BUILT FROM STANDARD COMPONENTS – EMBEDDED SYSTEMS FOR ALL PURPOSES

Depending on the area of application, embedded systems are subject to highly varied requirements in terms of mechanical stability such as shock and vibration resistance, IP and EMC protection and cooling. With its systems based on modular nVent SCHROFF system platforms offers ideal possibilities for fulfilling these different requirements. Systems can be assembled from a wide portfolio of off-the-shelf components for any level of ruggedness required.

SHOCK AND VIBRATION RESISTANCE

Some applications for systems such as in railroad and traffic systems, defense systems or for use near rotating machines, demand relatively high shock and vibration resistance levels. A suitable nVent SCHROFF system platform, together with the broad selection of off-the-shelf components, enables standard systems to be created with shock and vibration resistance levels from 2 to 40 g. Individual configuration of the mechanical system basis, using SCHROFF 19" subracks, with side panels of various thicknesses (screw-fixed or tox-cold welded), 19" brackets and corner profiles and various versions of horizontal rails such as a lightweight horizontal rail with single-point fixing, a heavy rail with two-point fixing or a version with three-point fixing, enables shock resistance levels of up to 25 g to be achieved. This is mostly sufficient for many applications in mobile applications, in defense systems and similar environments.

Fig. 1. Rugged Subrack with VME64x Backplane

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Where higher robustness levels are called for, another system basis is used. The enclosure platform developed for this is formed of aluminum components (base, top cover, side, front and rear elements) bolted together. A hole grid in the side components, top cover and base allows other optional parts such as mounting brackets to be attached. The front and rear elements are symmetrically designed and have identical hole positions and bolt-on dimensions. Various cut-outs can be integrated here for sockets, switches etc. The guides for the PCBs are milled into the base and top cover of the case. This modular enclosure platform is designed for shock and vibration levels of up to 40 g for all kind of applications.

Fig. 2. Completely closed Titan system: high shock and vibration resistance, high IP and EMC protection and high heat dissipation capacity

The systems can also be equipped with high IP and EMC protection. The cooling of the components is realized with conduction cooling. Additionally there is a mechanical system basis that combines these two platforms: 19" subracks plus high IP and EMC protection plus conduction cooling. A such system that is used, say, as a laboratory system for conduction-cooled boards, can also be constructed from off-the-shelf components. These platforms offer users the possibility of testing the technology or application with the conduction-cooled boards initially in the lab. The same components can then also be built into a Titan Conduction Cooled system.

Fig. 3. Robust laboratory system for "normal" and conduction-cooled boards

IP AND EMC PROTECTION

By their nature, ordinary subracks do not have high levels of IP or EMC protection since they are very open. Protection of the system components installed in them is generally provided by fitting the subrack into a cabinet. The fronts of the systems are then provided with appropriate EMC gaskets. If the systems themselves have to offer high EMC protection, they must be given a practically solid cladding. The Titan system meet this requirement, though in their basic configurations they are built without appropriate gasketing. Where requirements are higher, either a pure IP gasket or a combined IP and EMC gasket can be (retro)fitted into a groove provided for this purpose.

COOLING REQUIREMENTS

In most cases the cooling requirement and the type of cooling are selected on the basis of two criteria: the level of dissipation loss and the location of the installation. If the boundary conditions are met, air cooling by convection or forced air cooling are the methods of choice in many cases. In cost terms these are also the best value. Should such cooling methods be insufficient, however, conduction cooling and water cooling come into play, at either cabinet or system level. This may be the case e.g. if the system must offer a very high IP or EMC protection level, which precludes effective air cooling.

In the laboratory systems described above, the plug-in boards are conduction cooled in one area and the heat then extracted by fans on the side of the system. The ordinary system boards are cooled by the fans only. The Titan system offers a still more effective possibility for cooling. Here again we have a combination of conduction and air cooling. Heat is drawn from the PCBs via a simple board frame or a closed frame (clamshell) to the surface of the case, fitted with cooling fins. A sheet metal cover is placed over the heat sinks and a fan with suction chamber is fitted at the rear of the case. The presence of the cover creates an air channel. The internal fan now blows the air through the heat sinks and out of the system.

Fig. 4. Conduction cooled system with additional forced air cooling

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In case no particularly high level of IP protection is required but high protection against direct contact is necessary at board level, a further cooling solution is available. Here the boards are enclosed e.g. in a clamshell that has suitable air openings top and bottom. Air is then forced through these air channels and the heat drawn away from the boards. Another option is to use liquid cooling of hotspots on the boards combined with forced air cooling.

BUS TECHNOLOGIES AND PSUS

For a complete system, backplanes and power supply units are naturally also required. Here also the customer can choose from a wide spectrum of off-the-shelf components. Easily modifiable standard backplanes are available for various bus technologies (e.g. VME, VPX, VXS, CompactPCI, CompactPCI Plus IO, CompactPCI Serial) plus a selection of standard PSUs that meet the capacity demands of various applications.

The wide portfolio of off-the-shelf components for the mechanics, cooling, IP and EMC protection solutions and standard backplanes and PSUs thus enable systems to be configured to the various ruggedness levels entirely as specified by the customer.

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ABOUT ENCLOSURES

Electrical systems come in all shapes and sizes, from massive industrial controls to single components. nVent offers a comprehensive range of enclosures that house these vital assets. Marketed under the nVent HOFFMAN and SCHROFF brands, our enclosures offer two-pronged protection: safeguarding electrical equipment from the operating environment and people from electrical hazards. The nVent SCHROFF brand includes server cabinets, data center cooling solutions, power supplies and subracks and cases.

ABOUT NVENT

At nVent, we believe that safer systems ensure a more secure world. We connect and protect our customers with inventive electrical solutions. nVent is a $2.1 billion global company that provides enclosures, electric heat tracing solutions, complete heat management systems, and electrical and fastening solutions. nVent employs 9,000 people worldwide.

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