



As mobile machinery becomes increasingly automated, its manufacturers must address the requirements of the European Machinery Directive and the topic of safety technology. To avoid the added cost of developing safety solutions in-house, many of them seek assistance from a reliable technology partner.

The evolving market requirements for mobile machinery can no longer be met with mechanical solutions. Agricultural, construction and municipal vehicles are becoming increasingly automated. That means implementing things like fail-safe drive and steering systems as well as (semi-)autonomous processes. Stefan Taxer, B&R's product manager for

mobile automation, observes: "The level of automation we see in mobile machinery has skyrocketed over the past few years."

One of many examples of automated processes are drive-by-wire systems, which transmit information from the gas pedal electrically rather than mechanically. These systems offer many advantages, but are not without risk: "A malfunction while driving could cause a serious accident," notes Taxer. Safety technology is therefore critical for the drive system.

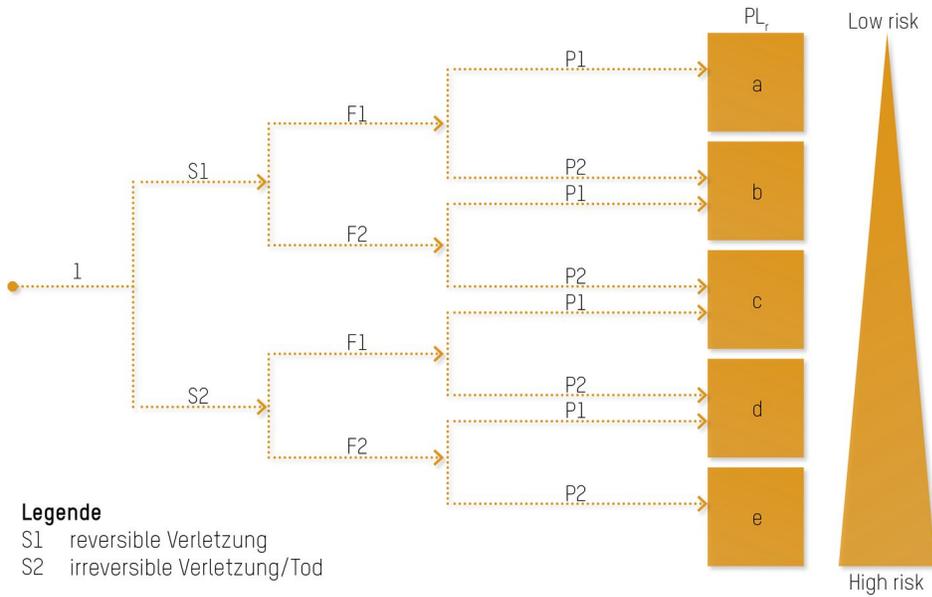
Identifying the safety level

But how does the manufacturer of a mobile machine know which requirements a safety solution must meet? First, they must determine whether the application falls under the jurisdiction of the European Machinery Directive – which is the case for nearly every mobile machine built today. "The Machinery Directive requires manufacturers to carry out a hazard analysis and risk assessment using a risk graph in order to determine the necessary level for the safety function," explains Taxer. From experience, Taxer knows that mobile machinery must generally achieve safety integrity level SIL 2 and performance level PL c.

According to Taxer, achieving these safety levels is no problem using programmable safety technology. "Nevertheless, many manufacturers shy away from programmable safety technology because they consider it too complex," says Taxer. He explains that this does not have to be the case – using the B&R system as an example: "For a wide variety of safety functions, there are software blocks available that are pre-certified by TÜV. The task of safety programming itself is thus reduced to simple configuration and linking of the safe software blocks via ladder diagram. The machine manufacturer then only has to prove to TÜV that this work has been carried out in accordance with the guidelines for safe development. This drastically reduces complexity, workload and certification time.



ISO 13849-1



Legende

- S1 reversible Verletzung
- S2 irreversible Verletzung/Tod

- F1 seltene oder kurze Gefährdungsexposition
- F2 häufige Gefährdungsexposition (mehrmals pro Schicht)

- P1 Vermeidung oder Begrenzung des Schadens möglich
- P2 Vermeidung oder Begrenzung des Schadens kaum möglich

Source: DIN EN ISO 13849-1:2007

The exact performance level required for a given machine can be determined through a risk assessment as specified in ISO 13489-1.



Modular system

The hardware to go with B&R's programmable safety technology is the X90 safety control and I/O system. The performance of the controller is scalable over a wide range and can be supplemented with functions such as additional I/Os, interfaces or vibration-based condition monitoring. The housing is extremely robust and features IP67K protection.

Future-proof technology

Thanks to the modular design of the X90 controller, it's easy to add additional functions – such as interfaces, condition monitoring or, in the future, PLe-rated safe I/Os.

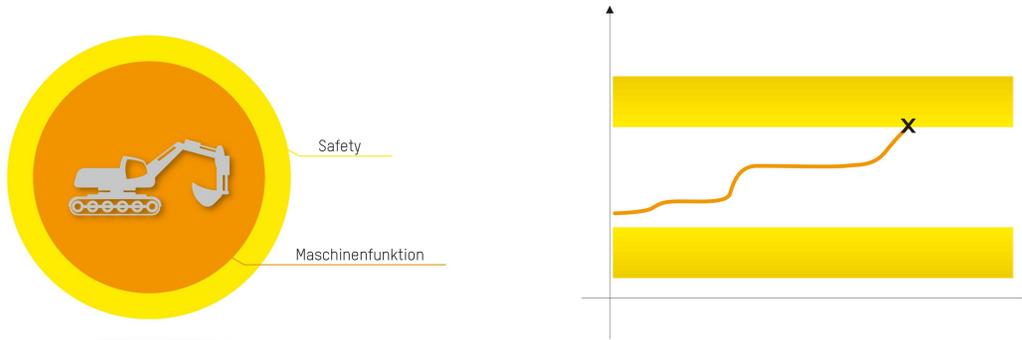
As a technology partner, B&R goes to great lengths to ensure that its platforms are future proof. If the safety requirements increase to SIL 3 or PL e, for example, there would be no need to redesign the hardware. The controller is already designed to support PL e. "In that case, we'll simply develop a new option board with the corresponding I/Os that meet PL e requirements," says Taxer. This board can then be easily integrated into the X90 controller.

Safety for mobile machines

PERFECTION IN AUTOMATION
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B&R also takes great care to ensure that interaction between the standard and safety-related components of a machine application is future proof. The user can imagine the safety solution as a protective yellow shell around the standard machine application. "As long as all the parameters stay within their limits, everything is fine. If a value strays outside its limits, the safety controller takes over and guides the machine into the defined safe state," explains Taxer. The big advantage of this is that when you modify or expand the machine application, there's no need to make any changes to the protective shell. Taxer: "That means there is no need for re-validation or re-certification."



B&R's safety solution forms a protective yellow shell around the machine functionality – only intervening if a parameter strays outside of its defined limits

Technology partner with industry experience

The Machinery Directive is gaining significance for manufacturers of mobile machinery due to increasing levels of automation. Automation specialist B&R has ten years of experience in the field of functional safety and in implementing the directives in industrial applications. This experience applies equally well to the agricultural, construction and municipal sectors. "With our comprehensive hardware and software platform and easy-to-configure engineering modules, we are the ideal technology partner for developing safety solutions for mobile machinery," says Taxer with conviction



Autor: Carmen Klingler-Deiseroth, freelance journalist

Machinery Directive 2006/42/EC

The EU's Machinery Directive regulates which safety measures must be taken by machine builders to ensure that their machines do not pose any danger to operators or others. The primary standards listed and harmonized for this purpose are ISO 13849 for the design of safety-related controls and IEC 62061 for the safety integrity level (SIL). These two standards are internationally recognized and therefore also apply outside the European Economic Area. B&R safety technology products meet the requirements of both standards. Other harmonized standards specify requirements for respective machine types, for example ISO 25119/EN 16590 for tractors and agricultural and forestry machines

"Programmable safety technology from B&R makes it easy to implement Machinery Directive requirements on mobile machines."
Stefan Taxer, Product Manager - Mobile Automation, B&R