LZS-003-HS Operation Manual

Dual Laser Version

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Document Revision History

Date	Version	Summary of Change
10/01/2007	1.08	New error code display sequence information added.
4/07/2007	1.09	New software version eliminates use of magnetic card. Mute point set-up and material sensing test improved functionality.
24/07/2007	1.10	Language settings added to parameter settings
03/12/2007	1.11	Updated error code section and listing

Copyright Information

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1 About This Manual

This chapter contains information about this manual, containing the following elements:

- Document Organisation
- Document Objectives
- Technical Competence Requirements
- Prerequisites
- Related Documentation
- Guide to Notes, Notice and Cautions
- Obtaining Technical Assistance.

1.1 Document Organisation

This manual is organised into the following chapters:

1. About This Document (this chapter)
2. Critical Safety Information
3. General Overview
4. Transmitter & Receiver Adjustment
5. Operating the LZS-003-HS
6. Operator Instruction and Demonstration
7. Parameter Programming with the Operator Panel
8. Error and Condition Codes
9. Glossary of Terms
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1.2 Document Objectives

This manual provides information on the operation of Lazer Safe's LZS-003-HS press brake operator guarding system.

1.3 Technical Competence Requirements

All operators of the LZS-003-HS equipment should be trained to use it and the press brake upon which it is installed in a manner that complies with established safety practices.

1.4 Related Documentation

This manual should be used in conjunction with;

- The Operation Manual for your press brake
- The Lazer Safe Transmitter and Receiver Alignment Manual

1.5 Guide to Notes, Notice and Cautions

Note:
This symbol indicates helpful information that helps you make better use of your Lazer Safe product.

Caution
This symbol alerts you to situations that could result in equipment damage

Warning
This symbol indicates danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the translated

safety warnings that accompanied this device.

1.6 Obtaining Technical Assistance

For technical support with the LZS-003-HS, email customerservice@lazersafe.com.au detailing your specific requirements.

2 Critical Safety Information

2.1 Proper Use of the LZS-003-HS

The LZS-003-HS is designed to protect hands and fingers in the area close to the edge of the punch. When installed correctly and safety instructions are observed fully, the LZS-003-HS permits safe manipulation close to the punch, as well as offering effective protection while tools close at high speed.

Please note these general safety notices:

- The LZS-003-HS is designed exclusively for installation and operation on hydraulic press brakes, or press brakes that comply with the statutory machine safety and accident prevention rules and regulations valid for the place where the press brake is operated, in particular after the LZS-003-HS has been installed.
- The LZS-003-HS must be installed either in the press brake factory, or by specialist technicians trained by Lazer Safe (or its authorised representatives).
- The operator must be fully conversant with the operation of the press brake and the risks associated with it, as well as the operation of the LZS-003-HS guarding system.
- The alignment of the protective equipment for punches of different lengths should be performed by a die setter (or someone with equivalent specialist expertise) trained in all relevant aspects of operating the press brake and the LZS-003-HS guarding system.
- Suitable protective equipment must be worn by the operator at all times.

2.2 Special Warnings

To ensure the highest possible degree of safety in operating a press brake fitted with the LZS-003-HS, it is important to note the following special warnings.

Warning: AVOID FAST, ERRATIC MOVEMENTS AS TOOLS CLOSE

When the tools close at high speed (above mute point) towards a static (fixed) obstruction, there will be less than maximum protection at the point where the laser detects the obstruction. For example, if a small obstruction, such as a finger, is rapidly and erratically pushed between punch and obstruction immediately before the laser senses the static obstruction, the finger might be touched.

Warning: NO PROTECTION BETWEEN MUTE POINT AND WORKPIECE

In Normal mode, the LZS-003-HS protects until the laser is within 2mm of the material surface. Even though this gap is too small for a finger to be inserted, always exercise care.

Warning: NO PROTECTION IN FIELD MUTED MODE

In Field Muted mode, the optical sensing is deactivated. Although the LZS-003-HS ensures that the machine does not exceed crawl speed in this mode, particular caution must still be exercised.

The LZS-003-HS Operator Panel requires a password to enable the Field Muted mode button. The password should only be available to suitably trained personnel.

Field Muted mode should only be used by suitably trained personnel and only in exceptional circumstances (changing tools, maintenance, etc.)

3 General Overview

The Lazer Safe LZS-003-HS is a guarding system for hydraulic press brakes that provides a highly effective solution for both operator safety and machine productivity.

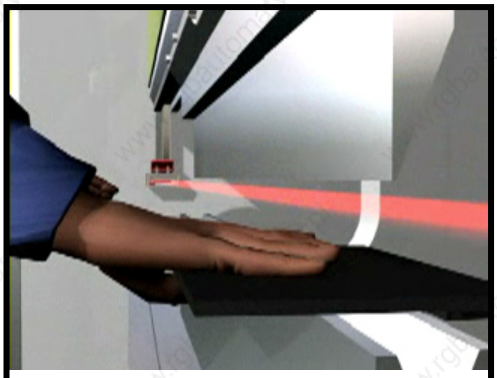
The system comprises the following components:

- LZS-003-HS Controller
- Operator Panel
- Optical Encoder
- Laser Transmitter / Receiver pair
- Brackets for mounting the Transmitter and Receiver

The LZS-003-HS can be installed either at the time of manufacture or as a retrofit to a press brake already in service.

3.1 Key Benefits

- Delivers comprehensive operator protection at close proximity to work piece.
- Allows tools to close at high speed, increasing productivity.
- Complex shapes can be achieved with the "Tray / Box" and "Field Muted" modes of operation.
- Encoder feedback provides closed-loop monitoring of speed and stopping distance of the press beam.
- A flat band of continuous laser light detects obstructions as small as 4mm while remaining vibration tolerant.
- The mute point is automatically determined, easily set and continuously monitored.



The LZS provides protection at close proximity to work-piece.

- The rear section of laser is easily muted to ignore the back gauge in "up-close" situations.
- Failure detection is performed by real-time monitoring of the process under control.

3.2 System Operation

The transmitter and receiver are mounted on the upper beam of the press brake, allowing the operator to remain close to the work-piece as the tools close at high speed. Hands and fingers are protected by a continuous band of laser light that senses the zone below the punch. If an obstruction is detected the beam movement is stopped. The punch cannot make contact with the obstruction.

The LZS-003-HS system continuously monitors the critical speeds and stopping distance of the moving member of the machine. If the crawl speed is exceeded and / or the stopping distance is exceeded, the LZS-003-HS controller will issue a stop command to the machine. There is no need for a separate stopping distance monitor.

3.2.1 LZS-003-HS High Speed Dual Laser Model

For press brakes with a high closing speed (150 mm / sec or faster) the LZS-003-HS is recommended (Figure 3-1). This model features a transmitter with two parallel lasers that are 4mm and 14mm below the punch. The lower laser (laser B) triggers the deceleration of the press to bending speed while the higher laser (laser A) continues to provide protection.

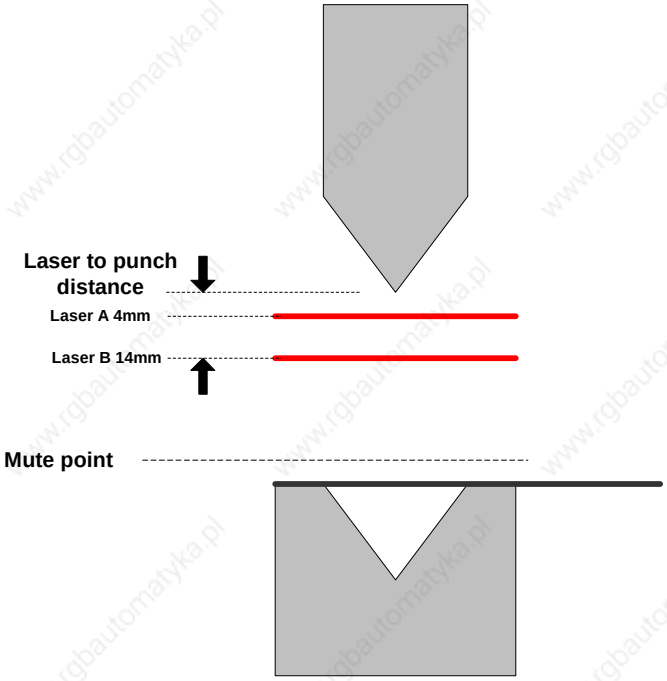


Figure 3-1: LZS-003-HS Dual Laser

3.2.2 Setup

During setup the laser is set at a distance of 14mm below the tip of the punch. When using the LZS-003-HS dual laser only the lower laser (Laser B) is switched on during set-up.

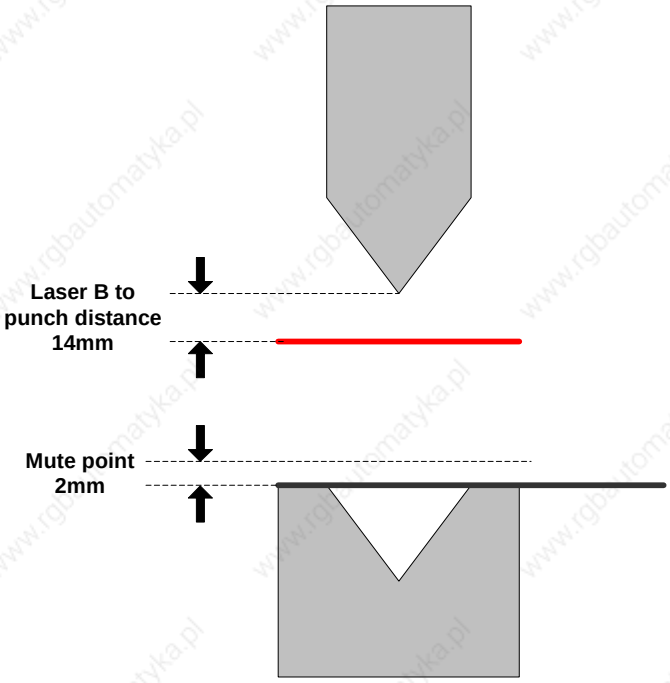


Figure 3-2: Laser to punch distance / Mute point distance

3.2.3 Mute Point

The Mute point must first be established so that the LZS-003-HS will not treat the material being formed as an obstruction. The Mute point is automatically set at 2.0mm above the surface of the material as the tools close for the first stroke. This mute point set-up can be initiated whenever the material thickness is substantially changed.

3.2.4 Normal Mode

If no obstruction is detected, the tools close at high speed until the laser reaches the mute 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 (front, middle and rear) is activated for recognition of obstructions. As the punch moves towards the work piece, the laser will detect obstructions ahead of the tip of the punch until it reaches the mute point, thereby covering the range where the beam is allowed to travel at high speed. When an obstruction is detected, the beam stops. 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 cycle will be completed in crawl speed with the sensing function muted. This feature is important for jobs where the shape of the work piece will obstruct the laser.

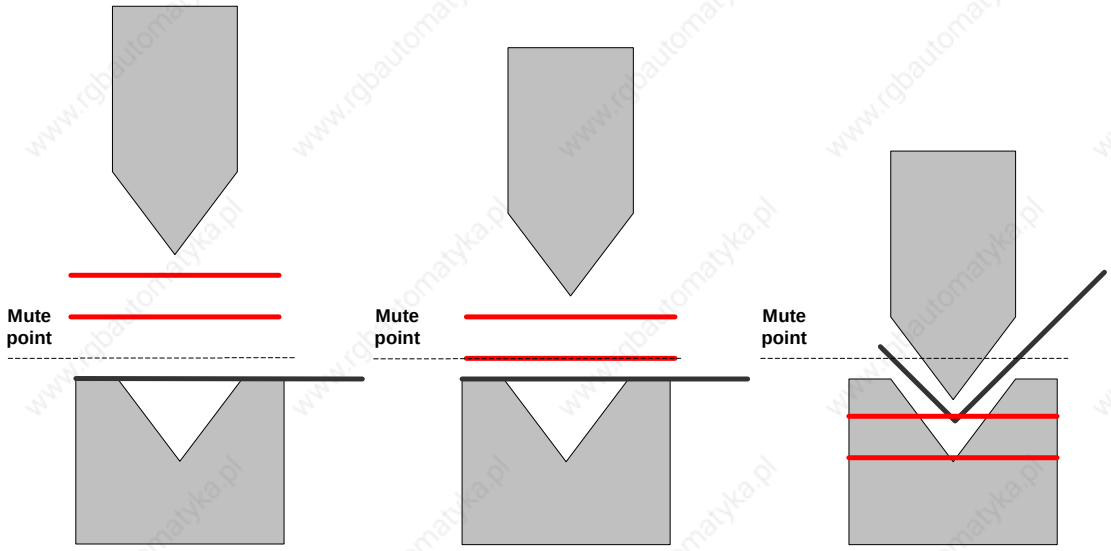


Figure 3-3: Normal Mode operation

3.2.5 Tray / Box Mode

When making boxes or trays, two opposing side walls are bent first. The work piece 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 and cause the system to mistake them for a dangerous obstruction. In this situation, if the system is in **Normal Mode**, the beam will come to a stop and wait for operation of the foot switch. Then, if the work piece is kept in place and the foot switch is depressed it will only be possible for the tools to close at crawl speed and time will be lost.

The LZS-003-HS **Tray / Box Mode** eliminates this lost time by allowing the beam to continue in high speed to the mute point only after stopping at the top of the side wall. The foot switch must be depressed to resume closing of the tools. The front, centre and rear sections of the laser 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 laser are deactivated for the remainder of the stroke.

The centre section of the laser remains active until the mute point is reached, unless an obstruction is detected. If an obstruction is detected by the centre section, the beam will stop and continuation of the stroke to the mute point will only be possible in crawl speed.

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 work piece side wall as described above. In this case, both front and rear sections are muted from the top of the back gauge, but the centre 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, the LZS-003-HS will automatically switch back to Normal Mode.

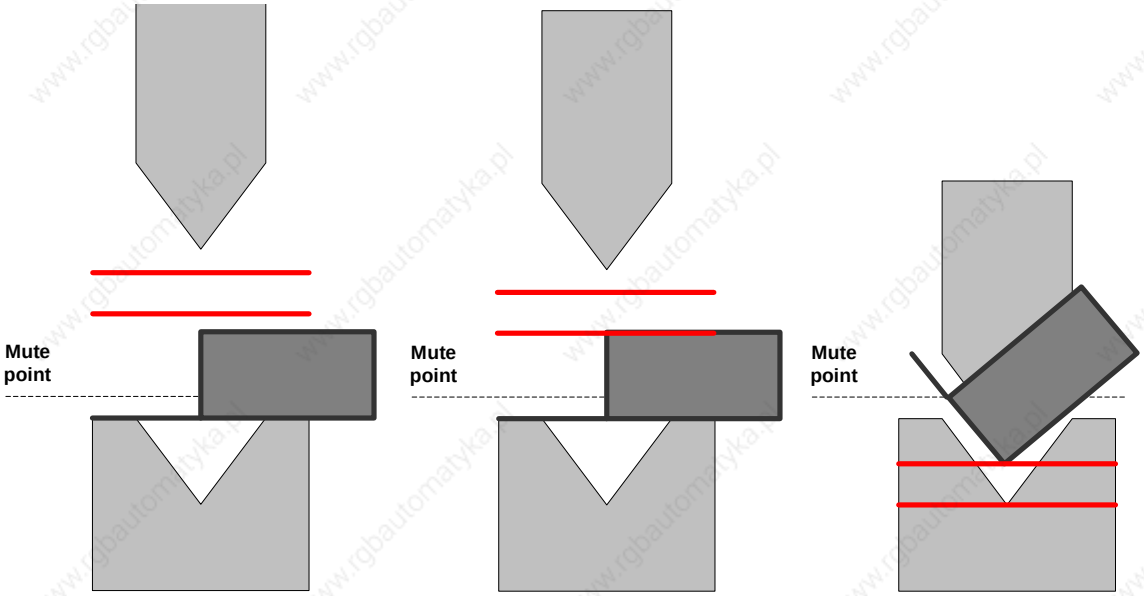


Figure 3-4: Tray / Box Mode operation

3.2.6 Field Muted Mode

WARNING: NO PROTECTION IN FIELD MUTED MODE

In Field Muted mode, the optical sensing is deactivated. Although the LZS-003-HS ensures that the machine does not exceed crawl speed in this mode, particular caution must still be exercised.

The LZS-003-HS Operator Panel requires a password to enable the Field Muted mode button. The password should only be available to suitably trained personnel.

Field Muted mode should only be used by suitably trained personnel and only in exceptional circumstances (changing tools, maintenance, etc.)

In this mode, protection from the laser is muted for the entire stroke of the beam and therefore does not provide protection. The LZS-003-HS however maintains all its other safety functions. For example, it continues to monitor that the closing of the tools occurs 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. Field Muted Mode can be locked and password protected.

3.2.7 Stop at Mute Point

The auxiliary **Mute Stop** mode may be engaged to cause the beam to always stop at the mute point. It is particularly useful when the back gauge is set close to the die causing the rear section of the laser to be interrupted. The rear section of the laser is muted within the area 10.0mm above the material to clear back gauge obstructions.

3.3 Tool Change

When changing the tools the transmitter and receiver can be easily moved clear so that the punch can be removed from either end of the machine. To realign the transmitter and receiver each is moved quickly back into position. The laser is adjusted to the correct distance from the punch tip with the aid of an alignment tool. The receiver is simply positioned so that the laser strikes any where in the 40mm window reception area. In most tool changes the receiver does not require any adjustment if the punch depth changes by less than 20mm. After the tool change is complete the mute point is then quickly and easily reset during the first stroke.

3.4 Closed Loop Design

The closed-loop design of the LZS-003-HS enables monitoring of the stopping distance of the moving beam every time it stops. If the stopping distance limit is exceeded, an emergency stop signal is issued and the machine is shut down.

The LZS-003-HS 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.

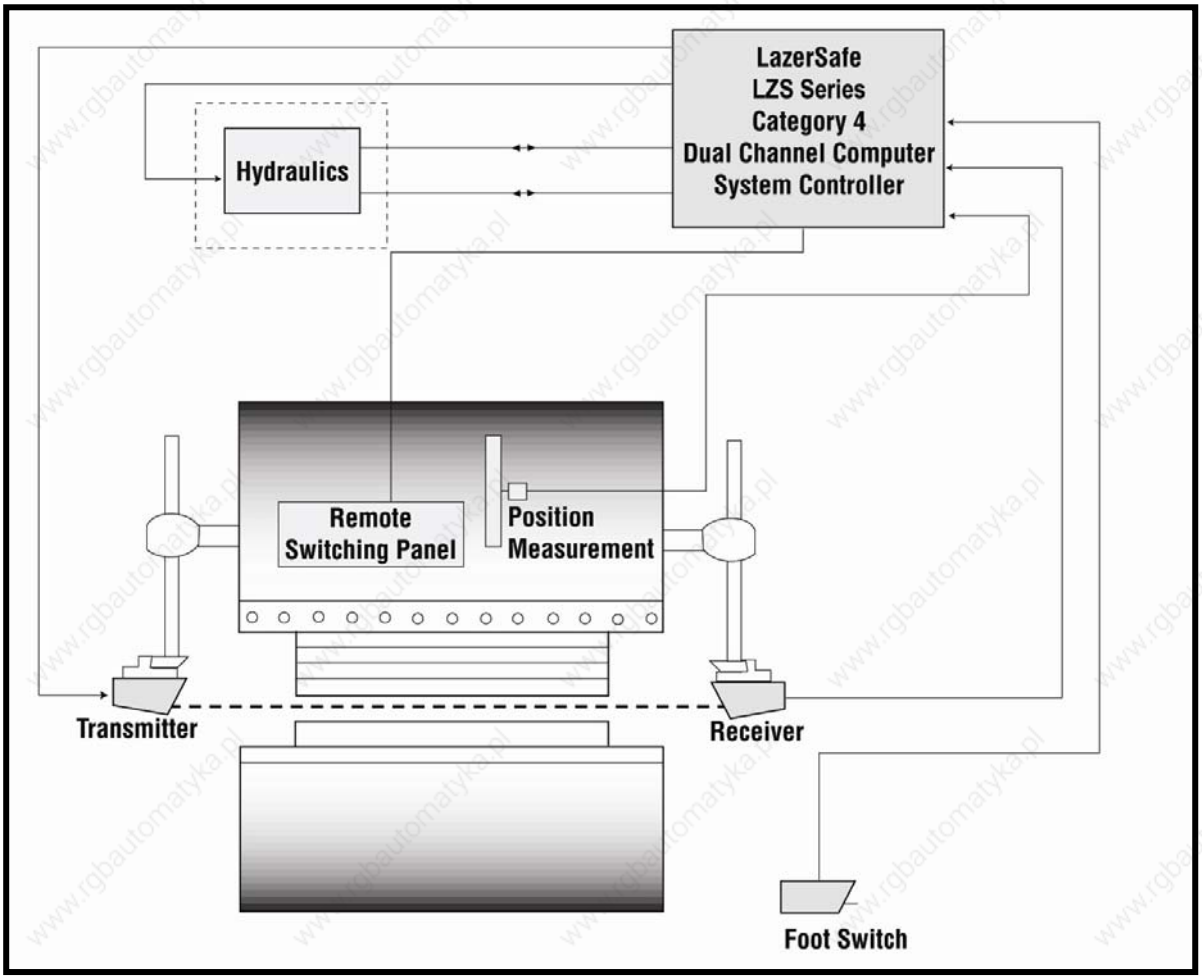


Figure 3-5: Closed loop design

4 Transmitter & Receiver Adjustment

Note:
Refer to the Transmitter and Receiver Alignment Manual for more detailed information.

4.1 Adjusting the laser to punch distance

Prior to operating the LZS-003-HS system, it is necessary to check the laser to punch distance. When the LZS-003-HS system is powered up the laser to punch distance setting of 14mm will be displayed on the top line of the LCD Operator Panel.

To check the laser to punch distance;

1. Power-up the LZS-003-HS system and check the laser to punch distance setting on the LCD Operator Panel. It will be displayed as 14mm.
2. Set the LZS-003-HS to Normal Mode (default start-up mode) and check that the laser is on.
3. Place the TX Alignment Magnet on the end of the punch with the punch tip aligned with the 14mm laser to punch mark (Figure 4-1).
4. Loosen the vertical bracket locking handle and adjust the vertical position of the laser so that it is positioned inside the window on the TX Alignment Magnet (Figure 4-2).

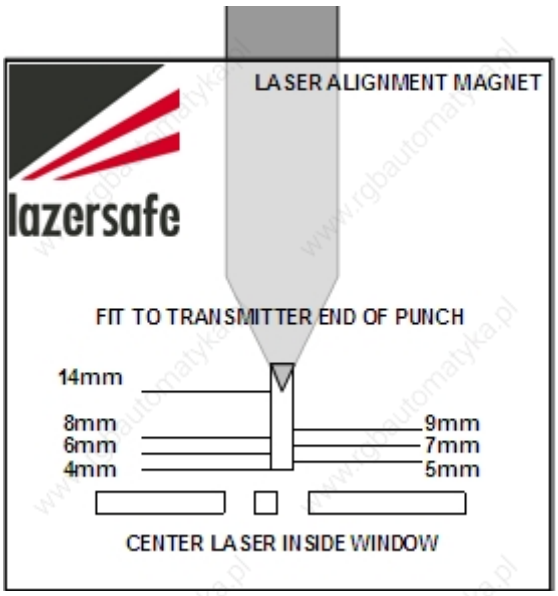


Figure 4-1: TX Alignment Magnet (set to 14mm)

Figure 4-2: Vertical bracket locking handle

4.2 Adjusting the receiver for tray/box bending

When using Tray Mode the front and rear sensors are muted after sensing the work-piece up-stand. The middle sensor remains active and provided it remains unobstructed the stroke can be completed in high speed. The middle sensor must be positioned approximately 1mm behind the centre line of the punch to avoid being obstructed by the up-stand (Figure 4-3).

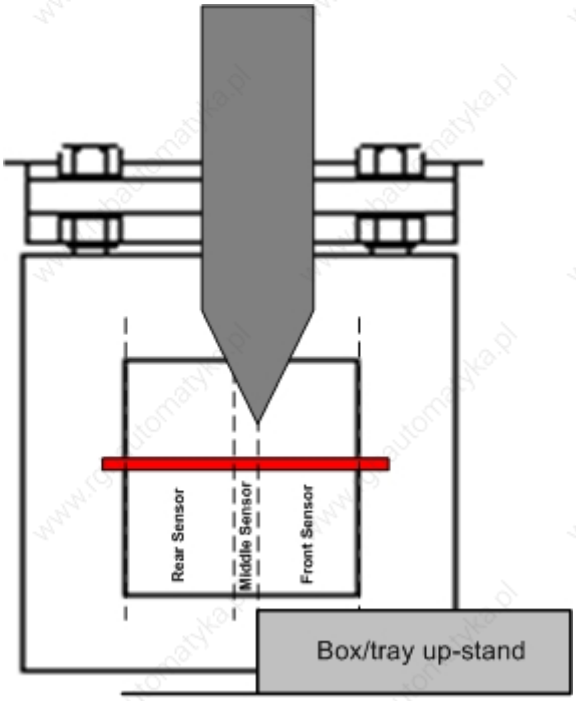


Figure 4-3: Receiver middle sensor position

To adjust the receiver position;

1. Place the RX Alignment Magnet on the end of the punch with the punch tip aligned with the 14mm laser to punch mark (Figure 4-4). A 4mm portion of the laser will be visible on the receiver window.
2. Unlock the slider mechanism screw (A) (Figure 4-5).
3. Move the front to back slider mechanism of the receiver forward until it reaches the front limit (Figure 4-5 & Figure 4-6).
4. Move the front to back slider mechanism of the receiver towards the rear of the machine until the LCD Operator Panel shows the middle sensor as being clear.
5. Lock the slider mechanism screw (A) (Figure 4-5).

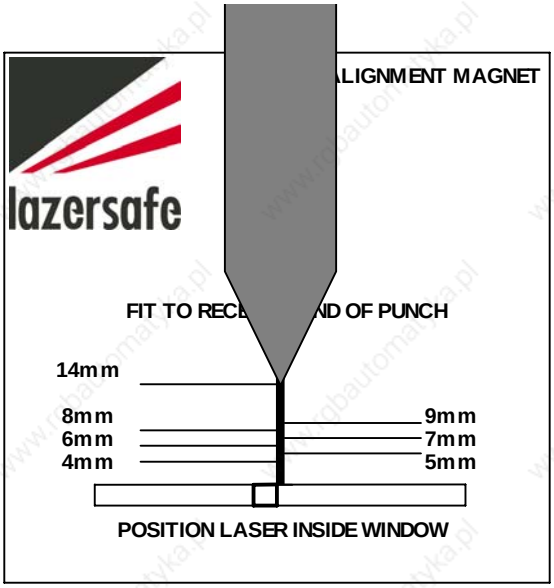


Figure 4-4: RX Alignment Magnet (set to 14mm)

Figure 4-5: Slider Mechanism Adjustment

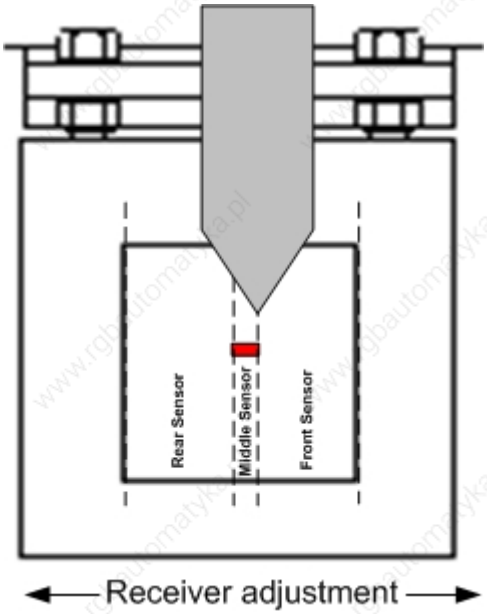


Figure 4-6: Middle sensor adjustment

5 Operating the LZS-003-HS

5.1 Operator Controls

5.1.1 Operator Panel

The instructions in this section refer to various controls on the LZS-003-HS **Operator Panel**, which is shown in Figure 5-1:

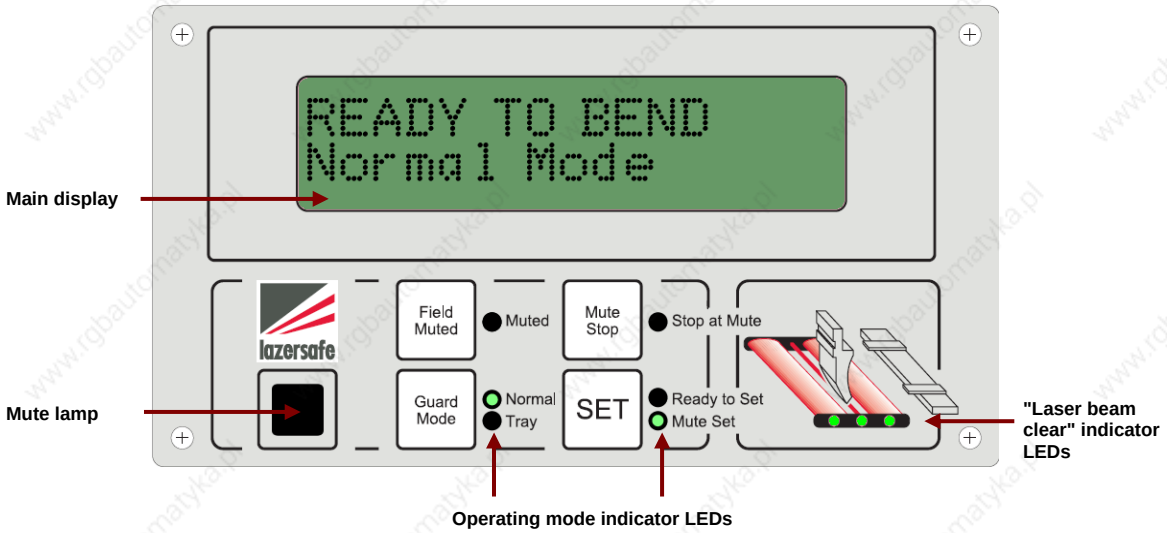


Figure 5-1: LZS-003-HS Operator Panel

Indicator States

The various indicators can have multiple states.

The Mute lamp's states are illustrated throughout this manual as follows:

Off	■
On	■
Flashing (slow)	!
Flashing (fast)	!!

The states of the operating mode and "laser beam clear" indicator LEDs are illustrated throughout this manual as follows:

Off	●
On	◉
Flashing	✳

Note:
In all operations, the display text "**READY TO BEND**" is replaced by the word "**BENDING**" when the **down** pedal is pressed and the tool is in motion.

5.1.2 LZS-003-HS Controller

The **LZS-003-HS Controller** is usually mounted on the side of the press brake. It has a two digit LED display that also provides important status information on the operation of the LZS-003-HS. The left-hand digit is referred to as the **Secondary Digit** and the right-hand digit as the **Primary Digit**. The LZS-003-HS Controller is shown in Figure 5-2:

Figure 5-2: LZS-003-HS Controller

Note:
Section 8 contains detailed information on error codes.

5.2 System Start-up

When the LZS-003-HS system is powered-up the controller will perform a self test. During the self test the LCD Operator Panel will display software version information and the controller will cycle various numbers on the two segment display. After the self test is complete the controller display will show 01 and the LCD Operator panel display will scroll the LZS-003-HS system software version and laser to punch distance setting across the top line of the display.

The laser to punch distance setting will be displayed as 14mm. Check that the laser is aligned 14mm below the punch.

Note:
Refer to Section 4 or the Transmitter and Receiver Alignment Manual for detailed information regarding alignment and laser to punch settings.

Once the laser to punch distance has been checked press the SET button as indicated on the LCD Operator Panel display. Proceed with the Start-up test.

5.3 Start-up Test

Once started, the LZS-003-HS will perform a start-up test to check the systems emergency stop function and stopping performance of the press brake. Check the following prior to commencing the start-up test:

- Open the tools to a minimum opening of 50mm.
- Check the transmitter and receiver are correctly aligned.
- Check the laser to punch distance.
- Check that the laser clear indicator LEDs are all on.

Note:
Refer to Section 4 or the Transmitter and Receiver Alignment Manual for detailed information regarding alignment and laser to punch settings.

To commence the test, press the **down** pedal as indicated on the display. The beam will move a short distance then stop.

Note:
After the start-up test is complete it may be necessary to restart the hydraulic pump.

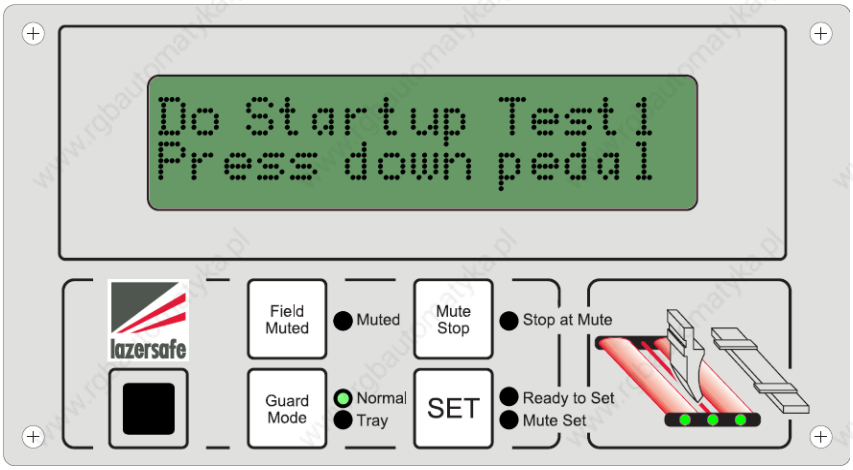


Figure 5-3: Start-up test display

If the test completes successfully, the mute point will be set next. Press the **down** pedal to continue, as shown in the following diagram. See Section 5.4 Setting the Mute Point.

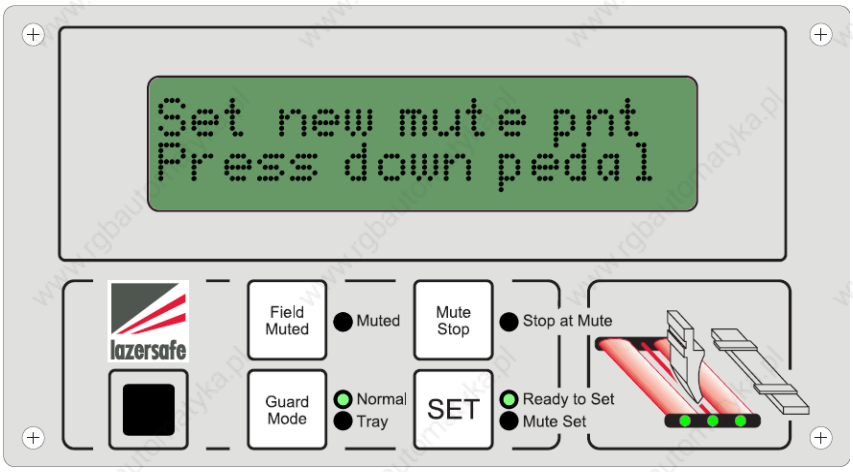


Figure 5-4: Initial mute point setting

If the start-up test generates an error, the display will show the following:

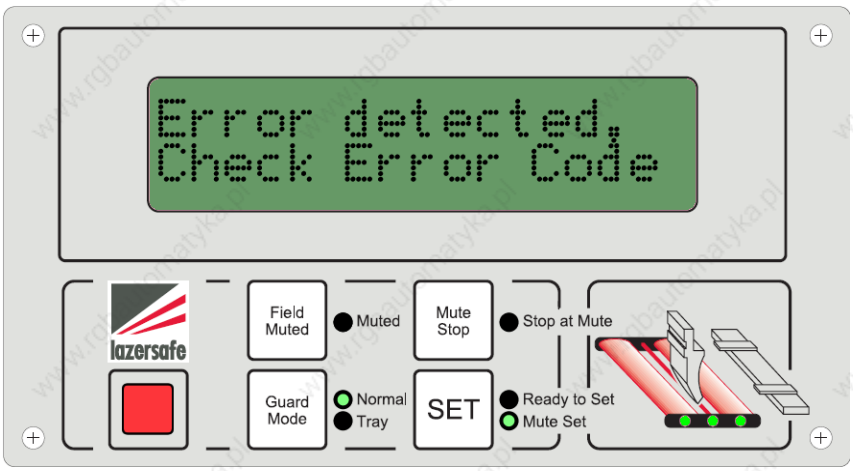


Figure 5-5: Error detected display.
(Note: the first line of the text display scrolls the message "Error detected, emergency stop activated".)

In this situation, the press brake is shut down and cannot be operated until the error condition is corrected. The error code is displayed on the LZS-003-HS Controller's two digit display - consult Section 8 for detailed information.

5.4 Setting the Mute Point

Prior to setting the mute point place a sample piece of material on top of the die.

- Place a sample piece of material on top of the die. The material should be the same thickness as the material that will be used during bending as the laser will detect the surface of the material when setting the mute point. See Figure 5-6.

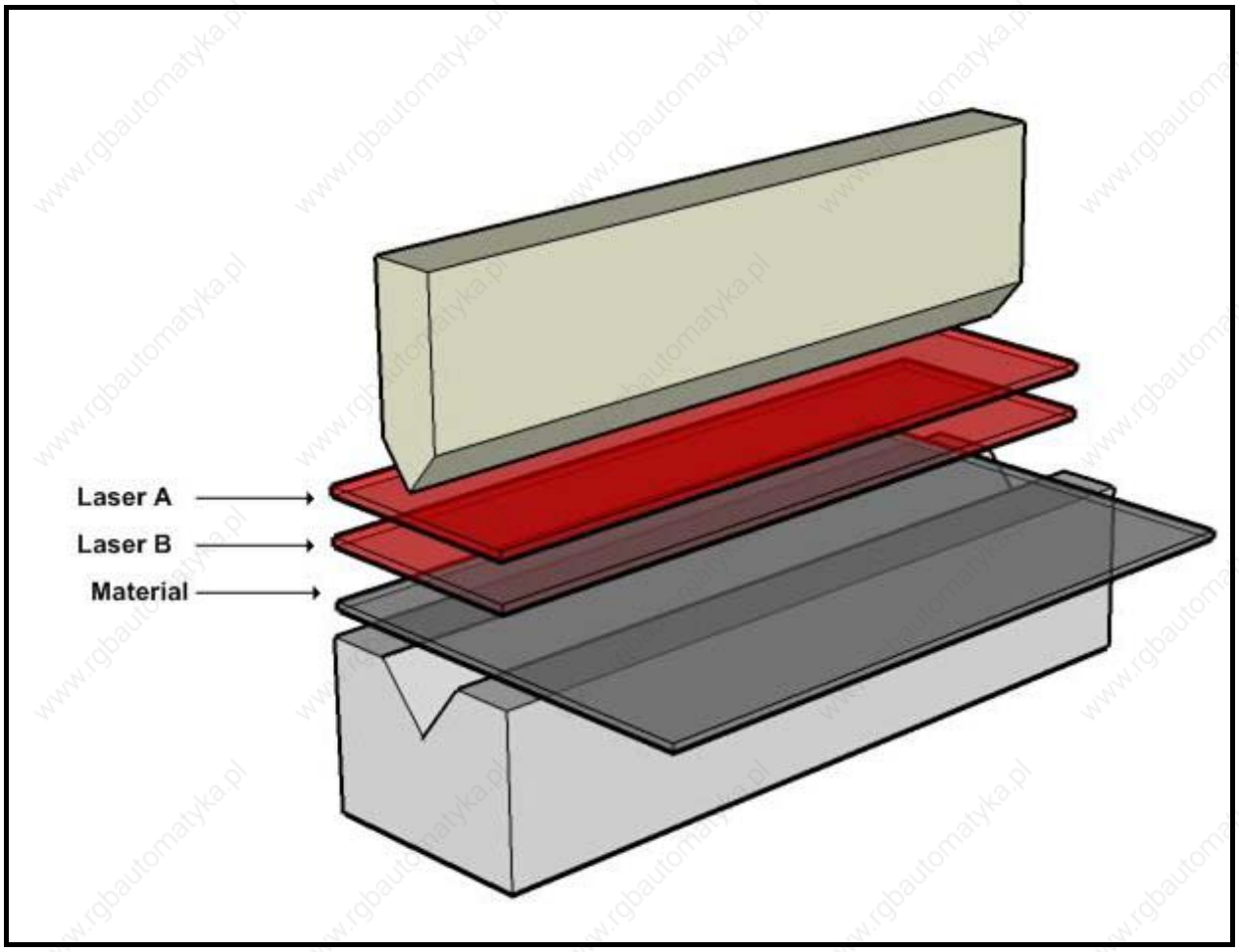


Figure 5-6: Material placement on the die.

Note:
In addition to being set immediately after the start-up test, the mute point must always be reset in any of the following situations:

- After changing from Normal mode or Tray mode to Field Muted mode.
- After changing from Field Muted mode to Normal mode or Tray mode.
- When material thickness changes.
- When the tools are changed.

To set the mute point, press the **SET** button. The **Ready to Set** LED will be on. If in Normal mode, the display will show:

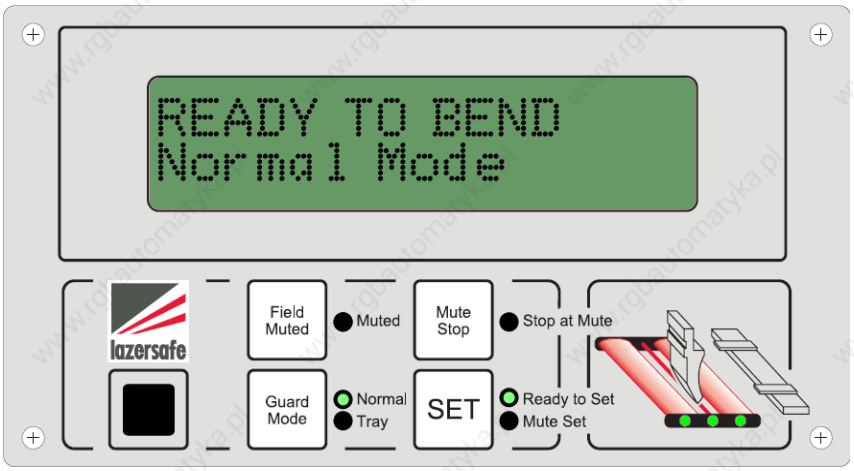


Figure 5-7: Setting the mute point (step 1)

Press the foot pedal to close the tools. When the laser detects the material the beam will stop and the message in Figure 5-8 will be displayed. Release the foot pedal.

Note:
During mute point set-up the LZS-003-HS system uses the front and middle sensors of the receiver to detect the material. When setting the mute point the rear sensor must remain unobstructed. If a rear sensor obstruction occurs the beam will stop. Release the foot pedal and press again. The beam will move a further 2mm. If the front or middle sensors do not detect the material then the mute point can not be set. The beam must then be retracted, the SET button pressed and the mute point set-up repeated.

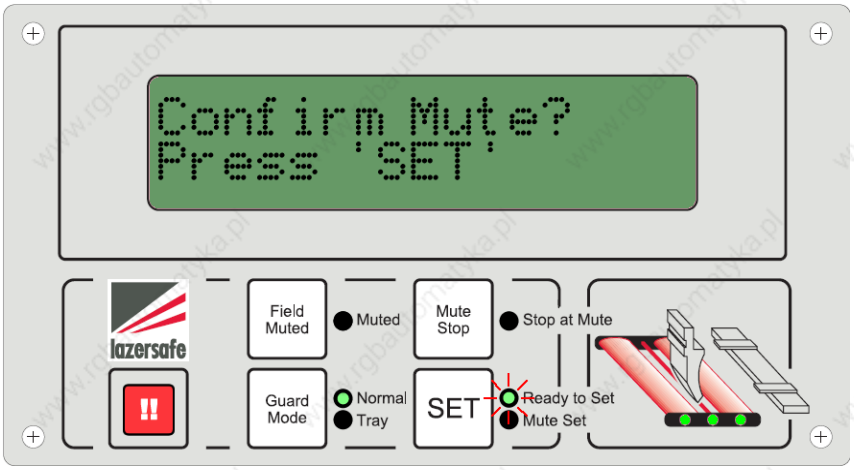


Figure 5-8: Setting the mute point (step 2)

Press the **SET** button to confirm. The **Ready to Set** LED will be off and the **Mute Set** LED will be on. The display will show:

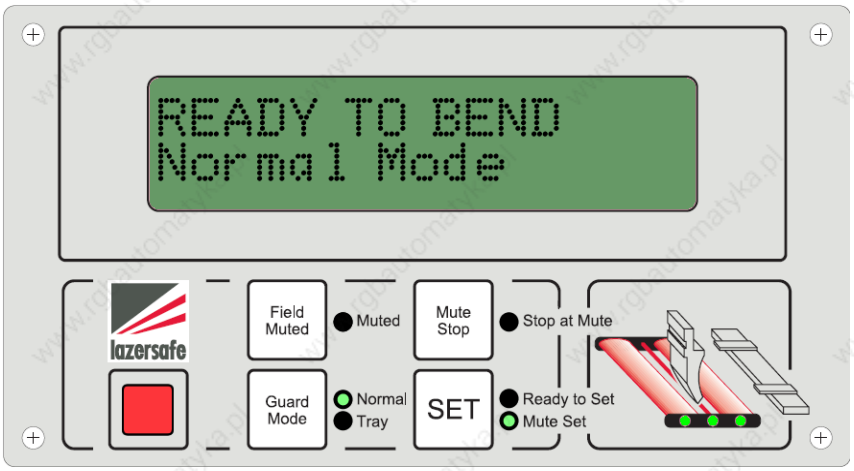


Figure 5-9: Mute point set

The mute point is now set.

The beam may now be driven further down, or retracted.

Note:
Retraction may occur automatically after the punch has been moved downwards, to the bottom dead centre.

The system may now be operated.

5.5 Selecting Tray / Box Mode

In order to select Tray / Box mode, the system must first be in Normal mode (the default start-up mode), as shown in Figure 5-10. The laser must also be above the mute point and clear of any obstructions.

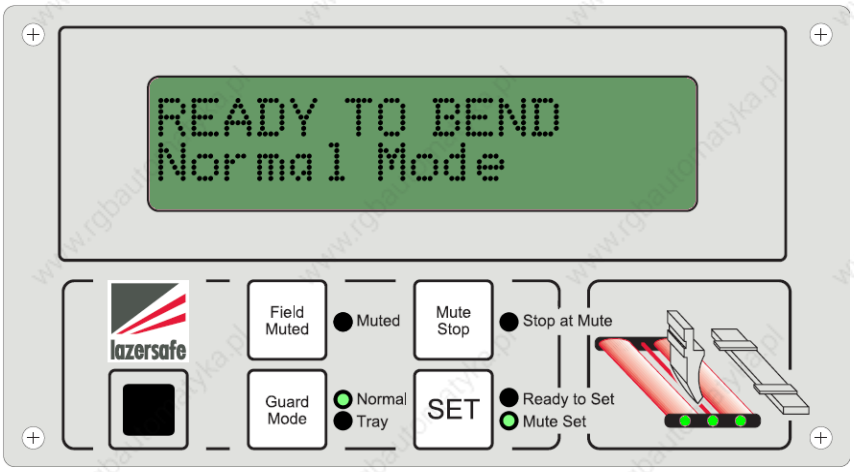


Figure 5-10: Normal mode panel display

Press the **Guard Mode** button - the display will change as shown:

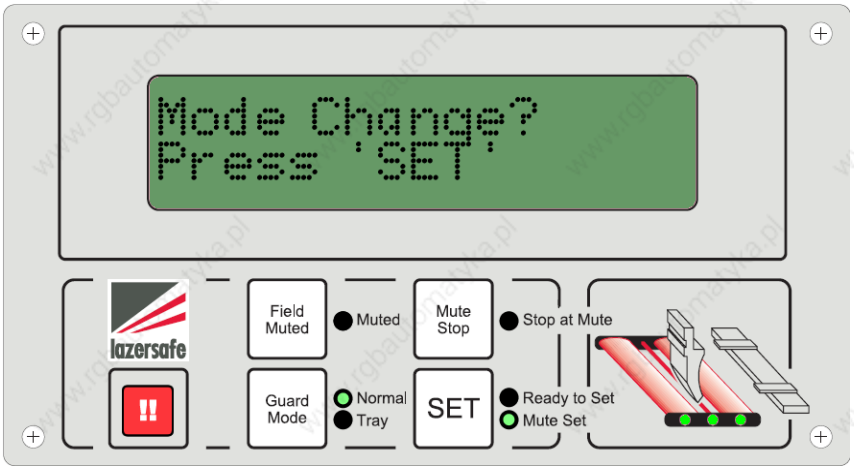


Figure 5-11: Mode change confirmation

Press the **SET** button - the display will change as follows to confirm Tray / Box mode and the **Tray** LED will be on:

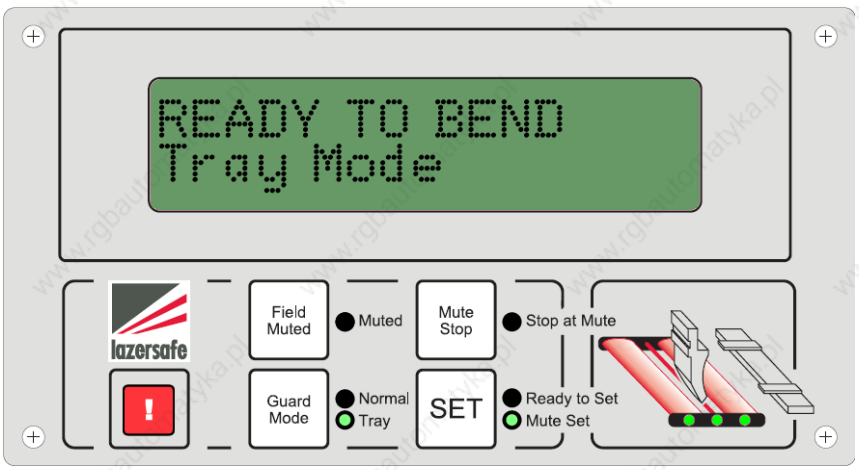


Figure 5-12: Indication of Tray / Box mode selection

Tray / Box mode is now activated.

Notes:

- The setting of the Mute point is stored in memory. For a new setting, perform the same procedure for Mute Point setting as described for Normal Mode (Section 5.4).
- When setting the mute point in Tray / Box mode, the front and middle sensors of the laser receiver find the reference position. However, if the rear sensor is obstructed first, there will be no 2 mm tolerance zone.

5.6 Returning From Tray / Box Mode to Normal Mode

The LZS-003-HS automatically returns to Normal mode from Tray / Box mode after 10 minutes of inactivity. It can also be returned to Normal mode by a procedure identical to that described previously:

Press the **Guard Mode** button - the display will change as shown:

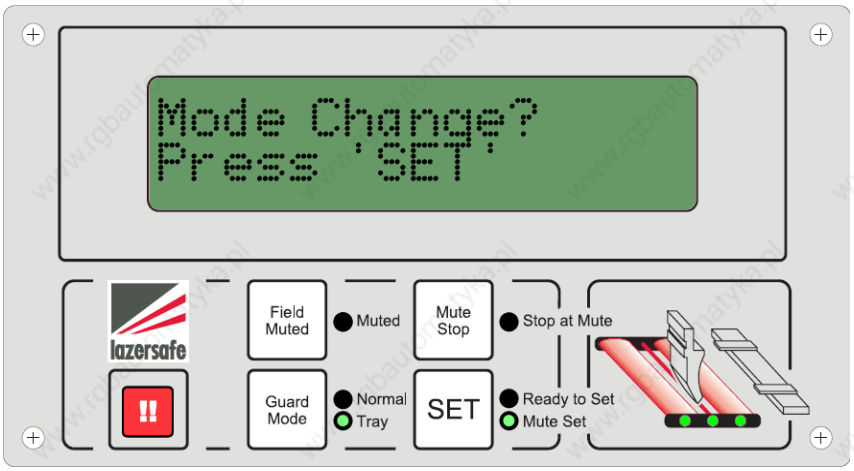


Figure 5-13: Mode change confirmation

Press the **SET** button - the display will change as follows to confirm Normal mode:

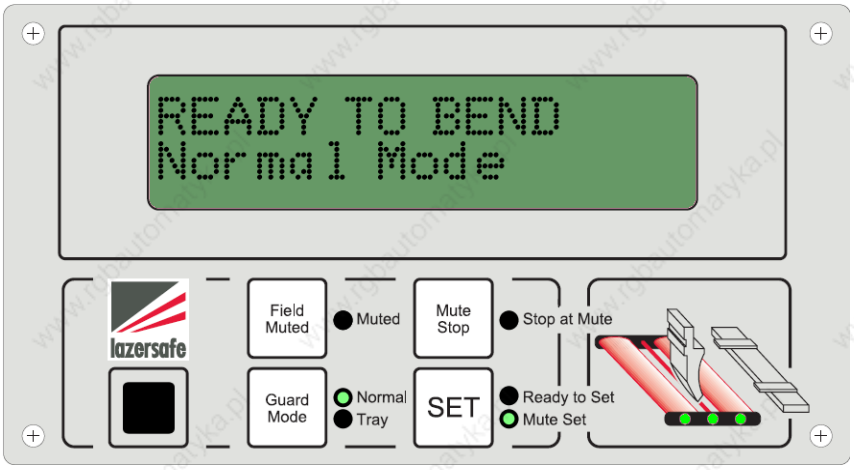


Figure 5-14: Indication of Normal mode selection

Normal mode is now activated.

5.7 Selecting Field Muted Mode

Note:
The availability of this mode depends on the setting of the relevant operating parameter. See Section 7 for more detailed information.

WARNING: NO PROTECTION IN FIELD MUTED MODE
In Field Muted mode, the optical sensing is deactivated. Although the LZS-003-HS ensures that the machine does not exceed crawl speed in this mode, particular caution must still be exercised.

The LZS-003-HS Operator Panel requires a password to enable the Field Muted mode button. The password should only be available to suitably trained personnel.

Field Muted mode should only be used by suitably trained personnel and only in exceptional circumstances (changing tools, maintenance, etc.)

To select Field Muted mode, press the **Field Muted** button. The display will show:

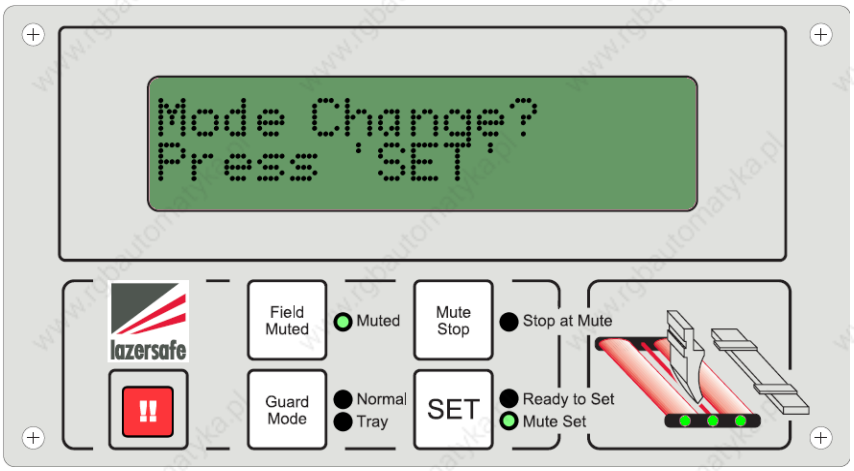


Figure 5-15: Mode change confirmation

Press the **SET** button to confirm. The display will show:

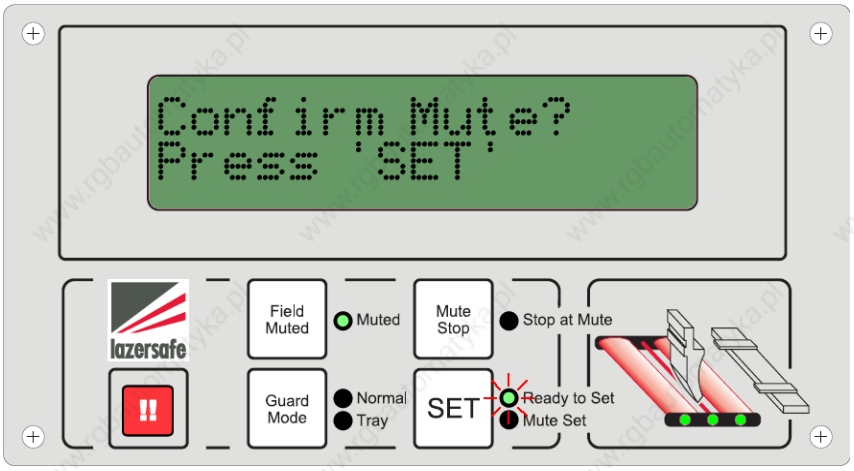


Figure 5-16: Selecting Field Muted Mode

At this stage a manual mute point can be set anywhere in the stroke.

- Press the foot pedal to close the tools.
- Release the foot pedal at the desired mute point position.

Press the **SET** button to confirm the mute point. The display will show:

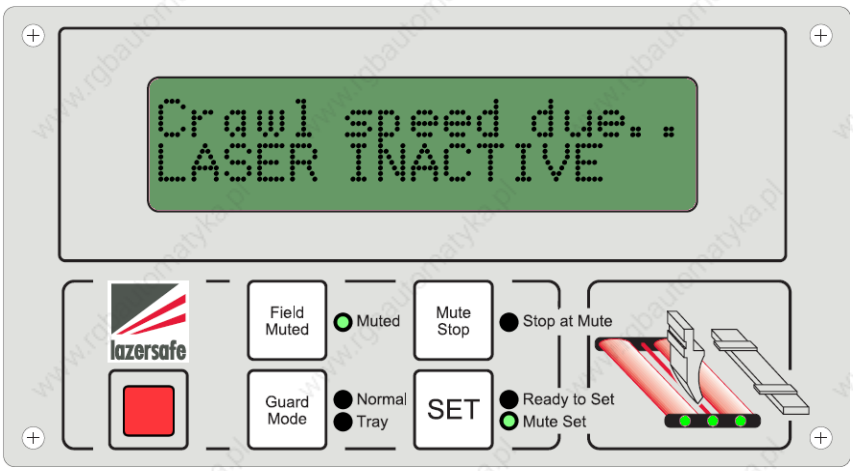


Figure 5-17: Indication of Field Muted mode selection.
(Note: the first line of the text display scrolls the message "Crawl speed due to field muted mode")

5.8 Returning From Field Muted Mode to Normal Mode

To return to Normal mode from Field Muted mode, press the **Guard Mode** button. The display will show:

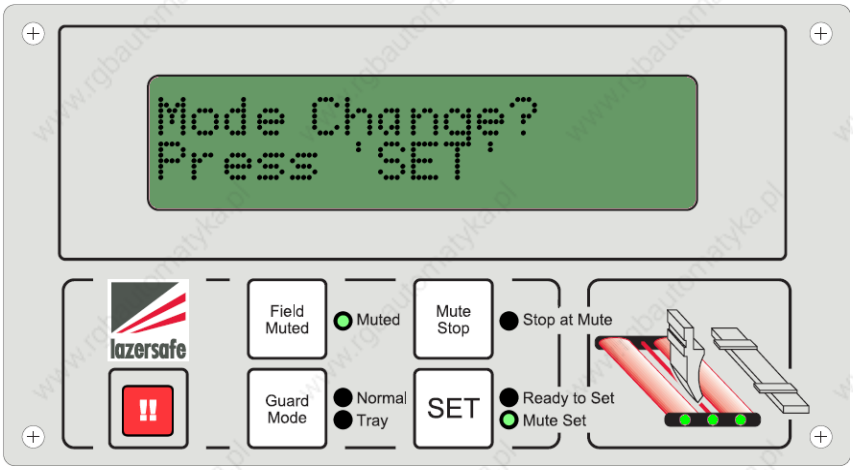


Figure 5-18: Change from Field Muted mode

After pressing the **SET** button, the mute point must be reset. Repeat the steps in section 5.4 Setting the Mute Point.

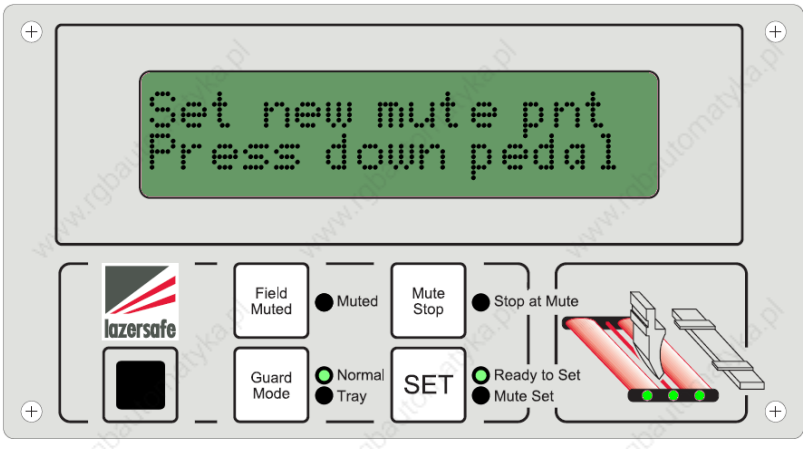


Figure 5-19: Reset mute point after mode change

Confirm the new mute point by pressing the **SET** button:

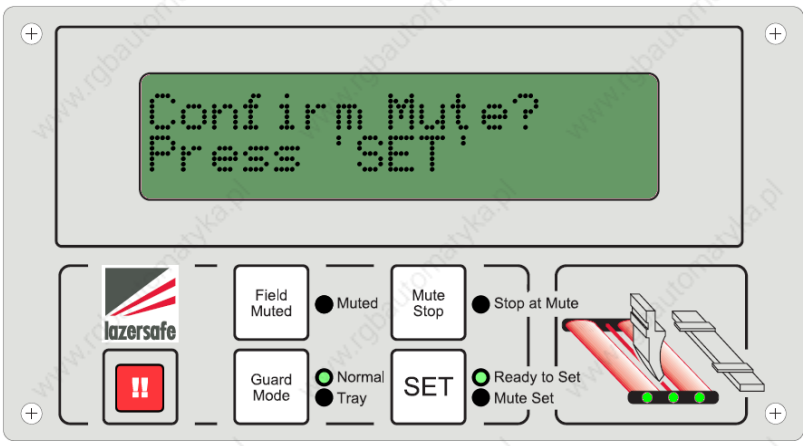


Figure 5-20: Mute point confirmation

After pressing the **SET** button, the system is returned to Normal mode:

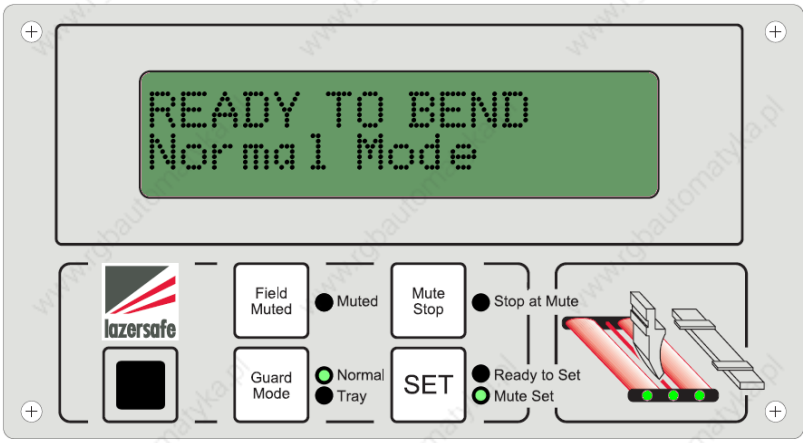


Figure 5-21: Indication of Normal mode selection

Normal mode is now activated.

5.9 Selecting Stop at Mute Point Mode

Note:
The availability of this mode depends on the setting of the relevant operating parameter. See Section 7 for more detailed information.

To select Stop at Mute Point mode (in Normal Mode, Tray / Box Mode or Field Muted Mode), press the **Mute Stop** button. Depending on the current mode, the display will appear as shown in either Figure 5-22 or Figure 5-23.

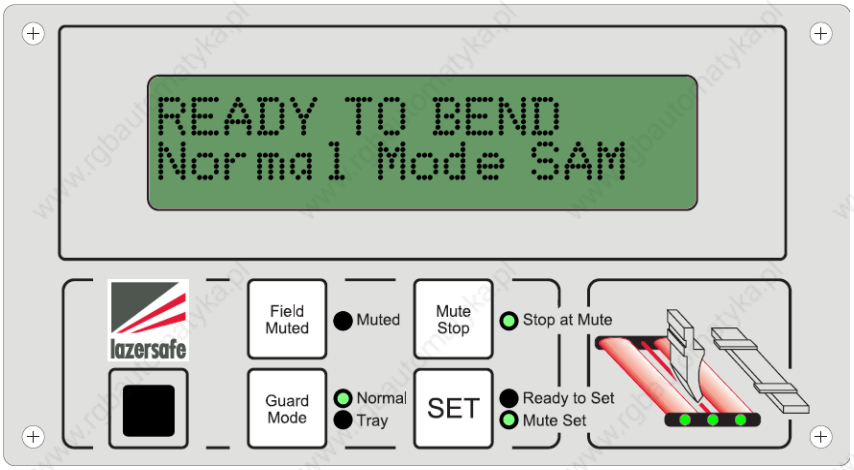


Figure 5-22: Selecting Stop at Mute Point Mode (in conjunction with Normal mode)

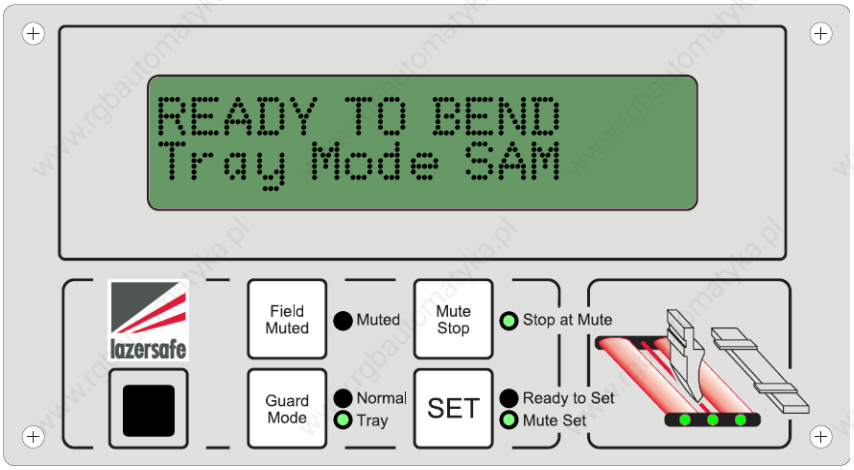


Figure 5-23: Selecting Stop at Mute Point Mode (in conjunction with Tray / Box mode)

Note:
"Stop at Mute Point" also mutes the rear beam for an increased height above mute point. This prevents the back gauge from interrupting the rear beam when the back gauge is set to less than 20 mm.

5.10 Disengage Stop at Mute Point Mode

To disengage Stop at Mute Point mode, press the **Mute Stop** button. The display will show:

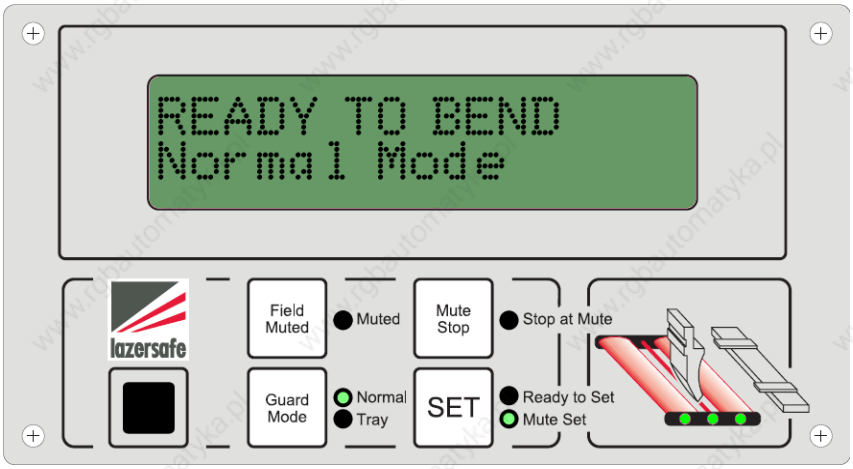


Figure 5-24: Disengage Stop at Mute Point Mode (Normal Mode)

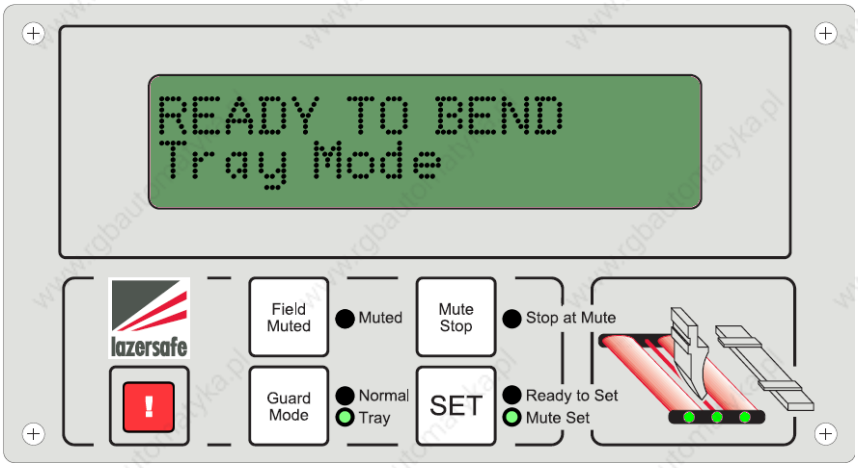


Figure 5-25: Disengage Stop at Mute Point Mode (Tray / Box Mode)

6 Operator Instruction and Demonstration

Lazer Safe Ref #: _____

Instructor's Name: _____ Company: _____

Signature: _____ Date: _____

Ensure that the responsible person - Operator, Foreman or Manager (whoever the company designates as responsible) reads and understands the manual (translate if necessary).

It is suggested that the manual be given to this person as the installation is started so they will have read the manual by the time the installation is completed.

6.1 Equipment Identification

Component	Model	Serial Number	Notes
LZS-003-HS Controller			
Transmitter			
Receiver			
Operator Panel			

6.2 Starting the System

Refer to Section 5.2 for a detailed description.

- Demonstrate and explain the start-up test. Demonstrate the stopping test during start-up and explain how it tests the safety stopping performance of the machine and either passes or shuts the machine down with an error. Explain the 30 hour test if the machine is run continually for 30 hours.
- Explain how the transmitter and receiver operate. Demonstrate how the receiver detects the laser in segments (using a 4 mm Allen key is usually convenient). Show how blocking the laser like this is indicated on the operator panel lights (front, middle, and rear sensors clear or not clear).

6.3 Mute Point Setting

Refer to Section 5.4 for a detailed description.

- **Highlight the purpose of the mute point.** Explain that the laser detects obstructions 2mm above the surface of the material that you have set mute from. Explain how a change in material thickness will be detected if it is greater than 2mm.
- **Get the operator to demonstrate setting and resetting the mute point.** Make sure the process outlined in Section 5.4 is understood.
- Ensure that it is understood that the mute point is set from the front and middle sensors.

6.4 Operation in Normal Mode

- Ensure that it is understood what happens when the system runs in normal mode.
- **The process must be understood and demonstrated.**
- Demonstrate the difference between front, middle and rear sensor obstructions with regard to the pressing beam retract function (if operational).
- Ensure it is understood that the laser is muted after one or two obstructions (depending on operation) and that the Mute lamp remains permanently lit to indicate this status. Explain the sensor blanking function of the receiver rear sensors.

6.5 Tray / Box mode

Refer to Sections 5.5 and 5.6 for detailed descriptions.

- Explain and demonstrate how this process is useful in box and tray type bending.
- **Get the operator to go into and come out of Tray / Box mode themselves.**
- Explain that the mute point is retained when switching from normal to Tray / Box mode. Also get them to change mute point in Tray / Box mode.
- Make sure they understand that the front and rear sensors are muted after an obstruction, but if the middle sensor is obstructed the laser will be muted for the remainder of the stroke.
- Make sure the operator is aware of the 10 minute time limit set into Tray / Box mode and that it ensures the machine cannot be left permanently in Tray / Box mode.

6.6 Field Muted Mode

Refer to Sections 5.7 and 5.8 for detailed descriptions.

- Demonstrate this function and ensure the operator understands that the laser protection will be switched off and the machine will only operate in crawl speed while being used in this mode.
- Explain that the system will still monitor the machine speed and stopping performance. Make sure the operator is aware that a responsible person should have access to the password for enabling the field-muted mode button.
- Show how to switch back to normal mode and explain that the mute point must be reset.

WARNING: NO PROTECTION IN FIELD MUTED MODE

In Field Muted mode, the optical sensing is deactivated. Although the LZS-003-HS ensures that the machine does not exceed crawl speed in this mode, particular caution must still be exercised.

The LZS-003-HS Operator Panel requires a password to enable the Field Muted mode button. The password should only be available to suitably trained personnel.

Field Muted mode should only be used by suitably trained personnel and only in exceptional circumstances (changing tools, maintenance, etc.)

6.7 Stop at Mute Point

Refer to Sections 5.9 and 5.10 for detailed descriptions.

- Explain the stop at mute function. Show how the rear sensor is muted 10 mm above the material to provide extra clearance for any back-gauge interference.

6.8 Setting Laser Position

Refer to Section 4 or the Transmitter Receiver Alignment Manual for a detailed description.

- Explain and demonstrate how to adjust the Transmitter and Receiver height.
- **Get the operator to adjust the brackets and check the alignment of the laser.**
- Demonstrate how the laser target is used to set the distance of the laser from the punch ensuring that it is parallel.
- Ensure the operator is aware that to view the laser striking the receiver, a small section of the laser can be obstructed to brighten the intensity.
- Explain that if the laser is not correctly aligned, the mute point can be inaccurately detected when bending and that errors codes can be generated.

6.9 Back Gauge Interference

- **Ensure that the operator understands the effect of the back gauge on the rear sensor section.** If an obstruction occurs, the system will react by stopping the machine.
- Establish if the back gauge or any processes they are performing may cause interference.
- Explain that approximately 10 mm of the rear sensor can be blocked by the back gauge without an obstruction to be detected.

6.10 Running the System

- **Have the operator perform each of the main functions.**
- Using each mode of the system have the operator bend some test pieces of material and also making sure to utilise the Tray / Box mode for a demonstration of the operation during box bending.
- Ensure the operator is aware of each mode they are in and the status of the LCD and indicator LEDs, including the Mute lamp during each mode.

6.11 Customer Sign Off – Training Completed

Company Name: _____ Date: _____

Names of Company Representatives:	Signatures of Company Representatives:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

7 Parameter Programming with the 1003-03 Operator Panel

The LZS-003-HS can be programmed with a number of operational parameters to suit individual user requirements.

These parameters are:

New password
To ensure that changes are made only by authorised personnel, the LZS-003-HS requires entry of a four digit password to enter the programming mode. This password can and should be changed from the factory default password

Field Muted button functionality
This option determines behaviour of the **Field Muted** button, controlling access to the Field Muted mode.

Mute Stop button functionality
This option determines behaviour of the **Mute Stop** button, controlling access to the Stop at Mute Point mode.

Crawl distance
This option allows you to set the distance above the work piece that the press brake travels at crawl (slow) speed.

Language selection

This option allows to you to select the different language options installed.

Note:
Pressing the **Lazer Safe** button at any time exits the Parameter Programming mode when no change has been made to the parameter currently being edited.

The options for each of the parameter programming methods are described in the following sections.

7.1 Using the Keypad in Parameter Programming Mode

In Parameter Programming mode, the Operator Panel keypad is used to make menu selections and enter parameter values. In this mode, the functionality of the buttons differs from normal operation. These differences are summarised in the following diagram and table:

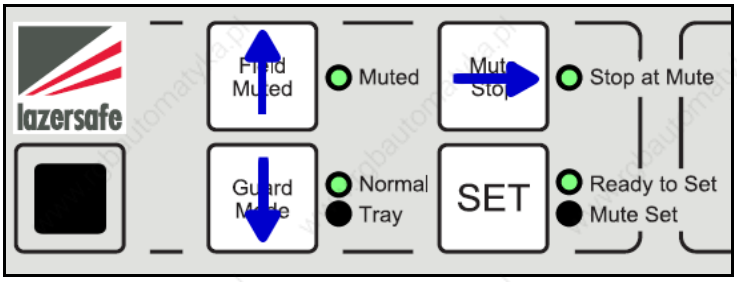


Figure 7-1: Keypad button functionality in Parameter Programming mode

Button	Function
Field Muted	Moves menu selection up or increments value (depending on context)
Guard Mode	Moves menu selection down or decrements value (depending on context)
Mute Stop	Moves cursor to next digit (where applicable)
SET	Accepts the current menu selection or value entered (depending on context)

Note:
Each button's LED is illuminated whenever the button is active.

7.2 Entering Parameter Programming Mode

To enter the Parameter Programming mode, press the Lazer Safe logo (directly above the Mute lamp). You will immediately be required to enter a four digit password, as shown in the following figure:

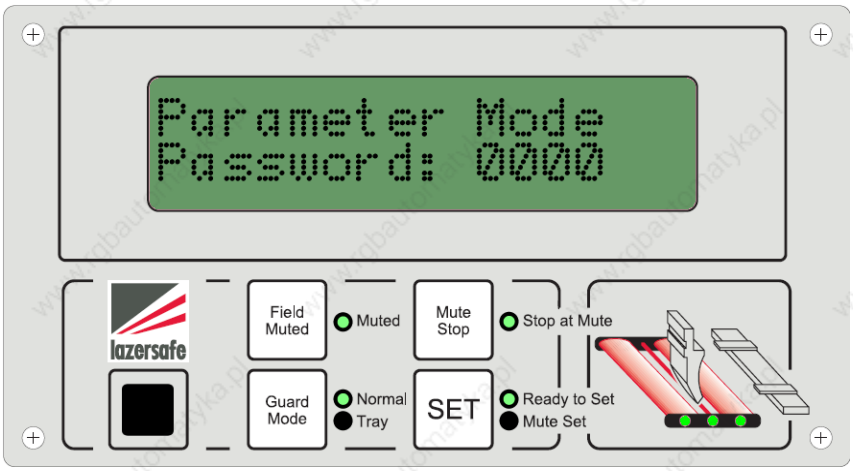


Figure 7-2: Password entry

Warning
The factory default password for entering Parameter Programming mode is 1234. For maximum safety, it is strongly recommended that the password be changed when the LZS-003-HS is installed. See Section 7.4 for detailed information on changing the password.

To enter the password:

1. Press the **Field Muted** button to increment the current digit (highlighted with an underscore) or press the **Guard Mode** button to decrement it.
2. When the correct value for that digit is displayed, press the **Mute Stop** button to select the next digit.
3. Repeat Steps 1 and 2 until all four password digits have been entered. At any time, you can go back to previous digits by pressing the **Mute Stop** button until it "scrolls" back to the position you wish to change.
4. Press the **SET** button to accept the value entered.

If you have entered the password correctly, the display will allow you access the parameter programming functions. If the password is entered incorrectly, the LZS-003-HS will return to normal operating mode.

7.3 Selecting the Parameter to be Programmed

Once the password has been correctly entered, the display shows:

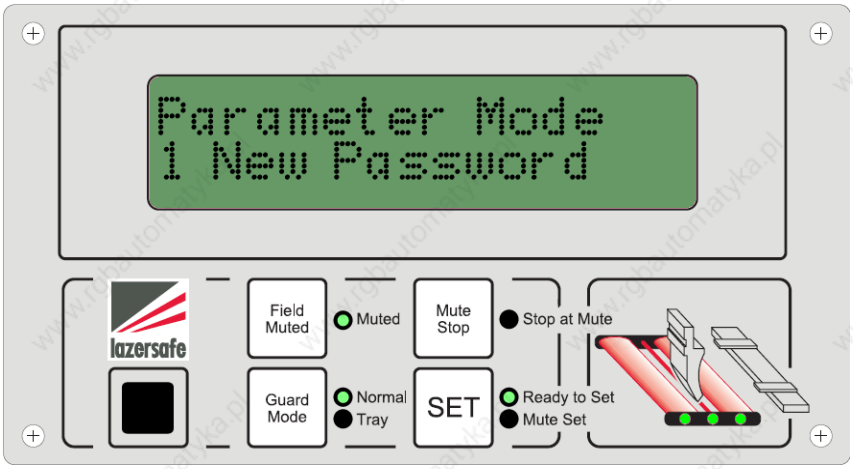


Figure 7-3: Set New password

Pressing the **Guard Mode** button scrolls to the next parameter, as shown in the following figures. Press **SET** to accept your selection.

If you go past the parameter you wish to set, press the **Field Muted** button to move "up" a menu item.

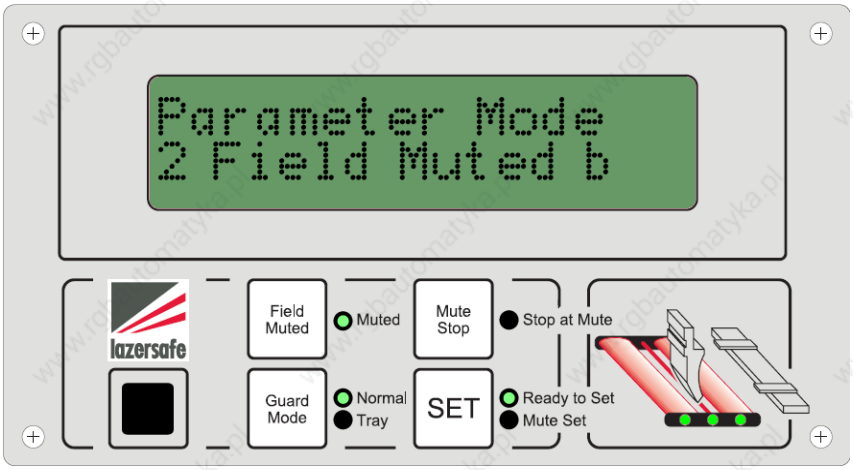


Figure 7-4: Set Field Muted button functionality

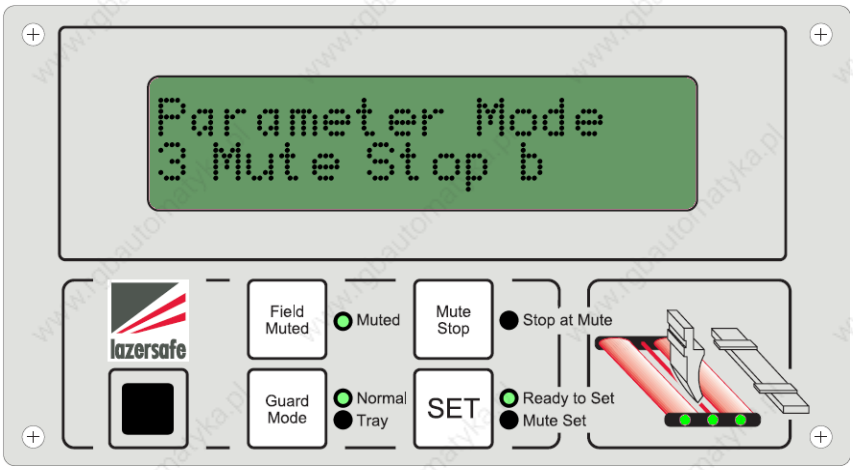


Figure 7-5: Set Mute Stop button functionality

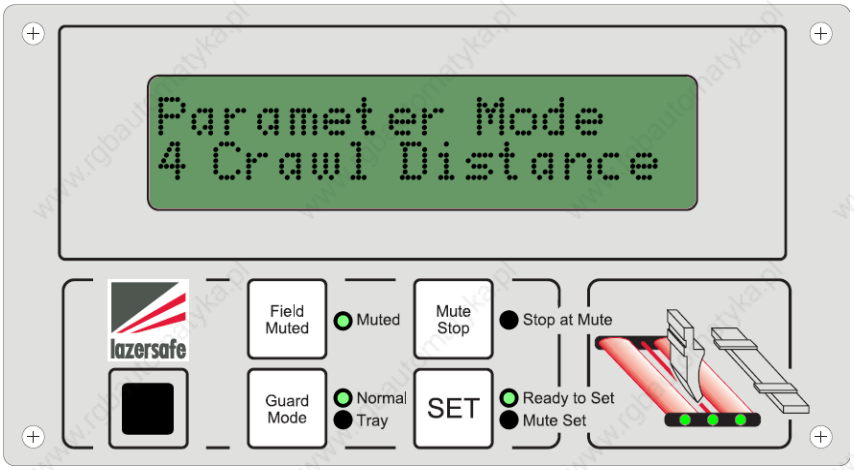


Figure 7-6: Set crawl distance

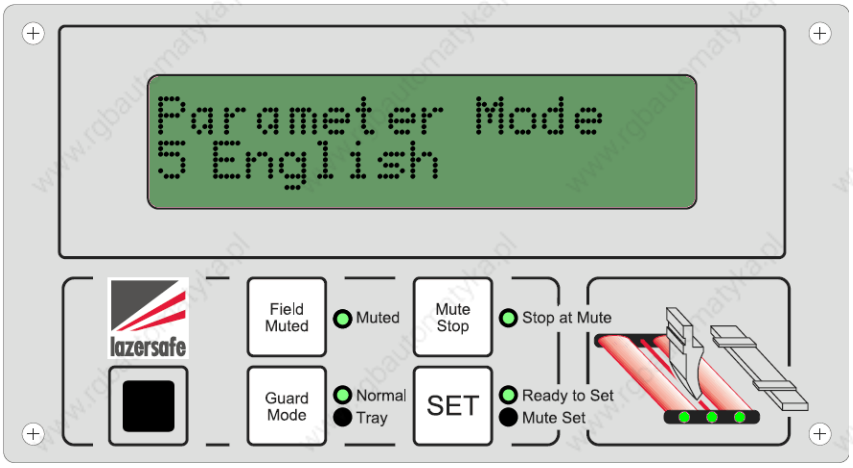


Figure 7-7: Set Language

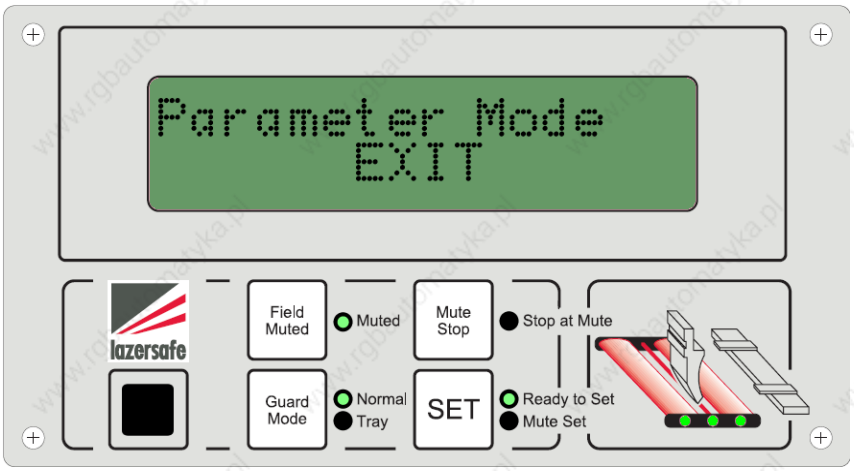


Figure 7-8: Exit parameter programming

7.4 New Password

As described in the previous section, it is strongly recommended that you change the parameter programming password as soon as the LZS-003-HS is installed. This specifically prevents unauthorised access to Field Muted mode, in which there is no laser protection.

Note:
For your convenience, it is important to record the new password and save it in a safe place. If you lose the password, the operator panel must be returned to Lazer Safe or your authorised distributor / installer to have the default password restored.

After entering this programming parameter, the display shows:

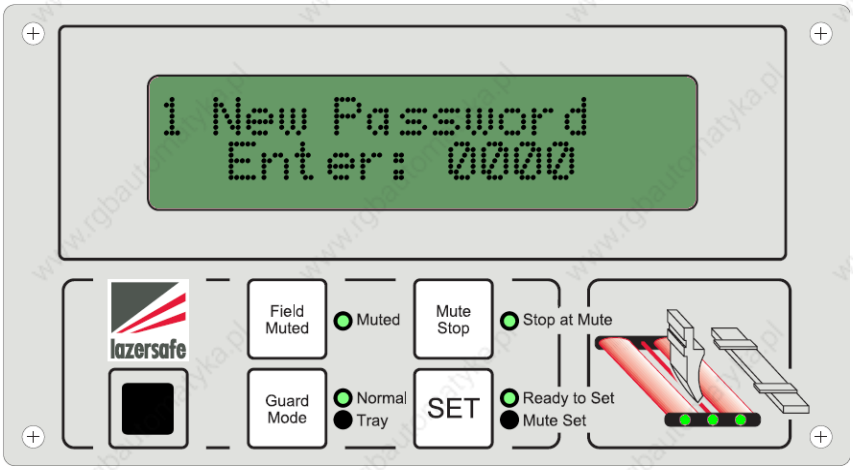


Figure 7-9: Enter new password

To enter a new password:

1. Press the **Field Muted** button to increment the current digit (highlighted with an underscore) or press the **Guard Mode** button to decrement it.
2. When the correct value for that digit is displayed, press the **Mute Stop** button to select the next digit.
3. Repeat Steps 1 and 2 until all four password digits have been entered. At any time, you can go back to previous digits by pressing the **Mute Stop** button until it "scrolls" back to the position you wish to change.
4. Press the **SET** button to accept the value entered.

Once all four digits have been re-entered, you will be prompted to re-enter the password to confirm it, as shown:

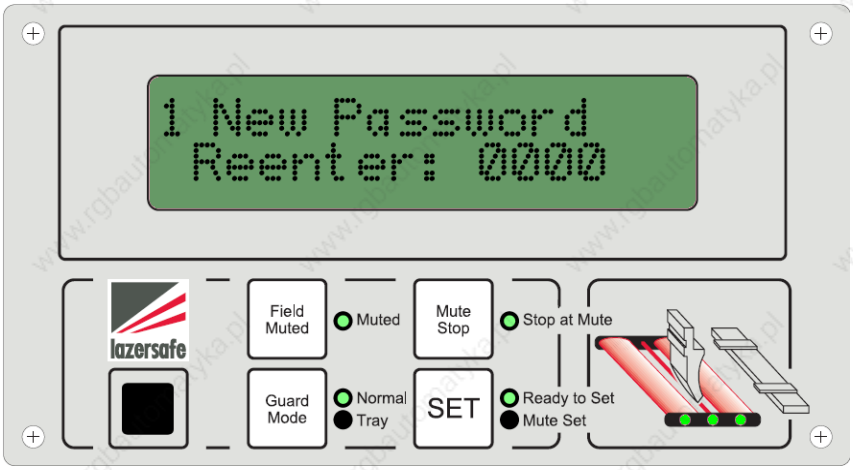


Figure 7-10: Re-enter new password

The process for re-entering the new password is identical to the process described above. If the new password is re-entered correctly and confirmed, the display will return to the main Parameter Programming menu.

If it is entered incorrectly, the following display is shown:

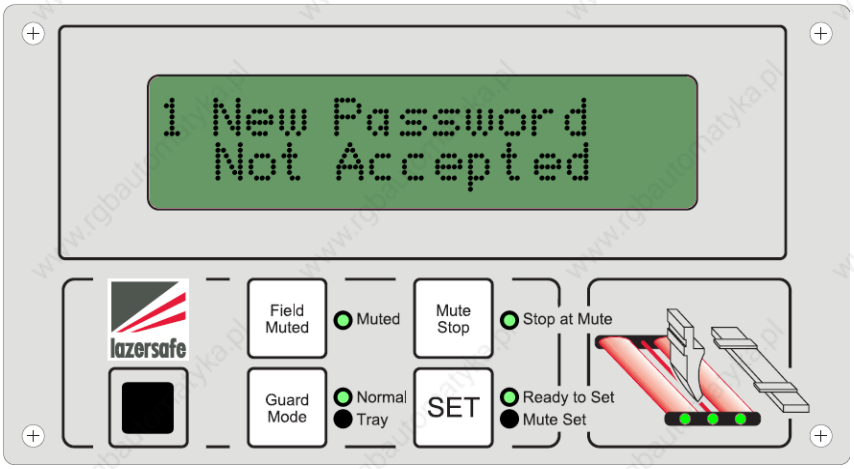


Figure 7-11: New password not accepted

If the new password has not been accepted, press the **SET** button to return to the main Parameter Programming menu. If you wish, you can attempt changing the password again by selecting the New Password option.

7.5 Field Muted Button Functionality

This parameter allows to you to select the functionality of the **Field Muted** button in press brake operation.

WARNING: NO PROTECTION IN FIELD MUTED MODE

In Field Muted mode, the optical sensing is deactivated. Although the LZS-003-HS ensures that the machine does not exceed crawl speed in this mode, particular caution must still be exercised.

The LZS-003-HS Operator Panel requires a password to enable the Field Muted mode button. The password should only be available to suitably trained personnel.

Field Muted mode should only be used by suitably trained personnel and only in exceptional circumstances (changing tools, maintenance, etc.)

The three options available are:

Option	Functionality
Enabled	The button is enabled and the operator can enter Field Muted mode at any time.
Disabled-On	The button is disabled and the system is locked into Field Muted mode.
Disabled-Off	The button is disabled and the system is locked out of Field Muted mode.

On entering this parameter's menu, the display shows:

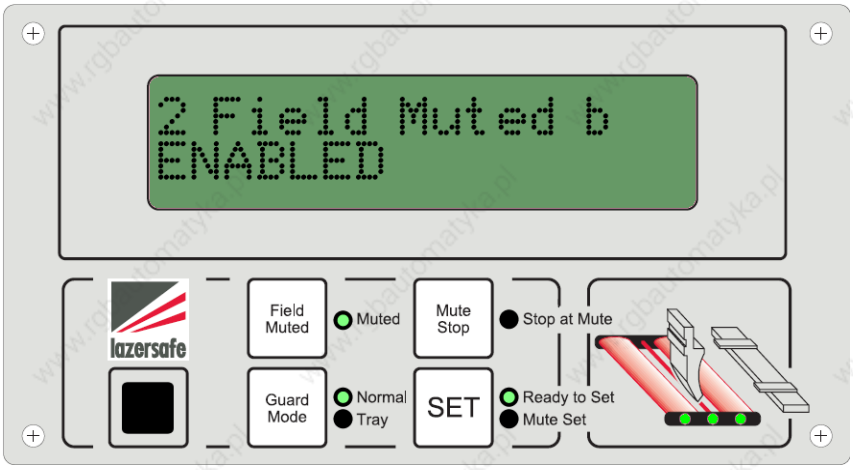


Figure 7-12: Field Muted button functionality - option 1

Pressing the **Guard Mode** button successively displays the other options for this parameter. Press **SET** to accept your selection.

If you go past the option you wish to set, press the **Field Muted** button to move "up" a menu item.

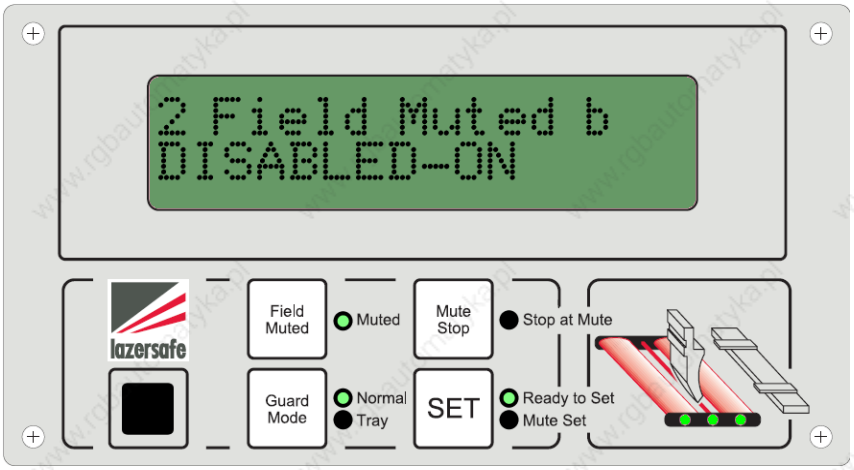


Figure 7-13: Field Muted button functionality - option 2

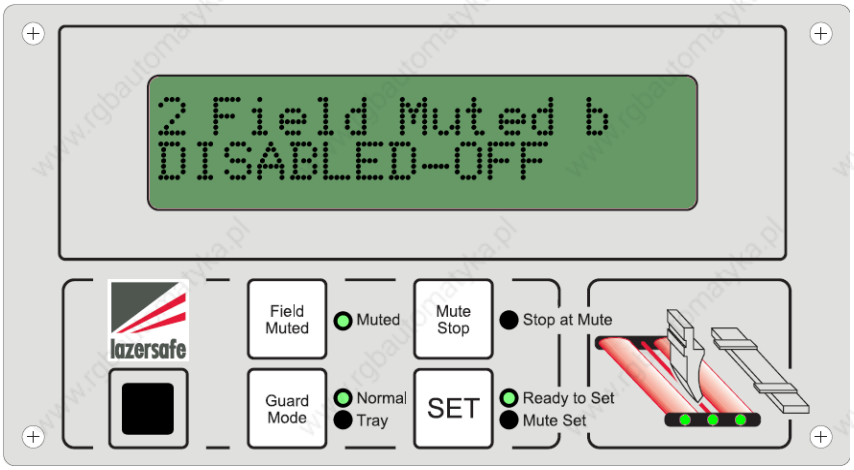


Figure 7-14: Field Muted button functionality - option 3

7.6 Mute Stop Button Functionality

This parameter allows to you to select the functionality of the **Mute Stop** button in press brake operation.

The three options available are:

Option	Functionality
Enabled	The button is enabled and the operator can enter Stop at Mute Point mode at any time.
Disabled-On	The button is disabled and the system is locked into Stop at Mute Point mode.
Disabled-Off	The button is disabled and the system is locked out of Stop at Mute Point mode.

On entering this parameter's menu, the display shows:

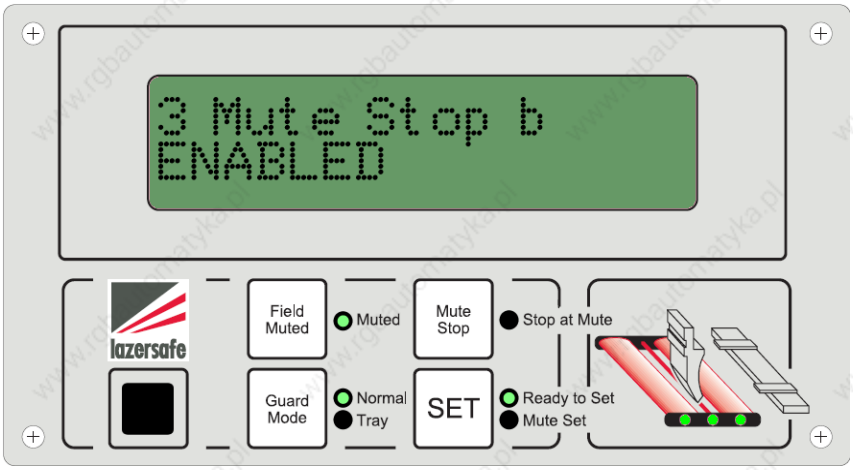


Figure 7-15: Mute Stop button functionality - option 1

Pressing the **Guard Mode** button successively displays the other options for this parameter. Press **SET** to accept your selection.

If you go past the option you wish to set, press the **Field Muted** button to move "up" a menu item.

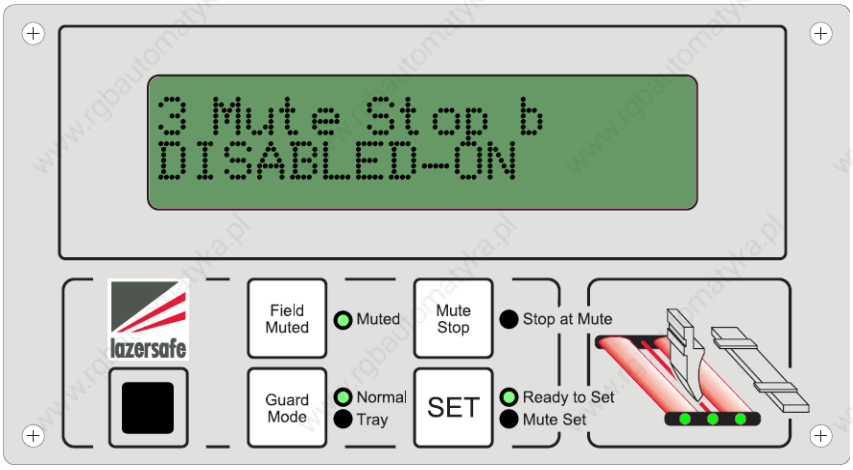


Figure 7-16: Mute Stop button functionality - option 2

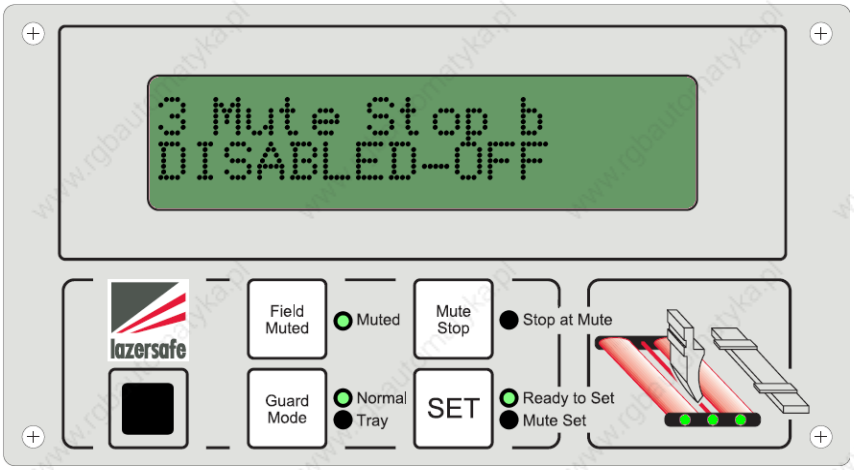


Figure 7-17: Mute Stop button functionality - option 3

7.7 Crawl Distance

This parameter allows to you to select the Crawl Distance (in mm, using two digits).

Caution:
This parameter is set by your supplier and should only be changed by trained personnel. An incorrect crawl distance setting will result in speed errors being detected by the LZS-003-HS controller which will prevent normal operation of the press brake.

On entering this parameter's menu, the display shows:

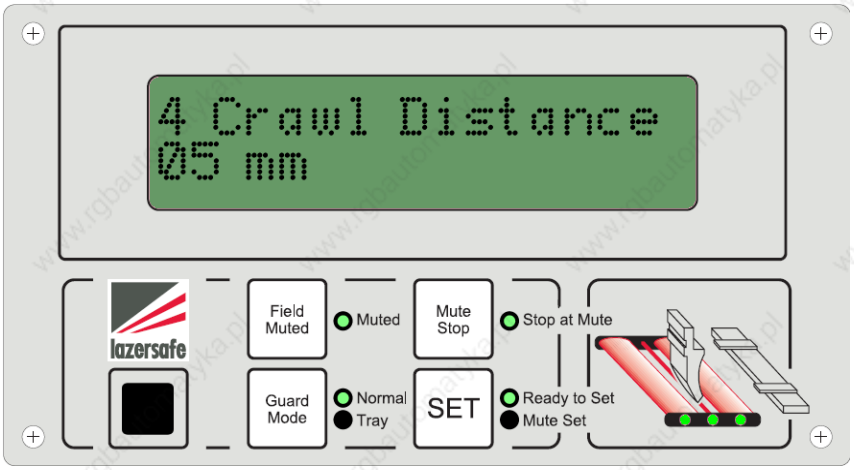


Figure 7-18: Set crawl distance

The default setting is 5mm for dual laser systems.

To enter a new crawl distance:

1. Press the **Field Muted** button to increment the current digit (highlighted with an underscore) or press the **Guard Mode** button to decrement it.
2. When the correct value for that digit is displayed, press the **Mute Stop** button to select the next digit, and repeat Step 1.
3. Press the **SET** button to accept the value entered. The display returns to the main Parameter Programming menu.

7.8 Language

This parameter allows to you to select the different languages installed.

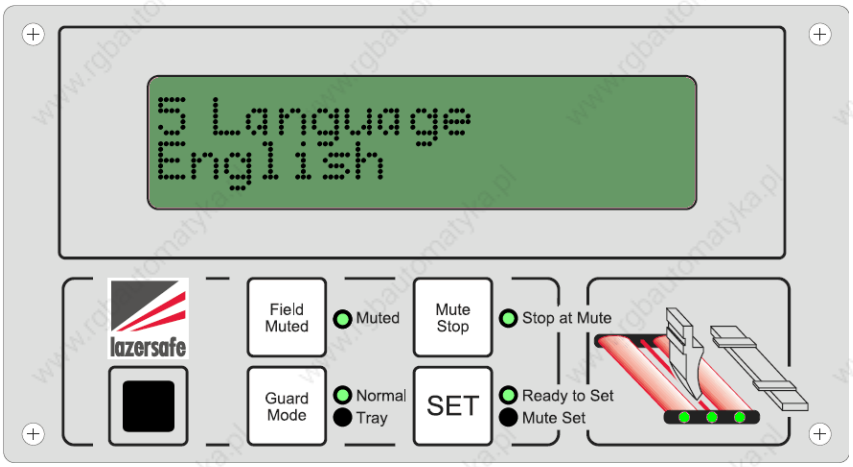


Figure 7-19: Set Language

7.9 Exit

Press the **SET** button when this option is displayed on the main Parameter Programming menu to exit Parameter Programming mode.

8 Error and Condition Codes

8.1 LZS-003-HS Controller Display Codes

The LZS-003-HS controller displays error and condition codes on the two segment display located on the front of the controller box. The right side digit displays the primary processor codes and the left side digit displays the secondary processor codes.

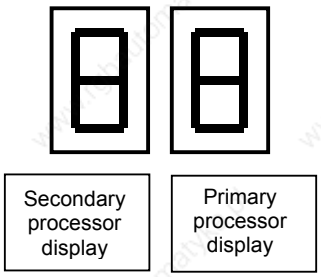


Figure 8-1: Layout of controller display

8.2 Condition Codes

8.2.1 Controller Condition Code Display

Condition codes are displayed during normal operation. These codes ranging from 00 to 07 indicate various steps during initial set-up and mute point setting. They also indicate minor problems that can be rectified by the operator reinitiating part of the set-up procedure.

Secondary Display	Primary Display	Condition Code
0	0	System operational
0	1	Start-up or 30 hour test
0	2	Mode changed
0	3	Obstruction during mute point set-up
0	4	Confirm mute point
0	5	Ambient light detected or receiver not connected
0	6	Start time exceeded
0	7	No material sensed after the mute point

Table 8-1

Note:
Refer to detailed description in this section for more information about condition codes and operator actions required.

8.2.2 1003-03 Operator Panel Conditions

The Operator Panel is programmed to display a range of messages about operational conditions on its two line screen. The first line displays the description of the condition and the second line displays the required action (if any). These are summarised in Table 8-2:

Display Line 1 (Condition)	Display Line 2 (Action Required)
System Power-up	Press 'SET'
Confirm Mute?	Press 'SET'
Mode Change?	Press 'SET'
Obstruction during mute point setup	Press 'SET'
Ambient light present	Press 'SET'
Start-up test1 complete	Down / Up pedal
Receiver clear / obstruction status error	Receiver line check error
No movement detected on down command	Press 'SET'
No material sensed below mute point	Return to top
No movement detected with down command active	Release down pdl
Opening too small for start-up test	prs 'SET' for 2s
Down stroke stopped by first obstruction in normal mode	Release down pdl
Down stroke stopped by second obstruction in normal mode	Release down pdl
Down stroke stopped by outside obstruction in tray mode	Release down pdl
Down stroke stopped by centre obstruction in tray mode	Release down pdl
Down stroke stopped at mute point in 'stop at mute' mode	Release down pdl
Crawl speed due to field muted mode	LASER INACTIVE
Crawl speed due to second obstruction in normal mode	-
Crawl speed due to centre obstruction in tray mode	-
Crawl speed due to open tools with protection off	-
Crawl speed due to no start-up test being performed	RESET MACHINE
Error detected, emergency stop activated	Check Error Code
Do Start-up Test1	Press down pedal
Set new mute pnt	Press down pedal
Unrecognised Error Code	-

Table 8-2: Operator panel condition codes

Abbreviations

The following abbreviations are used for conciseness in some of the above messages:

Abbreviation	Meaning
pdl	Pedal
pnt	Point
prs	Press
s	Seconds

Table 8-3

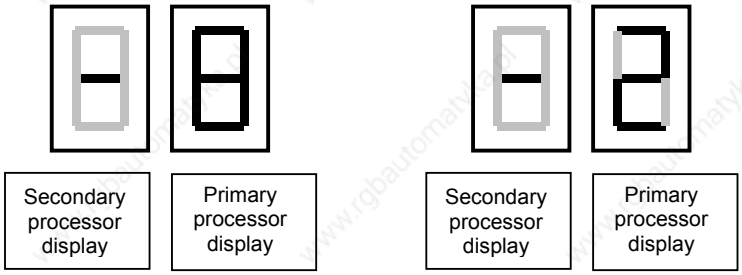
8.3 Understanding Error Codes

In the event of an emergency shut down the LZS-003-HS will display error codes on the two-segment display. Error codes are displayed as primary (right segment) and secondary (left segment) codes and have two parts to each. The display will cycle through the four error code numbers automatically and will continue to repeat until the LZS-003-HS controller is reset. The display sequence is as follows;

- Both displays show **--**
- Secondary display shows **-** Primary display shows 1st number
- Secondary display shows **-** Primary display shows 2nd number
- Both displays show **--**
- Secondary display shows 1st number. Primary display shows **-**
- Secondary display shows 2nd number. Primary display shows **-**
- Both displays show **--** then sequence is repeated

Note:
Section 8.7 contains detailed explanations of all error codes.

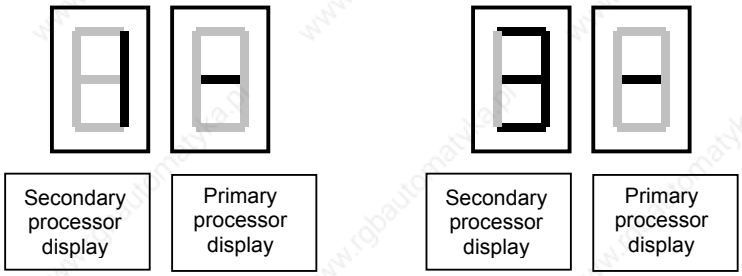
Example 1



Primary 1st number **Primary 2nd number**

This indicates primary error code 8/2 – Stopping distance exceeded

Example 2



Secondary 1st number **Secondary 2nd number**

This indicates secondary error code 1/3 – Crawl speed exceeded

To reset the LZS-003-HS system after an error code has been displayed, the power supply must be isolated for five seconds.

Note:
When reading the error codes a point (**.**) will sometimes appear after the secondary digit. It is important to make note of this when referring to the error code section.

8.4 Initial Start-Up Test

Step	Initial start-up test	Operation	SEC Display	PRI Display	Condition	Cause of Fault / Action Required
1	Start machine		0	1	Normal	➢ Continue to step 2.
2	Press SET button		0	0	Normal	➢ Continue to step 3.
			0	3	Fault	➢ Check that transmitter and receiver are aligned and laser is clear of any obstructions. Press SET button.
3	Press foot pedal	Beam travels short distance then stops. Hydraulic pump may be shut down.	0	0	Normal	➢ Continue to mute point set-up Section 8.5.
		Beam travels short distance then stops.	0	1	Fault	➢ No encoder movement detected during secondary stopping TEST. See fault 1.
		Beam does not move	0	1	Fault	➢ Start time exceeded. No movement detected within 1 second of the approach input turning on. See fault 1.
		Beam travels short distance then stops. System shuts down.		8/2	Fault	➢ No approach input signal to LZS-003 controller. See fault 2.
		Beam travels short distance then stops. System shuts down.	9./1		Fault	➢ No approach input signal to LZS-003 controller. See fault 2.
		Beam travels and stops when laser is obstructed	0	3	Fault	➢ No approach input signal to LZS-003 controller. See fault 2.
		Beam travels and does not stop. System shuts down.		8/2	Fault	➢ Stopping distance error - Secondary Stop. See fault 3.
		Beam travels and does not stop. System shuts down.	9./1		Fault	➢ Stopping distance error - Secondary Stop. See fault 3.
		System shuts down when beam is retracted		8/2	Fault	➢ Reverse encoder A and B channels
		System shuts down when beam is retracted	9./1		Fault	➢ Reverse encoder A and B channels

8.4.1 Initial Start-Up Test Faults

Fault	Description	Check
1	No encoder movement detected during initial start-up TEST.	➢ Check encoder wiring connections to the LZS-003 controller. ➢ Reverse encoder A and B channels ➢ Check mechanical operation of the encoder. Check the optical encoder sprocket is firmly secured to the encoder shaft. Check the optical encoder chain and spring travel. ➢ Replace the encoder
2	No approach input signal to LZS-003 controller.	➢ Refer to the LZS-003-HS Installation Manual
3	Stopping distance error - Secondary Stop	➢ Machine has exceeded the maximum allowable stopping distance. ➢ SEC 1 & 2 contacts not connected in best location to ensure adequate stopping distance. ➢ SEC 1 & 2 contacts not connected where they will cause the machine to stop. ➢ Reduce machine approach speed to allow stopping within maximum allowable limit

8.5 Mute Point Set-up

Step	Setting the mute point	Operation	SEC Display	PRI Display	Condition	Cause of Fault / Action Required
1	After initial start-up restart hydraulic pump (if applicable)					
2	Place sample material on die					
3	Check operator interface panel indicators	Mute lamp is off.	0	0	Normal	➢ Continue to step 5.
		Mute lamp is flashing.	0	3	Condition	➢ Laser obstructed. Press SET button to reset (00 should be displayed).
4	Press foot pedal to drive punch toward material	Beam travels and stops when laser detects material	0	0	Normal	➢ Continue to step 6.
		Beam travels and stops when laser detects material		8/2	Fault	➢ Stopping distance error. See fault 1.
		Beam travels and stops when laser detects material	9/1		Fault	➢ Stopping distance error. See fault 1.
5	Release foot pedal	Mute lamp is flashing	0	4	Normal	➢ Continue to step 7.
		Mute lamp is off.	0	0	Condition	➢ Material not detected. See fault 2.
6	Press SET button to confirm mute point	Mute lamp is on.	0	0	Normal	➢ Mute point is set.

8.5.1 Mute Point Set-up Faults

Fault	Description	Cause of Fault / Action Required
1	Stopping distance error	➢ Machine has exceeded the maximum allowable stopping distance. ➢ EN 1 & 2 contacts not connected in best location to ensure adequate stopping distance. ➢ EN 1 & 2 contacts not connected where they will cause the machine to stop. ➢ Reduce machine approach speed to allow stopping within maximum allowable limit
2	Material not detected	➢ Press foot pedal again. Beam will move additional 2mm to detect material. ➢ Material must be detected by middle sensor to set mute point. ➢ Check that front and rear laser sections remain clear above material when setting mute point.

8.6 Condition Codes

Secondary Display	Primary Display	Condition	Description	Action Required
0	0	Normal	Indicates normal operation.	➢ None (if mute point is already set).
0	1	Start-up or 30 hour test	System requires initial start-up test to be performed.	➢ Refer to initial set-up.
0	2	Mode changed	Operating mode has been changed.	➢ Press SET button to confirm mode change.
0	3	Obstruction during mute point set-up	Laser has been obstructed during mute point set-up or beam has been retracted during mute point set-up.	➢ Check laser is clear of any obstructions. ➢ Press SET button. Code will reset to 00. Continue with mute point set-up.
0	4	Confirm mute point	Laser has detected material and requires mute point confirmation.	➢ Press SET button to confirm mute point. Refer to mute point setting.
0	5	Ambient light detected	Receiver has detected ambient light or receiver is not connected.	➢ Check laser is clear of any obstructions. ➢ Press SET button to reset code to 00. Mute point must be reset.
0	6	Start time exceeded	The beam has not moved within 1 second of the LZS-003-HS receiving an approach input.	➢ Release machine foot pedal and repress to reset code to 00.
			Beam approach starts then stops.	➢ Check mechanical operation of the encoder. ➢ Check the optical encoder sprocket is firmly secured to the encoder shaft. ➢ Check the optical encoder chain and spring travel. ➢ Check encoder wiring connections to the LZS-003-HS controller. ➢ Replace the encoder.
0	7	No material sensed after mute point	The front or middle receiver sensors have not detected material below the mute point.	➢ Retract beam to reset code to 00. ➢ Check laser is aligned parallel with the punch. ➢ Reset the mute point.

8.7 Error Codes for LZS-003-HS

8.7.1 Primary Display Error Codes

Primary Display	Fault	Description	Cause of Fault / Action Required
8 1	Crawl speed exceeded	Crawl speed has exceeded the maximum allowable limit.	➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check the optical encoder sprocket is firmly secured to the encoder shaft. ➢ Check the optical encoder chain and spring travel. ➢ Check machine crawl speed is 10mm/s or less.
8 2	Stopping distance exceeded	The beam has not stopped moving within 100ms during the initial start-up test or the stopping distance has exceeded 13.5mm during mute point setting.	➢ No approach input signal to LZS-003 controller. Refer to the LZS-003-HS Installation Manual ➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check SEC 1/2 and EN 1/2 contacts are connected where they will cause the machine to stop. ➢ Check SEC 1/2 and EN 1/2 contacts are connected in best location to ensure adequate stopping distance. ➢ Machine approach speed must be reduced to allow stopping within maximum allowable limit.
8 3	Stopping distance exceeded	The stopping distance had exceeded 13.5mm with laser B active or 8.5mm with laser B muted.	➢ No approach input signal to LZS-003 controller. Refer to the LZS-003-HS Installation Manual ➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check EN 1/2 contacts are connected where they will cause the machine to stop. ➢ Check EN 1/2 contacts are connected in best location to ensure adequate stopping distance. ➢ Machine approach speed must be reduced to allow stopping within maximum allowable limit.
8 4	Stopping distance exceeded	The stopping distance has exceeded 13.5mm close to the mute point.	➢ No approach input signal to LZS-003 controller. Refer to the LZS-003-HS Installation Manual ➢ Check that the correct encoder sprocket is installed ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check EN 1/2 contacts are connected where they will cause the machine to stop. ➢ Check EN 1/2 contacts are connected in best location to ensure adequate stopping distance. ➢ Machine approach speed must be reduced to allow stopping within maximum allowable limit.

Primary Display	Fault	Description	Cause of Fault / Action Required
91	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
92	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
93	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
94	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
95	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
96	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
97	EN1 contact closing disparity	The EN1 contact has not been closed by the secondary processor or the EN1 contact has not been closed properly when the secondary processor has commanded it to.	➢ Check all interface connections and wiring. ➢ Check that the current through the contact has not exceeded its rating. ➢ Replace the LZS-003 controller.
98	EN1 contact opening disparity	The voltage across EN1 is not high enough when the contact is opened.	➢ Check that there is > 10v AC/DC across EN1 when it opens. Refer to the LZS-003-HS Installation Manual ➢ Check that no contacts in series with EN1 open within 10ms of EN1 opening. ➢ Check all interface connections and wiring. ➢ Check all contacts in series with EN1. ➢ Replace the LZS-003 controller.
99	SEC2 contact closing disparity	The SEC2 contact has not been closed by the secondary processor or the SEC2 contact has not been closed properly when the secondary processor has commanded it to.	➢ Check all interface connections and wiring. ➢ Check that the current through the contact has not exceeded its rating. ➢ Replace the LZS-003 controller.
9A	SEC2 contact opening disparity	The voltage across SEC2 is not high enough when the contact is opened.	➢ Check that there is > 10v AC/DC across SEC2 when it opens. Refer to the LZS-003-HS Installation Manual ➢ Check that no contacts in series with SEC2 open within 10ms of SEC2 opening. ➢ Check all interface connections and wiring. ➢ Check all contacts in series with SEC2. ➢ Replace the LZS-003 controller.
A1	Receiver bias error	The receiver test voltage is incorrect.	➢ Check all connections and wiring between the receiver and LZS-003 controller. ➢ Check that the receiver shield is connected to the LZS-003 controller. ➢ Replace the receiver. ➢ Replace the LZS-003 controller.
B1	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
B2	Counter overflow	The encoder count has exceeded 1750mm during beam retract.	➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check all connections between the encoder and LZS-003 controller. ➢ Replace the encoder.

Primary Display	Fault	Description	Cause of Fault / Action Required
B 3	Counter overflow	The encoder count has exceeded 1750mm during beam approach.	➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check all connections between the encoder and LZS-003 controller. ➢ Replace the encoder.
B 4	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
C 1	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
C 2	Mute lamp failure	No current detected through the mute lamp when it is switched on or off.	➢ Check all connections and wiring between the operator panel and the LZS-003 controller. ➢ Check that there are no shorts between the mute + & mute - terminals on CN12. ➢ Replace the operator panel. ➢ Replace the LZS-003 controller.
D 1	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
D 2	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
E 1	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
E 2	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
E 3	Invalid dip switch setting	An invalid dip switch setting has been detected during start-up	➢ Check dip switch configuration on switch banks SW1 and SW2.
E 4	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.
F 1	Internal code	Internal code	➢ Refer to secondary code or consult your supplier.

8.7.2 Secondary Display Error Codes

Secondary Display	Fault	Description	Cause of Fault / Action Required
1 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
1 3	Crawl speed exceeded	Speed has exceeded 20mm/s when laser A mutes in normal mode.	➢ Restart system and reset mute point. ➢ Check that the change of speed point is set above the mute point to allow the machine to decelerate to 20mm/s before laser A reaches the mute point. ➢ Check the machine mute point is set high enough. ➢ Check the change of speed point is set high enough using the LZS-003 dip switch or parameter settings. ➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine crawl speed is 20mm/s or less.
1 4	Crawl speed exceeded	Crawl speed has exceeded 20mm/s after laser A has been muted.	➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine pressing speed is 20mm/s or less.
1 5	50% speed check exceeded	Speed has exceeded 50% of maximum approach speed or 84mm/s when laser A is 5mm from the mute point.	➢ Check that the change of speed point is set above the mute point to allow the machine to decelerate to >50% of maximum approach speed or 84mm/s when laser A is 5mm from the mute point.
1 6	Crawl speed exceeded	Crawl speed has exceeded 10mm/s during forced crawl in field muted mode before a mute point has been set.	➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine crawl speed is 10mm/s or less.
1 7	Crawl speed exceeded	Crawl speed has exceeded 10mm/s during forced crawl in normal mode.	➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine crawl speed is 10mm/s or less.
1. 0	Internal code	Internal code	➢ Refer to primary code or consult your supplier.

Secondary Display	Fault	Description	Possible Cause of Fault and Action
1. 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
1. 2	Crawl speed exceeded	Crawl speed has exceeded the maximum allowable limit of 10mm/s when the mute input is on.	➢ Check that the change of speed point is set to allow the machine to decelerate to 10mm/s before the mute input is switched on. ➢ Check that the correct encoder sprocket is installed ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine crawl speed is 10mm/s or less.
1. 3	80% speed check exceeded	Speed has exceeded 80% of maximum approach speed or 134mm/s when laser B is muted.	➢ Check that the change of speed point is set above the mute point to allow the machine to decelerate to >80% of maximum approach speed or 134mm/s when laser B reaches the mute point.
1. 4	Crawl speed exceeded	Crawl speed has exceeded 10mm/s during forced crawl in field muted mode before the initial start-up test has been performed.	➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine crawl speed is 10mm/s or less.
1. 5	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
1. 6	Crawl speed exceeded	Crawl speed has exceeded 10mm/s during forced crawl in field muted mode.	➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine crawl speed is 10mm/s or less. ➢ Check that the correct encoder sprocket is installed.
1. 7	Crawl speed exceeded	Crawl speed has exceeded 10mm/s during forced crawl in tray mode or the speed has exceeded 20mm/s when laser A is muted in tray mode.	➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check machine crawl speed is 10mm/s or less. ➢ Check machine pressing speed is 20mm/s or less.
2 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
2. 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
3 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
3. 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.

Secondary Display	Fault	Description	Possible Cause of Fault and Action
4 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
4. 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
5 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
5. 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
6 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
6. 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
7 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
7. 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
9 1	Stopping distance exceeded	The stopping distance had exceeded 13.5mm with laser B active or 8.5mm with laser B muted.	➢ No approach input signal to LZS-003 controller. Refer to the LZS-003-HS Installation Manual ➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check EN 1/2 contacts are connected where they will cause the machine to stop. ➢ Check EN 1/2 contacts are connected in best location to ensure adequate stopping distance. ➢ Machine approach speed must be reduced to allow stopping within maximum allowable limit.
9. 2	Stopping distance exceeded	The stopping distance had exceeded 20mm during the initial start-up test.	➢ No approach input signal to LZS-003 controller. Refer to the LZS-003-HS Installation Manual ➢ Check that the correct encoder sprocket is installed. ➢ Check mechanical operation of the encoder. ➢ Check sprocket is firmly secured to encoder shaft. ➢ Check chain/spring travel. ➢ Check EN 1/2 contacts are connected where they will cause the machine to stop. ➢ Check EN 1/2 contacts are connected in best location to ensure adequate stopping distance. ➢ Machine approach speed must be reduced to allow stopping within maximum allowable limit.
A 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
A. 2	EN2 contact closing disparity	The EN2 contact has not been closed by the secondary processor or the EN2 contact has not been closed properly when the secondary processor has commanded it to.	➢ Check all interface connections and wiring. ➢ Check that the current through the contact has not exceeded its rating. ➢ Replace the LZS-003 controller.

Secondary Display	Fault	Description	Cause of Fault / Action Required
A. 3	EN2 contact opening disparity	The voltage across EN2 is not high enough when the contact is opened.	➢ Check that there is > 10v AC/DC across EN2 when it opens. Refer to the LZS-003-HS Installation Manual ➢ Check that no contacts in series with EN2 open within 10ms of EN2 opening. ➢ Check all interface connections and wiring. ➢ Check all contacts in series with EN2. ➢ Replace the LZS-003 controller.
B 1	SEC1 contact closing disparity	The SEC1 contact has not been closed by the secondary processor or the SEC1 contact has not been closed properly when the secondary processor has commanded it to.	➢ Check all interface connections and wiring. ➢ Check that the current through the contact has not exceeded its rating. ➢ Replace the LZS-003 controller.
B 2	SEC1 contact opening disparity	The voltage across SEC1 is not high enough when the contact is opened.	➢ Check that there is > 10v AC/DC across SEC1 when it opens. Refer to the LZS-003-HS Installation Manual ➢ Check that no contacts in series with SEC1 open within 10ms of SEC1 opening. ➢ Check all interface connections and wiring. ➢ Check all contacts in series with SEC1. ➢ Replace the LZS-003 controller.
B. 3	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
C. 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
C. 2	Receiver test failed	Middle receiver sensor test failure.	➢ Check all connections and wiring between the receiver and LZS-003 controller. ➢ Check that the receiver shield is connected to the LZS-003 controller. ➢ Replace the receiver. ➢ Replace the LZS-003 controller.
D 1	Receiver test failed	The receiver test voltage is incorrect.	➢ Check all connections and wiring between the receiver and LZS-003 controller. ➢ Check that the receiver shield is connected to the LZS-003 controller. ➢ Replace the receiver. ➢ Replace the LZS-003 controller.
D. 2	Receiver test failed	Front or rear sensor test failure.	➢ Check all connections and wiring between the receiver and LZS-003 controller. ➢ Check that the receiver shield is connected to the LZS-003 controller. ➢ Replace the receiver. ➢ Replace the LZS-003 controller.
E 1	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
E 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
E. 4	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F 0	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.

Secondary Display	Fault	Description	Cause of Fault / Action Required
F 3	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F 4	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F 5	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F 6	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F 7	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F. 0	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F. 2	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F. 3	Internal code	Internal code	➢ Refer to primary code or consult your supplier.
F. 4	Internal code	Internal code	➢ Refer to primary code or consult your supplier.

9 Glossary of Terms

Term	Description
Approach	The closing movement of the tools
Approach signal	A signal from the press brake controller to the LZS-003-HS controller to indicate that the foot pedal has been pressed to allow the tools to close
Approach speed	The closing of the tools in high speed >10mm/s
Beam / pressing beam	The moving member of the press brake
Crawl speed	The closing of the tools in slow speed ≤10mm/s
Die	Bottom tool of the press brake
Field muted mode	Operating mode of the LZS-003-HS where the laser is muted and the closing of the tools is possible in crawl speed only
Mute	Disabling of the protective laser field
Mute point	The point where the protective laser field is disabled
Normal mode	Operating mode of the LZS-003-HS
Punch	Top tool of the press brake
Retract	The opening movement of the tools
Stopping distance	The distance measured by the LZS-003-HS of the closing of the tools when a stop command is issued
Tray / Box mode	Operating mode of the LZS-003-HS used for bending tray and box shaped parts

Table 9-1: Glossary of terms

9.1 Abbreviations

Abbreviations	
CNC	Crawl normally closed output contact of the LZS-003-HS controller
CNO	Crawl normally open output contact of the LZS-003-HS controller
EN1 / EN2	Enable 1 / Enable 2 output contacts of the LZS-003-HS controller
mm/s	Millimetres per second
ms	milliseconds
pdl	pedal
pnt	point
PRI	Primary
prs	press
RX	Receiver
s	seconds
SEC	Secondary
SEC1 / SEC2	Secondary 1 / Secondary 2 output contacts of the LZS-003-HS controller
TX	Transmitter

Table 9-2: Abbreviations

10 Specifications

Functional	
Equipment Type:	Electro sensitive Protective Equipment (ESPE) to EN954-1: 1997 Category 4 for Hydraulic Press Brakes
Level of Protection:	Equivalent to Clause 5.3.2.(f) - prEN 12622 (1996)
Optical Range:	15 m net (distance between windows of laser sender and receiver)
Vertical Adjustment Range:	300 mm standard, other lengths available
Protective Functions:	1. 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. 2. Monitors stopping distance. 3. Monitors press brake beam high speed. 4. Monitors press brake beam low speed. 5. Monitors mute point position. 6. Forces press into a safe condition upon detection of fault.
Response Time:	12 ms from interruption of light beam until opening of relay contacts (both paths).
Laser Classification:	Class 1 (IEC 60825-1).
System Structure:	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. LZS 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.
Environmental	
Degree of Protection:	IP54 (all system units)
Operating Temperature:	0 to 55 ºC
Storage Temperature:	-30 to 75ºC
Humidity Class:	E
Electrical	
Supply Voltage:	115 V (-15%, 60 Hz) to 230 V (+30%, 50 / 60 Hz)
Nominal Supply Current	0.05 A
Safety Output:	4 Normally Closed contacts (2 primary & 2 secondary)
Auxiliary Output:	1 Normally Closed contact
Contact Rating:	5 A resistive, 2 A inductive @ 24 VDC; minimum load 10 mA @ 5 VDC
Isolation:	All contact paths are isolated.

Table 10-1

10.1 Circuits

Output Contact		Contact Specification
EN1	Enable 1	1 isolated contact path, EN 954 Category 4 (if in series with EN2)
EN2	Enable 2	1 isolated contact path, EN 954 Category 4 (if in series with EN1)
SEC1	Secondary 1	1 isolated contact path, EN 954 Category 4 (if in series with SEC2)
SEC2	Secondary 2	1 isolated contact path, EN 954 Category 4 (if in series with SEC1)
AUX	Auxiliary output	1 isolated contact path (functionally identical with EN-circuits)
CNO	Crawl speed (positive logic)	1 isolated contact path
CNC	Crawl speed (negative logic)	1 isolated contact path
RETR	Retract beam	1 isolated contact path
MUTE	Mute lamp (state)	1 isolated contact path

Table 10-2

10.2 Circuit Load Conditions and Contact Impedances (interfacing to 24 V systems)

Output Contact	Contact Impedance		Load current, ohmic load, cosφ = 1	Load current, inductive load, cosφ = 0,4; L/R = 7 ms	Minimum permissible load current at 5 V=
	OPEN	CLOSED			
EN1	7 kΩ	0 kΩ	10 A	5 A	100 mA
EN2	7 kΩ	0 kΩ	10 A	5 A	100 mA
SEC1	7 kΩ	0 kΩ	10 A	5 A	100 mA
SEC2	7 kΩ	0 kΩ	10 A	5 A	100 mA
AUX	∞ kΩ	0 kΩ	10 A	5 A	100 mA
CNO	∞ kΩ	0 kΩ	10 A	5 A	100 mA
CNC	∞ kΩ	0 kΩ	10 A	5 A	100 mA
RETR	∞ kΩ	0 kΩ	10 A	5 A	100 mA
MUTE	∞ kΩ	0 kΩ	10 A	5 A	100 mA

Table 10-3

Nominal Voltage of System to be Interfaced : 24V DC or 24V AC.

Note
Specifications are subject to change without notice.