

## INTEGRATED STARTER MOTOR GENERATORS

### T Y P E S

DC INTEGRATED  
FLYWHEEL  
GENERATORS

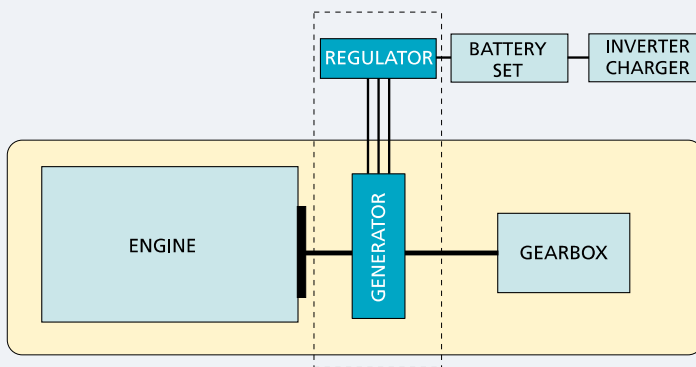
AC INTEGRATED  
FLYWHEEL  
GENERATORS

DC INTEGRATED FLYWHEEL  
STARTER MOTOR GENERATORS  
FOR HYBRID DRIVES



**Iskra**

Iskra Avtoelektrika d.d.



AIZ integrated generator

## APPLICATIONS

The integrated flywheel generator is intended for integration in internal combustion engines and for the use in the electric systems, where high consumption of electric energy occurs. The generator is designed to be built on the flywheel housing of the engine between the engine and the gearbox. This design enables many features regarding to the classic electric generator supply systems as it is defined in features in the specifications of the generator. The flywheel generator AIZ is mainly suitable for the applications in electric systems used in:

- Marine applications
- Stationary power sets
- Vehicles for special applications

## FEATURES

- High efficiency (> 80 %)
- High specific power
- Possible output voltages: 14V, 28 V and 42 V DC
- Output voltages with an additional inverter: 110 V or 230 V AC
- Maintenance-free solution
- Over-current and temperature protection
- Compact design integrated on the flywheel saves space on the engine
- Engine belt can be eliminated
- Selectable charging voltage (for wet or gel cell)
- Temperature dependent charge

## DESIGN

Iskra's integrated generator is a three-phase 12-pole brushless permanent magnet generator. The system includes a stator, a rotor and a separate electronic regulator with a single or two galvanically separated outputs. The outputs provide continuous electric power of up to 4.5 kW of the nominal voltages of 14 V, 28 V and 42 V. For 24 V and 42 V the higher output power is possible. The compact construction and the mode of mounting make it possible to reduce the needed mounting space at high output power. Carefully selected materials assure improved technical characteristics, long life and maintenance free operation even under the harshest conditions.

## Stator

The stator has a three-phase winding on a laminated pack. The selected design and high filling factor of the winding provide improved cooling, low noise and high output characteristics of the generator. For nominal output power, adequate water-cooling must be provided through the flywheel housing defined by the customer.

## Rotor

The rotor with 12 high-energy rare earth permanent magnets and without slip rings assures long life and maintenance free operation.

## Electronic regulator

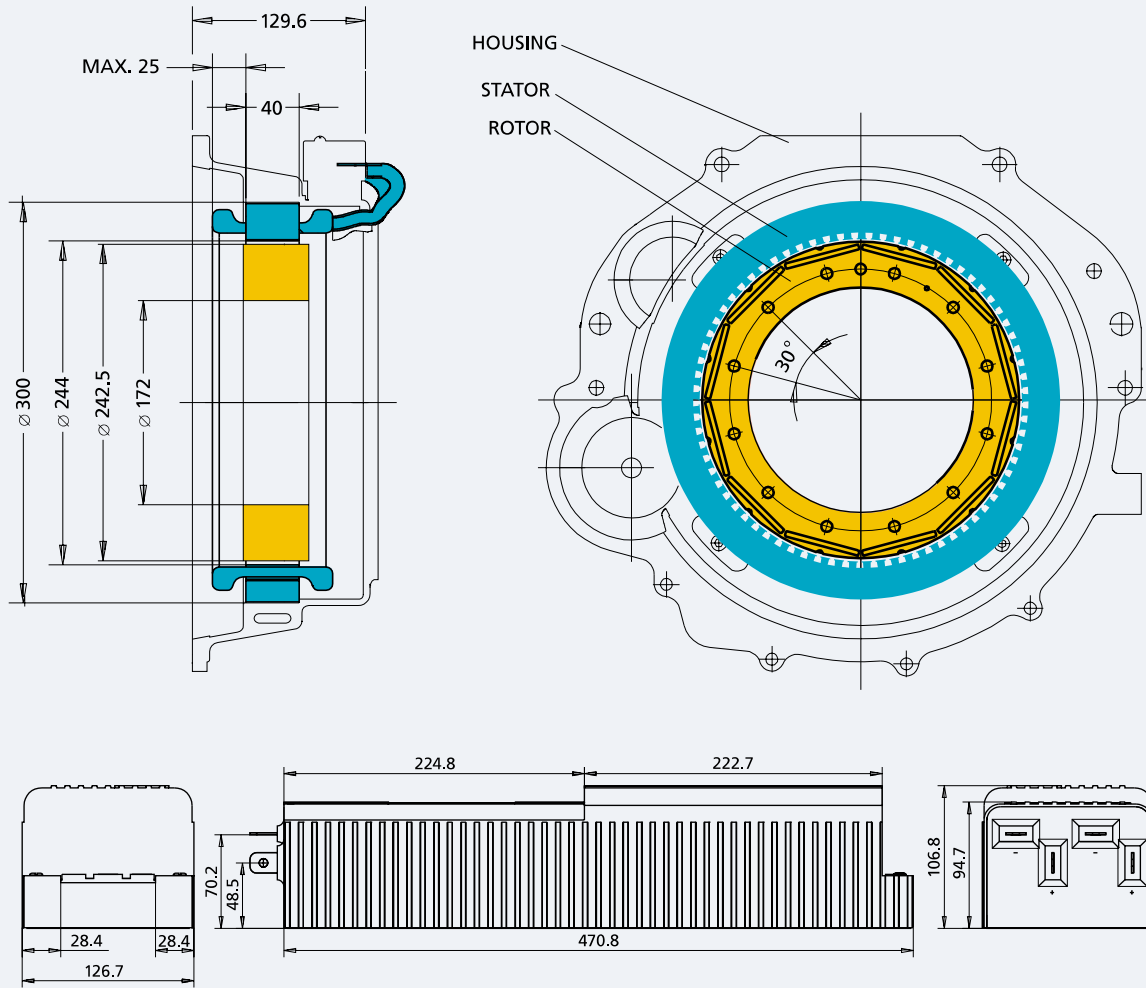
A separate electronic regulator provides a stable DC output of the nominal voltages of 14 V, 28 V or 42 V. Electric system is not sensitive to sudden and short time overload.

Note: Upon the customer's request for a special design of the electronic controller, additional functions of the system can be provided as for example: engine start, electronic propulsion and acceleration-booster.

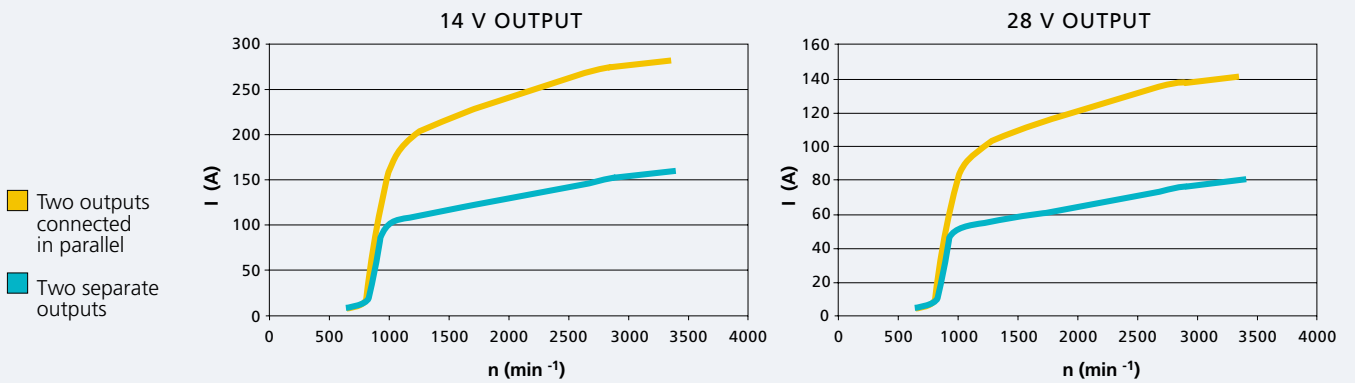
## MAIN TECHNICAL DATA

Type	AIZ	
Nominal voltage	14 V	28 V
Max current (Two separate outputs)	2 x 150 A	2 x 80 A
Max current (Two outputs connected in parallel)	300 A	160 A
Short time output power	4.2 kW	4.5 kW
Continuous output power	3.5 kW	4.5 kW
Stator diameter	300 mm	
Stator weight	~8.5 kg	
Rotor weight	~7.5 kg	
Max speed	5000 rpm	
Electronic regulator	Separate	

GENERATOR AND REGULATOR DIMENSIONS

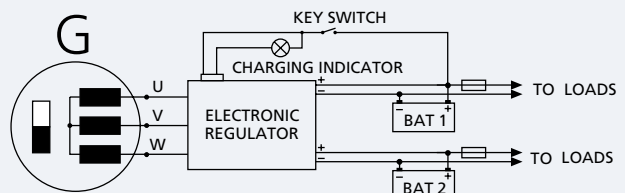


CHARACTERISTIC



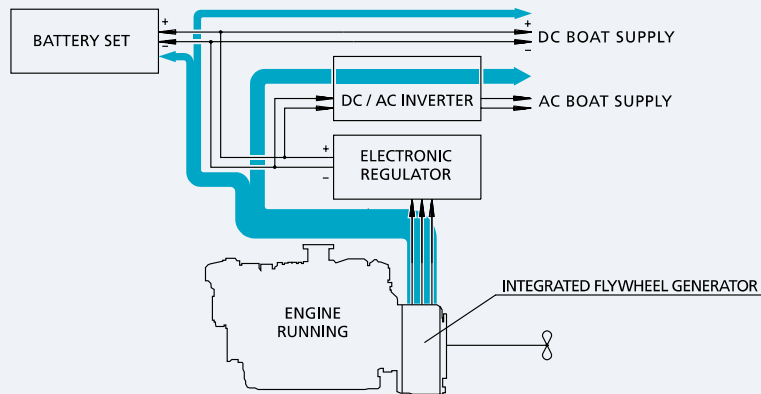
CONNECTION DIAGRAM

NOTE: For installation details see special instructions or contact us.



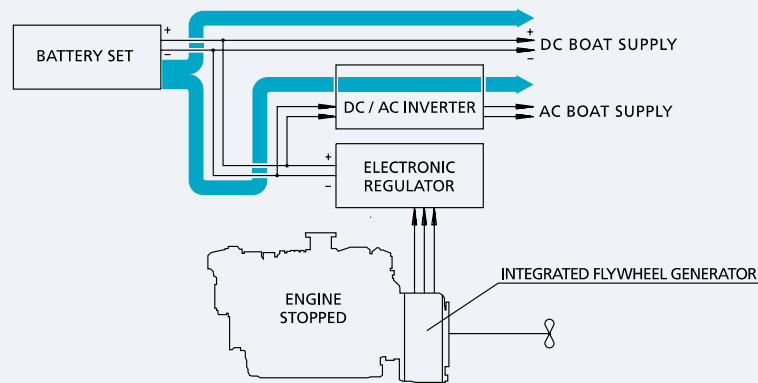
### Marine applications

The generators are normally constructed for the nominal voltage 14 V or 28 V, depending on the basic watercraft installation and the maximal output currents 300 A (2 x 150 A) for the 14 V variants or 160 A (2 x 80 A) for the 28 V variants. The appropriate output voltages are achieved by the corresponding regulator. While the internal-combustion engine operates, the generator supplies the watercraft consumers and at the same time enables charging of batteries installed to the watercraft.



*Energy flow during engine operation*

In case of engine stand still, it is possible to supply the watercraft consumers, based on the accumulation of electric energy in the batteries.

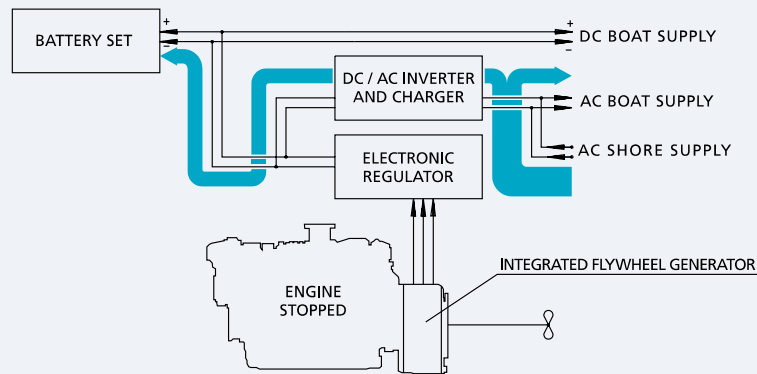


*Energy flow during engine is stopped*

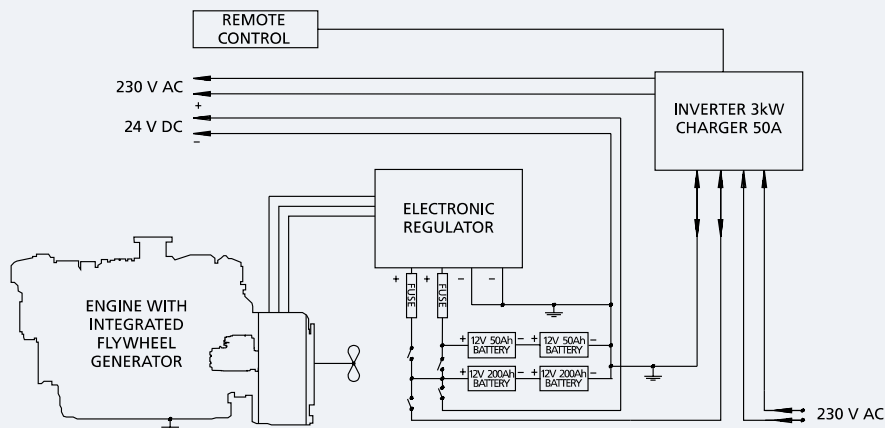
The minimal number of batteries and their capacity is specified by the requirement for cranking and is regarding the engine capacity and the requirements for cranking, defined by the engine producer. The minimal number of batteries enables limited time of supplying the watercraft consumers. To lengthen this time and to enable bigger consumption it is necessary to install additional batteries.

In cases, where the standard alternating voltage supply of 230 V (or 110 V) is required, this can be realized by the use of the inverters connected to the generator output with batteries that are connected in a parallel manner. This enables a constant supply with the alternating voltage while the generator operates in the appropriate mode. In case of the generator standing still (internal-combustion engine), the supply of the alternating voltage is enabled by the conversion of the in-the-batteries-accumulated energy into the required alternating voltage. The minimal number of batteries enables only short operation. To lengthen the operation and increase the power, additional batteries are necessary.

Different producers have different constructions of inverters. Recommended are the inverters equipped with the appropriate selector switches that enable a switch from the power supply of the watercraft to the standard power supply if this is attainable in the marines. Such inverter also enables charging of batteries at the same time.



Power supply from the mains in the marines.



Installation example of integrated flywheel generator into the electric system on the boat

**Stationary power sets**

AIZ generators are appropriate for incorporation into different types of internal-combustion engines and in this way they make an autonomous power supply unit for different electric systems. Usually they are used as individual units for supplying the consumers of the nominal voltage 12 V and 24 V and charging the battery sets. Together with the inverter and external supply from the mains there are more variants of operation, as defined in the previous chapter of marine applications.

**Vehicles**

The generators are mainly intended for applications in vehicles, where the supply systems of high energy are required. The generators can be used as the main source of electric energy, where the generators are incorporated to the main engines or as additional power sets as mentioned above. The engine position and the way of application depend mostly on the anticipated electric system of a vehicle, the ways of supply and the type of the consumers in the vehicle.

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