

TECHNICAL INFORMATION**Cooling lubricant oil mist separation on machine tools**

The oil mist separator series LGA: low maintenance and energy efficient oil separation with long service life

Modern machine tools produce high-quality workpieces at optimized costs per piece. This requires large quantities of cooling lubricant for heat dissipation, lubrication, and chip conveyance. An optimal workspace configuration and the use of high-pressure pumps for the cooling lubricant are therefore essential design characteristics of the machine design. These provisions result in a sharp increase in the concentration of finely distributed cooling lubricant oil mist in the workspaces. Conventional oil mist separation systems – which at one time were sufficient for the minimal oil mist loading that occurred in applications of the past – are now often extended beyond capacity and require replacement or retrofitting. In many cases, cost-efficient production is no longer ensured.

MAHLE oil mist separators achieve exceptional fractional collection efficiencies (99 percent at 0.5 μm and 100 percent at > 0.7 μm) with a service life of up to two years. These results are obtained with only a single-stage filter system, even at very high oil mist loads of up to 3,000 mg/m³. In demanding applications of this type, MAHLE oil mist separators still ensure reliable operation and cost-efficient maintenance intervals.

MAHLE filter concept

MAHLE filter cartridges comprise multiple specifically arranged fiberglass layers, which are formed into their typical star-pleated shape in a special manufacturing process.

The basic retention principle is based on coalescence:

Oil droplets present in the air flow through the fiberglass layer and become trapped on the individual fibers due to the effects of inertia, filtering action, and diffusion. As they pass through the filter, the fine oil droplets in the fiberglass structure coalesce into larger droplets, thus forming an oil film. These droplets are carried by the air current to the downstream surface of the cartridge and are dissipated downward in a drainage mat by the force of gravity. This drainage effect continuously cleans the cartridge, although a small number of dirt particles will still firmly adhere to the filter, thus shortening its service life.

Machine concept

Three unit sizes are available for direct mounting on (600 / 1200) and at (2400) machine tools:

- LGA 600 F/FU, throughput 600 m³/h
- LGA 1200 F/FU, throughput 1200 m³/h
- LGA 2400 FUW, throughout 2400 m³/h with booster function

MAHLE oil mist separators are driven by a frequency-controlled motor. A flow sensor that returns the actual value is used to achieve a constant volume flow. If the volume flow falls below the setpoint, the unit outputs an electrical signal. Maintenance procedures can then be implemented in a timely manner based on an evaluation of this signal.

Technical data

	LGA 600 F	LGA 600 FUW	LGA 1200 FUW	LGA 2400 FUW
Volume flow in m ³ /h	600	600	1200	2400
Dimensions (LxBxH) in mm	930x555x780	930x555x840	1155x640x1040	1600x1175x1850
Weight in kg	ca. 140	ca. 145	ca. 237	ca. 730
Supply voltage in V/Hz/Ph	3 AC 400 V/N/PE, 50-60 Hz	3 AC 400 V/N/PE, 50-60 Hz	3 AC 400 V/N/PE, 50-60 Hz	3 AC 400 V/N/PE, 50-60 Hz
Back-up fuse in A	16	10	10	25
Motor output in kW	1,5 - 2,2	1,5 - 2,2	4 kW	7,5 kW
Sound level	< 72 dB (A)	< 69 dB (A)	< 72 dB (A)	< 79 dB (A)



Image 1: LGA 600 on a broaching machine

System dimensions

A specific minimum extraction capacity is required for enclosed machine tools. The following principle applies in general: as little as possible – as much as necessary.

Based on previous experience with such applications, we can assume for calculation purposes that the air in the workspace will be renewed approximately 200–300 times per hour.

The required unit size can be calculated using the following equation:

- $\text{throughput (m}^3/\text{h)} = \text{air renewal (n/h)} \times \text{machine room (m}^3\text{)}$

Greater throughputs may be required for large door openings and manual workpiece removal. The critical design factor is the actual extraction capacity of the fan, not the nominal delivery rate of the fan without an extraction line.

The oil mist separator series LGA 600/1200/2400 FUW offers a broad range of applications. The frequency-controlled volume flow allows a cost optimized adjustment to the space in the exhausted machine room. Furthermore the LGA 2400 is run by booster operation, which exhausts the machine room short-run and quickly during toll or workpiece change.

Summary

MAHLE oil mist separators

- provide a best-in-class service life, even with exceptionally high oil mist concentrations in the inlet air,
- achieve excellent fraction rate efficiencies:
99 percent at 0.5 μm ; 100 percent at $> 0.7 \mu\text{m}$,
- maintain a continuously high collection efficiency over the entire service life of the filter,
- can be customized for a particular workspace with its frequency-controlled drive,
- require very little maintenance
- meet the regulations for workplaces,
- show best performances, when handling heavy oil mist loaded cooling lubricants.

MAHLE Industrial Filtration has been producing high-quality industrial filters for fluid technology, air filtration, and process technology for many years. As an innovative, reliable development partner and supplier all over the world, MAHLE Industrial Filtration is your expert partner in all areas of filtration and separation. MAHLE Industrial Filtration is an independent service area with its own engineering, production, and sales team, integrated in the MAHLE Group, and thus is backed by the strength of a worldwide market leader. The MAHLE Group is among the top 30 automotive suppliers globally and is the world market leader for combustion engine components, systems and peripherals. MAHLE employs approximately 45,000 employees in over 100 production plants and eight research and development centers. In 2008, MAHLE generated sales in excess of EUR 5 billion (USD 7.3 billion).

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