

Information on operating fluids

(previous name "Notes on Operating Materials")

CNC Lathes

Note on applicability

Illustrations in this publication may deviate from the product supplied. Errors and omissions due to technical progress expected.

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General Information



The applicable local rules and directives must be observed for the handling of operating fluids. Personal safety equipment must be worn when handling operating fluids in order to avoid damages to health. This applies in particular to direct skin contact.

Use of a fume exhaust is recommended to prevent the inhalation of harmful substances.



Only the operating fluids specified in the user documentation must be used.



Additives such as alcohols, glycols, biocides, anti-corrosion agents, high-pressure and anti-wear additives must be used only after consulting the respective vendor. Any warranties for damages to the machine that are found to be caused by interaction of different operating fluids are rejected.

The selection of suitable combinations of cooling lubricant and bed way oil or fluidized grease, as well as their maintenance and care, must be ensured.



Selection, use, and maintenance of operating fluids are the operator's responsibility.

Water-polluting substances

The operation of lathes partially requires the use of water-polluting substances. The installation location of the lathe must therefore be secured such that in case of failures, none of these substances can enter the ground water. If the installation location has no sufficient floor protection, the following precautions must be taken:

- Use lathes including system components in a containment device only. The size of the containment device depends on the released amount of fluid in case of failure.
- Secure the conveying and handling area against splattering and dripping losses.

Disposal of used operating fluids



The disposal of auxiliary materials, coolants, and lubricants must follow the applicable local regulations and directives.

Cooling lubricants

General notes on cooling lubricants

Cooling lubricants are used to dissipate the heat generated during machining from the machining area, to reduce the friction between the tool and the workpiece, and to keep the machining area free from chips.



Only cooling lubricants on mineral oil basis must be used. Neither synthetic, ester oil-containing or biological cooling lubricants are allowed.

The use of other cooling lubricants lies solely in the responsibility of the operator or cooling lubricant manufacturer.

In general, cooling lubricants:

- should be checked periodically,
- must not resinify,
- must not contain any grinding material residues, such as: corundum or CBN (cubic, crystalline boron nitride)
- must not corrode, harden or wash off other lubricants used,
- must be fully effective even after longer use,
- must be resistant to oxidation and emulsification,
- must not damage seals or wipers from materials such as nitrile butadiene rubber (NBR), polyurethane (PUR) or Viton,
- must not corrode two-component lacquers and sealing materials commonly used in mechanical engineering.

If in doubt, consult the respective cooling lubricant manufacturer.



Cooling lubricants serve as corrosion protection during machining. Follow the rules of the cooling lubricant manufacturers on mixing ratio, concentration monitoring, and pH.

The designations and properties of cooling lubricants are standardized according to DIN or ISO.

Cooling lubricants must be certified for their use and meet the environmental and health regulations.

The testing must comply with the VDI 3035 standard. In this context, reference is also made to the standard VDI 3397 Sheet 2, which describes the measures for quality maintenance, process improvement, waste and wastewater reduction.



When switching the cooling lubricant to another product or changing the manufacturer, the cooling lubricant system must be completely flushed and cleaned with this cooling lubricant. The vendor must guarantee the equivalence of the new cooling lubricant in writing.



When needed, only new or reconditioned cooling lubricant must be replenished. The reconditioned cooling lubricant must have the same technical characteristics as new cooling lubricant. This applies in particular to the portion and the size of the particles contained.

On machines working with cooling lubricants, slight mixing of cooling lubricant and hydraulic fluid may occur.

Foaming

Foaming of the cooling lubricant emulsion can be diminished by additives.

Improper handling

Improper handling (e.g., throwing food leftovers, cigarettes or the like into the chip container) may infect the cooling lubricant with bacteria and fungi.

This would result in:

- increased risk of corrosion
- clogging of cooling lubricant lines
- resolving of paint and plastic parts
- skin rashes or allergic reactions

Water-miscible cooling lubricants (emulsions)



The condition of the cooling lubricant must be checked by visual inspection in the cooling lubricant tank. There must be no closed oil layer on the resting emulsion, as this would cause severe growth of bacteria.

The use of emulsion as cooling lubricant requires more frequent and more intensive maintenance to ensure consistent quality, high availability, and value protection of lathes. Follow the instructions from the cutting fluids manufacturers regarding mixing ratio, concentration monitoring, pH check, etc.



The cooling lubricant emulsion must meet the specifications of the cooling lubricant manufacturer (see datasheet) at any time during its use. Also the test parameters and test intervals as specified by the manufacturer must be observed.

Important test parameters include:

- concentration
- pH
- bacterial count
- fungi

Preparation water / water hardness

The preparation water must have drinking water quality. The total hardness* of the water must be 1.79 to 3.57 mmol/l (10 °dH to 20 °dH). Softer water increases the foaming tendency while harder water impairs the physical stability of the cooling lubricant emulsion resulting in deposits.

Of major significance is also the concentration of electrolytes, such as chlorides, and the nitrate concentration that affect the stability and the corrosion protection of a cooling lubricant emulsion.

(*Please observe the country-specific conversions)

Non-water-miscible cooling lubricants (cutting oils)



When using cutting oils, fire prevention measures must be taken. This lies in the responsibility of the machine operator. The operator must specify and implement appropriate measures required for this purpose.

Only cutting oils on mineral oil basis must be used.

Cutting oils must not contain ingredients (e.g., chlorine, active sulfur) that cause damage in the machine (e.g., corrosion, component failure, seal decomposition).

Cutting oils on a biological basis must generally not be used. The use of other cooling lubricants lies also solely in the responsibility of the owner/operator or cooling lubricant manufacturer.

Essential characteristics of these cooling lubricants are viscosity, evaporation loss, and flash point.

The cutting oils used must have the following properties:

Viscosity class according to ISO 3448:1992	Viscosity at 40 °C according to DIN EN ISO 3104	Flash point measured with Cleveland open cup method acc. to ISO 2592	Evaporation loss at 250 °C (Noack) acc. to CEC L-40 -93
ISO VG 10	9.0 - 11.0 mm ² /s	> 155 °C	< 60 %
ISO VG 15	13.5 - 16.5 mm ² /s	> 190 °C	< 25 %
ISO VG 22	19.8 - 24.2 mm ² /s	> 200 °C	< 15 %

Coolant

Coolant serves as transport medium in cooling units (e.g., heat exchangers). It must not be confused with cooling lubricant.



When refilling, only the specified coolant (label on the coolant tank/ cooling unit) may be filled in. If there is no label on the container/ cooling unit, the coolant already used must be refilled.



If an external (operator-provided) coolant supply is used, the pressure, temperature and flow must meet the specifications in the user documentation for the specific machine.



Check the coolant concentration before replenishing.

The **entire cooling system** must be carefully cleaned and rinsed several times with clean water before refilling with new coolant.

Mixing different coolants may trigger biological/chemical reactions and cause consequential damage to components.

Such biological-chemical reactions have usually also direct impact on the machine (e.g., due to increased corrosion).

Coolant that has changed due to biological-chemical reactions – “gone off” – does no longer meet the required properties and must be completely replaced.

When preparing the coolant from concentrate and water, be sure to use demineralized water only.

Limits*

- Appearance	clear, no sediment
- pH (20 °C).....	7.5 ... 9.0
- Electrical conductivity (20 °C)	< 250 ms/m ³
- Total hardness*	< 20 °dH (3.57 m/mol)
- Chloride	< 50 g/m ³
- Organic impurities	< 1000 1/ml
- Sulfate	< 25 ppm
- Max. particle size	< 0.05 mm

(*Please observe the country-specific conversions)

Machines with external cooling water supply

Water quality and water treatment

The input side of most machines is provided with dirt sieves (mesh size 0.5 mm). These sieves are not used for cleaning contaminated water but should prevent dirt from entering into the machine in the event of a damage. External cooling water cleaning (fineness < 0.1 mm) is required.

Water circuit for external water supply

The cooling circuit must contain an anti-corrosion agent for preservation and a biocide against algae and slime bacteria. If prescribed by the cooling system manufacturer, the cooling water circuit must also contain an anti-freeze agent.

Machines with water recoler

Water circuit

The cooling water circuit is a semi-open system with mixing material use (steel, stainless steel, brass, copper, rubber, plastic), usually consisting of a water recoler near the machine, which is connected with the machine's cooling water system via two rubber hoses.

When refilling the system, an anti-freeze agent (down to -15 °C) and, if required according to the manufacturer's specifications, an anti-rust agent for preservation and a biocide against algae and slime bacteria must be added.

Water treatment

When initially filling or refilling with cooling water, be sure to add an anti-freeze agent to the water. To ensure the correct mixing ratios, we recommend using a ready mixture that can be obtained from the machine manufacturer. Adding an anti-freeze agent ensures sufficient protection both against freezing and corrosion.

The protective agent for the initial filling of the water circuit (machine with water recoler) is supplied with the machine.

Hydraulic fluid

Hydraulic fluid is used as coolant in cooling circuits, in addition to power transmission in hydraulic elements.

Cooling lubricant may enter the hydraulic fluid circuit due to technical circumstances. The hydraulic fluid must therefore be able to accommodate a small amount of cooling lubricant or coolant. However, this must not impair its hydraulic properties.



To avoid any possible harmful interactions between different hydraulic fluids, be sure to drain the existing hydraulic fluid from the reservoir (tank) when changing the manufacturer or between different products from the same manufacturer.

This applies even if the new hydraulic fluid has the same specification as the previously used hydraulic fluid.



Index recommends and fills all machines with

Renolin MR10 ISO VG 32 (from Fuchs)

Properties of hydraulic fluids

- Lubricant class **L**
according to ISO 19378
- Viscosity class **ISO VG 32**
according to DIN ISO 3448
- Classification **HLPD**
according to ISO 6743/4, DIN 51502, and DIN 51524-2
- Purity grade **15/13/10**
according to ISO 4406

Lubricants

In general:

- Lubricants must not be decomposed, hardened or washed off by the cooling lubricant.
- They must be resistant to aging, oxidation and emulsification, and they must not corrode the coating and the sealing materials commonly used in mechanical engineering.



The following specifications apply unless the machine documentation indicates other values:

Central lubrication and other places of use

Properties of lubricating oils

- Lubricant class **L**
according to ISO 19378

Viscosity class ISO VG 68 or ISO VG 220
according to ISO 19378



Be sure to follow the information at the lubricating oil tank.

- Classification **CGLP**
according to ISO 6743/4, DIN 51502, and DIN 51524-2

Properties of lubricating or fluidized greases

- Consistency class **NLGI 000**
according to DIN 51818
- **GP 000 N-30**
according to DIN 51502
- **ISO-L-XCHB 000**
according to ISO/DIS 6743-9



For the oils and greases used for clamping devices (chuck or collet), follow the specifications of each clamping device manufacturer.

Properties of spindle oils

Generally similar properties are required as those of lubricating oils:



Only spindle oils must be used that are very resistant to aging and have exceptionally good low-temperature properties.

- Lubricant class **CL** (gear oil)
- Viscosity class *DIN 51519*
- Requirements according to *DIN 51517-2*

Cleaning material

The machine must be cleaned only with a normal cleaning cloth and kerosene or cleaning oil.



Do not use cleaning rags and highly volatile solvents such as benzene, trichloroethylene or the like.



The machine must not be cleaned with pressurized air.



Cleaning the machine with steam, high-pressure or dry ice cleaners is not permitted.

Pneumatic system

Pneumatically controlled machine functions

- Sealing air
- Control of cooling lubricant valves
- Workpiece removal unit with gripper (option)
- Opening and closing of doors and flaps
- Customized facilities such as workpiece measuring device, contact checking units, fixture, aligning unit, etc.

Required properties

To ensure troublefree operation of the machine, the operator must provide compressed air in appropriate quality.

The quality of compressed air is divided into classes according to ISO 8573-1 that specify the allowed level and type of contamination.

Type of contamination	Quality class	Explanation
Solid contamination	4	Max. particle size 15 µm Max. particle density 8 mg/m ³
Pressure dew point	4	+3°C
Total oil content	4	≤ 5 mg/m ³

The required compressed air is conditioned in a maintenance unit. The maintenance unit requires no settings.

The factory default of the system pressure (pneumatics) is 6 bar.

Indicators are available to check normal functionality.

Air consumption

The air consumption is influenced both by the machine type and the specific machine equipment, as well as by the cycle time.

For the precise determination of the corresponding air consumption of the specific machine, be sure to consult the user documentation or contact the machine manufacturer.

Corrosion protection

The following anti-corrosion agents are used at the factory:

- RIVOLTA K.S.P. 204 simple oily corrosion protection with residual lubricating properties
- RIVOLTA K.S.P. 317 resistant waxy long-term corrosion protection for longer transports such as by sea, or for long storage.

Simple oily corrosion protection

Before delivery, all machines are provided with corrosion protection. Removing the corrosion protection before initial start-up is not necessary because it is flushed away by the cooling lubricant.

Waxy long-term corrosion protection

If a machine is stored for a long period of time or if the transport route is very long, for example, a transport by sea, the machine is sprayed at certain spots with an additional long-term waxy anti-corrosion agent. High-quality parts or items on the machine, such as ball screws or swivel grippers, must be sprayed with the simple oily version of corrosion protection only.



These machines are specially marked.

A warning sign indicating this type of corrosion protection is affixed to the viewing glass of the work area door.

Machines that are marked in this way must be cleaned, otherwise wipers and seals may be damaged.

Note that a thin mineral oil should be used as cleaning agent.

Prior to another transport, the machines must be again sprayed with an appropriate anti-corrosion agent (matching the conditions of transport).



If corrosion inhibitors from other manufacturers are used, their equivalence must be guaranteed by the supplier or manufacturer in writing.

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**INDEX-Werke GmbH & Co. KG
Hahn & Tessky**

Plochinger Straße 92
D-73730 Esslingen

Fon +49 711 3191-0
Fax +49 711 3191-587

info@index-werke.de
www.index-werke.de