

THE ESSENTIALS ALWAYS ON SCREEN

IN PRESS BRAKES from the press manufacturer **Bystronic**, the camera-based protection system **PSEnvip** - in combination with the automation system **PSS 4000** from **Pilz** - has for years stood for safe, efficient and user-friendly processes. With Pilz's newly developed module for bending angle measurement, Bystronic is expanding the scope of the camera-based protection system: the image data transmitted to the controller shows the operator the current angle measurement on the operator display as press braking takes place. No need for laborious manual measurements or expensive angle measurement systems that take up space.

Without doubt, a reliable safety solution is a must on presses. Particularly when they operate semi-automatically and are fed manually. Today, plant manufacturers and users alike take it for granted that modern protection systems must perform their safety and security mission not just efficiently, but also in a way that is user-friendly and tamper-proof.

Press brake is a special case

For a number of reasons, tools that are often used in press brakes push conventional safeguards to their limits. On compact machinery in particular: space is usually in short supply. Mechanical or laser-based bending angle measurement systems, which are installed on a track in front of the die and run parallel to it, are often complex, obstructive and expensive. In accordance with the stan-

dard DIN EN 12622, each bending line must be safeguarded by a protected field that is a minimum 15 mm in advance of the operator side. The challenge and requirement for complying with the normative specification is that the tool is completely within the protection system's field of vision. Both PSEnvip and the second, extended generation PSEnvip 2 of the Pilz camera-based protection system meet these standard specifications. "Its simple



1 Contact: The Bystronic press brake creates a bending contour with the specified bending angle. To the left of the photo, the receiver for the protection and measuring system PSEnvip 2 from Pilz.

2 Correct angle? Immediately after the bending process, the bending angle module from the camera-based measuring system PSEnvip 2 shows the achieved bending angle on the operator display.



handling, high reliability and resulting boost in productivity and machine availability are the main reasons why we have relied on the PSEnvip protection system for years in our Xpert series,” says Karsten Trautvetter, responsible for product management at Bystronic.

Fittingly, “Cutting, Bending, Automation” is also Bystronic’s slogan: one of the technology company’s focus areas is the automation of bending

»... Reliability, plus productivity and availability.«

Karsten Trautvetter,
Product Manager at Bystronic

and cutting processes in metalworking. In addition to laser cutting systems, the portfolio also includes press brakes and intelligent software solutions in particular. Bystronic’s headquarters are in Niederönz, Switzerland (canton of Bern). There are further development and production sites in Sulgen (Switzerland), Gotha (Germany), Cazzago San Martino and San Giuliano Milanese (Italy), Tianjin and Shenzhen (China), as well as in Hoffman Estates (USA). Bystronic is active with its own sales and service companies in over 30 countries →

STANDARD SERIES EN ISO 16092 FOR PRESS SAFETY

SAFETY-RELATED EQUIPMENT, upgrade and operation of presses – the standard series **EN ISO 16092** covers press safety and consists of four parts. Over the last few years, it has been upgraded to the state of the art. It forms the basis for safe presses, for new builds as well as for modernisation and retrofit.

Part 1 (EN ISO 16092-1) describes the safety aspects common to all presses. Part 2 (EN ISO 16092-2) covers mechanical presses, Part 3 (EN ISO 16092-3) hydraulic presses and Part 4 (EN ISO 16092-4, predecessor EN 13736) pneumatic presses. In accordance with the Machinery Directive, presses are subject in part to Annex IV. In other words, they are classed as “hazardous machinery” with a special conformity procedure, which is based particularly on harmonised EN standards. The standard series was published with a general part, independent of the drive type, and with parts of the standard that are press-specific. EN ISO 16092 Part 1 and Part 3 have been harmonised since March 2019. The transition period ended in September 2021 for EN 692 and EN 13736 and in March 2021 for EN 693.

KEY CHANGES AT A GLANCE

Until now, the level of the individual **safety functions** was still defined in accordance with EN 954-1, which was withdrawn some time ago. The current standard series now contains the specifications with the required performance level in accordance with **EN ISO 13849-1**.

- › The **drive type for initiating hazardous movements** has been completely revised and re-assessed with regard to accessibility.
- › The specifications for **noise measurement** have been revised.



3 The camera-based protection systems PSEnvip are mobile protection systems. They monitor the whole bending process visually. When installed on the upper die, they detect even the smallest foreign body in the protected field between the transmitter and receiver. **4** With the bending angle measurement module, usable image data is forwarded from the camera-based protection system PSEnvip 2 directly to the press controller, thereby guaranteeing an efficient bending process. The bending angle value is displayed on the machine's user interface. There's no need for time-consuming, manual angle measurement and expensive distance measuring systems.



and is represented by agents in numerous other countries.

Be more productive!

The technological basis for meeting the high normative specifications are powerful optics with LED light and the robust design of the protection system, which is insensitive to reflections as well as

»... makes our bending machines certainly even more in demand.«

Karsten Trautvetter

external and stray light. Even vibration and temperature fluctuations cannot harm PSEnvip. "As with its predecessor, the PSEnvip 2 can also be installed, configured and commissioned really easily, directly via a web interface," adds Karsten Trautvetter. In the press brakes from Bystronic, PSEnvip 2 uses an advance measuring field to monitor the entire press braking process – for rapid detection of a

ELECTRONIC RATHER THAN MECHANICAL ROTARY CAM ARRANGEMENT FOR INCREASED PRESS SAFETY

MORE SOFTWARE BLOCKS, which are also certified for safety or non-safety-related operation of presses, are also available with the PSSuniversal PLC in the automation system **PSS 4000**. Non-safety-related tasks are enabled with just one controller. So the control system PSSuniversal PLC can be used to implement an entire press application, simply and flexibly.

For special requirements in press technology, Pilz has developed an electronic rotary cam arrangement, which increases both the productivity and safety of presses in combination with the automation system. Going beyond safety, the electronic rotary cam arrangement also offers internal broken shearpin monitoring. There is no need for a complex, mechanical adjustment of the safety system, because the slide overrun distance is permanently monitored and automatically re-adjusted. From dynamisation of the overrun cam to internal broken shearpin monitoring, press solutions can be implemented safely and flexibly.

The BG-approved rotary cam arrangement solution consists of the controller **PSSuniversal PLC**, the counter module for direct connection of an SSI absolute encoder for failsafe applications, the absolute rotary encoder PSEnenco and

special press blocks from the engineering tool **PAS4000**. These can be used for flexible and simple control of mechanical presses. As the electronic rotary cam arrangement solution replaces mechanical rotary cam arrangements, it also provides a good solution for upgrading presses. The electronic rotary cam arrangement automatically calculates the optimum stopping point: The fully redundant and diverse absolute encoder has two separate interfaces and continuously communicates the shaft position to the control system. This means that the number of strokes or direction of rotation can be determined safely for each movement. The run-up and overrun cam can be set using just three parameters. As a result, the overrun cam can be calculated safely and dynamically for presses with a variable number of strokes.

The overrun distance is also monitored safely and automatically: each time the press is stopped it is measured automatically, output as a value and, if necessary, displayed on a visualisation system. If the warning limit is exceeded, an alert is issued; if the stop limit is exceeded, the press is subjected to an emergency stop. No additional proximity switches are needed, as broken shearpin monitoring is carried out internally. Additional cams can also be freely configured for the controller.

hand or fingers directly in the workspace, for example. PSEnvip 2 “sees” even the smallest foreign bodies and irregularities in the protected field between the transmitter and receiver. Rather than use a laser light source, this low-maintenance, LED-based solution manages with simple illumination of the receiver along the upper tool.

As space is mostly scarce, on PSEnvip 2 the size of the receiver module was reduced by around half. In combination with the automation system PSS4000, the integrated “Fast Analysis Unit” guarantees shutdown times of under one millisecond, plus the shortest overrun distances for the press brake tool. The press brake is therefore safe, even at very high speeds. “By using the camera-based protection system PSEnvip2 and the automation system PSS4000, we have verifiably increased the productivity of our press brakes by around 20 per cent,” says Karsten Trautvetter. “In comparison with models with similar pressing force, our presses react faster and provide higher performance!” The main reason for such productivity is the tremendous ease of use – in practice, operators are hardly aware of the safety solution running discretely in the background.

Tailor-made technology supports rapid processes

Close customer contact and knowledge of the user’s current needs and requirements are constant innovation drivers at Bystronic. “Pilz’s newly developed module for bending angle measurement - unique in its form - can easily be integrated into the camera-based protection system PSEnvip 2 and came along at exactly the right time,” states Karsten Trautvetter. It’s particularly advantageous

SERVICES COMPLEMENT THE PILZ PORTFOLIO

AS EXPERTS in retrofitting old presses, the complete supplier Pilz provides comprehensive support – from producing the circuit diagrams and controller program through to commissioning and approval. On request, Pilz can also undertake the safety-related fitting and retrofitting for safe operation of presses, including CE marking.

on small press brakes with short bending lengths, where there’s no room for measuring equipment to be installed. The measurement data for the metal sheet’s bending contour is collected via the camera system installed on the side of the upper die. It is then evaluated via the bending angle module and made available to the machine visualisation via a standard interface. The operator has the bending angle value displayed on the user interface as press braking takes place. This enables fast and efficient monitoring of the achieved bending angle.

“Low speed” phase as a key to efficiency

Dynamic muting also contributes effectively towards the increase in productivity: with a conventional muting procedure, the upper tool generally moves the last few millimetres at the permitted safe speed of 10 mm per second. When dynamic muting of the protection system PSEnvip 2 is used in combination with the Fast Analysis Unit, the upper tool reduces its speed dynamically from the

initial 300 mm per second to a minimum, via a “slow route”.

Only at the very last millimetre before making contact with the workpiece does the press brake tool switch to “low speed”. Implementation is via the camera-based, dynamic protected field of the PSEnvip 2, which is activated at the start of muting mode and is then continuously reduced. Finally, the configured “safe braking ramp” ensures that the speed is reduced. Benefit: the press can execute the individual strokes much more quickly.

Karsten Trautvetter summarises it like this: “Combined with the automation system PSS 4000 from Pilz, the camera-based protection and measuring system PSEnvip 2 is a significant factor in our customers valuing press brakes from Bystronic”. And looks to the immediate future: “The integration of bending angle measurement will certainly increase demand for our compact bending machines.”

Tobias Leska
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Ability to display the bending angle on the machine’s user interface (HMI)

All information on the Pilz camera-based protection system PSEnvip 2 can be found here:

