

## GRINDING MACHINE FOR SOLID RUBBER SPHERES

### 1 General description of the machine

This electro-pneumatic, PLC controlled machine is used for the external grinding of solid rubber spheres or spheres fitted with an insert.

It is composed of: a loading group fed by an accumulation channel where the raw spheres to be machined are deposited - the loader lifts the spheres up to a pre-determined height from the reference sphere placed at its bottom; a raw-piece-gripping group to be loaded onto the grinding units; a group for the vertical movement of the raw-piece-gripping pliers; a group for the horizontal translation of the raw-piece-gripping pliers from the loader to the work units; an upper and a bottom work unit for grinding raw pieces; a group for gripping the machined pieces and a group for the machined piece gripping pliers vertical movement.

The basement structure is divided into different areas:

- A rear area where the accumulation channel of raw pieces is fitted
- A right side area where the cable-holder chain and the horizontal axis slide
- A right central area where the loader is fitted
- A left central area where the grinding units are fitted
- A left side area where the unloading channel of pressed pieces is fitted.

The machine is composed of:

- An unloading channel
- A group for shaking the unloading channel
- A group for blocking the raw rubber column
- A group for contrast descending
- A group for loader ascending
- A group for the size reference piece positioning
- A group for the raw piece pliers
- A group for gripping raw pieces
- A group for the machined piece pliers vertical movement
- A group for gripping machined pieces
- A unit for the horizontal movement of piece-gripping pliers
- Two positions for checking the raw/machined piece presence
- A rotating grinder-supporting upper unit
- A rotating grinder-supporting bottom unit
- An electrical control panel
- A pneumatic system.

### 2 Description of the operation principle

The raw spheres to be ground are deposited into an accumulation channel, which lets the spheres slide up to the loader lifting point through a sussultatory movement. After detecting the presence of the spheres at the loading point, the contrast piston comes down to prevent the spheres from falling during the uplifting phase.

After the contrast piston has come down the loader uplift piston lifts the spheres up to the required height to operate the gripping.

The gripping height is determined by the sample piece inserted at the bottom of the loader. When the sphere is in the gripping position the raw piece gripping pliers come down. When the descent is over the gripping pliers close and grip the raw sphere to be ground. The contrast piston ascends and the raw piece gripping pliers ascend to the translation position. The horizontal movement unit waits until also the machined piece pliers come to the translation position before operating the translation run towards the work unit.

<b>DESCRIPTION OF THE MACHINE AND TECHNICAL SPECIFICATIONS</b>	I
--	---

Approximately half way through the internal translation run the raw piece pliers go down to the check position to detect the raw piece presence.

After a pause, which is necessary to check the presence of the raw piece and the machined piece in the respective pliers, the machined piece pliers are lifted up and the manipulator keeps running up to the moment when the raw piece pliers have reached the centre of the work units and the machined piece finds itself in the loading channel.

The two grinder-supporting, rotating units approach the piece to be machined through a PLC-controlled run. When the grinder-supporting units are in the work position the raw piece pliers opens so as to allow the grinder-supporting units to rotate. During rotation the grinder-supporting units further approach the piece by the size corresponding to the material to be removed. During machining, the raw piece pliers are lifted up, while the machined piece pliers come down, deposit the machined piece in the channel and - after the opening – move to the translation position towards the machining units.

During machining the loader and the raw piece pliers prepare for a new loading cycle.

At the end of the grinding units work cycle the machined piece pliers descend, after which they close and grip the machined piece. At the end of the pliers closing operation the rotating units move away from the machined piece, so allowing the pliers to lift and to reach the translation position towards the intermediate position to check the piece presence.