



**Generator
Technologies**

AvK[®]

Power Generation for
Small Hydro Power



Our Promise

At Cummins Generator Technologies, it's not just the products we make that sets us apart – it's how we engage our customers every day. The unique combination of knowledge, dependability and innovation we bring to each customer relationship turns everyday service into excellent efficiency, making it possible for them to compete more successfully throughout the world.

There for you™



Generating Energy From Water

Cummins Generator Technologies offers under the **AvK**® product brand a complete range of industrial synchronous generators that are robustly engineered and specifically designed to meet the rigorous challenges of the most arduous power generation applications and environments.

Small hydropower generation is playing a substantial role in meeting the rising global demand for electricity from renewable sources. From our extensive application experience and knowledge across power generation, Cummins Generator Technologies has the expertise to provide integrated design solutions in partnership with hydro turbine manufacturers and hydropower plant developers.

The **AvK**® generator range is designed for horizontal hydro turbine applications in the range of 0.5MVA – 11MVA, 4 to 14 pole. Our broad range allows for optimal technical integration with most types of hydro turbines – Francis, Kaplan, Pelton – enabling small hydro customers to achieve high performance ratings for both new and refurbishment projects.

AvK Brushless Synchronous Generators		
	DSG-Series (low voltage)	DIG Series (high voltage)
Voltage range:	400 – 690V	3.3kV – 13.8kV
Frequency (3-phase):	50 or 60Hz	50 or 60Hz
Rated power range(50/60Hz):	0.5 – 3 MVA	2 – 11MVA
Speed range(50/60Hz):	600 – 1800rpm	428 – 1800rpm
Number of poles:	4,6,8,10	4,6,8,10,12,14



Mechanical Features

Design

AvK manufactures a range of horizontal synchronous generators with different design modes to meet customers technical and application requirements. The basic design modes are IM1001 (B3) and IM1101 (B20) for horizontal mounting.

Frames are of rigid and robust steel construction and designed for high axial and radial forces caused by the water turbines. Generators can be completed with foundation equipment including steel frames or sole plates and anchoring fittings if required.

Protection

Standard **AvK** design is open drip-proof in accordance with IP23. Air inlet/dust filters as well as higher protection modes IP43, IP44, IP54 can be supplied. A wide range of cooling forms allows an optimum choice for operating and environmental conditions. Options include top-mounted air-to-air heat exchanger or air-to-water heat.

Rotor

The rotor is designed to meet the runaway speeds specific to hydro applications. Low vibration levels are achieved by dynamic balancing. Alternators may either have shaft end for elastic coupling or long shaft extensions for overhung mounting of turbine runners.

Bearings

Flanged sleeve bearings are highly suitable for radial and axial dynamic loads in hydro applications. Sleeve bearings provided are split type, to permit easy access for maintenance. Subject to frame size and speed they may be self-lubricated or force lubricated. For large generators mounted pedestal sleeve bearings (suitable for high axial or radial forces) can be supplied if required.



Electrical Features

Excitation System

Our generators have brushless excitation; the auxiliary exciter winding supplies the brushless AC exciter with current via the voltage regulator. The voltage generated by the exciter is rectified and fed to the generator rotor.

Automatic voltage regulator (AVR)

A range of digital AVR's are available, the type used depending on level of performance and functions required.

Typical AVR features :

- Voltage regulation in island mode ($\pm 0.5\%$)
- Power factor control in parallel operation with grid
- Reactive power droop balancing
- Frequency-dependent voltage reduction
- Under/over-excitation voltage protection
- Excitation fault diagnosis

Insulation: All windings conform to either Class F or Class H thermal insulation. Increased machine life and reliability is ensured through AvK's advanced insulation system: high-grade taping insulation, Resin Rich and Vacuum Pressure Impregnation (VPI) ensures excellent dielectric properties, enhanced dimensional and mechanical stability as well as superior chemical/moisture resistance.

Generator Protection

All AvK generators are fully assembled with their own bearing and stator winding detectors (RTD) for protection against thermal overload. Additionally generators can be fitted with equipment for monitoring:

- Inlet/outlet cooling air temperature
- Vibration
- Water leakage
- Rotating diodes
- Earth fault of main field winding

Testing

A comprehensive factory testing schedule is carried out on all generators to ensure optimum performance and reliability. Full load current and voltage testing is included. Standard balancing of the rotor is carried out in accordance with VDE 0530/IEC34-14.

Italy DIG150 (2500kVA)



Ecuador DIG171 (8500kVA)



Switzerland DSG125 (2500kVA)



Global Support

Technical Support and After Sales Service

Cummins Generator Technologies' engineers are available to provide technical information to assist in selecting the correct generator specifications that your job demands. We continue our support through commissioning and into after-sales service and support.

Our engineers are experienced professionals trained in electrical, electronic and mechanical skills. They in turn are supported by a worldwide spares and service network.

Our Global Service Network offers:

- 24 hour response to service emergencies - 7 days a week every day of the year
- Commissioning of generators on site
- Onsite bearing maintenance and bearing condition monitoring
- Onsite insulation integrity checks
- AVR and accessories set up on site
- Extensive aftermarket distribution for **AvK**® genuine parts.

Product Training

Product familiarity will ensure maximum productivity and optimum use of the generator. Our Customer Support department offers product training courses for engineers, operators, and service & support staff. Each course is individually tailored to suit the needs of the customer, the genset builder and the end-user.

Product familiarisation courses, with a choice of training modules - including generator control systems, applications, trouble-shooting, maintenance or other specific requirements are also available.

Vibration Analysis

We use sophisticated design tools to analyse the impacts of external torsional and linear vibrations on the generator, and work closely with our customers to solve their vibration issues.



Contact

For further details of our generator range for Small Hydro Power, please contact our **AvK** sales offices:

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