

Safe, secure and flexible: Automation solutions for the entire packaging industry

## **Future-proof packaging**

Ostfildern, July 2022 **Within the automation and engineering industry, the packaging sector is the innovative driver and pioneer when it comes to digitalisation. Against the background of today's environmental protection debates and a sensitised public, sustainability issues are becoming increasingly important according to IPV, Germany's industry association for paper and film packaging. There's a rise in demand for fibre-based materials to replace common plastics. So increasingly, packaging plant and machinery must above all be safe, secure and flexible. Safety and security components in automation solutions play a crucial part in the performance, handling ability and flexibility of a packaging machine.**

In light of the emerging trends, innovative automation concepts, tailored to the requirements of the future, are also gaining in significance: classic customer requirements such as high process safety, short downtimes and ease of maintenance now also include efficient and careful treatment of natural resources, plus handling and processing of alternative and recyclable materials. As a result, the demand today is increasingly for intelligent automation concepts, which offer a high degree of flexibility, not only on complete production lines but also on compact machines such as cardboard box erectors, for example. That's why both manufacturers and operators in the packaging sector require automation and safety solutions that are both tailor-made and flexible. These play a key role, not just in new developments, but also on retrofits of packaging plant and machinery that is essentially worth keeping.

## **“The” packaging sector?**

The packaging sector distinguishes roughly between primary, secondary, tertiary and end-of-line packaging. From both the manufacturer's and operator's perspective, the sector is characterised by a number of common issues and requirements, which can be assigned to the various areas. When it comes to the detail, however, they are different. In primary packaging, the product is at the centre. Fragile and delicate to varying degrees, it comes into direct contact with the plant and the respective packaging: dairy products, which must be packaged in a bottle; pharmaceutical substances in a plastic container; cold meats in the trays provided. Filling and packaging processes in the food and pharmaceutical industry have high hygiene and cleanliness requirements. Secondary packaging machines transport primary packaged products to outer packaging or combine them to form a single unit: powder sachets are placed into a folding carton; wrapped sweets into a bag; yoghurt pots into trays. Labelling and marketing issues play a central role; the handling and automation solutions used in secondary packaging machines vary greatly, depending on the product and customer requirement. During tertiary or end-of-line packaging, products are combined into larger containers and palletised, ready to dispatch: pouches or bags must be shipped in cardboard boxes; trays stacked in tiers; drinks bottles shrink-wrapped. The requirements of transport and goods logistics are paramount.

### **Operator's perspective: highest demands on machine builders**

One thing unites food, beverage and pharmaceutical companies, plus the domestic appliance industry: the supplied packaging machines must fulfil their tasks efficiently, reliably and without long downtimes. They expect a high level of industry-specific automation and process expertise from the plant manufacturers: filling and packaging machine

manufacturers for the pharmaceutical and food industry must be familiar with the relevant EU framework regulations and specifications of the FDA (Food and Drug Administration/USA). Their customers and consumers want to rely on perfect, aseptically packaged products. Companies that manufacture machines for producing outer and transport packaging must also be aware of the particular features, requirements and types of the customer's product: anyone producing compact, standard machines for packaging small series should offer customers tools that are quickly and easily changed, where possible.

### **Security as a safe player in packaging**

Moving beyond safety (machinery safety), security should be an integral component of every safe automation solution in packaging. It plays a crucial part in a plant's performance, handling ability and flexibility. The demands on process quality rise due to official or customer specifications. As a consequence, the amount of data required rises too: packaging machines are becoming increasingly networked.

Consequently, the demands on industrial security also rise – in other words, on the protection of plant and machinery from tampering and misuse in the packaging area. Industrial firewall solutions, such as the SecurityBridge from Pilz for example, should be considered in order to guarantee secure access from outside – during service and maintenance –, secure data retrieval and secure data exchange, for example.

This firewall monitors data traffic between the PC and controller and signals any unauthorised changes to the control project – it also monitors data communication between any additional network subscribers. Data transfer between the Client PC and SecurityBridge is safe from eavesdropping and tampering. The “packet sniffer” function saves valuable time during diagnostics: it enables users to record data

communication between subscribers from the secured control network and the unsecured network, so that data can be analysed more efficiently. This is particularly relevant in highly sensitive primary packaging for the pharmaceutical industry, or also in the food packaging industry, as this is where high requirements, and indeed even the highest requirements, are imposed on protecting the item to be packaged.

### **Requirements for the safety of packaging machines**

Distributed bottling plants and compact packaging machines both have guard locking devices, covers, flaps, gates and drives, to a greater or lesser extent. They mask varying degrees of risk, which both manufacturers and operators must confront in accordance with the requirements of the Machinery Directive. The internationally valid EN ISO 14119 (interlocking devices) must also be considered. Particular attention is paid to tamper protection; a risk assessment must be created for each interlocking device. Safe sensor technology, distinguished by coding levels and technology, must be selected, corresponding to the level of tamper incentive. For example, the manufacturer Pilz offers manufacturers and operators of packaging machines appropriate sensor technologies and solutions, which meet the requirements of EN ISO 14119.

### **Access manager for the packaging industry**

On large plants in particular – whether that's in the primary, secondary or end-of-line packaging area – access control is a safety-related issue: to guarantee an efficient, ideally failure-free operation, it makes sense for operators to regulate access and user rights clearly and explicitly on certain sections of the plant. These can be managed by safe operating mode selector switches. They are used to meet the requirements of EN ISO 14119 and ensure that only staff who have received appropriate

training and instruction can implement the intended operating modes on the plant. They also guarantee that unauthorised operating modes are effectively prohibited or prevented. A modular operating mode selection and access permission system such as PITmode Fusion from Pilz covers both safety and security requirements and offers safety benefits for the packaging industry. For this innovative operating mode selection technology controls access permission and the selection of operating modes within a device. It provides effective support to plant operators in any situation where it is regularly necessary to switch between different control sequences and operating modes. Operators can only make interventions that correspond to “their” permission level. Accidents, misuse and tampering are prevented.

## **Sensors must support packers**

Depending on the risk level, gates, covers or flaps on machines and packaging plants must be safely monitored and if necessary locked, magnetically or mechanically. Safety switches are used in variety of applications: when a guard is opened, hazardous machine movements must be stopped, for example, and a restart must be prevented. It must not be possible to either defeat or tamper with the guards. Safety switches are ideally suitable for safety gate and position monitoring, if they meet the requirements of EN ISO 14119. It's important to consider the special challenges regarding hygiene: should non-contact magnetic safety switches such as PSENmag from Pilz be used in this area, then the VA/stainless steel version must be installed. Only sensors such as these are suitable for areas with high cleanliness and sterility requirements – as in aseptic areas of the food & beverage or pharmaceutical industry.

However, if measures for safe interlocking and guard locking on gates in safety fences, covers and flaps also need to be implemented, then the modular safety gate systems are suitable. They should be quick and easy to install with plug-in cables and should meet all the requirements of EN ISO 14119. This modular safety gate system makes it easy to have individual, flexible safeguarding of all accessible gates, and, particularly for plant operators in the end-of-line packaging sector, it offers individual safety gate solutions, which are perfectly tailored to the respective application. Besides the safeguarding of safety gates, effective access permission management in the Pilz system guarantees that only authorised staff have access to the plant and are able to select special operating modes such as setup mode, cycle mode and any other defined, company-specific operating modes: a modular safety gate concept comprising the handle module (PSENmlock Door Handle Module) in conjunction with the PITreader integrated within the

pushbutton unit PITgatebox – in other words a control unit with access permission system – offers the operator a supportive, sophisticated solution for safeguarding end-of-line cells.

### **Manual work must also be safe**

Manual work is still unavoidable in many parts of the packaging industry, when loading infeed systems, inserting and removing the packaged product on small machines, or when order-picking and palletising packaged goods for shipment, for example. Light curtains, for example, allow safe access to danger zones: light curtains are predominantly used in end-of-line packaging, but occasionally they are beneficial in providing additional protection on primary and secondary packaging machines. With an invisible infrared field, the safety light curtain PSENopt II from Pilz, for example, protects against access or entry into dangerous machine areas and detects both static and dynamic obstacles (e.g. automated guided vehicle systems/AGVS). Depending on the requirement, it provides finger, hand and body protection in accordance with EN IEC 61496-1/-2 “Safety of machinery - Electro-sensitive protective equipment”.

And in some cases, risks still remain. This becomes clear during material infeed, in this case using a cardboard box erector as an example: as long as there are cardboard boxes in the infeed opening, “they close this gap” and there is no risk to the operator. However, when there is no longer cardboard material in the opening, it might be possible to encroach into this dangerous area. This is exactly where safety solutions are called for, to help avoid the hazard of the “empty opening”. Pilz, for example, offers a TÜV Süd-certified safety solution for PL d / Cat. 3 in accordance with EN ISO 13849-1 or SIL 2 in accordance with IEC 62061. Essentially this consists of the configurable safe small controller PNOZmulti 2 – or alternatively the modular safety relays myPNOZ – plus

two optical sensors. This compact safety solution prevents a situation whereby reaching into the innermost part of the cardboard box erector leads to injuries. Benefits for the plant manufacturer: when using this TÜV Süd-certified solution, the danger point is almost “automatically” considered to be protected and approved. For operators of older cardboard box erectors, the solution is available as a simple retrofit option. The certificate proves to be a significant help in the subsequent hazard assessment test. A further benefit of this certified solution is that it can also be implemented straight into existing applications. What's more, several cardboard feed operations can be monitored with just one PNOZmulti 2 base unit: all you need to do is consider the necessary hardware inputs and outputs in the configuration.

### **Special protection for special packaging sectors**

It's often necessary for safe sensors to safeguard areas or zones that are in special hygienic or rugged environments. The former scenarios are found mainly on shop floors with a low incidence of dust, such as in the pharmaceutical and medical technology industry for example, and here in the end-of-line sector. In this case, two-dimensional area monitoring is appropriate, which can provide area or cell guarding. Due to their integrated muting inputs, safety laser scanners such as PSEnscan from Pilz can monitor applications in which material is transported in and out simultaneously. The material is detected by the safety laser scanner and may cross the protected field without the conveyor speed being reduced. This will avoid downtimes and increase productivity. If partial muting is added to the dynamic muting found on the safety laser scanner PSEnscan, then, under certain, pre-defined conditions, the transported product may be moved within the protected area, without causing the machine to stop, for example. Laser scanners like PSEnscan can also be used in mobile applications and can safeguard AGVS in an end-of-line packaging scenario, when stacking cardboard boxes on



pallets, for example. Even precise navigation, to packing stations for example, is possible with this technology.

Areas can also be monitored via a solution using safe radar technology, particularly in applications in which rear access protection or stationary area guarding is required. It is particularly appropriate also when there's a need for area and zone monitoring on shop floors with a high incidence of dust and dirt, such as when packaging bulk materials for example.

### **Safe control, safe packaging**

Whether it's a multi-station, interlinked filling plant or a compact packaging machine: safe control systems have the task of monitoring safe signals and triggering safety-related stops. Modular, configurable control and automation systems such as the automation system PSS 4000 from Pilz, for example, are used where there are multiple safety-related signals. On large, widely distributed packaging machines with high flexibility and expandability requirements, the flexible automation system PSS 4000 meets the highest requirements for modularity and functional diversity. Also, at any time it can be adapted individually to new requirements. What's more, controllers in various performance classes for both safety and automation tasks are available, along with numerous I/O modules, plus visualisation and engineering software. On more compact machines with a lower function range, safe configurable small controllers such as PNOZmulti 2 from Pilz are sufficient. The Pilz small controller can be expanded at will in modular fashion, growing with the requirements and size of the machine. In addition to monitoring safety functions such as emergency stop, safety gates or light curtains, with its logic functions it can also perform control functions on a packaging machine. Configuration in this case is simple and intuitive via the software tool (PNOZmulti Configurator).

As with the safe cardboard feed, when answering the question “Which type of controller for which packaging machine – Safety relay or small controller?”, the optimum scenario may be to “only” use a safety relay, out of economic considerations. For if the function range is not the top priority, then the new type of safety relay myPNOZ from Pilz is generally suitable: the modular safety relay consists of a head module with up to a maximum of eight expansion modules, which can be freely combined. Advantage: users put together their own individual myPNOZ using the intuitive online tool myPNOZ Creator. This is done directly on the PC, with no knowledge of programming required. Within just a few days, they receive a completely pre-assembled myPNOZ that's set and ready for operation, for immediate (packaging) use.

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## BOXED TEXT

### **“Portrait of Pilz” (working title)**

For many years, the automation company Pilz has been a reliable automation and safety partner for the packaging industry, with its comprehensive range of products, solutions and services covering sensor, control and drive technology, as well as visualisation. Whether it's a new development, a plant retrofit or a modification to the material infeed: Pilz offers both plant manufacturers and operators scalable and flexible, one-stop automation and safety solutions.

Pilz has also established itself as a recognised, reliable supplier of machinery safety services, for both domestic and international companies. With more than thirty years of industry experience, the company provides immediately actionable answers to both general and industry-specific safety questions. The services package is geared to

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customer requirements, determining and assessing risks, accompanying the complete engineering process and undertaking CE marking in accordance with the Machinery Directive 2006/42/EC, so creating international legal certainty. With safety and international compliance services from Pilz, customers in the packaging industry can gain an advantage in global competition, particularly when exporting machinery.

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