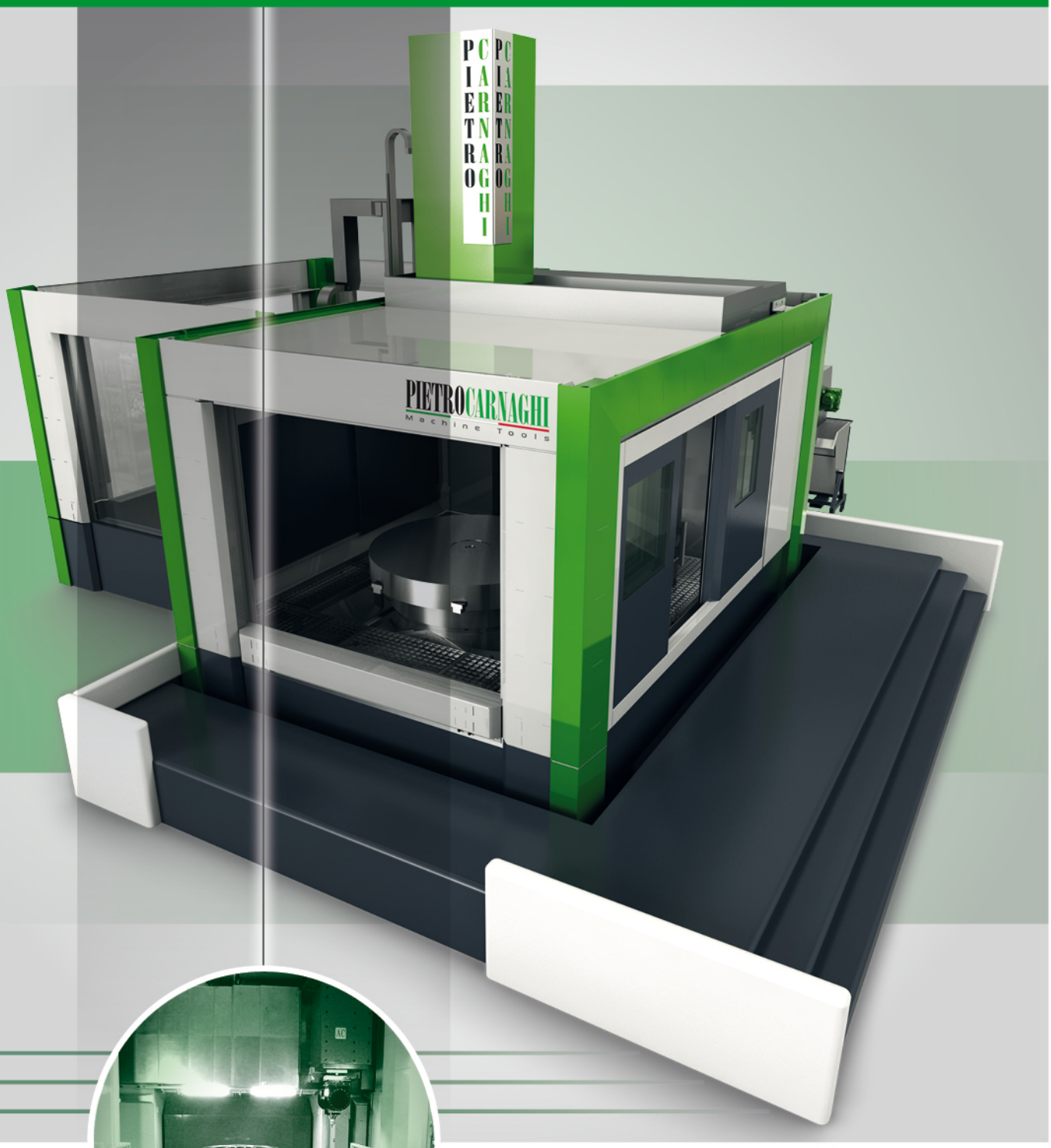
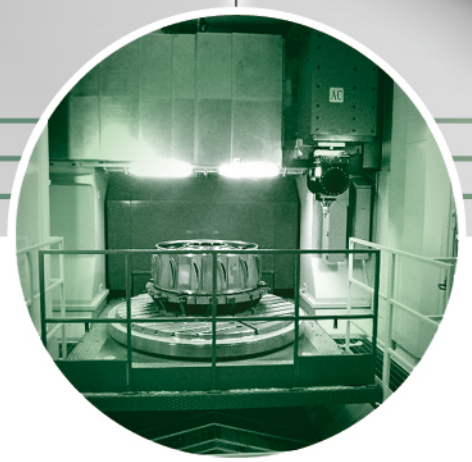


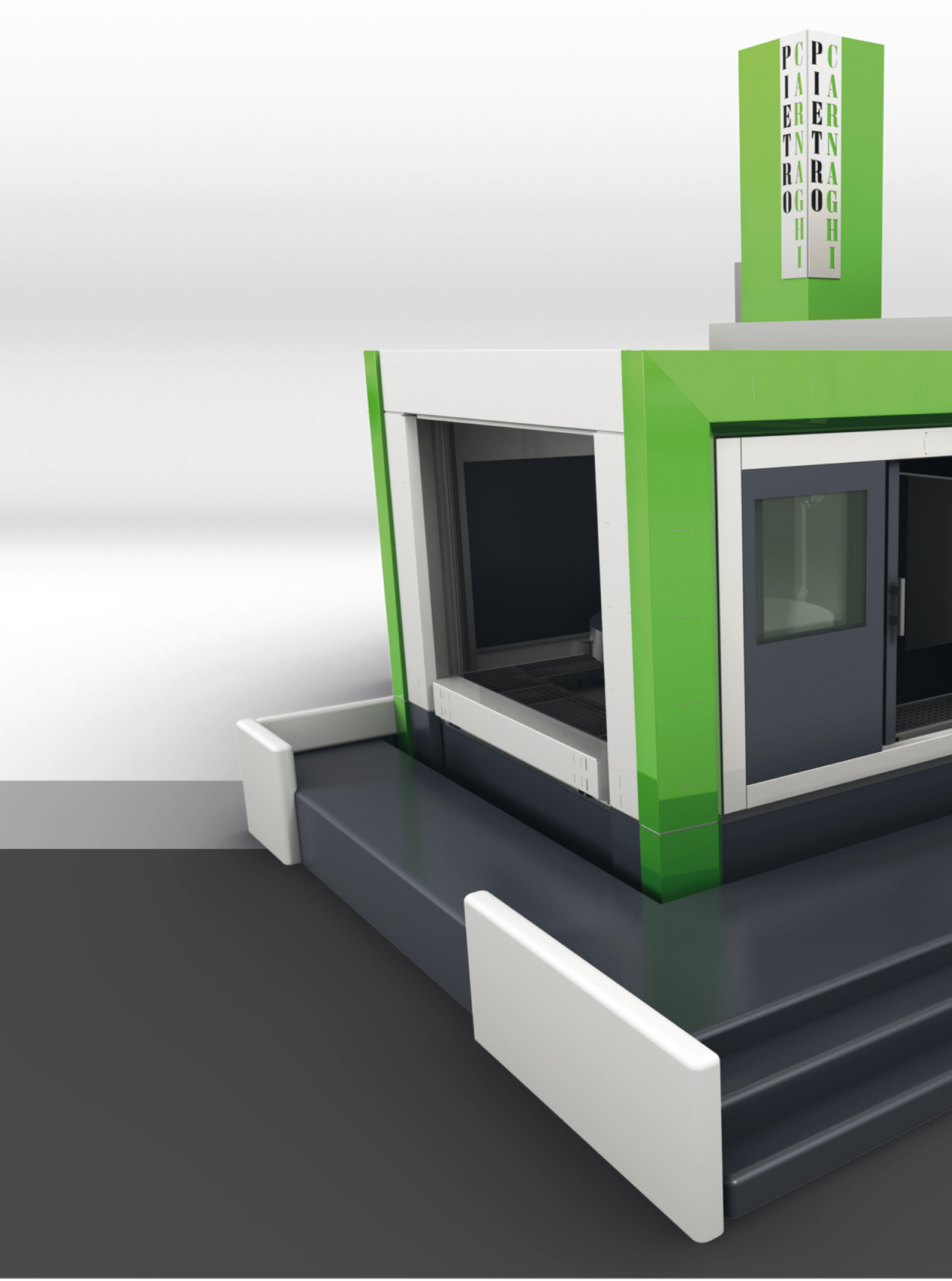


FLEXTURN

the vertical way

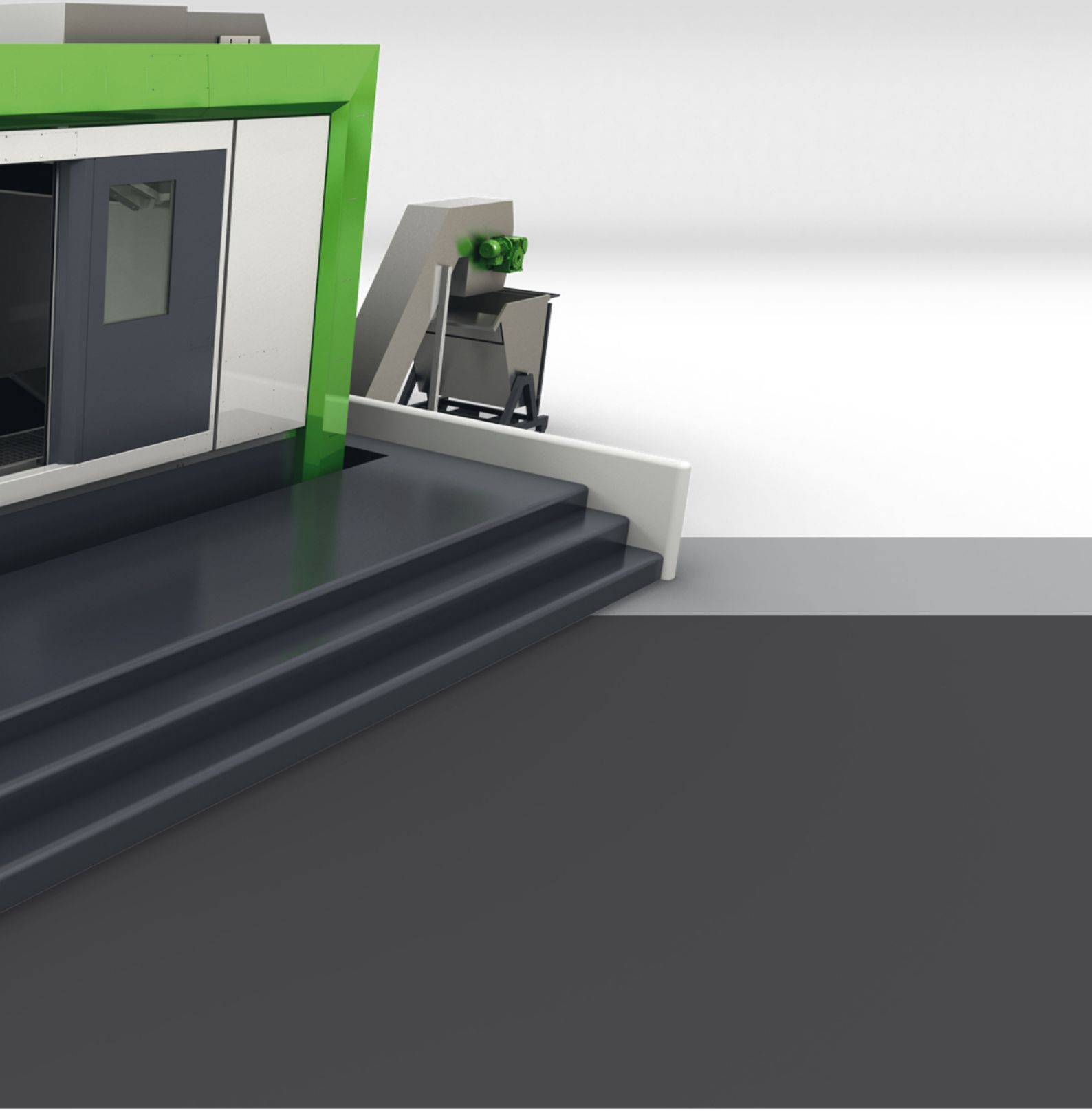
PIETROCARNAGHI

Machine Tools


PIETRO CARNAGHI
PIETRO CARNAGHI

FLEXTURN

the vertical way



Financial Stability
PIETRO CARNAGHI SPA obtained the D&B Rating 1, the max level of reliability in a business relation BtoB.

Top quality
Recognized since 1922 Pietro Carnaghi obtained the UNI EN ISO 9001:2000 for design, production, installation and service after sale of vertical lathes, grinders Vertical CNC machines, milling machines, mobile gantry and mobile banking.

Made in Europe
100% italian private property corporation, with the support of one of the highest technological district in Europe, North Italian Style.
Cooperation with UNIVERSITY Milano – Politecnico
Aachen University - Germany

Global Service
24 hours service available, 4 branches worldwide, commitment to customer support.

Italian Design
100% italian private property corporation, with the support of one of the highest technological district in Europe, North Italian Style.

Villa Cortese (MILAN) – Italy

Founded in 1922

PIETROCARNAGHI is an 1922 established company with young ideas and a dynamic approach in the field of vertical turning centres, FMS installations, and GANTRY milling machines, that has enabled it to achieve success and recognition with the most important international companies.

This pubblication is just an example of our achievements and quality.

Pietro Carnaghi invites you to come and visit our plant to examine your production requirements.

PIETROCARNAGHI *è una azienda di antica fondazione (1922), giovane nelle tecnologie e nelle idee che opera oggi nel settore dei torni verticali, delle fresatrici a portale mobile (tipo Gantry) e delle celle flessibili di produzione (FMS), con notevole dinamismo, premiata da lusinghieri successi internazionali.*
Significative installazioni sono collocate nelle più prestigiose aziende in tutto il mondo.

Questa pubblicazione è solo un esempio delle nostre realizzazioni e della nostra qualità.

Pietro Carnaghi Vi invita a visitare la nostra sede, ad esaminare assieme e risolvere le Vostre esigenze produttive.

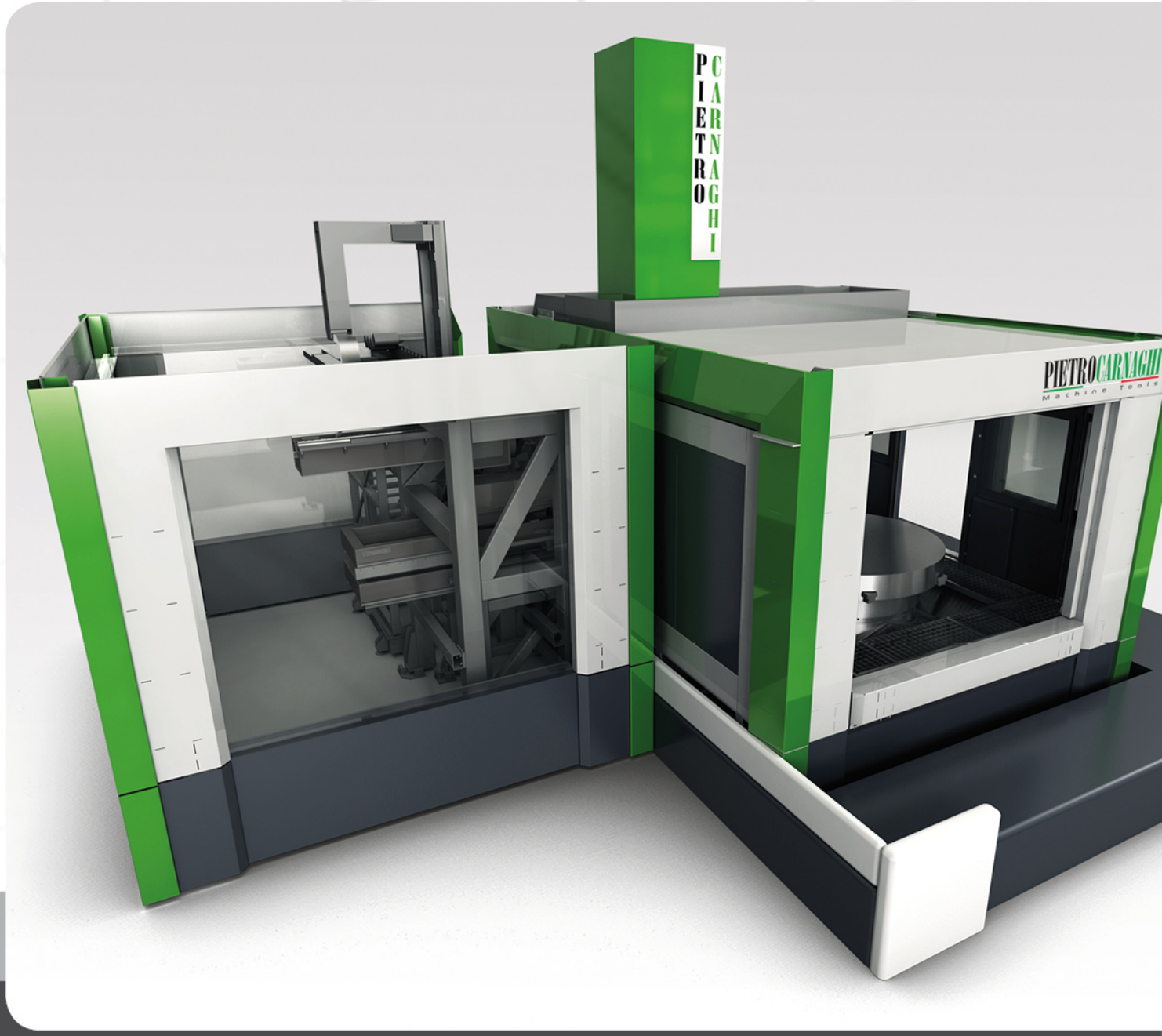
Marisa Carnaghi
President

5 AXIS HYDROSTATIC

VERTICAL multitasking machine

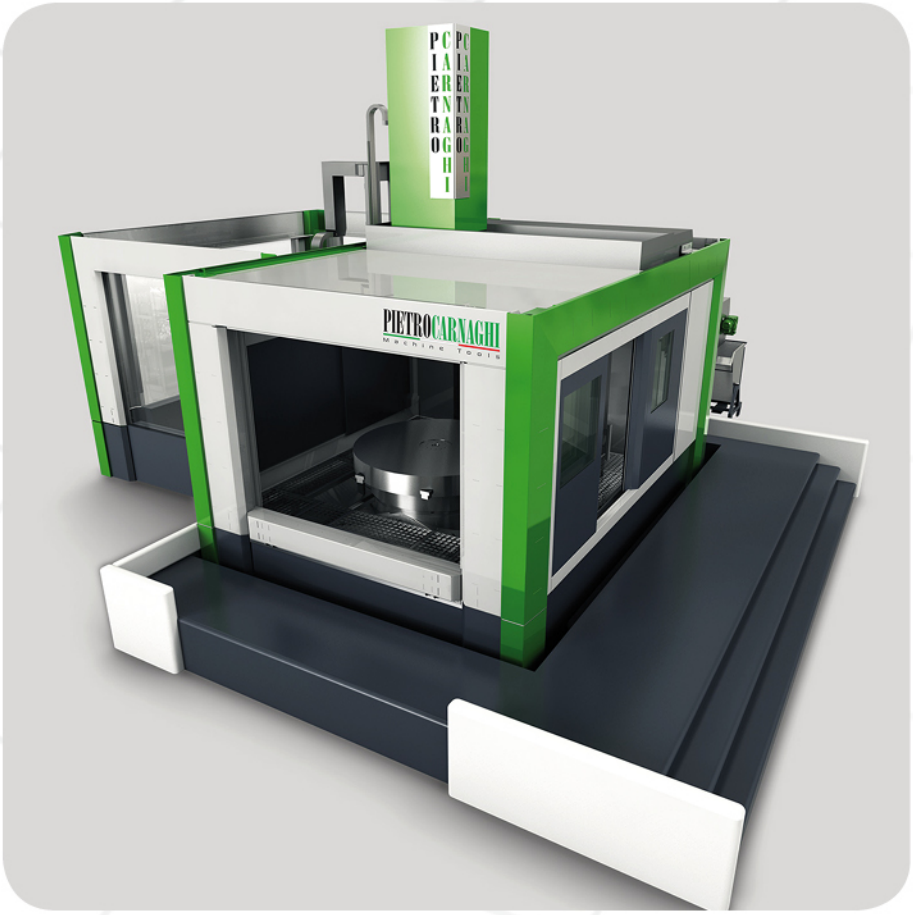
The design of FLEXTURN combines the typical characteristics of a Pietro Carnaghi vertical lathe: Rigidity and Precision + Top Level Milling features, having the capability to go deep inside the work-piece vertically, during both milling and turning operations.

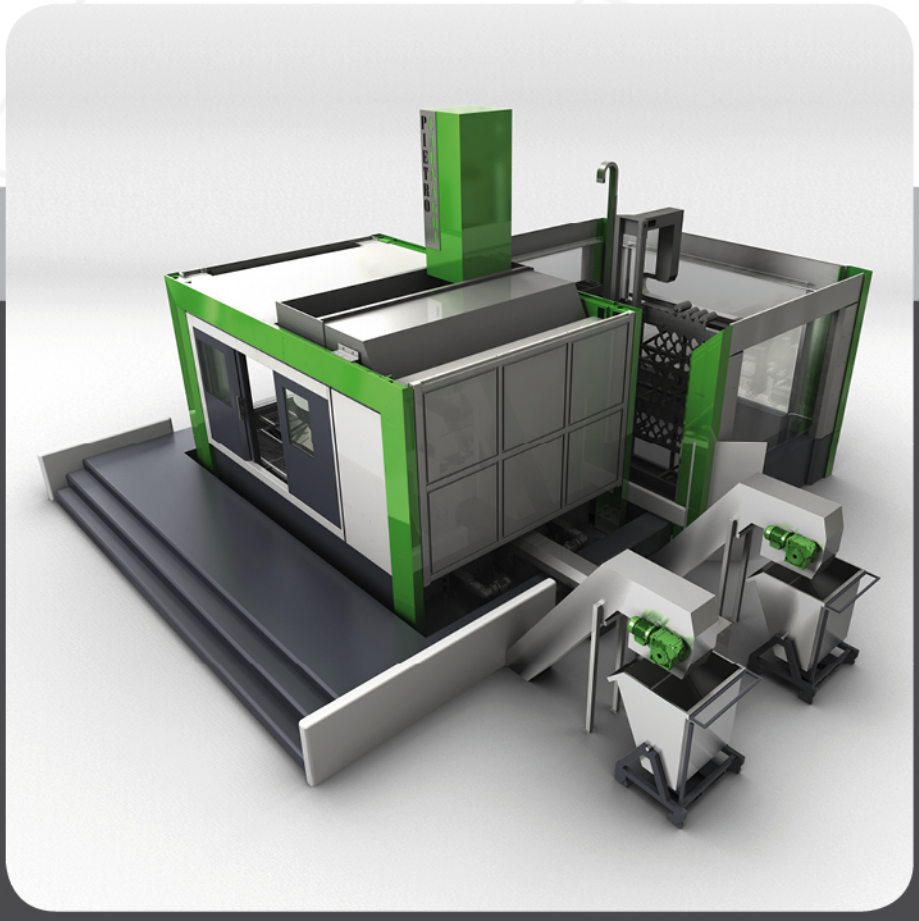
COMPACT DESIGN



FLEXTURN while retaining all the characteristics of Pietro Carnaghi vertical lathes, is created to meet the modern requirements of:

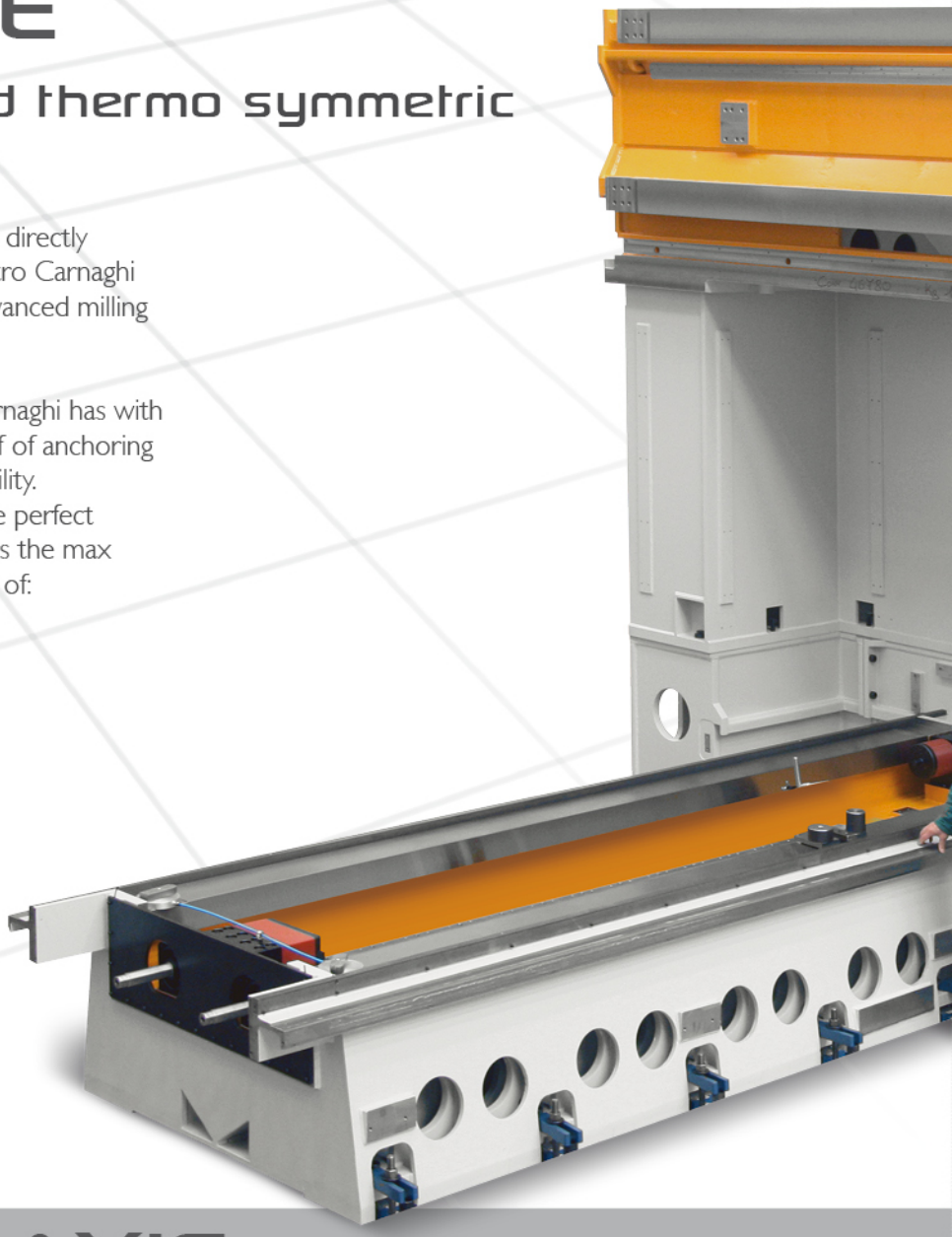
- Compactness (compared to standard machining centers)
- Easy shipment
- Small footprint on ground
- Modularity
- Configuration flexibility
- High capacity of evacuation of chips, water and mist
- Maintenance will be easier thanks to a high ergonomic plant
- The machine can be installed at the floor level, reducing foundation costs


PIETROCARNAGHI
Machine Tools



STRUCTURE

extremely rigid and thermo symmetric structures.

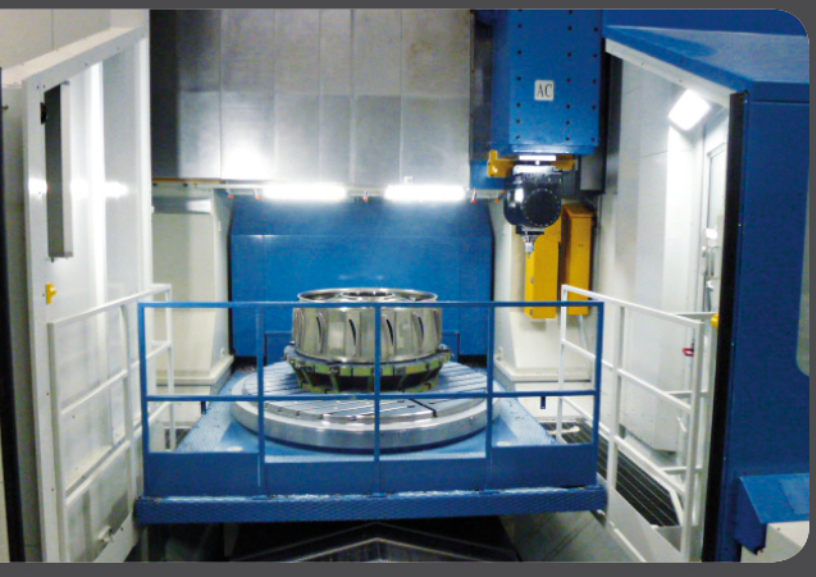


• The monolithic structure of FLEXTURN is directly designed from 100 years' experience by Pietro Carnaghi in vertical lathes Enriched with the most advanced milling feature on the planet.

Considering the huge experience Pietro Carnaghi has with big structures, Flexturn keeps the concept of of anchoring on jack levelers, ensuring the maximum stability.
The over dimension of the structure and the perfect stability of the portal gives to our Customers the max rigidity and over performing results in terms of:

- Stability (STRUCTURES)
- Dynamicity (40 mt/min)
- Precision (upto mm 0,007)
- High stiffness, perfect thermo symmetry and high damping capability, using the last temp-controlled systems.

MACHINE AXIS



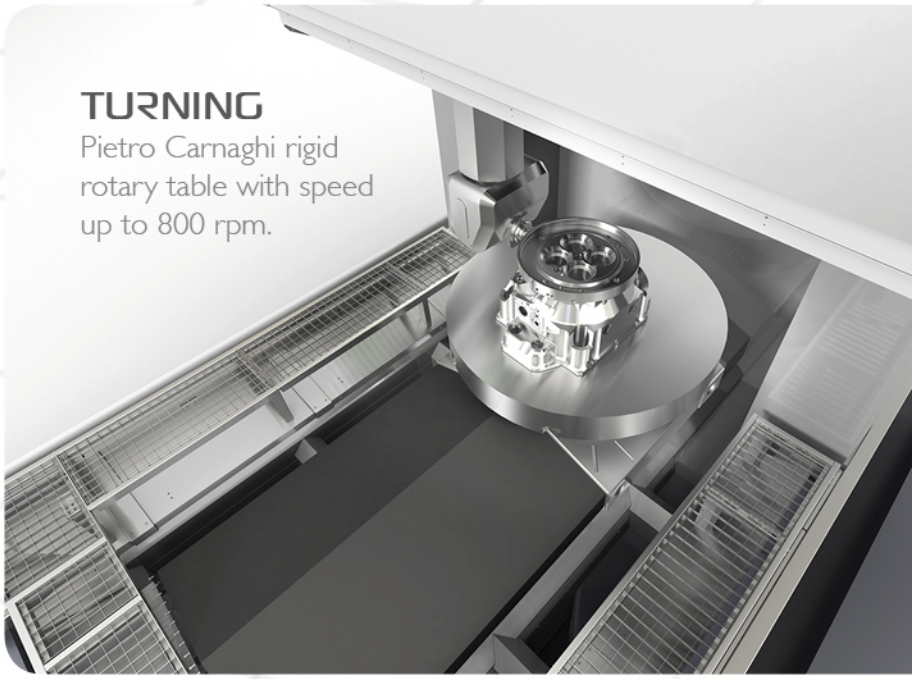
FLEXTURN is available in 2 variants:

- Fixed cross-rail
- Moving cross-rail (W axis)

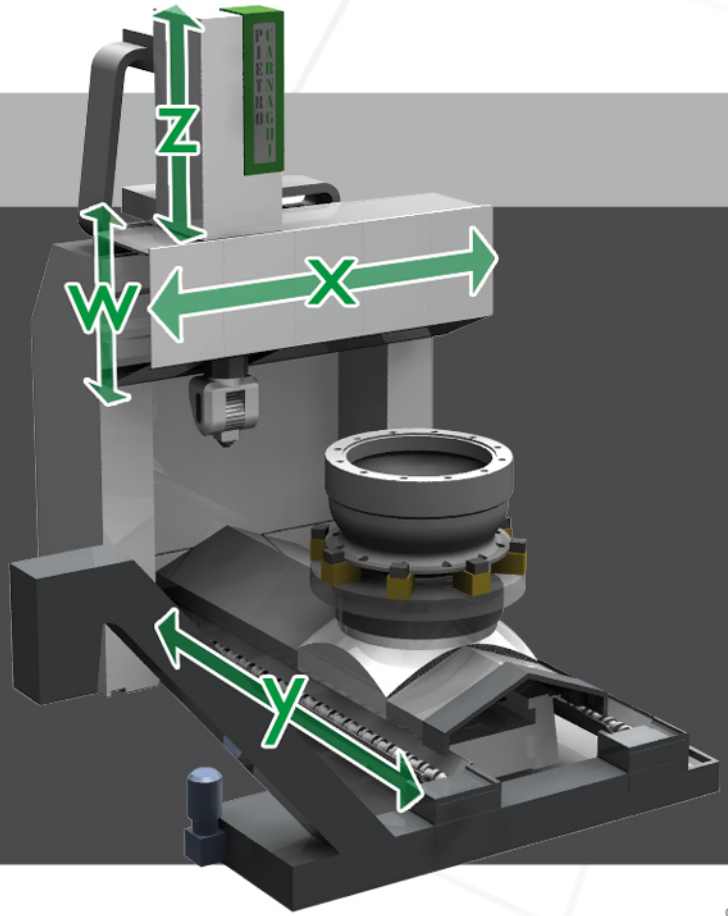
- The presence of the Y-axis (table linear axis) allows great flexibility in both operations: milling/turning process and work-piece loading/unloading operations.

TURNING

Pietro Carnaghi rigid rotary table with speed up to 800 rpm.



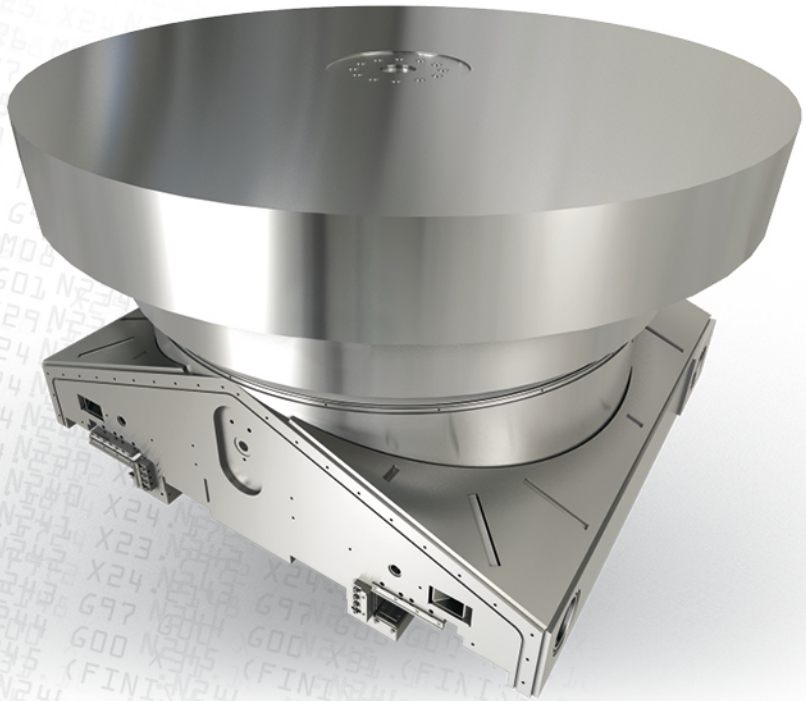
- All the structures are made with cellular construction and evaluated using FEM and Structural optimization software (Siemens NX CAE).
- 40 m/min X/Y/Z Axis rapid, thanks to the improvement in hydrostatic done in years of continuous development by Pietro Carnaghi.
- Advanced hydrostatic pads design **the best acceleration 4 m/s2 with zero friction!**

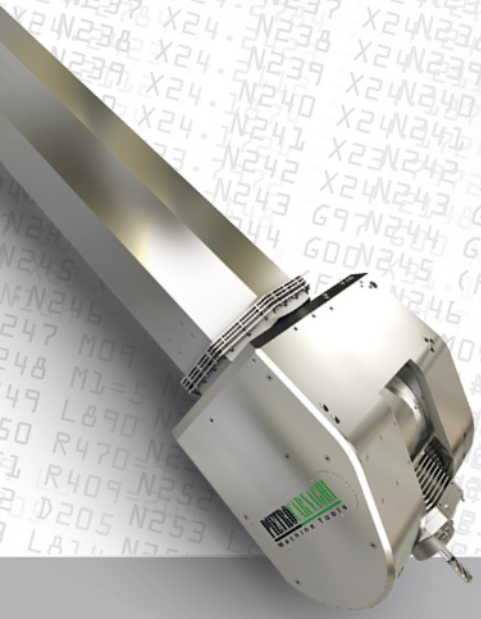


- High accuracy in the structure machining (all the production is machined internally in Pietro Carnaghi) and maximum detailed control during assembling.
- The axes Z,Y and W have a feed system with Safety ball screw for a perfect balanced working thrust.

DIRECT DRIVE

FLEXTURN is equipped with unique and superior direct drive motors, able to ensure the best performance of work in turning and in 5-axis milling; high dynamics and precision angular positioning (up to 0,001°). The rotary axis of the table is controlled by an absolute measuring system.
All direct drive motors are directly engineered and machined by Pietro Carnaghi, then assembled (according to OEM specifications) - SPARE PARTS stocked to ensure 100% replacing capacity.
All mechanical parts (rotor and stator) are machined into Pietro Carnaghi's workshop.





OCTAGONAL RAM

MILLING WITH DIRECT DRIVE

- Milling spindle with direct drive technology: power transmission in axis with spindle, with no reduction gearboxes. Cooling refrigeration with water. Optimal milling performances with no wear and heating of mechanical components.
- Minimum torsional vibrations, traditionally induced by the angular elasticity of the mechanical gear box
- Torque up to 939 Nm; speed up to 6000 rpm

Flexturn is equipped with interchangable accessory heads with hirth coupling connection Flexturn performs with outstanding results even in heavy cutting.

FLEXTURN SMART CYCLES

Check and monitoring of processes imbalances.
Automatic rpm tuning compared to vibrations.
Head orientation for multiaxis turning (vertical and horizontal).
In process measuring for all diameters, storing and reporting features.
Turning (work) spindle torque up to 30000 Nm.
Extremely rigid support of large-diameter turning spindle enables highly accurate machining.

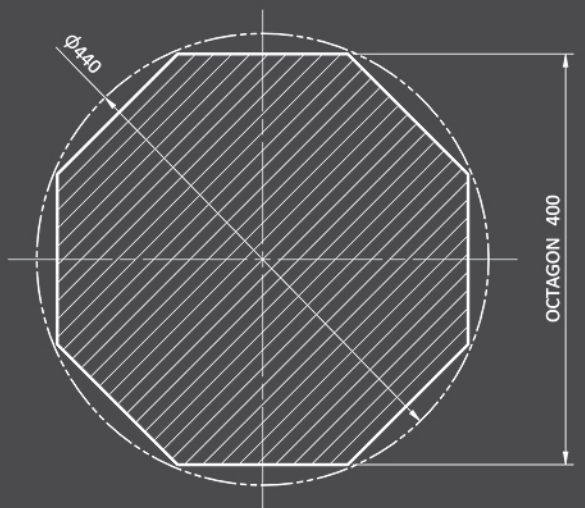
TYPE OF MACHINE		FLEXTURN 15	FLEXTURN 25	FLEXTURN 25 W
Turning Platform	mm	800 / 1000 / 1200	1600 / 1800 / 2000	
Turning / Swing	mm	1500	2500	
Milling Square	mm	1300 X 1300	2100 X 2100	
Max. Weight - no APC (APC)	ton	6 (4)	10 (7)	
Turning Power	kW	60		
Turning Speed	rpm	800 / 600 / 500	400 / 350 / 300	
Turning Torque	KNm	7	20	
Turning Height	mm	1100 (1400)	1100 (1400)	1400 (1700/2000)
OCTAGON RAM section	mm	400		
Z Axis stroke (RAM)	mm	1100 (1400)		
X Axis stroke (Carriage)	mm	1300	2100	
Y Axis stroke (Table Saddle)	mm	1600 (+1550/-50)	2100 (+2050/-50)	
W Axis stroke (Crossrail - continuous clamping position)	mm	---	---	400 (700/1000)
Milling Power	kW	30		
Milling Speed	rpm	6000 - 10000 HS		
Milling Torque	Nm	939		

HARDENED STEEL RAM

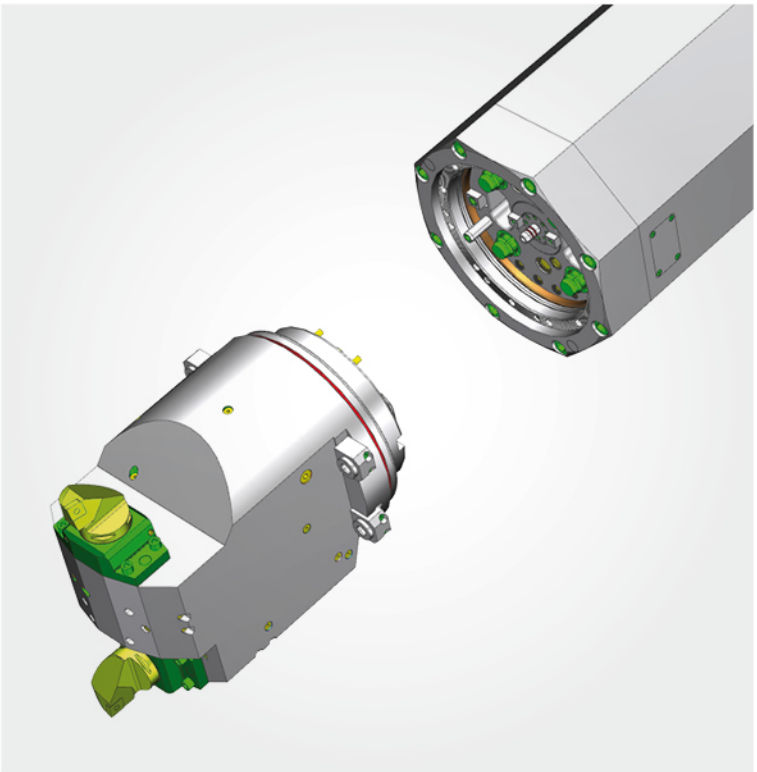
Octagonal shape, with boring diameter from 440mm with a depth of 1100/1400mm.

- The octagonal shape RAM includes
  - Full integrated axis C1
  - Direct drive motor
  - Cooled oil and air lubrication of the accessories
- Multisided machining electro spindles studies to reach inside ring 500mm dia for 5 axis machining.

Hydrostatic RAM large pads with triple pocket systems on the OCTAGONE, having impressive stiffness and symmetry



EXCHANGEABLE MULTI HEAD ATTACHMENT

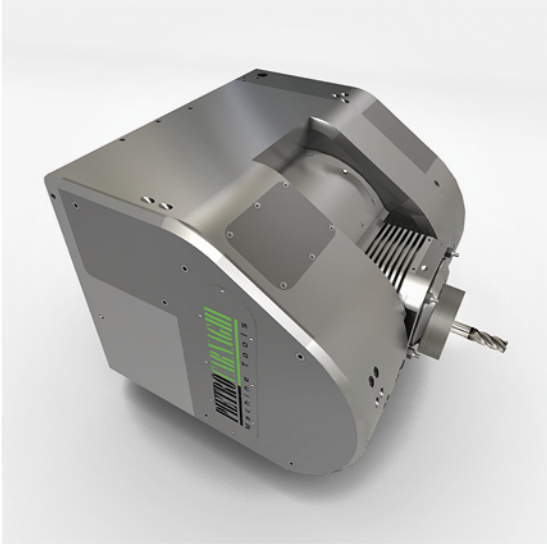


Complete range of changeable milling and turning accessories.

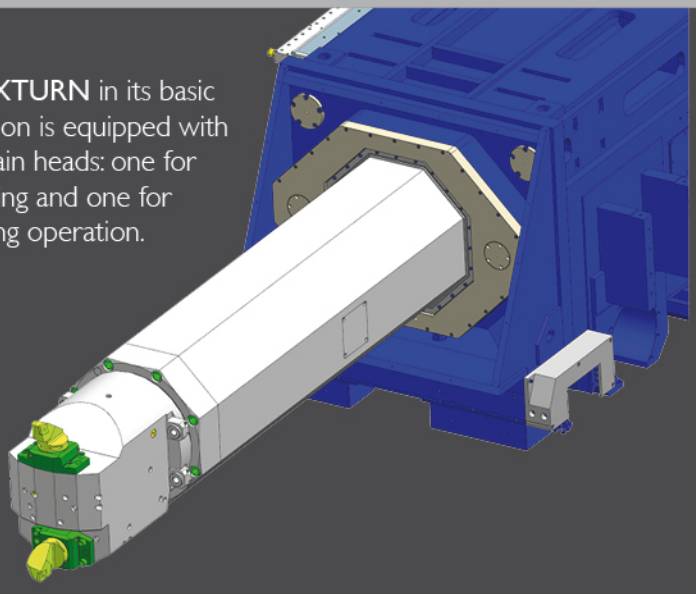
Extremely robust monolithic turning attachments (machined form a single monolithic block of steel).

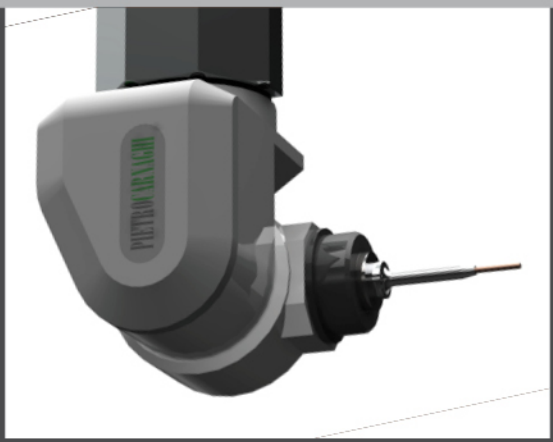
Orientating C axis.

During turning rigid hirth coupling connection allow to not stress the mechanics of milling head (bearings, milling spindle), transmitting the cutting forces directly to the RAM structure.



FLEXTURN in its basic version is equipped with 2 main heads: one for turning and one for milling operation.





In addition a wide choice of accessories, dedicated to turning, milling and grinding to meet every customer needs..

MILLING

with spindle speeds from 6000 up to rpm 40.000 to any material.

HIGH-SPEED MACHINING

machining units with integrated motor spindles, capable of speeds up to 40.000 rpm

Universal head feature a brand new 30° A axis head = for all the operations you need. Tilting Axis drive by double pinion system with anti-backslash function, with absolute encoder.

Complete air/oil lubrication for all bearings and bevel gears.

Innovate design to reach any angle!

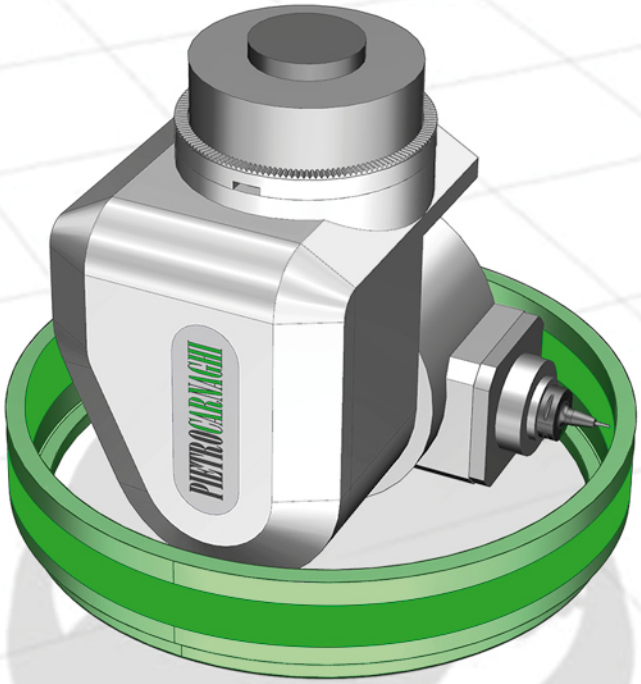
ELECTROSPINDLE

ACCESSORIES

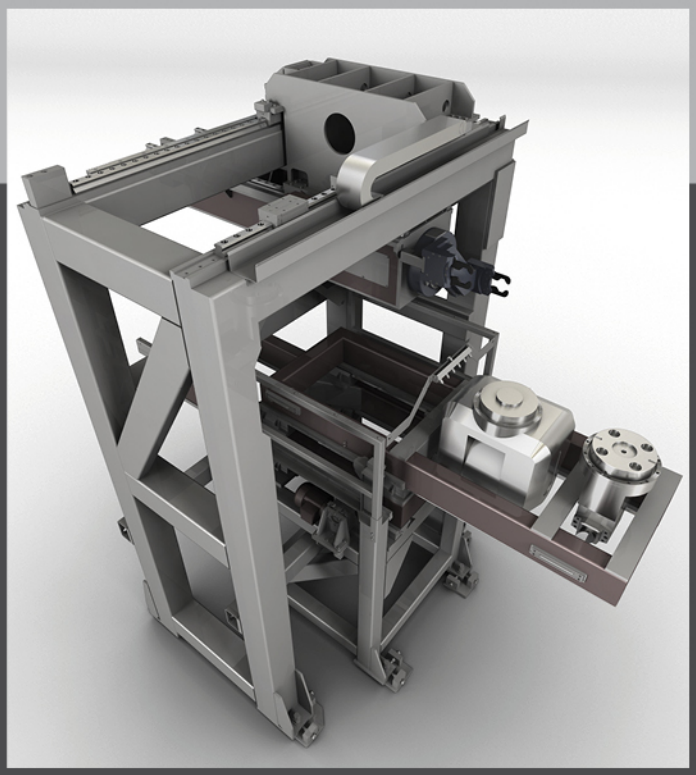
Maximum stability for outstanding milling performances

- Ceramic bearings with variable preload in function of different spindle rotation
- Air/oil recirculating cooled lubrication system
- Cooling system to control thermal deviations

Multi purpose electrospindles available
High-speed pack (up to 40.000 rpm)
High power electrospindles
(up to 300Nm - 60kW)



HEADS and TOOLS



Wide range of tool magazine application for attachments and modular tools:

- Pickup magazine (for head attachments)
- Chain magazine (from 20 to 120 tools)
- Rack magazine (from 240 tools to 1000)
- Robot magazines, efficiently configured with the new Tool "Run my robot" by Siemens

AUTOMATIC TOOL CONTROL

WASHING AND PRESETTING

TOOLS MANAGEMENT

Key Features

Hydrostatic axis
All the axis of Pietro Carnaghi machines are hydrostatic:
No metal to metal contact, to nullify wear, to reduce force dispersion, to absorb vibrations:
- infinite bearing life
- improved crash protection
- superior damping

Rigid hirth coupling
Most rigid and reliable connection between RAM and accessories, 4 micron repeatability, superior clamping force.

Perfect mechanical coupling
All machine structures machined in-house in Pietro Carnaghi, with all mechanical coupling optimized in order to avoid machine instability in the years.

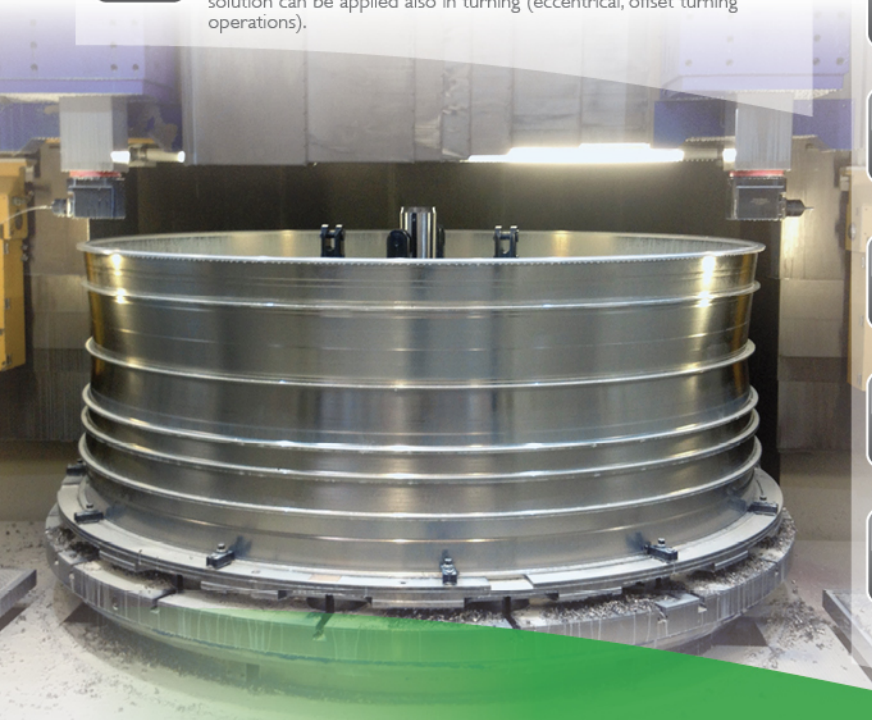
High rigidity structures
Over dimensioned structures to ensure the maximum performance in the years

Thermal control
the thermal control is managed providing thermostabilized and thermo-symmetric structures, with minimal impact on machining

Direct drive
Turning and milling in one solution. Direct drive system allow to pass from turning to milling operation directly:
Quality of motion:
less vibration, lower noise and maximum quality of machining.
Efficiency
Reliability
The direct drive system replaces a complex kinematic chain with two solid-state components (rotor and stator) operating without contact, are not subject to mechanical wear and are maintenance free.
Performance and stability over time.

KPI live control
Key parameter indicator: the machine is able to read live and record all the major kpi related to its status. Will be then available for download or directly read through a direct connection with the cnc of the machine.

High machine dynamic
Direct drive, high rapid movement and high acceleration of the axis allow the operator to machine with the newest technological technique, like trochoidal approach, high feed application. Special solution can be applied also in turning (eccentrical, offset turning operations).



Ergonomic comfort
Machines are studied for maximum operator comfort, view, handling and maintenance access.

Machine adaptive control
System monitors actual cutting conditions in real-time, and automatically adjust the feed rate to its optimal level during each operation.

Machine self tuning
Machine self geometrical tuning in relation to delta temperature reading.

Automatic tool & accessory change
Complete availability of hundreds types of accessories and up to thousands of tools.

Smart production scheduler
Pietro Carnaghi FMS are equipped with a production software that is studied to optimize the scheduling of part programs, tool management, part probing, calibrations and feeding in the workpieces.

Integrated presetting unit
Tools, milling and turning ones, can be directly presetted in the machine, in order to guarantee the highest performance in terms of accuracy.

In process measuring
Complete availability for machine geometrical in process check, ultrasonic probes for thickness check.

Low power consumption
With the aim to decrease energy consumption, PIETRO CARNAGHI has implemented several features, to reduce unnecessary machine activities, with idle cycles and the "Smart Automatic Shutdown Machine" function.

Low maintenance
PIETRO CARNAGHI machine price + average maintenance cost in 10 years is lower than traditional machines price + 10 years maintenance costs.

Extreme accuracy package
Special machine design to reduce geometrical, axes positioning and angular deviation tolerances (ref to ISO230-DIN 8609 /VDI 3441) to guarantee the best quality parts.
Pitch, Yaw and Roll (on full axis travel of working area)= 6 arcs

Customized table design
Special table design can be applied according to the different customer needs. High removal rate and consequentially high chip evacuation are always taken in consideration, with a dedicated special design.

FEM Analysis
Machine structures are designed using Finite Element Method, subdividing the components in small finite units and using most advanced calculus of variations in order to optimize structures behaviour during machining.

Anticollision system
Simulation system with virtual machining process check to avoid collisions.

APPLICATION CASES

FOR MULTITASKING MACHINING AND TURNING PARAMETERS

CONVENTIONAL MACHINES

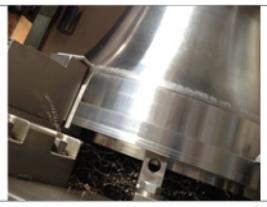
5-AXIS MULTITASKING MACHINE

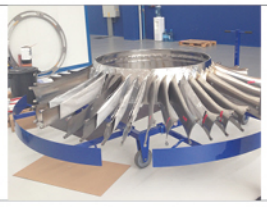
(Lead time drastically reduced)

SHORTER CYCLE TIMES

Low tooling cost, tool life extended

By optimizing the parameters involved Flexturn opens a new era to economic efficiency. Shorter machining time cost reduction and the greater productivity are huge. Impressive reduction in lead time with process-intensive machining.

	42CrMo4	Ti6Al4V	Inconel 718
Kc (N/mm^2)	2150	2500	3300
			
Ø (mm)	630	1250	890
Vc (m/min)	180	120	250
f (mm/rev)	1	0,7	1
ap (mm)	10	7	4,5
Q (cm^3/min)	1200	588	1125
Chip area (mm^2)	10	4,9	4,5

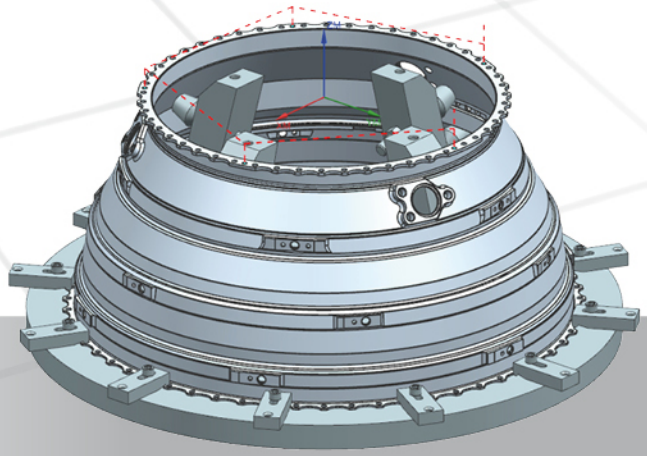
	AISI316	Ti6Al4V	GJS700
Kc (N/mm^2)	2300	2500	1750
			
Ø (mm)	1340	2200	1450
Vc (m/min)	120	100	280
f (mm/rev)	1,2	0,7	1,2
ap (mm)	12	10	15
Q (cm^3/min)	1728	700	5040
Chip area (mm^2)	14,4	7	18

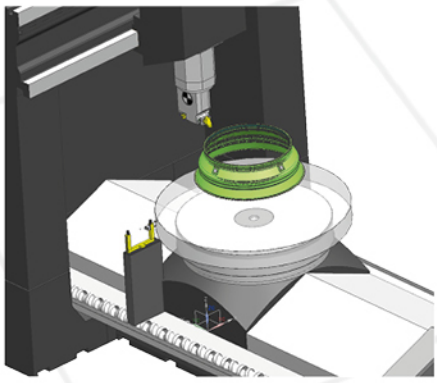
PROCESS TURNKEY
WITH FULL SUPPORT

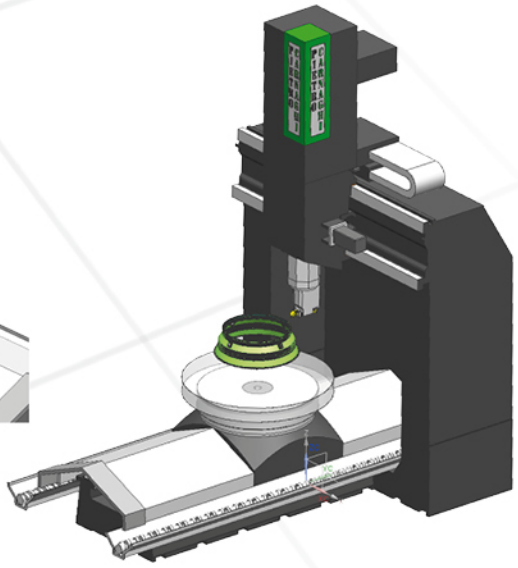
Selection of tools, approach,
fixtures, technology by

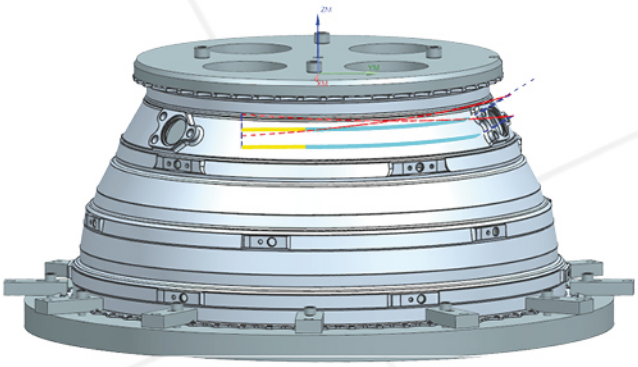
PIETROCARNAGHI
Machine Tools

SANDVIK
Coromant



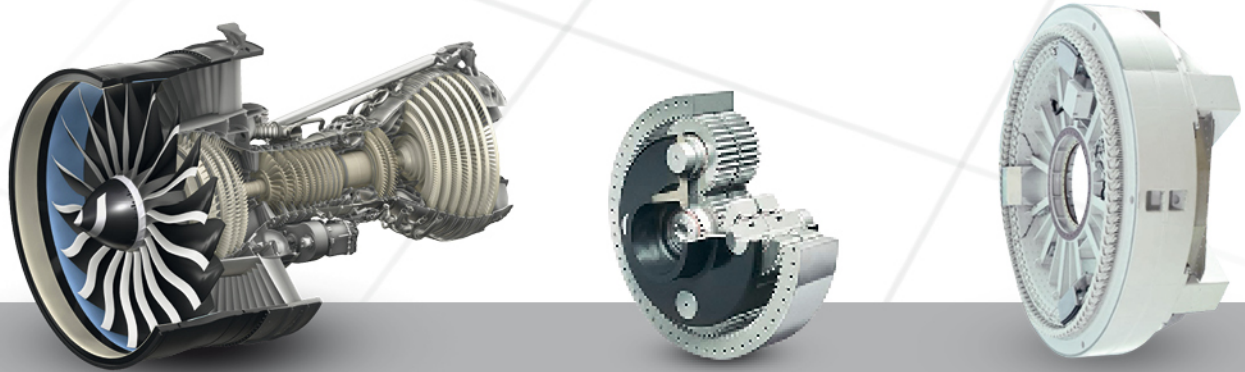




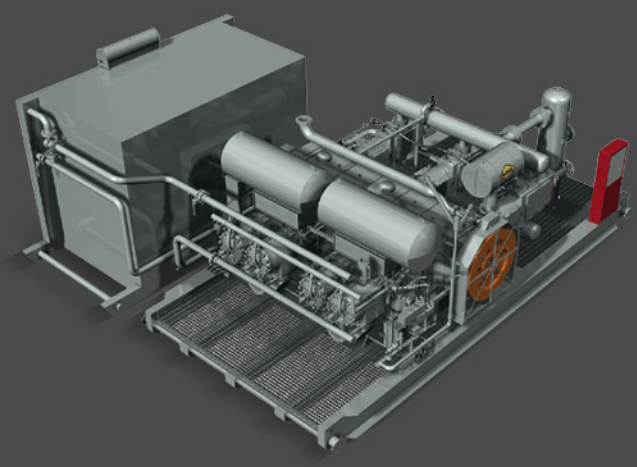


WIDE RANGE

OF BEST PRACTICE CASES



JET ENGINES ▪ PUMPS ▪ BEARINGS ▪ TURBINES ▪ GEARBOXES



GLOBAL SERVICE

MISSION

"Keep the customer operative extending the machine life cycle"

Focused on customers through a partnership approach, we are aimed by the provision of a quick response to requests with high skilled competence governed by the aim of short production break downs.

VISION

"A global coordination providing a local service"

Provide local services to customers coordinating each branch office by a global strategy to have a qualitative common and unique result wherever Pietro Carnaghi is operating.

- Installation Project Management;
- Interventions and repair services;
- Teleservices through remote connection;
- Spare parts;
- Preventive maintenance programs;
- Inspection & audit;
- Retrofit and modification;
- Machine relocation;
- Training and technological support;

Headquarters
Branch
Service - Sales Dept.

PIETROCARNAGHI
Machine Tools

SINCE 1922

ed. 09 / 2015




	Pietro Carnaghi Spa	Pietro Carnaghi GMBH	Pietro Carnaghi Inc.	Pietro Carnaghi Co. LTD.
Country	IT	DE	US	CN
Address	Via S. D'Acquisto 7, 20020 Villa Cortese - MI - Italy	Hauptstr. 171 70771 Leinfelden-Echterdingen	27 Wilson Dr. Sparta, NJ 07871	Room 1202, Building 2, Yinzuo Center, Jingshi Road, Jinan, 250022
Office	+39 0331 434536	+49 (0)711 220 90 200	+1 973 300 5842	+86 531 87978801 / (802)
Mobile			+1 256 565 0005	
Fax	+39 0331 434547	+49 (0)711 997 69 294	+1 973 940 0200	+86 531 87978809
Mail	service@pietrocarnaghi.it	service_de@pietrocarnaghi.de	service_us@pietrocarnaghi.com	service_cn@pietrocarnaghi.cn

Made in Europe

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV GL = ISO 9001 =

UCIMU