

# GM / SV / ZP / GP



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certified by DQS according to  
DIN EN ISO 9001 Reg. No. 53232-01



Seal of approval for the Barmag-wide certification according to DIN EN ISO 9001 carried through by a German corporation for certifying management systems, the "Deutsche Gesellschaft zur Zertifizierung von Managementsystemen mbH (DQS)".

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## 1. Safety

### 1.1 Notes for the Operating Company

Read these operating instructions before commissioning the pump.

### 1.2 Safe Operation Instructions of the Operating Company

As employer you are obliged to draw up safe operation instructions for your company.

This applies especially when components, such as pumps / pump units, are supplied for a line / machine and the supplied operating instructions are component specific.

The following sections should facilitate the production of your own safe operation instructions.

In addition, you can order a service book for any type of pump from Barmag. Barmag also supplies training for service activities.

### 1.3 Intended Use

The metering pump is intended for metering of liquid media of different viscosity.

Operate the pump only within the limits designated in the pump-data sheet (see information in Chapter 7.1).

For safety reasons, no other or additional use is allowed. Such use may lead to increased risks for the operating personnel.

Intended use includes observance of the operating instructions, especially of the repair instructions.

### 1.4 Qualifications of Personnel

Use only trained personnel for commissioning, operating, and maintenance of the pump / pump unit.

Maintenance or repair of electrical components must only be performed by qualified electricians.

### 1.5 Notes on Commissioning

After completing the installation and before each recommissioning of the pump / pump unit, you must carry out a test run including a check of the process parameters and all safety devices.

### 1.6 Operation and Maintenance

Do not change or convert the pump / pump unit without the explicit approval of Barmag. Failure to do so makes the entire warranty null and void. Inspection, maintenance, and repair activities may only be carried out by trained personnel.

Use Barmag auxiliary devices for professional maintenance and repairs. Order the corresponding catalogs.

Use only genuine Barmag parts.

### 1.7 Safety Instructions

The safety instructions are intended for anyone involved with the pump / pump unit within the scope of installation, commissioning, operating, and maintenance activities.

Carefully read the operating instructions drawn up by your company and observe the following safety instructions and explanations:

- Use the required personal protective devices (such as safety glasses, safety gloves, and safety clothes).
- Do not allow unauthorized persons access to the line / machine.
- When handling pump, flushing and sealing media or oils, greases, and other chemical substances, follow the safety regulations that apply to the product concerned. (Observe the material safety data sheets!)
- Be careful when handling hot pumps as well as pump, delivery, heating, flushing, and sealing media!
- Pumps / pump units must not be operated without protective caps installed on the driving components and, if required, other protective covers.
- Electrically switch off the pump drive and let it coast to standstill before beginning any repair and maintenance work.

**Observe switch-off regulations!**

**Secure the switched off drive against unauthorized restart.**

### 1.8 Safety Instructions for Pumps with Magnetic-Coupling



#### **Danger! High-intensity magnetic field!**

- People carrying medical-technical equipment, e.g. a cardiac pacemaker, are not allowed to work on the magnetic coupling. These persons have to keep a safety distance of 3m to magnetic couplings.



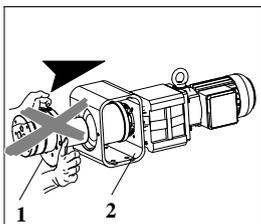
#### **Danger!**

- When using hazardous or flammable liquids, the operating pressures may only exceed the max. permissible pressure of the containment shell of the magnetic coupling, if the pressure of the shell is monitored. The pressure gage can be installed at the seal chamber connection. Please contact Barmag, if required. The max. permissible pressure is engraved on the containment shell of the magnetic coupling. If the permissible pressure is exceeded, the pump must be stopped immediately. If required, inlet and outlet of the pump have to be blocked.



#### **Danger of crushing!**

- The high-intensity permanent magnetic force leads to strong attraction of pump (i.e. interior magnet) and exterior magnet (32). Do not reach between adapter (1) and holder (2).
- Magnetizable components are subject to strong attraction by the magnet, too. Therefore, you must not bring magnetizable components by hand up to the magnet.



#### **Caution!**

- Never batter the magnetic coupling components against each other.

- Do not take magnetic couplings near personal computers, data carriers, and other electronic components.
- Keep magnetic couplings away from watches as well as magnetizable tools and measuring instruments!
- Never bring together both magnetic coupling components during operation! In any case, you should use a genuine Barmag drive.
- The outside- and inside rotor must operate at the same speed (rpm). It must not occur slip because this would lead to unallowed temperature rise and thus to irreversible power loss of the magnets. This is to be monitored e.g. by controlling the discharge flow.

### 1.9 Safety Instructions for Electrically Heated Metering Pumps:



#### **Danger!**

- Metering pumps must be grounded. Use one of the pump mounting screws.
- Electrical heating must be fused by means of a suitable fuse.
- Electrical heating must be energized only when being mounted.
- Electrical heating must not be operated without temperature sensor and control. Control of the heating system has to ensure that the operating temperature allowed according to the characteristics data sheet is not exceeded.
- The temperature sensor includes two PT100 resistors: One PT100 resistor has to be used for heating control and the second one has to be connected to an independent additional temperature control unit. When the operating temperature allowed acc. to the characteristics data sheet is exceeded, the electrical heating system must be disconnected.
- Avoid contact of liquid with the connecting cable of the electric heating system. The cable has to be routed accordingly. Check the connecting joints of the pumping / sealing medium for leakages.
- Do not squeeze or bend the cable!
- Operation of the pump under temperature with contact guard, only!
- The control of the electric heating system has to be adjusted so that the sealing liquid never reaches boiling temperature during heating (slow heating required).
- Mount electrical heating in such a way that there is sufficient heat transfer between heating and pump. The heating element must have close contact to the pump element. This has to be checked regularly during operation. Avoid any deformation due to e.g. an excessive spread of the electrical heating.
- Ensure a sufficient heat transfer between sensor and pump when mounting the temperature sensor. Apply heat-conducting paste.

### 1.10 Installation / Machine Specific Safety Instructions

- The values specified in the pump data sheet (see information in Chapter 7.1) are related to the mechanical rigidity of the pump.  
The operating company is therefore required to carry out suitable tests on the pump media (flushing and sealing media, if required) to establish the allowed operating values and ensure that neither the media themselves nor the media-specific operating conditions produce any risks.
- Delivery, flushing, heating and sealing media may be hazardous to health. Wear suitable protective clothing.
- The ignition temperature of the discharging, flushing, heating and sealing medium must be at least 50°C degrees higher than the pump's operating temperature.
- Flammable media have to be prevented from dripping into areas, which are subject to ignition. If required, put a protection pan under the pump unit. The pan has to be permanently checked for leakage.
- The boiling temperature of the seal liquid must be at least 20°C higher than the set operating temperature of the pump.
- Be careful when filling and bleeding media that cause irritations of the skin and the air passages, or hot media in / out of the seal chamber.
- Uncontrolled pump operation can lead to suction and delivery pressures that damage the pump or line and endanger the personnel. Therefore, it is absolutely obligatory to use pressure control devices incorporating limit switches at the suction and pressure sides. The allowed pressures can be derived from the pump data sheet (see information in Chapter 7.1).
- Mount pressure control devices with limit switches at the heating / cooling lines of liquid heated / cooled pumps.
- Observe the max. permissible operating pressure and the allowed operating temperatures of liquid heating and cooling systems. The values are engraved on the heating / cooling shell.
- When carrying out additional tightening of a stuffing box while the pump drive shaft is running, you must wear appropriate tight-fitting industrial clothes. All rotating driving parts must be safeguarded against contact (e.g. by protective covers).
- Check the connections of the pump medium in dependence of the direction of pump rotation. Confusing of connections can lead to damage to the pump as well as to the line.
- Adjust external control, external inverter or manual control device of the internal inverter so that the pump drive does not start automatically when the device is activated.
- Operating the unit without protective covers is prohibited.
- Working in the area of the magnetic coupling is only allowed, if the pressure has been released.
- The compatibility of pump, flushing, and sealing media with the sealings and pump materials must be ensured. If required, ask the Barmag Pump Service.
- The pump is lubricated by the medium pumped. Dry runs must be avoided at all costs, because of possible damage to the pump and any ignition danger for the pump medium.
- An excessive driving torque can damage the pump (see information in Chapter 7.1 of pump data sheet for max. permissible driving torque).  
The pump can be protected from excessive driving torques by installation of an overload coupling.
- Pump components may be damaged or destroyed due to improper operation or incorrect handling of the pump. Here, the drive shaft may be pushed out of the pump as long as the pump is pressurized. In this case, hot liquid may be ejected.  
Always depressurize the system before working on the pump or near it, removing protective covers, dismantling the shaft/clutch between gear motor and pump, loosening the locking nut of length-adjustable articulated shafts.

## 2. Machine Layout / Designations

### 2.1 Machine Layout

Consult the dimension drawings of the pump and of the pump unit (if included in Barmag's scope of delivery). The drawings can be ordered from Barmag, if not supplied.

### 2.2 Designations

Engraved characteristics:

- Number of pump
- Flow rate
- "Barmag"
- Article Number (for GM-series)

### 3. Assembly / Disassembly

#### 3.1 Package labels

The machines or machine parts are supplied in stable packages.

The packages have been labelled with letters and identification symbols that comply with international symbol standards. Observe these labels for the regular handling and transportation of the packed machine parts.

##### Label definition

- Order No.
- Weight (gross)
- Addressee

| Identification symbols used                |       |        |
|--|-------|--------|
| Meaning                                    | Color | Symbol |
| High-intensity magnetic field!             | black |        |
| Upper end                                  | black |        |
| Fragile                                    | black |        |
| Protect against dampness                   | black |        |
| Center of gravity                          | black |        |
| Attach lifting equipment here              | black |        |
| Sealed packing                             | black |        |
| Do not pick up with forklift at this point | black |        |

#### 3.2 Safe Transportation of Pumps / Pump Units

##### **Danger!**

- Only a transportation professional may handle pump units and heavy pumps.
- Transport heavy pumps and pump units with hoist units only.
- Pump aggregates that are not transported by means of hoist units, must be transported by 2 people. Wear protective gloves and safety boots.

Call Barmag's pump service, if you require support.

- Pumps with magnetic coupling

##### **Danger! High-intensity magnetic field!**

Persons carrying medico-technical equipment, e.g. a cardiac pacemaker, are not allowed to work on the magnetic coupling. High-intensity magnetic field! These persons have to keep a safety distance of 3m to magnetic couplings.

#### 3.3 General Information for Assembly / Disassembly

The assembly of the pump / pump unit including installation, alignment and connection must be carried out by the Barmag pump service or by the customer's own qualified personnel.

If the customer prefers to carry out the assembly with his own personnel, Barmag is offering the corresponding training for this group of people. Furthermore, you can order service books from Barmag.

#### 3.4 Assembly procedure

The assembly – including installation, alignment, and connection of the pump / pump aggregate must be carried out by trained personnel.

- At the time of delivery, inlet and outlet holes as well as flush holes (if present) will be sealed with protective plugs in order to prevent contaminations from entering the pump. Remove the protective plugs immediately before installing the supply pipes to the pump. Keep the protective plugs for reuse during any future disassembly.
- Be careful when transporting and assembling the pump / pump unit
- For units of the series AM-O-...Z, the leg of the gear unit must be screwed down to prevent the unit from any movement during operation.
- Before the pump / pump unit is installed into the line / machine, ensure that all parts that contact the product ahead of the pump (such as tanks, pipes, valves) are carefully cleaned. Contamination, metal particles, etc. lead to pump damage.
- Use surface seals on the inlet and outlet holes for the delivery medium as well as on the boreholes for sealing liquid. Do not seal with teflon tape or hemp in the thread!
- Do not start the pump in dry state. If required, use a lubricant (such as mineral oil) to manually rotate the pump before installing the pump into the line / machine. Upon delivery, Barmag pumps are already equipped with a lubricating medium. While in operation, the pump is lubricated by the delivery medium.

### 3.5 Disassembly procedure



#### **Danger!**

- *Before the pump is removed from the line / machine or the shaft sealing or magnetic coupling is disassembled, ensure that connection pipes are pressure-free and shut off.*
- *The containment shell of magnetic couplings must be pressure-free before disassembling.*
- *Slackening of the seal chamber screw plug may cause the sealing liquid to spurt out, or corresponding gases may evacuate. Wear appropriate protective clothing. Always open the upper screw of the seal chamber first in order to let possible gas accumulations evacuate.*

### 3.6 Storage of Installation Parts / Spare Parts

If the pump / pump unit is to be temporarily stored prior to mounting into the line / machine, then it must be kept in the original packing.

The storage of the pump / pump unit or separate parts must satisfy the following conditions:

- Ambient temperature: 15 to 25°C
- Rel. air humidity: max. 60%

Pumps / pump units that have been installed, but not yet commissioned are subject to the same conditions.

If the pump is stored, the inlet must be filled with a low-viscosity mineral oil. Filling is to occur while the drive shaft is slowly rotated in the specified direction of rotation, until the medium can be seen to flow out of the outlet openings. Next, seal the inlet and outlet holes and the flushing holes (if present), using the appropriate protective plugs.

The pump body must in all cases be greased using a resin-free preservation oil or similar product.

## 4. Commissioning

### 4.1 General

The pump / pump unit may be commissioned only by the trained personnel of the operating party or by members of the Barmag pump service.

Check the direction of rotation of the drive before each re-commissioning (see arrow on front side of pump for permissible direction of rotation). The wrong rotation direction can damage the pump and the line.

Before commissioning, check the duct connections at pump inlet and outlet for leakages (if required, also the flushing connections).

### 4.2 Pump with Stuffing Boxes

- Before start-up, check the pretension of the stuffing box (the tightening torque is given in the table in Chapter 7.2, and the pump-data sheet, see information in Chapter 7.1).
- If the packing material is being replaced or the pump is being commissioned for the first time, then first tighten the stuffing box screws or the retaining nut using 1.5 times the tightening torque listed in the table in Chapter 7.2 and the pump-data sheet. Then slacken the stuffing box screws or retaining nut and use the tightening torque listed in the table in Chapter 7.2 and the pump-data sheet.
- After starting the pump, check (correct, if necessary) the pretension of the stuffing box fairly frequently (two or three times during the first few hours of operation). After the stuffing box seal has stabilized, continuous operation can be adequately monitored at weekly intervals. Observe the safety instructions in Chapter 1.10.
- If a stuffing box is provided with several screws, then slightly tighten each one in turn in order to avoid tilting the stuffing box.
- For spring-loaded packings, the installation measures in the pump drawing, and perhaps the information given there, are to be observed.

## 5. Maintenance

### 5.1 Carrying out Maintenance

Maintenance activities must be carried out by Barmag's Pump Service or the operating party's trained personnel.

For maintenance, Barmag provides pump workshops.

Barmag can provide relevant training for the operating company's personnel carrying out maintenance themselves. In addition, you can order a service book for any type of pump from Barmag.



#### **Danger!**

*For any work on the motor or other electrical components (e.g. electric heating), these must be isolated from power supply and secured against restart.*

- *Periodically check the sealing of the connection pipes connected to the inlet and outlet of the pump (if required, the flushing connection) and of the shaft sealing. In case of liquid-heated pumps, check the sealing of the heating connections regularly.*
- *If the shaft sealing leaks excessively and if the stuffing-box sealings cannot be further tightened (observe the safety instructions in Chapter 1.10, the sealings must be replaced (e.g. packing rings, sealing rings) as specified in the spare-parts catalog (can be ordered from Barmag). The driving shaft of the pump must be checked for damage in the sealed part and replaced, if necessary.*

## Operating instructions

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Pumps with magnetic coupling are assembled to / disassembled from the unit in vertical position.



***Danger!***

Mount pump unit in vertical position. The mounting must be stable and tilt resistant.

The assembly / disassembly is subject to heavy magnetic forces, which has to be taken into account for the mounting.

### 5.2 Spare Parts

The following information is required when ordering spare parts:

- Barmag pump No. (engraved on the pump)
- Exact identification of the parts as listed in the spare-parts catalog (can be ordered from Barmag)
- Quantity

- Barmag article Number (for GM-series) (engraved on the pump)

Contact:

Pump Sales Dept.:  
Tel. 0049 2191 / 67-1235

Fax: 67-3364

Pump Service Dept.:  
Tel. 0049 2191 / 67-2815

Fax: 67-702815

### 6. Faults

Any faults can be remedied by the Barmag Pump Service or the operating company's own trained personnel. In addition, the pump / pump unit can be sent to Barmag's Pump Service with a damage identification note serving as repair order.

## Operating Instructions

### 7. Tables

#### 7.1 Pump Data Sheet

The pump data sheet is supplied together with the Operating Instructions.

#### 7.2 Tightening Torques for Stuffing-box Sealings



#### **Caution!**

First use 1.5 times the tightening torque listed in the table to pretension the retaining nut or screws, then slacken it / them and apply the tightening torque as listed.

| Tightening torques for metering pumps (GM series) |      |     |     |     |     |     |     |    |    |    |     |     |     |
|---|------|-----|-----|-----|-----|-----|-----|----|----|----|-----|-----|-----|
| Pump volume [cm <sup>3</sup> /revolution]         | 0,05 | 0,1 | 0,3 | 0,6 | 1,2 | 3,0 | 6,0 | 12 | 20 | 50 | 100 | 150 | 200 |
| Tightening torque [Nm] square type                | 15   | 15  | 15  | 11  | 11  | 11  | 11  | 11 | 11 |    |     |     |     |
| Tightening torque [Nm] round type                 | 4    | 4   | 4   | 6   | 6   | 6   | 6   | 6  | 6  | 12 | 12  | 23  | 23  |

| Tightening torques for other metering pumps  |   |        |       |        |        |        |        |        |        |       |        |
|--|---|--------|-------|--------|--------|--------|--------|--------|--------|-------|--------|
|  | Retaining nut thread / Pump bracket neck*** |        |       |        |        |        |        |        |        |       | Screws |
|  | W22   | W25    | W28   | W32    | M22    | M32    | M33    | M36    | M45    | M5    |        |
|  | Tightening torques [Nm]                     |        |       |        |        |        |        |        |        |       |        |
| Outside diameter of drive shaft /<br>inside diameter of stuffing box (mm)  | 10 / 15                                     | 5/7,5* |       | 6/9*   |        | 5/7,5* |        |        |        |       |        |
|  | 10 / 17                                     | 8/12*  |       |        |        |        |        |        |        |       |        |
|  | 10 / 20                                     |        |       | 14/21* |        |        |        |        |        |       |        |
|  | 12 / 17                                     |        | 7/11* | 7/11*  |        |        |        |        |        | 1,5** |        |
|  | 12 / 20                                     |        |       | 13/20* |        |        |        | 15/23* |        | 2,5** |        |
|  | 15 / 23                                     |        |       |        | 18/27* |        | 18/27* | 18/27* |        |       |        |
|  | 16 / 24                                     |        |       |        | 19/29* |        | 19/29* |        |        |       |        |
|  | 18 / 30                                     |        |       |        |        |        |        |        | 43/65* |       |        |
|  | 20 / 32                                     |        |       |        |        |        |        |        | 49/74* |       |        |
| <p>* These values are only valid using unbraided (not pre-pressed) sealing fibres (such as Teflon wool)</p> <p>** Per screw</p> <p>*** W = Whitworth thread<br/>M = metric thread<br/>The number corresponds to the nominal diameter in mm</p> |   |        |       |        |        |        |        |        |        |       |        |

