



**AvK<sup>®</sup>**

# Product Guide

There for you<sup>™</sup>



**Generator  
Technologies**



Versatile, robust and reliable brushless  
ac generators from 600 to 20,000 kVA



## Brushless AC Generators up to 20,000 kVA

Cummins Generator Technologies offers a range of quality products under the AvK product brand name from 600 kVA to 20,000 kVA, that meet the critical needs of various applications - be it in extraction of oil, gas, coal and minerals, or to keep the economy moving with the freight of commodities by providing critical marine power to tankers and container vessels, or by providing dependable power with various prime movers like diesel engines, gas engines, steam turbines, gas turbines or wind turbines in power plant applications.

We use the experience and knowledge gathered with the large number and diverse applications of synchronous generator installations worldwide to provide expertise in offering integrated design solutions that help our customers compete more successfully throughout the world.

### Features and Options

Rated Power:	600 kVA to 20,000 kVA
Rated voltage:	380V - 13.8kV
Rated frequency:	50 and 60 Hz
Speed:	500, 514, 600, 720, 750, 900, 1000, 1200, 1500, 1800 rpm
Protection:	IP23, IP23 with SOLAS, IP44, IP54, IP55
Cooling:	IC01/IC0A1, IC81W/IC8A1W7
Design:	IM 1001, IM 1101, IM 1005, IM 1105, IM 1205, IM 1305, IM 2401, IM 2001, IM 2101 are available on request.

### Standards

AvK industrial generators meet the requirements of IEC/EN60034, BS5000 and VDE0530. Our marine generators may be certified to Lloyds, DNV, Bureau Veritas, ABS, Germanischer-Lloyd, RINA, China Classification Society, Korean Register of Shipping and Russian Maritime Register of Shipping. Details on conformance to requirements of other societies can be obtained from our sales offices.

### Quality Assurance

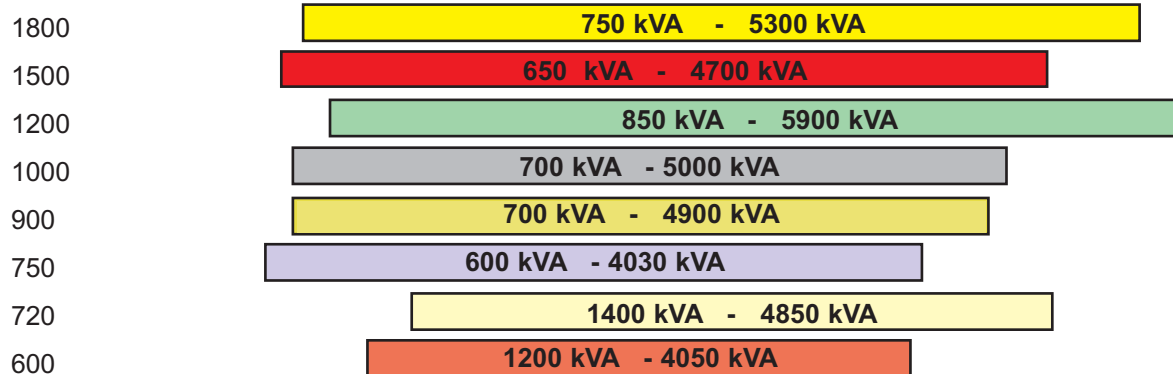
All generators are designed and manufactured to QA procedures conforming to ISO 9001.



## Product Range

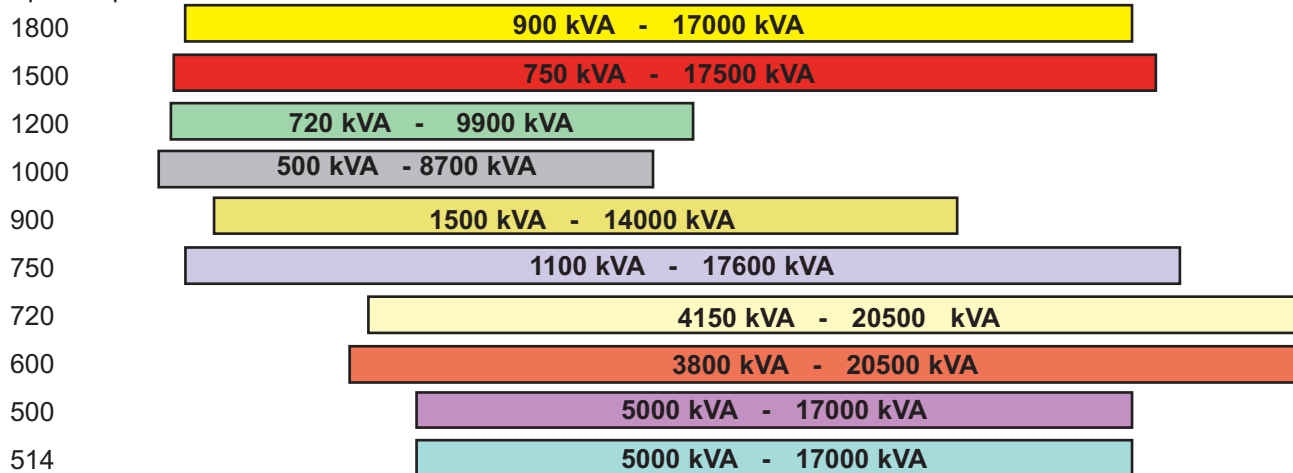
### Low Voltage Synchronous Generators 380V - 690V Power Range 600 - 5,900 kVA

Speed rpm



### Medium / High Voltage Synchronous Generators 2,4 kV - 13,8 kV Power Range 500 kVA - 20,500 kVA

Speed rpm



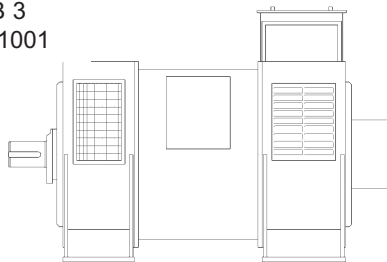
For higher ratings at specific speeds please check with the factory.



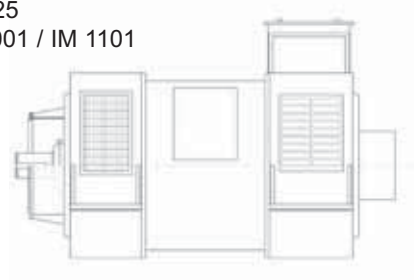
# Design

IEC 34 - 7  
DIN VDE 0530 - 7

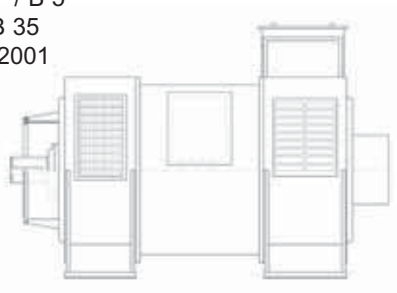
B 3  
IMB 3  
IM 1001



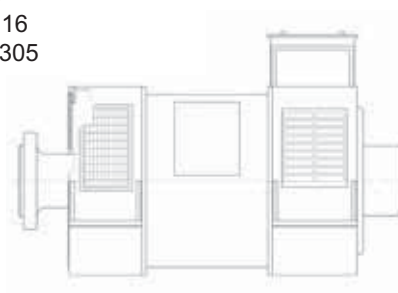
B 5 / B 20  
IMB 25  
IM 2001 / IM 1101



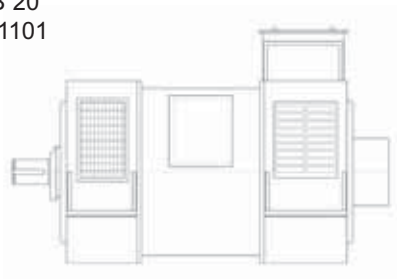
B 3 / B 5  
IMB 35  
IM 2001



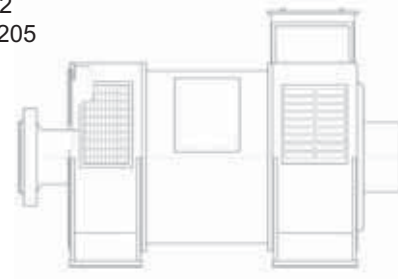
B 16  
IMB 16  
IM 1305



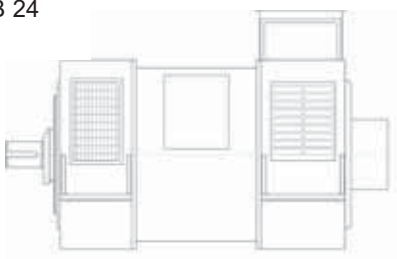
B 20  
IMB 20  
IM 1101



B 2  
IMB 2  
IM 1205



B 14 / B 20  
IMB 24





## Construction

### Stator

The stator cores are built from high grade lamination steel. The frame is mechanically designed to withstand tough applications and ensure that there is ample airflow to cool the windings. The windings are form wound for higher reliability and braced and supported to withstand the dynamic stresses generated by the electrodynamic forces involved.

### Rotor

The salient pole rotors have windings secured with wedges and end winding supports to withstand centrifugal forces. Damper windings are provided to reduce generator harmonics and absorb the impacts caused by unbalanced load conditions. The solid rotor acts as a damper in our generators above 6000 kVA. The dampers also reduce the system oscillations caused during parallel operation.

### Bearings

We offer anti-friction and sleeve bearings dependent upon the load, speed, ambient temperature and application in question. Please refer to factory for details.

For sleeve bearings, self lubrication is standard. Depending on the operating conditions, water cooling or forced lubrication can be provided. For safety reasons during transportation, we provide sleeve bearing alternators without oil filling.



## Automatic Voltage Regulator

### Excitation and Regulation

DM 110 digital AVR is used on AvK AC generators up to 5000 kVA. This AVR is either fitted or supplied loose, depending upon the application. For loads higher than 5000 kVA, the Unitrol 1000-15 AVR is the standard, and the DECS 200 AVR is available as an option. Both these AVRs are designed to be fitted into the control panel. All AVRs are electronic, solid-state, microprocessor based devices, with a regulation of  $\pm 0.5\%$  from no load to full load at steady state.

It is particularly suitable for non-linear load applications. Three phase sensing centres any voltage imbalance on the nominal voltages caused by load imbalances, and helps to ensure trouble-free operation under the most demanding loads.



### Short Circuit

Industrial machines will withstand a maximum short circuit of 300% of rated current, under a 3 phase (L-L-L) short circuit condition. The initial value of the short circuit current will be higher than 300%. (details can be obtained from the factory). The AVR will support the sustained short circuit condition for up to 10 seconds, at which point the AVR over-excitation protection system will de-excite the machine. This feature should not, however, replace the switchgear protection provided by the customer. Sustained current levels under 2 phase L-L or 1 phase L-N short circuit levels are much higher than the above L-L-L levels, and must be removed from the generator by breakers within 4 seconds for L-L faults, and within 2 seconds for L-N faults.

### Parallel Operation

All AvK generators are well suited for parallel operation with the mains utility or other generators. All AVRs have power factor control or reactive power control. For site conditions where the grid is weak and unstable, please refer to the factory.



## Protection and Cooling

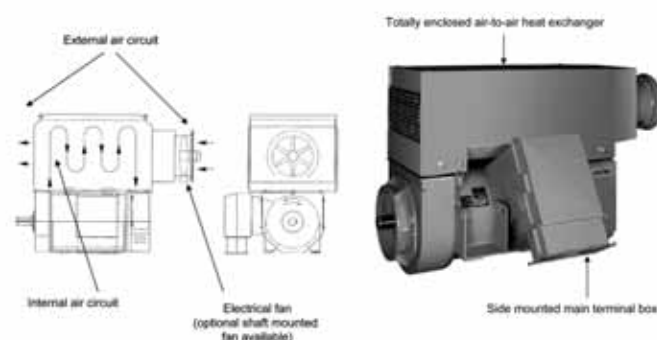
### Protection and Cooling

Our standard is the open drip-proof enclosure, suitable for clean air environments and where there are harsh environmental conditions, we can provide a variety of cooling and protection options.

The standard is IP23 and higher types of enclosure protection such as IP23 with filters, IP44, IP54, and IP55 can be supplied on request.

### Totally enclosed air to air cooled ( TEAAC/CACA)

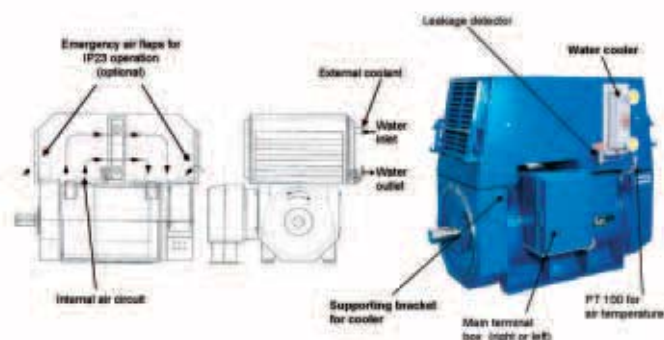
These are suitable for dusty environmental conditions, as found in mining, textile plants, oil & gas, quarries and wind applications. There are one or two internal fans that direct the enclosed air up and through an array of tubes, which are mounted on top of the generator. In the outer circuit, an external fan motor drives air through an outer sheet metal enclosure to cool the tubes, and the air is then exhausted on the drive-end side of the generator.



### Totally enclosed air to water cooled (TEWAC/CACW)

These are generally used when the volume of the ambient air available is restricted, as aboard a ship, or for other applications like steam turbine and CHP power plants where there is an abundance of water available for cooling.

There are one or two internal fans. Air is forced up and through air to water radiators within the generator enclosure. The heated air is cooled by the water in the tubes and recirculated through the generator to cool the windings. The radiator consists of an inner tube, and it may have an optional outer tube (recommended by AvK) to better protect against water leakage. A separate system to pump a continuous supply of cooling water through the radiator must be supplied on site, and is not in the scope of AvK.



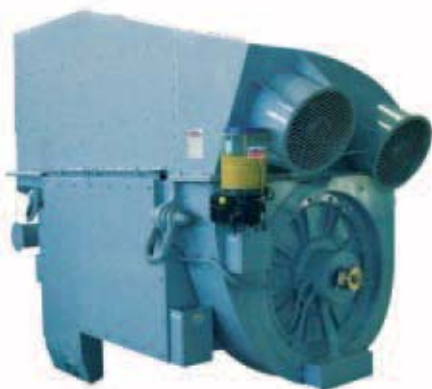


## Applications



### Marine

The form wound coil designs, along with the impregnation system and the choice of cooling and protection options have resulted in AvK machines withstanding harsh and critical marine power needs. They operate as shaft generators, PTI/PTO/PTH, in auxiliary gensets, or as main propulsion generators for diesel-electric applications in cruise liners, tankers, ice-breakers and offshore supply vessels. They comply with the requirements of most marine classification societies. AvK alternators with heat exchangers or air filters fulfil the requirements for local fire-fighting systems (SOLAS).



### Wind Turbines

Our synchronous wind alternator design, running at synchronous speed with variable speed gearboxes or alternatively, with variable speed drives, is designed for high efficiency and operating voltages up to 13.8 kV, thereby eliminating the need for local step-up transformers. This, along with the cooler construction involved, keeps the nacelle weight down. The subtransient and transient reactances are low to keep the machine in synchronism as long as possible for Low Voltage Ride Through (LVRT). The generator has provision for changing bearings in-situ.



### Oil and Gas

The form-wound coil design, robust mechanical design and tuning of the reactances help meet the power needs of oil rigs. Our DSG machines with Class H insulation can be derated for a Class B temperature rise, to ensure a long operating life. The insulation system is designed to withstand repeated surges caused by inverter-fed drives. Copper damper winding is designed to reduce the damper cage heating caused by non-linear loads on oil rigs.





## Applications

### Reciprocating Power Plants

Our high efficiency and integrated design solutions help our customers deliver the right packages for their power plant requirements. We work jointly with the set builder to develop a high degree of standardisation, resulting in shorter manufacturing times, which allow customers to deliver power plant packages ever more quickly. We also offer vibration analysis capabilities for proving the validity of genset designs or for solving the end users' vibration issues.



### Gas Turbines

We work closely with gas turbine manufacturers in sizing the appropriate AC generator and in developing integrated design solutions that enable the customer to supply compact packages necessary for transportable and containerized power plants.



### Steam Turbines

A stiff construction plus sleeve bearings help meet the low vibration requirements. We can also optionally supply provisions for vibration monitoring. The bearings are usually lubricated from the prime mover's oil circuit. We offer a wide range of cooling options to meet customer needs.





## Global Support

### Technical Support and After Sales Service

Cummins Generator Technologies' engineers are available to provide technical information before the sale to assist in selecting the correct generator specifications that the 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. You can call +49 841 792 163 during office hours (German Time Zone) and for field support after office hours, please call +44 1780 484732.

Our global service offers:

- Commissioning of generators on site.
- On-site insulation integrity checks.
- AVR and accessories set up on site
- Service parts are stocked in Germany and by our subsidiary companies, to ensure prompt availability of key 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

Generators coupled to reciprocating engines are exposed to engine induced vibrations. We use design tools to analyse the impact of linear and torsional vibrations, and work with the engine or genset builder to validate the design of the genset, as well as to solve end-user vibration issues. This technology is key in enabling customers to improve the innovation and reliability of new and current product designs.



## Our Promise

At Cummins Generator Technologies, it's not just the products we make that set us apart - it's how we engage our customers everyday. The unique combination of knowledge, dependability and innovation we bring to each customer relationship turns everyday service into excellent customer support. As a result we help our customers operate with greater efficiency, making it possible for them to compete more successfully throughout the world.

Cummins Generator Technologies manufactures the world's broadest range of ac generators from 0.5 to 20,000 kVA.



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