



S p r a y s y s t e m s & M Q L

Minimum.

Quantity.

Lubrication.

Systems.



PRODUCT RANGE



About.

Steidle.

Steidle GmbH has pioneered and paved the way for the technique known as Minimum Quantity Lubrication (MQL), which has now established itself as the most advanced strategy for metal processing.

Founded in 1979, Steidle GmbH began producing lubricooling systems in the early 80's, when they were still known as „spray cooling“ devices. Spurred on by this success, Steidle GmbH then focused on the application of minimal quantities of liquids.

As a result of our research, development and production, we were able to greatly extend our product range. Today, Steidle offers a unique range of over half a dozen minimum quantity lubrication (MQL) systems for internal and external lubrication, metal-cutting and chipless forming operations, for initial installers and end users.

You can put together your own individual system from over 900 components (in the standard range alone). And, if for any reason, you cannot find anything suitable, the provision of tailor-made solutions is one of our strengths.



The range of products offered, expert advice, extensive experience and continuous, customer-oriented innovations - all these factors give Steidle customers a distinct advantage. Our product range is rounded off with lubricoolants specially developed for MQL, and, as an expert systems supplier, you can rely on Steidle for all your MQL needs.



Experience.

Quality.

Product.

Diversity.

Consulting.

Specialists.

Customized.

Solutions.

Targeted.

Lubrication.



Quantity.

Optimization.

The idea behind MQL

In conventional circulating lubrication, an emulsion consisting of lubricant concentrate (approx. 5%) and water (approx. 95%) is generally used. Let us consider the effect of this mixture. Most of the emulsion serves only to cool down the heat that is produced by its poor lubricant effect. This was the starting point for MQL. If lubrication is optimized, the reduction in friction results in a reduction in the amount of heat produced, which means that there is less heat to dissipate.

Moreover, only a certain amount of the lubricant is needed for the lubrication process. Everything over and above this amount is wasted.

So MQL also means using only the exact quantity of lubricoolant required. This is why MQL is also known as „dry lubrication“.

MQL makes the lubricating process more efficiently and offers a lot of advantages. A time-consuming and costly cleaning of chips and work piece is not needed. Similarly the machine and the surroundings remain dry, which improves the safety of the workplace. No emulsions must be maintained and disposed of any more and dry chips can be reused as valuable materials. The tool lifetime normally increases.

Nowadays, the quantity of lubricant used needs to be between 20 and 50 ml per process hour for it to be defined as MQL. Compared to the amount used in closed-circuit cooling, this corresponds to a ratio of approx. 1 : 10,000 or, in other words: only one drop of MQL is needed for every litre of emulsion!

- = criteria fulfilled / very suitable
- = partly fulfilled / semi-suitable

	Lubrimat® L60	Sägefix® SF	Centernat® C30	Toolmat® T70	Pulsomat® P35	Spraymat® S700
System Properties						
Delivery principle						
Piston pump	●	●	●	●	●	
Overpressure						
Underpressure						●
Delivery quantity						
Micro quantities (up to 50 ml/h/nozzle)	●	●	●	●	●	●
Micro quantities (up to 2000 ml/h/nozzle)						●
Output						
Air/medium-mix, coarse	●	●				●
Air/medium-mix, fine	●	●		●		●
Air/medium-mix, aerosol			●	●		
Liquid only (airless system)					●	
Media						
Low viscose media (1 - 25 mm ² /s at 40°C)	●	●	●	●	●	●
Medium viscose media (25 - 50 mm ² /s at 40°C)	●	●	●	●	●	●
High viscose media (50 - 100 mm ² /s at 40°C)	●			●		●
Type of lubrication						
External lubrication	●	●			●	●
Internal lubrication			●	●		
Single channel/ external mixing			●	●		
Dual channel/ internal mixing				●		
Suitability for ranges of application						
Metal-cutting operations						
Drilling	●		●	●	●	●
Turning	●		●	●		●
Milling	●		●	●		●
Thread moulding	●		●	●	●	●
Thread cutting	●		●	●	●	●
Engraving	●					●
Reaming	●		●	●	●	
Countersinking	●				●	●
Sawing	●	●				●
Grinding	●					●
Chipless forming operations						
Bending	●					●
Compressing	●				●	
Punching	●				●	
Forming	●				●	
Other applications						
Lubrication of bearings	●		●	●		
Chain lubrication	●				●	
Cooling	●					●
Application of mould release agents	●				●	●
Application of anti-corrosion agents	●				●	●



Lubrimat® L60 / Sawfix® SF

Pages 8 - 15

Piston pumps transport the minimum quantity of the medium to the nozzle, which is then sprayed using compressed air. The discharge rate can be set at a consistent level. The version of Sawfix® SF is equipped with a nozzleblock for lubricating saws.



Centermat® C30 / Toolmat® T70

Pages 16 - 19

MQL systems produced especially for internal lubrication, for use in internally cooled appliances. Both can be easily connected to machine tools. Toolmat® T70 has a hybrid nozzle which produces fine particles, whereas with Centermat® C30, this function is carried out by an aerosol booster using PRO-CYCLON® technology.



Spraymat® S700

Pages 20 - 21

Low pressure produced by the sprayed air in the nozzle sucks the lubricant out of the unpressurized reservoir. Valves regulate the quantity of air and liquid. Spraymat® S700 is suitable for the spray application of larger quantities of liquid.



Pulsomat® P35

Pages 22 - 23

The „airless” lubrication system propels only liquid from its nozzle, without any addition of air. The intervalled and pinpoint application makes the Pulsomat® particularly suitable for chipless forming and light metal-cutting operations.



Lubrimax® lubricoolants

Pages 24 - 25

Steidle lubricoolants have been specially developed for MQL technology and so yield the best results. Alongside the all-purpose Lubrimax® Edel C, which is suitable for most uses, products for special purposes are also available.



Examples of application / Configuration help

Pages 26 - 35

Various examples of practical applications demonstrate the variety of possible uses for MQL. The Configuration help supports you choosing your individual MQL system.

- Brief description:** Piston pump system for spraying the smallest quantities of liquid.
- Main application range:** External MQL in all metal-cutting operations. Pinpoint or small area lubrication in chipless forming operations. Application of mould release and anti-corrosion agents or other spray-on substances.
- Operating principle:** The liquid flows from the reservoir into a piston pump. This pushes an exact quantity of the lubricant into the internal feed tube. Separately supplied compressed air splits the medium at the nozzle tip and sprays it.
- Adjustability:** Swept volume of the pump (manual)
Clock frequency of the pump (manual)
Quantity of spray air (manual)
Spray air pressure (manual)
Switch on/ off via actuation control device/drive (electric, pneumatic or manual)



Fig.: Lubrimat® L60

Technical Data:

Operating pressure	bar	4 - 8
Liquid throughput	ml/h per nozzle	0 - 150 ¹⁾
Typical consumption	ml/h per nozzle	10 - 20 ¹⁾
Lubricoolant		Lubrimax® and others
Recommended viscosity	mm ² /s (at 40°C)	1 - 100

¹⁾ depending on application, medium used, viscosity and temperature

System components:

1. Base / Base addition

- Pneumatically driven, finely meterable **piston pump** ① with FPM seals, manually adjustable with PMC precise metering control ③, enabling easy adjustment of the volume using a dial. Volume 0 - 0.03 ml per stroke. If required, pumps with double flow volume (2DF) with up to 0.06 ml per stroke are available.
- All pumps are standard synchronous drive. Separate drive, if required (all pumps individually or certain groups). The use of the logic panel enables all pumps to be operated using only one frequency generator.
- **Ventilation unit** ② integrated underneath the pump module.
- **Frequency generator** for pump pulses, manually adjustable 0 - 90 stroke min⁻¹.
- A dedicated air valve for each nozzle, to enable the quantity of spray air to be adjusted.
- **Pressure reducing valve** to set spray air pressure. It also equalizes pressure variations in the supply tube and the system and ensures that the spray profile is even.
- **Manometer** (0 – 10 bar) in front of door to display spray air pressure.
- Coupler plug for compressed air supply to left side of housing.
- **Air filter** with integrated water separator and drainage opening on housing underside.
- High-grade push in/screw fittings/ pneumatic tubes.
- Stable, compact metal housing (200x200x155, 250x250x210, 300x250x210, or 400x400x210) with robust metal closer and door seal for dust protection and noise reduction, earthing pin.

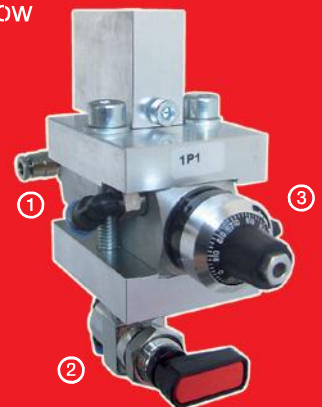


Fig.: Pump module L60

- Connections for feed tube with **EASY-COAX® system** (plug-in system for speedy, simple assembly, disassembly and interchange, including EASY-COAX® twist-stop) on the left side of the housing.
- **Component labelling** in accordance with the designations in the pneumatic connection diagram.
- **Numbering clips** on every liquid conduit.

2. Reservoirs from 0.33 to 27 litres available:

- Housing assembly

- Reservoir 0.33 litre PA with screw cap, ventilation plug, drainage sieve.
- Reservoir 1.0-/2.0-/3.0-litre with plexiglass cylinder / NBR seals or glass cylinder / FPM seals. With filler neck, screw plug, detachable sieve, automatic ventilation, drainage sieve. Can be supplied with float switch min or min+max (potential-free, either NC or NO).
- Reservoir 6.0-/10-/17-/27-litre aluminium. With filler neck, screw plug, detachable sieve, automatic ventilation, drainage sieve stopcock and fill level display. Combined wall-housing bracket of sturdy aluminium construction 40x40 with 4 mounting straps for wall installation. Can be supplied with float switch min or min+max (potential-free, either NC or NO).



Fig.: Reservoir P2NC (2.0l)

Vol.	ø	H
0.33	83	150
1.0	105	190
2.0	140	225
3.0	155	250

Dimensions*: Reservoir with wall-housing bracket (incl. housing)

Type	Vol.	Dimensions depending on housing size (HxWxD)			
		200x200x150	250x250x210	300x250x210	400x400x210
A6AWG	6.0	553 x 265 x 370	598 x 265 x 370	654 x 265 x 370	748 x 400 x 370
A10AWG	10	589 x 315 x 370	634 x 315 x 370	690 x 315 x 370	784 x 400 x 370
A17AWG	17	622 x 369 x 370	667 x 369 x 370	723 x 369 x 370	817 x 400 x 370
A27AWG	27	653 x 491 x 390	698 x 491 x 390	754 x 491 x 390	848 x 491 x 390

*) = Dimensions given are approximate in mm, excluding mounting straps, feed tubes or valve rocker; for the float switch min option: height +4, for the float switch min+max option: height +70.

- Wall installation

- Reservoir 6.0-/10-/17-/27-litre aluminium as described before. With wall bracket of sturdy aluminium construction 40x40 with 4 mounting straps for wall installation. Can be supplied with float switch min or min+max (potential-free, either NC or NO).

type	Vol.	Dimensions* (HxBxT)	weight (kg)
A6AW	6.0	288 x 260 x 370	4.0
A10AW	10	324 x 315 x 370	5.5
A17AW	17	357 x 369 x 370	7.0
A27AW	27	388 x 491 x 390	10.5

*) = Dimensions given are approximate, including wall bracket, stopcock and filler neck; for the float valve min option: height +4, for the float valve min+max option: height +70.



Fig.: Reservoir A27AWNC

- Stirrer (pneumatic) for aluminium reservoirs

- The aluminium reservoirs (6.0- to 27- litres) are available with a pneumatic stirrer. So it will be possible to keep media in motion that otherwise would separate out. The pneumatic drive is lasting and reliable and offers outstanding safety advantages (especially explosive protection). The rpm of the rotating piston air engine is progressively adjustable and an impulse generator guarantees the proper start of the engine.
- A combination with a float switch (min or min/max) is generally possible, but in case of a disproportionate high rpm faulty switching signals are possible.



Fig.1: A6AWQp

rpm	0 – 12,000	min ⁻¹ at 6 bar (without load)
operating pressure	2.5 – 7.0	bar
air consumption max.	100	L/min at 6 bar (without load)
air consumption typical	< 60	L/min (depending on adjustment and load)
Stirrer blade diameter	Ø 70	mm
Dimensions	+ 30	mm (added to the height of the reservoir)
Weight	1.5	kg

L/min (depending on adjustment and load)



Fig.2: Shaft and stirring blade

3. Drive electric, pneumatic or manual option:

- Solenoid valve 3/2 way (up to 3 nozzles 120 NI/min, 4 nozzles and over 1300 NI/min) with auxiliary actuation (for occasional manual switching on/off). Coil with plug in 24V DC, 24V AC, 110V AC or 230V AC. Cable bushing on left side of housing. In the case of separate actuation control device, each pump (or group of pumps) is controlled via a dedicated solenoid valve.
- Pneumatic valve 3/2 way (up to 3 nozzles 550 NI/min, 4 nozzles and over 1300 NI/min). With push in connection Ø6 for control air on left outer side of housing.
- Hand valve 3/2 way (600 NI/min) as valve rocker on right outer side of housing.
- Mechanical valves 3/2 way (700NI/min) as plunger, roller lever or knee roller lever in versions NC or NO. Delivered with the corresponding connectors and a 2m tube PUNØ8 to the unit.

4. Feed tube

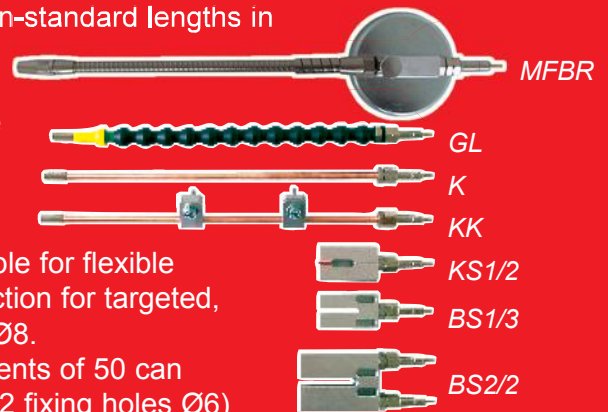
- Coaxial feed tube with EASY-COAX® system. Outer tube of strong rubber construction with robust metal sleeve Ø11, inner tube for delivery of medium, constructed of long-life PTFE Ø3. Standard length 3,000, non-standard lengths up to 20,000 available on request. Smallest bending radius R50.
- Numbering clips on feed tube for easy assignment of pumps and nozzles.



Fig.: EASY-COAX®

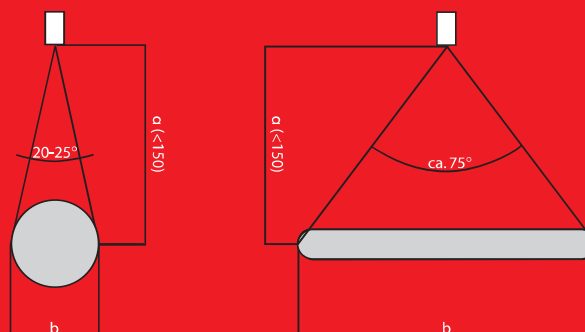
5. Nozzle option:

- Nozzle **copper tube** Ø6 with EASY-COAX® system. Can be bent once, most suitable for rigid positioning. Nozzle head with flow optimized construction for targeted, fogless spraying and nickel plated protective sleeve Ø8. Standard length 300, non-standard lengths in increments of 50 can also be supplied. 2 clamps, a connection block (40x30x15 with 2 fixing holes Ø6), or a connection block with round magnet Ø80 can be supplied for mounting, if required. Standard full jet, also available as flat-jet (spray angle approx. 75°).
- Nozzle **multi link tube** Ø17 with EASY-COAX® system. Can be bent several times, particularly suitable for flexible positioning. Nozzle head with flow optimized construction for targeted, fogless spraying and nickel-plated protective sleeve Ø8. Standard length 300, non-standard lengths in increments of 50 can also be supplied. A connection block (40x30x15 with 2 fixing holes Ø6) or a connection block with round magnet Ø80 can be supplied for mounting, if required. Standard full jet, also available as flat-jet (spray angle approx. 75°).
- Nozzle flexible metal tube Ø9 with EASY-COAX® system. Can be bent several times, particularly suitable for flexible positioning. Nozzle head with flow optimized construction for targeted, fogless spraying and nickel-plated protective sleeve Ø12. Standard length 340, but also available in 220 and 420. Connection block (40x30x15 with 2 fixing holes Ø6) with or without round magnet Ø80 can be supplied for mounting, if required.
- **Nozzleblocks** (Aluminium) with EASY-COAX® system. For 1, 2 or 3 feed tubes. With optimized spray points for band saws or circular saws and elongated holes for mounting 6x18 or 6x21.
- Individual solutions like conical nozzles, incorporated nozzles or complete spraying devices on demand.



General information about spray angle / spray distance / spray surface:

- Full jet nozzles have a spray angle of 20-25°, flat jet nozzles of 75°.
- In order to get an even covering of the surface*, the distance between the tip of the nozzle and the surface must not be more than 150 mm.
- The size of the covered surface* can be calculated like follow (as thumbrule):
 Full jet: Diameter of the surface* (b) = 1/3 of the distance nozzle to surface (a)
 Flat jet: Length of the surface* (b) = 1.5 x of the distance nozzle to surface (a)



* If the coverage of the surface will correspond to the ideal form shown here, will depend on the viscosity and the surface tension of the media itself.

6. Option

- 4 x round magnet Ø80 (mounted on the reverse side) for easy installation of the housing. (see example on page 12).
- 4 x mounting straps (mounted on the reverse side) for fixed installation of the housing. (see example on page 6).
- Filler reservoir 2.0-litre, fits into the filler neck (reservoir 1.0 litre and higher). This solution enables you to fill in media of high viscosity more easily. You do not have to wait until the media is poured in as its own weight makes the media flow faster through the sieve. In addition the filler reservoir has a bigger opening Ø. Dimensions: Ø120 x 240 height.

Order codes (Standard range, special solutions on request):

0. Base	L60	MQL with piston pumps and precise metering control (PMC)
1. Base addition	/.....	(state number of nozzles required, e.g. „/4“)
	/.....S	(separate drive, all nozzles separately, e.g. „/4S“)
	/.....S	(separate drive, not all nozzles separately, e.g. „/4S2+1+1“)
2. Reservoir	Y03	0.33-litre PA
	P1	1.0-litre plexiglas / NBR
	P1NC	... with float switch min NC
	P1NO	... with float switch min NO
	P1NCNC	... with float switch min NC + max NC
	P1NCNO	... with float switch min NC + max NO
	P1NONC	... with float switch min NO + max NC
	P1NONO	... with float switch min NO + max NO
	P2...	as P1, but 2.0-litres
	P3...	as P1, but 3.0-litres
	G1...	as P1, but glass / FPM
	G2...	as P2, but glass / FPM
	G3...	as P3, but glass / FPM
	A6AW	6.0-litre aluminium (wall installation) with wall bracket
	A6AW..	... with float switch variation, as P1
	A10AW...	as A6AW, but 10-litre aluminium
	A17AW...	as A6AW, but 17-litre aluminium
	A27AW...	as A6AW, but 27-litre aluminium
	A6AWG	6.0-litre aluminium (housing assembly) with wall-housing bracket
	A6AWG...	... with float switch variation, as P1
	A10AWG...	as A6AWG, but 10-litre aluminium
	A17AWG...	as A6AWG, but 17-litre aluminium
	A27AWG...	as A6AWG, but 27-litre aluminium
	A.....Qp	Stirrer, pneumatic

3. Drive	e...V..	electric up to 3 nozzles (24VDC, 24VAC, 110VAC oder 230VAC)
	E...V..	electric 4 nozzles and over (24VDC, 24VAC, 110VAC oder 230VAC)
	pv3	pneumatic up to 3 nozzles
	PV3	pneumatic 4 nozzles and over
	M3SNC2000	mechanic plunger valve, NC, with tube 2,000mm
	M3RNC2000	mechanic roller lever valve, NC, with tube 2,000mm
	M3KNC2000	mechanic knee roller lever valve, NC, with tube 2,000mm
	H3	hand actuated control device
4. Feed tube	ZM3000	feed tube, metal outer Ø11 / inner PTFE Ø3, length (L)=3,000 (standard)
	ZM.....	feed tube, length =.... (non-standard length, min. 500, in increments of 500)
5. Nozzle	K	copper tube (Ø6, L=300)
	KK	copper tube (Ø6, L=300) with 2 clamps
	KB	copper tube (Ø6, L=300) with connection block
	KBR	copper tube (Ø6, L=300) with connection block and round magnet Ø80
	KFE...	as nozzle K, but with flat-jet
	GL	multi link tube (L=300)
	GLB	multi link tube (L=300) with connection block
	GLBR	multi link tube (L=300) with connection block and round magnet Ø80
	GLFE...	as nozzle GL, but with flat-jet
	MFB	flexible metal tube (L=340) with connection block
	MFBR	flexible metal tube (L=340) with connection block and round magnet Ø80
	MF220B	flexible metal tube (L=220) with connection block
	MF220BR	flexible metal tube (L=220) with connection block and round magnet Ø80
	MF420B	flexible metal tube (L=420) with connection block
	MF420BR	flexible metal tube (L=420) with connection block and round magnet Ø80
	BS1/3	band saw nozzleblock for 1 feed tube/ with 3 spray points
	BS2/2	band saw nozzleblock for 2 feed tubes/ with 2 spray points
	BS3/3	band saw nozzleblock for 3 feed tubes/ with 3 spray points
KS1/2	circular saw nozzleblock for 1 feed tube/ with 2 spray points	
KS2/2	circular saw nozzleblock for 2 feed tubes/ with 2 spray points	
KS3/3	circular saw nozzleblock for 3 feed tubes/ with 3 spray points	
	(additional types and models also available))	
6. Option	RG	housing mounting 4 x round magnet Ø80
	MG	housing mounting 4 x mounting straps
	FY2	filler reservoir 2.0-litre (for reservoir 1.0 litre and higher)

Sample order code:

L60/3 - P1NC - e24VDC - ZM3000 - GLBR - RG



Brief description: Piston pump system for spraying the smallest quantities of liquid.

Main application range: External MQL for circular saws and band saws.

Operating principle: The liquid flows from the reservoir into a piston pump. This pushes an exact amount of the medium into the internal feed tube. Separately supplied compressed air splits the medium in the nozzleblock into tiny particles of fluid and sprays it onto the tooth profile of the saw.

Adjustability: Swept volume of the pump (manual), clock frequency of the pump (manual), quantity of spray air (manual), switch on/off via drive (electric, pneumatic or manual).



Technical Data:

Operating pressure	bar	4 - 8
Liquid throughput	ml/h	0 - 150 ¹⁾
Typical consumption	ml/h	15- 30 ¹⁾
Lubricoolant		Lubrimax® and others
Recommended viscosity	mm ² /s (at 40°C)	1 - 50
Dimensions (HxWxD)		
Housing (without reservoir)	mm	200 x 200 x 155
Nozzleblock	mm	15x 52 x 30

¹⁾ depending on application, medium used, viscosity and temperature

System components:

1. Base / Base addition

- Pneumatically driven, finely meterable piston pump ① with FPM seals, manually adjustable with PMC precise metering control ③, enabling easy adjustment of the volume using a dial. Volume 0 - 0.03 ml per stroke, including adjusting key.
- **Ventilation unit** ② integrated underneath the pump module.
- **Frequency generator** for pump pulse, manually adjustable 0 - 90 stroke min⁻¹.
- Coupler plug for compressed air supply to left side of housing.
- **Air valve** to set spray air quantity.
- High-grade push in/screw fittings/ pneumatic tubes.
- Stable, compact metal housing 200x200x155 with robust metal closer and door seal for dust protection and noise reduction, earthing pin.
- Connection for feed tube with **EASY-COAX® system** (plug-in system for speedy, simple assembly, disassembly and interchange) on left side of housing.
- **Component labelling** in accordance with the designations in the pneumatic connection diagram.



Fig.: pump module SF

2. Reservoirs from 0.33 to 3.0 litres available.

- Reservoir 0.33 litre PA with screw cap, ventilation plug, drainage sieve.
- Reservoir 1.0-/2.0-/3.0-litre with plexiglass cylinder / NBR seals or glass cylinder / FPM seals. With filler neck, screw plug, detachable sieve, automatic ventilation, drainage sieve.



Fig.: Reservoir P2 (2,0)

3. Drive options:

- Solenoid valve 3/2 way (120 NI/min) with auxiliary actuation (for occasional manual switching on/off). Coil with plug in 24V DC, 24V AC, 110V AC or 230V AC. Cable bushing on left side of housing.
- Pneumatic valve 3/2 way (550 NI/min). With push in connection Ø6 for control air on left outer side of housing.
- Hand valve 3/2 way (600 NI/min) as valve rocker on the right outer side of housing.

Vol.	ø.	H
0.33	83	150
1.0	105	190
2.0	140	225
3.0	155	250

4. Feed tube

- Coaxial feed tube with EASY-COAX® system. Outer tube of strong rubber construction with robust metal sleeve Ø11, inner tube for delivery of medium, constructed of long-life PTFE Ø3. Standard length 3,000, non-standard lengths up to 20,000 available on request.



Fig.: Nozzleblocks KS1/2 and BS1/3

5. Nozzle

- Nozzleblock (aluminium 15x52x30) with EASY-COAX® system. For band saws with 3 optimized spray points and two elongated holes for mounting 6x18. For circular saws with 2 optimized spray points and one elongated hole for mounting 6x21.

6. Option

- 4 x round magnet Ø80 (mounted on the reverse side) for easy installation of the housing. (see example on page 14).
- 4 x mounting straps (mounted on the reverse side) for fixed installation of the housing. (see example on page 8).

Order codes:

0. Base	SF	MQL with piston pumps for saws
1. Base addition	/1	(for 1 nozzleblock)
2. Reservoir	Y03 P1 P2 P3 G1 G2 G3	0.33-litre PA 1.0-litre plexiglas / NBR 2.0-litre plexiglas / NBR 3.0-litre plexiglas / NBR 1.0-litre glass / FPM 2.0-litre glass / FPM 3.0-litre glass / FPM
3. Drive	e...V.. pv3 H3	electric (24VDC, 24VAC, 110VAC oder 230VAC) pneumatic hand actuation
4. Feed tube	ZM3000 ZM.....	feed tube, metal outer Ø11 / inner PTFE Ø3, L=3,000 (standard) feed tube, L=.... (non-standard length, min. 500, in increments of 500)
5. Nozzle	BS1/3 KS1/2	band saw nozzle block for 1 feed tube / with 3 spray points circular nozzle block for 1 feed tube / with 2 spray points
6. Option	RG MG	housing mounting 4 x round magnets Ø80 housing mounting 4 x mounting straps

Sample order code:

SF/1 - Y03 - e24VDC - ZM3000 - BS1/3 - RG



Brief description: Aerosol booster with piston pumps and PRO-CYCLON® technology to produce fine oil-air mixtures.

Main application range: Internal MQL for single channel rotary union, middle and upper rpm.

Operating principle: A piston pump sprays the oil from the supply reservoir into a spray chamber. Coarse drops are filtered out in the upper separation chamber to produce a fine, homogenous aerosol mixture. This is transported via the feed tube to the rotary union.



Adjustability: Pump swept volume and frequency (manual), quantity of spray air (manual), quantity of additional air (manual)

At basic version C30/1: Simultaneously switch on/off of the spray nozzle and the additional air (machine-controlled)

At full version C30/1 V7: Separated switch on/off of the spray nozzle1, the spray nozzle2 and the additional air (each machine-controlled)



In the case of internal lubrication only the finest drops are able to get through as the centrifugal forces inside the spindle eject the bigger oil droplets. The Centermat® C30 utilizes this effect through its use of PRO CYCLON® technology. Coarse droplets are separated in the Centermat® C30 early on and transported back to the supply reservoir. The smallest droplets in the μ -range that remain form a fine, stable aerosol Mixture which is transported to the drill holes in the machine tool all the way through the feed tube, rotary union and spindle.

The basic version C30/1 provides one spray nozzle in the spray chamber and is designed for tools with a total channel cross section of **1.0 to 10 mm²**. Suitable for applications where the tools have similar channel cross sections in the above mentioned range.

The full version C30/1 V7 provides two independent spray nozzles in the spray chamber and is designed for tools with a total channel cross section of **1.0 to 10 mm²**. Suitable for applications where the tools have a wide range of total channel cross sections. The additional air can also be switched on/off separately and this can be used for particularly large tools or for blowing-out.

Querschnitt in mm ²	Ø der Kanäle (mm) bei Anzahl:			Empfehlung		
	1 Kanal	2 Kanäle	3 Kanäle	C30/1	C30/1V7	Minidüse
0,2	0,5	0,4	0,3	-	-	+
1,0	1,1	0,8	0,7	+	+	+
2,0	1,6	1,1	0,9	+	+	+
3,0	2,0	1,4	1,1	+	+	+
5,0	2,5	1,8	1,5	+	+	-
10	3,6	2,5	2,1	+	+	-
60	8,7	6,2	5,0	-	+	-
120	12,4	8,7	7,1	-	+	-

Tabelle: Empfehlung abhängig vom Werkzeugkanal-Querschnitt

For applications with a total channel cross section of 0.2 to 3.0 mm² a special mini spray nozzle is available on demand.

Technical Data:

Operating pressure	bar	5 - 8
Typical air consumption	NI/min (at 5bar)	C30/1: 40 – 130 / C30/1 V7: 40 - 160
Typical oil consumption	ml/h	10 – 30 ml/h ¹⁾
Lubricoolant		Lubrimax® and others
Recommended viscosity	mm ² /s (at 40°C)	1 - 50
Housing Dimensions (HxWxD)	mm	500 x 300 x 210
Feedtube diameter	mm	Ø 12

¹⁾ depending on application, medium used, viscosity and temperature

System components:

1. Base / Base addition

At basic version C30/1: One pneumatically driven, finely meterable piston pump to feed one spray nozzle in the spray chamber.

At full version C30/1 V7: Two pneumatically driven, finely meterable piston pumps to feed two spray nozzles in the spray chamber.

The following components are for both version identical:

- Piston pumps with FPM seals, manually adjustable with scale indicator, volume 0 - 0.03 ml per stroke.
- Spray nozzles with dedicated **air valve** with manometer (0 – 10 bar) to set spray air quantity.
- Dedicated air valve with manometer (0 – 10 bar) to set quantity of additional air.
- **Ventilation unit** integrated on the side of the pump block.
- **Frequency generator** for pump pulse, manually adjustable 0 - 90 stroke min⁻¹.
- **Manometer** (0 – 10 bar) in the door front to indicate reservoir pressure.
- Pneumatic **pressure switch** to switch off nozzles in case of pressure build up including **visual display unit** in the door front. Automatic **ventilation valve** with hand actuation.
- Coupler plug NG8 for compressed air supply to left side of housing.
- **Air filter** with integrated water separator and drainage opening on underside of housing.
- Robust, compact **metal housing** 500x300x210 with robust metal closer and door seal for dust protection and noise reduction, earthing pin, 4 mounting straps for wall mounting of the housing.
- Connection for feed tube with push-in coupler Ø12 on the upper side of housing.

2. Reservoirs

- Aluminium reservoir, 1.5 litre inside housing with float switch min (potential-free either NC or NO).
- Hand pump for filling the reservoir and funnel tube.
- Visual fill level display in door front.

3. Drive

At basic version C30/1: One solenoid valve for the spray nozzle and the additional air together.

At full version C30/1 V7: Two solenoid valves for the two spray nozzles, one for the additional air. Each solenoid valve is 3/2 way (120 NI/min) with auxiliary actuation (for occasional manual switching on/off). Coil with plug in 24V DC, 24V AC, 110V AC or 230V AC and cable bushing.

4. Feed tube (PUN Ø12) Standard length 3,000, non-standard lengths up to 15,000 available on request.

Order codes:

0. Base	C30	MQL for internal lubrication
1. Base addition	/1	basic version with 1 spray nozzle (cross section of 1.0 to 10 mm ²)
	/1 V7	full version with 2 spray nozzles (cross section of 1.0 to 120 mm ²)
2. Reservoir	A1HPNC	1.5 litre aluminium with hand pump and float switch min NC
	A1HPNO	1.5 litre aluminium with hand pump and float switch min NO
3. Drive	e...V..	electric (24VDC, 24VAC, 110VAC oder 230VAC)
4. Feed tube	ZP3000	feed tube PUN Ø12, L=3,000 (standard length)
	ZP.....	feed tube, L=.....(non-standard length, min. 500, in increments of 500)

Sample order code:

C30/1 V7 - A1HPNC - e24VDC - ZP3000



- Brief description:** Piston pump system with special nozzle design for fine oil-air mixtures.
- Main application range:** Internal MQL for single channel rotary union, lower and middle rpm
- Operating principle:** The piston pumps transport the liquid from the supply reservoir to the hybrid nozzle which sprays the air-oil mixture through the rotary transmission leadthrough. If requested, the hybrid nozzle can extend into the rotary transmission leadthrough and the spindle.
- Adjustability:** Swept volume (manual), clock frequency of the pump (manual), quantity of spray air (manual), quantity of casing air (manual), switch on/off via actuation control device/ drive (electric, pneumatic or manual)



With Toolmat[®] T70 the proven piston pumps provide for an exactly selectable flow rate. The spray grade can be determined via the spray air. The saturation of the mixture can be adjusted via the casing air. In the Vario3 and Vario7 versions, 3 or 7 pre-settable oil quantities can be selected.

The hybrid nozzle is principally delivered flush-mounted to the 3/8" thread connection at the end of the feed tube. So it is possible to mount the Toolmat[®] T70 at any appropriate connection.

If possible, the hybrid nozzle may project out of the 3/8" external thread connection for a certain length so that the body (Ø5mm) of the hybrid nozzle extends through the axial rotary transmission leadthrough into the spindle. This more complex installation pays off by better spraying results thanks to the shorter distance to the cooling channel outlet.



System components:

1. Base / Base addition

- Pneumatically driven, finely meterable **piston pump** ① with double flow volume (2DF) with FPM seals, manually adjustable volume dial ③ (0 - 0.06 ml per stroke). Vario3 and Vario7 variations have piston pumps with simple flow (0 - 0.03 ml per stroke), individually adjustable.
- **Ventilation unit** ② integrated underneath the pump module.
- **Frequency generator** for pump pulses, manually adjustable 0 - 90 stroke min⁻¹.
- Dedicated **air valve** to determine spray air quantity.
- Dedicated **air valve** to determine casing air quantity.
- **Manometer** (0 – 10 bar) in the door front to indicate spray air pressure.
- Coupler plug for compressed air supply on left side of housing.
- **Air filter** / water separator with drainage opening on underside of housing.
- High grade push in/screw fittings / pneumatic tubes.
- Stable, compact **metal housing** (250x250x210 or 300x250x210) with robust metal closer and door seal for dust protection and noise reduction, earthing pin.
- Connection for feed tube on the left side of housing.
- **Component labelling** in accordance with the designations in the pneumatic connection diagram.



Fig.: Pump module T70

2. **Reservoirs** from 2.0 to 27 litres available (details, variations and data: see **Lubrimat[®]**, on page 9).

3. Drive electric, pneumatic or manual option:

- Solenoid valve 3/2 way (1300 NI/min) with auxiliary actuation (for occasional manual switching on/off). Coil with plug in 24V DC, 24V AC, 110V AC or 230V AC. Cable bushing on left side of housing. Vario3 and Vario7 also offer separate actuation control of each pump via a solenoid valve.
- Pneumatic valve 3/2 way (1300 NI/min). With push in connection Ø6 for control air on the left side of housing.
- Hand valve 3/2 way (600 NI/min) as valve rocker on the right outer side of housing.

4. Feed tube

- Feed tube with Ø16 external tube with robust metal sleeve, two internal tubes for lubricant and air supply, constructed of PTFE Ø3. Standard length 3,000, non-standard lengths up to 20,000 available on request.

5. Nozzle

- HY: hybrid nozzle flush with the 3/8" external thread connection at the end of the feed tube.
- HY...: hybrid nozzle projects ...mm out of the 3/8" external thread connection at the end of the feed tube.

6. Option

- 4 x round magnet Ø80 (mounted on the reverse side) for easy installation of the housing.
- 4 x mounting straps (mounted on the reverse side) for fixed installation of the housing.

Technical Data:

Operating pressure	bar	5 - 8
Liquid throughput	ml/h	0 - 300 ¹⁾
Typical consumption	ml/h	20 - 50 ¹⁾
Lubricoolant		Lubrimax® and others
Recommended viscosity	mm ² /s (at 40°C)	1 - 50
Dimensions (HxWxD)		
Housing (without reservoir)	mm	250 x 250 x 210 (Standard and Vario3) 300 x 250 x 210 (Vario7)

¹⁾ depending on application, medium used, viscosity and temperature

Order codes:

0. Base	T70	MQL for internal lubrication, hybrid nozzle on feed tube
1. Base addition	/1 /1V3 /1V7	(for 1 nozzle, standard) (for 1 nozzle, Vario 3 = 3 pre-adjustable settings for the oil quantity) (for 1 nozzle, Vario 7 = 7 pre-adjustable settings for the oil quantity)
2. Reservoir		(2.0 to 27 litres available, for order code see Lubrimat, page 12)
3. Drive	E...V.. PV3 H3	electric (24V DC, 24V AC, 110V AC oder 230V AC) pneumatic hand actuated
4. Feed tube	ZM3000 ZM.....	feed tube, metal outer Ø16 / inner 2 x PTFE Ø3, L=3,000 (standard) feed tube, L=.... (non-standard length, min. 500, in increments of 500)
5. Nozzle	HY HY...	hybrid nozzle flush (standard) with the 3/8" external thread connection hybrid nozzle projects ...mm out of the 3/8" external thread connection
6. Option	RG MG	housing mounting 4 x round magnet Ø80 housing mounting 4 x mounting straps

Sample order code: T70/1 - P2NC - E24VDC - ZM3000 - HY - RG



- Brief description:** Low pressure system for spraying low viscose substances in medium quantities.
- Main application range:** External MQL in simple metal-cutting operations. As a spray system in application of substances in not to small quantities. Depending on the substance and type of application, a suction is recommended.
- Operating principle:** In the Venturi nozzle ⑤, the spray air produces a partial vacuum, which causes the liquid to be sucked out of the unpressurized reservoir ④ and sprayed.
- Adjustability:** Spray air ③ quantity (manual), quantity of liquid ② (manual), spray air pressure ① (manual), switch on/off actuation (electric, pneumatic or manual)

Technical Data:

		Nozzle VD07	Nozzle VD15
Operating pressure	bar	4 - 7	4 - 7
Liquid throughput	ml/h per nozzle	0 - 1.000 ¹⁾	0 - 6.000 ¹⁾
Typical consumption	ml/h per nozzle	30 - 50 ¹⁾	50 - 100 ¹⁾
Lubricoolant		Lubrimax® and others	Lubrimax® and others
Recommended viscosity	mm ² /s (at 40°C)	1 - 25 ¹⁾	1 - 50 ¹⁾
Max. suction height	mm	1.000 ¹⁾	3.000 ¹⁾
Max. feed tube length	mm	10.000 ¹⁾	20.000 ¹⁾

¹⁾ Partly application-specific, depending on operating pressure, medium used, tube length and suction height

Dimensions (HxWxD) of the standard version, depending on reservoir

S700/1-Y1W	250 x 175 x 150
S700/1-Y6W	250 x 300 x 200
S700/1-Y20	300 x 400 x 300
S700/1-Y40	300 x 600 x 400

System components:

1. Base / Base addition

- For each nozzle a **needle valve** to adjust **air spray** and one to adjust quantity of **liquid**.
- **Pressure reducing valve** for spray air to adjust spray jet (low pressure = coarse spray droplets; high pressure = fine spray droplets).
- Manometer (0 – 10 bar) on pressure reducing valve to indicate spray air pressure.
- **Ascending pipe** for liquid with non-return valve and liquid filter.

2. Reservoirs 1.0 to 40 litres available:

- Reservoir 1.0 litre PE (S700/1 only) with aluminium screw cap, ventilation plug and wall bracket (with 2 round magnets Ø57, on request).
- Reservoir 6.0 / 20 or 40 litre PP, with filler neck, screw plug, detachable sieve, automatic ventilation, hinged cover, visual fill level display on the outside. Can be supplied with float switch min or min+max (potential-free, either NC or NO). Wall bracket for reservoir 6.0 litre on request, with or without 4 round magnets Ø57.

3. Actuation electric, pneumatic or manual option:

- Solenoid valve 3/2 way (up to 4 nozzles 120 NI/min, over 4 nozzles 1300 NL/min) with auxiliary actuation (for occasional manual switching on/off). Coil with plug in 24VDC, 24VAC, 110VAC or 230VAC. In case of separate actuation each nozzle (group) controlled via a dedicated solenoid valve. Pneumatic valve 3/2 way (up to 4 nozzles 550 NI/min, over 1300 NL/min)
- Hand actuated ball valve (2/2 way).

4. Feed tube, coaxial, PUN Ø8 outer with internal PUN Ø3. Standard length: 1,000; non-standard length: see Technical Data. On request with outer metal protection sleeve.

5. Nozzle

- Venturi nozzle VD07 for lower capacity of up to 1l/h. Available in copper tube or multi link tube style, length 300. Nozzle tip full jet as standard or flat-jet. Different mounting options available.

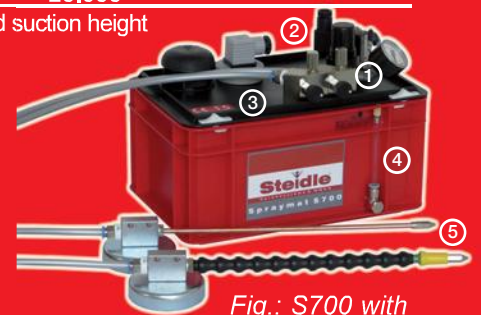


Fig.: S700 with reservoir Y6



Fig. S700 with reservoir Y1W

Spraymat® S700

- Venturi nozzle VD15 for higher capacity of up to 6 l/h. Available in copper tube or multi link tube style, length 300. Nozzle tip full jet. Different mounting options available.



Fig.: Multi link tube and copper tube style

6. Option

- Pneumatic drip shut-off system (per nozzle) in FPM. Required if the nozzle is inserted underneath (otherwise danger of subsequent dripping) or far above (otherwise increased reaction time) of the reservoir level.



Fig.: Detail showing nozzle tip VD15, VD07F and VD07

Order codes:

0. Base	S700	Spray system with Venturi nozzle
1. Base addition	/..... /.....S...	(state number of nozzles, e.g. „/4“) (separate drive. All nozzles separately, e.g.: „/3S“ or in groups, e.g.: „/3S2+1“)
2. Reservoir	Y1W Y1WR Y6 Y6W Y6WR Y6...NC Y6...NO Y6...NCNC Y20 Y20.... Y40 Y40....	1.0-litre PE with wall bracket (S700/1 only) ... with 2 x round magnet Ø57 6.0-litre PP ... with wall bracket ... with wall bracket and 4 x round magnet Ø57 ... with float switch min NC ... with float switch min NO ... with float switch min NC + max NC 20-litre PP ... with float switch variations as Y6 40-litre PP, ... with float switch variations as Y6
3. Actuation	e...V.. E...V.. pv3 (PV3) H2	electric, up to 4 nozzles (24VDC, 24VAC, 110VAC or 230VAC) actuation electric, over 4 nozzles (24VDC, 24VAC, 110VAC or 230VAC) actuation pneumatic actuation, up to 4 nozzles hand actuation
4. Feed tube	ZP1000 ZP..... ZPM.....	feed tube, PUN Ø3 inner / PUN Ø8 outer, L=1,000 non-standard length, L=.... (min. 500, in increments of 500) feed tube as ZP, but with metal protection sleeve, length like ZP
5. Nozzle	VD07GLB VD07GLBR VD07GLF... VD07KK VD07KB VD07KBR VD07KF... VD15GLB VD15GLBR VD15KK VD15KB VD15KBR	Venturi nozzle, full jet, multi link tube, L= 300, with connection block ... with round magnet Ø80 Venturi nozzle VD07GL like above, but flat-jet Venturi nozzle, full jet, copper tube (L= 300) with 2 clamps Venturi nozzle, full jet, copper tube (L= 300) with connection block ... with connection block and round magnet Ø80 Venturi nozzle VD07K like above, but flat-jet Venturi nozzle, full jet, multi link tube, L= 300, with connection block ... with round magnet Ø80 Venturi nozzle, full jet, copper tube (L= 300) with 2 clamps Venturi nozzle, full jet, copper tube (L= 300) with connection block ... with connection block and round magnet Ø80
6. Option	NpF	pneumatic drip shut-off system, FPM

Sample order code: S700/3 - Y6WRNC - e24VDC - ZP1000 - VD07KBR - NpF



- Brief description:** Airless system for intermittent application of low viscose liquids from a distance without the addition of air.
- Main application range:** External MQL in simple, metal-cutting and chipless forming operations.
- Operating principle:** The liquid flows out of the reservoir into the piston chamber. The piston is accelerated by means of a compressed air impulse and shoots the liquid at high pressure through the nozzle.
- Adjustability:** Fluid volume at the PMC precise metering control dial (manual)
Optional: Pressure of piston actuation air (manual)
Switch on/off via drive (electric, pneumatic mechanic or by foot pedal)



Fig. P35/1 - Y03 -
- GLV - SH3

Technical Data:

Operating pressure	bar	3 – 8
Max. dosage quantity	ml/stroke	0.06 ¹⁾
Lubricoolant		Lubrimax® and others
Recommended viscosity	mm ² /s (at 40°C)	1 - 50 ²⁾
Max. distance	mm	750 ¹⁾
Dimensions of the base unit (ØxL) without reservoir		
P35/1-...-V	mm	Ø31 x 135
P35/1-...-GLV	mm	Ø31 x 270

¹⁾ Maximum values refer to water sa fluid

²⁾ Partly application-specific, depending on operating pressure, fluid, dosage quantity and dosage

System components:

1. Base / Base addition

- Compressed air-powered piston in aluminium housing Ø31, liquid seals of FPM construction.
- Free adjustability of the fluid volume (up to max. 0.06 ml/stroke) including an indication scale from 0.00 to 6.40 at the PMC.
- Seating 1/4" for reservoir 0.33-litre PA or push in connector Ø6 for fluid entry.
- Push in connector Ø4 for compressed air entry.
- Fixing bar Ø10 / Ø8.

2. Reservoir 0.33 to 27 litres available:

- Base assembly: Reservoir 0.33 litre PA with screw cap, ventilation plug, drainage sieve.
- Wall installation:
 - Reservoir 1.0-litre PE, with screw cap, ventilation hole, stopcock, feeding pipe L=1,500 and wall bracket (if required, with 2 x round magnet Ø57).
 - Reservoirs 6.0 to 27 litres from the Lubrimat series. See catalogue page 9.



Fig.: detail PMC dial

3. Drive electric, pneumatic, mechanic or pedal-operated option:

- Solenoid valve 3/2 way (120 NI/min) with auxiliary actuation (for occasional manual switching on/off).
- Coil with plug in 24V DC, 24V AC, 110V AC or 230V AC.
- Pneumatic valve 3/2 way (550 NI/min).
- Mechanic valves 3/2 way (700NI/min) as plunger, roller lever or knee roller lever.
- Pneumatic foot pedal switch 3/2 way (800 NI/min). If required, with protection cap.

5. Nozzle

- As standard multi link tube (Ø13, L=170) with full jet nozzle, suitable for comfortable positioning. If required, this version can be converted into the short version.
- Also available as a short version with the full jet nozzle (Ø13, L=32) installed directly on the base unit, in case no space for the multi link tube is given.



Fig.: P35/1 with multi link tube nozzle GLV



Fig.: P35/1 with short version nozzle V

6. Option

- Stand with switchable block magnet (55x50x80) or round magnet Ø80 and with articulated bar (L_{max}=250).
- Pressure reducing valve including manometer for improved regulation of spray distance and profile (only in conjunction with a stand)

Order codes:

0.-1. Base and addition	P35/1	airless system for one nozzle
2. Reservoir	Y03 Y1AW Y1AWR	0.33-litre PA (base assembly) 1.0-litre PE with stopcock, wall bracket (wall installation) 1.0-litre PE with stopcock, wall bracket and 2 x round magnet Ø57 further reservoirs (wall installation) 6.0 to 27 litres: order code see Lubrimat, catalogue page 12.
3. Drive	e...V.. pv3 M3SNC2000 M3RNC2000 M3KNC2000 F3 F3S	electric (24VDC, 24VAC, 110VAC oder 230VAC) pneumatic mechanic plunger valve, NC, with tube 2,000mm mechanic roller lever valve, NC, with tube 2,000mm mechanic knee roller lever valve, NC, with tube 2,000mm foot pedal switch, pneumatic foot pedal switch, pneumatic, with protection cap
5. Nozzle	GLV V	multi link tube with full jet nozzle, standard version full jet nozzle, short version
6. Option	SH3 SH4 ...DM	block magnet stand and articulated bar round magnet stand and articulated bar pressure reducing valve with manometer (only in conjunction with a stand)

Sample order code: P35/1 - Y1AW - e24VDC - GLV - SH3 - DM



Lubrimax[®] Edel C

Lubrimax[®] Edel C is high grade vegetable oil with additives, developed for MQL. It is used mainly in machining processes. The materials that it can be used with range from unalloyed steels to hard, high-alloy high grade steels. Lubrimax[®] Edel C has excellent wetting properties and the high grade EP additives improve the edge life of the tools. Special additives prevent Lubrimax[®] from oxidising and thereby resinifying. Lubrimax[®] Edel C is applied undiluted in small quantities. MQL systems with exact metering for the smallest quantities are suitable for applying Lubrimax[®] Edel C.



Chemical-physical data

Colour	yellow	Density	0.93 g/cm ³ (15 °C)
Setting point	< -15 °C	Initial boiling point	not available
Flash point	200 °C	Ignition temperature	> 200 °C
Viscosity	88 mm ² /s (20 °C) 43 mm ² /s (40 °C)	Water hazard class	WGK1

Lubrimax[®] Alu-Quick

Lubrimax[®] Alu-Quick is a hydrocarbon mixture. Lubrimax[®] Alu-Quick is used mainly in machining of aluminium and forming of thin-walled metals up to 0.5 mm thick. Lubrimax[®] Alu-Quick is odour-neutral and when applied in thin coats, evaporates in the minimum amount of time, leaving the workpiece and chips virtually dry. Lubrimax[®] Alu-Quick is applied undiluted in thin coats. MQL systems with exact metering for the smallest quantities are suitable for applying Lubrimax[®] Alu-Quick.



Chemical-physical data

Colour	colourless	Density	0.76 g/cm ³ (20 °C)
Setting point	not available	Initial boiling point	190 °C
Flash point	76 °C	Ignition temperature	not available
Viscosity	3.0 mm ² /s (20 °C) 1.5 mm ² /s (40 °C)	Water hazard class	WGK1

Lubrimax[®] Alu Fleckfrei

Lubrimax[®] Alu Fleckfrei is a fatty alcohol mixture, specially developed for MQL for use in metal-cutting and chipless aluminium forming operations with additional heat treatment. Lubrimax[®] Alu Fleckfrei does not leave any tiny marks on the workpiece. Lubrimax[®] Alu Fleckfrei has a high lubrication effect, good wetting properties, is low-odour, is not harsh on the skin and is biodegradable. Lubrimax[®] Alu Fleckfrei is applied undiluted in small quantities. MQL systems with exact metering for the smallest quantities are suitable for applying Lubrimax[®] Alu Fleckfrei.



Chemical-physical data

Colour	colourless	Density	0.84 g/cm ³ (15 °C)
Setting point	approx. -68 °C	Initial boiling point	290 °C
Flash point	156 °C	Ignition temperature	ca. 260 °C
Viscosity	45 mm ² /s (20 °C) 20 mm ² /s (40 °C)	Water hazard class	WGK1

Twinmax®

Twinmax® is a water-soluble lubricoolant for MQL based on vegetable oils and emulsifiers in specific proportions. In addition to extremely low consumption, Twinmax® offers excellent results in extra heavy machining of metals and all NE metals, e.g. increased tool service life. Twinmax® also offers a high level of protection against corrosion and wear. The emulsion leaves behind no sticky residues. Twinmax® is used at a concentration of 5 % -10 %. In exceptional cases, it can also be used undiluted. MQL systems with exact metering for the smallest quantities are suitable for applying Twinmax® as well as systems for larger quantities.



Chemical-physical data

Colour	amber	Density	1.9 g/cm ³ (20 °C)
Setting point	+2 °C	Initial boiling point	°C
Flash point	not available	Ignition temperature	not available
Viscosity	180 mm ² /s (20 °C)	Water hazard class	not available
	70 mm ² /s (40 °C)		WGK1

Recommended micro lubrication lubricoolants depending on material type:

plastics / non ferrous metal	unalloyed & low-alloyed steel	high alloyed steel
	Lubrimax Edel C	
Lubrimax Alu-Quick		
Lubrimax Alu Fleckfrei		
	Twinmax (pur)	
	Twinmax (Emulsion)	

Ordering information:

Lubrimax® Edel C	5 l	890 003
	20 l	890 004
	200 l	890 005
Lubrimax® Alu-Quick	5 l	891 503
	20 l	891 504
	200 l	891 505
Lubrimax® Alu Fleckfrei	5 l	890 503
	20 l	890 504
	200 l	890 505
Twinmax®	5 l	896 003
	20 l	896 004
	200 l	896 005

Please note: All our lubricoolants are free of PCB, PCT and other inorganic chlorine compounds, nor do they contain nitrosamines or secondary amines.

Lubrimat® L60
Sawfix® SF

Centermat® C30
Toolmat® T70

Spraymat®
S700

Pulsomat®
P35

Lubrimax®
Lubricoolants

Examples of
application



Milling in hardened tool steel (60 HRC) mould making with a processing time of 3 hours per workpiece. In the case of dry processing, the edge life was not sufficient for one workpiece. 2 MQL nozzles lubricate the milling cutters and double the edge life. Thus, tool replacement during processing operations is no longer necessary.



Milling of a compressor rotor made of alloyed steel with a milling cutter Ø 250 mm. Compared to dry processing, the use of MQL resulted in increased edge life, improved finished surfaces and a reduction in the temperature of the workpiece.



Milling of plastic parts on a machining centre. Because emulsion would attack the plastic, until the introduction of MQL, dry processing had been used. However, this meant that the surface of the finished product was often unsatisfactory. Now the milling process is lubricated using one nozzle. This has improved surface quality, and has even made a gloss effect possible on some types of plastic.



Milling and drilling of aluminium on a machining centre. MQL with internal lubrication using internally cooled spindle and machine tool.



Milling of ring T-nuts in surface plates (Ø up to 3,000 mm) of St52 construction. Because of the size of the parts and the open construction, flood cooling is not possible. Two nozzles lubricate the milling cutters. There was a 100% increase in the edge life compared to dry processing.



Milling of sample gauges of plastic or aluminium on a Zimmermann FZ 40 5-axle portal milling machine. In this process, the oil-air mixture is conducted through a lateral cooling channel of the spindle and sprayed on by a multi-link tube nozzle using an MQL system for the internal feed. In addition, chips are removed from the workplace with the spray air function, if necessary.



Milling of individual pieces of diverse material types on a DMG 50T in the mechanical workshop of an institute. Compared to the previous dry processing, the lifetime of the tools could be decisively improved.



Milling of prototypes and samples of hardened steel. So far, lubrication has been carried out in this case with a hand spray bottle, with which always too much medium has been used contaminating the tool, chips and the surroundings. With MQL not only the area surrounding the machine has become clean and the chips have become dry but also the processed surface has been improved decisively.

Please note: The applications presented here are all genuine practical examples. They are intended to give some insight into how Steidle systems might be used. The list given here is intended to serve as an example only and is not a complete list. Other types of procedures and materials not listed here may also be suitable for use with our products.

Examples of application

Milling of 3m long, forged steel ingots made of X4CrNiMo16-5-1. The scale layer is removed and the block is brought to size. With MQL it was possible to increase the edge life of the tool compared to dry processing. Furthermore processing time is reduced by 2 ½ hours per ingot as advance and feeding could be improved.

Milling of toothed wheels made of bronze or steel casting on conventional milling machines. A very high quality of the finished surfaces is required which could not be implemented without lubrication. Thanks to MQL the quality of the finished surfaces was improved by 30% and the machine environment remains clean.

Turning of components for pump systems of high grade steel construction up to Ø 1,200 mm. 2 nozzles lubricate the tool. The heavy pollution of the area around the open machinery, associated with conventional flood cooling, was also largely eradicated. Furthermore, in relation to intricate materials, there was also an improvement in the edge life and surface finish.

Turning of grooved rolls Ø 1,500 mm made of forged steel. The diamond edges of the lathe tools were lubricated using one nozzle to prevent them becoming too hot and consequently coming loose.

Turning in a tool and jig making shop. In this department, an employee became ill and suffered from skin rashes due to contact with the lubricoolants. For this reason an alternative for the flood cooling was investigated. After changeover to MQL, the employee is now free of complaints.

Turning of aluminium screw connections with subsequent thread rolling. The process was lubricated with emulsions, which however damaged the loading robot. Trials of dry processing failed due to the built-up edge formation. Production could be changed with MQL.

Turning on a Gildemeister Graziano CTX 310 of an educational establishment for training and test purposes. Since the machine is not regularly used, it has never been filled with lubricoolants. Problems with bad tool lifetimes were faced, which can be removed with MQL.

Turning of internal threads in pressure measuring elements made of 1.4305. Compared with the former lubrication, the oil consumption has been cut down significantly by using MQL, without having any problems with increased temperatures of the work piece or the tools.



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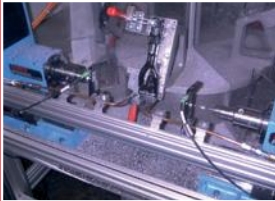
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Tapping M4 x 9 in zinc die casting with prior drilling of the cored blind hole. A single droplet of lubricant is fired onto the tool with a very high degree of accuracy, prior to its use. 20 litres of MQL lubricant is sufficient for an annual output of 1.2 million threads.



Tapping in zinc die casting for the automobile industry. Compared with the presently used basic MQL equipment, it was possible to dose a significantly more exact quantity and avoid nebulosity with a product made by Steidle.



Tapping M8 in die cast and stainless steel for the manufacture of door locking systems. Up to present, oil has been applied with a brush. Since this procedure required too much efforts and costs and was not uniform, alternatives were looked for. Thanks to the fogfree MQL, the lubrication is now processsafe, saves time and an unnecessary displacement of oil is excluded.



Thread moulding of two internal threads with a TIN-coated M10 thread former in sanitary installation products made of galvanized sheet steel. It was necessary to avoid the flood cooling so that first the dry processing was tested, through which the lifetime of the tool only amounted to approx. 200 threads. With the Steidle MQL, good lifetimes of 7,000 threads have been achieved.



Thread moulding in zinc die cast parts with a Maxion drill in the company of a subcontractor. Up to present, lubrication by brush has been used, which resulted in an oiling of insufficient quantity or too much quantity. Through the refitting of an MQL airless system the productivity could be increased by 10 % and the lifetime of the tool by approx. 30%.



Thread moulding M5 x 5 of aluminium sections for plant engineering. First of all the tap holes are punched out. The thread former is briefly sprayed by a nozzle prior to use. There was a drastic reduction in the quantity of lubricant required compared to the drip feed lubricators previously used.



Thread moulding of M8 and M6 threads in assembly plates made of V2A. The specified edge life of the tool could be exceeded by 33% with the system directly planned with MQL.



Thread moulding M36 in rotor rings for wind power stations. Rings with a diameter of up to 6m are made of high-grade forged steel. As a high dimensional accuracy is demanded, the workpiece must not heat up too much. More oil as common for MQL is used here deliberately to reach the necessary cooling effect.

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Examples of application

Deep hole drilling of aluminium pump cases at a drilling depth of 260 mm. Switching to MQL internal lubrication trebled the edge life in comparison to internal cooling using emulsion.

Deep hole drilling of hydraulic shafts using single-lip drills. When MQL is used, the lifespan of the drills exceeds the manufacturer's specifications by approx. 50%. The MQL spray air also has the useful function of blowing any chips out of the drill hole.

Deep hole drilling of Ø13mm with a drilling depth of 400mm. Chips can be easier removed out of the hole thanks to a good chip break and the lower own weight with MQL. As a result, the workpieces with a diameter of only 70mm remain cool.



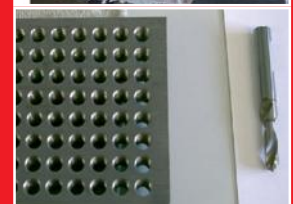
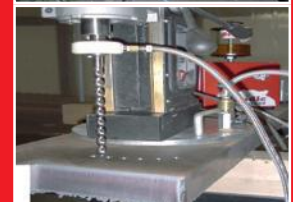
Drilling of rectangular steel tubes. Flood cooling was used previously. Switching to MQL resulted in a reduction in pollution and improved workplace safety. In addition, the lifespan of the drills trebled.

Drilling Ø 11.5 of a hole notch for a plasma cutting machine in X2CrNiMo22, 80 mm thick. Dry boring was the method used previously. Using a drill with internal MQL cooling resulted in a 20 fold increase in the edge life and a reduction in the processing time from 20 to 6 minutes, as tool replacement was no longer necessary.

Drilling and thread cutting on a machine centre to the specifications of a particular customer. The work was to be carried out using MQL with internal lubrication. In the comparative test, 4,000 holes were drilled using flood cooling; using MQL, the required edge life of 8,000 drill holes was achieved.

Drilling Ø 4 mm of aluminium rollers (Ø 250 mm) on a machine centre. The holes must be dry as taper pins are to be subsequently affixed into them. When using flood cooling, the emulsion therefore had to be specially centrifuged out using a lathe. However, with MQL, the drill is lubricated using a nozzle. The drill holes stay dry and centrifuging is no longer necessary.

Drilling with the internal lubrication on a complete processing system provided with three spindles for structural design parts, such as for e.g. double Tcarriers up to 9 m length of St37. Due to the missing closed housing a flood cooling is not possible. Drill holes of up to Ø 40mm are provided. The integrated saw unit has also been equipped with MQL.



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Band sawing of aluminium tubing. Two nozzleblocks provide lubrication both before and after the tubing has been cut. When flood cooling was used, the emulsion ran into the tubes and had to be removed, and this also impaired the safety of working conditions.



Band sawing of steel pipes for drilling systems for the construction of deep wells and streets on a forte. Through the length of the pipes, it always led to a considerable discharge of emulsion in the surroundings of the machine. Thanks to the use of the MQL system, the surroundings of the machine were "made dry".



Band sawing of diverse solid materials up to a diameter of 600 mm with MQL on an Amada H-600 with band height of 55. The customer appreciated the surroundings of the machine, which is now clean. Furthermore, the waste disposal costs of the emulsions are saved. Also the emulsion cannot freeze in winter any more.



Band sawing for a large steel business on Kasto twinA4 saw equipment. In case of saws of solid material \varnothing 100 mm in pairs, lifetime problems occurred with the old spraying device, which did not produce the required volume. With a Steidle system, the rods are now sawed without any failure and at normal lifetime.



Cold circular saws for the series manufacture of sanitary tapware. The salient brass casting is separated by the sawing equipment. A flood cooling was out of question, because it was not desirable to have any residues when remelting the gates. Dry processing and MQL were compared in a test series. Due to the longer lifetimes, an amortisation period for the MQL system of 13 days resulted.



Cold circular saws of steel rolls \varnothing 400 mm. Because the saw was rarely used, the costs of maintaining and removing the emulsion bore far outweighed the saw's productivity. Switching to MQL means that emulsion is no longer required.



Cold circular saws of aluminium profiles at a job order production company on a Kaltenbach SKL450NA. The old spraying device did not provide satisfying performance. With a new MQL device and medium of Steidle, very good results were achieved immediately. The consumption could be reduced from 4 to 1.5 litre per day. The lifetime could be increased by even up to 1,000%, avoiding built-up edges.



Hack sawing in a tool shop. The Kasto HBS1 was operated with a flood cooling system. However, as this unit is not used frequently, the emulsion always spoiled completely during the warm time of the year. With the MQL system, which has been installed in the meantime, this problem does not arise any more.

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Examples of application

Engraving coated aluminium sheets. Because one nozzle lubricates the process, the workpiece remains so clean that it can be painted directly without the need for the components to be cleaned. Prior to the use of MQL, flood cooling was used and all the workpieces had to be washed.

Engraving of text elements in plastic plates with HSS cutter. As a consequence of the high speed (up to 60,000 min⁻¹), the plastic glues at the tool which results in a low edge life. Gluing is successfully prevented with a MQL system.

Countersinking (90°) of door furniture constructed of St37 (cold rolled) with coated HSS (high-performance speed cutting steel) countersinks. The lifespan of the machinery rose to 40,000 countersinks compared to 10,000 for dry processing.

Countersinking of sheet steel 8 mm thick using Ø 20 mm carbide countersinks, hardened subsequently. Emulsion residues in the hardening furnace resulted in poor flue gas values and sooting of the furnace. With MLS, the countersink is lubricated using one nozzle, resulting in an edge life of 10,000 drill holes.

Reaming of slots for ball-heads made of aluminium die casting with PKD reamers of diameters between Ø 22 R 6 and Ø 40 R 6. In former times, this machine was operated with a flood cooling. With MQL a perfect surface and high lifetimes of the reamers are obtained.

Grinding and polishing of knife blades with a double belt grinding machine, which is normally operated in dry condition. In order to prevent the tarnishing of the blades, grinding oil was sprayed in lowest quantities onto the band preventing the glazing of the grinding belts. With MQL, the surfaces have an even grinding pattern and the belts have a higher lifetime.

Grinding of HSS drills with CBN grinding wheels, sprayed by 3 nozzles. Compared to flood cooling, the method used previously, the finished surface is now greatly improved and the work environment remains cleaner.

Grinding of motor saw chains through a grinding service. Up to present, the grinding has been done in completely dry condition, which sometimes led to a wearing-out of the cutting edged through increased temperature, as a result of which the chain had to be ground again. With MQL, the smallest quantities of lubricating material are sufficient to achieve a very good micro-section with an essentially clean cutting edge and to avoid the wearing-out.



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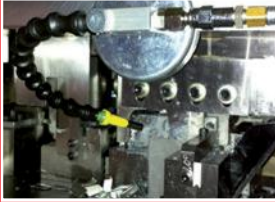
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Punching of connecting rods. The top side and underside are sprayed. Compared with manual lubrication, the method used previously, the application of the lubricant is now much more even and the tool life greater.



Punching of rivets, buttons and eyes for the garment industry, made of various types of metals (high grade steel, steel, brass). Each band conveyor is sprayed on both sides by two nozzles.



Punching of back-up strips made of a compound of zinc steel and a white steel band. When punching the ends small pieces of waste are produced that may be pulled into the tool. A fine adhesion-preventing coating is applied with an MQL system.



Bending of copper closed circular pipelines. The rolls are sprayed during the bending process. Consequently, the copper no longer sticks to the roll coils and the finished products do not have to be reworked.



Forming of blanks (Ø 15 mm, height 40 mm) of lead construction for automobile industry components in one operating cycle. One droplet of forming oil is fired onto each blank prior to the operating cycle.



Remodelling of pipes made of St37 and V4A for the manufacturing of lightning conductors. Up to present, the very viscous forming-oil was applied manually with a brush. The complete process has now been automated, so that only an MQL system sprays on the end of the pipe.



Remodelling of sealing cap made of stainless steel, which has been moistened with a kind of drop-feed lubricator up to present. However, the quantity was so high that the manufactured parts had to be collected in draining reservoirs and cleaned. With the present MQL system, the consumption was reduced from 10 to 3 litres oil per layer. In addition, the lifetime of the cleaning bath has increased, since the oil injection is lower.



Beading of high grade steel elements in washing machine drum production. Four nozzles lubricate the forming rollers and protect them against overheating and wearing out.

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Examples of application

Calibration of cylindrical gears made of forged steel for automatic transmission cars. The trapezoidal section is calibrated on a hydraulic press using a mould made of hardened tool steel. Prior to the switch to MQL, the calibration oil was applied manually, whereas now the workpiece is sprayed by 6 nozzles. This has meant a considerable reduction in oil consumption and processing time.

Calibration in a production department of motor operated valves. In this process, a calibration ball of \varnothing 5 mm must be pressed through a transit drill hole of \varnothing 4.95 mm. The process should actually take place in dry state, but the internal wall of the drill hole was too raw after pushing the ball through. Now a spraying system moistens the drill hole and the ball.

Broaching of coupling supports for lifts made of aluminium alloy. The uncoated round broach needle is sprayed by 4 nozzles. Compared to flood cooling, the tool life has increased by approx. 20% and pollution of the work environment is a thing of the past.

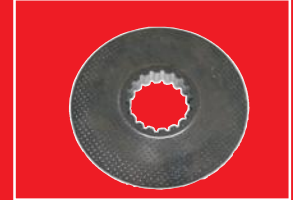
Broaching for the manufacture of steel truck axles. A large amount of oil was shot on the needle with an oil dispenser beforehand resulting in a consumption of oil of approx. 3 litres per day and in a contamination of the surroundings of the machine by oil residues. Now only 0.3 litres are consumed per day and the parts, the chips and the area surrounding the machine are clean.

Broaching of locating bushes which are provided approx. 300mm inside a trailer axle. Four nozzles provide for a spraying onto the broach during the insert stroke; other air nozzles remove possible pasting chips from the broach during the extension stroke.

Cooling of compound springs for trucks, made of spring steel. After forming at 900°C, a fixing hole is punched out. 2 nozzles spray an emulsion onto the punch (\varnothing 12 – 16 mm) to keep it cool. This prevents material build-up and so has trebled the tool life.

Application of release agents in moulds for zinc die casting. Prior to the casting process, a carrier with 6 nozzles travels between the moulds and sprays them for 5 seconds. The even application successfully prevents the finished die cast components from sticking to the mould and this has resulted in a greatly improved surface quality.

Application of anti-corrosion agents on channel sections made of flat steel. After forming, the workpieces of 2m length shall be provided with a rust protection for transport. One flat jet nozzle each sprays onto the material from the top and the bottom.



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If you have decided for a system of Steidle, you can choose the components individually and submit your RfQ with the order code or place the order. In the following you will find some instructions for the configuration:

1. Basic addition

The basic addition determines the number of the feed pipes and thus the number of nozzles or nozzle blocks connected. By default, all nozzles of a system work simultaneously. If you wish to have the individual nozzles (groups) work separately, a “separate drive” has to be selected.

Frequently asked questions to this topic:

- *How many nozzles do I need?*
Normally, 1 nozzle per cutting tool to be lubricated is sufficient. At least 2 nozzles are to be recommended for milling in view of the multi-dimensional traversing directions. For smaller saws, one nozzle block with one feed pipe is sufficient; larger saws require several.
- *Can I connect two or more nozzles to one feed pipe?*
No. Since this could never guarantee a uniform distribution, a nozzle could be undersupplied. In view of the already low minimum quantities a failure of the lubrication system could result.
- *Can I increase the number of nozzles later?*
This is not possible for most of the devices without a larger modification. Therefore the number of the nozzles required should be selected right from the beginning.

2. Reservoir

The medium to be sprayed is stored in the reservoir. Different sizes are available. As option, you can select float switch, stirrer and several fixation options depending on the system.

Frequently asked questions to this topic:

- *How large should the reservoir be selected?*
Normally 20-50 ml is sprayed per nozzle and spraying hour with the MQL. If this value is multiplied with the effective spraying time per day, you receive the medium consumption of the system per day. Select the size of the reservoir so that you do not have to refill too many times.
$$\text{Consumption in ml per day} = 20 - 50 \text{ ml} \times \text{number of nozzles} \times \text{spraying time per day}$$
- *When do I need a float switch?*
A float switch is reasonable, if the system with the reservoir is not located in the field of view of the user or if a heavy contamination of the reservoir or the filling level display has to be expected due to the working environment; in addition, if a serious damage would quickly occur due to a failure of the lubrication system.
- *Shall I take the float switch as NC (=opener) or NO (=closer)?*
In most cases, both can be used for the control which monitors the contact signal of the float switch. However, the NC offers the advantage that a possible parting of a cable in the line is monitored at the same time.

3. Drive

Through the drive you switch the system on and off. This drive can be carried out by an electrical or pneumatic control signal or through manual actuation by means of a switch. In this case, the systems work as long as the signal is alive and/or the switch is on the position “open”. (Exception: Pulsomat, which carries out only one stroke per signal.)

Frequently asked questions to this topic:

- *Do I need current to operate the systems?*
No. All Steidle systems work exclusively with compressed air. Current is only necessary to open the compressed air supply, if you have selected an electric drive control.
- *How much compressed air do I need for the system?*
Except for Pulsomat, all Steidle systems use compressed air as spray air. Normally approx. 50 NI/min per nozzle are consumed
- *Can I also use the compressed air of my machine (instead of the compressed air from the network)?*
Yes, but in most cases only as control air. If it is used as working air, the air pressure and the compressed air flow rate must be adapted to the system requirements.

4. Feed tube

Feed tubes are the connection between the basic device (housing or reservoir) and the nozzle. They conduct the medium and the spray air and can be designed coaxially ("hose in hose") or parallel. Depending on the system, the tubes are provided with a metal sleeve.

Frequently asked questions to this topic:

- *Which length do I need?*
Please consider where you wish to install the basic device and the nozzles and how you wish to lay the feed tubes between them. Measure this distance generously. Please note the maximum tube lengths depending on the system (see technical data).
- *Can I shorten or lengthen a tube on my own?*
This is possible only in the system Centermat.
- *Can I install the tubes in a cable drag chain?*
Yes, in this case, please select always the PUN synthetic tube version (presently on demand), since the danger of rubbing against other cables is too large for the tubes with metal sleeve.

5. Nozzles

In most cases, nozzles can be delivered in copper tube design (for rigid arrangement) and multilink tube design (flexible arrangement). For the fixing of the nozzles, connection blocks, round magnet systems or clamp mounting are available. Apart from the full jet nozzles, also flat jet nozzles can be offered for some systems. Saws can be provided with nozzle blocks.

Frequently asked questions to this topic:

- *Which nozzle length do I need?*
By default, nozzles are 300mm long. Other lengths are possible on demand.
Please note that for larger lengths a decrease of the position stability has to be expected.
- *Can I shorten a nozzle myself?*
No. The nozzles have a coaxial design and therefore, cannot be shortened.

6. Option

Depending on the system, fixing for the basic device, additional filling reservoirs or a drip shut off (S700) are available as option.



S p r a y s y s t e m s & M Q L

Is there anything else you would like to know?

Then contact us.

We are happy to advise you directly,
or personally on-site through one of sales partners.

You can benefit from our extensive experience and expertise in all matters relating to minimum quantity lubrication systems by requesting our advice on the best equipment to suit your machinery or how to switch your production process to MQL.

your contact person:

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