

# GIORIA s. p. a.

FONDERIE E COSTRUZIONI MECCANICHE  
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## **GIORIA UNIVERSAL GRINDING MACHINE**

### ***Foreword***

In 2009 a leading Italian manufacturer of **very large heavy duty horizontal lathes** approached us with a particularly tough request: the ability to design and provide a special purpose universal cylindrical grinding machine capable of performing external, internal, cylindrical and taper grinding operations in one set up for the whole range of work spindles of for their lathes.

This presentation highlights the outcome in taking a such challenge which lead us to produce a truly unique piece of equipment.



***General view of the grinding machine R/163 – 4000 x 600 CNC***



### ***Machine main features***

Machine model = ***GIORIA R/163 – 4000 x 600 CNC Siemens Sinumerik 840D***

Designation: universal cylindrical grinding machine

Components to grind = work spindles of large heavy duty lathes

Grinding concept = travelling wheel grinding machine

Grinding tasks: outside diameter, inside diameter, outside taper, inside taper, faces

Maximum grinding length = 4000 mm

Maximum internal grinding depth = 650 mm

Maximum outside grinding diameter = 1200 mm

Maximum inside grinding diameter = 800 mm

Maximum workpiece weight allowed on the machine = 8000 kg.

Number of controlled axis = 6      *Z AXIS* wheel carriage longitudinal movement

*X AXIS* wheelhead cross infeed

*S1 AXIS* work spindle speed of rotation

*S2 AXIS* grinding wheel spindle speed of rotation

*B AXIS* swivelling of wheelhead

*Z2 AXIS* additional slide for taper grinding in trasverse mode



## **ADDED VALUE WHEN CHOOSING A GIORIA CYLINDRICAL GRINDER**

Every GIORIA grinding machine is built completely at GIORIA.

The castings are produced inside GIORIA owned cast iron foundry.

The machining of the castings takes place in GIORIA machine shop as well.

This guarantees a direct control of the entire production process.

Production at GIORIA also comprehends: painting, assembly, wiring (machine and power cabinet), software development/customization.

## **ADVANTAGES OF GIORIA WHEEL MOVING DESIGN**

**The first GIORIA wheel moving grinding machine was commissioned in 1980**

### **Floorspace saving**

Lengthwise, the space taken by a wheel moving grinding machine is, as an average, 40% less than the corresponding table moving grinding machine.

Some machine peripherals such as the electric cabinets and the coolant filter can be positioned freely around the machine depending on how the space is available.

### **Machine stability**

The bed of all GIORIA wheel moving machines is made using highly resistant, thermally stabilized cast iron.

The box-like, squared shape of the bed guarantees higher stability with respect to the bed of a table moving grinding machine.

A box shaped bed is more compact and solid for it is equally supported on all four sides.

Furthermore the bed is strengthened by properly sized longitudinal and cross ribbing.

In a wheel moving machine the mass being moved (longitudinal wheel carriage plus wheelhead cross slide) is always constant. It never changes.

Therefore the sizing of the linear axes (size of the guideways, spacing between the guideways, power of linear axes motor) is made referencing to a constant mass which is not affected by the weight of the workpiece to be ground.



## **MACHINE STRUCTURE**

The bed of the grinding machine as well as all of its assemblies are made of cast iron produced inside our company.

GIORIA has been producing iron castings ever since its foundation in 1962.

The production capacity is around 3000 tons per year.

GIORIA grinding machine shop is the first "customer" of the foundry absorbing the 30% of the total production.

The rest of the production is sold to the market where the majority of GIORIA foundry customers are leading machine tool builders.

The weight of each single casting ranges from 2 to 24000 Kilograms (the heaviest single casting ever realized is the bed of a very large GIORIA wheel moving grinder model R/163 – 7000 CNC, see pictures here below).





## **TRULY UNIVERSAL CONCEPT**

There were many reasons for the customer to invest in a new grinding machine; these were the most important justifications of the investment.

- Increase the grinding capacity in accordance with the trend in the increase of the size of their lathes as demanded by their target markets.
- Improve the dimensional accuracy of the ground component with regards to runout, roundness, straightness, taper angle and coaxiality between OD and ID.
- Improve overall machine set up time and grind time.
- Source a machine which would comply to European Directives in force at the basis of the "CE" declaration of conformity and comply to most recent international manufacturing standards.

The above mentioned guidelines lie under **one key requirement: the ability to completely grind the various features of the component in one set-up.**





## **IN THE MACHINE**

### ***Outside grinding***

The component to be ground is clamped in the machine with a 4-jaw chuck on workhead side and dead centre on tailstock side. After the component is aligned outside grinding takes place.



***A front view of machine work area.***

***The machine can grind a component up to 4000 mm long with a maximum diameter of 1200 mm and a weight of 8000 kg.***



### ***Inside grinding***

For inside grinding the open steady rest is centered to the outside clamping diameter of the component thanks to three contact pads. After this operation the tailstock is disengaged and moved to parking position at table far end location allowing in such a manner the clearance required for the ID grinding spindle to enter the bore to be ground.

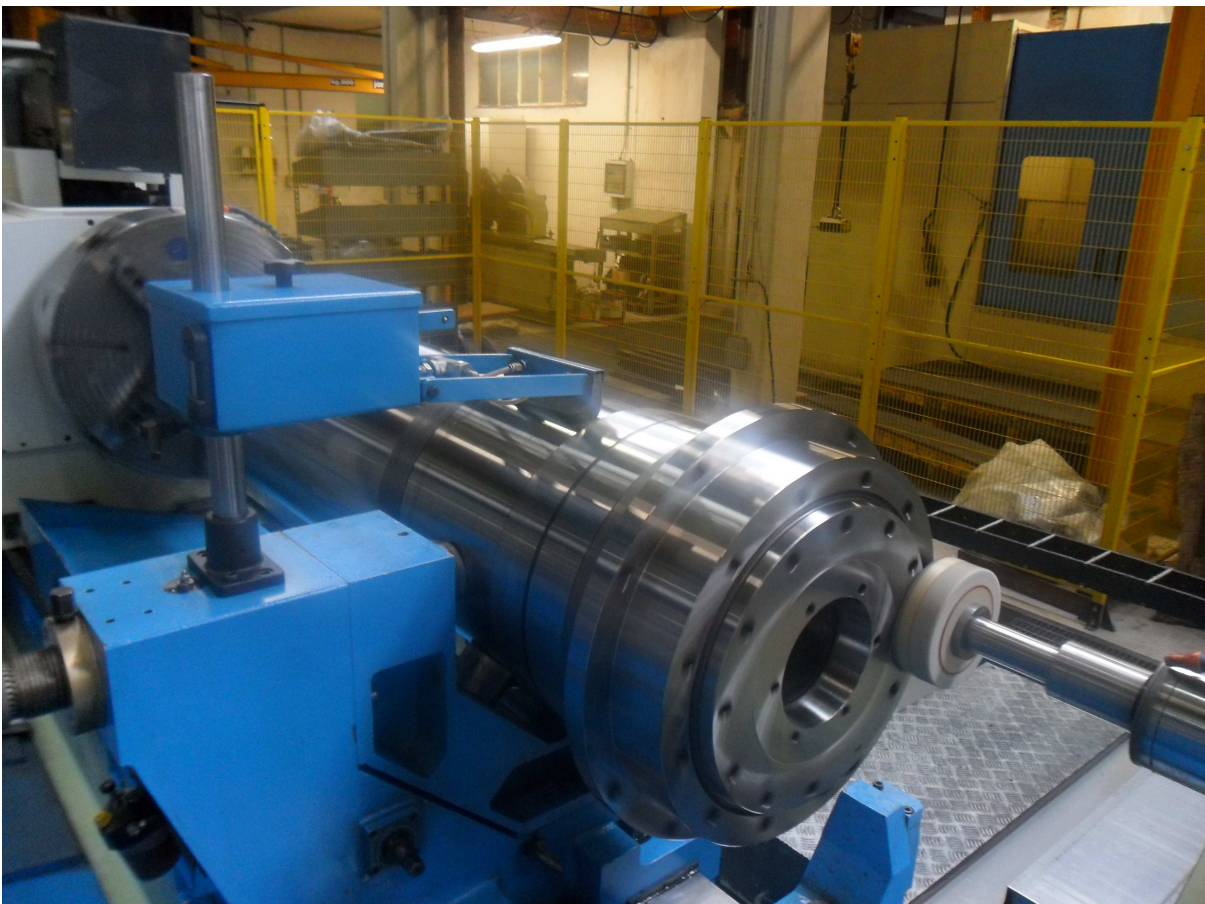
The ID grinding attachment moves automatically to grind position by means of a geared motor.

OD and ID grinding are programmed and managed by the CNC in a fully automatic grinding process.



***ID grinding attachment in working position.***





***A work spindle on the machine during face grinding operation.***

***This machine can grind a maximum ID of 800 mm for an ID depth up to 650 mm.***





## ***Taper grinding***

The added value to the grinding process performed by this machine is the possibility to grind tapers in a full automatic mode by means of two additional CNC axes.

**B AXIS** control of wheelhead swivelling by  $\pm 10$  degrees

**Z2 AXIS** control of the longitudinal movement of the additional slide for taper grinding by 600 mm. Using this slide **the taper is ground in traverse mode, without interpolation** resulting in a much better accuracy, improved surface finish and reduced grind cycle time.



***Wheelhead is swivelled for taper grinding on the B AXIS.***

***In the foreground it is possible to see the additional slide to grind tapers in traverse mode (Z2 AXIS)***



## **GIORIA GENERAL PRODUCTION**

All technical specifications and machine capacity data contained in this presentation are peculiar to the machine analyzed herewith.

Whenever your requirement may differ from this case study just know that our overall maximum grinding capacities are as follows:

Grinding length = 10000 mm

Outside grinding diameter = 2000 mm

Component weight allowed on the machine = 40 ton

For more information you can visit our website [www.gioria.com](http://www.gioria.com)  
or enquire at [info@gioria.com](mailto:info@gioria.com)