



Flexible PCBs with Unprecedented Opportunities for the Lighting Market

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Inhouse Production of Flexible Electronics

Lumitronix is a specialist for [LED](#) systems with in-house development and production for LED modules and controllers in southern Germany. For more than 10 years, the high-quality lighting solutions have been implemented with rigid PCBs. In 2019, an additional production line was added to the machine park, on which flexible substrates can now also be processed in large series using the roll-to-roll process.

With its innovative reel-to-reel manufacturing capabilities for flexible electronics, Lumitronix now sees itself as a supplier to the entire industry and can process a wide variety of electronic components using the reflow process. *"We do not shy away from any challenge in the field of flexible electronics and today we handle numerous customer-specific requirements within the framework of development projects and contract manufacturing. The assembly of electronic components on flexible materials can reduce the complexity of the end product and enable new functions. We consider our technologies to be a unique added value for the entire business. Our goal is to bring challenging and at times futuristic requirements of our customers quickly and reliably to the mass market."* - Paul Sparenborg, Director of Sales.

As flexible substrates, Lumitronix processes various base materials such as polyimide, PET and paper. After a successful feasibility test, customised flexible materials can also be fitted with components. Depending on the application, copper, aluminium or conductive "silver paint" can be used as the electrical conductor. Aluminium and silver

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Innovative Flexible Modules Enable Convincing Advantages for General Lighting

Based on the company's history, the current product portfolio is oriented towards the demand from the classic lighting market. With the manufacturing competences of flexible LED assemblies, new future-oriented solutions for lighting applications are presented.

When compared to rigid printed circuit boards, FPCs are characterised by several advantages. Due to their flexible base material, they can be used individually and due to their low weight, they additionally provide first and foremost luminaire manufacturers with more creative leeway. Furthermore, it is possible to implement whole new dimensions when it comes to the length.

1) Z-Flex - Flexible Module in 56m Roll Form for Easy Installation in Linear Luminaires

For industrial luminaires, an existing LED module based on a rigid PCB (FR4) was converted into a flexible solution. The flexible technology excels in enabling a slim design of the virtually limitless LED board with good efficiency at lower costs, resulting in handling advantages for the luminaire manufacturer.



Left: Example of end product: Application in industrial luminaire. Right: Lumitronix Z-Flex Strip, lengths up to 56m; assembled on flexible PET substrate

The modules are produced from roll to roll and therefore do not have to be packed individually. This results in a considerable reduction of logistics effort. There is no need for screwing during assembly, as adhesive strips on the back make fastening easier. In addition, a large part of the cabling effort is eliminated.

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The entire roll can be divided every 280 mm over a length of 56 m, which is reflected in one image with 27 LEDs. This dimension is based on the lighting industry's widely spread Zhaga standard of modules (280 x 20 mm) with a length of one foot and is thus compatible with many linear luminaire types.

With the length of 56 m the storage and transport expenditures are lower. The large-scale manufacturers benefit from this form of PCBs, since they are able to further process them on their own production line immediately and in an automated manner.

Also for other electronic assemblies, the use of flexible base materials can bring many advantages over rigid boards (PCB). The following illustration diagram provides an overview:

2) Paper-Flex - Flexible Area Module Made of Paper

For large-scale interior use, Lumitronix produces an [LED](#) module called Paper-Flex with paper as its base material. This future-oriented product, which uses paper as a sustainable and environmentally friendly base, is a novelty in the industry.

The diffusion openness of Paper-Flex is a decisive factor in ensuring that the paper modules can be used as wallpaper. Due to the breathability of the paper, there is no danger of moisture accumulation.

Left: Example of end-product: Application as LED wallpaper (illuminated paper). Top and bottom right: Lumitronix Paper-Flex

The paper modules can be installed in a time-saving manner. The extremely low weight and the roll shape ensure that storage and transport costs are significantly minimised. Moreover, the paper substrate is ultra-flat (approx. 0.8mm after assembly) and thus more than suitable for large-area applications where a low installation height is required.

Lumitronix offers a standard version of Paper-Flex and enables a variety of customised solutions for a wide range of applications. The paper module provides a high degree of individualisation. During production, a wide range of decorative surfaces can be selected from, depending on the customer's application. Whether with or without punching or diffusion layer - basically any combination is possible.

as a base material - especially in the [packaging](#) industry, a great added value can be generated.

Lumitronix sees a high potential for paper as a base material in other applications as well. Paper electronics can be used in the field of advertising in the form of postcards, stationery, posters or packaging and be fitted with light-emitting diodes and other electronic components.

3) Flexibility and Efficiency "Made in Germany" - The LED Strip for Everyone

The state-of-the-art production facility in Germany offers very special competitive advantages on a global scale, both in terms of price and quality.

At high capacity utilisation, the highly automated reel-to-reel production line achieves a price-performance ratio that is unique in Europe. [LED](#) flex strips, which are used worldwide in a typical width of 8 mm, are now produced in high volumes on the state-of-the-art flex production line. The flexible base materials are fitted with electronic components in one piece. In contrast to the conventional production of flexible LED strips, the base material is not soldered together every 50 cm. These solder joints are both mechanical and electrical weak points that are avoided a priori by reel-to-reel processing.

In addition to the standard versions, Lumitronix offers a high degree of customisation options.

4) Never Stop Innovating: Lamination of Flexible Area Modules

These days, a new type of technology is in the preliminary stage for serial production. A new laminating machine complements the production park and is currently busy with initial test runs. The machine is used to laminate the flexible area modules. With this special coating, they become waterproof and robust against physical stress.

The Lumitronix technology is a hot lamination under high pressure. A combination of different specially developed polymers which, on the one hand, create a very hard-wearing top layer on the outside and, on the other hand, ensure that all cavities are filled without bubbles formation on the inside.

If required, textile-reinforced materials are used on the reverse side to achieve a

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possibilities is that there is hardly any colour shifting of the light and a very high efficiency is enabled due to a very high transmission of the material.

The extremely low influences on the photometric properties is the key added value for this type of lamination process. This is the basic prerequisite for keeping the quality of the **LED** system high.

Moreover, the lamination process results in a very flat solution with a total thickness of 2-4mm. With the technology, a protection level of up to IP69K can be realised.

The current set-up can laminate flexible sheets in a size up to max. length of 1.50m, but in the long term, the next step here will also be reel-to-reel automation, which will then also enable longer lengths in one piece.

This way of laminating the flexible modules enables new light installations with LED technology in outdoor areas (architecture or advertising space lighting) or in a humid environment (wellness rooms, swimming pools ...).

For more information about Lumitronix, please visit: b2b.lumitronix.com

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