

Advanced CO₂ Laser Cutting Lenses

Ultra-Lens

Our best cutting lens for your CO₂ laser machine

**Improve Tool Productivity
Lower Cost of Consumables With
Ultra-Lens Technology**

A must read for Laser Engineers, Business Owners,
Laser Cell Managers, Maintenance Engineers,
Laser Operators and Buyers

Are you ready ?



Laser Optics and Mechanisms

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Ultra-Lens Topics

- Why Ultra Lenses?
- Lower Your Cost of Laser Operation with Ultra Lenses
- Ultra Lens Technology Explained – What's different...
- Ultra Lens vs. Standard Lens – Cut Quality & More
 - Same price but superior performance
- Lens Compatibility With Processing Power
- Feedback On Ultra Lenses From Laser Operators
- Ultra Lens Initial Setup Explained
- Ultra Lenses – Available sizes for laser machines
- Tips For Ultra Lens Care and Performance

Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality

Why Ultra-Lenses?

- Cutting lens technology has seriously lagged laser development over the last 25 years as laser manufacturers gradually increased laser power from 1kW to 6kW to improve system performance and capability.
- Standard OEM lenses used by most laser operators, were developed 25 years ago for 1-2kW laser machines. Unfortunately, these lenses are clearly inadequate for handling the laser power in today's 3-6kW laser machines, limiting their system performance and cost of operation. Many laser operators complain that their laser machines consume too many standard lenses which drives the cost for operating the laser machines. This is great for the OEMs and the optics manufacturers but not for laser business. We have a solution.
- LOM's precision Ultra-lenses now offer state of the art coating technology for handling power levels up to 6kW. Over the last 5 years Ultra lenses have helped many businesses reach higher levels of performance compared.
- Laser users around the world have seen significant improvements with Ultra-lenses
 - Well over 50% longer lens life, improvement in tool productivity and feed rates
 - Better cut quality and superb consistency over the entire plate
 - More forgiving for process setups with capability to cut thicker materials
- *As one laser operator said "the switch to Ultra Lens technology was seamless and I am paying about the same price for a lens that clearly outperforms a standard lens".*

Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality

Lower Your Cost of Laser Operation

- Have you considered the cost of operating your laser tools?
- Cutting lenses play a critical role in laser productivity, performance and other daily issues facing laser operators.
- Ultra-lenses can help you reduce cost:
 - Long life lenses lower lens consumption and cost
 - Higher feed rates & better cut quality can improve tool efficiency, rework & reduce waste
 - Capability for cutting thicker materials
 - Better lens reliability means laser operators can focus on running production and less time attending to lens issues.
 - Real benefits without the upfront high lens costs . Ultra lenses usually cost the same or less than standard lenses.
- The choice is clear. The Ultra-lens technology offers the best solution for reducing operating cost for high power laser cutting.

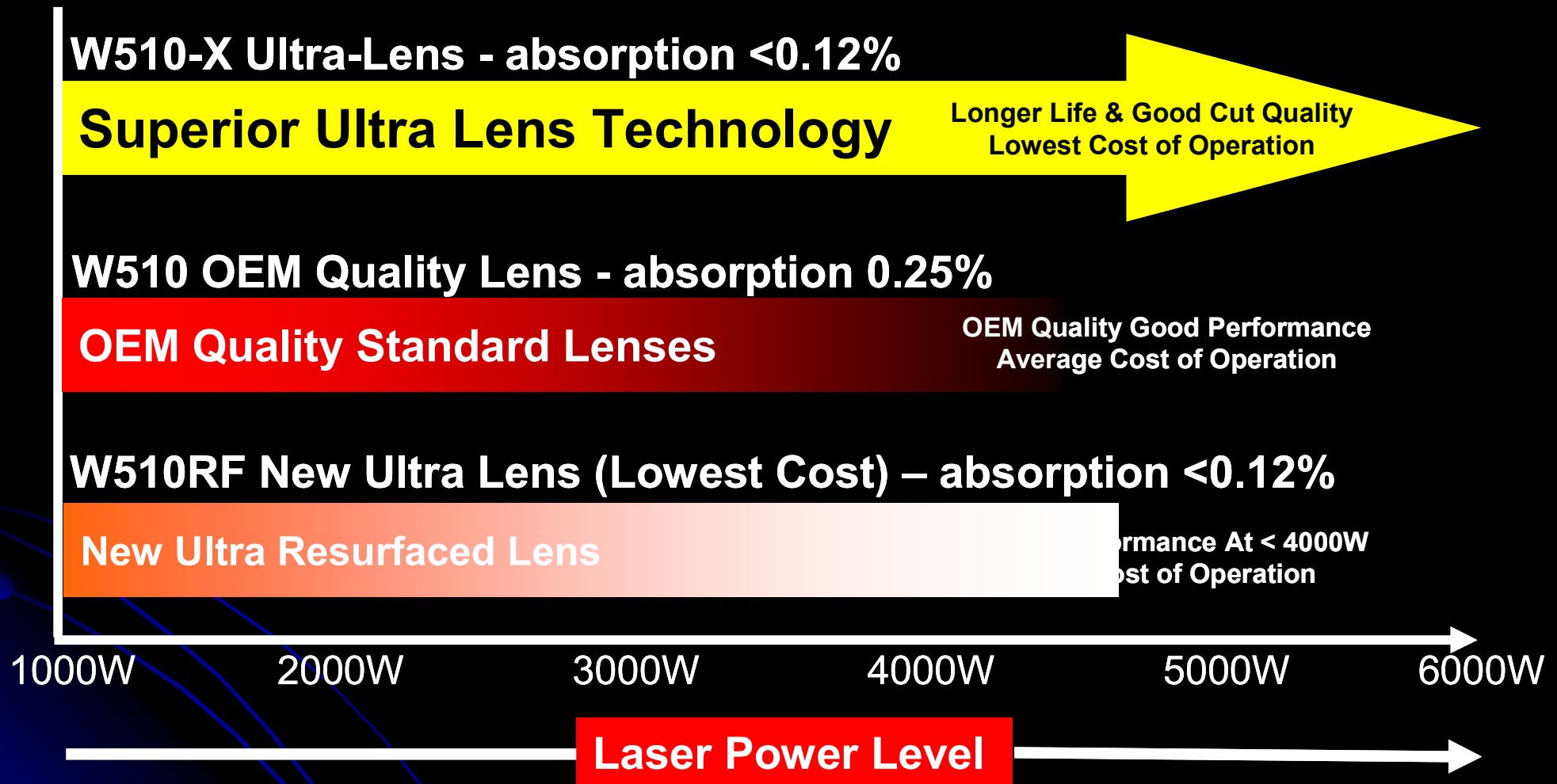
Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality

Ultra Lens Technology Explained

- Laser radiation absorbed by a lens is directly proportional to the stability and quality of the focused beam which affects cut quality and feed rates. Lower lens absorption translates into reduced thermal distortion of the lens, stable focus and improvements in cut quality and, in some cases, feed rates.
- Ultra-lenses offer 50% lower absorption (<0.15%, ~0.10% typical absolute) compared with higher absorption standard lenses (0.25 – 0.30%).
- Ultra-lenses help maintain **uniform focus intensity distribution and improve dynamic focus stability** as the lenses are continuously subjected to piercing (cold lens) and normal cutting (warm lens) operations (see graph on page 7). The resulting stable focus results in realizable cut quality from one plate to the next. Superior focus stability makes Ultra-lenses ideal for 1 to 6kW laser machines for processing a various materials for laser job shops.
- Stable and uniform focus can help promote faster feed rates, improve cut quality, widen process window, reduces backspatter and extends the life of the lens.
- LOM's Ultra lenses are clear, not cloudy or black and look the same as standard lenses. Allow visible alignment laser beam to pass and inspection with cross-polarizers.
- The ultra-lens technology has been thoroughly tested by OEMs and laser operators. All the ultra lenses are vacuum packaged and go through 100% factory testing to ensure that the highest quality lenses are delivered to laser users nationwide with every order. The results speak for themselves.
- We continue to receive positive feedback from both laser operators and service/applications engineers – page 9.

Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality

Lens Compatibility With Processing Power



Feedback received over 3 yrs from laser operators using Ultra-Lenses in 4kW Mitsubishi® systems

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Ultra Lens vs. OEM Lens – Cut Quality

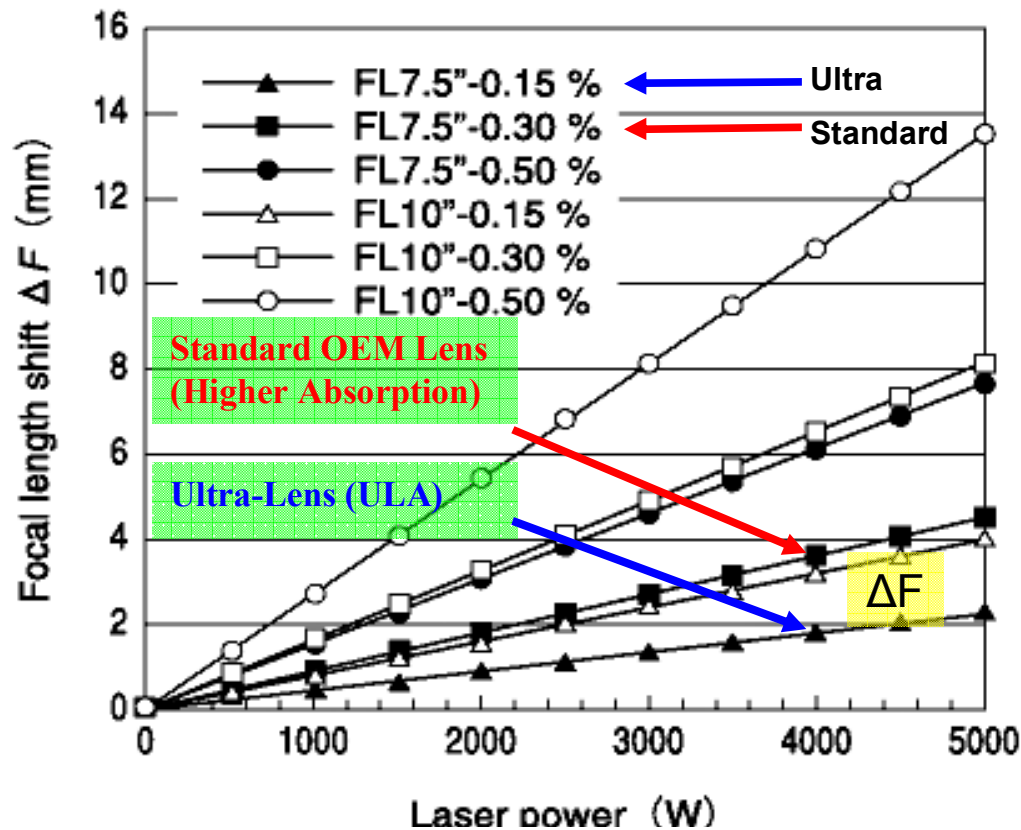


Fig. 1. Focus shift of ZnSe lenses by thermal lens effect

Look! The proof is in the cut quality

High Strength Steel Cuts With 4kW Trumpf® Laser
All other cut parameters the same.



Standard OEM Lens
Rough Edge Quality

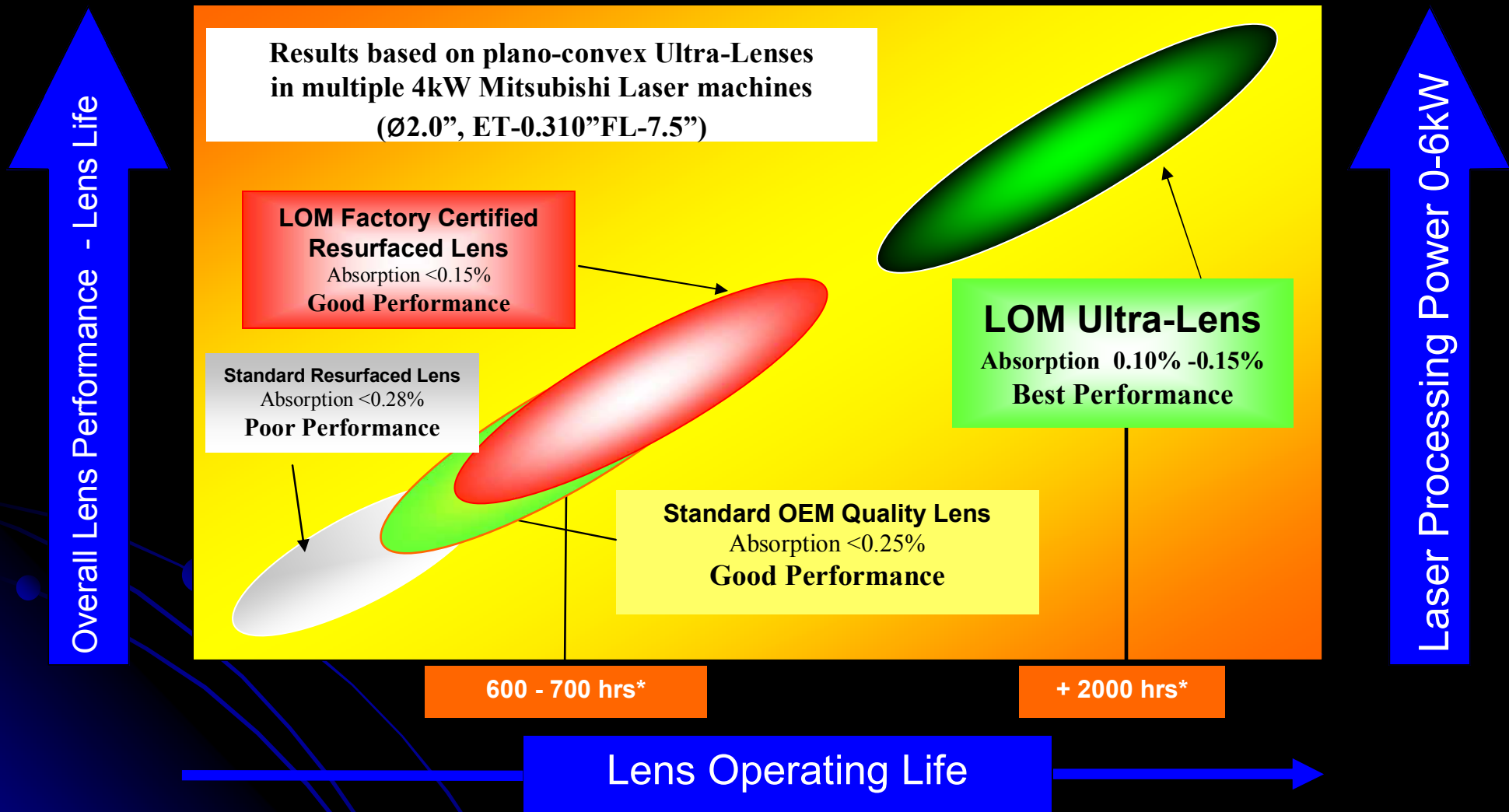
LOM Ultra-Lens
Smoother Edge Quality

Results provided by
Priority Cutting
(Independent Trumpf® Laser Service Co.)

Graph illustrates the differences in focus between ultra-lenses with absorption of 0.15%, standard lenses with absorption of 0.30% and severely degraded lenses with absorption of 0.50%; the focal length shift (ΔF) is directly proportional to the lens absorption and laser power. **Smaller focus shift (ΔF) from Ultra Lenses gives to better cut quality and process control.** * - results top right based on $\phi 2.0''$, ET - 0.310'', 7.5'' FL lenses running at 4kW

Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality

Ultra-Lens Life (Customer Feedback)



Feedback received over 3 yrs from laser operators using Ultra-Lenses in 4kW Mitsubishi® systems

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Feedback - Laser Operators / Engineers

- The ultra lenses go out like the standard lenses at 4kW laser power, handle laser power much better.
- I am at 1900 hrs with the ultra lens compared with about 600-700 hrs with the standard lenses supplied by the OEM. My cut quality has improved for thicker metals. My other two ultra lenses are at 2100 hours – customer operates 5 4kW machines, lights out. Same customer reported +3000 hrs on 6/28/2010 with another ultra lens.
- I am at 2239 hrs with my W510 ultra lens. My operators take real good care of the lens.
- I am able to cut thicker material than with the standard lenses. The focus setup for the ultra lens is more forgiving and I get a consistent cut over the entire plate.
- The ultra lens works with auto focus system unlike the black or cloudy lenses.
- I increased the feed rate by 10% as specified by the tool maker – Ci Inc.
- The ultra lens are more forgiving and offers a bigger process window compared with other lenses – Mits. Service Engineer

Ultra lenses have the potential to help improve laser performance and reduce cost, however, performance results will vary depending on the laser condition, system alignment, cutting gas quality, nozzles alignment and adjustment, gas turn-on and optimization and lens care.

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Ultra Lenses For Common Laser Types

- Adige Sala® (BML Laser)
- Amada ® (New mounts & lens replacement service)
- Bystronic ®, Cincinnati Inc. ®
- Favor Laser®
- Finn-Power ®, Prima ®
- LVD Strippit ®
- Mazak ®
- Mitsubishi ®
- NTC ® HanKwang ®
- Trumpf ® (soon)
- Tanaka ® , Koike ® and other laser machines



Call LOM for pricing. Most lenses in stock for immediate shipment.

LOM is no way affiliated with the OEMs listed in this presentation. Any references to OEM part numbers is for your convenience only.

Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality

Ultra Cutting Lenses For Common Laser

LOM Part Numbers	Type	OEM	OEM Part Number	Diameter	Focal Lens	Edge Thickness
1001	Standard, Plano Convex Lens	Mitsubishi	W510	2.0"	7.5"	0.310"
1001R	Factory Certified Reconditioned, Plano Convex Lens	Mitsubishi	W510RF	2.0"	7.5"	0.310"
1003	Ultra Lens, Plano Convex Lens	Mitsubishi	W500	1.5"	5.0"	0.310"
1004	Ultra Lens, Plano Convex Lens	Mitsubishi	W018	1.5"	7.5"	0.310"
1005	Ultra Lens, Plano Convex Lens	Mitsubishi	W505	2.0"	5.0"	0.310"
1006	Ultra Lens, Plano Convex Lens	Mitsubishi	W502	2.0"	10.0"	0.310"
1007	Ultra Lens, Plano Convex Lens	Cincinnati Inc	908085	1.5"	5.13"	0.28"
1008	Ultra Lens, Plano Convex Lens	Cincinnati Inc	909484	1.5"	7.63"	0.30"
1020	Ultra Lens, Plano Convex Lens	Mazak	z50zz005200	2.0"	7.5"	0.38"
1021	Ultra Lens, Plano Convex Lens	Mazak	z50zz005160	2.0"	5.0"	0.38"
1026	Lens Assembly, Ultra Lens, Plano Convex, Anodized	Amada	81140306	1.5"	5.0"	~0.30"
1030	Lens Assembly, Ultra Lens, Plano Convex, Anodized	Amada	81140400	1.5"	7.5"	~0.30"
1035	Lens Assembly, Ultra Lens, Plano Convex, Nickel Plated, Gemini	Amada	71369830	1.5"	5.0"	~0.30"
1036	Lens Assembly, Ultra Lens, Plano Convex, Nickel Plated, Gemini	Amada	71369831	1.5"	7.5"	~0.30"
1039	Ultra Lens, Plano Convex Lens	Mitsubishi	W510-X	2.0"	7.5"	0.310"
1045	Lens Assembly, Ultra Lens, Plano Convex, Nickel Plated, FO-NT	Amada	7973109	1.5"	5.0"	~0.30"
1046	Lens Assembly, Ultra Lens, Plano Convex, Nickel Plated, FO-NT	Amada	7973110	1.5"	7.5"	~0.30"
2004	Standard, Meniscus Lens	Bystronic	400186	1.5"	5.0"	6mm
2005	Standard, Meniscus Lens	Bystronic	400187	1.5"	7.5"	6mm
2006	Standard, Meniscus Lens	Trumpf	97517	1.5"	7.5"	7.4mm
2007	Standard, Meniscus Lens	Trumpf	88114	1.5"	5.0"	7.4mm
2008	Ultra Lens, Plano Convex Lens	Bystronic, Prima	4-05094, 4-07475	1.5"	5.0"	9mm
2009	Ultra Lens, Plano Convex Lens	Bystronic, Prima	4-05095, 4-07476	1.5"	7.5"	9mm
2059	Ultra Lens, Meniscus	Mitsubishi	W510-Z	2.0"	7.5"	0.380"
2051	Ultra Lens, Meniscus	Mazak, Trumpf, LVD	z50zz005160	2.0"	5.0"	0.380"
2052	Ultra Lens, Meniscus	Mazak, Trumpf, LVD	z50zz005200	2.0"	7.5"	0.380"
2053	Ultra Lens, Meniscus			2.0"	10.0"	0.380"

Ultra Lenses prices are comparable to standard lens. Call LOM for latest prices.

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Ultra-Lens

Quite possibly the best cutting lens in the world



Are you ready ?

Laser Optics and Mechanisms

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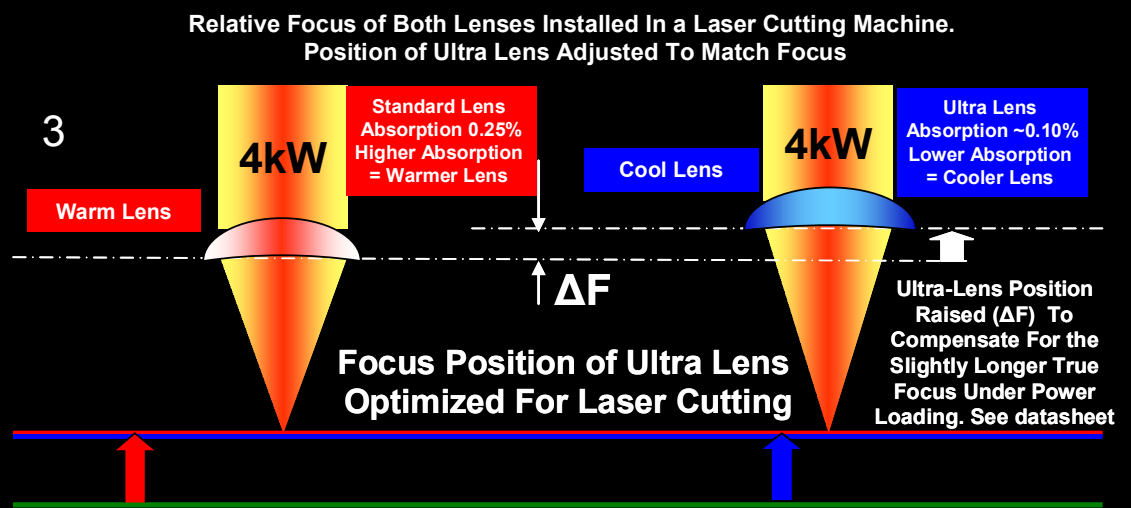
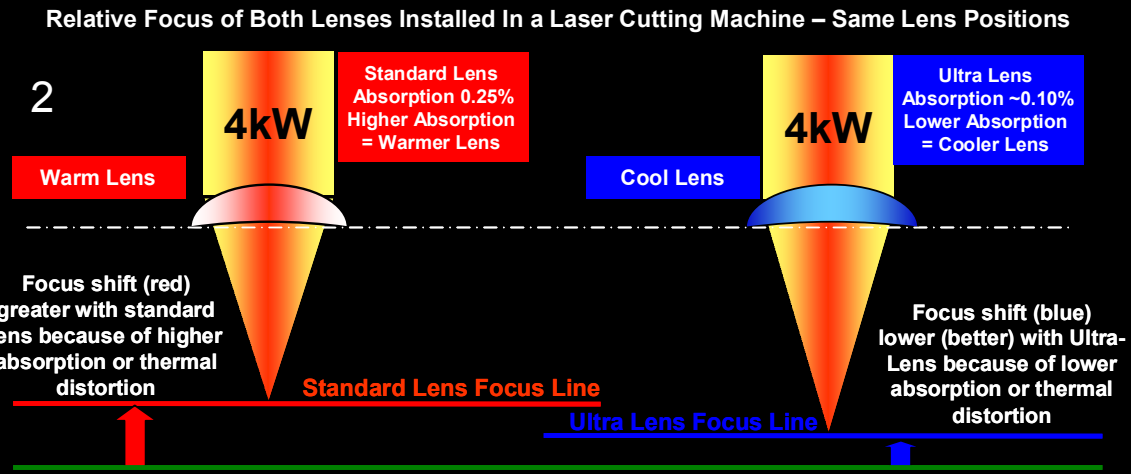
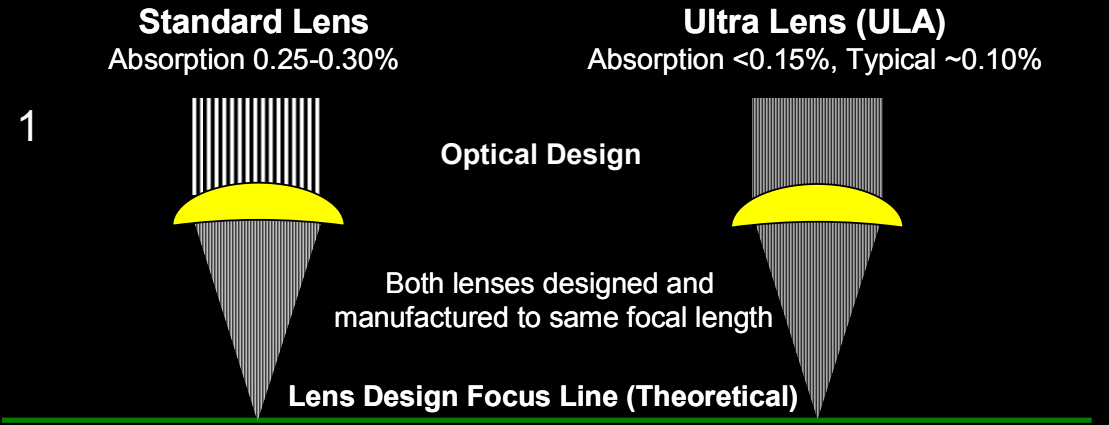
Ultra-Lens Focus Improvement & Initial Lens Setup Explained

IMPORTANT

Owing to lower thermal distortion of the ultra-lens, the focus is slightly longer compared with standard higher absorption lenses with distorted focus.

We recommend a focus check with the Ultra lens.

Extent of Z-axis adjustment of the ultra lens position will depend on the difference in quality between the ultra and standard lens – see illustration to the left.



Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality

Tips - Ultra Lens Care

1. Use recommended cleaning techniques. Clean lenses with 99.9% HPLC grade isopropyl alcohol, acetone or methanol, Ultra lens wipes and dispensing bottles. Many laser operators use solvents (denatured acetone and isopropyl) from hardware stores which degrade lenses from the onset – very important. White distilled vinegar can be used to remove lite hydrocarbon residue on the lens surface followed by a thorough cleaning with 99.9% (HPLC Grade) isopropyl alcohol and acetone.
2. Use of the white polishing compound should be limited or avoided as minute traces of polishing compound remaining on the lens coating will increase the absorption of the lens. Furthermore, coating removal will change the spectral characteristics of the lens, potentially increasing hazardous reflection back into the laser.
3. Ensure that the recommended torque is used for lens mounting and the lens mounting surfaces are clean – mechanical stress on the lens will distort the laser beam focus.
4. Ensure that the recommended cutting gas pressures are not exceeded – very high gas pressures will stress the lens and distort the laser beam. Conversely, lower pressure than recommended by the OEM will contribute poor cut quality and an increase in backspatter, impacting lens life.
5. Regular cleaning of the lens to minimize contamination build up. Check lens stress with cross-polarizers on a regular basis – available from LOM.
6. A significant percentage of lenses evaluated by LOM exhibit debris on the top side of the lens facing the beam delivery system. Regular checks and good house keeping of the beam delivery systems will help prevent premature failure of lenses.
7. Any work on the beam delivery systems (mirror replacement, cleaning of bellows) can potentially leave contamination on the convex surface of the lens. Ensure that beam delivery system is sufficiently clean before installing ultra lenses. It's sometimes cost effective to manage this risk with slightly used but good older lenses (or high quality resurfaced ultra lenses) to get through this uncertain period.

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Tips - Maximizing Ultra Lens Performance

1. Always make sure that the focus is set correctly (imbedded) per OEM procedures - never on top of the material as this increase back reflections and may damage bellows and laser resonator.
2. Ensure cutting gas is clean, dry and turns on at least 0.25 seconds (or timing recommended by the OEM) before laser piercing / drilling – check that the gas-on solenoid valves are functioning correctly.
3. Smallest diameter nozzle sizes are selected for the jobs and nozzles are centered with the correct height adjustment to minimize lens backspatter.
4. Smallest orifice nozzles help minimize lens back spatter.
5. Piercing at full power will increase backspatter and shorten lens life. Piercing at lower power or by ramping the laser power (ramp pierce) as recommended by the OEM is better. A higher gas pressure, set within the parameters allowed the laser manufacturer, will also help clear the metal plasma and keep the lens clean.
6. Ensure that the laser is well tuned as changes to the beam (divergence and profile) will affect beam focus and lens life - a degrading PR, mirror or collimating lens will also affect cut quality and lens life. In extreme cases a degrading output coupler, collimating (telescope) optics can cause focus drift towards the lens, which will crack the lens.
7. Unless recommended by the OEM, avoid cutting highly reflective metals such as copper, aluminum, brass or bronze as the back reflection from the metal can damage the lens, laser resonator and contaminate the beam delivery system. These can be fairly costly to address.
8. Call LOM to discuss your specific cleaning issues or concerns.

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Optics Cleaning Supplies From LOM

Lens Paper



Dispensing Bottles



New Professional Holder For Optics Cleaning



- Ideal for factory floor where clean surfaces are hard to find
- Takes various diameter optics - 2.0", 50mm, 1.5", 1.1", 1.0"
- Ergonomic and easy to use. Secures the optics for cleaning
- Minimizes surface damage – scratches, digs, fingerprints
- Fraction of the price of a new lens
- Custom sizes available – please call LOM

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Ultra Lens Cleaning Procedure

Critical Cleaning Supplies

99.9% HPLC
Grade Alcohol

Distilled Vinegar

99.9% HPLC
Grade Acetone

Ultra Lens Wipes - Soft

Alcohol and Acetone
Dispensing Bottles

Non-contact Optics Holder

Cleaning New Optics

Clean coated surfaces with
alcohol and Ultra Wipes

Clean coated surfaces with
Acetone and Ultra Wipes



Alcohol and acetone steel pump
dispensing bottles available
from LOM



Optics Holder
available from LOM



Ultra Lens Wipes
available from LOM

Cleaning Used Optics

Clean coated surfaces with
alcohol and Ultra Wipes

Clean coated surfaces with
vinegar and Ultra Wipes

Clean coated surfaces with
alcohol and Ultra Wipes

Clean coated surfaces with
acetone and Ultra Wipes

Repeat maintenance steps at
regular intervals as needed

Questions? Call LOM at (858)755-1105

Web: www.lom.cc e-mail: sales@lom.cc

New optics require minimal cleaning.

Optics in operation accumulate various contaminants on the coated surfaces and so require additional steps (listed above) for cleaning. Backscatter (metal fused into the lens) is usually hard to remove.

Lowest Cost of Operation, Improve Tool Productivity & Better Cut Quality