

Hydro Generator Stator Coil and Bar Insulation Systems

ABB Electrification Industrial Solutions



ABB's HV600 and LV400 insulation systems are designed with the latest materials and processes to meet stringent customer specifications. When coupled with proven stator engineering design standards the stator winding will provide years of trouble-free operation with minimum maintenance.

Overview

For nearly forty years, GE's GEGARD™ insulation systems have been used for hydro and thermal generator applications, as well as motor stator windings. In 2018, ABB acquired the Hydro Services business from GE Industrial Solutions, including the facility (located in Beloeil, Quebec, Canada) where the high voltage stator windings continue to be manufactured. The insulation systems have been maintained, only the names have changed to HV600 (High Voltage) and LV400 (Low Voltage). The design, manufacture and installation of the stator windings are critical elements to a generator and motor 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 materials and ISO 9001 accredited procedures, the windings designed, manufactured and installed by ABB in hydro generators continually surpass the IEEE requirement standards.

HV600 — High Voltage

HV600 is a Class F insulation system which incorporates use of "B" stage epoxy resin rich mica tapes and computerized manufacturing equipment to produce coils and bars capable of significantly uprating existing hydro generators.

Characteristics include:

- Service proven, rugged insulation system for rewind of high voltage (typically 7 kV to 15 kV) hydro generators
- Specifically, designed Class F materials and manufacturing processes in ABB's dedicated facility
- During the manufacturing process, constant tension taping machines are used to apply the B-staged tapes, ensuring uniform lapping and tightness is achieved
- The coils/bars are compacted into a homogenous, virtually void-free insulation structure utilizing state-of-the-art hot press technology to ensure precise alignment and fit during site installation
- Rigorous in-process testing to 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

LV600 — 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 hydro generators and industrial motors 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.

Standard features	LV400 (Low Voltage – Typically Less Than 7 kV) Type Winding: Stator Coils Only	HV600 (High Voltage – 7 kV to 15 kV) Type Winding: Stator Bar or Coil	
Insulation System	Fused polyester glass or Esterimide magnet wire	Double Dacron glass insulated wire	
	Electrolytic tough pitch copper	Electrolytic tough pitch copper	
	“B” stage epoxy armor tapes	“B” stage epoxy resin rich mica tapes	
	Taped and sealed leads	Taped and sealed leads	
	Corona suppression system (4200V & above)	Corona suppression system	
	180-degree inverted turn transposition (as required)	180-degree inverted turn transposition (coil)	
	Bonded strands/turns	360-degree transposition (Roebel bar)	
	Mica paper polyester film and glass tapes	Hot press consolidation of turn and ground-wall insulation	
	Polyester resin treatments	Flexible end turns supporting site installation	
	Manufacturing Quality	100% dimensional checks	100% dimensional checks
100% unit specific mock stator checks to ensure proper design clearances and fit at site		100% unit specific mock stator checks to 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	
		Dissipation factor testing per IEEE 286	
		Voltage endurance test per IEEE 1553 as required by contract	
Site Installation		Brazed connections - series loops, circuitrings, 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)	
	Unit specific Quality Assurance Report (QAR) Program details all site installation requirements with acceptance criteria	Unit specific Quality Assurance Report (QAR) Program details all site installation requirements with acceptance criteria	

Contact us:

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