

MANUAL



ACn

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Introduction

The ACn series centrifugal pump from BOMBA ELIAS is a solution designed for pumping water in general service applications. Thanks to its robust and efficient design, it offers optimum performance with quiet and reliable operation. This manual provides the necessary instructions for the installation, operation, and maintenance of the pump, with the aim of ensuring its correct functioning and prolonging its service life.

Directives and Regulations

The ACn pump complies with the essential safety and health requirements established in the following European directives and regulations:

- Regulation (EU) 2023/1230.
- Low Voltage Directive 2014/35/EU.
- Electromagnetic Compatibility Directive 2014/30/EU.
- Machinery safety – EN ISO 12100:2010, EN 809:1998+A1:2009 and EN 60204-1:2018.
- Electromagnetic compatibility – EN 61000-6-2 and EN 61000-6-4.
- Dimensional standard: EN 733 for standardized single-stage centrifugal pumps.

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ISO 9001:2015

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Specifications

Materials

Pump casing/ volute	GG-20 Gray Iron
Impeller	304 Stainless steel
Pump shaft	420 Stainless steel
Pump casing cover	GG-20 Gray Iron
Sealing solution	Internal bellows seal. Materials according to application
Bearing bracket	GG-20 Gray Iron

Motor electrical data

Motor	Single- or three-phase acc. to IEC stds.
Efficiency	- IE2 or IE3 for powers > 1CV - IE1 if power < 1CV - Can be supplied up to IE5.
Tension	- Single phase 230V $\pm$ 10% up to 1CV - Three-phase 230/400 V $\pm$ 10% up to 5,5 CV - Three-phase 400/690 V $\pm$ 10% from 7,5 CV
Poles	2 or 4
Level of protection	IP55
Insulation	F Class

Usage limits

Flow range	Hasta 1300 m ³ /h, según modelo
Pressure range	Hasta 16 bar, según modelo
Max. working pressure	PN 16
Max. working temperature	Up to 150°C
Max. Suction head	6 m

Connections

	Suc.	Dis.
32/13, 32/16, 32/20 and 32/26	DN 50	DN 32
40/13, 40/16, 40/20, 40/26 and 40/32	DN 65	DN 40
50/13, 50/16, 50/20, 50/26 and 50/32	DN 65	DN 50
65/13, 65/16, 65/20, 65/26 and 65/32	DN 80	DN 65
80/16, 80/20, 80/26, 80/32 and 80/40	DN 100	DN 80
100/16, 100/20, 100/26, 100/32 and 100/40	DN 125	DN 100
125/20, 125/26, 125/32 and 125/40	DN 150	DN 125
150/20, 150/26, 150/32 and 150/40	DN 200	DN 150
200/32 and 200/40	DN 250	DN 200
250/32 and 250/40	DN 300	DN 250

Electric safety overview

- Pay attention to the symbols    accompanied by the words 'danger' or 'attention', as they indicate the possibility of electrocution if the relevant safety regulations and standards are not followed.
- **Proper power cord selection:** Make sure that the power cord used complies with the **CEE** standard or **with the HO7RN-F** standard according to **VDE O250**.
- **Power disconnection:** Before installing or performing any type of maintenance on the pump, make sure that it is completely disconnected from the power source. Use a lockout/tagout (LOTO) system to prevent accidental reconnections during the procedure.
- **Earthing system:** Make sure that the pump is correctly earthed. Earthing is essential to prevent electrical accidents and for the safety of the operator in case of insulation failure.
- **Use of protective devices:** Install protective devices such as differential switches and circuit breakers to prevent overloads, short circuits and other electrical faults. These devices automatically shut down the pump in case of electrical problems, protecting both equipment and operators.
- **Handling the terminal box:** Keep the terminal box closed and do not handle internal components unless strictly necessary. If you need to intervene in this part, make sure that there is no energy present in the conductors.
- **Personal Protective Equipment (PPE):** During electrical installation and maintenance, always wear insulating gloves, safety goggles and other appropriate protection to reduce the risk of injury from accidental contact with energised parts.
- **Voltage and compatibility check:** Confirm that the supply voltage matches the equipment specifications before connecting the equipment. Incorrect installation of a unit with an inappropriate voltage can damage the electrical components of the unit.
- **Personnel training:** Ensure that only trained and authorised personnel install, handle or carry out maintenance on the pump. Proper training helps to minimise errors and risks.

Installation of the equipment

To carry out a correct installation of any model of the ACn Series it is advisable to follow these steps in order of wording:

Site preparation

- **Area review:** Check that the installation area is clean, dry and free of foreign objects that could interfere with the operation of the pump. Ensure that the motor is properly ventilated.

Bomba Elias equipment can operate outdoors, but in no case exposed to the elements. They must be protected by some type of structure, cover or shelter to avoid prolonged exposure to the elements and to ensure safer and longer lasting operation.

- **Verification of the available space:** Make sure that there is sufficient room around the pump to allow access for maintenance.

Inspection prior to installation

- **Verification of the equipment:** Before installation, inspect the pump to ensure that there is no external damage to the pump components during transport, especially the electric motor.
- **Checking specifications:** Check that the pump is designed for the type of fluid, pressure and flow to be handled by checking the data on the nameplate of the equipment supplied. Make sure that the pump is set up according to the required specifications (e.g. direction of rotation and type of connection).

Anchoring of the equipment

- For the ACn Series, it is mandatory to install the unit on a solid, level, and stable surface. The pump base is equipped with slotted holes in the feet to allow anchoring with screws. This anchoring is essential to ensure the stability of the assembly and to facilitate subsequent piping connections, preventing undue stress on the pump.

Hydraulic connection

- **Diameter suitability:** The diameter of the piping must match the diameter of the pump ports to ensure proper flow and to avoid performance problems.
- **Use of adaptors:** If the piping does not match the size of the pump ports, adapters can be used to achieve the proper connection.
- **Suction inlet:** Connect the suction pipe to the pump. Make sure that the connections are tight and that the piping is free of impurities that could damage the pump.
- **Discharge outlet:** Connect the discharge piping in such a way that it is not subject to excessive stresses and angles, which could affect the performance of the pump.
- **Flow direction checking:** Check that the piping is installed according to the recommended flow

direction and that the direction of fluid flow is correct for the pump. The arrow label on the fan cover indicates the direction of rotation of the drive shaft.

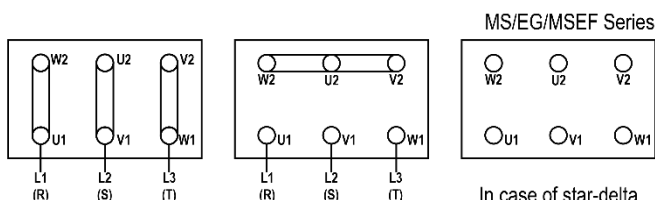
Installation of hydraulic safety devices

- It is essential that the installation includes appropriate pressure control systems, such as external safety or relief valves when required by the system, thereby ensuring the protection of the equipment against possible overpressure.
- For proper operation, the discharge pipe must be free of obstructions that could cause excessive pressure or damage to the pump.
- The **suction strainer** protects the pump from impurities and particles in the fluid. Its installation at the suction inlet is essential to protect the impeller and extend the equipment's service life.
- **It is mandatory to install a foot valve on the suction line when the pump is not flooded**, that is, when the suction pipe may empty or is not permanently filled with fluid. This valve maintains priming and prevents the pipe from draining, protecting the pump from damage due to dry running. In installations where the pump is always flooded, the foot valve may not be necessary, but it is essential to ensure that the suction pipe is properly primed before each start-up.
- Additionally, the installation of a **pressure gauge** in the discharge line will allow you to measure and monitor the pressure in the system.

Electrical connection

- **Power disconnection:** Make sure that the pump and motor are disconnected from the power supply before making any electrical connections.
- **Voltage and compatibility check:** Confirm that the supply voltage matches the specifications on the pump nameplate before connecting the pump. Incorrect installation of the pump with improper voltage may damage the electrical components of the motor.
- **Motor connection:** Make the electrical connections to the motor according to the diagram provided below. Check that the connections are correct and that there are no loose or incorrectly connected wires.

1-speed three-phase motor



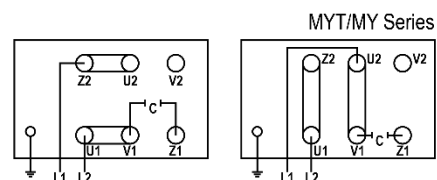
Low voltage (Δ)

High voltage (Y)

Starter (Y-Δ)

In case of star-delta switch without bridges, connection according to the switch diagram.

Single-phase motor



Clockwise

Counterclockwise

- **Continuity test:** Before switching on the pump, perform an electrical continuity test using a multimeter to check that everything is correctly connected.
- **Checking the direction of rotation of the motor:** As indicated above, an arrow label indicates the direction of rotation of the drive shaft. Perform another short start-up to verify, via the fan, that the direction of rotation is correct. If not, the direction of rotation can be changed by alternating two of the three phases (called L1, L2 and L3, or R, S and T), for three-phase AC motors. For single-phase motors the process is more complex to carry out.

Equipment alignment

- **Verify the correct alignment between the pump shaft and the motor**, since the coupling between them is elastic and any misalignment may cause vibrations and premature damage. For this purpose, refer to the coupling alignment manual included in the package with the pump.

Lubrication and priming

- The ACn pump is equipped with a bearing housing containing **open bearings**, which require **periodic greasing** to ensure proper operation and extend the service life of the equipment. The bearing support incorporates a **grease fitting** through which suitable grease must be applied as needed, following the maintenance intervals specified by the manufacturer. Use high-quality industrial grease suitable for bearings (NLGI grade 2 or equivalent).
- The mechanical seal is automatically lubricated by the pumped fluid during operation. For this reason, it is essential to ensure that the seal is in contact with the fluid from the very beginning. **The pump must never be started dry**, as this can cause irreversible damage to the seal.
- **The priming process** is crucial to ensure the proper operation of the ACn Series and to avoid damage caused by dry running. Priming must be carried out in the following cases:
 - Before the **first start-up** after installation.
 - After a **prolonged shutdown**.
 - After any **maintenance** operation that required draining the pump or suction pipe.
 - Whenever it is detected that **the pump is not flooded** and there is a risk of air in the system.
- The purpose of priming is to completely **fill the pump casing with the working fluid**, ensuring that the mechanical seal is properly lubricated from the start and preventing dry running, which can cause serious and irreversible damage. **The following procedure must be followed:**
 1. **Close the discharge valve**, if installed, to avoid backpressure during filling.
 2. **Remove the priming plug** located on the top of the pump casing.
 3. **Fill the pump with the working fluid** (normally water) until it overflows through the priming port and no air bubbles are observed.

4. **Reinstall the priming plug** and tighten it securely.
5. **Slowly open the discharge valve** until it is partially open.
6. The pump is now ready for start-up, provided that the direction of rotation and the alignment of the unit have been previously verified.

Start-up and operation

- **Dry run test:** No dry run test should ever be performed, as the ACn pump must be fully primed before start-up.
- **Load test:** Fill the pump with the working fluid and operate it under normal conditions. Ensure that the pump starts drawing the fluid without issues and that the hydraulic system responds properly.
- **Leakage check:** During loaded operation, inspect the pump and system connections for fluid or oil leaks. If any leaks are detected, stop operation immediately and make any necessary adjustments.
- **Valve adjustments:** Adjust the pressure and flow control valves to ensure that the pump operates within the recommended specifications. This step is crucial to avoid problems of over-pressure or under-performance.
- **Operation monitoring:** During the first minutes of operation, monitor pressure, temperature, and vibration levels. Make sure the pump is operating within the proper parameters to detect potential problems early.

Preventive maintenance of the equipment

First of all, it is essential to remember that before carrying out any maintenance on the pump, it must be completely disconnected from the power supply. Use a lockout/tagout (LOTO) system to prevent accidental reconnection during maintenance work.

The maintenance tasks to be carried out to extend the life of the unit and the frequency with which they should be carried out, as well as further recommendation, are detailed below:

Lubrication of rotating components

- The ACn pump is equipped with an independent bearing housing fitted with open bearings
- It includes a grease fitting that allows external lubrication during maintenance tasks.
- **Frequency:** Every 6 months, or sooner if abnormal noise or increased temperature is detected in the equipment.
- **Task:** Grease the bearings through the grease fitting on the bearing housing. Use lithium-based grease, NLGI grade 2 or equivalent.

Electrical System

- **Frequency:** Every 3 months (quarterly).
- **Tasks:** Check electrical connections to ensure that they are secure and in good general condition. Also check that the protection system is working properly.

Gaskets and mechanical seal

- **Frequency:** Every 12 months (annually) or when a leakage is observed in the operation.
- **Tasks:** Check that the pump operation is completely leak-free. If a leak is present, identify where it is and contact Bomba Elias sales department for the appropriate selection of spare parts.
- **Recommendation:** Every four pump operating years, carry out a complete replacement of seals and mechanical seals or lip seals to prevent possible future leakages.

Strainer cleaning

- **Frequency:** Depending on the type of fluid and conditions of use.
- **Recommendation:** Ideally, a monthly cleaning should be carried out.
- **Tasks:** Clean or replace the suction strainer to ensure that the flow to the pump is free of particles that could clog the system.

Possible failures and recurrent solutions

Insufficient flow

Possible cause	Suggested solution
Suction pipe with insufficient diameter	Replace with one of equal or greater diameter than that of the pump.
Partially open suction valve	Clean or replace the valve.
Air intake in suction preventing vacuum	Inspect the entire suction pipe, including unions and accessories.
Fluid too viscous	Heat to reduce viscosity and allow proper flow.
Incorrect rotation direction	Reverse the motor's rotation direction.
Totally or partially clogged strainer	Clean or replace the strainer.
Working pressure exceeding the maximum allowed, triggering the safety valve	Adjust the pressure, reducing it within the limits specified on the nameplate.
Cavitation caused by low suction pressure or insufficient NPSH	Verify that the suction pressure is sufficient and that there are no excessive pressure losses in the piping. Check that the tank is properly vented and that the fluid level is adequate.

Insufficient or unstable pressure

Possible cause	Suggested solution
Partially closed suction valve	Inspect the condition and repair or replace the valve.
Air intake in suction causing pressure fluctuations	Check the entire suction system, including joints and fittings.
Internal leaks	Identify the location of the leak and install the necessary spare parts.
Cavitation	Check that the available NPSH exceeds the pump's required NPSH. Eliminate restrictions on the suction line and avoid suction lifts above the pump without adequate pressure.

Noise and vibrations

Possible cause	Suggested solution
Wear or damage to bearings	Inspect the bearings and replace them if worn.
Internal leaks or air intake	Check the pump for leaks in connections, gaskets, mechanical seals or lip seals.
Misalignment between the motor shaft and the pump shaft	Realignment of the flexible coupling or replacement of the pump shaft or the entire motor.

Improper installation or poor anchoring	Tighten the connections and anchors to prevent additional vibrations.
Cavitation (formation and collapse of vapor cavities)	Check the fluid level, eliminate pressure losses in the suction line, and ensure a sufficient positive net suction head (available NPSH > required NPSH).

Leaks through the mechanical seal

Possible cause	Suggested solution
Wear of the mechanical seal or lip seal components	Replace the sealing solution.
Presence of abrasive particles in the pumped fluid	Ensure a good suction filtration system and/or replace the mechanical seal or lip seals with one more suitable for abrasive fluids.
Incorrect operation conditions (excessive temperature or pressure)	Ensure that the pump operates within the recommended temperature and pressure ranges.
Material incompatibility	Check that the mechanical seal or lip seals, gaskets and o-rings are compatible with the pumped fluid and replace them if needed.
Prolonged dry running (only applies to mechanical seal)	Avoid prolonged and long dry running. Replace the mechanical seal if worn.

Excessive temperature

Possible cause	Suggested solution
Insufficient or blocked ventilation	Ensure that the pump and motor are installed in a well-ventilated area and, if necessary, change the location or the ventilation system.
Fluid at a temperature above pump specifications	Verify the temperature of the fluid before passing through the pump. Install heat exchangers or select another type of pump.

Over-consumption or abnormal motor operation

Possible cause	Suggested solution
Incorrect power supply	Check that the power supply is within the voltage parameters specified for the motor.
Poor engine connection	Check the electrical connections of the motor, ensuring that the wires are securely connected, with no signs of corrosion or wear.
Partial blockage in the discharge line	Inspect and clean the discharge line. Ensure that no valves are partially closed and that there are no internal deposits.
Worn bearings or shaft	Inspect the equipment. Replace the bearings if they show wear or abnormal noise.

Pump oversized for the installation

Check if the pump is operating far from its optimal duty point. If necessary, consider installing a frequency converter or adapting the system.

In the event of any potential failure, it is recommended to contact Bomba Elias S.A. technical service for an accurate diagnosis and appropriate solution.

Use of the equipment in ATEX zones

This section only applies to pump types of the ACn series which have been specially supplied for potentially explosive atmospheres at the customer's request. In no case does this classification apply to pump models supplied without an ATEX-certified electric motor.

The user must first prepare a risk assessment of the area where the ACn pump is to be installed, in accordance with the application of Directive 1999/92/EC, of 16 December 1999 (published in the DOCE no. 23, of 16 January 2000) and its regulatory transpositions to the legislation of each country (in Spain it is transposed by Royal Decree 681/2003, of 12 June 2003, regarding the protection of health and operators' safety against the potentially explosive atmospheres risks), for the purposes of classifying the preconditions for the location of the installation. In particular, it is necessary to delimit the emplacement and obtain its classification in accordance with the provisions of art. 7 and Annex I of the aforementioned Royal Decree 681/2003.

Equipment and components intended for installation in locations classified and affected according to Directive 1999/92/EC (mentioned in the previous point) must comply with the ATEX Directive 2014/34/EU of 26 February 2014, on the harmonisation of the laws of the Member States concerning equipment and protective systems for use in potentially explosive atmospheres (recast) and with its regulatory transpositions to the legislation of each country (in Spain, Royal Decree 144/2016 of 8 April is applied, which establishes the essential health and safety requirements for equipment and protective systems for use in potentially explosive atmospheres).

This ACn Series single-stage horizontal centrifugal pump, according to the classification by the Spanish transposition of Directive 2014/34/EU (RD 144/2016 of 8 April, in its Annex I) has the classification:

- **Equipment group II:** Equipment designed for use in industrial (non-mining) areas with explosive atmospheres due to gases, vapours, mists or dusts.
- **Equipment category 3:** Basic protection, for areas where explosive atmospheres are less frequent and present only under abnormal conditions.
- **Explosive atmosphere type G:** Equipment designed for explosive atmospheres with gases, vapours or mists.

This ACn Series single-stage horizontal centrifugal pump unit is designed to be used in the following zones, according to the classification by the Spanish regulations of the Directive 1999/92/CE (RD 681/2003 of 12 June, article 7 and Annex I):

- **Zone 2:** Unlikely to occur, only under abnormal conditions

The use, installation or maintenance of the ACn Series centrifugal pump is not permitted outside the Zones listed in the list above. In particular, its use is not permitted in Zones 0, 1, 20, 21 and 22.

In compliance with Directive 2014/34/EU (ATEX) on equipment intended for use in explosive atmospheres and in accordance with EN 60079-15, the ACn Series centrifugal pump has been granted the following Ex-protection type:

- **Protection by construction Type Ex 'c':** This protection ensures that the pump has been safely designed to minimise the risk of ignition through a robust design that prevents the generation of sparks, excessive heat or electric arcing under normal operating conditions. No additional potting or pressurisation is required.

In accordance with **Directive 2014/34/EU** concerning equipment intended for use in explosive atmospheres, and following the applicable regulations for the classification of gases and temperatures, this pump has been classified as follows:

- **Gas group IIB:** This equipment has been classified for use in atmospheres containing medium-hazardous gases, such as ethylene. Classification IIB corresponds to gases of lower hazard compared to those of group IIC, but is still suitable for use in areas where potentially explosive gases may be present. This classification is in accordance with EN 60079-20-1.
- **Temperature Class T3:** The pump has been classified with a maximum surface temperature of 200 °C. Although the operating temperature of the pump does not exceed 110 °C, the T3 classification is appropriate as it covers the maximum temperature range achievable by the equipment. This classification is in accordance with EN 60079-0 and the Annexes of the ATEX Directive 2014/34/EU.

The marking/labelling of the ACn series pumps (according to EN ISO 80079-36), and their intended uses permitted according to current legislation is:



II 3 G Ex c IIB T3

Declaration of conformity

Company details:

Company	BOMBA ELIAS S.A.
Address	Ctra. de Molins de Rei a Rubí km 8,7, 08191, Rubí (España)

Equipment data

Series	ACn
Models included	ACn 32/13, 32/16, 32/20 and 32/26; 40/13, 40/16, 40/20, 40/26 and 40/32; 50/13, 50/16, 50/20, 50/26 and 50/32; 65/13, 65/16, 65/20, 65/26 and 65/32; 80/16, 80/20, 80/26, 80/32 and 80/40; 100/16, 100/20, 100/26, 100/32 and 100/40; 125/20, 125/26, 125/32 and 125/40; 150/20, 150/26, 150/32 and 150/40; 200/32 and 200/40; 250/32 and 250/40.
Year of construction	From 2023 onwards

BOMBA ELIAS S.A declares under his sole responsibility that the above-mentioned product is in compliance with the requirements of the following directives and regulations:

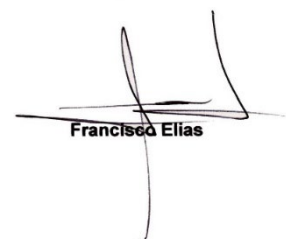
- Regulation (EU) 2023/1230.
- Low Voltage Directive 2014/35/UE.
- Electromagnetic Compatibility Directive 2014/42/UE.

The following harmonised standards have been applied to demonstrate compliance:

- Machine safety - EN ISO 12100:2010, EN 809:1998+A1:2009 y EN 60204-1:2018.
- Electromagnetic compatibility - EN 61000-6-2 y EN 61000-6-4.

Place and date: Barcelona, enero de 2024

Signature: Francisco Elías, president


Francisco Elías



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