SIEMENS

Compare the new Siemens 3FL insulators

Long rod insulators – design comparison

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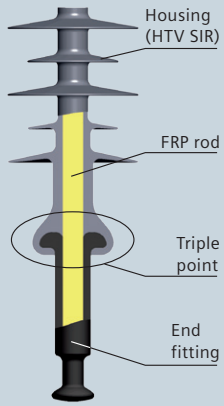
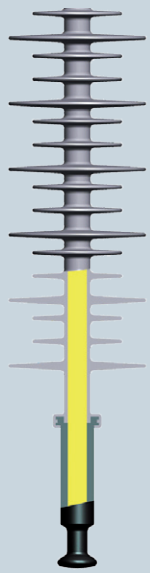
Answers for energy.

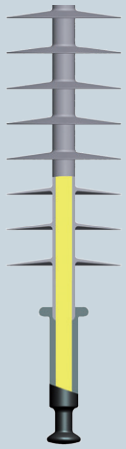
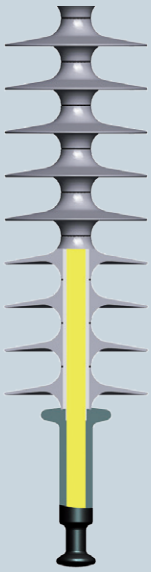
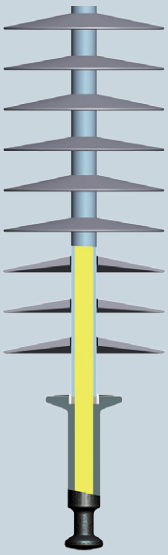
3FL silicone long rod insulators – performance meets durability

Suspension insulators for overhead power lines are subjected to severe physical and chemical stresses over their service life. These stresses can be electrical or mechanical in nature, or they can result from the local environmental conditions. The short- and long-term performance of polymer long rod insulators and how they can continue to function reliably is critically dependent upon their material and design characteristics.

Siemens 3FL silicone suspension insulators offer significant advantages over the other insulators on the market today. They combine the finest raw materials with a superior insulator design, providing excellent functionality, outstanding performance, highest quality, and long life.

	Design	Characteristics	Advantage ⊕ / Disadvantage ⊖	Effect ● positive / ● negative
3FL	**One-piece housing with overmolding system and with built-in E-field control** 	**Housing:** One-piece HTV silicone rubber, i.e. weathersheds and core sheath are a single piece.	⊕ No additional housing interfaces ⊕ Most robust housing ⊕ UV-resistance of silicone	● No housing erosion
		Core rod: ECR-glass[1] (boron-free) epoxy resin FRP[2] rod	⊕ Brittle-free core rod ⊕ Hydrolysis- and acid-resistant	● No brittle fracture
		Sealing: Overmolding system: triple point (core-fitting-housing) is totally encapsulated in the HTV silicone housing	⊕ Perfectly sealed triple point during the high-pressure injection-molding process ⊕ No additional sealing used	● No moisture ingress ● No risk of brittle fracture
		E-field control: Integrated inner grading ring (on both upper and bottom end fittings) for reduction of E-field stress in the triple point	⊕ Minimized electrical stress at the triple point	● Minimized corona effects ● No risk of sealing erosion → Extended service life
Competition	**One-piece housing with overmolding system** 	**Housing:** One-piece silicone rubber or EPDM	⊕ No additional housing interfaces ⊖ EPDM not UV-resistant	● No housing erosion ● severe ageing of EPDM
		Core rod: E- or ECR-glass FRP rod	⊕ ECR-glass: brittle-free core rod (hydrolysis- and acid-resistant)	● No brittle fracture
			⊖ E-glass FRP rod: core rod is not acid-resistant	● Brittle fracture of the core rod
		Sealing: Overmolding system: triple point (core-fitting-housing) is over-molded thinly with a small part of the polymer housing	⊕ No additional sealing used ⊖ Overlapping protection is not sufficiently strong	● Sealing erosion ● Moisture ingress
		E-field control: No integrated grading ring is used End fittings have very small and edged rim concentrating E-field strengths in the triple point without modeling an integrated grading ring	⊖ No E-field reduction in triple point ⊖ Permanently high electrical stress (partial/corona discharges) at the triple point	● High electrical stress ● Sealing erosion ● Moisture ingress ● Brittle fracture → Total mechanical insulator failure!

1 ECR-glass: Electrical- and corrosion-resistant glass 2 FRP rod: fiber-reinforced plastic rod

	Design	Characteristics	Advantage ⊕ / Disadvantage ⊖	Effect ● positive / ● negative
Competition	**One-piece housing without overmolding system** 	**Housing:** One-piece silicone rubber or EPDM	⊕ No additional housing interfaces ⊖ EPDM not UV-resistant	● No housing erosion ● severe ageing of EPDM
		Core rod: E- or ECR-glass FRP rod	⊕ ECR-glass: brittle-free core rod (hydrolysis- and acid-resistant)	● No brittle fracture
			⊖ E-glass FRP rod: core rod is not acid-resistant	● Brittle fracture of the core rod
		Sealing: Triple point (housing-fitting-air) is exposed to all weather and environmental conditions → additional sealing layer at this juncture is needed	⊖ Additional (erosion-prone) sealing is used	● Sealing erosion ● Moisture ingress
		E-field control: The point of the highest E-field strength correlates with the triple point (housing-fitting-air)	⊖ Permanently high electrical stress (partial/corona discharges) at the triple point	● High electrical stress ● Sealing erosion ● Moisture ingress ● Brittle fracture → Total mechanical insulator failure!
Competition	**Modular design** 	**Housing:** • Silicone rubber or EPDM • Several housing modules, each including weathershed and core sheath → numerous module interfaces need to be sealed	⊖ Numerous housing interfaces ⊖ Numerous interface sealings used ⊖ EPDM not UV-resistant	● Erosion of individual module seals ● Moisture ingress ● severe ageing of EPDM
		Core rod: E- or ECR-glass FRP rod	⊕ ECR-glass: brittle-free core rod (hydrolysis- and acid-resistant)	● No brittle fracture
			⊖ E-glass FRP rod: core rod is not acid-resistant	● Brittle fracture of the core rod
		Sealing: Triple point (housing-fitting-air) is exposed to all weather and environmental conditions → additional sealing layer at this juncture is needed	⊖ Additional (erosion-prone) sealing used	● Sealing erosion ● Moisture ingress
		E-field control: The point of the highest E-field strength correlates with the triple point (housing-fitting-air)	⊖ Permanently high electrical stress (partial/corona discharges) at the triple point	● High electrical stress ● Sealing erosion ● Moisture ingress ● Brittle fracture → Total mechanical insulator failure!
Competition	**Stacked shed design** 	**Housing:** • Silicone rubber or EPDM • Certain number of separately molded individual weathersheds are applied and vulcanized additionally onto the core sheath	⊖ Numerous housing shed-to-sheath interfaces following the E-field direction ⊖ Numerous interface sealings used ⊖ EPDM not UV-resistant	● Erosion of individual shed-to-sheath interfaces/seals ● Moisture ingress ● severe ageing of EPDM
		Core rod: • E- or ECR-glass FRP rod • Core rod is covered individually with extruded polymer sheath	⊕ ECR-glass: brittle-free core rod (hydrolysis- and acid-resistant)	● No brittle fracture
			⊖ E-glass FRP rod: core rod is not acid-resistant	● Brittle fracture of the core rod
		Sealing: Triple point (housing-fitting-air) is exposed to all weather and environmental conditions → additional sealing layer at this juncture is needed	⊖ Additional (erosion-prone) sealing used	● Sealing erosion ● Moisture ingress
		E-field control: The point of the highest E-field strength correlates with the triple point (housing-fitting-air)	⊖ Permanently high electrical stress (partial/corona discharges) at the triple point	● High electrical stress ● Sealing erosion ● Moisture ingress ● Brittle fracture → Total mechanical insulator failure!

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