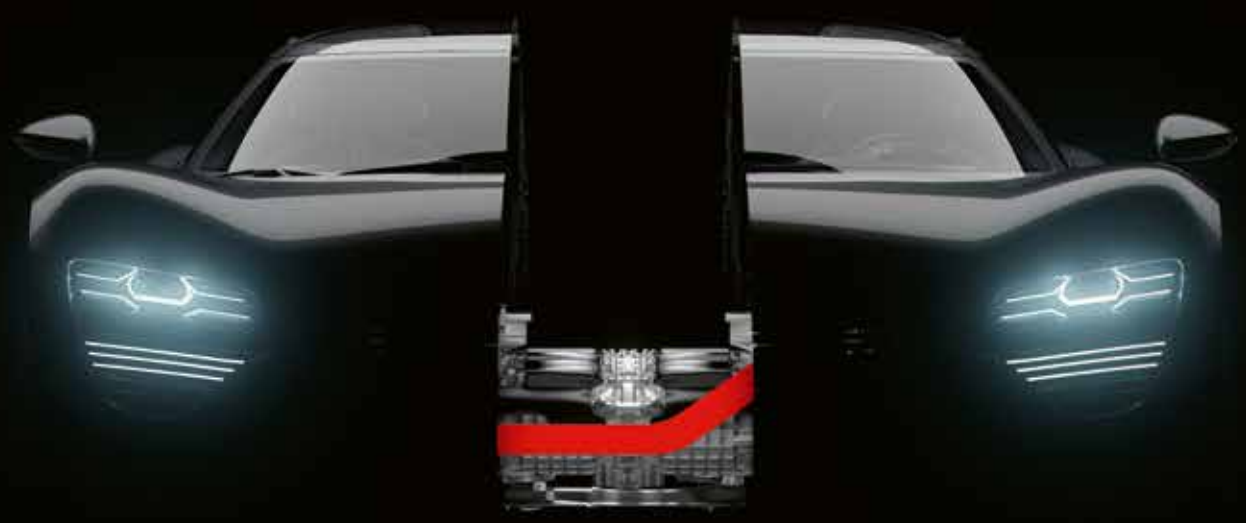
COIL WINDING TRACTION SOLUTIONS

WINDING AND ASSEMBLY TECHNOLOGY FOR E-MOBILITY



IMA AUTOMATION FASP

IMA AUTOMATION FLAWLESS ASSEMBLY

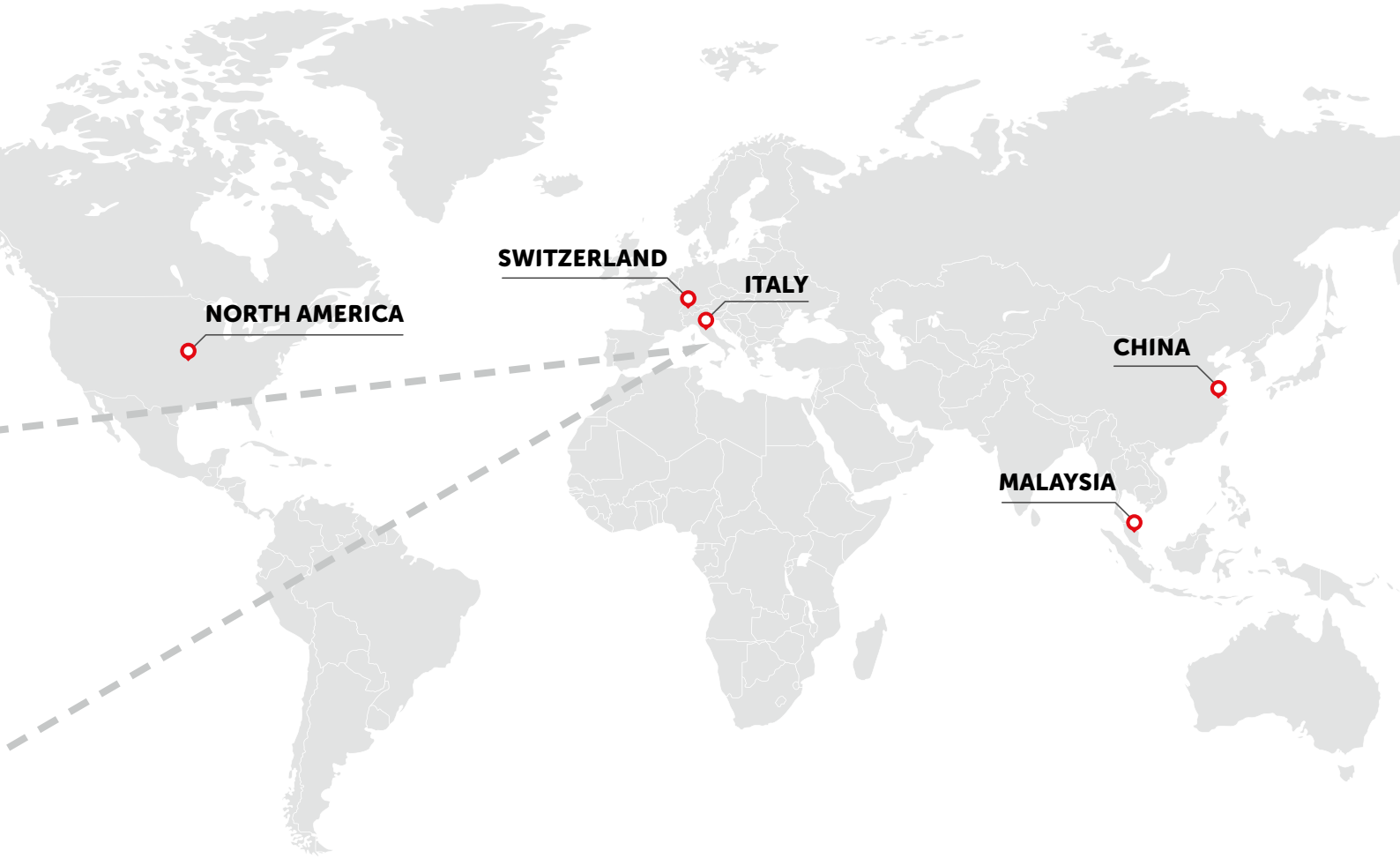
IMA AUTOMATION IS THE SEGMENT OF IMA GROUP COMPOSED OF LEADING COMPANIES IN THE AUTOMATION AND ASSEMBLY INDUSTRY, WITH OVER 50 YEARS OF EXPERIENCE.

With its integrated network of companies which guarantees a worldwide coverage, IMA Automation designs and manufactures advanced technology lines for handling and assembling parts for different applications fields, such as Automotive, E-Mobility, Electrical Motors, Medical Devices, Eye Care, Caps & Closures, Electro Mechanics and Watchmaking.
IMA Automation companies have developed top-of-the-line technical skills, earning excellent market reputations and positioning themselves as leaders among those offering specialized technological solutions. IMA Automation hub is a perfect addition to the already consolidated packaging experience of IMA, allowing a synergy in the sharing of clients and widening our offer of technological solutions.

- AUTOMOTIVE
- E-MOBILITY
- ELECTRICAL MOTORS
- MEDICAL DEVICES
- EYE CARE
- CAPS & CLOSURES
- ELECTRO-MECHANICS
- WATCHMAKING

IMA, A SOLID LEADING GROUP IN PROCESSING, PACKAGING & AUTOMATION

Established in 1961, with the headquarters in Bologna, Italy, IMA is world leader in the design and manufacture of automatic machinery for processing, packaging and assembling products for several application fields. With a turnover of more than 1.600 million euros and 6000+ employees, the Group is present in about 80 countries, supported by a sales network made up of several branches, representative offices in central-eastern Europe and more than 50 agencies. IMA Group has more than 40 production plants in Italy, Germany, France, Switzerland, Spain, the UK, the USA, India, Malaysia, China and Argentina.

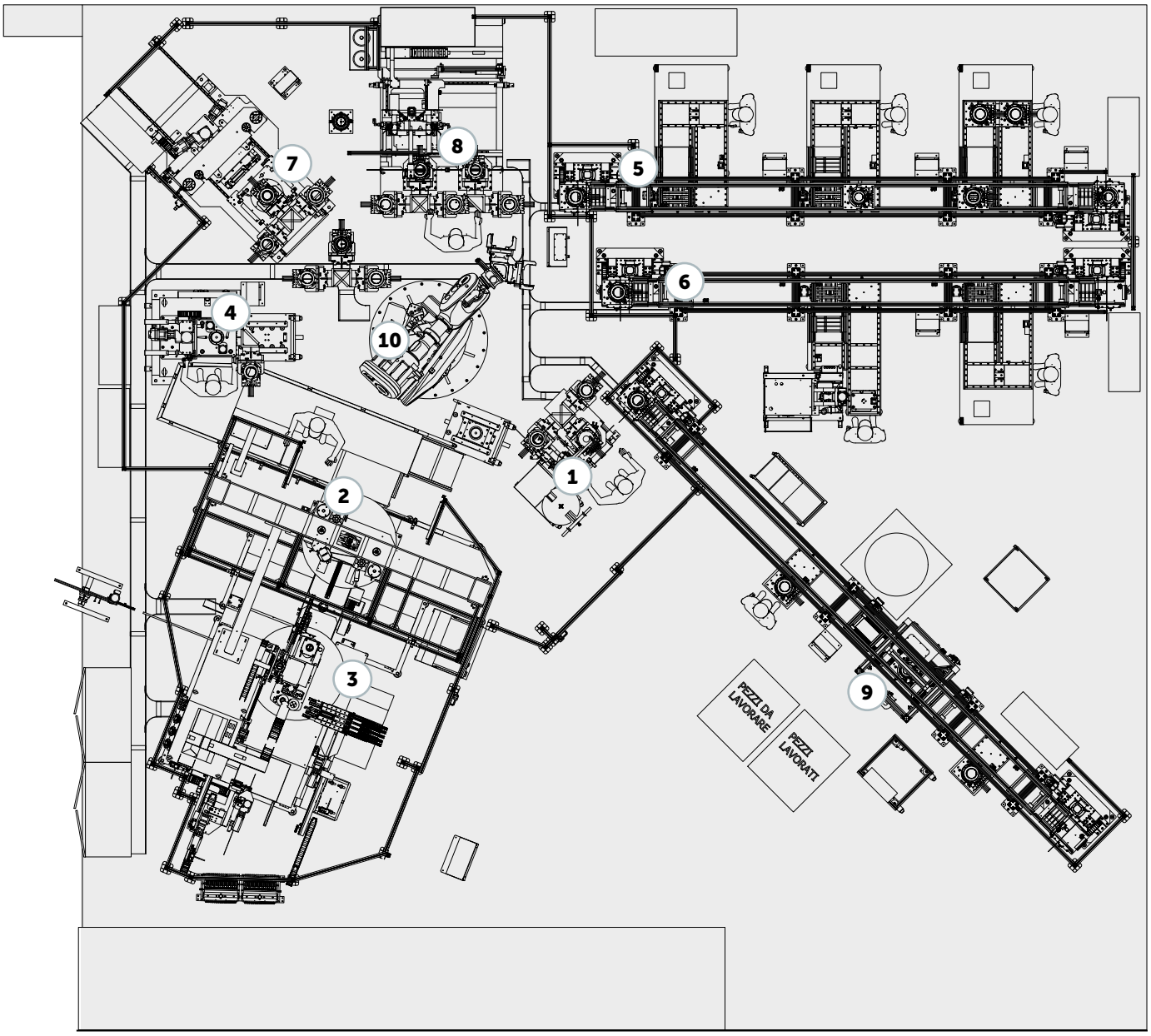


**A WIDE NETWORK OF LEADING COMPANIES,
A UNIQUE EXCELLENT OFFER.**

THE TECHNOLOGY

IMA Automation FASP has designed and built a fully automatic coil winding line for stators size from IEC 100 to IEC 132 FASP model "CWL007-00-14-25" mod.007, devoted to the stators production for EV auto traction motors.

1. Slot bottom insulating process
2. Automatic coil winding and inserting process
3. Preforming process
4. Expander machine
5-6. Conveyors with layout-bays for the phase isolation and the connection processes
7. Final head process
8. Winding head lacing Process
9. End Assembly electric test process
10. Robotised system for stators handling



The plant realized by IMA Automation FASP is highly optimized in terms of efficiency and precision. This latest production line designed by our company is one of the highest expressions of the Industry 4.0 scenario: operator and robot, supported by a cutting-edge and modulated technology, work in full consonance and come to produce a simply perfect product.

THE CHALLENGE

The Coil Winding Line is designed for low and high voltage motors production, with max. internal dia. of 140 mm and external max. dia. of 220 mm, by means of a station equipped with a dynamic production system. The “DPS1” dynamic production system is divided into sequential and operational continuity: the plant is be able to optimize the production processes by managing various working steps in sequence and by reducing to the minimum terms the temporary stop of the machines for the tooling and the format changing.

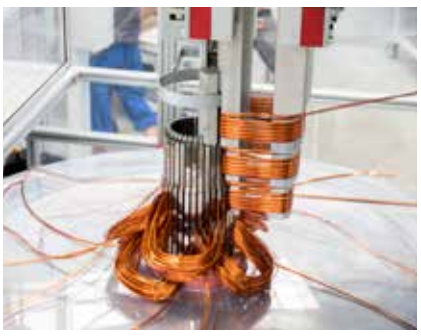
The new plant is therefore to be able to flexibly modify the stators types processes by varying the coil longitudinal size, the turns number, the number of the wires in parallel, the diameter, without being constrained within logics of minimum production batches and without stopping the production flow.

The complexity of the windings is related to wires number - up to 30 parallel wires - and to the terminals length - up to 800 mm.
Finally, the process of each stator is exactly traced throughout the overall manufacture flow according to the imperatives of the applied methods, times and materials.

1

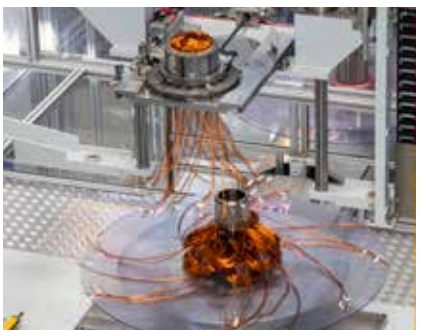
Slot bottom insulating process

2



Automatic coil winding and inserting centre

3



Preforming process

4

Expander machine

5

Conveyors with layout-bays for the phase isolation and the connection processes

6

THE SOLUTION

The machines that IMA Automation FASP designs and builds are self-adjust during the various manufacturing phases, thanks to the technological system conceived by IMA Automation FASP: the process automation, called DPS1 Dynamic Production System 1, allows to manage in an automated way all the steps of the motor production and allows the machines to change automatically and in a controlled way the number of parallel wires to be used and the winding specifications, such as the coils dimensions and the turns number.

The layout-bays conceived for the operators' activities enhances their performances and frees the process phases from the interdependence logic. The tutorials, supplied with the operators' stations, provide the same operators with instant and continuous instruction and training. By applying the FTW Free Twist Wires technology - rotating-blade winding technology permitting the coils winding with highly accurate stratifications, while preventing the wires kinking and overlapping on the insertion tool - and the HPCIS High Performance Coil Insertion System technology - high-staple insertion technology of the windings on the slots – working processes are obtained with a coefficient of insertion over 80 - 85% of the net area of the stator slot. Following this design choice, the FTW and HPCIS technologies have been combined, by eliminating the problem of the windings twist, in the case of rotors conceived with many wires in parallel, and by increasing thus the efficiency.

Finally, the introduction of the terminals taping process is useful to contain the important lengths of the same terminals - up to 800 mm - thus preventing their interference in the different stages of the stator working process.
The product traceability follows its production flow, from its process up to the next assembly phases: the identification of the stators in process takes place through a control system based on RFID and TAG installed on pallets transporting the stators, together with the possibility of integrating a DMC code directly applied on the stator. The marking on the product thus allows a flexible management by an information system interfacing with metadata.

7

Stators head forming machine

8

Lacing machine

9

Electric test

10

Robotised system for stators handling

THE ADVANTAGES

- Reduction of about 80% of the defect due to incorrect handling of the terminals
- Increase over 85% of the process efficiency (OEE)
- Reduction of the production time
- Very high precision and accuracy in processing
- User-friendly equipment and tool
- Updated training and continuous assistance to operators through updated tutorials on site
- Constant flows monitoring by supervisors
- Ergonomics of the operator's workplaces combined with optimization of the physical work environment in terms of brightness, ventilation, flexibility, safety and health, through the insertion of accessory and fixed line systems (lights, ventilation) and movable (trolleys for equipment, baskets for scraps).

INNOVATIVE TECHNOLOGIES FOR INDUSTRY 4.0

DPS1 Dynamic Process System 1

Tutorials systems for operator station

KEY APPLIED TECHNOLOGIES




- Rotating-blade winding system
- FTW Free Twist Wires technology
- ATLT Adhesive Tape Leads Technology
- HPCIS High Performance Coil Insertion System
- 3DWCT 3D Winding Conformation Technology
- Quick Change Tecnology

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