

Operating instructions Direct current permanent magnet geared motors BA 148 04 GB

1 Installation

The drive must be assembled and connected by qualified personnel (skilled electrical personnel). The relevant safety and accident prevention regulations must be observed (see Safety-Note-Print-No. 122..).

The motor is designed for IP 54 protection to EN 60529 and EN 60034 and is therefore protected against dust and occasional splash water.

Operation outdoors or in very damp conditions or in areas where there is a risk of explosion is not permissible. It is recommended to cover drinking water, food, textiles and similar under the geared motor.

The housing is corrosion-protected. Under certain circumstances, it must be cleaned regularly and the protective coat touched up. Aggressive liquids or gases must not make contact with the motor if it does not have a special protective coating and acid-resistant shafts.

Permanent magnet motors require no ventilation over the entire speed setting range. A build-up of heat due to heavy contamination, non-thermally conductive fastening parts and a plastic housing must be avoided.

Flexible couplings which are free of backlash should be used if power is transmitted directly from the gear unit to the driven machine. If there is any danger of blockage, commercial slip clutches should be used.

Power transmission elements must be carefully fitted to the output shaft of the gear unit, which is ground with ISO k 6, m 6 or h 6 limits, by using if at all possible the hole to DIN 332 tapped in the face of the shaft end for this purpose. Heating the drive component to be fitted to approximately 100° C (212° F) has been found to be advantageous. The bore should be measured in accordance with the following table and must therefore have the following tolerances:

| Nominal bore diameter (in mm) | Output shaft k 6 or m6 Bore H7 with tolerances (in $^{1/1000}$ mm) |
|----------------------------------|--|
| above 6 to 10 | 0 to + 15 |
| above 10 to 18 | 0 to + 18 |
| above 18 to 30 | 0 to + 21 |
| above 30 to 50 | 0 to + 25 |
| above 50 to 80 | 0 to + 30 |
| above 80 to 120 | 0 to + 35 |
| above 120 to 140 | 0 to + 40 |

Where the gear unit is designed with hollow shaft and keyway for highprofile feather keys in accordance with DIN 6885, Page 1, and hollow shaft for shrink-fit coupling, the shafts designed to form the counter part must be dimensioned in accordance with ISO h 6. They must therefore have the following tolerances:

| Shaft diameter (in mm) | Nominal tolerance (in $\frac{1}{1000}$ mm) |
|------------------------|--|
| above 18 to 30 | 0 to - 13 |
| above 30 to 50 | 0 to - 16 |
| above 50 to 80 | 0 to - 19 |
| above 80 to 120 | 0 to - 22 |
| above 120 to 140 | 0 to - 25 |

In all cases it is essential that all burrs, swarf etc. are carefully removed prior to fitting and that all register areas are lightly greased to prevent seizing of the parts.

However, if hollow shafts with shrink-fit coupling are to be fitted these should not be greased. The appropriate assembly instructions should be followed. The eyebolt should be re-tightened if it has worked loose during transportation

2 EU Directives

Delivery state I

The motor has radio interference suppression as defined by DIN EN 50081 \pm Part 2 (industrial sector) and DIN EN 55011 (Class A). Identifiable by the designation "EMC", in the type designation. Example: BS02-11V/BS02-MV/P04LA32/EMC.

In conjunction with a Danfoss Bauer power converter or a Danfoss Bauer speed control unit, the drive fulfils the regulations of the EU directives 89/392/EEC (Machinery Directive), 89/336/EEC (EMC Directive) and 73/23/EEC (Low-Voltage Directive).

An additional mains filter obtainable on request is only necessary for use in the residential, business and commercial sectors and in small-scale companies as defined by DIN EN 50081 \pm Part 1 and DIN EN 55011 (Class B).

If the motor is fed by power converters made by other manufacturers, responsibility for observing the EMC directive lies with the operator.



Important:

The motor has radio interference suppression capacitors. Transistor control units with a higher clocking frequency may therefore not be used without a filter choke or may only be used following consultation with the factory.

Delivery state II

The motor is **not** radio interference suppressed at the factory. The letters "EMC" do not appear in the type designation when the motor is delivered.
Example: BS02-11V/BS02-11V/P04LA32.

The motor fulfils the regulations of the EU directives 89/392/EEC (Machinery Directive) and 73/23/EEC (Low-Voltage Directive) and bears the CE symbol only on the basis of the Low-Voltage Directive.

Adherence to the EMC directive 89/336/EEC is the responsibility of the user.

3 Electrical connection

When connecting the motor, refer to the details on the rating plate and the connection diagram as well as the relevant safety regulations and accident prevention regulations.

All cables to the motor must be shielded. There must be large-area shielding of the earth at the motor, e. g. by way of metallic cable inlet with shield contact.

Unless there is a special design, the rating data refers to $\pm 5\%$ voltage tolerance, 0 to 40° C (32° F to 100° F) ambient temperature, altitudes up to 1000 m above sea level, continuous operation and form factor 1.2 which results with bridge rectification or with a thyristor controller with filter choke. The form factor is the quotient of the effective value and the arithmetic mean value currents which can be measured with a moving-iron instrument or moving-coil instrument. The form factor influences heating and carbon brush wear, and should therefore be as low as possible.

The motor speed can be adjusted by reducing the armature voltage to approximately 60 r/min. Speed fluctuations occur below these values. The speed is dependent on voltage, load and temperature.

Electronic open-loop control and closed-loop control units allow infinitely variable speed adjustment, armature current limitation and connection to the single-phase supply.

The direction of rotation can be altered by changing round the two connecting leads. A change in the direction of rotation is only permissible after the motor has come to a standstill. If there is no armature current limitation, motors with rated speeds of over 2000 r/min. should be accelerated in a controlled manner or switched on via a starting resistor. Conductive parts can be damaged and the magnet segments can become demagnetised if the motor is switched on at temperatures below 0° C (32° F) in particular..

The permissible switching frequency depends on the design of the motors, the load torque and the mass moment of inertia.

For motors with cast-on terminal boxes connection openings on side A and C are possible.

The cable entry openings required depending on fitting position must be made carefully using an appropriate tool. Care must be taken to ensure that the terminal board is not damaged.

A locknut and a seal are located in the terminal box for the metric screw connections.

4 Motor protection

In order to protect the armature winding from overload a motor protection switch can be fitted or the current limitation of an electronic control unit set to the root mean square value of the current. See paragraph 3.

5 Maintenance

Motors, brakes, tachometers and gears in sizes 02, 03, 04, 05 and 06 are low-maintenance or maintenance-free.

The bearings have a long service life provided no extreme transverse, longitudinal or impact forces arise.

Under certain circumstances the drives must be cleaned regularly and the protective coating touched up.

Wear on the carbon brushes must be checked at regular intervals depending on the loading.

After the carbon brushes have worn down to a residual length of 6 mm or less they must be replaced. The brushes are accessible by removing the cover on the collector.

Depending on its condition the commutator running surface can be returned or honed. An evenly shiny patina is required and must therefore not be removed.

6 Lubricant changes

The gear units are supplied with lubricant ready for operation.

In normal operating conditions and with a lubricant temperature of approximately 80° C, the oil should be replaced after approximately 15000 operating hours when using CLP 220, or after 25000 operating hours when using PGLP 220/PGLP 460. The lubrication interval must be reduced at higher temperatures (halve it for each 10 K increase in the lubricant temperature).

The lubricant must be changed after 2 or 3 years at the latest whatever the operating hours.

The medium and larger gear units have filling plugs and drain plugs. In the standard designs, these make it possible to change the lubricant without disassembly.

With smaller gear units, the interior is accessed by unscrewing the connecting bolts. Alignment pins and centring secure the assembly.

Worm-gear units are sliding gear units whose tooth flanks, contrary to rolled gear units, only become smooth once run in. They should therefore initially be run in under partial loading (about $\frac{2}{3}$ of the rated load) until the full load capacity of the flanks and the optimal efficiency is achieved. After approximately 200 operating hours, the lubricant should be changed and the gear unit enclosure thoroughly flushed, so that the minimal, but inevitable amount of material removed by smoothing abrasion is cleared.

It is also necessary to flush the gear unit enclosure if the lubricant grade or lubricant type is changed.

If the motor is only used briefly it is sufficient to drain off the original oil and use the original lubricant type to refill the maximum possible amount for the gear unit as defined in the lubricant volume table. Then operate the drive unit briefly under no load, drain this oil off again and refill with the new lubricant as defined on the rating plate. In special cases, refill up to the oil level mark.

It is advisable to inspect and if necessary replace the wear parts (bearings and seals) when changing the lubricant.

7 Lubricant grade

Oils CLP 220, PGLP 220 and PGLP 460 complying with DIN 51502 and DIN 51517 are suitable for lubricating the gear unit, or in special cases use soft flow grease GLP 00f with good EP properties.

The lubricant must permit low-friction, virtually wear-free continuous operation. The damage load level on the FZG test as specified in DIN 51354 shall be in excess of load level 12, and the specific wear below 0.27 mg/kWh. The lubricant should not foam, should protect against corrosion and should not attack the interior paint, the rolling contact bearings, gearwheels and seals.

Lubricants of different types may not be mixed, as otherwise the lubrication characteristics may be impaired. A long service life is only ensured by the use of a lubricant listed below or which is demonstrably equivalent. The original lubricant can also be supplied in small amounts (5 and 10 kg) from the factory.

8 Storage

If geared motors are to be stored for a long period before first use, please consult information sheet 89 (please request this sheet if necessary).

Wear-protecting EP gear lubricant oils as listed in the lubricant table below have proved particularly suitable.

| Lubricant-manufacturer | Standard oil for gear units of type series | Standard oil for gear units of type series | Standard oil for gear units of type series | Low temperature oil for gear units of type series | Foodstuffs industry oil of type series |
|------------------------|---|--|--|---|--|
| | BF, BG, BK60-BK90 | BS02-BS10, BK06-BK10, BM09-BM10 High temperature oil for gear units of type series BF, BG, BK10, BK60-BK90, BS02-BS10, BM09-BM10 | BS20-BS40, BK20-BK50, BM30-BM40 High temperature oil for gear units of type series BS20-BS40, BK20-BK50, BM30-BM40 | BF, BG, BK, BM, BS | BF, BG, BK, BM, BS |
| | Mineraloil CLP 220 | Syntheticoil PGLP 220 | Syntheticoi PGLP 460 | Syntheticoi PGLP 68 | USDA H1 oil |
| AGIP | Blasia 220 | | | | |
| ARAL | Degol BMB 220 Degol BG 220 | Degol GS 220 | Degol GS 460 | | Eural Gear 220 |
| BEICHEM RHUS | Staroil SMO 220 | | | | |
| BP | Energol GR-XP 220 | Enersyn SG-XP 220 | Enersyn SG-XP 460 | | |
| CASTROL | Alpha SP 220 HYPOY EP 80W-90 Optigear 220 | Alphasyn PG 220 OPTIFLEX A 220 | Alphasyn PG 460 OPTIFLEX A 460 | | OPTILEB GT 220 |
| DEA | Falcon CLP 220 | | | | |
| ESSO | Spartan EP 220 GP 80W-90 | | | | |
| FUCHS | Renolin CLP 220 Renolin CLPF 220 Super | Renolin PG 220 | Renolin PG 460 | Renolin PG 68 | |
| KLÜBER | Klüberoil GEM 1-220 | Klübersynth GH 6-220 | Klübersynth GH 6-460 | Klübersynth GH 6-80 | Klüberoil 4UH1-220N |
| MOBIL | Mobilgear 630 Mobilube GX 85 W-90A | Glygoyle HE 220 Glygoyle 30 | Glygoyle HE 460 | | |
| OEST | Gearyl C-LP 220 | | | | Cassida Fluid GL 220 |
| SHELL | Omala Oil 220 | Tivela S220 | Tivela S460 | | |
| TEXACO | Geartext EP-A SAE 85W-90 | | | | |
| TOTAL | Carter EP 220 | | | | NEVASTANE SL220 |
| WINTERSHALL | Ersolan 220 | | | | |




Attention:

Synthetic gear oils with a polyglycol base (e.g. PGLP etc) must be kept separate from mineral oils and disposed of as special waste.

As long as the ambient temperature does not fall below -10° C, ISO viscosity grade VG 220 (SAE 90) is recommended in accordance with the international definition of viscosity grades at 40° C in accordance with ISO 3448 and DIN 51519, and AGMA 5 EP in North America.

For lower ambient temperatures, oils of a lower nominal viscosity, with correspondingly better starting characteristics should be used, such as PGLP with a nominal viscosity of VG 68 (SAE 80) or AGMA 2 EP. These grades may also be required at temperatures around the freezing point if the drive unit's breakaway torque has been reduced with a view to achieving soft starting or if the motor has a relatively low power output.

9 Lubricant volume

The recommended lubricant quantity for the particular style is indicated on the rating plate of the motor (symbol ). When filling, make certain that the upper gear unit components, depending upon the installation position, are also well lubricated. The oil level mark should be taken into consideration in special cases. Information about the lubricant volume required for other styles construction can be obtained from the works.

10 Disposal

The metallic parts of the gear unit and the geared motor can be disposed of as scrap, segregated into steel, iron, aluminium and copper. The lubricants used are to be disposed of as waste oil, and the synthetic oils are to be disposed of as special waste. Information on this can be found on the lubrication chart or the rating plate.

11 Bearing lubrication for small geared motors (motor size less than or equal to IEC 200)

With smaller and middle sized gear units, the input components/motor components are designed with enclosed ball bearings.

An input speed of 1500 rpm results in a lubrication interval of 10000 operating hours. The maximum permissible speed is 3600 rpm. The lubrication interval is halved in this case. The lubricant change is to be carried out here when the bearings are replaced in the context of maintenance/monitoring of the rotary shaft seals. Cleaning and lubrication of the bearings is not recommended due to the risk of contamination.

