

# Stator Coil Insulation Systems

Designed for operation with minimal maintenance



ABB's LV200, LV VPI 300s, LV400, HV VPI, and HV600 insulation systems are designed with the latest materials and processes to meet industry standards. When coupled with proven stator engineering design standards, the stator winding will provide years of trouble-free operation with minimal maintenance.

## Overview

For nearly forty years, GE's GEGARD™ insulation systems have been used for motor and generator stator windings. In 2018, ABB acquired the GE Industrial Solutions business. The insulation systems have been maintained and only the names have changed to LV200 (Low Voltage), LV VPI 300S (Low Voltage), LV400 (Low Voltage), HV VPI (High Voltage) and HV600 (High Voltage). The design, manufacture, and installation of the stator windings are critical elements to a motor and generator's reliability and performance. The insulation systems have been well proven over many decades of operation at power plants across the globe. Using qualified suppliers to manufacture the stator coils to our design procedures and requirements, the stator coils are then installed by ABB.

## LV VPI 300s — Low Voltage

LV VPI 300s is a Class F insulation system applicable across a wide spectrum of applications. Characteristics include:

- Most common in rewinds of low voltage industrial motors and generators rated 6.9 kV and below
- Increased ability to resist mechanical vibrations and penetration by moisture and other contaminants
- Provides excellent heat transfer and a cooler running motor
- Recommended for windings requiring sealing protection against severe duty contaminants
- The slot section and end turns of the coil are insulated with the design-specific number of half-lapped layers of micamat tape followed by untreated glass armor
- Manufactured by qualified coil manufacturing facilities following strict adherence to ABB's insulation system requirements
- Sealed leads are fully taped for protection from environmental conditions
- 100% tested to ABB and IEEE standards for turn and ground-wall insulation integrity, both during manufacturing and after installation

### HV VPI — High Voltage

HV VPI is a Class F insulation system applicable across a wide spectrum of applications. Characteristics include:

- Most common in rewinds of high voltage industrial motors and generators rated 6.9 kV and above
- Increased ability to resist mechanical vibrations and penetration by moisture and other contaminants
- Provides excellent heat transfer and a cooler running motor
- Recommended for windings requiring sealing protection against severe duty contaminants
- The slot section and end turns of the coil are insulated with the design-specific number of half-lapped layers of micamat tape followed by conducting armor (slot section) and grading tape and untreated glass armor on end turns
- Manufactured by qualified coil manufacturing facilities following strict adherence to ABB's insulation system requirements
- Sealed leads are fully taped for protection from environmental conditions
- 100% tested to ABB and IEEE standards for turn and ground-wall insulation integrity, both during manufacturing and after installation

Standard features	LV VPI 300s (Low voltage – typically less than 7 kV)	HV VPI (High Voltage – 7 kV to 15 kV)
<b>Insulation system</b>	Fused polyester glass or Esterimide magnet wire	Fused polyester glass or Esterimide magnet wire
	Electrolytic tough pitch copper	Electrolytic tough pitch copper
	Bonded strands/turns	Bonded strands/turns
	Micamat tapes and glass tape armor	Micamat tapes
	Corona suppression system (4200V & above) Conducting armor and grading tape	Corona suppression system (4200V & above) Conducting armor and grading tape
	N/A	Glass tape armor on the end turn section of coils
	Taped and sealed leads	Taped and sealed leads
	Transposition (as required)	Transposition (as required)
	Polyester or epoxy resin VPI treatments	Epoxy resin VPI treatments
<b>Manufacturing quality</b>	100% dimensional checks	100% dimensional checks
	100% unit specific mock stator checks to help ensure proper design clearances and fit	100% unit specific mock stator checks to help ensure proper design clearances and fit
	Strand/continuity test (120 volt AC)	Strand/continuity test (120 volt AC)
	100% surge comparison test per IEEE 522	100% surge comparison test per IEEE 522
	100% high potential tests above IEEE standard	100% high potential tests above IEEE standard
<b>Installation</b>	Brazed connections - series loops, circuit rings, cable connections	Brazed connections - series loops, circuit rings, cable connections
	Slot support system - wedge system including semi-conductive fillers when required	Slot support system - wedge system including semi-conductive fillers when required
	Stator winding bracing system designed specifically for each application	Stator winding bracing system designed specifically for each application
	100% in-process and final electrical testing of windings after VPI treatment (surge comparison, hi-pot and resistance)	100% in-process and final electrical testing of windings after VPI treatment (surge comparison, hi-pot and resistance)

### LV400 — Low Voltage

LV400 is a Class F insulation system applicable across a wide spectrum of applications.

Characteristics include:

- Most common in rewinds of low voltage industrial motors and generators rated 6.9 kV and below
- Flexible but rugged insulation system provides a barrier to moisture, oil, solvents, or other aggressive materials
- Utilizes glass-reinforced mica tapes for both ground and turn insulation
- The slot section and ends of the coil are insulated with the design specific number of half-lapped layers of micamat tape and finished with a “B” stage resin rich armor tape. The coils are then baked at high temperature and cured to develop the required dielectric and mechanical strengths.
- Manufactured by qualified coil manufacturing facilities following strict adherence to ABB’s insulation system requirements
- Sealed leads are fully taped for protection from environmental conditions
- 100% tested to ABB and IEEE standards for turn and ground-wall insulation integrity, both during manufacturing and after installation

### HV600 — High Voltage

HV600 is a Class F insulation system that incorporates use of “B” stage epoxy resin rich mica tapes.

Characteristics include:

- Service proven, rugged insulation system for rewind of high voltage (typically 7 kV to 15 kV) windings
- Specifically designed Class F materials and manufacturing processes in qualified supplier’s facility
- During the manufacturing process, constant tension taping machines are used to apply the B-staged tapes, helping ensure uniform lapping and tightness
- The coils are compacted into a homogeneous, virtually void-free insulation structure utilizing state-of-the-art hot press technology to help ensure precise alignment and fit during site installation
- Rigorous in-process testing to help ensure high quality product
- 100% final testing includes strand-to-strand/continuity test, dissipation factor testing, surge comparison testing, high-potential testing, surface resistivity, and mechanical inspection
- Stator winding components including support rings, circuit rings, and associated connections utilizing the same insulation system
- Corona suppression system consisting of slot armor tape and grading tapes fully processed during manufacturing

Standard features	LV400 (Low Voltage – typically less than 7 kV)	HV600 (High Voltage – 7 kV to 15 kV)
<b>Insulation system</b>	Fused polyester glass or Esterimide magnet wire	Double Dacron glass or Film + Mica insulated wire
	Electrolytic tough pitch copper	Electrolytic tough pitch copper
	Bonded strands/turns	Bonded strands/turns
	Taped and sealed leads	Taped and sealed leads
	Mica paper polyester film and glass tapes	Hot press consolidation of turn and ground-wall insulation
	“B” stage epoxy armor tapes	“B” stage epoxy resin rich mica tapes
	Corona suppression system (4200V & above) Conducting armor and grading tape	Corona suppression system - Conducting armor and grading tape
	Transposition (as required)	Transposition (as required)
	Polyester resin treatments	Flexible end turns (if required)
<b>Manufacturing quality</b>	100% dimensional checks	100% dimensional checks
	100% unit specific mock stator checks to help ensure proper design clearances and fit at site	100% unit specific mock stator checks to help ensure proper design clearances and fit at site
	Strand/continuity test (120 volt AC)	Strand/continuity test (120 volt AC)
	Surface resistivity (4.2 kV and above)	Surface resistivity (4.2 kV and above)
	100% surge comparison test per IEEE 522	100% surge comparison test per IEEE 522
	100% high potential tests above IEEE standard	100% high potential tests above IEEE standard
	N/A	Dissipation factor testing per IEEE 286
	N/A	Voltage endurance test per IEEE 1553 if required by contract
<b>Installation</b>	Brazed connections - series loops, circuit rings, cable connections	Brazed connections - series loops, circuit rings, cable connections
	Slot support system - wedge system including semi-conductive fillers when required	Slot support system – wedge system including tapered sliders, top ripple springs, side ripple springs, semi-conductive fillers
	Stator winding bracing system designed specifically for each application	Stator winding bracing system designed specifically for each application
	100% in-process and final electrical testing of windings after insertion (surge comparison, hi-pot and resistance)	100% in-process and final electrical testing of windings after insertion (surge comparison, hi-pot and resistance)

**LV200 — Low Voltage**

LV200 is a Class F insulation system, ideal for drip-proof and TEFC motor and generators. Characteristics include:

- Most common in rewinds of low voltage industrial motors and generators rated 6.9 kV and below
- Flexible but rugged insulation system provides a barrier to moisture, oil, solvents, or other aggressive materials
- Utilizes glass-reinforced mica tapes for both ground and turn insulation
- The slot section and ends of the coil are insulated with the design-specific number of half-lapped layers of micamat tape. The coils are resin treated, then baked at high temperature and cured to develop the required dielectric and mechanical strengths
- Manufactured by qualified coil manufacturing facilities following strict adherence to ABB’s insulation system requirements
- Sealed leads are fully taped for protection from environmental conditions
- 100% tested to ABB and IEEE standards for turn and ground-wall insulation integrity, both during manufacturing and after installation

Standard features	LV200 (Low Voltage – typically less than 7 kV)
<b>Insulation system</b>	Fused polyester glass or Esterimide magnet wire
	Electrolytic tough pitch copper
	Bonded strands/turns
	Taped and sealed leads
	Mica paper polyester film and glass tapes
	“B” stage epoxy armor tapes
	Corona suppression system (4200V & above)
	Transposition (as required)
	Polyester resin treatments
	<b>Manufacturing quality</b>
100% unit specific mock stator checks to ensure proper design clearances and fit at site	
Strand/continuity test (120 volt AC)	
Surface resistivity (4.2 kV and above)	
100% surge comparison test per IEEE 522	
<b>Installation</b>	100% high potential tests above IEEE standard
	Brazed connections - series loops, circuit rings, cable connections
	Slot support system - wedge system including semi-conductive fillers when required
	Stator winding bracing system designed specifically for each application
	100% in-process and final electrical testing of windings after insertion (surge comparison, hi-pot and resistance)

**Contact us**

For more information, call toll free +1 888 434 7378 or visit [electrification.us.abb.com/services](http://electrification.us.abb.com/services).