

Generators for small wind-energy installations

Synchronous 3-phase with permanent excitation (cast-iron housing)



Fabrik elektr. Maschinen GmbH

Siemensstr. 7, D-35394 Giessen

Phone +49 (0)641 / 7969-(0)

Fax +49 (0)641 / 73645

Contact persons/e-mail:

Ewald Ohl, Maik Will; extension: -17
ewald.ohl@huebner-giessen.com
maik.will@huebner-giessen.com

Battery operation

General data and applications

These permanently excited generators have been specially developed for small wind and water energy applications, and are especially suited for charging up 12 or 24 V batteries.

In order to achieve an optimum start-up behavior, particularly at low wind speeds, the generators have been designed to have nearing zero standstill torque, i.e these machines will start to supply energy at very low wind speeds.



Advantages:

- very low cogging torque
- no wearing parts, other than ball bearings
- long life time
- high efficiency, even with partial load



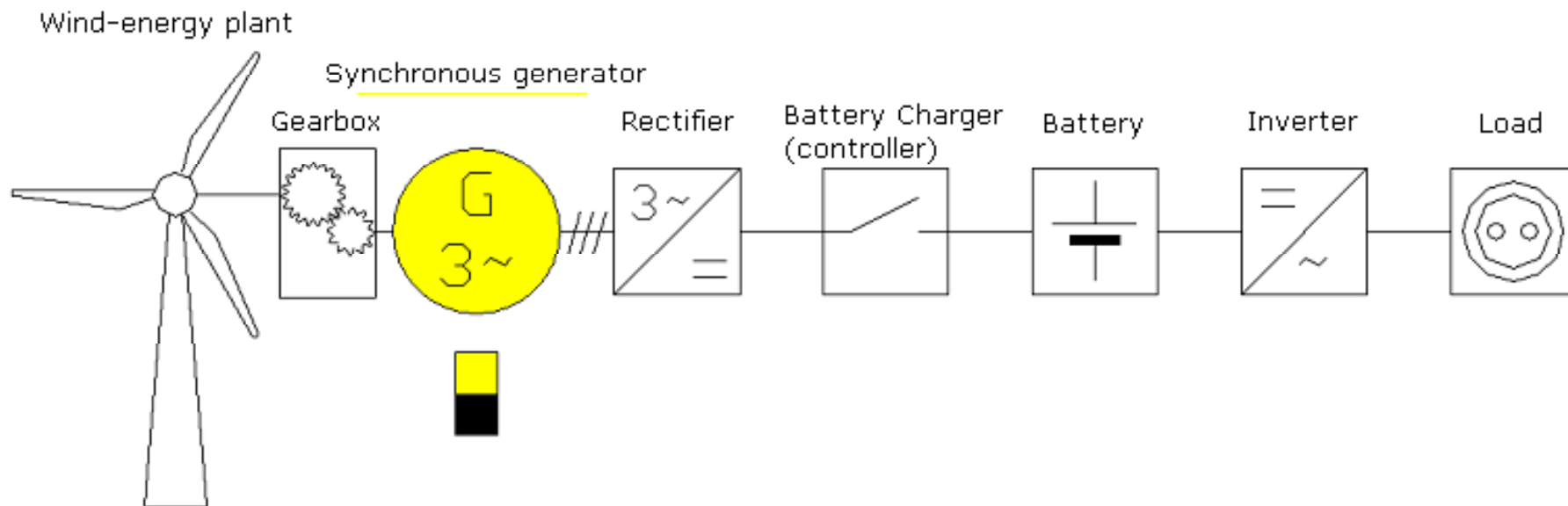
Applications:

1) Energy feedback into a stand-alone electrical supply:

The generators listed in the table are very well suited to charging up batteries (as energy storage for stand-alone electrical supply networks) in connection with the SMA inverters, which we can also provide.

These inverters ensure energy recovery over a wide range of voltage and speed (with p.f. ≈ 1.0).

We can also adapt the various output voltages.



2) DC operation:

Via a rectifier (mounted in the terminal box). The rectifier can be provided if required.

I) General Data:

Excitation:	permanent (magnets)
Voltage:	AC (DC with a rectifier)
Style:	B3/B5
Operating mode:	SI
Insulation class:	F
Cooling:	Surface (completely enclosed version)
Enclosure protection:	IP 55
Color (standard):	RAL 7030

Notes on cooling:
 If the wind speed falls or the load is reduced, the rotor speed will be reduced accordingly.
 The machine must be swept by the wind at low speeds (cooling).

2) Other type-dependent data and characteristics:

DSG P series

	71.07-0,8	71.07-8
Speed	Battery power [W]	
200 rpm	0	0
600 rpm	45	205
1000 rpm	90	500
1500 rpm	-	-
2000 rpm	-	-

	80.10-8	112.14-10	112.17-10	112.16-10
	Max. power to heater resistor [W]			
	120	130	160	500
	670	1.800	2.200	2.700
	1.200	3.700	4.550	5.700
	-	5.800	7.100	8.800
	-	7.900	9.700	11.900

Performance details and characteristics can be found in the file:
Performance_summary.pdf (power data and characteristics).
 Dimensioned drawings can be found in the file:
Dimension_table_B3-B5.pdf (dimension sheets B3/B5).
 As an orientation aid and to simplify queries:
Enquiry_offer_form.doc (this file helps you to ask for an offer by fax or e-mail, without any complications).

Other type-dependent details about the individual machines can be found on the following pages.

Frame size 71

Type 71.07-0,8

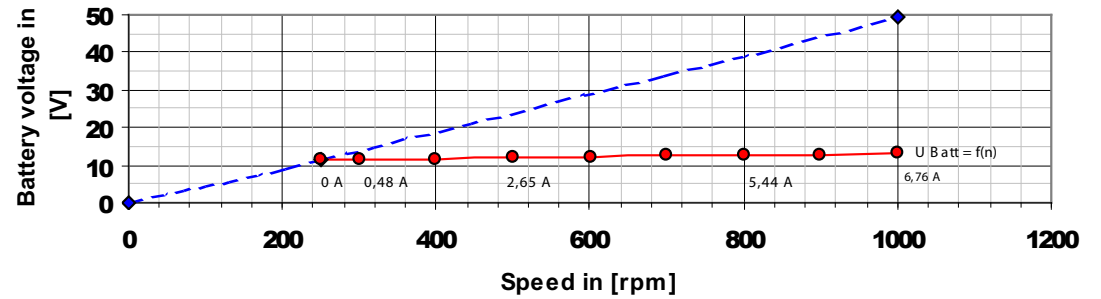
No. of poles: **4**
Voltage: **DC**
Excitation: **Ferrite**
Shaft end: **14 x 30**

Battery voltage 12 V:
Off-load voltage 43 V at 1000 rpm
Nominal voltage 13 V (7.3 A) at 1000 rpm **90 W**

Battery voltage 24 V:
Off-load voltage 86 V at 1000 rpm
Nominal voltage 26 V (3.5 A) at 1000 rpm **90 W**

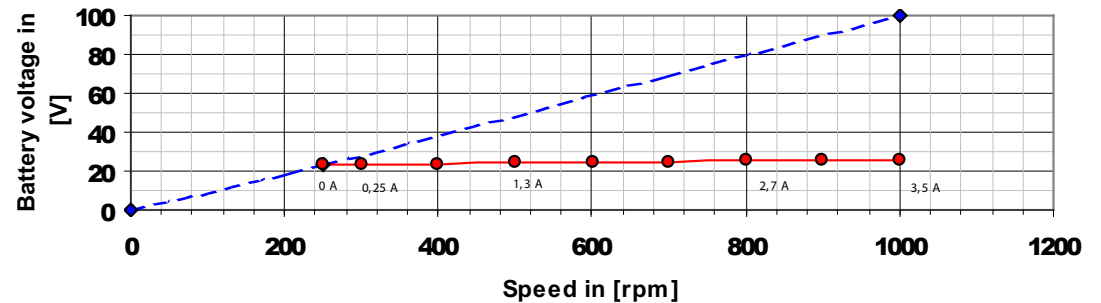
Charging characteristic for 12 V battery 170 Ah

DSG P 71.07-0,8 4-pole with ferrite magnets



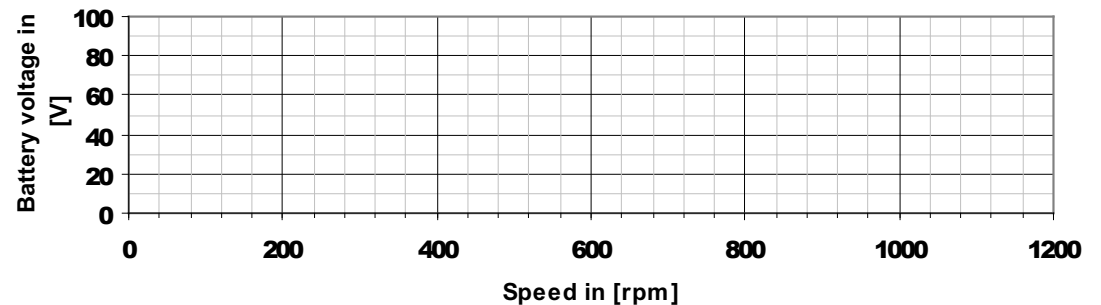
Charging characteristic for 24 V battery 170 Ah

DSG P 71.07-0,8 4-pole with ferrite magnets



Charging characteristic for 48 V battery 170 Ah

DSG P 71.07-0,8 4-pole with ferrite magnets



Fabrik elektr. Maschinen GmbH

Siemensstr. 7, D-35394 Giessen

Phne +49 (0)641 / 7969-(0)

Fax +49 (0)641 / 73645

Frame size 71

Type 71.07-8

No. of poles: **8**
Voltage: **DC**
Excitation: **Nd. Fe. B.**
Shaft end: **14 x 30**

Battery voltage 12 V:

Off-load voltage 48 V at 750 rpm

Nominal voltage 15,1 V (17 A) at 750 rpm **255 W**

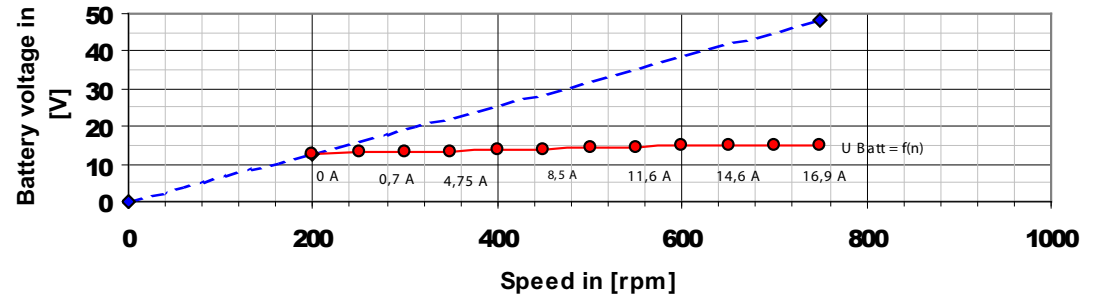
Battery voltage 24 V:

Off-load voltage 58 V at 750 rpm

Nominal voltage 26.5 V (10 A) at 750 rpm **265 W**

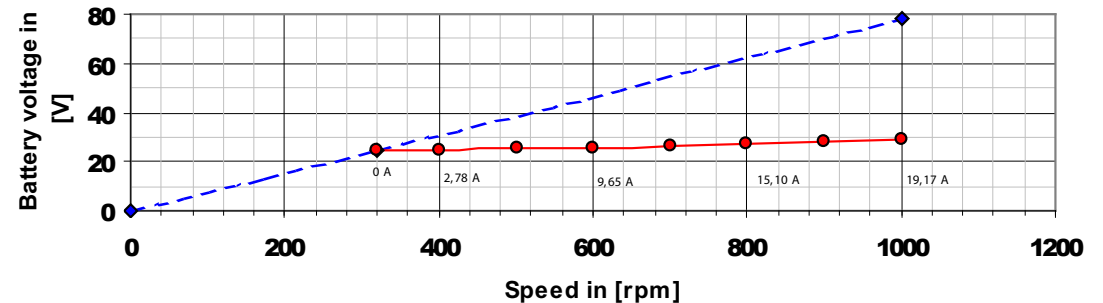
Charging characteristic for 12 V Battery 170 Ah

DSG P 71.07-8 8-pole with Nd. Fe. B.-magnets



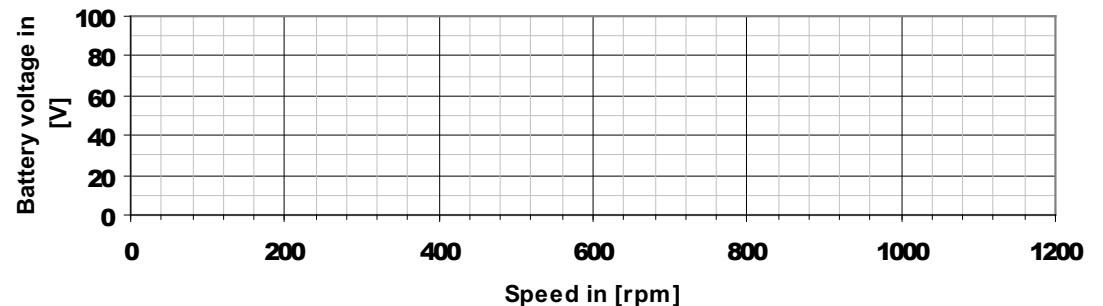
Charging characteristic for 24 V Battery 170 Ah

DSG P 71.07-8 8-pole with Nd. Fe. B.-magnets



Charging characteristic for 48 V Battery 170 Ah

DSG P 71.07-8 8-pole with Nd. Fe. B.-magnets



Fabrik elektr. Maschinen GmbH

Siemensstr. 7, D-35394 Giessen

Phne +49 (0)641 / 7969-(0)

Fax +49 (0)641 / 73645

Frame size 80

Type 80.10-8

No. of poles: **8**
 Voltage: **DC**
 Excitation: **Nd. Fe. B.**
 Shaft end: **22 x 50**

Battery voltage 12 V:
 Off-load voltage 35 V at 320 rpm
 Nominal voltage 14.5 V (19.5 A) at 320 rpm **283 W**

Battery voltage 24 V:
 Off-load voltage 54.5 V at 500 rpm
 Nominal voltage 28.5 V (20 A) at 500 rpm **570 W**

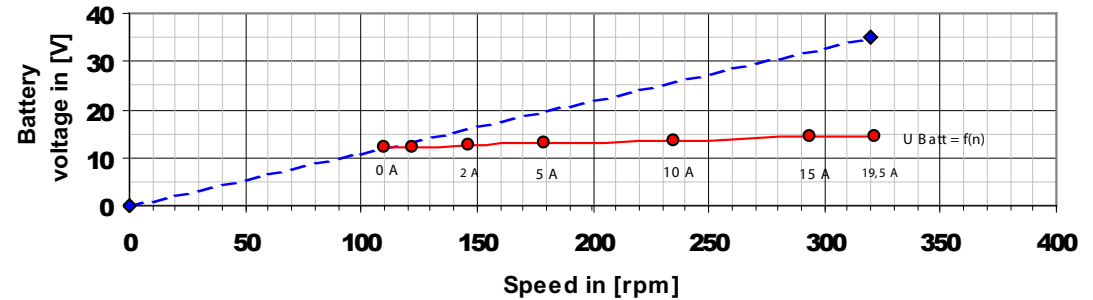
DC-voltage (on heater resistor):
 Off-load voltage 110 V at 1000 rpm
 Nominal voltage 90 V (14.4 A) at 1000 rpm **1.300 W**
Converting energy into heat



Fabrik elektr. Maschinen GmbH
 Siemensstr. 7, D-35394 Giessen
 Phne +49 (0)641 / 7969-(0)
 Fax +49 (0)641 / 73645

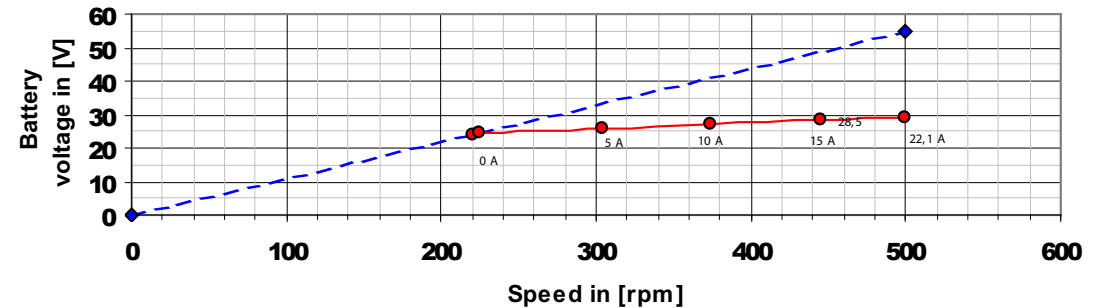
Charging characteristic for 12 V Battery 170 Ah

DSG P 80.10-8 8-pole with Nd. Fe. B.-magnets



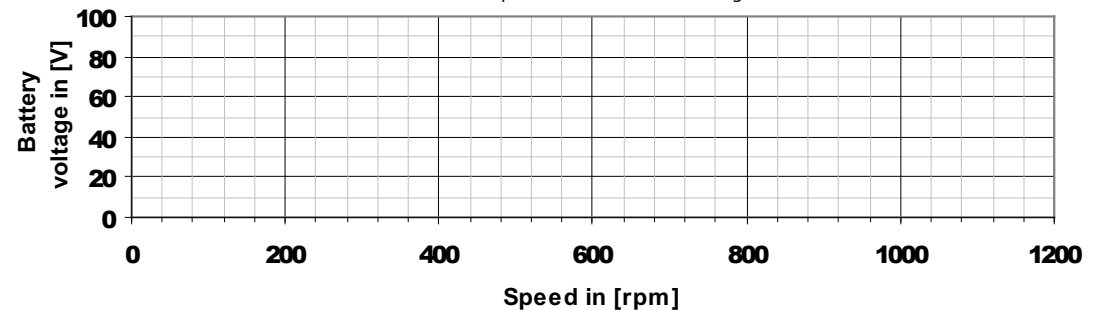
Charging characteristic for 12 V Battery 170 Ah

DSG P 80.10-8 8-pole with Nd. Fe. B.-magnets



Charging characteristic for 12 V Battery 170 Ah

DSG P 80.10-8 8-pole with Nd. Fe. B.-magnets



Frame size I12

Type I12.14-10

No. of poles: **10**
 Voltage: **DC**
 Excitation: **Nd. Fe. B.**
 Shaft end: **28 x 60**

Battery voltage 12 V:
 Off-load voltage 30 V at 200 rpm
 Nominal voltage 16 V (25 A) at 200 rpm **400 W**

Battery voltage 24 V:
 Off-load voltage 50 V at 350 rpm
 Nominal voltage 30 V (25 A) at 350 rpm **800 W**

Battery voltage 48 V:
 Off-load voltage 100 V at 550 rpm
 Nominal voltage 58 V (25 A) at 550 rpm **1.500 W**

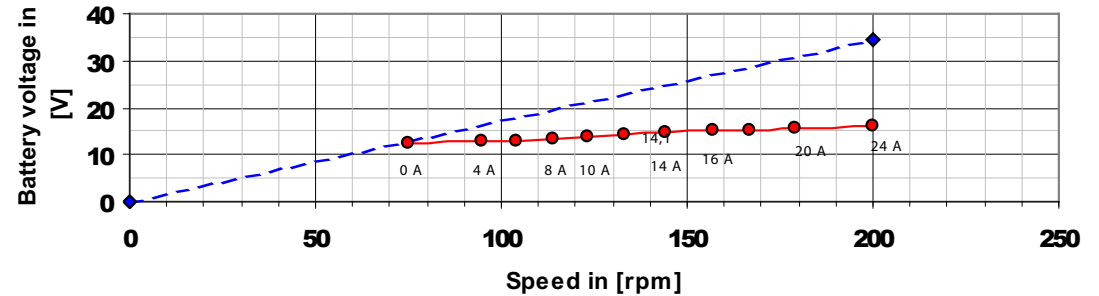
DC-voltage (on heater resistor):
 Off-load voltage 511 V at 600 rpm
 Nominal voltage 325 V (4.92 A) at 600 rpm **1.600 W**
Converting energy into heat



Fabrik elektr. Maschinen GmbH
 Siemensstr. 7, D-35394 Giessen
 Phne +49 (0)641 / 7969-(0)
 Fax +49 (0)641 / 73645

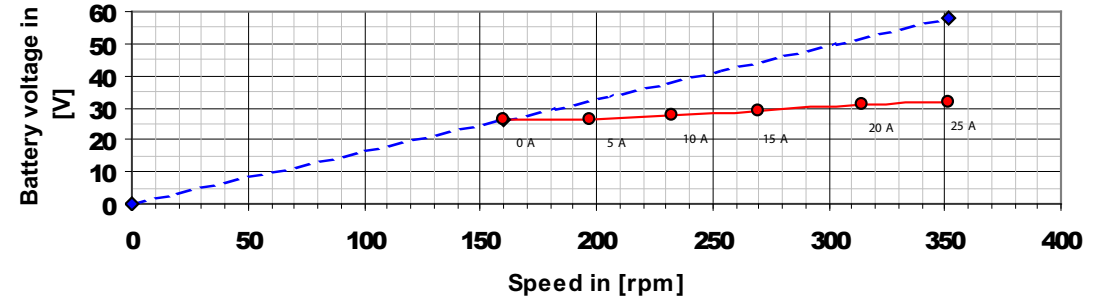
Charging characteristic for 12 V Batterie 170 Ah

DSG P 112.14-10 10-pole with Nd. Fe. B.-magnets



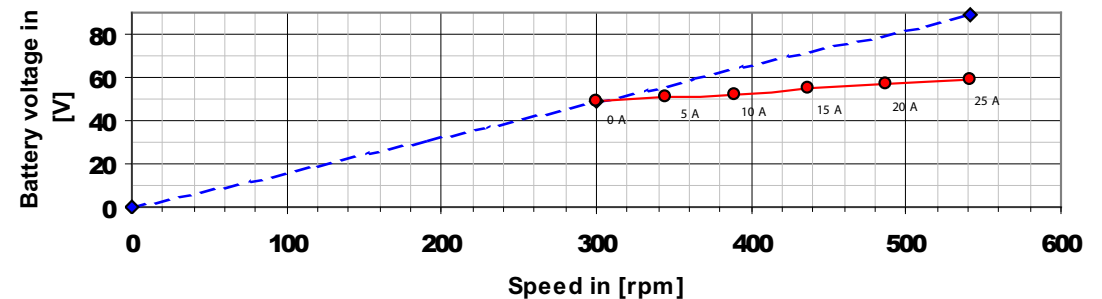
Charging characteristic for 24 V Batterie 170 Ah

DSG P 112.14-10 10-pole with Nd. Fe. B.-magnets



Charging characteristic for 48 V Batterie 170 Ah

DSG P 112.14-10 10-pole with Nd. Fe. B.-magnets



Frame size I12

Type I12.16-10

No. of poles: **10**
Voltage: **DC**
Excitation: **Nd. Fe. B.**
Shaft end: **32 x 80**

Battery voltage 24 V:

Off-load voltage 85 V at 300 rpm

Nominal voltage 27.5 V (24 A) at 300 rpm **660 W**

DC-voltage (on heater resistor):

Off-load voltage 513 V at 600 rpm

Nominal voltage 371 V (7.38 A) at 600 rpm **2.700 W**

Converting energy into heat



Fabrik elektr. Maschinen GmbH

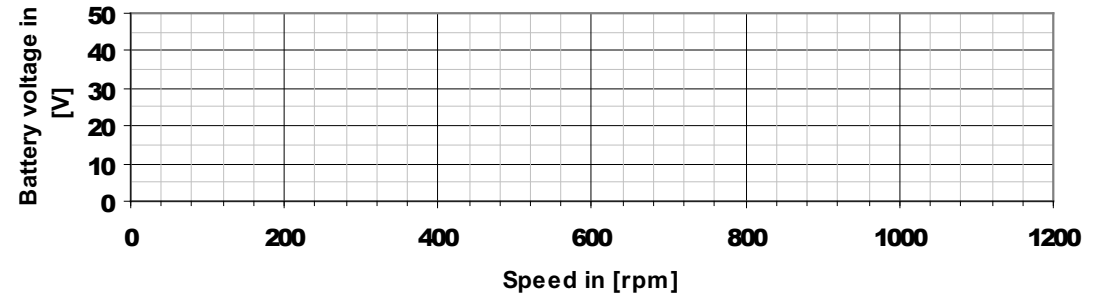
Siemensstr. 7, D-35394 Giessen

Phne +49 (0)641 / 7969-(0)

Fax +49 (0)641 / 73645

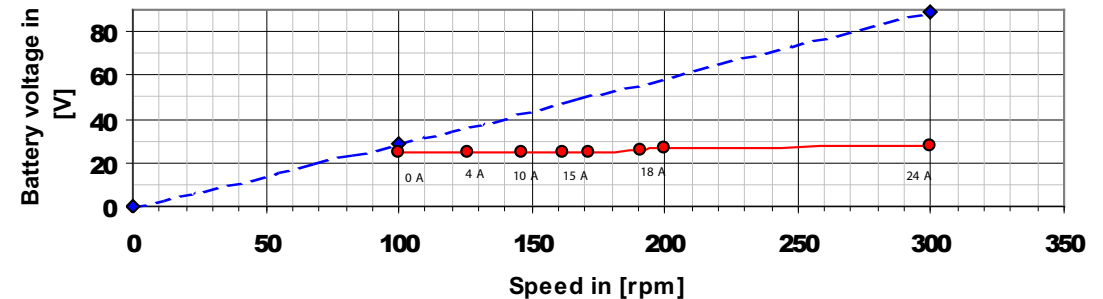
Charging characteristic for 12 V Battery 170 Ah

DSG P 112.16-10 10-pole with Nd. Fe. B.-magnets



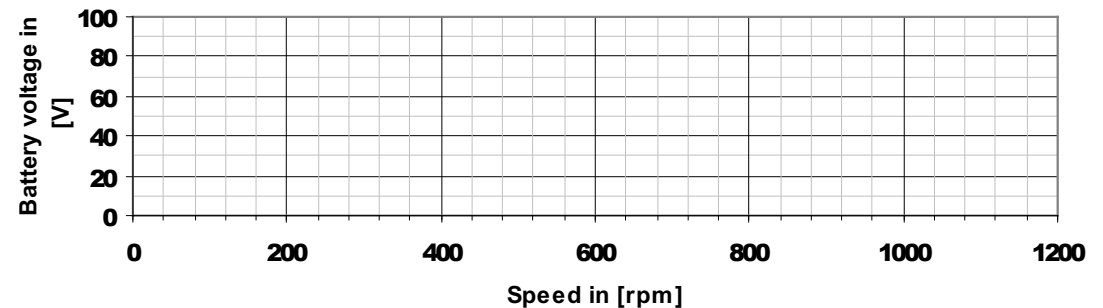
Charging characteristic for 24 V Battery 170 Ah

DSG P 112.16-10 10-pole with Nd. Fe. B.-magnets



Charging characteristic for 48 V Battery 170 Ah

DSG P 112.16-10 10-pole with Nd. Fe. B.-magnets



In a time of energy scarcity, wind generators are in demand again. Particularly when effective utilization can be achieved with acceptable expense, such as converting the wind energy into electrical energy in an environmentally friendly manner. In windy areas, such an installation, with a generated output power in the range from 1 to about 10 kW at 1500 rpm, can operate very efficiently. In this power range, masts and rotors still have the kind of size that can often be set up by the users themselves. And such small installations are usually free from approval procedures.

Battery storage

A special design of the generators makes it possible to use batteries as buffers for the electrical energy. In this case, the windings are dimensioned in such a way that the voltage variation is small over a relatively large speed variation (6 to 10 meters/sec, for example). This behavior is achieved by making use of the so-called bicycle dynamo effect, i.e. above a certain speed, the internal voltage drop rises because of the increased internal resistance of the machine, which depends on the frequency, so that the voltage on the output terminals remains approximately constant. Nevertheless, a battery charger/controller is absolutely necessary for continuous operation. A stand-alone supply (at constant voltage and frequency) can then be provided via an inverter.

Application of permanently excited synchronous generators

If a permanently excited synchronous machine is used as a generator, it is able to generate a voltage with the slightest movement (no standstill torque). The generator has a 3-phase stator, familiar from the classic asynchronous machine. The rotor (magnet rotor in this case) is fitted with permanent magnet segments that provide the magnetic field. The advantage of this special construction is that it can provide a power output over a very wide speed range, and has a long working life, since the only wearing parts are the ball bearings. This design therefore has a particularly high efficiency.

Overdimensioning the wind generator can even provide protection against storms, since the increased incident torque caused by the storm can produce an equal, counteracting torque in the generator, if the latter is producing a correspondingly higher output power. Under these conditions, the wind rotor will not reach speeds that could be high enough to damage it.