Tricoord

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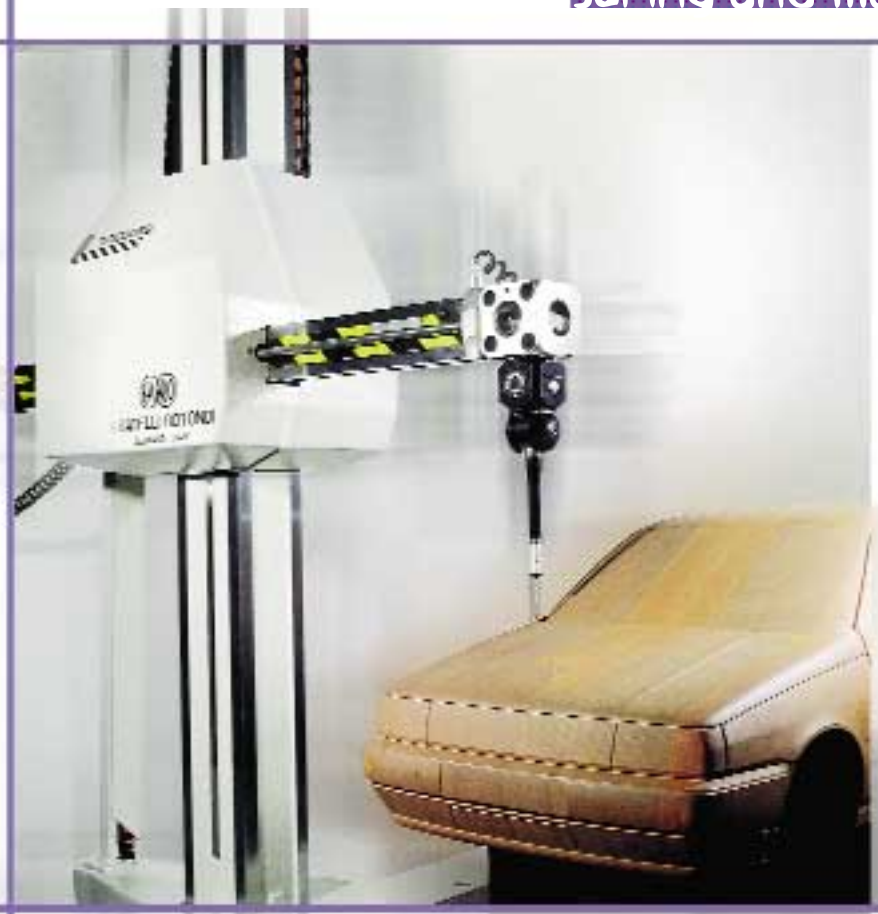


3D measurina and markina-out machines

FRATELLI ROTONDI

3D measuring and marking-out machines
MINITRICOORD - TRICOORD 2000 - TRICOORD 3000

3D measuring and marking-out machine - open structure on all the sides and horizontal axis type - high performance standards.

Versions:

- automatic

- manual

Different and custom-made models permit to face any requirement and therefore this kind of machine may be suitably utilized in various fields of the dimensional control. The working range concerns the small, middle and large sizes.

This machine is the outcome of a tradition in metrology lasting more than fifty years and an experience of thirty years in the manufacturing of this type of units.

Structure and FEATURES

Vertical column: section in hot extruded- steel C40 - n. 8 sliding tracks - (two on each side), hard-chrome plated, hardness HRc60/62, high precision ground, arranging on the head a pulley system (mounted on bearings) for counter-balancing - internal adjustable counterweight for the slider balancing - limit switches.

Horizontal arm: section in hot extruded- steel C40 - n. 8 sliding tracks - (two on each side), hard-chrome plated, hardness HRc60/62, high precision ground - with working head locks - limit switches - slide guides machining carried-out as to compensate the flexure produced by their own weight (variable according to the movement).

Slider: made in light alloy - with ribs suitably arranged as to avoid as much as possible the flexures - the casual fall of the slider following a possible breakage of the counterweight cable is protected by an instantaneously-operating safety system.

Working head:

- cube in hardened steel with 5 accessible faces - each face has a hole with connections for the scribing points, probes and so on.

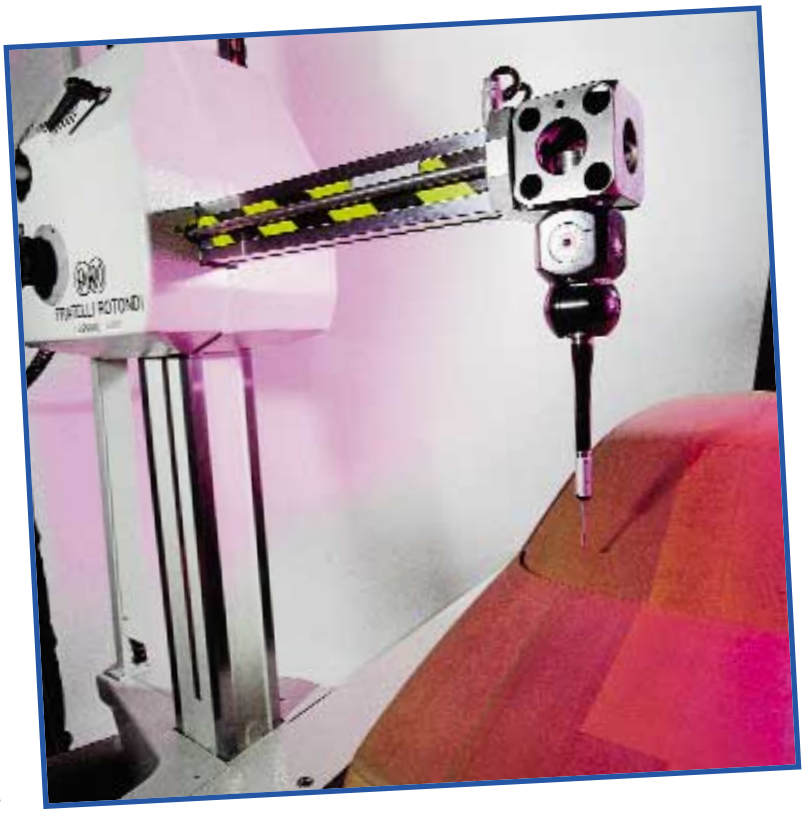
as alternative:

- universal goniometric head with three goniometers - in order to mark-out and control surfaces whatever arranged and inclined in the space - rotating groups mounted on precision bearings - connections for scribing points, special accessories, probes and so on.

Sliding of the axes: through selected - high precision bearings with carrying capacity dozens of times higher than the real stress - all bearings are fitted on eccentric pins as to allow an easy and accurate micrometric adjustment and a safe positioning.

Driving of the axes: through pinion and rack on all the axes (manual version) - through pinion and rack and special smooth bar systems (automatic version).

Measuring system: optical steel photoelectric scales and electronic scanning heads (measuring system without contact and wear) - these scales are enbloc executed (without junctions) even for very long strokes - reading resolution 0,005/0,01 mm - provided of connections to the various dimension visualizers and data processing systems.



Axes locking (manual version): through a self-centering collet device, as to avoid strains and positioning errors - option: electromagnetic lockings - remote controlled with and without wiring.

Axes movement:

- manual version: handwheels
- automatic version: d.c. motors with speedometer dynamo and relevant drives operated by a numerical control directly controlled through the measuring software- the rapid movement and probing speeds, the accelerations and decelerations are continuously program-mable from 1% to 100%. - the system configuration prevents from accidents in case of false moves or anomalous external events (collisions, vibrations, decrease of the axes electronic signals and so on) - status monitoring - operator pannel with joystick, axes selection, emergency, track-ball for selection of measuring programs and functions; or dedicated operator pannel with all management functions (178 keys, joy-stick, axes selection emergency) - possible disconnection of the driving units to work manually through the handwheels.

Reading of the translations:

- digital read-out
- digital read -out with integrated 3D features
- integrated digital rad-out in the measuring software

Probes:

- electronic probes
- optic and laser probes
- mechanical probes

Accuracies

	G/U_1	M/U_3
MINITRICOORD	(15 + 16L/1000) µm	(20 + 28L/1000) µm
TRICOORD 2000 CP * according to the surface plates accuracy	(30 + 20L/1000) µm	(30 + 30L/1000) µm
TRICOORD 2000 BS * according to the surface plates accuracy	(20 + 20L/1000) µm	(25 + 30L/1000) µm
TRICOORD 2000 SFE	(20 + 20L/1000) µm	(25 + 30L/1000) µm
TRICOORD 2000 GIP	(20 + 20L/1000) µm	(25 + 30L/1000) µm
TRICOORD 2000 GIV	(20 + 20L/1000) µm	(25 + 30L/1000) µm
TRICOORD 3000 CP for Y = 1600 mm. and for Z up to 2500 mm. for Y over 1600 mm. and for Z over 2500 mm. * according to the surface plates accuracy	(25 + 20L/1000) µm (40 + 35L/1000) µm	(30 + 30L/1000) µm (50 + 40L/1000) µm
TRICOORD 3000 BS for Y = 1600 mm. and for Z up to 2500 mm. for Y over 1600 mm. and for Z over 2500 mm. * according to the surface plates accuracy	(20 + 20L/1000) µm (35 + 35L/1000) µm	(25 + 30L/1000) µm (50 + 40L/1000) µm
TRICOORD 3000 SFE for Y = 1600 mm. and for Z up to 2500 mm. for Y over 1600 mm.	(20 + 20L/1000) µm (35 + 35L/1000) µm	(25 + 30L/1000) µm (50 + 40L/1000) µm
TRICOORD 3000 GIP for Y = 1600 mm. and for Z up to 2500 mm. for Y over 1600 mm. and for Z over 2500 mm.	(20 + 20L/1000) µm (35 + 35L/1000) µm	(25 + 30L/1000) µm (50 + 40L/1000) µm
TRICOORD 3000 GIV for Y = 1600 mm. and for Z up to 2500 mm. for Y over 1600 mm. and for Z over 2500 mm.	(20 + 20L/1000) µm (35 + 35L/1000) µm	(25 + 30L/1000) µm (50 + 40L/1000) µm

*** According to CMMA/VDI specification**

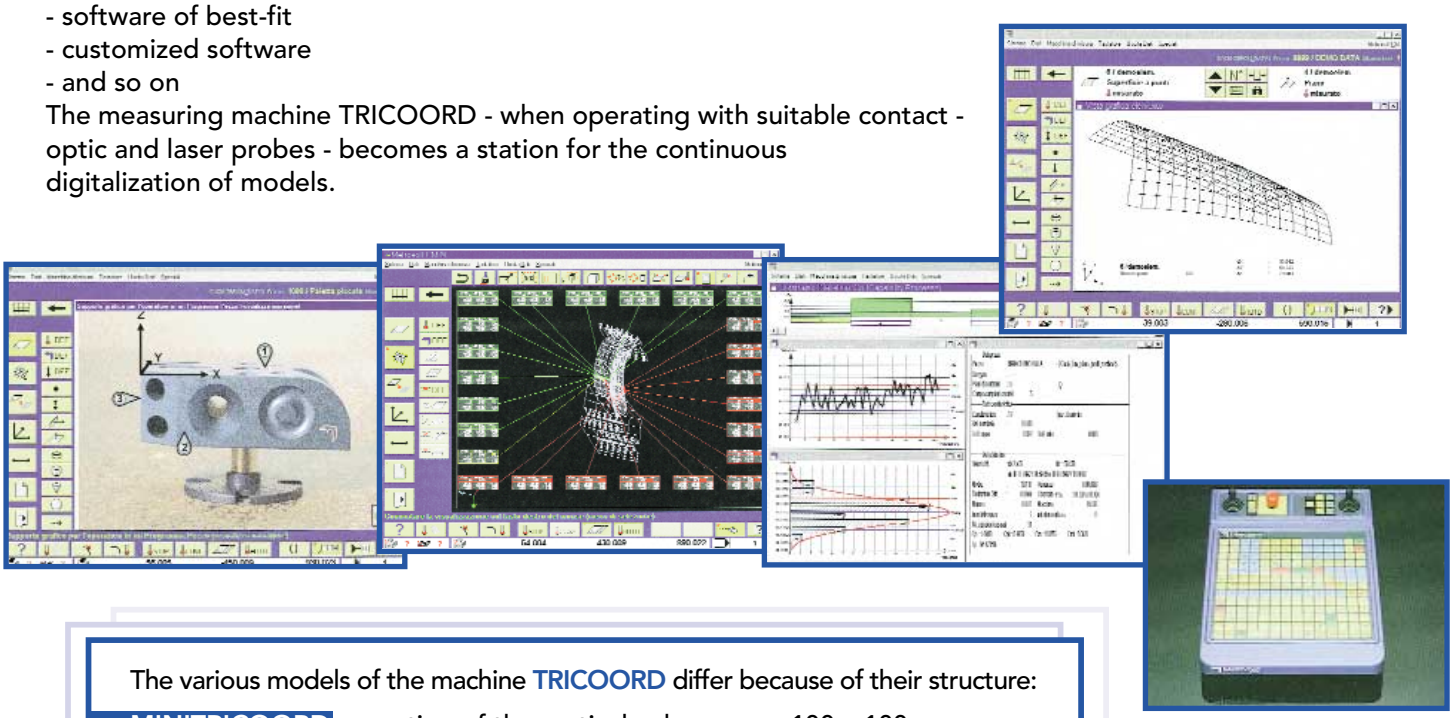
Measuring SOFTWARE

The complexity of the pieces to be controlled and the modern industrial technologies, to meet the quality standard requirements call for the application of a state of art metrology through the use of measuring software that have introduced new methods against the traditional ones.

The various models of the measuring machine TRICOORD provided with software in environment WINDOWS, with high performances are tested and certified, in the top class of merit, by International Institute of Metrology. Their utilization becomes very easy because involving the use of an ergonomic and practical graphic interface and of some operator pannels. This implies a shorter learning time by any operator. Whenever and against a simple request - considering their flexibility and modular structure - the units may be improved and enlarged as much as necessary in order to comply also with the changed requirements. Besides they are constantly renovated and organized in a single system fully interactive from which can be selected:

- software for elements with definite geometry
- software for elements with undefinited geometry
- software for surface elements by a mathematical model
- software of digitalization
- software of statistics
- software for communication with the external sources
- software for compensation of the geometrical errors and of the environmental variables
- software for running in self-learning and off-line
- software of best-fit
- customized software
- and so on

The measuring machine TRICOORD - when operating with suitable contact - optic and laser probes - becomes a station for the continuous digitalization of models.



The various models of the machine TRICOORD differ because of their structure:

MINITRICOORD
- section of the vertical column mm. 100 x 100
- section of the horizontal arm mm. 50 x 40

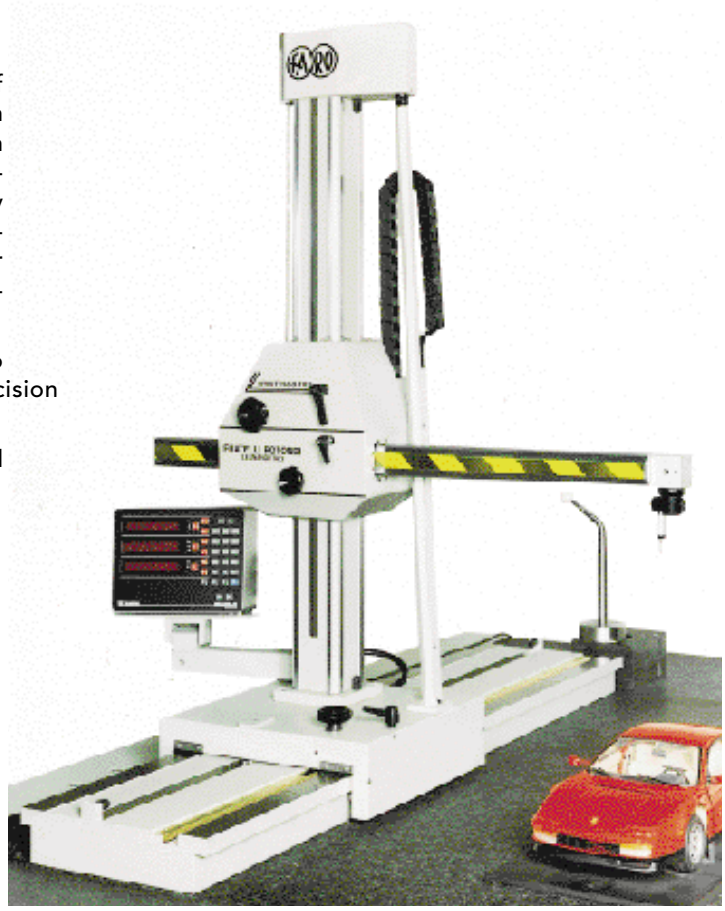
TRICOORD 2000
- section of the vertical column mm.140 x 120
- section of the horizontal arm mm. 70 x 50

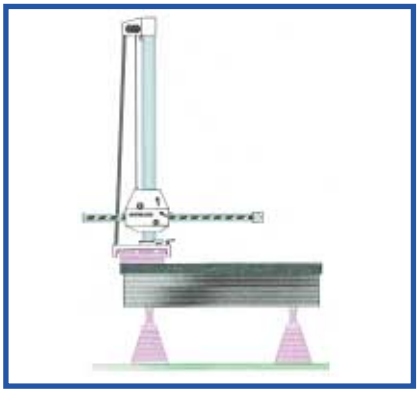
TRICOORD 3000
- section of the vertical column mm. 192 x 168
- section of the horizontal arm mm. 90 x 60

The versions of the machine TRICOORD differ because of their type of sliding along the longitudinal axis.

model MINITRICOORD A

- Measuring machine for inspection and marking-out of small and middle size pieces. By its configuration, it can be steadily fastened on a surface plates or moved on the same or different plates of the same test or production department. Really the translation of its guide-way follows through air pads and the whole unit can be easily lifted and placed next to the piece to be inspected or marked-out. The guide-way may also arrange permanent magnets for locking on supporting planes.
  - The guide-way is made in annealed cast-iron G26 and the sliding and alignment guides are high precision ground.
- The base carriage is made in annealed cast-iron G26 and moves through precision bearings.





measuring range:	X-AXIS	Y-AXIS	Z-AXIS
MINITRICOORD A	1000/1500 mm.	500/600/800 mm.	500/600/800/1000 mm.

model MINITRICOORD C

- 3D measuring and marking-out machine for small and middle size pieces, trailer-mounted
  - It can be moved to the different departments
- It's intended as a cast-iron supporting plane on side of which is mounted the longitudinal slide guide.
  - The whole system is placed on a trailer in electro-welded steel, with drawers, 4 wheels (2 steering), adjustable caps for locking and leveling purpose in the working area.

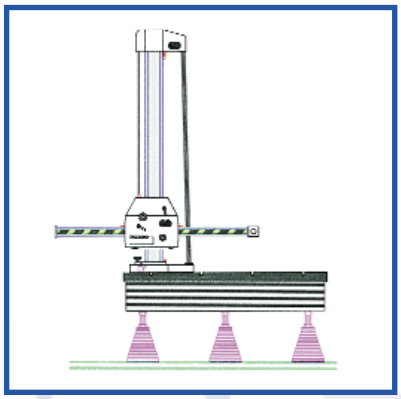
nge:	X-AXIS	Y-AXIS	Z-AXIS
MINITRICOORD C	1000 mm.	600/800 mm.	800 mm.

models

TRICOORD 2000 CP - TRICOORD 3000 CP

- Measuring and marking-out machine for middle and big size pieces. These models slide on surface plates provided with rectangular slots of mm. 10x8 placed on the surface as a square grid.
  - The way of the longitudinal axis is formed by the slots of the plane and the measure along the axis is arranged by the rod sliding in the base; the locking of this sliding rod follows through a small block that may be inserted into the slot orthogonal to the sliding one.
- The sliding base carriage of the machine is in annealed and ribbed cast iron G26 and runs on the surface of the plane, on couples of precision bearings. Three alignment and sliding small blocks (two of them fixed and one adjustable), in hardened steel, get into the surface plate slot. They are provided with a releasing device.
  - The reading range of the longitudinal movements is mm. 400 or mm. 600 and multiples.

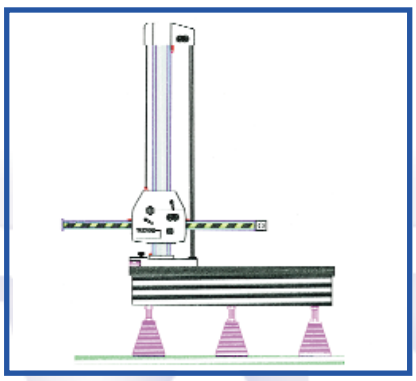
measuring range:	X-AXIS	Y-AXIS	Z-AXIS
TRICOORD 2000 CP	400/600 mm.	1000/1200/1500 mm.	1200/1500/1800/2000 mm.
TRICOORD 3000 CP	400/600 mm.	1600/1800/2000 mm.	2200/2500/3000/3500/4000 mm.



models
TRICOORD 2000 BS - TRICOORD 3000 BS

- 3D Measuring and marking out machine for middle and big size pieces. These models slide on the area of a surface plate or of paths, released from the piece to be inspected, through a longitudinal guide.
  - This guide way consists of a stainless steel bar locked by means of screws and pins - on the surface of the plane along its full length.
- This model may be simply and conveniently fitted on preexistent plates or paths, thus avoiding movements and workings.
  - The sliding base carriage of the machine is in annealed and ribbed cast iron G26 and runs on couples of precision bearings.
- The longitudinal sliding and alignment is provided by n. 2 couples of precision bearings running in the slide.

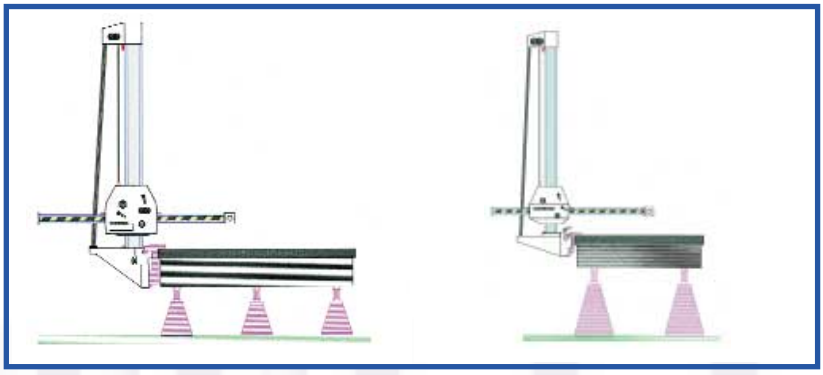
measuring range:	X-AXIS	Y-AXIS	Z-AXIS
TRICOORD 2000 BS	on request	1000/1200/1500 mm.	1200/1500/1800/2000 mm.
TRICOORD 3000 BS	on request	1600/1800/2000 mm.	2200/2500/3000/3500/4000 mm.



models MINITRICOORD SFE
TRICOORD 2000 SFE - TRICOORD 3000 SFE

- 3D measuring and marking- out machine for small, middle and big size pieces.
- The longitudinal axis of these models is composed of a guide way assembly orthogonal to the working plane, applied along one of its sides.
- High working and ergonomic levels: the machine is completely out of the working plane; the operator is put in position to operate promptly and close to the piece to be inspected.
- The stiffness and structural sturdiness allow the application of the machine also on existing surface plates; in this case no workings are required on the plane, except for the execution of few drillings on the surface; these drillings may be carried out contextually at the installation (without moving the plane).
- The guide way assembly is in annealed cast iron G26, enblock for any length with structure opportunely ribbed to annul bendings.
- The sliding and anti-tilting guides are completely out of the working plane and are high precision ground.
- Micrometric adjusting system to facilitate assembling and calibrations.
- Drillings for plane application.
- Because of its huge sturdiness, the guide way may be longer than the plane as to utilize the full surface (also lengthwise).
- The base carriage of the machine is of square type; it's in annealed and ribbed cast-iron G26 (in electrowelded and stabilized steel for MINITRICOORD SFE); the base sliding follows through special systems of bearings.

measuring range:	X-AXIS	Y-AXIS	Z-AXIS
MINITRICOORD SFE	1000/1500/2000/2500 mm.	500/600/800 mm.	500/600/800/1000 mm.
TRICOORD 2000 SFE	on request	1000/1200/1500 mm.	1200/1500/1800/2000 mm.
TRICOORD 3000 SFE	on request	1600/1800 mm.	2200/2500 mm.



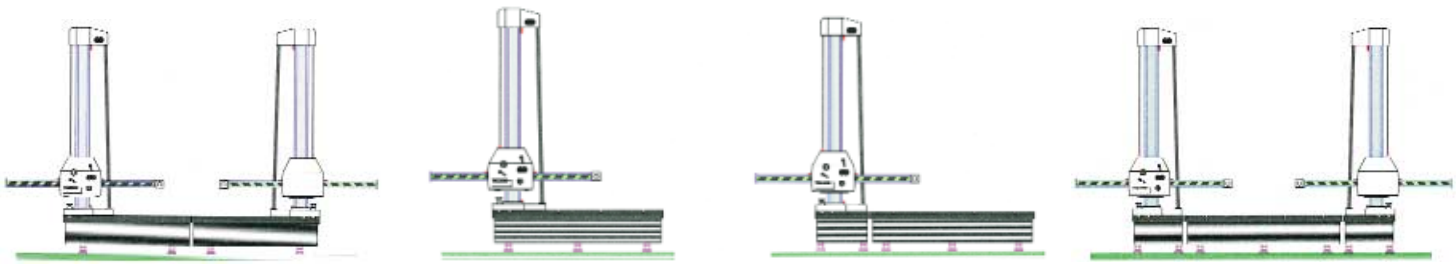
models TRICOORD 2000 GIP - TRICOORD 3000 GIP

- 3D measuring and marking-out machine for middle and large size pieces.
  - The longitudinal axis of these models consists of the area of a surface plate where is realized the slide guide.
- The base carriage of the machine is in annealed and ribbed cast iron G26 and runs on couples of precision bearings. The longitudinal sliding and alignment is provided by n. 2 couples of precision bearings running in the slide.
  - The slide guide of the X axis may be trampled (walk-on)- at floor level.

models TRICOORD 2000 GIV - TRICOORD 3000 GIV

- 3D measuring and marking-out machine for middle and large size pieces.
  - The longitudinal axis of these models consists of a separate rail way where is realized the slide guide. The base carriage of the machine is in annealed and ribbed cast iron G26 and runs on couples of precision bearings.
- The longitudinal sliding and alignment is provided by n. 2 couples of precision bearings running in the slide.
  - The rail way can be supplied with protection bellows.
- The slide guide of the X axis may be trampled (walk on) - at floor level.

measuring range:	X-AXIS	Y-AXIS	Z-AXIS
TRICOORD 2000 GIP	on request	1000/1200/1500 mm.	1200/1500/1800/2000 mm.
TRICOORD 2000 GIV	on request	1000/1200/1500 mm.	1200/1500/1800/2000 mm.
TRICOORD 3000 GIP	on request	1600/1800/2000 mm.	2200/2500/3000/3500/4000 mm.
TRICOORD 3000 GIV	on request	1600/1800/2000 mm.	2200/2500/3000/3500/4000 mm.



GIP GIV

Systems with DOUBLE TRICOORD

All models may be intended as a machine composed of two separate systems working opposed for the inspection of big size pieces - so doing, is allowed the control of all sides of the piece (a car-body, for instance).

The system permits the separate or simultaneous running of the two machines: then can be obtained single inspection reports or concerning the controls made altogether by the two machines: in this case all data coming from the two systems are processed by a single computer as to define and establish a single system for reference and test purpose.

When is involved an automatic machine, a particular and original procedure prevents any collision between the two machines - allowing or denying - time by time - the access to the piece of one of them in a safe and fully automatic way.

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