

# End gun booster

Installation and operating instructions





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**Warning**

*Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.*

**Warning**

*The use of this product requires experience with and knowledge of the product. Persons with reduced physical, sensory or mental capabilities must not use this product, unless they are under supervision or have been instructed in the use of the product by a person responsible for their safety. Children must not use or play with this product.*

**1. Limited warranty**

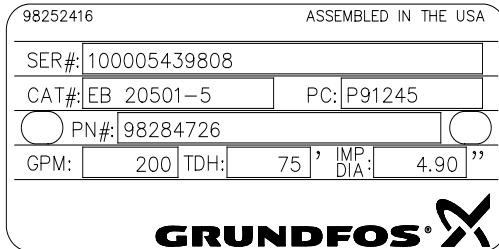
Products manufactured by GRUNDFOS PUMPS CORPORATION (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos' manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by Grundfos are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions. To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos' products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions. Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed. GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limit actions on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

## 2. Installation - mechanical

All installations should be performed by personnel experienced with the placement, connection, and alignment of pumping equipment. The following instructions are general in nature, and may not deal with the specifics of your installation. Read these instructions thoroughly before installing and operating your Grundfos type EB centrifugal pump. Keep these instructions handy for future use.

### 2.1 Pump identification

All Grundfos Pumps are identified by Catalog and Serial Numbers. These are stamped on the pump nameplate Fig. 1 affixed to each pump casing and should be referred to in all correspondence with the Company.



**Fig. 1** Nameplate

### 2.2 Receiving

Check pumping unit for shortages and damages immediately upon arrival. Pump accessories, when required, are packaged in a separate container and shipped with the unit. If equipment is damaged in transit, immediately report the damage to the truck line's agent. Make a complete report on the freight bill to speed satisfactory adjustment by the carrier. Unload and handle the equipment with a sling or tow motor.

### 2.3 Temporary storage

If pump is not to be installed and operated soon after arrival, store it in a clean, dry area of moderate ambient temperature. Rotate the shaft by hand periodically to coat bearing with lubricant to retard oxidation and corrosion. Follow motor manufacturer's storage recommendations where applicable.

### 2.4 Location

Locate the pump as close to the suction supply as possible. Use the shortest and most direct suction piping practical. Locate the pump below system level wherever possible. This will facilitate priming, assure a steady liquid flow, and provide a positive suction head. Make sure sufficient NPSH (Net Positive Suction Head) is provided at the suction end by considering the pump's location in relation to the entire system. Available NPSH must always equal or exceed required NPSH specified on the pump performance curve. Always allow sufficient accessibility for maintenance and inspection. Provide a clear space with ample head room for use of a hoist strong enough to lift the unit. Make sure a suitable power source is available for the pump motor. Electrical characteristics should match those specified on the motor data plate, within the limits covered in Sections 3 and 4. Avoid pump exposure to sub-zero temperatures to prevent pump liquid from freezing. If freezing conditions exist during shutdown periods, see Sections 4.5 and 4.6 for specific recommendations.

## 2.5 Vertical mounting instructions

The Endgun booster is designed to be mounted vertically on a 2 ½ " NPT nipple. It may also be mounted with a nipple and companion flange on both the pump and the pivot. The majority of installations are threaded straight onto the nipple where the suction must be the same size (no decrease in pipe size at suction allowed). Discharge pipe size will be the same at the pump or may be one or two sizes larger depending on the length. Our pump unit is equipped of a wash down duty motor and may be used in a variety of outdoor applications.

## 2.6 Mechanical seals

All Grundfos Type EB pumps that are equipped with mechanical seals are matched to the conditions for which the pump was sold. Observe the following precautions to avoid seal damage and obtain maximum seal life. Do not exceed temperature or pressure limitations for the mechanical seal used. Do not run the pump dry or against a closed valve! Dry operation will cause seal failure within minutes. Purge all air from the seal chambers and recirculation lines prior to operating the pump. Clean and purge suction piping in new installations before installing and operating pump. Pipe scale, welding slag and other abrasives can cause rapid seal failure.

## 3. Installation-electrical

### 3.1 Motors general

The motor control circuit must have the following components in order to comply with the National Electrical Code.

- Motor Disconnecting Device: A motor disconnecting device must be installed that is capable of disconnecting both the controller (motor starter) and the motor from their source of power.
- The disconnecting device must be located so that the controller (motor starter) can be seen from the disconnecting means. In all cases, the distance from the disconnecting device to the controller must be less than 50'.
- In most installations the disconnecting device will be a circuit breaker or fusible disconnect switch.
- Motor short circuit and ground fault protection: Short circuit and ground fault protection are usually provided by means of a circuit breaker or fusible disconnect switch. The selection of the size of the circuit breaker or fuse must be in accordance with Section 430-52 and Table 430-152 of the National Electrical Code.
- Motor controller with running over current protection (magnetic starter): These components must be installed in accordance with applicable local and state electrical codes in addition to the National Electrical Code.

#### Warning

***Whenever powered equipment is being used in explosive surroundings, the rules and regulations generally or specifically imposed by the relevant responsible authorities or trade organizations must be observed.***

### 3.2 Installation wiring

Mount the control panel or motor starter(s) in close proximity to the pump to provide convenient control and ease of installation. Wire panel or starter(s) to motor(s) and pilot device(s): Wires to each motor must be sized for at least 125% of the motor nameplate full load amps. AWG #16 Type THW stranded wire is recommended for wiring of pilot devices (float switches). Check incoming power source to ensure that it is the same as the



voltage and phase of the motors. Verify that the starters are suitable to operate the pump motors on voltage and phase that is available.

## 4. Operation

### 4.1 Priming

The Grundfos Type EB pump is not self-priming, and must be completely primed (filled with liquid) before starting. If the pump will operate with a positive suction head, prime by opening the suction valve and allowing liquid to enter the pump casing. Open the air vent at this time and make sure all air is forced from the pump by liquid before closing. If the pump has suction lift, priming must be accomplished by other methods. The use of foot valves, ejectors or vacuum pumps, or by manual filling of the pump casing and suction line with liquid are possible methods suggested for this purpose.

**Never run the pump dry in the hope that it will prime itself! Serious damage to the shaft seals, pump wear rings and shaft sleeves will result.**

**Caution**

### 4.2 Pre-start checklist

#### Warning

**In the interest of operator safety, the unit must not be operated above the nameplate conditions. Such operation could result in unit failure causing injury to operating personnel. Consult instruction book for proper operation and maintenance of the pump and its supporting components.**

Make the following inspections before starting your Grundfos EB pump:

1. Make sure all wiring connections to the motor (and starting device) match the wiring diagram and produce **clockwise** rotation as viewed from the back of the motor.
2. Double check rotation. Rotation must be clockwise. Operating in reverse will destroy the impeller and shaft.
3. If the motor has been in storage for an extended length of time, either before or after installation, refer to motor instructions before starting.
4. Check the voltage, phase, and line circuit frequency with the motor nameplate.
5. Tighten plugs in gauge and drain taps. If the pump is fitted with pressure gauges, keep gauge cocks closed when not in use.
6. Check suction and discharge piping for leaks, and make sure all flange bolts are securely tightened.

### 4.3 Motor rotation

After the unit has been wired and checked to insure that all components in the system (disconnect device, magnetic starters, pilot devices and motors) are properly connected, check motor rotation as follows: For 3 phase units only—momentarily energize the motors to ensure that the rotation is correct as indicated by the arrow cast into the pump volute. If rotation is incorrect, interchange two wires at the motor starter terminals T1 and T2. **IMPORTANT:** The pumps must not be operated while dry. Use extreme caution that motors are energized only momentarily to determine proper rotation.

### 4.4 Starting the pump

1. Fully open gate valve (if any) in suction line, and close gate valve in discharge line.
2. Fill suction line with liquid and completely prime pump.

3. Start the motor (pump).
4. Immediately make a visual check of pump and suction piping for pressure leaks.
5. Immediately after pump reaches full operating speed, slowly open the discharge gate valve until complete system flow is achieved.
6. Check discharge piping for pressure leaks.
7. If pump is fitted with pressure gauges, open gauge cocks and record pressure reading for future reference. Verify that the pump is performing in accordance with parameters specified on performance curve.
8. Check and record voltage, amperage per phase, and kilowatts, if a wattmeter is available.

### 4.5 Voltage regulation

The motor will operate satisfactorily under the following conditions for voltage and frequency variation, but not necessarily in accordance with the standards established for operation under rated conditions: The voltage variation may not exceed 10% above or below rating specified on the motor data plate. The frequency variation may not exceed 5% above or below motor rating. The sum of the voltage and frequency variations may not exceed 10% above or below motor rating, provided the frequency variation does not exceed 5%.



### 4.6 Pump shutdown

The following shutdown procedures will apply in most normal shutdowns for the Grundfos Type EB pumps. If the pump will be inoperative for an extended length of time, follow storage procedures in Extended Period Shutdown. Always close the discharge valve before stopping the pump. Close the valve slowly to prevent hydraulic shock. Cut and lock off power to the motor.

### 4.7 Short duration shutdown

For overnight or temporary shutdown periods under non-freezing conditions, the pump may remain filled with liquid. Make sure the pump is fully primed before restarting.

For short or frequent shutdown periods under freezing conditions, keep fluid moving within the pump casing and insulate or heat the pump exterior to prevent freezing.

### 4.8 Extended period shutdown

For long shutdown periods, or to isolate the pump for maintenance, close suction gate valve. If no suction valve is used and the pump has positive suction head, drain all liquid from suction line to terminate liquid flow into pump suction nozzle. Remove plugs in pump drain and vent taps, as required, and drain all liquid from the pump volute casing. If freezing conditions will exist during long shutdown periods, completely drain the pump and blow out all liquid passages and pockets with compressed air. Freezing of pump liquid can also be prevented by filling the pump with antifreeze solution.

## 5. Maintenance

Before attempting any inspection or repair on the pump, the driver controls must be in the "OFF" position, locked and tagged to prevent injury to personnel performing service on the pump.

### 5.1 Motor lubrication

To lubricate the motor while running or at rest, remove grease drain plug (if any) and filler plug on grease fitting. Grease with clean lubricant until grease appears at drain hole or along motor shaft.

One-half to one cubic inch of grease is sufficient for motors 5 HP and under, with proportionately more grease for greater HP motors.

Always follow motor manufacturer's lubrication instructions if available, and periodically check grease fittings and drain plugs for leaks.

If lubricating instructions do not accompany the motor, refer to the following table for recommended lubrication periods.

| <b>Motor Lubrication</b> |                 |                             |       |         |
|--------------------------|-----------------|-----------------------------|-------|---------|
| <b>Motor RPM</b>         | <b>Motor HP</b> | <b>Operating conditions</b> |       |         |
| 3500                     | All hp          | Standard                    | Sever | Extreme |
|                          |                 | 6 mo                        | 3 mo  | 3 mo    |

**Standard conditions:**

8 Hours per day operation, normal or light loading, clean air, 100°F, maximum ambient temperature.

**Severe conditions:**

Continuous 24-hour operation, shock loading or vibration, poor ventilation, 100-150°F, ambient temperature.

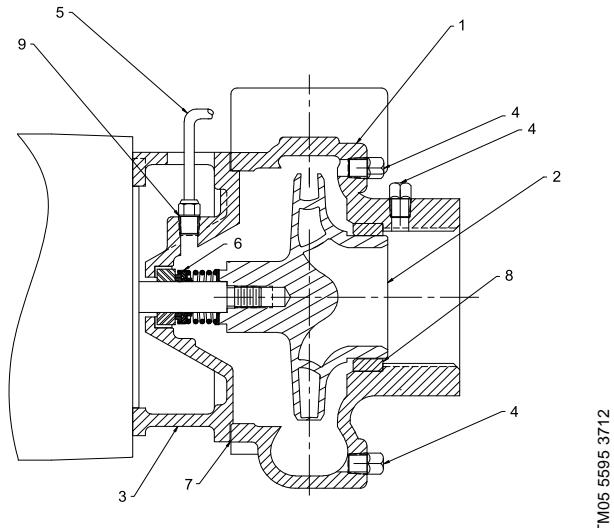
**Extreme conditions:**

Continuous operation, heavy shock or vibration, dirt or dust in air, extreme ambient temperature.

The following table lists the recommended types of grease for motor lubrication. These types have all been thoroughly tested and should be used whenever possible.

| <b>Manufacturer</b> | <b>Lubricant</b>    |
|---------------------|---------------------|
| Shell               | Dolium R            |
| Exxon               | Polyrex             |
| Chevron             | SRi grease NLGI 2   |
|                     | Blackpearl - NLGI 2 |
| Phillips            | Polytac             |
| Texaco              | Polystar RB         |

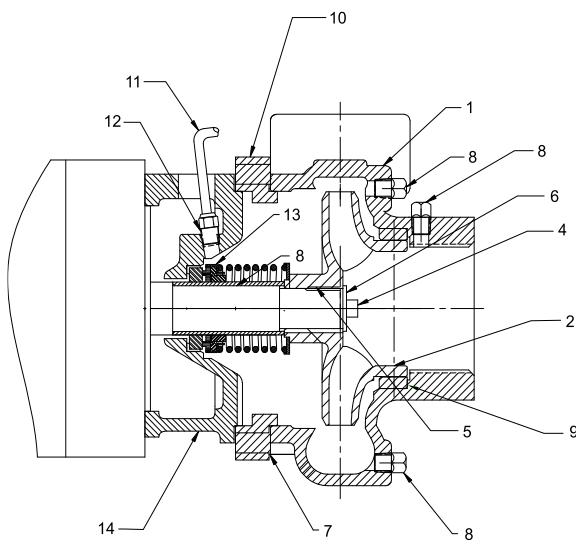
## 5.2 Cross section and parts list for EB 20503-2



TM05 5595 3712

| <b>Position Number</b> | <b>Part Name</b> | <b>Position Number</b> | <b>Part Name</b>  |
|------------------------|------------------|------------------------|-------------------|
| 1                      | Casing           | 6                      | Seal Assy         |
| 2                      | Impeller         | 7                      | Gasket casing     |
| 3                      | Bracket          | 8                      | Wear ring         |
| 4                      | Pipe Plug        | 9                      | Push Type Fitting |
| 5                      | Tubing           |                        |                   |

## 5.3 Cross section and parts list for EB 20501-5



TM05 5593 3712

| <b>Position Number</b> | <b>Part Name</b>   | <b>Position Number</b> | <b>Part Name</b>  |
|------------------------|--------------------|------------------------|-------------------|
| 1                      | Casing             | 8                      | Pipe. Plug        |
| 2                      | Impeller           | 9                      | Wear Ring         |
| 3                      | Shaft Sleeve       | 10                     | Adapter           |
| 4                      | Cap Screw Impeller | 11                     | Tubing            |
| 5                      | Key, Impeller      | 12                     | Push Type Fitting |
| 6                      | Washer, Impeller   | 13                     | Seal Assy         |
| 7                      | Gasket, Casing     | 14                     | Bracket           |

## 5.4 Disassembly of pumps



### Warning

**Depending on the product being pumped, the pump should be washed down before any work is done on it.**



### Warning

**Observe extreme caution when venting and/or draining hazardous liquids. Wear protective clothing in the presence of caustic, corrosive, volatile, flammable, or hot liquids. DO NOT breathe toxic vapors. DO NOT allow sparking, flames, or hot surfaces in vicinity of the equipment.**

Complete disassembly instructions are outlined below. Proceed only as far as required to perform the maintenance work needed.

1. Turn off power.
2. Drain System. Flush, if necessary.
3. Remove motor hold down bolts.

### 5.4.1 Disassembly of liquid end

1. Remove casing bolts that attaches the volute to the bracket. Set volute aside.

**Do not insert screwdriver between impeller vanes to prevent rotation. It may be necessary to use a strap wrench around the impeller or shaft to prevent rotation.**

#### For EB 20503-2:

1. Inspect impeller for anti-reversing set screws.
2. Impeller and set screws will need to be evenly heated to approximately 350 °F to loosen locktite.
3. To hold rotating element steady, remove the drip canopy and fan cover exposing the opposite end of the shaft.
4. Use the proper hand tool required to hold the shaft steady for impeller removal.
5. Once proper heat has been applied and the shaft can be held secure, remove impeller.
6. Remove capscrews that fasten the bracket to the motor.
7. Place bracket on flat surface and press out seal seat.

#### For EB 20501-5:

1. Loosen and remove the impeller capscrew along with impeller washer.
2. Use approximate size gear puller aligned behind impeller vanes to remove impeller from shaft.
3. Remove impeller key.
4. Remove capscrews that fasten the bracket to the motor.
5. Place bracket on flat surface and press out seal seat.
6. If shaft sleeves require replacement, it must be evenly heated to approximately 350 °F to loosen locktite.
7. Twist sleeve off shaft.

## 5.5 Reassembly of pumps

1. All parts should be cleaned before reassembly.
2. Refer to parts list to identify required replacement items  
Specify pump serial or catalog number when ordering parts.
3. Reassembly is the reverse of disassembly.
4. Observe the following when reassembling the liquid end:
  - All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly is recommended.
  - New shaft sleeves are installed by bonding to shaft with hydraulic setting locktite.

## 5.6 Ordering parts

Grundfos Pumps has over 90 years of experience in the design, manufacture, and application of centrifugal pumps and pumping systems. Grundfos's commitment to state-of-the-art pump design and quality manufacturing assures maximum user benefits with optimum equipment life at lower cost. Grundfos's commitment to their customers continues through an extensive service organization. Highly trained technicians can assist customers with initial startup, troubleshooting, repair, and system analysis. To ensure that the proper replacement parts are ordered for your particular pump model, see the Parts kit section 5.7.

## 5.7 Parts kit

| Pump Model | Seal Kit | Impeller/Wear ring Kit |
|------------|----------|------------------------|
| EB 20503-2 | 91909684 | 98351890               |
| EB 20501-5 | 91910839 | 98351903               |







U.S.A.  
Grundfos CBS, Inc.  
902 Koomey Road  
Brookshire, TX 77423 USA  
Phone: 281-994-2700  
Toll Free: 1-800-955-5847  
Fax: 1-800-945-4777

**BE ➤ THINK ➤ INNOVATE ➤**

Being responsible is our foundation  
Thinking ahead makes it possible  
Innovation is the essence

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