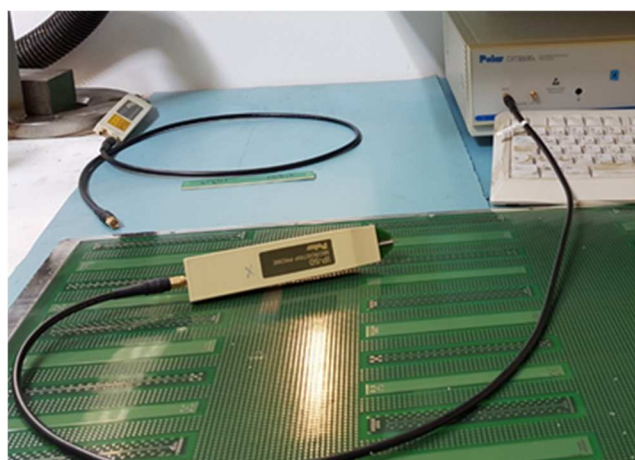


## Impedance control

Impedance controlled boards are today very common and considered standard. However, when track and gap gets smaller or differential pairs are required on innerlayer it might be tricky. MMAB can assist with build-up and calculations. Based on the calculations we can recommend a suitable solution which is often close to what could be considered as standard.

Layer No.	Via	Description	Layer Name	Material Type	Dielectric Constant	Dielectric Thickness	Copper Thickness	Trace Clearance	Trace Width	Current (Amps)	Characteristic Impedance (Zo)	Edge Coupled Differential (Zdiff)
		Soldermask		Dielectric	3,3	12,7						
1	203	Signal	Top	Conductive			70	151	147	0,67		100,04
		Prepreg		Dielectric	4,3	200						
2		Plane	GND	Conductive			35					
		Core		Dielectric	4,3	355						
3		Plane	GND	Conductive			35					
		Prepreg		Dielectric	4,3	340						
4		Signal	Inner 4	Conductive			35	287	100	0,31		120,16
		Core		Dielectric	4,3	355						
5		Plane	GND	Conductive			35					
		Prepreg		Dielectric	4,3	200						
6		Plane	GND	Conductive			70					
		Soldermask		Dielectric	3,3	12,7						

Regardless all calculations one should allow adjustments of build-up and track/gap. This will optimize the impedance values for the material and manufacturing processes used at each manufacturing site. MMAB normally calculate with +/-10% tolerance from specified impedance value, provided that minor adjustments are allowed.



MMAB are using TDR-measurement (Time Domain Reflectometer) with an instrument from Polar, for measurement of both single and differential pairs and values between 40-120 Ohm. Measurements of required impedance values are performed on a standardized testcoupon positioned in the same production panel together with the printed circuit boards. With this method we will get accurate measurements each time.

If you order your Printed Circuit Boards from us, we offer calculation support for impedance!

**More information about our products and technical support can be found at [www.mmabgroup.com](http://www.mmabgroup.com)**

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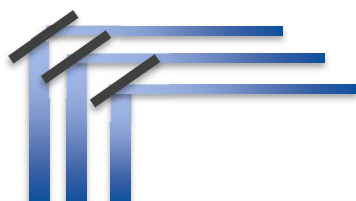
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## Direct imaging of pattern

The investments in our Swedish factory continues according to plans. The photolithographic processes for image transfer are based on old technology with films and UV-exposure. This old method is suitable for simple boards and mass production. A higher resolution and precision are often required for printed circuit boards with reduced track and gap, often with small annular rings. The solution is Direct Imaging and this autumn MMAB installed and started up an advanced machine from Schmolz, Germany.



The blue dryfilm is exposed by 25  $\mu\text{m}$  UV-beams from a powerful UV-LED via 2 million micromirrors.

Our Schmolz MDI is based on direct imaging with UV-LED and micromirrors which transfers pattern directly from CAM-data with a high precision. This allows fast exposure with a high resolution down to 25  $\mu\text{m}$ , making it possible to produce even more complex patterns.

The new direct exposure also required an upgrade of our cleanroom, where everything from floor to ceiling was replaced, with new lighting and airlock. We also installed an upgraded laminator to coat the production panels with dryfilm prior to exposure.



Schmolz MDI direct imaging installed in our new cleanroom in our Swedish factory.

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