SACMI MOLDS & DIES

MOULDS WITH MOBILE DIE-BOX

“INSTRUCTION MANUAL”
GENERAL WARNING

This manual is part and parcel of the product. Carefully read the instructions of the manual as they give important information about the utilization and maintenance safety.

This machine should be used only for the purpose it has been expressly built. Any other use should be considered improper and thus dangerous. The manufacturer cannot be held responsible for possible damage due to improper, wrong and unreasonable use.

SACMI answers for the machine in its original configuration.

All interventions modifying the machine structure or operating cycle must be made or authorized by SACMI Technical Department.

SACMI does not answer for the consequences arising from the use of non-genuine spare parts.

SACMI reserves the right to make possible technical changes on this manual and on the machine without any need of notice.

SACMI is responsible for the information written on the manual original version and protects its rights on drawings and catalogues, according to the law.
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1. GENERAL FEATURES

1.1 Lower shaping mould with mobile die-box

The group of moulds with lower shaping, featured by a die-box floating, includes:
- semi-entering punch mould (fine side downwards)
- Mirror mould (traditional or overturned).

1.2 Features of the moulds with mobile die-box

1.2.1 INTRODUCTION ON THE MOULD WITH MOBILE DIE-BOX

The main reasons making the semi-entering punch mould utilization useful are the following:
- production of tiles with large size and/or thick, with spacer, to be pressed with the fine side downwards. It is a mould with intermediate features between the entering punch and the overturned mirror mould. It can be used for producing tiles with the fine side upwards, but in this case the spacer cannot be made.
- Powdering of the lower back side punch vs. the entering punch mould, tile ejection stroke lower than the same mould (but higher than the mirror mould).

The main reasons making the mirror mould utilization useful are the following:
- production of large and very large and/or thick tiles for unfired cutting or after polishing and squaring after firing, production of standard tiles to be pressed with the fine side upwards, without spacer or also for the production of tiles with double powder layer.
- This technology achieves a mirror plate life extremely long. Tile ejection stroke reduced and fast, with advantages on the pressed product quality.
1.2.2 DESCRIPTION OF THE MOULD MOBILE DIE-BOX

The mould is formed by two parts. The upper part is fastened to the press mobile cross-bar, while the lower one is linked to the bench.

UPPER ELECTROMAGNETIC PLATE
On one side, the upper plate is used to fasten the press mobile cross-bar and links the upper punches (mechanically or magnetically).

UPPER FIXING PLATE
At times, upper punches can be fitted on an intermediate plate, fastened to the upper plate on its turn, by mechanical or magnetic fixing.

PUSHERS
The pushers operate hardened pads installed in the lower box.
The pushers have a blowing system for cleaning the area touching the die-box. The pushers can be fitted on the upper fixing plate - when installed - or directly on the electromagnetic plate.

ELECTRICAL DEVICE
Two 48 V ac transformers are thus required for heating the die box and the monolithic plate/hydraulic plate assembly. The supply to the electromagnetic coils for upper punch fastening is obtained by a 48 V dc transformer. On the mould front side, two proximity sensors inform about the tile ejection from the cavity.

PUNCHES
The upper punch, the back side one, and the lower punch, the edge one, shape the two sides of the tile and must be supplied with rubber or resin coating, or also with chromium coating. The upper punch finishing degree and surface quality determine the tile aesthetic aspect on the “fine side”. The fine side punch in the mirror mould is called mirror plate.

BELLOWS
The bellows prevent dust penetration between the block and the bench protection plate, to prevent any damage to the tile lifting system (SMU or SPE).

ELECTROMAGNETIC COILS
They are fitted in suitable housings in the monolithic plate and lock the punch to the monolithic plate itself.

MOULD BOX
The mould box is heated by electrical resistances and houses the liners in its cavities. It is fastened to the bench protection plate by the supporting columns.

LINERS
The liners shape the contour of the tile and are made in steel, being strongly subject to wear.

BASES
The mechanical or electromagnetic bases support and fasten the lower punches. The electromagnetic system is made by fitting coils embedded in the steel base. They have a heating system by mechanical resistances.

LOWER FIXING PLATE
Lower bases can be fitted on an intermediate plate, the fixing plate, like upper punches.

BLOCK ASSEMBLY - BENCH PROTECTION PLATE
The matching of these two parts can be in the SMU configuration, as traditional lifting mould, or in SPE configuration (electronic proportional lifting). The block achieves the tile ejection and powder charging step in the lower cavities. The bench protection plate is used to install the mould on the press bench and houses the bellows protecting against powder penetration.
1.3 OPERATING FEATURES

1.3.1 WORKING STEPS OF THE MOULD WITH SEMI-ENTERING PUNCHES

CHARGING

The situation shown in the diagram of fig. 5 is the initial step, where the charging drawer has just filled the die box cavity with powder. The mobile cross-bar is in its highest level. Before the upper punch (back side punch) starts entering the cavity, the lower punch (edge punch) lowers in the second stroke position (the ejection plate touches the base plate) so that the pressing process can start. In this mould, the liner ejection radius is available like on the entering punch (it does not damage the tiles during the last expansion and during the true ejection step).

The spacer contour is higher than the lower punch. It is located in the best position when the die-box lowers pushed downwards by the pushers.

![Diagram showing the working steps of the mould with semi-entering punches.](image-url)
PRESSING

The upper back side punch starts touching the powder at about 2 mm below the die-box surface (second stroke value). This level difference between powder and die-box surface reduces the powder “blow” caused by the powder touching the upper punch. The back side punch starts compacting the powder and stops when the required tile thickness is obtained (this value depends on the powder thickness, on the compression ratio of the latter and on the pressure value set on the press piston).

The diagram shows that the thickness of the upper punch is higher than that of the pusher, by a value called “back side penetration”. In this way, the upper punch enters the cavity by this value (usually 7-8 mm), then it starts lowering the die-box until getting the wished tile thickness.
EJECTION

Once the tile has been shaped, the cross-bar starts lifting while the die-box stays in its bottom dead center for a preset time (due to the die-box locking system). The tile lifting can be in "sandwich" position if it is placed between the two punches, or in the standard way if the ejector block lifting starts a few seconds after the cross-bar lifting. Once the tile and the lower punch have been lifted to the top, the die-box approaches them to start the true tile ejection.
1.3.2 WORKING STEPS OF THE MIRROR MOULD

CHARGING

The diagram shows the mould cavity situation, already filled with powder and second stroke already made. The liner has a single flaring at the top; while pressing, this corresponds exactly to the tile thickness. The liner has no connecting radius like the mould with entering punches, as this would influence the pressed product shape in an unacceptable way.
PRESSING

The cross-bar starts lowering until the pusher touches the die-box. In this situation, there is no contact between the upper mirror plate and the liner, due to the small thickness difference between pusher and mirror plate.

This "deaeration slot" keeps the same during the pressing cycle and is extremely important to increase the upper mirror plate life and to ensure a good deaeration, that can be easily modified if required. The cross-bar continues lowering pressing the die-box downwards (through the pusher-to-die-box contact) until getting the wished tile thickness.
EJECTION

Once the tile has been shaped, the cross-bar starts lifting while the die-box stays in its bottom dead center thanks to the die-box locking system. The ejector block lifts immediately after the cross-bar lifting, placing the pressed tile in its top removal point. The tile can be lifted in a “sandwich” position between upper mirror plate and lower back side punch. The tile is kept between the two punches and, within some limits, its intrinsic expansion step can be reduced.
2. SAFETY INSTRUCTIONS

2.1 GENERAL INSTRUCTIONS

INSTALLATION
• Carry out the installation according to the manufacturer's instructions, in compliance with the safety norms and regulations in force.
• Connect the machine to a suitable and efficient grounding system.
• A wrong installation can cause injuries to people or things and the manufacturer cannot be held responsible for such situations.

SAFETY DEVICES
• The machines are equipped with electrical and/or mechanical safety devices to protect the operators and the machine itself.
• The manufacturer rejects any responsibility due to removal, tampering with or missed utilization of such devices.

CHECKS, REPAIRS, MAINTENANCE
It is expressly forbidden to carry out any check, repair and maintenance works on moving parts.

Before carrying out any operation, disconnect the machine from the power supply mains, through the main switch.

To prevent accidental start-ups of the machine, a main switch is available that can be locked in the "power off" position.

To ensure the machine efficiency and its correct operation, comply with the instructions of the manufacturer and carry out the routine maintenance operations on the machine, paying special attention to the correct operation of all the safety devices and to the insulation of electric cables, that should be replaced if found damaged.

LIVE COMPONENTS
It is forbidden to work on live components or nearby. The access doors to all electric cabinets must be kept locked at all times and show the required danger signs.

Before opening electric cabinets or boards, disconnect the machine through the main switch.

SKILLED STAFF
The operations for assembly, removal and general maintenance must be charged to skilled staff, technically trained. The suitable tools or devices should always be available and used at all times; the relevant instructions should be complied with.

DISCONTINUED UTILIZATION
If the machine should not be used anymore, make it inoperative by disconnecting the power supply cable from the mains and fitting the possible safety devices (item 8).

2.2 SPECIAL INSTRUCTIONS FOR MOULD WITH FLOATING DIE-BOX

The mould has been designed and manufactured complying with the safety regulations to reduce all risks during assembly, operation and routine maintenance steps.
During the mould routine maintenance, make sure that the press cannot operate parts directly or indirectly linked to the latter (mobile cross-bar, traditional lifting or SMU), by fitting a handlebar or similar safety device. In these situations, the press can only operate by a push button and upon the operator's request.

Before checking or operating on heated mould components, check the programmed temperature and always wear suitable gloves.

During checks or routine maintenance, with lifted handlebar, check that the kinematic movements of the mould are fully disabled.

While cleaning the mould from powder deposits, never use metal objects that could cause short circuits or damage the mould itself.

While installing the mould on the cross-bar and fitting the upper punches, strictly comply with the instructions given by the manufacturer. Any other assembly procedure can involve serious injuries for the operator and an incorrect mould output.

2.3 INSTALLED SAFETY DEVICES

The mould has been fitted with a set of safety devices aimed at protecting the operator and the press/SFS mould assembly.

During the automatic cycle, if an electromagnetic coil burns or short-circuits, the special trimmer for ammeter adjustment inside the magnetic control board can lock the press (for an ammeter variation exceeding the set range).

A timed pneumatic circuit prevents powder deposits on the ribs of the upper die box, with an improved product quality.

A mechanical system for punch falling locking is available as well. See attached diagram.

The electrical outfit (heating and magnetization system) has been manufactured in compliance with the EN 60204-1.

2.4 OPERATOR'S SAFETY DEVICES

Many accidents occurring while working on the machine or servicing it are due to the non-compliance of those precautions involving personal safety.

It is thus indispensable that all operations on the machine are carried out by skilled and authorized staff, duly informed on the machine operation and safety features. Before starting-up, using and servicing the machine, it is advisable to read this manual carefully and make sure that any condition involving safety has been suitably removed.

It is recommended to use approved safety clothing such as non-slip shoes, ear muffs or pads, safety goggles and gloves.

The area where all maintenance operations are carried out must be always kept clean and dry.
In case of risk of being hit by the projection of metal parts or similar, wear goggles with side protections, helmets and gloves.

Never use thinners or other flammable liquids as detergents for cleaning purposes. Use standard thinners available on the markets, that are non-flammable and non-toxic.

Suitable pictograms on the mould inform about residual risks. See attached picture.

Never carry out any cleaning, lubrication or service operation when the machine is moving or live.

Never wear rings, wrist watches, jewels, loose or unfastened clothing (ties, scarves, jackets) that could get trapped in the machine moving parts.

Immediately remove all oil stains.

Do not pile up rags with oil or grease, as they represent a high fire risk. Always store them in a sealed metal container.

Make sure all safety and guard devices have been correctly repositioned before starting the machine up.

Never try to check or adjust the belt or chain tension while they are operating.
Pictograms

Grounding instructions
3. INSTALLATION

3.1 START-UP

3.1.1 LIFTING AND TRANSPORT

The mould is shipped to the user in two possible packaging types:

- on pallet, fastened by lists or wooden frames and laid on two 8-cm high shims. The assembly is thermally wrapped with plastic.
- Packaged in a wooden case.

In both cases, the mould is positioned correctly in the package for the next assembly step, that is with its hydraulic plate facing upwards. Pay the utmost care while unloading and storing the package.

The package weight should always be checked by a suitable fork lift.

3.1.2 STORAGE

The package storage must be made in a suitably protected and sheltered area, free from moisture and temperature sudden changes. The mould should be unpacked only when it must be actually installed on the press, to prevent any oxidation and damage.

Do not place additional components or cases on the package.

3.2 ASSEMBLY

3.2.1 ASSEMBLY ON PRESS USING A FORK LIFT

The following instructions refer to the mould assembly by a fork lift (presses with drawer support, CAL type, or in any case presses with quite large manoeuvring areas).

1. If the mould is packaged in a case, use M16 eyebolts and relevant steel ropes, at least 70-cm long, to remove the mould from the package, as shown in the figure.
Carefully check the wear conditions of the eyelets and of the steel cables before using them.

2. Lay the mould on two wooden shims, about 10-cm high.
3. Place two wooden shims or two rubber plates on the lift forks, to prevent damaging the liners during mould lifting.
4. Place the lift forks under the mould (in the area allowed by the two, 10-cm wooden shims), lifting it symmetrically to its centre of gravity.

5. Move towards the press, checking that the cross-bar of the same is lifted to the top.
6. Check that there are no chips or other particles on the press bench. Clean the two touching surfaces.
7. Lift the mould entering under the press cross-bar. Approach the lower plate to the SPE, checking that the mould is centered vs. the columns and the SPE columns.
8. Take out the lift forks from under the press. Now the mould is laying on the SPE columns. Tighten the mould fittings as shown in the diagram.
9. The assembly is completed by activating the SPE columns downwards and fastening the bench protection plate by the suitable screws.

Whenever a mould is replaced, always use new screws. Use screws class 12K. Check that the screw thread engages by at least 25 mm.
3.2.2 ASSEMBLY ON A PRESS USING A MOULD CHANGE CARRIAGE

Installation of the mould by a mould change carriage with roller devices (presses with charging device that cannot be removed, with reduced installation areas - about 1.5 at the front of the press).

1. Lay the mould on the carriage roller devices.

CAUTION: RISK OF OVERTURNING

Approach the carriage to the press bench as far as possible. Before pushing the mould on the rollers, make sure that the carriage cannot move in either direction.
2. Move the carriage into the available area at the press front.
3. Take the carriage roller devices out and place them on the SPE.
4. Make the mould slide and locate it in the middle of the SPE.
5. Operate the SPE columns and tighten the mould fittings.
6. Take the carriage roller devices out.
7. The assembly is completed by activating the SPE columns downwards and fastening the bench protection plate by the suitable screws.
3.2.3 CONNECTION TO THE ELECTRICAL POWER SUPPLY MAINS

The mould front side has a set of terminals for the connection to the press supply cables. The following pictures show the position and type of the different connections.

Connector for punch heating cable
Connector for ground cable of the heating mould
Connectors for die-box heating cable
Connectors for die-box ground cable

Connector for base magnetic system cable
While connecting the cable harness, make sure that the transformers are disconnected. Fully tighten the cable terminals to the relevant terminals, after checking the correct correspondence between terminal and transformer.
3.2.4 LOWER PUNCH ASSEMBLY IN THE RELEVANT CAVITIES

⚠️ These instructions should be strictly complied with. Any other type of installation could be dangerous for the operator.

1. The punches must be placed on the lower magnetic blocks, in high position.

![Diagram of punch assembly](image1)

2. Operating on the SPE lifting system, the magnetic blocks lower, with subsequent centering of the punches inside the cavity.
3. Once the punches have been centered, they are magnetically fastened to the magnetic blocks.
4. To remove the punches, proceed in the reverse order.

![Diagram of punch removal](image2)
3.2.5 UPPER PUNCH ASSEMBLY

1. Operating on the SPE mould driving system, the lower punches must be placed flush with the upper die-box.
2. Upper mirror plates are centered in the cavities by the suitable centering devices.
3. At the end of the punch centering on the cavities, the cross-bar lowers and the punches are fastened to the upper electromagnetic plate.

3.2.6 UPPER PUNCH MECHANICAL SAFETY

Once the upper punches have been centered, the mechanical safety is ensured as follows.

In the mould with fixing plate, the latter is fitted over the punches and then magnetically fastened to the magnetic plate.
Safety screws fasten the plate/punch assembly to the electromagnetic plate.
In the mould without fixing plate, the safety is ensured by a safety bar:

1. Fasten the safety bar.

2. Lower the mobile cross-bar where the electromagnetic plate is fastened and complete the magnetising process.
3. At the end of the punch magnetisation, the safety bar is finally fastened to the electromagnetic plate.
4. MAINTENANCE

4.1 ROUTINE MAINTENANCE

The following checks and operations should be made regularly.

4.1.1 EVERY DAY

1. Mould cleaning from powder deposits.
2. Grounding cable tightening check.
3. Check (by controlling the tile edge) the centering between punches.
4. Check the blowing system in the bellows chamber.
5. Check the blowing system on the pushers.

4.1.2 EVERY WEEK

1. Check the correct tightening of die box fastening screws.
2. Check the correct tightening of the transformer cable terminals.
3. Check the correct tightening of M16 fastening screws.
4. Upper plate rotation by 90°.
5. Visual check of the liner wear conditions.
6. Check the wear conditions of the upper punches.
7. Check the dust bellows.
5. SPARE PART TECHNICAL SHEETS

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<td>Mould box</td>
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<td>6</td>
<td>Measuring liner</td>
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