

LUBRILEAN® Vario

Minimum quantity lubrication
system for internal lubrication

Operating instructions
Version 2



1 Table of Contents

| | | | | | |
|----------|--|-----------|-----------|--|-----------|
| 1 | Table of Contents | 3 | 9 | Assembly | 14 |
| 2 | Information for declaration of EU conformity and manufacturer's declaration | 4 | 9.1 | Connector for aerosol outflows..... | 14 |
| 3 | Remarks about these instructions | 5 | 9.2 | Rotary joints and spindles..... | 16 |
| 4 | Range of application | 5 | 9.3 | Compressed air connection..... | 16 |
| 5 | Safety warnings | 6 | 10 | Adjusting the parameters | 17 |
| 5.1 | Using the MQL systems..... | 6 | 10.1 | General..... | 17 |
| 5.2 | Personnel | 7 | 10.2 | Effect of primary pressure | 17 |
| 5.3 | Working on the MQL system..... | 7 | 10.3 | Procedure for adjusting parameters... .. | 17 |
| 5.4 | Lubricants..... | 7 | 11 | Start-up | 19 |
| 6 | Transport, delivery, storage | 8 | 12 | Maintenance | 19 |
| 7 | Lubricants | 8 | 12.1 | Refilling lubricant | 19 |
| 8 | Structure and function | 10 | 12.2 | Changing lubricant | 20 |
| 8.1 | Principle of minimal quantity lubrication (MQL) | 10 | 12.3 | Draining lubricant | 20 |
| 8.2 | Aerosol mechanism of action | 10 | 12.4 | Cleaning..... | 20 |
| 8.3 | Structure of the system..... | 12 | 13 | Malfunctions | 22 |
| 8.4 | Optical fill level display | 12 | 14 | Shutdown | 24 |
| 8.5 | Electrical fill level indicator | 12 | 14.1 | Temporary shutdown | 24 |
| 8.6 | Display and setting of the lubricant flow rate..... | 13 | 14.2 | Permanent shutdown | 24 |
| | | | 15 | Service | 24 |
| | | | 16 | Technical Data | 25 |

2 Information for declaration of EU conformity and manufacturer's declaration

The following product:

LUBRILEAN® Vario

has been endorsed as meeting the main safety requirements, which are defined in the guideline(s) of the council for the conformity of the legal requirements of the member states ...

- **Electromagnetic compatibility 89/336/EEC**

Remarks

- (a) This declaration certifies the compliance with the specified directives but does not, however, contain any assurance of properties.
- (b) The safety warnings in the documentation included with the product are to be observed.
- (c) The commissioning of the certified product is prohibited until it has been guaranteed that the machine, vehicle or similar in which the product has been installed complies with the stipulations and requirements of the relevant directives.
- (d) The operation of the product with non-standard voltage as well as non-observance of installation indications can have consequences affecting the EMC properties as well as electrical safety.

Additionally, we declare that the aforementioned product:

- is defined in accordance with **EU machine directive 98/37/EU, Appendix II B** for installation in machines / for use with other machines. The commissioning is forbidden until it has been established that the machine in which these parts or with which these parts are assembled complies with EU directive 98/37/EU.
- must only be used in reference to the **EU directive 97/23/EU pertaining to pressure devices** only properly and according to the indications contained in the documentation. Here the following are especially important:

SKF products are not designed or permitted for use with liquids of the Group I (hazardous liquids), definition according to Article 2, Paragraph 2 of Directive 67/548/EEC from 27 June, 1967.

SKF products are not designed or permitted for use with gases, liquefied gases, gases under pressure in solution, steam and liquids with a vapour pressure more than 0.5 bars above the normal atmospheric pressure (1013 mbar) for the maximum permitted temperature.

When used properly, the products provided by us do not reach the limit values listed in Article 3, Paragraph 1, Number 1.1 through 1.3 and Paragraph 2 of Directive 97/23/EU. They are therefore not subject to the requirements of Appendix I of the directive. They therefore also do not receive any CE marking with respect to directive 97/23/EU. They are classified by us according to Article 3, Paragraph 3 of the directive.

SKF products must only be used in accordance with regulations and requirements. The use or commissioning of the products in areas with gassy or dusty atmospheres where there is a danger of explosion is not permitted.

If necessary, you may request the declaration of conformity or the manufacturer's declaration for this product by contacting us at our central contact address.

3 Remarks about these instructions

The SKF minimal lubrication system LUBRILEAN® Vario is built according to the generally recognised engineering rules and corresponds to the applicable work and accident protection regulations. Hazards can arise during operation, however, which can involve bodily damage to the user or a third party, interference with machine operations, or damage to other valuables. In order to guarantee trouble-free operation and avoid hazards, we ask that you read these instructions carefully and observe the warnings contained therein.

Use the table of contents to find the required information quickly and easily.

Please observe the following symbol in the instructions, which brings attention to particular situations:



Text marked with this symbol indicates particular dangers or delineates work that must be performed with particular care.

Please note that these instructions are part of the system and must be handed over to the new owner upon sale of the system.

4 Range of application



All products from SKF LUBRICATION SYSTEMS GERMANY AG must only be used in accordance with regulations and according to the information contained in the operating instructions of the respective product.

We would particularly like to point out that hazardous materials of all types (especially materials classified as hazardous according to EU directive 67/548/EU Article 2, Paragraph 2) require agreement and the expressed written consent of SKF LUBRICATION SYSTEMS GERMANY AG to pour these substances into SKF products, transport them and/or distribute them.

All products manufactured by SKF are not permitted for use with hot gases, liquefied gases, gases under pressure in solution, steam and those liquids with a vapour pressure at the maximum permitted temperature more than 0.5 bars above the normal atmospheric pressure (1013 mbar).

Except for the specially listed products, SKF products are not permitted for use in areas where there is a danger of explosion.

The SKF minimal quantity lubrication system LUBRILEAN® Vario, or MQL system for short, was designed for the internal lubrication of cutting tools for machining. Internal lubrication is defined as the direct feeding of lubricant through tool spindle or tool revolvers and the tool directly at the point of friction between the tool tip and the component.

Other use or use that goes beyond this is considered improper use. SKF assumes no liability for any damages possibly resulting from improper use.

If you also want to use the MQL system LUBRILEAN® Vario for exterior lubrication tasks, you should consult us about this first.

The SKF MQL system LUBRILEAN® Vario can be used for the original fitting of machine tools as well as for the retrofitting of machine tools with existing cooling lubricant supply. The system operates according to the principle of internal lubrication, making it suited for connecting to tools with very small cooling channel diameters. A consultation with SKF is necessary.

5 Safety warnings

 **For internal lubrication, only rotary joints designed for dry running may be used.**

Only the minimal quantity lubricants offered by us, which were specially designed for this type of application, should be used.

 **Only the lubricants permitted for the MQL system must be transported. Unsuitable lubricants can result in a failure of the lubrication system and possibly to severe damage to property and physical injury.**

You can find additional indications pertaining to lubricants in the “Lubricants” chapter, page 8.

SKF provides no guarantee for damages resulting from use of lubricants that are not explicitly permitted in writing by SKF with respect to the device compatibility and transportability.

Please observe the following safety warnings in order to guarantee the trouble-free operation of the MQL system and prevent damages.

5.1 Using the MQL systems

The MQL system LUBRILEAN® Vario must only be used in a technically faultless condition and in accordance with rules and regulations, with cognisance of safety matters and hazards, and in observance of the operating instructions and the local safety regulations.

 **All types of fire in the form of open flames, sparks, cigarette embers, etc. must not be anywhere near the directed spray or in rooms where the aerosol concentration exceeds the explosion limit. The aerosol must not be sprayed on hot surfaces.**

Depending on the type of lubricant used, the work rooms to which the aerosol is fed must have an exhaust system with the appropriate filter system.

In the event of error, the MQL system LUBRILEAN® Vario must be separated as quickly as possible from the compressed air supply. This can be done, for example, by activating the self-sealing coupling on the compressed air connection if this does not pose an additional hazard.

Malfunctions, especially ones that could interfere with safety have to be eliminated immediately. Contact a SKF service location for this.

The safety devices and equipment (if provided) must not be damaged, shut down, rendered unusable or replaced by any parts other than those explicitly approved in writing by SKF.

The unauthorised retrofitting of the MQL system as well as use of non-approved replacement parts and supplies are not permitted and render the guarantee null and void.

Worn out MQL systems must be put out of commission and then disposed of in compliance with the rules and regulations.

5.2 Personnel

The assembly, the electrical connection and all procedures such as repairs, part replacements, etc. must only be performed by trained and qualified technical personnel.

 **Severe damage to property and bodily injury can result from improperly connected MQL systems.**

Qualified personnel are persons who have been trained, commissioned and instructed by the operator of the device. These persons are familiar with the relevant standards, specifications, accident prevention regulations and operating conditions as a result of their training, experience and instruction. They are authorised to perform the particular tasks required and are aware of and avoid dangerous situations in doing so. The definition of technical personnel and the prohibition of non-qualified personnel is regulated by DIN VDE 0105 or IEC 364.

5.3 Working on the MQL system



CAUTION DANGER OF DEATH
Repair tasks must only be performed on the MQL system by technical personnel who have first disconnected the power and ensured the system is voltage-free.



CAUTION DANGER OF DEATH
Working on MQL systems that have not been disconnected from the power supply and are not voltage-free can result in bodily injury.



Working on pressurised systems can result in physical injuries.

For work on the MQL system in particular, the system must be disconnected from electrical voltage and from the compressed air supply.

The general rules and safety regulations that apply for working with machines and devices that use compressed air must absolutely be observed.

5.4 Lubricants

The applying of lubricants or substances with the SKF MQL system other than those approved by SKF is not permitted.



Persons or animals must not be sprayed with aerosol. The aerosol must not come into contact with the eyes and under no circumstances be breathed in directly.



It is important that the application of lubricants or substances containing lubricants can result in damages to one's health.



The uncontrolled application of lubricants or substances containing lubricants can result in mixtures of lubricant and air in concentrations that are potentially explosive.

6 Transport, delivery, storage

The MQL system is packaged according to standard industry practices in the country of the recipient as well DIN ISO 9001. The transport packaging has to include a "Do not throw!" warning.

There are no restrictions for land, air or sea transport.

Upon receiving the delivery please check the goods for any possible damage and ensure that all the delivery documents are there. Keep the packaging material in case there are any discrepancies.

In general, materials should be stored in a dry, dust-free environment. The storage temperatures can be found in the technical data.

7 Lubricants



Only the lubricants permitted for the MQL system must be pumped. Unsuitable lubricants can result in a failure of the lubrication system and possibly to severe damage to property and physical injury.

The lubricants prescribed for use in the SKF MQL system LUBRILEAN® Vario have chemical and physical properties that are specially attuned to the high demands of the MQL technology applied here. Therefore only lubricants offered by SKF must be used. If you would like to use other lubricants, you should first consult SKF.

The lubricants listed in Table 1 are compatible with each other in a way that makes cumbersome cleaning of the container unnecessary in all instances when the lubricant is changed.

If you have any additional questions pertaining to lubricants, we would be happy to assist you.



Do not mix different lubricants without the express consent of SKF: damages and unforeseeable hazards can result, and a cumbersome interior cleaning of the system will be unavoidable.

SKF provides no guarantee for damages of any type resulting from improper use of lubricants or from the use of lubricants that are not explicitly approved in writing by SKF with respect to the device compatibility and transportability.



It is important that you always observe that lubricants are substances that damage the environment and are flammable. In addition, particular care must be exercised for the transport, storage and processing of these materials. Please observe the safety information sheet for the relevant lubricant.

Table 1. Recommended lubricants

| Description | Composition | Properties | Range of application |
|-----------------|--|---|---|
| LubriOil | Fatty acid ester with additives | Viscosity: 47 mm ² /s at 40°C Density: 0.92 g/cm ³ at 20°C | Universal applications |
| LubriFluid F100 | Synthetic polyol ester with natural fatty oil derivative base with anti-oxidizing agents | Viscosity: 25 mm ² /s at 40°C Density: 0.84 g/cm ³ at 20°C | Especially for small tools and lubricating tasks with aluminium |

8 Structure and function

Fig. 1 shows the structure of the MQL system LUBRILEAN® Vario.

8.1 Principle of minimal quantity lubrication (MQL)

Minimal quantity lubrication is based on a principle of loss or consumption. In other words, the lubrication that is applied is nearly completely used up during processing, making a processing of the lubricant in the circulation unnecessary. The actual task of lubrication at the point of friction between the tool and the swarf running in the groove is provided by a finely dispersed drop of lubricant in the stream of air or aerosol.

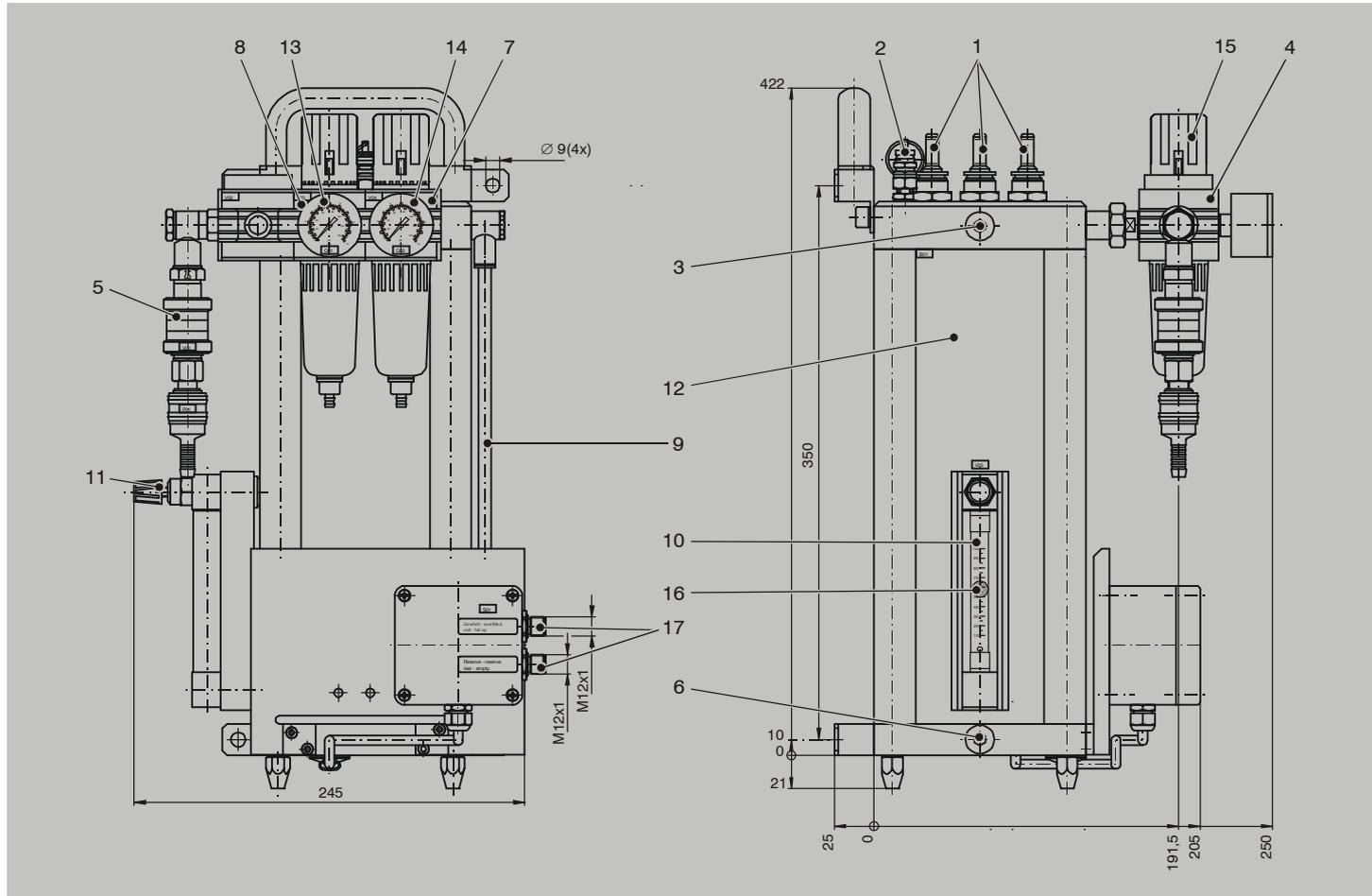
The minimal quantity lubrication principle allows the smallest quantity of lubrication to be used to achieve an effective lubrication of machining processes. The cumbersome cleaning and disposal of large quantities of lubricants and cooling lubricants is unnecessary or reduced to a minimum.

8.2 Aerosol mechanism of action

The SKF MQL system LUBRILEAN® Vario described here with respect to the size and distribution of the lubricant droplet generates a very homogenous aerosol with a very small droplet size. Due to the small size, the lubricant droplets are very light, which therefore requires a very low inertia. These small lubricant droplets can be transported long distances through conduits without their settling due to inertia. In addition, the transport of the aerosol poses via rotating spindles and tools – even at very high rotational speeds – also poses no problem for the MQL system because the centrifugal force on the lubricant drops is very low.

Fig. 1. Structure LUBRILEAN® Vario (Schematic illustration, subject to technical changes)

- 1 Aerosol outlets (Ø 12 mm)**
- 2 Safety valve (12 bar)**
- 3 Lubricant filling hole with back-pressure valve**
- 4 Air supply unit**
- 5 Main air valve with pressurised air connection (NG 7-8 mm)**
- 6 Oil drain plug**
- 7 Pressure control valve main air**
- 8 Pressure control valve secondary air**
- 9 Fill level display**
- 10 Float flowmeter**
- 11 Adjusting screw oil valve**
- 12 Aerosol container**
- 13 Pressure gauge display secondary air pressure**
- 14 Pressure gauge display primary pressure of compressed air supply**
- 15 Rotary knob for pressure regulation**
- 16 Float (oil flow rate display)**
- 17 Connector level switch (Fig. 2, Fig. 3) (optional)**



8.3 Structure of the system

The MQL system LUBRILEAN® Vario is equipped with the following valves, which serve the purpose of regulating the mixture composition of the aerosol and regulating the aerosol volume flow:

8.3.1 Main air valve (no. 5)

The main air valve separates all of the following parts of the aerosol container from the pressurised air supply. No aerosol is generated when the main air valve is closed.



The aerosol container and the following connected parts can also be under pressure when the main air valve is closed.

8.3.2 Oil valve (no. 11)

The oil valve regulates the quantity of lubricant needed for the generation of aerosol. The oil valve is integrated into an adjustable float flowmeter. It is operated manually and is continuously adjustable. Changing the lubricant flow rate is indicated by the display of the float flowmeter.

8.3.3 Pressure control valve (no. 7)

The pressure control valve regulates the flow of aerosol. It is operated manually and is continuously adjustable. To open the valve, pull the rotary knob out in the direction away from the system, hold it in this position and then turn it clockwise. To close it, pull the knob and turn it anti-clockwise. The change to the setting is indicated on the pressure gauge.

8.3.4 Secondary air valve (no. 8)

The secondary air valve dilutes the aerosol with additional air. This guarantees a sufficient flow rate of the aerosol. The secondary air valve is operated by hand like the air valve. The change to the setting is indicated on the pressure gauge.

8.4 Optical fill level display

There is a column pipe on the side of the aerosol container where you can directly see the reading of the lubricant level. Minimum and maximum levels are indicated by the markers on the aerosol container.

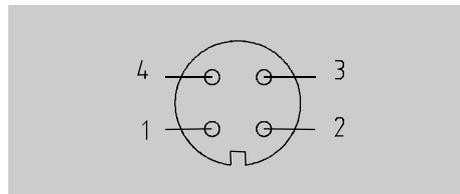


Fig. 2. Fill level indicator (no. 17) – pin assignment for upper connector

- Pin 1:** + 24 V
- Pin 2:** Output max. fill level
- Pin 3:** 0 V
- Pin 4:** Output overflow

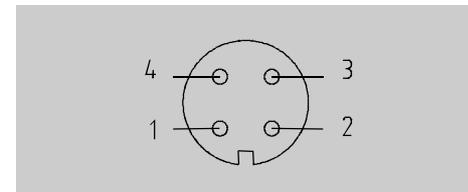


Fig. 3. Fill level indicator (no. 17) – pin assignment for lower connector

- Pin 1:** + 24 V
- Pin 2:** Output min. fill level
- Pin 3:** 0 V
- Pin 4:** Output reserve

8.5 Electrical fill level indicator

There is also the option to equip the MQL system LUBRILEAN® Vario with a four-point float switch. See Fig. 2 and for the pin assignment.

8.6 Display and setting of the lubricant flow rate

The lubricant flow rate is indicated by a flowmeter with float, which is attached to the side of the aerosol container. The level of the float in the glass pipe shows the flow rate of the particular lubricant.

Note:

The float is always read using its horizontal diameter (Fig. 4).

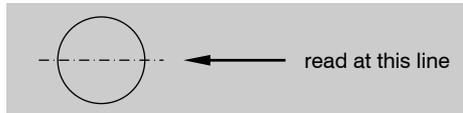


Fig. 4. Taking a reading of the float (no. 15)

The required lubricant flow speed is adjusted using a rotary knob on the float flowmeter.

9 Assembly

The scope of delivery of the MQL system LUBRILEAN® Vario includes a mounting bracket, which is attached to the rear side of the aerosol container. This bracket is used to attach the MQL system to the machine tools.

Fig. 5 contains the fitting dimensions for assembly of the MQL system LUBRILEAN® Vario.

! **Connecting the system must only be performed by appropriately qualified and trained personnel. The indications contained in these operating instructions must be respected.**

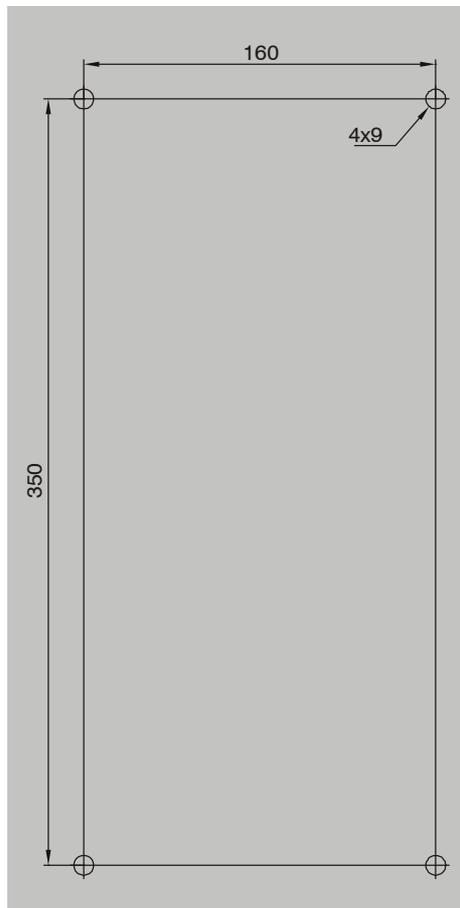


Fig. 5. Drill hole plan

9.1 Connector for aerosol outflows

The MQL system LUBRILEAN® Vario is equipped with three aerosol outlets (no. 1, Fig. 1), which are set up as a plug-and-socket connection for hoses with an outside diameter of 12 mm.

! **Only pneumatic hoses may be used that are suited for an operating pressure of at least 10 bars and are stable when used with the type of lubricant used.**

In general, only one pressure discharge is used. The two alternative outflows are sealed with closing stoppers.

! **Before loosening the closing stoppers, the pressure in the container must be released.**

The lubricant quantity which is discharged on the tool in the form of the aerosol depends on several factors including the existing conduit and line cross sections of the aerosol transport route from the MQL system to the outflow opening on the tool.

To avoid a loss of aerosol and pressure in the transport to the point of application, you should observe the following rules:

- The lubricant supply should not exhibit any significant changes to the cross section, any concentric obstructions or sharp kinks because the lubricant will separate from the aerosol at these places and can precipitate. This means that proper lubrication can no longer occur.
- The line cross-section of the aerosol lines should be large enough to transport a sufficient quantity of lubricant to the tool. Near the tool, the canal diameter should be < 8 mm because a higher flow rate is desired here.
- The length of the main aerosol line should be kept as short as possible. As the length of the aerosol line increases, the losses in pressure and aerosol also increase due to the lubricant separating. In addition, a longer distance between the MQL system and the machine means that the response time after changing an aerosol takes longer.
- The aerosol lines should be laid as straight as possible, and “sharp kinks” are particularly to be avoided because the lubricant can separate at these places. If bends are unavoidable, there should be a radius of at least 200 mm.
- The main aerosol line should exhibit as few cross-section alterations as possible. If cross-section alterations are unavoidable, the junctions should be made as smooth as possible. An ideal junction angle is $< 15^\circ$.
- All connections should be smooth-faced and without pockets or protruding edges. This particularly applies to the junction between the tool and the tool-receiving socket.
- The aerosol lines should be exposed to as few vibrations and oscillations as possible.
- The aerosol routing should exhibit a continuous incline towards the machine. Downward bends should be avoided as much as possible because lubricant can collect in these places, for example, when the machine is idle.
- If laying the aerosol lines with downward bends is unavoidable, it is necessary from time to time to blow out the lubricant that has collected after the tool has been removed. When doing this, please respect the relevant safety warnings.
- The aerosol supply for spindles or rotating parts should occur in an axial direction as much as possible. For a radial supply, the lubrication can be “spun out”, especially at high spindle speeds. In other words, the result is the separation of the aerosol. This especially affects applications with small, quickly rotating tools.
- When handling the component, only suitable tools should be used for the minimal quantity lubrication. Only in this way can it be ensured that lubricant is supplied in a sufficient quantity during processing.
- The outflow opening of the cooling channel borehole on the tool should not (as standard for many tools with solid-stream lubrication) exclusively be on the tool edge. When using these types of tools, you do not achieve the ideal results that can usually be achieved with the application of minimal quantity lubrication in comparison with solid-stream lubrication where the operating pressure is considerably lower, the point of application between the tool and component is insufficiently lubricated in the case of the minimal quantity lubrication principle.

9.2 Rotary joints and spindles

 **Only rotary joints must be used that are constructed for dry running.**

The low quantities of lubricant used in the minimal quantity lubrication system are insufficient for lubricating the rotary joints.

Considerable damage to the machine tools can result if this warning is not observed. Please contact and consult the machine manufacturer to find out whether the rotary joint of the machine tool is suited for dry running.

 **Rotary joints and spindles with built-in back pressure valves must be modified.**

Machine manufacturers often build back pressure valves into rotary joints and spindles.

These back pressure valves have to be removed because otherwise it is impossible to ensure that they will be fully opened by the low operating pressure of the MQL systems. The sufficient lubrication of the machining process is therefore not guaranteed.

Please consult the machine tool manufacturer to find out how the back pressure valves can be removed.

9.3 Compressed air connection

 **Before connecting your MQL system to the compressed air supply, make sure that the main air valve is closed.**

The MQL system LUBRILEAN® Vario is equipped with an NG8 connection socket for hoses with an internal diameter of 7-8 mm for the connection to the compressed air supply.

Please observe the specifications compiled in Table 2 for the compressed air that will be used.

The MQL system LUBRILEAN® Vario is working and functional with a primary pressure of at least 6 bar. The full output of the system is, however, only possible with a primary pressure of 8 bar.

 **The MQL system LUBRILEAN® Vario must only be operated with a primary pressure of 10 bar at the most. Higher pressures pose dangers to persons and machines.**

Table 2. Compressed air requirements

| Requirements | Values |
|---|----------------------------|
| Maximum primary pressure in system | 10 bar |
| Minimum primary pressure | 6 bar |
| Supply pressure for discharge of 1200 normal litres/min | max. 6 bar excess pressure |
| Compressed air quality standard in accordance with ISO 8573-1 | 5 |
| maximum particle size | 40 µm |
| maximum particle density | 10 mg/m³ |
| maximum pressure dew point | +7 °C |
| maximum lubricant concentration | 25mg/m³ |

10 Adjusting the parameters

10.1 General

The optimum adjustment of the MQL system LUBRILEAN® Vario depends on several factors such as the applicable primary pressure, length of the aerosol transport lines, type and size of the tool, cross-section of the cooling channel as well as the processing procedure. For this reason it is not possible here to specify absolute adjustment parameters for the particular processing situations.

The adjustment parameters illustrated in Fig. 6 are approximate values and should provide you with an initial orientation for adjusting the MQL system LUBRILEAN® Vario for your particular application.

We recommend that you determine and optimise the necessary adjustment values for your particular application by performing test runs so that you can achieve the best results for your processing procedure.

If the machine has been idle for extended periods or a tool has been replaced, this can result in temporary discontinuities in the aerosol supply to the lubrication point and the generation of oil mist. The supply of lubricant will re-stabilise during operation and possible oil mist that has been generated will disappear.

10.2 Effect of primary pressure

The MQL system LUBRILEAN® Vario obtains the energy necessary for generating aerosol from the compressed air supplied to the system.

The system is functional at least 6 bar of primary pressure and able to generate an aerosol suitable for most lubricating tasks.

The full output of the system is, however, only possible with a primary pressure of 8 bar.

10.3 Procedure for adjusting parameters

The following indications should help you determine the correct adjustments for the MQL system and your particular application.

1. Put the MQL system LUBRILEAN® Vario into operation by opening the main air valve.

2. Set the air valve to 6 bar and the lubricant flow rate to 100 %. With the spindle idle, check whether the aerosol is able to flow unimpeded through the channel system of the machine tool. This is easiest to recognise if the tool from the tool-receiving socket is removed. The aerosol must visibly discharge from the channel system.
3. Put the tool back into the tool-receiving socket and hold an oil-free component surface approximately 1 - 3 mm below the tool on the discharge channel. If no lubricant film collects on the component surface, there is a malfunction in the channel system of the tool. Check the tool and tool-receiving socket.
4. To determine the amount of lubricant that has been transported in the case of a rotating tool, spread a smooth and oil free panel on the machine table. Next, move the rotating tool until it is approximately 1 - 3 mm above the panel.

5. Move the tool with a horizontal feed of approx. 0.6 m/min. There should then be a closed film with a width of approximately twice the diameter of the tool visible on the panel.
6. Adapt the aerosol mixture and the aerosol quantity to the processing procedure until the processing result satisfies your requirements.

We recommend that you make a note of the adjustments you have made so that you can reproduce them at any time.

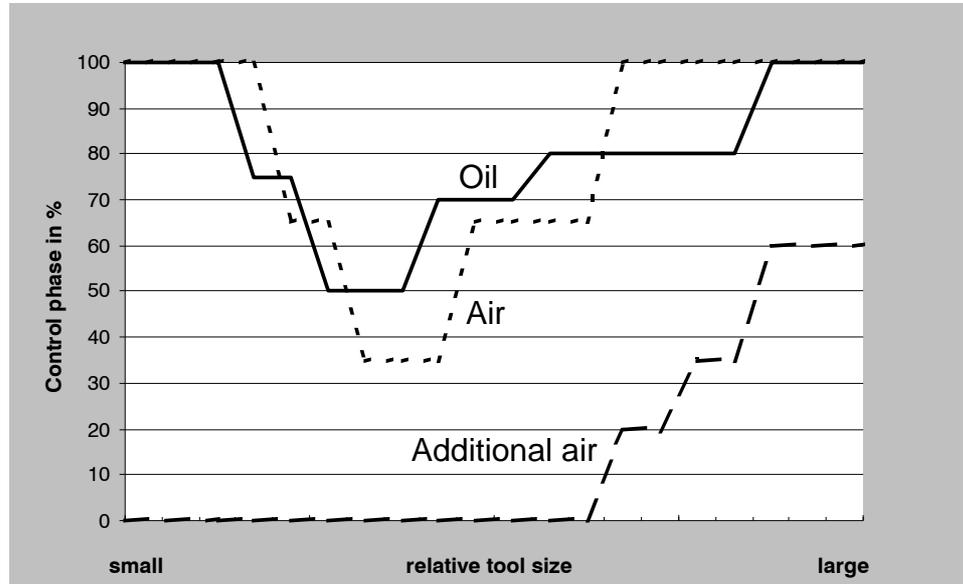


Fig. 6. Guideline assistance for the setting of parameters

11 Start-up

Starting up the MQL system includes a functional check and adjustment of the operating parameters.

The start-up procedure is as follows:

1. Before start-up, check that the housing of the equipment cabinet and all connections are fixed firmly into place.
2. Check that there is enough lubricant in the lubricant container.
3. Check that whether compressed air is supplied.
4. Adjust the operating parameters as described in the previous chapter.
5. Start up the system.

12 Maintenance



Maintenance tasks must only be performed by appropriately qualified and trained technical personnel.



Maintenance tasks must only be performed on an MQL system that has been disconnected from the power supply by the appropriate personnel and put in a voltage-free state. Working with a system that is not in a voltage-free state can result in bodily injury to persons.



The lubricant container may be pressurized. It must therefore be depressurized before installation, repair or maintenance tasks.

The SKF MQL system LUBRILEAN® Vario requires little maintenance. To ensure perfect functioning and avoid hazards from the outset, you should, however, regularly check all connections as well as functions.



All advanced work beyond what is described in these instructions must only be performed by authorised SKF service personnel.

SKF LUBRICATION SYSTEMS GERMANY AG assumes no liability for damages of all types resulting from improper servicing of the MQL system.

12.1 Refilling lubricant



Only lubricants supplied by SKF must be used. Please note that we provide no guarantee for damages resulting from the use of lubricants that are not expressly approved by us in writing with respect to the device compatibility and transportability.



The lubricant container has to be depressurised before refilling with lubricant.

In order to depressurise the container, first close the main valve and then disconnect the MQL system from the compressed air line.

Wait until the pressure is discharged through the aerosol outflows in the direction of the tool as long as this path is not closed off by a ball valve or similar. If this is the case, the depressurisation occurs only via the relief position of the main valve.

Please note that the valve has to be opened using the machine controller.

Check whether the pressure has been fully released by briefly actuating the pressure limiting valve. Check the indicator on the pressure gauge as you do this.

If you are sure that the pressure has been fully released, you can now unscrew the filling hole with a suitable tool.

Caution:

There is a sealing ring under the screw.

Use a funnel with a sieve insert to fill the container with lubricant up to the maximum fill level marking.

If the container is overfilled (above maximum fill line), the excess lubricant must be drained. Otherwise, no aerosol can be generated (see chapter "Draining lubricant", page 20).



Make sure that the filling hole is tightly closed again after refilling the container.

Make sure that the sealing ring is positioned correctly before you screw the locking screw back in.

Tighten the locking screw, but do not force it. Otherwise, the seal could become damaged.

Perform a visual inspection to ensure the tightness once the system is put into operation.

12.2 Changing lubricant

If you want to change lubricant, pour out the previously used lubricant before filling the container with the new lubricant. Please read the following section about draining the lubricant.



Do not mix different lubricants with each other if there is no explicit approval from SKF. Otherwise, damages may result and a cumbersome internal cleaning of the system will be unavoidable.

Next, fill the container with the new lubricant as described in the previous section.

12.3 Draining lubricant



The lubricant container has to be depressurised before draining lubricant.

To depressurise the container, see the indications from section "Refilling lubricant, page 19".

To drain the lubricant, use a suitable tool to release the drain screw on the underside of the container.

Please observe the legal regulations for the disposal of lubricants.



Make sure that the drain valve is closed again after draining the lubricant.

12.4 Cleaning

If necessary, the MQL system can be cleaned with mild, compatible (non-alkaline, no soap) cleaning agents.

For safety reasons, we recommend that you disconnect the MQL system from the compressed air supply and depressurise the container as described in section "Refilling lubricant", page 19.

During cleaning, leave hoses and cables connected where possible and close off all openings so that no cleaning agent can get inside the MQL system.

For normal operation and with use of lubricants that are compatible with each other, internal cleaning is not necessary.

If you accidentally fill the container with the wrong or with contaminated lubricant, the inside of the lubricant container must be cleaned. Contact us in any case if this happens. Never clean the interior of the MQL system yourself.



The disassembly of the lubrication container or other parts of the MQL system is not permitted and renders all warranty claims null and void. Moreover, this can result in hazards posed, for example, by lubricants that are discharged.

There are sensitive fittings inside the lubricant container. An improper disassembly can result in functional malfunctions or failure of the system.

13 Malfunctions

The following requirements must be satisfied for trouble-free functioning of the MQL system:

- The system is connected correctly,
- Compressed air has sufficient primary pressure (at least 6 bar).

Table 3 offers an overview of several problems that you can solve yourself. If the problem cannot be solved by any of the measures described here, you should contact us.



CAUTION DANGER OF DEATH

Repair tasks must only be performed on a system that has been put into a voltage-free state by the appropriate technical personnel.



CAUTION DANGER OF DEATH

Working on systems that are conducting current can result in bodily harm to persons.

Table 3. Malfunctions and how to fix them

| Malfunction | Possible cause | Solution |
|------------------------------------|--|--|
| The system produces no aerosol. | Use of lubricants not approved by SKF. | Use only lubricants approved by SKF. |
| | The system is defective or maladjusted. | Contact our service department. |
| No aerosol is applied to the tool. | The aerosol transport lines are kinked, obstructed or exhibit exaggerated cross-section alterations. | See our indications on laying transport lines as described in chapter "Connector for aerosol outflows", page 14. |
| | A stop valve on the spindle intake is not working properly or at all. | Consult your machine tool manufacturer. |
| | The spindle has a built-in back pressure valve. | The back pressure valve has to be removed. See our indications in chapter "Rotary joints and spindles", page 16 on this. |
| | The existing spindle is unsuitable (e.g. junctions are too abrupt, cross-section too small). | Use a suitable spindle, and consult the manufacturer of your machine tool. |
| | The rotary joint is unsuitable. | See our indications in chapter "Rotary joints and spindles", page 16. |

Continuation Table 3. Malfunctions and how to fix them

| Complaint | Possible cause | Solution |
|---|--|--|
| No aerosol is applied to the tool. | The junctions between spindle and tool-receiving socket are unfavourable. | Use only the tool-receiving sockets suited for minimal quantity lubrication. |
| | The tool-receiving socket is not tight. | Use only the tool-receiving sockets suited for minimal quantity lubrication. |
| | The tool has an unsuitable intake and a very small cooling channel. | Use only the tools suited for minimal quantity lubrication. |
| | For small tools: the primary pressure is too low. | Increase the primary pressure. |
| Despite sufficient aerosol discharge on the tool, processing is faulty. | The tool has an unsuitable exit hole. | Use only the tools suited for minimal quantity lubrication. |
| | The cut parameters are not adapted to processing using minimal quantity lubrication. | Modify the cut parameters. |

14 Shutdown

14.1 Temporary shutdown

To shut down the MQL system temporarily, the entire system should be disconnected from the compressed air supply and the container should be depressurised. In addition, the system has to be disconnected from the operating voltage and properly protected against reactivation and direct contact.

It is recommended that the lubricant be drained for extended shutdown periods.

14.2 Permanent shutdown

If you want to shut down the MQL system permanently, please observe the legal regulations pertaining to the disposal of components containing lubricants.

SKF will also dispose of systems for a fee.

15 Service

If you have problems or questions, please contact our sales offices or field sales representatives.

You can find a list of the current addresses on the Internet at:

www.skf.com/schmierung

16 Technical Data

Table 4. Technical data for the system LUBRILEAN® Vario

| Description | Unit | LUBRILEAN® Vario |
|--|----------------------------|--|
| Housing Aerosol outlets External dimensions Enlarging the casing dimensions with protruding attachments (without connections) Weight | mm mm kg | above H: 422, W: 235, D: 250 H: 422, W: 235, D: 250 9.8 |
| Compressed air Max. primary pressure Min. primary pressure | bar bar | 10 6 (8*) *for tools with small aerosol channel |
| Connections Compressed air connection Aerosol outlets Calibration of the hoses Material Diameter | mm | Connection socket NG8 exterior polyamide 12 |

SKF Lubrication Systems Germany AG

Motzener Straße 35/37

12277 Berlin

Postfach: 970444, 12704 Berlin

Telefon: (+ +49) 30-7 20 02-0

Fax: (+ +49) 30-7 20 02-111

E-Mail: lubrication-germany@skf.com

WWW: www.skf.com/schmierung