



## Customized Electronics Housings Intelligently Packaged Instead of Just 'Hidden Away'

**A White Paper presented by:**

Michael Schlue  
Electronic Housing Product Manager  
Phoenix Contact GmbH & Co. KG  
Blomberg, Germany

Phoenix Contact USA  
P.O. Box 4100  
Harrisburg, PA 17111-0100  
Phone: 717-944-1300  
Fax: 717-944-1625  
[www.phoenixcontact.com](http://www.phoenixcontact.com)



## Customized Electronics Housings Intelligently Packaged Instead of Just Hidden Away

### Key concepts:

- Electronics manufacturers face increasing pressure to reduce manufacturing costs
- At the same time, they need to bring products to the market faster than ever before
- Choosing a full-service, experienced housing partner can simplify this process for the designers of electronic devices

### Introduction

With the increasing globalization of markets, producers of industrial equipment face the pressures of shorter product cycles and falling product prices. Unique visual features and corporate identity are becoming more important as devices from different manufacturers are becoming technically more and more comparable.

When developing new devices or redesigning them, electronics manufacturers are under considerable pressure regarding both “target costs” and “time to market.” All manufacturers want to launch their new products into the market as quickly as possible – but with fixed manufacturing costs. Developing and producing electronics housing takes time and costs money, so many companies have stopped producing these housings in-house. Instead, they draw on professional system solutions created by experienced partners. As device manufacturers reduce their vertical manufacturing range, they must work closely together with housing specialists to optimize new products (Figure 1).



**Figure 1:** An experienced housing partner can provide a wide range of customized options.

### Product Data Available at a Click of the Mouse

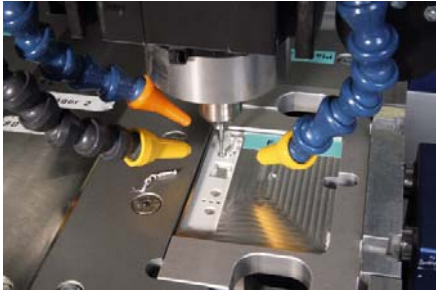
When searching for a suitable housing with mounting rails, it is important to select a supplier with an extensive portfolio. Online search engines, such as Phoenix Contact’s Combicon-Select, can also help hardware developers identify the right product. The user enters the known parameters (such as maximum PC board dimensions, number of input and output signals, specified current and voltage values), and the engine will display a hit list of the items that fulfill these specifications.

Additional product data and supplementary information can be called up with a mouse click. In addition, many of these product selectors provide geometrical data for the selected housing or connection technology in different 2D and 3D formats that can be downloaded via the Internet. First simulation runs of the future device - such as collision tests with the selected components before the first prototypes are generated - help mechanical design engineers avoid mistakes and keep development within budget.

### Customizing

Once the designer has found the right standard product, a housing supplier partner is required. Several questions have to be clarified before the device can be launched into the market, including special colors and color combinations. For instance, labeling options as well as function circuit diagrams or logos must be printed onto the housing. Modification of the front of the housing for operator control and display elements of the devices using milling and or punching must be harmonized and coordinated. Ideally, product models downloaded as CAD files can be individually modified and used for inquiries and calculations.

To determine the most cost-effective production technique, the designer must consider parameters such as expected unit quantities, product lifetime, and investment costs. Here are a few rules of thumb for selecting the best technique (Figure 2):



**Figure 2:** A variety of factors determine the best production technique.

- For **milling**, there are no investment costs. Cost increases in proportion to the number of pieces. This technique is best suited for quantities from 250 units up to several thousand per year. For instance, this might apply during series ramp-up of the devices. An additional advantage: Any changes required can be quickly implemented at a favorable cost.
- Compared with milling, **punching** can shorten production times and reduce costs. Approximately 3,000 housings per year are required to offset the costs for producing the necessary punching tools.

- The **injection molding process** allows a special housing to be manufactured without additional work steps. Individual tool mold inserts guarantee extremely short manufacturing times. Approximately 5,000 housings per year are required to cover the investment costs.

**Color and Labeling**

In many cases, customers would like to have their own individual device design in a particular housing color that differs from the standard items offered in the catalog. Some manufacturers offer a selection of preferred colors depending on the particular housing shape. When ordered at a certain minimum batch size, these are available at the same price as standard housings.

Modern industrial electronics frequently have complex integrated functions that must be explained to the device user. This requires individual labeling - for example pad or screen printing - which must remain legible over the long term even in rugged industrial environments. Thermoplastic insulating materials can also be laser labeled. Readability and contrast depend very heavily on the particular plastic and color combination, the laser wavelength, as well as the process parameters. Once again, an experienced housing supplier can offer valuable advice. After all, an electronics housing is not just “some box” but the integrating packaging for connection elements and electronics, and it has a high impact on the overall impression of the final device (Fig. 3).



**Figure 3:** Electronics housing can be customized to meet customer specifications.

**Connectivity for the Mounting Rail**

The development of PCB connection technology is continually progressing. By using high-tech connector systems for DIN mounting rails, the engineer can network several stand-alone modules and create one system (Figure 4). It is simply snapped onto the DIN mounting rail and takes up a very small amount of space. The housings or devices are then simply attached from above, and an integrated mechanical coding prevents incorrect connections. Connectors with five gold-plated contact metals in a 3.81 mm pitch ensure a reliable, long-lasting electrical connection to the PC board and therefore to the electronics of the device - up to a maximum of 125 V and 8 A.

This makes it easy to establish a reliable connection between different voltage levels - such as bus signals, group fault message, or a common power supply (Fig. 5).



**Figure 4:** DIN rail-mount housings simplify the design process.



**Figure 5:** The T-connector for the mounting rail is used to loop through “power” and “signals.”

T-connectors are available in matching widths 12.5, 17.5, and 22.5 mm of the associated housing of type. This makes local assembly work obsolete (Fig. 6). No special connectors are required for feeding or retrieving signals from the device group. In this case, commercially available connectors in a 3.81 mm pitch can be used.

Some manufacturers also offer a range of accessories, such as cable housing and a special end holder with integrated labeling option. A T-connector for the mounting rail that is independent of the housing can be flexibly used as an option. It is up to the end customer to decide whether they want to have a particular degree of user friendliness and thus select the appropriate option. As a consequence, costs are only increased for those devices that actually require this function.



**Figure 6:** Customized coupling is possible without the need for customary on-site assembly work.

### Customized Electronics Housing - Just What is Important?

When it comes to developing new devices, electronics manufacturers are under high competitive pressure. Outsourcing is often the strategy of choice to cope with shorter product cycles and falling prices. This, however, can only work smoothly if the customer collaborates with the housing specialists during the development phase. The following factors play a key role in the project’s success:

- *Electronic support*  
Online electronic search engines help to select suitable products. CAD geometrical data that can be downloaded permit cost-saving simulation runs to be made at early development stages.
- *Customizing the housing*  
Once the product has been defined, it must be tailored to the individual customer requirements. Special colors, machined housings, and labeling up to custom developments are possible here.
- *Innovative connectivity*  
Ongoing development of the connection technology forms the basis for reliable, ergonomic, and cost-effective industrial electronics. The family of T-connectors for mounting rails from Phoenix Contact is a good example.

### Conclusion

Given the increasing importance of customer orientation, the designer’s objective should be to offer a specific product that can be easily incorporated in the assembly of the final device without any additional work. By integrating a well-conceived and innovative housing with the right connection technology, the customer will have the ideal product to meet market demands.

**About Phoenix Contact**

Phoenix Contact is a leading developer of industrial electrical and electronic technology. The company's diverse product range includes components and system solutions for industrial and device connection, automation, electronic interface and surge protection. Phoenix Contact GmbH & Co. KG, Blomberg, Germany, operates 47 international subsidiaries, including Phoenix Contact USA in Middletown, Pa. Phoenix Contact's formal Integrated Management System is registered to ISO quality, environmental and safety standards (ISO 9001:2008, 14001:2004 and 18001:2007).