

**LINCOLN**



# Stationary rail lubrication systems for the mainline rail infrastructure

Systems for the supply of greases and friction  
modifiers to the rail



**SKF**

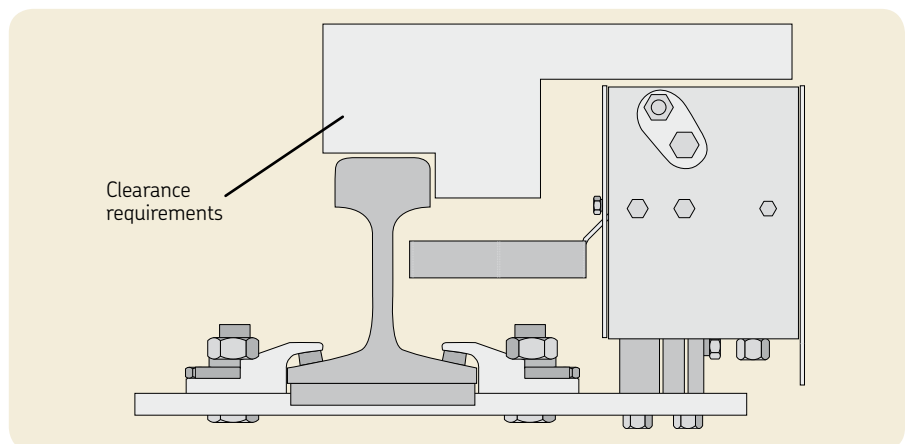
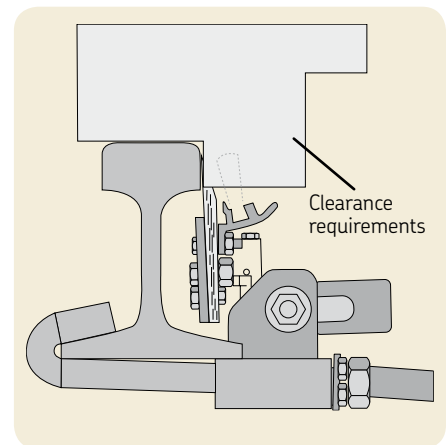
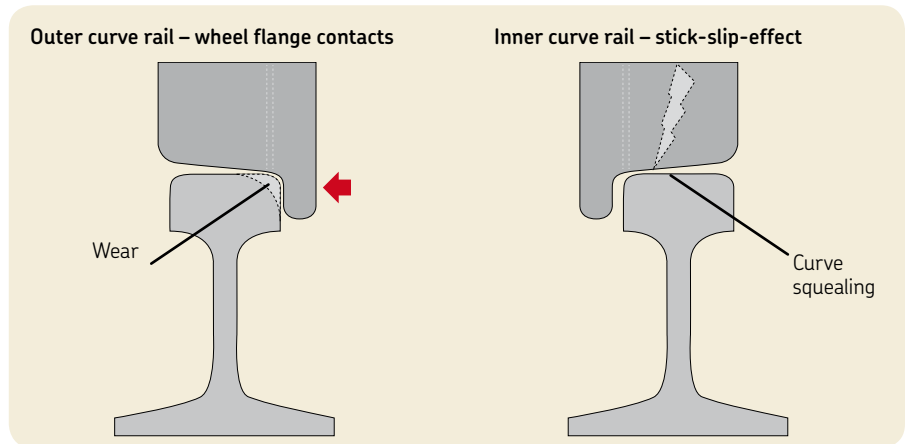
# Why rail lubrication?

Rail wear has been a challenge for many years in areas of tight curves or heavily loaded tracks. Additionally in dry weather, the so-called curve screeching or squeal is apparent. The reasons for this are well-known: For one it is the wear that occurs between the wheel flange and the outer curve rail. Secondly it is the so-called stick-slip-effect. This originates from the inner curve rail where the wheel must slide through in order to compensate for the shorter distance on the inner track.

The task is to reduce wear and noise pollution. Due to the different demands it is necessary to separate the wheel from the outer curve rail at the gage face by tribological means – in other words by lubrication. On the inner curve rail we need to place a layer between the wheel and the top of rail in order to dampen the slipping of the wheels.

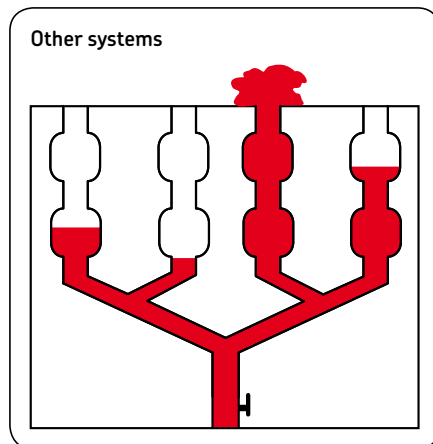
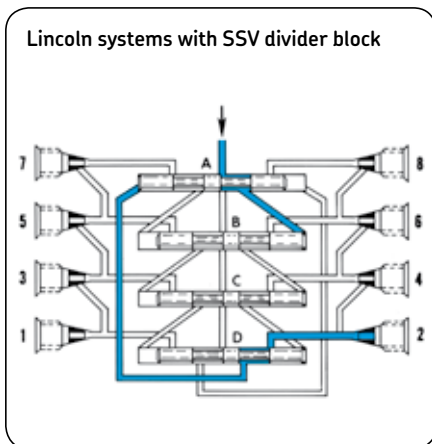
This is achieved with high-viscous lubricants and friction modifiers that are applied automatically and independently from each other.

In comparison to trams, the tracks of mainline railways are subject to higher stresses, which is why lubricant channels through the rails cannot be used. The lubricants and friction modifiers are therefore brought to the point (gage face and top of rail) with applicators.



# Differentiation overview

Lincoln	Competitor
<p>Manufacturer of centralized, automatic lubrication systems and their main components (pumps, metering devices, applicators) for over 100 years.</p>	<p>Often manufacturers of rail lubrication systems, which consist of purchased components.</p>
<p>Belongs to the worldwide operating SKF Group with partners, subsidiaries and service locations on all continents in over 130 countries.</p>	<p>Often only small, regionally operating companies that were founded by railway and rail construction companies.</p>
<p>Products and systems can handle and manage reliably and at long term fluids with solid particles, as well as high-viscous lubricants. Components have been developed and optimized for this.</p>	<p>Cannot handle “true” friction modifiers and usually have to buy standard off-the-shelf components.</p>
<p>Apply the lubricant and metal pastes without the usage of compressed air or nitrogen.</p>	<p>Frequently use spray technology which is difficult to control in winter times.</p>
<p>In-house production of high pressure pumps – up to 350 bar – provide flexibility in the layout of multi-track systems, and provide reassurance in ambient conditions.</p>	<p>Use pressure bottles and pumps up to 250 bar – often only 100 bar (gear pumps).</p>
<p>Prevention of uncontrolled lubricant delivery by:</p> <ul style="list-style-type: none"> <li>– progressive technology for gage face lubrication</li> <li>– single-line technology for top-of-rail systems</li> </ul>	<p>Different pipe lengths and outlet channels might result in over or under lubrication.</p>



# Gage face lubrication and top-of-rail conditioning

## Two strategies for rails

### Gage face lubrication – Example A1

The systems essentially comprise a pump station, axle counting sensor and the wiper bar with an integrated progressive metering device. The pump station contains a pump and a controller, as well as an electrically monitored progressive metering device with a varying number of outlets. From here the lubricant is pumped through lubrication lines to the applicator on the rail.

Preferably standard electrical connections (220/230 V) are used. Solar power is optionally available.

The design on the rail is always the same: Usually a 1,4 m long wiper bar (applicator) is mounted to the outer curve rail. It is also possible to have an additional bar on the inner curve rail or even two bars per side – depending on the application.

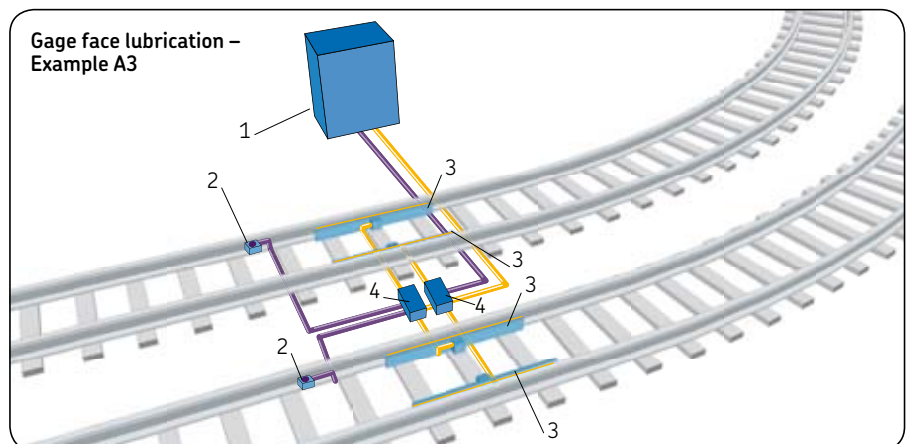
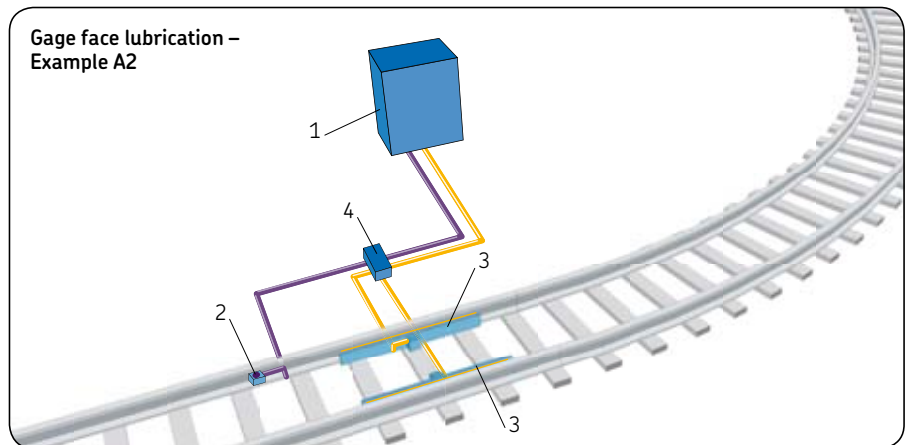
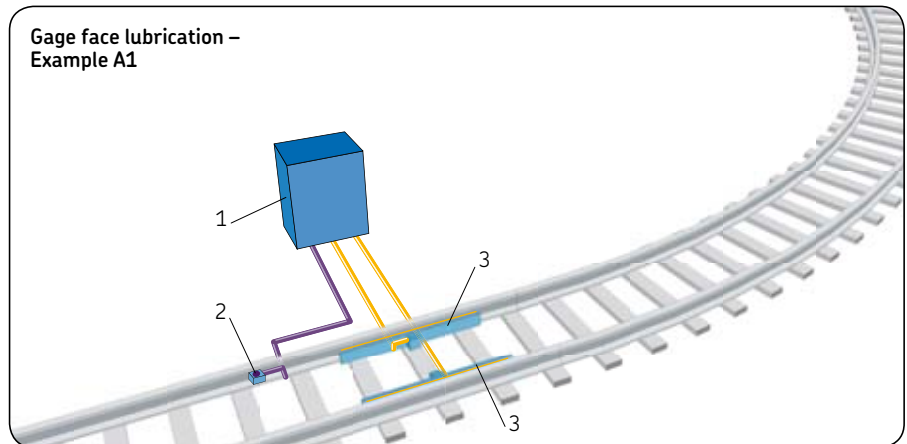
Every track is equipped with its own axle counter sensor that detects the number of passing axles, thereby signaling the controller when a lubrication cycle should start. This parameter can be freely set on the controller. Optionally there is a simple time controlled system available.

### Gage face lubrication – Example A2

In many cases it is necessary and practical to place the pump station far from the track. Where the distance between pump station and the lubrication points are more than 10 meters, a main divider box is installed near the track, which houses the electrically monitored main metering device.

### Advantages

- Only one lubrication line to the metering device
- Line cut-offs or leakages are detected by the electrical monitoring device



### Gage face lubrication – Example A3

From a centrally located pump station several tracks can be served. To keep the tracks (lubrication circuits) independent of each other, an additional 2-way valve is installed in the divider. Every track is equipped with its own axle counter sensor.

### Top-of-rail conditioning – Example B1

The systems essentially comprise a pump station, axle counter sensor and the applicators that are mounted to the rail without drilling. To join the electrical connections there are cable junction boxes on the track. In the pump station both the pump and controller are installed. From there the friction modifier is supplied via lines to the applicators on the track.

Preferably standard electrical connections (220/230 V) are used. Solar power is optionally available.

The design on the rail is always the same: Usually two applicators are installed on the inner curve rail. It is also possible to have additional applicators on the outer curve rail – depending on the application. The applicator can be mounted on the inside or outside of the rail, depending where the rail running surface is.

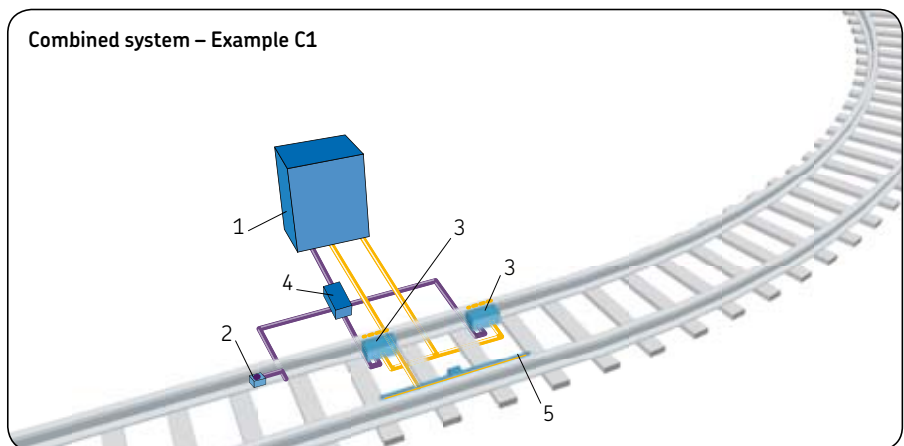
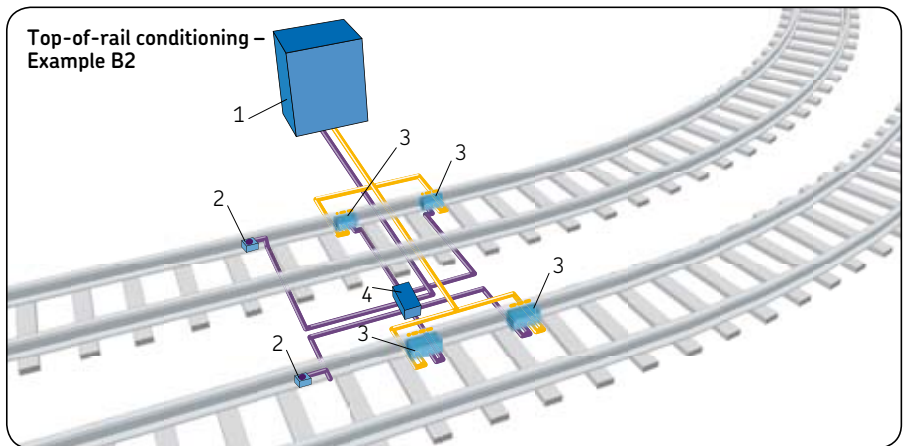
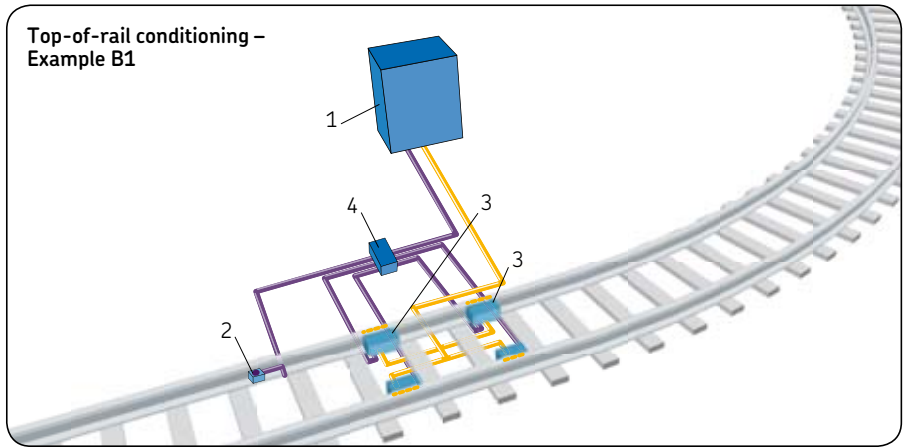
Every track is equipped with its own axle counter sensor that detects the number of passing axles, thereby signaling the controller when a lubrication cycle should start. This parameter can be freely set on the controller. Optionally there is a simple time controlled system available.

### Top-of-rail conditioning – Example B2

Several tracks can be served from a centrally located pump station. Every track is equipped with its own axle counter sensor in order to operate the tracks independently from each other.

### Combined system – Example C1

By combining both system types one can create a complete system in which cost savings are achieved over individual systems as only one single controller can operate both sides of the system.



- 1 Pump cabinet
- 2 Axle counter sensor
- 3 Top-of-rail applicator "SLID"
- 4 Cable junction boxes
- 5 Wiper bar

# Location

The position of the applicators/wiper bars is usually in the tangent section of track before the curve entry, in travel direction.

## Wiper bars

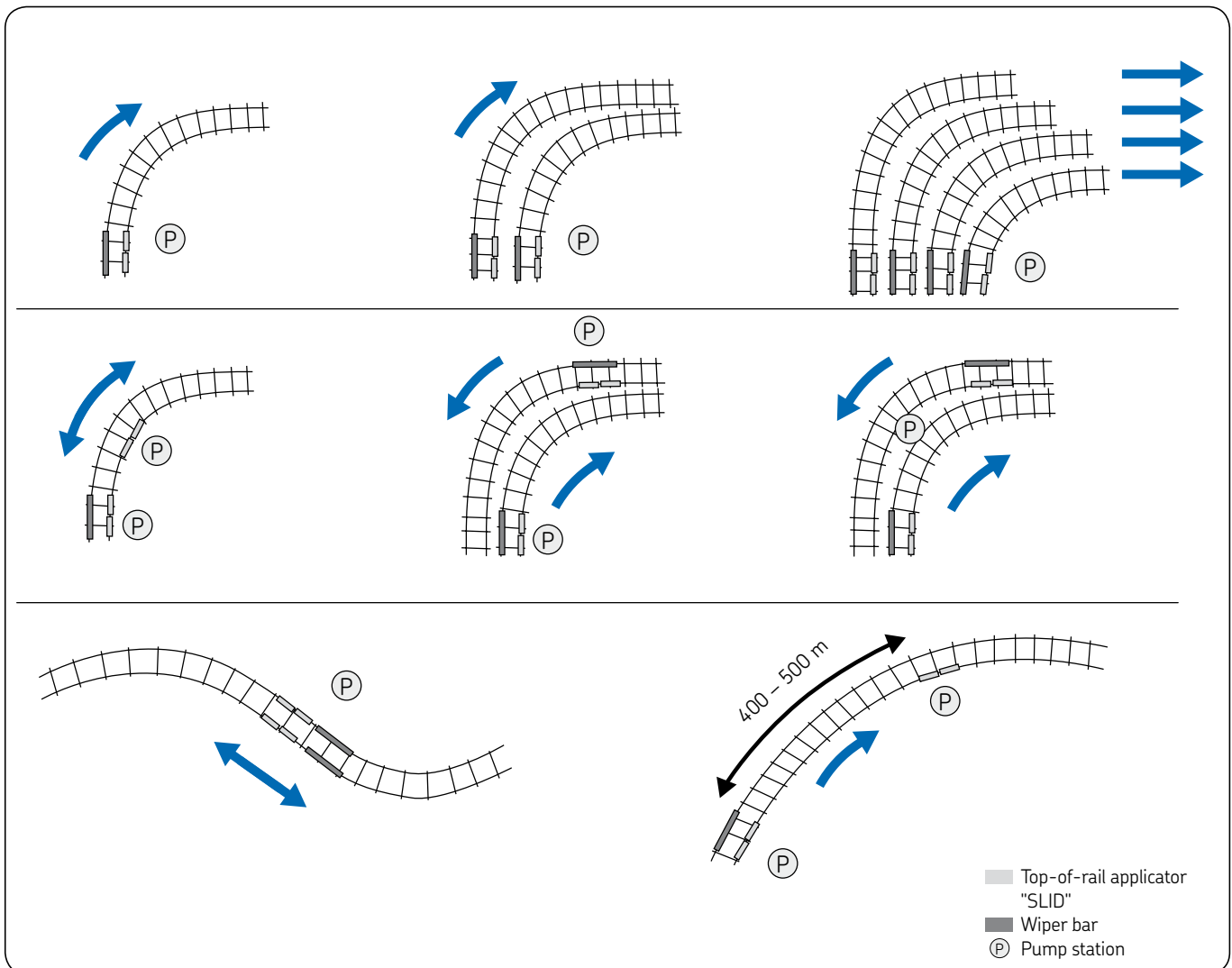
They usually apply grease to several consecutive curves, and because of the "carry effect", up to several kilometers of track.

## Top-of-rail applicator – SLID

Track curves with traffic in one direction can get treated by one system, taking into account the distribution length of the friction modifier of about 400 to 500 m.

Longer track curves in travel direction need to be managed by additional systems.

In the case of tracks with two-directional travel, the friction modifier is carried in both directions. Therefore the applicator can be placed in the middle of the track curve.



# System components

## Applicators: Wiper bars

The wiper bars have an integrated progressive metering device that equally meters the lubricant to 12 outlets ( $12 \times 0,2 \text{ cm}^3$ ) pushing the lubricant evenly on the gage face of the rail. Passing wheels take the lubricant and spread it in the upcoming curve(s). Brushes assist with the transfer of the gage face grease to the wheel flange.

Dependent on the traffic, a continuous lubrication film develops on the riding edge/face of the track curve that reduces wear and maintenance costs.



## Applicators: Top-of-rail applicator SLID

The SLID top-of-rail applicators operate on the single-line concept in which 4 nozzle chambers are filled with a predetermined quantity ( $4 \times 0,1 \text{ cm}^3$ ) of friction modifier. Simultaneously, a spring and piston mechanism is charged, and when the pressure is vented from the mainline, it discharges and applies the friction modifier to the top of the rail. This enables the controlled delivery of friction modifier.

The wheels spread the friction modifier over several hundred meters of track which dampens the hard slipping of the wheels – also called stick-slip-effect. Curve squealing or screeching is therefore prevented.

As the characteristics of metal pastes (so called friction modifiers) change at low temperatures, the applicators can be equipped with internal heaters. The applicator heater keeps the temperature of the friction modifier within the metering chamber constant in order to enable a steady, even and reliable squirt pattern.



# Lincoln pumps

For over 100 years Lincoln has been developing and producing pumps for various applications. For stationary or wayside rail lubrication and conditioning systems Lincoln offers three types of pumps: drum, multi-line and container pumps.

The choice of pump depends on the application and is determined by the lubricant consumption and the amount of traffic. Additionally, maintenance routines and intervals also play a role.



Model	Type	Description	Reservoir	Output (cm <sup>3</sup> /min)
FlowMaster	Drum pump	Reciprocating piston pump with follower plate	25 kg hobbocks (to 200 kg drums)	10 – 100 (adjustable)
P 203	Multiline pump	3 pump elements, with follower plate or stirring paddle	2, 4, 8, 15 liter reservoir	2/2,8/4 (selection)
P 653	Reservoir pump	3 pump elements combined to one outlet, with follower plate or stirring paddle	4, 8, 10, 15, 20 liter reservoir	max. 24,6

# Metering devices

SSV Progressive metering devices are piston metering devices that progressively divide the supplied lubricant to the connected lubrication points. In doing so, 0,2 cm<sup>3</sup> of lubricant is delivered per outlet and piston stroke.

Outlets can be combined to a single outlet in order to increase the lubricant amount.

In the event of a blockage in a lubrication circuit, the electrical monitoring (piston detector) will detect the failure and send a signal to the controller.





# Controller

Both simple and complex controllers may be used. The simple controller is a Lincoln development that is limited to 1-track systems.

The complex controller is a freely programmable PLC for multi-track systems.

The actual controller module is housed in a protected cabinet.

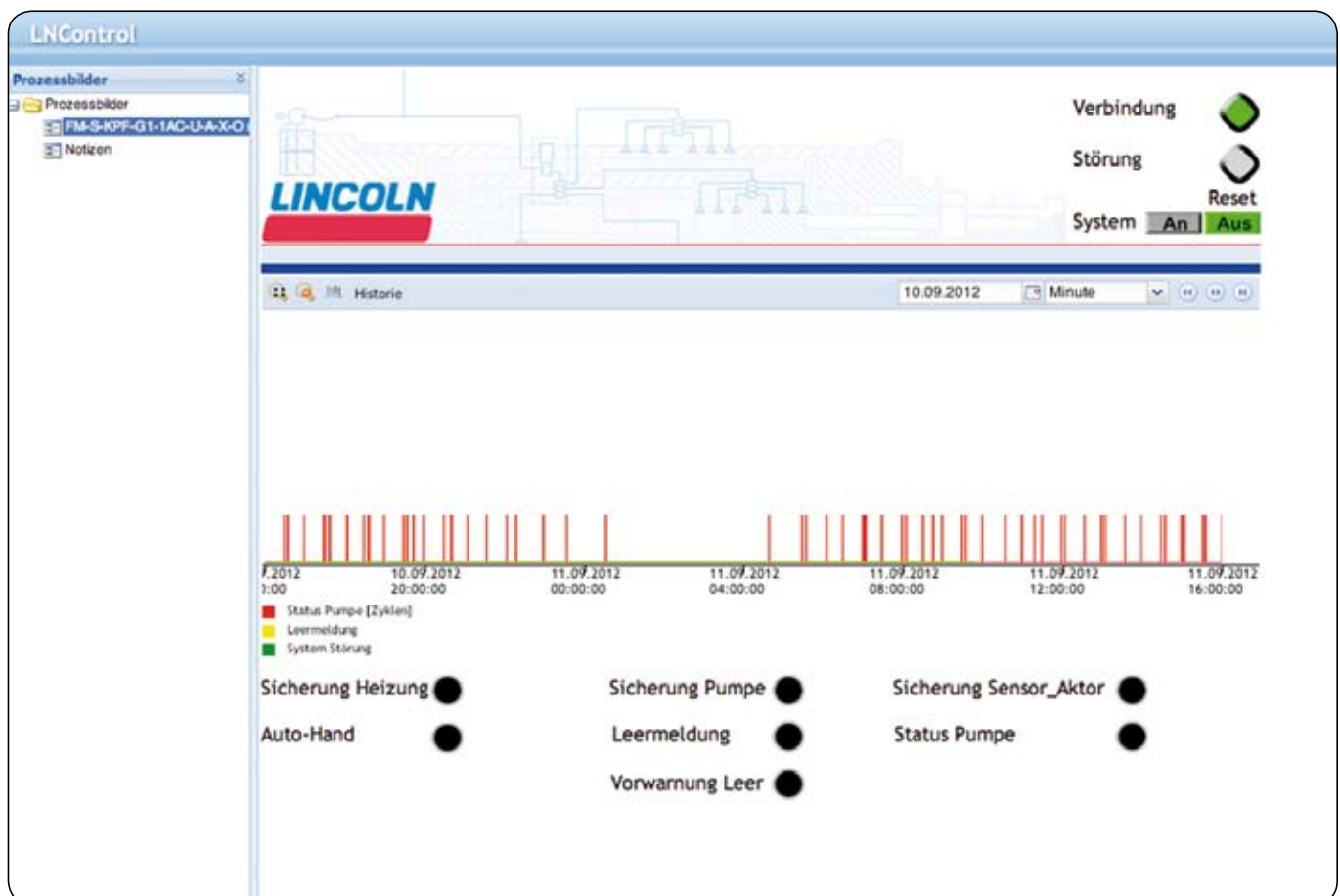
Adjustable parameters: run time monitoring, metering device cycles, number of axles.

Provided the traffic volume is constant and regulated, a simple time-controlled unit is also feasible. This feature is already integrated into most Lincoln pumps which substantially reduces costs.



# Accessories and optional equipment

- Cabinet heater
- Rain sensor
- Pump station door sensor
- External signal lamp for displaying failures
- Solar unit with battery storage
- Remote monitoring
  - Fault and low-level by SMS text messaging
  - Status monitoring by WEB systems





*Axle counter sensor*



*Metering device cabinet*



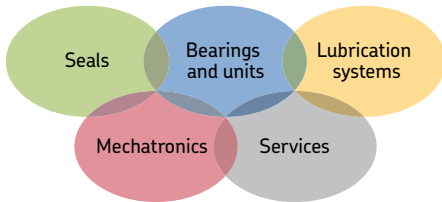
*Solar unit with battery storage*



*Outdoor pump cabinet 800 x 500 x 1200 mm*



*with suitable concrete slab*



### The Power of Knowledge Engineering

Drawing on five areas of competence and application-specific expertise amassed over more than 100 years, SKF brings innovative solutions to OEMs and production facilities in every major industry worldwide. These five competence areas include bearings and units, seals, lubrication systems, mechatronics (combining mechanics and electronics into intelligent systems), and a wide range of services, from 3-D computer modelling to advanced condition monitoring and reliability and asset management systems. A global presence provides SKF customers uniform quality standards and worldwide product availability.

#### Important information on product usage

All products from SKF may be used only for their intended purpose as described in this brochure and in any instructions. If operating instructions are supplied with the products, they must be read and followed.

Not all lubricants are suitable for use in centralized lubrication systems. SKF does offer an inspection service to test customer supplied lubricant to determine if it can be used in a centralized system. SKF lubrication systems or their components are not approved for use with gases, liquefied gases, pressurized gases in solution and fluids with a vapor pressure exceeding normal atmospheric pressure (1 013 mbar) by more than 0,5 bar at their maximum permissible temperature.

Hazardous materials of any kind, especially the materials classified as hazardous by European Community Directive EC 67/548/EEC, Article 2, Par. 2, may only be used to fill SKF centralized lubrication systems and components and delivered and/or distributed with the same after consulting with and receiving written approval from SKF.

#### Lincoln GmbH

Heinrich-Hertz-Str. 2-8  
69190 Walldorf  
Germany

Tel. +49 (0)6227 33-0  
Fax +49 (0)6227 33-259

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