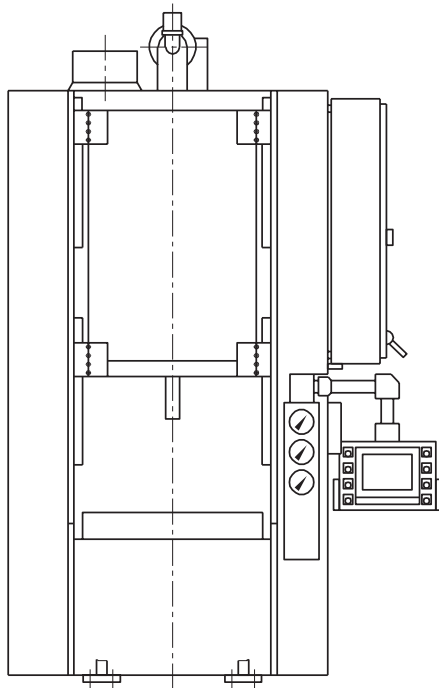
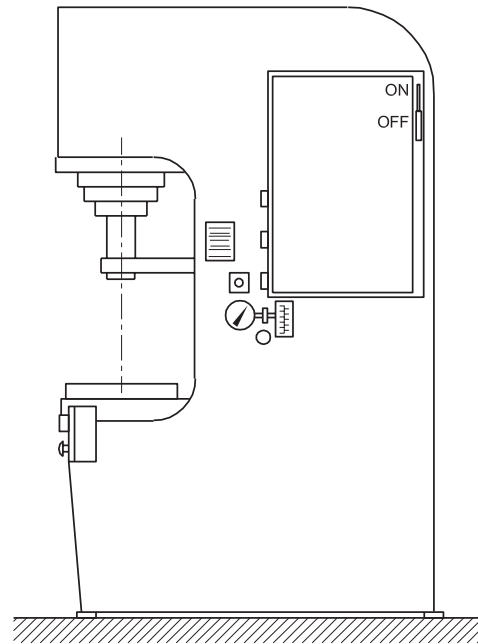


2.4.12 Hydraulic press

Legislative Decree 81/08 App. V, Presidential Decree 459/96 App. I, UNI EN 693/04



Hydraulic press with frame



Open hydraulic press

Machine for cold-machining sheet metal with a moving element (punch) with reciprocating motion moving towards a fixed element (die), both appropriately shaped. Energy is transmitted using fluid under pressure.

2.4.12.1 HAZARDS

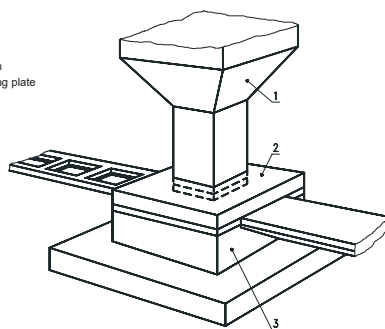
Crushing of upper limbs between the two parts of the die

To use hydraulic presses safely, the machining (pressing) area can be protected using:

- Closed dies, the shape, size and location of which prevent the hazardous parts being reached (see 2.2.4 "Safety distances"), and which are designed and made to be intrinsically safe.

Legend

- 1 Punch
- 2 Holding plate
- 3 Die



Segregation can be obtained by making the sheet metal holding plate, fastened to the die, thick enough to prevent the punch from coming out.

The shape, size and location of the slits for inserting and removing the material must not make it possible to reach the hazardous element (see 2.2.4 "Safety distances").

- Fixed guards with total segregation (see "Fixed guards" in 2.2.3.2) placed in such a way as to prevent the hazardous part being reached.
- Movable interlocked guards (see "Movable guards" in 2.2.3.2) with or without guard-locking (see "Movable interlocked guards with guard-locking" in 2.2.3.2) that prevent the hazardous area being reached during the hazardous die closing and re-opening phases. During the die re-opening phase, provided that there are no hazardous elements, when the guard is opened the punch can continue moving until the die reaches the daylight position.
- If there are hazardous elements during the die re-opening phase, the die-holder slide must be stopped as quickly as possible when the guard is opened.

2.4.12.1A OPENING THE GUARD

Opening the guard must control the stopping of the hazardous movement using special redundant devices with automatic monitoring.

The stop point must also be controlled continuously and automatically to avoid overtravel.

Redundancy and automatic monitoring (see 2.2.5.1 "Interlock devices")

These devices are used to ensure that, if one of them does not do its job, another is available to do this job.

It is used to minimise the hazard of involuntary repetition or accidental starting of the cycle.

The piston upstroke and downstroke must be controlled by two hydraulic check valves fitted in series, one of which must be installed as near as possible to the cylinder outlet. The correct operation of the gates must be checked each cycle using a detection system with electromechanical position sensors and wired, redundant and monitored circuits.

Control of overtravel

The overtravel monitoring devices must ensure that, if the normal stop position is exceeded by an amount greater than that specified by the manufacturer, a stop signal is sent immediately and a new cycle cannot be started.

- Immaterial barriers positioned vertically. This safety device placed in front of the hazardous area creates a protected area. Crossing the barrier during machining causes the machine to stop immediately; releasing it does not start it immediately. During the upstroke, provided that there are no hazardous elements, if the barrier is crossed, the punch can continue moving until the die reaches the daylight position (early access).

2.4.12.1B DIE DAYLIGHT POSITION (UPPER STROKE LIMIT POINT)

Maximum distance between the machine's moving elements, in relation to the specific work cycle. Stopping the moving elements must be automatically controlled by special redundant devices fitted with automatic monitoring.

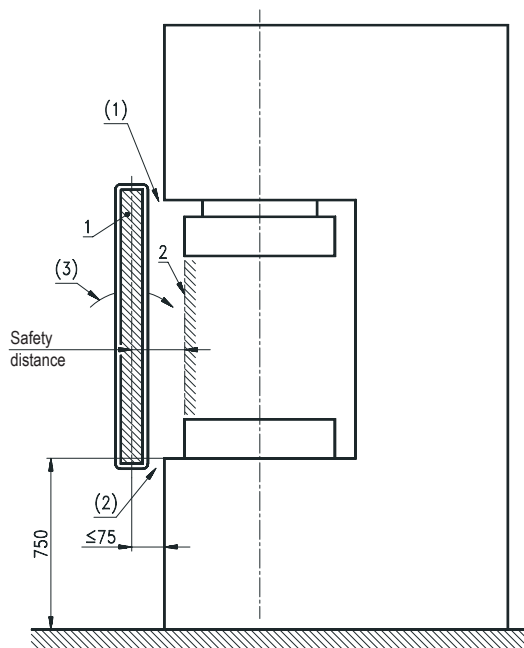
2.4.12.1C IMMATERIAL BARRIERS

- Protection systems made of immaterial barriers (see 2.2.5.3 “Immaterial barriers”) must meet the following requirements:
- Immaterial barriers made for safety functions with maximum reliability and autonomously fitted with redundancy and automatic monitoring (see 2.2.5.1 “Interlock devices”);
- Access to the hazardous area must be possible only by crossing the device’s interception field; additional protective devices must prevent access to the hazardous area from any other direction;
- When it is possible to remain in a position between a light curtain and the hazardous area of the press, additional means must be provided, for example additional beams, to detect the presence of a person in that position. Unmonitored portions of beams must not be more than 75 mm long;
- The barrier must be positioned at a safe distance so that the hazardous elements cannot be reached, taking into account the overall inertia of the press: the distance must be properly calculated (see 2.2.5.3 “Immaterial barriers”).

Legend

- 1 Active optoelectrical device
2 Limit of hazardous area

Sizes in mm



Note - The values to prevent access from the top (1), bottom (2) and sides of the guard (3) comply with EN 294

- Two-hand control to be kept activated throughout the die closing stroke. During the upstroke phase, provided that there are no hazardous elements, the control can be released and the punch can continue moving until the die reaches the daylight position (early access).

2.4.12.1D TWO-HAND CONTROL

The two-hand control (see 2.2.5.2 "Two-hand control"), which can be used if there is just one press operator, must be type III (see 2.2.5.2 "Two-hand control") and meet the following safety conditions:

- Use of both hands at the same time;
- Hold-to-run (see 2.2.6.2 "Hold-to-run") throughout the hazardous phase (punch downstroke);
- Interruption of the cycle if even one of the actuators is released;
- Release of both actuators to start a new cycle;
- Requirement for synchronised action of both pushbuttons within 0.5 seconds maximum.

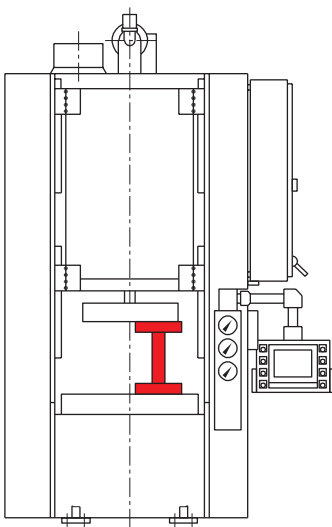
If several workers are operating the press at the same time and there are no other protective devices, a number of two-hand controls equal to the number of operators must be activated. The two-hand controls must be positioned at a safe distance so that the hazardous elements cannot be reached, taking into account the overall inertia of the press: the distance must be properly calculated (see point 2.3.1 in 2.2.5.2 "Two-hand control"). The correct positioning of the two-hand control device, at the right distance from the hazardous area, is vital for ensuring the operator's safety. If a mobile workstation is used, it is vital for safety that its correct positioning is tied to the floor or fixed structures.

2.4.12.1E MECHANICAL HOLDING DEVICE

The device must be capable of absorbing the entire force of the press; if this is not possible, it must be interlocked with the press control so that the machine cannot be started. For presses with a die more than 800 mm deep and a stroke of more than 500 mm the device must be secured and incorporated in the press.

Crushing caused by falls due to gravity during production

When you need to put even a part of you between the upper and lower moving elements of the press during production, the machine must be fitted with a device to hold the upper moving part.



2.4.12.1F HOLDING THE UPPER MOVING PART DURING PRODUCTION

For presses with a die more than 800 mm deep and a stroke of more than 500 mm the upper moving part must be able to be stopped during the work cycle using:

- A mechanical retaining device;
- A hydraulic retaining device;
- A combination of a single-valve hydraulic retaining device and a mechanical retaining device.

Hydraulic retaining device for the upper moving part during production

It can be made in one of the following ways:

- Two separate support or return cylinders, each with a hydraulic check valve, capable of independently supporting the slide/hammer;
- Two hydraulic check valves in series, one of which should be installed, using flanged or welded tubing, as close as possible to the cylinder outlet or preferably directly on the cylinder body, capable of supporting the slide/hammer.

Crushing caused by falls due to gravity during die changeovers, maintenance or repairs

During die changeovers or maintenance, or whenever you need to put even a part of you between the upper and lower moving elements of the press, a mechanical holding device (e.g. mechanical clamp, strut that is also interlocked to the press control) must be inserted to physically prevent the upper moving element from descending.

Crushing during die set-up and stroke adjustment

During die set-up or stroke adjustment, when the protective devices used during the normal production cycle cannot be used, a safety method must be used involving slow closure speed (≤ 10 mm/s) combined with a hold-to-run control device. This operating mode must be selected using a key selector (see 2.2.6.5 "Operating mode").

With the press in slow-speed mode, only hold-to-run control devices should be used. Selecting a speed of more than 10 mm/s must activate at the same time one of the other alternative safety systems.

The combination of protective measures described above must protect all exposed persons, i.e. those who might access the hazardous area during operation, set-up, maintenance, cleaning and inspection of the machine.

2.4.12.2 CONTROL EQUIPMENT

Starting

The only way to start the machine is to use specific control devices (see 2.2.6.1 "Starting") that are easy to recognise and are protected against the risk of being accidentally activated (e.g. pushbuttons with guard ring, shrouded pedals, etc.). These modes must be selected using a special key mode selector (see 2.2.6.5 "Operating mode selector"); this selection must be done by expert staff during the machine positioning and set-up phases. During normal operation, the key must not stay in the switch but must be kept by a specifically identified supervisor. When correctly designed and intrinsically safe closed dies are used, the machine can be started using any starter control device (see 2.2.6.1 "Starting") provided that it is easy to recognise and protected against the risk of being accidentally activated. When open dies are used, the choice of device to start the work cycle is particularly important and must be made taking account of the selected operating mode and the protective devices used.

Starting with two-hand control in single cycle - In these working conditions, no further protection is needed provided that the operator is in complete control of the work area. If several operators are needed to run the machine, the safety of each of them must be ensured, for example by providing the equivalent number of two-hand control devices or making the die closure area inaccessible during the hazardous phase.

Starting with two-hand control in continuous cycle or with pedal control in any type of cycle - In these working conditions the hazardous area must be made fully inaccessible, for example by using: fixed guards (see "Fixed guards" in 2.2.3.2), movable interlocked guards (see "Movable interlocked guards with guard-locking" in 2.2.3.2) or immaterial barriers (see 2.2.5.3 "Immaterial barriers").

Starting with guard-locking - If the hazardous area is fully protected with movable interlocked guards with guard-locking (see "Movable interlocked guards with guard-locking" in 2.2.3.2) starting the machine can be controlled directly with the locking of the guard. If the start of the cycle is controlled directly by the locking of the guard, it must not be possible to remain between the guard and the hazardous area. This protection can be used only when the stroke length is less than 600 mm and the die-holder table depth is less than 1000 mm.

Unexpected restart

Spontaneous restarts (see 2.3 "Machine electrical systems") of the machine after power is restored must be prevented using a specific device.

Stopping

The machine must have a control device (see 2.2.6.3 "Stopping") to stop it safely.

Emergency stop

All machines must have at least one emergency stop device (see 2.2.6.4 "Emergency stop") placed within easy reach of the operator. If there are several operators (large machines) there must be emergency stop devices that can be activated quickly by each worker.

2.4.12.3 ERGONOMICS

Positioning

Machines must be installed so that there is free access to the work area when setting, loading and unloading devices, etc. are being used (for example, devices for lifting or transporting the sheet metal, such as wheeled workbenches).

2.4.12.4 OCCUPATIONAL HEALTH AND SAFETY

Noise

Find out the noise levels to which staff are exposed when using the machine and follow the employer's instructions.

2.4.12.5 PERSONAL PROTECTIVE EQUIPMENT



Gloves (see 5.6.4 "Gloves giving protection from mechanical risks") protecting against mechanical and cutting risks and which are waterproof when oils are used.



Safety shoes (see 5.7 "Foot protection") with protective toe cap (S1).



Hearing protectors (see 5.3 "Hearing protection").

2.4.12.6 OPERATING INSTRUCTIONS

The machine must come with a manual, in Italian, explaining correct use and maintenance, including a programme of periodic inspections.

2.4.12.7 OCCUPATIONAL HEALTH AND SAFETY ACTIONS

Before use

- Read the Operating and Maintenance Instructions provided with the machine.
- Check that the guards (see 2.2.3 "Guards") are present and positioned correctly and that the safety devices are working (see 2.2.5 "Safety devices").
- Check that the guard interlock systems work (see 2.2.5.1 "Interlock systems").
- Check that the emergency stop button works (see 2.2.6.4 "Emergency stop").
- Remove from the press all tools not needed for the machining process.
- Remove the keys from the mode selectors on the machine; these keys should be kept by a supervisor.
- Wear the personal protective equipment (PPE) shown in this data sheet.

During use

- Keep the guards and safety devices on the machine positioned correctly.
- Before any set-up or maintenance work, make sure that there are no elements under pressure; if this has not been done, use the manual valve to discharge the pressure in all elements that could still be under pressure (there must be a warning sign).
- Report promptly any oil seepage or leaks from the hydraulic circuit.
- Report any malfunctions or faults promptly to the machine supervisor.

2.4.12.7A HYDRAULIC CIRCUITS

These must be designed so that:

- All elements of the systems (e.g. rigid tubing and hoses) are protected against harmful external effects;
- There are no hazardous jets of fluid under pressure if components are broken or damaged;
- The tank pressure is discharged when the machine is closed off from its energy source;
- The maximum operating pressure cannot be exceeded by more than 10% (pressure-limiting valves);
- There are devices which, if the circuit is damaged, pressure is low or there is no pressure, ensure that the moving parts are stopped or their descent is controlled: check valve during the lifting phase and throttle valve in the descent phase;
- There is a device disengaging the press control if the stop stroke limit value is exceeded.

After use

- At the end of the shift, or in any case before switching off the machine, fully lower the moving part of the upper die so that it rests on the lower die.
- Switch off the machine.
- Leave the area around the machine (especially the workstation) free, clean and tidy.
- Put measuring equipment and instruments back in their containers.
- Reactivate any deactivated guards.