MarelliMotori Hydropower

C3G - C4G

Model	C3G - C4G
Power	Up to 3.400 kW
Voltages	Up to 6.600 V
Frame	250 ± 710
Pole	From 4 to 16 poles (over contact Marelli Motori)
Cooling	IC 01
IP	IP 23. Available up to IP 56
Enclosure	ODP – Open Drip Proof Motors.
Main Applications	Cross-Flow turbines, Francis turbines, Kaplan turbines, Pelton turbines, Turgo turbines
Sector	Hydropower

kW 50 Hz	**4 Poles**	**6 Poles**	**8 Poles**	**10 Poles**	**12 Poles**

General description	
Asynchronous generators	An induction machine is capable to work as a motor or as a generator depending on the rotating speed. Below the synchronous speed the machine will act as a motor. At synchronous speed, the line supplies reactive power and machine losses, but no torque or power is generated. Above the synchronous speed the machine act as a generator. Induction generators works in the stable region between the no-load condition and maximum torque region. If the speed of the generator increases, the breaking torque reaches a max value of torque (breakdown torque) that it can operates before the operating conditions become unstable.
Certificates and testing	
Certificate	Test Certificate supplied with the machine.Material certificates in accordance with EN 10204 : 2001 can be supplied.
Main components	
Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Generators for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
Shield	Made of grey cast-iron (EN 1561 – GJL 200) up to 500 frame size asynchronous generators. Made of hot-rolled structural steel (EN 10025 – S235 JR) from size 560 and above.
Shaft	General data Made in carbon steel (EN 10083 – 2 C40 – TN) up to 450 frame and hot-rolled structural steel from 500 frame (EN 10025 – S355 JR). Shaft design Cylindrical shaft with key. The shaft can be designed to install the flywheel, the brake or the specific client's requirements (hollow shaft).
Main terminal box	Usually mounted on top can be located on the sides of the frame. Made of cold-rolled formable steels EN 10025 – S235JR.An oversized terminal box can be supplied according to customer requirements.

Internal Fan	Made of aluminum alloy up to 400 frame.Made of hot-rolled structural steel above (EN 10025 – S235 JR).
Construction	
Cooling System	IC 01 as per IEC60034-6Free circulation.Internal air is flowing by a fan mounted on the shaft of the asynchronous generators at the driven side. The cooling air is taken on the ND-end, the air outlet is on the D-end. On request for variable speed application an external ventilation unit can be supplied to get the IC 06 cooling type.
Degree of protection	IP 23 as per IEC60034-5.The series can be supplied with air inlet filters to achieve the IP 44 rating. Higher IP is available on request with different construction (TEFC, TEAAC, TEWAC)
Mounting	IM B3, V1 and V10 as per IEC60034-7.
Technical data	
Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses. The stator winding is made of flat copper or round copper wire depending on the machine size. The completely wound stator pack with housing is thereby impregnated in an epoxy-resin VPI. The subsequent heat treatment hardens the resin.
Rotor	Short circuit rotor type. Depending on machine size, the rotor construction is either a solid shaft or welded ribbed shaft. The rotor winding can be either a pressure die cast aluminum or a copper bar construction.Full shaft or drilled shaft according to turbine type. The rotor is dynamically balanced with half a key.

Bearing	Asynchronous generators are supplied with rolling bearing as standard. The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction generators, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours. Usually locating bearing is on the D end side and floating bearing on the ND end side on horizontal machines. Both bearings are fitted with a regreasing system. The used grease is removed through a valve locked in the outer bearing cover. Where special design is requested the proper types and sizes of bearings are selected according to customer requirements, turbine type and loads and confirmed by proven calculations. Using cylindrical roller bearings high radial forces can be supported at the generator shaft end. Radial forces below the minimum value can lead to bearing damages within a few hours. Rolling bearings are lubricated with grease or oil; sliding bearings are lubricated with internal oil or with oil circulated by an external lubrication unit specially developed for hydro generators.
Impregnation system	Stator is VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.
Insulation system	Low voltage. Stator: F class insulated with a synthetic enamel. (H class insulation available on request)
Protective treatments	Dedicated protective enamel is applied on the winding.
Operating conditions	
Parallel operations	The most common operation for the asynchronous generators is connected with the electrical grid.ì In this case the generator takes the necessary reactive power from the mains, and additional excitation systems are not necessary. The mains maintains voltage and frequency so that separate regulators are not necessary.

Isolated operations	When using asynchronous generators in isolated operation, the excitation is realized through the parallel connection of a capacitor bank. Its dimensioning depends on the generator power and on the generator parameters. The operating mode is considerably more expensive than the parallel operation with the mains and is only used for lower outputs. When compared to a synchronous generator, the induction generator has several advantages: No voltage regulator is required, nor the exciter. Voltage and frequency are controlled by the electrical grid. Exciter is not required. Reactive power is provided by the grid. Simple construction; no brushes, diodes, or collector rings. Lower maintenance costs.
Auxiliary device	

Optional features	
List	RTD's on winding, beraings and air / water circuit flanged shaft or special shaft end on both sides increase protection degree up to IP 56 speed measurement (encoder or tachogenerators) vibration sensors special bearings dedicated design for variable speed applications anticondensation heaters flywheel hydraulic brake oil lube system filters on air inlet / outlet other options available on request.