Galileo Carding Section
Experience and technology. Passion and research. Perfect fusion between competence and technology, know-how and experimentation, capacity and commitment. Marzoli is the only European manufacturer able to produce complete lines for opening, preparation and spinning, advising the clients on the current tendencies and carefully assessing the market conditions in which the client is operating. Not only that. Marzoli can also offer solutions for the nonwoven industry, fiber processing and the formation of the web. Marzoli’s philosophy is to be the only partner for the client in order to simplify, if not even avoid, any problem related to project management: from the preliminary study to the construction of the plant, from the start-up of the lines to their optimization. The care given to every detail differentiates Marzoli from any other supplier. A new project is an additional opportunity for innovation, a new occasion to work in team with the customer for the achievement of a common objective.

Marzoli

The value of being a Smart Company

- 36,000 m² TOTAL AREA
- Over 160 YEARS OF SUCCESSES
- Over 70 COUNTRIES WITH ACTIVE CLIENTS

COMPLETE SPINNING LINE
- COMPLETE OPENING LINE
- CARD
- DRAW FRAME
- COMBING SECTION
- ROVING FRAME
- SPINNING FRAME
- TRANSPORT SYSTEMS
- PRODUCTION MANAGEMENT PLATFORM
- REMOTE MAINTENANCE
For the implementation of its solutions, Marzoli draws on advanced electronics and innovative systems for production management, ‘smart’ tools through which the client can reach the desired returns on investment. Beside the three perfectly-integrated sections (opening and carding, combing and spinning), Marzoli offers two software platforms that allow to control, optimize and monitor the production process in a simple and effective way.

The synergies with Camozzi Group have enabled Marzoli to draw on an extensive heritage of technical, methodological and R&D competences that stem from the different production realities comprising the Group, all operating in a Total Quality regime. With one single machine or with a complete spinning line, the result that Marzoli assures to the client is always the same: the perfect match with the agreed technical features, with qualitative and managerial performances that are perfectly in line with the Group standards, as required by the common philosophy and ethic values.
Carding has always been and will continue to be one of the most important phases of the spinning process. Only with an effective carding of the fiber the spinner can produce a homogeneous, regular, resistant and clean yarn and therefore ensure efficiency and quality in all downstream operations.

The raw material available on the market today, with continuously increasing prices and always less selected quality, is forcing spinning companies to ask for help from textile machinery manufacturers in order to maintain high quality standards in their end product. The card, in particular, becomes a fundamental machine to get the best quality out of any fiber.

From the processing of cotton to artificial and synthetic fibers and also to the new and always more complex technical fibers, the Marzoli C701 Card, with its countless innovative solutions, has been designed to fully satisfy the increasingly demanding requirements of the market on greater production and quality.

The Marzoli C701 Card stands for technical and technological excellence and confirms the great effort of Marzoli in research and development.
Machine description

Technical description | Legend

1  Control feed inlet
2  Dust extraction outlet
3  Silo feed roller
4  Opening roller
5  Fan
6  Lower air discharge outlet
7  Card feed roller
8  Licker-in
9  Precarding area
10  Flats cleaning device
11  Revolving flats
12  Main cylinder
13  Postcarding area
14  Under main cylinder covers
15  Doffer
16  Under doffer covers
17  Sliver forming system
18  Calender
19  Control panel
20  Coiler
21  Electric box
22  Suction system
The dimensions of the main cylinder - width and diameter - have important consequences on the machine efficiency, productivity and on its output quality. Small dimensions reduce the weight of the cylinder, which grants lower friction and minor mechanical stress. Moreover, small diameters, in combination with higher cylinder speed, grant higher centrifugal force, which improves the extraction of impurities. On the other hand, bigger cylinders entail a greater carding surface of the machine.

This has three major consequences:
• It improves productivity, because the card can process bigger amounts of raw material.
• It enhances quality and carding effectiveness because the same amount of raw material is distributed on a bigger carding area.
• It reduces maintenance costs because the flats are less subject to wear, as the same amount of fibers is distributed on a greater carding surface.

Accurate studies and several tests carried out in the R&D department have led Marzoli to identify the cylinder dimensions that perfectly balance all the above-listed advantages. This technology has been incorporated in Marzoli’s C701, which currently operates in several spinning plants around the globe.

Main cylinder centrifugal force

![Main cylinder centrifugal force graph]

- LOW FRICTION AND LOW MECHANICAL STRESS
- HIGH ENERGY SAVINGS
- EFFECTIVE EXTRACTION OF IMPURITIES
- HIGH PRODUCTION
- TOP CARDING EFFECTIVENESS
High Carding Angle & Carding Surface

In the architecture of the Card C701, the main cylinder has been raised and the licker-in and the doffer have been located underneath the main cylinder in order to reach a 284° carding angle (angle between the center of the licker-in and the center of the doffer). Thanks to this configuration, the working width of 1,500 mm and the diameter of the main cylinder of 1,006 mm, Marzoli C701 Card has a carding surface of 3.74 m², the greatest carding surface on the world market today.

The carding surface is subdivided as follows: pre-carding area 1.08 m², moving flats area 1.57 m² and the post carding area 1.09 m².

<table>
<thead>
<tr>
<th></th>
<th>PRE CARDING AREA m²</th>
<th>CARDING AREA m²</th>
<th>POST CARDING AREA m²</th>
<th>TOTAL AREA m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>C701</td>
<td>1.08</td>
<td>1.57</td>
<td>1.09</td>
<td>3.74</td>
</tr>
</tbody>
</table>

Carding densities with different main cylinder geometries

Under the same production levels, the geometry of Marzoli C701 Card allows to reduce the density of the processed material in the carding area with mobile flats (See Figure a). This entails a thinner layer of the carded material with two positive effects:

1. Superior carding performance;
2. Lower mechanical stress on the cloths and the flats.

In fact, with other geometries with smaller diameter and lower working width of the main cylinder (see Figure b and c), in order to keep the same fibers carding density and achieve the same carding quality of Marzoli C701 Card, it is necessary to increase the rotating speed of the main cylinder.

This entails damaging of the fibers, wear of the mobile flats and the carding cloths and high energy consumption.

Technical description | Legend

| H | Web height |
| W | Working Width |
| D | Main cylinder diameter |
It is well known that the effectiveness of the feed system of a textile machine has remarkable effects on its performances. Therefore, when talking of a card, the main player for silver quality, correct feeding is vital.

The fully integrated chute feed of Marzoli C701 Card is conceived to:
- improve the formation and the evenness of the feeding batt;
- guarantee batt homogeneity;
- increase dust removal efficiency;
- improve cotton opening;
- eliminate fiber curling.

The most innovative features of the integrated chute feed are the following:
- all the convoy parts in contact with the fiber are in stainless steel in order to guarantee maximum fluency with all types of fiber. This solution is available only with Marzoli chute feed;
- the feed table has a special design that allows to feed the batt with smaller and more open tufts;
- the patented system to introduce the air directly in the batt formation chamber in order to transport the fibers without turbulences and without curling;
- in the batt formation chamber, thanks to an innovative solution, the air leaks without collecting any workable fiber;
- all the pre-chute feed elements, the batt formation area and the cylinders are easily accessible from the back side of the card for cleaning and maintenance.

These features, along with the autoleveler on the feed roller, improve carding and the regularity of the silver, achieving very low Uster values for cotton carded sliver.
Licker-in

Easy elimination of dust & trash
One of the main objectives of a card is to reduce impurities in the sliver. A very important feature of the C701 is the small dimension of the licker-in that must consequently work at high speed. The result is a greater centrifugal force that, in combination with the knife and the carding segments positioned underneath the licker-in, contributes to an easy elimination of dust and trash. The waste percentage adjustment is easily modifiable with the flap positioned in the waste chamber.

Perfect opening & separation of fibers
In order to allow an effective carding of the fiber it is necessary to open the batt and separate the fibers. These activities are carried out through a drafting effect, occurring between the feed roller and the main cylinder, that is not affected by the number and the dimension of the licker-in. In fact, in all spinning machines the draft is always and only the ratio between the delivery speed and the input speed: the intermediate rollers do not affect the draft value.

The draft between the feed roller and the main cylinder of Marzoli C701 Card is very high (800) ensuring the perfect opening of the fiber. This adds onto the high cleaning performance stemming from the licker-in dimension, which does not alter the drafting effect in any way.
Card C701 / Pre-Carding, Carding & Post-Carding

Pre-Carding

The Card C701 has a pre-carding area of 1.08 m², that allows the installation of 6 carding units and 2 fiber control units with relative knives that have the task of removing impurities, dust and short fibers.

The pre-carding zone can be flexibly equipped by choosing the number of carding units and knives on the basis of the processed raw material: up to 8 carding units can be applied with one fiber control element and with relative knife. As shown in the image, the pre-carding area comprises an active and a passive zone. In fact the fiber must be effectively carded, but at the same time must be able to stretch and recover from the carding stress, in order for the impurities to be captured by the knives and by the discharge mobile flats and evacuated through the air suction ducts.

Carding

At the heart of every card there is the mobile flats area, the carding zone dedicated to the removal of neps, pepper trash and short fibers. It is in this zone where there can be substantial declines in carding quality and a rapid wear of the card cloths if production is increased because the card must process more fibers in the time unit. This boosts the stress on the fibers and causes a rapid wear of the card cloths: first the cloths of the mobile flats and then the cloth of the main cylinder.

Thanks to Marzoli C701 greater carding area it is now possible to increase production by 50% while maintaining the same carding density.

Marzoli Card C701 has a carding zone that has been designed in order to achieve
In the post-carding area, the 1.09 m² surface has permitted the installation of 4 carding units and 2 fiber control elements with relative knives (in the standard configuration) whose task is to extract the residual impurities (pepper trash) and particles of dust.

The parallelized and cleaned fibers are delivered to the cloth of the doffer.

Also the post-carding zone can be flexibly equipped with different combinations of carding segments.

Technical description | Legend

1 Revolving flats
2 Flats cleaning device
3 Outlet cover
4 Dedusting knife with suction hoods
5 Pre-carding segment
6 Inlet cover
7 Post-carding segment
8 Main cylinder
Doffer

The transfer of fibers from the main cylinder to the doffer is important, because it directly affects sliver cleanliness and uniformity. When the two metallic wires are closest to each other, the different speed of the two cylinders creates a carding action and causes the transfer of fibers from the main cylinder to the doffer. However, the doffer only collects the fibers that enter in contact with its metallic wire; if the distance between the main cylinder and the doffer is too large or if the doffer is overloaded with fiber, the transfer and the carding action between the main cylinder and the doffer are inhibited.

Marzoli C701 Card has a design that specifically addresses these problems. In particular, the C701 design has achieved:

• minimum mechanical distance between the main cylinder and doffer for an optimum transfer of fibers;

• large working surface between main cylinder and doffer (contact zone) thanks to the employment of a 700mm diameter doffer, which has always been used on Marzoli cards.

In conclusion, the design and the highly precise construction of the main cylinder and doffer supporting structure are the premises for a stable and reliable production of high quality sliver.
A key success factor for spinners is to boost productivity without compromising on quality. On one hand, productivity allows to reduce the investment cost; on the other hand, higher production levels require higher working speed which can damage sliver quality and uniformity, cause breakages of the sliver and, hence, affect the efficiency and productivity of downstream operations.

The productivity-quality trade off can be substantially improved in some key areas. One of these areas is where the web detaches from the doffer. Thanks to Marzoli technology, the web detaching device of C701 can work at high production volumes without compromising on quality.

The web delivery area between the doffer and the web detaching device allows for an ideal transfer of fibers. The subsequent sliver formation with transverse movement makes it possible to process all known fibers at elevated delivery speeds, which is equivalent to high productivity, without compromising web quality.

**Web detaching device**

| 1  | Doffer |
| 2  | Brush roll |
| 3  | Stripper roll |
| 4  | Accompanying roll |
| 5  | Sliver former |
| 6  | Funnel |
| 7  | Calender |

**Web extraction calender**

The sliver insertion device with extraction calender, with its automatic rollover allows a quick and easy reattachment of the web at minimum running speed and guarantees optimum control at high production speeds.
One of the key functions of a card is to remove impurities from the raw material and to eliminate them in order to keep all working organs clean and allow them to always work at their best. In modern cards, this activity is carried out by air: card suction systems have a very important role and they must also be efficient because of the high production and moving cost of air.

The suction system of Marzoli C701 Card has been designed with consideration of the bigger working width of the machine (+50%), of the increase in production and of the resulting increase in impurities (trash) to be removed. The suction system has been designed and produced using real data collected from various spinning plants, the extensive technological expertise accumulated in Marzoli and the cooperation with partners specialized in software for fluid dynamics applications. The meticulous care given to the design has produced a suction system that guarantees excellent trash removal and machine cleaning, while containing the amount and pressure of the air needed.
Autolevelers

In order to control sliver count variations and to provide a great improvement in the evenness of the card sliver, the Card C701 is equipped, as standard, with the medium-short autoleveler (MTA).

The MTA leveler senses the thickness of the feed material and its variation determines a variation of the speed of the feed roller that allows to maintain the same evenness of the web. This system functions over a medium-short term which guarantees perfect leveling of the web with great benefits for yarn quality.

User-friendly interface

The card C701 is managed by a modern PC microprocessor: all the production data and the working parameters are controlled and saved during the production cycle.

The multi-language touch screen is user friendly and permits a simple use with clear diagrams, detailed monitoring pages and step-by-step trouble shooting procedures.
Coiler/Can changer

In order to preserve the maximum width of the Card C701 (structure, body and coiler) similar to the one of the previous model, it was necessary to move the distributor from the side to the front of the machine. This was done to maintain unchanged the number of cards that could be placed side by side given a fixed amount of space available. The need to redesign the coiler presented the opportunity to introduce concepts such as, for example, the pendulum movement that simplifies the mechanics and makes the movement of cans a lot more efficient. In addition, the centering of the cans has been improved by increasing the can location guides from 2 to 4, guaranteeing more precise and better positioning.

Sliver monitoring area

A continuous control and monitoring of the sliver is located on the last area of compaction of the sliver to guarantee constant quality control.

Covers

The design of the external covers of Marzoli C701 Card allows to easily access every part of the card for better and quicker maintenance and cleaning of the machine. The sliding doors of the C701 Card can be easily moved to a “parking” position. As clearly shown in the picture, the parking system allows full access to every part of the machine without any restrictions, with great benefits to mobility and visibility for maintenance personnel.
Achievable productions

Production up to 270 kg/h.

These productions are achievable thanks to:
• large carding surface (cylinder width, diameter and carding angle);
• working width of 1,500 mm;
• increased centrifugal force on licker-in and main cylinder;
• containment of inertia;
• reduced weight and mechanical stress;
• contained radial expansions in the main working systems;
• reduced distance setting between carding components (the minimum mechanically achievable);
• wide contact zone between main cylinder and doffer, thanks to the 700 mm doffer.

Benefits of the C701

Thanks to higher productivity, Marzoli C701 Card allows the customer to reach the same production level with a lower number of machines, with obvious and remarkable benefits:
• lower investment costs;
• less space requirements and lower building costs;
• lower costs for suction and related filtration;
• lower maintenance costs thanks to longer metallic wires life;
• greatly reduced energy consumption: reductions of Kw/Kg of sliver up to 30%;
• less personnel required thanks to the reduced number of machines and to the improved efficiency.
### Technical data

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processed fibers</td>
<td>Cotton, man-made fibers and wool with length up to 65 mm (2&quot; 1/2)</td>
</tr>
<tr>
<td>Production</td>
<td>Up to 270 Kg/h</td>
</tr>
<tr>
<td>Installed power</td>
<td>26 kW (with MTA autoleveler)</td>
</tr>
<tr>
<td>Delivered sliver count</td>
<td>Ktex 3-40</td>
</tr>
<tr>
<td>Suction type</td>
<td>continuos</td>
</tr>
<tr>
<td>Compressed air</td>
<td></td>
</tr>
<tr>
<td>Free air consumption</td>
<td>1,000 Nl/h</td>
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<tr>
<td>Pressure</td>
<td>8 bar</td>
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</tbody>
</table>

![Diagram of the equipment]
Card C701 / Web Delivery Module

Higher quality web for Nonwovens production

Among the segments comprising the textile industry, few have enjoyed the continuous and rapid growth of nonwovens. Nonwoven production has reached over 2 million tons per year only in Europe and the installed capacity will continue to grow worldwide. A clear trend in the nonwoven sector is the increase in web quality; nonwoven manufacturers are increasingly required to produce webs with well-parallelized and homogeneously-distributed fibers. The machine that entails the highest quality results on nonwoven webs remains the card with moving flats.

Marzoli C701 Card can be equipped with a dedicated web delivery module in order to produce outstanding quality webs, at high production speeds, with low energy consumption. This once again demonstrates the excellent versatility of Marzoli C701 and the great effort that Marzoli dedicates to research and development.

Marzoli C701 Card can be equipped with condensing and random cylinders that allow to reach a web weight of 100 g/m (depending on the type of fiber being processed) and a production level of 270 Kgh.

By removing the sliver formation unit, it is possible to install the web delivery module also on existing C701 cards.

Technical data

<table>
<thead>
<tr>
<th>Material</th>
<th>Cotton, synthetic fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Up to 220 kg/h (up to 180kg/h for bleached cotton)</td>
</tr>
<tr>
<td></td>
<td>Up to 270 Kg/h (with condensing and random cylinders)</td>
</tr>
<tr>
<td>Web Weight</td>
<td>Up to 40 g/m</td>
</tr>
<tr>
<td></td>
<td>Up to 100 g/m (with condensing and random cylinders)</td>
</tr>
</tbody>
</table>
Power consumption: Marzoli C701 Card

The equipment manufactured by Marzoli is conceived, designed, developed and built with the goal of offering affordable quality and excellent performance within the production process, so that the final product will have a competitive advantage that is created starting with the earliest stages of production. Marzoli cares about energy consumption saving and its R&D office aims at reducing the environmental impact of its products and lines.

Reduction in power consumption last 20 years Combed Yarn

![Graph showing power consumption reduction over time](chart1.png)

C701 power consumption

![Graph showing C701 power consumption](chart2.png)
Carding Section / Software Platforms

End2end production management platform: the YarNet

The YarNet is Marzoli’s highly innovative production management software which allows the user to easily monitor and manage from his/her computer each & every machine of the spinning mill. Thanks to the simple and logical structure of YarNet, with no complicated and useless functions, the customer can have a clear overview of the entire spinning plant and reach a highly improved speed of response in production operations. Furthermore, when the customer must insert a new production recipe, he can do that while sitting in his office instead of standing in front of the idle machine: this highly reduces the chances of mistakes and machine downtimes.

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The Remote Maintenance

The Remote Maintenance is Marzoli’s unique service that draws on diagnostic technology installed inside the machine to identify technical malfunctions at an early stage and, thus, reduce all the related inefficiencies, costs and losses of productivity. Through the adoption of a specific hardware, sensors installed in critical parts of the machines, predictive algorithms developed in the research phase and the latest paradigms and technologies (IoT, data warehouse, big data, cloud computing, machine learning, M2M, M2H) based on an important partnership with Microsoft, it is possible to scan the machine operating conditions, to monitor critical parameters and send, electronically, the relevant information to a dedicated team inside Marzoli. This team monitors in real time all Marzoli machines installed at the client’s plant, sends reports on their status on a weekly basis and, if there is any parameter out of control, it contacts the customer and provides live assistance.

Benefits of the Remote Maintenance

• Higher productivity
• No machines unplanned downtimes
• Prevention from major machine failures
• Longer plant lifespan
• Higher efficiency
• Complete reliability
• Trouble free spinning experience
• Better maintenance planning