Microdosage system MDS

Product series MDx

For oil
For continuous monitored lubrication with minimum quantities from 0.5 to 5 mm³/min

The MDS is an intelligent microdosage system for especially demanding applications. Only the combination of perfectly matched components, a high-precision valve, micro flow sensor, and a highly sophisticated control unit make it possible to precisely meter and monitor extremely small quantities of lubricant.

In contrast with conventional lubrication systems, the MDS does not use any compressed air to transport the lubricant. This makes it especially energy-efficient and offers considerable potential cost savings over conventional systems.

Advantages
- Precise:
  - Continuous lubrication without consuming air
  - Precise metering of minimal quantities of oil
- Reliable:
  - Continuous monitoring and adjustment of the metered quantity
  - Self-calibrating
  - Lubricant feeding directly to the lubrication points
- Environmentally compatible:
  - No compressed air consumption
  - Reduced noise emissions
  - Minimal lubricant quantities

Applications
- High-speed spindles >2 million n x dm
- High-speed bearings

Microdosage makes an important contribution to greater sustainability.

The system is:
- Energy-efficient
- Quiet
- Resource-conserving.

System integration only in close cooperation with SKF Portfolio management
Microdosage system

System design

The microdosage system is a lubricant metering system that allows individual supply of up to four lubrication points with minimal quantities of oil from a common reservoir. The oil is transported directly to the lubrication points through capillary lines (→ Fig. 3).

The entire system is monitored by a flow sensor which can be readjusted by the machine control unit (→ Fig. 2).

The system can adjust the amount of lubricant very dynamically when, for example, the spindle speed or basic machining conditions change and cause a change in the oil requirements. The system also responds immediately to viscosity changes in the lubricant (e.g., due to temperature fluctuations).

The system’s MDU microdosage unit has a small and compact design and belongs to electrical protection class IP67. It can be installed directly in the spindle compartment of the machine tool and thus close to the lubrication points. The MDR lubricant reservoir can be placed in the fluid cabinet (→ Fig. 2).

It is statically pressurized with compressed air to keep the lubricant pressure in the reservoir constant. This does not, however, consume any compressed air.

*Figures 2 and 3 are simplified illustrations. Please mount the microdosage unit MDU near to the spindle according the structural conditions.
Function

The lubricant is metered by microvalves that generate a homogeneous and nearly continuous volumetric flow when actuated accordingly. The volumetric flow can be individually set to between 0.5 and 5 mm³/min for each lubrication point (Fig. 4).

The continuous volumetric flow is monitored by a flow sensor and can be periodically re-adjusted so that it remains constant regardless of external conditions such as pressure, temperature, or viscosity.

Lubricant can also be metered intermittently at longer intervals according to the lubrication task.

[Diagram showing lubrication system with labels for lubricant input, control signal, valve control, flow sensor, and lubricant outputs.]
The performance required of the spindle bearings is only possible in the long-term if combined with a well-designed lubrication solution (Diagram 1).

Grease-lubricated spindles do not permit maximum speeds as high as spindles with oil lubrication. The lubricant is supplied either once during installation or intermittently by relubrication.

Oil+air lubrication systems that supply an almost continuous oil streak are well suited for high-speed tool spindles.

Lubrication systems that supply minimal quantities of lubricant to bearings nearly continuously and thus eliminate over lubrication and under lubrication are primarily suited for the high-precision lubrication of high-speed spindles with speed factors >2 million n x dm.

SKF’s microdosage system is capable of providing this microdosage. It is characterized both for eliminating air as the carrier medium for the oil and for the very fast response times to changed lubricant requirements. This makes it possible to adjust metering according to load speed at any time during machining processes.

The integration of MDS into a spindle-machine-system must be planned in closed cooperation with SKF portfolio management.

What is nearly continuous microdosage?

Microdosage, as implemented by SKF in the microdosage method for high-speed bearings, means that the metered quantity of an oil drop (Fig. 5) is dispersed in a volumetric flow composed of 1 000 microdroplets (Fig. 6).

The oil microdroplets are thus metered uniformly to provide a nearly continuous volumetric flow and thereby ensure a steady supply of lubricant to the friction points.
In oil+air lubrication, which is widely used for spindle lubrication, a quantity of lubricant metered at a certain frequency is drawn into a streak which then provides a continuous supply of lubricant to a lubrication point. This method is expensive not least due to the costs of supplying compressed air. The operating costs for the required compressed air network are composed of three factors:

- Installation costs
- Maintenance and repair costs
- Energy costs.

The relative importance of the individual factors differs based, among other things, on the number of annual operating hours. Calculations have shown that energy costs are the largest cost factor at 70-90%.

SKF’s microdosage system requires compressed air only to statically pressurize the oil in the reservoir, though no air is actually consumed. Employing lubrication systems that do not consume compressed air may effect significant savings, which make short payback period possible (→ Table 1).

The extremely low quantity of oil used by the system also helps reduce the environmental impact.

The system does not require any expensive special lubricants. Low-viscosity spindle oils such as those typically used in machine tools are suitable for the microdosage system.

### Potential savings with the SKF’s microdosage system

<table>
<thead>
<tr>
<th>Energy costs for treated compressed air per lubrication point*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air consumption per lubrication point [Nm³/h]</td>
<td>1</td>
</tr>
<tr>
<td>Costs per hour [€/h]</td>
<td>0.015</td>
</tr>
<tr>
<td>Costs per day [€/d]</td>
<td>0.36</td>
</tr>
<tr>
<td>Costs per year** (rounded) [€/a]</td>
<td>130</td>
</tr>
</tbody>
</table>

* 0.15 €/kWh for 0.1 kW/Nm³  
** 8 750 hours per year and lubrication point

Table 1
MDU microdosage unit

Technical data

- Order number: MDU1-AAAA-000
- Dimensions (WxLxD): 105 x 60 x 45 mm
- Number of lubricant outlets: 4, individually adjustable
- Volumetric oil flow per outlet: 0.5–5 mm³/min
- Operating voltage for control unit: 24 VDC
- Electrical connection: M12x1
- Protection class: IP67
- Working temperature: 10–50 °C
- Operating viscosity: 20–500 mm²/s

MDU microdosage unit

Indicator lamps

Lubricant outlets

Lubricant input

Volumetric flow adjustment per lubrication point

E. connection M12x1

Mounting / dismounting

2x M5

28

92

5
MDR pressurized lubricant reservoir

Technical data

- **Order number**: MDR1-1000-000
- **Dimensions (WxDxH)**: 110 x 192 x 393 mm
- **Capacity**: 1 Liter
- **Fill level monitoring in reservoir**: 24 V DC
- **Priming pressure generation**: 4–8 bar (compressed air)
- **Reservoir pressure**: 4 bar
- **Working temperature**: 10–50 °C
- **Operating viscosity**: 20–500 mm²/s

**MDR lubricant reservoir**

- Electric fill level monitor
- Air input
- Sight glass max. fill level
- Lubricant outlet
- Ball valve
- Sight glass min. fill level
- Pressure regulating valve
- Filler coupling
- Venting
The Power of Knowledge Engineering

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

Important information on product usage

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

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

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