**MATRIX** present the established family of presses for
**Ceramic Powders Compaction**

model CX

The successful series of
**MATRIX presses**
models from 6.000 kN up to 10.000 kN

- New electronic system
- High resolution (0,002 mm) of the position measuring system
- Graphic programming of the part shape
- Intuitive man machine interface
- Continuous check of the actual process parameters

- Real time process diagnostic
- Supervisory control and data acquisition
- Off-line programming
- Network connectivity
- Knowledge base driven trouble shooting
- Short machine downtimes for tool change
Available models of the MATRIX presses for refractory compaction

Production of low complexity parts

<table>
<thead>
<tr>
<th>Model</th>
<th>HM 300</th>
<th>HM 600</th>
<th>HM 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compacting force [kN]</td>
<td>3200</td>
<td>6000</td>
<td>9000</td>
</tr>
<tr>
<td>Maximum filling height [mm]</td>
<td>450</td>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td>Stroke of the upper ram [mm]</td>
<td>600</td>
<td>650</td>
<td>500</td>
</tr>
<tr>
<td>Ejection force [kN]</td>
<td>1000</td>
<td>1300</td>
<td>1300</td>
</tr>
<tr>
<td>Clearance between pillars [mm]</td>
<td>930</td>
<td>1100</td>
<td>1120</td>
</tr>
<tr>
<td>Shakeout table cavity [mm]</td>
<td>700x500</td>
<td>800x500</td>
<td>800x500</td>
</tr>
<tr>
<td>Production rate [cycle / hour]</td>
<td>240-300</td>
<td>240-300</td>
<td>240-300</td>
</tr>
<tr>
<td>Power [kW]</td>
<td>70</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>Weight [kg]</td>
<td>19.000</td>
<td>29.000</td>
<td>39.000</td>
</tr>
</tbody>
</table>

- Special version of the MATRIX presses, with additional axes, are also available on request.
- The above information are subject to change without prior notice.
SIMPLY USE AND PROGRAMMING

The MATRIX man-machine interface is realized by an operator panel, based on Real Time Windows CE operating system, installed in a control panel on mobile pedestal or arm, combined with a simply machine control push-button panel.

The high technology of used component, as the solid estate hard disk, grants to mobile control panel a resistance to:

- powder and water jets
- shocks from impact up to 15 g (IP65)
- vibration up to 1 g

The operator panel, based on a 64 bit RISC CPU, has an 11" graphic colour screen LCD TFT and it is built with TOUCH SCREEN technology.
This solution permits the information visualisation and an intuitive data introduction and it simply function just touching the screen with a finger. In fact, a transparent film, sensible to pressure, covers the graphic screen.

In spite to use a pointing device, as a mouse or an optical pen, it can be used a finger to point directly the object on the screen.

Then able to select the functions, change parameters, simply touching the right image on the screen.

The using of the operator panel is simple and intuitive, information and function buttons are visualized with graphical symbols, conforms to ISO7000 and Microsoft Windows standards.

Exploiting the fonts of defined characters on UNICODE international standard, it results possible to realize the interface on desired country language, without any limit on alphabetical characters to use: from which necessary for occidental languages to ones for oriental Asiatic languages. Besides are contemporaneously available on the machine, up to 5 different languages, selectable with the simple pressure of one key.

**Programming of producing cycle**

Also the programming of production cycle is graphically executed, following two simple steps:

- selecting the piece shape in a predefined shapes library
- inserting the required geometrical and technological data

The piece dimensions to program are simply getting out from a piece-dimensioned draw and they are referred to the piece coordinates system (₀) and not to axis (machine coordinates system).

The transformation from one coordinates system to the other it is automatically executed using the parameters stored during the auto-learning procedure, executed at die change time.

Compacting forces are directly programmed on kN and not as pressure referred to cylinders sections of different axis.
Axis control
Hydraulic axis movements are controlled using proportional valves and pressure transducers to control the applied force. This permits to grant the continuous and complete speed control of real force applied by the axis on whatever using condition.

The position transducer is of absolute type, with high resolution (0.01 mm or even less whether required). In this way it is granted the exact knowing of axis position in whatever situation, also if the axis undergo some movement at switched off machine, or after a die change executed in a station external to the press. The position transducer is built with magnetostrictive technology, which exploits the ultrasounds coupling to magnetic fields; this grants the contact absence behind mechanical parts and consequently a prolongation of component life.

The axis electric control is completely digital and parametrical. Exploiting the most advanced control technics, suitably devolved and optimised for hydraulic axis, it is realised a real control of position, speed and force. Then on manage both to position the axis always to required position (with an error of ± 0.02 mm), to really move the axis at the programmed speed and to really apply the programmed force without uncontrolled force peaks.

Press integration into factory automation
The MATRIX presses can be connected into industrial Ethernet network at 10 or 100 Mbit/s speed, with TCP/IP protocol to:

- share programming data of producing cycle
- print production reports, programming data and diagnostic messages
- acquire data for process statistic control and store them separately for each produced piece (identifiable by an univocal progressive number with 9 digit)
- acquire data for the supervision of producing process (hour producing, quantity of produced discards)
- monitor and registry all the modification brought to the producing cycle programming
- execute the OFF-LINE programming of cycle data from a remote computer
- exchange information and data between separately productive units
**Automatic adjustment of loading depth**

To follow the variation to which the powder density is suggested, the filling depth can be automatically modified with regard to the measured weight on previously produced pieces, or with regards to the force applied on the previously effected cycles.

Then, the correction is not calculated on the basis of a single date, but in relation to the run that measure put on.

**Real time process control**

The significant process parameters are constantly controlled at every cycle. In case the position and force values being out of the programmed values windows to accept the piece, this is declared as discard and separately treated by the piece drawing device.

If the IN-PROCESS feedback function of discard piece is enabled, at reaching of the final cycle position (referring position) if the applied force is out of the programmed window, the press further tries to compact the piece, in the attempt to make re-enter the applied force inside the programmed window.

During the automatic production cycle the applied force is measured and evaluated continuously on all the axes. The evaluated force, together with the axes position, could be used for a continuous automatic monitoring of the axes behaviour in the cycle, to detect in advance any compacting process change.

These data could also be stored in a HOST COMPUTER to further analysis.
PRESS STRUCTURE

A particular attention has been given in the construction of the load bearing structure. With the purpose to reduce the elongation deformation it has been realised an enbloc structure where vertical walls are pre-loaded by four ties with rectangular section, thermally pre-deformed. In this way it results a stable structure, that permits a certain and real taking of positions assumed by all axis during the press cycle, in a perfectly repeatable way.

THE SUPERIOR PRESSER GROUP

“X” axis is constrained to the mobile ram, which slides on two guides with self-lubricating bushings. A lubrication set permits the proper system lubrication, granting a perfect orthogonality of working plate for all vertical axis strokes.

POWDER FEEDER GROUP

Very stout steel construction. The feeding system is a sliding carriage fixed to the shakeout table, with a box on hardened and tempered steel wheels and guides. The box is operated by a double-acting hydraulic cylinder, controlled by a linear encoder. Any positions and speeds are programmable. An oscillating movement over the mould cavities can be used to shake the raw material to press and ease its fall inside the die cavities.

A double mechanical cylinder, coaxial to the box guarantees the adjustment height-wise of the charging unit compared with the die-case, in order to have the carriage sliding plane be aligned.

It is also possible to get a sloping filling height, by depositing the material inside the die in an inclined way (wedge), with the same slant the part must have after its pressing.

Inside the box cavity there can be installed a stirrer with revolving swifts, controlled by a hydraulic motor. The mix to be pressed falls into the upper part of the box through a slit placed at the intersection point of the two swifts, thus ensuring a perfect homogenization during the rotation. The blades forming the swifts may have different shape or geometry, to fit various kinds of cavities. The quantity of the mix inside the box is controlled by a torque detector, thrown-in in the supply circuit of the hydraulic motor, which enables to keep just the volume of material required. Revolving speed and direction are adjustable. A particular tightness system with adjustable pressure mobile elements allows to contain the mix inside the box during the transfer stroke over the die.
THE HYDRAULIC UNIT
It is realized with the most modern REXROTH components, inserted on modular stainless blocks.

In order to prevent the oil from being polluted by the infiltration of dust, the hydraulic circuit is sealed and pressurized.

The system works at a low pressure, being high pressure developed through a special piston pump. The circuit is designed provided with proportional control regulation and safety valves. This system is extremely simple and easy to operate. The operator has no need to make either manual adjustments or alterations on the hydraulic parts.

The motor-pump units are fixed on anti-vibrating elements: this arrangement allows easy access to all components for maintenance purposes. An independent pump draws the oil continuously from the tank and sends it back to it, after having made it pass through a filter and a high-efficiency heat-exchanger. Furthermore, the unit is equipped with an electric indicator signalling clogged filters and with a safety device, should the oil temperature be too high or of insufficient level.

A hydromechanics device for a rapid die case locking is also provided.

SPEED AND PRECISION
The hydraulic axes are controlled in position and pressure, with a modern system of electronic cards for axis control (by Rexroth), coupled to proportional valves (by Rexroth) and interfaced with ultrasound linear position transducers with high resolution.

The ensemble of those elements, governed by a modern PLC (by Siemens) fitted with a suitably structured software, permits to operate press axes on all operative cycle phases, with precision of 0.01 mm (or even less whether required) and repeatability inferior to ± 0.02 mm on position, and ± 1 bar with repeatability inferior to ± 2.5 bar on pressure.
ACCESSORIES - OPTIONALS

**Picking-up and placement device**
This accessory can be furnished in different versions, to satisfy the specified needs, using vacuum suction cups or adjustable pneumatic pliers.)
**Conveyor belt**
Formed by commercial modular elements, it can be furnished with the length and width required by the customer; the driving is given by a geared motor with inverter.
The entire group is fixed externally to the press on a flexible support for a rapid release of front press; the height adjustment of belt working plate is adjustable by a manual handwheel.

**Punches lubrication**
Automatic lubrication of the die, complete with: two 100 litre tanks, filters and spray-nozzles, directly installed at the front of the box.

**Punches and die heating**

**Weighing device**
We have several types of automatic weighing devices available, from the most simple ones, with electronic balance connected to the producing cycle on post-process, for the survey of productive quality, statistic, trends, etc., to more complex devices working in-process, able to send to the press the automatic weight correction signals.