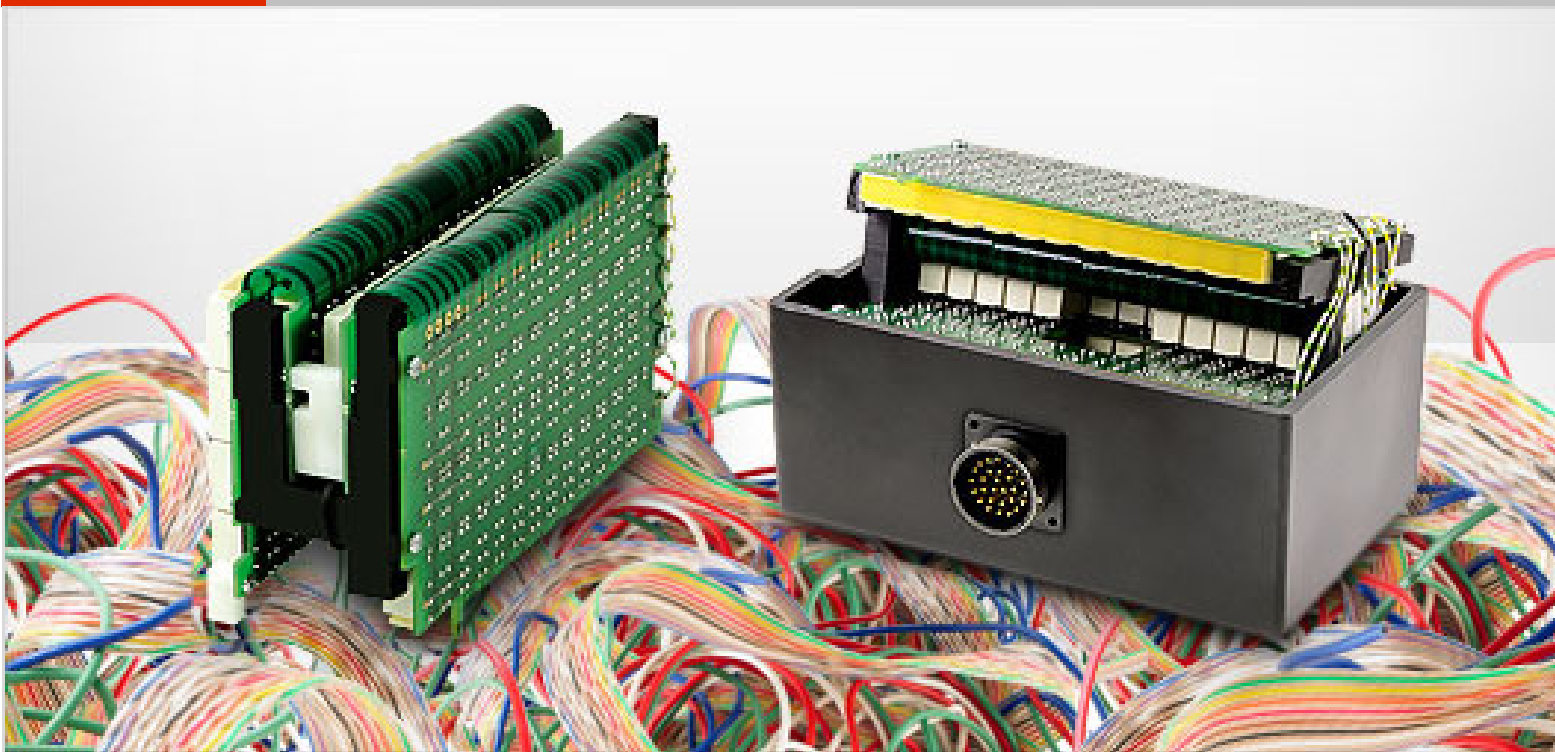


No more cable spaghetti – Wiring 4.0 via Semiflex

March 03, 2015 | 11:00 am

Instructor: Andreas Schilpp



No more cable spaghetti – Wiring 4.0 via Semiflex

March 03, 2015 | 11:00 am
No more cable spaghetti –
Wiring 4.0 via Semiflex



In this webinar we will show you the benefits of the Semiflex technology by creating a scenario. The bases for this is the successful introduction of a mechatronic Semiflex solution. Through a fictional reverse development, we will show you what the PCB system would look like with the use of conventional wiring using plugs and wires. We will compare the two opportunities and evaluate them in terms of:

- Space
- Complexity in developing and manufacturing
- Production costs and logistics
- Reliability and signal integrity
- Material and production costs



Basics regarding Semiflex



Electronic & Electromechanical Components	Printed Circuit Boards	Intelligent Systems	Würth Elektronik Group
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... have already been covered in a Webinar in detail.

Please see in our Webinar Archive or at



Webinars
Speakers
FAQs
Webinar Archive
Basic Design Guide
Embedded Component Technology
Flex-rigid
Part I
Part II
Part III
Part IV

ON AIR

Webinar Flex-rigid III

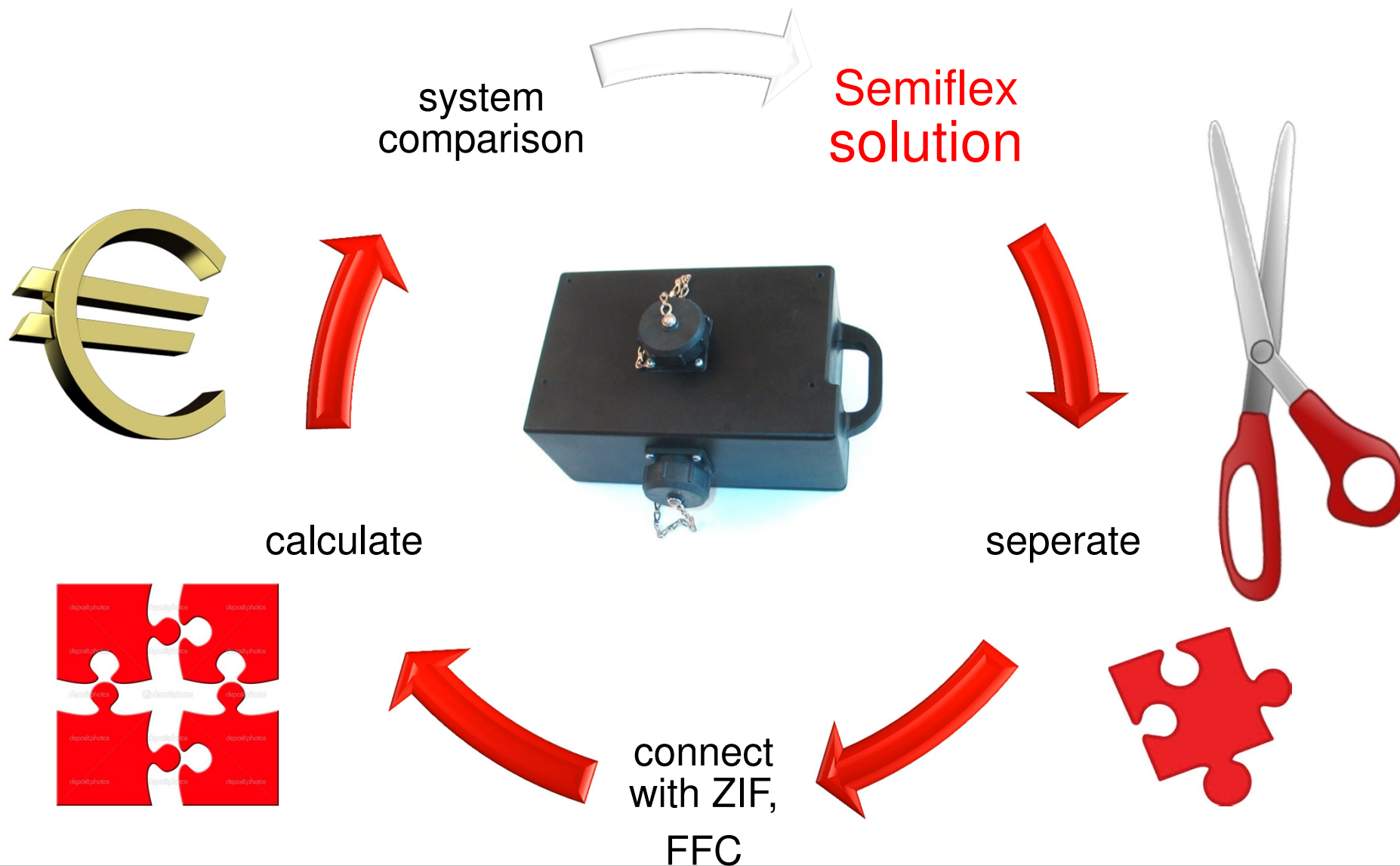
Flex-rigid printed circuit boards:
[FR4 Semiflex - cheaper than a cable harness?](#)

Welcome to our webinar!
We start at 11.00 a.m.

06.05.2014
www.we-online.com

00:06:50:24

No more cable spaghetti – Wiring 4.0 via Semiflex



Application

Switchbox Typ „12 x 13“



Applications:

Groundwater exploration,
geotechnical investigation,
monitoring of dams and dikes,
environmental studies,
geological survey,
mineral prospecting,
archaeology,
detecting of cavities and buried
objects,
underwater, marine, borehole
and cross-hole measurements.

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Black Box



Switchbox 12 x 13

- ca. 200 x 110 x 70mm³
- **156** relays
- driving electronic

switching 12 cables, each 13 signals.

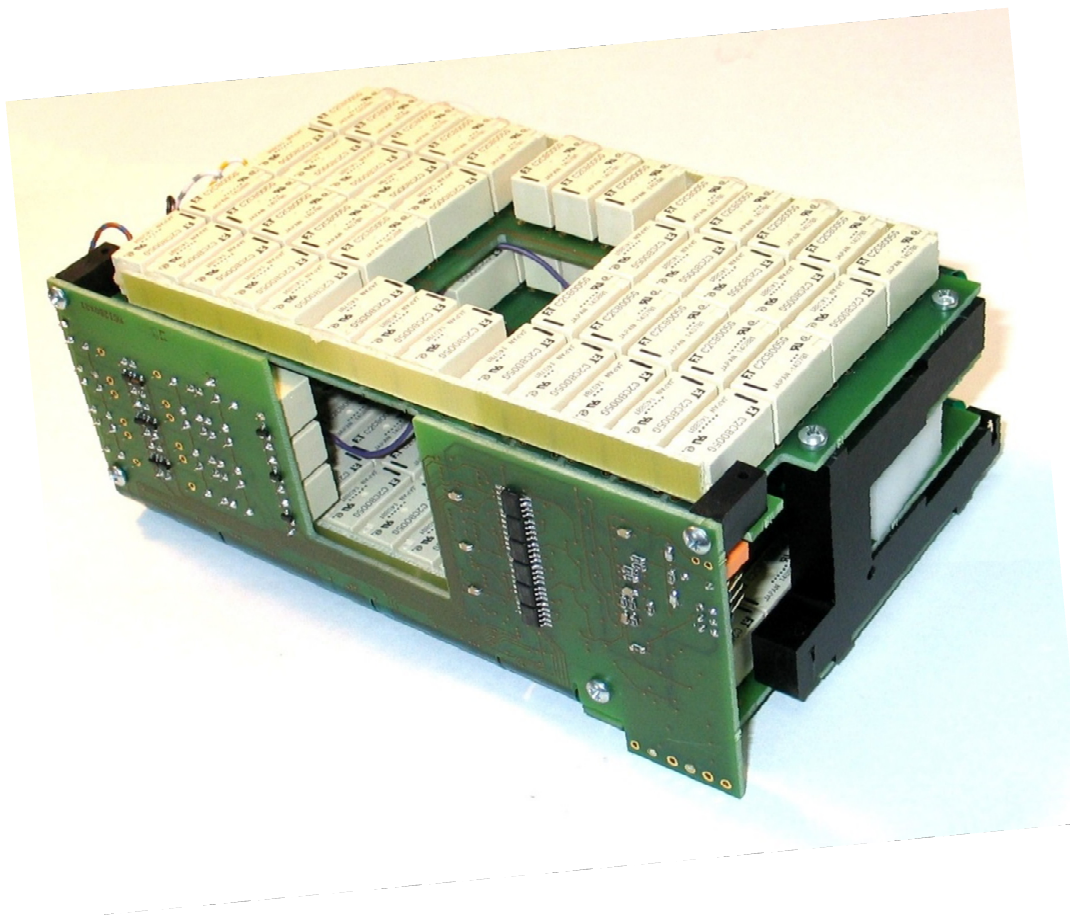
designed for automatic geoelectrical measurement.

This kind of measurement allows to detect geological structure up to hundreds of meters below surface.

GF Instruments s.r.o.
Czech Republic

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total system



Switchbox 12 x 13

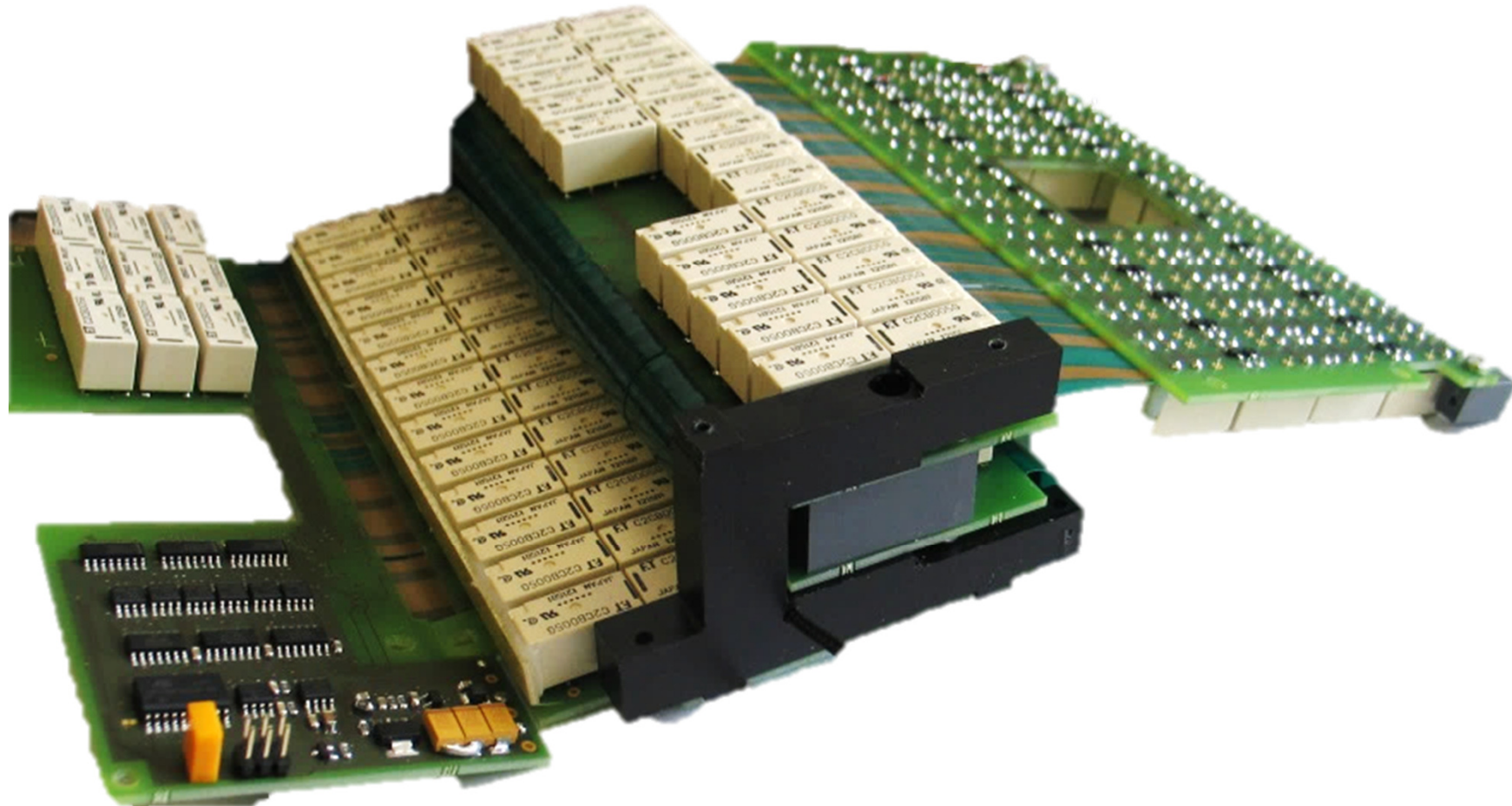
- ca. 200 x 110 x 70mm³
- 156 relays
- driving electronic
- **Semiflex 1Ri-3Ri**

rigid pcb with z-axis milling in the bending area



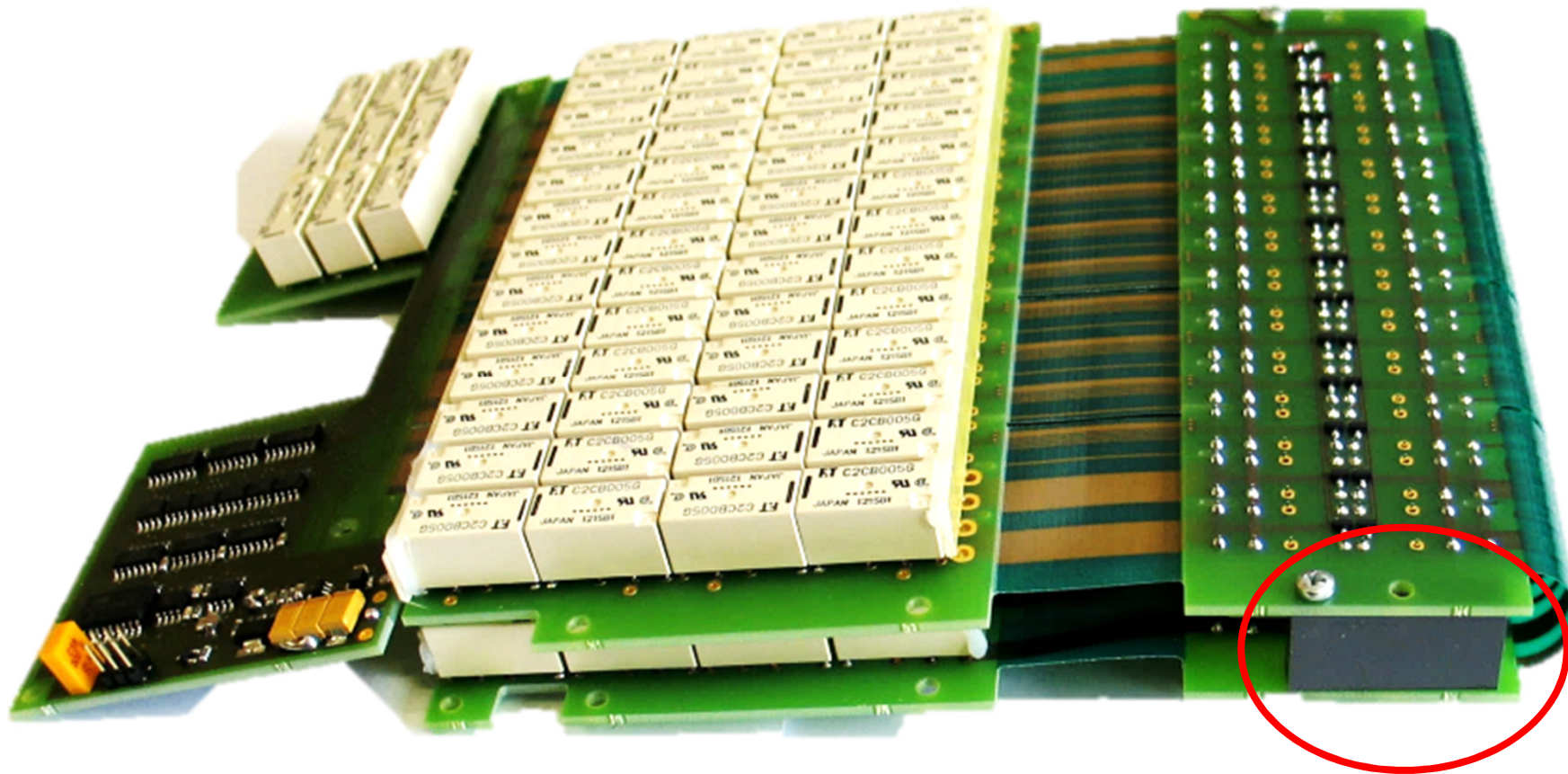
No more cable spaghetti – Wiring 4.0 via Semiflex

2 wings not fixed, rest fixed on carrier



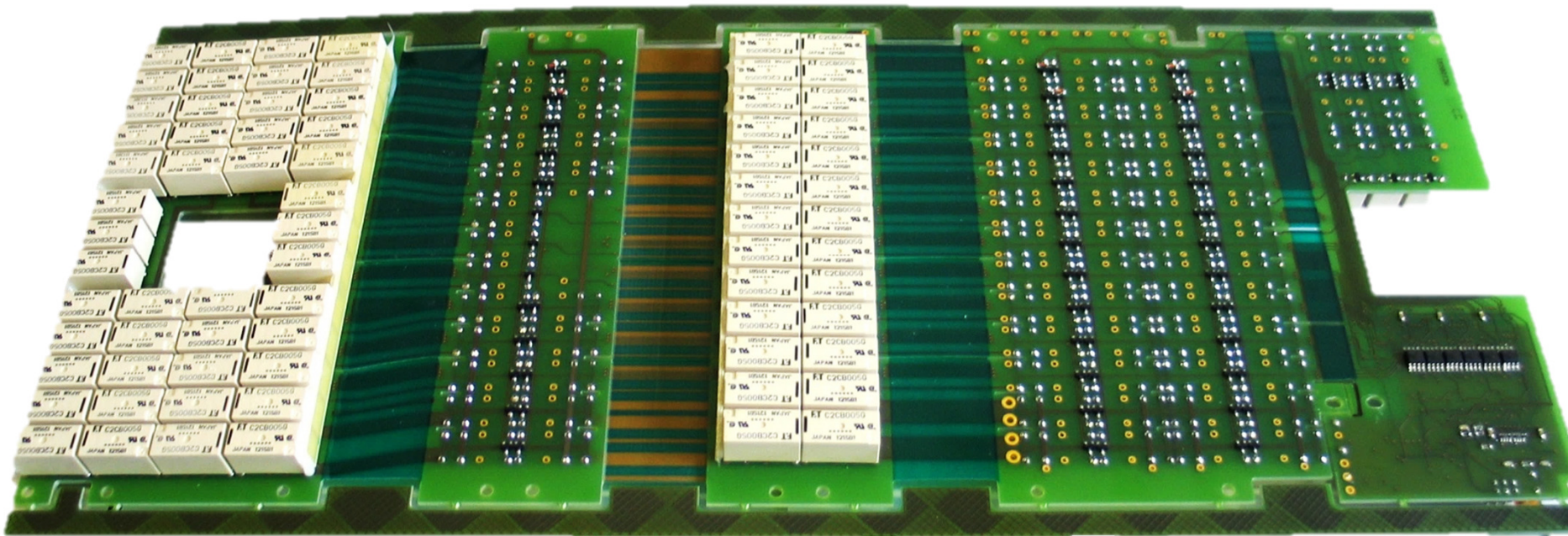
No more cable spaghetti – Wiring 4.0 via Semiflex

1x bended, fixation block

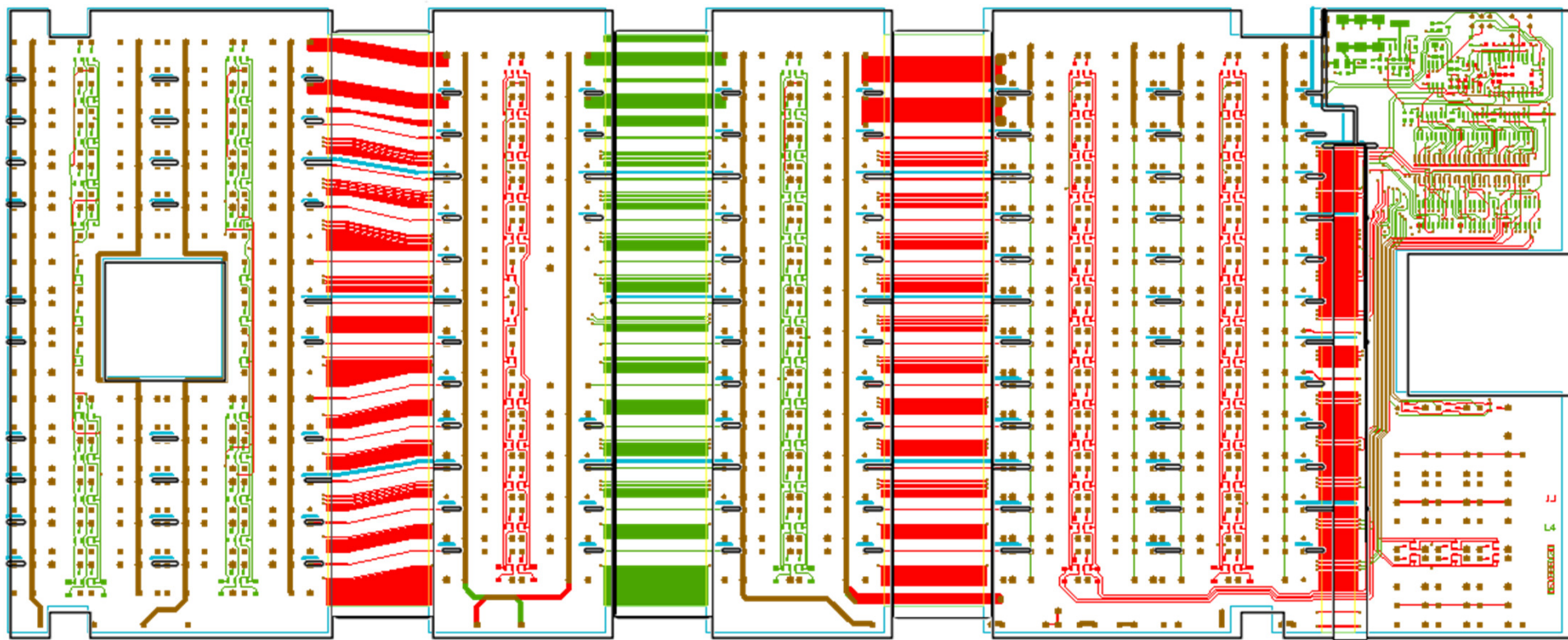


No more cable spaghetti – Wiring 4.0 via Semiflex

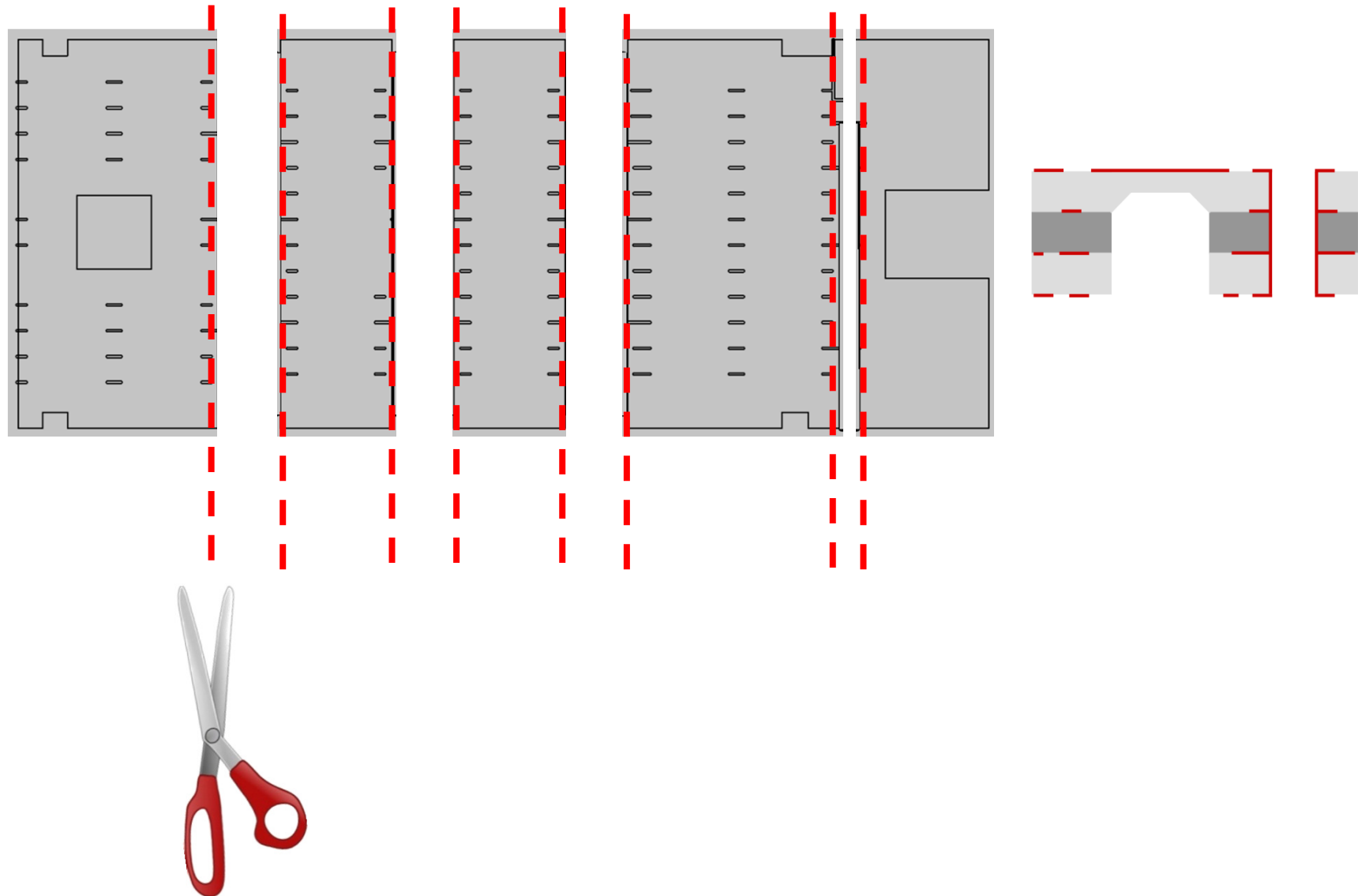
flat, assembled, with delivery frame



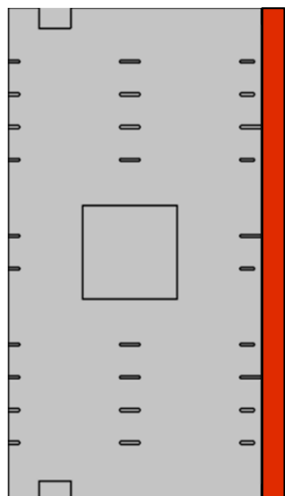
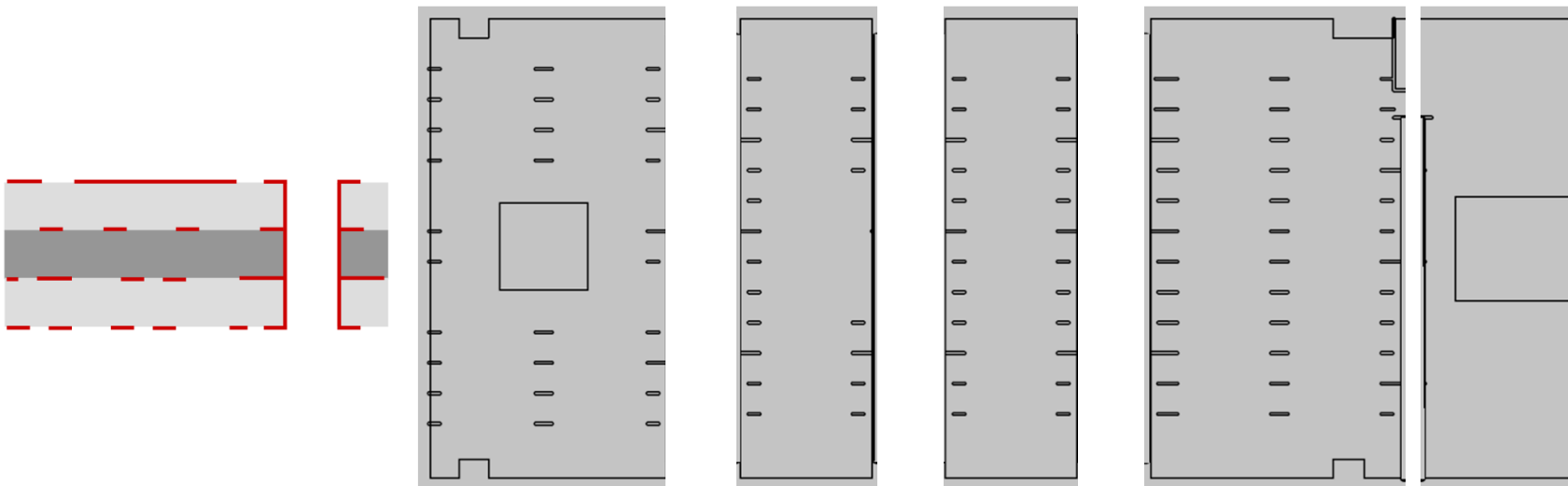
No more cable spaghetti – Wiring 4.0 via Semiflex



No more cable spaghetti – Wiring 4.0 via Semiflex

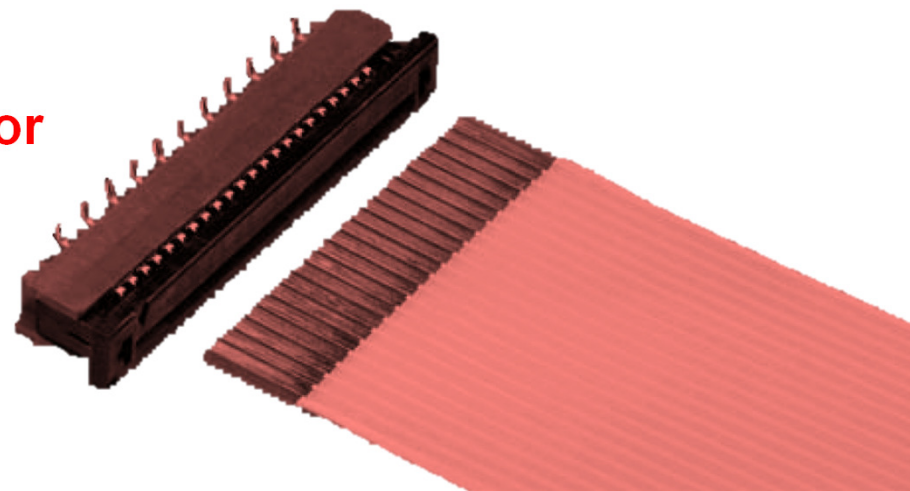


No more cable spaghetti – Wiring 4.0 via Semiflex

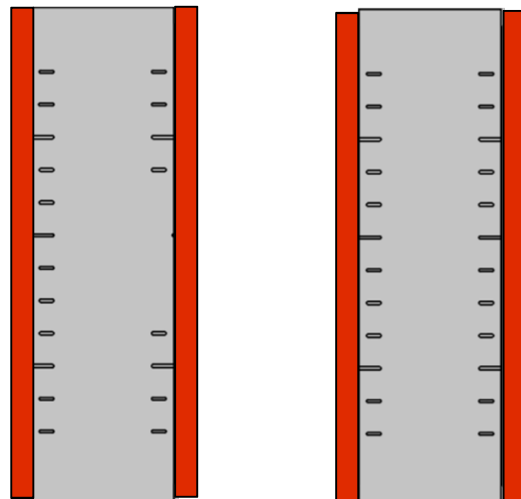
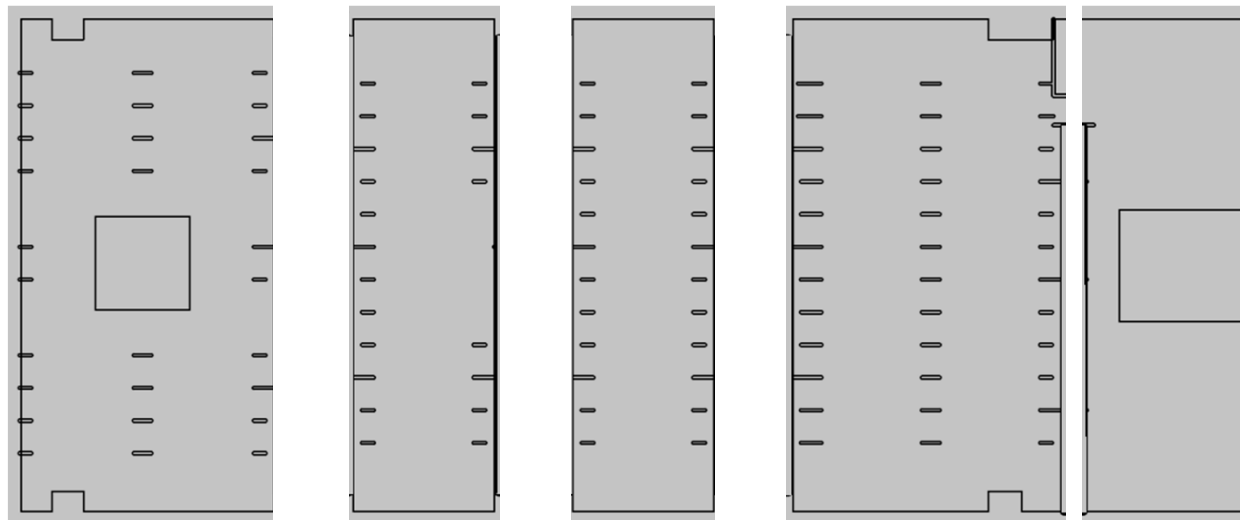


**additional area for
ZIF-connector:**

**width +7mm
+8%**



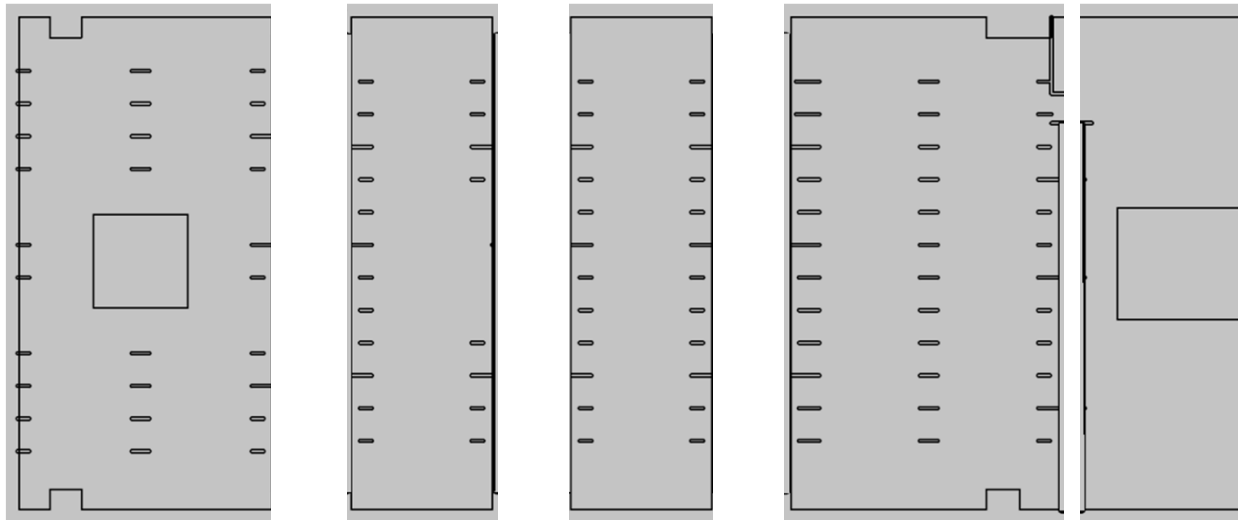
No more cable spaghetti – Wiring 4.0 via Semiflex



**additional area for
ZIF-connectors:**

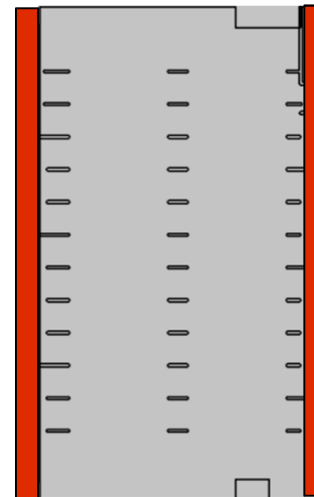
**width +14mm
+30%**

No more cable spaghetti – Wiring 4.0 via Semiflex

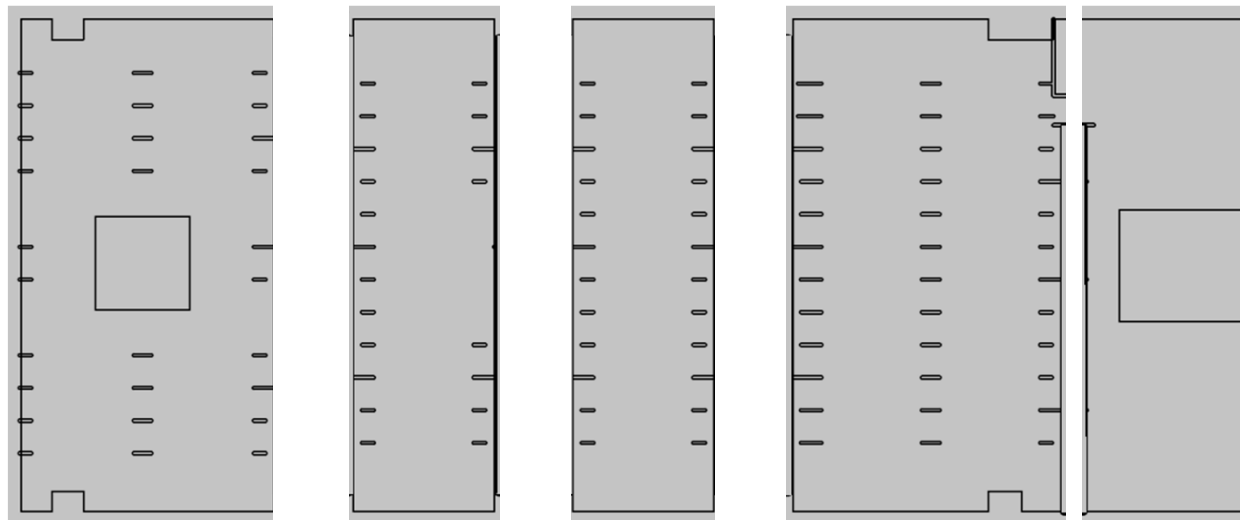


**additional area for
ZIF-connectors:**

**width +14mm
+8%**

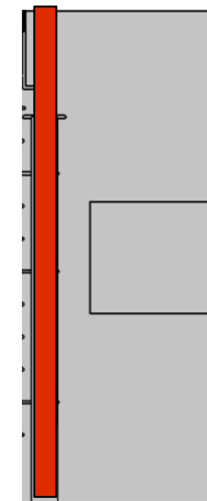


No more cable spaghetti – Wiring 4.0 via Semiflex

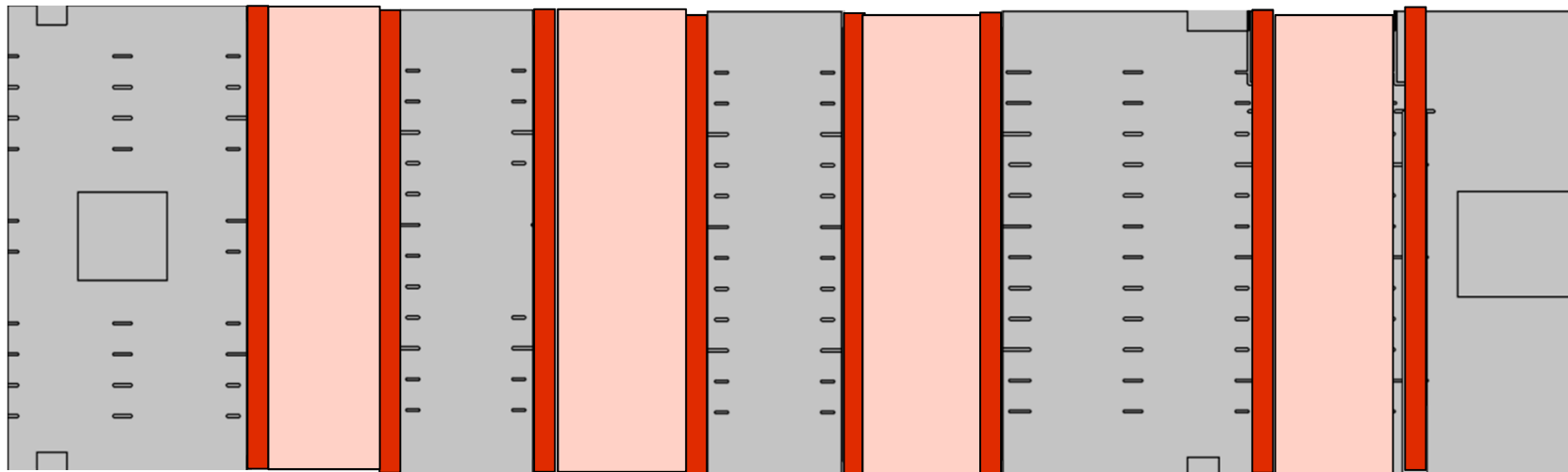
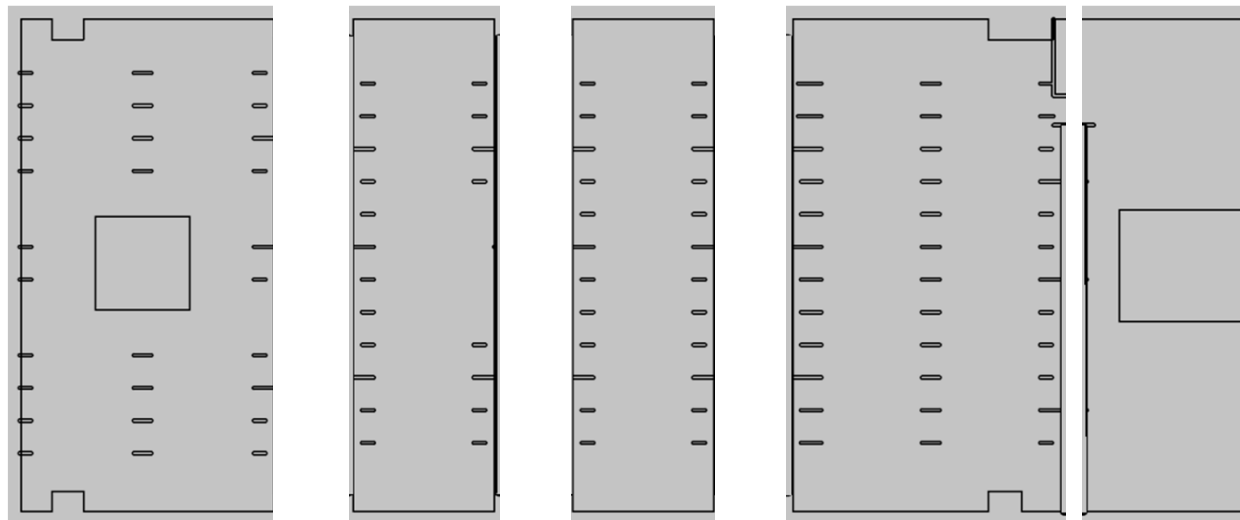


**additional area for
ZIF-connector:**

**width +7mm
+12,5%**

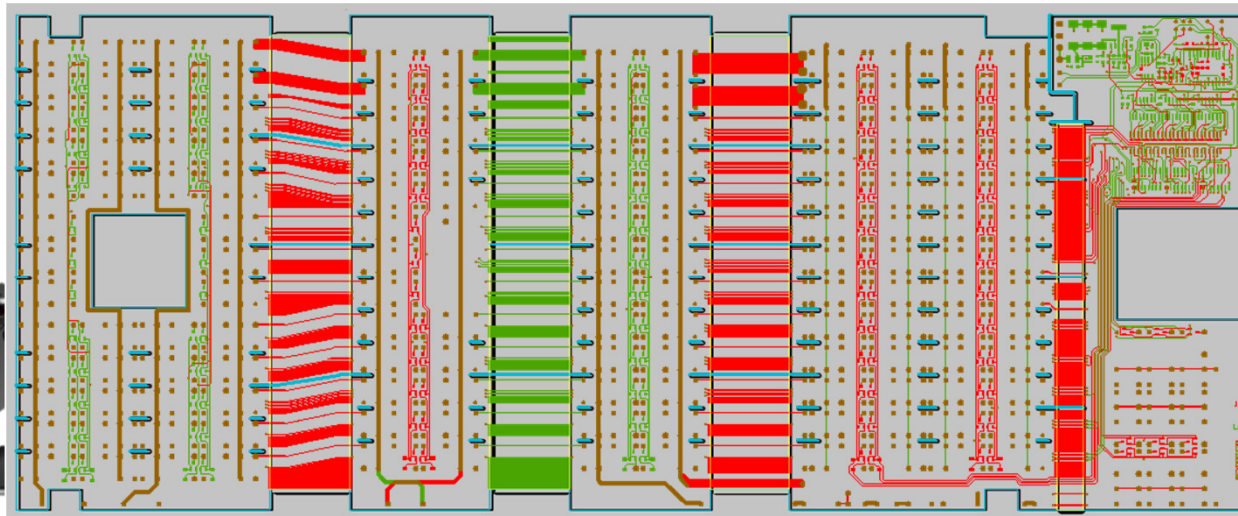


No more cable spaghetti – Wiring 4.0 via Semiflex

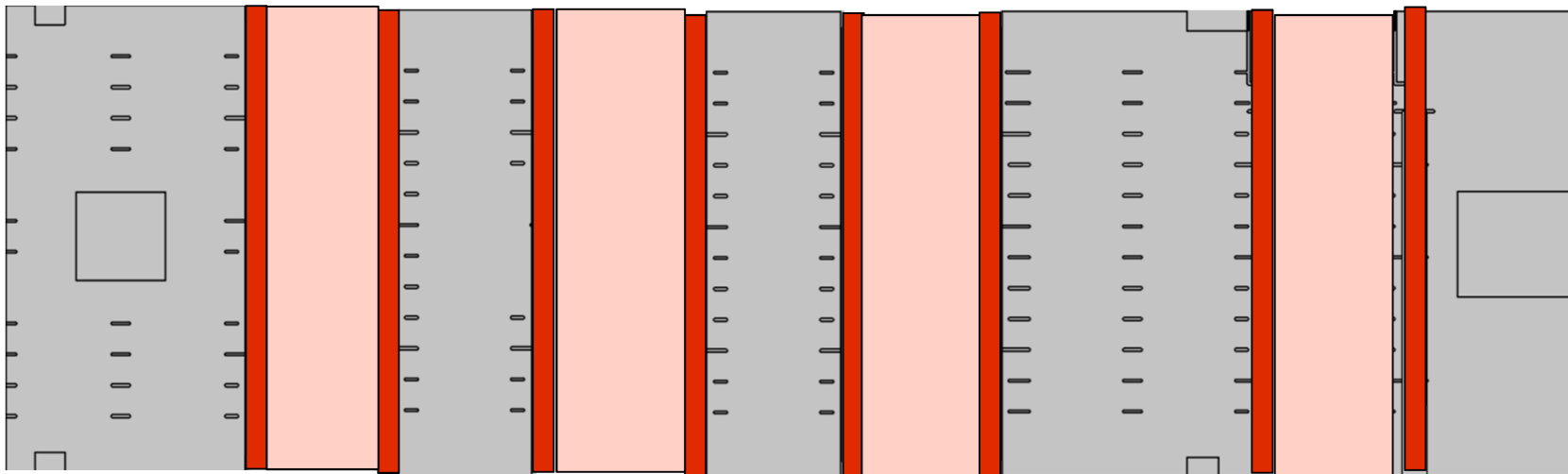




cost comparison: 1.000 Stück

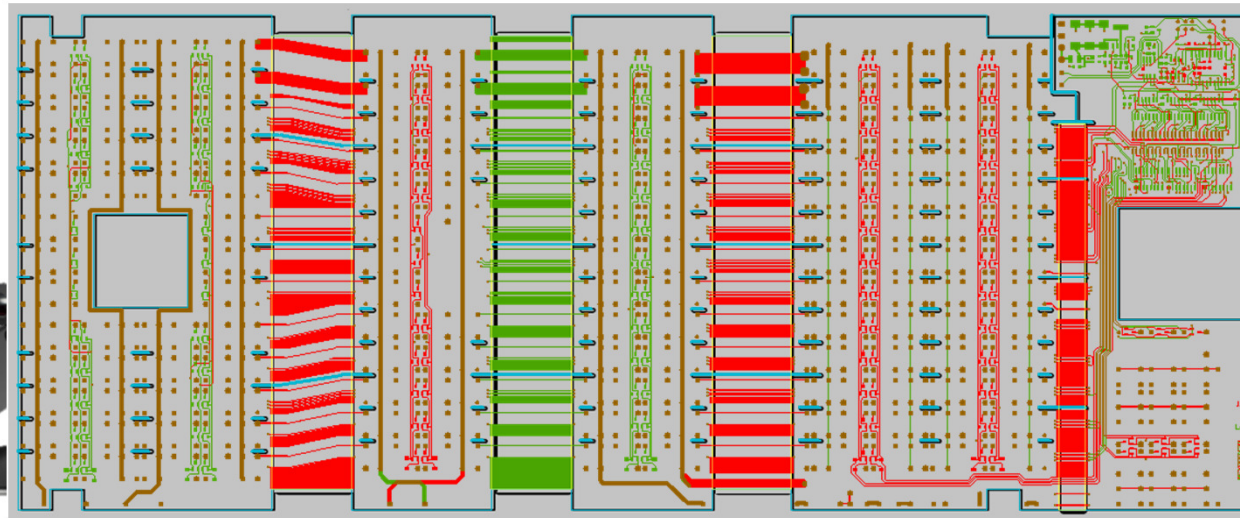


✳

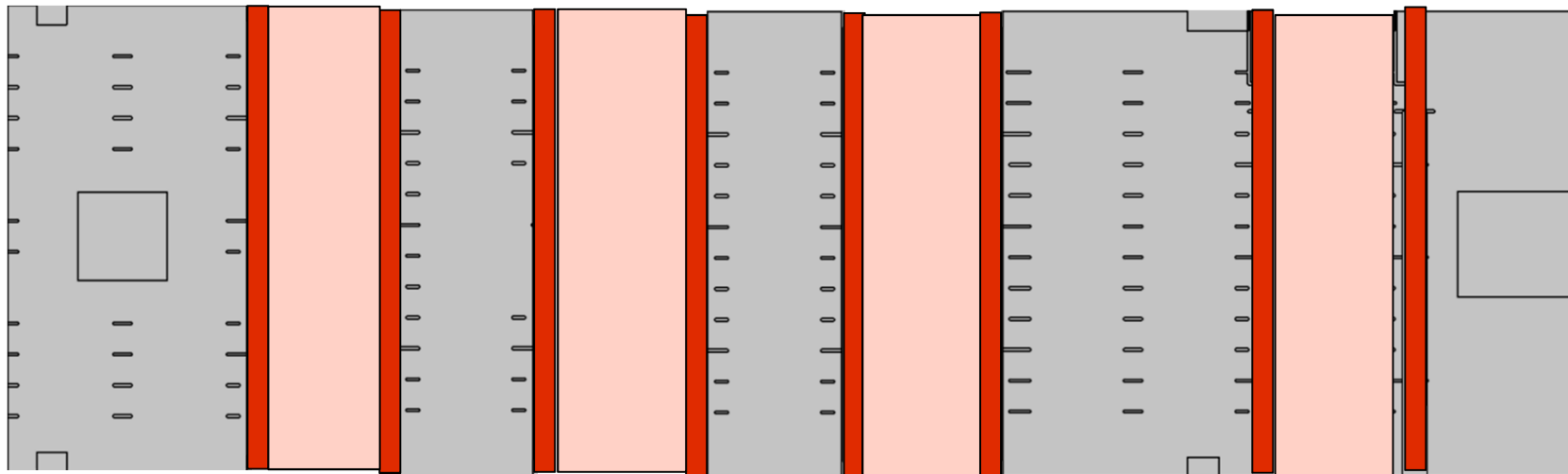




cost comparison: 100 Stück



✳





comparison: total system

	rigid pcbs with cables and connectors	Semiflexible pcb
balance sheet		





Kostenbilanz: Gesamtvergleich



balance sheet	rigid pcbs with cables and connectors		Semiflexible pcb		Remarks
	100 pcs	1.000 pcs	100 pcs	1.000 pcs	
a) pcb price	58,50 €	40,50 €	55,90 €	45,50 €	pcbs from Europe
b) FFC cables, ZIF connectors	30,00 €	13,00 €	-	-	EMS Sweden
c) for this SMD assembly AOI	2,00 €	1,50 €	-	-	EMS Sweden
d) final assembly	2,00 €	1,50 €	-	-	EMS Sweden
e) final test	1,50 €	1,00 €	1,50 €	1,00 €	EMS Sweden
sum of BoM and processing	94,00 €	57,50 €	57,40 €	46,50 €	
			-39%	-19%	cost saving
additional cost factors:					
f) design for	5 pcbs		1 pcb		1
g) inventory control	17 components + 5 stencils		1 component + 2 stencils		
h) assembly expenditure	5 x		1 x		
i) test expenditure	6 x		1 x		
k) stock / logistics	22 positions		3 positions		
l) Pin- and solder connections	312 ZIF-contacts + 312 solder joints		integrated Semiflex connection		

Now we will have a ...

→ POLL

What is correct for you (multiple choice possible) ?

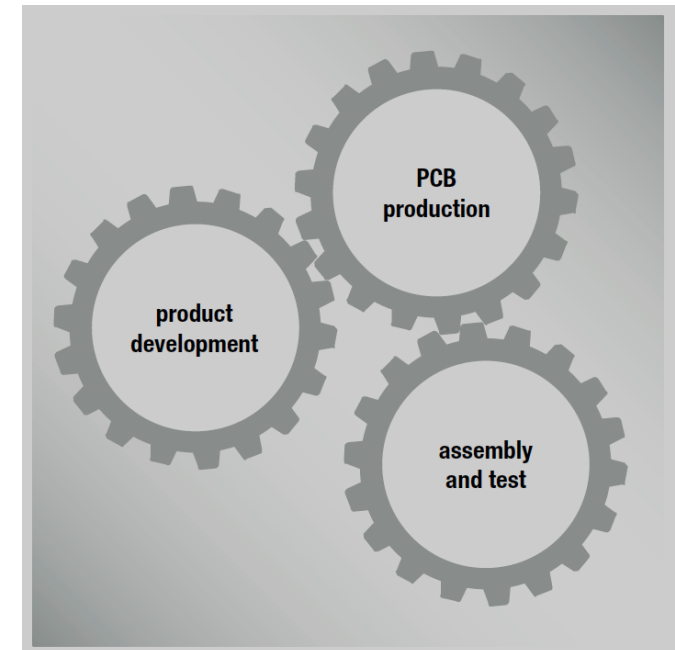
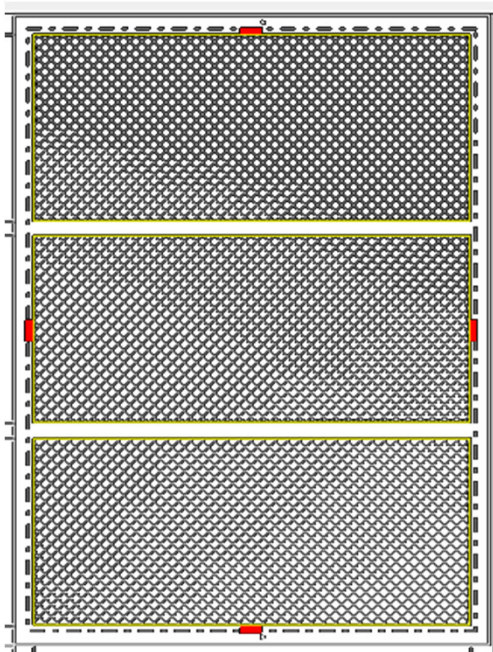
1. We are already using Semiflex
2. We plan to use Semiflex in one of the next projects
3. We have products where we think that Semiflex is possible and reasonable
4. We see restrictions which prohibit the usage of Semiflex





Mechanical design

- optimized size – best area usage possible



- the smaller the box the higher the potential for area reduction!

Mechanical design

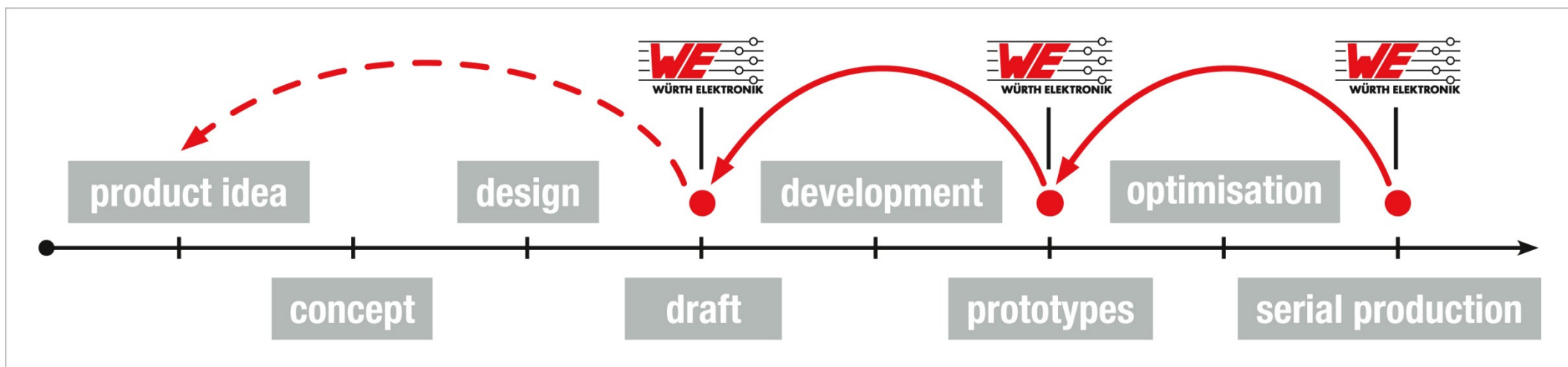
Box assembly

- carriers
- frames
- → stable and reliable fixing of the rigid parts
- → good reliability in case of shock and vibration



Unfixing

- cable / connectors are detachable
- Semiflex provides more stability during handling for box assembly

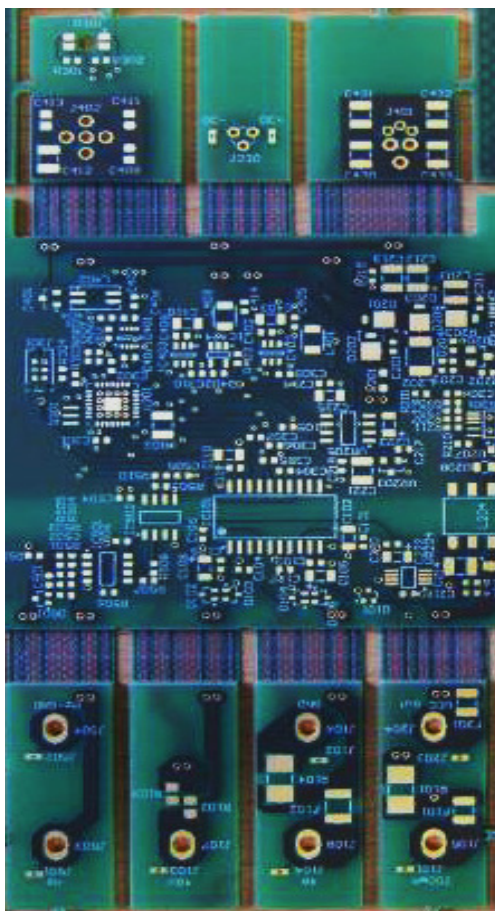


applications

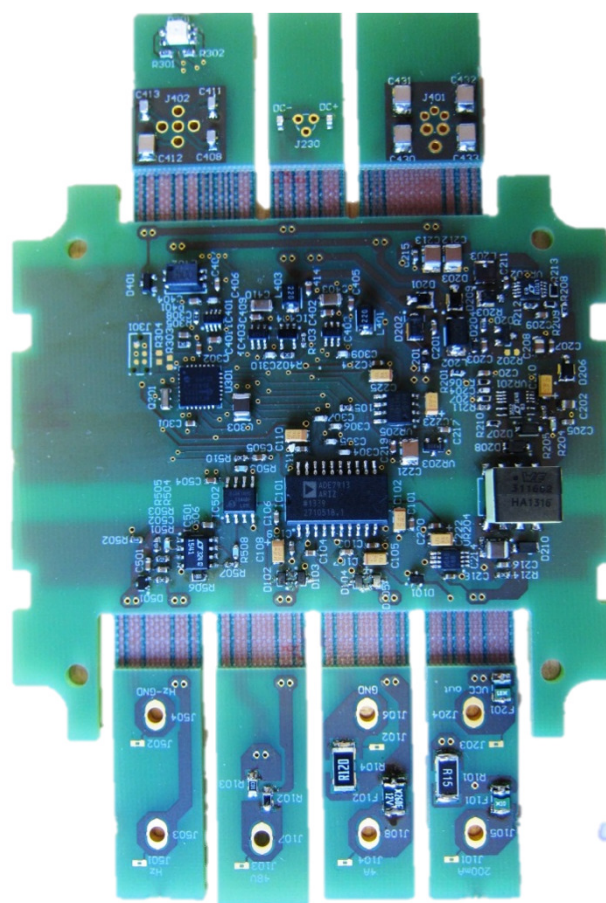
Sensor for hydro drive



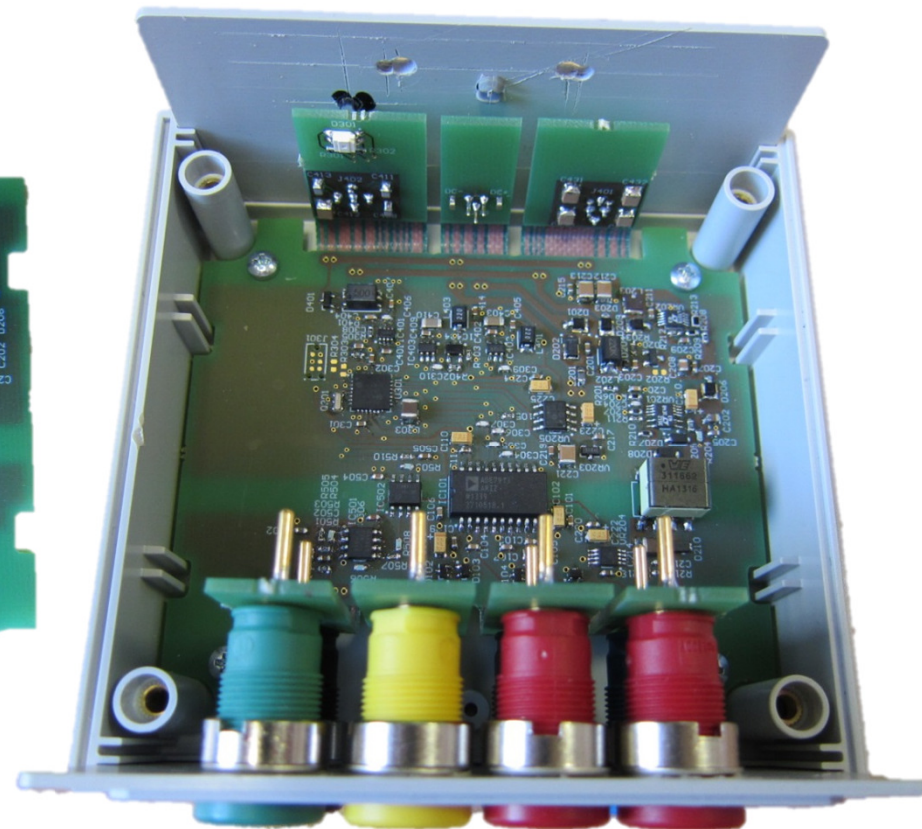
PCB...



...assembled...



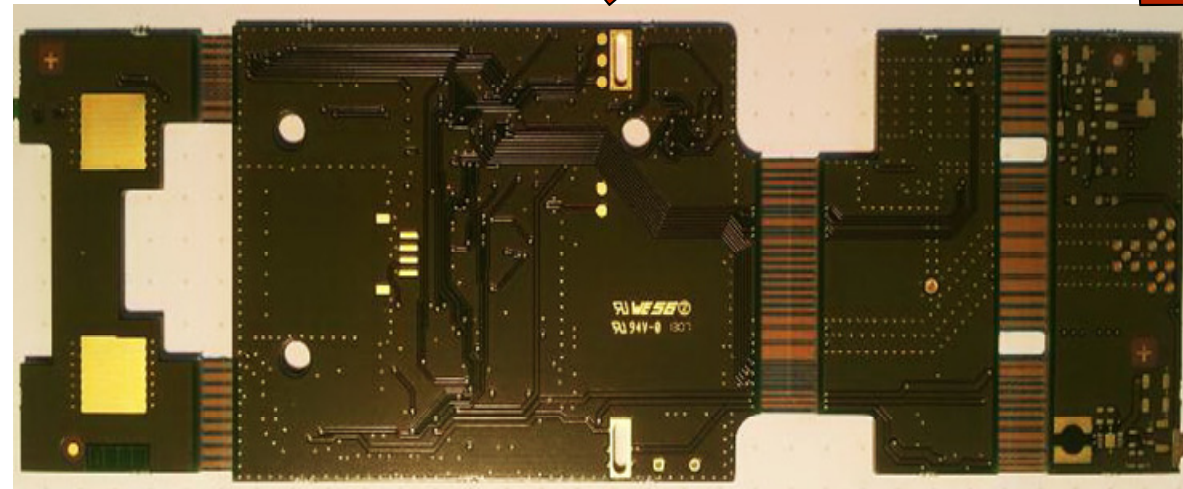
...built-in



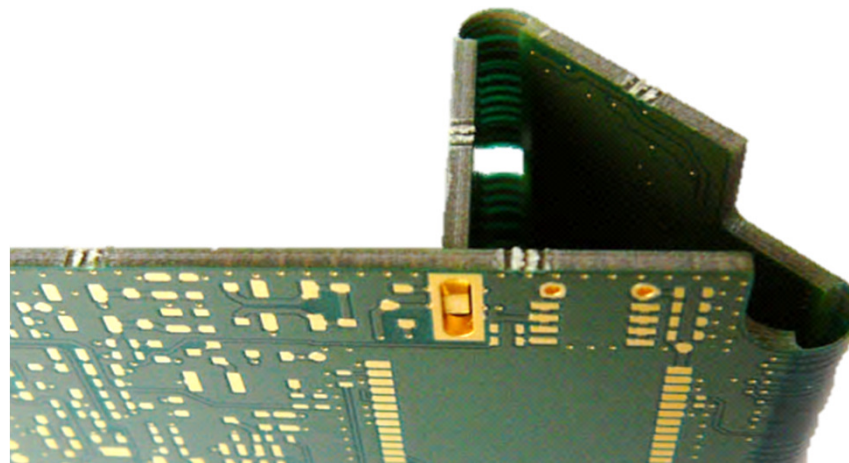
application

GSM module – 1Ri-3Ri

PCB...

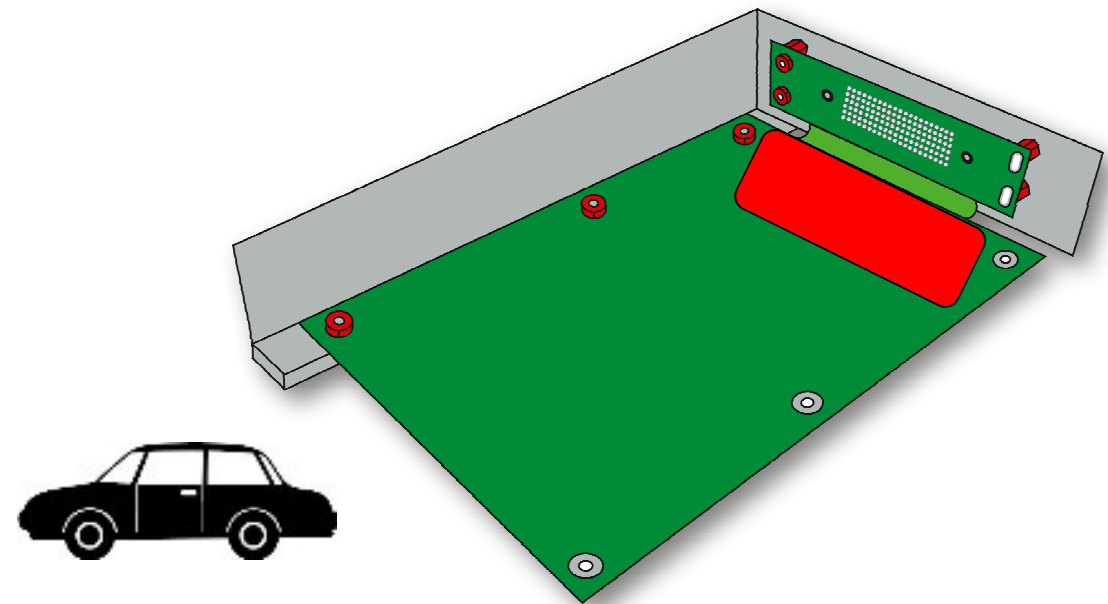
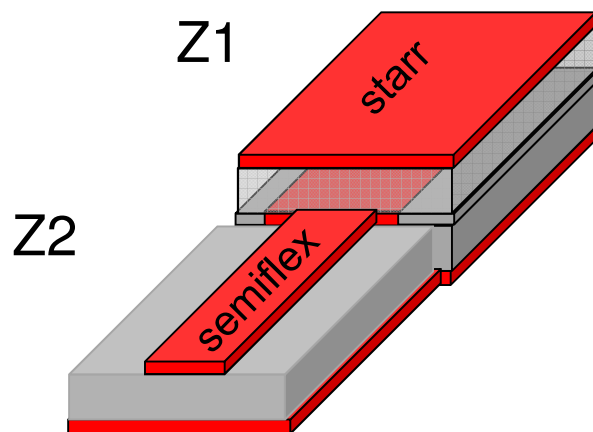
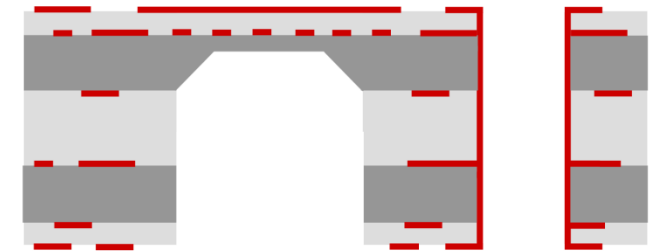


...final shape



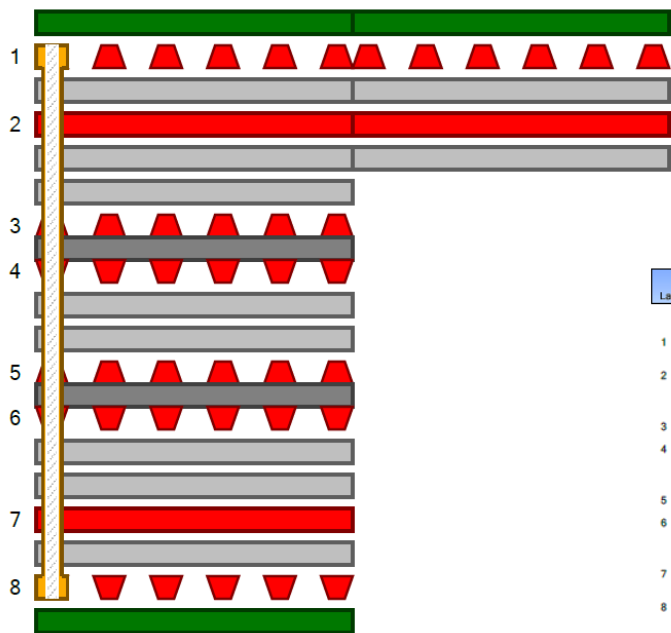
2Ri – xRi : Semiflexible area with 2 layers

- for very high pin count in the bending area
- for complete reference layer – impedance matching
- ➔ replacement of high pin-count connectors and shielded cables
- ➔ in this case price advantage is even higher!





impedance calculation for Semiflex 2Ri-xRi



FR4Semiflex 2Ri-6Ri_1,6_35... FR4Semiflex 2Ri-6Ri_1,6_35...

Layer	Stack up	Description	Type	εr	Finish Thickness	Base Thickness
1		Soldermask		3,50		
1		Cu-Foil			35,00	18,00
2		2116 TG135*	PP	3,60	100,00	100,00
2		Cu-Foil			35,00	35,00
		2116 TG135*	PP	3,60	100,00	100,00

Layer	Stack up	Description	Type	εr	Finish Thickness	Base Thickness	Impedance	Ref.	Ref.	Lower Trace Width (W1)	Trace Separation (S1)
1		Soldermask		3,50						15,00	0,00
1		Cu-Foil			35,00	18,00					
2		2116 TG135*	PP	3,60	100,00	100,00					
2		Cu-Foil			35,00	35,00					
2		2116 TG135*	PP	3,60	100,00	100,00				45,00	0,00
2		2116 TG135*	PP	3,60	100,00	100,00					
3		TG 135*	Core	4,10	200,00	200,00					
3		2116 TG135*	PP	3,60	100,00	100,00					
3		2116 TG135*	PP	3,60	100,00	100,00					
3		TG 135*	Core	4,10	200,00	200,00					
3		2116 TG135*	PP	3,60	100,00	100,00				60,00	150,00
3		2116 TG135*	PP	3,60	100,00	100,00					
4		TG 135*	Core	4,10	35,00	35,00					
4		2116 TG135*	PP	3,60	100,00	100,00					
4		2116 TG135*	PP	3,60	100,00	100,00					
4		TG 135*	Core	4,10	35,00	35,00					
4		2116 TG135*	PP	3,60	100,00	100,00					
4		2116 TG135*	PP	3,60	100,00	100,00					
5		Cu-Foil			35,00	35,00					
5		2116 TG135*	PP	3,60	100,00	100,00					
5		2116 TG135*	PP	3,60	100,00	100,00					
5		TG 135*	Core	4,10	200,00	200,00					
5		2116 TG135*	PP	3,60	100,00	100,00					
5		2116 TG135*	PP	3,60	100,00	100,00					
6		Cu-Foil			35,00	35,00					
6		2116 TG135*	PP	3,60	100,00	100,00					
6		2116 TG135*	PP	3,60	100,00	100,00					
6		Cu-Foil			35,00	35,00					
6		2116 TG135*	PP	3,60	100,00	100,00				25,00	150,00
6		2116 TG135*	PP	3,60	100,00	100,00					
7		Cu-Foil			18,00	18,00					
7		2116 TG135*	PP	3,60	100,00	100,00					
7		2116 TG135*	PP	3,60	100,00	100,00					
8		Soldermask		3,50							

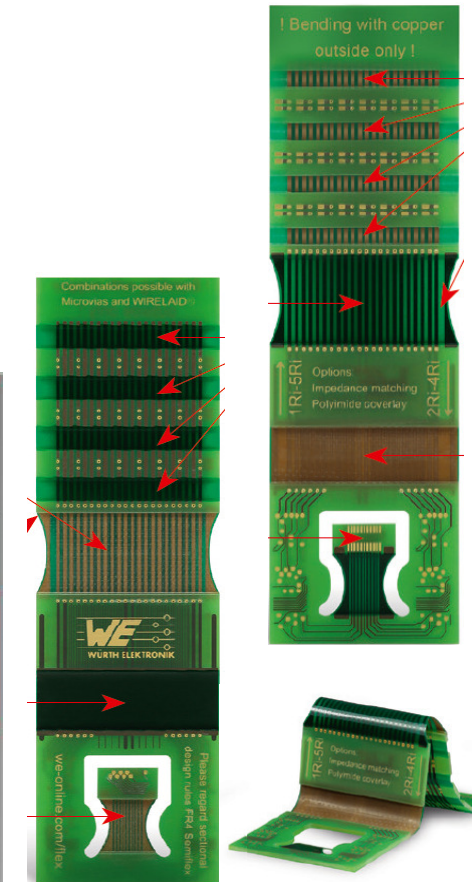
Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Target Impedance	Calculated Impedance	Tol (+/- %)	Lower Trace Width (W1)	Trace Separation (S1)
1		Coated Microstrip 1B	1	2	0	45,00	45,18	10,00	215,00	0,00
2		Coated Microstrip 1B	1	2	0	55,00	54,95	10,00	145,00	0,00
3		Edge Coupled Coated Microstrip 1B	1	2	0	90,00	90,13	10,00	160,00	150,00
4		Edge Coupled Coated Microstrip 1B	1	2	0	100,00	99,87	10,00	125,00	150,00

StackName: FR4Semiflex 2Ri-6Ri_1,6_35/RIGID	Version:	Revision:	Modification:	Date of Revision:	Editor:	
Date: 15.01.2014	Associated Documents:					
Author: Werner Ochsen						
Department:						
Site:						

Software 00000 - 02endbeck
www.pcbstructure.de

Service – our proposal

- design guide
- design rules
- hands-on samples
- training and discussion
- price estimation quotes
- protoypes 1 piece → Series



Final Summary

- this kind of pcb technology is still not very common. But in my opinion there are a lot of possible applications.
- The target of this Webinar was to show the really big potential of this technology
- I am really excited and I am looking forward to your ideas and requests

Thank you very much for your participation!

