



OPERATING INSTRUCTIONS

EN

Translation of the original instructions

ACP 15

Dry compact Multi-stage Roots pump

PFEIFFER  **VACUUM**

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1 About this manual

1.1 Validity

This operating manual is for customers of Pfeiffer Vacuum. It describes the functioning of the designated product and provides the most important information for safe use of the unit. The description follows applicable EU guidelines. All information provided in this operating manual refers to the current state of the product's development. The documentation remains valid as long as the customer does not make any changes to the product.

Up-to-date operating instructions can also be downloaded from www.pfeiffer-vacuum.com.

This document is a translation of the original French instructions.

This manual covers products with the following references:

Part number	Model	Description
V5SAXXXXXX V5VSXXXXXX	ACP 15	Models for standard applications
V5GAXXXXXX V5VGXXXXXX	ACP 15 G	Models for applications with traces of corrosive gases

1.1.1 Applicable documents

Declaration of conformity	included with this manual
UL/CSA compliant use (ETL mark)	included with this manual

1.2 Conventions

1.2.1 Safety instructions

The safety instructions in Pfeiffer Vacuum operating instructions are the result of risk evaluations and hazard analyses and are oriented on international certification standards as specified by UL, CSA, ANSI Z-535, SEMI S2, ISO 3864 and DIN 4844. In this document, the following hazard levels and information are considered:

DANGER
Imminent danger Indicates an imminent hazardous situation that will result in death or serious injury.
WARNING
Possibly imminent danger Indicates an imminent hazardous situation that can result in death or serious injury.
CAUTION
Possibly imminent danger Indicates an imminent hazardous situation that can result in minor or moderate injury.
NOTICE
Command or note Command to perform an action or information about properties, the disregarding of which may result in damage to the product.

1.2.2 Pictographs



Prohibition of an action or activity in connection with a source of danger, the disregarding of which may result in serious accidents



Warning of a displayed source of danger in connection with operation of the unit or equipment



Command to perform an action or task associated with a source of danger, the disregarding of which may result in serious accidents



Important information about the product or this document

1.2.3 Instructions/Abbreviations used

⇒ or → Work instruction: you must perform an operation here.

1.2.4 Labels

I/O	Pump Start/Stop
INLET	Pump inlet connection
PUMP EXHAUST↓	Pump exhaust connection

WARNING
HOT SURFACE
Contact with pump bodies may cause burn.
Switch off and wait until pumps cooled before servicing.

This label warns the user against possible risk of injury due to any hand contact with hot surfaces.
⇒ It states that protective gloves should be used before performing any intervention.

WARNING
MOVING PARTS PRESENT
Moving parts can crush and cut.
Keep hands or feet away from moving parts.

This label informs the user, that moving parts present inside the pump could cause personal injury, like crushing or cutting.
⇒ The user must keep all body parts away from moving parts.

WARNING
HEAVY OBJECT
Can cause muscle strain or back injury.
Use lifting aids and proper lifting techniques when removing or replacing.

This label indicates that due to its heavy weight, the product should not be handled manually,
⇒ but always through appropriate handling devices.

WARNING
HAZARDOUS VOLTAGE
Switch off the pump and disconnect the main power cable before opening the power box cover.

This label indicates that some of the internal parts are energized and could cause electrical shocks in case of contact.
⇒ It advises to disconnect the pump before any intervention or to properly lock-out and tag-out the equipment breaker before any intervention on the pump.

Référence **P0385E4**
AC Rating 110-230V 50/60Hz 15-10A

Frequency inverter serial n°

This label indicates the voltage of the equipment in which the pump is to be connected.

SEISMIC TIE DOWN
A 329 962 - 5

This label indicates the location of the holes for seismic bracket installation.



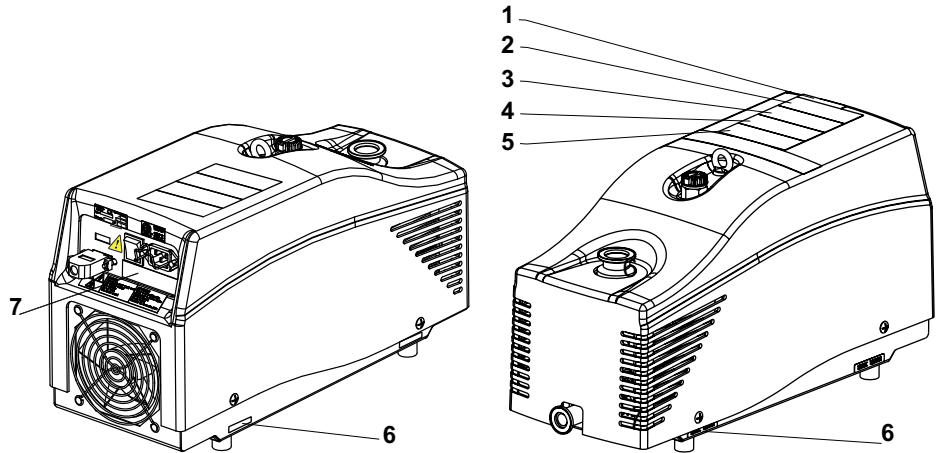
This label indicates that the power supply must be switched off before connecting and/or disconnecting the pump. Any person responsible for installation or operation of the product must first refer to the operating manual.

	CAUTION Use suitable power supply cord for required voltage Hot surface Do not touch See user's manual	ATTENTION Utiliser le câble d'alimentation adapté pour la tension requise Surface chaude Ne pas toucher Consulter les documents joints
--	--	--

This label warns the user against potential risks associated with the use of this product. Any person responsible for installation or operation of the product must first refer to the operating manual.

The installer must glue the following labels to the most appropriate and visible place on the pump to warn the operator about potential hazards:

- 1 **Weight Label**
- 2 **Heavy object label**
- 3 **Hot surface label**
- 4 **Hazardous voltage label**
- 5 **Presence of moving part label**
- 6 **Seismic down label**
- 7 **Mains voltage Label**



2 Safety

2.1 Safety precautions



Obligation to inform

Any person responsible for installing, using or maintaining the product must first read the security instructions in this operating manual and comply with them.

→ It is the operating customer's responsibility to protect all operators against the dangers associated with the product, with the media pumped and with the entire installation.



Installation and use of the accessories

The products can be fitted with special accessories. The installation, use and refurbishment of the connected accessories are described in detail in the respective manuals.

→ Only use original accessories.
 → Accessory part numbers: see **Accessories**.



WARNING

Hazard associated with non-compliant electrical installation

Safe operation after installation is the operator's responsibility.

→ Connect the product to an installation that is compliant with local safety standards.
 → Do not carry out any alterations or modifications to the product on your own initiative.
 → For specific questions, contact your service center.



WARNING

Electric shock hazard in case of contact

When the product's mains switch is set at **O**, some internal components still have an electrical charge.

→ Make sure that the mains connection is always visible and accessible so that it can be unplugged at any time.
 → Disconnect the power cable from all power sources before starting any work on the product.



WARNING

Danger due to lack of lock out/tag out (LO/TO) electrical device.

In order to properly secure the pump for installation and/or maintenance, it is required to lock out/tag out the pump properly in accordance with OSHA requirement 29 CFR.1910.147.



WARNING

Other located hazardous energies

Electrical circuit and other pressurized circuits as nitrogen are potential hazards:

→ Always lock out these energy sources before working on the product.



WARNING
<p>Risk associated with process gases</p> <p>The user and/or integrator of the product is/are fully responsible for the operational safety conditions of the equipment. The manufacturer has no control over the types of gases this pump is exposed to. Frequently process gases are toxic, flammable, corrosive, explosive and/or otherwise reactive. It is the user and/or the integrator's responsibility to follow the necessary safety requirements. Toxic gases can cause serious injury or death. Operators and users must:</p> <ul style="list-style-type: none"> → Take the appropriate safety recommendations to prevent injury. Consult the responsible department for instructions and safety information. → Hazardous gases from the pump can cause serious injury or death. Regulations require to connect the pump's exhaust to a facility hazardous gas exhaust system which incorporates appropriate filters, scrubbers, etc. This system must meet all air and water regulations. → Check that the pump is correctly connected to the equipment (see <i>Installation</i>). Contact the service center for further information.

The potential risks with an air cooled, dry multi-stage Roots pump involve electricity, the chemical processes, hot surfaces, the pressurized nitrogen device.

- Only qualified personnel trained in safety rules (EMC, electrical safety, chemical pollution) may carry out the installation and maintenance described in this manual. Our service centers can provide the necessary training.
- Do not remove the blanking plates sealing the inlet and exhaust ports if the product is not connected to the pumping line.
- Do not operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.
- Do not expose any part of the human body to the vacuum.
- Comply with all safety and risk prevention instructions in accordance with local safety standards.
- Regularly check compliance with all precautionary measures.
- Do not turn on the product if the covers are not in place.

2.2 Protective equipment

In some situations, personal protective equipment must be worn when handling the vacuum pump and its components. The owner must provide operators with the necessary equipment. This equipment must be checked regularly and used in accordance with the supplier's recommendations.



DANGER
<p>Health risk relating to contact with toxic materials</p> <p>The vacuum pump, pumping line components, and operating media may be contaminated with toxic, corrosive, reactive, or radioactive materials, depending on the process.</p> <ul style="list-style-type: none"> → Wear appropriated safety equipment when pump is disconnected for maintenance, or re-installed, and also for oil filling and draining.

WARNING
<p>Risk of injury due to hot surfaces</p> <p>For the operator's safety, the products are designed to avoid thermal risk. However, specific operating conditions may exist that require extra caution from users due to the high temperatures (external surfaces > 70°C on the exhaust pipe).</p> <ul style="list-style-type: none"> → Let the part cool before working on the product. → If necessary wear protective gloves according to directive EN 420.



WARNING

Risk of injury due to falling objects

When transporting parts/items by hand, there is a danger of loads slipping and falling down.

- Carry small and medium-size parts/items with two hands.
- Carry parts/items > 20 kg with a suitable lifting device.
- Wear safety shoes with steel toe according to directive EN 347.

2.3 Proper use



NOTICE

EC conformity

The manufacturer's declaration of conformity becomes invalid if the operator modifies the original product or installs additional components.

→ Following installation into a plant and before commissioning, the operator must check the entire system for compliance with the valid EU directives and reassess it accordingly.

- The vacuum pump may only be used to generate a vacuum while pumping gases.
- The product may be used in an industrial environment.
- The product may be used in a laboratory environment.
- The G version pump is compatible with traces of corrosive gases.

2.4 Improper use

Improper use will cause all claims for liability and warranties to be forfeited. Improper use is defined as usage for purposes deviating from those mentioned above, especially:

- pumping of flammable and explosive mixtures
- pumping of corrosive gases (exception: pumps in G version)
- pumping of liquids
- pumping of dusts
- use of the vacuum pump to generate pressure
- operation in potentially explosive areas
- use of accessories or spare parts, which are not named in this manual

The product is not designed to carry people or loads and is not for use as a seat, step-ladder or any other similar purpose.

3 Transport and storage

Upon delivery, check that the product has not been damaged during transport. If the product is damaged, contact the carrier and notify the manufacturer. In all situations we recommend:

- Keeping the product in its original packaging so it stays as clean as it was when dispatched by us. Only unpack the product once it has arrived at the location where it will be used.
- Keeping the packaging (recyclable materials) in case the product needs to be transported or stored.
- Keeping the blanking plates in place on the inlet, exhaust and purge ports while the product is not connected to the pumping line.

3.1 Transport



WARNING

Risk of injury associated with heavy loads

Given the weight of the product, it should be removed from its packaging only by personnel qualified and trained in handling heavy materials.

- Use the lifting rings and devices provided with the product.
- The manufacturer cannot be held liable for the consequences of using lifting devices other than those provided.



WARNING

Risk of tilting

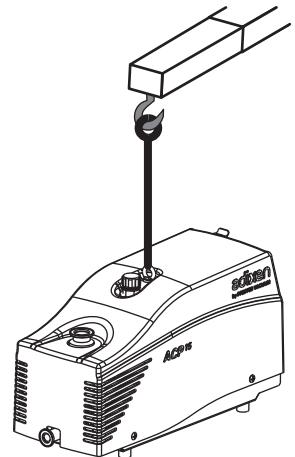
Even though compliance with EEC safety rules is guaranteed, all necessary precautions should be taken when moving, installing and operating the product.

- Do not place the product on an inclined plane.
- Place it on a flat, hard floor.
- Do not push the product sideways.

To lift the product:

- Use a lifting device suitable for the product's weight.
- Use a lifting sling with a single arm that can withstand a load **> 23 kg**.

A wheel kit is available as accessory: fitted over the frame, it facilitates the displacement of the pump over short distances (see 11) and (see 12.4).



3.2 Storage

Storage of a new pump

If the new pump is going to be put into storage:

- Keep the pump wrapped in its protective film.
- It is **absolutely necessary** to leave the inlet, the exhaust and purge blanking plates in place.
- Store the pump according to storage temperatures (see 12.3.1).
- Store the pump in a clean and dry area, **for a maximum period of 1 year**.

For longer storage, we recommend operating the pump regularly **at least once a year**: factors such as temperature, degree of humidity, salt air, ... may cause the deterioration of the pump components. Proceed as follows:

- Let the pump to run:
 - for 30 minutes with gas ballast opened or by injecting a dry inert gas into the pump (G version),
 - then, for 30 minutes at ultimate pressure (inlet, gas ballast and purge ports closed).
- Stop the pump.
- Seal the pump inlet, exhaust and purge ports with included accessories.
- Repeat this at least once a year.

For a storage period of over 4 years, the pump must be revised before any start up. Return it to a service center according to the product return **Service procedure** (see 10).

Storage after use

- Stop the pump according to pump shut-down procedure (see 6.3.1), (see 6.3.2) or (see 6.3.3).
- Disconnect the pump from the installation (see 7.4.1).
- Seal the pump inlet, exhaust and purge ports with included accessories.
- Store the pump in a clean, dry, non-polluted area for a maximum of 6 months according to the storage temperatures (see 12.3.1).

For longer storage, we recommend operating the pump **every 6 months**. Proceed as follows:

- Let the pump to run:
 - for 30 minutes with gas ballast opened or by injecting a dry inert gas into the pump (G version),
 - then, for 30 minutes at ultimate pressure (inlet, gas ballast and purge ports closed).
- Stop the pump.
- Seal the pump inlet, exhaust and purge ports with included accessories.
- Repeat this every 6 months.

For a storage period of over 2 years, the pump must be revised before any start up. Return it to a service center according to the product return **Service procedure** (see 10).

4 Product description

4.1 Product identification

To correctly identify the product when communicating with Pfeiffer Vacuum, always have the information from the rating plate available.

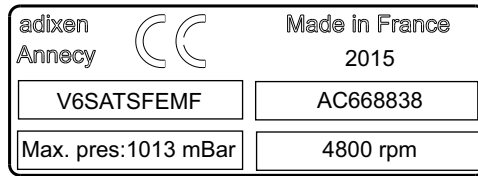


Fig. 1: Product identification on the rating plate

4.1.1 Scope of delivery

- 1 vacuum pump
- 1 remote cover plug for remote connector (connected to the pump)
- 1 operating instructions
- 1 sheet of multilingual labels

and depending on the ordering guide, the following components are present:

- ➔ 1 main power cable

4.1.2 Differences between the pump versions

The multi-stage Roots pump technology of **the ACP series** meets the requirements of applications where clean and dry vacuum is needed.

Standard version The **SD version** is designed for applications that require pumping of clean (dust-free) and non-corrosive gases. Standard pumps are equipped with a gas ballast device to improve pumping of light gases and avoid vapor condensation inside the pump.

G version The **G version** pump is compatible with traces of corrosive gases. Three purge gas jets protect low and high pressure bearings and dilute trace amounts of corrosive gases. Please contact Pfeiffer Vacuum to obtain more detailed information according to the applications.

4.2 Man/machine interfaces

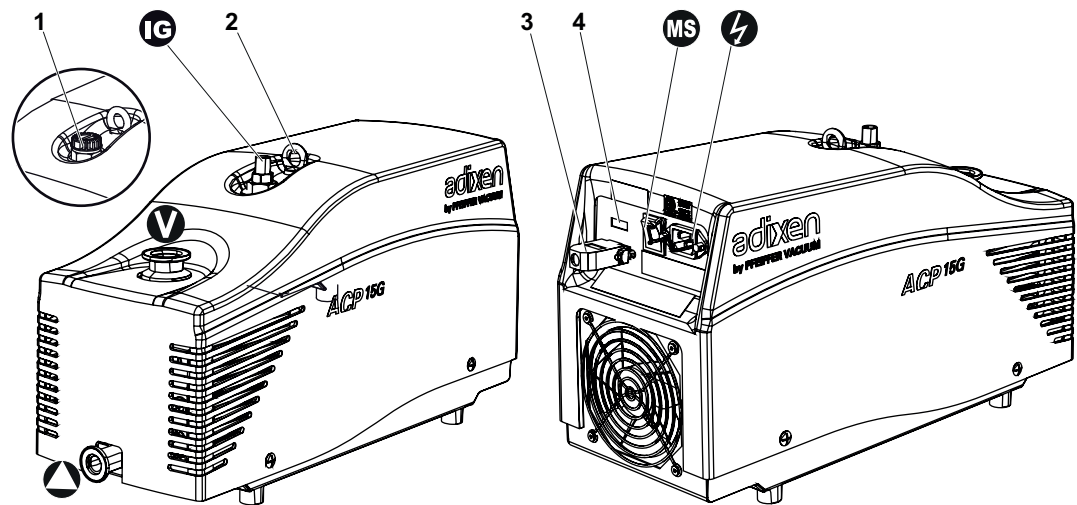


Fig. 2: ACP 15 with single-phase frequency converter

▼	Pump inlet	1	Gas ballast (SD version)
▲	Pump exhaust	2	Hoisting ring
MS	I/O mains switch	3	Remote connector and RS-485 connector
⚡	Power supply	4	Hour meter
IG	Inert gas purge connection (G version)		

5 Installation

5.1 Set-up

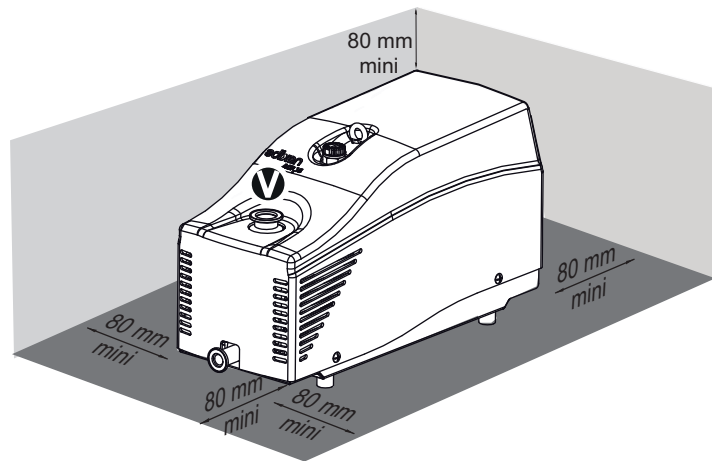
The pump must be operated in the horizontal position in support on its feet, with the pumping axis vertical and the inlet opening upwards.

- Determine where the pump will be placed.
- Use the handling devices to position the pump in the desired location, lift the pump using hoisting rings (see 3.1).
- Install the pump so that the **I/O** mains switch is accessible by the operator.

Ventilation

To guarantee the characteristics and performances of the pump within the boundaries of the operating conditions:

- Check that the air circulation grids are not blocked.
- Take away the pump of the fixed walls, at least the value indicated on the diagram below.



5.2 Connection to the pumping line



WARNING

Risk of crushing or cutting related to the rotating parts

Do not expose any part of the human body to the vacuum. The product is supplied with the inlet and exhaust sealed.

- Remove these blanking plates when you are ready to connect the product to your vacuum system.
- Do not operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.
- Use accessories on the inlet and exhaust lines whose materials and sealing properties are compatible with gases being used.
- Provide in the pumping line, accessories to isolate the pump from the vacuum and exhaust line, to make the maintenance easier (inlet and exhaust isolation valves, purges,...).
- Remove the blanking plates blocking the inlet and exhaust ports.
- Keep the blanking plates, screws and washers for reuse when transporting the pump.
- Ensure that no screws, washers or other objects are dropped into the pump inlet.
- Fit flexible flanged bellows in the pumping line to reduce the transmission of vibrations.

The O-rings located under the blanking plates are compatible with standard applications. Other types of connection accessories are available in the product catalogue. The inlet and exhaust connections must not cause stress that could lead to leaks in the pumping line.

5.2.1 Connection at pump inlet



NOTICE

Limit of operation

→ Make sure that the parts or chambers connected to the inlet of our products withstand a negative pressure of $1 \cdot 10^3$ hPa in relation to atmospheric pressure.



NOTICE

When the pump stops, the pressure rises at the inlet. This rise depends on the inlet volume.

→ If necessary, install an isolation valve on the inlet which closes when the pump stops.

The product is not designed to withstand loads on its inlet flange which may compromise stability.

→ Mechanically attach the vacuum chamber separately from the pump.

It may be necessary to install a filter on the inlet (particulate filter or (see 11) condensables filter).

To improve pumping speed, the pumping line must be as short as possible and its internal diameter must not be less than the pump inlet flange.

→ Use only dry parts and clean, grease-free, dust-free pipelines.

5.2.2 Connection at pump exhaust



NOTICE

Limit of operation

→ Ensure that all components in the exhaust pipeline have maximum pressure rating which is greater than the highest pressure that can be generated in your system.

G version



DANGER

Health risk in case of contact with toxic substances

Exhaust of corrosive, reactive, flammable, pyrophoric or oxidizing process gases may result in severe injury or death.

→ Always connect the pump exhaust to an exhaust extraction system.

5.2.3 Connecting the purge circuit

The gas purge consists of injecting an inert gas into the pump.

In this manual, the inert gas will be called 'nitrogen', as it is the most commonly used gas. For more information about the type of purge gas, contact your service center Pfeiffer Vacuum.



DANGER	
Risk of explosion	<p>If pyrophoric materials above the LEL (lower explosive limit) are sent to the pump, the nitrogen supply must make it possible to dilute this concentration.</p> <ul style="list-style-type: none"> → Ensure there is a sufficient flow of nitrogen to lower the concentration below the LEL. → Provide in addition an interlock to ensure that gas flow towards the pump is stopped when nitrogen is lost.



NOTICE	
Risk of nitrogen supply failure	<p>If loss of purge flow creates a significant risk for the process:</p> <ul style="list-style-type: none"> → Control the nitrogen supply using an external system able to take over in case of failure.

G version

A gas purge circuit protects the low and high pressure bearings and dilutes trace amounts of corrosive gases.

- Connect the inert gas pipe to the 1/4 BSPT connector provided for this purpose (flexible or rigid pipe supplied by the customer).
- Install as close as possible from pump gas port, an isolation valve on the inert gas pipe, to allow pump performance recovering when the gas supply is not used (see 12.2).
- Inject inert gas purge with maximum relative pressure of 300 hPa (see 12.2).

A filtered dry nitrogen supply with the characteristics defined is required for optimum performance (see 12.3.2).

5.3 Leak test



WARNING	
Leak-tightness of the equipment	<p>It is the user's responsibility to ensure this level of leak tightness is maintained, especially when dangerous gases are pumped. The operator must maintain this level of tightness, particularly when pumping dangerous gases. Proceed as follows:</p> <ul style="list-style-type: none"> → Perform a leak test on the entire pumping line after installation. → Carry out regular checks to ensure that there are no traces of the gases pumped in the surrounding environment and that no air is entering the pumping line while the pump is running.

For more information concerning leak tests, please contact your service center.

5.4 Electrical connection



WARNING	
Electric shock hazard in case of contact	<p>When the product's mains switch is set at O, some internal components still have an electrical charge.</p> <ul style="list-style-type: none"> → Make sure that the mains connection is always visible and accessible so that it can be unplugged at any time. → Disconnect the power cable from all power sources before starting any work on the product.

**WARNING****Risk of electromagnetic disturbance**

The product's EMC behavior is guaranteed only if the relevant EMC standards are followed during installation.

→ Use shielded cables and connections for the interfaces in interference-prone environments.

**WARNING****Hazard associated with non-compliant electrical installation**

Safe operation after installation is the operator's responsibility.

- Connect the product to an installation that is compliant with local safety standards.
- Do not carry out any alterations or modifications to the product on your own initiative.
- For specific questions, contact your service center.

Electrical safety

The pump is equipped with an **I/O** mains switch that isolates the product from power line when it is on **O** position.

The pump is equipped with a frequency converter in compliance with EC standards that allows pump running in high and low voltages (see 5.4.1). The frequency converter is protected against short-circuits from power line. Once this safety activated, power is switched off and the pump is put in a safe condition. To restart the pump, you must:

- switch power off, mains switch **MS** to **O** position,
- delete the origin of the fault, then,
- wait for about 15 seconds,
- then, switch power on **MS**, to **I** position.

The pump is equipped with thermal sensors that prevent pump start-up at certain temperatures (see 6.1).

5.4.1 Customer electrical installation protection

The pump is connected to the mains with the delivered mains power cable. The earth connection (frequency converter, cover, pump) is made via the power cable connected to a compliant electrical installation.

When the mains power cable is provided by the customer:

- Use an EEC cable in compliance with IEC 60227 and IEC 60245 standards with the following characteristics:
 - heatproof (because it can come into contact with hot surfaces),
 - with conducting wire section suitable with the voltage (see 12.3.3),
 - and which one of the wire ensures grounding of the pump.

Installation protection with circuit breaker

The user must supply the pump from facilities equipped with main circuit breaker, curve D (IEC 60947-2), in accordance with local regulations and with at least a 10 kA short circuit cut-off capacity. This protection device should be in close proximity to the pump (no further than 7 m) within line of sight of the pump.

This circuit breaker supply and wiring is a customer's responsibility: main circuit breaker rating (see 12.3.3).

**WARNING****Absence of emergency off**

This pump is not equipped with an emergency off device EMO or a lock-out device. It is designed to be integrated with the host tool equipment equipped with an emergency device. This EMO device must de-energize the pump when it is activated.



NOTICE	
Operation in local mode	
There is no device to warn that the pump is operating in local mode.	
→ Provide a device to warn about local mode operation when the pump is not integrated with equipment/host tool.	

5.4.2 Connection to the mains power supply

→ Connect the mains power cable to the connector ⚡.

5.5 Remote connector wiring

Connection made via the Remote connector (Male 15-pin D-Sub) (see 4.2), allows:

- remote control of following functions: start, stop of the pump,
- setting of pump rotational speed (see 5.5.2).

The remote control connector wiring is the customer's responsibility.

5.5.1 Wiring of digital inputs

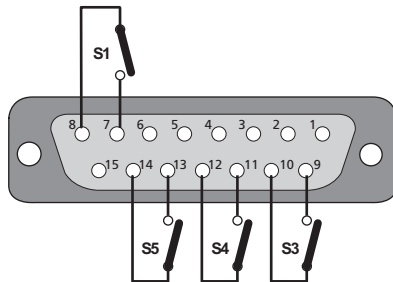


Fig. 3: Digital input wiring

There are dry contact inputs. Do not add more connections than those provided : S1, S3, S4 and S5.

Contact	Function	
S1 (7-8)	Pump Start/Stop	Contact open, S1=0 : pump stopped Contact closed, S1 =1 : pump start-up
S3 (9-10)	Rotational speed setting	Depending on the contact status (open or closed), the rotation speed changes.
S4 (11-12)		
S5 (13-14)		

5.5.2 Setting of the rotation speed

ACP 15 model				
Contact S3	Contact S4	Contact S5	Rotation speed	
			Hz	min ⁻¹
S3 = 1	S4 = 0	S5 = 1	60	3600
S3 = 1	S4 = 0	S5 = 0	70	4200
S3 = 0	S4 = 1	S5 = 1	80	4800
S3 = 0	S4 = 1	S5 = 0	90	5400
S3 = 0	S4 = 0	S5 = 1	95	5700
S3 = 0	S4 = 0	S5 = 0	100*	6000*

* Corresponds to the speed set on the cover plug delivered with the pump.



NOTICE

Rotation speed

Pump performances are guaranteed for a nominal speed of **100 Hz**. Changing the rotation speed affects the pumping speed and the ultimate pressure of the pump. In low speed, it is the customer's responsibility to find the correct settings according to the pump and the process.

→ **For the safety of the pump, do not exceed the maximum frequency.**

→ **Do not run the pump continuously at speeds ≤ 60 Hz.**

5.5.3 Wiring of the digital outputs

Contact	Function
S2 (5-6)	Status of the rotation speed Contact closed: nominal speed reached



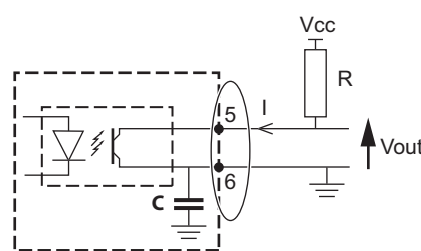
NOTICE

S2 output wiring precautions

→ Do not connect a relay between contacts 5 and 6: the relay coil could create an induced current which may damage the frequency converter.

→ Do not apply to S2 output a current greater than **35 mA**: a greater current would damage the frequency converter.

→ Use the open collector output S2 according to the wiring below.



Vcc : direct voltage delivered by the installation *(between 7 and 30 VDC)
R : resistance value *
Vout : output voltage

* supply and wiring are the customer's responsibility.

The values of Vcc and R must be calculated so that the current I is less than 35 mA. When the setpoint speed is reached, the transistor becomes conductive 'on-state' and Vout = 0 V. As long as the setpoint speed is not reached, the transistor is blocked ('off-state') and Vout = Vcc. This assembly does not make pass of power, add an amplifier stage to control the power. The S2 output can be used as a relay (dry contact) using the accessory socket interface (see 11).

5.6 RS-485 serial link wiring



WARNING

Risk of electromagnetic disturbance

The product's EMC behavior is guaranteed only if the relevant EMC standards are followed during installation.

→ Use shielded cables and connections for the interfaces in interference-prone environments.



WARNING

Electric shock hazard in case of contact

When the product's mains switch is set at **O**, some internal components still have an electrical charge.

→ Make sure that the mains connection is always visible and accessible so that it can be unplugged at any time.

→ Disconnect the power cable from all power sources before starting any work on the product.

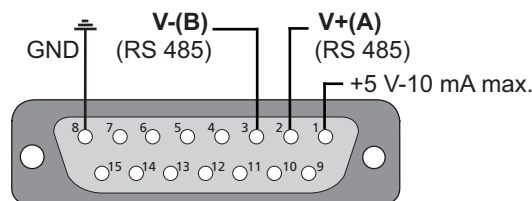
5.6.1 Connections

The male D-Sub 15 pin connector (see 4.2) is used to control and monitor the pump using a computer. It allows also the installation of several pumps in a network. The default serial link setting can be modified from the connected computer, according to the command list (see 5.6.3).

Description	Default setting
Serial link	RS-485
Transmission speed	9600 bauds
Date word length	8 bits
Parity	none (no parity)
Stop bit	1
Echo	no

Pin	Assignment
8	GND
3	RS-485 : V-
2	RS-485 : V+
1	+5 VDC -10 mA max (only for RS-485)

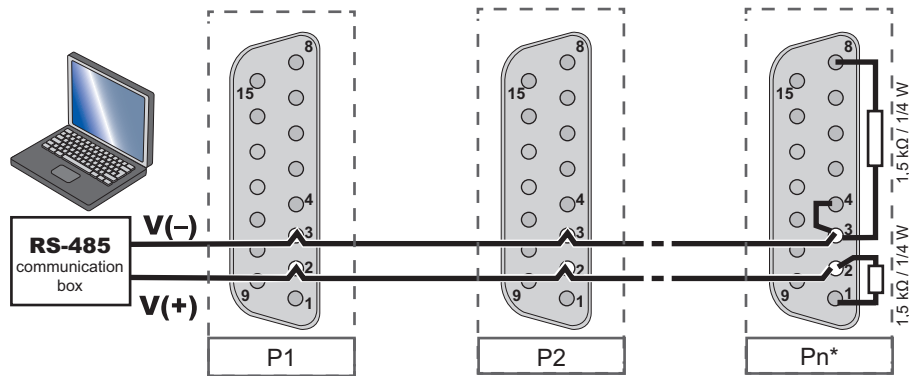
It is the operator's responsibility to use shielded links and connections in compliance with EMC and electrical safety standards.



RS-485 connection

A computer manages several pumps (P1, P2, Pn, ...) using an RS-485 serial link via **RS-485** connector. This parallel wiring allows communication between the pumps even if a pump is disconnected.

The wiring of the product at the end of line Pn* and the wiring of a single product on the network is specific (see figure below).



5.6.2 Setting

When the wiring is done, to allow pump control via serial link, proceed as follows:

- Position the mains switch **MS** to **I** position.
- Send an order via the serial link: this order has no priority on remote control mode via dry contacts (see 5.5.1).

The control commands

Header character	The default setting is the decimal code 035 of the character #
Address	Number given to the pump, 3 characters
Order	Command sent on serial link, 3 characters
Parameter	The number of characters depends on the command
End character	This is the message end character. Default setting: ASCII code 13 <CR>.

Example:

Header character	Pump address	Order	Parameter	End character
#	ADR	ODR	XXXX	<CR>

The responses

Header character	Pump address	Order	Parameter	End character
#	ADR	yyyxxxabc		<CR>

Interpretation of the responses

OK	OK or specific response to the order.
ERR0	Setting fault.
ERR1	Context fault.
ERR2	Parameter fault.
ERR3	Order fault.

Example of dialog

Order: #005ACPON<CR>
 Response: #005,OK<CR>

5.6.3 Command list

Setting	Parameter	Description	Functions	Min	Max
ADR	xxx	Number given to the pump in the serial link	Can be used only when the pump is stopped. adr = pump address before change aaa = new pump address When the address of the product is unknown, it is possible to recover pump address only if this pump is connected in the link. For this, send the order: #???ADR<CR> ??? chain of three ASCII characters.	000	255
IDN	none	Identification of the connected product	<i>Example: #adr,ACP 15- VB.05<CR></i> Returns the type of pump connected with the computer (12345), the software of the pump (V) followed by the software release (zz).		
NSP	none	Switches from set point speed to the nominal speed	<i>Example: #adrNSP<CR></i> Nominal speed = 100 Hz		
RPM	nnnn*	Set point speed setting	<i>Example: #adrRPMnnnn<CR></i> Set point speed can be set in steps of 10 min ⁻¹ : minimum speed : 35 Hz ACP 15, maximum speed : 100 Hz Before changing the set point speed with RPM order, it is mandatory to send the SBY order.	35	100 Hz
SBY	none	Switches from stand-by speed to the default setting	Stand-by speed is reset at 35 Hz.		
ACP	ON or OFF	Start/Stop the pump	The pump rotation starts with ACPON, pump stops with ACPOFF.		

*** Note: Only speeds recommended in the rotational speed setting table are allowed (see 5.5.2).**

Order	Parameter	Description	Functions																					
STA	none	Pump status	<i>Example: #adr,xxxxxx yyyyyy,zzzzz,sssss,iiii, www,ppp,vvv,tttt<CR></i> sssss = pump rotation speed (min ⁻¹) iiii = motor power (W) www = reserved (by default 000) ppp = frequency converter temperature (°C) vvv = reserver (by default 000) tttt = pump operating time (from first start-up) (h)																					
		xxxxxx: status bits	<table border="1"> <thead> <tr> <th>Bit</th> <th>5</th> <th>4</th> <th>3</th> <th>2</th> <th>1</th> <th>0</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>-</td> <td>-</td> <td>1</td> <td>1</td> <td>1</td> <td>-</td> </tr> </tbody> </table>	Bit	5	4	3	2	1	0	0	0	0	0	0	0	0	1	-	-	1	1	1	-
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Bit	5	4	3	2	1	0																		
0	0	0	0	0	0	OFF																		
1	-	-	-	-	-	-																		

6 Operation

6.1 Prerequisites to use



WARNING

Risk associated with process gases

The user and/or integrator of the product is/are fully responsible for the operational safety conditions of the equipment. The manufacturer has no control over the types of gases this pump is exposed to. Frequently process gases are toxic, flammable, corrosive, explosive and/or otherwise reactive. It is the user and/or the integrator's responsibility to follow the necessary safety requirements. Toxic gases can cause serious injury or death. Operators and users must:

- Take the appropriate safety recommendations to prevent injury. Consult the responsible department for instructions and safety information.
- **Hazardous gases from the pump can cause serious injury or death. Regulations require to connect the pump's exhaust to a facility hazardous gas exhaust system** which incorporates appropriate filters, scrubbers, etc. This system must meet all air and water regulations.
- Check that the pump is correctly connected to the equipment (see *Installation*). Contact the service center for further information.



WARNING

Electric shock hazard

Some components have capacitors charged to over 60VDC. When power is switched off, they maintain this charge for some time. Residual voltages from the filter capacitors can cause electric shocks all the way back to the mains plug.

- Wait 5 minutes after power-off before commencing any work on the product.



DANGER

Risk due to auto-restart

When the pump has been stopped following a temperature rise, **the pump automatically restarts when the ambient temperature returns to within the permissible range.**

- Provide a device integrated with the host tool equipment to warn or avoid this auto-restart.
- Take all the measures required to prevent risks resulting from this type of operation.



WARNING

Increased noise emission

At the beginning of the chamber's pumping and at high pressure operation, the pump noise level may temporarily exceed 70 dB (A).

- Connect the exhaust port to a chimney or to an exhaust pipe.
- Install an external silencer on the pump exhaust (see *Accessories chapter*).
- Wear hearing protection.



NOTICE

Operating fluids

The pump is delivered with filled oil charge. The oil safety data sheet concerning the lubricant (MSDS) are available on our website.

- Do not modify the lubricant level.
- Do not drain the pump: the draining will be done during pump overhaul in our repair service center.



NOTICE

Thermal safety

The pump is fitted with temperature sensors which prevent operation or start-up when the temperature of the pump body is **< 12 °C** or **> 40 °C**. In order for the pump to operate:

- Operate the pump within the required temperature range (see 12.3.1).
- Avoid sudden changes of ambient temperature when the pump is running.

The pump automatically restarts when the thermal safety fault disappears.

Before each switching on:

- Check that the pump inlet is connected to the pumping line.
- Check that exhaust pipe line is not clogged and that all the valves in the exhaust system are open.
- Connect the pump to the mains supply.
- Check that the inlet pressure is not higher than atmospheric pressure. A too high pressure can damage the product.
- Check that the ambient temperature is well within the permitted operating range (see 12.3.1).
- Check the exhaust line during pumping to prevent the risks related to excess overpressure.

6.2 Matrix gas/applications

You are advised to use the appropriate pump version according to the applications and the nature of the gases pumped and apply the usual precautions to guarantee the reliability and safety of the procedure.

→ Ensure that the gases pumped are compatible with the various materials (see 8.3).

Type of gas or vapor pumped		Recommended equipment	Actions/Monitoring to be done	Minimum configuration		
				ACP		ACPG
				Gas ballast open	Gas ballast closed	Purge open
Neutral or inert gas	Air, nitrogen, CO ₂ , noble gas or permanently non-reactive gas	None	⇒ See use of gas ballast for purging (see 6.4).		✓	
Gas containing condensable vapor	<ul style="list-style-type: none"> • Cyclic pumping of volume • Pumping large volumes • Presence of degassing material: plastic, elastomer, polymer, etc. • Drying 	Avoid condensation which reduces the performance and reliability of the pump	⇒ Before and after pumping on the installation, allow the pump to run for 1 hour at ultimate pressure with the gas ballast open (inlet closed).	✓		
Reactive and/or corrosive gas excluding halogens (F ₂ , Cl ₂ , Fr ₂ , I ₂)	Pumping reactive gas: <ul style="list-style-type: none"> • Oxidising • Base • Acid 	Dilute the corrosive gas to reduce its activity. Avoid the presence of humidity which increases the reactivity of acids and bases.	⇒ Dilute the gas to lower its concentration and avoid any condensation. ⇒ Use the purge. ⇒ Avoid excess pressure at the exhaust. ⇒ Check that the pump materials and their sealing are compatible with the pumped vapors.			✓
Inflammable or explosive gas		Work outside the flammability range of the product. (ideal = 25 to 50 % of the LEL ¹ and/or below the MOC) ²	⇒ Dilute the pumped gas upstream or in the pump to lower its concentration below the lower flammability limit via purge and/or the neutral gas ballast. ⇒ Dilute the gas discharged by the pump to lower its concentration to 25% of the LEL via purge and/or the inert gas ballast. ⇒ Avoid any build-up of gas in the pumping line. ⇒ Avoid air or humidity back-streaming by maintaining a gas speed > 0.1 m/s in the exhaust line. ⇒ Check the tightness of the installation.			✓

1. Reference in USA NFPA 69-2002, chap. 6.3.1 Combustible concentration threshold;

LEL = Lower Explosion Limit

2. MOC = Minimum Oxygen Concentration

6.3 Different control modes

3 control modes are available:

- LOCAL** The pump is controlled with **I/O** mains switch. The pump is running as a stand-alone part of the equipment on which it has been integrated.
- REMOTE** The pump is remote controlled. The pump rotational speed is set by the opening and closing dry contacts on the remote control connector (see 6.3.2).
- SERIAL LINK** The pump is remote-controlled by the commands transmitted via the serial link **RS-485**(see 6.3.3).

6.3.1 Local mode operation

In local mode, **the pump can run only if the cover plug** is fitted on the remote control connector. This cover plug is delivered with the pump.

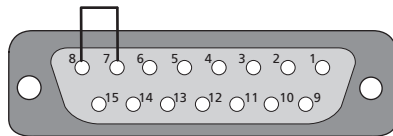


Fig. 4: 15-pin plug with strap for operation in local mode

- Pump start-up** → Position the mains switch **MS** to **I** position: pump starts **automatically**.
An hour counter displays the pump model and running time in hours.
→ **G version:** allow the purge to run (see 6.5).
- Pump shut-down** → Isolate the pump in the pumping line (isolation valve at pump inlet, closed) and let it **to run for 1 hour with gas ballast or purge open** (see 6.4).
→ Position the mains switch **MS** to **O** position, and/or activate the mains circuit breaker: pump stops.

Prolonged stop

If the pump has to be stopped for a prolonged period, apply the **Decommissioning** procedure (see 8).

Restart



DANGER

Risk due to auto-start

In local mode, the pump starts automatically when the mains switch is switch to **I**.

- Install an interlock safety device in the equipment/tool to warn the operator or to avoid this type of operation.
- Take all the measures required to prevent risks resulting from this type of operation.

Restart after emergency stop (from the equipment)

The equipment/tool emergency off manages the pump stop. To restart the pump after an emergency stop, it is necessary to:

- fix the problem,
- unlock the emergency button from the equipment/tool: the pump restarts automatically.

Restart after power failure

After a power failure, the pumps restarts automatically when the power comes back.

6.3.2 Remote mode operation

- Pump start-up
- Wire and connect the remote connector located at the rear of the pump (see 5.5).
 - Position the mains switch **MS** to **I** position: the pump is powered.
 - Send a 'Start' pump order via S1 contact :
 - the pump starts up and **runs at the speed set on the contacts of the remote connector**.
 - **G version:** allow the purge to run (see 6.5).

Note: when S1 is closed, sending of ACPON or ACPOFF via the serial link doesn't disturb the operation ('context error' response).



NOTICE

Rotation speed

Pump performances are guaranteed for a nominal speed of **100 Hz**. Changing the rotation speed affects the pumping speed and the ultimate pressure of the pump. In low speed, it is the customer's responsibility to find the correct settings according to the pump and the process.

- **For the safety of the pump, do not exceed the maximum frequency.**
- **Do not run the pump continuously at speeds ≤ 60 Hz.**

- Pump shut-down
- Isolate the pump in the pumping line (isolation valve at pump inlet, closed) and let it **to run for 1 hour with gas ballast or purge open** (see 6.4).
 - Send a 'Stop' pump order via S1: the pump stops.

Switching off

- Position the mains switch **MS** to **O** position.

Prolonged stop

If the pump has to be stopped for a prolonged period, apply the **Decommissioning** procedure (see 8).

Restart



DANGER

Risk due to auto-start

In local mode, the pump starts automatically when the mains switch is switch to **I**.

- Install an interlock safety device in the equipment/tool to warn the operator or to avoid this type of operation.
- Take all the measures required to prevent risks resulting from this type of operation.

Restart after emergency stop (from the equipment)

The equipment/tool emergency off manages the pump stop. To restart the pump after an emergency stop, it is necessary to:

- fix the problem,
- unlock the emergency button from the equipment/tool: the pump restarts automatically.

Restart after power failure

After a power failure, the pumps restarts automatically when the power comes back.

6.3.3 RS-485 serial link operation

- Wire and connect the serial link pins from the remote connector (see 5.6.1)
- Pump start-up → Position the mains switch **MS** to **I** position: the pump is powered.
- Send an '**ACPON**' order via the serial link (see 5.6.3) :
 - the pump starts and **runs at the speed set on the serial link parameters.**
- **G version:** allow the purge to run (see 6.5).

Note : when ACPON is activate, if S1 contact on remote connector is closed then open, then the pump stops.



NOTICE

Rotation speed
 Pump performances are guaranteed for a nominal speed of **100 Hz**. Changing the rotation speed affects the pumping speed and the ultimate pressure of the pump. In low speed, it is the customer's responsibility to find the correct settings according to the pump and the process.

- **For the safety of the pump, do not exceed the maximum frequency.**
- **Do not run the pump continuously at speeds ≤ 60 Hz.**

- Pump shut-down → Isolate the pump in the pumping line (isolation valve at pump inlet, closed) and let it **to run for 1 hour with gas ballast or purge open** (see 6.4).
- Send an '**ACPOFF**' order via the serial link: the pump stops. (see 5.6.3).

Restart after emergency stop (from the equipment)

The equipment/tool emergency off manages the pump stop. To restart the pump after an emergency stop, it is necessary to:

- fix the problem,
- unlock the emergency button form the equipment/tool,
- send an '**ACPON**' order via the serial link.

Restart after power failure

After a power failure, send '**ACPON**' order via the serial link to restart the pump.

Switching off

- Position the mains switch **MS** to **O** position.

Prolonged stop

If the pump has to be stopped for a prolonged period, apply the **Decommissioning** procedure (see 8).

6.3.4 Operation monitoring

The pump equipped with a three-phase frequency converter has two LED at the rear that indicate the pump operating status.








LED	LED status	Display	Description
Green 	Off		No power supply
	On, constant light		The pump is powered. The pump has reached the selected speed.
Red 	Off		No default
	On, constant light		<ul style="list-style-type: none"> • During pump start-up, LED is On when the selected speed is not reached. • Presence of a default which prevents the pump running.
	On, flashing		The thermal safety indicates that the pump temperature is too low, or too high (imminent shutdown or starting impossible).

Fig. 5: LED meaning on a pump equipped with a three phase frequency converter

6.4 Gas ballast operation

Principle The user must take the appropriate measures in case of condensable vapors pumping or when gas ballast use is required (see 6.2).

When condensable vapors or moist air are being pumped, gas is compressed beyond its saturated vapor pressure in the compression phase. It can condense, impairing pump performance.

The gas ballast can be used to inject a certain quantity of air (neutral or dry gas) into the pump during the 'compression' phase so that the partial pressure of the pumped gas is less than its saturated vapor pressure at the temperature of the pump. Condensation is therefore impossible if this limit is not reached.

The saturated vapor pressure of a body is higher when the system is hot than when it is cold; therefore, the pump must reach operating temperature before pumping condensable vapors.

Using the gas ballast increases the ultimate pressure of the pump as well as the temperature.

Commissioning To better pump with condensable vapors or moist air, it is necessary to operate with a hot pump. Proceed as follows:

- Isolate the pump from the system (inlet isolation valve closed) and **allow it to operate for 1 hour with the gas ballast open.**
- Then, open the isolation valve: the pump operates in the best conditions by reducing the risk of condensation inside the pump.

Recommendations To ensure the proper discharge by the exhaust of condensable vapors, avoid to connect an ES25S type silencer.

The gas ballast can be automated. It is an accessory available upon request (see 11). Besides, the gas ballast could be supplied with filtered dry air. Contact us.

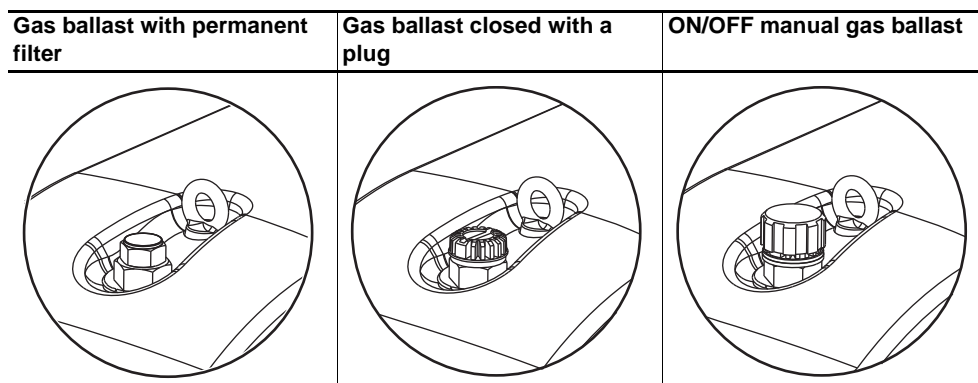


Fig. 6: The various gas ballast models

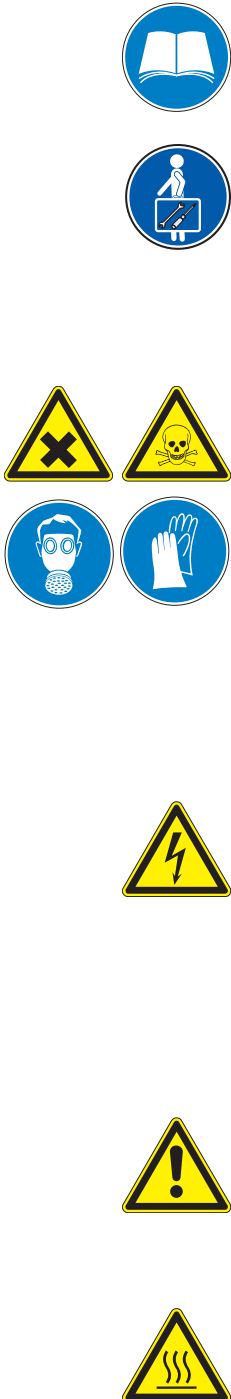
6.5 Purge operation

- Principle** A gas purge circuit protects the low and high pressure bearings and dilutes trace amounts of corrosive gases.
- Commissioning** When the inert gas pipe is connected on purge connection (see 5.2.3):
→ Inject inert gas purge according to the flow rate values (see 12.2).
- Recommendations** To ensure the proper discharge by the exhaust of corrosive gases, avoid to connect an ES25S type silencer.
Inert gas connection (see 4.2).

7 Maintenance

In case of presence of corrosive gases, users are advised to observe the following precautions before working on the product.

7.1 Safety and maintenance information



Duty to inform
 Every person who is involved in maintenance and servicing work on the pump must read and follow the safety-relevant parts of all associated documents.

NOTICE

Exclusion of liability
 Pfeiffer Vacuum accepts no responsibility concerning equipment damage, disrupted service or physical injury resulting from maintenance carried out by technicians who have not been trained in safety rules (EMC, electrical hazards, chemical pollution). Liability and warranty claims shall be inadmissible in this case.

DANGER

Risk to the health in the event of contact with toxic substances
 The vacuum pump, pumping line components, and operating media may be contaminated with toxic, corrosive, reactive, or radioactive materials, depending on the process.

- Wear appropriate safety equipment when pump is disconnected for maintenance, or reinstalled, and also for oil filling and draining.
- Ventilate the premises well.
- Do not eliminate maintenance waste via standard disposal channels. Have it destroyed by a qualified company if necessary.
- Install the inlet and exhaust blanking plates, accessories delivered with the pump or available as accessories (see chapter **Accessories**).

WARNING

Electric shock hazard in case of contact
 When the product's mains switch is set at **O**, some internal components still have an electrical charge.

- Make sure that the mains connection is always visible and accessible so that it can be unplugged at any time.
- Disconnect the power cable from all power sources before starting any work on the product.

WARNING

Tightness after maintenance
 Insufficient tightness after servicing could result in chemical hazards.

- Always perform a leak test after maintenance.

WARNING

Risk of injury through hot surfaces
 The exhaust temperature remains high even after the pump has stopped.

- Wait for the product to cool completely before carrying out any operations on it.



WARNING

Other localised hazardous energies
 Electrical circuits and other pressurized circuits, such as nitrogen and water are potential hazards.
 → Always lock out these energy sources before working on the product.

- Ensure that the maintenance technician is trained in the safety rules concerning pumped gases.
- Disconnect the mains cable on the product from all sources of power before carrying out any work on the product.
- Wait 5 minutes after switching off the electricity supply before carrying out any operations on the electrical components.
- Collect the residues from the processes and call in a competent organisation to destroy them.
- Always protect the inlet and exhaust surfaces.

7.1.1 How to contact us

Personnel trained by the manufacturer must perform the overhaul. Contact your nearest service center at the following e-mail address: support.service@adixen.fr

7.2 Maintenance frequency

Description	Frequency	ACP 15	ACP 15 G
Pump overhaul by Pfeiffer Vacuum service center.	20,000 h or 4 years	✓	✓

Maintenance frequencies are typical values for non corrosive applications. For applications using G version pump, these values can be reduced. Contact the service center (see 10).

In general no maintenance is required before product overhaul in your service center(see 10).

Life-time Under normal operating conditions (at ambient temperature, low humidity and neutral pumped gas), in a non-polluted environment, a new pump which is regularly maintained according to the instructions in this manual (subject to the components becoming obsolete) has a life-time greater than 10 years.

7.3 Maintenance on the customer’s site

The pump does not require any maintenance on the customer’s site apart from that described in this manual. All other maintenance must be carried out by your service center (see 10).

- Clean the outer surfaces of the product using a clean, lint-free cloth and a product that will not damage the screen-printed surfaces and adhesive labels.
- Cleaning of the air ventilation grids with a cloth to remove dust. Do not use compressed air blower.

7.4 Standard repair exchange

To proceed with a standard exchange, key steps must be followed in sequential order:

- Disconnecting the pump from the installation (see 7.4.1)
- Conditioning the pump for shipping (see 7.4.2)
- Declaration of contamination (see 10)
- Handling the new pump (see 3)
- Installing the new pump (see 5)

When returning a product to our service center, please consult the **Service** procedure (see 10) and fill in the contamination declaration available on our website.

7.4.1 Disconnecting the pump from the installation



DANGER

Risk to the health in the event of contact with toxic substances

During pump disconnection, operator could be in contact with process residues on the exhaust that could cause severe injury or death.

→ Take the appropriate safety recommendations to prevent injury. Consult the department manager for instructions and safety information.

- Position the mains switch **MS** to **O** position.
- Switch off your main circuit breaker.
- Disconnect the main plug (see 5.4.2).
- Disconnect the nitrogen purge connector.
- Disconnect the pump from the inlet piping and fit a blanking plate on the inlet (see 11).
- Disconnect the pump from the exhaust and fit a blanking plate on the exhaust port (see 11).
- Remove the pump from the installation.

7.4.2 Conditioning the pump for shipping

- | | |
|---|--|
| After use in clean applications | <ul style="list-style-type: none"> → Install the connecting accessories provided with the pump when it was first delivered. Contact the service center to order accessories if necessary (see 11). → Join the cover plug (delivered with the pump) connected to the remote connector. |
| After use with traces of corrosive gases | <ul style="list-style-type: none"> → Respect safety instructions before working on the product (see 2.1) and (see 7.1). → Install the connecting accessories allowing to seal the pump (see 11). → Join the cover plug (delivered with the pump) connected to the remote connector. |
| Product transport and shipping | <p>For product transport and shipping, pack it in the original packing and apply the instructions from the Service procedure (see 10).</p> |

8 Decommissioning

8.1 Shutting down for longer periods

- Stop the pump according to pump shut-down procedure (see 6.3.1), (see 6.3.2) or (see 6.3.3).
- Disconnect the pump from the installation (see 7.4.1).
- Store the pump (see 3.2).

8.2 Re-starting

To restart the pump after a prolonged storage, refer to the installation instructions (see 5).

8.3 Disposal

According to the regulations 2012/19/EC about Waste of electrical and electronic equipment, and 2011/65/EC about Restriction of Hazardous substances, the manufacturer provides a paid recycling service for the end of life of the equipment.

Any obligation of the manufacturer to take back such equipment shall apply only to complete not amended or modified equipment, using Pfeiffer Vacuum SAS original spare parts, delivered by Pfeiffer Vacuum, containing e.g. all its components and subassemblies.

This obligation will not cover the shipping cost to a Pfeiffer Vacuum reclamation facility. Before returning the product, please consult the **Service** procedure (see 10). Fill in the declaration of contamination form available on our website. Attach it to the product before shipping to the closest service-repair office.



WARNING

Environmental protection

The product or its components must be disposed of in accordance with the applicable regulations relating to environmental protection and human health, with a view to reducing natural resource waste and preventing pollution.

The materials

Our products contain different materials which must be recycled:

Description	SD version	G version
Jet	-	Brass
Purge line	-	Stainless steel
Valves	FPM	
O-rings, lip seals	FPM / NBR / PTFE	
Shaft, spring, inlet filter	Stainless steel	
Stators, lobes	Aluminum, aluminum alloy + Al ₂ O ₃ coating	
Screws, worked pins, deflectors	Stainless steel	
Ball bearings	Steel, PFPE grease	
Inlet and exhaust flanges	Aluminum	

Take particular precautions for:

- fluoroelastomers which may breakdown if they are subjected to high temperatures.
- components in contact with the products resulting from the processes which may have been contaminated.

This list of materials corresponds to the products listed in the chapter (see 1.1). Contact us for products with specific features.

9 Malfunctions

Read the safety instructions for maintenance (see 7.1).

9.1 Trouble at pump start-up

Symptom	Cause	Remedy
The pump does not start and the fan does not run	Mains switch	⇒ Check the mains switch position to I.
	The pump supply voltage is not compatible with the equipment's power configuration	⇒ Check the equipment's voltage corresponds to required power voltage (see 1.2.4).
	Main cable not correctly connected or damaged	⇒ Check / replace the main power cable.
	Other problem	① Contact your service center.
The pump does not start but the fan runs	Temperature	⇒ Check the pump ventilation conditions (see 5.1) ⇒ Wait for 1 hour at ambient temperature between 12 °C et 40 °C. The pump must start automatically (see 6.1).
	Remote control connector wiring	⇒ Check that the cover plug is properly connected to the remote connector at the rear of the pump.
	Other problem	① Contact your service center.

9.2 The pump runs incorrectly

Symptom	Cause	Remedy
Pump runs intermittently	Temperature	⇒ Check the pump ventilation conditions (see 5.1).
	The pump supply voltage is not compatible with the equipment's power configuration	⇒ Check the equipment's voltage corresponds to required power voltage (see 1.2.4).
	Other problem	① Contact your service center.
Pump noisy	Gas ballast	⇒ Check if the gas ballast is open. Warning: if the application requires it, the gas ballast must remain open despite the noise!
	The pressure does not go down - leak in the installation	⇒ Check the pressure at the pump inlet (see 6.1).
	Vibration	⇒ Check that the pump is properly attached to the frame.
	Other problem	① Contact your service center.
Bad vacuum	Gas ballast	⇒ Check if the gas ballast is open. Warning: if the application requires it, the gas ballast must remain open despite the noise!
	Purge (G and CV versions)	⇒ if the purge is used: check the purge connection between pump and installation. ⇒ If the purge is not used: check the tightness of the plug installed on the purge port.
	Rotation speed	⇒ If remote controlled via RS-485: check the value of the speed set point (see 5.6.3). ⇒ If remote controlled via dry contacts: check the contact setting (see 5.5.2).
	Pumping of condensable vapors	⇒ If the application allows it, let the pump to run for 30 min to 1 hour with gas ballast open; this evacuates the condensable vapors.
	Defective gauge	⇒ Check the accuracy of the measurement means.
	Leak in the installation	⇒ Perform a leak test on the pumping line.
	Other problem	① Contact your service center.

10 Service

Pfeiffer Vacuum offers first-class customer service!

- On-Site maintenance for many products
- Overhaul/repair at the nearby Service Location
- Fast replacement with refurbished exchange products in mint condition
- Advice on the most cost-efficient and quickest solution

Detailed information, addresses and forms at: www.pfeiffer-vacuum.com (Service).

Overhaul and repair at the Pfeiffer Vacuum Service Center

The following general recommendations will ensure a fast, smooth servicing process:

- ➔ Fill out the "Service Request/Product Return" form and send it to your local Pfeiffer Vacuum Service contact.
- ➔ Include the confirmation on the service request from Pfeiffer Vacuum with your shipment.
- ➔ Fill out the declaration of contamination and include it in the shipment (mandatory!). The Declaration of contamination is valid for any product/device including a part exposed to vacuum.
- ➔ Dismantle all accessories and keep them.
- ➔ Close all the flange opening ports by using the original protective covers or metallic airtight blank flanges for contaminated devices.
- ➔ If possible, send the pump or unit in its original packaging.

Sending contaminated pumps or devices

No devices will be accepted if they are contaminated with micro-biological, explosive, or radioactive substances. "Hazardous substances" are substances and compounds in accordance with the hazardous goods regulations (current version).

- ➔ Neutralize the pump by flushing it with nitrogen or dry air.
- ➔ Close all openings airtight.
- ➔ Seal the pump or device in suitable protective film.
- ➔ Return the pump/device only in a suitable and sturdy transport container and send it in while following applicable transport conditions.

Pump or device returned without declaration of contamination form fully completed and/or not secured in suitable packaging will be decontaminated and/or returned at the shipper's expense.

Exchange or repair

The factory operating parameters are always pre-set with exchange or repaired devices. If you use specific parameters for your application, you have to set these again.

Service orders

All service orders are carried out exclusively according to our general terms and conditions for the repair and maintenance, available on our website.

11 Accessories

Accessory	Description	Dimension	Model	P/N
Inlet filter	Installed on the pump inlet, it allows to collect particles with a diameter greater than 25 microns (in clean applications such as vacuum packing, metallurgy, lamp manufacture, evaporation, etc...).	DN 25 ISO-KF	IPF 25	111649
Exhaust silencer	It allows to reduce noise level at the exhaust when the pump operates at high pressures, on clean applications. Noise level reduction at atmospheric pressure (-12 dBA).	DN 25 ISO-KF	ES25S	109873
Noise reduction cover	In order to reduce significantly noise level. Noise level reduction (-5 dBA) at 35 °C. max. ambient temperature		NRC 15	111968
Sound enclosure kit	In order to reduce significantly noise level. Noise level reduction (-10 dBA) at 32 °C. max. ambient temperature.		SEK 15	122480
Frequency converter interface plug	and to manage a power supply up to 24 VDC - 1 A.			112851
Pump fastening kit	It allows to fasten the pump in the equipment with plates (M6 screws for frame assembly not supplied) (compatible with all pump models).			112846
Wheel kit	It allows to install 4 wheels on the frame to move easier the pump (compatible with all pump models).			111138S
Automatic gas ballast	It ensures tightness when the pump stops or it can be used to remote control cyclical air inlets (compatible with all pump models).		230 V 50/60Hz 200 V 50/60 Hz 110 V 60 Hz 100 V 50/60 Hz 24VDC	114812 114815 114813 114814 114816
Isolation valve	Installed upstream of the pump, it enables the pump to be reset to the atmospheric pressure by isolating it from the pumping line.		ISV 25 - 240 V 50/60 Hz ISV 25 - 220 V 50/60 Hz ISV 25 - 200 V 50/60 Hz ISV 25- 110 V 50/60 Hz ISV 25 -100 V 50/60 Hz ISV 25 - 24VDC ISV 40 - 240 V 50/60 Hz ISV 40 - 220 V 50/60 Hz ISV 40 - 200 V 50/60 Hz ISV 40- 110 V 50/60 Hz ISV 40 - 100V 50/60 Hz ISV 40 - 24VDC	115899 115898 115897 115901 115900 115902 118815 118814 118813 118812 118811 118816
Connecting accessories	Centering ring with FPM o-ring		DN 25 ISO-KF DN 16 ISO-KF	068189 068193
	Blanking plate in stainless steel		DN 25 ISO-KF DN 16 ISO-KF	068196 068195
	Quick-connect clamp		DN 25 ISO-KF DN 16 ISO-KF	083264 083333

Table 1: Refer to the accessory operating instructions to install the accessory.

12 Technical data and dimensions

12.1 General

Basic principles for the Technical Data of Pfeiffer Vacuum Turbopumps:

- Recommendations of PNEUROP committee PN5
- ISO 21360; 2007: "Vacuum technology - Standard methods for measuring vacuum-pump performance - General description"
- Sound pressure level at ultimate pressure according to EN ISO 2151

12.2 Technical data

Technical data	Unités	ACP 15	ACP 15 G
Inlet flange (ISO-KF)		DN 25	DN 25
Exhaust flange (ISO-KF)		DN 16	DN 16
Pumping speed max.	m ³ /h	14	14
Typical ultimate pressure (without purge nor gas ballast)	hPa	3 · 10 ⁻²	3 · 10 ⁻²
Typical ultimate pressure (with gas ballast open)	hPa	1 · 10 ⁻¹	-
Typical ultimate pressure (with purge) ⁽³⁾	hPa	-	1 · 10 ⁻¹
Maximum ultimate pressure (without purge nor gas ballast)	hPa	5 · 10 ⁻²	5 · 10 ⁻²
Maximum ultimate pressure (with gas ballast open)	hPa	3 · 10 ⁻¹	-
Maximum ultimate pressure (with purge) ⁽³⁾	hPa	-	3 · 10 ⁻¹
Max. pumping capacity of pure water vapor (gas ballast open) ⁽²⁾	g/h	80	80
Continuous inlet pressure, Max.	hPa	1013	1013
Maximum exhaust pressure	hPa	1200	1200
N ₂ Purge flow ⁽³⁾	slm	-	5
Gas ballast flow at atmospheric pressure	m ³ /h	0.5	-
Sound level (gas ballast and purge closed)	dB(A)	< 70	< 70
Helium leak rate ⁽⁴⁾	hPa l/s	< 5 · 10 ⁻⁷	< 5 · 10 ⁻⁷
Power supply ⁽¹⁾ (according to ordering guide)	V	110-230 V- 1-phase or 200-440 V- 3-phase	
Power consumption at ultimate pressure	W	450	450
Power consumption at atmospheric pressure	W	550	550
Dimensions		(see 12.4)	(see 12.4)
Weight	kg	23	23

(1) In accordance with EC regulations, the pumps can withstand a voltage variation of ±10%.

(2) at ambient temperature: 20°C.

(3) Inert gas flushing 300 hPa relative pressure.

(4) Test by Helium spray.

Conversion table: pressure units

	mbar	bar	Pa	hPa	kPa	Torr mm Hg
mbar	1	1 · 10 ⁻³	100	1	0.1	0.75
bar	1000	1	1 · 10 ⁵	1000	100	750
Pa	0.01	1 · 10 ⁻⁵	1	0.01	1 · 10 ⁻³	7.5 · 10 ⁻³
hPa	1	1 · 10 ⁻³	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr mm Hg	1.33	1.33 · 10 ⁻³	133.32	1.33	0.133	1

$$1 \text{ Pa} = 1 \text{ N/m}^2$$

Conversion table: gas throughput units

	mbar-l/s	Pa·m ³ /s	sccm	Torr-l/s	atm·cm ³ /s
mbar-l/s	1	0.1	59.2	0.75	0.987
Pa·m ³ /s	10	1	592	7.5	9.87
sccm	$1.69 \cdot 10^{-2}$	$1.69 \cdot 10^{-3}$	1	$1.27 \cdot 10^{-2}$	$1.67 \cdot 10^{-2}$
Torr-l/s	1.33	0.133	78.9	1	1.32
atm·cm ³ /s	1.01	0.101	59.8	0.76	1

12.3 Facilities characteristics

12.3.1 Environmental conditions

Use	indoor use
Installation altitude	up to 2000 m
Ingress protection	IP20
Ambient operating temperature	12-40 °C
Storage temperature	-10-+60 °C
Relative humidity	max. 80% at T ≤ 31°C, up to max. 50% at T ≤ 40°C
Overvoltage protection	category II
Pollution degree	rate 2

12.3.2 Nitrogen characteristics

H ₂ O concentration	< 10 ppm v
O ₂ concentration	< 5 ppm v
Dust	< 1 µm
Oil	< 0.1 ppm v
Absolute pressure (before pressure reducer, supplied by customer)	$1.5 \cdot 10^5$ Pa
Nitrogen inlet	1/4 BSPT male connector
	Stainless steel

12.3.3 Electrical characteristics

Circuit breaker with a minimum interrupting short circuit current	10 kA
GFI (or RCD) type B, differential circuit breaker compatible with type T.T electrical network 1) For other networks, types T.N or I.T, use the proper protection device	30 mA ¹⁾
Power supply	Single-Phase LV (100-115V) HV (200-230V) Three-Phase LV (200-240V) HV (240-440V)
Main circuit breaker rating (minimum values)	12 A 6 A 5 A 3A
Cable wire specifications	2.5 mm ² 1.5 mm ² 1.5 mm ² 1 mm ²

12.4 Dimensions

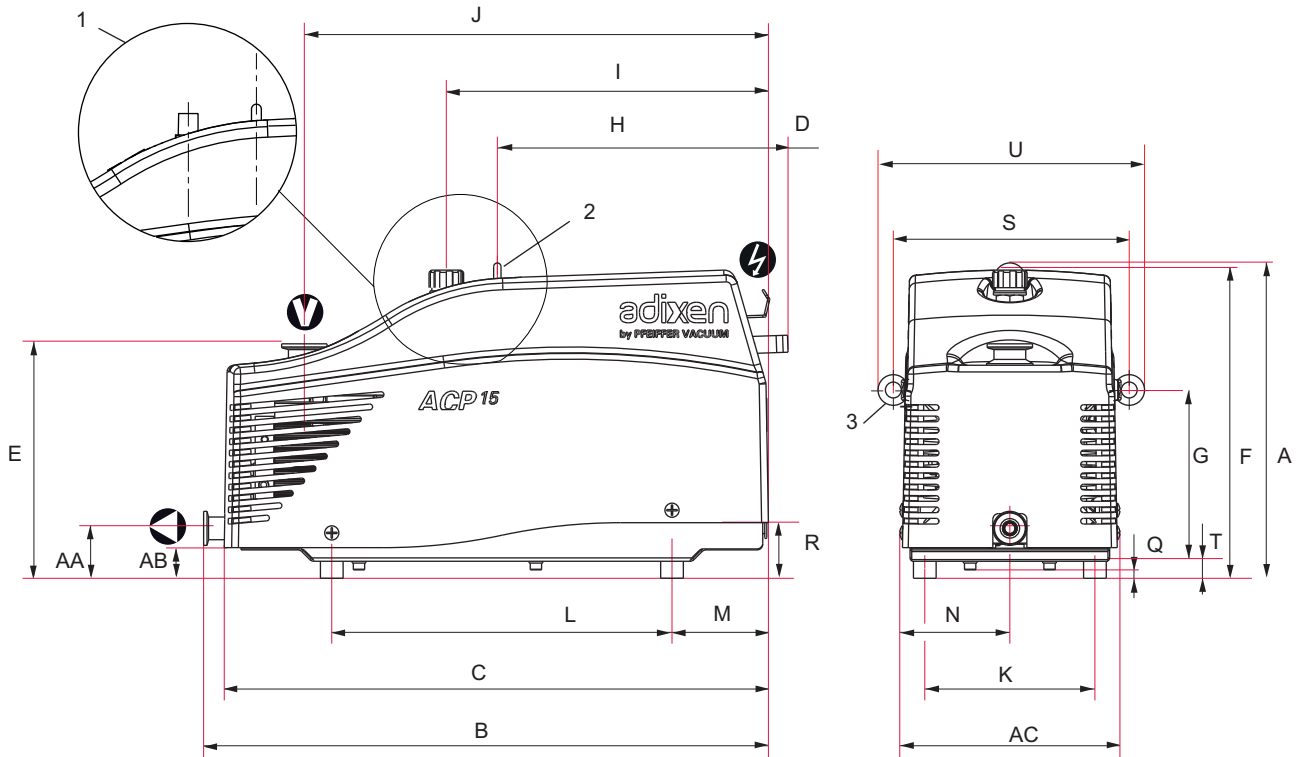
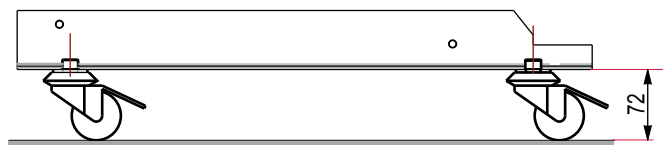
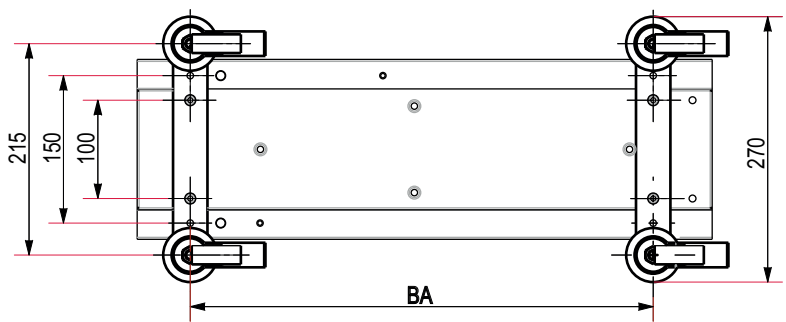
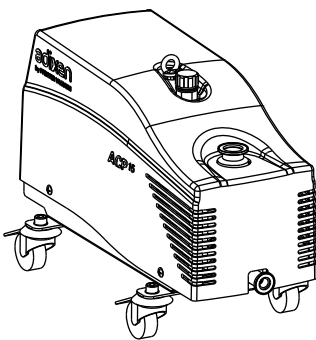


Fig. 7: ACP 15 /ACP 15 G - Dimensions (mm)

1	Purge port (ACP 15 G model)
2	Hoisting ring (with single-phase frequency converter)
3	Hoisting rings (with three phase frequency converter)

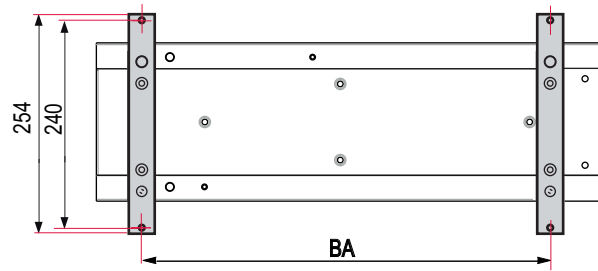
ACP 15/ACP 15 G	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Q	R	S	T	U	AA	AB	AC
Single-phase	272	498	475	11	207	-	-	239	284	409	150	300	85	93	7	-	-	15	-	44	-	190
Three-phase	272	497	477	18	207	266	170	238	283	408	150	300	84	95	7	52	208	15	235	44	30	190

Wheel kit dimensions



Fastening kit dimensions

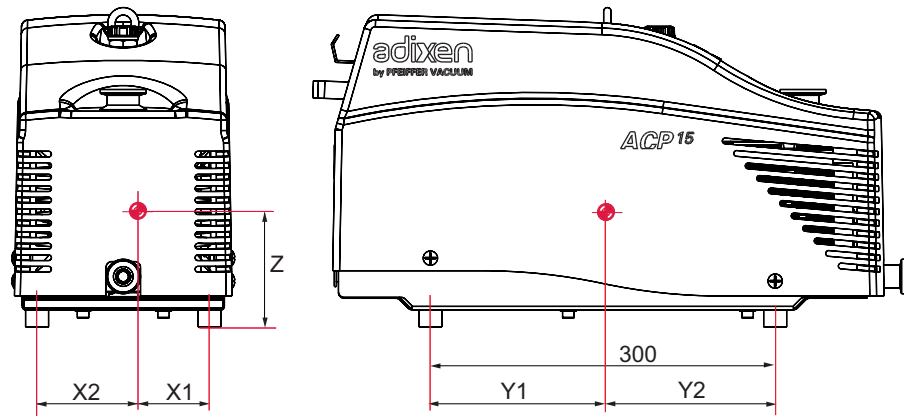
BA = 300 mm



12.5 Weight distribution and seismic brackets



Center of gravity

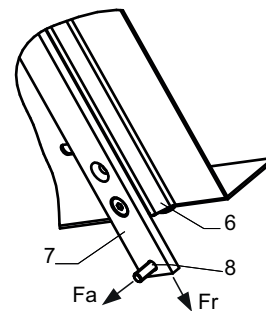
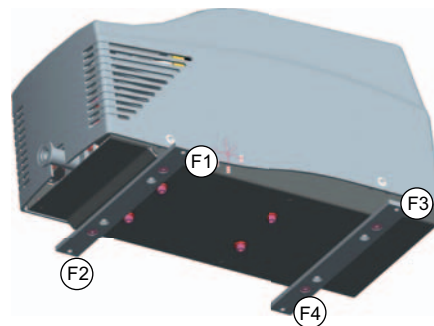


Model	Center of gravity (mm)				
	X1	X2	Y1	Y2	Z
ACP 15/ACP 15 G Single-phase	65	85	156	144	110
ACP 15/ACP 15 G Three-phase	67	83	157	143	116

Model	Load by foot (daN)			
	F1	F2	F3	F4
ACP 15/ACP 15 G Single-phase	6.8	5.2	6.3	4.8
ACP 15/ACP 15 G Three-phase	6.7	5.4	6.1	4.9

Load on foot with fastening kit

It is strongly recommended to secure the pump on the host tool with 4 screws (supply of these screws is the customer's responsibility, at least 2 screws per fixation plate). The screw material must comply with foot load specifications, given in the table below.



6	Pump frame	8	M 6 X 20 screw ,qty 4, grade 12-9
7	Fastening plate, thickness: 6 mm (delivered in the fastening kit)		

Model		Load per foot (N)			
		F1	F2	F3	F4
ACP 15 /ACP 15 G Single-phase/Three-phase	Tension (Fa)	120	-13	72	31
	Shearing (Fr)	85	25	87	52

ETL Mark



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Thomas J. Patterson, Certification Manager



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Standard(s):	UL 61010-1 Issued: 2012/05/11 Ed: 3 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements CAN/CSA C22.2 No 61010-1 Issued: 2012/05/11 Ed: 3 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements
Product:	Electrical Dry Primary Pumps
Brand Name:	
Models:	ACP15 XX, ACP15V XX, ACP28 XX, ACP40 XX, the XX can be G, LG or CV represents different options existing for non electrical or specific adaption for customer application.





Declaration of conformity

We hereby declare that the product cited below satisfies all relevant provisions according to the following **EC directives**:

- **Machinery 2006/42/EC (Annex II, no. 1 A)**
- **Electromagnetic Compatibility 2014/30/EU**
- **Restriction of the use of certain Hazardous Substances 2011/65/EU**
- **Low Voltage 2014/35/EU**

The technical file is drawn up by Mr Gilles Baret, Pfeiffer Vacuum SAS, [simplified joint stock company], 98, avenue de Brogny · B.P. 2069, 74009 Annecy cedex.

ACP 15 - ACP 15 G

Harmonised standards and national standards and specifications which have been applied:

Standard NF EN-1012-2 : 2009
Standard NF EN-61010-1 : 2011
Standard NF EN-61000-6-2 : 2005
Standard NF EN-61000-6-4 : 2007

Signatures:

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01/07/15

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Ed 01- Date 2015/09 -P/N:1238840EN



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