



 SYNCHRONOUS GENERATORS SERIES GSV

Basic Data and Application Possibilities

Synchronous brushless self-regulating generators of series GSV are the result of an optimizing of electromagnetic circuits and design executions. This series has been developed with a stress on high efficiency, accuracy of voltage regulation and outstanding dynamic.

The GSV generators are suitable for applications in:

- transportable and stationary land equipment
- supplying board mains, in individual or parallel operation with other generators
- water power generation equipment
- emergency power supply of special aggregates
- as frequency convertors and in further special applications

As driving units of generators can be used:

- internal combustion engines
- gas motors
- electric motors
- water, gas or steam turbines

Standard execution:

The synchronous brushless generators of series GSV are produced as 4-, 6- and 8-pole machines, i.e. for the speed of 1500 min⁻¹, 1000 min⁻¹, and 750 min⁻¹, voltages 400 up to 690 V, frequency of 50 Hz and 60 Hz, cos phi 0.8, mechanical design IP23/IC01, insulation class H, vibrations according to DIN ISO 2373 grades R, noise according to DIN EN 60034-9, interference suppression N according to DIN VDE 0875.

Rated Data and Accessories

The table below gives a survey of rated parameters of synchronous GSV-generators,

Axis heights 250 to 500 mm, 2p = 4, IP23/IC01, U = 400 V, 50 Hz, 1500 min⁻¹, cos phi = 0,8

Type GSV	Iron Length	Output		Efficiency for S _N [%]	Input P _P [kW]	Amount of Cooling Air Q [m ³ /min]	Moment of Inertia [kgm ²]
		S _N [kVA]	P _N [kW]				
280	S	175	140	91,8	153	33	2,0
	M	210	168	92,1	183	33	2,3
	L	255	204	93	220	33	2,7
315	S	400	320	92,5	342	62	6,0
	M	450	360	94,2	382	62	6,9
	L	500	400	95	421	62	7,7
355	S	740	592	94,8	625	100	12,7
	M	850	680	95,1	715	100	15,3
	L	1000	800	95,9	834	100	18,4
400	S	1250	1000	95	1053	140	31,5
	M	1600	1280	95,4	1342	140	34,7
	L	1950	1560	95,9	1627	140	44,5
500	S	2000	1600	94,9	1686	174	64,5
	M	2400	1920	95,2	2017	174	73,7
	L	2800	2240	95,3	2351	174	85,5

Modifications of generators and accessories which can be delivered with the generators:

Mechanical

- single-bearing design
- non-standard housing
- second free end shaft
- special free end shaft
- tachogenerator
- slide bearings
- balancing to grade Q1
- additional thermal sensors
- anti-condensation heating
- air filters

Electric

- non-standard voltage
- special impregnation
- auxiliary terminal box
- No. of terminals in the terminal box
- automatic voltage regulator
- manual voltage regulation
- switch-off or limiting at overexcitation
- devices for parallel operation with the mains
- interference suppression to grade K

Types of Construction, Degrees of Protection, Methods of Cooling

Types of construction, degrees of protection and methods of cooling not mentioned here can be applied separately.

The generators are supplied in following types of construction: B3 (IM1001), B20 (IM1101), B3/B5 (IM2001), B16 (IM1305), V1 (IM3011)

Basic degree of protection complies with IP23, cooling with IC01.

Also IP41, IP42, IP44R, IP44, IP54 and IP55, cooling IC31 or with a water-cooler ICW37A81 can be delivered.

Standards and Regulations

The GSV-generators comply with these standards: IEC 34, DIN VDE 0530, BS 4999/5000, NFC 51-111, NBN7, DS 5002, CEI 2-3, NEN 3173, SEV 3009, SEN 260101.

Further they comply with the regulations of marine classification associations: ABS, BV, DNV, GL, LRS.

Mechanical Design

The generators consist of the main machine, the exciter machine and the electronic voltage regulator these parts form one unit, the voltage regulator is built in the terminal box as standard.

Stator

The housing of the stator is welded from steel sheets and profiles, the stator yoke consisting of both sides insulated dynamo steel sheets is embedded into the housing where it is secured with clamping rings. The housing has feet welded to it, the height of the feet may be changed upon request.

Rotor

The rotor pack consists of pressed and longitudinally welded steel sheets, it contains a built-in damping cage for ensuring the optimum electrical properties. On the same shaft there is a rotor of the exciter and a rotating rectifier. With standard designs the free shaft end is cylindrical with slot and key.

The rotor is dynamically balanced according to grade Q 2,5.

Insulation

The insulation system of the main machine complies with thermal class H.

Terminal Box

The spacial terminal box is placed on the top or on the side of the generator, it enables easy access to all the terminals. The cable bushings can be led to the right or to the left.

Electrical Design

Excitation

The exciting winding of the brushless exciter is fed from a voltage regulator. The output produced in a three-phase rotor exciter winding is rectified by a 6-pulse bridge

rectifier from semiconductor diodes and is feeding the generator rotor winding.

Regulation

With the generators of series GSV analog voltage regulators Basler type AVC, AEC, APR or SR are used, also power factor regulators/reactive power regulators type SCP.

The maximum regulation accuracy is 0,25 % for both analog regulators SR and digital regulators DECS.

The regulation accuracy of cos phi is ± 5 % of the adjusted value.

Working Properties

Voltage Adjusting Range

Using of high ohmic potentiometer enables generator voltage adjustment within the range of ± 10 % of the rated voltage.

Voltage Form

The voltage waveform is practically sine shaped.

The deviations comply with DIN EN 60034-1, i.e. less than 5 %.

The harmonics content is 3 %, measured between the phases.

Overload

The synchronous generators are designed for overloading with 1.5 x the rated current for the duration of 30 s. With regard to the overloading capacity of internal combustion engines the generators may be operated once within 6 hours with 1.1 times the rated current for 1 hour. The short-time overloading of the generators also enables 1.8 times rated current for 10 s.

Short-Circuit Behaviour

The shock short-circuit current complies with DIN EN 60034-4.

Asymmetric Load

The sufficient dimensioned damping cage permits asymmetric generator loading, but in no winding phase the current may not exceed its rated value.

Parallel Operation and Synchronisation

All the generators with a damping cage are destined for parallel operation. For synchronisation it is necessary to ensure compliance of the generator output voltage value, frequency and phase with the mains. Permissible deviations of the voltage are adjustable within the range of ± 5 % to ± 15 % of the mains voltage, at the frequency ± 0.1 Hz or less, and at the phase angle ± 5 % to ± 20 %.

Mains Parallel Operation

Parallel operation with the mains, with adjustable statics of 0 – 10%.

Parallel operation with the mains, with a cos phi regulator.