

MKD-DUAL

Minimal lubrication
for near dry-working systems

User and Maintenance Manual

Warranty

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Manufacturer	DropsA SpA
Product	MKD-Dual
Year	2003
Certification	

1. INTRODUCTION

This manual refers to the ***MKD-Dual for near Dry-working systems***.

You can find additional copies and newer revisions of this document from our website <http://www.dropsa.com>. Alternatively contact one of our *Sale Offices*.

This *User and Maintenance Manual* contains important information on health and safety issues for the personnel.

It is recommended to attentively read this manual and carefully keep it in good condition so that it is always available to personnel requiring to consult it.

2. GENERAL DESCRIPTION

2.1 MINIMAL LUBRICATION –PRINCIPLES OF OPERATION

Generally, lube-cooling substances are used in the milling and turning of metal materials.

Mostly the work site is exposed to the flow of an oil-water mixture.

The ***MKD-Dual minimal lubrication system*** is different from the traditional systems because it can generate a thin film of aerosol mixture which is brought directly inside the machine tool, for example, via the machine spindle toolpost of a work site.

ADVANTAGES:

- ❑ **Cycle time reduction: from 25% up to 80%.**

This is the result you could aim at by choosing Dropsa dry-working system.

Dropsa exclusive *MKD-Dual* unit represents the first step towards the world of dry-working. The operation of removing metal shaving, previously carried out via lube-coolants, is now made by an aerosol mixture. The user will be advantaged in:

- ❑ **important reduction of cycle times;**
- ❑ **cut in lubricant consume**
- ❑ **long life of the machine tool**
- ❑ **better part finishing.**

These are only some of the advantages guaranteed by our technology.

MKD-Dual has been designed mostly for middle-high target – this sophisticated technology of generation of a ultra thin aerosol mixture allows the flow of micro-parcels (< 1µm size) through the spindle and the machine tool, avoiding the wear of the mixture.

2.2 CONNECTION AND FUNCTION

Please refer to drawing on page 4.

A compressed air supply with a pressure of 6 bar (88.2 psi) is necessary.

The compressed air supply must be connected to the air inlet (1) and regulated via manual regulation valve (2).

To generate the aerosol mixture in the container use the aerosol regulation valve (3) and the manometer: the oil rises via flowmeter (10) and a flexible pipe into the air/oil mixture spray; in a second stage, it is transformed into an aerosol with particles smaller than 1µm.

To regulate additional air supporting aerosol flow to the machine tool and the oil quantity of the aerosol, use the air pressure valve (4) and the manometer.

The Dual unit is provided with two outlets which can be supplied with electro-pneumatically controlled ball valves.

When fitted with electro-pneumatic ball valves (option), these can be installed for simultaneous use via the machine operating controls. In this way, it is possible to control ON and OFF functions as well as phasing of the aerosol jet.

WARNING: Additional air pressure must always be 1.5 bar (22.05 psi) lower than the aerosol pressure.

2.3 SAFETY AND SERVICE

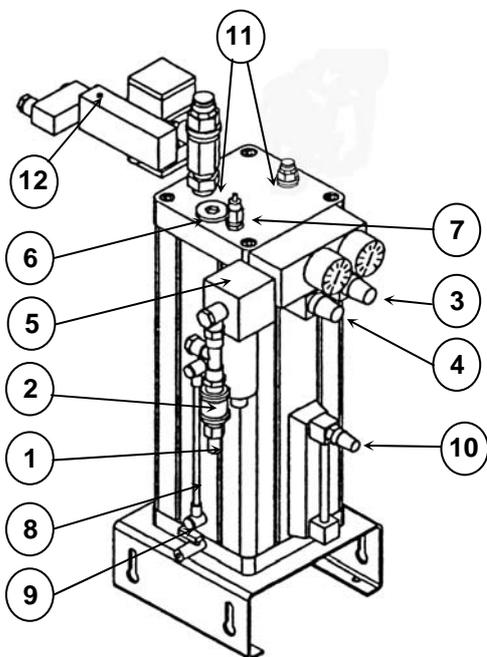
The DUAL dry-working system must be installed and operated in accordance with the instructions and parameters described on the User Manual. The MKD-Dual may only be used in metal cutting or conversion processes and it must not be used for aims different from the ones agreed by the manufacturer. The manufacturer is not liable for any damage caused by improper use or wrong operation of the appliance. In order to comply with the safety regulations the following precautions are applied:

- Disconnect and insulate each supply source before system start-up.
- Discharge system pressure before installing or maintenance.
- Ensure all supply lines and electric connections are insulated from the system and cannot be used during installing and machine start-up.
- All the above precautions must be inserted in the User and Maintenance Manual of the machine on which the unit is installed.
- **For internal lubrication, only perform those cutting processes which are suitable for dry operation.**
- The general rules and safety regulations for machinery and appliances using compressed-air also apply for the *MKD-Dual* and must be observed under all circumstances.
- Before any machine start-up, verify that the compressed-air connection and the regulation valves are in proper condition.
- Human beings or animals must NOT come into contact with the aerosol spray; in particular avoid spraying into the eyes or directly inhaling the aerosol.
- Avoid sparks or open flames come into contact with the aerosol spray.
- For safe operation, the *MKD-Dual* may only be installed and operated in accordance with the manufacturer's instructions.
- Before lubricant refilling, the *MKD-Dual* must be disconnected from its compressed-air supply under all circumstances; the pressure container must be pressure-free (manometer needle points to "ZERO").
- In the case of damage to the appliance or a defect occurring, disconnect the machine from the compressed-air supply IMMEDIATELY either by closing regulation valve (2) or by opening the quick-release coupling of the connecting pipe.
- Repairs, replacement of spare parts and any other interventions to the *MKD-Dual* are ONLY to be carried out AFTER having contacted our after-sales service.
- Before maintenance and/or cleaning of the *MKD-Dual*, ALWAYS disconnect it from the compressed-air supply and decompress the pressure container (manometer needle points to "ZERO").
- Defective *MKD-Dual* units must NOT be put into operation.
- Old and worn out *MKD-Dual* units must be made unfit for further use IMMEDIATELY, and then be disposed of properly.

3. TECHNICAL SPECIFICATIONS

Air supply	MAX 6 bar (88.2 psi)
Air inlet pipe	Ø6÷10 mm (0.23÷0.4 in.)
Aerosol outlet pipe	Ø10÷16 mm (0.4÷0.6 in.)
Electro-pneumatic ball valve power supply	24VDC 200mA

4. MACHINE COMPONENTS



Pos.	Description
1	Compressed-air inlet
2	Manually adjustable regulation valve
3	Aerosol regulation valve
4	Air pressure regulation valve
5	Surplus water outlet
6	Refilling plug
7	Safety valve
8	Refilling level indicator
9	Oil outlet tap
10	Flowmeter
11	Aerosol outlets
12	E-valv. 24V DC cod. 3155187

5. UNPACKING AND INSTALLING THE MACHINE

5.1 UNPACKING

Once a suitable location has been found to install the unit, remove the machine from the package. Check the unit has not been damaged during transportation or storage. No particular disposal procedures are necessary as package materials are no dangerous for health or environment. However, package should be disposed of in accordance with regulations that may be in force in your area or state.

5.2 INSTALLATION

There are TWO ways of installing the *MKD-Dual* unit:

1. The appliance is tightly bolted onto the casing of the machine tool. In this case, make absolutely sure that it is not exposed to extreme oscillations or vibrations.
2. The *MKD-Dual* may also be mounted beside the machine tool. Make sure that the site of installation is suitable. For example, the appliance must not be mounted where vehicles (such as fork lifters etc) are likely to pass, in order to avoid damage to pipelines.

In addition, please observe the following recommendations:

- For faultless operation, the unit **must** under all circumstances **be installed in a perfectly vertical position**
- NEVER allow the *MKD-Dual* to stand on its head; its operating elements must always be at the top
- The *MKD-Dual* unit should be mounted in a place where the oil refill inlet is at all times EASILY ACCESSIBLE for maintenance and lubricant refill.

The operator of the appliance will be responsible for any damage caused by improper installation of the MKD-Dual unit.

5.2.1 SOLENOID VALVE CONNECTION

Connect the solenoid valve to the aerosol outlet (11). To deliver the quantity of lubricant proportionate to machine tools hole nozzles with different-sized holes can be supplied. (For more info, please contact our Engineering Dept.)

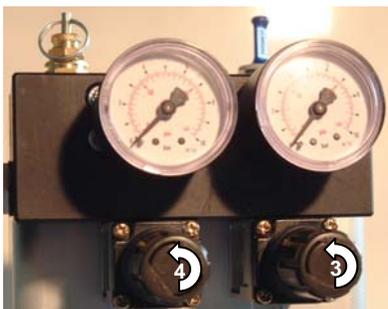
5.2.2 CONNECTING THE COMPRESSED-AIR SUPPLY

WARNING: Proper connection to the compressed air supply must be carried out by QUALIFIED PERSONNEL only.



Connect the *MKD-Dual* air inlet (1) to the compressed-air supply.

For safety reasons, NEVER let the compressed-air system EXCEED a pressure of 6 bar (88.2 psi)!



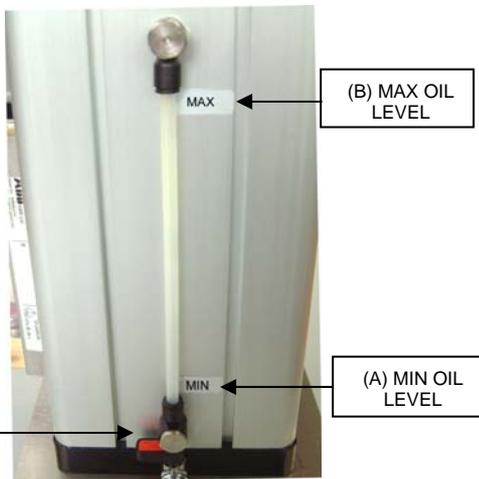
Prior to connecting, make sure that main air valve — the manually adjustable regulation valve (2) — and the regulation valves (3) and (4), are all CLOSED (turned anti-clockwise). Regulate the aerosol regulation valve (3) between 6 and 8 bar (88.2÷117.6 psi) and the air pressure valve (4) between 0 and 2 bar (0÷29.4 psi).

5.3.1 REFILL



5.3.1.1 REFILLING FOR THE FIRST TIME

When refilling for the first time, make sure that the container of the *MKD-Dual* unit is not already under pressure (the needle of the manometer must point to "ZERO"). Open the screw cap to pour the lubrication oil into the lubricant inlet (6). Do NOT exceed the "Maximum" mark on the indicator column (8).



5.3.1.2 REFILL

When the level has dropped to the "Minimum" mark on indicator column (8), refill the *MKD-Dual* with lubricant. If the unit has already been in operation, the container must be depressurized before refilling. Now proceed as described above under 5.3.1.1 "Filling for the first time"

WARNINGS:

- For safety reasons, ALWAYS disconnect the *MKD-Dual* from the compressed-air supply BEFORE refilling.
- When refilling, do not exceed the "maximum" filling mark on indicator column (8)!

IMPORTANT:

Make sure that you use the SAME OIL when refilling. If you want to refill with an oil different from the one previously used, please contact the supplier/ manufacturer first to find out if it is compatible. It is advised first to drain off the old oil from the container by opening the oil outlet tap (9) and letting it drip out (into a bowl or tin); Then refill the *MKD-Dual* with the new lubricant oil up to the "maximum" mark. The unit can now be operated again.

NOTE: We accept no claims resulting from damage caused by using incompatible lubricants without previous correct and thorough cleaning, or caused by using aggressive and/or unsuitable detergents (cleaning agents)

Recommended lubricant: MK - ÖL 50

6. INSTRUCTIONS FOR USE

WARNING: Operate the equipment only with the voltage indicated on the product label and within the specific operating parameters.

MKD-Dual observes the same general regulations of the traditional lube-cooling systems.

6.1 *MKD-Dual* REGULATIONS

- Air quantity via the air pressure regulation valve and manometer (4).
- Aerosol via aerosol mixture regulation valve and manometer (3).
- Oil quantity via flowmeter regulation valve (10).

Auto-Adaptive

The auto-regulation is one of the most special characteristics of *MKD-Dual* you will not find on other machine on the market.

Generally aerosol generators are based on the Venturi principle: a non linear aerosol mixture is generated at low speed air flow. This will determine a low quality of the mixture itself. To solve the problem, *MKD-Dual* is provided with an auto-regulation system which optimises the process through an automatic adjustment of the micro-oil mist depending on the air flow – this means best aerosol quality with any kind of cutting machine tool and a considerable time saving (no complex regulation required).

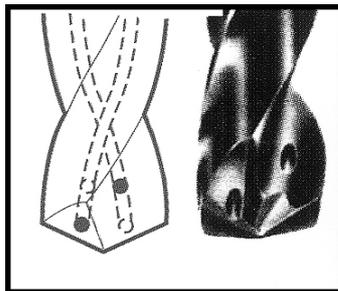
6.2 MACHINE OPERATION – BASIC PRINCIPLES

Please refer to drawing on page 4.

- a. Close regulation valves (3) and (4) by turning anti-clockwise.
- b. Close flowmeter regulation valve(10) by turning clockwise.
- c. Connect the compressed-air pipe to the air inlet (1).
- d. Mount the machine tool.
- e. Open the following valves:
 - Manually adjustable regulation valve (2) for compressed-air
 - Electro-pneumatic ball valve for aerosol inlet(s)
 - Flowmeter regulation valve(10)
- f. Use aerosol pressure regulator (3) to set a pressure of 2 bar (29.4 psi); pressure can be increased up to a maximum of 6.0 bar (88.2 psi), if required.
- g. Use the air pressure regulator (4) and manometer for additional air supply pressure, if required. Air pressure must be 1.5 bar (22.05 psi) lower than the aerosol pressure.

6.3 INTERNAL LUBRICATION

The *MKD-Dual* minimum lubrication system is used mainly for internal lubrication processes, whereby the aerosol is transported to site by spindles and the machine tool is equipped with cooling channels:



In this context, please observe the following instructions:

- The spindle must be suitable for dry-working
- The manufacturer may already have fitted some spindles with safety valves (i.e. back-pressure) which could not respond to the relatively low operating pressures of the *MKD-Dual*. Such valves need to be modified; please contact Dropsa.
- Verify that there are no transversal cuts or cracks on the lubricant delivery piping, which could cause presence of lubricant in cracks and no correct oil quantity to the cut-points.
- LET US HELP YOU in selecting suitable machine tools for internal minimum lubrication.
- On its way to the tooling site, there should be no excessive bends (kinks) or narrowings (changes in diameter) in the transport line for the lubricant; otherwise, the liquid can collect in these areas and thus prevent enough aerosol from reaching the tooling site.

- With machine tool set in work position and motionless spindle, check to see that the aerosol is not de-mixed on its way through the line; the spray should come out in the form of a fine mist.
- The clean piece to be tooled must be held at a maximum distance of 40 mm (1.57 in.) from the spray outlet; a fine film of lubricant should cover it.
- The quantity of aerosol must be suitable to the working process involved. Regulation of lubricant/oil flow is also possible via control valve (10)

Note: The *MKD-Dual* is also capable of effective lubrication through very small (capillary) cooling channels; in such cases, it may be necessary to increase aerosol pressure.

7. MAINTENANCE PROCEDURE

The machine does not require any special tool for check or maintenance tasks. However, it is recommended the use only of appropriate and in good conditions tooling, protective devices (gloves) and clothing (626/94 and DPR 547/55) to avoid injury to persons or damage to machine parts.

WARNING: Prior to any maintenance, be sure that the power, hydraulic and pneumatic supplies are off.

7.1 EXTERNAL CLEANING

To clean the *MKD-Dual* unit:

- Disconnect the compressed-air supply.
- Clean with a damp cloth; do NOT use a metallic brush!
- Do NOT use running water
- Do NOT use aggressive cleaning agents, detergents or chemicals etc.
- After wiping externally the machine, use a soft cloth to dry the *MKD-Dual*.
- Mount the unit back in place. Do NOT connect the *MKD-Dual* to the compressed-air supply UNTIL all other connections have been carried out.

7.2 INTERNAL CLEANING

Under normal operation, no internal cleaning is necessary. In the event of deposits (i.e. oil mud) in the machine or piping it is necessary to change the lubricant, proceeding as follows:

- Disconnect the *MKD-Dual* from the compressed-air supply.
- All outlet lines must be completely depressurised.
- Open the oil outlet tap (9).
- Collect the escaping oil in a suitable bowl or tin, and dispose of it properly (according to waste removal regulations).
- Close the outlet tap (9). Refill the unit with the new lubricant (approx. 2 lt – 0.44 gals - as described under Section 5.3.1).
- The *MKD-Dual* can now be put into operation (*see Ch. 6. Instructions for Use*).

We assume no responsibility for any damage caused by the use of detergents or other cleaning agents!

8. DISPOSAL

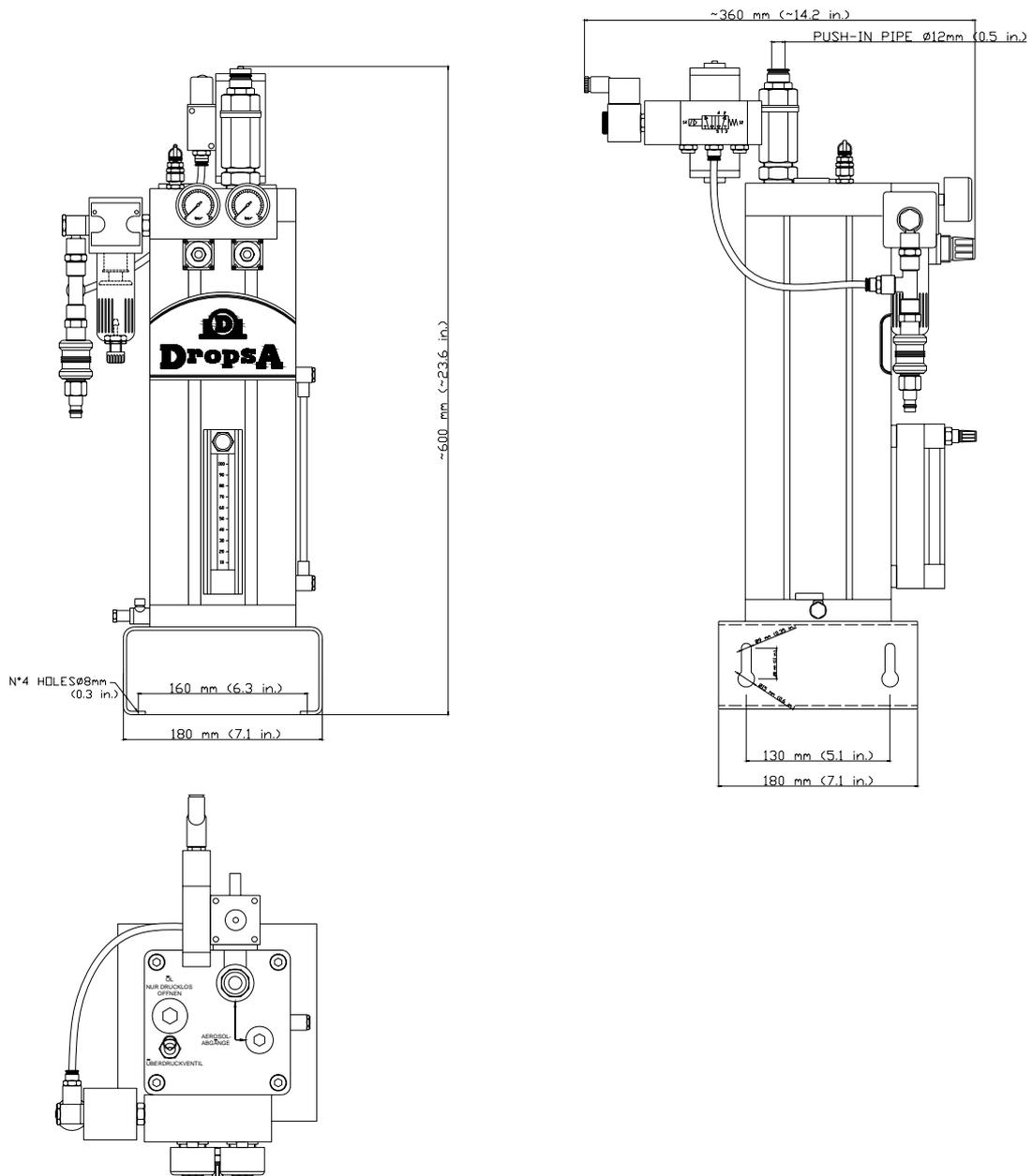
During maintenance or disposal of the machine care should be taken to properly dispose of environmentally sensitive items. Refer to local regulations in force in your area.

When disposing of this unit, it is important to ensure that the identification label and all the other relative documents are also destroyed.

9. ORDERING INFORMATION

PART NUMBER	DESCRIPTION
3135085	AIR/OIL TWO-PHASE LUBRICATOR MKD-DUAL
3135086	AIR/OIL TWO-PHASE LUBRICATOR MKD-DUAL WITH MIN. LEV.

10. DIMENSIONS



11. HANDLING AND TRANSPORTATION

Prior to shipping, the equipment is carefully packed in a cardboard package. On receipt, check that the package is not damaged. Then, storage the machine in a dry location.

12. OPERATING HAZARDS

It is necessary to read and understand the possible hazards and risks involved when using lubrication machines. The operator must know the machine functioning through the user manual.

Power supply

Any type of intervention must not be carried out before the unplugging of the machine from power supply. Make sure that no one can start it up again during the intervention.

All the installed electric and electronic equipment, reservoirs and basic components must be grounded.

Flammability

The lubricant generally used in lubrication systems is not normally flammable. However, it is advised to avoid contact with extremely hot substances or naked flames.

Pressure

Prior to any intervention, check the absence of residual pressure in any branch of the lubricant circuit as it may cause oil sprays when disassembling components or fittings.

Noise

Pump does not produce excessive noise, less than 70 dB(A) .

13. WARRANTY INFORMATION

All products manufactured and marketed by Dropsa are warranted to be free of defects in material or workmanship for a period of at least 12 months from date of delivery. Extended warranty coverage applies as follows:

Complete system installation by Dropsa: 24 Months

All other components: 12 months from date of installation; if installed 6 months or more after ship date, warranty shall be maximum of 18 months from ship date.

If a fault develops, notify us giving a complete description of the alleged malfunction. Include the part number(s), test record number where available (format xxxxxx-xxxxxx), date of delivery and installation and operating conditions of subject product(s). We will subsequently review this information and, at our option, supply you with either servicing data or shipping instruction and returned materials authorization (RMA) which will have instructions on how to prepare the product for return. Upon prepaid receipt of subject product to an authorized Dropsa Sales & Service location, we will then either repair or replace such product(s), at our option, and if determined to be a warranted defect, we will perform such necessary product repairs or replace such product(s) at our expense.

Dropsa reserves the right to charge an administration fee if the product(s) returned are found to be not defective.

This limited warranty does not cover any products, damages or injuries resulting from misuse, neglect, normal expected wear, chemically caused corrosion, improper installation or operation contrary to factory recommendation. Nor does it cover equipment that has been modified, tampered with or altered without authorization.

Consumables and perishable products are excluded from this or any other warranty.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or costs resulting from any such defective product(s).

The use of Dropsa product(s) implies the acceptance of our warranty conditions. Modifications to our standard warranty must be in made in writing and approved by Dropsa.

14. DECLARATION OF COMPLIANCE WITH CE STANDARDS

Manufacturer:

DROPSA SpA

Via B. Croce, 1 - 20090 Vimodrone (MI)

Address

02 - 250.791

Telephone

Certifies that:

The machine: MKD-Dual

- Has been manufactured in conformance with the EUROPEAN COMMUNITY DIRECTIVE relating to machines (98/37/EC), low voltage (BT 73/23/CEE), electromagnetic compatibility (EMC 89/336/CEE).
- Has been manufactured in conformance with the following technical harmonised standards and specification.

EN 12100-1

Technical Director

W. Divisi

Product Manager

Name

DROPSA SpA Vimodrone (Mi) - Italy

Company



December 2003

Signature

Date

15. DROPSA LOCATIONS



Dropsa USA Inc.
50679 Wing Drive
Utica, Michigan 48315, USA
Tel: (+1) 586-566-1540
Fax: (+1) 586-566-1541
E-mail: salesusa@dropsa.com



Dropsa (UK) Ltd
Unit 6, Egham Business Village,
Egham, Surrey, TW20 8RB
Tel: (+44) 01784 - 431177
Fax: (+44) 01784 - 438598
E-mail: salesuk@dropsa.com



Dropsa S.p.A.
Via B. Croce, 1
20090 Vimodrone (MI) Italy.
Tel: (+39) 02 - 250.79.1
Fax: (+39) 02 - 250.79.767
E-mail: sales@dropsa.it (Export)
E-mail: vendite@dropsa.it (National)



Dropsa GmbH
Volmerswerther Strasse 80
40221 Dusseldorf 1, Germany
Tel: (+49) 0211-394-011
Fax: (+49) 0211-394-013
E-mail: sales@dropsa.de



Dropsa France
23, Av. des Morillons
Z.I. des Doucettes
95140 - Garges Les Gonesse
Tel: (+33) 01-39-93-00-33
Fax: (+33) 01-39-86-26-36
E-mail: sales@dropsa.com



Dropsa do Brazil
Rua Sobralia 175/866
Sao Paulo
Tel: (+55) 011-563-100-07
Fax: (+55) 011-563-194-08
E-mail: salesbr@dropsa.com



Polydrop S.A.
Av. Fabregada 26 - Pje Est.2
08907 L'Hospitalet de Llobregat
Barcelona, Spain
Tel: (+34) 93-26-022-50
Fax: (+34) 93-26-022-51
E-mail: sales@dropsa.it



Dropsa Australia Pty.
C20/148 Old Pittwater Road
Brookvale NSW 2100
Tel: (+61) 02-9938-66-44
Fax: (+61) 02-9938-66-11
E-mail: sales@dropsa.com



Web site: <http://www.dropsa.com> - E-mail: sales@dropsa.com