



Our path!



Our beginning 1960



**FELM** Electric Motors

# Electric Motors, Drives and Transformers

## Facts and Figures - FELM Group



International producer company born in 1960

20 MEUR order intake in 2018

45 people, 2 factories, multiple warehouses in different locations

7 Official Partners plus agents and distributors all over the world

1 Central service at Inveruno - Milan

Power range from 0.18 kW to 5 MW



# Business Units

## FELM Portfolio Products



Drives

Low voltage drives  
Medium voltage drives  
Industrial drives  
Service



Motors

Asynchronous motors  
Compact motors  
Slip-ring motors  
Special motors  
General performance  
Industrial performance  
DC motors  
Service



Step up Transformers

Power transformers  
Oil & Dry  
Service

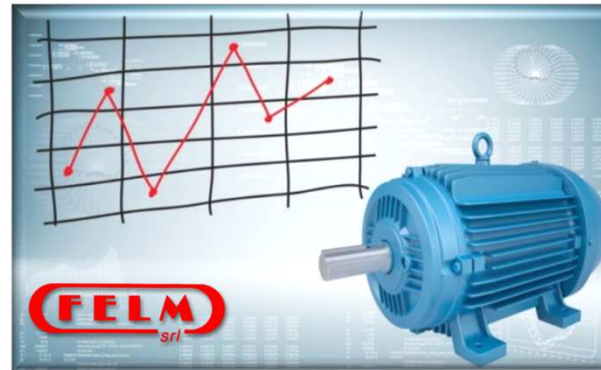
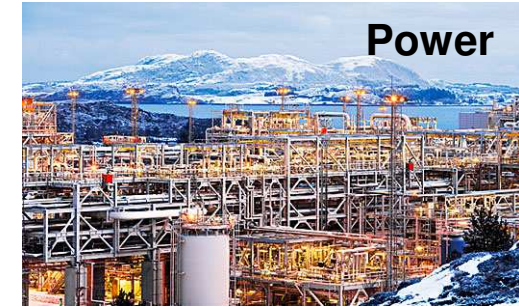


Tele Maintenance

LV & MV Motors  
Predictive & Preventive  
Remote control  
Surveillance

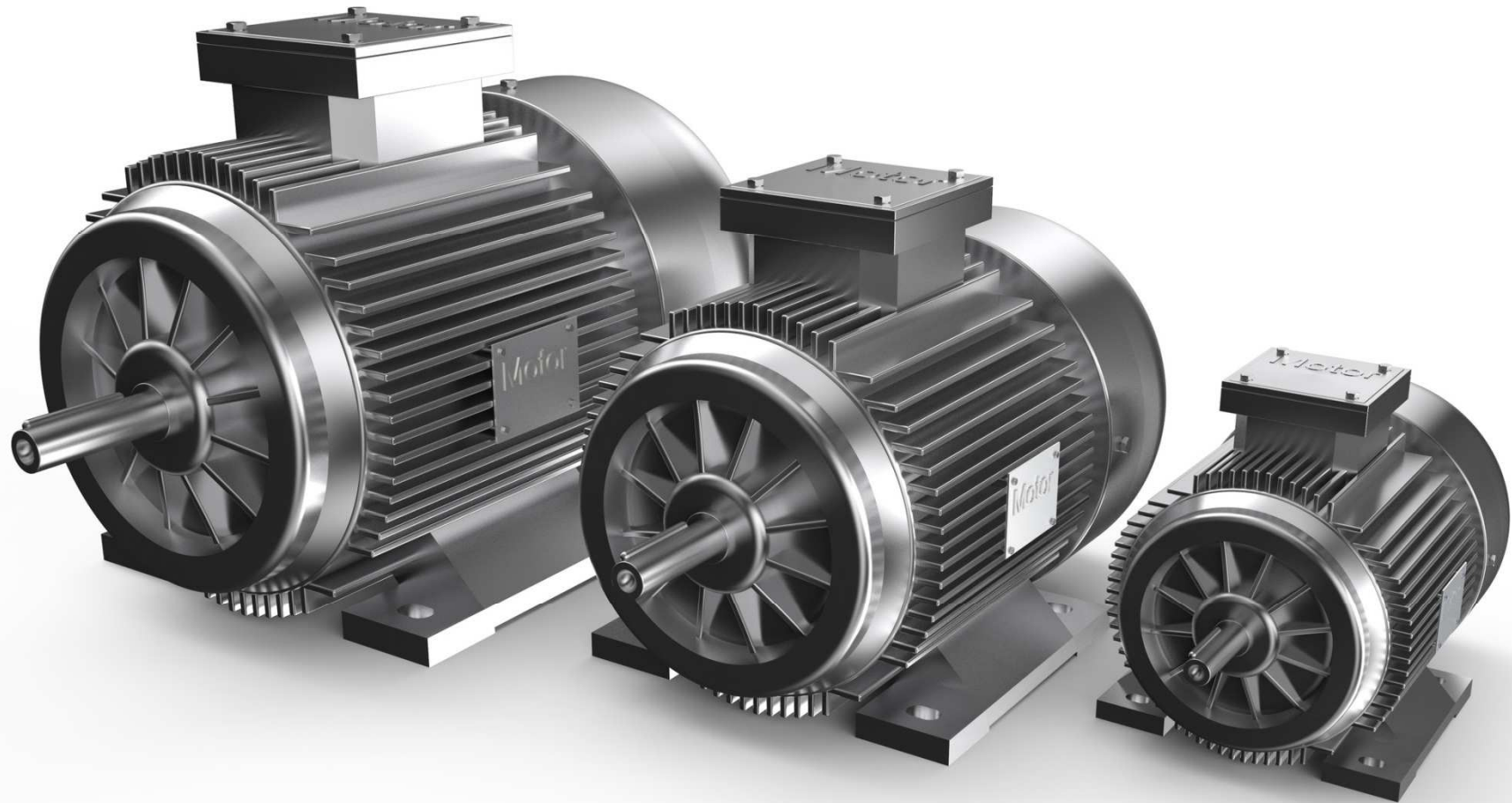
# Motors, Drives and Transformers

## Applications knowledge



# Electric Motors Product Range

## FELM Group



# Electric Motors Product Range

## FA ALUMINUM MOTORS IE2 IE3



Totally enclosed fan-cooled aluminum motors are designed according to IEC.

Power range: 0.8KW~18.5KW

Frame range: H63-H160

Frame material: cast aluminum

Standard mounting: IEC60034-F

Standard protection: IEC60034-5

Specific winding can support various voltages (50HZ or 60HZ).

Cooling: IC411

Connection: Y connection < 3kw and below,  $\Delta$  connection > 4kw and above.



# Electric Motors Product Range

## F2 HIGH EFFICIENCY MOTORS - IE2



Totally enclosed fan-cooled motors are designed according to IEC.  
The frames are made of cast iron, while terminal boxes can be made of steel plate.  
The efficiency can meet the requirements of IEC 60034-30 standards.  
Frames range and power: 80 to 366 / 0,75 to 375 kW  
PTC, PT100, Heaters and other thermal elements can be offered.



# Electric Motors Product Range

## F3 – F4 HIGH EFFICIENCY MOTORS IE3 – IE4



Totally enclosed fan-cooled motors are designed according to IEC.  
The frames are made of cast iron, while terminal boxes can be made of steel plate.  
The efficiency can meet the requirements of IEC 60034-30 standards.  
Frames range and power: 80 to 366 / 0,75 to 375 kW  
PTC, PT100, Heaters and other thermal elements can be offered.





# Electric Motors Product Range

## F3 FX LOW VOLTAGE BIGGER POWER MOTORS (COMPACT MOTORS)



Totally enclosed fan-cooled three phase asynchronous motors.

Frame range: H315~H560

Power range:132~1800KW

Frame material: cast iron, welded frame with flange

Mounting: B3, B35, V1

Protection: IP55

Cooling: IC411, IC416.

PTC, PT100, Heaters and other thermal elements can be chosen.



# Electric Motors Product Range

## F2VP VARIABLE FREQUENCY MOTORS



Variable frequency motors are designed for frequency converter drive  
Variable frequency motors for constant torque and constant power variable speed.  
Motors are equipped with ventilation for good cooling under different speed.  
Power range: 0.55~1800KW  
Frame range: H80~H630  
Frame material: cast iron or steel plate welding  
Standard mounting: IEC60034-F  
Standard protection: IEC60034-5  
Cooling: IC416  
Options: Encoder,PT100, Heaters  
Above than 110 kW insulated bearings is recommended.



# Electric Motors Product Range

## FODP IP23 LOW VOLTAGE MOTORS



Motors with cast iron or steel plate welding frames.

Protection: IP23

Cooling: IC01 (or IC81W)

Mounting: B3, B35, V1

F/B

S1 duty

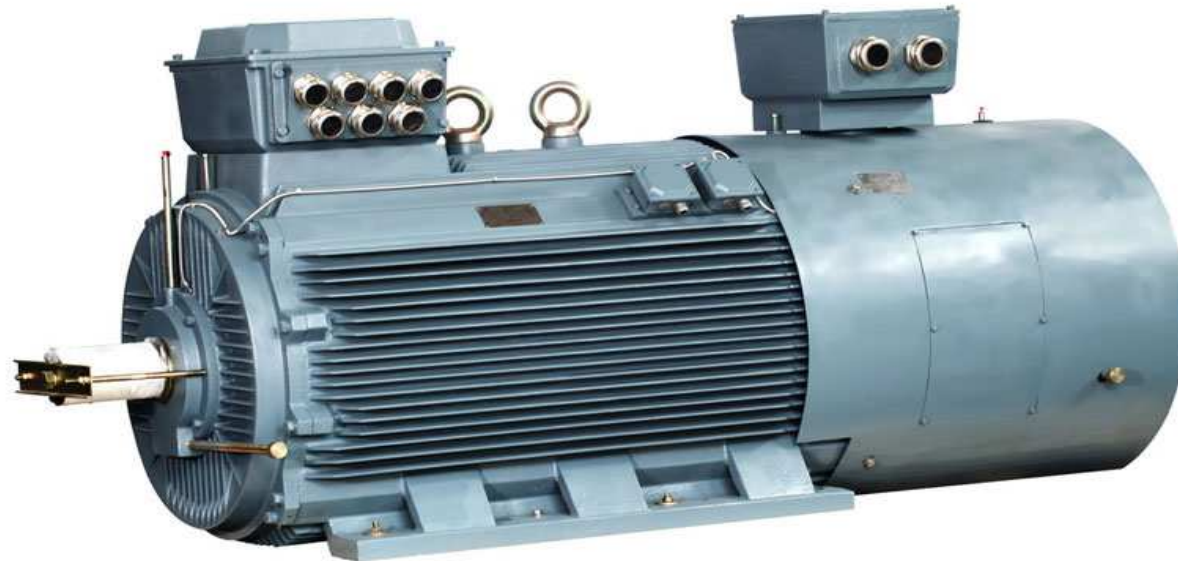
Power range: 45KW~355KW

Frame range: H250~H315



# Electric Motors Product Range

## FR FRHV SLIP RING LOW – HIGH VOLTAGE MOTORS



Cast iron or welded frame with flange

Power range : 30 Kw ~ 2600 KW

Frame range: H280-630

Protection: IP 54

Slip ring motors that can support big start torque under low start current.



# Electric Motors Product Range

## FHV STANDARD HIGH VOLTAGE MOTORS (IP54/IP55)



High voltage squirrel-cage induction motors are designed and produced according to IEC.

They are made of high quality cast iron or steel plate.

Power range: 160KW~1800KW

Frame range: H315~H560

Protection: ip55/IP54/FIP44

Cooling: IC411

Mounting: B3, B35, V1

Duty: S1



# Electric Motors Product Range

## FAA HIGH VOLTAGE MOTORS IC 611

Number of Poles: 2 up to 12

Frequency: 50 Hz. and on request

Voltage: 3.6 - 6.6 - 11 kV

Frames: 355 up to 1000

Power range: 220 kW - > 7500 kW

Steel welded frame

Cooling system: IC611

(Options IC 616: Inverter use rated 1:10)

Shaft sealing: O-Ring

VPI Insulation System

Insulation class F (class B temperature rise)

Degree of protection: IP55 - (Options: IP56 - IP65)

Painting procedure: According to ISO 12944 S

Internal epoxy coating (tropicalized)

Sintered drain plug

Shaft Material: C45

Double grounding (1 inside terminal box + 2 on the frame)

Grease Caltex SRI-2 or SKF LGHP2



# Electric Motors Product Range

## FAW HIGH VOLTAGE ASYNCHRONOUS MOTOR WATER COOLING

Number of Poles: 2 up to 12

Frequency: 50 Hz. and on request

Voltage: 3 - 6 - 6.6 - 11 kV

Frames: 355 up to 710

Power range: 20 kW - > 4500 kW

Steel welded frame

Cooling system: IC81W

Shaft sealing: O-Ring

VPI Insulation System

Insulation class F (class B temperature rise)

Degree of protection: IP55 (Options: IP56 - IP65)

Painting procedure: According to ISO 12944 S

Internal epoxy coating (tropicalized)

Sintered drain plug

Shaft Material: C45

Double grounding (1 inside terminal box + 2 on the frame)

Grease Caltex SRI-2 or SKF LGHP2



# Electric Motors Product Range

## FREQUENCY DRIVES – LV & MV



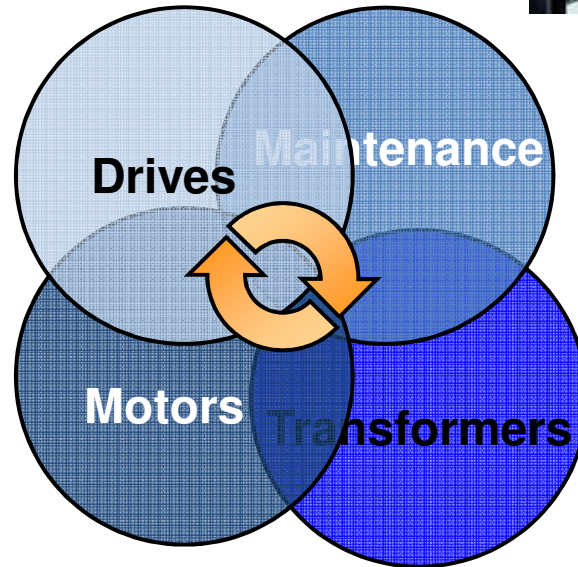
Range of power: 1 to 3 MW  
Voltage: 400 – 690 – 3.300 – 6.600 – 11.000 V





# Motors, Drives and Transformers

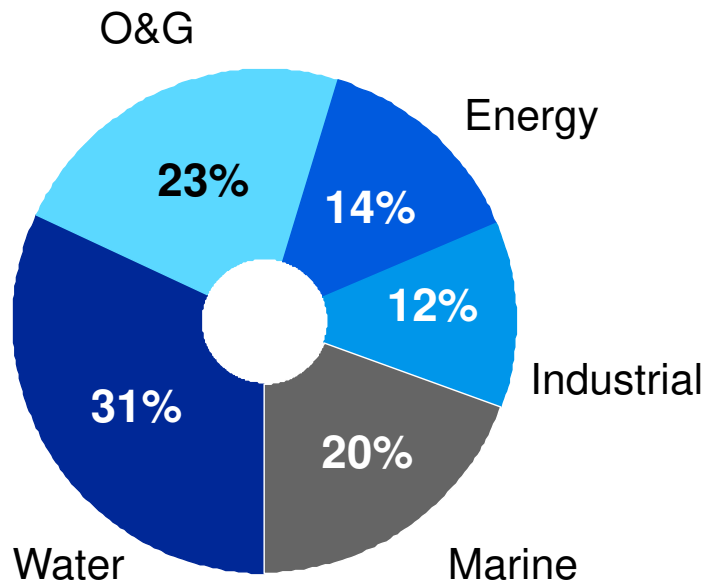
## Making Products work together



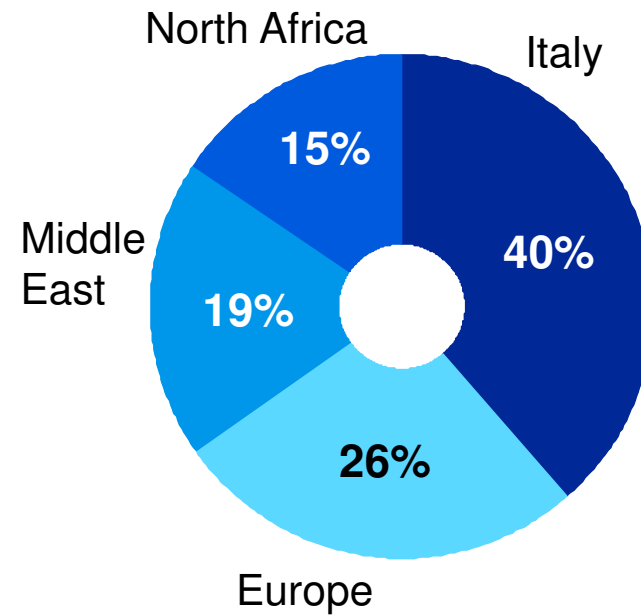
# Motors, Drives and Transformers Business

## Capturing Opportunities

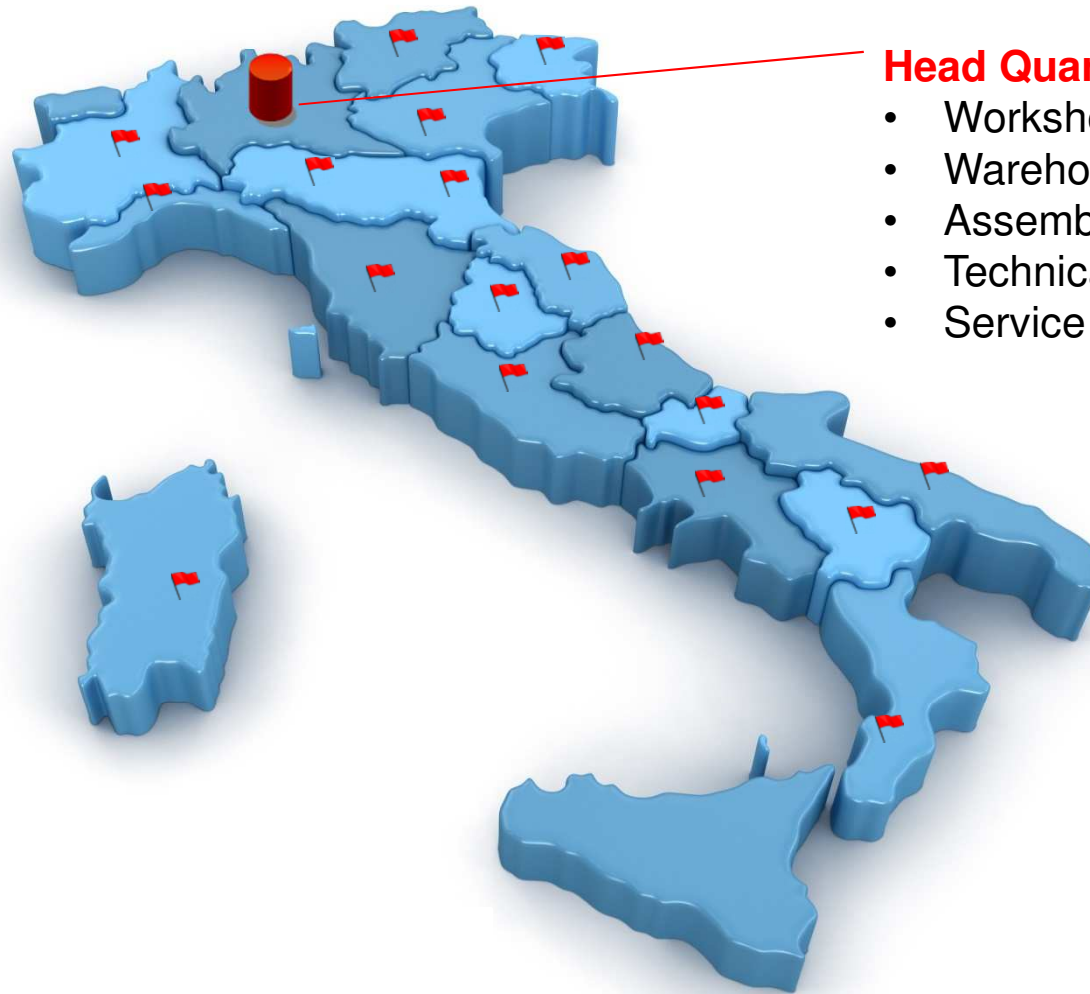
Orders by business sector  
*% of total orders 2018*



Orders by region  
*% of total orders 2018*



# Partners FELM CEAM Italia

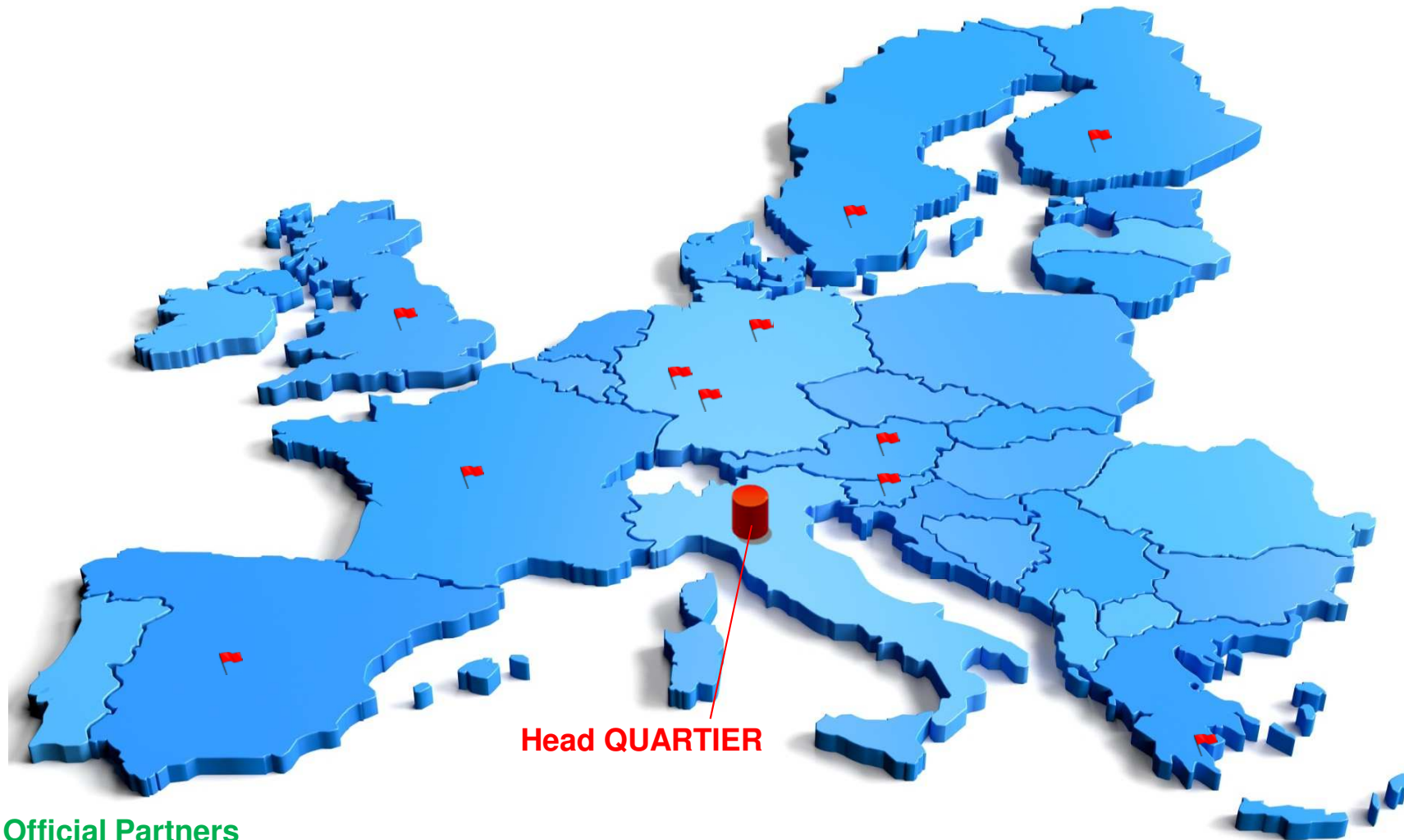


## Head Quartier at Inveruno

- Workshop
- Warehouse
- Assembling
- Technical Office
- Service



# Partners FELM EU



## Official Partners

Germany - Slovenia - Austria - Spain - UK

## Target of New Partners

France - Scandinavia - Greece



# Motors, Drives and Transformers

## Worldwide Partners



### Official Partners

Arab Emirates - Egypt - Morocco - Tunisia - Lebanon - Pakistan - South Korea - China

### Target of New Partners

Iran - Iraq - US & Canada (in stand by) - South America



# Motors, Drives and Transformers

## Head Quarter - Manufacturing - Warehouse

### About us:

Our large stock of electric motors (offices, workshop and warehouses cover more than 25,000 m<sup>2</sup>) from 0.18 to 5MW and a widespread distribution network.

FELM guarantees product availability and fast delivery across EMEA Region.

### Warehouses:

- Inveruno (Milano), Italy - 13,000 m<sup>2</sup>
  - Via Varese 3,500 m<sup>2</sup> head quarter office + warehouse
  - Via Morandi 6,000 m<sup>2</sup> workshop and warehouse
  - Via Fattori 3,500 m<sup>2</sup> warehouse
- Castano Primo (Milano), Italy - 2,500 m<sup>2</sup>
  - Winding and Repair for HV Motors from 300 to 3 MW
- Turbigo (Milano), Italy - 1,500 m<sup>2</sup>
  - Winding and Repair for LV Motors from 1 to 1500 kW + brake motors up to 55 kW



# Motors, Drives and Transformers

## Head Quarter - Manufacturing - Warehouse



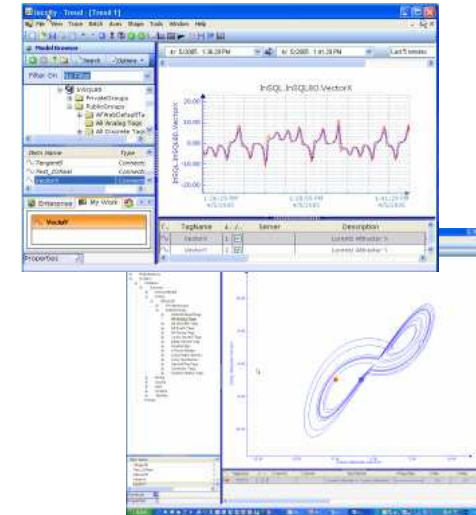
# Motors, Drives and Transformers

## Technical Office and Service

Composed by a team with a large experiences matured with prestigious companies like:  
Leroy Somer, ElectroAdda and ABB.

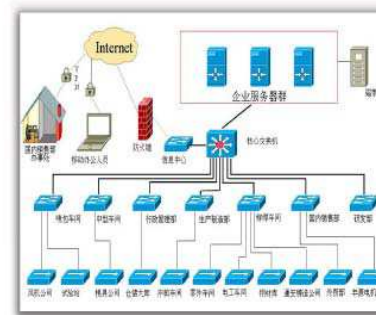
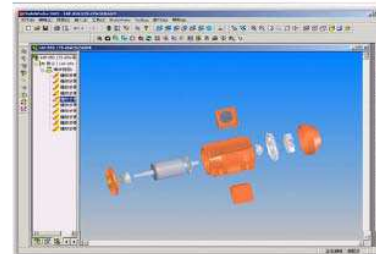
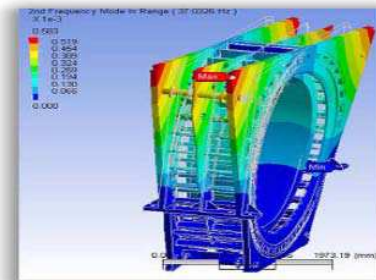
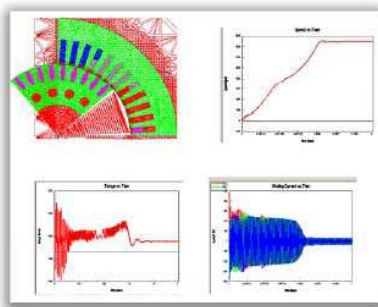
Software Programs: AutoCAD and DWG

Calculation Motors program

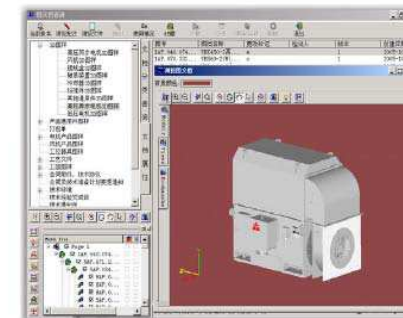


### FEA/CAD/CAE

- 3-D CAD (Solidworks)
- Electromagnetic design (Ansoft)
- Mechanical Design (Ansys)



Network Topogram



PDM





# Motors, Drives and Transformers

## Manufacturing & Workshop



# Motors, Drives and Transformers Manufacturing & Workshop

## Motors customization:

Shape arrangement

Accessories

Special painting

Cable connection

Bearings arrangement

Forced ventilation

Selection of material for heavy environmental conditions

Special customer request

Application PT100, Heaters, Insulated Bearings

## Motors Instrumentation:

CT's Transformer, Surge Arrestor and Capacitor

Vibration probes

Transmitters



# Motors, Drives and Transformers

## Testing Room



Low and MV Motors can be tested  
at our premises

Facility at Inveruno up to 160kW  
Facility close to Gorizia up to 3MW



# After Sales Service

## On Site Analyses

- Preliminary analysis
- Predictive monitoring system
- Vibration frequency analysis
- Sound pressure measurement
- Sound pressure octave band analysis
- Alignment motor - driven machine
- Wave shape analysis
- Check of dielectric strength
- Insulation resistance measurement
- Polarization index measurement
- Unbalance diagnostic
- Balancing built-in ISO balancing grades
- Balancing :Velocity, Acceleration or Displacement.
- Different types of balancing corrections
- Degrees, fixed mass or location, tape measure, “negative mass”



# Certifications

## In hand and in progress

Certified company UNI EN ISO 9001:2000  
CISQ / ICIM CERT. IT – 27970

In hand



ISO 9001:2000  
Cert. N°: 2508



Certificate Russian Market

Standard and special electric motors based on customer's specifications  
Trading of electric motors, accessories and spare parts



In progress



USA and Canada  
Market



Atex zone 21



# Contacts


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**Serving our clients for a better  
World**

