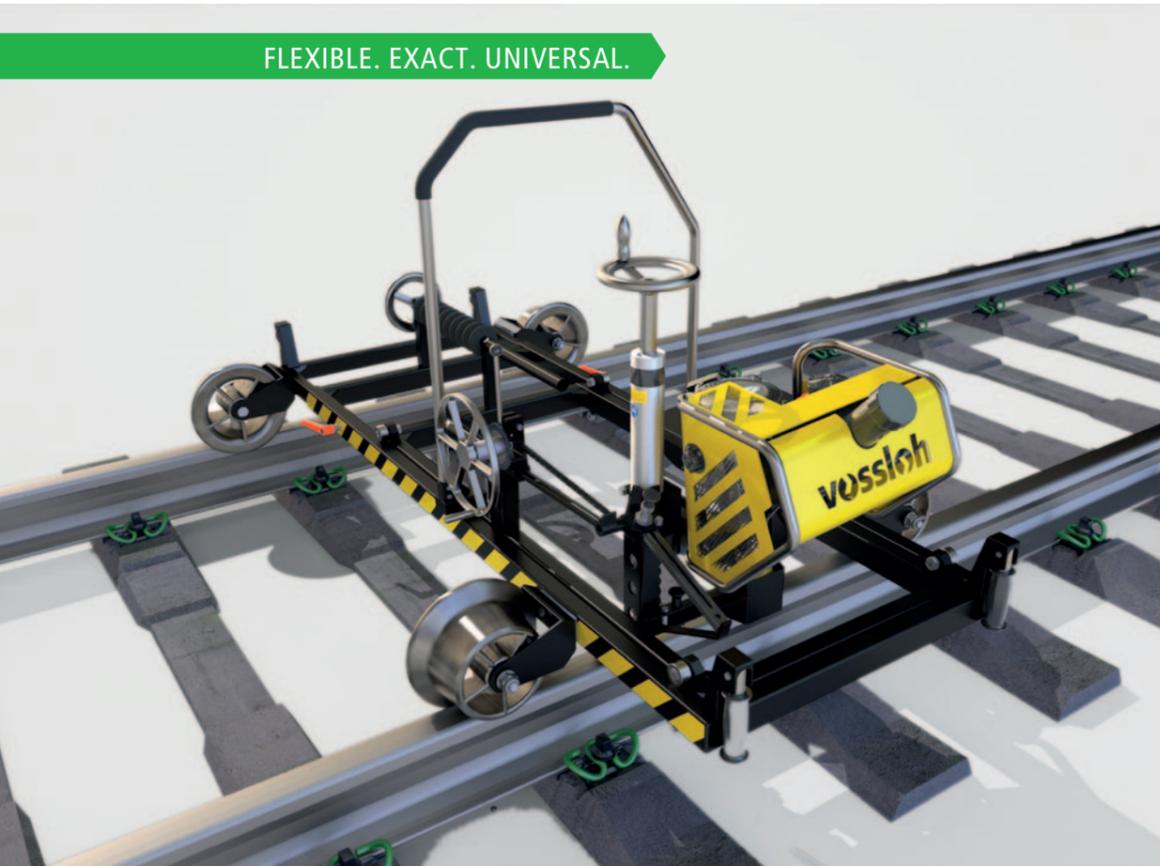
The easy maintenance system for turnouts

Turnouts are a central component of a rail network. Heavy loads and heavy traffic cause wear and rail defects such as skid spots, head checks and corrugations. In order to avoid expensive rail replacements and reduce the risk of operational failure, we have developed the Flexis System for preventive maintenance. A turnout's condition is carefully analyzed before machining begins in order to determine how much material to remove. The grinding work is then done in a series of work steps. The Flexis System is compatible with all international track gauges (light rail and mainline) and excels thanks to its short track possession times, flexible handling and precise surface machining. No preparation work is necessary and turnouts and rails can be vacated in a matter of minutes, which allows machining to be done without disrupting the timetable.

Flexis Facts

- ▶ Additional measuring technology: material removal, longitudinal profile, cross-sectional profile and eddy current
- ▶ Track gauge: 990 mm up to 1,550 mm
- ▶ Material removal from preventive to corrective (up to 1.5 mm)
- ▶ Average machining time: 4 hours for a turnout with a radius of up to 760 mm
- ▶ Weld-based removal of isolated defects
- ▶ Grinds the entire area requiring machining
- ▶ Grinds of break-outs in point blades

FLEXIBLE. EXACT. UNIVERSAL.



Flexis Top Features



Universally deployable



Exact machining



Flexible deployment



Machines the entire turnout



Can also be used during short track possessions (fast off-railing)

vossloh

Discover easy maintenance

One portfolio for all your needs

	Main line	UTS	Track	Turnout	Removal rate	Speed	Type	Flexible gauge
HSG-2	✓		✓	(✓)	0.035 mm	80 km/h	Preventive	
HSG-city		✓	✓	(✓)	0.01 mm	60 km/h	Preventive	
HPM	✓		✓		0.5–3 mm	up to 2 km/h	Corrective	
SF03 (plus)	✓		✓		0.5–2 mm	up to 800 m/h	Corrective	
SF02	✓	✓	✓	✓	0.3–0.9 mm	up to 500 m/h	Corrective	(✓)
MPM	✓	✓	✓	✓	0.5–2 mm	up to 300 m/h	Corrective	✓
System Flexis	✓	✓	✓	✓	up to 0.3 mm	4 hours for turnouts up to 760 mm radius	Corrective and preventive	✓





Our machines and services are used by the operators of very different rail networks all around the world. From machining high-speed lines in Germany and China to the urban light rail networks of many European cities and preventive rail grinding in the Gotthard Tunnel – our customers put their trust in our expertise and ingenuity.

We would be delighted to discuss your needs and explain what we can do for you. **Simply contact us:**

Tel. +49 40 430931-0
info.ls@vossloh.com
www.vossloh.com