

UV Scan Lens — For large-area precision laser processing

Introduction

UV lasers at 355nm are advantageous as micromachining tools. Light at this wavelength interacts with materials primarily through photoablation, through which high-energy photons break molecular bonds, resulting in a clean cut with minimal disruptive effects on the surrounding material. For applications ranging from microelectronics to medical equipment production, solid-state UV lasers offer high versatility at low operational costs for the micromachining industry. Demand for large area scanning range, simplified optical system design for both laser processing and vision inspection beams, present new challenges for a critical component in a laser system, namely, scanning lens.

Operation Principle

The two main design categories of scan lens include telecentric and non-telecentric F-Theta scan lens. Telecentric F-Theta scan lens is a special type of lens system whereby the deflected off-axial laser beam can be perpendicularly focused onto the work piece like the on-axial focusing beam. The advantage of the telecentric scan lens is that it can flatten the field curvature to be least distorted while offering superb spot quality throughout the scan field. The overall design concept is shown in Figure 1.

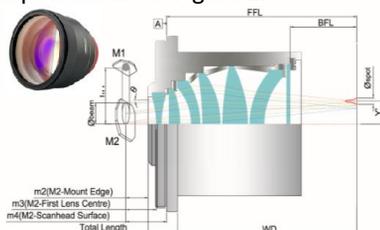


Figure 1. Layout of telecentric F-Theta lens

When a vision system is being integrated into a laser machining system, our achromatic telecentric scan lenses are colour-corrected between working and vision wavelengths. The achromatic telecentric scan lens offer the same benefits as the normal telecentric lens while providing accurate vision positioning. The design layout is shown in Figure 2.

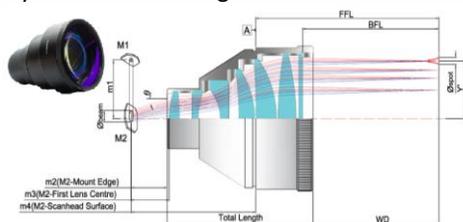


Figure 2. Layout of achromatic telecentric F-Theta lens

The key specifications of the UV scan lens are listed below. Compared to similar products in the market, we offer larger scanning area and flexible design of achromatic performance. For high powered laser and ultrafast laser source, we offer the special Q-series to minimize thermal lensing and focal shift.

	T	TA	NT	NTA
Wavelength(nm)	355	355 /635	355	355 /635
EFL (mm)	420	120	800	328
WD (mm)	560	85.4	646	265
Diameter (mm)	354	80	298	104
Input beam Φ (mm)	14	6	25	6
Scan Field (mm)	300	50	600	212

Table 1. Specifications of UV scan lens: T-telecentric, TA- achromatic telecentric, NT-Non-telecentric, NTA-achromatic non-telecentric

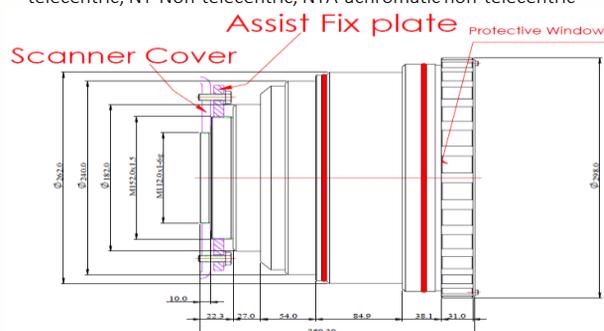


Figure 3. Outline of the UV F-Theta lens with 600mm scanning field

Applications

The large scanning area is advantageous for high throughput precision laser processing. This is essential when display electronics require high speed manufacturing; e.g. the laser lift-off in flexible and large area OLED process. These scanning lens can work in conjunction with our customized design of beam expanders (refer to WOE application note of Versatile Beam Expansion – from tunable to automation) and new design of beam shapers (refer to WOE application note of Beam Shapers – shaping the beam from DUV to MIR).

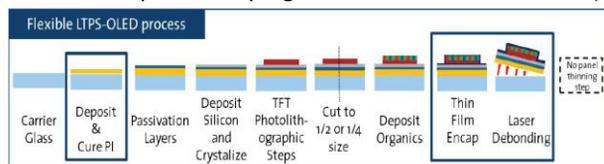


Figure 4. Application of UV laser for OLED lift-off process.

Conclusion

As a global enterprise, leading photonics innovation since 2002, WOE has built up customization engineering capability for laser optics, ranging from beam expansion, beam shapers and large area scanning lens.

