



primelite ALE/1C

Advanced UV-LED Light Engine ONE C

ALE/1C – Photolithography UV-LED Exposure Systems



Key Applications

- Mask aligner systems
- Stepper systems (i.a., advanced packaging)
- Wafer edge exposure
- Other applications that require highest UV-radiation output in manufacturing equipment (e.g., adhesive curing, broadband exposure)

ALE/1C Solution Highlights

- Built-in solution for maximum efficiency and performance
- Up to 50 Watts of broadband exposure (UV-LED 350-450 nm)
- Closed-loop controlled output for maximum process stability
- Future-proof mercury-free light source with significant Cost of Ownership advantages
- Quality Made in Germany



primelite
Advanced Light Engines

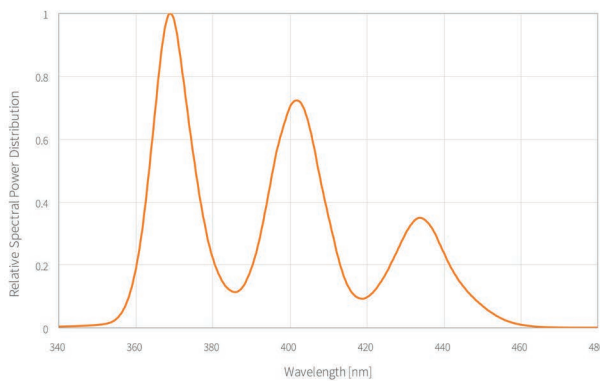
Multispectral Modularity for Highest Intensities

Illumination power of 1 kW and 2 kW mercury arc lamps

Standard Lithography Setup

3 NUV-LEDs (365, 405, and 435 nm)¹

Broad band lithography applications using i-, h-, and g-line in the semiconductor industry



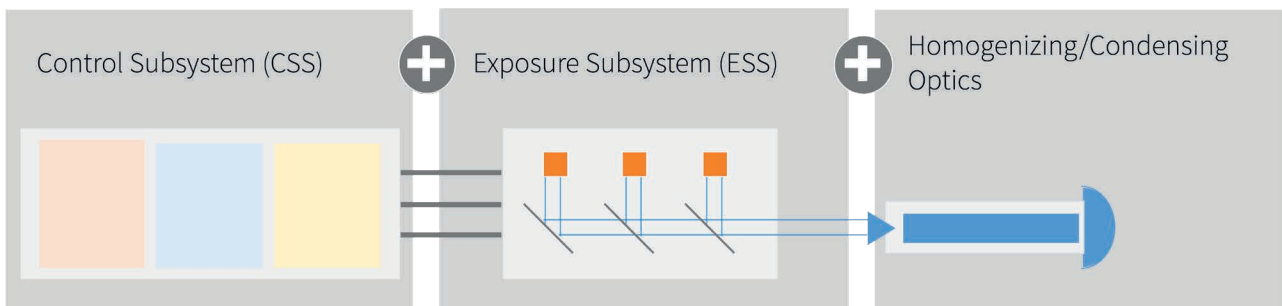
1 CWL of emitters: 367.5±2.5 nm, 387.5±2.5 nm, 402.5±2.5 nm, and 435.0±2.5 nm
2 Full spectrum measured; deviation of ±10% possible;

Radiation output in Watts	Broadband (350-470 nm)	I-line (350-385 nm)
Primelite's ALE/1C²		
ALE/1C+ (w/ external cooling) Optics: Ø8.0 mm HEX AR	50	21
ALE/1C+ (standard) Optics: Ø8.0 mm HEX AR	40	17
ALE/1C+ (standard) Optics: Ø6.5 mm RND AR	35	14
Mercury arc lamp		
1000 W type	37	17
500 W type	19	9

Distributed Setup for Optimal OEM-integration

ALE/1C units follow a distributed design approach, typically made up of a Control Subsystem (CSS) and a single or multiple separate Exposure Subsystems (ESS).

Very compact, yet extremely powerful: This design principle of our UV-LED exposure head allows for easy integration directly into your equipment. The light exit of our Exposure Subsystem may be combined with a variety of available light pipes, light guides and additional (also customized) optics.



Control Subsystem (CSS)

- Available as stand-alone unit and as 4U 19" rack mount system
- Includes power supply, cooling system, and external interfaces

Exposure Subsystem (ESS)

- Compact design to be directly integrated into exposure equipment
- Includes emitters for i-, h-, and g-line, as well as LED-drivers



Modular Technology Platform

System Properties and Specifications

Included emitters	Up to 3 LEDs ranging from 365 nm to 970 nm
Total radiation output ¹	Up to 40 W (50 W with additional external cooling)
Output intensity ¹	Up to 100,000 mW/cm ²
Numerical aperture	Variable, depending on condenser optics
Control configurations	<ul style="list-style-type: none">▪ Individual LED power management and presets▪ High-resolution intensity adjustment (20-100%)▪ LED rise time approx. 1 millisecond▪ Continuous monitoring of optical output and feedback control via internal or external signal
Communication interfaces	<ul style="list-style-type: none">▪ USB: ALE/remote (ALE PC-Software)▪ PLC: Discrete interface▪ Fieldbus: As per customer requirement (e.g. CANopen, PROFINET)
Heat management	<ul style="list-style-type: none">▪ Internal liquid cooling▪ External cooling (optional), for elevated output level
Dimensions (W H D)	<ul style="list-style-type: none">▪ ESS: 20 cm X 13 cm X 20,5 cm (7.9" X 5.1" X 8.1")▪ CSS: 20 cm X 15 cm X 45 cm (7.9" X 5.9" X 17.7")▪ CSS (Rack): 44 cm X 18 cm X 37 cm (17.3" X 7.1" X 14.6")
Weight	<ul style="list-style-type: none">▪ ESS: 5 kg (11 lbs)▪ CSS: 9 kg (20 lbs)▪ CSS (Rack): 10 kg (22 lbs)
Power supply input	110-240 VAC / 50-60 Hz / 1,000 W
Light Guide Options	<ul style="list-style-type: none">▪ Hex, square and round light pipes (i.a., Ø6.5 mm and Ø8.0 mm)▪ Customized condenser or focussing optics

¹ Full spectrum measured at end of light pipe (Ø8.0 mm, HEX AR-coated); deviation of ±10%





Accessories for the ALE/1C

Primelite Performance Optics

Very much like the Advanced Light Engines, our standard UV-LED optics product portfolio also follows a modular design principle. You may opt to use a flexible light guide or one of our light pipes/homogenizers with our ALE/1C light sources. In many cases it makes sense to take a closer look at our condensing optics, too.

As the output aperture from our flexible light guides and light pipes/homogenizers is around 0.6 ($\alpha \sim \pm 30\text{-}35^\circ$), our lens systems can be an efficient addition to reduce divergence. Our light pipes and homogenizers are available in a selection of round, hexagonal, and square shapes. Primelite Performance Optics exclusively use UV-grade material.

Homogenizing and Condensing Optics



Light Pipes / Homogenizers	
Available types:	Round Ø6.5 and Ø8.0 mm / Hex Ø8.0 mm / Square 7.0X7.0 mm; Length 58 mm
Numerical aperture:	0.60 / 70° (2 α)
AR-coating:	R _{abs} [350-450nm] ≤ 1%
Condensing Optics	
Available types:	ASP Ø25 mm ASP Ø34 mm
Numerical aperture:	0.24 / 28° (2 α) 0.14 / 16° (2 α)
AR-coating:	R _{abs} [350-450nm] ≤ 1%

About Primelite

History and Guiding Principles

History

- Primelite GmbH was founded in Munich, Germany, in 2016 by a team of experienced engineers and managers.
- A prototype of our first high-power UV-LED light engine, the versatile, fiber-coupled ALE/1, was presented at the SEMICON Japan end of 2016. Series production started in 2017.
- In 2018, we added the ALE/1C to our product portfolio: A UV-LED exposure solution with standard-setting output performance, which you can directly integrate into semiconductor manufacturing equipment.
- Providing superior value, we can now call some of the biggest names in the semiconductor, pharma, and automotive industries our customers.

Guiding Principles

- We have committed ourselves to develop advanced UV-LED light sources which are best-in-class solutions for our customers.
- Perfect quality is our aspiration: We design and manufacture our UV-LED systems in Munich, Germany. To achieve industry-leading product reliability, we rely on carefully selected suppliers of critical components. These include made-to-spec optics from semiconductor-grade Japanese glass and superior LED emitter technology.
- To stay way ahead of our competition, we continually advance our core know-how on optical and mechanical design. Additionally, improving our electronic hardware and software architecture is just as essential.
- We enable product innovation as well as fast-track development and product rollout by having a lean organization, deep market insight, customer-focus, and dynamic business culture at Primelite.



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