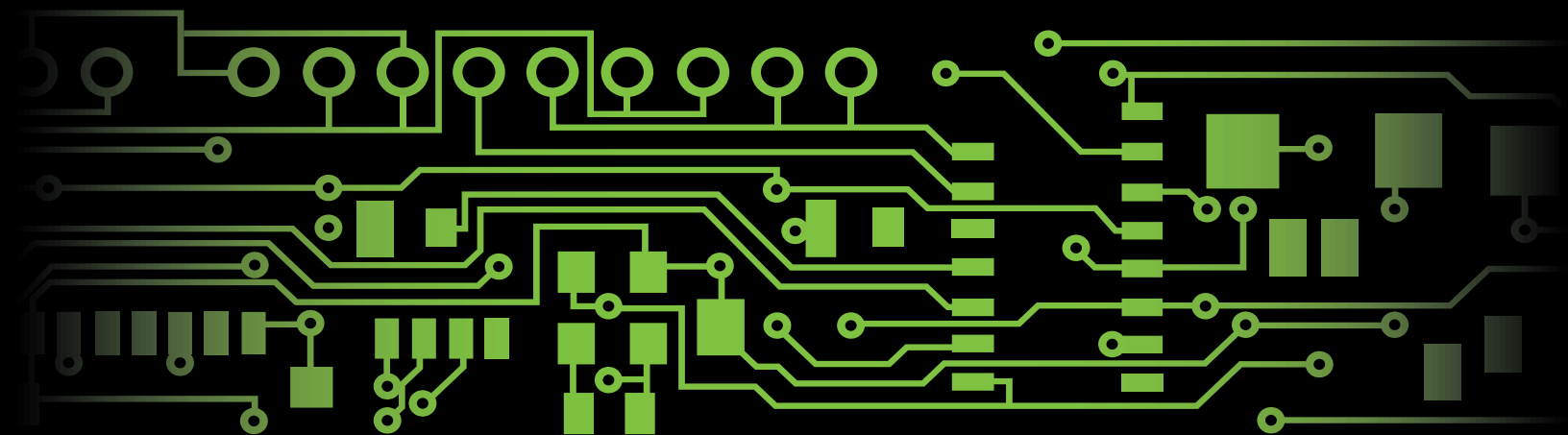




# Revolution<sup>™</sup> *Revolutionary MQL Technology*





U.S. Pat. No. 8,934,998

- Eliminate flood coolant mess
- Increase production rates
- Improve surface finish
- Extend the life of your tools

## Revolutionary MQL Technology

The Revolution™ is the world's first integrated, programmable Minimum Quantity Lubrication (MQL) applicator designed specifically for CNC machines. Its patented technology brings the same level of computer controlled accuracy, precision, and repeatability to your cutting tool lubrication as the CNC controls bring to your machining operations.

The system can be configured with one or two oil/air outputs which can be used for either external spray nozzles or through the spindle lubrication. The output volume of the Revolution™ can be tailored to each tool in a machine directly from the CNC program, allowing for optimization of each machining process.



## What Is MQL?

Minimum Quantity Lubrication (MQL) replaces the flood coolant commonly used in machining operations with a minute amount of high-quality lubricant precisely applied to the interface of the cutting tool and work piece. The lubricant minimizes friction between the material and the tool, greatly reducing the heat that is generated during machining. MQL technology has been used for over 25 years and has proven its effectiveness in a broad range of machining operations.



Machining with flood coolant



Machining with MQL

## Why Use MQL?

Many of the benefits of MQL are a direct result of eliminating flood coolants and the issues they create. Splashing coolant often coats equipment and surrounding areas, negatively affecting machine reliability and creating hazardous, slippery floors. The circulation and disposal of coolant requires additional spending for specialized equipment, labor and disposal costs making coolant an expensive proposition.

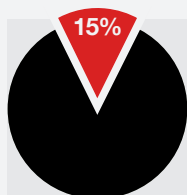
In contrast to using flood coolant, an MQL applicator dispenses environmentally friendly lubricant in such minute amounts that it is often consumed in the machining process. This leaves little or no excess fluid to clean up or dispose of, and the chips produced are dry enough to be recycled without additional processing.

## Revolution™ & Coolube®

Maximize the benefits of MQL by filling your Revolution™ reservoir with Unist Coolube®. Coolube® is a 100% natural biodegradable lubricant derived from renewable vegetable products. This environmentally friendly cutting oil is completely safe for operators and when applied properly, Coolube® is completely consumed in the machining process, eliminating the mess of traditional flood coolant. As an added benefit, when a Revolution™ is used exclusively with Coolube®, Unist guarantees the pumps forever!

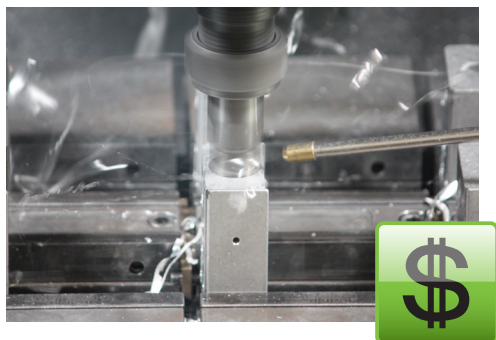


Coolube® 2210 & 2210EP are USDA certified biobased products



## Coolant = Up to 15% of machining costs!

Studies have shown that the cost of dealing with flood coolants, including mixing, treatment, circulation, and disposal can account for up to 15% of total machining costs.



## Revolution™ Saves You Money!

The Revolution™ not only improves the efficiency of your CNC machines, but also your bottom line. Unist systems routinely eliminate the need for flood coolant while also significantly increasing tool life and feed rates. Fluid disposal costs are now a thing of the past, and overall production costs can be reduced by up to 15%. Since the lubricant application is so minimal, your chips will be dry and ready to recycle without any further processing. Now that is revolutionary! Eliminate the ongoing costs of flood coolant and welcome the Revolution™ to your shop today!

## Revolution™ & M-codes

Designed to be programmed from M-codes, the Revolution™ allows the operator to precisely control the amount of fluid being dispensed for each job. Featuring two independently controlled fluid applicators and an air blow-off nozzle for chip removal, the Revolution™ allows you to dispense the lubricant exactly where needed, in the amount needed - down to 0.20 oz [6 mL] per hour. Whether it's being applied through the cutting tool or an external nozzle, the Revolution™ is the ultra-precise lubrication system that will take your CNC machine to new levels of performance.



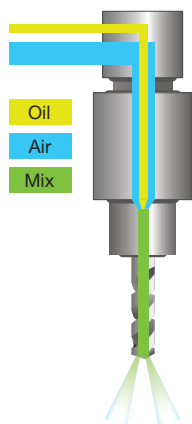
# Machine Integration

## Horizontal Or Vertical CNC Machining Centers

The Revolution™ can be installed on a machining center to dispense MQL lubricant to the cutting tools in the most effective way possible. Depending on the machine, this can be done externally through a spray nozzle, internally through tools with oil holes, or a combination of both.

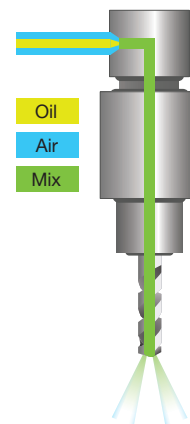
### 2-channel through the spindle

- Separate lubricant and air lines connect to a 2-channel rotary union
- Lubricant and air are mixed together just before the tool holder
- Near-instantaneous changes in fluid output at the cutting tool
- Requires a Unist MQL rotary union
- Requires tools with oil holes



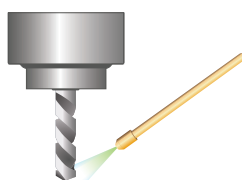
### 2-channel coaxial to the spindle or coolant inducer

- Lubricant line is run in a separate tube inside the air line
- Lubricant and air mix together just before the spindle
- A slight delay before fluid output changes are seen at the cutting tool
- Often works with the rotary union on the machine
- Requires tools with oil holes



### External spray nozzle

- Easiest to install
- Instantaneous changes in fluid output at the nozzle tip
- May need adjustment for varying length tools
- Only option for tools without oil holes

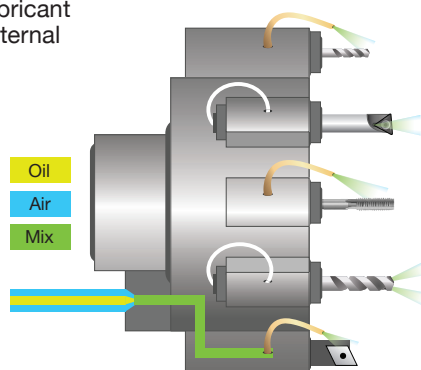


## CNC Turning Centers

The Revolution™ can be installed on most turning centers to provide MQL lubricant to the tools externally through a spray nozzle, through the turret for either external or internal lubrication of any tool, or a combination of both.

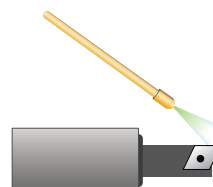
### 2-channel through the turret

- Lubricant line is run in a separate tube inside the air line
- Lubricant and air mix together just before entering the turret
- A slight delay before fluid output changes are seen at the tool
- Copper or stainless steel tubes used to direct fluid toward tool (external lubrication)
- Boring bars and other tools with oil holes connected with nylon or copper tubing (internal lubrication)



### External spray nozzle

- Easiest to install
- Instantaneous changes in fluid output at the nozzle tip
- Can be difficult to position for multiple machining operations





The **Revolution™** includes many features which make it easy and versatile to use. All operational setup and configuration are done through easy to follow menus which are shown on a high-contrast 4-line X 20 character LCD display.

## Specifications:

### MQL application

- Two independent 2-channel (separate air and oil) MQL outputs allow for instantaneous response to changes in output quantity
- User selectable maximum oil output from 10-255 drops/minute [0.33-8.42 mL/min]
- Oil delivered in programmable steps of 25, 50, 75, or 100% of maximum output setting
- Proven Unist positive-displacement oil pumps
- MQL air flow electronically controlled with proportional flow valves
- Optional pulsed air blow-off nozzle for chip removal with electronically adjustable frequency (1-255 pulses/min) and duty cycle (1-100%)

### Programmability

- Three M-code inputs available to control two independent MQL outputs and a pulsed air blow-off nozzle
- Works with pulsed, confirmation, or latched M-code signals from dry contact M-code inputs
- Isolated SPDT alarm relay (2 amp maximum load)

### Alarms

- Audible/Visual alarm and an alarm relay output
- Supports alarms for:
  - Low air pressure via integrated air pressure sensor
  - Low fluid
  - No fluid flow (with optional oil flow sensors)

### General

- 2 qt [1.9 L] polyethylene oil reservoir with integrated low level switch
- 20 character, 4 line LCD display
- Tactile membrane switch user interface
- NEMA type 2 enclosure
- 24 VDC power input (1.5 amps maximum current)
- Password protected lock on control panel to prevent tampering

### Options

- Oil flow sensors
- Auto-refill of reservoir from a pressurized central fluid supply
- Pulsed air blow-off nozzle

### Dimensions

- 14.10" [358 mm] height
- 10.63" [270 mm] width
- 8.46" [214.9 mm] depth





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