ELPA

WONROS tm technology

SOLUTIONS FOR

REDUCTION OF RAIL FRICTION

NOISE, WEAR & VIBRATIONS

OF RAILS IN CURVES & BEFORE RAILWAY STATIONS

ISO 9001
ISO 14001
BUREAU VERITAS
Certification

TÜV SÜD Rail

RAIL CERT

CL-E1

Catalogue version: 2024-I-ENG

Language: English

ABOUT CL-E1

CL-E1 device reduces RFN (rail friction noise) on sharp radius curves and wear caused by friction between a rail and a wheel. Depending on the needs and requirements of the market, different device configurations in different applications are at disposal. The device can apply CHFC material through boreholes or with blades. The boreholes are made into the rail head (patented and certified method), what enables dosing of the material onto the precisely defined point on the rail head.

BENEFITS

- Stable and reliable operation.
- Filling the reservoir every few months.
- Outstanding RFN (rail friction noise) reduction.
- Highly effective protection against wear.
- Reduction of rails and wheels life-cycle cost (LCC) at supplied area.
- Stable and constant dosing of CHFC material regardless of the weather conditions.
- Usage of the same material throughout the year.
- No clogging of the dosing points.
- Adhesion and traction are maintained.
- No effect on the electric conductivity.

RESULTS

- Decrease of rail friction noise up to 30 dBA (99.9%) with usage of CHFC material.
- Wear is reduced for more than 3.3 times which proportionally reduces the maintenance costs.
- Same CHFC material can be used for gauge and top of rail.
- Less vibrations – smoother ride of rail vehicles.
- Reduction of GCC – Gauge Corner Cracking.
- Reduction of RCF – Rolling Contact Fatigue.
- Reduction of rail corrugation – sinus line.

MAINTENANCE

- Stable and reliable device operation – minimum maintenance required.
- Checking / servicing of the device once / twice per year.
- Filling the reservoir with the CHFC material every few months.
- Set up of dosing can be adjusted manually or electronically (or for separate dosing field or / and per each dosing point).

INSTALLATION OPTIONS

■ Wayside or underground installation.
■ Fixed or mobile concrete foundation.
■ Compatible for the installation on all types of vignole or grooved rails.
■ Compatible for the installation in all kinds of the environment

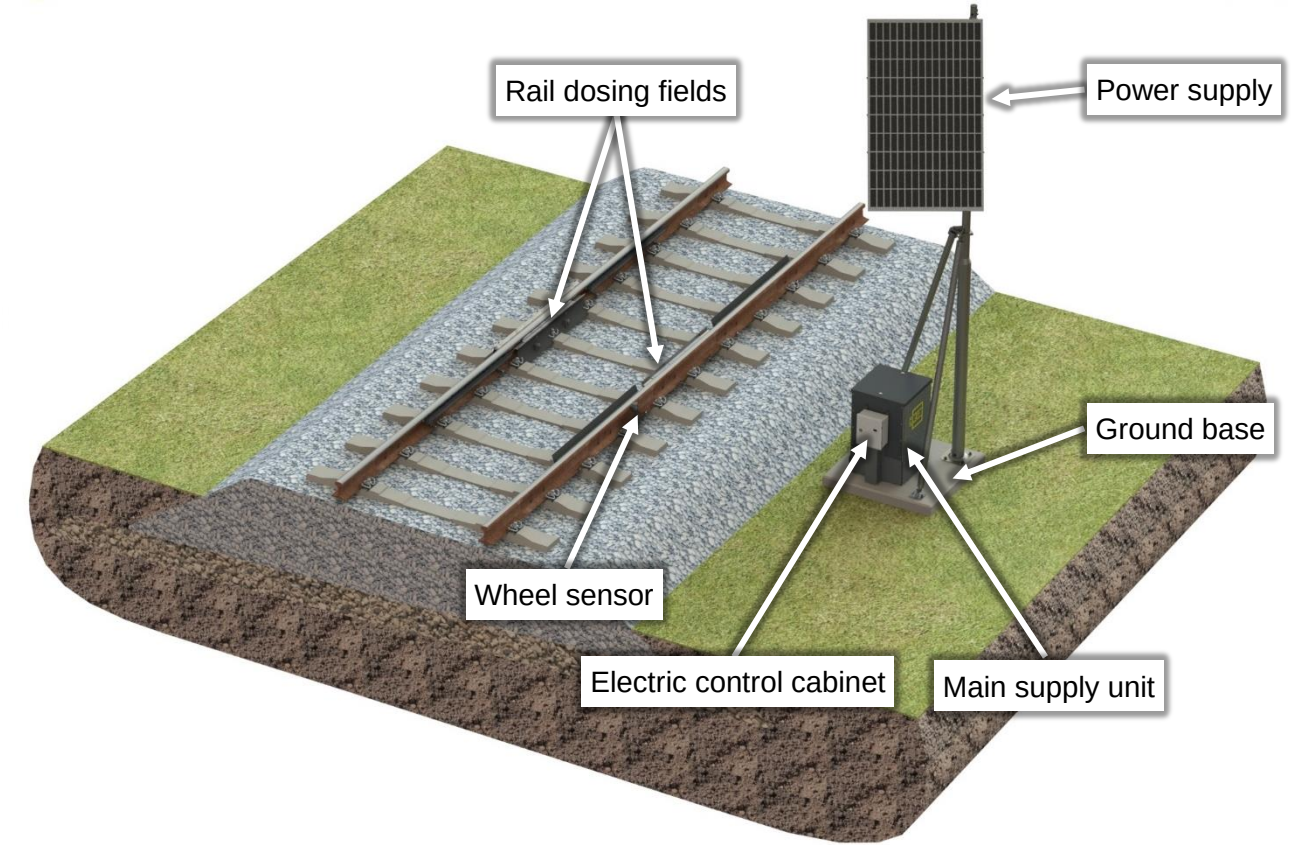
CHFC MATERIAL

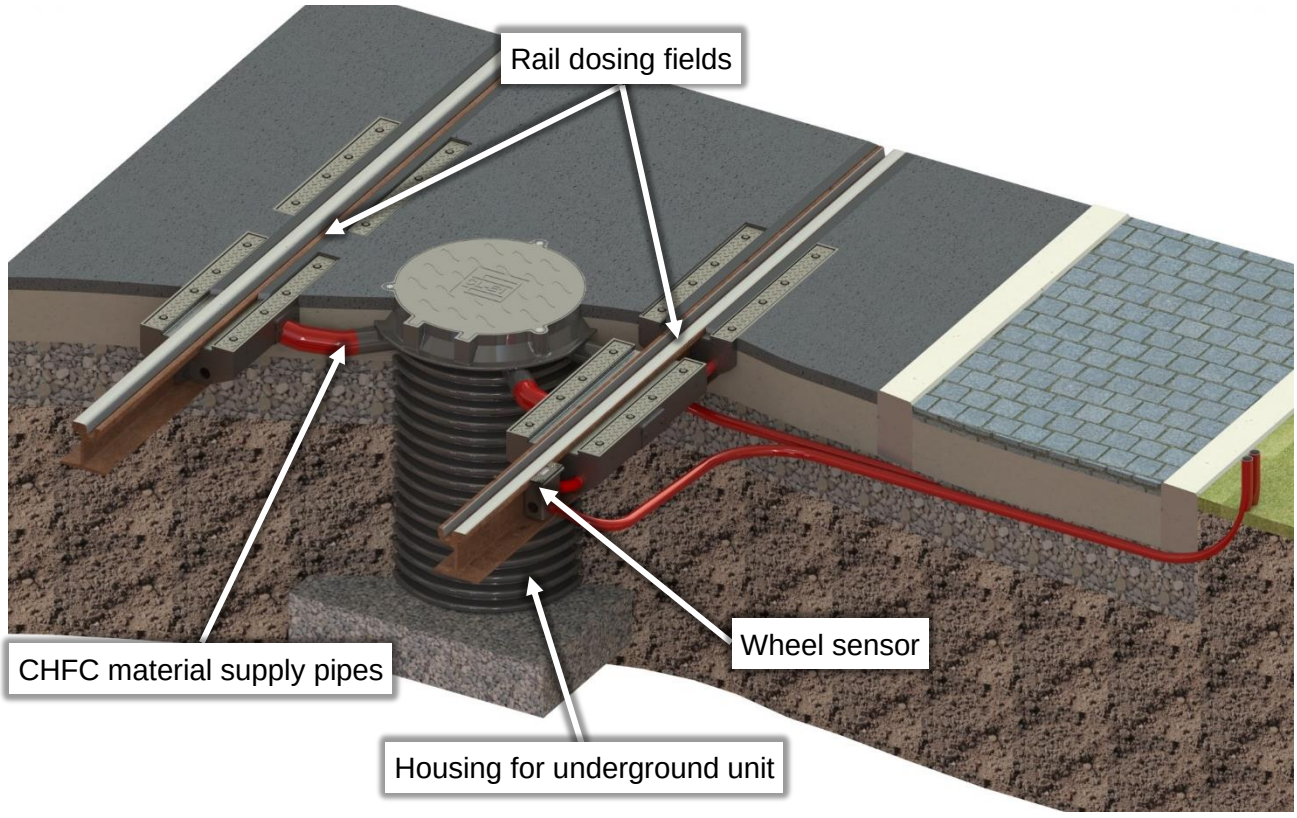
■ Contains more than 40% of solid particles.
■ Can be used for gauge and top of rail.
■ Capable of taking over extremely high-pressure loads.
■ Low consumption (microfilm of material needed).
■ Without bio accumulative heavy metals.
■ Not slippery – safe operation.
■ Environmentally friendly.
■ Biodegradable base.
■ Without solvents.
■ Non-corrosive.

POWER SUPPLY SOLUTIONS

■ Electro – from electrical power grid (230 VAC)
■ Solar – from solar panel (24 VDC)
■ Convertor – from railway power grid (600, 900… VDC)
■ Special - Mechanical drive unit LIMbo (0 V)

Example of wayside and underground device assembly





MAIN SUPPLY UNIT (MSU)

Main supply unit stores the CHFC material in reservoir and distributes it through dosing module and via pumping elements through CHFC material supply pipes to the rail dosing fields modules.

Main supply unit consists of:
- Housing
- Reservoir
- Pumping module
- Dosing elements
- Drive for pumping module and stirrer
- Stirrer
- Lid for filling opening
- Electric control cabinet
- Control module ERC-RG

Reservoir capacity: 20 – 70 L (25 – 90 kg)
Dosing elements: 2 – 8
Dosing modules: 1 - 4

CL-E1ws BA (70 L)

CL-E1ws inox (20 L)

CL-E1ws BA »PES« (63 L)

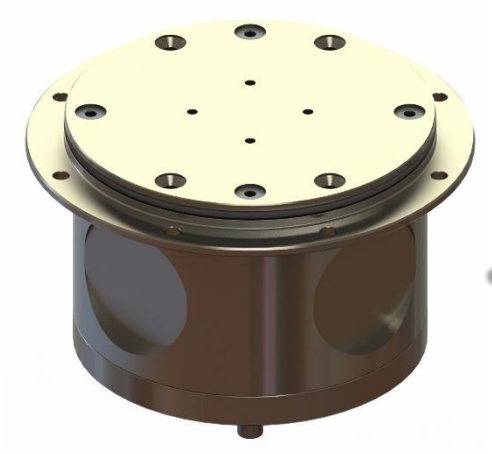
CL-E1ws inox »slim« (46 L)

CL-E1ug (60 L) + installation housing

Main supply unit can be installed above ground or underground. Underground main supply unit is waterthight to prevent leakage of water inside the reservoir or pumping modules with drive.

Standard pumping modules and dosing elements

Type	***BA-2***	***BA-4***	***BA-6***
Number of dosing elements	2	4	6
Type of dosing elements	BA	BA	BA
Labels of dosing elements	*BA = Big dosing element*		



Pumping module (example)

Dosing element (example)

Number of pumping modules per device

Type	*Single*	*Double*	*Triple*	*Quadruple*
Number of pumping modules	1	2	3	4
Version	Standard		Special	

Reservoir volumes

Type	*315-360*	*315-740*	*400-600*	*500-450*
Volume (L)	20	46	63	70
Mass volume (kg)	25	58	80	90
Dimensions DxH (mm)	fi315 x 365	fi315 x 740	fi 400 x 600	fi 500 x 450
Note: Mass volume is defined based on the CHFC material average specific mass 1.25 kg/dm^3				

Housing types

Type	*CL-E1ws BA*	*CL-E1ws BA "PES"*	*CL-E1ws Inox*	*CL-E1ws Inox "slim"*	*CL-E1ug BA*
Dimensions LxWxH (mm)	546 x 546 x 874	640 x 780 x 1135	353 x 356 x 702	353 x 356 x 1081	fi560 x 892
Material	Powder coated steel	Polyester	Stainles steel	Stainles steel	Polyethylene

RAIL DOSING UNIT

This is an auxiliary (optional) unit for distribution of the material when the distance from the main supply unit is more than 10m or when the main supply unit supplies the material to more than one track (for example CL-E1 "Double" type).

Standard RDU unit dimensions are 320x230x200 mm. It has it own small reservoir for the material and pumping module with dosing elements. It is installed above ground or ungerground (like Main supply unit).

INSTALLATION OPTIONS OF MSU

Installation of main supply unit depends on the type of terrain, configuration of the device and users demands (limitations). Different sollutions of main supply unit installation options are available to cover all kinds of situations.

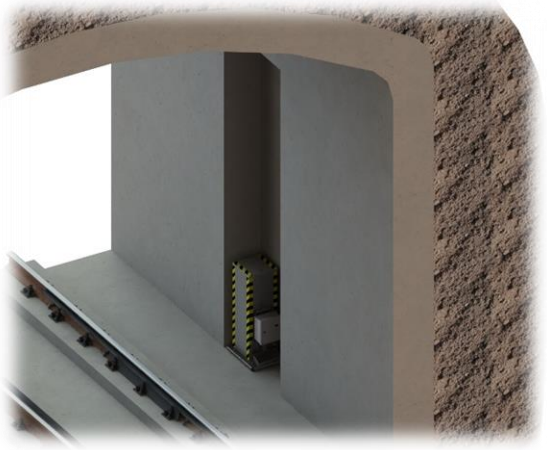
Main supply unit on mobile concrete foundation

Main supply unit in underground shaft

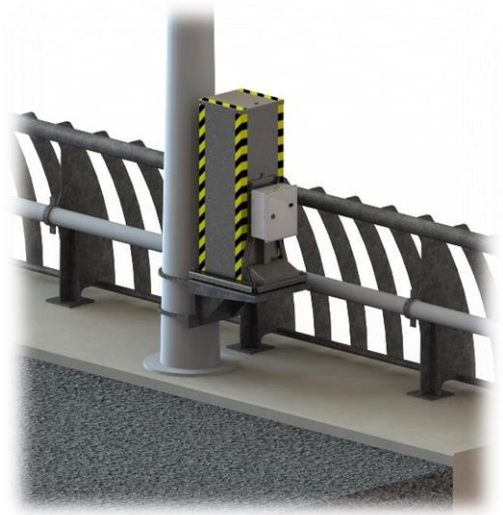
Main supply unit on fixed concrete foundation (together with solar set)

Main supply unit in tunnel under the pathway

Main supply unit in tunnel niche



Main supply unit (inox) on power grid pillar (lifted from the ground)



Main supply unit (inox »slim«) on power grid pillar (lifted from the ground)

ELECTRIC CONTROL CABINET

Electric control cabinet with ERC-RG control module operates the main supply unit and its modules (drive units, sensors…). Control module's programme enables settings of various parameters for the desired effects depending on the input conditions and user's demands.

When remote control is included in the device configuration ERC-RG20 type of control module is integrated in the device. The device works via GSM modem, logging in and / or printouts and /or notifications are possible via email or GSM phone number.

The device has multi-level use with assigned rights for each level (viewing only, changing certain setting parameters, changing all setting parameters, changing the program, all rights); the rights are granted to the user according to the contractual commitment and according to the level of achieved education (general user, trained user, certified user, authorized servicer).

Statistics:
- Number of axles traveled over the dosing field
- Number of shutdowns and turn ons of the device
- Updates or changes of program parameters
- Data on material consumption
- Number of resetments
- Historical data display
- Error display

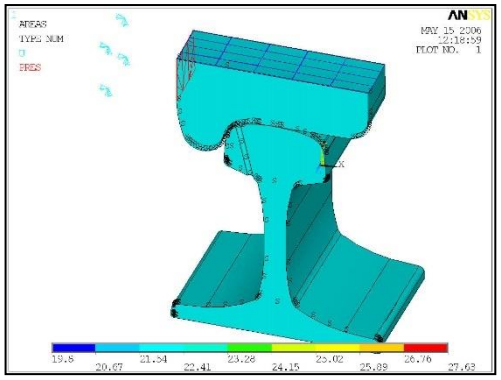
Error reports:
- Malfunction of motors
- Malfunction of sensors
- Signaling of the material minimum
- Signaling of blockage of the device

RAIL DOSING FIELD

Rail dosing field modules apply the CHFC material on selected rail surfaces:

- **Rail edge surface (Qr)**
- **Outer edge of the running surface (TOR)**
- **Check rail (on grooved rail)**
- **Rail wheel flank (on back side of the flange) for guard rail**

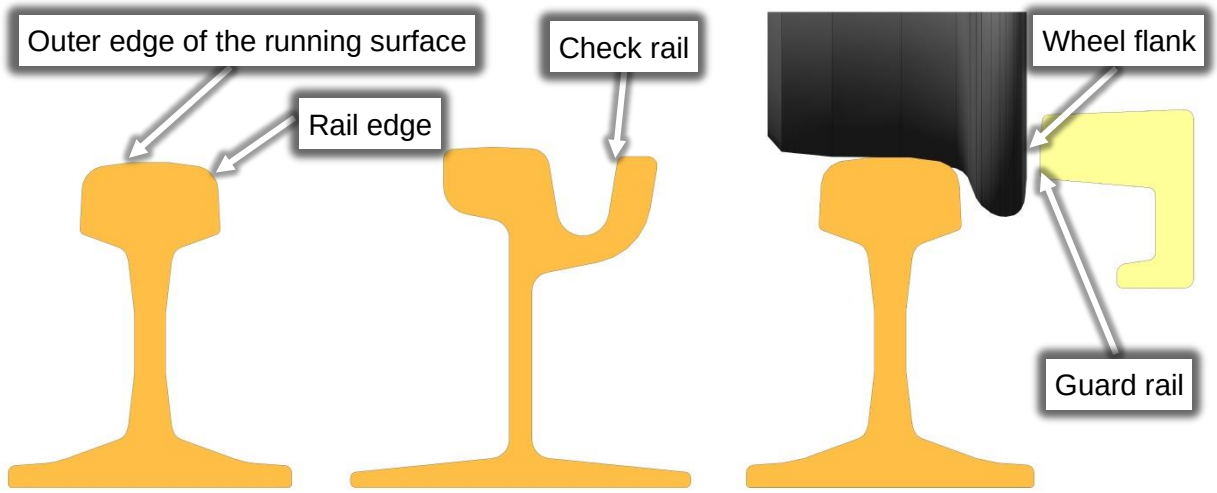
Different versions of the modules allow material supply of all types of rails (vignole, grooved, check rails) and on frog and switch rails at turnouts. On vignole rails the material is supplied throug boreholes in rails or with blades (without boreholes in rails). On grooved rails the material is always supplied through boreholes in rails.



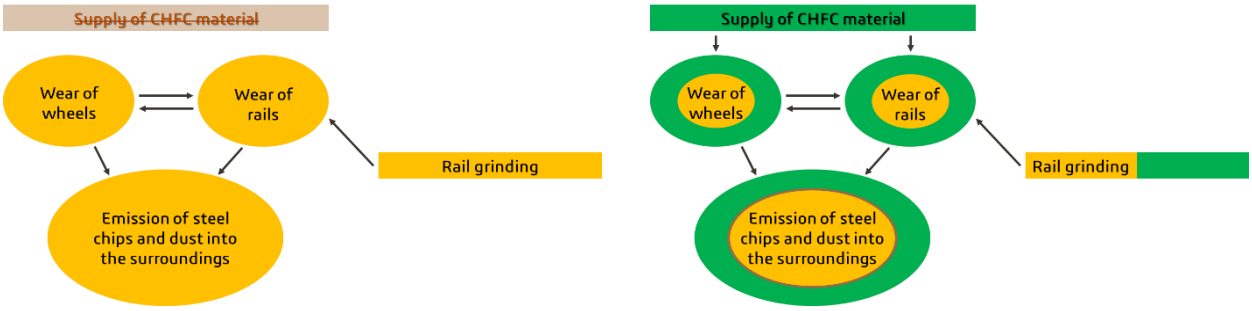
CHFC material can be supplied to rail surfaces through patented and verified method in use over 25 years.

This method enables dosing onto the precisely defined rail surfaces. It enables selective dosing on Qr (reducton of wear) or / and rail head TOP/TOR (reduction rail friction noise).

This is the most economical consumption of CHFC material.



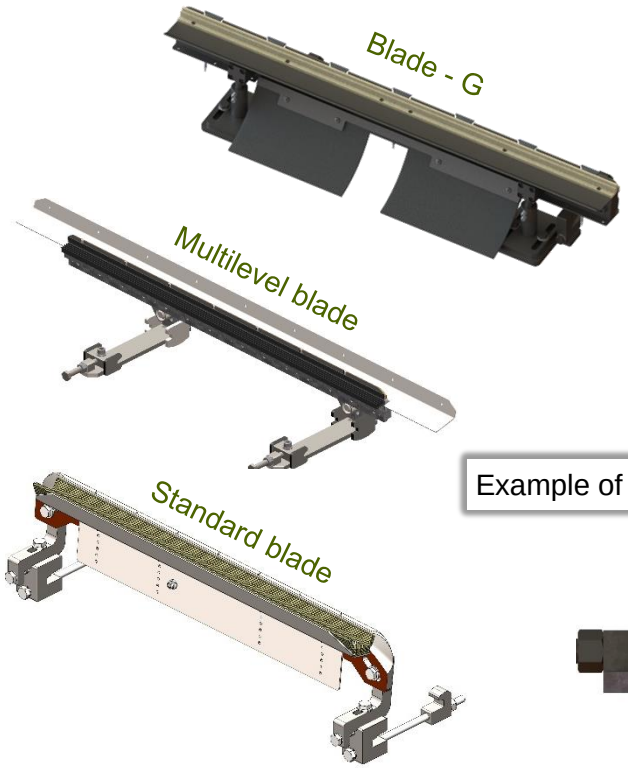
Discharge in the environment because of abrasion on side of the wheels, rails and because of the rail grinding / time unit / with supply of CHFC material is significantly lower.

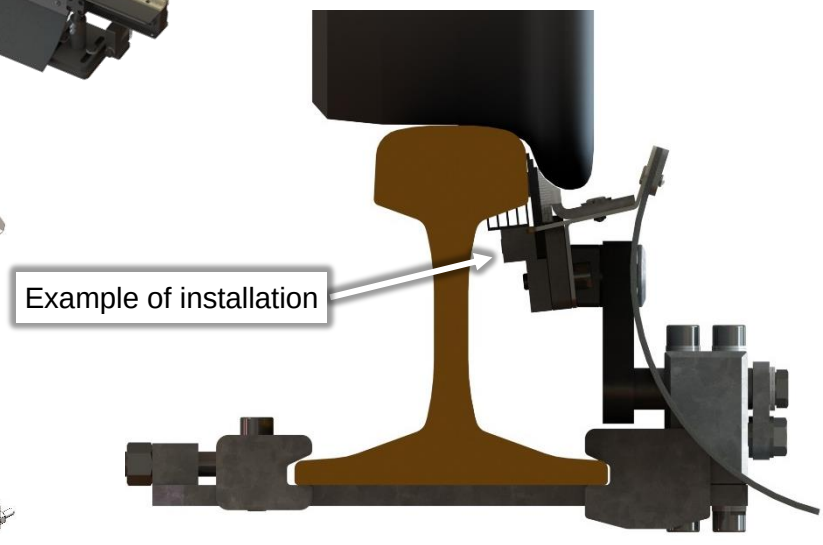


Rail applying modules – vignole rails – without boreholes in rails

Supply of CHFC material on the rail edge surface (Qr) and TOP of rail.

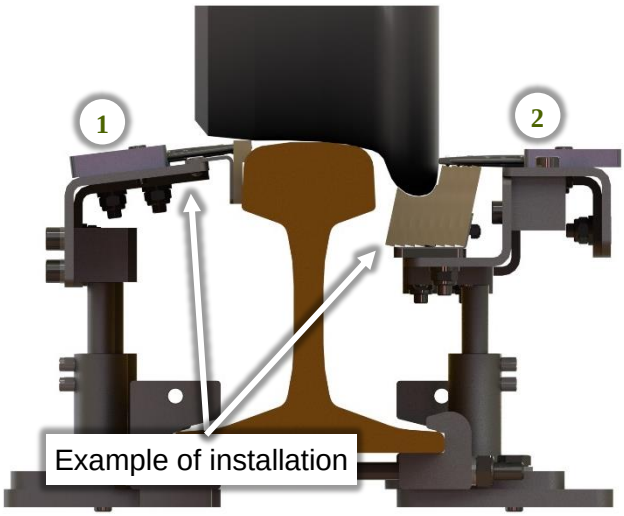
Type	***Dosing points***
Blade - G	7 / blade
Multilevel blade	Up to 21 / blade
Standard	7 / blade

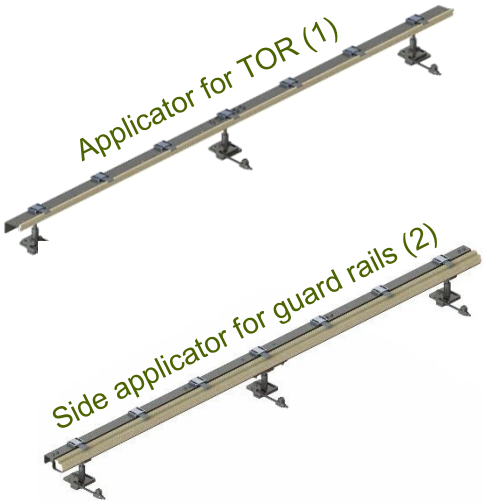




Type	*Dosing points*
Side applicator for guard rails	7 / applicator
Applicator for TOR	7 / applicator

Supply of CHFC material on the outer edge of running surface (TOR) and wheel flank surface.





Rail applying modules – vignole rails – with boreholes in rails

Supply of CHFC material on the
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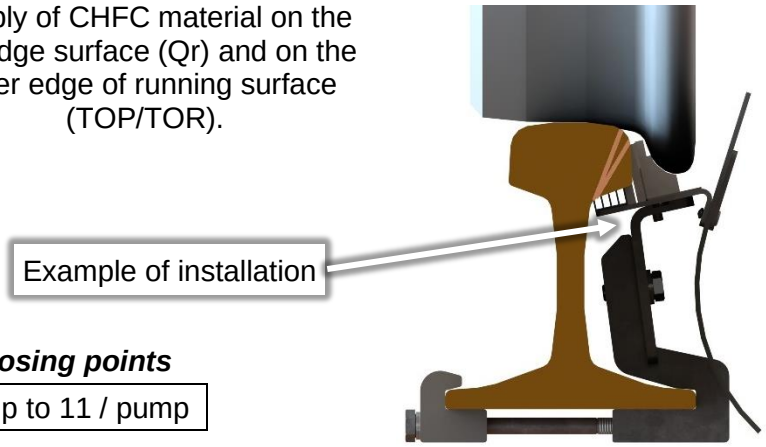
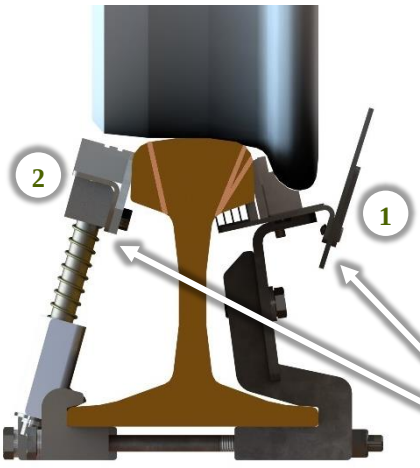
outer edge of running surface
(TOP/TOR).



Type	*Dosing points*
Protection set for supply pipes	Up to 11 / pump

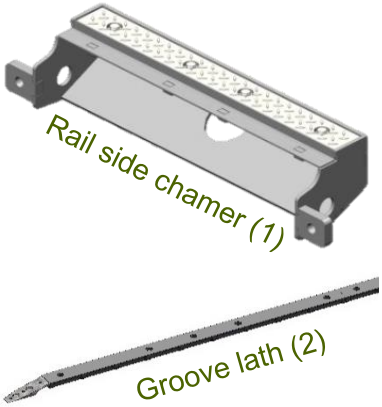
Rail auxiliary modules – vignole rails – with boreholes in rails

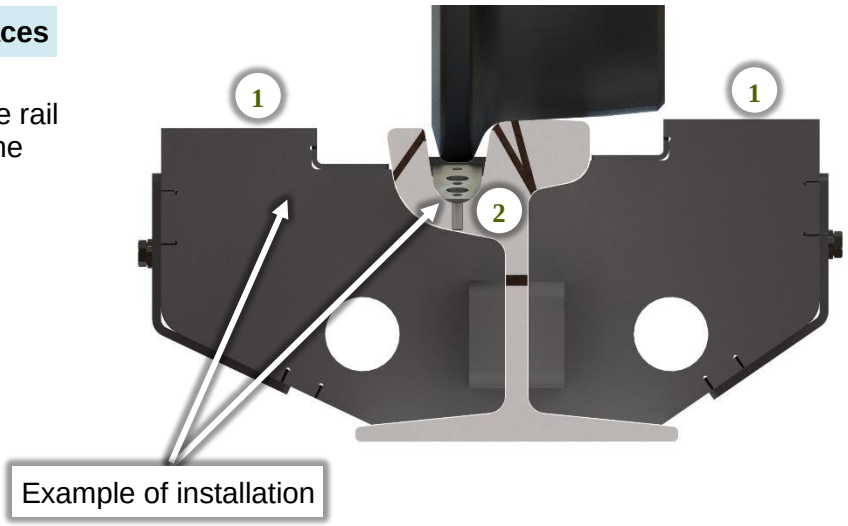
Extension of dosing field and retention of CHFC material on rail surfaces.



Embeded rails on road surfaces

Supply of CHFC material on the rail edge surface (QR), TOR and the surface of the Check rail.



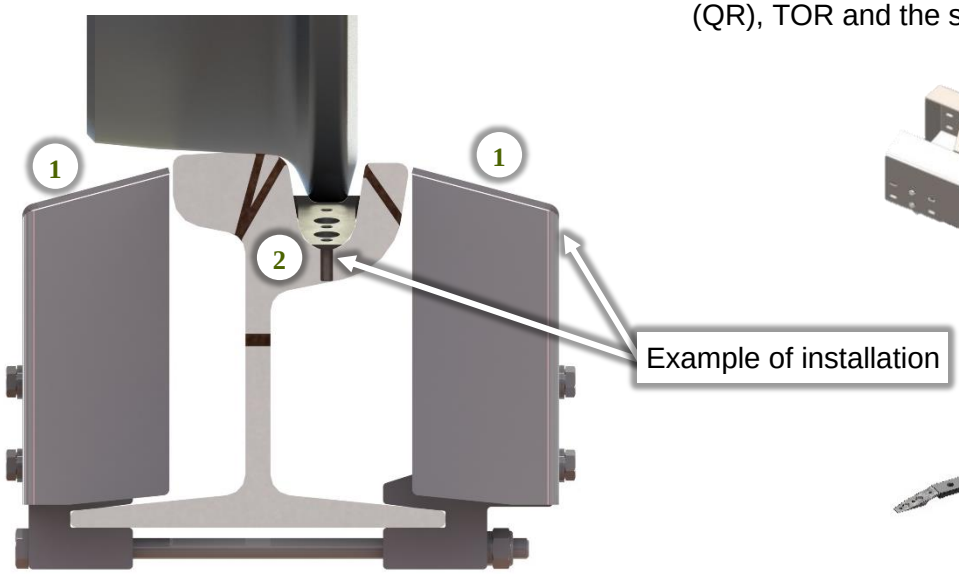


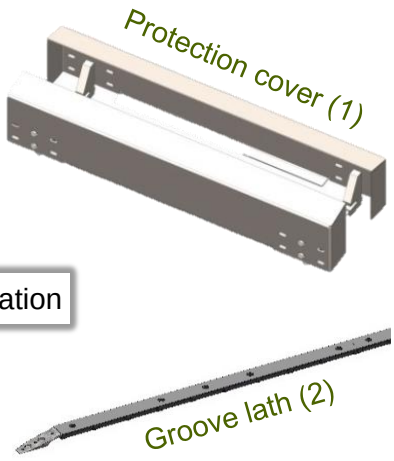
Type	*Dosing points*
Rail side chamber	7 / chamber set

Non-embeded rails on non-road surfaces

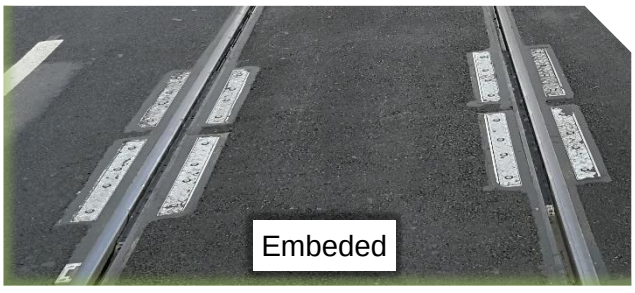
Supply of CHFC material on the rail edge surface (QR), TOR and the surface of the Check rail.

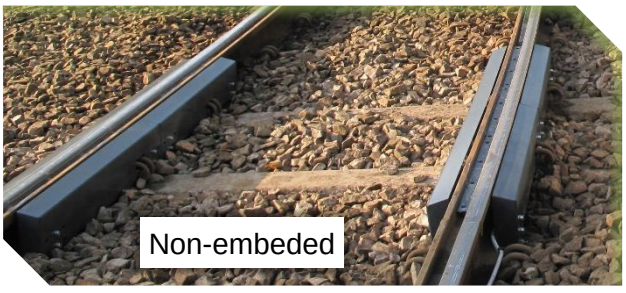
Type	*Dosing points*
Protection cover	7 / cover set





Example of embeded and non-embeded rails





POWER SUPPLY

Version: Electro

Electrical power supply source 230 VAC 50 Hz is connected via electrical cable (3x1.5mm2) to the electric control cabinet. Power supply module inside the cabinet converts input power of 230 VAC to operating power of 24 VDC.

Version: Solar

Solar panel converts sun light energy to electrical energy of 24 VDC which is stored through solar regulator in the batteries. Electric cabinet with solar regulator and batteries is connected to the electric control cabinet of the device via electrical cable (2x4mm2).

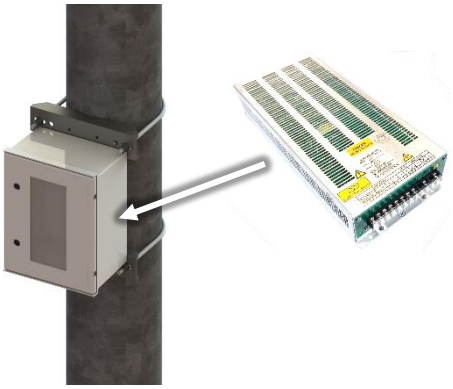
Solar set on pillar of train power grid

Electrical energy storage

Battery type	12 V / 95 Ah
Number of batteries	2 pcs.

Solar set with own pillar and supports on mobile modular foundation

Standard lower height above ground is 3,5m. In some cases, solar set is also installed on the ground when inside a fenced protected area or on mobile modular foundation for testing purposes.



Version: Convertor

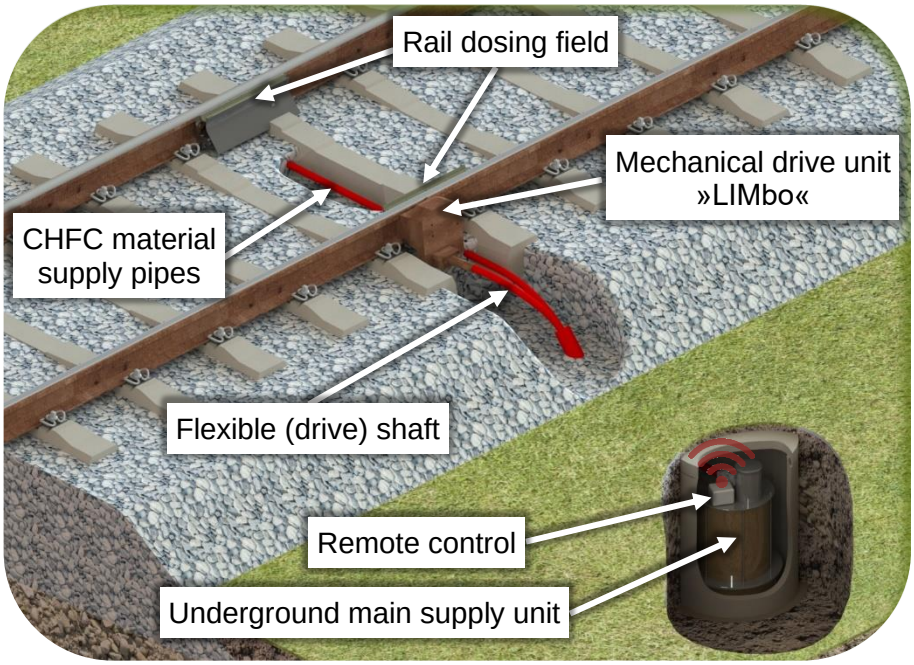
Train electrical power supply grid is connected via electrical cable (2x4mm2) to the electric cabinet with integrated convertor (600 VDC, 900 VDC…). Convertor reduces input power supply to operating power of 24 VDC. Convertor is usually installed on the nearest pillar to the main supply unit.

Convertor info

Input power supply	600, 900… VDC
Operating power supply	24 VDC

Special power supply version: Mechanical drive unit - LIMbo

LIMbo is a mechanical drive module for power CL-E1 device directly via flexible shaft which is connected on one side to the mechanical drive actuator powered by kinetic energy of train wheels and on the other side to the dosing module of the device.



- **External electrical energy consumption = ZERO!**
- **Location of the device is hidden – anti-theft and anti vandalism protected!**
- **Especially suitable for remote railways with no external power supply**
- **Wheel sensor is not needed**
- **No effect on the electric conductivity**

CL-E1 device with this drive *does not need any external electrical power source* and wheel sensor. On the other hand, the device can be remotely monitored via special control module.

It is especially suitable for situations where alternative sources of electrical power, such as photovoltaic and wind generators don't have a sufficiently high / stable level of supply (shadow positions, windless position, tunnels, etc.) provided.

General info

Input power supply	0 V
Raily type compatibility	All types of vignole rails

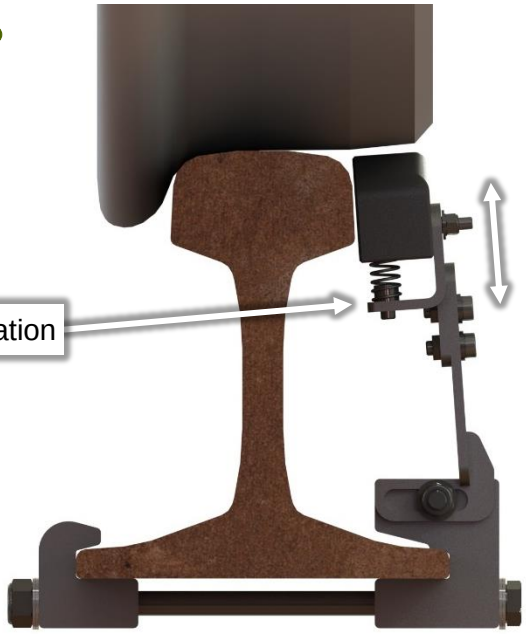
Launching In Mechanical mode, beyond Obstructions

WHEEL SENSOR

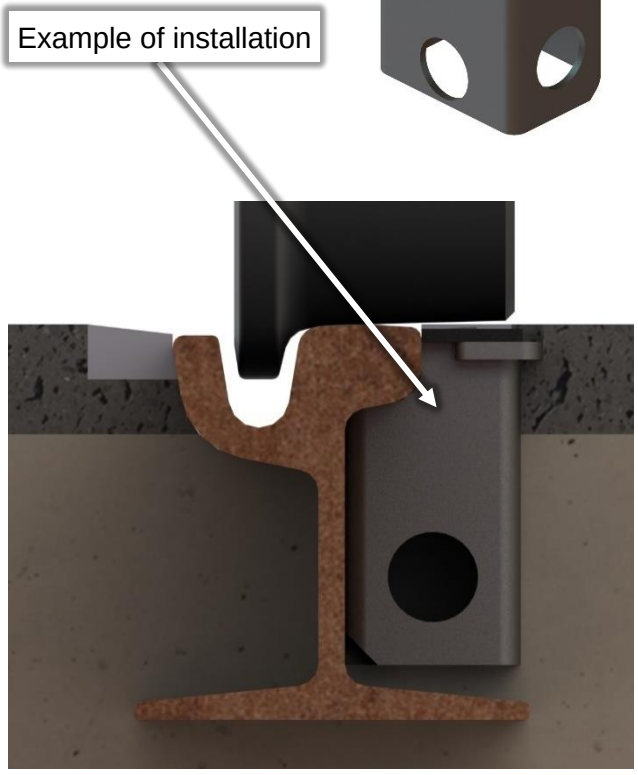
Wheel sensor detects train wheels (axles) and sends the electrical signal to the ERC control module to activate the device. It is installed beside rail head. Wheel sensor for vignole rail is height adjustable. Wheel sensor for grooved rail is installed in the ground level.

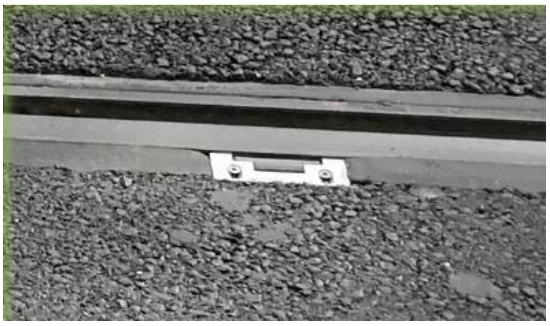
Vignole rail

- **Height adjustable**
- **All types of rails**
- **Safety springs**



Grooved rail





Wheel sensor info

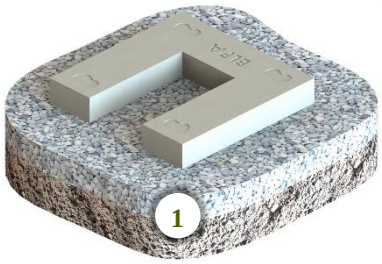
Sensor type	Inductive
Operating power supply	24 VDC
Safety mechanism	Sensor head with springs

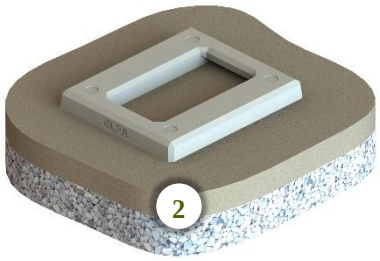
GROUND BASIS

Main supply units and / or solar sets are placed on the ground basis when the grund below is not made of concrete (or asphalt) – flat leveled solid surface. Different types of ground bases are used.

Type	***1***	***2***	***3***	***4***	***5***	***6***
Length (cm)	65	66,5	110	80	117	100
Width (cm)	65	56,5	110	65	106	71,5
Height (cm)	10	7	40	15	54	61
Mass (kg)	76	35	1230	123	1000	680
Intended use	A1	A2	B + A(1,2)	A3	B + A(1,2)	B
Note	*A1 – for main supply unit BA 70L, A2 – for main supply unit »inox«, A3 – for main supply unit »PES«, B – for solar set*					

Mobile concrete foundations



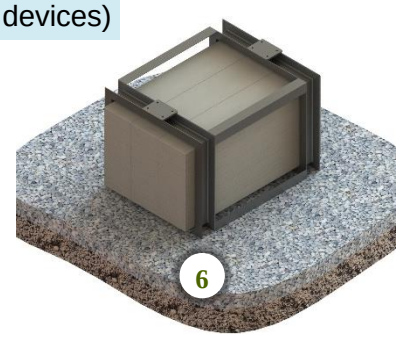


Prefabricated portable foundations for the bases of the main supply units

Fixed reinforced concrete foundations

Fixed foundations are usually made at the installation site for base of a solar set and / or main supply unit.

Mobile modular foundations (for test devices)



Modular foundations are made of concrete weights that are loaded into a steel frame and are usually used for test devices.

Composite Hardly Fluid Compound

Technical data

Appearance	homogenous paste
Colour	grey-brown
Consistency - NLGI	2
Density (at 20ºC)	1,25 g/cm^3
Viscosity (at 20ºC)	67.06 cSt
Thermal decomposition	> 370ºC
Drop point (˚C)	1
Biodegradability-base	> 69%
Four ball test	> 400 kg

BENEFITS AND ADVANTAGES

- reduces wear of rails,
- reduces sinus-line (corrugation),
- eliminates noise (squealing) in curves generated at the wheel/rail interface (TOR),
- contains high percentage of solid metal particles and due to that prevents erosion of the rail anti-crack effect (against GCC and RCF),
- it is environmentally friendly (evaluated under OECD 201, OECD 202)
- provides high performance all year around, irrespective of the season (temperature),
- reduces maintenance costs,
- it does not affect braking,
- it does not affect adhesion (at controlled dosage),
- it does not affect electric conductivity,
- single use for all friction contacts.

An **extremely resistant micron film** is applied to the wheel/rail contact which is worn instead of wheel/rail and slows down their wear.

It contains special additives that **reduce the noise**.

It contains special additives that increase the adhesion ability of the material during increased humidity or rain, which is a problem with other materials.

It **stabilizes the coefficient of friction on the contact part of the wheel/rail**, which reduces the possibility of derailment and traffic safety is increased.

It **significantly reduces the risk of wheel flange slipping through the rail**, which is the disadvantage of lubrication with sliding lubricants with increased lateral force in the curves, as well as the "risk of riding the rail" due to the excessive coefficient of friction in case when the rails in the curves are not lubricated.

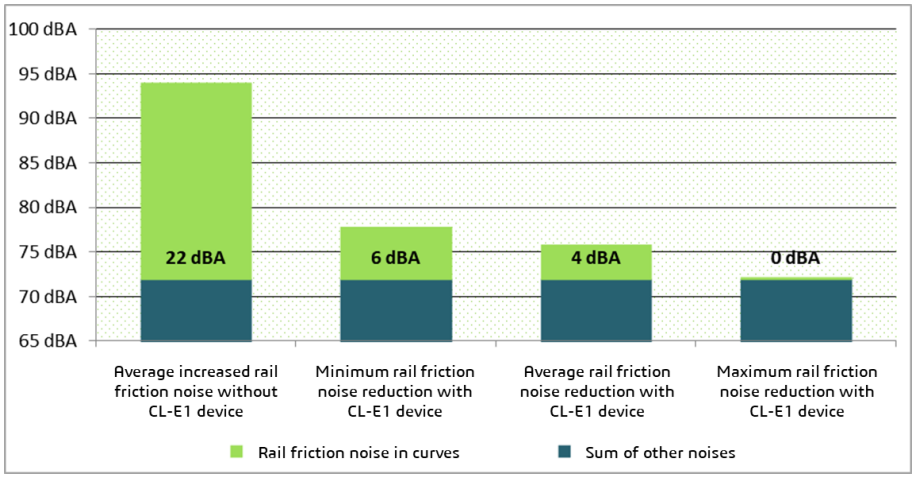
Relatively low consumption ensures great anti-noise effect, as well as a high reduction of wear and reduction of LCC in the influential area of CHFC DBM material.

Traffic safety first !

RESULTS

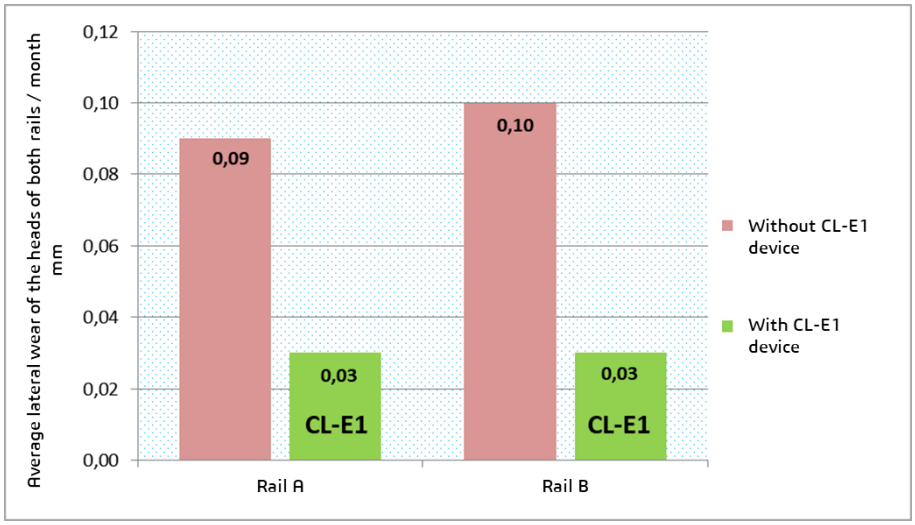
Many tests of the device CL-E1 with CHFC material were performed over the years that confirms the success of the development of anti-noise and anti-wear devices.

Numerous official and independednt tests were performed by our users and on the pictures below there are just some of the results.



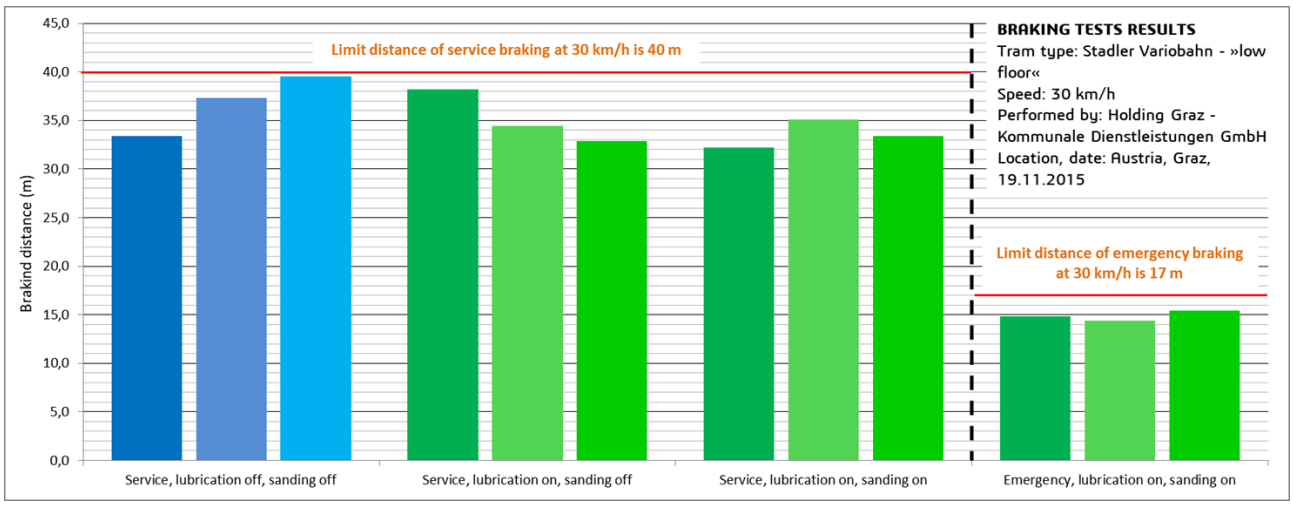
Rail friction noise (power) reduction in curves **up to 99.9%**.

Reduction of wear of rails for **more than 3.3 times**.



New generation of CL-E1 devices – **traffic safety first !** – proven by tests.

The average **braking distance** with CHFC material supply **is lower** than without it.



CERTIFICATES AND AWARDS

- Certificate ISO 9001
- Certificate ISO 14001
- Certificate TÜV SÜD Rail
- Certificate SIQ
- Certificate RAILCERT
- Seal of Excellence from EC
- Award granted by UIC and IRRB for the sustainability
- Award granted from EC for the product of the year
- Award for the significant contribution to the innovation of the global railway system

Awards

Certificates

Patented technology

ABOUT ELPA

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