

The background of the slide is a collage of LED-related images. In the top left, there's a close-up of a circular LED array with many small, clear lenses. In the bottom left, a strip of LEDs is visible, showing individual components in a row. On the right side, there's a blue, translucent component, possibly a heat sink or a lens cover, with some internal structure visible. The overall color scheme is dark with highlights from the LEDs.

Led Event 2017
Simon Aldred

LEDiL

From Light to Lighting

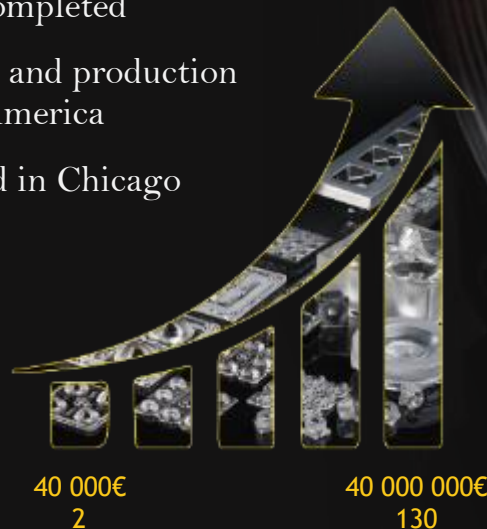
LEDiL

www.ledil.com

Company Overview

From design optics engineering to global manufacturer

- A world leading supplier of standard and customized LED secondary optics
- The 2002 start-up with 2 engineers today employs 100+ people, Engineer bias
- A dynamic company constantly achieving double-digit growth
- Over 300 Million lenses shipped
- Technology leadership in asymmetric optics
- Over 4 000 optical design completed
- Design expertise in Finland and production in Europe, China & North America
- LEDiL, Inc subsidiary based in Chicago



LEDiL

www.ledil.com

Measurements & testing

With a lot of dedicated recourses & latest equipment

- Continuous UV testing
 - Always on UV chamber
- Thermal design & testing
 - Thermal camera and dedicated software
- Environmental and mechanical testing capabilities
 - Impact test - IK01-10
 - Shear test 0-100N; fully automated testing
 - Temperature test -45 - +280 constant or in cycles
 - Water immersion at 1m depth (IPX7)
 - Dust & Water Jet testing capabilities (IP55-66)
 - Screw torque resistance measurements
 - Video microscope for mechanical measurements and quality inspection
- Electrical measurements
 - Fully programmable Electrical Safety Tester GPT-9000 series: AC/DC Withstanding Voltage, Insulation Resistance, Ground Bond

LEDiL

www.ledil.com

Advanced materials

PMMA, PC & Silicone

- Continuous testing of new materials & coatings
- Mostly using Automotive grade PMMA
 - High resistance for outdoor UV aging
 - High transmittance 93%
- Poly carbonate (PC)
 - Better impact but lower UV resistance than with PMMA > UV coating may be needed
 - Possible for special requirements e.g. Fire rating and glow wire
- Optical silicone
 - Great UV and thermal resistance; sealable designs
 - Higher material cost but can reduce system cost as well as prolong a lifetime of a luminaire

	PMMA	PC	Silicone
Max recomm. temp.*	80°C	110°C	150°C
UL RTI	90°C	115°C or higher	150°C
Transmittance	Typ.93%	Typ.88%	Typ.94%
UV resistance	☼☼☼ (30years)	☼	☼☼☼
IK resistance	☼	☼☼ (up to IK10)	☼☼☼

*LEDiL max recommended temperature taking light absorption and other environmental circumstances into account

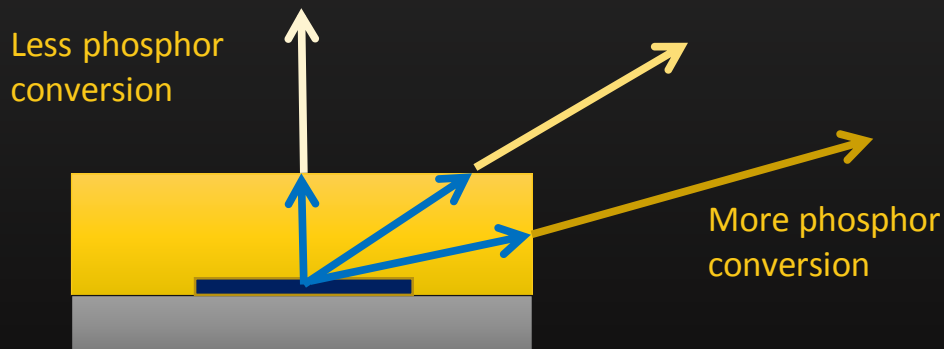
LEDiL

www.ledil.com

Color uniformity of light

LEDs and optics

- Good phosphor layer quality and design is the base of good quality light
- Especially cost and lm/W optimized COB, midpower, and high power lenses are known to have color over angle and color consistency issues
 - » OK for some applications, and with some optics
- Good CoA (color over angle) properties (typically cannot be found from the datasheets) give better results with most optics.
 - » Critical when high accuracy beam control is required like narrow spot and wall grazing beams.
- Bad CoA properties can become more visible especially with narrow spot light optics or be fixed with optical design or/and diffusion.
- Color mixing optical technologies can be used for CoA issues, tunable white and RGB.

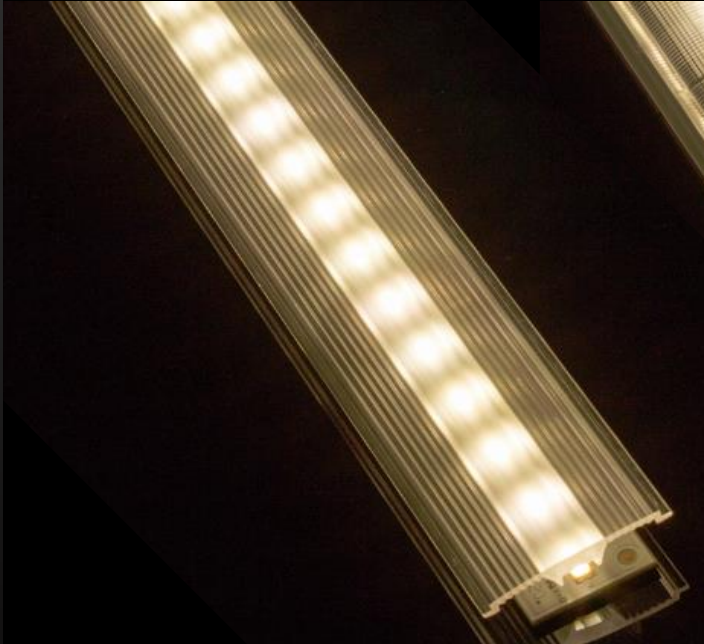


Extrusions vs. Molded lens

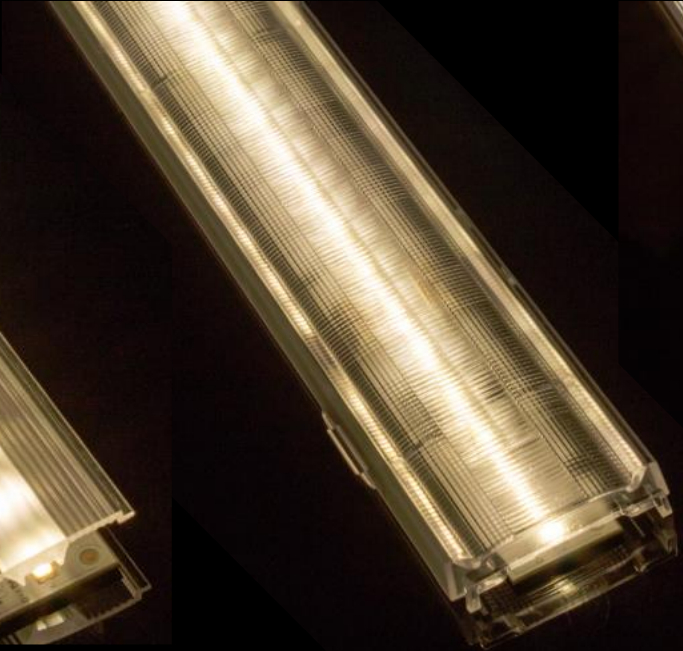
Aesthetics

- Lack of longitudinal control in extrusion optics often causes bright spots
- Microstructure can improve color uniformity issues

Extrusion lens A



LEDiL Linnea
Molded linear lens



Extrusion lens B



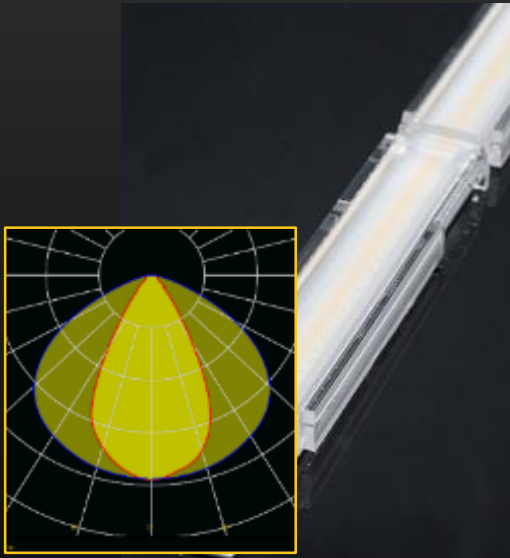
Extrusions vs. Molded lens

Beam control

- Longitudinal beam control can be limited causing glare (UGR), especially with extrusion optics where longitudinal beam cannot be controlled.

Extrusion type

- No longitudinal control
- Highest UGR beam



Microsurface lens

- Partial longitudinal control
- Lower UGR beam



Lens linear array

- Full longitudinal control
- Lowest UGR beam

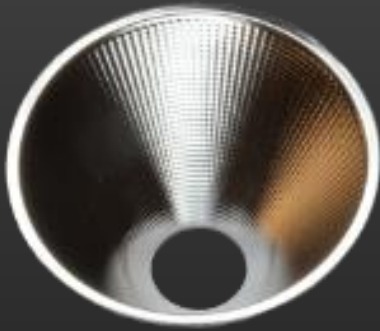


LEDiL

www.ledil.com

Reflector vs. Lens

Indoor lighting track light



- + Traditional design
- + Light weight
(more critical with big size)
- + Efficiency
- Limited optical control
- LED exposed directly



- + Modern design
- + Full optical control
- + Diffuses and protects the LED
- + Lower fixture height.



LEDiL

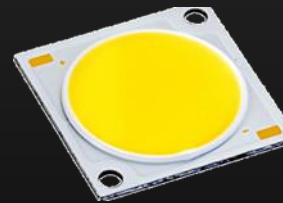
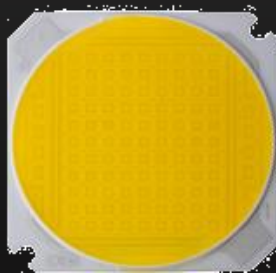
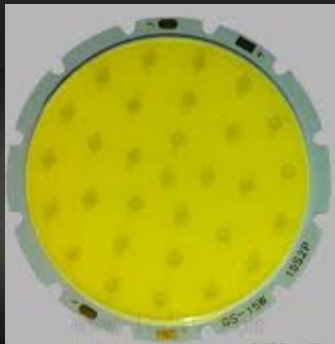
www.ledil.com

Color uniformity of light

3 different COBs

Chip location
Phosphor layer

Big spacing can make the beam pixelated
Quality, consistency, amount and technique

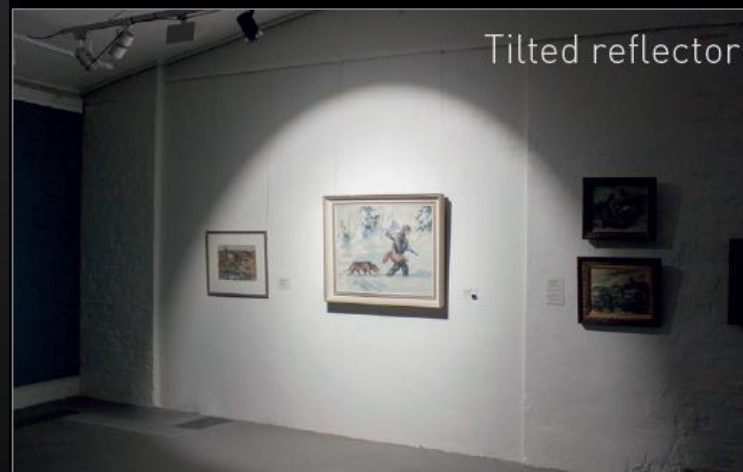
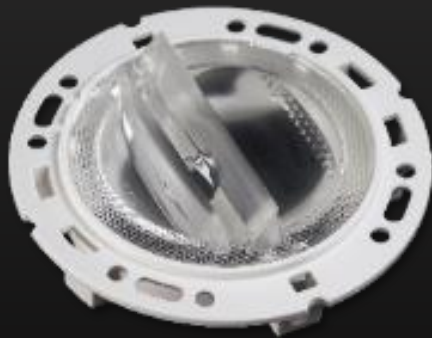
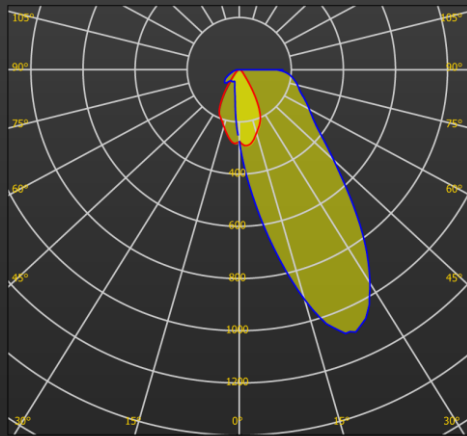


LEDiL

www.ledil.com

Lens for even more control

Ronda-WAS

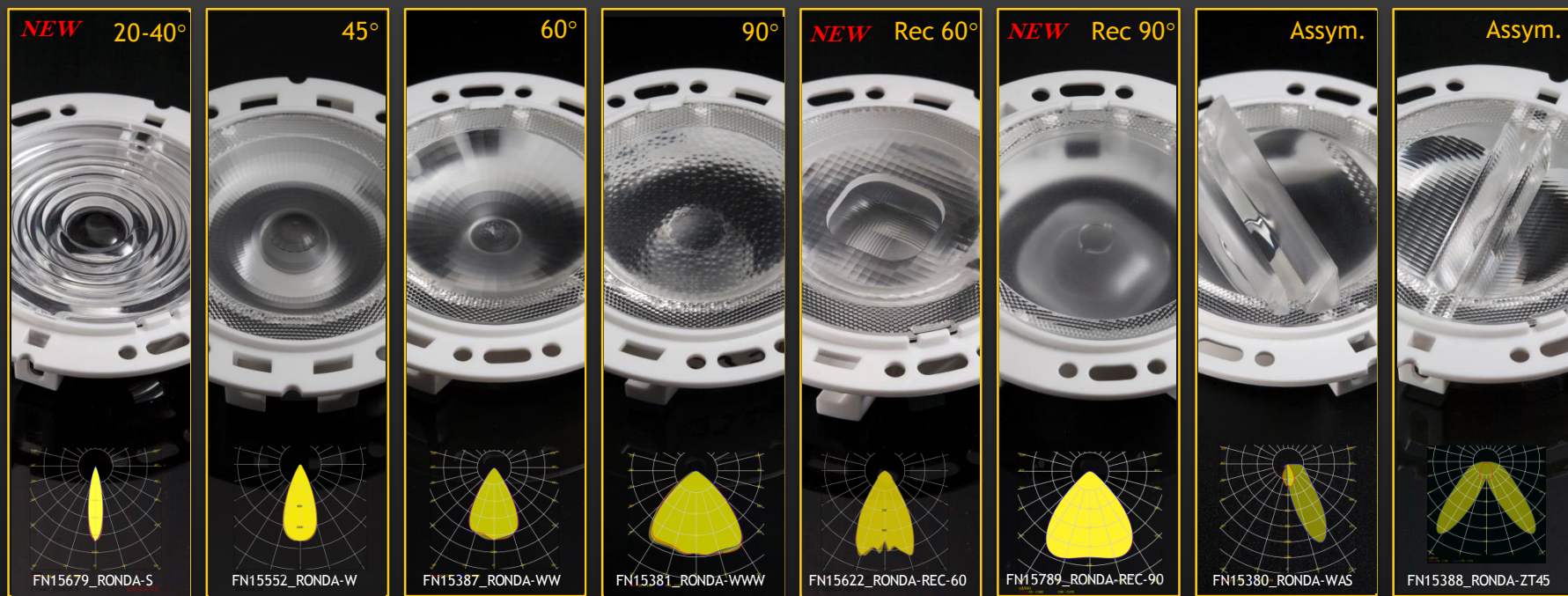


LEDiL

www.ledil.com

RONDA-family

System for all architectural needs with 7 symm. And 3 assym. beams



LEDiL

www.ledil.com

HEKLA

Ø44 mm sockets & solderless connectors

- **COMPATIBLE:** support for many COBs and LEDiL optics
- **USABLE:** easy to use twist & lock mechanism
- **DURABLE:** long lasting materials that can handle high temperatures without losing grip
- **INNOVATIVE:** Same system – freedom to choose between solderless connector or mechanical socket



MIRELLA-G2
Ø 50 mm



BROOKE-G2
Ø 45 mm



CARME
Ø 70 mm
Ø 50 mm
incl. CARME



ZORYA
Ø 55 mm
incl. ZORYA-ADAPTER-HEKLA



RONDA
Ø 54 mm
incl. RONDA-HLD-C



WINNIE
Ø 50 mm
incl. WINNIE-HLD-C

Solderless
connector



Socket



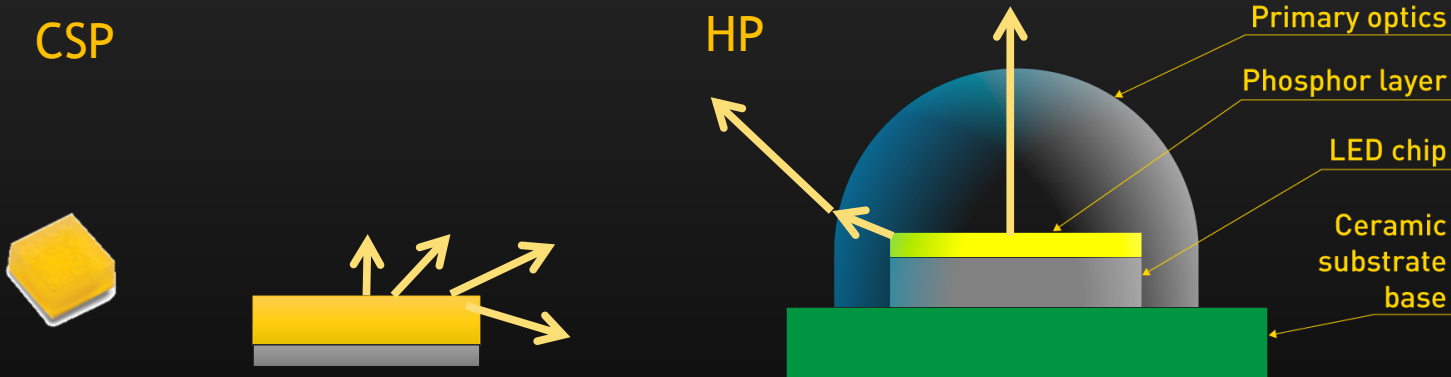
LEDiL

www.ledil.com

CSP LEDs

Chip scale package

- Chip and phosphor only, “no package”
- Very small but comparable performance to packaged high power LEDs (L_{mn} , V_f)
- Wider beam angle, lower height
- Optical compatibility?
 - » In some cases needs to be optimized



LEDiL

www.ledil.com



Thank you!
Simon.aldred@ledil.com

LEDiL

www.ledil.com