Laser for Marking

General Manual

minilase™

keon

Patent Pending
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Technical Specifications

Your MiniLase Keon™ Laser Marking System is available in different laser models, options, and accessories depending on marking application and customer specifications. Please reference your Sales Order for system details.

MiniLase Keon™ Laser Marking System

- Class 1 or Class 4 Laser Mode Operation
- Four-Sided Collapsible Power Door
- Two-Position Shroud for Maximum Operator Access
- Auto/Manual Mode for Part Marking Cycle Start
- Large 13.75”W x 12”L x 6”H Part Loading Area
- Touchscreen Display for Machine Control and Laser Setup
- Power Focal Height Adjustment
- One-plug 115VAC Operation
- Laser programming software included
- Air-Cooling
- Total System Weight - 160 Lbs

--Laser Specifications:

- Laser Source - Solid State Fiber
- Wavelength 1060-1080nm
- Average Power 10, 20, or 30W(+/- 10%) Depending on Model
- Frequency Range 1-200K (10-20W), 1-1000K (30W)
- Red Pointing laser, wavelength 635 nm, Class 2M
- Focusing lense: FL 160mm (Optional FL100, 254S, and 254L)
- Marking field: 100 mm x 100 mm with FL160
**Laser Safety**

The Zetalase™ is a Class 1 laser marking system designed, developed, and manufactured in accordance with EC directives, DIN EN 60825-1, ANSI Z136.1, and Complies with FDA Performance Standards for Laser Products.

Class I laser systems are completely safe for operators to use under normal working conditions. However, it may be possible during machine maintenance or physical modification to be exposed to direct and/or scattered laser radiation. The following section describes laser basics and potential safety hazards they may produce in these unlikely circumstances.

The word laser is an acronym for Light Amplification by Stimulated Emission of Radiation. In this document, the word laser will be limited to electromagnetic radiation-emitting devices using light amplification by stimulated emission of radiation at wavelengths from 180 nanometers to 1 millimeter. The electromagnetic spectrum includes energy ranging from gamma rays to electricity. Figure 1 illustrates the total electromagnetic spectrum and wavelengths of the various regions.

![Figure 1. Electromagnetic Spectrum](image)

The primary wavelengths for lasers include the ultraviolet, visible and infrared regions of the spectrum. Ultraviolet radiation for lasers consists of wavelengths between 180 and 400 nanometers (nm). The visible region consists of radiation with wavelengths between 400 and 700 nm. This is the portion we call visible light. The infrared region of the spectrum consists of radiation with wavelengths between 700 nm and 1 mm.

The color or wavelength of light being emitted depends on the type of lasing material being used. For example, if a Neodymium:Yttrium Aluminum Garnet (Nd:YAG) crystal is used as the lasing material, light with a wavelength of 1064 nm will be emitted. Table 1 illustrates various types of material currently used for lasing and the wavelengths that are emitted by that type of laser. Note that certain materials and gases are capable of emitting more than one wavelength. The wavelength of the light emitted in this case is dependent on the optical configuration of the laser.

![Table 1. Laser Wavelengths](image)

While not strictly adopted by OSHA, the ANSI standard, Z136.1-2000, “Safe Use of Lasers”, is considered an appropriate guideline for ensuring a safe environment where lasers are present. The ANSI standard requires that companies using Class IV lasers have a designated Laser Safety Officer (LSO). The LSO is one who has authority to monitor and enforce the control of laser hazards. Typically the Industrial Hygiene department or the company Safety Specialist oversees the implementation of laser safety.
Laser Safety

OSHA information concerning laser hazards can be assessed through the following link:


Common Laser Hazards

Other than the light that is emitted, lasers generate the same hazards as many other types of equipment. Common hazards are high voltage, compressed gases and intense radio frequency energy. The presence of these hazards depends upon the specific laser technology employed. For example, pulsed CO2 lasers can generate internal voltages in excess of 25,000 volts and often contain large capacitors capable of delivering over 200 Joules of energy. These lasers have interlocked enclosures, which should not be defeated. When opening the enclosures of these lasers, capacitive discharge procedures should be understood and strictly followed.

Pulsed lasers also typically use a flowing gas design, requiring connection to a cylinder of compressed gas. While most laser gases are very safe, pressurized cylinders can be hazardous and must be properly restrained during use and transportation.

Radio frequency energy can cause severe burns. Only trained personnel should service laser equipment employing RF generators (like sealed CO2 lasers). Connections carrying RF energy should never be touched during operation.

Often materials being marked give off fumes and gases. Sometimes these gases are noxious or even toxic. Fumes from laser marking should be controlled with an adequate fume extraction system. When in doubt, a chemical analysis of the fumes is suggested to determine if any fume hazards exist.

Light Hazards

Laser systems are typically designed to prevent a beam from directly contacting a person. Risks, therefore, are more a result of unintentional reflected light. Reflected light falls into two categories, diffuse and specular. Diffuse reflections result when reflective surface irregularities scatter light in all directions. Diffuse reflections are typically much safer as the energy is split into many directions.

Specular reflections are mirror-like reflections and can reflect close to 100% of the incident light. Because such a large percentage of the energy can be redirected, specular reflections are more hazardous. Note that as the diameter of the laser beam increases, the ability to cause damage decreases. Laser intensity is measured in power or energy over a measured area (W/cm²). While focused laser beams produce a very small spot size (and very intense energy) at the mark point, they are typically safer than unfocused beams because the laser beam size spreads out much more rapidly as the distance from the mark point increases.

While specular reflections are more hazardous, they are much less common. Most laser marking systems can be designed to eliminate specular reflective surfaces in the beam path.
Laser Safety

Laser Radiation Effects on the Eye - Visible Light and Infrared-A (400-1400 nm)

The marking laser most commonly used in this category is the Q-switched Nd:YAG laser, which operates at a typical wavelength of 1,064 nm. Eye exposure to this laser beam is more hazardous since at this wavelength the laser beam is transmitted through the eye and focused onto the retina. Exposure may initially go undetected because the beam is invisible and the retina lacks pain sensory nerves. Visual disorientation due to retinal damage may not be apparent to the operator until considerable thermal absorption has occurred. Since the energy is concentrated by the eye’s lens, the strength of the laser beam that is required to damage the eye is significantly less. Figure 2 shows various laser wavelengths and their effect on the eye.
Laser Safety

While specular reflections are more hazardous, they are much less common. Most laser marking systems can be designed to eliminate specular reflective surfaces in the beam path.

Visible Light and Infrared-A (400-1400 nm)

The marking laser most commonly used in this category is the Q-switched Nd:YAG laser, which operates at a typical wavelength of 1,064 nm. Eye exposure to this laser beam is more hazardous since at this wavelength the laser beam is transmitted through the eye and focused onto the retina. Exposure may initially go undetected because the beam is invisible and the retina lacks pain sensory nerves. Visual disorientation due to retinal damage may not be apparent to the operator until considerable thermal absorption has occurred. Since the energy is concentrated by the eye’s lens, the strength of the laser beam that is required to damage the eye is significantly less.

Skin effects are generally considered of secondary importance with lasers used for most marking applications. High power infrared lasers, like those used in cutting and welding applications, pose a larger skin effect hazard. Lasers emitting radiation in the visible and infrared regions produce effects that vary from mild reddening to blisters and charring. These conditions are usually repairable or reversible. However, de-pigmentation, ulceration, scarring of the skin and damage to underlying organs may occur from extremely high powered lasers.

Maximum Permissible Exposure (MPE)

The MPE is defined in ANSI Z-136.1-1993 as “The level of laser radiation to which a person may be exposed without hazardous effect or adverse biological changes in the eye or skin.” The MPE is not a distinct line between safe and hazardous exposures. Instead they are general maximum levels to which various experts agree should be occupationally safe for repeated exposures. The biological effects of laser radiation are dependent on the wavelength and exposure duration. The goal of any control measures is to ensure that any laser radiation contacting a person is below the MPE.

Nominal Hazard Zone (NHZ)

In many marking applications, and most packaging applications, it is not practical to fully enclose the area where the laser beam is delivered onto the product. In these instances, it is necessary to define an area of potentially hazardous laser radiation. This area is called the Nominal Hazard Zone (NHZ). The NHZ is the space within which the level of direct, scattered or reflected laser radiation exceeds the MPE. The purpose of a NHZ is to define an area in which control measures are required. The Laser Safety Officer should determine the NHZ and the control measures to protect the laser worker from exposure to radiation above the MPE.
**Laser Safety**

To quote the OSHA Technical Manual, Section III, Chapter 3: “This (NHZ), is an important factor since, as the scope of laser uses has expanded, controlling lasers by total enclosure in a protective housing or interlocked room is limiting and in many instances an expensive overreaction to the real hazards.”

Carefully designed guarding can eliminate any real light hazards associated with laser radiation during equipment operation. This guarding can often be of very simple design. For example, the infrared emissions from a CO2 laser can be blocked by clear polycarbonate (lexan) sheet. Often a simple tunnel through which the product passes while being marked provides reliable, adequate protection, preventing unsafe exposure from the direct beam or any diffuse reflections.

**Control Measures**

Certain control measures need to be in place wherever there are lasers in use. The extent of the control measures is a function of the type of equipment installed, the nature of any shielding, and any maintenance procedures that may be undertaken. These control measures include:

**Engineering Controls**

Engineering controls include proper shield interlock designs (when required), and safe system operation controls, as in situations where the laser will be integrated into another control system.

**Electrical Hazards**

The use of lasers or laser systems can present an electric shock hazard. This may occur from contact with exposed utility power utilization, device control, and power supply conductors operating at potentials of 50 volts or more. These exposures can occur during laser set-up or installation, maintenance and service, where equipment protective covers are often removed to allow access to active components as required for those activities. The effect can range from a minor tingle to serious personal injury or death. Protection against accidental contact with energized conductors by means of a barrier system is the primary methodology to prevent electrical shock.

Additional electrical safety requirements are imposed upon laser devices, systems and those who work with them by the federal Occupational Safety and Health Administration (OSHA), the National Electric Code and related state and local regulations. Individuals who repair or maintain lasers may require specialized electric safety-related work practices training.
Laser Safety

Personal Protective Equipment - Protective Eyewear

In the case of virtually all laser marking installations, personal protective equipment is limited to the use of proper eyewear. Protective eyewear must be chosen with regard to the wavelength of the laser light and, where appropriate, the wavelength of any light emitted from the material surface during the marking process.

Table 2. Optical Densities for Protective Eyewear for Q-Switched Nd:Yag

<table>
<thead>
<tr>
<th>Laser Type/Power</th>
<th>Wavelength (μm)</th>
<th>OD for 0.25 seconds</th>
<th>OD for 10 seconds</th>
<th>OD for 600 seconds</th>
<th>OD for 30,000 seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nd:YAG (Q-switch)</td>
<td>1.064\textsuperscript{a}</td>
<td>---</td>
<td>4.5</td>
<td>5.0</td>
<td>5.4</td>
</tr>
</tbody>
</table>
Laser Safety

Administrative and Procedural Controls

These controls largely involve access to the laser-controlled area. Any controls put in place during abnormal conditions, such as equipment repair and maintenance; and general safety rules (such as insisting the equipment be operated with shielding removed) are “at risk” situations based on individual company management policies.

Table 3. Control Measures for the Four Laser Classes

<table>
<thead>
<tr>
<th>Control Measures</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Controls</td>
<td>1  2a  2  3a  3b  4</td>
</tr>
<tr>
<td>Protective Housing</td>
<td>X  X  X  X  X  X</td>
</tr>
<tr>
<td>Without Protective Housing</td>
<td>Laser Safety Officer establishes alternative controls</td>
</tr>
<tr>
<td>Key Control</td>
<td>--  --  --  --  ?  X</td>
</tr>
<tr>
<td>Viewing Portals</td>
<td>--  --  MPE  MPE  MPE  MPE</td>
</tr>
<tr>
<td>Collecting Optics</td>
<td>MPE  MPE  MPE  MPE  MPE  MPE</td>
</tr>
<tr>
<td>Totally Open Beam Path</td>
<td>--  --  --  --  X  X</td>
</tr>
<tr>
<td></td>
<td>NHZ  NHZ</td>
</tr>
<tr>
<td>Limited Open Beam Path</td>
<td>--  --  --  --  X  X</td>
</tr>
<tr>
<td></td>
<td>NHZ  NHZ</td>
</tr>
<tr>
<td>Enclosed Beam Path</td>
<td>None required if protective housing in place</td>
</tr>
<tr>
<td>Remote Interlock Connector</td>
<td>--  --  --  --  ?  X</td>
</tr>
<tr>
<td>Beam Stop or Attenuator</td>
<td>--  --  --  --  ?  X</td>
</tr>
<tr>
<td>Activation Warning Systems</td>
<td>--  --  --  --  ?  X</td>
</tr>
<tr>
<td>Emission Delay</td>
<td>--  --  --  --  --  X</td>
</tr>
<tr>
<td></td>
<td>MPE  MPE  MPE  MPE</td>
</tr>
</tbody>
</table>
### Table 3 continued. Control Measures for the Four Laser Classes

<table>
<thead>
<tr>
<th>Control Measures</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Firing and Monitoring</td>
<td>--</td>
</tr>
<tr>
<td>Labels</td>
<td>X X X X X X X</td>
</tr>
<tr>
<td>Area Posting</td>
<td>-- -- ? X X</td>
</tr>
<tr>
<td></td>
<td>NHZ NHZ</td>
</tr>
<tr>
<td>Administrative and Procedural Controls</td>
<td></td>
</tr>
<tr>
<td>Standard Operating Procedure</td>
<td>-- -- ? X</td>
</tr>
<tr>
<td>Output Emission Limitations</td>
<td>-- -- LSO Determines</td>
</tr>
<tr>
<td>Education and Training</td>
<td>-- ? X X</td>
</tr>
<tr>
<td>Spectator Controls</td>
<td>-- ? X</td>
</tr>
<tr>
<td></td>
<td>MPE MPE MPE MPE</td>
</tr>
<tr>
<td>Laser Fiber Optic Systems</td>
<td>MPE MPE MPE MPE X X</td>
</tr>
<tr>
<td>Eye Protection</td>
<td>-- -- -- ?</td>
</tr>
<tr>
<td></td>
<td>MPE MPE</td>
</tr>
<tr>
<td>Protective Windows</td>
<td>-- -- X</td>
</tr>
<tr>
<td></td>
<td>NHZ NHZ</td>
</tr>
<tr>
<td>Protective Barriers and Curtains</td>
<td>-- -- ?</td>
</tr>
<tr>
<td>Skin Protection</td>
<td>-- -- X</td>
</tr>
<tr>
<td></td>
<td>MPE MPE</td>
</tr>
<tr>
<td>LEGEND</td>
<td>X = shall ? = should -- = no requirement NHZ = NHZ analysis required</td>
</tr>
<tr>
<td></td>
<td>? = shall if enclosed Class 3b or 4 MPE = shall if MPE is exceeded</td>
</tr>
</tbody>
</table>
Laser Safety

Warning Signs and Labels

All laser equipment must be labeled indicating hazard classification, output power/energy, and lasing material or wavelength with words and symbols as indicated below:

Class 4 laser equipment: DANGER, Laser Radiation (or laser symbol) - Avoid Eye or Skin Exposure to Direct or Scattered Radiation

Labels and warning signs should be displayed conspicuously in areas where they would best serve to warn individuals of potential safety hazards. Normally, signs are posted at entryways to laser controlled areas and labels are affixed to the laser in a conspicuous location.

Universal Laser Warning Sign
EXPOSURE TO THE LASER BEAM MAY CAUSE PHYSICAL BURNS AND CAN CAUSE SEVERE EYE DAMAGE.

Proper use and care of this system are essential to safe operation.

Danger Sign
Exposure to the laser beam possible when interlocks are defeated

EXPOSURE TO THE LASER BEAM MAY CAUSE PHYSICAL BURNS AND CAN CAUSE SEVERE EYE DAMAGE.

Universal Avoid Exposure Sign

Conclusion

Laser marking systems can be operated safely and in compliance with national and regional safety requirements, often with very simple shielding and controls. The above material has been produced as guide for your company. It is the responsibility of each company to develop a laser safety program that complies with the national standard.
**Introduction**

Thank you for purchasing the TYKMA™ MiniLase™ Keon Laser Marking System. Ideal for single or multiple part marking on all metals, hard plastics, and painted or anodized materials. Mark text, graphics, barcodes, 2D, Data Matrix™, UID codes and much more.

In the past, laser marking systems have required elaborate, time consuming set-up, plus complex assembly and training sessions. But simple, powerful, affordable laser systems from TYKMA™ come fully assembled and can be up and running within an hour.

If, at any time, you experience difficulties or have installation or operation questions, please call TYKMA™ 24/7 - toll free at 877-318-9562 for technical assistance.

**Let's Get Started!**

MiniLase™ Keon is shipped in two fully assembled pieces. If, however, your unit is customized with a rotary, Fumex Air Filtration unit, or other part handling equipment, those items need to be installed separately.

First, unscrew the crate side panels and packing. *(Using a pallet jack or fork lift, raise the pallet carefully and move it to the work area.)* The MiniLase™ Keon is a tabletop or workbench system, so you will need a sturdy 40” wide x 26” deep workbench with the following access area: at least 30” of headroom. The unit weighs approximately 160lbs, so two people will be needed to lift the MiniLase™ Keon from the pallet and set it in place.

*LIFT THE MINILASE™ KEON RACK OUT FIRST AND PLACE IT ON THE WORKBENCH. BE CAREFUL NOT TO EXCESSIVELY BEND THE YELLOW FIBER OPTIC CABLE CONNECTING THE LASER RACK TO THE MINILASE™ KEON WORKSTATION, WARRANTY IS VOID IF CABLE IS BROKEN. THEN, LIFT THE MINILASE™ KEON (USING TWO PEOPLE) WORKSTATION FROM THE BOTTOM BASEPLATE ONLY. DO NOT PUT ANY PRESSURE ON THE TOP PANEL TO AVOID DAMAGING THE FRAME. THE NON-LIFT POINTS ARE CALLED OUT AND LABELED ON YOUR MINILASE™ KEON SYSTEM.*

Once set in place remove the protective sheet wrap from the machine. Please locate the following items included inside of your MiniLase™ Keon and set aside for installation:

- Two (2) 15’ Power Cord
- One (1) USB Communication Cord
- One (1) Laser Control Dongle
- One (1) Hardware Interlock Dongle
- One (1) 6’ DB9 Smart Cable
- One (1) 10’ DB25 Laser Head Cable
- One (1) USB Stick (with Manuals & Software)
**Machine Overview**

Your MiniLase™ Keon comes configured as a Class I or a Class 4 Laser Marking System ready for marking right out of the box. Each system is configured based on application and laser type so please check your order confirmation for exact system configuration. Please reference the below diagram for identification of components and terms used in this manual.

1) Workstation Toolpost  
2) Workstation Touchscreen  
3) Service Ports (on side)  
4) Stop Button  
5) Start Button  
6) Focus (up & down)  
7) Collapsible Shroud  
8) Laser Rack  
9) Laser Rack Touchscreen  
10) Laser Rack Indicator Light  
11) Main Power Workstation (on side)  
12) Main Power Rack (on back)
System Setup

STEP 1: After MiniLase™ Keon is secure on a worktable, check the front sliding shroud on the workstation for smooth operation front to back, making sure there are no obstructions in the travel channels.

Step 1: Shroud being pushed to the rear

The shroud can be pushed back out of the way so that the MiniLase™ Keon can be used in a Class 4 environment to mark bigger parts. If using in a Class 4 capacity, laser safety glasses need to be worn, and proper safety protocols followed.
**System Setup**

STEP 2: Connect the supplied Power Cords to the Input Power port on both the Rack and the Workstation. Plug in the other end of the Power Plug into a Power Strip with Surge Protection. TYKMA highly recommends the use of surge protection for safe operation of your laser marking system.

STEP 3: Connect DB25 Laser Head Cable to the laser rack and Keon hood.

STEP 4: Plug in Hardware Interlock Dongle

STEP 5: Plug in USB communication cable from Rack to PC.

STEP 6: Plug in Laser Control Dongle

STEP 7: Plug in DB9 Smart Cable from Rack to Workstation

STEP 8: Power ON your system by pressing the rocker switch next to the power port on both the Rack and the Workstation.
System Setup Continued

STEP 7: After the MiniLase™ Keon is powered on, the PC will find a new device connected. The drivers needed for the MiniLase™ Keon are installed automatically. IF they do not install on their own, you can find the drivers on the supplied memory stick in the “Drivers” folder.

If drivers are not installed automatically, the drivers are located in the folders shown here.
**Touch Screen Interface**

Reference the figure below for Touch Screen Interface layout and descriptions on next page.

1) Laser On/Off
2) Shutter Active/Inactive
3) Start
4) Info
5) About
6) Screen
7) Administrator Options

8) Up
9) Down
10) Class Mode
11) Settings
12) Home
**Touch Screen Interface**

1) Laser On/Off - Turns the laser engine on and off. Will prompt for password when turning on. Default Password is 89562, this can be changed by administrator.

2) Shutter Active/Inactive - Activates and Deactivates the shutter when the laser engine is running.

3) Start - Start marking. In Class 1 Mode the shroud must be in the down position to mark, in Class 4 Mode the safety shroud is disabled. Safety Glasses must be worn and Safety Procedures adhered to.

4) Info - Laser Engine Information

5) About - Rack Information

6) Screen - Screen Options

7) Admin - Administrator Options, password options

8) Up - Shroud Up

9) Down - Shroud Down

10) Class Mode - Displays whether the system is operating in Class 1 or Class 4 mode.

11) Settings - Brings up the settings menu.

12) Home - Brings back the Home menu.

Password Screen
System Operation

STEP 1

Turning on the Laser - Press the “Laser On/Off” button on the touchscreen. You will then be prompted to enter a password. The default password is 89562, the password can be changed by the Administrator. Please wait 5-10 seconds for the laser to warm up.
**System Operation**

**STEP 2** Open Minilase Pro SE - Locate the “Minilase Pro SE” link on the desktop and double click to open.

**STEP 3** Verify System Status - Confirm the Laser and Computer are connected by opening the software. Should the laser not be connected the software will state “No Laser System Present”. If you have no connection contact TYKMA Service & Support (1-877-318-9562).

**STEP 4** Focus the Laser - Press the up and down arrows on the front of the Workstation to converge the 2 red aiming beams together.

![Step 4: Aiming Beams not Focused](image1)

![Step 4: Aiming Beams in Focus (converged)](image2)
System Operation

**STEP 5 Preview Laser** - After creating your text and/or graphics for laser marking you may then use the “Trace” function to align your mark to your part. Click the button that says “Trace”. You will see a red outline simulation on the base plate of the MiniLase™ Keon Workstation. Move your part or move the mark to align to the desired location. When completed with alignment click “Stop” to close the screen.

***Please refer to the Minilase™ Pro SE Software Manual for instructions on creating graphics and configuring laser settings

**STEP 6 Marking with the Laser** - To mark with the laser, lower the shroud (Class 1 Mode), press “Shutter”, then press “Start” or click the “Mark (F2)” button, this will start the marking for all active objects on your workspace.
**System Operation**

**STEP 6 continued...** Marking with the Laser - After clicking “Mark” a pop up window will appear and the Laser will be marking. “Laser Emission” will be indicated on both Touch Screens, and the Main Menu will be displayed once marking is complete.
**Maintenance Schedule**

Your MiniLase™ Keon system requires little maintenance since it is air cooled and has very few mechanical or moving parts.

Maintenance Schedule:

Below is the recommended maintenance schedule for the MiniLase™ Keon.

Cooling Fan Filter - Rack - Replace every 3 months (shorter intervals may be required in dirty / oily environments). See “Cooling Fan Filter Replacement” procedure.

Laser Lens - The focusing lens on your laser should be cleaned once every 3 months (shorter intervals may be required in dirty / oily environments). See “Laser Lens Cleaning” procedure.

Z-Axis Lubrication - The Motor Driven Z-Axis should be lubricated with Velmex BL-1 oil a minimum of once a year. See “Z-Axis Lubrication” procedure.

Please see the following pages for information on performing routine maintenance.
**Maintenance Procedures**

Cooling Fan Filter Replacement

The cooling fan on the back of the Rack has a removable cover. Push down and out on the fan cover to gain access to the replaceable filter media. See picture below.

---

**Step 1**

**Step 2**
**Maintenance Procedures**

**Laser Lens**

The laser focusing lens on the MiniLase™ Keon should be cleaned once every 3 months (shorter intervals may be required in dirty / oily environments).

Use a mixture of 90% water 10% Acetone to clean the lens using a lint free cloth. Visually inspect the lens for cleanliness and scratches or cracks.
**Maintenance Procedures**

**Z-Axis Lubrication**

The Motor Driven BiSlide Z-Axis should be lubricated with Velmex BL-1 oil a minimum of once a year. To access the Z-Axis you must remove the right service panel of the Zetalase by removing the 4 bolts shown below. Remove the side access panel and set aside. See Velmex lubrication illustration for details on lubricating the Z-Axis below.

**Lubrication**

Motor Driven BiSlide Assemblies should be lubricated with Velmex BL-1 oil if minimum friction, maximum life, and repeatability are a concern. Using any other than BL-1 lubricant may damage bearing pads, nut, or lead screw support bearing. Re-lube when the lead screw and ways appear dry of lubricant. Continuous use applications with heavy loads may necessitate daily lubrication.

To lubricate BiSlide Assembly, traverse carriage near center of travel and apply 3 to 4 drops of oil to the end of carriage at the way surfaces and on the lead screw threads. Apply oil to both end of carriage, refer to the diagram above for lube points.

Occasionally apply 1 to 2 drops of BL-1 to the point where the lead screw enters the lead screw support bearing (end plate end).