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Global Leader

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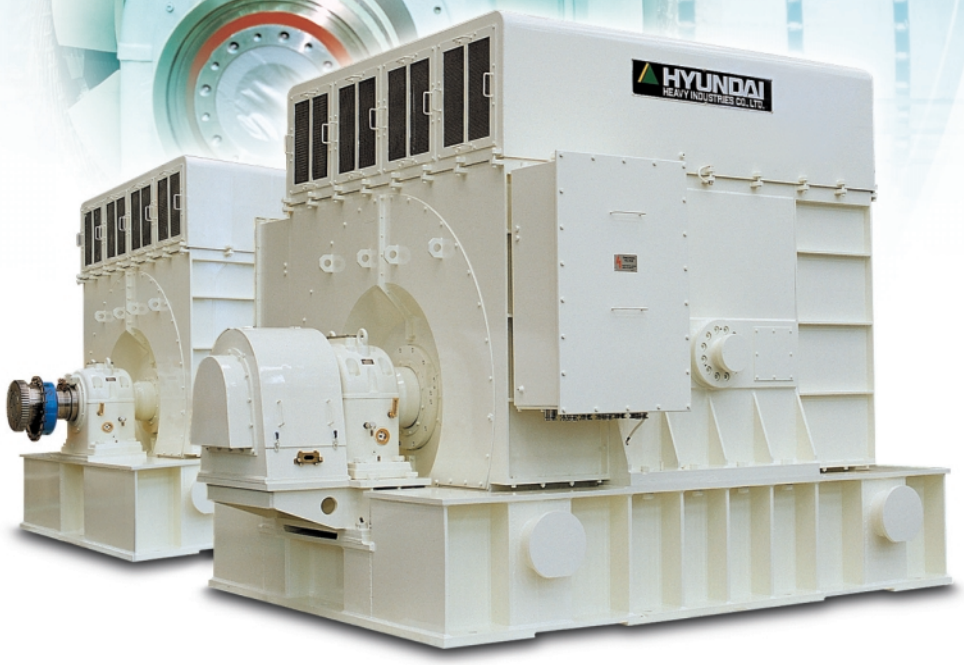
RvA C024
DNV Certification B.V., The Netherlands

Three-Phase
High Voltage Generators



HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

Three-Phase

High Voltage Generators

Outstanding Feature

Accumulated skill through variable experience and the manufacturing technique for turbine generator.

We have accumulated qualified skill over variable experience, providing worldwide customers with alternators for marine and industrial purposes. Based on two decades of accumulated skill, we have experience in manufacturing for large steam turbines of up to 612MVA, 22kV which requires the most highly developed techniques in the electric and mechanical fields. This reliable manufacturing technique has been reflected in our high voltage synchronous generator.

Most up-to-date insulation system.

Our high voltage synchronous generator has the best insulation system to meet the requirements of various environments such as moisture, water drips, water splashes, oils, heat, salt, dust, etc. The insulation quality has proven to be dependable due to a strictly controlled VPI insulation system and auto-tapping machine, etc. (VPI: Vacuum Pressure Impregnation.)

Skillful workmanship

We employ young workers with a high educational back-ground to bring up skilled professionals to enhance the quality of our products.

Computerized system

We can make highly qualified products and meet deliveries due to our computerized automation system which can manage sales, design, manufacturing, delivery, etc.

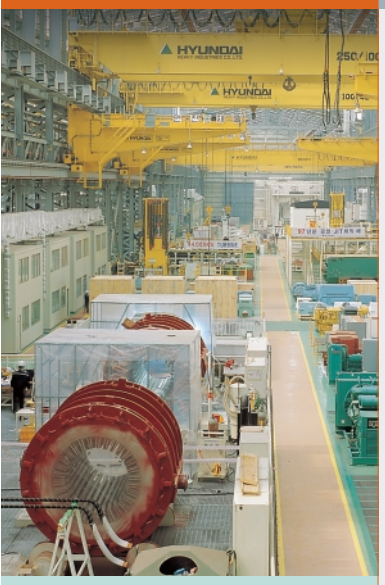
Quality control system

ISO 9001 has been applied to all process-design, production, test, and after-service functions. We have adopted the latest facilities and executed production identification systems to obtain strict quality control.

Three-Phase High Voltage Generators

Contents

High Voltage Synchronous Generator



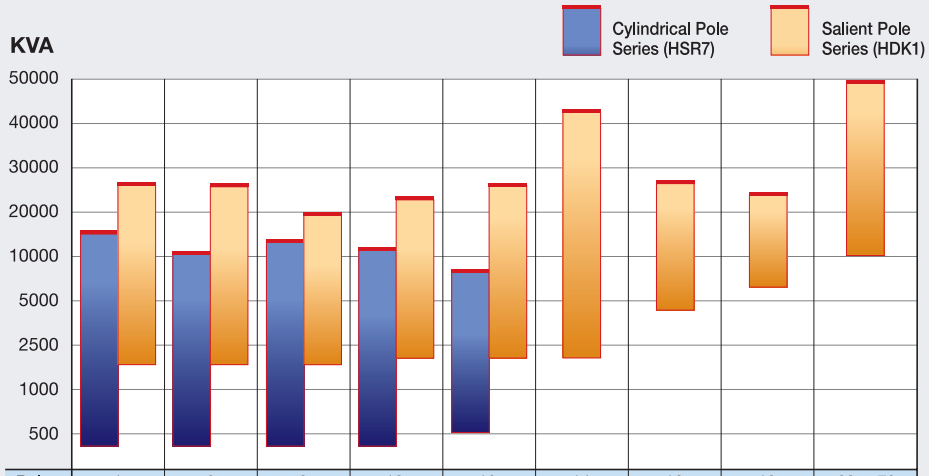
Three-Phase
High Voltage Generators

HHI is one of the world's leading synchronous machine manufacturers and is also able to draw on decades of experience as a manufacturer of generators. They are used as main and standby units in land-based power installations and for ship's electrical systems. The generators can be driven by internal combustion engines or gas, steam or hydropower turbines and electric motors.

HHI-built generators give excellent performance all over the world, both in extreme climates and in particularly demanding applications. Our mainline program in generators is shown opposite. Please enquire for off-standard ratings, voltages, and speeds.

Performance data is applied at 40° ambient temperature and at a site altitude of ≤1000m above sea level. The HHI generators covered by this brochure are highlighted in blue in our overview of diesel generators.

Synchronous Generator Manufacturing Program

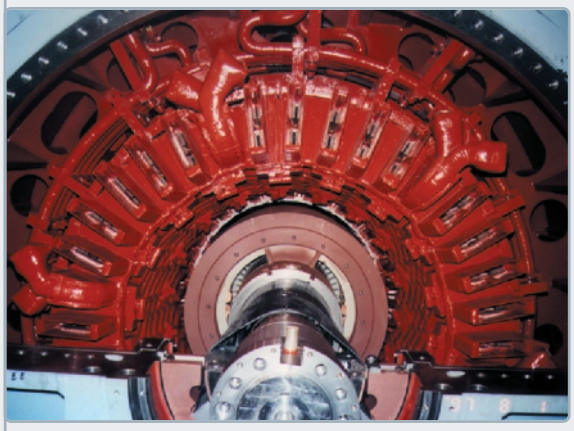


Poles	4	6	8	10	12	14	16	18	20 to 76
50Hz	1500	1000	750	600	500	428	375	333	300 to 79
60Hz	1800	1200	900	720	600	514	450	400	360 to 94.7

High Voltage Diesel Generator

5,500KVA, 6.6kV, IP23, 8Pole

High Speed Turbine Generator



150MVA, 3,600RPM, 13.8kV, Open Air Cooled

High Speed Generator

19,160KVA, 6Pole, 60/50Hz, 6.6kV

Low Speed Diesel Generator

12,500KVA, 6.6kV, 52P, IP23

Technical Design

Three-Phase
High Voltage Generators

HHI synchronous generators are salient or cylindrical-pole high-voltage machines designed for the harsh conditions of diesel-driven service. They satisfy the requirements established by international classification societies and are qualified for emergency power plants in nuclear power stations.

HHI generators are self-excited and self-regulating and mostly of the brushless type. Excitation power is provided by a stationary-field exciter whose rotor is mounted on the generator shaft.

The excitation unit with the automatic voltage regulation system is accommodated either in the generator itself or in a separate switchboard.

The generators can be combined with diesel engines of all internationally renowned makers.

Output, Speed

Generator output and speed are matched to the requirements of the prime movers. The generators are designed for a power factor of 0.8 lagging as standard, i.e. they are mechanically adequate for the active-power component of their KVA rating.

The operational safety and strength of the generators is verified by a two-minute work overspeed test at 1.2 times the rated speed.

Frequency, Voltage

The generators are available for 50Hz or 60Hz and for rated voltages between 3.0kV and 22kV. Using a reference value setter, the generator voltage can be adjusted within a range of ±5% of the rated voltage.
This set value is adhered to by the automatic voltage regulator. Other voltage adjustment ranges are available on request.

Unbalanced-load Capability

The generator can be fed an unbalanced power supply system.

The design of our generators' closed damper cage is such that a continuous unbalanced-load current of 12% is per-missible as long as the rated current is not exceeded in any of the phase windings.

An unbalanced-load current is defined as the ratio of the inverse component I_2 of the power system to the rated current I_N in accordance with VDE 0530 Part 1 and IEC 34-1.

In the event of a fault that leads to a higher unbalanced-load current than 12% (single-pole earth fault, two-pole short-circuit, etc.), the relationship $(I_2 / I_N)^2 t=20$ sec. applies.

Designs for higher continuous unbalanced-load currents are available on request.

Radio Interference Suppression

Radio interference suppression to level N, VDE 0875, is standard for HHI generators.

Overload Capacity

In compliance with IEC 34-1 the generators can be overloaded at 1.5 times the rated current for 30s. They have moreover been adapted to the demands made on diesel engines and can be operated at 110% rated output for one hour within any 12-hour period.

The resultant temperature rise is not harmful to the generators.

Sine-shaped Voltage Curve

A practically sine-shaped voltage curve is achieved with a special design of the magnet pole (pole contour) and the matching design of the stator winding.

The telephone harmonic factor (THF) according to VDE 0530 and IEC 34-1, staggered according to output size, is reliably adhered to.

High Efficiency

Thanks to the low-loss materials used and the efficient interaction of all mechnical and electrical processes in the generator (excitation, air conduction, cooling, etc.), above-average efficiency levels are attained.
Such a design can only be achieved with modern, computer-aided design techniques, combined with our many years of experience in developing electrical machines.

The efficiency levels we indicate take into account all the losses referred to in VDE 0530 Part 2 and in IEC 34-2.

Sustained Short-circuit Current

The generators and its excitation systems are designed to supply a sustained short-circuit current of at least three times the rated current for a maximum period of five seconds if a three-phase or two-phase terminal short-circuit occurs.

This enables protection systems to reliably detect faults and to operate as well as to selectively disconnect the affected unit.

Standards and Codes of Practice

The generators are designed, manufactured and tested in accordance with the applicable IEC/VDE regulations and DIN standards (IEC 34 and VDE 0530).

Compliance with EMC directives is also guaranteed.

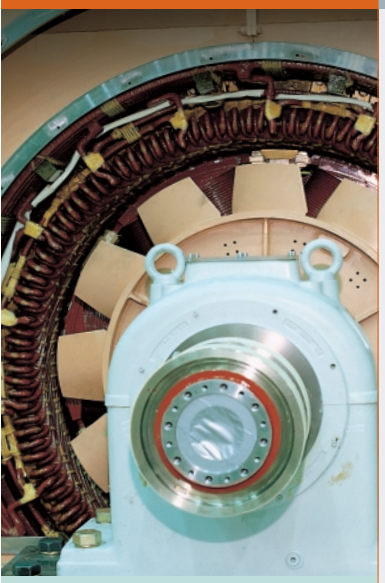
On request, we also supply generators which satisfy other international standards such as ANSI, NEMA, BS, etc.

Moreover, the increased requirements placed on generators for use on ships according to IEC 92, especially with regard to utilization, degree of protection, type of cooling and dynamic response, are satisfied in accordance with the international classification societies such as ABS, BV, DNV, GL, LRS, RINA, KR, NK, etc.

HHI generators have been successfully tested and certified for many years by the leading classfication societies.

In addition, the generators are certified for use as emergency power-supply generators in nuclear power stations.

Technical Design



Three-Phase
High Voltage Generators

Type of Construction

The types of construction are the usual ones with one or two bearings as specified in IEC 34-7. The B type of construction with end-shield bearings is preferred (the bearings are integrated on or in the end-shield, as flanged bearings or mounted on the housing console).

Owing to the compact construction of the machines, designing the generator foundations and installing the machines on-site are considerably simplified.

In the single-bearing model with flanged shaft, the rotor is completely aligned in the factory before dispatch and fixed in place with a special rotor transport device fitted in the end-shield on the drive-end (DE). It is necessary to adjust the magnetic center and the air gap at the place of installation as is normally the case with other makes.

Generators with an output of up to approx. 10MVA are preferably mounted on a shared base frame together with the prime mover. They can, however, be directly mounted on a foundation block. Generators above 10 MVA are usually mounted directly on the foundation block.

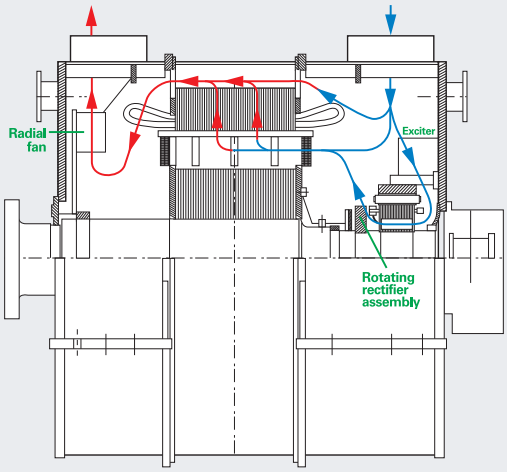
One or two bearings can be provided, depending on the requirements. The shafts of generators intended for rigid coupling to the diesel crankshaft are provided with an integrally forged flange; flexibly coupled machines have a cylindrical shaft extension.

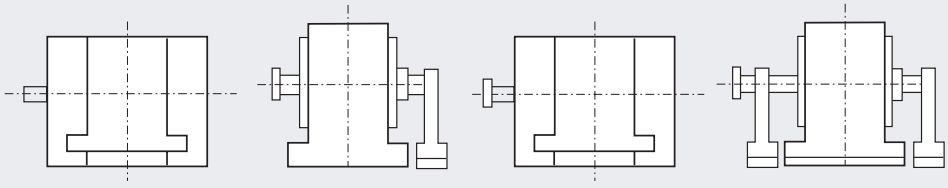
Other types of construction are available on request.

Degree of Protection - Cooling

The standard model has degrees of protection IP21 or IP23 with IC01, IC11 or IC21 type of cooling.

The generators, however, are also available with other degrees of protection and types of cooling, such as degree of protection IP44 corresponding to the IC31 or IC37 type of cooling, or degree of protection IP44, respectively IP54 with IC81W cooling with an air/water cooler.





[IM1306 / IM1206] [IM7025 / IM / 125] [IMB 20 / IMB 3] [IM7225 / IM7325]

Bearings

The generators generally equipped with air-cooled sleeve bearings have oil-rings for self-lubrication.

The smaller sizes of the 4-, 6-, 8- and sometimes 10-pole machines have roller bearings in their basic versions but can also be fitted with sleeve bearings on request.

For larger outputs greater than, for example, 10MVA, the sleeve bearings have an additional oil-circulating pump as a standard feature in order to ensure reliable lubrication during start-up/shut-down and in turning mode.

An external oil supply system with recooling (circulating-oil lubrication) can be provided to cater for extreme operating conditions where the bearings are subjected to a high degree of stress, e.g. on board ships (inclined position, high ambient temperatures, etc.).

A lub-oil pump or recooling system can be provided to cater for extreme operating conditions.

Anti-condensation Heater

Generators likely to be exposed to extreme ambient temperature fluctuations can be ordered with a built-in anti-condensation heater. However, even without a heater the quality winding insulation and the anti-corrosion coating make the generators fully suitable for use in the tropics or in order humid environments.

Cooling - Ventilation

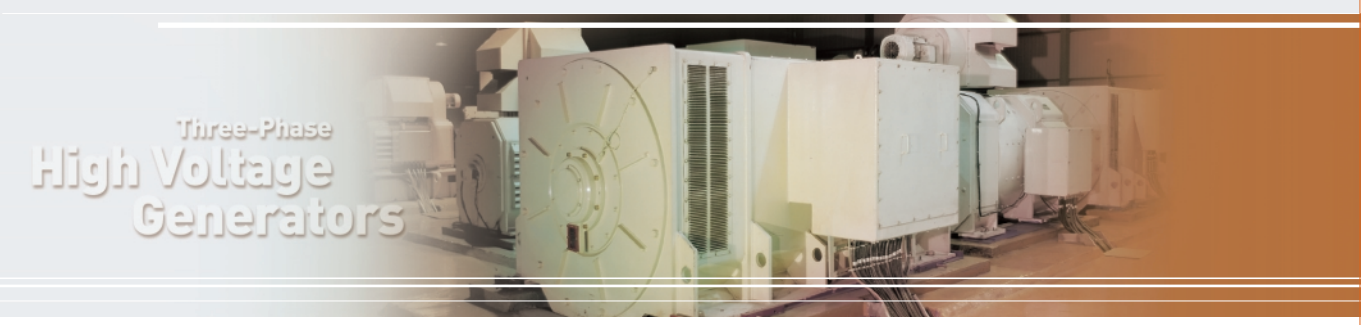
The generators are internally cooled with cooling air supplied from the non-drive end. Inside the generator the air is effectively distributed by one or two radial fans before being discharged at the drive end.

Special care should be taken for sufficient ventilation and optimum cooling-air arrangements with generator ratings over approx. 10MVA and under certain conditions. Our enclosed generators can therefore be ordered with provisions for three different cooling-air arrangements:

- The cooling air is drawn from the machine hall atmosphere or is supplied through the foundation from below. The heated air is either discharged into the machine room through an air discharge arrangement on the top of the generator or ducted to the open. Degree of protection IP21 or IP23.

- The cooling air is supplied from the outside via a duct. Another duct, which may be heat insulated if required, takes the heated air to the open. Machine with degree of protection IP44.

- Air/water cooler or coolers are mounted on the generator, usually on top. These recool the air circulating inside the generator. Enclosed machine with degree of protection IP44 or IP54. This type of cooling is almost always used for ship's generators but can also be employed for generators on land.



Generator Stator

Three-Phase
High Voltage Generators

Housing and Stator Core

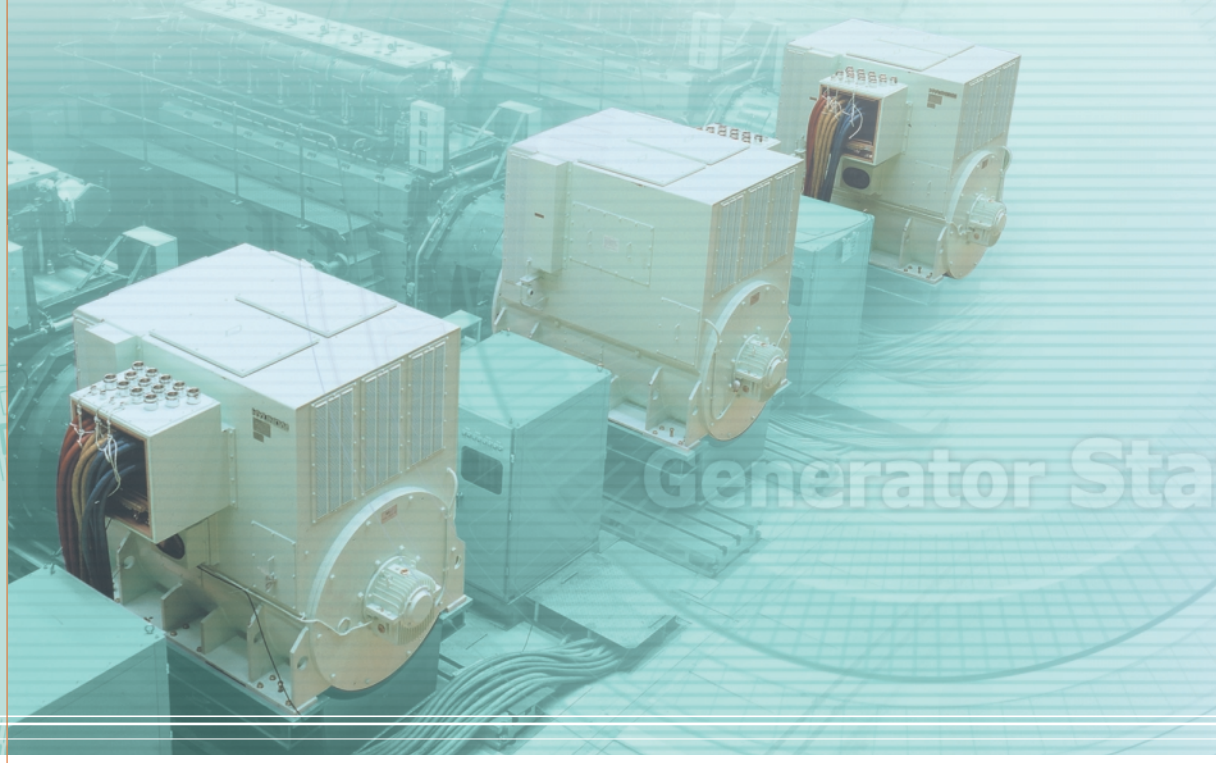
The stator core is built into a rugged welded housing. It is axially compressed and held together by the clamping elements on the back of the core. The stator core consists of high-grade electric sheet steel laminations, insulated from each other by a varnish coat. The three-phase winding and auxiliary winding for supplying the excitation unit are accommodated in the slots of the stator core.

Monitoring

The stator winding temperature is monitored by resistance temperature detectors embedded in the winding. The generator bearings can also be monitored by means of resistance or limit value contact thermometers.

Winding Terminals

The stator winding terminals consist of flat copper bars which are either exposed at the lower section of the stator or housed in a terminal box laterally on the stator box.



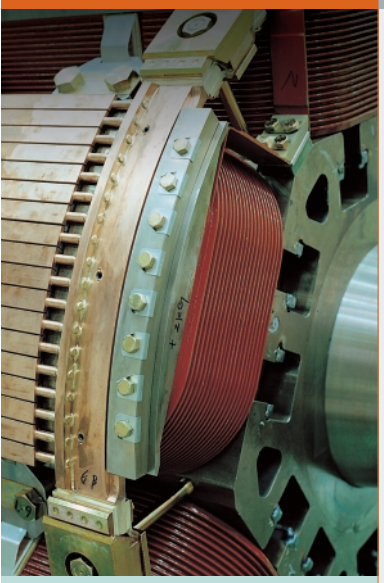
Insulation System

The stator windings are of the two-layer barrel type (integral coils) and are star connected.
The mica-based, resin impregnated insulation has proven its worth over many years in all parts of the world.
It involves impregnation of the whole stator with a high-grade, solvent-free synthetic resin of low viscosity in a vacuum vessel and subsequent hardening in a drying oven (VPI technology)

advantages:

- Protection from contamination and dirt.
- Protection from moisture, oil, and chemically aggressive atmospheres.
- Low dielectric loss.
- Good thermal conductance.
- Resistance to tropical climates and thermal attack.
- High service reliability and long life due to the use of temperature-resistant insulating materials.

Generator Rotor



There are two types of rotors used in the generators manufactured at HHI. The salient pole rotor and the cylindrical rotor design that is available for the smaller generator type.

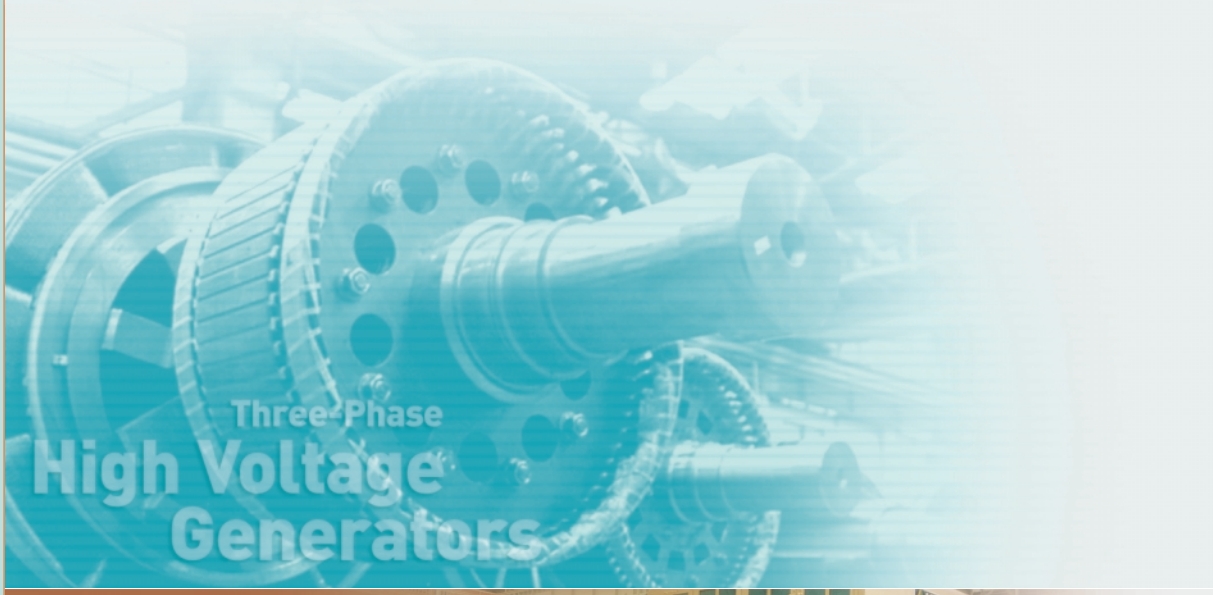
The rotor winding, like the stator winding, conforms to temperature class F.
The connections between the poles and the rotating rectifier assembly are attached with insulation to the shaft. The fans are attached on the shaft and ensure an optimum distribution of air in the machine.

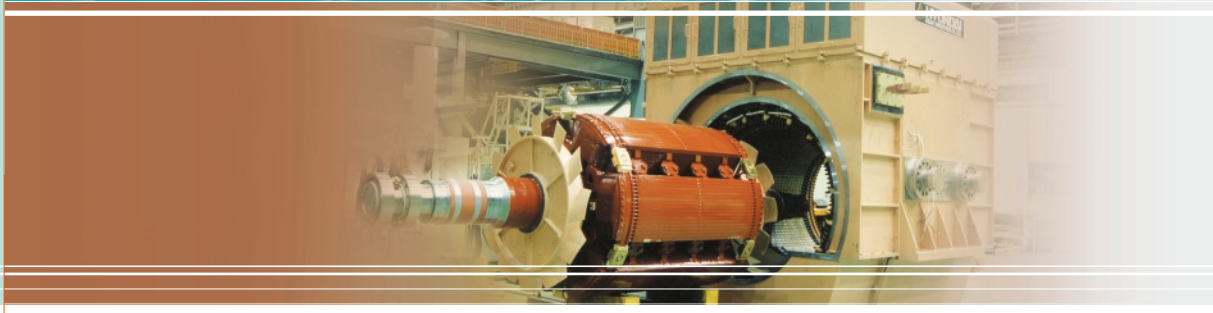
The field or pole winding is made of pre-insulated flat copper which is wound around the pole body in several layers.

The individual poles or the rotor-laminated core are completely wound and then soaked in synthetic resin, after which they are hardened in an oven.

Each generator rotor is tested in the factory for 2 minutes at 1.2 times the rated speed in order to verify its service reliability and strength.

The rotor assembly consists of a forged shaft, a pole arrangement with field and damper windings and the rotor of the exciter as well as the rotating rectifier assembly.





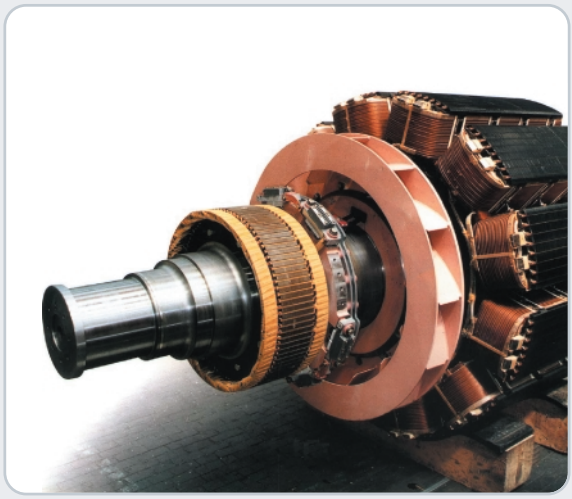
Salient Rotor

Two different methods are used to secure the poles to the shaft of a salient pole rotor.

Depending on the size, a laminated rotor or a solid magnet wheel with bolted-on poles is used.

In the case of a laminated rotor, steel sheets-shaped according to the number of poles-are placed next to each other, axially clamped between pressure plates and shrunk onto the shaft as a rotor-laminated core.

In the version with the poles bolted on, the magnet wheel is shrunk onto the shaft and the individual poles are bolted onto the wheel rim.



Cylindrical Rotor

The core is made of laminated punched steel sheet, pressed and secured between two solid endplates and shrink fitted onto the shaft. The rotor winding is locked tightly in the rotor slots with wedges and the winding ends are supported with a glass fibre band. To help maintain the efficient cooling of the generator, the rotor core is cooled by air flowing radially through the ducts in the rotor core itself.

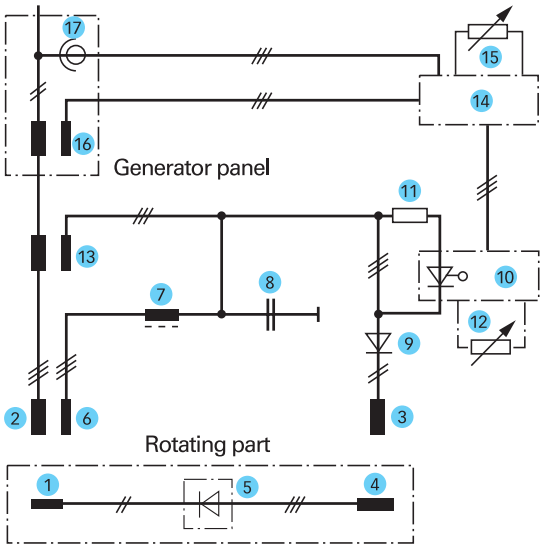
Excitation System

Damper Winding

The generator rotor has a generously dimensioned damper winding for problem-free parallel operation and for effective damping of the contra-rotating field in the case of unbalanced loading.

This damper arrangement endows the generator with highly effective damping properties for combating transient oscillations which are caused by irregular torque of the driving combustion engine and which can occur during parallel operation with large load changes (switching operations).

Excitation System



1. Generator rotor
2. Generator stator
3. Exciter stator
4. Exciter rotor
5. Rectifier
6. LV auxiliary winding
7. Reactor
8. Capacitor
9. Rectifier
10. Voltage regulator
11. Bypass resister
12. Reference value setter
13. Current transformer
14. Cross-current compensator
15. Droop resister
16. Current transformer
17. Voltage transformer

Brushless Excitation

The exciter is a brushless synchronous machine with stationary, armature poles.

The rotor of the exciter is mounted on the shaft of the main generator.

The three-phase current generated in the rotor winding of the exciter is rectified by rotating silicon diodes (three-phase bridge circuit) and applied to the rotating pole winding of the main generator.

The current for the stationary field winding of the exciter is supplied by the pilot excitation unit, a combination of excitation system, designed for load-dependant excitation, and the thyristor voltage regulator.

A low-voltage auxiliary winding contained in the stator slots of the main generator in conjunction with an oscillating circuit comprising a reactor and capacitor is used to generate the load-independent no-load exciter current component is picked up by a current transformer in the main circuit.

Both current components are vectorially added and adjusted as necessary to ensure that the maximum excitation demand occurring during operation within the pre-determined voltage regulator maintains stable operation through setpoint/actual value comparison. Should the automatic voltage control fail during isolated operation, the voltage rise will not exceed 15% of the rated voltage.

An adjustable quadrature-droop circuit provides for the distribution of the reactive load required in parallel operation.

The switchboard must usually be provided with voltage transformers for the voltage regulation and current transformers required for the droop circuits.

Three star point current transformers can be fitted in the generator if required.

Parallel Operation

Our generators are suitable for paralleling with one another and with an infinite network. For parallel operation with diesel-driven generators made by other manufacturers, the operating conditions must be analyzed beforehand.

Three-Phase
High Voltage
Generators

Selection Tables

6600 V, 60 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

Column 1 ℃	2 CT ℃	3 ℃	4 ℃	Rules		kVA	kVA	kVA	kVA
						900 rev/min (8-pole) 6600 V			
40	45	50	55	VDE		2,597	2,524	2,450	2,377
		40	45	KR		2,915	2,833	2,750	2,668
-	-	-	50	ABS		3,339	3,245	3,150	3,056
-	40	45	50	BV		3,657	3,554	3,450	3,347
40	45	-	-	GL	HSR(J)7	4,134	4,017	3,900	3,783
-	40	45	50	LRS		4,505	4,378	4,250	4,123
35	-	45	-	DNV		4,982	4,841	4,700	4,559
-	45	50	-	RINa		5,406	5,253	5,100	4,947
						5,883	5,717	5,550	5,384
					HSR(J)7	6,413	6,232	6,050	5,869
						7,102	6,901	6,700	6,499
						7,738	7,519	7,300	7,081
						8,268	8,034	7,800	7,566
						8,904	8,652	8,400	8,148
					HSR(J)7	11,130	10,815	10,500	10,185
						12,508	12,154	11,800	11,446
						13,992	13,596	13,200	12,804

6000 V, 50 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

Column 1 ℃	2 CT ℃	3 ℃	4 ℃	Rules		kVA	kVA	kVA	kVA
						750 rev/min (8-pole) 6000 V			
40	45	50	55	VDE		2,597	2,524	2,450	2,377
		40	45	KR		2,915	2,833	2,750	2,668
-	-	-	50	ABS		3,339	3,245	3,150	3,056
-	40	45	50	BV		3,657	3,554	3,450	3,347
40	45	-	-	GL	HSR(J)7	4,134	4,017	3,900	3,783
-	40	45	50	LRS		4,505	4,378	4,250	4,123
35	-	45	-	DNV		4,982	4,841	4,700	4,559
-	45	50	-	RINa		5,406	5,253	5,100	4,947
						5,883	5,717	5,550	5,384
					HSR(J)7	6,413	6,232	6,050	5,869
						7,102	6,901	6,700	6,499
						7,738	7,519	7,300	7,081
						8,268	8,034	7,800	7,566
						8,904	8,652	8,400	8,148
					HSR(J)7	9,275	9,013	8,750	8,488
						10,388	10,094	9,800	9,506
						11,660	11,330	11,000	10,670

6600 V, 60 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

Column									
1	2	3	4						
	CT								
℃	℃	℃	℃	Rules					
40	45	50	55	VDE					
		40	45	KR					
-	-	-	50	ABS					
-	40	45	50	BV					
40	45	-	-	GL					
-	40	45	50	LRS					
35	-	45	-	DNV					
-	45	50	-	RINa					
kVA	kVA	kVA	kVA						
720 rev/min (10-pole) 6600 V									
2,586	2,513	2,440	2,367	HSR(J)7	713 - 10				
2,783	2,704	2,625	2,546		715				
3,106	3,018	2,930	2,842		717				
3,339	3,245	3,150	3,056		719				
3,657	3,554	3,450	3,347	HSR(J)7	803 - 10				
4,187	4,069	3,950	3,832		805				
4,547	4,419	4,290	4,161		807				
5,088	4,944	4,800	4,656		809				
5,268	5,119	4,970	4,821	HSR(J)7	913 - 10				
5,894	5,727	5,560	5,393		915				
6,519	6,335	6,150	5,966		917				
7,134	6,932	6,730	6,528		919				
7,950	7,725	7,500	7,275		921				
9,381	9,116	8,850	8,585	HSR(J)7	1,203 - 10				
10,282	9,991	9,700	9,409		1,205				
11,554	11,227	10,900	10,573		1,207				

6000 V, 50 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

Column			
1	2	3	4
	CT		
℃	℃	℃	℃
40	45	50	55
		40	45
-	-	-	50
-	40	45	50
40	45	-	-
-	40	45	50
35	-	45	-
-	45	50	-
kVA	kVA	kVA	kVA
600 rev/min (10-pole) 6000 V			
2,120	2,060	2,000	1,940
2,279	2,215	2,150	2,086
2,544	2,472	2,400	2,328
2,756	2,678	2,600	2,522
2,968	2,884	2,800	2,716
3,392	3,296	3,200	3,104
3,710	3,605	3,500	3,395
4,240	4,120	4,000	3,880
4,346	4,223	4,100	3,977
4,876	4,738	4,600	4,462
5,406	5,253	5,100	4,947
5,936	5,768	5,600	5,432
6,572	6,386	6,200	6,014
7,738	7,519	7,300	7,081
8,480	8,240	8,000	7,760
9,540	9,270	9,000	8,730

Selection Tables

13800 V, 60 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

Column 1	2 CT	3	4	Rules		Column 1	2 CT	3	4
℃	℃	℃	℃			℃	℃	℃	℃
40	45	50	55	VDE		40	45	50	55
		40	45	KR				40	45
-	-	-	50	ABS		-	-	-	50
-	40	45	50	BV		-	40	45	50
40	45	-	-	GL		40	45	-	-
-	40	45	50	LRS		-	40	45	50
35	-	45	-	DNV		35	-	45	-
-	45	50	-	RINa		-	45	50	-
kVA	kVA	kVA	kVA			kVA	kVA	kVA	kVA
900 rev/min (8-pole) 13800 V						750 rev/min (8-pole) 11000 V			
3,286	3,193	3,100	3,007	HSR(J)7	800 - 8	2,650	2,575	2,500	2,425
3,816	3,708	3,600	3,492		801	3,180	3,090	3,000	2,910
4,346	4,223	4,100	3,977		803	3,604	3,502	3,400	3,298
5,194	5,047	4,900	4,753		807	4,240	4,120	4,000	3,880
5,618	5,459	5,300	5,141		811	4,664	4,532	4,400	4,268
6,254	6,077	5,900	5,723	HSR(J)7	917 - 8	5,194	5,047	4,900	4,753
6,784	6,592	6,400	6,208		919	5,618	5,459	5,300	5,141
7,632	7,416	7,200	6,984		921	6,360	6,180	6,000	5,820
8,480	8,240	8,000	7,760	HSR(J)7	1,205 - 8	6,996	6,798	6,600	6,402
9,540	9,270	9,000	8,730		1,207	7,950	7,725	7,500	7,275
10,600	10,300	10,000	9,700		1,211	8,798	8,549	8,300	8,051

11000 V, 50 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

13800 V, 60 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

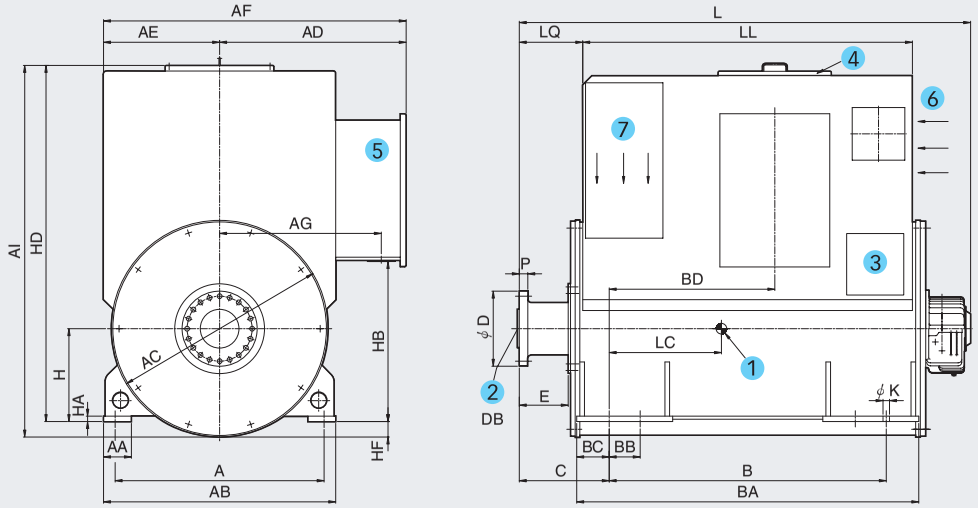
11000 V, 50 Hz

Rated output
at p.f. 0.8 to 1.0
and coolant temperature
(CT)···℃

Column					Column			
1	2 CT	3	4		1	2 CT	3	4
℃	℃	℃	℃	Rules	℃	℃	℃	℃
40	45	50	55	VDE	40	45	50	55
		40	45	KR			40	45
-	-	-	50	ABS	-	-	-	50
-	40	45	50	BV	-	40	45	50
40	45	-	-	GL	40	45	-	-
-	40	45	50	LRS	-	40	45	50
35	-	45	-	DNV	35	-	45	-
-	45	50	-	RINa	-	45	50	-
kVA	kVA	kVA	kVA		kVA	kVA	kVA	kVA
720 rev/min (10-pole) 13800 V					600 rev/min (10-pole) 11000 V			
2,703	2,627	2,550	2,474	HSR(J)7 801 - 10	2,226	2,163	2,100	2,037
3,180	3,090	3,000	2,910	803	2,650	2,575	2,500	2,425
3,604	3,502	3,400	3,298	805	2,968	2,884	2,800	2,716
4,081	3,966	3,850	3,735	806	3,392	3,296	3,200	3,104
4,346	4,223	4,100	3,977	809	3,604	3,502	3,400	3,298
4,982	4,841	4,700	4,559	811	4,134	4,017	3,900	3,783
5,406	5,253	5,100	4,947	HSR(J)7 917 - 10	4,452	4,326	4,200	4,074
5,883	5,717	5,550	5,384	919	4,876	4,738	4,600	4,462
6,572	6,386	6,200	6,014	921	5,406	5,253	5,100	4,947
7,187	6,983	6,780	6,577	HSR(J)7 1,205 - 10	5,936	5,768	5,600	5,432
7,950	7,725	7,500	7,275	1,207	6,572	6,386	6,200	6,014
8,756	8,508	8,260	8,012	1,209	7,208	7,004	6,800	6,596
9,752	9,476	9,200	8,924	1,211	8,056	7,828	7,600	7,372

Dimension Tables

HSR7 710 to HSR7 811 Type of Construction IM B16 Sleeve Bearing(IC01 Air Cooling)



1. Center of gravity
2. Tapped hole DB to DIN 332
3. Cover for rotating rectifier
4. Cover for terminal and excitation equipment
5. Cable gland holder
6. Air inlet
7. Air outlet

6600 V / 6000 V

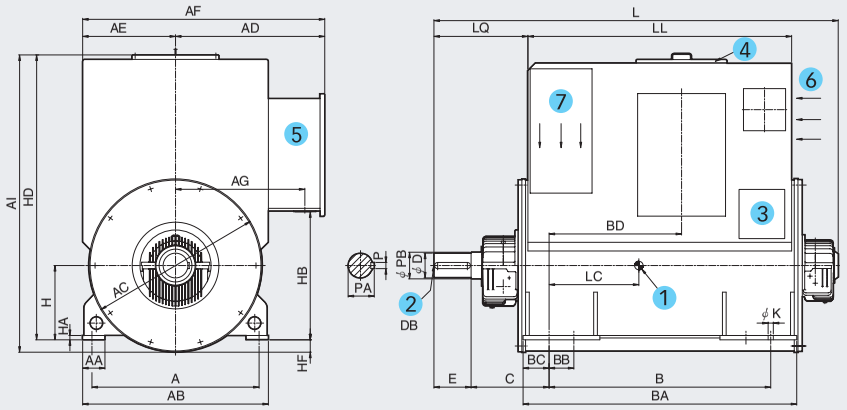
Unit = mm

Type HSR7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Shaft End			
																											D	DB	E	P
713	10	1350	180	1500	1400	1205	750	1955	1045	2401	1790	2210	200	210	1070	581	600	35	1034	2301	100	42	2916	725	2130	410	485	M30	316	55
715	8...10																													
717	8...10										1950	2370			1230								3076	805	2290					
719	8...10																													
801	8	1620	180	1800	1550	1280	825	2104	1120	2529	1870	2220	250	175	1245	578	510	40	1012	2264	265	42	3001	815	2120	453	572	M36	351	60
803	8...10										2020	2370			1165								3151	875	2270					
805	8																													
805	10										2140	2490			1285								3271	937	2390					
807	8...10																													
809	8...10										2300	3650			1445								3431	1020	2550					

13800 V / 11000 V

Unit = mm

Type HSR7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Shaft End			
																											D	DB	E	P
801	8...10	1620	180	1800	1550	1280	950	2104	1120	2529	2140	2490	250	175	1285	578	510	40	1012	2264	265	42	3271	937	2390	453	572	M36	351	60
803	8...10										2300	2650			1445								3431	1020	2550					
805	8...10																													
807	8...10										2500	2850			1645								3631	1120	2750					
809	10																													
809	8										3640	2990			1785								3771	1190	2890					
811	10																													



1. Center of gravity
2. Tapped hole DB to DIN 332
3. Cover for rotating rectifier
4. Cover for terminal and excitation equipment
5. Cable gland holder
6. Air inlet
7. Air outlet

6600 V / 6000 V

Unit = mm

Type HSR7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Shaft End					
																											D	DB	E	P	PA	PB
713	10	1350	180	1500	1400	1205	750	1955	1045	2401	1790	2210	200	210	1070	630	600	35	1034	2301	100	42	3265	725	2130	759	200	M30	300	50	211	ϕ215
715	8...10																															
717	8...10										1950	2370			1230								3425	805	2290							
719	8...10																															
801	8	1620	180	1800	1550	1280	825	2104	1120	2529	1870	2220	250	175	1245	635	510	40	1012	2264	265	42	3478	815	2120	930	240	M36	420	56	252	ϕ250
803	8...10										2020	2370			1165								3628	875	2270							
805	8																															
805	10										2140	2490			1285								3748	937	2390							
807	8...10																															
809	8...10										2300	3650			1445								3908	1020	2550							
913	8...10	1930	220	2150	1770	1500	950	2450	1274	2964	2364	2575	250	105	1543	600	590	45	1225	2669	295	42	3800	990	2480	850	220	M36	310	50	231	ϕ250
915	8...10																															
917	8...10										2534	2745			1493								3970	1075	2650							
919	10																															
919	8										2704	2915			1663								4140	1160	2820							
921	8...10																															

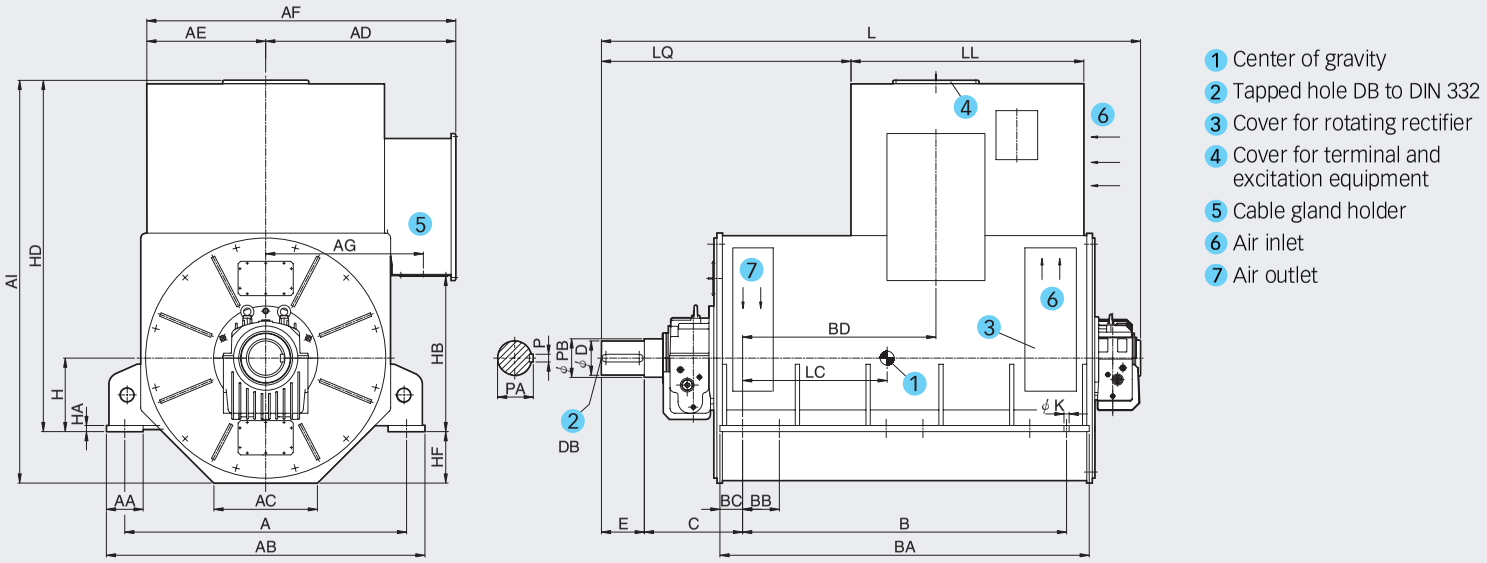
13800 V / 11000 V

Unit = mm

Type HSR7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Shaft End					
																											D	DB	E	P	PA	PB
801	8...10	1620	180	1800	1550	1280	825	2104	1120	2529	2140	2490	250	175	1285	635	510	40	1012	2264	265	42	3748	937	2390	930	240	M36	420	56	252	ϕ250
803	8...10										2300	2650			1445								3908	1020	2550							
805	8...10																															
807	8...10										2500	2850			1645								4108	1120	2750							
809	10										3640	2990			1785																	
809	8																						4248	1190	2890							
811	10																															
917	8...10	1930	220	2150	1770	1500	950	2450	1274	2964	2814	3025	250	105	1773	600	590	45	1225	2669	295	42	4250	1215	2930	850	220	M36	310	50	231	ϕ250
919	8...10										2994	3250			1953								4430	1305	3110							
921	8...10																															

Dimension Tables

HSR7 1200 Type of Construction IM B20 Sleeve Bearing(IC01 Air Cooling)



1. Center of gravity
2. Tapped hole DB to DIN 332
3. Cover for rotating rectifier
4. Cover for terminal and excitation equipment
5. Cable gland holder
6. Air inlet
7. Air outlet

6600 V / 6000 V

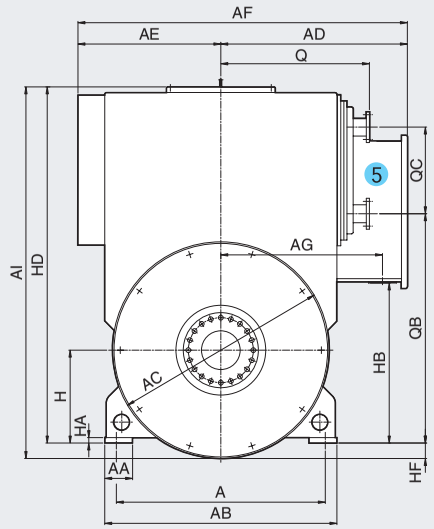
Unit = mm

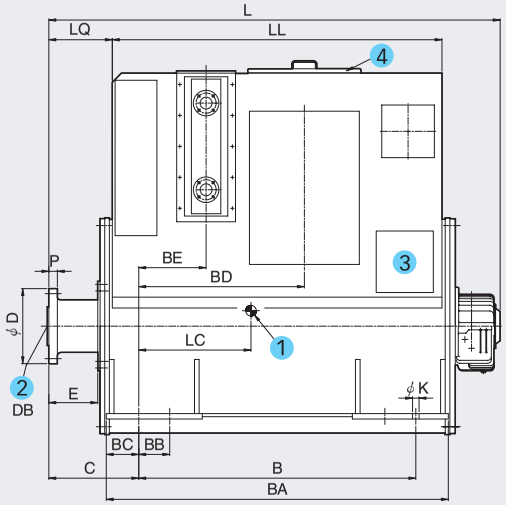
Type HSR7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Shaft End					
																											D	DB	E	P	PA	PB
1203	8...10	2400	300	2600	845	1552	970	2522	1287	3288	2404	2774	300	185	1338	802	600	50	1268	2868	420	42	4160	1900	1447	1007	280	M36	350	63	292	ϕ315
1205	8...10																								1687							
1207	8...10										2644	3014			1578								4400									

13800 V / 11000 V

Unit = mm

Type HSR7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Shaft End					
																											D	DB	E	P	PA	PB
1205	10	2400	300	2600	845	1552	970	2522	1287	3288	2404	2774	300	185	1338	802	600	50	1268	2868	420	42	4160	1900	1447	1007	280	M36	350	63	292	ϕ315
1205	8										2644	3014			1578								4400		1687							
1207	8...10																															
1209	10																															
1211	8...10										2864	3234			1798								4620		1907							





1. Center of gravity
2. Tapped hole DB to DIN 332
3. Cover for rotating rectifier
4. Cover for terminal and excitation equipment
5. Cable gland holder

6600 V / 6000 V

Unit = mm

Type HSJ7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	BE	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Q	QB	QC	Shaft End			
																															D	DB	E	P
713	10	1350	180	1500	1400	1205	923	2128	1045	2401	1790	2210	200	210	1070	435	581	600	35	1034	2301	100	42	2916	725	2130	410	960	1482	560	485	M30	316	55
715	8...10																																	
717	8...10										1950	2370			1230	359								3076	805	2290								
719	8...10																																	
801	8	1620	180	1800	1550	1280	998	2276	1120	2529	1870	2220	250	175	1245	538	578	510	40	1012	2264	265	42	3001	815	2120	453	1031	1447	560	572	M36	351	60
803	8...10										2020	2370			1165									3151	875	2270								
805	8																																	
805	10										2140	2490			1285									3271	937	2390								
807	8...10																																	
809	8...10										2300	3650			1445									3431	1020	2550								

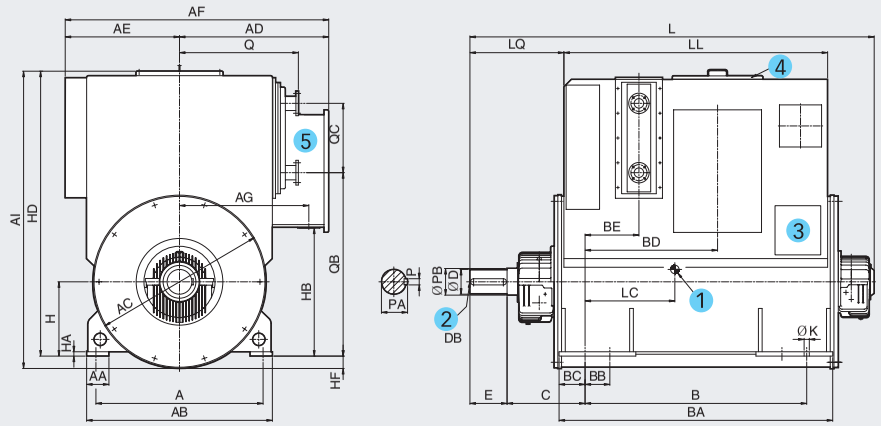
13800 V / 11000 V

Unit = mm

Type HSJ7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	BE	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Q	QB	QC	Shaft End			
																															D	DB	E	P
801	8...10	1620	180	1800	1550	1280	998	2276	1120	2529	2140	2490	250	175	1285	538	578	510	40	1012	2264	265	42	3271	937	2390	453	1031	1447	560	572	M36	351	60
803	8...10										2300	2650			1445									3431	1020	2550								
805	8...10																																	
807	8...10										2500	2850			1645									3631	1120	2750								
809	10																																	
809	8										3640	2990			1785									3771	1190	2890								
811	10																																	

Dimension Tables

HSJ7 710 to HSJ7 921 Type of Construction IM B20 Sleeve Bearing(IC81W Air to Water Cooling)



1. Center of gravity
2. Tapped hole DB to DIN 332
3. Cover for rotating rectifier
4. Cover for terminal and excitation equipment
5. Cable gland holder

6600 V / 6000 V

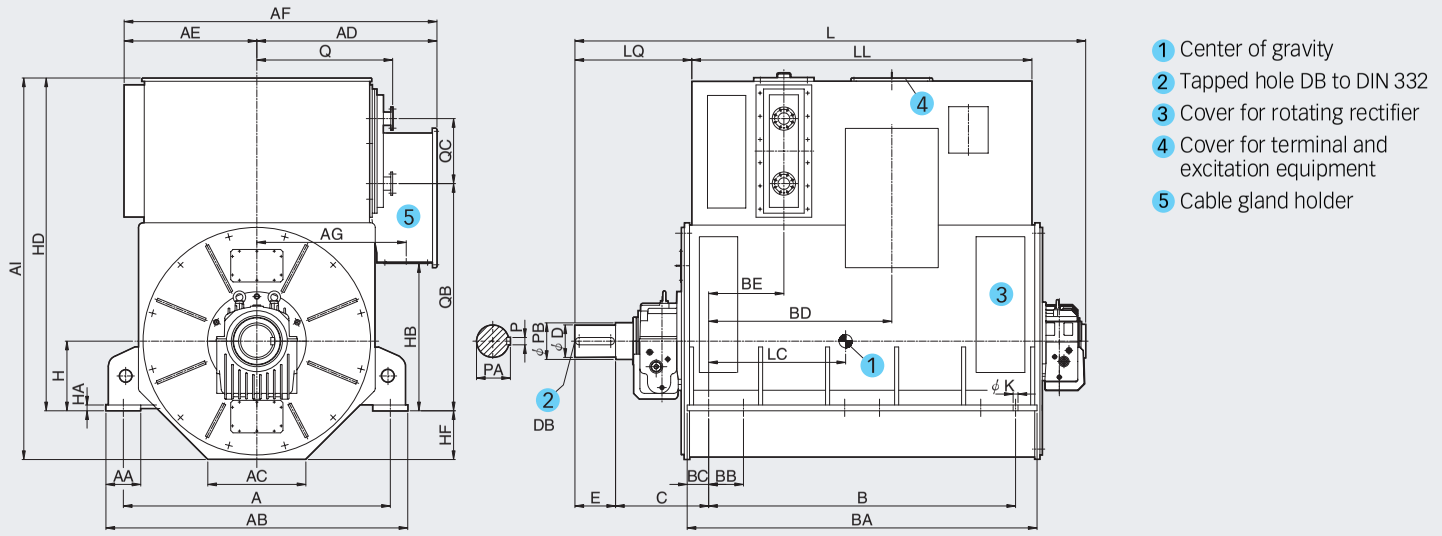
Unit = mm

Type HSJ7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	BE	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Q	QB	QC	Shaft End					
																															D	DB	E	P	PA	PB
713	10	1350	180	1500	1400	1205	923	2128	1045	2401	1790	2210	200	210	1070	435	630	600	35	1034	2301	100	42	3265	725	2130	759	960	1482	560	200	M30	300	50	211	ϕ215
715	8...10																																			
717	8...10										1950	2370			1230	359								3425	805	2290										
719	8...10																																			
801	8	1620	180	1800	1550	1280	998	2276	1120	2529	1870	2220	250	175	1245	538	635	510	40	1012	2264	265	42	3478	815	2120	930	1031	1447	560	240	M36	420	56	252	ϕ250
803	8...10										2020	2370			1165									3628	875	2270										
805	8																																			
805	10										2140	2490			1285									3748	937	2390										
807	8...10																																			
809	8...10										2300	3650			1445									3908	1020	2550										
913	8...10	1930	220	2150	1770	1500	1123	2623	1274	2964	2364	2575	250	105	1543	733	600	590	45	1225	2669	295	42	3800	990	2480	850	1150	1757	560	220	M36	310	50	231	ϕ250
915	8...10																																			
917	8...10										2534	2745			1493									3970	1075	2650										
919	10																																			
919	8										2704	2915			1663									4140	1160	2820										
921	8...10																																			

13800 V / 11000 V

Unit = mm

Type HSJ7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	BE	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Q	QB	QC	Shaft End					
																															D	DB	E	P	PA	PB
801	8...10	1620	180	1800	1550	1280	998	2276	1120	2529	2140	2490	250	175	1285	538	635	510	40	1012	2264	265	42	3748	937	2390	930	1031	1447	560	240	M36	420	56	252	ϕ250
803	8...10										2300	2650			1445									3908	1020	2550										
805	8...10																																			
807	8...10										2500	2850			1645									4108	1120	2750										
809	10																																			
809	8										3640	2990			1785									4248	1190	2890										
811	10																																			
917	8...10	1930	220	2150	1770	1500	1123	2623	1274	2964	2814	3025	250	105	1773	733	600	590	45	1225	2669	295	42	4250	1215	2930	850	1150	1757	560	220	M36	310	50	231	ϕ250
919	8...10										2994	3250			1953									4430	1305	3110										
921	8...10																																			



1. Center of gravity
2. Tapped hole DB to DIN 332
3. Cover for rotating rectifier
4. Cover for terminal and excitation equipment
5. Cable gland holder

6600 V / 6000 V

Unit = mm

Type HSJ7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	BE	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Q	QB	QC	Shaft End					
																															D	DB	E	P	PA	PB
1203	8...10	2400	300	2600	845	1552	1143	2695	1287	3288	2404	2774	300	185	1338	648	802	600	50	1268	2868	420	42	4160	1060	2690	1007	1170	1958	560	280	M36	350	63	292	ϕ315
1205	8...10																																			
1207	8...10										2644	3014			1578									4400	1180	2930									

13800 V / 11000 V

Unit = mm

Type HSJ7	No. of Poles	A	AA	AB	AC	AD	AE	AF	AG	AI	B	BA	BB	BC	BD	BE	C	H	HA	HB	HD	HF	K	L	LC	LL	LQ	Q	QB	QC	Shaft End					
																															D	DB	E	P	PA	PB
1205	10	2400	300	2600	845	1552	1143	2695	1287	3288	2404	2774	300	185	1338	648	802	600	50	1268	2868	420	42	4160	1060	2690	1007	1170	1958	560	280	M36	350	63	292	ϕ315
1205	8										2644	3014			1578									4400	1180	2930									
1207	8...10																																			
1209	10																																			
1211	8...10										2864	3234			1798									4620	1290	3150									