

CO₂ Laser Scanning Lenses

ULO Optics, the market leader in scanning lens technology for almost a decade, offers the widest range of singlet, doublet and triplet lenses available on the market. Amongst the first to make these lenses commercially available, ULO developed what is now considered to be the industry standard, the 48TSL series. These lenses are often used with our CO₂mpact Range of beam expanders (C-BE Series).

Single lens objectives, the TSL series

ULO Optics ZnSe scanning lenses are optimised to minimise the off-axis aberrations.

- best compromise for all aberrations, field flatness and F-theta error using a single-element, spherical surface lens
- for beams up to 15mm full diameter
- focal length from 75mm to over 2122mm
- covering field sizes from 50mm to 1500mm square
- use extends over many engraving, marking and cutting applications
- designed to be positioned at the same location relative to the scanning mirrors, so are directly replaceable with another focal length
- also available mounted

For the more demanding applications, multi-element lenses are available. ULO Optics offers them at the shorter focal lengths where the benefits are most obvious.

Doublets, the ZSD-15-Series

The new ZSD-15 series doublets contain ZnSe elements made from the same laser grade ZnSe and fully coated with low absorption anti-reflection coatings. They are capable of handling high powers whilst focusing down to smaller spots and with lower F-theta errors.



1 | A doublet, with protective window

The ZnSe-Triplets, ZST-15-75 and ZST-15-100

- focal lengths 75 and 100mm respectively
- the 75mm focal length lens is also nearly telecentric (see below) with the focused beam less than 5° to the normal
- diffraction limited performance over the entire image plane
- virtually zero F-theta error
- can be fitted with a protective window

Table 1: Singlets

Field size (mm)	Part no.	Spot Ø (s.d*) (µm)
50	48TSL75	171 (49)
70	48TSL100	181 (41)
105	48TSL150	219 (32)
140	48TSL200	269 (28)
175	48TSL250	320 (23)
210	48TSL300	373 (20)
250	48TSL360	445 (16)
280	48TSL400	481 (15)
300	48TSL435	525 (15)
500	48TSL720	850 (9)
840	48TSL1150	1390 (6)
900	48TSL1285	1520 (7)
1500	48TSL2122	2480 (3)

Table 2: Doublets

Field size (mm)	Part no.	Spot Ø (s.d*) (µm)
50	ZSD-15-75	118 (25)
70	ZSD-15-100	139 (22)
105	ZSD-15-150	171 (0)
140	ZSD-15-200	225 (0)
175	ZSD-15-250	282 (0)
210	ZSD-15-300	338 (0)

Note:

These lists are not exhaustive. The most up to date list of available lenses can be accessed on our website at www.ulooptics.com

Table 3: Triplets

Field size (mm)	Part no.	Spot Ø (s.d*) (µm)
50	ZST-15-75	89 (4)
70	ZST-15-100	113 (1)

s.d* = Standard deviation

Spot dia. is determined from optical computation and are not measured values from marking or engraving. The width of an engraved line is affected by laser power, material, scan speed, etc and is normally less than the values listed here.

Increasingly larger beams are being used to achieve a smaller focus. To enable our customers to design cutting-edge systems, ULO Optics is continually developing new lens designs. Ask about our latest developments.

Telecentric Lenses

These are special (multi-element) designs that focus the beam down onto the image plane at normal incidence. Typically used to drill holes, they prevent the hole from being oblique through the material.

Each specific application demands custom solutions for these lens types. Contact us with your specifications for a preliminary design and quote.

Post-Objective

The lenses mentioned above are all used in the 'pre-objective' scanning configuration. However, there is a second arrangement called 'post-objective' (or '3-axis') where the scanning mirrors follow the focusing optics. The small first lens is also translated in synchronisation with the mirrors to keep the correct focus on the image surface. Unlike the pre-objective arrangement, the same set of optics can usually cope with more than one field size.

ULO Optics can design and manufacture these post-objective lens sets to your requirements.

Scanning Mirrors

To complete our range, ULO Optics also manufacture Scanning Mirrors made from monocrystalline Silicon.

- maximum reflectance, >99.85%
- extremely durable, passes MIL-C-48497A severe abrasion test
- phase retardation minimised

Although we have a range of standard mirrors, we can quote on your designs as well as our own.

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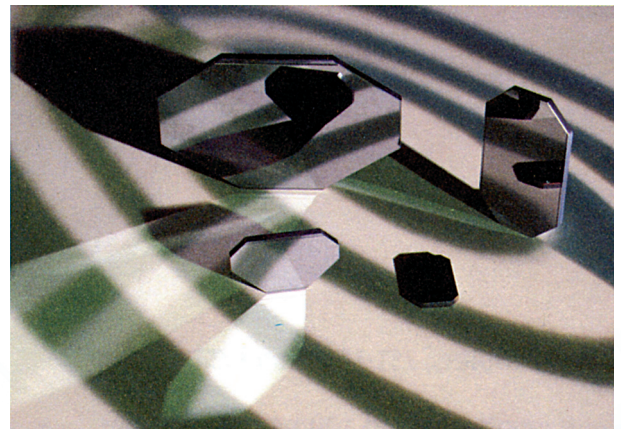
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2 | A triplet lens, with protective window



3 | Post-Objective Configuration (diagram not to scale)



4 | Scanning Mirrors, why not send us your design for a quote?

