

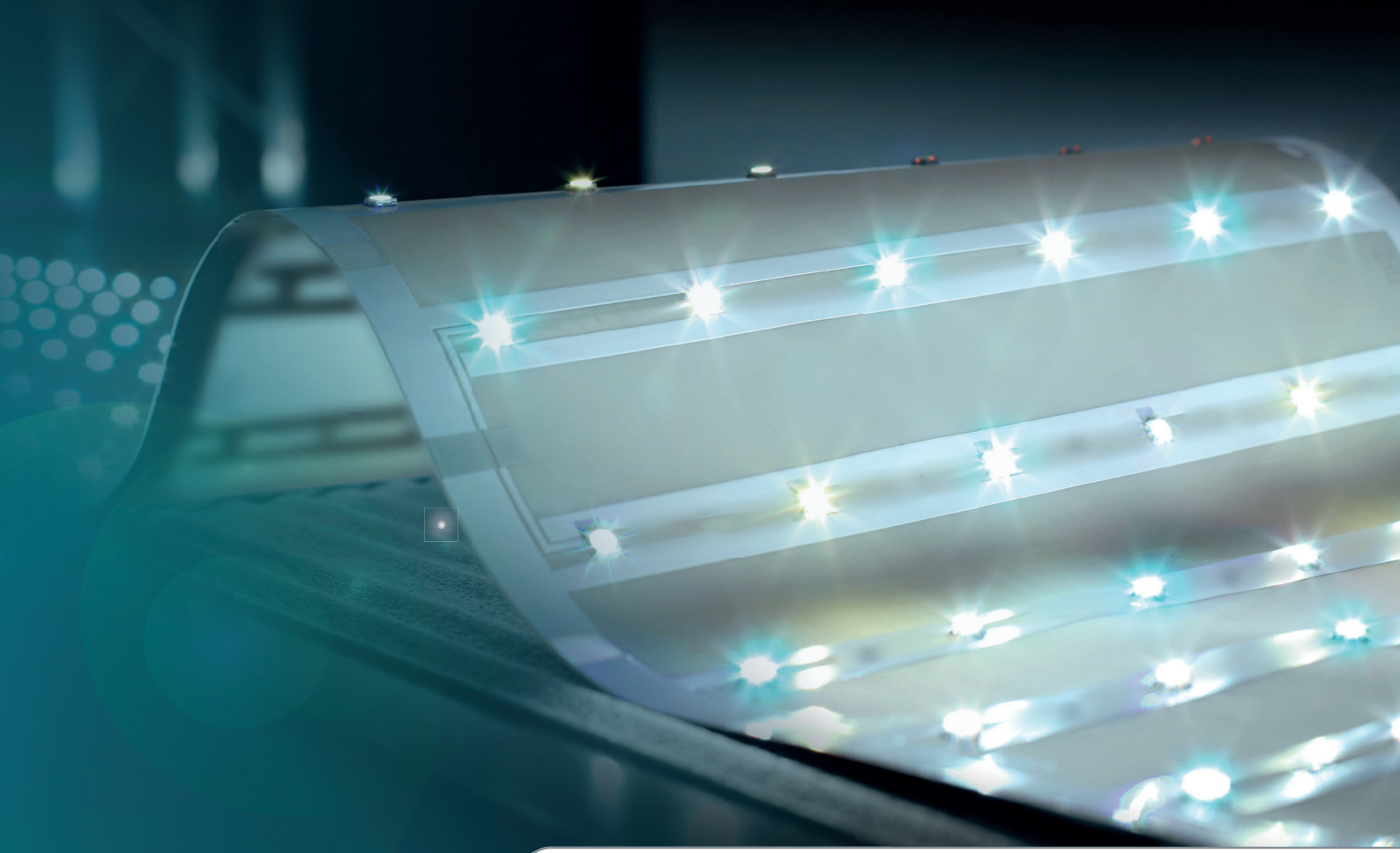


**Mühlbauer**

High Tech International

## SMART AND FLEXIBLE ELECTRONICS

INNOVATIVE REEL TO REEL MANUFACTURING SOLUTIONS  
FOR MULTICOMPONENT APPLICATIONS

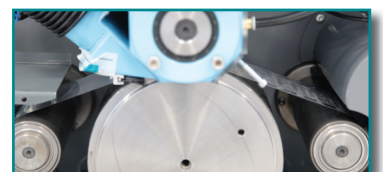
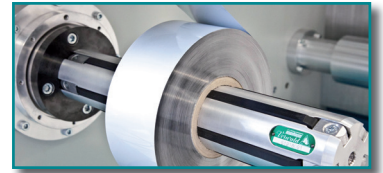
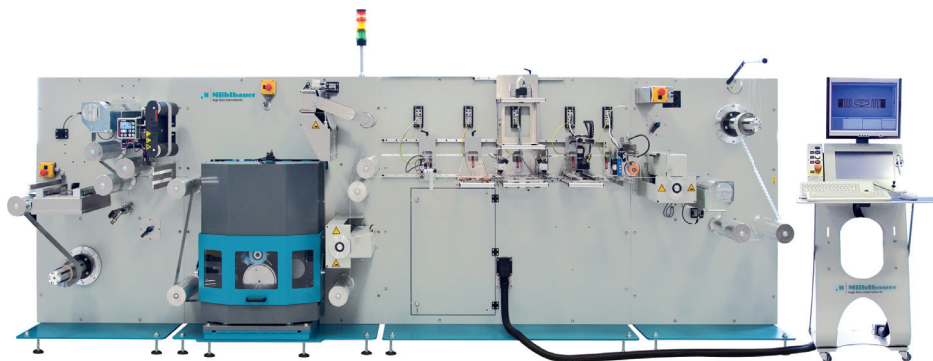


FOR LOW POWER LED, DISPLAY PANEL, ACTIVE RFID AND MORE

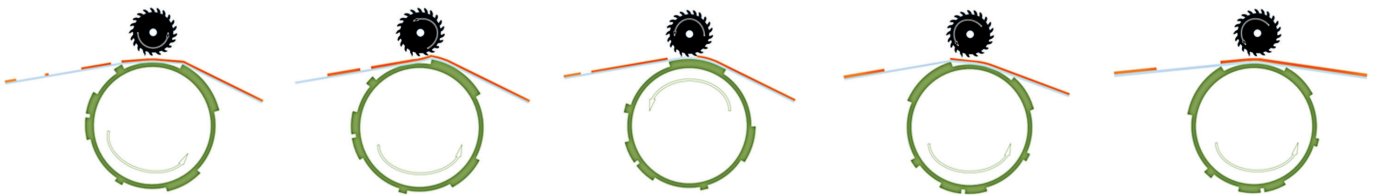
[www.muehlbauer.de](http://www.muehlbauer.de)

# ALUMINUM CIRCUIT PRODUCTION

Produce your own flexible circuit in just 8 hours



Easy and simple process:



Flexible circuit production

## ACS 100 & ACS 350

- Time saving – a new aluminum circuit is created and produced within just half a day
- Design your layout, create a new cliché through laser engraving or etching and start sample production of even high volumes with the ACS - everything within a few hours
- More flexibility – makes you independent of suppliers and their delivery times
- Easy and simple process due to its non-chemical cutting method
- Production yield of 99.5%
- Speed: up to 30m/min.
- Output: aluminum circuit on PET, visually inspected and electrical verified; copper circuit under verification
- Saves up to 50% on cost compared to the conventional etched aluminum circuits

**SPEED**

5m/min

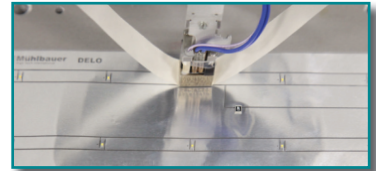
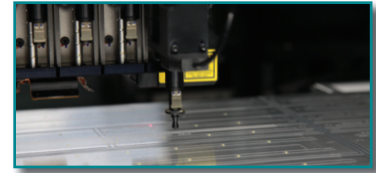
15m/min

30m/min



# REEL TO REEL LED PRODUCTION LINE

## Wide and narrow web solutions for Flexible Intelligence



### MCL - Multi Component Line

Multi row, up to 16 000 UPH  
optional up to 25 000 UPH

## Flexible LED luminaires

### Multi component line "MCL"

- NEW: ALL IN ONE production solution
- Adhesive apply (either jetter via dispenser or printing)
- Conductive glue (such as ACP or ICP) or solder paste
- Flip chip (CSP) LED or SMD package LED attach
- SMD component assembly, i.e. electronics, sensors, connectors, batteries, lenses or RFID
- Placement accuracy of +/- 50µm
- In line curing (thermodes or reflow oven)
- Glop top unit for encapsulation
- Integrated test station
- Output slitting (optional)
- Wind up with support of spacer tape

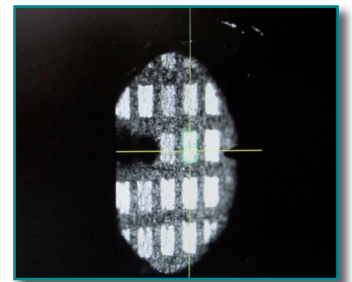
UPH



1 000    3 000    10 000    20 000    25 000    30 000    35 000    40 000

# WAFER TO WAFER / PANEL LED PRODUCTION

## LED display / panel production with DDA W2W/P



source wafer

target wafer

## Micro LED bonding

### DDA W2W/P

#### Flip chip bonder for Wafer to Wafer / Panel

- Release of single LED chips from wafer
- LED chip size down to 250µm
- Under R&D: Micro LED chip down to 100µm or even 30µm (target)
- Only good LED chips will be bonded (Bad ones remain on the wafer)
- Placement accurate +/- 25µm optional +/- 15µm
- Die picking WITHOUT a bond head (even without a die ejector)
- Die picking WITH inspection wheel for 100% 6-side inspection and full speed
- RGB panel bonding with super high pixel density down to 20µm
- Multi die transfer process possible
- No bad die replacement / repair required
- Optical inspection included
- Panel size 12", optional 18"

UPH

in future

1 000 3 000 10 000 20 000 25 000 30 000 35 000 40 000

# Solutions for Flexible Luminaires ...

... and Flexible Electronics (flex PCB)

## Mühlbauer Competence in Reel to Reel Assembly



### Luminaire assembly

- Solder or adhesive connection (ACP, ICP or reflow)
- CSP/Flip chip LED or SMD packages
- Electrical components, current or color controller
- Connector, lenses or other components
- Wide web up to 350mm
- Narrow web up to 100mm
- Glob top unit for encapsulation
- Test Unit



### Display application

- Micro LED bonding
- Multi chip bonding
- High speed wafer to panel application

## Applications for Flexible Luminaires and Flexible Electronics (Flex PCB)

### Low and mid power lighting application

- LED strip (single row)
- LED wide web luminaires (multi row)
- Smart Lighting Multi Component layout, combining LED and other applications such as RFID
- Internet of Light

### Multi component electronics

- Get flexible instead of rigid to discover new market applications
- Make use of a super low cost material such as aluminum PET and save more than 30% manufacturing costs
- Other high end materials available such as copper or PI/ Kapton can run as well in case of higher performance
- Latest curing technology for interconnection such as ACP or solder materials

## Performance and boundary conditions

- Flexible luminaires start from 500lm/m (or less) up to 2900lm/m or even >6000lm/m on wide web applications
- Nominal drive current from 10mA up to 120mA with ACP adhesive, higher current possible with solder connections
- Any CCT can be produced e.g.: 2700K, 3000K, 3500K, 4000K, 5700K
- Target CRI is usually >80; on request even higher
- Efficacy: 120 lm/w
- Operating temperature: 0° to 40°C
- Even outdoor use with special packaging / housing

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