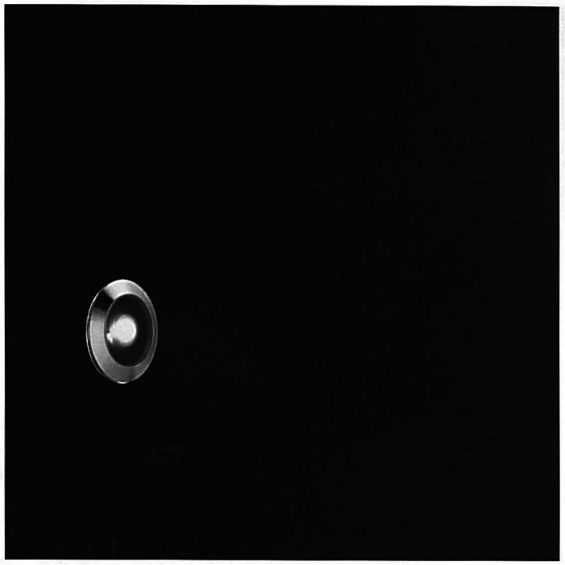
# LED technology

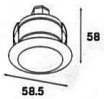
# QUESTION

–

In which year was the first Modular LED fixture launched?



mono led clear glass

| | | | |
|---|---|---|---|
| white | |  58 58.5 | |
| black | | | |
| alu | 10920105 (441105) white led<br>10920205 (441115) amber led | | |
| chrome | | | |
| gold | | | |
| | 1x LED white star / -<br>1x LED amber star / - | | Ø 44 h: 70 |
| | gear not incorporated | | interior + exterior use |
| ! | 10921430 (442100)<br>White LED gear 350 mA max. 7 LEDS | | |
| | 10921530 (442200)<br>Amber LED gear 250 mA max. 8 LEDS | | conbox: 10921630 (442300) |
| | | | |
| III | 0,05 CE IP 54 | | |



# ANSWER

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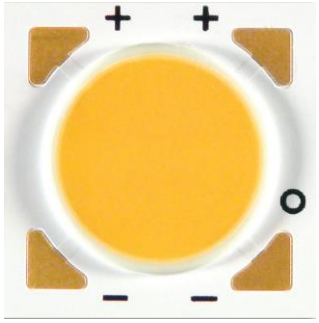
- MonoLED
- Year 2001
- 18 lm – 1,2W – 4500K

# LED general

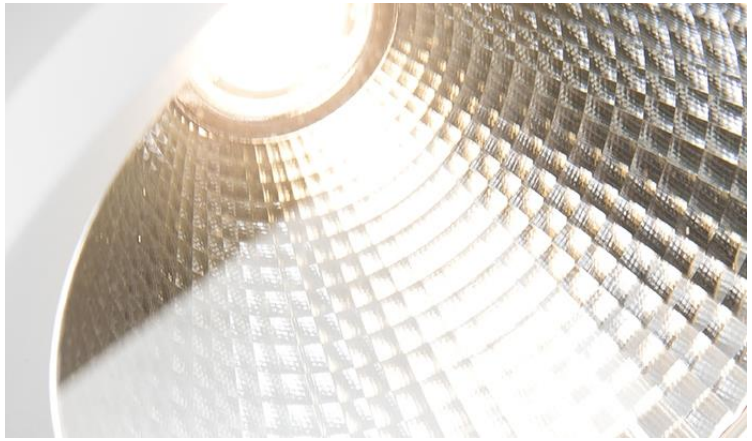
*Why choose LED?*

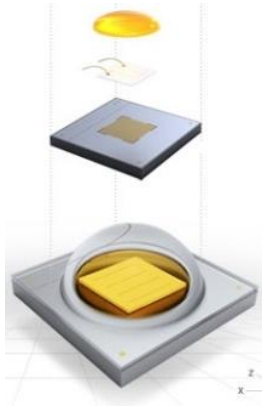


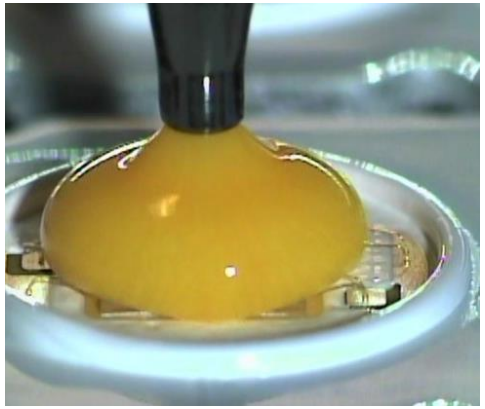

Since 2013 we develop dedicated LED

- LED is more energy efficient
- Longer lifetime
- Non toxic and greener
- More flexible in design
- More flexible in color of light

# LED COB
*(Chip On Board)*

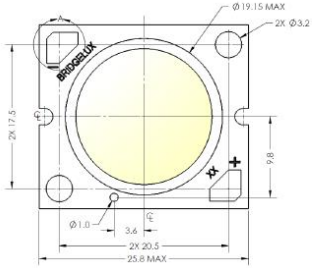


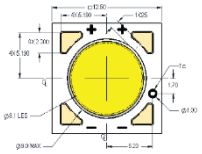




- LED = PCB + die + phosphor
- Currently 140 lm/W
- Which brand = Finding the balance between lm/W – quality component – quality light & price

- TREND
  - 150 lm/W by end of 2017
  - Smaller LES (Light Emitting Surface) Ø19 mm → Ø8 mm



# LED COB

*Integration into fixture*

# LED COB

*Integration into fixture*

- LED

# LED COB

*Integration into fixture*

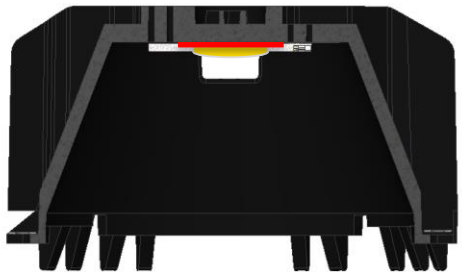
- LED

  **+**

- TIM

# LED COB

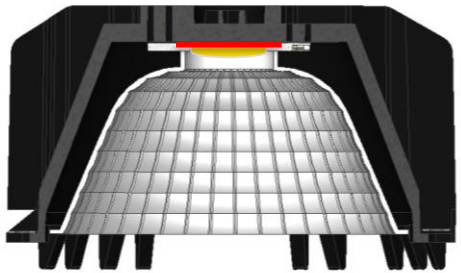
*Integration into fixture*



- LED
- \+
- TIM
- \+
- Heatsink

# LED COB

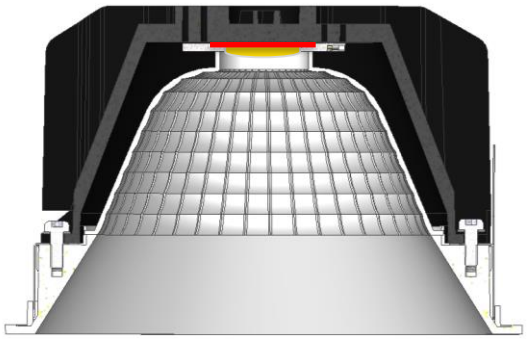
*Integration into fixture*



- LED
- \+
- TIM
- \+
- Heatsink
- \+
- Reflector

# LED COB

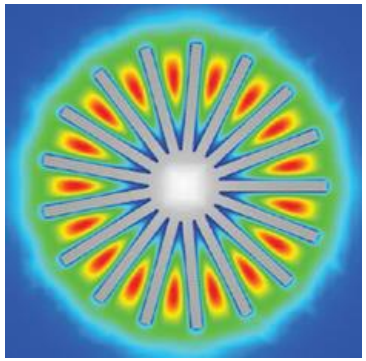
*Integration into fixture*

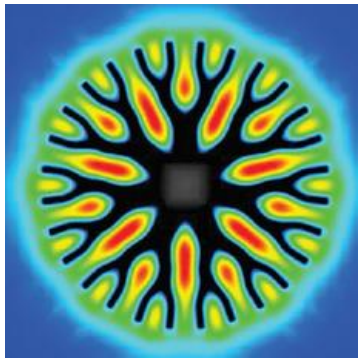


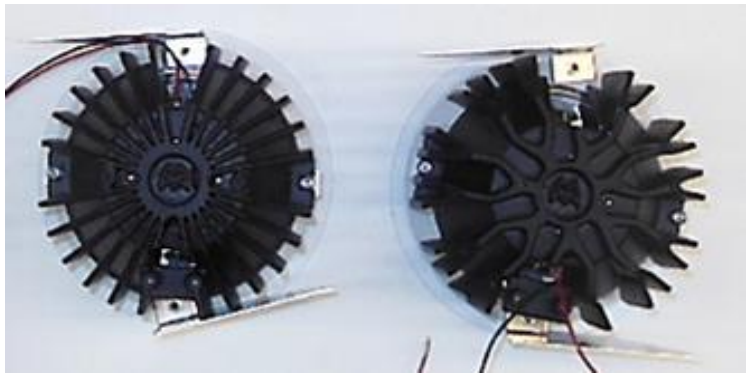
- LED
  +
- TIM
  +
- Heatsink
  +
- Reflector
  +
- Design

# LED COB

*Integration into fixture*







- Heatsink
  - Modular dedicated heatsinks
  - Passive
  - Bionic design
  - cooler LED
    = higher light output
    = longer the lifetime

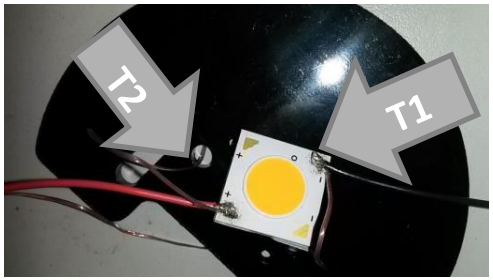
# LED COB

*Integration into fixture*

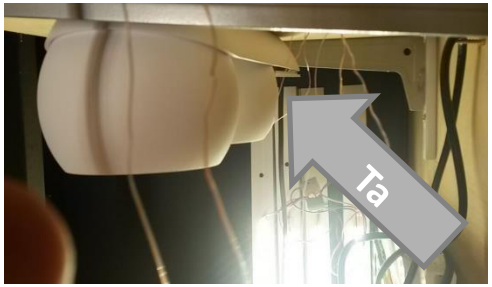
- Thermal testing
  - Temp testing with Tamb 35°C (standard indicates 25°C)
  - And stay 10% below max Tc

# LED COB

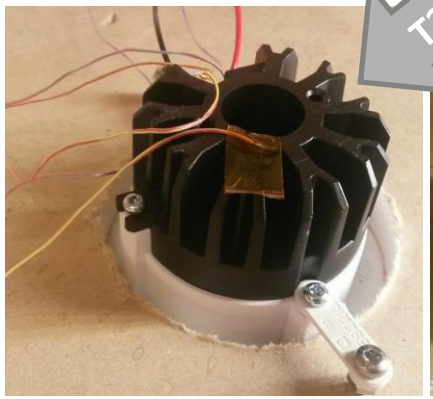
*Integration into fixture*





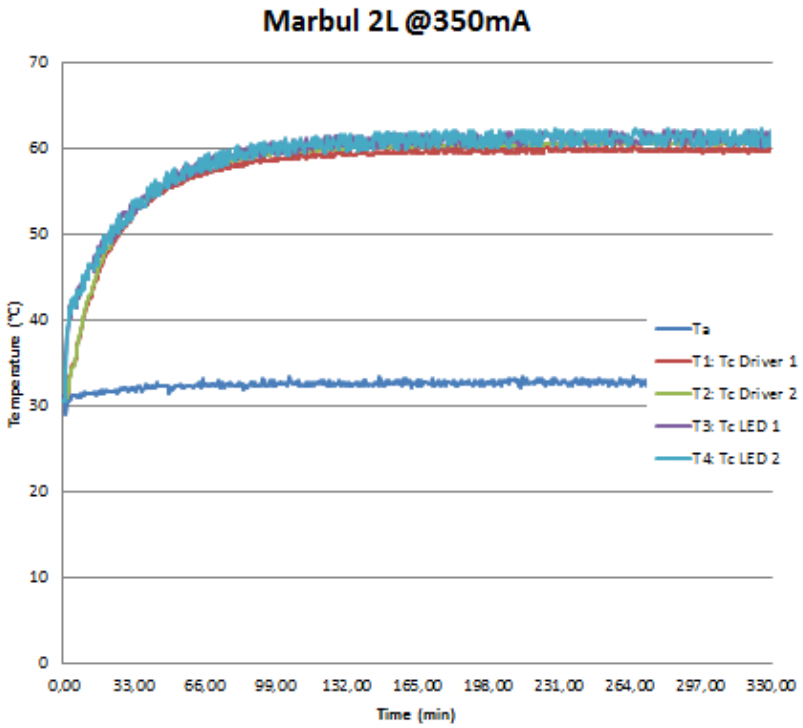



- Thermal testing
  - Temp testing with Tamb 35°C (standard indicates 25°C)
  - And stay 10% below max Tc
    - Cover recessed luminaire with wooden enclosure


# LED COB

*Integration into fixture*

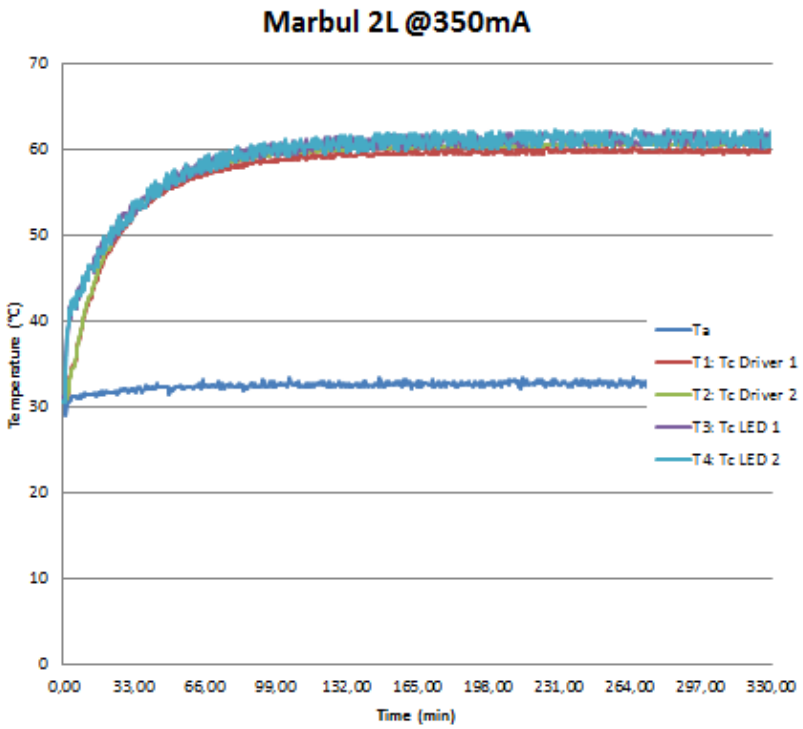



- Thermal testing
  - Temp testing with Tamb 35°C (standard indicates 25°C)
  - And stay 10% below max Tc

| T | MAX measured | MAX allowed | Result pass/fail |
|---|---|---|---|
| Ta | 33,50 | 35 | PASS |
| T1: Tc Driver 1 | 60,20 | 75 – 67 | PASS |
| T2: Tc Driver 2 | 60,50 | 75 – 67 | PASS |
| T3: Tc LED 1 | 62,00 | 105 – 95 | PASS |
| T4: Tc LED 2 | 62,20 | 105 – 95 | PASS |

# LED COB

*Integration into fixture*

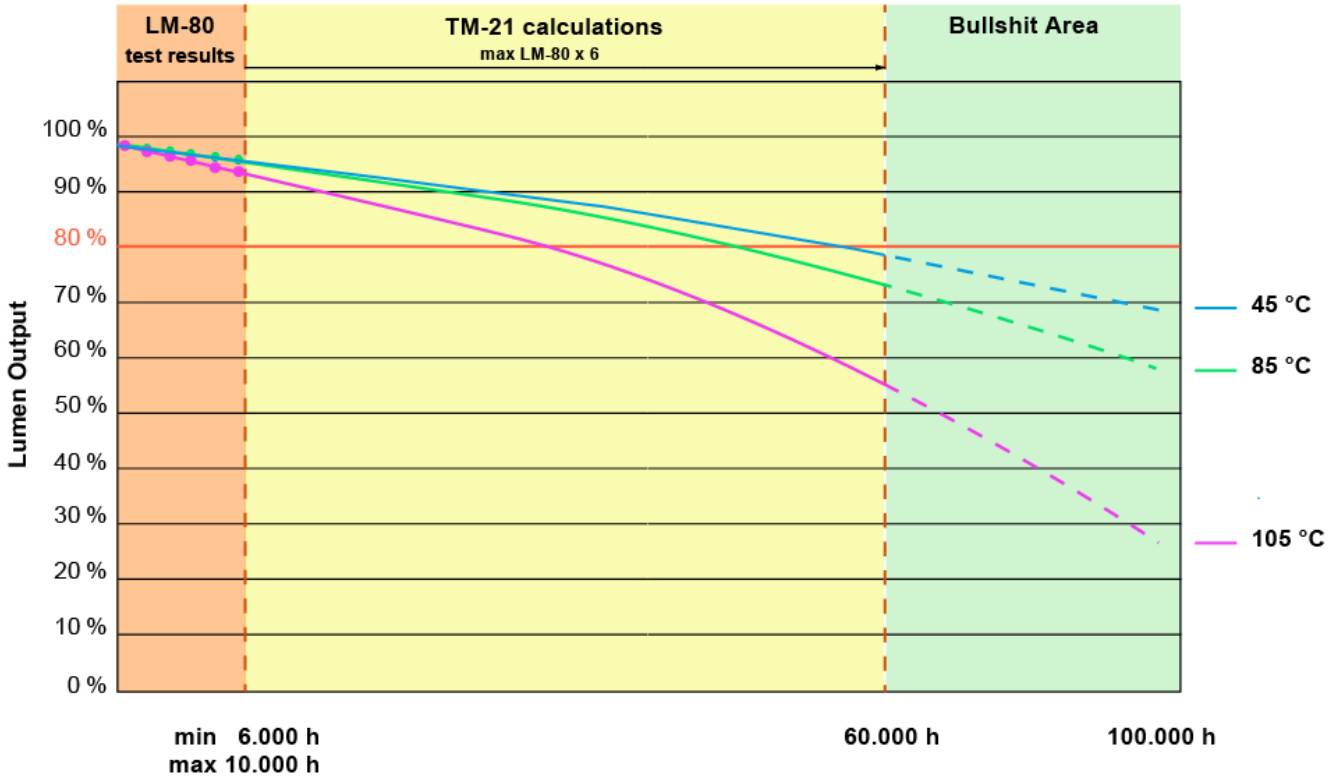



- Thermal testing
  - Temp testing with Tamb 35°C (standard indicates 25°C)
  - And stay 10% below max Tc

→ Lifetime 50.000 hrs

- Trend
  - Thermal performance LED latest generation is 20% better compared to 3 years ago
    - 20% more light
    - make fixtures smaller

# LM80 & TM21

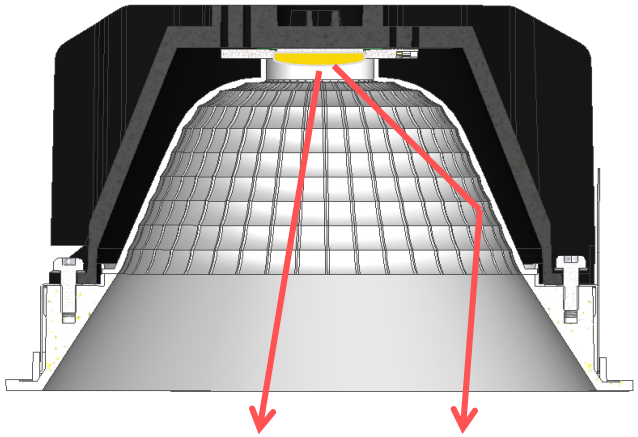


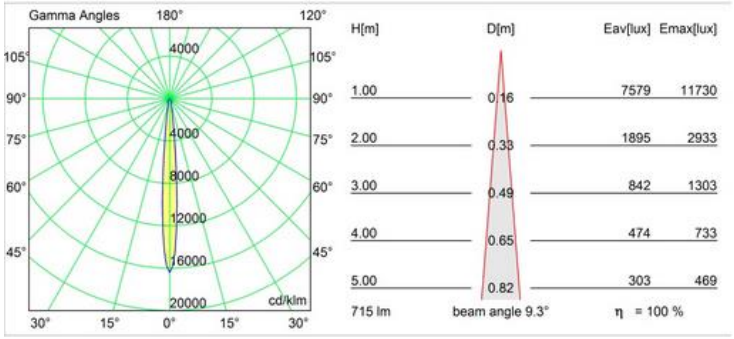

Modular

- L80B20: spot
  - After 50.000 hrs 20% of the luminaires may fail or be below 80% of their initial luminous flux
- L80B10: linear
  - After 50.000 hrs 10% of the luminaires may fail or be below 80% of their initial luminous flux

# LED COB

*Integration into fixture*






- Optics
  - High gloss alu reflectors 99.6% alu with sferical facets → reflection = +95%
  - Super spot = 10°
  - Spot = 15°
  - Medium = 25°
  - Flood = 40°
  - Wide flood = 55+°
- TREND: Smaller LES
  - Spot beam angle in smaller fixtures (K72, K77adj)
  - Super spot in bigger fixtures (Marbul)

# WARM DIM

- 3000K – 2000K
- 1000lm  CRI 90+
- AM dimming (no PWM dimming)


# LED linear


- Mid-power LED on pcb or flex
- Currently 150 lm/W (CRI 90)

- TREND
  - 160 lm/W by end 2017
  - Smaller package

# LED linear

- 3850 lm/m: pcb
  - optics lens (low UGR)
  - office compliant
- Flex: 1000 lm/m (CRI 90)
- Flex on request : 1.400lm/m & 2.300lm/m (CRI 90)
- IP67

# Modular own development of LED pcb’s

- Made at subcontractor Philips
- Round & C-shape pcb (Flat moon)
- Slim pcb for Vaeder
- 2700K 3000K 4000K CRI 90