

A man with a beard and short hair is looking directly at the camera. He is wearing a dark shirt. The background is a dark blue, textured surface with glowing blue circuit board traces and lines. The overall tone is technological and professional.

# DEVELOP YOURSELF FURTHER

Implement electronics reliably –  
from the idea to series production



A man with a beard and short hair is looking directly at the camera. He is wearing a dark shirt. The background is a dark blue with a glowing, intricate circuit board pattern in a lighter blue. The overall tone is technological and professional.

# FROM DEVELOPER TO PARTNER

Numerous development service providers and customers with in-house product development count on RAFI as an innovative, reliable partner. We plan to further intensify this collaboration work in the future. Why? Because there are multiple benefits for both sides.

### **RECOMMENDED BY LEADING COMPANIES AND PARTNERS.**

We take you on board as a development service provider for a large number of our customers. In return, you recommend us as an EMS producer.

### **NO NASTY SURPRISES.**

By following our guide, you can supply even better samples and pre-series products for perfect series production, enhancing your standing with your customers. This ultimately allows you to make use of development that is ready for series production and save the customer expensive revision loops.

### **IT'S ALL ABOUT SERIES PRODUCTION.**

In RAFI, you are recommending a reliable production partner to your customers. And customers appreciate this. At the same time, RAFI unbureaucratically pieces together the life cycle management for the product with your collaboration. This is how we lay the foundation for a long-term partnership with one clear objective: shared success.





# GUARANTEE YOUR OWN SUCCESS

At RAFI, we constantly analyze our processes and projects. Time and again we have noticed that our customers are impressed by one thing in particular: when producibility and testability are taken into account.

After all, there are often situations in which prompt series production of a prototype is expected, but series producibility is not yet guaranteed. This costs the customer time and effort and, in the worst-case scenario, it costs the development service provider the customer. That's why we've put together a guide that takes producibility and testability into account from the outset – while also increasing process reliability.

We're sure you already take many of these points into consideration, but this guide gives you an additional tool that provides you with all the key points at a glance. We'll also be happy to support you with a qualified Dfx analysis to confirm production and testing suitability in advance.



- 1. Functional sample or qualification sample?**
- 2. Already thought about production?**
- 3. Already got your EMS partner on board?**
- 4. What's the best way to electrically test the assembly?**
- 5. What about automation?**
- 6. Already optimized your parts list?**
- 7. What data is included in the optimal data package?**



# 1

## FUNCTIONAL SAMPLE OR QUALIFICATION SAMPLE?

As you know, the sample type defines the entire process. That's why it's essential to clarify, right from the outset, whether you or your customer need a functional sample or a qualification sample.

### FUNCTIONAL SAMPLES

With a pure functional sample, the PCB is highly likely to change during the course of the process, due to a planned or required redesign. Yet there are opportunities to offer your customer added value here – both technically and financially.

#### ARE AFFORDABLE PCBs MADE IN GERMANY AVAILABLE?

Our qualified, German PCB suppliers specialize in functional samples and know all the fast prototype requirements. This will keep you and your customer flexible.

#### HOW CAN YOU REDUCE NON-RECURRING COSTS?

When it comes to samples, your customer only invests in production aids that are absolutely necessary, such as soldering paste printing templates, and in expenses for efficient series production, such as THT soldering templates. They don't implement blank separators until the start of series production.

In the prototyping phase, the customer is therefore not confronted with the unnecessary ballast of series production.

#### FOCUS ON FUNCTIONALITY, YET IPC STANDARD STILL ENSURED?

Your sample must function. The fact that the details of the circuit may still change is not important at this stage. Nevertheless, the functional samples still meet the IPC standard.





## **QUALIFICATION SAMPLES**

It's time for the qualification sample when you or your customer assume that no further redesign will be necessary. There should no longer be anything standing in the way of series production. To avoid nasty surprises at this stage, you should note the following points. Your customer and your nerves will thank you for it.

### **HOW CAN YOU PLAY IT SAFE WITH PCBs?**

Have RAFI purchase the PCB directly from the planned series producer. That way, you can be sure they will also be able to reliably produce the PCB in large quantities. RAFI takes care of panel design to optimize the cost and process. This is easier for you because you don't have to deal with different manufacturers.

### **WHO SUPPLIES SERIES EXPERTISE?**

Experienced EMS manufacturers like RAFI produce qualification samples using series equipment in all process steps. The added value for you and your customers is the certainty that the automated production process will run with top quality and reliability, also at series production quantities.

### **ANY SPECIAL QUALIFICATIONS REQUIRED?**

If special qualification tests are required in your customer's industry, let your production partner know at an early stage. The assemblies can then be tailored to these requirements from the start, during the design phase.



## 2 ALREADY THOUGHT ABOUT PRODUCTION?

If you think ahead with a focus on production from an early stage, you'll save valuable time-to-market. You should contact your EMS partner as early as possible to arrange component procurement. That's because component procurement is almost always time-critical in electronics. Time and again the same questions crop up, so we would like to answer them for you here.

### **WHEN'S THE RIGHT TIME TO ISSUE A MATERIAL PROCUREMENT RELEASE?**

As soon as you've determined the parts list or at least the most important – sometimes hard-to-procure – components. This gives you a buffer zone to cope with delivery bottlenecks.

### **WHAT ABOUT SERIES PRODUCTION QUANTITIES?**

In addition to the material procurement release, you should also issue the series quantity order at an early stage. This ensures timely preproduction and series production in the quantities the market demands. The RAFI advantage for you and your customers: For every sample produced, we focus on checking its suitability for production to enable a smooth workflow with efficient processes in series production.

### **WHAT IF THE PARTS LIST CHANGES DURING THE COURSE OF THE PROJECT?**

No problem. Your parts list is bound to change before the final order placement stage. However, it's usually the less critical components that change.

### **WHEN DO I NEED TO DETERMINE THE COMPONENT DELIVERY DEADLINE?**

Ideally, before the final PCB data is established. Then we can jointly decide whether it's worth investing in the PCB manufacturer's express service for faster sample delivery.

### **IS IT ENOUGH TO SHOW THE EMS PARTNER ONLY THE SAMPLE BATCH?**

In principle, yes – but it's not really practical. If you generally plan with one or two redesign loops, it makes sense to procure the components required for these from the outset.

### **WHAT PRODUCTION DATA SHOULD BE TRACED?**

Traceability guarantees product quality – for you and your customers. So you should put some thought into this at an early stage. During layout design it's essential to determine the correct position of the 2D barcode and the preconditions of the programming processes that require a serial number. RAFI supports you here with valuable expertise and established traceability processes.





## ALREADY GOT YOUR EMS PARTNER ON BOARD?

# 3

In many projects, the EMS partner is brought on board too late – at least, that’s what most EMS manufacturers feel. Yet timely involvement opens up a wide range of potential optimizations for you.

### **WHEN SHOULD THE EMS PARTNER BE INVOLVED?**

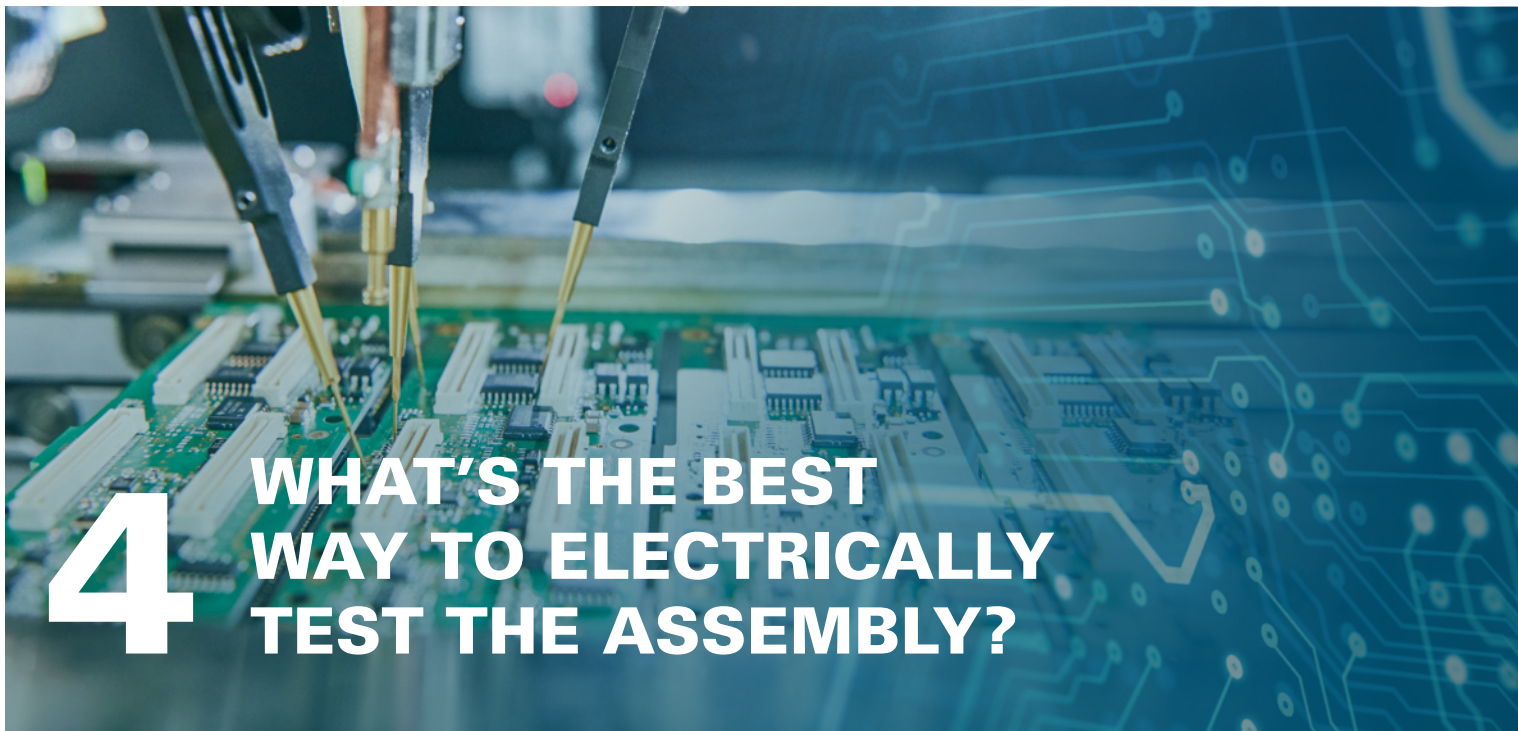
At the latest when the outer layers of the assembly have been almost completely routed.

### **WHAT DOES THE EMS PARTNER NEED?**

Ideally, all the data necessary to outline the project in the best possible way. The function plays a secondary role here. What’s crucial are the parts list, the positioning of the components and test points, the component designs used, and the mechanical properties. An ODB++ data export of the layout contains all the key data for the producer.

### **MOST IMPORTANTLY, HOW DOES ALL THIS BENEFIT YOU?**

Experienced production service providers like RAFI make recommendations you can already implement in the final layout. This often saves you a redesign loop – before you get to the hardware.



# 4 WHAT'S THE BEST WAY TO ELECTRICALLY TEST THE ASSEMBLY?

To answer this question, one thing is crucial: communication between you and your EMS partner – the sooner the better. Test requirements can then be discussed and a test concept mutually agreed on. Always focus on compliance with the agreed specifications and the functionality of your products.

## **WHEN SHOULD THE TEST CONCEPT BE READY?**

At the very latest before you have the qualification sample produced.

## **WHAT SHOULD AN EFFECTIVE TEST CONCEPT INCLUDE?**

A good test concept tells you which tests enable the desired depth of testing within a cost-effective test scope. RAFI can provide specific test processes, such as in-circuit tests, functional tests, boundary scan tests, and end-of-line tests for production. When drawing up the test concept, other issues to be clarified include which test points are specified and which test steps are defined in the inspection specification, including the corresponding parameters.

## **WHICH TEST MAKES SENSE WITH THE CURRENT DATA SITUATION?**

If the data is almost final, there is nothing to stand in the way of early procurement of a test adapter. Remember, needle-bed adapters often have long delivery times. The earlier you act, the sooner your series can be tested. If your data is not yet mature enough, it's too early to get an adapter. But a test in itself is worth it. This is where a flying probe test is useful.

## **WHAT IF THE SERIES TEST HASN'T BEEN COMPLETED?**

If there are qualification samples but the electrical series test hasn't yet been done, we can agree preliminary tests with you.





# WHAT ABOUT AUTOMATION?

# 5

Automation can save you time and money – provided it is meaningful and used appropriately. To find out, you should ask the following questions before the start of the process.

## **HOW LARGE AND SECURE ARE THE PLANNED SERIES QUANTITIES?**

100, 1,000, 10,000, 100,000, or 1,000,000? Automation must be accurately tailored to the guaranteed series quantity. The EMS producer already provides its standard processes with a high degree of automation. For larger series quantities, careful checks are required to see the extent to which manual activities can be eliminated through product-specific automation concepts.

## **IS THE INVESTMENT RISK WORTH IT?**

Your EMS partner invests work in the calculation and development of suitable automation solutions. Based on previous projects, the EMS partner has a good process for estimating which automation options can achieve the corresponding benefit regarding the production costs. RAFI also draws on a large production network and can assess which location can achieve a cost-effective production solution with what degree of automation. This is how, for every range of quantities, we can recommend and implement an optimized automation and logistics process for your product.

## **WHEN DOES THE DECISION ON AUTOMATION NEED TO BE MADE?**

Ideally, you should involve your EMS partner as early as the development stage. This allows processes to be designed for the qualification sample that are already comparable with the later automated processes.



# 6 ALREADY OPTIMIZED YOUR PARTS LIST?

Optimization is always a good idea, and optimizing parts lists is no exception. But why are optimized parts lists necessary in the first place, and what exactly do they look like?

## **WHY OPTIMIZE PARTS LISTS ANYWAY?**

To speed up data transfer to the production partner's ERP while minimizing manual input errors. This requires standardized parts lists.

## **WHY STANDARDIZE PARTS LISTS?**

Experienced EMS partners like RAFI use intelligent software systems to copy customer data automatically to the ERP. So if the parts lists always come in the same file format and with the same structure, the system learns this pattern. The result is faster data transfer and no input errors.

## **ARE CUSTOMER ARTICLE NUMBERS REQUIRED FOR INDIVIDUAL COMPONENTS?**

A parts list with the component manufacturer's parts numbers is ideal. At the very least, we need an Excel parts list with your customer's parts numbers. This allows us to see directly which components we know already from your previous projects and which alternatives are approved. So we avoid the need to check back with you, improve material availability, and keep the process moving fast.

## **WHAT ARE THE ADVANTAGES OF SOFTWARE-BASED AUTOMATION FOR YOU?**

RAFI checks which components are already available in the integral system. This means we can optimize the availability and cost structure for you through multiple uses.



A high-angle photograph of two men in a server room. The man on the left, with grey hair and a light blue shirt, is pointing at a document held by the man on the right. The man on the right, with dark hair and a beard, is wearing a dark blue suit and looking down at the document. The background shows server racks and a blue circuit board overlay. The text is overlaid on the bottom half of the image.

**“THE ENTIRE PROJECT  
DEPENDS ON  
A FAULT-FREE  
PARTS LIST.”**

Tobias Krickl





# 7 WHAT DATA IS INCLUDED IN THE OPTIMAL DATA PACKAGE?

The better the input, the better the output. Of course, this is also true for the production of samples, prototypes, and assemblies. That's why the data quality is crucial for the success of the project.

## **WHAT DATA IN THE DATA PACKAGE ENSURES PROJECT SUCCESS?**

- ODB++ data or a similar ASCII-formatted ECAD format
- Gerber data including drill data
- Specifications for the raw PCB
- SMD and THT layout diagrams
- STEP data of the assembly
- Other production requirements regarding traceability, coating plan, test specification, etc.
- Specifications, drawings, and STEP data on other components, e.g. housing, packaging, mechanics, assembly parts

This data structure will not only make your production partner's work easier, but will also speed up the entire process. And it will reduce your workload significantly. Once implemented, you can base every subsequent project on this.

**If you have questions about any of these topics, feel free to contact us directly.**





#### **HOW CAN YOU SPEED UP THE IMPORT?**

- Use the same column sequence for every parts list
- Ideally also provide us with the manufacturer part numbers, or at least your own customer part numbers
- Always use the same column titles in the header
- Always provide your own customer article numbers in the same pattern
- Separate your data clearly by not grouping together anything that doesn't absolutely belong together
- Use a separate column to enter information such as "n.a." for components that are not populated
- Send a separate list of approved manufacturers if you would like to restrict the selection to specific component manufacturers
- Do you have a master parts list with all the components you use? Please send it too
- Make a note of changes in a change history and assign version numbers to your parts lists
- In Excel, observe the maximum character count of 64 for the customer article number and manufacturer name
- Label THT, SMD, and Mech components in a separate column
- If known, mark components for provision which you provide free of charge
- Use a top or bottom info for each reference designator
- Always separate with the same separator if there are several approved manufacturers (e.g. Murata, 1234567)
- Omit the separator for AML manufacturers

#### **WHAT SHOULD YOU ABSOLUTELY AVOID?**

- Excel parts lists that include VBA, and PDF parts lists
- Never cross out components in Excel files to indicate that they must not be considered
- Do not mix up columns or rows when populating the list





**RAFI Eltec GmbH**

A RAFI Group company

Im Langäcker 1

88662 Überlingen, Deutschland

[info.eltec@rafi-group.com](mailto:info.eltec@rafi-group.com)

[rafi-group.com](http://rafi-group.com)

**RAFI**