Why Micro-Lubrication?

Economy

- The production costs per workpiece with conventional cooling emulsions are approximately 7-17% of the total costs. This percentage can be significantly reduced by the use of micro lubrication.
- The reduction of friction and the resulting increase of productivity will allow a more economical processing of workpieces.
- Shorter machine down time by increase of tool life.
- Reduction of disposal costs due to almost dry chips.
- No extra installation for the operation of coolants required - therefore additional saving of energy costs.

Cost effectiveness study

| Consumption and cost analysis for the use of lubricant and lubricating system other than Accu-Lube. |
|---------------------------------------------------|---------------------------------------------------|
| Production of aluminium rims in 3 working shifts | appr. 360 rims |
| Oil consumption | appr. 13,320 ml |
| Consumption per rim | appr. 37 ml |
| Cost for oil (per litre) | € 3.00 |
| Cost for 13,320 ml | € 39.96 |
| Cost per day for 12 machines | € 479.52 |
| Cost for 12 machines (calculation based on 250 working days) | € 119,880.00 |

<table>
<thead>
<tr>
<th>Consumption and cost analysis for the use of ACCU-LUBE LB-5000 in combination with Accu-Lube micro lubrication technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production of aluminium rims in 3 working shifts</td>
</tr>
<tr>
<td>Consumption of ACCU-LUBE LB-5000</td>
</tr>
<tr>
<td>Consumption per rim</td>
</tr>
<tr>
<td>Cost for ACCU-LUBE LB-5000 (per litre)</td>
</tr>
<tr>
<td>Cost for 1,332 ml</td>
</tr>
<tr>
<td>Cost per day for 12 machines</td>
</tr>
<tr>
<td>Cost for 12 machines (calculation based on 250 working days)</td>
</tr>
<tr>
<td>Savings with the use of Accu-Lube</td>
</tr>
</tbody>
</table>
Why Micro Lubrication?
Environmental Friendliness

Conventional way using coolants

Accu-Lube Minimum Quantity Lubrication

Accu-Lube lubricants harm neither operators nor the environment:
- biologically decomposable
- non-toxic
- free of EP-additives, chlorine, nitrite, sulphur, phenol, biocides
- based on natural, renewable resources
- odourless
- valuable economy of potable water

The use of Accu-Lube lubricants will stop:
- high energy costs
- delays due to machine down time
- absence of operators on grounds of allergies
- slippery floors
- dirty work places

Accu-Lube Micro lubrication technology – Assuring economy
Accu-Lube – Your contribution to environmental protection
Outside Lubrication

Accu-Lube applicators - assuring economy and precise application of lubricants

The Accu-Lube applicators enable an exact dosage of lubricant supplied to the cutting edge of the tool. Consumption is clearly measurable. Smallest droplets of the lubricant are transported by the air stream precisely to the cutting edge of the tool without producing any dangerous mists. The approved modular system allows the Accu-Lube applicators to be tailor-made for every type of operation.

The use of Accu-Lube applicators results in:
- continuous moistening of cutting tools
- even application of lubricant
- lowest requirement of lubricant
- high cutting performance of tools by using Accu-Lube lubricants
- dry workpiece and tool as well as dry machine

Accu-Lube applicators for outside lubrication

A small quantity of lubricant makes the great difference between dry machining and minimum quantity lubrication. With dry machining there is no moistening of the work-piece or tool, there is no protection from heat generation and there is no great potential of increasing tool life. These issues are solved by minimum quantity lubrication with the help of a minute quantity of lubricant and the precise application of lubricant droplets to the cutting edge of the tool.

The Accu-Lube pump has been specially designed to ensure a continuous flow of lubricant from the moment the applicator is switched on until it is switched off. The piston pump works with a continuous precision, to supply the lubricant smoothly and continuously to the cutting edge. Warranty is four years on condition that Accu-Lube lubricants are being used.

The Accu-Lube piston pump requires compressed air to activate the pump cycle. With the return stroke a precisely defined quantity of lubricant is drawn into the pump chamber. The following fore stroke supplies the lubricant into the capillary tube in the inside of the air tube. Thus all Accu-Lube lubricants are supplied to the cutting edge of the tool with the same performance.
Components of Accu-Lube Applicator

1 **Actuator**
   ON/OFF switch
   Options: solenoid valve, toggle switch, roller valve, slide valve, foot pedal, air-actuated

2 **Air flow valve**
   Regulates the air output at the nozzle. Each aluminium pump has its own air flow valve that can be operated independently

3 **Adjusting scale for lubricant quantity**
   The adjusting screw regulates the required quantity of lubricant

4 **Frequency generator**
   Controls the frequency at which the pump cycles
   Pneumatic frequency generator: 5-180 strokes/min
   Electric frequency generator: 1-128 strokes/min
   Solenoid valve: freely programmable

5 **Metal box**

6 **Mounting system**
   Pre-drilled holes for permanent mounting of applicator to machine tool or to fix magnetic mounts to the metal box

7 **Air supply**
   Input pressure: min. 4 bar, max. 10 bar

8 **Air filter**

9 **Reservoir**
   Sizes: 0.3 L ; 1.0 L, 2.0 L, 3.0 L also available with level indicator

10 **Nozzles**
   Circular and band sawing nozzles, copper, steel and loc-line nozzles, flexible metal nozzles, rotative and special nozzles

11 **ACCU-LUBE lubricant**

**Accu-Lube applicator on setting angle**

This simple applicator is equipped with a 0.3 litre reservoir, 1 pump, 1 cox tube with a loc-line nozzle and can easily be fitted to any kind of metal surface with the help of a magnet.

Being connected to compressed air supply it can be operated immediately.

Operation areas: simple drilling, milling and sawing operations
Brass pumps are used for lubricants other than Accu-Lube or for larger volumes of lubricant.

### Lubricant consumption ml/h
#### Aluminium Pump

<table>
<thead>
<tr>
<th>Frequency generator</th>
<th>0,5</th>
<th>1</th>
<th>1,5</th>
<th>2</th>
<th>2,5</th>
<th>3</th>
<th>3,5</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,25</td>
<td>2</td>
<td>9</td>
<td>19</td>
<td>27</td>
<td>34</td>
<td>47</td>
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<td>66</td>
</tr>
<tr>
<td>0,5</td>
<td>2</td>
<td>6</td>
<td>12</td>
<td>15</td>
<td>21,5</td>
<td>30</td>
<td>33</td>
<td>41</td>
</tr>
<tr>
<td>0,75</td>
<td>1,5</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>14</td>
<td>18</td>
<td>20,5</td>
<td>24</td>
</tr>
<tr>
<td>1</td>
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<td>4</td>
<td>6,5</td>
<td>8,5</td>
<td>9,5</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>1,25</td>
<td>0,8</td>
<td>1,5</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>1,5</td>
<td>0,7</td>
<td>0,8</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>1,75</td>
<td>0,6</td>
<td>0,7</td>
<td>0,8</td>
<td>1,5</td>
<td>1,5</td>
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<td>0,6</td>
<td>0,6</td>
<td>0,7</td>
<td>1,5</td>
<td>1,5</td>
<td>2</td>
<td>2,5</td>
<td>2,5</td>
</tr>
</tbody>
</table>

### Lubricant consumption ml/h
#### Brass Pump

<table>
<thead>
<tr>
<th>Frequency generator</th>
<th>38</th>
<th>33</th>
<th>28</th>
<th>23</th>
<th>18</th>
<th>13</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,25</td>
<td>34</td>
<td>39</td>
<td>56</td>
<td>65</td>
<td>84</td>
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<td>109</td>
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<tr>
<td>0,5</td>
<td>18</td>
<td>25,5</td>
<td>35</td>
<td>38</td>
<td>48</td>
<td>61</td>
<td>65</td>
</tr>
<tr>
<td>0,75</td>
<td>12,5</td>
<td>16</td>
<td>21</td>
<td>26</td>
<td>31</td>
<td>37</td>
<td>38,5</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>9</td>
<td>12,5</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>1,25</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>8,5</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>1,5</td>
<td>2</td>
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<td>3</td>
<td>4</td>
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<tr>
<td>1,75</td>
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<td>4</td>
<td>4,5</td>
</tr>
<tr>
<td>2</td>
<td>1,5</td>
<td>2</td>
<td>2,5</td>
<td>2,5</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

### Nozzles and Special Nozzles

#### Band sawing nozzles
- K
- S
- R
- L
- P

#### Circular sawing nozzles
- Q
- M

#### Flexible Nozzles
- Loc-line Nozzles

#### Metal Nozzles 320 or 400mm
Copper / steel nozzles with adjusting block

Nozzle tips

Wide angle nozzle No. 1
Brass nozzle 3,0mm
Brass nozzle 1,5mm
Wide angle nozzle No. 2
Full cone nozzle
Hollow cone nozzle
Point nozzle
Round jet nozzle

Rotative nozzles

Special nozzles

The selection of appropriate nozzle will ensure a precise and correctly dosed application to the cutting edge.

Operating areas for Accu-Lube Applicators:
- band sawing
- circular nozzles
- milling
- drilling
- thread cutting
- punching
- broaching
- thread rolling
- chamfering
- stamping
- cold roll forming
- grooving
- bending
- knurling
- forming

Examples of applications

Milling
Thread rolling
Forming
**Accu-Lube Micro Lubrication** is used for the production of the following components:

**Automotive industry:**
- Air conditioning
- Engine
- Steering
- Carriage/interior
- Braking system
- Aluminium rims
- Chassis
- Drivetrain
- Exhaust system
- Wheel suspension

**Aircraft industry:**
- Spars
- Fuselage
- Rivet bores
- Wings
- Engine components
- Fuselage nose
- Wing spars

And many more industries...

Some references:
- AIRBUS
- Rolls Royce
- GE
- PSA
- Adige S.p.A.
- Bisiach & Carru
- EADS
- Prowin
- Porsche
- Audi
- ZF Lemförder Fahrtechnik
- Mercedes
- ASL Lemwerder
- MT Aerospace
- RUAG
Especially with CNC machining centres and special purpose machines it has proven, that, due to the multitude of different tools and tool lengths, external positioning of the nozzles required for minimum quantity lubrication is problematic and thus leads to additional costs.

The Accu-Lube MiniBooster has been designed for exactly these kinds of applications. Other than with the coaxial tube system (i.e. tube-in-tube system where the oil tube runs inside the air tube) used for outside lubrication, here air and lubricant are already mixed inside the Accu-Lube MiniBooster.

This lubricant-air-mixture is then transported through a tube from the Accu-Lube MiniBooster to the rotating union of the machine tool. From there the lubricant-air-mixture is led through the spindle of the machine tool and will leave the coolant fed tools in operation at their cutting edge thus enabling their optimum lubrication.

During the transport of the lubricant-air-mixture within the machine tool spindle, care must be taken to prevent any possible uncontrolled escape of the lubricant-air-mixture, as this would not lead to the desired lubrication of the cutting edge.

The Accu-Lube MiniBoosters consist of the following main components:
- Accu-Lube precision controlled volume pump(s)
- Accu-Lube frequency generator(s)
- Accu-Lube MiniBooster chamber = the core of the system; this is where air and lubricant are brought together and the lubricant-air-mixture is produced. Lubricant droplet size is ≤ 0.001 mm.
- Electronical control automatically adapting to different tool diameters with different cooling channel cross sections (only with SR-version). Time-consuming programming of lubricant and air volume for every single tool is no longer necessary.

To cover any individual case we offer a variety of ACCU-LUBE MiniBooster systems which will be described in depth on the following pages:
- Accu-Lube MiniBooster MB 2010 Mini
- Accu-Lube MiniBooster MB 2010 Mini SR
- Accu-Lube Doppel-MiniBooster MB 2010 Power
- Accu-Lube MiniBooster MB2010 Power SR
- Accu-Lube MiniBooster MB2010 Power C

Moreover, the MiniBooster systems can optionally be extended and thus adapted precisely to any of your applications.

In comparison with other systems already on the market the ACCU-LUBE MiniBooster stands out in particular for its excellent cost-performance ratio, minimum consumption of lubricant and air as well as for its easy handling.
**Accu-Lube MiniBooster**

for CNC machining centres

Micro-lubrication is provided when an air and lubricant mixture is transported through the machine-tool-spindle ensuring the **Accu-Lube** lubricant is delivered precisely to the cutting edge.

The **Accu-Lube MiniBoosters** consist of the following main components:

- **Accu-Lube** precision controlled volume pumps
- **Accu-Lube** frequency generator
- **Accu-Lube MiniBooster** chamber = the core of the system
- Electronic control system for automatic adjustment to different tool diameters (only with “SR” versions)

The lubricant-air mixture with droplets of \( \leq 1\,\mu\text{m} \) is produced in the MiniBooster chamber.

### Application areas:

- Turning lathes with rotating tools
- CNC-machines with different tools and different tool diameters
- For coolant fed tools with a diameter of 1 - \( \leq 12\,\text{mm} \) or up to max. 2 x 6 mm

### Technical data:

- Operating current: 24 V DC 2W
  (optionally 110 V, 230 V)
- Operating pressure: 5.5 – 9 bar
- Reservoir: 500 – 750 ml
  (optionally 950 – 1.400 ml)

### Components:

- 1 Booster chamber
- 1 precision controlled volume pump
- 1 frequency generator
  (optionally: solenoid valve freely programmable;
   15-50 strokes / min)
- 1 pressure sensor
  (optionally available without pressure sensor depending on the type of application)

The machines of the following machine tool manufacturers are equipped with this **Accu-Lube** system among others:

- Depo
- Matec
- EMAG
- Somex
- Suhner
- Fill
- Reis Robotics
- Index
- Zinser
**Accu-Lube Double MiniBooster MB 2010 Power**

For coolant fed tools with a diameter of 1 - ≤ 40 mm or max. 2 x 12 mm

**Technical Data:**
- Operating current: 24 V DC 2W (optionally 110 V, 230 V)
- Operating pressure: 5.5 – 9 bar
- Reservoir: 500 – 750 ml each (optionally 950 – 1.400 ml each)

**Components:**
- 4 Booster chambers
- 2 precision controlled volume pumps
- 2 frequency generators (optionally: solenoid valves freely programmable; 15-50 strokes / min)

This **Double-MiniBooster MB 2010 Power** consists of two separate systems, which are united in one box.

This **Double-MiniBooster MB 2010 Power** was developed for multi spindle heads.

Optionally available with electric control.

This system is used:
- on drilling units with different tools
- for threading lugs
- for milling of parts for the automotive industry

**Automatic refill device for minimum quantity lubrication systems**

Refilling an applicator with lubricant often requires machine down times which will cause extra costs. For this reason the automatic refill device has been designed. By using an additional blue ACCU-LUBE pump simple units for outside lubrication (see illustration above) can be refilled during operation. With more complex systems where the pumps are not operated simultaneously (individual pump control) two blue ACCU-LUBE pumps will be needed for the refilling process. Minimum quantity lubrication systems with their reservoir under pressure can be refilled automatically during operation as well. In general one blue ACCU-LUBE pump per reservoir is needed.
Accu-Lube MiniBooster MB 2010 Power with Pressure Sensor

For coolant fed tools with a diameter of 1 - ≤ 40 mm or max. 2 x 12 mm

Technical Data:
Operating current: 24 V DC 2W (optionally 110 V, 230 V)
Operating pressure: 5.5 – 9 bar
Reservoir: 500 – 750 ml (optionally 950 – 1.400 ml)

Components:
- 2 Booster chambers
- 1 precision controlled volume pump
- 1 frequency generator
  (optionally: solenoid valve freely programmable; 15-50 strokes / min)

The **Accu-Lube MiniBooster MB 2010 Power** is suitable for coolant fed tools in CNC machining centres and CNC turning lathes.

The **Accu-Lube MiniBooster MB 2010 Power** allows for a safe production process.

The main advantages of the **Accu-Lube MiniBooster MB 2010 Power** are its user-friendliness, cost-effectiveness as well as its simple and quick installation.

Further advantages:
- Through the electronic control the system is adjusted automatically to the different diameters of coolant fed tools.
- After a tool change it is not necessary to program an M-function for each tool.
- The existing CNC-programs need not be changed for a special M-function for the micro lubricating system.
- Simple installation! This system requires an air supply of 5.5-9 bar and an electrical output of 24 V on the CNC-machine tool (M-function cooling-lubricant ON/OFF).
- This system is easy to operate and offers process safety especially during high volume batch production.
- The consumption of air is reduced by 20% because the system switches on only when more oil-air mixture is needed, as the lubricant is always present in the reservoir.
- Lubricant consumption is approximately 8-14 ml/h depending on the size of the tools used and the time of use of the tool.

Operating areas: Bending, drilling, deep hole drilling, milling, turning, reaming

This system is used for the production of:
- cooler tubes
- exhaust pipes
- machine components
- hydrants
- compressor engine blocks
- drive train

The machine tools of the following manufacturers are equipped with this **Accu-Lube** system among others:
- Crippa
- Fill
- Homag
- EMAG
- Ex-Cello
- Weeke
- Chiron
- Kaltenbach
- Suhner
- Zayer
- Hurco
- Suhner
- Somex
**Accu-Lube MiniBooster MB 2010 Power C**

This MiniBooster consists of two systems (inside and outside lubrication) in one box.

**Inside lubrication**
- 2 Booster chambers
- 1 precision controlled volume pump
- 1 frequency generator
  (optionally: solenoid valve freely programmable; 15-50 strokes / min)

For coolant fed tools with a diameter of 1 - ≤ 40 mm or up to max. 2 x 12 mm

**Outside lubrication**
- 3 precision controlled volume pumps
  (optionally extendable)
- 3 frequency generators
  (according to number of pumps)
  (optionally: solenoid valves freely programmable; 15-50 strokes / min)

There are no limits as far as the tool diameter is concerned, provided that the positioning of the nozzle can be optimised and the lubricant will reach the cutting edge of the tool.

**Technical Data:**
- Operating current: 24 V DC 2W (optionally 110 V, 230 V)
- Operating pressure: 5.5 – 9 bar
- Reservoir inside lubrication: 500 – 750 ml
  (optionally 950 – 1.400 ml)
- Reservoir outside lubrication: 1.000 ml
  (optionally 2.000 ml)

**Advantages:**
- It is not necessary to replace all non coolant fed tools.
- During heavy duty operations both outside and inside lubrication can be used.

Optionally available with electronic control.

This system covers all cutting operations on a CNC machining centre.

This system is used for the production of:
- forged aluminium rims
- hinges
- cast aluminium crankcases

- threaded pins
- transverse links for F1

The machine tools of the following manufacturers are equipped with this **Accu-Lube** system among others:
- Matec
- Homag
- Chiron
- Kaltenbach
- EMAG
- Suhner
- Fill
Applications using Inside Lubrication

Thread moulding

Drilling

Drilling

Bending

Milling

Drilling
Accu-Lube Applicators and Accu-Lube MiniBoosters for special applications

8 pumps for outside lubrication
8 pumps for inside lubrication
8 pumps for additional lubrication

6 pumps for outside lubrication
timer valve

6 pumps for outside lubrication
4 pumps for inside lubrication

2 pumps for inside lubrication

6 pumps for outside lubrication
6 pumps for inside lubrication
6 pumps for additional lubrication

2 pumps for outside lubrication
**Accu-Lube Lubricants – harm neither operators nor the environment**

**Accu-Lube lubricants** are manufactured of non-toxic, renewable, vegetable resources. They are environmentally friendly and biologically decomposable. In addition to the environmental aspects these lubricants can be used for safe processing of all metallic materials.

**Improvement of machining processes**

In comparison with conventional coolants **Accu-Lube lubricants** show a clear improvement of lubricity leading to a reduction of friction in metal processing. This results in an increase of both tool life as well as surface quality.

**Economy as well is increased by the use of Accu-Lube lubricants.** Maintenance and cleaning costs are reduced, costs for monitoring the water mixable coolants are completely dropped.

**Water saved – no disposal required**

Within a period of 6 months an average **Accu-Lube** customer can replace 220 litres of coolant concentrate – this is equivalent to approximately 4000 litres of cooling emulsion – by only 20 litres of **Accu-Lube lubricant**.

---

4000 litres of cooling emulsion

20 litres of **Accu-Lube**

**Accu-Lube lubricants** are used up during the cutting process, disposal is not necessary and any possible post treatment is significantly facilitated.
**Accu-Lube Lubricants – harm neither operators nor the environment**

**Accu-Lube lubricants** which do not leave any stains on the material after post heat treatment.

<table>
<thead>
<tr>
<th>Processing areas</th>
<th>Lubricant</th>
<th>LB 5000</th>
<th>LB 6000</th>
<th>LB 5500</th>
<th>LB 4500</th>
<th>LB 4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>All metallic materials</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pin+V-Block lubricity test</td>
<td>1.000</td>
<td>1.250</td>
<td>900</td>
<td>1.250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>&gt;160°C</td>
<td>214°C</td>
<td>&gt;160°C</td>
<td>191°C</td>
<td>214°C</td>
<td></td>
</tr>
<tr>
<td>Pour point</td>
<td>2°C - 7°C</td>
<td>-20°C</td>
<td>0° - 3°C</td>
<td>4°C</td>
<td>-20°C</td>
<td></td>
</tr>
<tr>
<td>Viscosity at 40°C</td>
<td>18</td>
<td>12</td>
<td>20</td>
<td>5</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Suitable for Booster system</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Characteristics of these lubricants:

- **LB 5000** For medium to heavy cutting operations
- **LB 6000** For light to medium-heavy cutting operations. *Accu-Lube LB 6000* is manufactured out of natural, vegetable resources.
- **LB 5500** For light to medium-heavy cutting operations
- **LB 4500** For light cutting operations. *Accu-Lube LB 4500* consists of natural ingredients. It is especially appropriate for working in aluminium. *Accu-Lube LB 4500* is conditionally suitable for post heat treatment.
- **LB 4000** For light to medium-heavy cutting operations. *Accu-Lube LB 4000* is based on natural fatty acids.
**Accu-Lube** Lubricants – harm neither operators nor the environment

The following **Accu-Lube lubricants** are especially appropriate for processing of ferrous material. Should these ACCU-LUBE lubricants be used on non-ferrous material, it must be degreased prior to post heat treatment in order to avoid stains on the material.

<table>
<thead>
<tr>
<th>Processing areas</th>
<th>Lubricant</th>
<th>LB 2000</th>
<th>LB 8000</th>
<th>LB 10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>All metallic materials</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Pin+V-Block lubricity test</td>
<td>1.750</td>
<td>1.750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>&gt;300°C</td>
<td>310°C</td>
<td>&gt;250°C</td>
<td></td>
</tr>
<tr>
<td>Pour point</td>
<td>-8° - -5°C</td>
<td>ca. -20°C</td>
<td>&lt;0°C</td>
<td></td>
</tr>
<tr>
<td>Viscosity at 40°C</td>
<td>35</td>
<td>36</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Suitable for Booster system</td>
<td>-</td>
<td>✓</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item-no.</th>
<th>Item-no.</th>
<th>Item-no.</th>
<th>Item-no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 litre</td>
<td>805 000</td>
<td>805 240</td>
<td>805 150</td>
<td></td>
</tr>
<tr>
<td>5 litres</td>
<td>805 005</td>
<td>805 245</td>
<td>805 155</td>
<td></td>
</tr>
<tr>
<td>20 litres</td>
<td>805 010</td>
<td>805 250</td>
<td>805 160</td>
<td></td>
</tr>
<tr>
<td>205 litres</td>
<td>805 015</td>
<td>805 255</td>
<td>805 165</td>
<td></td>
</tr>
</tbody>
</table>

**Characteristics of these lubricants:**

**LB 2000**
- For light to heavy cutting operations
- **Accu-Lube LB 2000** - is manufactured out of natural, highly refined triglycerids.

**LB 8000**
- For light to medium-heavy cutting operations
- **Accu-Lube LB 8000** - is a mixture of natural ingredients.

**LB 10000**
- For light to medium-heavy cutting operations
- is manufactured out of natural, refined triglycerids.

The following **Accu-Lube lubricants** in solid and paste-like form are especially appropriate for manual application:

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>805 021</td>
<td>ACCU-LUBE LB 5000 Paste (gel 226 g)</td>
</tr>
<tr>
<td>805 020</td>
<td>ACCU-LUBE LB 5000 Paste (solid 226 g)</td>
</tr>
<tr>
<td>805 035</td>
<td>ACCU-LUBE LB 5000 Solid Block (71 g)</td>
</tr>
<tr>
<td>805 040</td>
<td>ACCU-LUBE LB 5000 Solid Stick (62 g)</td>
</tr>
<tr>
<td>805 041</td>
<td>ACCU-LUBE LB 5000 Solid Stick (368 g)</td>
</tr>
<tr>
<td>805 076</td>
<td>ACCU-LUBE LB 2000 Spray (222 g)</td>
</tr>
<tr>
<td>805 078</td>
<td>ACCU-LUBE LB 4000 Spray (222 g)</td>
</tr>
<tr>
<td>805 075</td>
<td>ACCU-LUBE LB 5000 Spray (222 g)</td>
</tr>
<tr>
<td>805 082</td>
<td>ACCU-LUBE LB 5500 Spray (222 g)</td>
</tr>
<tr>
<td>805 077</td>
<td>ACCU-LUBE LB 10000 Spray (222 g)</td>
</tr>
</tbody>
</table>
**Accu-Lube Micro Lubrication in comparison with conventional systems**

**Milling**

**Wear with ball-end milling**  
Material: hardened steel 30-38 HRC  
Tool: Solid carbide ball-end mill R3x6  
Rotation speed: 10,000 rpm  
vf= 2,000 mm/min.

**Surface quality with ball-end milling**  
Material: hardened steel 29-30 HRC  
Tool: Solid carbide ball-end mill Ø 12 mm

**Drilling**

**conventional system:**  
HSS drill and water-soluble coolant, 13 steps, vc=18 m/min, fn=0,095 mm

**Accu-Lube:**  
Solid carbide drill and Accu-Lube, no steps, vc=100 m/min, fn=0,08 mm
Deep hole drilling

Conventional system:
Solid carbide drill and water-soluble coolant, vc=80m/min, fn=0,05mm

Accu-Lube:
Solid carbide drill and ACCU-LUBE lubricant, vc=80m/min, fn=0,15mm

Different chip shapes with the change of feed of a solid carbide slot drill operated with minimum quantity lubrication.

Turning

Material: Steel St 44-2
Operation time of insert: 53 min
Cutting speed: 200m/min
Feed: 0,25mm/rev
Infeed: 1,5 mm

Toolholder: Mircona MDJNR2525-15-EB (toolholder with cooling channels)
Cutting insert: DNMG150412

Micro lubrication

Coolant

Result: With the help of minimum quantity lubrication tool life of the cutting insert was increased by 1,5 times (wear mark 0,194 mm) in comparison with the use of cooling emulsion (wear mark 0,302mm).
**Accu-Lube Micro Lubrication in comparison with conventional systems**

**Band sawing**
- Band sawing machine: AMADA HK-800
- Work piece: Tube
- Material: Steel St52-3
- Lubricating system: *Accu-Lube Applicator*
equipped with 3 pumps for outside lubrication
- Lubricant: *Accu-Lube LB-2000*
- Lubricant consumption: 16ml/h

Result: Tool life of band saw
- 7.5 weeks per band saw with *Accu-Lube lubricant*
- 2 weeks per band saw with cooling emulsion

**Circular sawing**
- Circular sawing machine
- Tool: circular saw blade Ø 300mm
- Work piece: piston
- Material: aluminium
- Lubricating system: *Accu-Lube Applicator*
equipped with 3 pumps for outside lubrication
- Lubricant: *Accu-Lube LB-5000*
- Lubricant consumption: 15 ml/h
- vc= 30 m/min
- vf= 214 mm/min

Result: Tool life of circular saw blade
- appr. 10,000 cuts with *Accu-Lube lubricant*
- appr. 2,000 cuts with cooling emulsion

Another advantage is that the chips can be re-melted immediately without any drying time (in the present case it was 2-3 days).
For the addresses of our ACCU-LUBE distributors in Asia, North or South America please contact the respective production plant – they will provide you with all the details.