Product Range

Segment	Automotive / EV Traction Motors	Power Generation	HVAC / Refrigeration	Special Applications
Type of Enamel wire	• Dual Coat Enamel (DC) • Corona Resistant (CR) • Poly Imide (PI) • Poly Amide Imide (PAI) • Winding Wires & Strips	Dual Coat & PAI Enameled Wires	Dual Coat & PAI Enamelled Wires for Hermetic Applications	PI Enamelled Wires & PAI Enamelled Wires
Temperature class	180°C, 200°C & 220°C	200°C & 220° C	200°C & 220° C	200°C & 240°C
Applications	• Traction Motor • Hub Motor • Starter • Alternator • Magneto • Ignition Coil • Wiper Motor • Power Seat / Window Motor • Blower / Fan Motor • EPS/ABS Motor	Alternators, Generators	Compressors for Refrigeration & Air Conditioning	Smoke Extraction Motors, BLDC Motors
Packaging	KSH can supply in different types of spools including PP (PT20 to PT90), ABS (PT45 to PT200) and Wooden (as per customer winding requirements)			

Tests Comparison

Corana Resistant Enamel Wire Vs. Dual Coat Enamel Wire (1.25mm Grade-2)

Tests	Specifications		Observed Value	
			Corana Resistant Enamel Wire	Dual Coat Enamel Wire
Abrasion Resistance (N)	Min:	11.00	15.00	14.50
	Avg:	12.90	16.00	16.67
Thermal Test				
Cut-Through	To pass at 320°C for 2 min minutes		Pass	Pass
Breakdown Voltage (KV)				
At 200° C	Min:	3.8	9.90 ~ 10.30	9.80 ~ 10.60
At Room Temperature	Min:	5.0	12.60 ~ 14.40	12.30 ~ 14.40
Corona Resistant performance (Pulse Endurance Test)	>30h		> 100 Hrs.	10 minutes

Reference Specifications

Winding Wires for Electric Vehicles & Automotive Applications can be tailored to suit customer specifications in order to improve performance for winding. Customised products are designed to meet international norms such as ISO, IEC, ASTM etc. or the respective national standards.

KSH manufacturing facilities for round and rectangular enamelled winding wires are certified for IATF 16949:2016 .

IATF 16949:2016

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Winding Wires for Electric Vehicles (EV)

Typical Applications

- Traction Motor
- Hub Motor
- Starter & Alternators
- Magneto & Ignition Coil
- Wiper Motor
- Power Window / Seat Motor
- Blower / Fan Motor
- EPS Motor & ABS Motor

EV Motor Technology

Electric motor designs have significantly improved the power density for Hybrid & Electric Vehicle applications. Many of these improvements have been through the use of more exotic materials (Rare earth magnets, High grade electrical steels, etc.). However, significant design improvements have been made through the insulation system design (magnet wire, insulating papers and other materials within the stator). Specifically related to Magnet Wire, the accepted standards of yesterday would not allow for the successful operation of today's HEV & EV motors.

Critical parameters for design of winding wires for HEV & EV motors are High Operating Voltages, Increased Fill Factor, Chemical Compatibility, Greater Flexibility Requirements & Increased Thermal Requirements.

Why Corona Resistant Enamels

There is need of inverters for EV Traction motors to control speed and torque of motor. However it generates transient voltages due to switching electronic devices. When surge voltages exceeds Partial Discharge Inception Voltage (PDIV) Amplitude, Partial Discharges (PD) takes place. PD's erode organic enamels and reduces life of the enamelled wires drastically. For this application we need specially designed "Nano Structured Enamels" to sustain PD's and increase life of machine.

KSH Corona resistant enamel coated wires offer excellent solution for the above problems.

Typical Temperature class & Enamels used

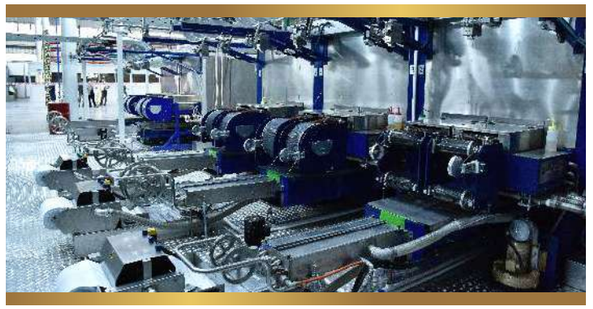
- **PEI & PAI based wires**
  - Class 180 PEI Wires
  - Class 200 PEI+PAI Wires
- **Corona Resistant wires**
  - Class 200 CR PEI +PAI Wires
  - Class 200 PEI + CR PAI Wires
  - Class 220 CR PAI Wires
- **PI based wires**
  - Class 240 Polyimides Wires

Type of Motors

- **BLDC:** Brushless DC (BLDC) motors are a common choice for electric vehicles (EVs) because of their high efficiency, reliability, and performance.
- **PMSM :** Permanent magnet synchronous motors (PMSMs) are a common choice for electric vehicles (EVs) because of their high efficiency, power density, torque, low noise and Fast acceleration and deceleration, smooth rotation over the entire speed range.
- **IM:** Induction motors have many advantages for electric vehicles (EVs), including Cost-effectiveness, Durability, Efficiency, High torque density, Simple construction, No risk of demagnetization.

Solutions for EV Segment

KSH offers Robust Solutions for EV & Automotive segment	Dedicated state of the art plant machines for serving automotive segment. Develop individual solutions for specific motor / system design and manufacturing processes.		
	Provide a world-class magnet wire product that meets and exceeds customer's specification and expectations throughout the product life cycle.		
	Be a one stop solution provider for all types enameled copper wire requirements for EV motors		
KSH Special Test Capabilities	Pulse Endurance Tester	PDIV / PDEV Tester	Voltage Endurance Tester



Enamelling Line: Fully Automated Process

Enamelling Line: Latest Technology

Product Details

Enamelled Copper Magnet Wires for EV Motors Specifications

Type of Wire	Round Wire			Flat Wire		
Size Range	0.2 - 4.0 mm			**Width**	3.0 - 8.0 mm	
				Thickness	0.8 - 3.0 mm	
				CS Area	≤15 mm^2	
Insulation Type	**PEI + PAI**	**PAI**	**Inverter Duty**	**PEI + PAI**	**PAI**	**Inverter Duty**
Thermal Class (°C)	**200**	**220**	**200**	**200**	**220**	**200**
Coating Thickness Range	**Grade 1 - Grade 3**			**Total Insulation Build: 0.300 Max**		
Corona Resistance	↔	↔	↑↑	↔	↔	↑↑
Abrasion Resistance	↑	↑	↑	↑	↑	↑

Advanced Quality Testing Lab

Stringent Quality Assurance