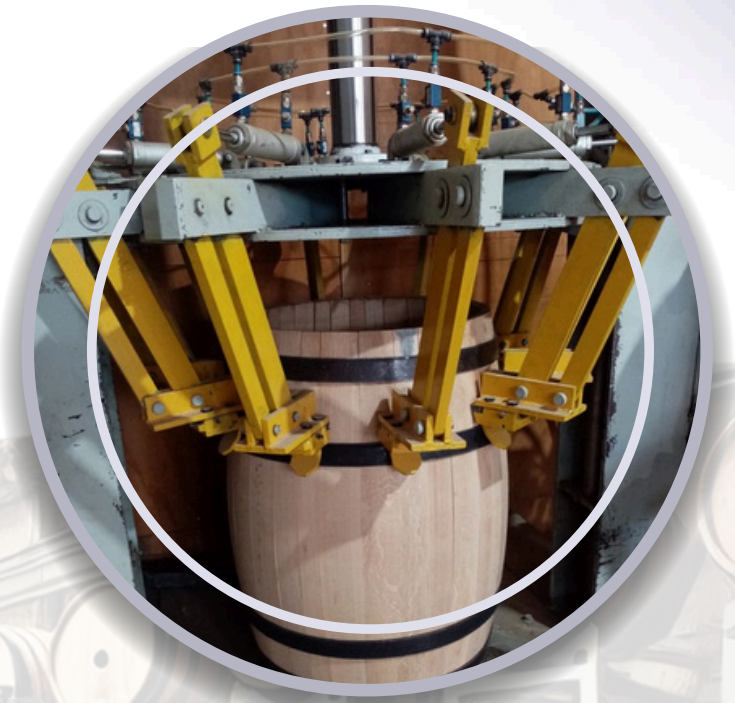
The Hoop Driver

MARIAUD CONSULTING



Our PROGRAM

The Hoop Driver

01 Presentation

The hydraulic press

More specifically the hooping press (or barrel press), plays a central role in the cooperage process of making barrels (casks). This powerful tool, capable of generating up to 25 tonnes of thrust (push), allows for the homogeneous tightening of the hoops around the staves, thus ensuring the solidity and watertightness of the cask (barrel).

By replacing a large part of the manual labour formerly done with hammer strokes, the hydraulic press provides a significant gain in efficiency while reducing the arduousness of the work for the cooper. It is useful at several key stages of manufacturing: during toasting (heating), during heading up (crozing), and during the finishing touches.

This indispensable tool combines robustness, precision, and safety. In this course, we will explore its operation in detail, its advantages, as well as the best practices for maximizing its use while ensuring operator safety.

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02 Terminology

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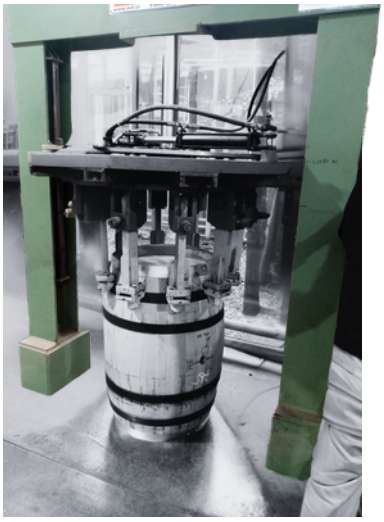
02 Terminology

1. Press Frame

The frame constitutes the main structure (skeleton) of the press. It is generally an **IPN structure** (or I-beam structure) or made of robust metal profiles (sections), **ensuring high mechanical strength and optimal stability** during the press's operation.



Role of the Frame

- **Support for the table and chaser assembly :** It firmly holds the different press components in place, ensuring their precise alignment.
- **Cylinder attachment:** The hydraulic cylinder is **generally attached to the upper part of the frame,** allowing the force to be transmitted towards the moving table.
- **Stress absorption :** During machining or pressing, the frame must **resist the forces** exerted without deforming, thereby ensuring consistent and safe work.

Depending on the needs, some frames are equipped with **structural reinforcements**, guided slides (guided ways), or even **damping systems** to improve their rigidity and durability.

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2. Press Table Guide Ways (Press Platen Slide Ways) ⚙

The guide ways (slides) play an essential role in the proper functioning of a press by ensuring **the precise guidance of the moving table** (moving platen) during its descent and ascent. They guarantee **a stable linear** motion, preventing misalignments or tilts that could affect the precision and quality of the pressing.

- L**inear Guidance :** The guide ways keep the moving table on a perfect axis, preventing any lateral play (side clearance) or torsion under the effect of pressure.
- **Load Distribution :** They allow for a better distribution of mechanical stresses (efforts) and prevent premature wear of components.
- **Friction Reduction :** Thanks to specific materials (hardened steel, bronze, technical polymers) or lubrication systems, they minimize friction and increase the machine's lifespan.
- **Prismatic Guide Way (V-Way) :** This type of guide way offers high rigidity and is suitable for applications requiring high precision.
- **Dovetail Guide Way :** Known for its stability and its ability to support heavy loads, this guide way ensures precise guidance of the table (platen).
- **Roller Guide Way :** Used to reduce friction, this guide way allows for fluid motion and is ideal for applications requiring fast and precise movements.

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3. Operation of a Hydraulic Cylinder 🔧

A hydraulic cylinder (hydraulic ram) is a device that transforms hydraulic energy into mechanical force to produce linear motion. It is composed of several essential elements:

The cylinder tube : The cylinder within which the piston moves.

The piston : Separates the cylinder into two chambers and moves under the pressure of the hydraulic oil.

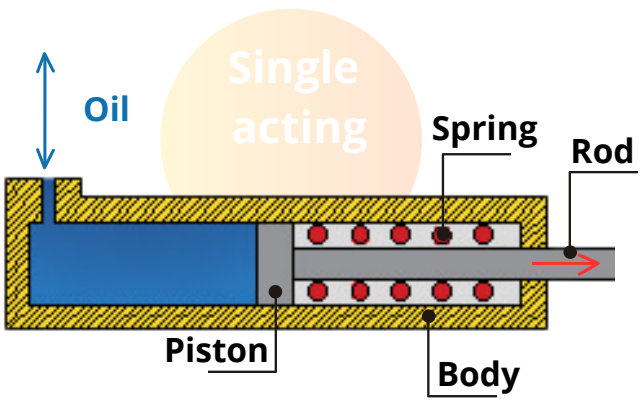
The rod : Attached to the piston, it transmits the motion to the part to be actuated.

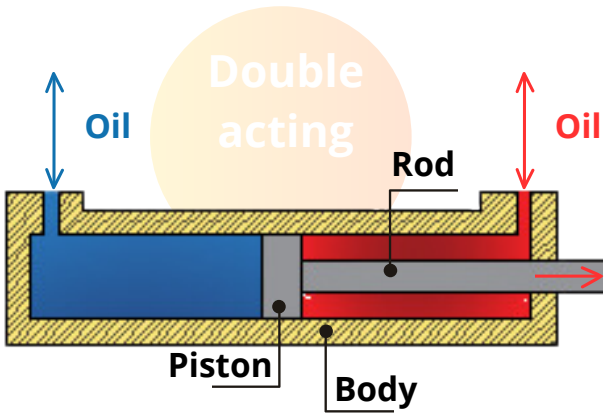
The seals (sealing joints) : Prevent fluid leaks between the two chambers.

The inlet and outlet ports (orifices) : Allow pressurized oil to enter and exit the cylinder.

👉 **Operating Mode :**

- When oil is injected under pressure into a chamber, it pushes the piston and causes the rod to move.
- Depending on the type of cylinder, it can operate as **single-acting** (thrust in one direction only, return by a spring or the load) or as **double-acting** (push and pull thanks to oil sent alternately into the two chambers).





- As hydraulic oil is incompressible, it fully transmits the applied force, which allows for powerful and precise actions.

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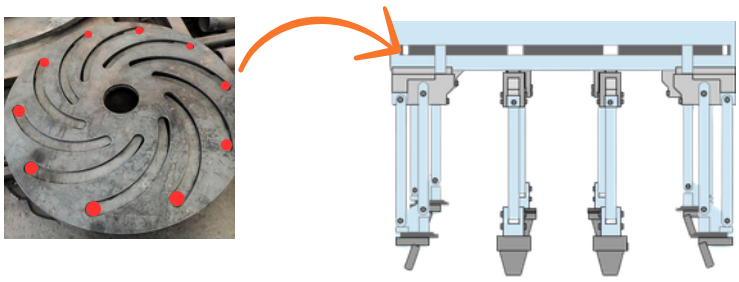
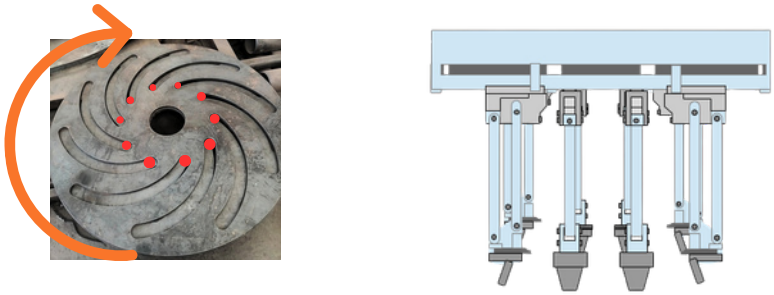
4. The table

The **diaphragm system** integrated into the press tables (press platens) allows for the **precise adjustment** of the chasers (hooping shoes). Thanks to its **circular mechanism**, this system makes it possible to **tighten or spread** the chasers according to machining needs. By turning the central disc, a synchronized radial movement adjusts the pressure exerted on the parts, thus guaranteeing a **uniform and secure hold.** This design offers **great flexibility and a better distribution of forces** during pressing, reducing the risks of deformation of the treated materials.

These diagrams illustrate **the operation of the diaphragm system** used to **adjust the spacing of the chasers** (hooping shoes) on a press.



The disc is in a position where the chasers (hooping shoes) are **more spread apart**, allowing it to adapt to larger diameters.



A rotation of the disc **reduces the spacing of the chasers** (hooping shoes), bringing them closer together to firmly hold smaller diameters.

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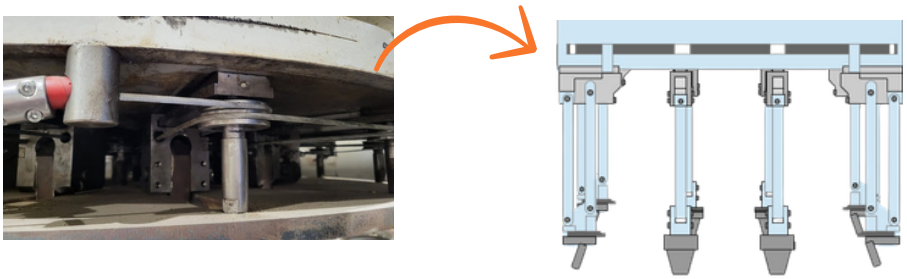
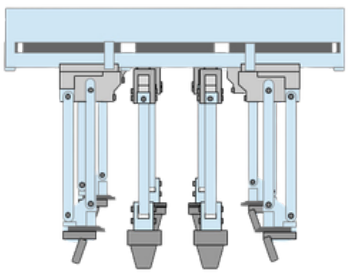
4.Le plateau

Le système à câble utilisé dans certaines presses assure **un mouvement synchronisé des chasses grâce à un mécanisme de croisement par galets**. Ce dispositif permet de relier deux chasses avec un câble de 3 mètres, garantissan**t une répartition équilibrée des forces** lors du pressage. En passant par des galets de guidage, le câble est dirigé avec précision, optimisant **la fluidité du mouvement**.

Ces schémas illustrent **le fonctionnement du système de diaphragme** utilisé pour **ajuster l'écartement des chasses** sur une presse.



Le disque est dans une position où les chasses sont **plus écartées,** permettant de s'adapter à des diamètres plus larges



Une rotation du disque **réduit l'écartement des chasses,** les rapprochant pour maintenir fermement des diamètres plus petit.

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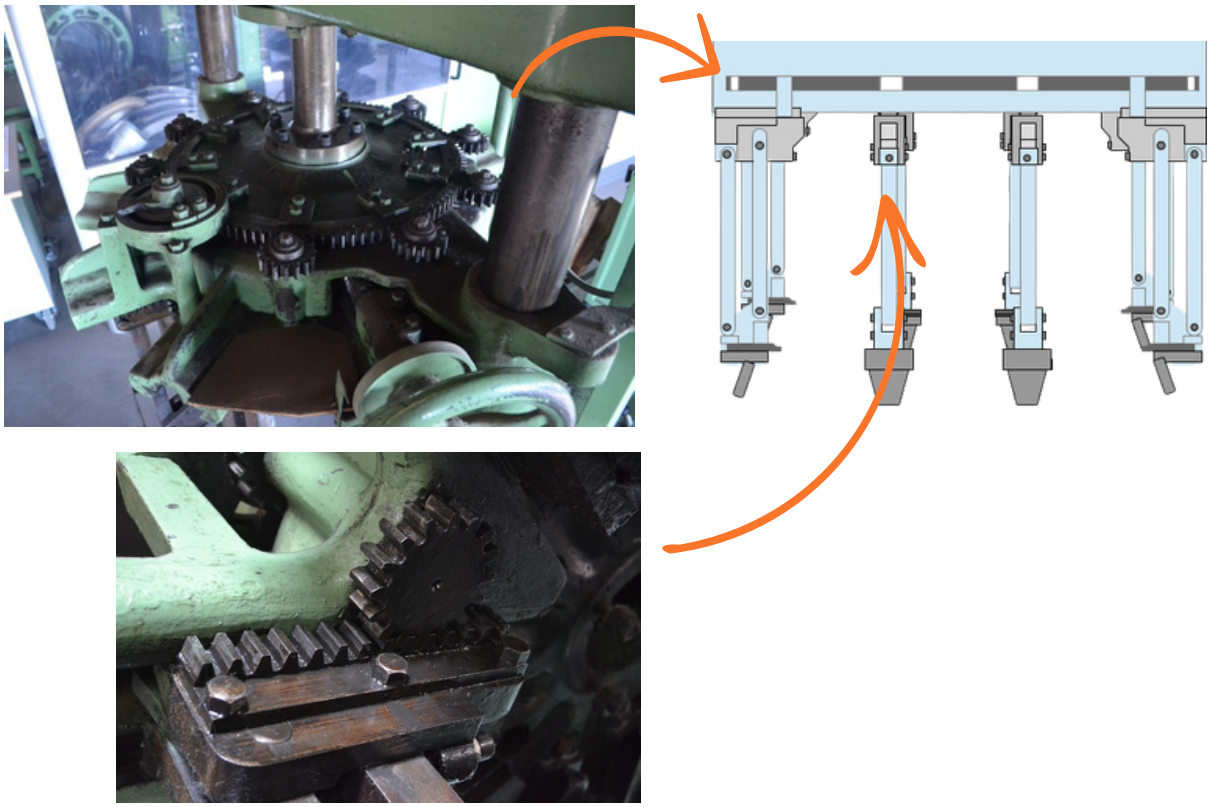
02 Terminology

4. The table

The mechanical system visible in this image relies on **a gear and rack mechanism,** enabling the synchronized movement of the chasers (hooping shoes) on the press.

✓ **Gear Transmission** : A central gear ring (crown gear) is connected to several satellite pinions (planet gears), which ensure a homogeneous circular movement of the chasers.
✓ **Precise Guidance :** The integrated racks allow for a progressive adjustment of the opening and closing of the chasers, ensuring a uniform distribution of pressure on the cask (barrel).
✓ **Reliability and Robustness** : This type of mechanism is mechanically simple and efficient, reducing the risks of misalignment while supporting significant forces exerted by the press.

This system guarantees a progressive and **uniform tightening of the cask (barrel), limiting deformation and optimizing the precision of the hooping.**



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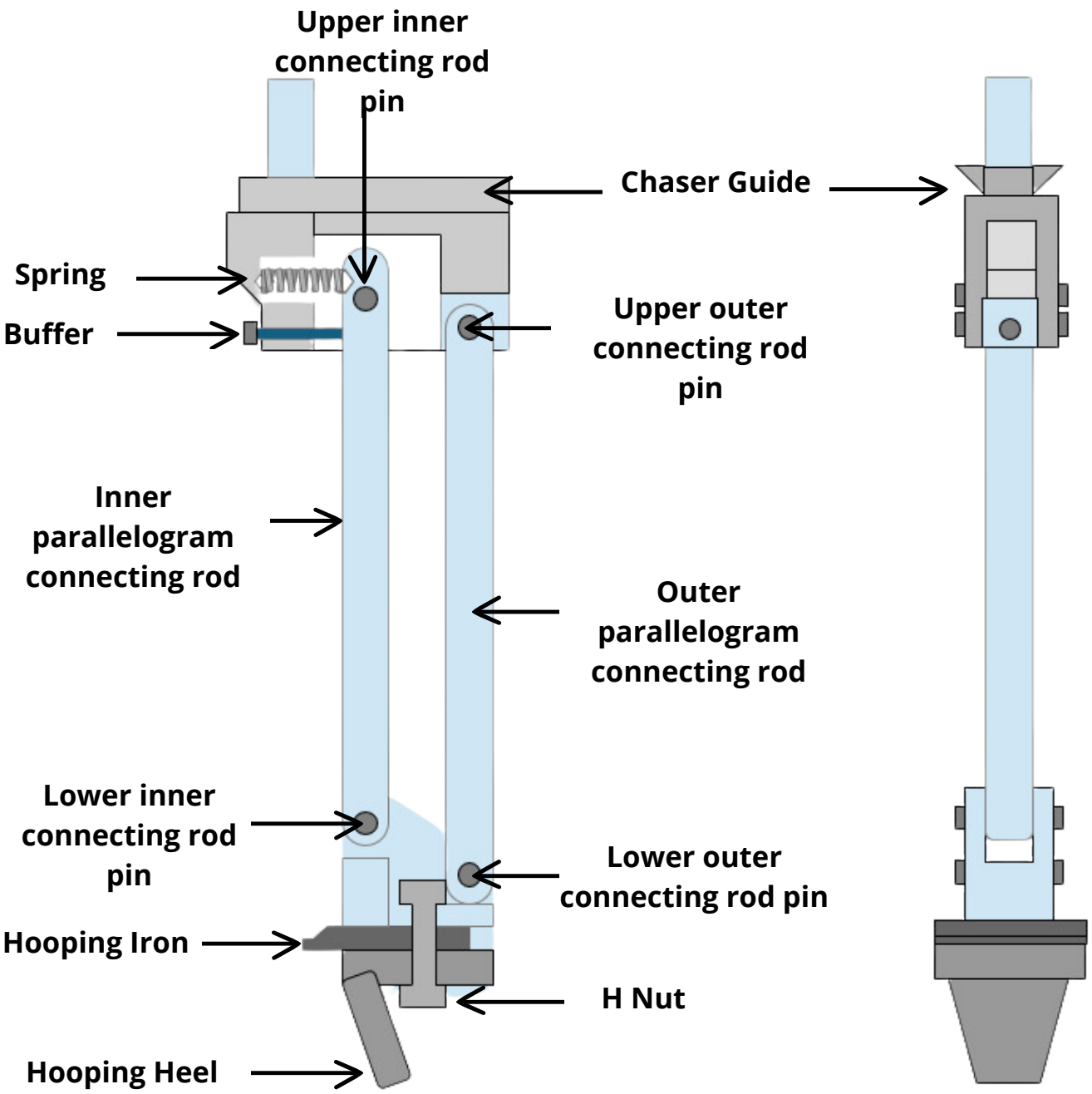
5. Chaser Assemblies



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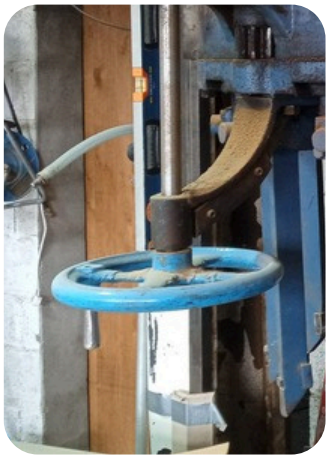
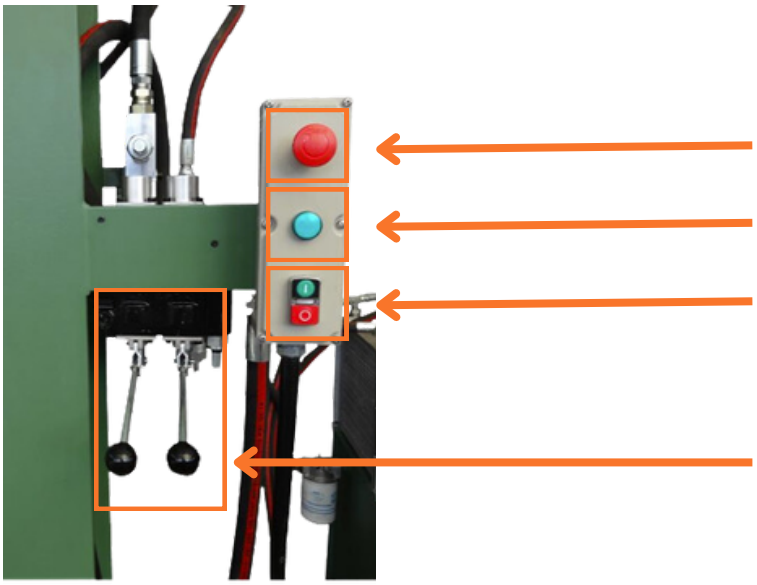
02 Terminology

6. The controls

Presses can be equipped with **different control systems**, ranging **from manual** (levers, handwheels) to **hydraulic** (cylinders controlled by distributors / valves) and **electrical** (automation via a digital control panel), thus offering various levels of precision and ease of use.





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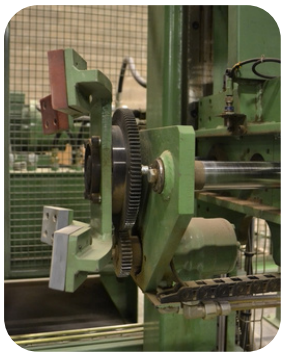
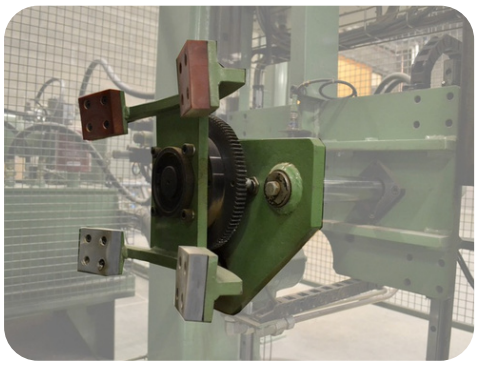
02 Terminology

The Barrel Turner

Some presses are equipped with **a cask turning system (barrel turning system)** allowing its position to be reversed without excessive manual effort. This mechanism, generally based **on pivoting arms, hydraulic cylinders (hydraulic rams) or pneumatic cylinders (pneumatic rams),** facilitates the handling of casks (barrels), improves the ergonomics of the workstation and reduces the risk of injury for the operator.





This barrel turning system is designed to prevent any marking or deterioration of the wood thanks to **four rubber pads** fixed to the jaws. During the operation, a **hydraulic cylinder** pushes the jaws until they make contact with the barrel. Once sufficient pressure is applied, the turning mechanism activates automatically, allowing the barrel to be manipulated safely and accurately.

The turning sensor ensures the correct positioning of the barrel (cask) by detecting the end of the rotation. When the jaw completes a full turn, **the detection cell** repositions itself **opposite the detector**, thus signalling that the turning is complete and stopping the movement. This mechanism guarantees a precise cycle and avoids any excessive rotation.

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The Barrel Turner

The sensor used for barrel (cask) turning is generally **an inductive or optical detection cell**.

- **Inductive Cell :** Detects the presence of a metallic object (example: a metallic piece fixed to the jaw) when it passes in front of the sensor. This type of cell is robust and insensitive to dust or projections.

- **Optical Cell (Photoelectric) :** Works by emission and reception of a light beam. When the cell encounters an obstacle (a mark or a reflector), it sends a signal to stop the rotation.

The choice of cell type depends on the working environment and the desired level of precision. In the case of a barrel turning system, **an inductive cell** is often preferred for its reliability in a dusty environment.

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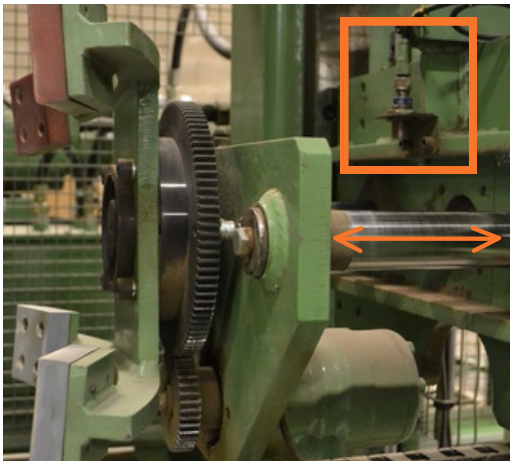
The Barrel Turner

The limit switch (end-of-travel switch) can be of several types depending on its detection and actuation mode.



Mechanical Limit Switch

- Functions with a lever or a push button that is actuated by physical contact with the jaw.
- Simple and robust, it is suitable for industrial environments.

Inductive Limit Switch

- Detects the metallic presence of the jaw without contact.
- Resistant to wear and tear and to dusty or humid environments.
- Precise and used in many hydraulic presses.

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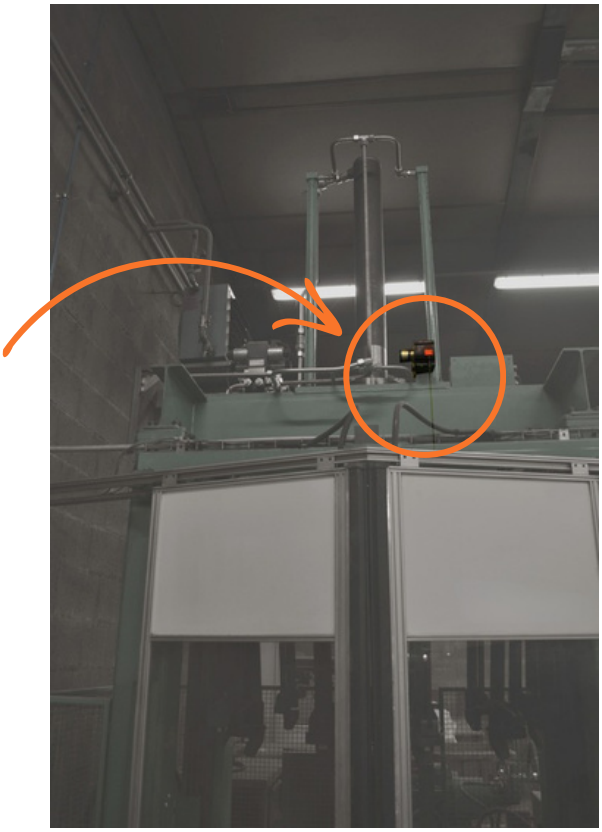
Draw Wire Sensor: Precise Table (Platen) Positioning

The press is equipped with **a draw wire** sensor directly connected to the table (platen), allowing it to indicate **its exact location in real time** to the control program.

✓ **Precise Movement Tracking :** The sensor **continuously** measures **the position of the table (platen),** ensuring optimal positioning.
✓ **Communication with the PLC (Programmable Logic Controller) :** The transmitted data allows **for the adjustment of movements and the force exerted based** on the selected program.

This **system guarantees increased precision** in the operation of the press, improving **both safety and the quality of the work performed**.



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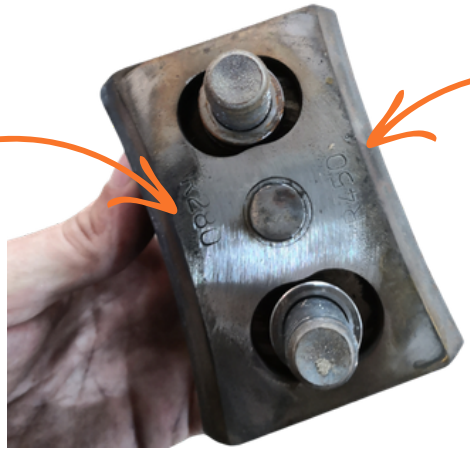
03 Settings

The Chasing Iron (The Hooping Shoe)

The chasing irons (hooping shoes) are designed **to adapt to different barrel (cask)** sizes thanks to their two distinct radii. When switching from a small to a large barrel (or vice versa), it is essential to follow a safe procedure.

- **Cut the press power supply** before any intervention to prevent any accidental movement.
- **Wear personal protective equipment (PPE).**
- **Loosen the nut that holds the iron,** using the appropriate tool to avoid excessive effort or sudden movements.
- **Flip the iron over to choose the correct radius,** checking that it is properly positioned before tightening it.
- **Firmly tighten the nut.**
- **Check the chaser assembly (hooping shoe assembly)** before putting the press back into operation, ensuring that no element shows play or misalignment.



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03 Settings

Adjustment of the Cask Ejector Stop – Automatic Press

The manual adjustment of the cask ejector stop is an essential step to ensure precise and efficient positioning. Here is the safe procedure to follow:

- **Environment check :** Ensure that the work area is clear and that the press is stopped before any manipulation.
- **Place a barrel (cask) under the press,** ensuring it rests correctly on the table (platen).
- **Close the press doors** to secure the area and prevent any involuntary movement.
- **Tighten the chasers (hooping shoes) in manual mode** to properly centre the barrel and guarantee homogeneous pressure.
- **Raise the press table (platen) once** the positioning is validated.
- **Open the doors** to access the ejector and adjust its positioning.
- **Advance the ejector up to the barrel (cask),** then adjust the stop (buffer) to ensure efficient ejection without excessive constraint.
- **Final check :** Test the proper functioning of the system before putting it into production.

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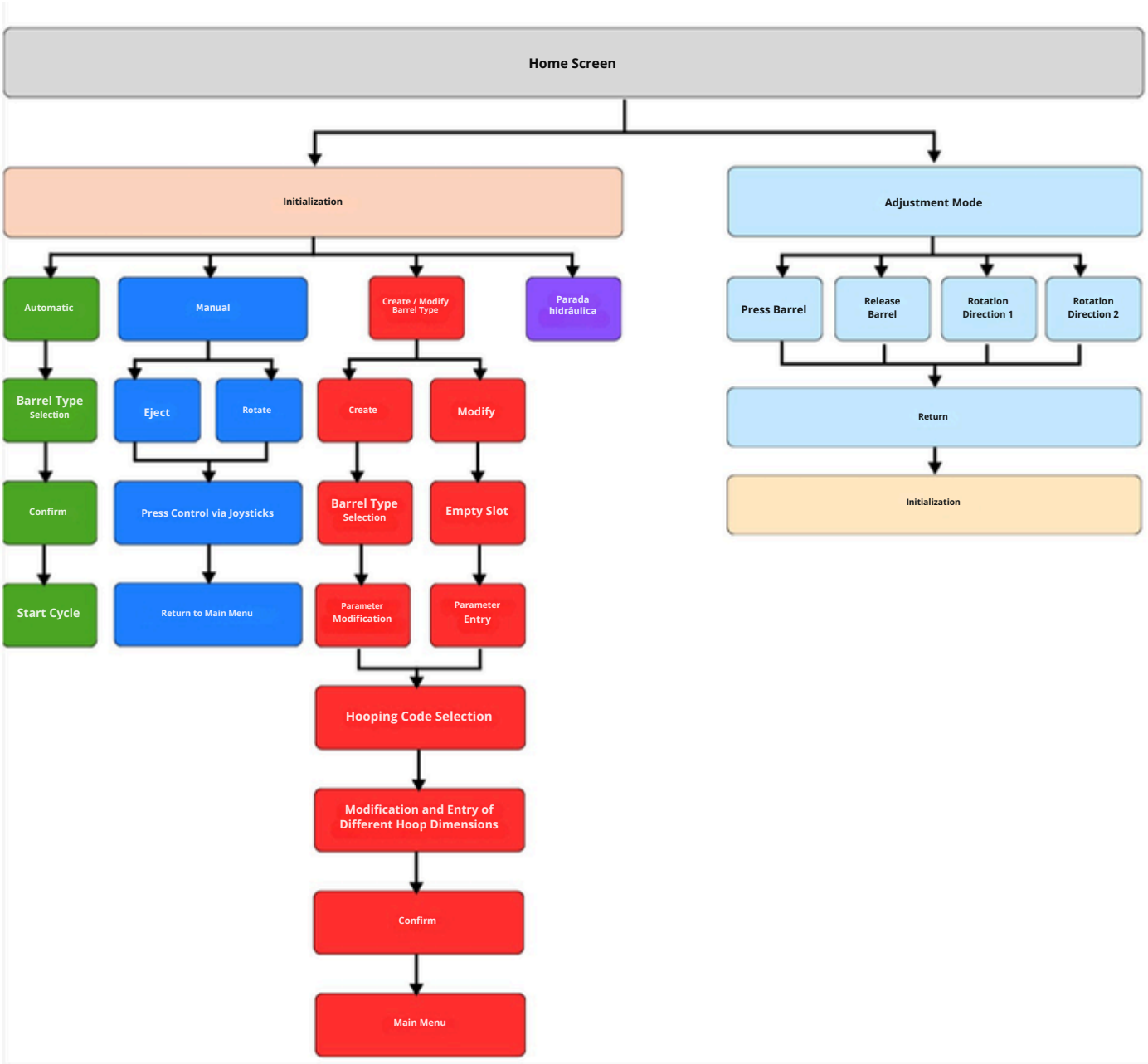
03 Settings

Digital Interfaces



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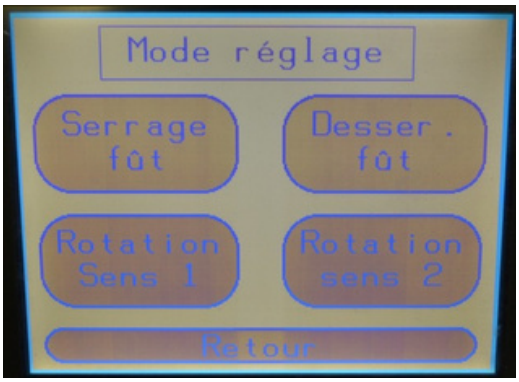
03 Settings

Digital Interfaces

The screen shown here corresponds to the PLC (Programmable Logic Controller) startup interface when it is operational. At this stage, the operator has two main options: initialise the machine or access the "adjustment mode" ("settings mode").

Initialisation is a key step that allows the machine to return to all its home positions (origin points). Specifically, all moving parts advance to their respective stops (limit switches) in order to reposition themselves correctly to ensure optimal and safe operation.



The adjustment mode (Mode réglage), for its part, gives access to parameters allowing for the adjustment of the different press configurations according to the specific machining needs.

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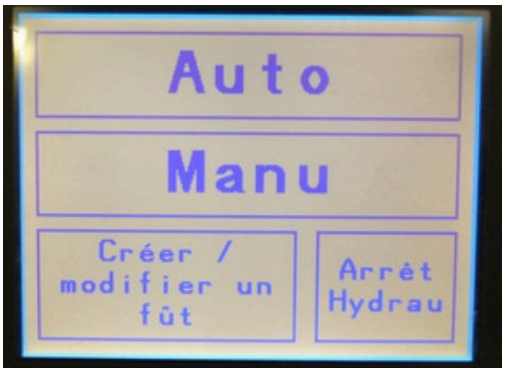
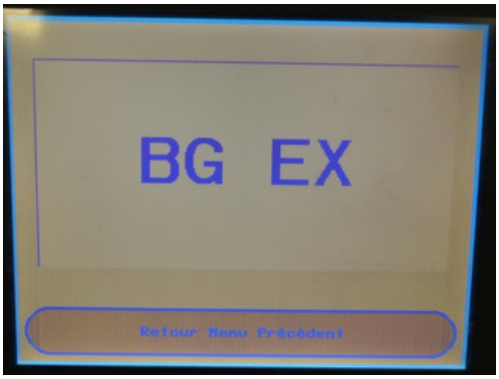
Automatic Mode Selection

To activate the automatic mode, the operator must touch the "**Auto**" box on the touchscreen. A list of pre-registered cask (barrel) types then appears, allowing the model of barrel in production to be easily selected.



Once the selection is made, **the name of the chosen file** is displayed in full screen. At this stage, it is enough **to press the "Start Cycle" (Départ Cycle)** button, located next to the touchscreen, to start the pressing process.



In the event of an error or a need for modification, it is always possible to **cancel the operation** by clicking on **"Return to previous menu" (Retour menu précédent)**, thus allowing a return to the main screen without starting the cycle.

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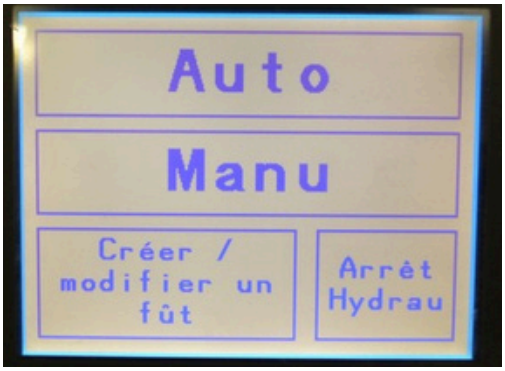
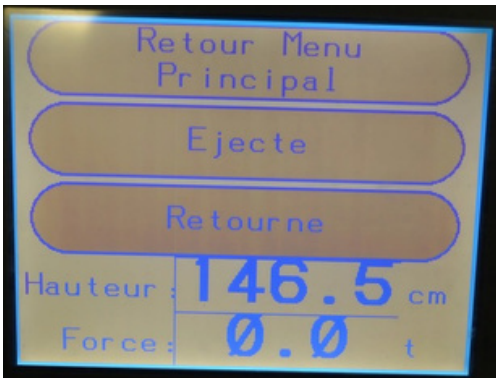
03 Settings

Manual Mode Selection

To activate the **manual mode**, the operator must touch the "**Manu**" box on the touchscreen.



This mode allows the cask (barrel) to be **ejected (Ejecte)** or **turned (Retourne)** directly from the screen. **Manual control of the table** (platen) is done using the **joysticks**, offering precise control over movements.



The screen also displays **the height (hauteur) under the chaser** (hooping shoe) as well as **the force exerted by the press**, allowing the operator to monitor and adjust parameters in real time for optimal operation.

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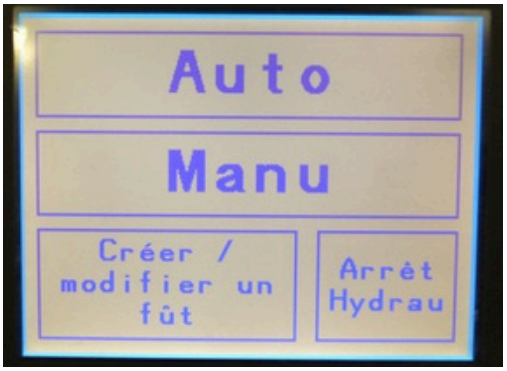
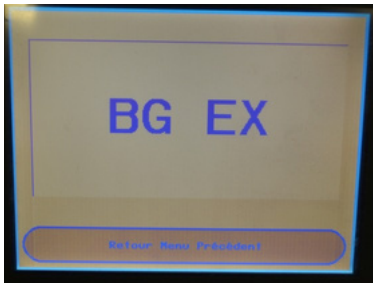
03 Settings

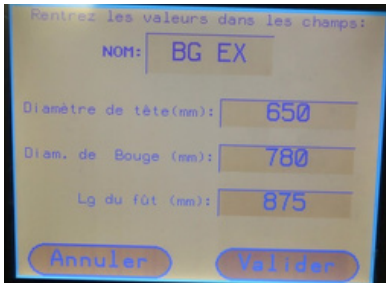
Creation and Modification of a Cask (Barrel) Type



To create or modify a cask (barrel) program, the operator must select the "**Create/modify a cask" (Créer/modifier un fût)** box on the touchscreen.

A **list of casks (barrels)** appears. If the operator wishes to modify an existing program, such as "**Bourgogne Export (BG EX)**", they select the corresponding box.





The screen then displays **the dimensions of the cask (barrel)**, which can be adjusted according to needs.

Once the modifications are made, it is enough to touch **"Validate" (Valider)** to save the changes, or **"Cancel" (Annuler)** to go back without modifying the parameters

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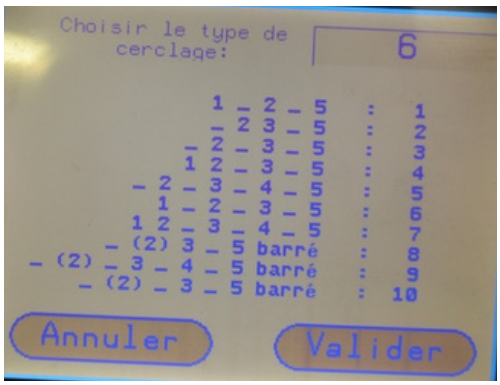
Hooping Type Selection

The **second step** is to choose **the cask (barrel) hooping type.**
In the example opposite, **the selected program is number 6,** corresponding to a specific hooping sequence : **1-2-3-5**.

- **Each number** represents a hoop on the cask (barrel) :
  - **1** → Talus (Chine Hoop / Setting Hoop)
  - **2** → Collet (Quarter Hoop)
  - **3** → Sous Collet (Under Quarter Hoop)
  - **5** → Bouge (Bilge Hoop)



The **"–"** indicates the necessary adjustments of the **chasers** (hooping shoes) before installing the next hoop.

This setting guarantees a **precise alignment** of the hoops and a uniform distribution of pressing forces.

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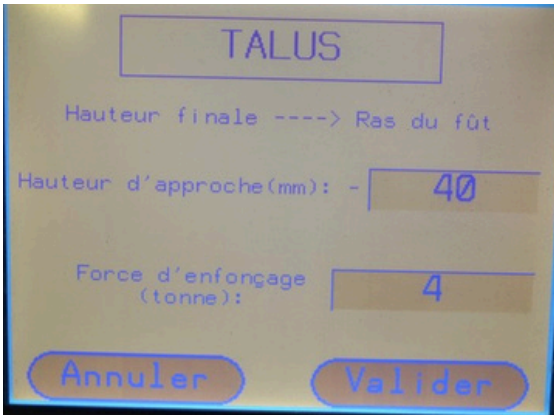
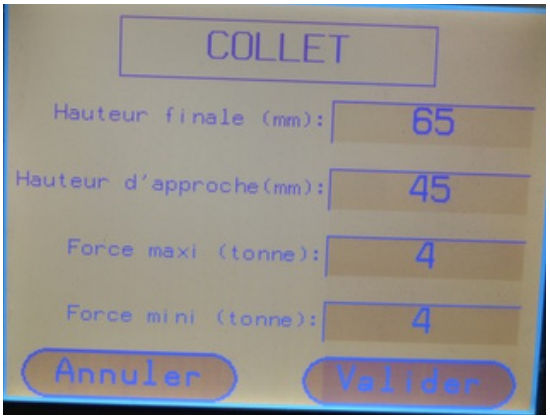
03 Settings

Hooping Type Selection

Once **the hooping program** is selected, the operator must enter the parameters for each hoop :

Final Height (Hauteur finale): Exact position of the hoop once hooping is complete.
Chaser (Hooping Shoe) Approach Height (Hauteur d'approche des chasses) : Initial position before tightening.
Maximum Force (Force maximum): Maximum pressure exerted by the press for hooping.
Minimum Force (Force minimum) : Pressure threshold below which the press continues to descend until it is reached.





The press will automatically adjust the hoop's descent by **slightly exceeding** the final height **if the required minimum force is not reached**.
After entering the parameters, the operator validates (confirms) **to return to the main menu.**

04 Maintenance

Maintenance and Servicing of the Press

To ensure optimal performance and extend the lifespan of the press, the cooper must carry out **regular maintenance:**

After Each Use

✓ **Dust off and inspect** the entire machine.

✓ **Lubricate the ejection mechanism,** as well as the grease fittings on both **the lower and upper sections.**

➡ Use the recommended grease type (e.g., NLGI Grade 2).

✓ **Check the proper operation of the platen locking system** (spring and actuator).

✓ **Inspect hydraulic seals and the condition of the air filter.**

✓ **Monitor the oil level in the hydraulic power unit and top up if necessary.**

➡ Use the appropriate oil (e.g., ISO46 MOBIL DTE 25).

✓ **Check the clogging indicator** on the oil filter.

Periodic Maintenance

🔄 **Replace the breather filter** and the **oil filter** of the hydraulic power unit.

💧 **Drain the hydraulic system** and **either replace** or **decontaminate the oil.**

Thorough maintenance **prevents breakdowns, enhances performance, and prolongs the machine's service life.**

The Hoop Driver

05 Safety

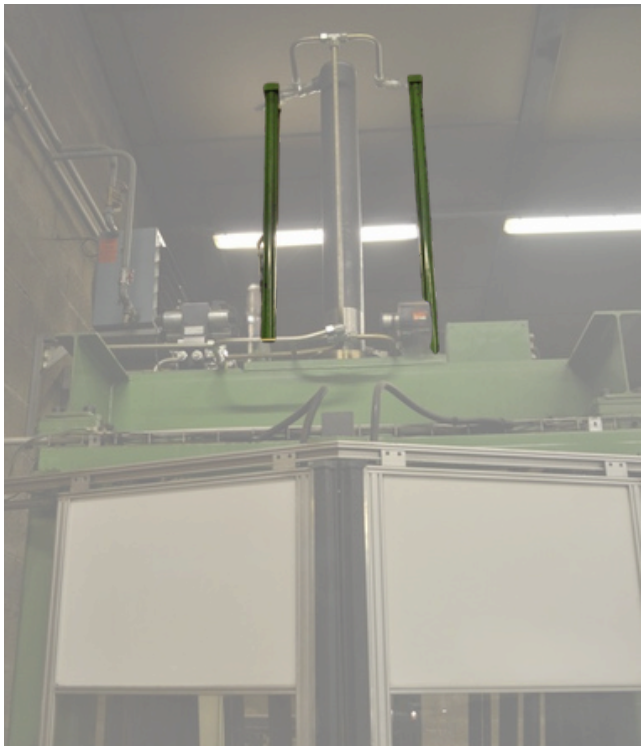
Platen Safety System

To prevent any risk in the event of failure of the main hydraulic cylinder, several safety mechanisms are integrated:

✓ **Two auxiliary safety cylinders** are installed alongside the main cylinder.
➡ Their function is **to hold the platen in place** in case of failure.
➡ **They operate independently and are not connected to the same hydraulic circuit as the main cylinder.**

✓ **A rack-and-pinion system** provides additional **mechanical safety.**
➡ In the event of a fall**, the racks take over.**
➡ The downward motion of the platen **is then slowed by disc brakes, preventing a sudden drop.**

These systems ensure **maximum safety for both the cooper and the machine,** effectively preventing accidents in the event of hydraulic failure. 🔧⚙



The Hoop Driver

05 Safety

Safety Doors: A Critical Feature

Safety doors play a vital role **in protecting the cooper** during the machine's operating cycle.

✓ **Cycle Interlock:** If the doors are **not fully closed, the machine cannot start, thereby eliminating any risk of accidental activation.**
✓ **Securing the Work Area:** The doors prevent **any unintended contact** with moving parts during operation.

This system ensures **a safe working environment** by restricting access to hazardous zones **only when the machine is completely stopped.**

Peripheral Safety Systems for Presses

To protect **operators** and prevent accidents, some presses are equipped **with various peripheral protection devices:**

✓ **Safety fencing**
- Surrounds the machine completely **to prevent accidental access to hazardous areas.**
- Prevents crushing injuries and shields against flying parts.

✓ **Emergency stop cable**
- Run around the machine, it allows **the press to be stopped immediately** when pulled or touched.
- Wired **to an emergency stop switch** to secure interventions in dangerous situations.

The Hoop Driver

05 Safety

Two-Hand Control Joysticks Enhanced Safety

Two-hand contact joysticks require the operator **to use both hands simultaneously** to activate the press, ensuring safe operation.

✓ **Accident prevention:** The cycle can only start if both joysticks are actuated at the same time, preventing any hand from remaining in the pressing zone.

✓ **Immediate stop on release:** If either joystick is released, the machine stops instantly to avoid crushing hazards.

This system provides **optimal protection for the operator,** complies with industrial safety standards, and allows precise, ergonomic control of the press.

The Hoop Driver

05 Safety

Personal Protective Equipment and Safety / Sécurité et Équipements de Protection Individuelle (EPI)

- **Safety footwear 👞:** Protects against crushing hazards and falling heavy objects.
- **Hearing protection (ear defenders or earplugs) 🎧:** Essential to reduce exposure to noise generated by the machine.
- **Protective gloves🧤:** May be used provided they do not present an entanglement risk with the press's moving parts.

Precautions and Appropriate Workwear

- **Use suitable gloves:** Prefer close-fitting gloves specific to the task. Avoid loose or fabric gloves that could be caught by mechanisms.
- **Tie back long hair:** Prevents entanglement in moving parts.
- **Avoid loose clothing, rings, and bracelets:** Reduces the risk of being snagged by moving components.

Operational Safety Rules

- Always **ensure the machine is fully stopped** before any adjustment or intervention.
- Never **place hands in the pressing zone** while the machine is running.
- Observe **load and pressure limits** to avoid damage to the press or ejection of parts.
- Use **integrated safety devices,** such as emergency stop buttons and peripheral guards.

Apply the Recommendations put these recommendations into practice now and take control of your machine with confidence and mastery.