Oil lubrication

Oil lubrication systems

Compared to grease-lubricated bearings, the application of lubricating oils enables long-term reliable operation at maximum speeds.

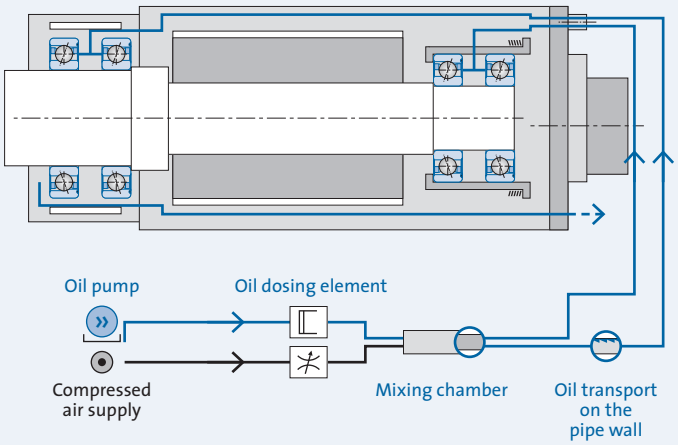
Different methods are available for the supply of oil to high speed bearings:

· Oil air lubrication (minimum quantity lubrication)

· Oil injection lubrication

· Oil fog lubrication

Oil air lubrication (block diagram)



Oil air lubrication

Oil air lubrication provides specific as well as volume-regulated lubricant delivery to the rolling and sliding surfaces in the bearing.

The oil is transported by means of an air stream that form streaks along the inner wall of the transparent supply hose and released uniformly at lubricating points in specified intervals.

Oil air lubrication guarantees utmost effectiveness with respect to consumption and lubricating effect at maximum speeds:

· Reduced flexing work

· Minimum friction losses

· Reduced heat generation

· High operating security

· Specific, volume-regulated lubricant supply

· Low oil consumption

· Low oil fog formation

· Very good lubricating effect

· Environmentally friendly and highly economical

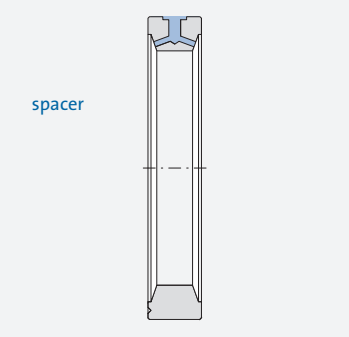
· Oil cooling and oil filtering not required
(in comparison to oil injection lubrication)

GMN Paul Müller GmbH & Co. KG · Äußere Bayreuther Str. 230 · 90411 Nürnberg · Tel. ++49-911-5691-249 · vertrieb.kula@gmn.de · www.gmn.de

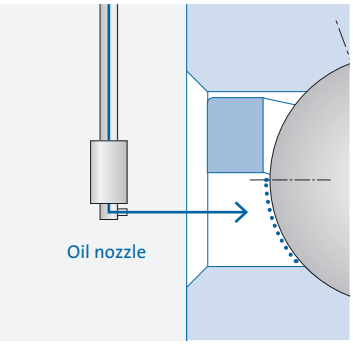
Oil lubrication

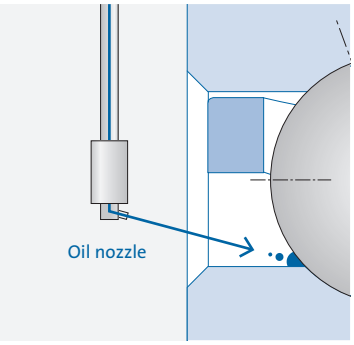
Oil supply

Conventional bearing lubrication systems have oil injection nozzles in an intermediate sleeve or in a spacer between 2 bearings.



A nozzle position aligned parallel to the spindle axis is sufficient for applications in high speed ranges.
A nozzle position aligned at an angle increases bearing speed suitability (more accurate lubricant supply in the rolling area).





Length and bore diameter of the oil nozzle:
Sufficient lubricant supply is assured with a ratio of nozzle length/nozzle bore diameter of more than 3 and less than 5 (pressure of oil air current greater than opposing pressure generated by bearing turbulences).

Oil for high precision spindles:
Hydraulic oil with kinematic viscosity VG 32 or VG 46 mm^2/s

Oil filtering:
Purity class 13/10 per ISO 4406:99 (particle size < 5 µm)

Oil volume per lubrication pulse:
30 up to 35 mm^3 per connection for 1 or 2 bearings

Cycle time:
VG32: 2 to 4 min., VG46: 4–10 min. (independent of $d_{bearing}$)

Number of nozzles:
1 per bearing

Nozzle diameter:
1.2 mm ($d_{bearing}$ < 50 mm) ..... 1.6 mm ($d_{bearing}$ > 70 mm)

Nozzle position:
Between cage and inner ring rim (technical data tables, TA cage)

Oil supply, oil drain:
Transparent hose, d_i = 4 mm

Air pressure upstream of spindle:
0,6 to 1 bar

Air volume:
3 to 4 m^3/h (50 to 65 L/min)

Air quality:
Meets ISO 8573: particle size < 5 µm,
particle concentration < 5 mg/m^3,
dew point < 3°C, oil concentration < 1 mg/m^3

Start-up:
Spindle start-up only after oil supply is secured

GMN Paul Müller GmbH & Co. KG · Äußere Bayreuther Str. 230 · 90411 Nürnberg · Tel. ++49-911-5691-249 · vertrieb.kula@gmn.de · www.gmn.de

Oil lubrication

Lubricating oils

Mineral lubricating oils achieve adequate bearing lubrication for the lubrication of machine tool spindles.

Frequently used lubricating oils						
Oil type	Operating Pour point	Flashpoint [°C]	Kinematic viscosity [mm²/s]		temperature range [°C]	Remarks / Application
			40° C	100° C		
Mineral	-33	+120	32.0	5.4	-25 to +80	Good wear protection; good corrosion and aging resistance
Mineral	-25	+226	46.0	6.7	-15 to +110	Good wear protection; good corrosion and aging resistance
Synthesis	-60	+220	12.2	3.2	-35 to +130	Low evaporation, particularly at low temperatures, resistant to oxidation and corrosion / gyro bearings
Silicone	-65	+280	60	20	-55 to +200	High and low temperature oil / aerospace and aviation industries, fine mechanics
Ester	-68	+220	14.3	3.7	-50 to +120	Good corrosion and aging resistance, low evaporation / aircraft and instrument bearings

GMN Paul Müller GmbH & Co. KG · Äußere Bayreuther Str. 230 · 90411 Nürnberg · Tel. ++49-911-5691-249 · vertrieb.kula@gmn.de · www.gmn.de