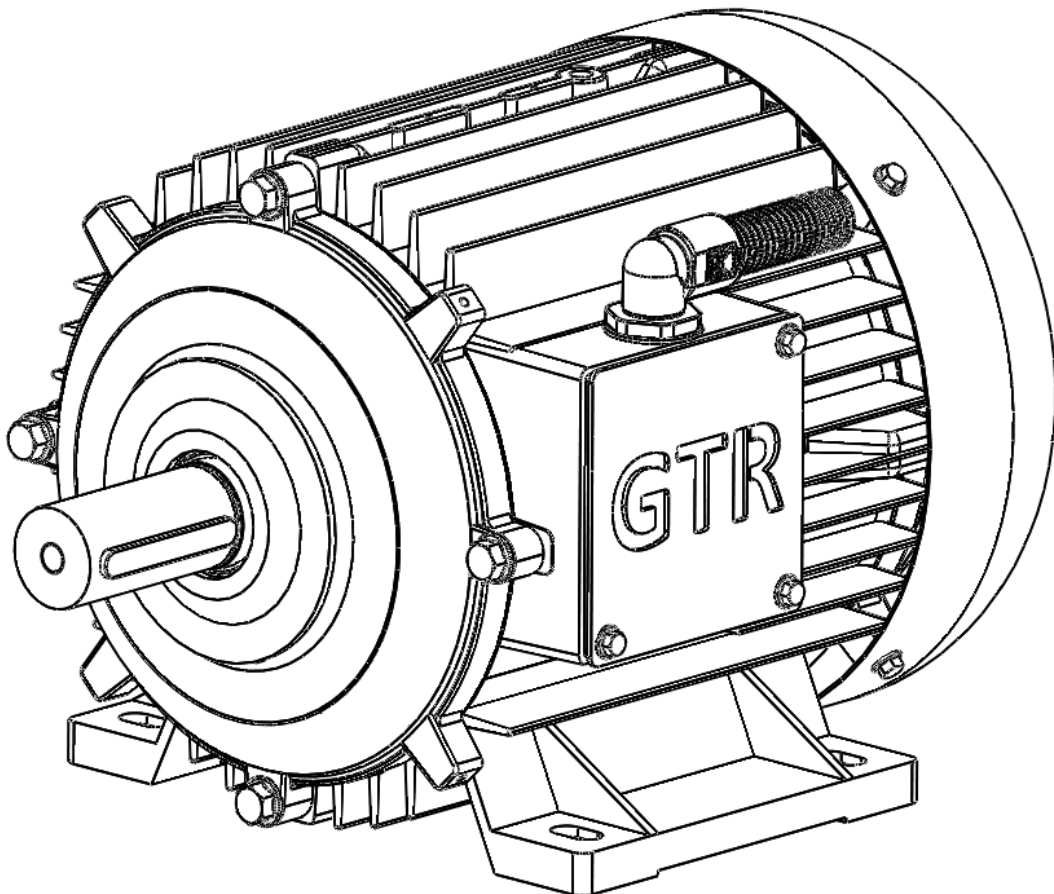


Installation and Operating Instructions

Permanent Magnet Generators

of the Model Range BG 132, BG160, BG180, BG200

IP54 – IP69K



Applicability of the Operating and Installation Instructions

The operating and installation instructions apply to the permanent magnet generators of the sizes 132, 160, 180 and 200 in all power, voltage and frequency classes.

For a better overview, only the three-phase PMG 132/160/3/ZL permanent magnet generator is named and represented in these operating and installation instructions. All other sizes, frequencies or special voltages are applicable correspondingly in accordance with the installation and operating instructions.

Guarantee

For the generators of the model series described here, we grant a guarantee in accordance with the respective, current general European conditions. With the exception of written special agreements between the customer and Generatoren Technik Rüdinger.

Regulations and Standards

All our generators are designed on the basis of the Standards and the Regulations of DIN EN 60034 / VDE0530 and conform to the RoHS.

Technical Changes

Technical changes after printing are not taken into account. The right to make technical changes is reserved.

Manufacturer's Address

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Copyright

Without the express consent of Generatoren Technik Rüdinger, no part of his operating instruction may be duplicated, published or communicated, irrespective of the method or by what means this is carried out.

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Introduction

Dear Customer,

Generatoren Technik Rüdinger designs and produces permanent magnet generators in the power range from 2 to 100kVA.

Through continuous research, development and optimization of materials as well as complex generator calculations, our permanent magnet generators achieve an extremely high power density and a high degree of efficiency with a simultaneously small assembly space.

With the permanent magnet generator, you have chosen a highly engineered product. In the production of the components, only tested and approved parts that comply with the requirements of VDE testing, DIN Standards, EN Standards and RoHS conformity are used.

All the information in these installation and operating instruction has been carefully compiled and checked by us to the best of our knowledge and belief. Before installing and using the generator, please thoroughly and carefully read through these installation and operating instructions. The generator must only be used in accordance with the specifications in the operating instructions and for the purposes specified in the preceding Section "Intended Purpose".

Generatoren Technik Rüdinger shall accept no liability whatsoever for any applications that are contrary to the descriptions given in these operating instructions nor for personal injury or material damage caused by incorrect operation and handling, incorrect installation, improper use, unauthorized technical changes or due to repairs by unauthorized personnel.

Yours sincerely,

Generatoren Technik Rüdinger

Safety Instructions

The generators of Generatoren Technik Rüdinger of the model range PMG 132/xxx/x/xx (see the rating plate for the rating plate designation) are not ready for use products but are designed as components for energy technology.

The generators must only first be operated when they have been installed in accordance with their intended purpose and their safety has been ensured by means of protective devices in accordance with DIN EN ISO 13857 (DIN EN ISO 12 100) or other constructional protective measures.

General Warning and Safety Instructions



The installation, electrical connection and commissioning of the generators as well as maintenance, service and repair work must only be carried out by authorized, qualified and trained specialist personnel who know and observe the relevant regulations!

Never connect the generators to the public electricity supply network or to other systems for power generation. Risk of death, fire and destruction!

The generator must not be operated in potentially explosive environments or areas.

Never carry out visual inspections for maintenance purposes and cleaning work while the generator is in operation. Switch off the generator drive beforehand and ensure that the drive cannot be unintentionally restarted.

Never connect several generators together. Risk of death, fire and destruction!

Never subject the generator or its components to jets from high-pressure cleaners.

The cable connection ends must never be short-circuited. Risk of destroying the generator.

For the installation and for repairs, exclusively only original parts or third-party parts expressly approved by the manufacturer must be used.

No modifications must be made to the generator or individual components. Every modification, improper repair or use of unsuitable third-party parts shall lead to the forfeiture of all rights to warranty claims and to the voiding of the type approval in accordance with the Product Safety Act. In this case, Generatoren Technik Rüdinger shall accept no liability whatsoever.

The generator output must be protected against overcurrent and overload by means of a suitable thermally and magnetically triggered fuse. In doing so, the maximum current and ambient temperature stated on the respective rating plate must be observed. Generatoren Technik Rüdinger shall accept no liability whatsoever for material damage or personal injury resulting from the incorrect choice of fuse or the malfunction of a fuse.

Warning of Electrical Voltage



Work on electrical systems and operating resources must only be carried out with the approval of the Safety Officer and also with the machine switched off and all poles disconnected from the mains / generator and after it has been checked for zero voltage and been secured against unintentional switching back on again.

Danger to Life from Electric Shock!

The generator must not be rotated if the generator terminals are not covered or respectively the generator cables are not protected against contact. Attention! The generator immediately generates a voltage on being rotated.

Danger to Life from Electric Shock!

If the generator is to be connected to an existing distribution network (for example, a house installation) it must be ensured that the system is completely and reliably disconnected from the public electricity network of the power supply company. Feedback into the public network or a mains parallel operation are not permitted. Danger to life from electric shock through feedback for people possibly working on switched off public electricity networks.

Danger to Life from Electric Shock!

As standard, all our generators are delivered in the IT network configuration, that is the star point of the generator (neutral conductor, central point conductor, N) is not connected to earth. Through the IT network configuration, the generator complies with the protective measure "protective separation" and must be monitored for internal or external faults, such as through, for example, defective loads, by suitable insulation monitoring.

Danger to Life from Electric Shock!

If the star point is to be earthed, however, then this must only be done by a qualified, skilled electrician. In this case, a suitable residual current circuit breaker (FI, RCD) must be connected downstream at the generator output. The effectiveness of the electrical protective measures must be certified by means of appropriate measurements and test reports.

Danger to Life from Electric Shock!

During operation, the generator delivers life-threatening electrical voltage! During operation, never touch the generator itself or the loads connected to the generator with wet hands.

Danger to Life from Electric Shock!

Warning of a Magnetic Field



The disassembly and opening of the generator must only be carried out by the manufacturer or by a company trained and authorized to do so in writing by the manufacturer.

Exclusively, only non-magnetic or non-magnetizable tools must be used as generator assembly tools.



The disassembly and opening must only take place at an absolutely clean workplace! Risk of destruction of the generator through attracted, magnetic metal swarf, particles and / or magnetic tools.



Never disassemble the rotor from the stator, the generator can be damaged or destroyed through the incorrect disassembly of the rotor. In addition, there is a very high risk of **personal injury, especially through crushing and cutting hazards.**

The installation personnel must not have magnetic items of any kind on their person, in their clothing, magnetic items of clothing, medical aids such as, for example, heart pacemakers and especially not wear magnetic body jewellery. High risk of **personal injury through crushing and cutting hazards.**

During the installation, the installation personnel must wear work clothes in accordance with the valid safety regulations

Data carriers, magnet storage media, electronic devices or measurement instruments must not be brought into the immediate vicinity of the permanent magnet rotor! **Data loss and / or risk of destruction of the respective devices.**

Magnetized tools used must not be brought into the vicinity of data carriers, magnet storage media, electronic devices or measurement instruments! **Data loss and / or risk of destruction of the respective devices.**

Generatoren Technik Rüdinger shall accept no claims whatsoever for material damage and / or personal injury or for damages that occur as a result of non-compliance with the instructions.

Intended Purpose

The permanent magnet generators described in these operating and installation instructions are intended exclusively for mains backup operation for stationary or transportable electric power systems.

The generators must only be used in accordance with the voltage, current and performance specifications and the environmental conditions stated on the rating plate. The direct mains parallel operation of the permanent magnet generators is not intended and is only possible conditionally following consultation with the manufacturer. The generators must be driven at the specified nominal speed, if the nominal speed is fallen short of or exceeded by more than 10%, Generatoren Technik Rüdinger must be consulted and its written approval obtained. An incorrect rotational speed setting can lead to a fault on a connected load and to personal injury. Generatoren Technik Rüdinger shall accept no claims of any kind for material damage or personnel injuring arising from incorrect setting.

The permanent magnet generator (for example, a special duplex bearing generator with belt, chain or cardan shaft drive) must first be operated when it has been appropriately installed in accordance with the purpose and its safety has been ensured by means of protective devices in accordance with DIN EN ISO 13857 (DIN EN ISO 12 100) or other constructional protective measures.

The generator outputs must be protected according to the performance data on the rating plate and the network configuration (IT or TN) by a suitable fuse and / or warning device against overcurrent, residual current and short circuit.

The generators must not be connected or synchronized with other power distribution and / or generating systems (for example, other generators or the public electricity supply network).

The generators must only be used for the applications specified here and only in accordance with the specifications in these operating instructions. Any other use shall be considered to be improper use and is not permitted.

In the event of the incorrect or improper use of the generator or individual components, Generatoren Technik Rüdinger shall accept no liability of any kind.

Preconditions and Requirements at the Installation and Operation Site

All generators are protected against water spray in accordance with IP54 and can, therefore, also be used in the open. The closed IP54 generators are not explosion protected and must, therefore, not be operated in potentially explosive environments. The installation and operation site must be so chosen that the required minimum clearances are maintained, at all times adequate ventilation is ensured and that the temperature of the generator intake air in continuous operation does not exceed 40°C. With installation in a housing system together with the drive unit, it must be respected that the radiant heat of the drive system or surrounding thermal sources does not feed into the generator. In this case, the generator must be thermally de-coupled by means of protective systems such as, for example, heat shields. We will willingly advise you about your installation situation.

The generators of protection type IP54 and the attached parts must not be cleaned with high-pressure cleaners. Therefore, the generators must be so positioned that the unintentional spraying of the generators with high-pressure cleaners is not possible.

Our determined performance and temperature values are valid from an installation height of between 0m above mean sea level to a height of 1500m above mean sea level. If you intend other operating heights for your application, then the generator must be adapted to these requirements.

Generator Designs

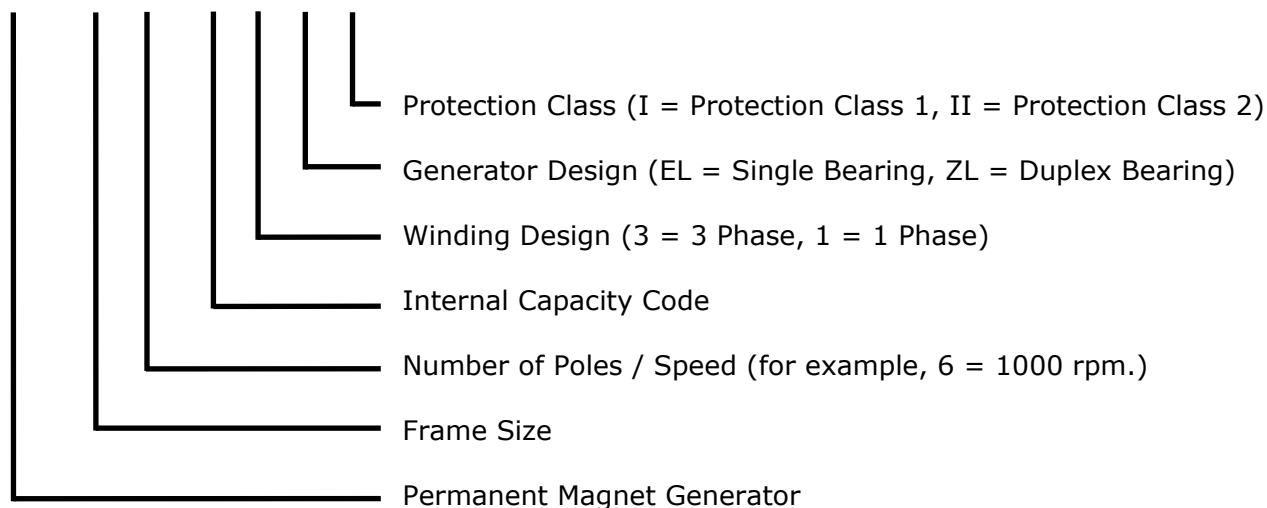
Generator Type Designation

Every generator has a type designation on the rating plate as well as a unique serial number. Please have this data ready for a repeat order, spare part order or a question over the telephone or send it to us in your e-mail.

Example of a generator serial number: **86201001**

Example of a generator type designation:

PMG/132/6/200/3/EL/I



Generator Construction

The generators consist of an inner pole permanent magnet rotor and a stator laminate stack with single phase or 3-phase windings in the respective voltage and frequency versions.

Our PM generators characteristic is very voltage stiff and, therefore, they require no active readjustment of the generator voltage via, for example, a generator governor or inverter. As a result, our generators have no other excitation devices such as capacitors, exciter units or slip rings with carbon brushes.

Through dispensing with the active voltage regulation, our generators can be designed considerably shorter, whereby the weight is also reduced.

The housing and the bearing plate consist of a robust, proven and weight-optimized aluminium die-cast housing.

In addition, the bearing plate has a cast-in sintered steel bush at the ball bearing seat through which the greatest possibly robustness and rotor shaft stability is achieved.

Single Bearing Generators

Single bearing generators are flange-mounted directly on the drive. With single bearing generators, a part of the radial bearing load of the permanent magnet rotor is transmitted to the secondary side bearing on the drive, here it must be noted that the permissible radial force of the secondary bearings of the drive must not be exceeded. The coaxiality of the drive shaft to the flange seat of the drive on which the generator is centered must be less than 0.05mm. The run-out of the flange seating surface to the drive shaft must be 0.03mm. Before assembly, the cone of the drive motor must be cleaned and any anti-corrosion grease must be removed.

Duplex Bearing Generators

Duplex bearing generators are normally installed next to the drive and driven by means of a belt, chain, cardan shaft or hydraulic unit. The generator must be installed firmly and securely on an absolutely flat and level substrate suitable and adequately load-bearing for the weight of the generator.

Generators with Drive Shafts for Further Units

Units flange-mounted on the drive shaft of the generator on the fan side or B side must not transmit any radial force on to the generator housing and must have their own torque support for the drive motor or drive unit.

IP Protection Types

Our generators are manufactured in the designs IP 54 to IP 69K.

Please check your respective generator application requirement according to the table below.

The identification of the IP protection type is done using 2 numerals. The first numeral identifies the protection against contact and foreign bodies. The second numeral the protection against water.

Example of a specification for a protection type: for example, **IP 54**

First numeral = **5** = protected against dust

Second numeral = **4** = protected against spray water

First Numeral	Designation	Explanation
1	Protected against solid foreign bodies of 50mm diameter and greater	The object probe, sphere 50 mm diameter, must not fully penetrate ¹⁾ .
2	Protected against solid foreign bodies of 12.5mm diameter and greater	The object probe, sphere 12.5 mm diameter, must not fully penetrate ¹⁾ . The jointed test finger may penetrate up to a length of 80mm but adequate clearance must be maintained.
3	Protected against solid foreign bodies of 2.5mm diameter and greater	The object probe, sphere 2.5 mm diameter, must not penetrate at all ¹⁾ .
4	Protected against solid foreign bodies of 1.0mm diameter and greater	The object probe, sphere 1.0mm diameter, must not penetrate at all ¹⁾ .
5	Protected against dust	The ingress of dust is not fully prevented but dust may not enter in such quantities that the satisfactory operation of the equipment or its safety are adversely affected.
6	Dustproof	No ingress of dust at a negative pressure of 20 mbar in the housing.

1) The full diameter of the object probe must not pass through an opening in the housing.

Second Numeral	Designation	Explanation
1	Protected against dripping water	Vertically falling drops must have no harmful effects.
2	Protected against dripping water with the housing tilted up to 15°	Vertically falling drops must have no harmful effects when the housing is tilted up to an angle of 15° on either side of the vertical.
3	Protected against spray water	Water sprayed at an angle up to 60° on either side of the vertical must have no harmful effects.
4	Protected against splashing water	Water splashed against the housing from any direction must have no harmful effects.
5	Protected against water jets	Water projected in jets against the housing from any direction must have no harmful effects.
6	Protected against powerful water jets	Water projected in powerful jets against the housing from any direction must have no harmful effects.
7	Protected against the effects of temporary immersion in water	Water must not enter in a quantity causing harmful effects if the housing is temporarily immersed in water under standardised conditions of pressure and time.
8	Protected against the effects of continuous immersion in water	Water must not ingress in a quantity causing harmful effects if the housing is continuously submerged in water under conditions that must be agreed between the manufacturer and the end user. The conditions, however, must be more severe than for Numeral 7
9	Protected against water during high pressure / steam cleaning	Water under significantly increased pressure directed at the housing from any direction must not have any damaging effects.

Overview of Common IP Protection Types

First Numeral Contact Protection	Second Numeral – Water Protection									
	IP X0	IP X1	IP X2	IP X3	IP X4	IP X5	IP X6	IP X7	IP X8	IP X9
IP 0X	IP 00									
IP 1X	IP 10	IP 11	IP 12							
IP 2X	IP 20	IP 21	IP 22	IP 23						
IP 3X	IP 30	IP 31	IP 32	IP 33	IP 34					
IP 4X	IP 40	IP 41	IP 42	IP 43	IP 44					
IP 5X	IP 50				IP 54	IP 55				
IP 6X	IP 60					IP 65	IP 66	IP 67	IP 68	IP 69

General Generator Characteristics

The following data are guideline values of our PM generators. Depending on the generator size and performance, differences are possible. The exact technical data can be found in the respective generator data sheet or on the rating plate.

Power range:	2-100kVA
Frequency:	50Hz,60Hz, 200Hz or 400Hz
Voltage AC:	110/220V, 127/220V, 220/380V, 230/400V, 240/480V
Voltage DC:	12, 14, 28, 48, 96V Other voltages are compatible.
Current DC:	Up to 800A
Unbalances load:	175%
Power factor:	cos ϕ : 0.8 to 1.0 inductive cos ϕ : -0.7 to 1,0 capacitive
Efficiency:	95% at part and full load
Rotational speeds:	750, 1000, 1500, 2000, 3000 or 3600 rpm.
Maximum speed:	Nominal speed * 1.5 factor = maximum speed Example: 3000 rpm * 1.5 = 4500 rpm
Rotation direction:	Single bearing with conical connection: clockwise Single bearing with flange disc: clockwise and counter-clockwise Duplex bearing: clockwise and counter-clockwise
Weight:	11 – 185kg
Harmonic content (THD):	Below 5%
Protection type:	IP 54 – IP 69K Other protection classes are compatible
Protection class:	I or II
Insulation class / thermal class:	F or H Other insulation classes are compatible
Insulation resistance:	5- 2000M Ω
Maximum ambient temperature:	Operation: -40 to +40°C Storage: -50 to +90°C Other temperatures are compatible
Maximum relative humidity:	Operation: 85% at 25°C, 95% short time up to max. 35°C Storage: 95%
Ventilation:	Surfaces rib-cooled with forced rotation fan on the B side
Voltage tolerance:	\pm 5% in accordance with Class G1 DIN 8528-5 Other voltage tolerances G2, G3 are compatible
Installation height:	0m above mean seal level to 1500m above mean sea level

Types of Drive of Permanent Magnet Generators

Drive via Combustion Engine.

With a drive by means of a combustion engine, it must be observed that the engine rotational speed is held constant or is regulated. The hot exhaust stream of the combustion engine must not flow against the air flow of the generators and must, if necessary, be diverted via air baffles.

Drive via Cardan Shaft

With a drive by means of a cardan shaft, it must be observed that the angular offset of the cardan shaft between the normal utility vehicle transmission output and the generator must be kept as small as possible. The speed of the drive must be held correspondingly constant or be regulated.

Drive via Belt

With a drive by means of a V-belt, V-ribbed belt and toothed belt, it must be observed that the belt tension is adequately dimensioned and the belt has low slippage. In addition, the maximum permissible belt pretension must be observed in order not to permanently overload the generator ball bearings with a too high radial force.

Drive via Chain

With a drive by means of a chain, it must be observed that the chain tension does not have a too high or too low pretension. A too high chain tension can damage the generator, with a too low pretension, the chain tends to slacken and in extreme cases can jump out. The chain must be protected against unintentional contact by a suitable and robust cover.

Drive via Electric Motor

With a drive by means of an electric motor such as, for example, via a frequency converter, the generator must be installed with the electric motor, via a suitable shaft coupling with a very low shaft offset, on a robust and level frame.

Drive via Hydraulic Motor

With a drive by means of a hydraulic motor, it must be observed that the hydraulic volumetric flow rate and hydraulic pressure are regulated to the generator load. Incorrect regulation and basic setting can lead to a generator overspeed through which the generator is destroyed.

Installation

The fitting of the generator to the drive, especially, the electrical connection and the commissioning, must only be carried out by trained specialist personnel.

The tightening torques of connecting elements such as screws and nuts must be strictly complied with. It is recommended to tighten flanged connections with several screws using a step by step sequence.

During installation, the generator may be rotated at a maximum of 20 rpm, in doing so, the connection terminals or connecting cables must be covered and be separated from each other. In addition, during the installation the generator must be all-pole disconnected from the electrical cabinet or loads to be supplied.

(Danger to Life from Electric Shock)

The generator must be protected from overcurrent by a circuit breaker in accordance with the rating plate specifications and against overload and short circuit. The magnetic activation of a circuit breaker must be recorded by means of a suitable test and measurement device and be verified and documented.

The contact surfaces between the drive and the generator, especially with single bearing generator with a conical connection, must be degreased. Any lacquer layers, dust or dirt accumulation must be removed.

The drive flange delivered with a single bearing generator must only be fixed to the drive using screws and washers the total installation height of which is below 8mm. With a higher installation height, the generator windings can be damaged.

(Danger to Life from Electric Shock)

After the fitting of a single bearing generator to its drive, the drive shaft axial play (special combustion engines with crankshaft plain bearing shells) must be checked and compared with the documentation of the combustion engine manufacturer. Too low an axial play can lead to drive train damage.

If the generator is driven via a belt or chain, then the pretension force of the belt or the chain must not exceed a maximum radial shaft load of 3500N.

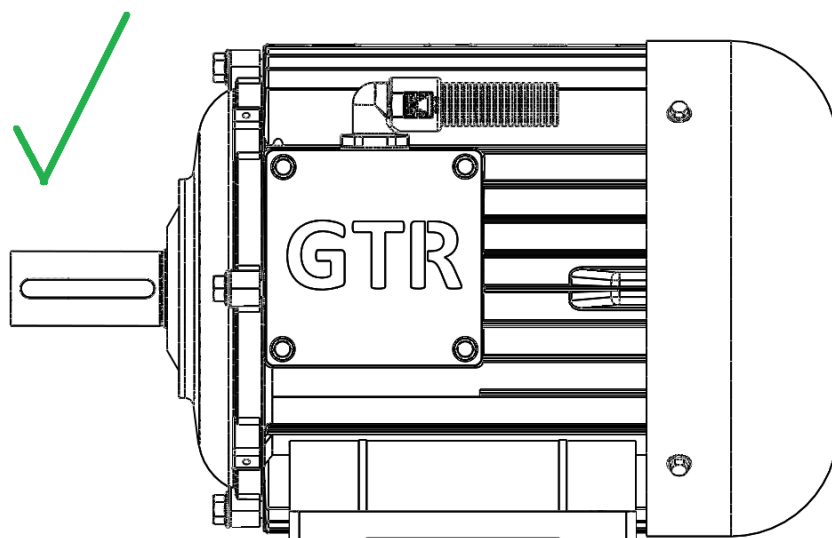
Tightening Torque Values Screws

The following table contains the tightening torque values for screws with standard threads in accordance with DIN 912. Please note the respective strength class of the screws.

Thread	Strength class							
	5.8		8.8		10.9		12.9	
M2	0.22	Nm	0.35	Nm	0.49	Nm	0.5	Nm
M3	0.77	Nm	1.2	Nm	1.7	Nm	2.1	Nm
M4	1.8	Nm	2.9	Nm	4	Nm	4.9	Nm
M5	3.6	Nm	5.7	Nm	8.1	Nm	9.7	Nm
M6	6.1	Nm	9.8	Nm	14	Nm	17	Nm
M8	15	Nm	24	Nm	33	Nm	40	Nm
M10	29	Nm	47	Nm	65	Nm	79	Nm
M12	51	Nm	81	Nm	114	Nm	136	Nm
M14	80	Nm	128	Nm	181	Nm	217	Nm
M16	123	Nm	197	Nm	277	Nm	333	Nm
M18	172	Nm	275	Nm	386	Nm	463	Nm
M20	240	Nm	385	Nm	541	Nm	649	Nm
M22	324	Nm	518	Nm	728	Nm	874	Nm
M24	416	Nm	665	Nm	935	Nm	1120	Nm
M27	600	Nm	961	Nm	1350	Nm	1620	Nm
M30	819	Nm	1310	Nm	1840	Nm	2210	Nm

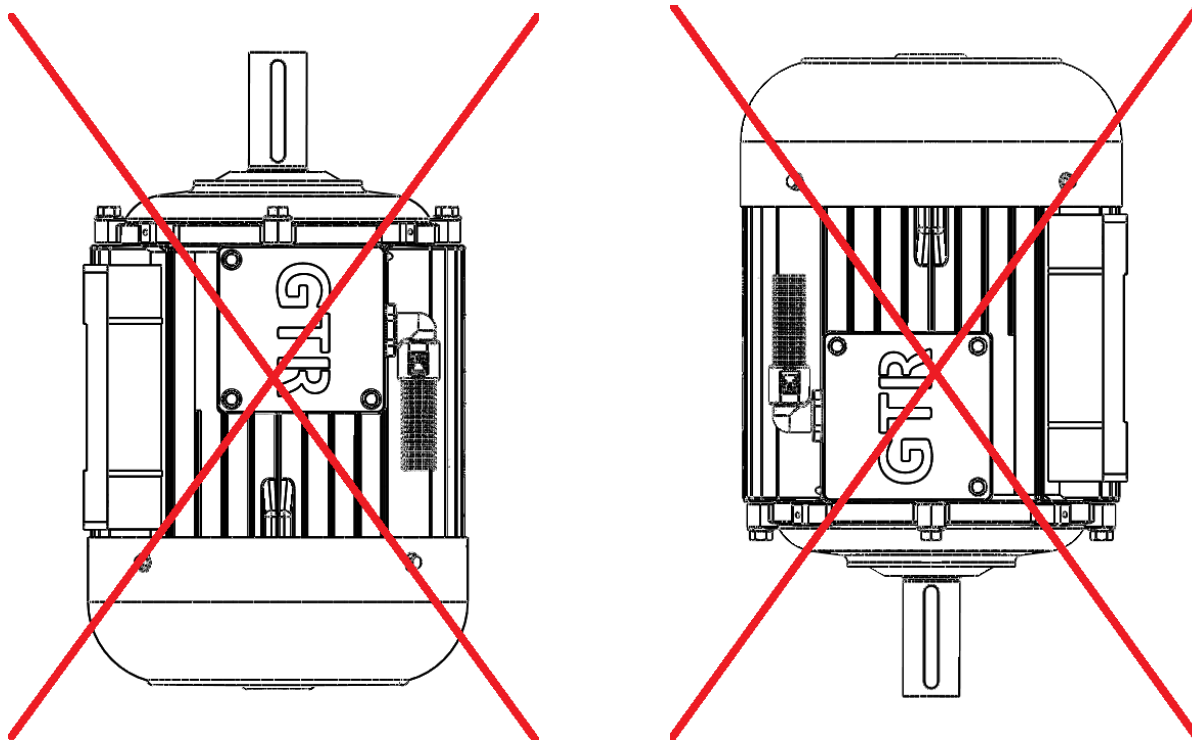
Installation Position of the Generator

Our standard generators must only be installed and operated in a horizontal installation position as in the following image.



Other installation positions such as vertical installation must not be implemented with our standard generators.

The vertical installation requires special axial ball bearings that we will gladly fit for you following consultation.



Commissioning

The initial commissioning of the generator must only be carried out by a trained specialist who knows and observes the relevant Standards and Regulations. Especially to be checked before the initial commissioning are:

- Installation and electrical installation professionally completed?
- Protective earth connected?
- Protective earth resistance in accordance with the Standard?
- Insulation Resistance in accordance with the Standard?
- Possibly present installation left-over items and foreign bodies removed
- Circuit breaker to the load disconnected?

Before the generator drive is started it must be ensured that no one is working on the system or is present in the immediate vicinity of the danger area. It is highly recommended to connect suitable measurement instruments in order to be able to monitor limit values. The drive should be speeded up gradually so as to be able to detect possible problems.

After the starting of the generator drive, it is imperative that the voltage, frequency, rotating field and the operation of the fan are checked. In addition, attention must be paid to abnormal noises or vibrations.

On reaching the nominal speed, the voltage must be remeasured and possibly be corrected by a small adjustment of the speed. It is recommended to check the generator for full capacity by means of the connected load or a suitable load bank.

Insulation Resistance

During the final inspection in the Generatoren Technik Rüdinger works, each generator is checked for insulation resistance in accordance with the Standards using a high voltage test instrument. Before the commissioning in the system and above all following a long period of storage, the generator must be checked for adequate insulation using an insulation test instrument with 500V. In the process, it must be respected that only the generator is tested as connected electronic devices can be damaged by the high voltage. The insulation value of the windings against earth, PE must be greater than 5Mohm. If the value is not in order, then please contact Generatoren Technik Rüdinger.

If the insulation resistance is below 5Mohm, then under no circumstances must the generator be put into operation.

(Danger to Life from Electric Shock)

Operating Temperatures

The generator can be used in a thermal environment of -40 to +40°C. Here it must be respected that the air intake temperature on the fan impeller on the B side is the crucial factor.

Servicing and Maintenance

Our permanent magnet generators have no parts that need regular servicing or readjustment. Through the use of ball bearings with "lifetime lubrication", our generators are, therefore, maintenance free. At the end of the lubricant operating life, in normal standard application, the replacement of the ball bearings is first necessary after approximately 25000 hours.

The ball bearing service life is very highly dependent on the generator ambient temperature as well as the radial shaft load such as, for example, through a belt or chain drive. It is recommended, therefore, to carry out a ball bearing sound test every 5000 hours. If harsh running noises can be heard then the ball bearings must be replaced.

Service, repair and maintenance work must only be carried out with the generator switched off, all-pole disconnected and secured against unintentional switching back on.

Pay attention to low vibration running and adapt the inspection intervals according to the degree of soiling of the generator. A regular inspection with cleaning, if necessary, is recommended in order to prevent the imbalance of the fan due to dirt deposits.

Never clean the generator with a high-pressure jet, the generator can be damaged or destroyed by it.

Wet cleaning whilst under voltage can lead to an electric shock.

Danger to Life from Electric Shock

Transport and Storage

The generator is dispatched firmly screwed to a pallet and fully assembled and ready for installation. It is recommended that the generator is carefully checked for transport damage on arrival at the final destination. Any possible visual damage must be immediately reported to the transport company and to Generatoren Technik Rüdinger.

The generator housing has threaded holes that serve for the lifting of the generator using M10 eyebolts. It must be ensured that the lifting equipment used for the generator transport is adequately dimensioned and is approved.

The generator must not be moved and / or lifted using the connection cables.

Impacts and shocks to the generator must be avoided.

If the generator is not immediately installed and put into operation, then it must be stored in a clean, dry, vibration and shock-free location in a temperature range of -50 to +90°C "non-condensing".

After approximately 6 months, it is recommended that the generator is rotated at a maximum speed of 50 rpm in order to prevent contact corrosion in the ball bearings. In doing so, the generator terminals or generator cables must be covered as well as separated from each other and must not be accessible. **Danger to Life from Electric Shock**