



MILLING REVOLUTION



Roller mill

# Leonardo

DATA SHEET



4-8 cast iron balance cylinders with hardness 500 HB

Omas Ker System

Pressure measurement system OPS

Omas Drive System



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## TECHNICAL FEATURES

Automatic machine with 4-8 horizontal rollers for thrust milling. Streamlined machine including:

- differentiated structure made of 3 types of structural materials such as:
  - Stainless steel AISI 304, on surfaces in contact with flours, making the inner structure perfectly smooth, with no contaminating materials.
  - Anodised aluminium profiles, increasing the entire structure's robustness. Profiles are treated electro-chemically, giving us considerable surface cleaning, appreciable aesthetics; and considerably reduced vibrations thanks to treatment filling cavities with sound-proofing material!
  - Electro-welded, varnished carbon steel, with braided frame for increased structural resistance and considerably reduced vibrations.
- 4-8 cast iron balance cylinders with hardness 500 HB
- supports with ball bearings in double row of barrel-shaped rollers
- automatic pneumatic command system to attach/detach milling rollers, with safety micron
- robust PETG type polyethylene inlet hopper, obtained through a specific hot moulding process, completely transparent to make the product easier to control. Control of feeding flow with infrared ray probes connected electronically with the variable speed feeding rollers
- cleaning of milling cylinders using brushes or scrapers that detach automatically.
- command and management device with touch screen, intuitive and polyfunctional, prepared for profibus, ethernet, modbus connection.
- Drive with revolutionary, permanent magnet torque motors providing an infinite number of technical and technological advantages
- Milling roller pressure control system (OPS - Omas Pressure System) (only with torque motors).
- Feeding rev control system
- Possible traditional drive with differentials to return movement to milling rollers, by special rubber groove belts.





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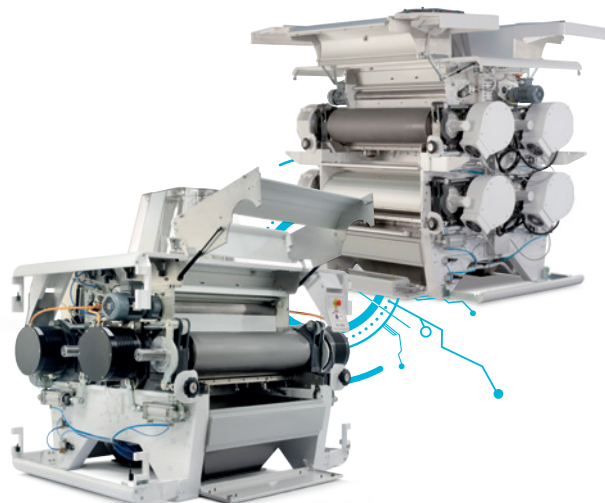
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## ADVANTAGES

This application has numerous novelties and advantages

- a) Possibility to control torque parameters and number of revs enabling operators to manage the milling performance in the best possible way, regulating it to satisfy very different use needs. The technologist can control grinding using dedicated recipes for each flour type and grain mix. The recipe will consider wear to rollers, product moisture, and other environmental variables!
- b) Possibility to recover energy as the slow cylinder is dragged by the fast one (OKS – Omas kers system) with lower energy costs. Torque motors have a high energy yield and enable, with the same sizes (referred to those with asynchronous motors), better performance. And not least, possibility to manage energy for each milling cylinder, only supplying what is strictly needed: contributing to making this application unique the world over.
- c) Extremely silent motors, with really strong reduction in noise.
- d) Simplified general plant, as an entire level dedicated to traditional belt motors is eliminated \*only with torque motor drive
- e) Ordinary maintenance activities and, above all, costs reduced to a minimum.
- f) Insertion of a dynamic milling cylinder milling pressure measurement system OPS (Omas pressure system), which measures pressure;
  - to have a reference parameter that the operator did not have before, except analogic, and completely static! Display visualisation.
- g) Elimination of kinematic motion that create drive relations between motor and use, and between front and rear cylinders.
- h) Ease of application as the rotor can be splined directly to the end of the cylinder to be rotated; whilst the stator is fixed directly to the flange of bearings supporting the cylinder.
- i) Availability of nominal torque with high rev number range. The torque is also available when the rotor is stopped.
- j) Different powers available on a single motor size.
- k) Belt drives and returns have been eliminated making the machine more efficient. Thus eliminating problems of alignment between motor pulley and the cylinder's drive pulley
- l) Electronic drive means rotation speed can be managed precisely keeping torque supplied constant.
- m) Differentiate speed between front and rear cylinders as desired with no need for mechanical kinematic motion means such as cogs or belts.
- n) Motor temperature can be controlled.
- o) A water cooling system can be applied for milling rollers



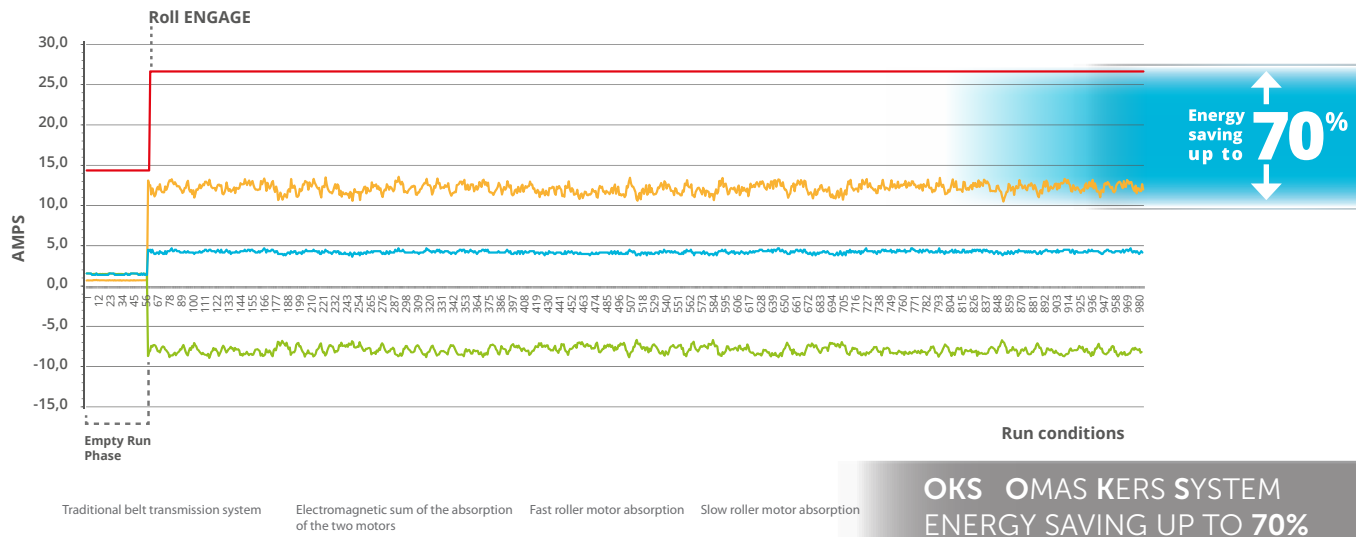


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## THE POWER SAVER



### Leonardo S vs. belt Roller mill graphic of absorbed ampere by network example of roll compression passage (1000x250) 1500kg/h

Below is a graph showing power input compared to a traditional belt transmission system (red line) and the Leonardo S installation (fluo line).

Specifically, we have defined two time stages: empty and full load. The line between one stage and the next is given by the engagement of the rollers, where it is possible to see a drastic increase in absorbed power.

**Off load running:** in this stage it is already possible to see how just eliminating the kinematics will lead to a considerable reduction in power absorption.

**Full load running:** in this stage, as well as the benefits from eliminating the kinematics, we have also added power regeneration (OKS), due to the compression between the rollers and their differential speed. We would like to point out that the power absorption monitored is:

1. Slow roller motor absorption
2. Fast roller motor absorption
3. Electromagnetic sum of the absorption of the two motors (which represents the intake of energy from the mains)

The graph shows the **extraordinary energy-saving abilities of Leonardo S**, both when running off load but above all, during the milling stage.

The greater the effort required of the machine, the higher the managed savings and the energy saving delta compared to with belt transmission.

### OKS OMAS KERS SYSTEM ENERGY SAVING UP TO 70%

Omas patented cutting-edge technology to save up to 70% energy.

OKS, Omas Kers System, is an Omas-patented system that recovers energy from the fast roller over the slow one, allowing up to 70% energy savings for the whole mill.



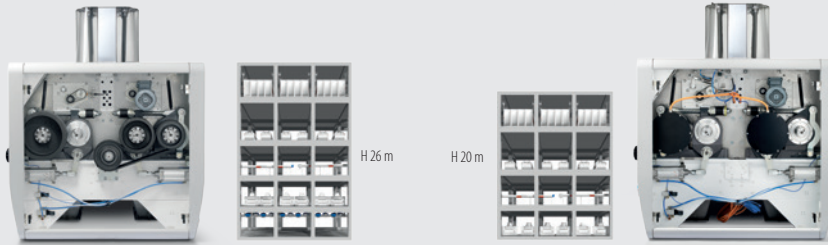
KERS is a technology based on Kinetic Energy Recovery System, applied by Omas for Leonardo roller mill.





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### Traditional driving system:

Leonardo can be assembled with traditional belts & pulleys system keeping in this way the present tradition of milling installation. Below is represented a traditional assembling framework with the underlying motor level.

### Revolutionary system with Torque motors:

rolls shaft direct application can allow a general simplification of the milling installation. In the project phase is possible to eliminate the underlying level providing huge savings. The advantages of this revolutionary application can allow as a consequence a



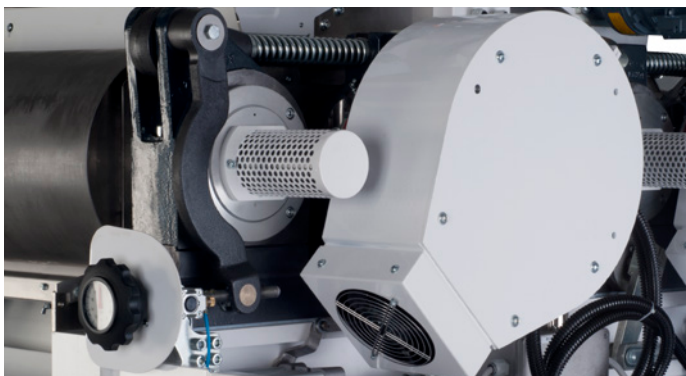
## ELIMINATING KINEMATICS

By removing the kinematics, in case of green field, we are able to eliminate a whole floor of the building. This avoids all mechanisms, trusses, pulleys, belts and much more, which inevitably represent the traditional transmission system that today has been rendered obsolete by Omas.



## CLEANING

Leonardo has also been researched and developed with an eye to cleaning and hygiene of the environment. The fact the roller mill is raised above the floor allows easy cleaning of the surfaces under the machine.



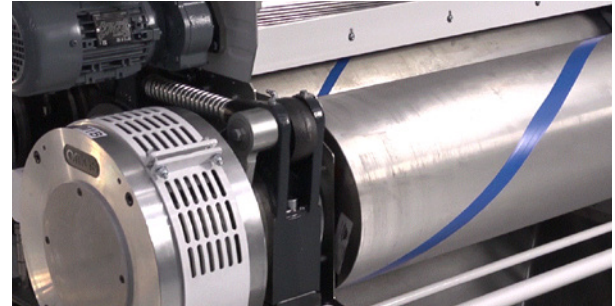
## SILENT OPERATION

Omas drastically reduces noise levels in the roller mill room, thanks to the elimination of belts, pulleys and external motors. The typical noise of a traditional milling room is replaced by the silent operation of a machine that is fully electric. What's more, the steel structure, aluminium profiles and reticular structure allow the machine great stability as well as expressing absolute sturdiness, while vibration has been practically eliminated, meaning it is not spread to the environment or surrounding structures.



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## REDUCTION IN ROUTINE MAINTENANCE

The Leonardo S has no toothed gears or toothed transmission belts, and pulleys, as well as the motor transmission V-belts.

The elimination of the kinematics has made it possible to drastically reduce routine and special maintenance, with resulting advantages:

1. Elimination of costs for consumables.
2. Elimination of system downtimes for maintenance operations.
3. Increased plant efficiency.
4. Fast roller change.
5. Drastic reduction in the mechanical forces caused through pulling on the belts (typical of traditional installation) with resulting improvements to operating conditions and the duration of support bearings.



## SAFETY

An essential eye to safety in the workplace. Leonardo S is an incredibly safe machine, even when the side panels are open. In fact, all of the moving parts are encased and there are no pulling elements that may affect the health and safety of operators, in compliance with all European standards and others besides.

## POSSIBILITY TO ADJUST EACH SINGLE ROLLER

The directly coupled torque motors on each single roller allow perfect speed and positioning control on each one. Leonardo S is in fact the only roller mill that makes it possible to:

1. Set the speed for each single roller.
2. Set a speed ratio between the two rollers.
3. Vary the speed ratio for an even greater production.
4. Vary the speed ratio for better management of roller wear.
5. Pass from cut-cut situation to back-back ones, rather than cut-back and vice versa, with the possibility to change milling technology.
6. Manage container levels.
7. Manage the ratio between feed rollers and milling rollers, so as to be able to vary peripheral speed and maintain the optimum milling degree and grain size.
8. Constantly control motor temperature.
9. Constantly control mains power absorption.
10. Extract punctual and precise statistics according to time intervals.
11. Create genuine milling recipes.

All of these benefits are easily achieved through the colour touchscreen interface.



Roller mill

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## MAIN COMPONENTS

### Torque motors: 360° revolution

Smaller in size, very quiet, drastic reduction in energy consumption (from 25 to 70% energy savings), thanks to the high energy efficiency level and the OKS (Omas Kers System), enabling recovery of fast cylinder energy over the slow one. Revolutionary, unique, extraordinary, absolute.

Elimination of traditional traction bodies, resulting in reduced ordinary



maintenance. Guarantee of quality and durability

A further torque motor benefit concerns general plant simplification: by application to the neck of the milling cylinders directly, there is no need to build the underlying level traditionally dedicated to belt motors.

### Interior in aluminium and stainless steel

Highly valuable frame enabling respect and non-contamination of flours: the interior is in noble materials such as stainless steel AISI 304, and anodised aluminium alloy



### Inlet hopper



Unique and revolutionary, completely transparent. Visible 360°, robust, and with its inner parts easy to maintain. Complete with infrared probes, to measure product levels, for excellent flow management, with excellent product capacity fluidity.

### Command Plc

Command with touch screen display, easy, intuitive synoptics: clear commands, coloured interface and, in dusty environments, electromechanical buttons too to guarantee functionality at all times. Possible interface in 5 languages, prepared for network connection through profibus, modbus, ethernet.





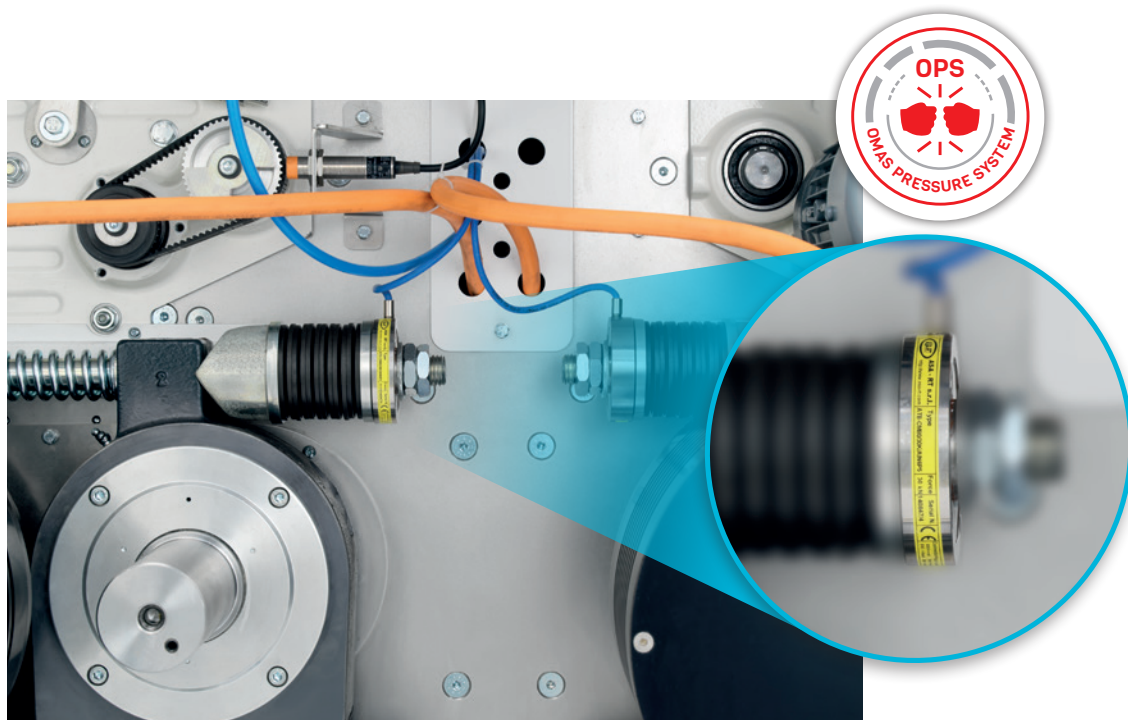
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## MAIN COMPONENTS

### OPS (Omas Pressure System): pressure measurement system



Pressure control and measurement system for milling rollers, through a load cell device applied to cylinder implementation systems directly; dynamic measurement of milling pressure, visible on interface display. Complex mathematical algorithms we will use this data to manage the peripheral speed of the two milling cylinders, feeding roller rotation speed (synchronised and determined by the bell's level sensors) in the best possible way, as well as correct supply of power for main motors, using only the energy needed.

\*The OPS system operates differently if drive is traditional, using pulleys and belts.

The pressure between rollers is 12 000 kg/m





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## OMAS DRIVE SYSTEM

*Traditional manual driving system*

*Revolutionary driving system*



The traditional adjustment systems mean that the milling rollers are adjusted using handwheels with analogue measuring gauges, which is the most widely used system and allows excellent adjustment of the pressure at the two ends of the roller, while leaving the operator with the burden of manual adjustment and therefore, the distance/pressure between them.

With the addition of the step motors to adjust the rolls gap, the millers will be able to obtain a micrometrical setting of the distance between the rolls. Each revolution will reduce the gap by 0,01 mm. Every ideal rolls setting per every different wheat grits can be store and recall anytime to replicate the quality of the flours during the years. Composed of 2 step motors per each couple of rolls the system will need a dedicated data communication cable to the main PC where more than 100 different can be hoist.



The combination of the ODS on Leonardo S with rolls at variable speed will allow the mill to produce a unlimited varieties of flour not achievable with conventional rollermill.



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It is a device developed and manufactured to adjust the milling gap, using a pair of electrical actuators that operate on the eccentrics in the adjustment units on Leonardo.

The system can be used both manually and automatically.

In the first case, the operator uses the control buttons on the panel to set grinding intensity in the traditional manner, testing the effect of the adjustment directly on the product as it leaves the milling rollers. Once the machine has been set, the operator has the possibility to store the setting and call it up at any time. The operator panel shows the number of the "recipe" setting and this can be referred to the shift manager, who is responsible for setting the machine. All other operators may in any case make some adjustments, although these can be viewed on the panel display, which shows the opening and closing microns compared to the adjustment made by the manager.

In the second, where the roller mill is supplied with one or more control devices, such as the grain size or the force control via the loading cell (OPS), it is sufficient to set the target value on the control panel (grain size or milling force), and this value will be constantly tracked and controlled automatically by the ODS device without the need for any manual intervention by the operator.

## Technical data

- Precision (minimum adjustment) 0.012 mm (0.4% of the maximum adjustment gap)
- Maximum milling roller closure force (sum of the two actuators) 100000N (one hundred thousand Newtons) \*
- Adjustment travel (Max gap) 3mm
- Actuator power voltage 24V DC
- Continued control of travel via analogue device 0-10V

(\* ) 100000N is the maximum force that it is possible to exert with the actuators on the milling rollers; this force is above that of the compression springs. This means that from the actuator side, the milling rollers, even during the adjustment stages, meet a high degree of resistance that makes it possible to work with the contrast springs, which deform to provide the right reaction force to that exerted by the passage of the product being milled. The springs also continue to act as a safeguard, deforming further in the case of a foreign body being present, leaving the actuator adjustment settings unchanged.



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## MAIN COMPONENTS

### Milling group

Top quality rollers, tempered with hardness up to 500 HB (greater hardness available on request), mounted on strong cast iron spheroid supports and European bearings of primary international makes; components used guarantee quality and durability.

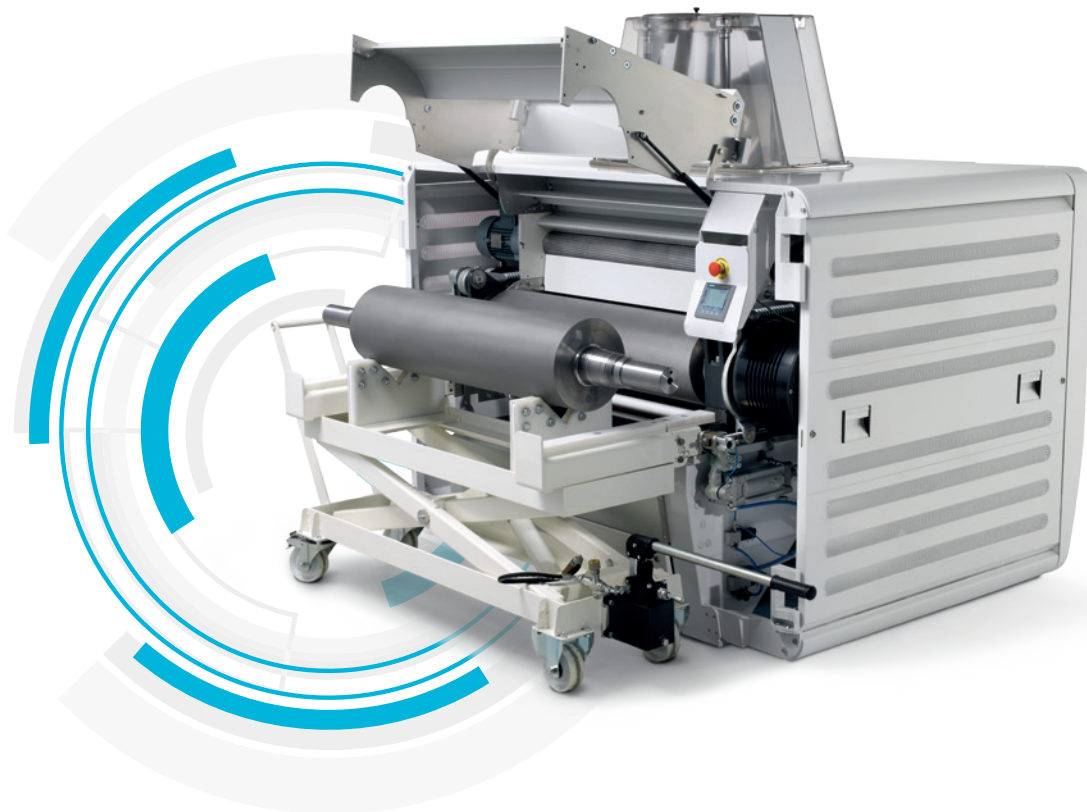


### Cleaning brushes



Brushes or scrapers, with pneumatic detachment and approach system, directly connected to the milling cylinders. Regulated by thrust springs and screws, so that wearable material can be used till the very end.

### Roller extraction carriage



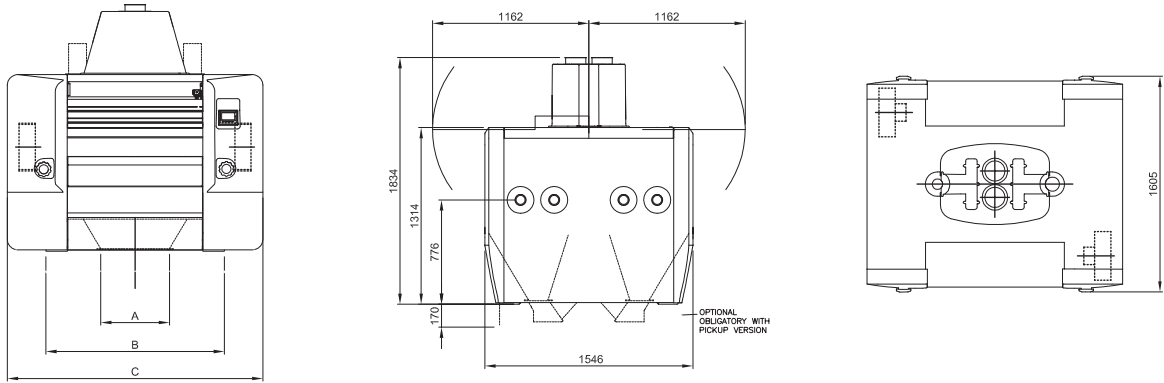


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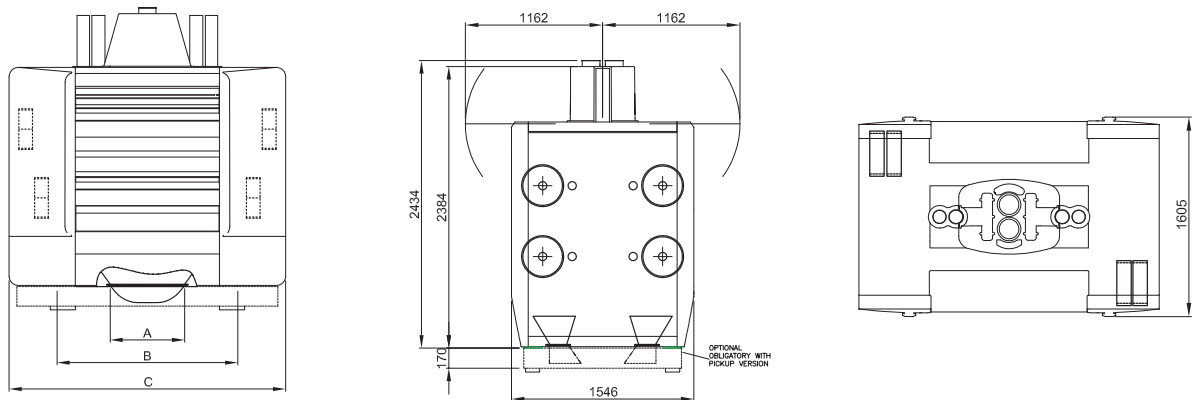
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## "LEONARDO" 4



## "LEONARDO" 8



### Mod. LEONARDO 8

Type	Dimensions	Weight	Sea packing volume
	C	(kg)	(m <sup>3</sup> )
LEO8 100-25 LEO8 100-25 S	2164	5270	7,9
LEO8 125-25 LEO8 125-25 S	2414	6260	9,0
LEO8 100-30 LEO8 100-30 S	2164	5420	7,9
LEO8 125-30 LEO8 125-30 S	2414	6460	9,0

### Mod. LEONARDO 4

Type	Dimensions	Weight	Sea packing volume
	C	(kg)	(m <sup>3</sup> )
LEO4 60-25 LEO4 60-25 S	1500	2800	6,9
LEO4 80-25 LEO4 80-25 S	1700	2900	6,9
LEO4 100-25 LEO4 100-25 S	1900	3000	7,2
LEO4 125-25 LEO4 125-25 S	2150	3400	8,0
LEO4 100-30 LEO4 100-30 S	1900	3250	7,2
LEO4 125-30 LEO4 125-30 S	2150	3600	8,0

PERFORMANCE EVOLUTION IN THE ART OF MILLING

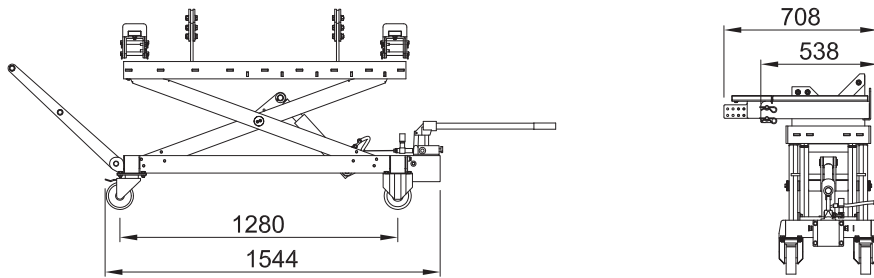


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PERFORMANCE  
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MILLING REVOLUTION

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