

# EasyRail Lubrication Solutions

Applications for railway vehicles



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Photo DB AG



Photo GLG GmbH

Wheel flange and railhead lubrication systems for:

- High-speed trains
- Regional & commuter trains
- Locomotives
- Metro trains
- Light rail vehicles
- Efficient solutions for innovative trains
- Contributing to lower operating costs
- Ecologically sustainable

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## Introduction

### Overview

Wheel flange and top-of-rail lubrication have become an important and two-fold strategy for operators and rail vehicle maintenance providers: to reduce wear, friction and noise substantially and sustainably.

Active noise emission reduction, through additional application of customized lubrication solutions, pay tribute to increased environmental awareness and will above all increase acceptance of public transport in our society.

Accurate application of biodegradable lubricants and intelligent control of the lubricant application process are reducing environmental pollution to a minimum and are a huge progress to earlier lubrication solutions.

Following information will enable the reader to select and install the right lubrication solution for use on rail-bound vehicles.

### Importance of wheel flange lubrication

The interaction of a rail vehicle with its infrastructure is a key fundamental aspect of a railway system. The highly stressed wheel/rail interface is a key cost driver for a rail operator due to its effects not just on wheel-set performance and maintenance costs but also upon track deterioration, maintenance and renewals. Vehicle and track maintenance intervals are strongly determined by this wear process and highly influence the cost. Considerable energy and material cost savings can be achieved by reducing the friction to a necessary minimum and an optimised lubrication regime,

Flange lubrication does not only apply to traditional loco-hauled operations, but also to multiple units, metro vehicles and tramways, where it contributes not only to the friction properties of directly lubricated wheels, but also to following unlubricated wheelsets of passenger coaches or freight cars. Moreover, rail vehicles left completely unlubricated bear a risk of derailment.

### WFL technology

SKF provides a range of solutions to support the railway industry in developing innovative train concepts. SKF Lubrication Systems is developing on-board wheel flange lubrication and railhead lubrication systems for railway vehicles.

On-board wheel flange lubrication systems help to reduce friction and wheel wear significantly and contribute to lower operating cost. These systems have proven to be the most flexible and effective applications for railway operators due to their variable setting options.

SKF wheel flange lubrication systems, united under EasyRail, cover the complete range of on-board flange lubrication technology and can be configured as single and double line applications to operate rolling stock successfully everyday.

## Effects on maintenance planning and operational benefits

The service life of wheelsets and tracks can be considerably extended, provided they using suitable lubrication solutions. Intervals of up to 300.000 km before wheelset reprofiling or 1.500.000 km before wheelset exchange are no longer a distant target for railway operators. Bearing in mind the cost saving potential for this major maintenance cost block, the return on investment in a wheel flange lubrication system can be achieved within a short time. The savings resulting from longer rail track life, above all in curves, have to be considered additionally.

Thanks to their high reliability, combined with significant technical developments in control and monitoring techniques, SKF Lubrication Solutions wheel flange lubrication systems can be adapted to any type of powered rail vehicle or the operator's requirements.

The main benefits of wheel flange lubrication can be summarized as:

- Noticeable reduction of downtime and increased operational reliability and availability
- Maintenance optimized system configuration, therefore improved LCC values
- Reduction of impact on the environment through use of rapidly biodegradable greases
- Reduced noise emissions, therefore increased acceptance of public transportation
- Increased safety through reduced risk of derailment by so called wheel "climbing".

SKF Lubrication Systems have a long record of excellent performance and reliability.

Leading railway rolling stock suppliers equip key vehicle fleets with our systems and major transport operators are running successfully their rolling stock equipment with SKF lubrication products:

List of Users:

Deutsche Bahn, Trenitalia, Danish State Railway DSB, Norwegian State Railway NSB, Berliner Verkehrsbetriebe BVG, Hamburger Hochbahn AG, Erfurter Verkehrsbetriebe AG, Metro Hong Kong, Japan Railways Cargo, etc.

## Comparison of EasyRail systems

System	High Pressure	Low Pressure	Compact
Type	dual line	dual line	single line
Line lengths pump/nozzle	max. 10 m	max. 5 m	max. 7 m
Air supply required	●	●	●
Input air pressure	6-10 bar	6-10 bar	6-10 bar
Lubricant feed	piston pump	grease reservoir	piston pump
Standard reservoir capacity	25 liters	4.5 or 6 liters	11 liters
Two directions of travel	special model	special model	special model
Distance-dependent lubrication	●	●	●
Curve-dependent lubrication	●	●	●
Time-dependent lubrication	●	●	●
Temperature range	-25 to +80 °C	-25 to +80 °C	-25 to +80 °C
Special model	down to -40 °C	down to -40 °C	-
Lubricant	oil / fluid grease NLGI grade 000 or 00	fluid grease NLGI grade 000 or 00	oil / fluid grease NLGI grade 000 or 00
Rated quantity, standard	0.03 or 0.05 ccm/spray	0.03 ccm/spray	0.025 or 0.010 ccm/spray

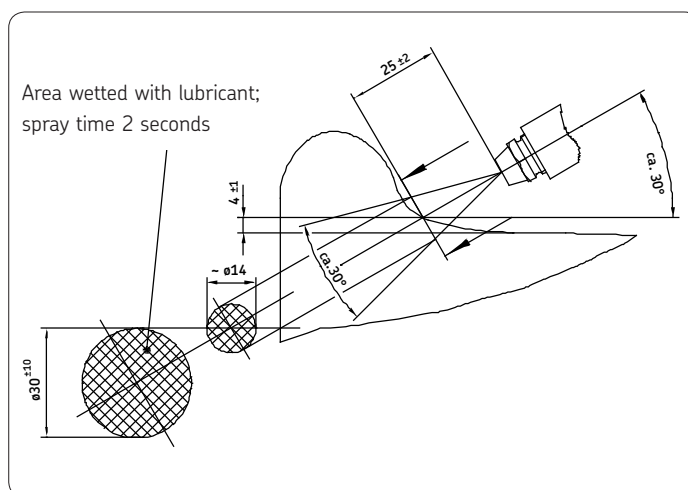
System	Track	Airless	Airsupply
Type	dual or single line	single line	dual line
Line lengths	max. 10 or 7 m	n.a.	max. 10 m
Air supply required	●	n.a.	●
Input air pressure	6-10 bar	no air supply	6-10 bar
Lubricant feed	piston pump	magnetic piston pump	piston pump
Reservoir capacity	11 liters	customized	customized
Two directions of travel	special model	customized	special model
Distance-dependent lubrication	●	●	●
Curve-dependent lubrication	●	●	●
Time-dependent lubrication	●	●	●
Temperature range	-25 to +80 °C	-20 (with heater) to +60 °C	-25 to +80 °C
Special model	down to -40 °C	-	-
Lubricant	special fluid grease NLGI grade 000 or 00	oil / fluid grease NLGI grade 000 or 00	oil / fluid grease NLGI grade 000 or 00
Rated quantity, standard	0.03 or 0.025 ccm/spray	0.04, 0.04 or 0.05 ccm/stroke	0.04 ccm/spray

## Adjustment of spray nozzle

The spray cone is angled at approx. 30°. The spray nozzle is set to an angle of approx. 30° to the wheel's contact surface. The area between the contact surface and wheel flange is covered by the spray.

The nozzle should be positioned  $25^{+2}$  mm from the spraying point.

The area wetted with lubricant on a resting wheel at ambient temperature 20°C has a diameter of  $30^{+10}$  mm after being sprayed for 2 seconds.



## Lubricants

Lubricant quality has a decisive impact on the effectiveness of the lubrication applied to the wheel-rail interface. Ultimately, it determines the friction, wear and noise level. In the past few years attempts have been made to achieve optimal surface smoothness and minimal wear with the help of increasingly higher percentages of solid additives.

Lubricant and wheel flange lubrication supplier as well as operators of rail vehicles have cooperated to develop a number of biodegradable lubricants for wheel flange lubrication systems and separating agents for top-of-rail lubrication. The grease-based products are made of substances that are broken down into their basic ingredients by ubiquitous microorganisms as quickly and completely as possible. They can be applied not only for new lubrication systems but also for applications installed in the past.

SKF Lubrication Systems approve the deliverability of a wide assortment of wheel flange lubricants of leading suppliers for its lubrication systems. The lubricants are also tested extensively in laboratories of major transport operators before releasing them on their own fleet.

Typically, NLGI grade 000 and 00 fluid grease are used in the systems made by SKF Lubrication Systems. The grease can contain as much as 40% solid particles. The lubricants recommended for certain types of systems by the manufacturers can be found in the corresponding list of approved products.

The lubricant, sprayed on the wheel flanges of the first or second axle in the direction of travel, is transferred to the rail face, thus lubricating the following wheel flanges.

On average, spraying volume is only 0,03 to 0.05 g per 250 m. Optimally configured wheel flange lubrication systems can supply in ideal cases as many as 250 axles. Is a majority of rolling stock of an operator equipped with wheel flange lubrication, they provide the requisite for the lubrication of the respective rail network. This is the prerequisite on which wheel flange lubrication systems can achieve the desired effect.

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### List of lubricants approved by SKF Lubrication Systems for wheel flange lubrication applications

Designation	Supplier	Service temperatures [°C]
LOCOLUB NSB *)	Fuchs Lubritech GmbH	-40 to +60
LOCOLUB ECO *)	Fuchs Lubritech GmbH	-30 to +60
LOCOLUB SILENCE *)	Fuchs Lubritech GmbH	-30 to +60
LOCOLUB TRAMLUB F 234 *)	Fuchs Lubritech GmbH	-30 to +60
WFL 30/50 *)	IGRALUB	-40 to +60
HEADLUB *)	IGRALUB	-30 to +60
Bio Top 9418 *)	Tribol	-25 to +60
EasyRail Grease *)	SKF Lubrication Systems	-40 to +60
EasyRail Oil *)	SKF Lubrication Systems	-25 to +60

\*) rapidly biodegradable.

Pressure has to be relieved if left to stand in SP9 systems for extended periods of time.

See important product usage information on the back cover.

## System EasyRail Compact

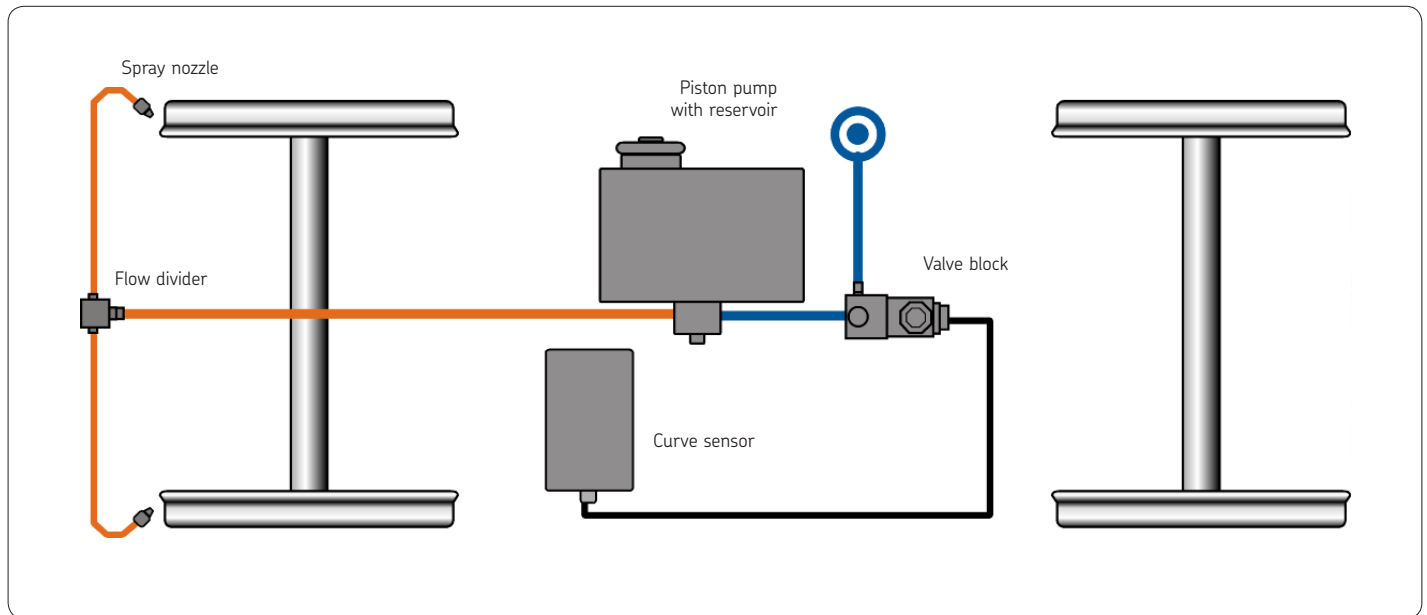
### Description of system

Single line systems EasyRail Compact operate through continuous output of lubricant, whereby compressed air is used as transport medium and lubricants are applied in a defined quantity on the wheel flange. The lubricant is already metered in the piston pump and transported by compressed air to the spraying nozzles via a flow divider. Thus only one line, carrying both the lubricant and compressed air at the same time, is installed. The air/lubricant mixture in the flow divider is split up into equal parts when the flow conditions prevailing in the outlet branches are similar.

### Function

The EasyRail Compact system consists of a piston pump with a lubrication reservoir, a flow divider and the respective spray nozzles. All moving parts were brought together in the lubrication module consisting of a piston pump with reservoir. This means the components are highly accessible and easy to service or replace. Moreover, neither the flow divider nor the spray nozzles have any moving parts, which considerably reduce maintenance time and expense.

EasyRail Compact systems can be used universally on all vehicle segments from urban transport to regional and intercity trains as well as locomotives, as long as they fitted with compressed air supply.



#### Application

- System with a max. line length of 5 m between the grease reservoir and spray nozzle
- Single pump solution for vehicles with a maximum of 10 m distance between the wheelsets to be sprayed
- System air pressure: up to 10 bars

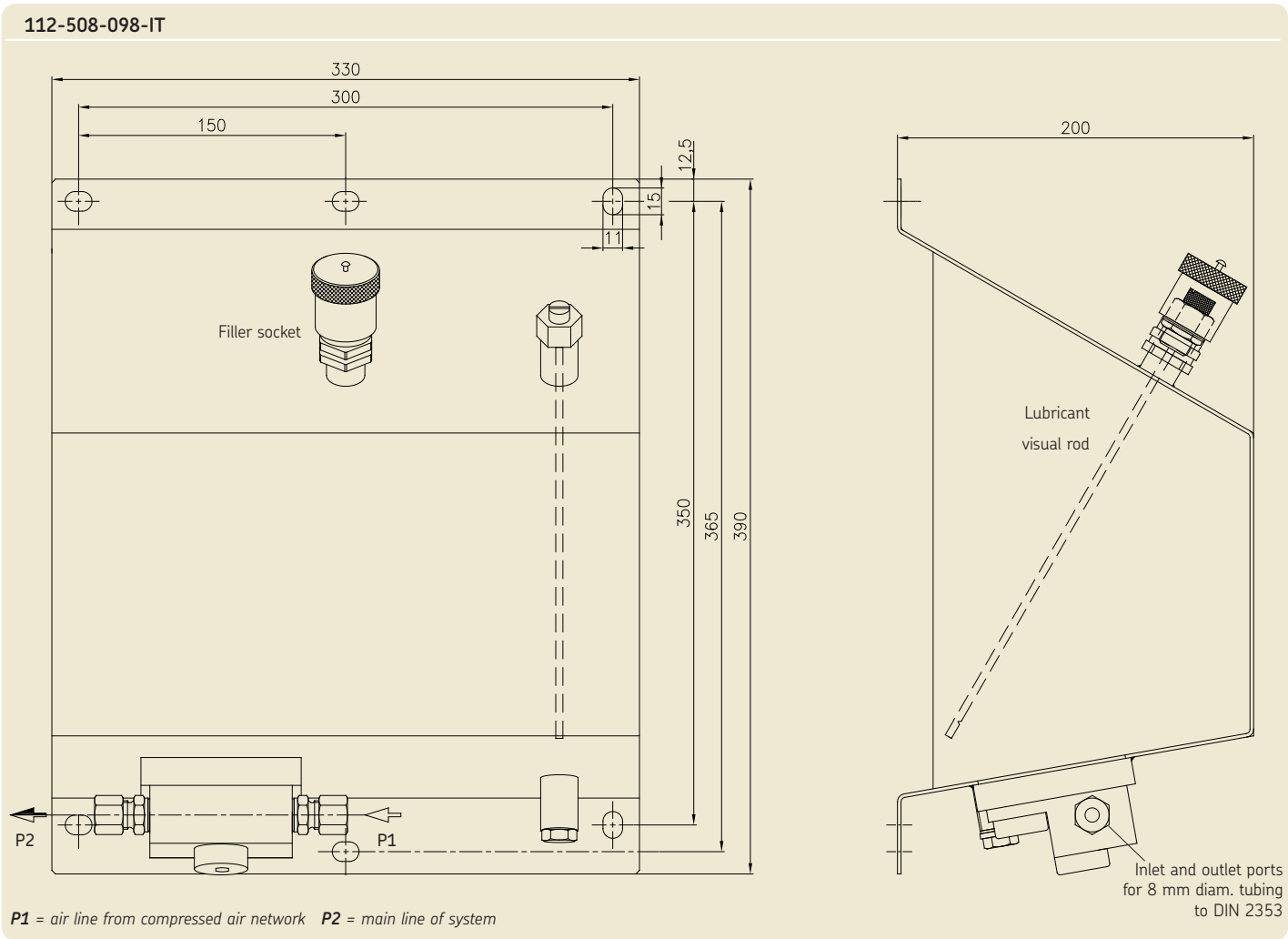
#### Advantages

- Compact design
- Low Life Cycle Cost
- Bottom-up lubricant recirculation
- Reduced installation efforts
- Working with oil and fluid grease with high percentage of solid additives

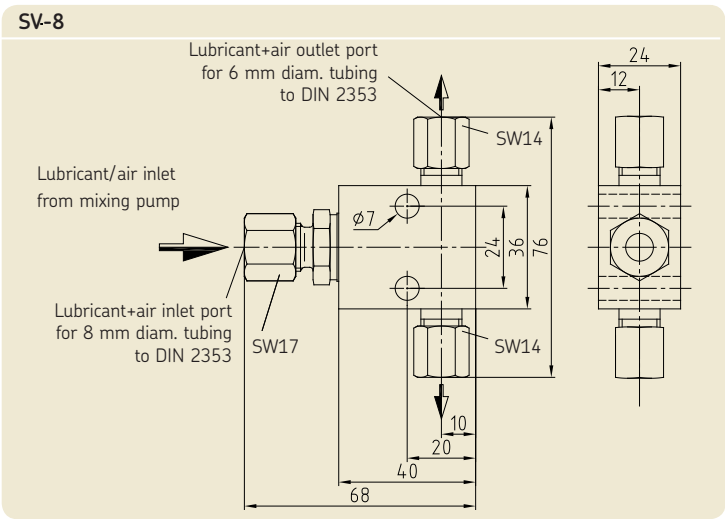
#### Standard Components

Piston pump with reservoir 112-508-098-IT  
 Flow divider SV-8  
 Spray nozzles 169-000-400, 169-000-410  
 Actuation via 2/2-way valve unit

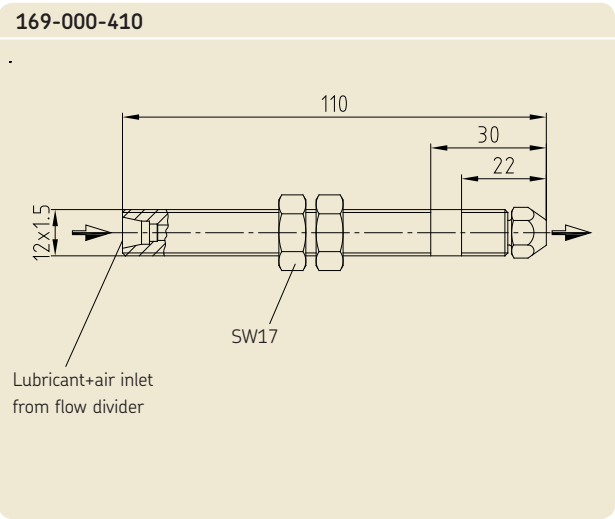
# 112-508-098-IT Piston pump with reservoir



## SV-8 Flow divider



## 169-000-410 Spray nozzle



## System EasyRail Compact with air supply module

### Description of system

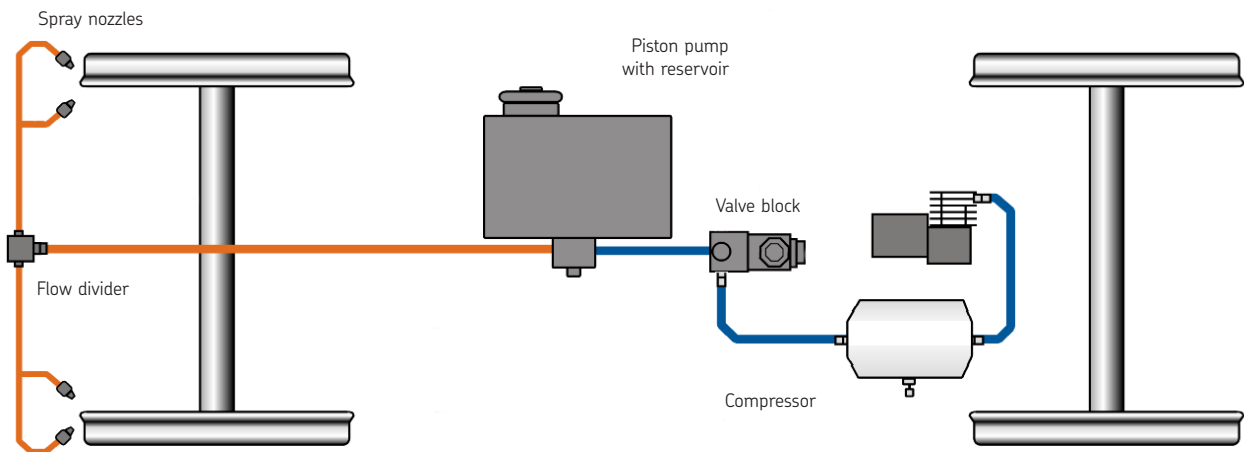
Single line systems EasyRail Compact operate through continuous output of lubricant, whereby compressed air is used as transport medium and lubricants are applied in a defined quantity on the wheel flange. The lubricant is already metered in the piston pump and transported by compressed air to the spraying nozzles via a distributor. Thus only one line, carrying both the lubricant and compressed air at the same time, is installed. The air/lubricant mixture in the flow divider is split up into equal parts when the flow conditions prevailing in the outlet branches are similar. The lubricant is finally sprayed onto the inner and outer wheel flanges by compressed air.

EasyRail Compact with air supply module is a single-line system that is only used for application on tramway vehicles or LRV systems.

### Function

The EasyRail Compact system with air supply module consists of a piston pump with a lubrication reservoir, a flow divider and the respective spray nozzles. The air supply module contains of a compressor, an air control unit, an air conditioner, air reservoirs, an air limiter, and the valve block.

The lubrication module consisting of a piston pump with reservoir, plus the peripheral components for the compressed air supply can be installed as one unit for installation in a cabinet or as separate subunits to allow customized fitting on the vehicle. This means the key components can be kept highly accessible and easy to service or replace.



#### Application

- System with a max. line length of 5 m between the grease reservoir and spray nozzles
- Two nozzles for spraying of inner and outer wheel flange of tram wheel
- With module for compressed air supply

#### Advantages

- Compact design
- Low Life Cycle Cost
- Bottom-up lubricant recirculation
- Reduced installation efforts
- Working with oil and fluid grease with high percentage of solid additives

#### Standard Components

Air module 250-290.70+924  
 Piston pump with reservoir 250-290.71  
 Flow divider SV-84  
 Spray nozzles 250-263.86  
 Actuation via valve unit  
 2/2-way valve



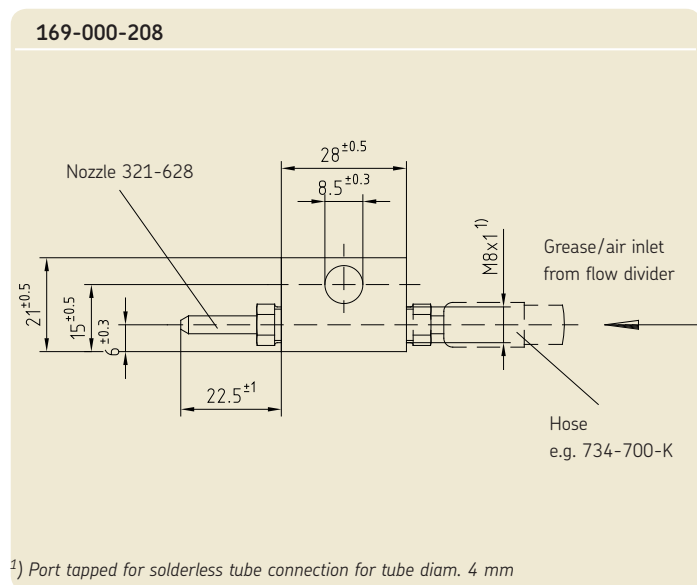
## 290-000-107+924 Piston pump with reservoir and air unit



### Technical data

Order No. ....	290-000-107+924
Reservoir capacity .....	4,5 liters
Delivery rate .....	0.05 ccm/stroke
Rated operating voltage .....	max. 10 bar
Lubricant .....	oil or fluid grease, NLGI grade 000, 00
Operating temperature .....	-25 to +80 °C
Type of enclosure to EN60 529/10.91 ..	IP65.

## 169-000-208 Spray nozzle



### Technical data

Order No. .... 169-000-208

Order No. .... SV-84

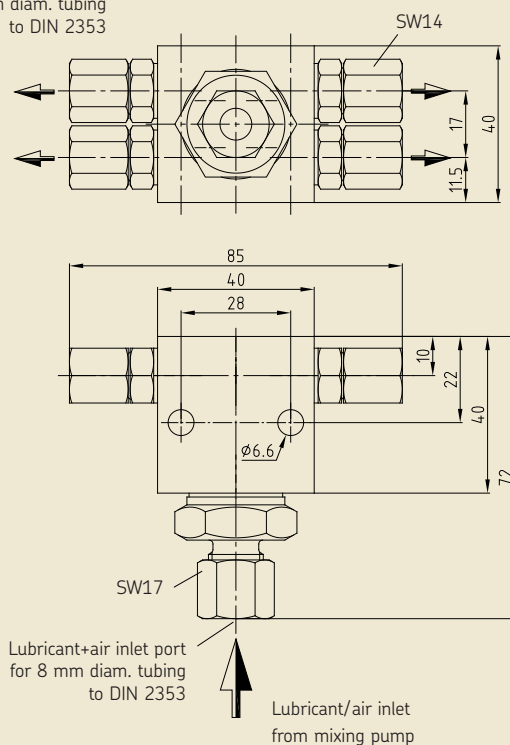
Temperature range .....

Mounting position .....

## SV-84 Flow divider

### SV-84

Lubricant+air outlet port  
for 6 mm diam. tubing  
to DIN 2353



# System EasyRail High Pressure

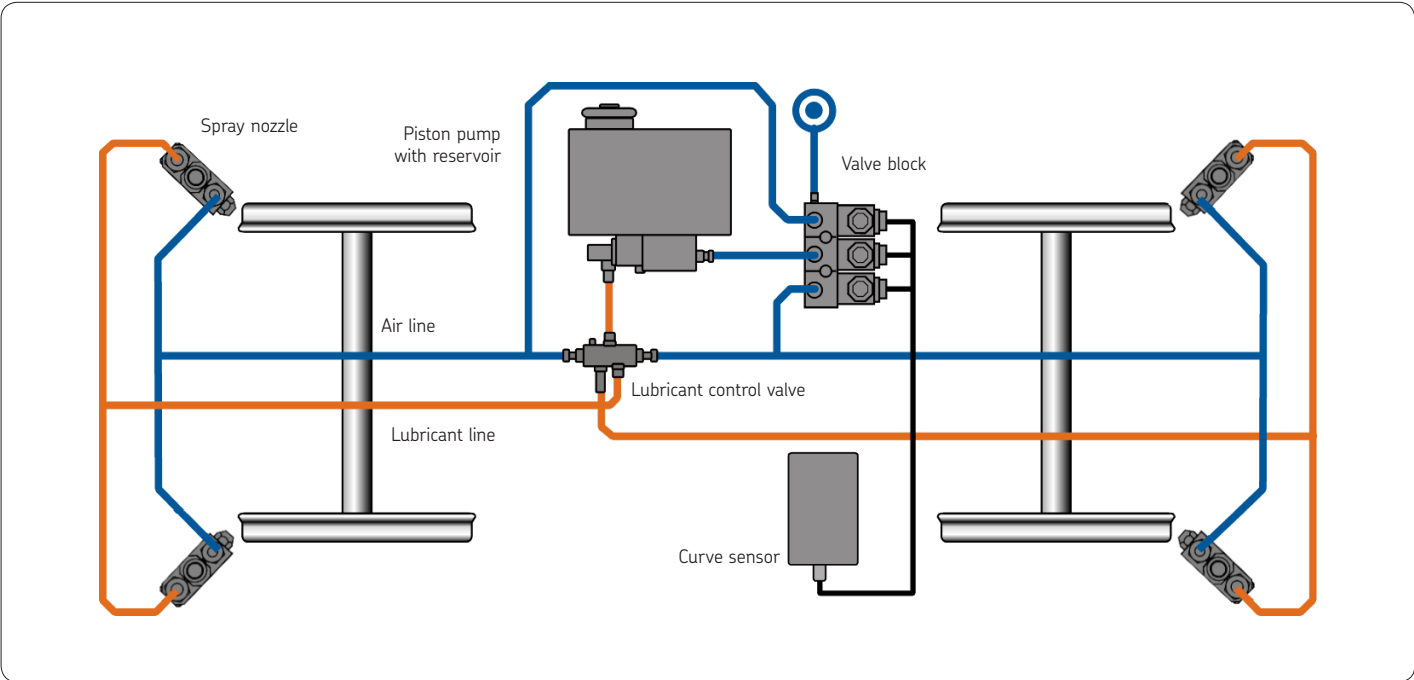
## Description of system

Double line systems EasyRail High Pressure transport compressed air and the lubricant in separate lines and meter the lubricant directly inside the spray nozzle and apply it with high accuracy even at extremely low temperatures or at very high speed operations.

EasyRail High Pressure is a dual-line, high-pressure system that is mainly used on large locomotives, high-speed trains with power heads, but also other applications that require a lubricant reservoir bigger than 7 litres for maintenance reasons. The maximum distance between the pump unit and spray nozzle is 10 m.

## Function

The spray nozzles supply lubricant to the wheel flanges on the leading axle and/or the wheel flanges of the respectively leading axle on a bogie. The pump feeds the lubricant via the grease control valve. From the grease control valve the lubricant is directed to the spray nozzles for lubricant application in the appropriate direction of travel. The lubricant is metered inside the spray nozzles in volumes typically 0.03 or 0.05 cm<sup>3</sup>/spray and sprayed onto the wheel flanges with a system pressure of up to 10 bars. The high system pressure enables operations even under extreme operating environmental conditions, like low temperatures (down to -40°C) and with suitable lubrication products. The system can be customized for bi-directional operations.

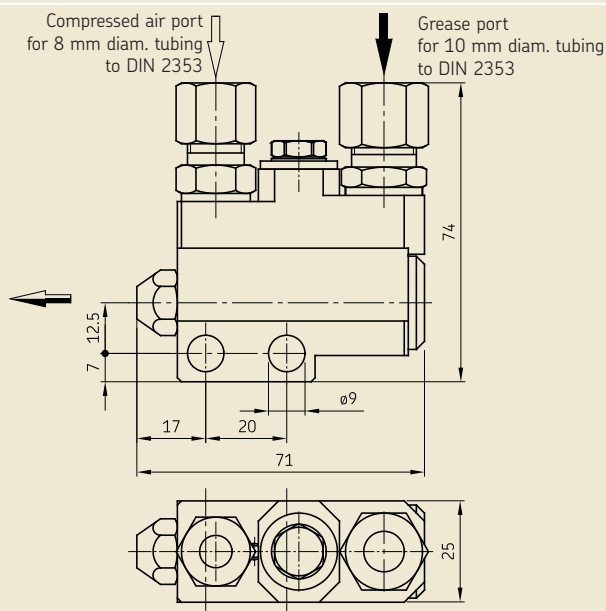


Application	Advantages	Standard components
<ul style="list-style-type: none"><li>– Max. line length between pump and spray nozzle: 10 m</li><li>– Low ambient temperature</li><li>– Single pump solution for vehicles with a maximum of 20 m distance between the wheelsets to be sprayed</li></ul>	<ul style="list-style-type: none"><li>– System lubricant pressure: 100 bars</li><li>– Suitable for bi-directional travel</li><li>– Separable nozzle feeding (right/left)</li><li>– Exact spray-nozzle metering</li><li>– Working with oil and fluid grease</li></ul>	<p>Piston pumps with reservoir PF-100-21, 112-508-042</p> <p>Spray nozzles SP8-5, SP8-4, SP8-2</p> <p>Grease control valve SF10</p> <p>Actuated via valve unit STG12-2 or STG13, 3/2-way valve</p>

References
ETR600/610 .....Alstom Transport
Minuetto .....Alstom Transport
ETR500 .....AnsaldoBreda
S220 Allegro .....Alstom Transport
E402/E403.....Firema

## SP8-5, SP8-4, SP8-2 Spray nozzle

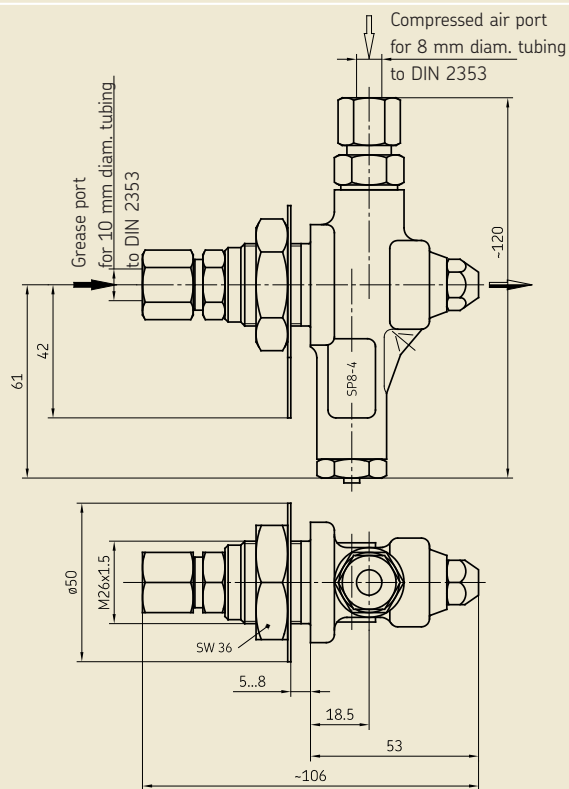
**SP8-5**



### Technical data

Order No. ....	<b>SP8-5</b>
Rated spray quantity .....	0.03 ccm/actuation
Order No. ....	<b>SP8-4</b>
Rated spray quantity .....	0.03 ccm/actuation
Order No. ....	<b>SP8-2</b>
Rated spray quantity .....	0.05 ccm/actuation
Air pressure .....	6 to 10 bars
Air consumption .....	~ 3 NL (at 6 bars/1.5 s)
Temperature range .....	-25 to +80 °C
Medium pressure .....	100 bars
Lubricant .....	oil / fluid grease, NLGI grade 000, 00

**SP8-4 / SP8-2**



## 112-508-042 Piston pump with reservoir



### Technical data

Order No. ....	<b>112-508-042</b>
Reservoir capacity .....	11 liters
Delivery volume .....	12 ccm/stroke
Delivery pressure .....	100 bars
Lubricant .....	oil / fluid grease, NLGI grade 000, 00
Air pressure .....	6 to 10 bars
Area ratio	
air side : grease side .....	10 : 1
Drive medium .....	filtered compressed air
Ambient temperature .....	-25 to +80 °C
Mounting position .....	as shown

**The piston pump must only be installed inside!**

# System EasyRail Low Pressure

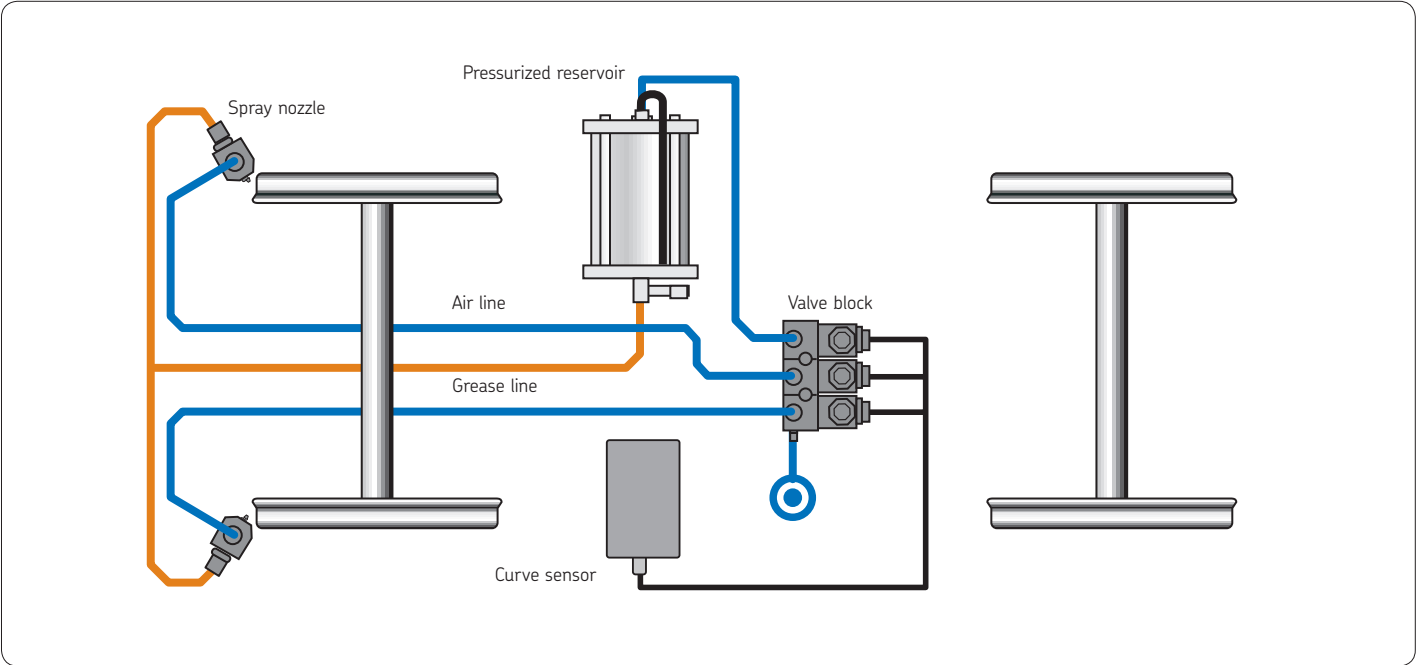
## Description of system

Double line systems EasyRail Low Pressure transport compressed air and the lubricant in separate lines and meter the lubricant directly inside the spray nozzle and apply it with high accuracy even at extremely low temperatures or at very high speed operations.

EasyRail Low Pressure is a dual-line, low-pressure system that is mainly used for application on multiple units and smaller locomotives up to 5 m between the lubricant reservoir and the spray nozzles. The pressurized reservoir has been customized to holding capacities of 4.5 and 6 litres.

## Function

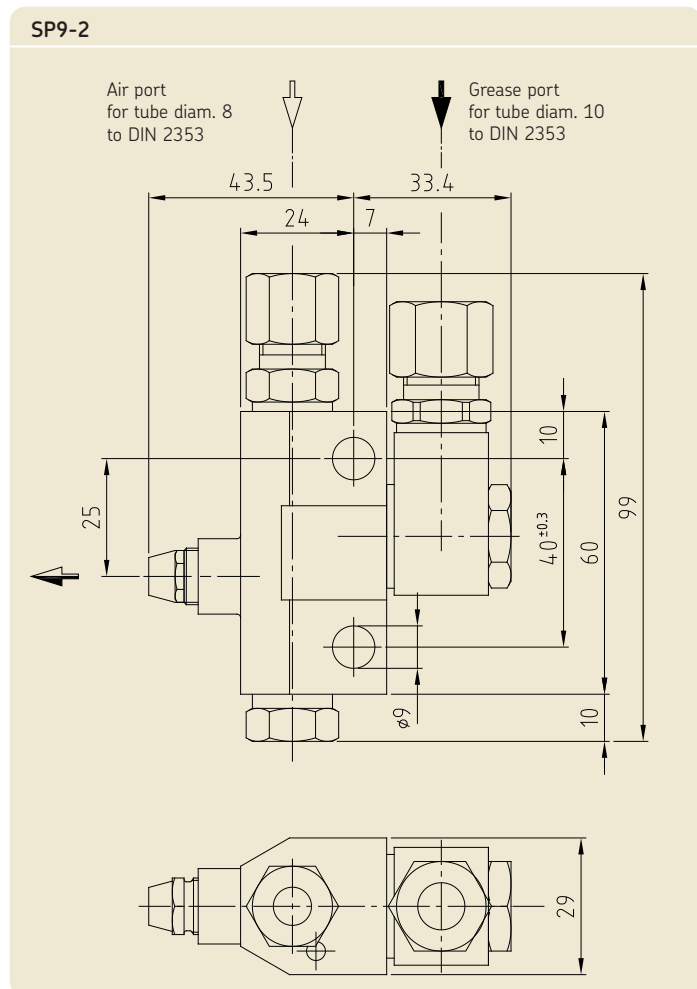
The continuous compressed air supply for the pressure reservoir is enabled when the rail vehicle is made operational. The lubricant is fed to the spray nozzles and is constantly available in the form of a column. The metering of the lubricant takes place in the spray nozzles. The spray nozzles are actuated by compressed air, and the compressed air is controlled by a valve block. The grease reservoir is de-pressurized when the rail vehicle is shut down. The system can be customized for bi-directional operations..



Application	Advantages	Standard Components
<ul style="list-style-type: none"><li>– System with a max. line length of 5 m between the grease reservoir and spray nozzle</li><li>– Single pump solution for vehicles with a maximum of 10 m distance between the wheelsets to be sprayed</li><li>– System air pressure: 10 bars</li></ul>	<ul style="list-style-type: none"><li>– Compact design</li><li>– No separate grease pump</li><li>– Separable nozzle feeding (right/left)</li><li>– Exact spray-nozzle metering</li><li>– Flexible reservoir mounting position (horizontal/vertical)</li></ul>	<p>Pressure reservoir BF4.5 or BF6-S3</p> <p>Spray nozzles SP9-2, SP9-2-S7</p> <p>Actuation via valve unit</p> <p>3/2-way valve</p>

References
RS1 .....Stadler Rail Group
DT Series Hamburg .....Alstom LHB
Contessa.....Bombardier
ICE T.....Bombardier
EF510 .....Kawasaki

## SP9-2, SP9-2-S7 Spray nozzle



### Technical data

Order No. ....	<b>SP9-2</b>
Rated spray quantity .....	0.03 ccm/actuation
Order No. ....	<b>SP9-2-S7</b>
Rated spray quantity .....	0.05 ccm/actuation
Air pressure .....	4.5 to 10 bars
Mean air consumption .....	~ 4,5 NL (at 6 bars / 1.5 s)
Max. lubrication pressure .....	40 bars
Lubricant .....	fluid grease, NLGI grade. 000, 00

## BF4.5, BF6-S3 Grease reservoir



### Technical data

Order No. ....	<b>BF4.5 / BF6-S3</b>
Reservoir capacity .....	4,5 / 6 liters
Filling level display .....	analog, by indicator
Operating pressure .....	max. 10 / 8 bars
Pressure limiting valve .....	16 <sub>-2</sub> bars (overfill preventer)
Perm. ambient temperature .....	-25 to +80 °C
Mounting position .....	preferably as shown

# System EasyRail Airless

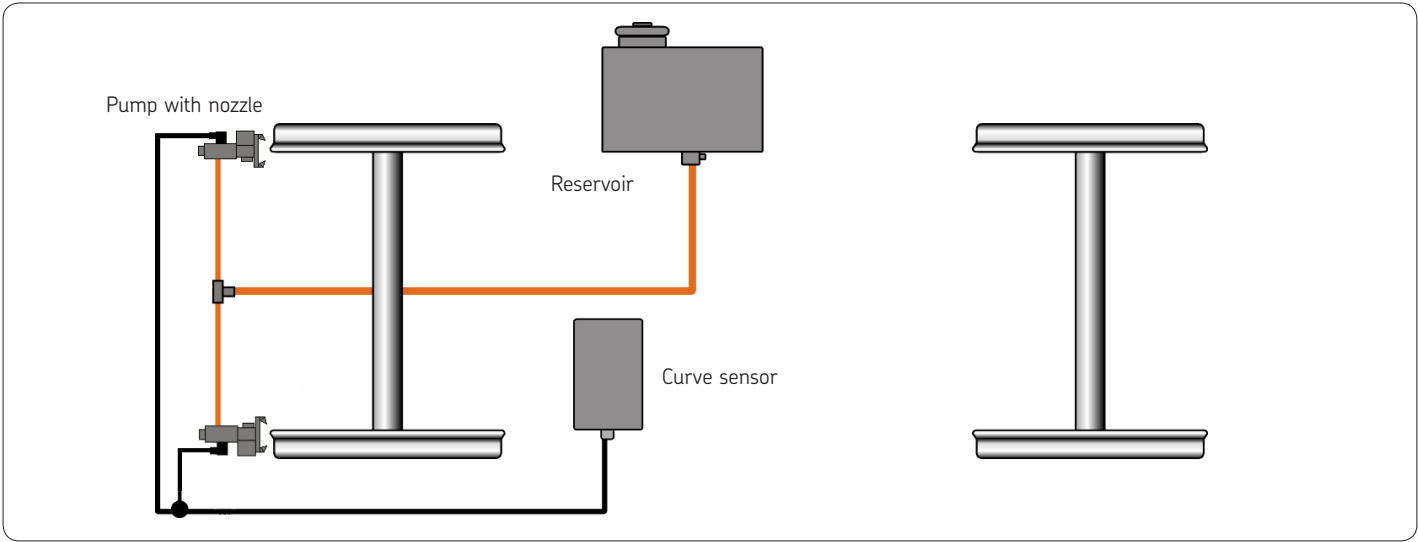
## Description of system

Single line systems EasyRail Airless operate through output of the lubricant via an electromagnetic pump, whereby the lubricants are applied in a defined quantity on the wheel flange without use of compressed air. The unit is equipped with a heating system to ensure the delivery of lubricant under challenging weather condition.

Single line systems EasyRail Airless are used mainly on tramway or RV systems and metros where the supply of compressed air is not available.

## Function

From a tailor-made reservoir, the lubricant (oil or fluid grease) feeds the electromagnetic pump unit. The integrated spray nozzle meters the right quantity of lubricant to the wheel flange. The lubricant is then sprayed onto the inner and outer wheel flanges by compressed air. This solution is a technical alternative to the stick lubricator. All components are developed according to a Smallest Replaceable Unit Concept and highly accessible, therefore easy to service or exchange, which considerably reduce maintenance time and expense.



Application	Advantages	Standard Components
<ul style="list-style-type: none"> <li>– Electric magnetic pump unit</li> <li>– Recommended for Metro and LRV applications</li> <li>– Double nozzle unit for spraying of inner and outer wheel flange of tram wheel</li> </ul>	<ul style="list-style-type: none"> <li>– Very compact design</li> <li>– Low weight</li> <li>– No compressed air needed</li> <li>– Exact pump-nozzle metering</li> <li>– Pump with internal heater</li> <li>– Working with oil and fluid grease</li> </ul>	Reservoir MOD-031-NC Pump nozzle PRJ-2

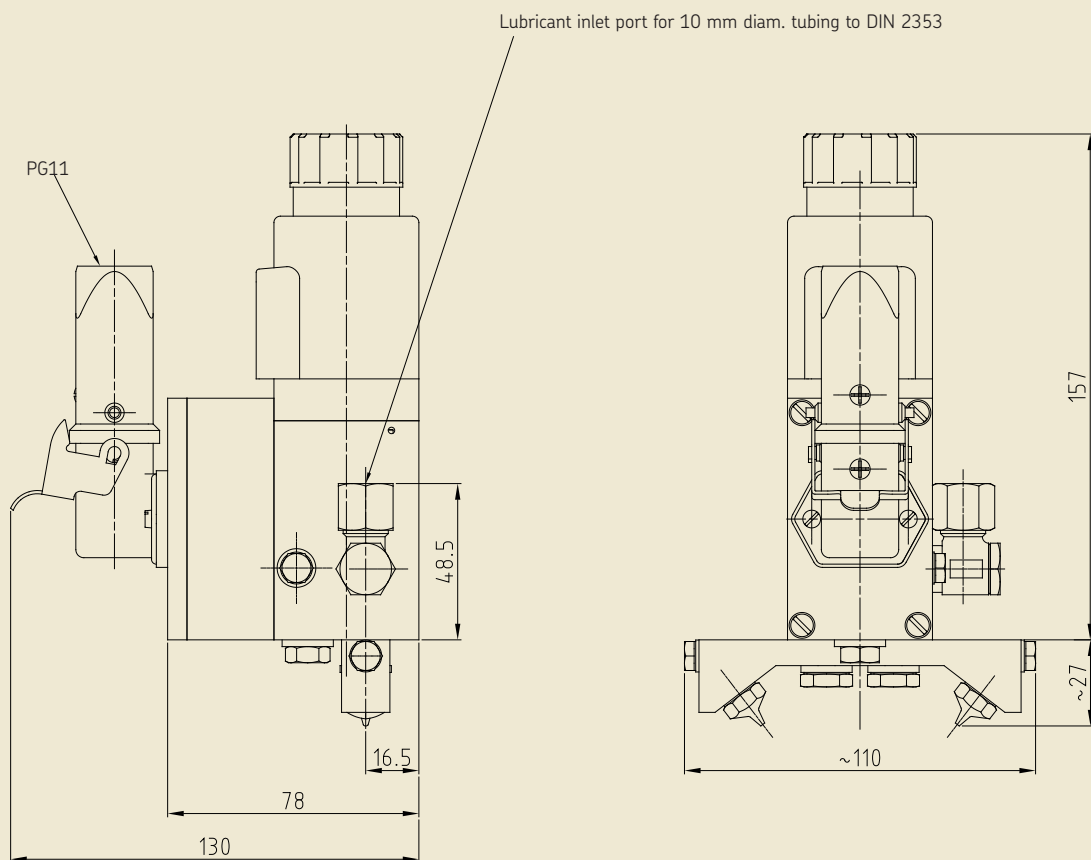
## PRJ-2 Magnetic pump with nozzle



### Technical data

Order No. ....	PRJ2643-230
Reservoir capacity .....	customized
Lubricant .....	oil / fluid grease, NLGI grade 000, 00
Operating pressure .....	no air supply
Rated quantity .....	0.03, 0.04, 0.05 ccm/stroke
Perm. ambient temperature .....	-20 (with heater) to +60 °C
Mounting position .....	any
Rated operating voltage .....	24 V DC or 110 V DC
Rated power input .....	approx. 125 W
Type of enclosure to EN 60 529/10.91..	IP 65
Weight .....	1.2 kg

### PRJ2643-230



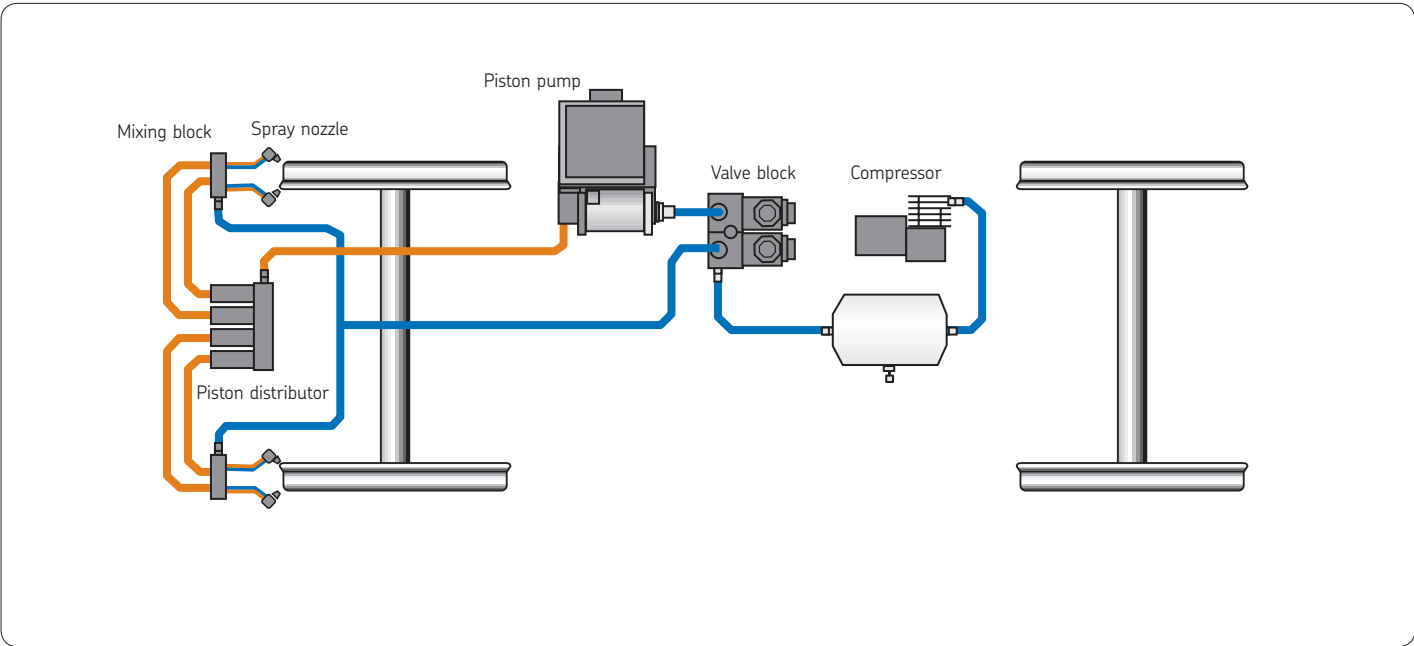
# System EasyRail Airsupply with its own supply of compressed air

## Description of system

EasyRail Airsupply is a dual-line, low-pressure system that is only used for application on tramway vehicles or LRV systems. The system can only be operated with an independent compressed air supply module.

## Function

The pneumatically actuated pump delivers lubricant to the piston distributor. The metered quantity of lubricant goes into the mixing blocks after the pump switches off. The metered lubricant mixes with compressed air in the mixing blocks. The compressed air flows through the mixing block intermittently and blows the metered lubricant through the mixed-flow line to the nozzles. The lubricant is then sprayed onto the inner and outer wheel flanges by compressed air.



Application	Advantages	Standard Components
<ul style="list-style-type: none"><li>– System with a max. line length of 5 m between the grease reservoir and spray nozzles</li><li>– Two nozzles for spraying of inner and outer wheel flange of tram wheel</li><li>– With module for compressed air supply</li><li>– Recommended for LRV applications</li></ul>	<ul style="list-style-type: none"><li>– Variable metered quantities of piston distributors</li><li>– Exact spray metering</li><li>– Easy access to main components</li><li>– Working with oil and fluid grease</li></ul>	<p>Piston pump with reservoir PEF-98 or PEU-98</p> <p>Mixing block 169-000-205</p> <p>Piston distributors VKS0</p> <p>Spray nozzles 169-000-208, 169-000-209</p>

References
Incentro Nantes .....Bombardier
SWIMO .....Kawasaki



## Piston pump with reservoir, pneumatically actuated



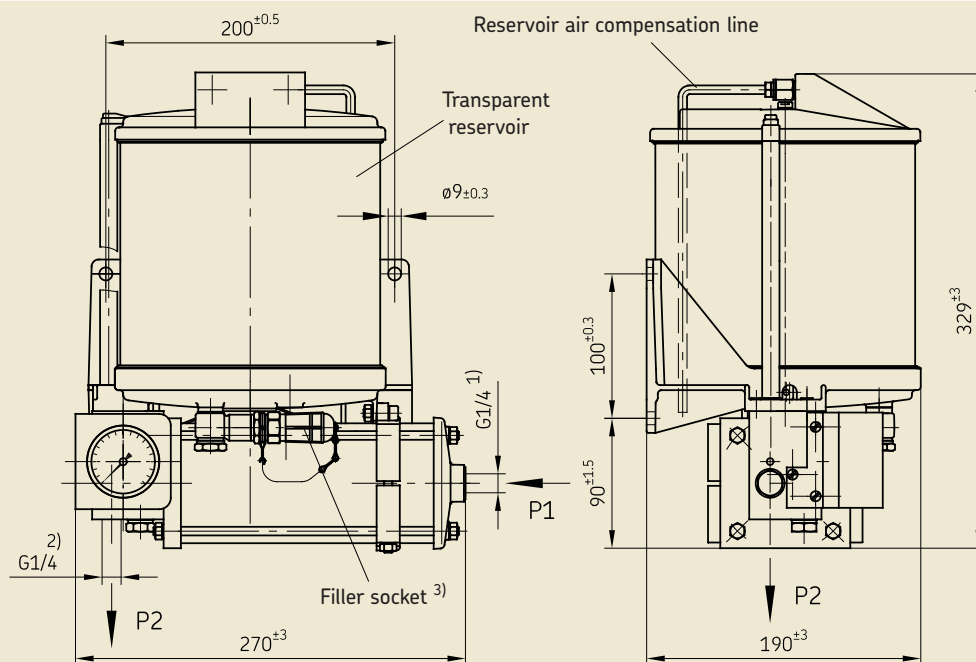
A maximum of 50 ccm of lubricant is fed into the main line with every stroke of the PEF-98 pump. The main line is briefly pressurized with a least 30 bars of pressure, the distributors being filled as a result.

Two spring-loaded cone valves serve as the intake and outlet valve.

The pressure-relief valve forms a unit together with the residual-pressure valve.

When the pump's piston returns to its initial position, the outlet valve disconnects the main line from the pump chamber to assure new intake. At the same time, the main line is relieved via the pressure-relief valve.

PEF-98



### Technical data

Order No. ....	PEF-98
Reservoir capacity ....	4 liters
Delivery rate ....	50 ccm/stroke
Perm. air pressure P1 ....	max. 10 bars
Lubricant ....	Fluid grease, NLGI grade 000, 00
Operating temperature ....	-25 to +80 °C
Mounting position ....	as shown
Make sure the pump is installed without distortion.	

<sup>1)</sup> Air port tube diam. 8 to DIN 2353

<sup>2)</sup> Lubricant port for tube diam. 10 mm to DIN 2353

<sup>3)</sup> Coupling bush for filler socket order separately, order No. 995-001-500.

**P1** = air line from compressed air network

**P2** = main line of system

# 169-000-205 Mixing Block 169-000-209 Spray nozzle

## Function

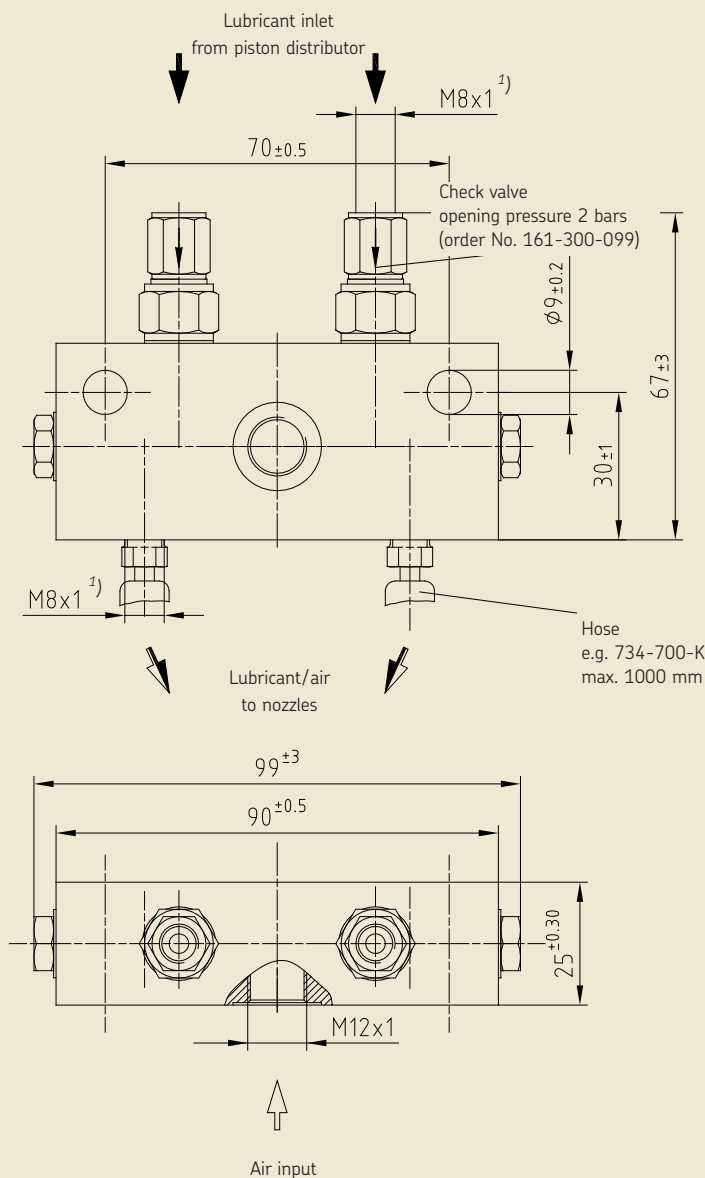
One respective mixing block is installed on the body near the nozzles for one wheel. In each mixing block the lubricant presupplied by the piston distributor for a wheel flange (= two lube points) is fed by pulses of compressed air through the hose to the nozzles, being mixed with air in the process.

## Adjustment of spray nozzle

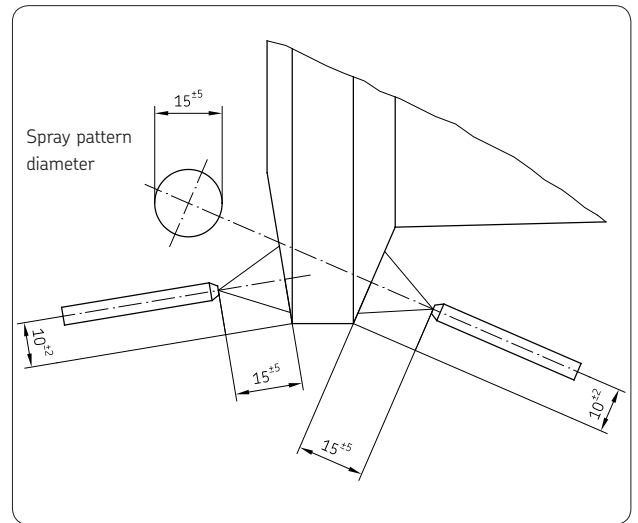
The spray nozzles point directly at the two sides of the wheel flange (front and back of wheel flange) and feed the mixture of lubricant and air exactly to the area to be lubricated. The length of the tubing between the mixing block and spray nozzle should not be any longer than 1 m to ensure an optimal, even lubrication effect.

The nozzles can be pointed in different directions so that the spray angle and spray distance can be optimized again when the wheel flange is recontoured.

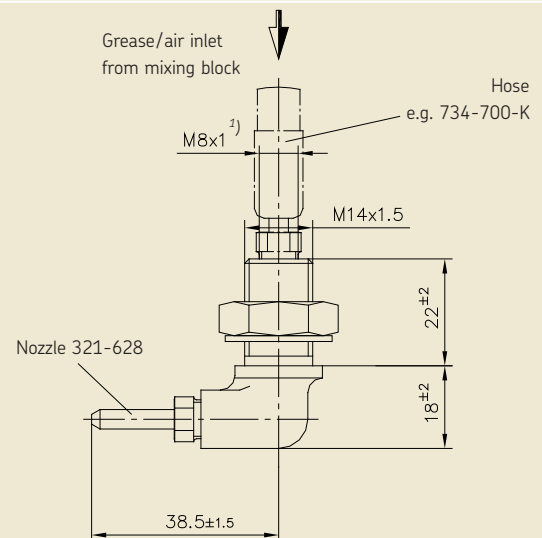
### 169-000-205



<sup>1)</sup> Ports tapped for solderless tube connection for tube diam. 4 mm



### 169-000-209



## Technical data

Order No. ....	169-000-205
Order No. ....	169-000-209
Temperature range .....	-25 to +80 °C
Mounting position .....	any

## Piston distributors, group VKSO



The distributors meter and distribute the lubricant from the pump to the individual lubrication points. They do so independent of each other.

Interchangeable metering nipples make it possible to adapt the quantity to the amount of lubricant required by the friction point.

The cycle number, i.e. the number of pump strokes per time unit of the lubrication system, also permits further coordination of the lubricant quantity with the friction point and entire system.

Lubricant is only delivered under spring pressure after the end of pump operation, i.e. after the pressure is relieved.

A collar (changeover valve) in the distributor closes the outlet to the lubrication point during the delivery stroke, thus storing the lubricant beneath the piston. The changeover valve opens the outlet as soon as the pressure drops in the main line, i.e. when the pressure relief valve of the pump opens.

Assign only one lubrication point to each distributor outlet port.

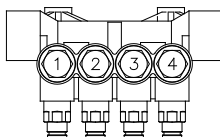
Connect the secondary line (connection: distributor - mixing block) to the mixing block only after bubble-free lubricant emerges from the tubing after the pump is repeatedly actuated. Fill long secondary lines beforehand if necessary.

Piston distributors are only supplied with metering nipples fitted.

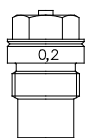
Order No.                      Number of lubrication points

VKS02 ...                      2

VKS04 ...                      4



When ordering distributor, please quote the desired metered quantities (0.1; 0.2; 0.4 ccm) in the respective order.



Metering nipples, with O-ring

for metered quantity      Order No.

0.1 ccm

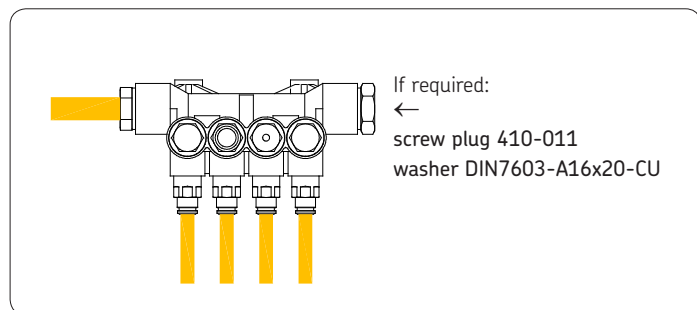
VKU010-K

0.2 ccm

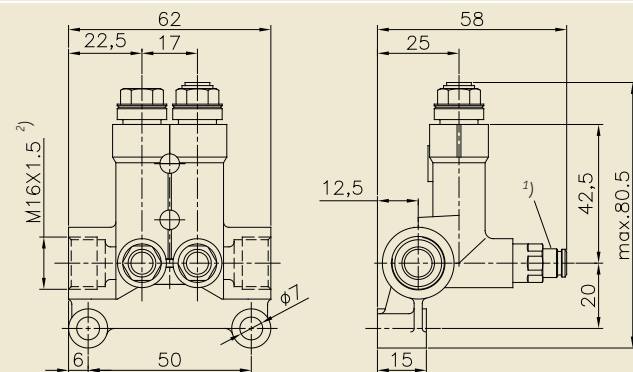
VKU020-K

0.4 ccm

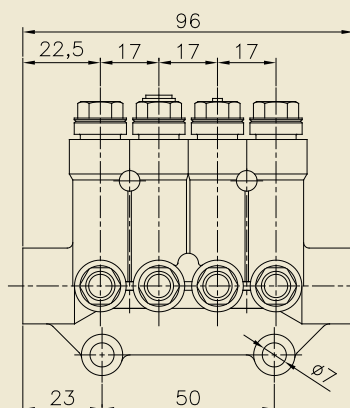
VKU040-K



### VKS02... 2-port distributor



### VKS04... 4-port distributor



<sup>1)</sup> Quick connector connection for  $\varnothing 4$  plastic tubing.

<sup>2)</sup> Ports tapped for solderless tube connection for tube diam. 10 mm.

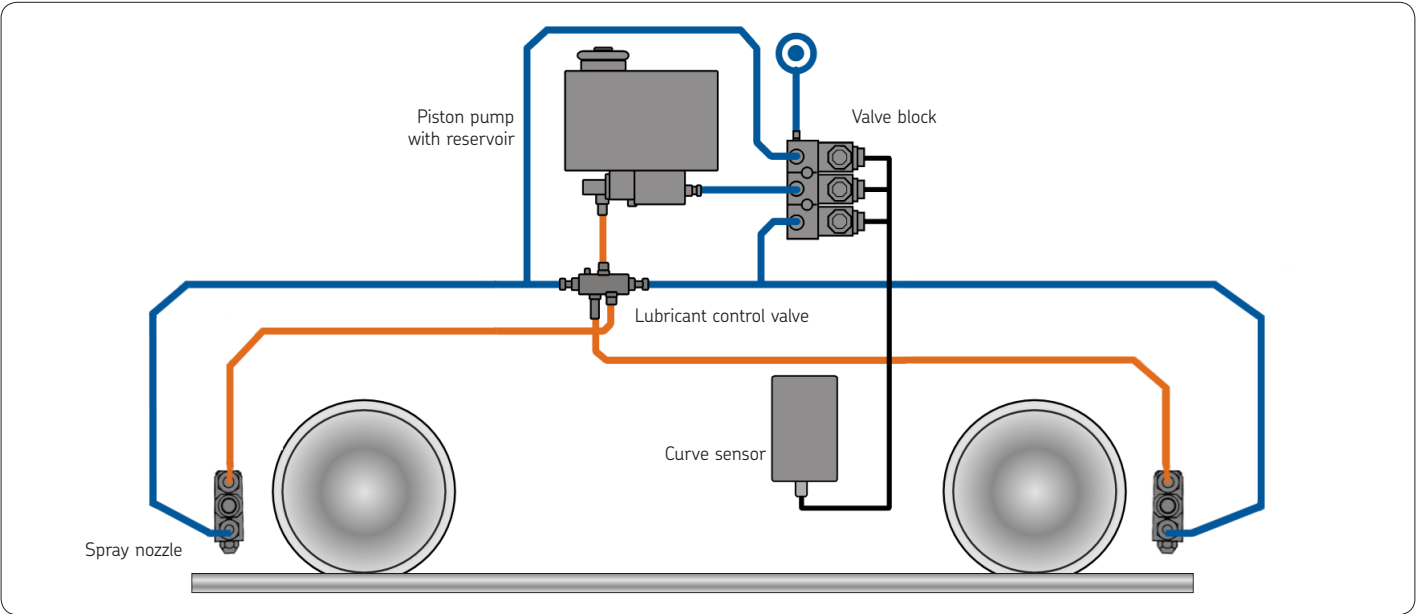
# System EasyRail Track

## Description of system

Additionally, SKF Lubrication Systems developed a double line lubrication system that can be installed as on-board unit on rail vehicles to minimize squealing noises on inner-city lines or residential areas and positively affects the operational performance of rolling stock equipment to the benefit of their operators. The so-called Top-of-Rail (TOR) lubrication applies a specially configured lubricant on top of the rail and decreases significantly noise and friction without contributing to the train's braking performance, significantly lessening fuel consumption and rail and track wear. This solution can replace fixed lubrication installations or special purpose vehicles to lubricate the network.

## Function

The spray nozzles are specifically mounted on the vehicle to supply lubricant to the top of the rail, usually on the second axle/bogie of the vehicle. The pump feeds the lubricant via the grease control valve. From the grease control valve the lubricant is directed to the spray nozzles for lubricant application in the appropriate direction of travel. The lubricant is metered inside the spray nozzles in volumes typically 0.03 or 0.05 cm<sup>3</sup>/spray and sprayed onto the railhead with a air system pressure of up to 10 bars. The high lubricant system pressure enables operations with specifically developed lubrication products with very high solid contents. The system can be customized for bi-directional operations.



Application	Advantages	Standard components
<ul style="list-style-type: none"><li>– Max. line length between pump and spray nozzle: 10 m</li><li>– Low ambient temperature</li><li>– Single pump solution for vehicles with a maximum of 20 m distance between the wheelsets to be sprayed</li></ul>	<ul style="list-style-type: none"><li>– System lubricant pressure: 100 bars</li><li>– Suitable for bi-directional travel</li><li>– Separable nozzle feeding (right/left)</li><li>– Exact spray-nozzle metering</li><li>– Working with oil and fluid grease</li></ul>	<p>Piston pumps with reservoir PF-100-21, 112-508-042</p> <p>Spray nozzles SP8-5, SP8-4, SP8-2</p> <p>Grease control valve SF10</p> <p>Actuated via valve unit STG12-2 or STG13, 3/2-way valve</p>

References
Combino Erfurt. . . . .Siemens

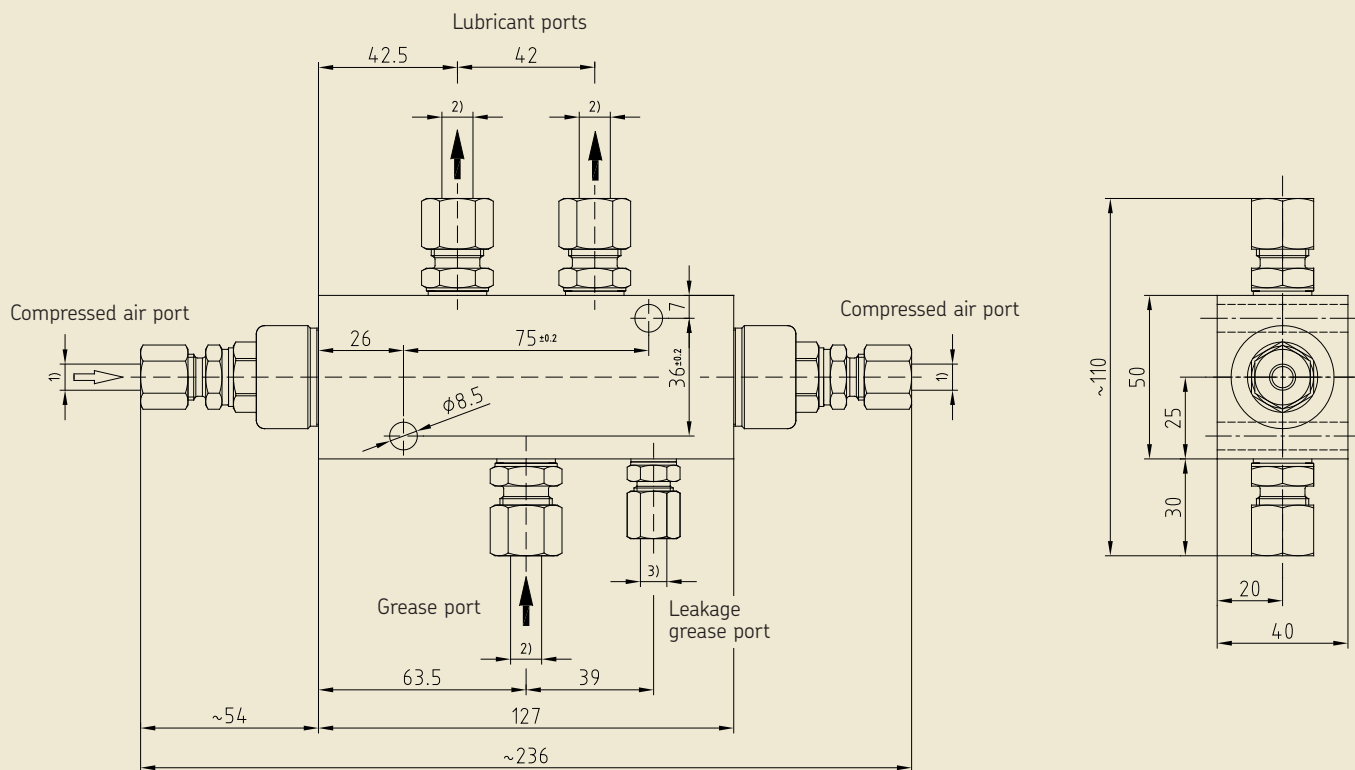
## SF10 Lubricant control valve

The grease control valve controls the flow of lubricant in the dual line systems, e.g. for curve-dependent lubrication (left/right spray nozzles) or distance-dependent lubrication (front/rear spray nozzles).

### Technical data

Order No. ....	<b>SF10</b>
Air pressure .....	6 to 10 bars
Lubricant .....	oil / fluid grease, NLGI grade 000, 00
Lubrication pressure .....	100 bars
Ambient temperature .....	-25 to +80 °C
Mounting position .....	as shown

### SF10



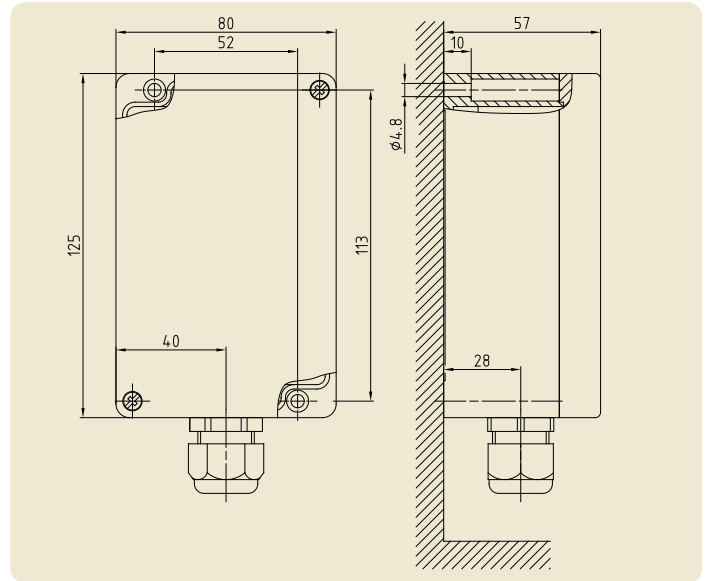
<sup>1)</sup> Compressed air ports for 8 mm diam. tubing to DIN 2353

<sup>2)</sup> Lubricant ports for 10 mm diam. tubing to DIN 2353

<sup>3)</sup> Leakage port for 6 mm diam. tubing to DIN 2353

## CS200 Curve sensor control unit

CS200



### Intelligent lubrication control by CS200

As curves increase friction and wear, SKF Lubrication Systems has developed a detection system that initiates lubrication just before a train enters a curve. The CS200 curve sensor, used for all wheel flange lubrication systems, offers a comprehensive range of functions and customer values.

#### Function

The CS200 is used to control wheel flange lubrication systems to optimize the sprayed lubricant quantity. Curves are detected via an integrated sensor with adjustable sensitivity. Two spray nozzles are actuated, the lubrication taking place in curve-, time- or distance-dependent modes. Lubrication is triggered after a certain number of previously specified pulses are received.

A combination of two operating modes is programmable. The parameters for the different operating modes are set at an 8-position DIP switch.

In the case of curve-dependent lubrication, it is possible to specify whether lubrication is to take place on both sides or only on the respective outside curve, depending on the direction of travel.

The CS200-S3 is a special version of the curve sensor controller CS200 and especially meant for lubrication systems in which all spraying nozzles in travelling direction are controlled by only one solenoid valve.

The CS200-S1 and -S7 are customized solutions for 110VDC operating voltage.

#### Technical data

**Order No.** ..... CS200(-S3)+924

##### Housing

Material ..... aluminum

Type of enclosure to EN 60 529/10.91... IP 65

Weight ..... 0.57 kg

##### Ambient temperature

Class ..... T3

Operation ..... -25 to +70 °C

##### Electrical connection

Terminals ..... 8 spring-loaded terminals for core diam. 0.2-2.5 mm<sup>2</sup>

Cable gland ..... 1x M20x1.5 for line diam. 7-13 mm

Rated operating voltage ..... 24 V DC

Operating voltage tolerance ..... -50%, +30%

Closed-circuit power consumption ..... max. 75 mA (without output load)

Clock-pulse spaces ..... 1.5; 3; 4.5; 6 sec.

Spray time ..... 1.5 sec.

##### Curve sensor

Detection threshold adjustable in 15 stages from 0.5 %/s to 1.9 %/s

##### Time-dependent operation

Spray period ..... 10 to 244 sec. in 15 stages

##### Distance-dependent operation

Input pulses ..... 500 to 123,000 in 15 stages

##### Inputs

FG ..... - spray enable

VR ..... - direction of travel

P ..... - distance pulses:  
visually separate input

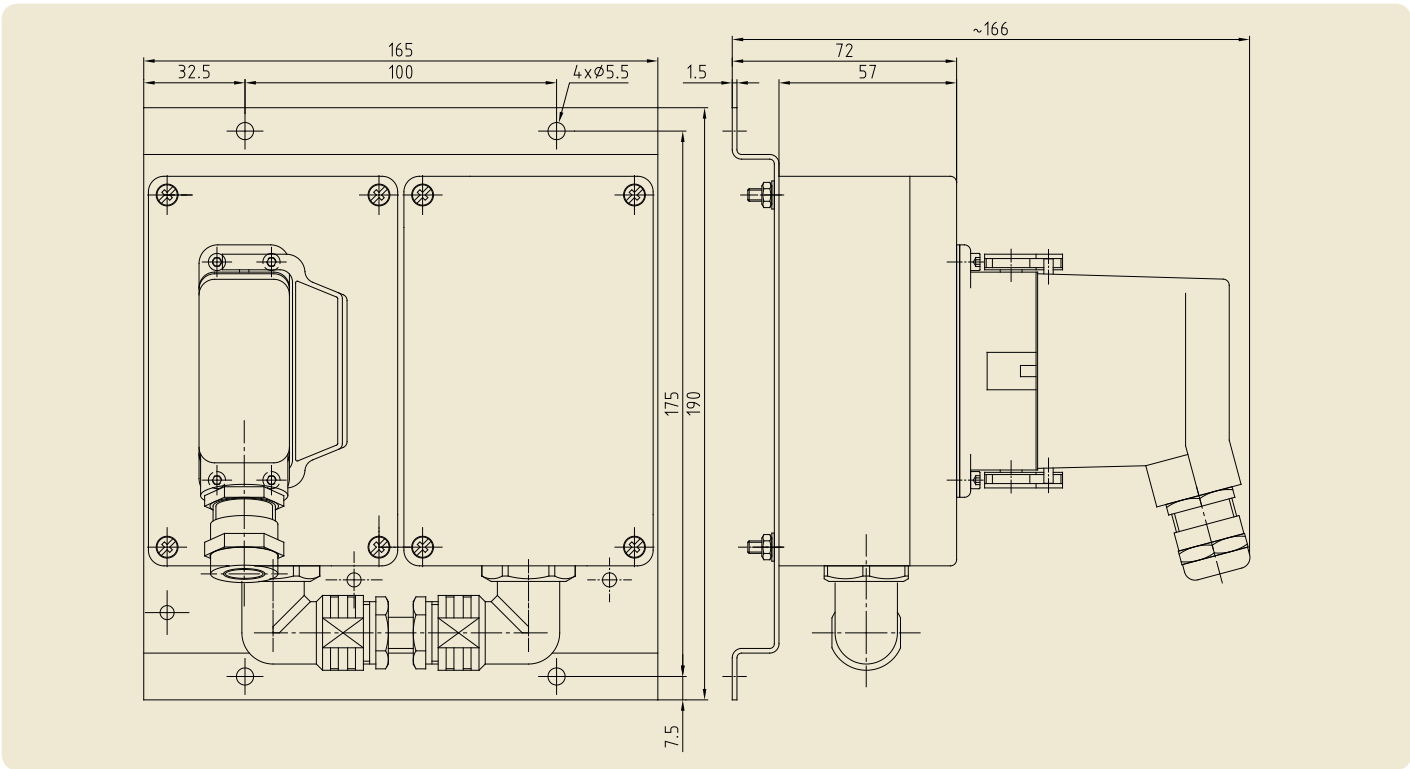
##### 2 valve outputs

Rated output current ..... 1 A per output

Short-circuit protection ..... yes

Standards see page 23

CS200-S1+902 Curve sensor control unit



Function

see CS200

Technical data

Order No.	CS200-S1+902
Housing	
Material	aluminum
Type of enclosure to EN 60 529/10.91	IP 65
Weight	1.6 kg
Ambient temperature	
Class	T3
Operation	-25 to +70 °C

Electrical connection

Plug and socket connection	HARTING HAN 15 D
Cable gland	1x M20x1.5 for line diam. 7-13 mm
Rated operating voltage	72 V DC ...110 V DC
Operating range	50.4 V DC ...137.5 V DC
Rated power input	approx. 8 W (without output load)
Clock-pulse spaces	1.5; 3; 4.5; 6 sec.
Spray time	1.5 sec.
Curve sensor	
Detection threshold	adjustable in 15 stages from 0.5 %/s to 1.9 %/s
Time-dependent operation	
Spray period	10 to 244 sec. in 15 stages
Distance-dependent operation	
Input pulses	500 to 123,000 in 15 stages
Inputs	
FG	- spray enable
VR	- direction of travel
P	- distance pulses: visually separate input
2 valve outputs	
Rated output power	36 W per output
Short-circuit protection	yes
Standards	
	EN 50153, EN 50155, ENV 50121-3-2 (EMC for railway equipment); Electromagnetic compatibility EMC 89/336/EEC; EN 50081-1, EN 50082-2

## 3/2-way valves, valve manifolds

### Technical data

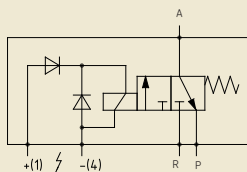
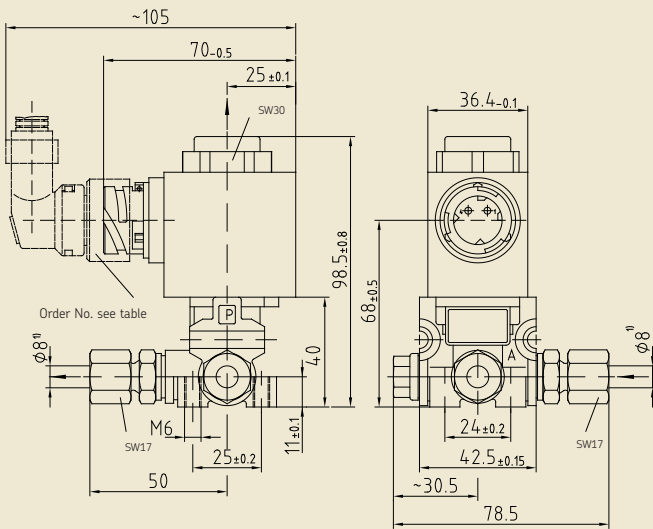
Order No. (1 port)	221-296-031+924
Order No. (2 ports)	221-296-032+924
Order No. (3 ports)	221-296-033+924
Rated width DN	3 mm (admission and venting)
Operating pressure P	0 to 10 bars
Valve seat seal	FKM (FPM)
Temperature range	-25 to +80 °C
Medium	compressed air
Mounting position	any
Rated voltage *)	24 V DC
Voltage tolerance	±25 %
Duty cycle	100 % ED
Power input	~10 W
Magnet	with two built-in diodes
Type of enclosure acc. to EN 60529	IP 65

### Technical data

Order No. (2 ports, 110 V DC)	221-296-052+926
Order No. (2 ports, 72 V DC)	221-296-052+927
Order No. (3 ports, 110 V DC)	221-296-053+926
Order No. (3 ports, 72 V DC)	221-296-053+927
Rated width DN	3 mm (admission and venting)
Operating pressure P	0 to 10 bar
Valve seat seal	FKM (FPM)
Temperature range	-25 to +80 °C
Medium	compressed air
Mounting position	any
Rated voltage *)	110 or 72 V DC
Voltage tolerance	+10 % / -30 %
Duty cycle	100 % ED
Power input	~16 W
Type of enclosure acc. to EN 60529	IP 65

### 221-296-031

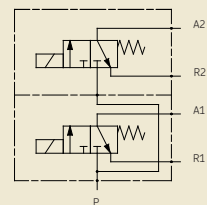
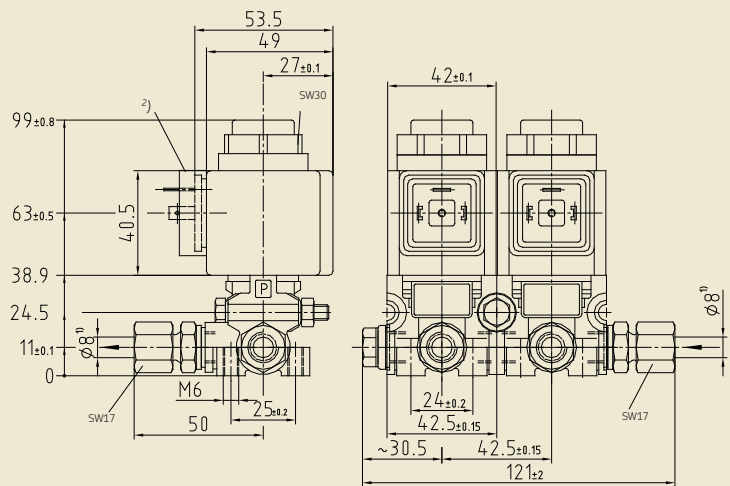
#### 1-port type



P (supply)  
A (consumption)  
R (return)  
electr. terminals (1) +; (4) -

### 221-296-052

#### 2-port type



### Cable harness

Designation	Order No.
-------------	-----------

Cable harness with corrugated tubing cable length 3 m	997-000-712
--	-------------

<sup>1)</sup> Cutting sleeve screw union to DIN 2353  
Port for Ø8 tubing

<sup>2)</sup> Plug connector to DIN EN 175301-803;  
matching socket 179-990-147



2/2-way valves, valve manifolds

Technical data

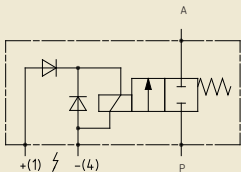
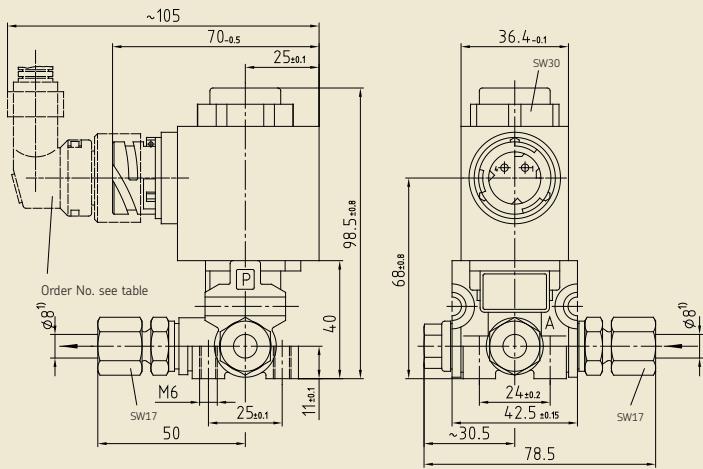
Order No. (1 port, 24 V DC)	221-196-031+924
Order No. (2 ports, 24 V DC)	221-196-032+924
Rated width DN	3 mm
Operating pressure P	0 to 10 bar
Valve seat seal	FKM (FPM)
Temperature range	-40 to +80 °C
Medium	compressed air
Mounting position	any
Rated voltage *)	24 V DC
Voltage tolerance	+25% / -25%
Duty cycle	100% ED
Power input	~10 W
Type of enclosure acc. to EN 60529	IP 65

Technical data

Order No. (1 port, 110 V DC)	221-196-051+926
Order No. (1 port, 72 V DC)	221-196-051+927
Order No. (2 ports, 110 V DC)	221-196-052+926
Order No. (2 ports, 72 V DC)	221-196-052+927
Rated width DN	3 mm (admission and venting)
Operating pressure P	0 to 10 bar
Valve seat seal	Viton
Temperature range	-25 to +80 °C
Medium	compressed air
Mounting position	any
Rated voltage *)	110 or 72 V DC
Voltage tolerance	+10% / -30%
Duty cycle	100% ED
Power input	~16 W
Type of enclosure acc. to EN 60529	IP 65

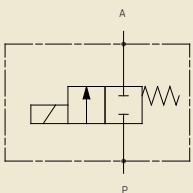
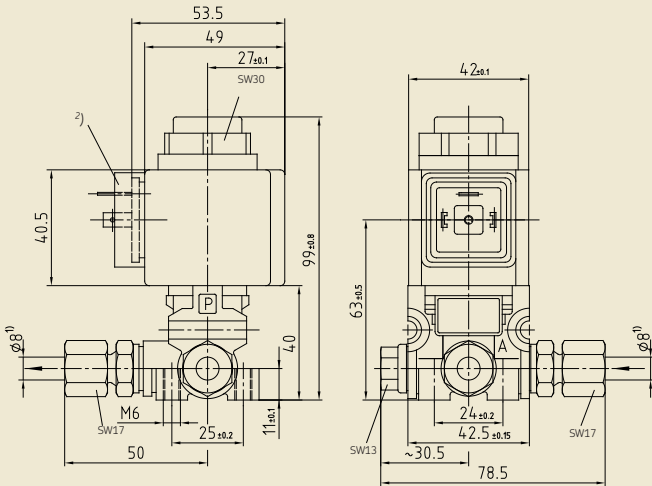
221-196-031+924

1-port type



P (supply)  
A (consumption)  
electr. terminals (1) +; (4) -

221-196-051+926



Cable harness

Designation	Order No.
Cable harness (halogen free) cable length 5 m	997-000-772

<sup>1)</sup> Cutting sleeve screw union to DIN 2353  
Port for Ø8 tubing  
<sup>2)</sup> Plug connector to DIN EN 175301-803;  
matching socket 179-990-147

## Accessories

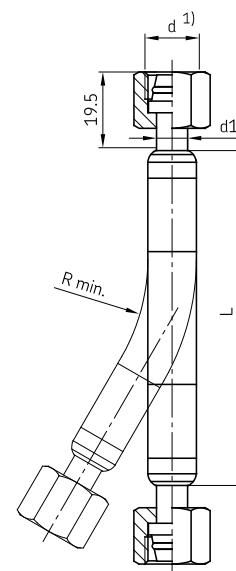
### Hoses acc. to DIN 5510 for railway applications

Order No.	d	Tube diam. d1	L <sup>±10 %</sup>	R min.	Perm. operating press [bars]	Application
SLH86-180-K SLH86-580-K	M14x1.5	8	180 560	50	225	as compressed air line
SLH106-180-K SLH106-580-K	M16x1.5	10	180 560	60	180	as lubricant line

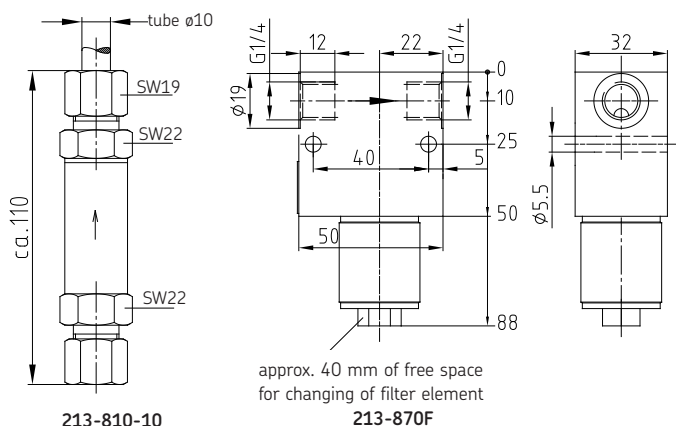
#### Design

Inner liner	synthetic rubber NBR
Reinforcement	1 wire braiding
Outer cover	synthetic rubber CR
Resistant to	lubricants, also rapidly biodegradable ones based on synthetic ester, vegetable and mineral oils, compressed air
Perm. operating temperature	-25 to +70 °C
To fire protection standard	DIN 5510 "Preventive fire protection in rail vehicles"
Flammability class	S3
Smoke development class	SR1

<sup>1)</sup> Prepared in conformity with DIN 3865, light series:  
with 24 ° cone and O-ring for port and W to DIN 3861



### Micro filters

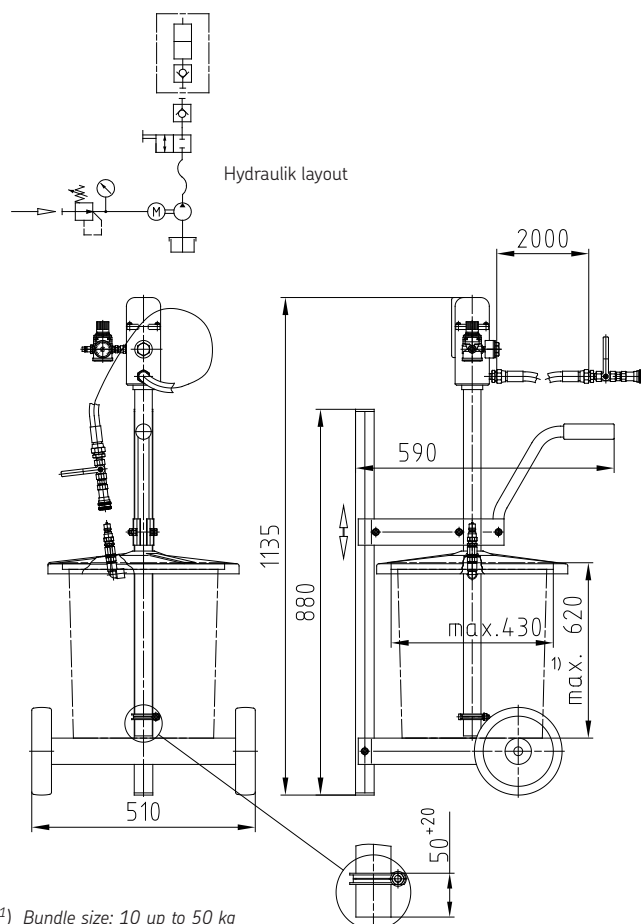


Order No.	Filter fineness [µm]
213-808-10	320
213-870F	160

#### Technical data

Order No.	169-000-224
Medium	fluid grease, NLGI grade 000, 00, 0
Delivery rate	ca. 3 l/min
Temperature range	0 to +60 °C
Grease connection for Parker filler socket BH2-61-...	fits reservoirs BF4.5 and BF6-S3

### Pneumatic topping-up pump 169-000-224



# Checklist

From ☐ Dealer Name .....

☐ Customer Date .....

## Replay

Berger Vogel S.r.l.  
SKF Lubrication Systems  
Via Gramsci 55  
20032 Cormano (MI)  
Italy

Company .....

Name .....

Dept. ....

Street .....

City .....

Zip Code .....

Phone .....

Fax .....

E-mail .....

Fax: +39 (0)2 663089-37

Please complete the following check list. Send the check list back to the above address or fax.

Vehicle: ☐ High-speed trains ☐ Regional & commuter trains ☐ Locomotives  
☐ Metro trains ☐ Light rail vehicles

Type/series: .....

Number of systems: .....

Delivery schedule: .....

Bid deadline: .....

Retrofit: ☐ yes ☐ no

Compressed air supply: ☐ yes, from ..... bars to ..... bars ☐ no

Power supply: ☐ 24 V DC ☐ 72 V DC ☐ 110 V DC ☐ ..... V AC  
tolerance + ..... / - ..... V

Type of lubrication: ☐ curve-dependent ☐ distance-dependent ☐ time-dependent ☐ curve-/time-dependent ☐ curve-/distance-dependent

Type signal for distance dependent lubrication:

Speedometer: .....

Others (specify): .....

Multiple unit: ..... ☐ yes ☐ no

Max. vehicle length: ..... m

Directions of travel: ☐ 1 direction ☐ 2 directions

Driving speed: Operational speed ..... km/h

Special requirements/options: .....  
.....

Additional rail vehicles data (specs)? ☐ yes (attached) ☐ yes (will be supplied) ☐ no

**Order No. 1-8092-EN**

Subject to change without notice! (07/2009)

**Important product usage information**

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 (1013 mbars) 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.

**Further brochures**

1-0103-EN Fittings and accessories

**Berger Vogel S.r.l.**

SKF Lubrication Systems

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[www.skf.com/lubrication](http://www.skf.com/lubrication)

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