



08/205/B1-PM01700



# LazerSafe

## Safeguarding System for Hydraulic Press Brakes

- New LCD menu-driven operator interface panel with magnetic base provides for easy menu-driven programming, fast and easy setup, real-time operational mode status, password protection for supervisory control, and protective field status.
- UL listed based on the requirements of ANSI/UL61496 (Type 4 Laser Guarding System) and UL508
- Listed for use in compliance with NFPA79-2002, Clause 11.3.4
- Complex bends achieved with "Tray/Box" and "Field Muted" modes of operation
- Controls the point of operation through closed-loop monitoring of speed, direction, position and stopping distance of the ram
- Dual flat bands of continuous laser light detect obstructions as small as 4 mm while still being vibration tolerant
- Comprehensive operator protection at close proximity to the point of operation
- Mute point automatically determined, easily set and continuously monitored
- Rear section of laser bands easily muted to ignore back gauge in "up-close" setups
- Failure detection performed by real-time monitoring of the process under control
- LazerSafe is within "Class I Laser Product" limits as defined in IEC 60825
- TUV registered number 08/205/B1-PM01700
- Allows tools to close at high speed, increasing productivity

### ■ Description

LazerSafe is a Machine Safeguarding system for hydraulic press brakes that provides the most effective solution for operator safety and machine productivity combined. The transmitter and receiver are mounted on the ram of the press allowing the operator to stay close to the workpiece as the tools close at high speed.

Due to the location and size of the beams, multiple bends in the material are easily accomplished without interrupting the laser beams. The muting point is automatically determined during the initial test stroke of the machine. First, the material surface is detected by the laser, then the operator confirms the LZS-003HS position by merely pressing the set button. There are no switches, photoelectrics or proximity switches to adjust. The mute point position is permanently monitored. A change in the mute position will be detected and the machine brought to a stop.

LazerSafe continuously monitors the speed and stopping distance of the moving member of the machine. If the crawl speed of 10 mm/sec. is exceeded and/or the stopping distance of 13 mm is exceeded, LazerSafe will issue a stop command to the machine. There is no need for a separate stopping performance monitor.



hydraulic press brake guarding

## ■ Description (continued)

### Safety and Productivity Combined

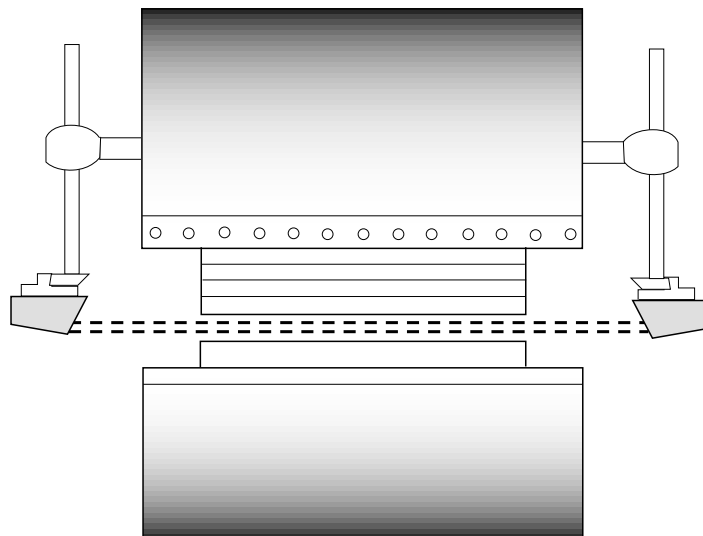
Productivity is greatly enhanced with LazerSafe as compared to light curtains. Light curtains used on press brakes usually reduce throughput by 25 to 40 percent. LazerSafe's unique bands of laser light combined with its mounting location on the machine and its "step-through" bend cycle provides considerably greater throughput while providing operator safety.

### Press Brake Safety

The LazerSafe press brake safety system permits freedom of handling the workpiece while providing operator protection and real-time monitoring of the bending process for press brake failures.

### International Recognition

LazerSafe LZS-003HS is built to the highest safety integrity defined for machinery safety, EN954-1 Category 4, and meets control reliability requirements as set forth in ANSI B11.19 and OSHA 1910.217. LazerSafe was EC-type examined by TUV in Germany. It is certified to comply with the relevant safety standards of the European Community and carries the CE mark.



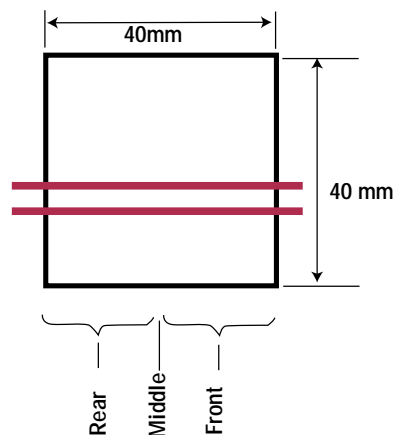
### How It Works

Hands and fingers are protected by continuous bands of laser light that scan the zone below the punch. If an obstruction is detected, the ram movement is stopped and retracted a short distance for down-acting brakes. The ram will stop but not reverse for most up-acting brakes. The punch will not make contact with the obstruction.

Changing the workpiece is easily accomplished with LazerSafe's automatic muting point adjustment. Pushing a button and operating the foot switch is all that's needed. No mechanical adjustment is required.

Changing the vertical position of the LazerSafe's LZS transmitter or receiver may be required to accommodate a change in stroke length or tooling. This is accomplished by a simple mechanical

adjustment of the height of the vertical arms to which the laser transmitter and receiver are mounted. Only the transmitter may need adjustment if the change of stroke length is less



This picture shows the active area of the laser receiver. LazerSafe is aligned when the horizontal bands of light, shown here as broad lines, are captured by the receiver's window.



than 40 mm. A linear measurement scale located on each vertical arm facilitates this procedure.

The LazerSafe **Tray/Box Mode** allows the punch to travel at high speed into a box or tray type workpiece in which the opposing sides are already bent up. Since each laser light band is made up of 3 sections, the front and/or rear sections can be obstructed without loss of speed or safety.

LazerSafe's closed-loop design enables monitoring of the stopping distance of the moving ram every time the ram stops. If the stopping distance limit is exceeded, an emergency stop signal is issued and the machine is shut down.

LazerSafe surveys the effect of failures of hydraulic valves, failures of electrical components, and failures in the machine controller software in relation to the actions of the parts of the machine that pose risk to the operator.

### Unique Laser Technology

In order to check the zone below the punch for obstructions, detection should be continuous. Individual laser beam guarding systems could leave intolerable gaps where a fingertip may be left undetected. Also, dispersing the beam to minimize the effects of vibration can lead to a reduction in safety performance.

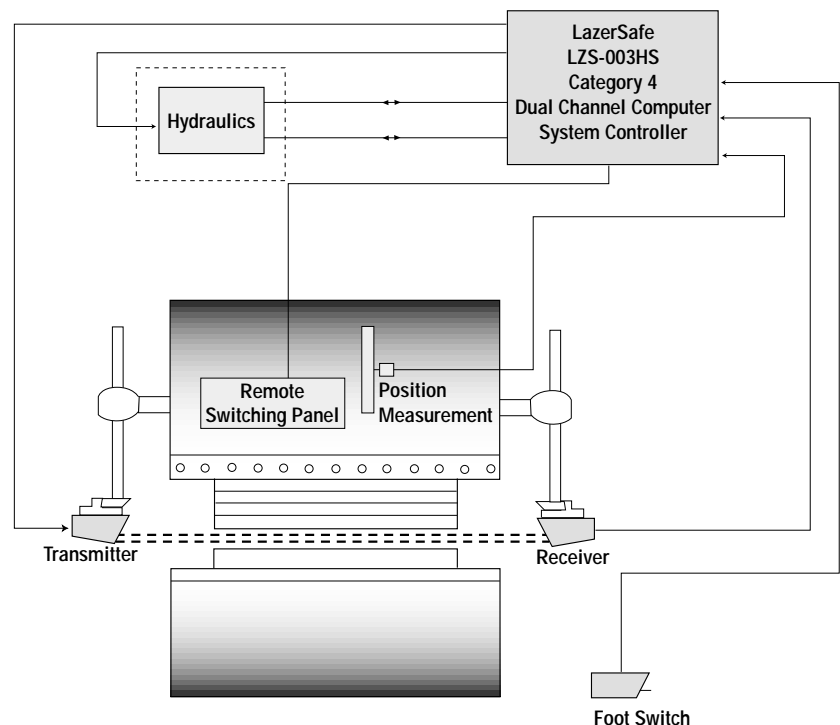
LazerSafe uses dual flat bands of laser light that continuously cover the zone below the punch, and is over 40 mm wide. Its unique optical design detects obstructions as small as 4 mm while still being tolerant to vibration.

### Back Gauge Interference

When running a job that requires a short bend, the back gauge must be set in close proximity to the back side of the die thereby obstructing the rear section of the laser light band. LazerSafe allows this rear section to be muted by merely pushing a (mute stop) button. The front and middle sections of the band remain active providing operator protection.

### Closed Loop Design

LazerSafe LZS-003HS is the only press brake safety system that performs failure detection by real-time monitoring of the process under control, meeting the requirements of IEC 61508, "Functional Safety – Safety Related Systems". The objective is to detect failures by monitoring the entire operating cycle of the press brake. Should LazerSafe's speed and position monitor detect an error, a stop-and-alarm or shutdown signal is issued, forcing the machine into a safe condition. In addition to providing an unprecedented degree of hydraulic press brake safety, hydraulic, electrical and machine controller software logic faults may also be detected.



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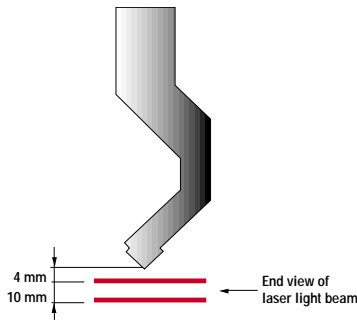
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## ■ Modes of Operation

### Setup

During setup, the top laser light band is always set at 4 mm below the tip of the punch.

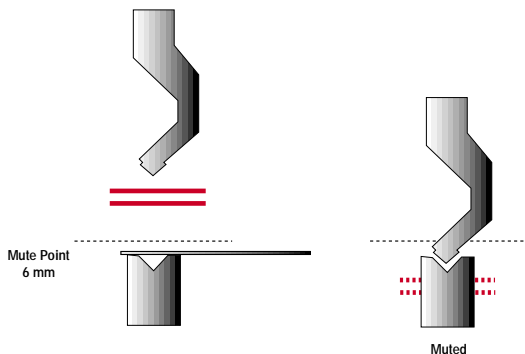


### Muting Point

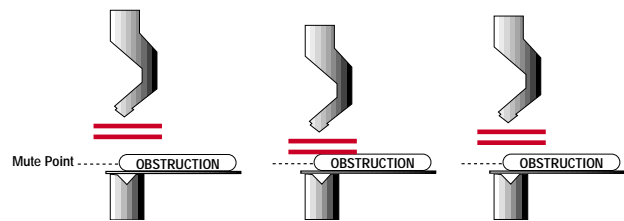
The Muting Point must first be established so that LazerSafe will not treat the material being formed as an obstruction. The Muting Point is automatically set at 6 mm above the surface of the material (distance between the tip of the punch and the work piece).

### Normal Mode

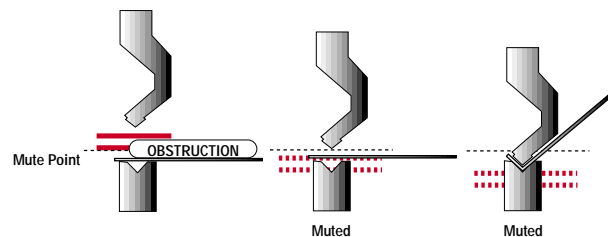
If no obstruction is detected, the tools close at high speed to the muting point and continue at pressing speed with the sensing functions muted, bending the material until finished.



In normal mode, the entire width of the laser beam (front, middle, and rear) is activated for recognition of obstructions. As the punch moves towards the workpiece, the laser light band will detect obstacles ahead of the tip of the punch until it reaches the muting point, thereby covering the range where the ram is allowed to travel at high speed. When an obstruction is detected on a down-acting brake, the ram stops and retracts by several millimeters. When an obstruction is detected on an up-acting brake, the ram will also stop but not retract. The punch will not touch the obstruction.



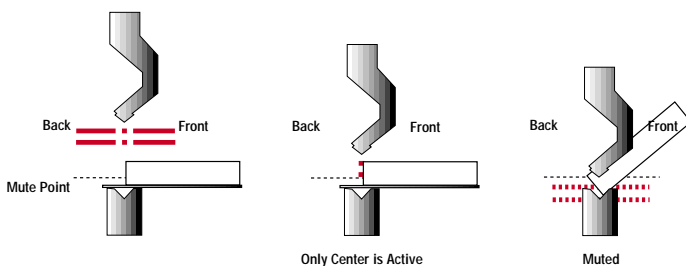
Should the operator decide to continue with the stroke, the foot switch will have to be depressed again. The tools will begin to close. If, however, the obstruction has not been removed and is still detected, the ram will stop but not reverse. This feature is important for jobs where the shape of the workpiece will break the laser light band. Any time an obstruction is detected the ram will always stop at the mute point. Depressing the foot switch again will permit the cycle to be completed in crawl speed (10 mm/sec) and with the sensing function muted.



### Tray/Box Mode

When making boxes or trays, two opposing side walls are bent first. The workpiece is then turned horizontally so the remaining two side walls can be bent. The two previously bent side walls now obstruct the front section of the laser light bands and cause the system to mistake them for a dangerous obstruction. In this case, if the system is in **Normal Mode**, the ram will come to a stop and retract a small distance for down-acting brakes and just come to a stop for up-acting brakes, and wait for renewed operation of the foot switch. Then, if the workpiece is kept in place and the foot switch is depressed, the ram will descend again and stop at the top of the bent side wall. At this point, it will only be possible for the ram to continue its descent at crawl speed and time will be lost.

The **Tray/Box Mode** eliminates this lost time by allowing the ram to continue in fast speed to the muting point only after stopping at the top of the side wall. The foot switch must be depressed to resume descent of the ram. The front, center and rear sections of the light band are active from the top of the stroke to the top of the side wall. Upon reaching the side wall, the front and rear sections of the light band are deactivated for the remainder of the stroke.



The center section of the laser light bands remain on until the muting point is reached, unless an obstruction is detected. If an obstruction is detected by the center section, the ram will stop and retract a short distance for down-acting and merely stop for up-acting. Then, a continuation of the down stroke to the muting point will only be possible in crawl

speed. After the muting point has been reached, renewed operation of the foot switch is required to complete the stroke.

Tray/Box Mode may also be used to ignore interference from the back gauge. In Tray/Box Mode, the back gauge will then be treated like the workpiece side wall as described above. In this case, both front and rear sections are muted from the top of the back gauge downward, but the center section always remains active.

Once selected, Tray/Box Mode will remain active while the machine is operating. If the machine is idle for ten minutes, LazerSafe will automatically switch back to Normal Mode.

### Field Muted Mode

In this mode, protection from the optical portion of the system is being muted for the entire stroke of the ram and therefore does not provide protection. The LazerSafe equipment, however, maintains all its other safety functions. For example, it continues to monitor that the closing of the tools occur at crawl speed and stops the machine if that speed is exceeded.

The Field Muted Mode should only be used in cases where no alternative mode with activated protection exists. It is recommended that the Field Muted Mode only be activated by supervisory personnel and that the password protection feature be used for activation.

### Stop at Mute Point

The auxiliary mode, "Stop at Mute Point" may be engaged to cause the ram to always stop at the mute point. This mode is activated by merely pushing the "Mute Stop Button." Stop at Mute (SAM) is particularly useful when the back gauge is set close to the die causing the rear section of the laser light band to be interrupted since the rear section of the laser light band is muted within the area 10 mm above the material.

Note: This auxiliary mode may only be engaged in Normal Mode and Tray/Box Mode, *not* in Field Muted Mode.



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## ■ Features



hydraulic press brake guarding

	LazerSafe	Other Traveling and Fixed Beam Technology
Designed and developed for hydraulic press brakes only	YES Optical monitoring of danger zone and surveillance of machine dynamics	NO Basically light curtain controller with curtain configuration changed and location shifted
Maximum simplicity of operation in high production environment	YES Operator can work within 20 mm of front of punch with no disruption to approach speed or bending process	NO Blade must travel in pressing speed for a large part of the cycle
Automatic Mute Point operation	YES No manual adjustment of mute point	NO Not standard equipment
If the punch depth (top die) is changed, normally only the height of laser sender is adjusted – not both ends	YES This adjustment is quick and easy	NO Must adjust both ends and realign in correct position
Mute point height constantly monitored	YES Mute point is always at the correct height	NO Could present a hazard to the operator
Constant stopping distance monitoring	YES Helps to ensure safe stopping distance at all times	NO No machine dynamics surveillance. Stopping distance not checked
Full press fault monitoring	YES Helps to ensure that hydraulic, electrical, electronic or mechanical faults causing unwanted movement are detected	NO Monitors some faults in hydraulic valves only if fitted in conjunction with monitored valves
Tray or box bending mode without fully disabling protection in front of work area	YES Mode especially designed for rapid tray or box bending but maintaining high level of safety	NO Can only disable protection in front of work area to allow this type of bending
Closed loop design. Double redundant fail safe	YES	CONDITIONAL Only valve contact sensing
Separate primary and secondary stop circuits separately monitored and checked	YES	NO



	LazerSafe	Other Traveling and Fixed Beam Technology
Laser light safety and accuracy. Safe visible, accurate laser light	YES Safe visible light with no divergence provides ease of alignment, no reflection, maximum safety and reaction time. Class I laser product.	NO Visible light source dispersed so that it can be received during vibration effect. Dispersed light may be subject to reflective surface interference.
Protection against blockage. As per requirements in standard EN292.	YES If an obstruction was left on the bed (hand tool, coffee mug, etc.) the system will detect and stop/reverse	YES
Operator is protected in front and behind the moving die	YES Visible laser light band extends its continuous protection in front and behind the die tip	NO
Crawl speed fully monitored	YES System helps to ensure the press is not faster than 10 mm per second when required to travel in crawl speed	NO No speed monitoring



hydraulic press brake guarding



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hydraulic press brake guarding

## ■ Specifications

<b>Functional</b>	
<b>Equipment Type:</b>	Electrosensitive Protective Equipment (ESPE) to EN954-1: 1997 Category 4 for Hydraulic Press Brakes; UL listed based on the requirements of ANSI/UL61496 and UL508; Listed for use in compliance with NFPA79-2002, Clause 11.3.4
<b>Optical Range:</b>	15 m net (distance between windows of laser sender and receiver)
<b>Vert. Adj. Range:</b>	300 mm standard, other lengths available
<b>Protective Functions</b>	
	<ul style="list-style-type: none"> <li>• Recognition of interruptions in sections of a flat band of laser light which runs both in parallel and in a fixed position to and ahead of the edge of the punch</li> <li>• Monitors stopping distance</li> <li>• Monitors high beam speed</li> <li>• Monitors low beam speed (crawl speed)</li> <li>• Monitors mute point position</li> <li>• ESPE provides signals and feedback to force press into a safe condition upon detection of fault</li> </ul>
<b>Response Time:</b>	12 ms from interruption of light beam until opening of relay contacts (both paths)
<b>Laser Classification:</b>	Class 1 (IEC 60825-1)
<b>System Structure:</b>	Two-channel computer system with mutually independent processing of input signals, exchange of parity data, and reciprocal monitoring of output data in accordance with requirement classes 5 and 6-DIN V VDE 0801-/A1 (principles of computers in safety related systems) congruent with EN 954 category 4. LazerSafe has been EC type examined to the requirements of IEC 61496-1, -2 for a Type 4 ESPE. TUV registration number 08/205/B1-PM01700.
<b>Press Brake Performance Parameters:</b>	The LazerSafe LZS system will constantly monitor the ram's stop distance, bending speed, and crawl speed. If the press brake exceeds any of these parameters, the LazerSafe LZS will send a control-reliable stop to the machine, shut the machine down, and display the appropriate fault code.
<b>Ram Stop Distance:</b>	13 mm maximum
<b>Ram Bending Speed:</b>	20 mm/sec maximum
<b>Ram Crawl Speed:</b>	10 mm/sec maximum
<b>Environmental</b>	
<b>Degree of Protection:</b>	IP54 (all system units)
<b>Operating Temperature:</b>	0 to 55°C
<b>Storage Temperature:</b>	-30 to 75°C
<b>Humidity Class:</b>	E
<b>Electrical</b>	
<b>Supply Voltage:</b>	115 V – 15%, 60 Hz to 230 V +30%, 50/60 Hz
<b>Safety Output:</b>	4 N.C. contacts (2 primary & 2 secondary)
<b>Auxiliary Output:</b>	1 N.C. contact
<b>Contact Rating:</b>	5 A resistive, 2 A inductive @ 24 VDC; minimum load 10 mA @ 5 VDC
<b>Isolation:</b>	All contact paths are isolated

Specifications are subject to change without notice.

## ■ Ordering

LazerSafe is shipped as a complete system ready for installation on most hydraulic press brakes. Some new hydraulic components may be required depending on age and model of the press brake. **Installation services and operator training must also be purchased from an authorized STI installer/integrator at the same time LazerSafe is ordered. Ask your local STI distributor for the name of an authorized installer/integrator.**

Model No.	Description
LZS-003HS	LazerSafe hydraulic press brake safeguarding system (mounting brackets and installation kits not included)



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