Lubrimat® L60

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.

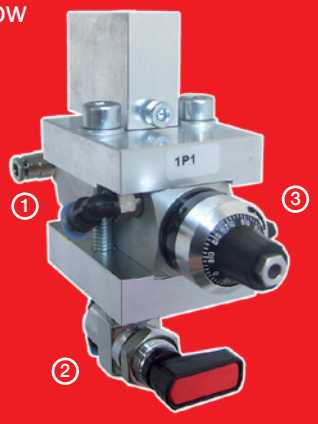


Fig.: Pump module L60

- 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. Combinated 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.

Fig.: Lubrimat with reservoir A6AWGNC

- Wall installation

- Reservoir 6.0-/10-/17-/27-litre aluminium as discribed 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 Nl/min, 4 nozzles and over 1300 Nl/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 Nl/min, 4 nozzles and over 1300 Nl/min). With push in connection Ø6 for control air on left outer side of housing.
- Hand valve 3/2 way (600 Nl/min) as valve rocker on right outer side of housing.
- Mechanical valves 3/2 way (700Nl/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.

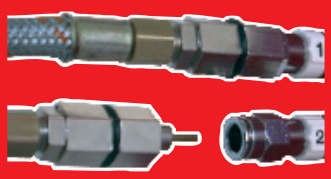
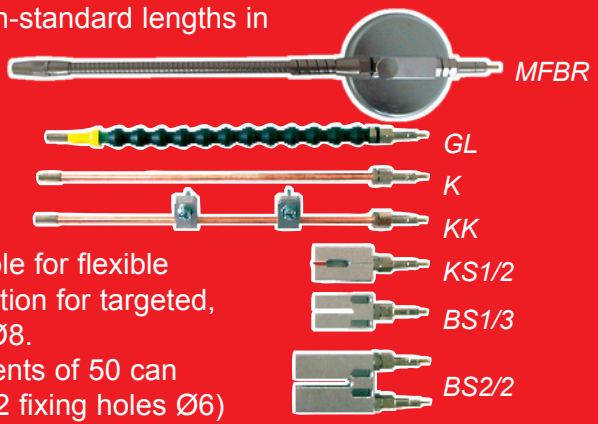


Fig.: EASY-COAX®

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°).

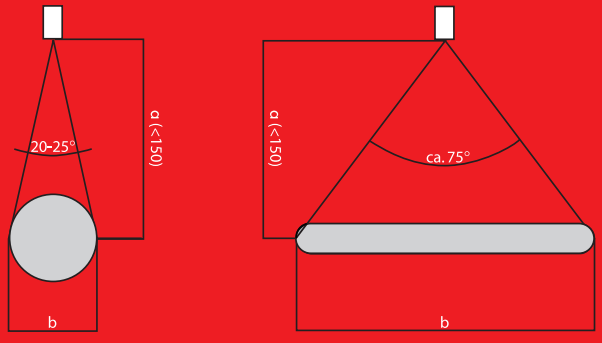


- Nozzle **multi link tube** Ø17 with EASY-COAX® system. Can be bent several times, particularly suitable for flexible positioning. Nozzle head with flow optimized construction for targeted, fogless spraying and nickel-plated protective sleeve Ø8. Standard length 300, non-standard lengths in increments 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

0. Base
1. Base addition
2. Reservoir
3. Drive
4. Feed tube
5. Nozzle
6. Option

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.

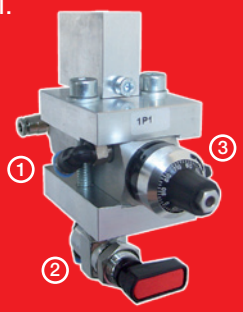


Fig.: pump module SF

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 (2,0l)

3. Drive options:

- Solenoid valve 3/2 way (120 Nl/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 Nl/min). With push in connection Ø6 for control air on left outer side of housing.
- Hand valve 3/2 way (600 Nl/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.

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.

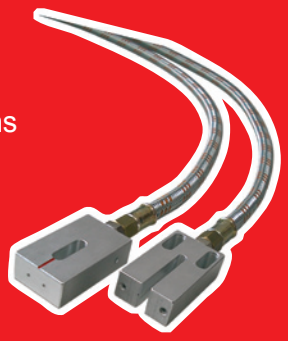


Fig.: Nozzleblocks KS1/2 and BS1/3

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

Sample order code: SF/1 - Y03 - e24VDC - ZM3000 - BS1/3 - RG

0. Base
1. Base addition
2. Reservoir
3. Drive
4. Feed tube
5. Nozzle
6. Option