

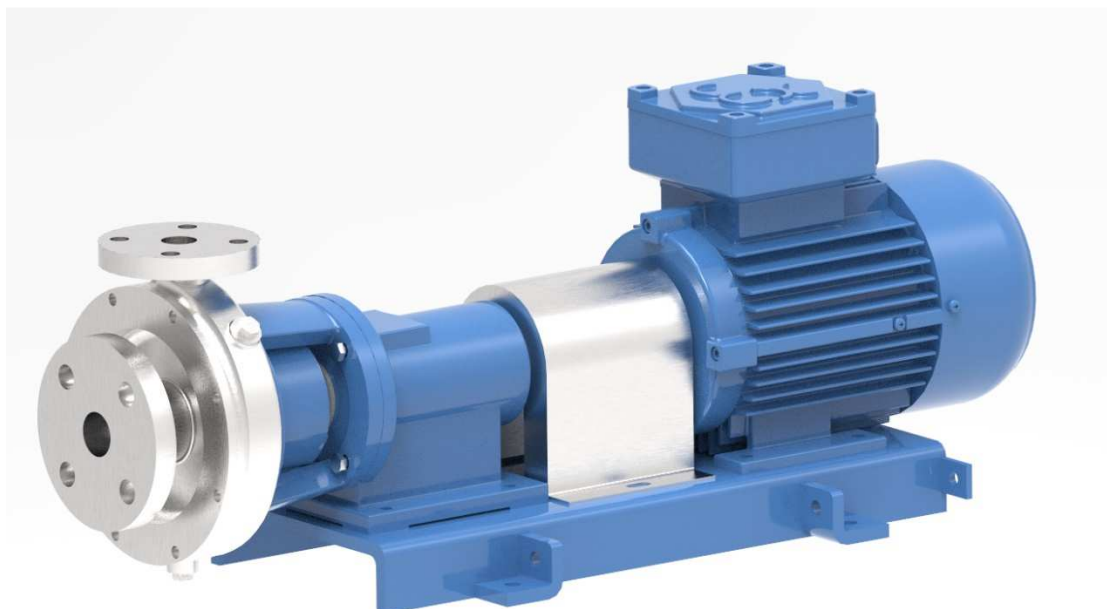


POMPES GROSCLAUDE

Parc du chêne - 29, rue du 35^{ème} régiment d'aviation
69 500 BRON – France APE 2813Z - RCS Lyon
Siret : 50966640000023 TVA : FR46 509 666 400
Tel : (33) 4 72 37 94 00 Fax : (33) 4 72 37 94 01
www.pompes-grosclaude.fr info@pompes-grosclaude.fr

INDUSTRIAL PUMPS

EX-BX



INSTRUCTION MANUAL FOR INSTALLATION, OPERATION AND MAINTENANCE



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I GENERAL

This pump has been manufactured according to proven techniques, guaranteeing a reliable machine in compliance with the 2006/42 / EC machine directive. The condition of a good functioning and a long use resides in the strict observation of this note.

It is imperative to ensure, prior to installation, that all service conditions meet its specification.



This manual contains information for installation, service and maintenance, as well as the essential conditions to be met for safe and reliable use of the pump. This manual, as well as any accessories supplied with the unit, must be read carefully before proceeding with the installation and start-up of the pump.

This manual contains instructions for the installation, operation and maintenance of Ex-Bx pumps, mainly with regard to the safety of people and property. However, since it is not possible to provide an exhaustive list of all incidents that may occur on all installations, it is mandatory that the staff be appropriate, specialized and expert in the tasks mentioned below, both in terms of installation and operation. The said staff should have the opportunity to read this manual carefully, and to contact the company **POMPES GROSCLAUDE** for any particular problem that is not addressed in this manual, or for more detailed explanations or additional. For these contacts, it is absolutely necessary to indicate the serial number of the pump concerned.

In accordance with the Labor Code, the employer must inform, in an appropriate manner, the workers in charge of the implementation and maintenance of the work equipment. Communication to the end operator of the instruction manual can help the user to comply with the Labor Code.

The pump must be used in the correct service conditions for which it was purchased and as described in the technical specifications of the technical file supplied with the pump. Any change in the physical or chemical characteristics of the pumped liquid or conditions of use shall be evaluated in cooperation with the manufacturer.

The pump has not been designed to exceed the performance (*flow, head, rotational speed, temperature, pressure, etc.*) indicated in the sales documents and / or on the nameplate or be used in the presence of ionizing radiation.



An additional leaflet concerning the protection for use in an Atex environment is attached to this manual and contains important warnings when the pump is installed in an explosive environment according to EU Directive 2014/34 EU: 2014; it is imperative to respect them in order to avoid all dangers. This does not take into account the safety regulations in force at the place of installation. The responsibility for their respect lies with the operator itself in the matter of the personnel to which it has called.

The company **POMPES GROSCLAUDE cannot be held responsible for any malfunction, deterioration due to conditions of service, use or liquid not consistent with that for which the equipment was designed.**

I-1 Warranty

Our equipment is guaranteed 12 months after commissioning, limited to 18 months delivery date against any manufacturing defect or material defect. The guarantee is limited to the replacement or reparation, in our workshops, of the part recognized as defective.

The warranty does not apply to replacements or repairs that would result from normal wear and tear of equipment, damage or accidents due to negligence, lack of supervision or maintenance, faulty installation or any other reason beyond to our control.

Our warranty is void immediately and completely if the supplied material has been modified or repaired without our agreement. Repair, modification or replacement of parts during the warranty period cannot have the effect of extending the original warranty period. We do not accept any return of material without prior agreement from us.

In case of return to our factories, shipping and packing are the responsibility of the sender.

In any case, our contractual warranty does not replace the legal warranty that requires the professional seller to guarantee the buyer against all defects or hidden defects of the thing sold. However, the contractual guarantee does not in any way imply the possibility of a claim for damages or indemnities. We are not responsible in case of particular destination of the material or subjection not declared by the purchaser in the order form.

I-2 Liability limits

The responsibility of **POMPES GROSCLAUDE** for recourse of any kind does not exceed in any case the purchase price of the equipment and / or installation at the origin of the recourse. It ceases at the end of the guarantee period defined in *Chap I-1*. "Recourse of any kind" means any loss or damage arising out of or in connection with, including negligence, performance, design, manufacture, operation, use or even possibly, at the installation, to the decisions of technical direction of the installation, the visit, the maintenance or the repair of any equipment and / or any installation delivered.

Under no circumstances, either as a result of a breach of the **POMPES GROSCLAUDE** warranty, or by negligence, **POMPES GROSCLAUDE** will not be liable for any particular and consequential immaterial damage including, but not limited to:

- loss of profit and income,
- loss of use of equipment, installations or ancillary tools,
- the cost of capital, the cost of equipment, or replacement facilities,
- services and equipment they require
- costs of downtime or recourse of the buyer's customers for these damages

II SAFETY

As a manufacturer, we allow you to remember the following recommendations

- Internal instructions and safety legislation must be followed and respected.
- Only suitable tools and handling equipment should be used.
- The pump must be used in the correct operating conditions for which it was purchased and as described in the technical specifications of the technical file supplied with the pump. Any change in the physical or chemical characteristics of the fluid carried or conditions of use shall be evaluated in cooperation with the manufacturer.
- All safety standards specific to electrical equipment and those specified by the manufacturer must be respected.

II-1 Meaning of symbols used in this manual

The instructions to be complied with to prevent any danger to persons are indicated by the symbol:



Electric current risks are indicated by the symbol:



Machine integrity risks are indicated by the symbol:



Explosion-proof protection instructions are indicated by the symbol (see Appendix):



Markings placed directly on your pump such as an arrow indicating the rotating direction or arrows indicating the inlet or outlet holes must be respected and maintained in good reading condition.

II-2 Personnel qualifications and training



The personnel responsible for installing, operating and maintaining the equipment must be competent, authorized and informed about the rules of the art and have this manual in their possession. Before proceeding with any operation, the pump purchaser must verify and ensure that the personnel authorized to perform these tasks have read and understand the contents of this manual.

In the event where the personnel would not be competent, the operator must be trained accordingly. Personnel incompetent to perform assembling / disassembling operations could cause risk to:

- Operator lives (*effects of an explosion*)
- The pump and its environment
- Characteristics normally obtained from the pump

The company **POMPES GROSCLAUDE** will be relieved of all responsibility in event of accident.

When the unit is installed in an explosive environment, the appendix of this notice marked must be particularly respected:



(NCPAE 19b-02)

II-3 Accident prevention

You the pump purchaser agree to respect all the safety instructions mentioned in this manual and in the manual of pump, as well as national and international prescription concerning safety instructions.



In potentially explosive areas, the operator is responsible for ensuring the proper operation of the equipment and for preventing any failure leading to an unacceptable mode of operation for the equipment.

II-4 Safety instructions for users

This pump has been manufactured in accordance with the standards for pump safety, in a temperature classification T1 to T5 European Directive 2014/34 EU: 2014



- Parts subject to temperature fluctuations ($T^{\circ}C > 65^{\circ}C$ or $T^{\circ}C < -20^{\circ}C$ present a risk of burning by hot or cold) and whose contact can be hazardous must be protected by appropriate systems. Sudden changes in liquid temperature cause thermal shock and may cause damage or destruction of some pump components. They must be specially avoided when the pump construction materials have not been selected for this eventuality and / or the manufacturer has not been informed that this is the case.
- Protections against accidental contact of moving parts (*coupling guard, for example*) should only be removed when the machine is switched off and off. The pump should never be started without a coupling guard or any other protection provided with the pump. Starting in the wrong direction of rotation can damage the pump and must be checked according to the rules of the art. The maximum rotation speed is indicated on the nameplate or it is indicated in the technical specifications of the technical file provided with the pump.
- To protect people and the environment according to the regulations in force considering the temperature, the toxicity, the harmfulness, the flammability, the corrosivity etc. of the conveyed




fluid, protection, filling and emptying devices must be provided for both normal leaks and accidental leaks that may result from failures.

- **The discharge valve will never be closed and it must allow the passage to at least 8% of the nominal flow. Adjustments are made using the discharge valve by checking the pressure using pressure gauge or safety device and making sure not to exceed the power consumption indicated on the motor nameplate.**
- **Any operation of the pump with suction valve closed and / or discharge valve closed is not allowed.**
- The pump must operate without excessive vibration. If this is not the case, check the alignment and wear of the coupling elastic element (*see Section VI-9 Lineness*) and if this does not solve the problem, contact the manufacturer.
- A backup pump should start at least once a month, make sure that it is full of liquid and follow the instructions given in *Chap. VI & VII*.
- To ensure correct lubrication and to avoid overheating of the bearings, it is necessary to observe the appropriate oil level and the recommended intervals between two maintenance operations or the service life of the bearings greased for life (*see also Chapter VIII - Interview*)

THIS PUMP MUST NEVER RUN DRY EVEN A SHORT INSTANT

- The use of the pump without liquid causes the seizure of rotating parts resulting in the destruction of shaft seals and consequently liquid leaks endangering people and the environment. It is imperative to ensure that all installed safety devices are in use.
- Dispose of all electrical risks, consult the specific regulations of the country of installation, as well as those of local services if applicable.

II-5 Safety instructions for application in explosive atmospheres

When the unit is installed in an explosive environment, it is particularly important to comply with the appendix of this manual  and the special dedicated notice provides in addition (*NCPAE 19b-02*).

II-6 Safety instructions for the maintenance, disassembly of the pump

The operator must ensure that all actions concerning the installation, maintenance and inspection of the equipment are carried out by competent and qualified persons who have read this manual.

It must be remembered that pumps carrying dangerous liquids must undergo decontamination.

After the end of the interventions all protections and safety devices must be immediately reinstalled and immediately reactivated

II-7 Pump modification and spare parts

The attention of the user is particularly drawn to the fact that the use or installation of spare parts and / or accessories not supplied, not approved by the manufacturer and which are not subject to a control or approval may impair the proper functioning of the pump and / or render it unfit for the purpose for which it was designed. The company **POMPES GROSCLAUDE** declines any responsibility for damages resulting from the use of spare parts other than the original parts or the use of non approved accessories.

III - NAMEPLATES

Identification: Each pump has a company identification plate in one of the following models:

III-1 Standards Pumps




 POMPES GROSCLAUDE 29 Rue du 35 ^e Régiment d'Aviation 69500 BRON - France			 		
Type	EX215/3X-xxx-4-2I				
N°	30123				
An./Y.	2019				
H	8	m	Ø	160/140/140	
Qv	50	m ³ /h	n	2 900	min ⁻¹
Tag	CD-400-B01-P01				
www.pompes-grosclaude.com					
(33) 4 72 37 94 00					

Fig 1a

The parts in **red** are adapted according to the needs and the selected material

III-2 Atex Pumps





 POMPES GROSCLAUDE 29 Rue du 35e Régiment d'Aviation 69500 BRON - France			 		
Type	EX215/3X-xxx-4-2A				
N°	30123				
An./Y.	2019				
H	8	m	Ø	160/140/140	
Qv	50	m ³ /h	n	2 900 min ⁻¹	
Tag	CD-400-B01-P01				
	 II 2 G Ex h IIB T 4 Gb INERIS -EQEN 035085/19				

Fig 1b



IV - UNPACKING, HANDLING, STORAGE

IV-1 Unpacking

Upon receipt of the equipment and before unpacking, check that the packaging of the pump shows no damage, if not indicate it on the waybill and set up the necessary actions with the carrier to make a claim. If a claim has not been made with the carrier, the company **POMPES GROSCLAUDE** reserves the right to decline any liability for damage sustained during transport.

IV-2 Handling

Material handling must absolutely be done in the following way:

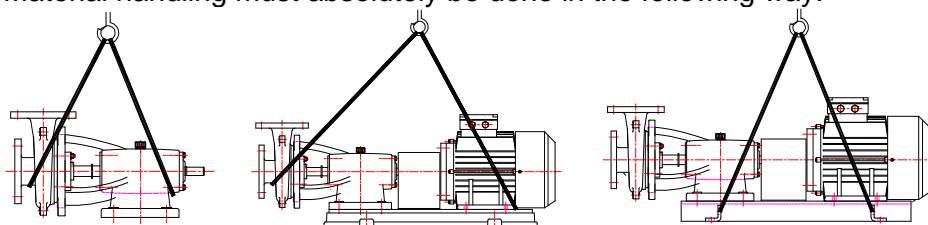


Fig 2

IV-3 Intermediate storage

To allow intermediate storage under good conditions the following instructions are applicable:

- Store in a closed and dry place, free from vibrations.
- Do not remove the protective caps from the pump flanges.

- Periodically operate the rotating part of the pump to avoid marking the ball bearing and gluing the friction faces of the mechanical seal.
- Contact the company **POMPES GROSCLAUDE** to agree on the recommended and adapted products for your application for storage longer than 3 months.
- Maximum storage time:
 - for pumps made of stainless materials: 3 years
 - for oxidizable materials (*cast iron, steel*): 1 year

For prolonged and predictable storage, under different conditions, thank you to inform the company **POMPES GROSCLAUDE** for the implementation of protections and appropriate packaging.

V - DESCRIPTION OF THE PRODUCT AND ACCESSORIES

V-1 General description

Centrifugal single or multicellular horizontal pump with radial sealing surface with axial suction flange and radial discharge flange for pumping fluids for industrial use.

V-2 Identification

EX	109	/2	X	-	95/90	-	0,37	-	2	A
Type de pompe	Orifices E/S	Nombre de roues	Matière en contact avec le liquide		Diamètre des roues		Puissance en kW		Moteur	Protection
EX Entretoise	109	1 roue	X Inox 316L						2 2 pôles (# 2900 tr/mn)	A ATEX
BX Bâti	210	/2 2 roues	F Fonte GS						4 2 pôles (# 1450 tr/mn)	I non ATEX
	...	/3 3 roues	U Uranus B6							
	619		C Hastelloy C276							
	827		Ti Titane							

V-3 Design and function

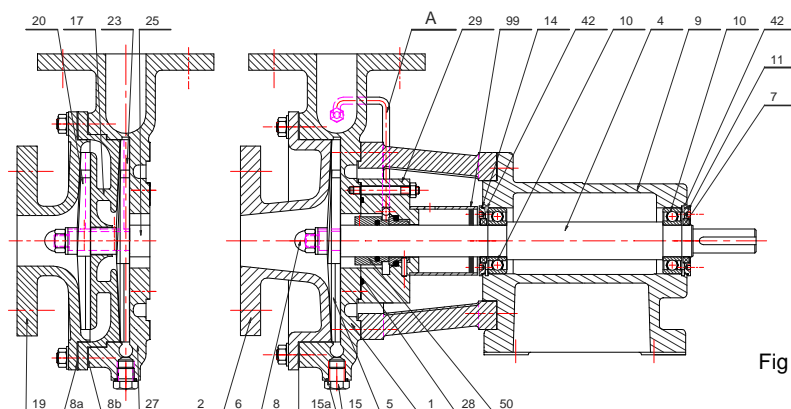


Fig 3

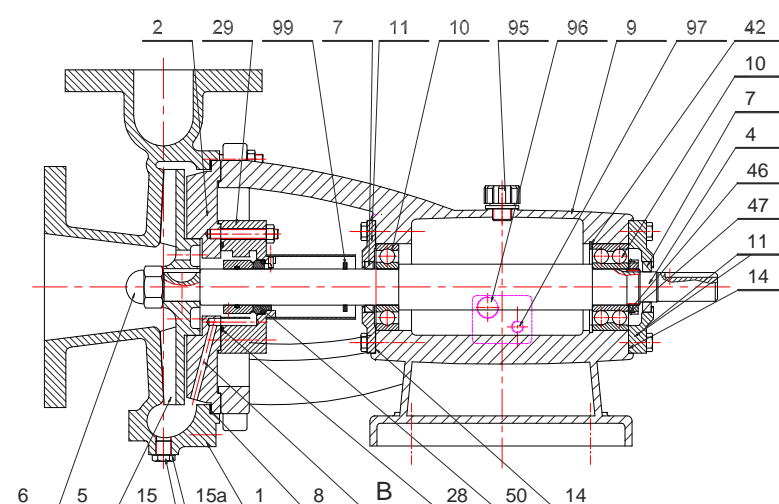


Fig 4

Where the impellers are mounted on a shaft itself guided by a ball bearing. BX - EX pumps are fitted with shaft seals.

The conveyed liquid provides the essential functions of lubrication and cooling of the seal. Indeed, a part of the flow is recycled from the orifices A and B and it allows the conveyed liquid to enter the casing lining, cool are contained and return to the suction of the pump.

V-3-1 Pump casing

EX and BX pump bodies come in two versions:

- The 109-212-215-315 pumps can be mounted either in single cell or multicell, according to fig 3
- 106-209-210-216-312-316-414-516-522-614-619-827 pumps can be mounted in single cell only fig 4

The pump casings can be mounted in 4 orientations (*to be specified when ordering*):

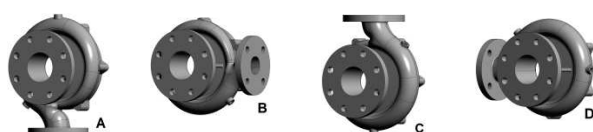


Fig 5

V-3-2 Impellers

EX and BX pump wheels come in two versions:

- Open impellers 109-212-215-216-312-315 according to fig 6



Fig 6

- Semi-open impellers 209-210-316-414-516-522-614-619-827 fig 7 with balanced axial thrust by a hydraulic seal.



Fig 7

V-3-3 Bearing bracket

The shaft is guided by ball bearings in a cast iron bearing. Axial movement is limited by circlips and / or steel flanges.

V-3-4 Sealing

Tightness is ensured by the sliding of a rotating ring on static part (mechanical seal) according to EN 12756: 2001 standard. The BX-EX pumps can be equipped with single or double mechanical seal, back to back, tandem, with or without cooling, lubricated by the conveyed liquid, an external liquid or a gas or alternatively by a magnetic coupling.

Mechanical seal

The perfect inherent flatness of the mechanical seal surfaces and their high degree of finish make possible exceptional leakage-free tightness.

Running a pump dry even for a short time will damage the friction surfaces and will cause overheating and seizure.

According to the characteristics of the fluid being conveyed and the operating conditions, different types of fittings, suitable materials, and different types of fixtures are adopted. The replacement period takes these criteria into account. Only the mechanical seals supplied and approved by the manufacturer will ensure operating conditions in accordance with those for which the equipment was designed.

The company **POMPES GROSCLAUDE** declines any responsibility for the damages resulting from the use of spare parts other than the parts of origin or the use of accessories not approved.

Gas mechanical seal

This type of mechanical seal without any contact between friction areas is based on a very narrow layer of gas between the two parts of the mechanical seal, as a result no friction is created (*no generation of heat*).

The company **POMPES GROSCLAUDE** declines any responsibility for the damages resulting from the use of spare parts other than the parts of origin or the use of accessories not approved.

V-3-4-1 Single Mounting

Mechanical seals in single mounting are lubricated by the pumped liquid.

ASSEMBLY DRAWING 11

"Lubrification" from outlet (*pumps 109-212-215-315-318*)

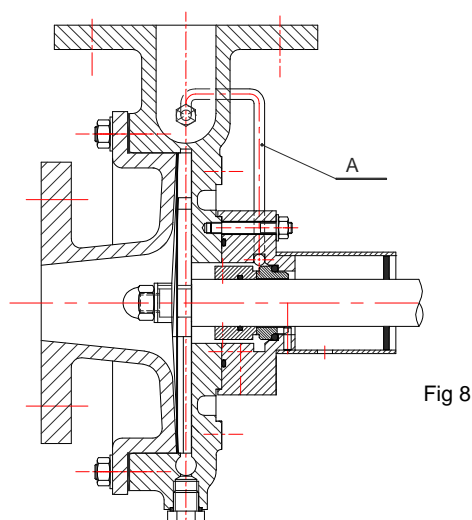


Fig 8

ASSEMBLY DRAWING 01

"Lubrification" of internal groove (*pumps 216-312-414-516-522-614-619-827*)

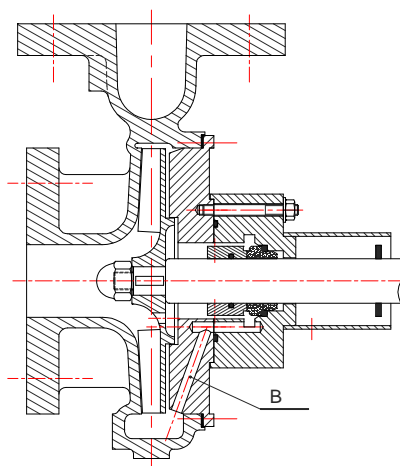


Fig 9

ASSEMBLY DRAWING 02

"Issueless inlet" without flow

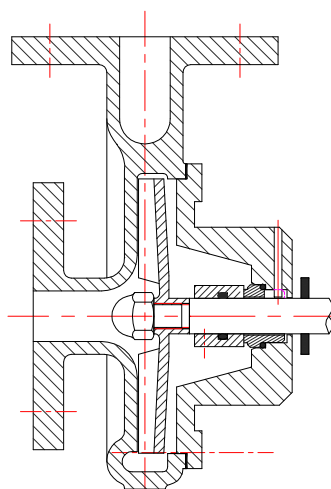


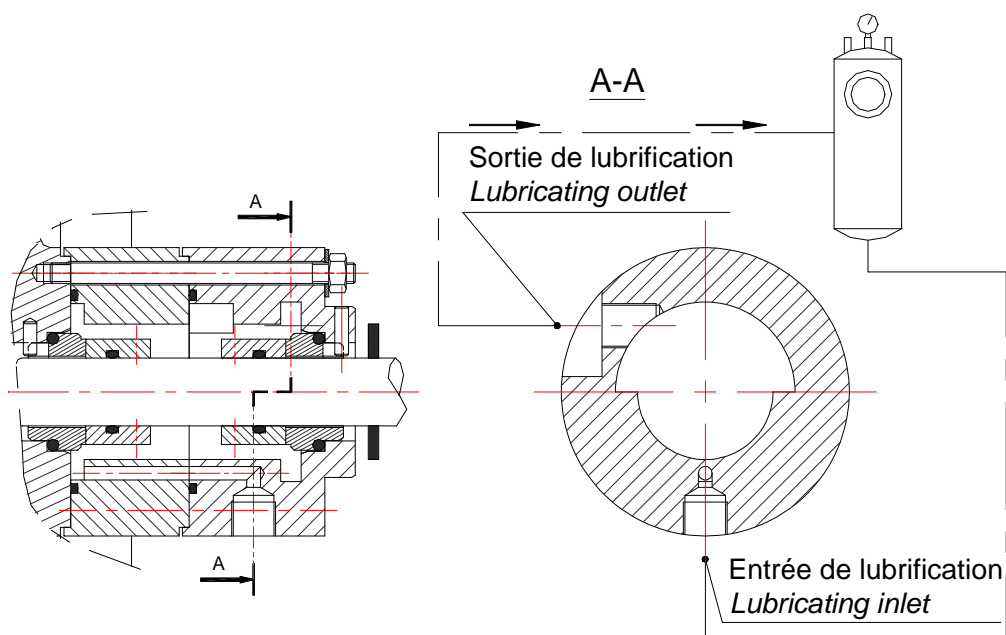
Fig 10

V-3-4-2 Dual Mounting

ASSEMBLY DRAWING 54 (pressurized - Back-to-Back)

"Lubrication" is accomplished from an external source with a buffer fluid compatible with the pumped fluid and having a pressure 1 to 1.5 bars higher than that of the pump's outlet. This Lubrication must start up before the pump and shut down after it. *(If the pump is running with hot liquids, the Lubrication should be stopped after the pump's temperature at shutdown drops below 70° C).*

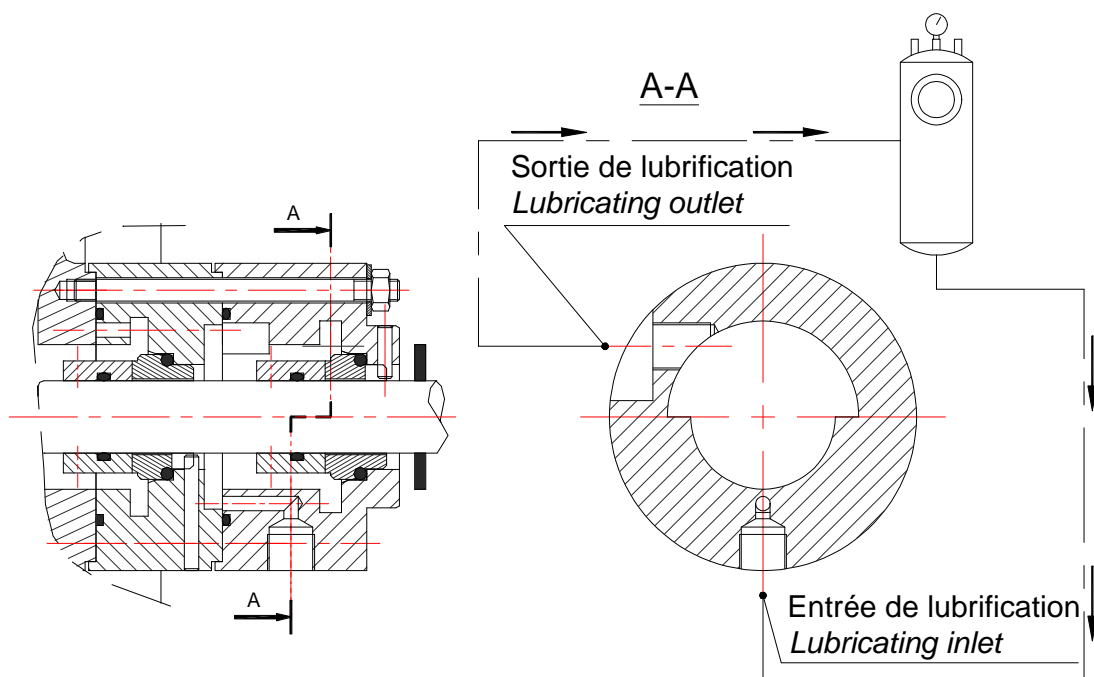
To ensure the monitoring of the mechanical seal, an instrumentation has to be installed on the Lubrication pot. A visible level and a pressure gauge must be provided as a minimum and be monitored by the operator. Additional instrumentation with high / low level and pressure contacts is often used to trigger an alarm or a shutdown system in order to signal a lack of flow of the buffer fluid or a pressure drop.



ASSEMBLY DRAWING 52 (unpressurized- Tandem)

"Lubrification" is accomplished from an external source with a buffer fluid compatible with the pumped fluid and **WITHOUT PRESSURE**. This Lubrification must start up before the pump and shut down after it. *(If the pump is running with hot liquids, the Lubrification should be stopped after the pump's temperature at shutdown drops below 70° C).*

To ensure the monitoring of the mechanical seal, an instrumentation has to be installed on the Lubrification pot. A visible level and a pressure gauge must be provided as a minimum and be monitored by the operator. Additional instrumentation with level and pressure contacts is often used to trigger an alarm or a shutdown system.



V-3-4-3 /S or ERX type mounting

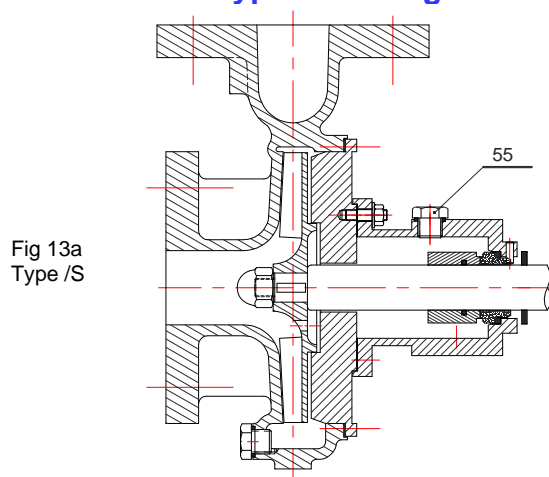


Fig 13a
Type /S

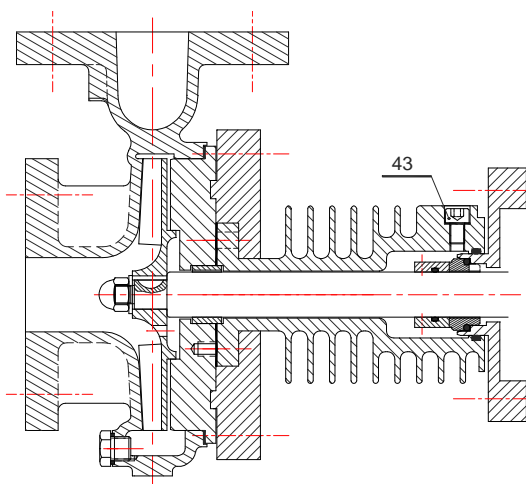


Fig 13b
Type ERX



Before the first start-up and after each filling operation, drain the housing using the screw ref. 55 or 43.

V-3-4-4 Quench « mounting »

This mounting may be made on all types of tightness configurations:

Liquid quench mounting :

- Evacuation of leaks.
- Lubrication, cooling or reheating on the mechanical seal side opposite the conveyed product.
- Stabilization of the Lubrication film in case of operation at no load and / or close to the vapor pressure.

Steam / gas quench

- Heating
- Protection against icing (*injection of nitrogen or dry air*).

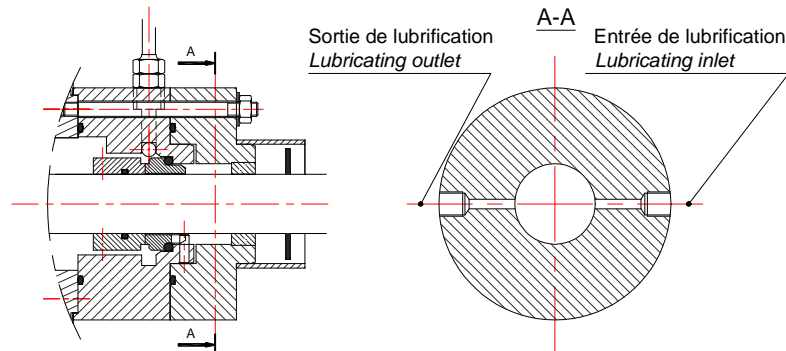


Fig 14

V-3-4-5 Mounting with magnetic coupling

Please refer to the specific instructions for magnetic drive pumps.
MG-LG 19b-02.

V-3-4-6 Pump casing cooling

The maximum allowed pressure in the cooling enclosure is 6 bars (*this value can be increased upon request*).

The required average water flow rate is 0,10 m³/h. It depends on the cooling water temperature and the pump's operating temperature. Therefore, a valve has to be installed at the circuit outlet to regulate the temperature between the inlet and outlet in order to obtain a temperature from 5°C to 15°C.

A cooling water flow controller also has to be installed so that:

- The pump starts only after the cooling / heating system has been switched on.
- When the pump stops, the cooling / heating system continues to run until the pump temperature has reached an acceptable level.
- If the cooling flow is missing or reduced, the pump must stop automatically and / or an alarm must be activated



Use of water may cause scale-like depositing, which can reduce heat exchange capabilities and can prevent the flow. As a result, it is important to schedule regular cooling chamber inspections and cleanings.

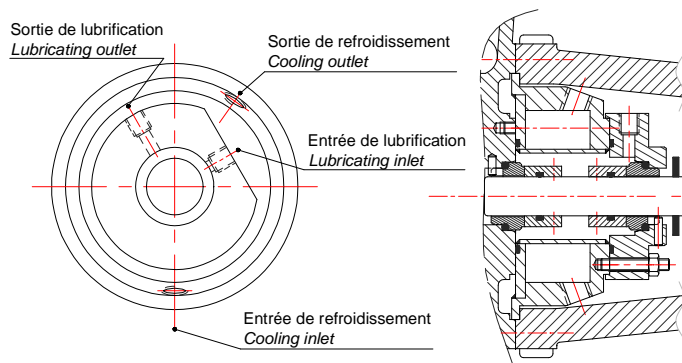


Fig 16

V-3-4-7 Reheating the pump body

The maximum allowed pressure in the cooling jacket is 3 barg (*this value can be increased on request*)

It is also necessary to install a control device so that:

- The pump starts only after the heating system has been activated.
- In case of absence or decrease of the temperature, the pump stops automatically and / or an alarm is activated.



The use of water can cause scale-like deposition, which can reduce heat exchange capabilities to prevent circulation. Therefore, it is important to plan the inspection and cleaning of the heating envelope periodically.

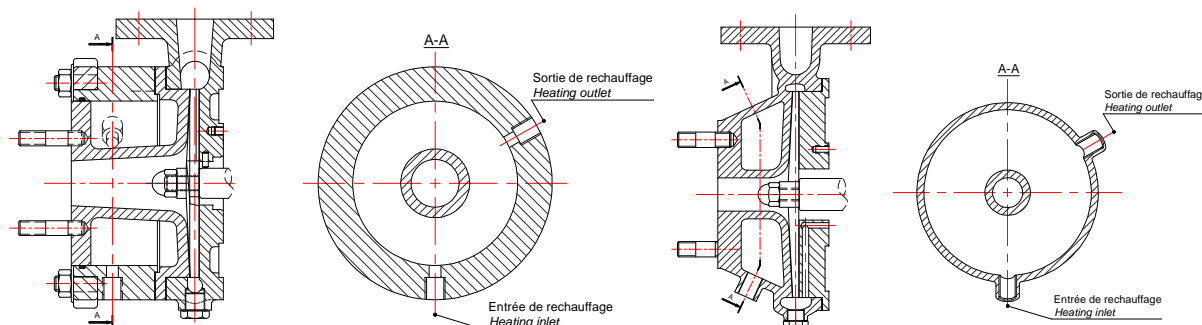


Fig 17

V-3-4-8 Packing

Tightness is obtained by the sliding between the rotating shaft and the braided packing fixed in the stuffing box.

In order to dissipate the heat produced, a constant leak is required between the shaft (or shaft sleeve) and the braided packing (and not between the braided packing and the stuffing box). Lack of this leak will lead to a localized heating which can quite rapidly compromise the effectiveness of the braided packing and damage the shaft sleeve and the pump shaft.

The leak must be on the order of one to three drops per second according to operating conditions.

Low pressure inlet pumps may be equipped with a Lubrication cup; this device lubricates the braided packing by a liquid compatible with the pumped product and pushes out abrasive particles.

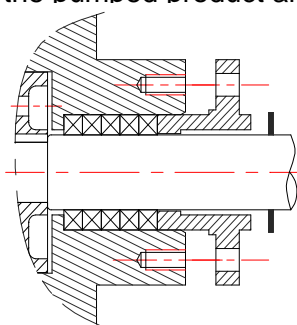


Fig 18

V-3-5 Accessories

The following accessories may be supplied:

- packing Lubrification cup
- pressure gauge
- level detection indicator
- pressure detection indicator
- temperature probe (*magnetic drive pump*)
- PTC probe on motor (*pump equipped with speed variator*)
- pump running dry detection indicator
- Frequency inverter (*recommended frequency range 20 to 60 Hz*)
- Lubrication pot

Pot de lubrification et ses accessoires

Permettant une circulation par effet thermosiphon du liquide de barrage

Ensemble pré-monté et pré-raccordé pour groupe motopompe avec potence Inox

Code article : **KIT TS1020/A002**

Conditions de conception

Législations applicables :	DESP 97.23-CE & ATEX 94/9/CE
Température de conception :	-30 à +200°C
Pression Maxi d'utilisation :	20 barg une version est disponible en 7 barg (DESP - Art. 3.3)
Volume interne :	7 litres

Matériaux en contact avec le fluide

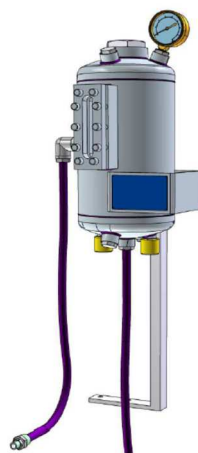
Réservoir	Inox 304/316 Ti
Hublot de lecture	Verre
Flexible de raccordement	Inox revêtu NBR (ex: Nitrile) <small>Modifiable sur simple demande (Inox...)</small>

Type de connexions

Entrée/Sortie thermosiphon	1/2" GAZ Femelle
Serpentin de refroidissement	3/8" GAZ Femelle
<small>Sur demande du client</small>	<small>Utilisation recommandée du serpentin pour des fluides de lubrification avec une température > 70°C</small>
Raccordement disponible	2" GAZ Femelle

Éléments inclus dans la fourniture

Liaisons équipotentiel	Tresses de mise à la terre
Manomètre (0-10 bar)	Type WIKA Diam.63 en Inox
Documentation incluse dans la fourniture	Notice de mise en service et de maintenance Certificat matière 3.1



We draw attention to the fact that under certain operating conditions, the surface temperature of the pot may exceed 65 ° C, it is then recommended to cool the contents of the pot with the cooling coil (*if it is equipped*) or with external means but in any case to protect the operators from the risk of contact with its surface.

Options

Pressostat

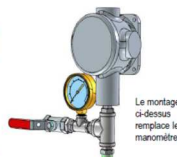
Pour s'assurer du bon fonctionnement des pots de lubrification, il est nécessaire de suivre sa pression afin d'identifier un problème potentiel. Ce suivi peut être fait manuellement, par l'intermédiaire du manomètre ou en automatique, par l'intermédiaire d'un pressostat.

Pressostat - EEx ia IIC T6

avec sécurité intrinsèque (limitation de l'énergie présente dans le circuit électrique)

Pressostat - EEx d IIC T6

avec enveloppe antidéflagrante (en cas d'inflammation à l'intérieur de l'enveloppe, le boîtier résiste à la pression, l'explosion n'est donc pas transmise à l'extérieur)



Le montage ci-dessus remplace le manomètre

Détecteur de niveau bas

Pour s'assurer du bon fonctionnement des pots de lubrification, il est nécessaire de vérifier que le pot de lubrification conserve du liquide pour lubrifier les garnitures mécaniques. Ce suivi peut être fait manuellement par l'intermédiaire du hublot de lecture ou en automatique, par détection de niveau minimum bas

Détecteur Niveau Bas - EEx ia IIC T6

avec sécurité intrinsèque (limitation de l'énergie présente dans le circuit électrique)

Détecteur Niveau Bas - EEx d IIC T6

avec enveloppe antidéflagrante (en cas d'inflammation à l'intérieur de l'enveloppe, le boîtier résiste à la pression, l'explosion n'est donc pas transmise à l'extérieur)



Son montage remplace le bouchon 2"

KIT-Accessoires-Pot-Lub

Pour s'assurer du bon fonctionnement des pots de lubrification et afin que ces derniers remplissent leur rôle de lubrification des montages des garnitures mécaniques doubles, il est nécessaire de les :

- Remplir avec un liquide de barrage compatible avec votre application
- Pressuriser à une pression au-dessus de la pression de refoulement de la pompe avec un gaz compatible avec votre application. Une valeur plus précise peut être obtenue grâce à l'outil mis en ligne sur notre site internet :

www.pompes-grosclaude.com/fr/outils



- Entonnoir de remplissage avec bouchon
- Un Té avec son jeu de vannes pour

VI INSTALLATION PREPARATION

VI-1 Personnel

The pump must be installed by qualified and authorized people.

VI-2 Tools

No special tools are required.

VI-3 Safety

Before starting up the pump :

- Check that the flange caps are removed ;
- Check that the flanges are properly connected to prevent leaks ;
- Make sure that the inlet and outlet valves are closed ;
- Make sure that all the electrical conductors are not supplied with power
- Ensure that the pump is filled with the liquid to be conveyed



VI-4 Installation site, environment

The pump or the pump/motor unit should be placed on a flat concrete floor and should not be exposed to external vibrations. 3 to 10 mm shims will be carefully selected so that the pump/motor unit is installed in a perfectly horizontal position. Fill in the mortar holes. Wait until the mortar is hard before tightening nuts. The mechanically welded bases will be filled in with mortar having an epoxy binder in order to prevent its contraction during hardening.

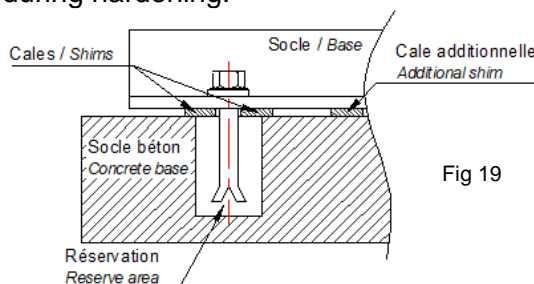


Fig 19

Check the space around the pump/motor unit. Behind the motor allow for a space from the wall equal to the motor's cooling air inlet diameter.

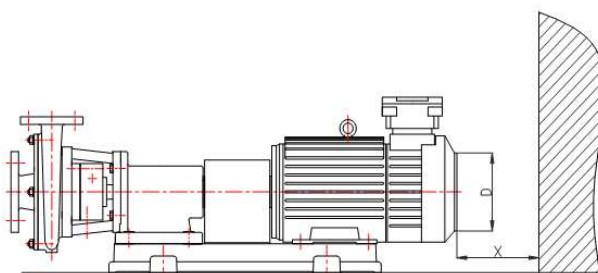


Fig 20

The pump must be implanted in such a way that it is not subjected to climatic constraints and in particular the risk of lightning. In addition, it is important to avoid any risk of falling objects on the pump or that it can fall from the support where it will have been installed permanently attached to the ground or in a subset to avoid any risk of fall (*with the appropriate mechanical protection to prevent shocks in the transport (pedestal or support of higher dimensions for example ...)*).

VI-5 Piping

Check that the cleaning of the installation has been carried out correctly before any operation of setting up the pump (*to avoid contamination of the inside of the pump and in particular the sealing of the pump with particles, unwanted fluids ...*).

Please observe the flow direction of the fluid (*if necessary adjust the direction of rotation of the motor*).

The piping must be at least equal in diameter to the I / O ports of the pump. If necessary, use convergent / divergent to adjust the diameters.

The flange seals must not protrude inside the pipes and be put in place according to the recommendations of the suppliers.

Adjust the pipe fasteners so that they do not cause any stress on the pump flanges (*the pump must be removable from its location without the piping moving*). The stresses due to the expansion can be compensated by expansion sleeves.

Avoid sudden changes in diameter (*use asymmetrical convergents*) as well as short radius bends near the pump I / O connections.

Provide for suction a straight length equal to at least 10 times the nominal diameter of the pump suction and discharge 5 times the nominal discharge diameter of the pump.

The flow velocity of the fluid will be between 1 to 2 m/s at the suction and 2 to 3 m/s at the discharge

Provide for the installation of control and security devices:

- gauge
- Mano-vacuum gauge
- Thermal relays
- Emergency stop devices on malfunction detector following:
 - No liquid carried or auxiliary fluid (heating, cooling), checking the presence of liquid and / or the minimum pressure.
 - Heating due to mechanical seizure.
- ...

During the installation of the pump or the group, it is important to keep in mind, the materiality and the liquid conveyed.

The pump must be started full of liquid.

The pump must not be used as a fixed point for piping.

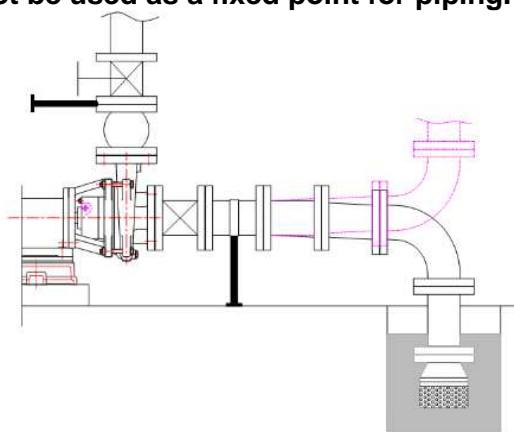


Fig 21

Support must be installed within 0.5 m of the I / O flanges of the pump.

If there are auxiliary connections and accessories, they must be mounted and connected according to plan. They are essential for the proper functioning of the group.

VI-6 Stress forces on flanges



If the allowable stress forces and moments are exceeded, tightness failures may occur on the pump. In such a case, personnel and the environment may be exposed to a dangerous situation if the pumped liquids are hot or toxic.

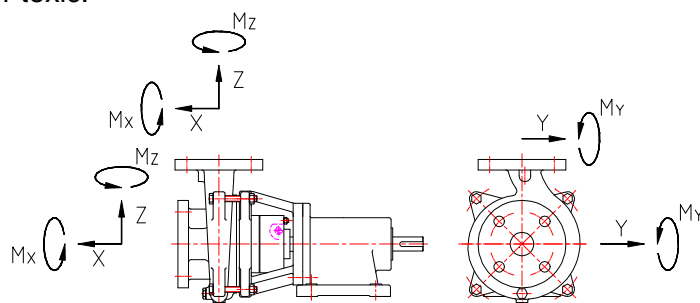


Fig 22

INLET FLANGE

Pump	DN	FORCE (daN)			MOMENT (m.daN)		
		FX	FY	FZ	MX	MY	MZ
109	20	23	8	5	0,455	0,805	0,805
210	20	22	9	7	0,848	1,166	1,166
212	25	32	16	12	1,624	1,856	1,856
215	32	32	16	14	1,740	1,856	1,856
216	25	27	11	12	1,334	1,566	1,566
312	32	32	16	14	2,10	2,24	2,24
315	40	32	16	14	2,25	2,40	2,40
316	50	35	16	16	2,67	2,91	2,91
318	40	32	16	14	2,25	2,40	2,40
414	40	30	13	12	1,875	2,25	2,25
516	80	38	19	18	3,70	3,80	3,80
522	65	38	18	20	3,53	3,53	3,53
614	65	35	18	19	3,44	3,26	3,26
619	80	38	18	19	3,70	3,80	3,80
827	100	40	19	27	5,06	4,40	4,40
515	50	32	16	16	2,62	4,00	2,62
620	80	40	22	20	4,20	4,00	4,00
822	100	45	31	29	6,60	4,95	4,95

OUTLET FLANGE

Pump	DN	FORCE (daN)			MOMENT (m.daN)		
		FX	FY	FZ	MX	MY	MZ
109	15	12	12	9	0,315	0,315	0,84
210	20	13	14	11	0,583	0,583	1,431
212	20	16	22	18	0,954	0,954	2,014
215	25	16	22	20	1,060	1,060	2,014
216	25	14	20	17	0,901	0,901	1,802
312	32	16	23	20	1,400	1,400	2,73
315	32	16	23	20	1,400	1,400	2,73
316	32	21	28	25	1,750	1,750	3,43
318	32	18	18	18	1,260	1,260	2,52
414	40	14	16	14	1,050	1,050	2,25
516	50	26	26	23	1,909	1,909	4,316
522	50	28	27	23	1,909	1,909	4,565
614	65	24	23	22	2,05	2,05	4,371
619	65	27	26	24	2,23	2,23	4,929
827	80	35	35	25	2,50	2,50	7
515	50	26	26	23	1,880	1,880	4,26
620	65	25	24	22	2,20	2,20	4,9
822	80	38	38	28	3,08	3,08	8,36

VI-7 Direction of rotation of motor



Rotation direction of the pump directly depends on the rotation direction of the motor

To verify the direction in which the motor turns (*clockwise seen from motor fan side*), the pump and the motor must be uncoupled in order to avoid any damaging of the pump.

- The reversing of the rotation direction can only be made by the reversing of phase
- An arrow on the pump indicates the direction of rotation

VI-8 Coupling

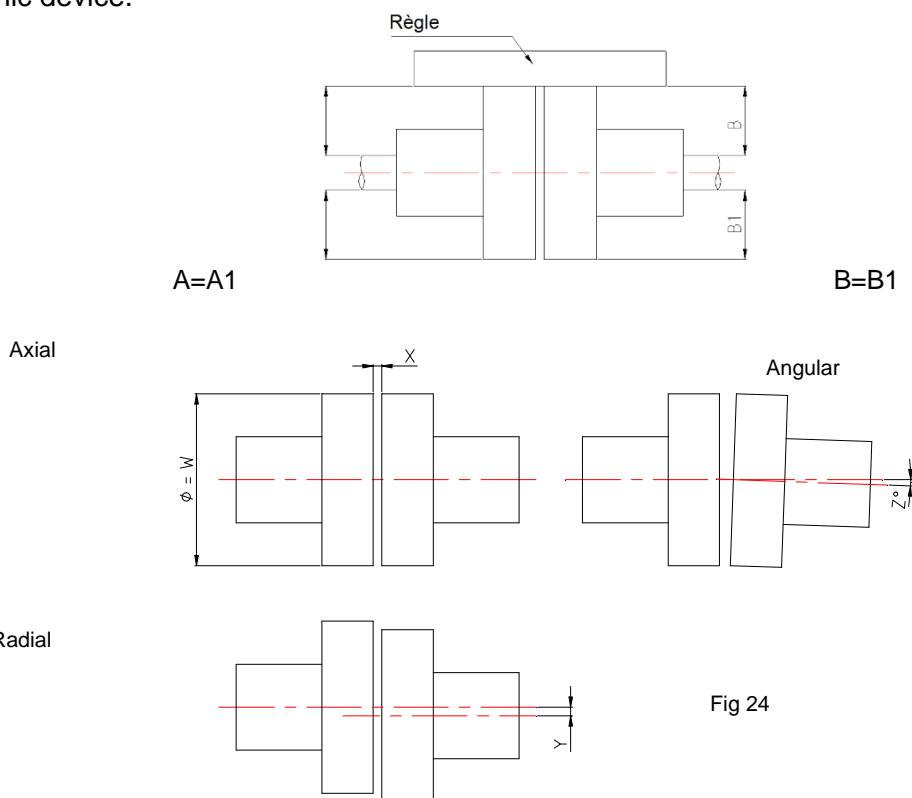
The coupling sleeves will be mounted on the shafts without shocks. It may be necessary, if necessary, to heat them to facilitate the operation.

VI-9 Alignment

The pump and the motor must be aligned at room temperature after the attachment of the base and connection of the pipes. Then adjust accordingly after the service temperature is reached (*differential expansions*). See section 7.6

Align the motor with respect to the pump by adding shims under the motor's feet.

To check alignment, use a comparator or an appropriate device (*metal ruler*), or alternatively with an electronic device.



Refer to the recommendations of the supplier of the coupling to validate the conformity of the assembly.

VI-10 Levels control

For pumps whose roller bearings are lubricated with oil or grease, refer to section 8.2.

VI-11 Electrical connection






The electrical connection must be made only by a certified electrician.

The motors are calculated for power line voltage tolerances of + or – 10%. The power line's characteristics must comply with the pump or pump/motor unit identification plate. The motor must be connected in compliance with the electrical wiring diagram located in the terminal box in direct start-up.

When the electric pump unit is connected to a frequency converter (*recommended frequency ranges 20 to 60 Hz*), the motor is equipped with a temperature sensor in the winding to ensure its protection and we recommend that you connect it.



When the unit is installed in an explosive environment, it is particularly important to comply with the appendix of this manual marked  (NCPAE 19b-02).

VI-12 Last check before start-up

Final inspection/control operations must involve the following points:

- No one should be endangered by starting
- The pipes are well connected
- Verification of the tightness of the joints
- The pump is filled with the fluid to be conveyed as well as the pipes
- The discharge side valve is partially closed to allow the passage of at least 8% of the nominal flow
- The suction side valve is fully open.
- The tightness and functionality of auxiliary piping.
- The tightness of the shaft is not too tight (when using braided sealing)
- The shaft turns freely by hand.
- Check the supply voltage and the connection of the motor terminal box correspond to the said voltage
- The direction of rotation of the motor is correct.
- Clamping and sealing of flange connections.
- The tightening of the anchor bolts.
- The good lineage of the engine and hydraulic assembly
- Parallelism and concordance of the pipe flanges with those of the pump.
- If a starter filter is fitted to protect the pump against dirt and impurities from the installation; the clogging of the latter must be controlled by the differential pressure measurement, in order to avoid cavitation.

VII START-UP

VII-1 Safety constructions



The electrical connections and protections must be made according to the rules of the art and by trained, qualified and qualified personnel in accordance with the prescriptions and standards in force. See in particular the recommendations of the engine manufacturer's manual

In potentially explosive atmospheres comply with the requirements of EN 60079-14: 2008



The pump must be filled with liquid to avoid deterioration see the destruction of the shaft seal

The flow rate will be adjusted with the outlet valve.

The inlet side valve should always be open to prevent cavitation.

The pumps of the Ex-Bx series must not be used as a reactor (*place of reaction between two chemical compounds*) and must be washed / rinsed / neutralized when used on several chemicals that could potentially / possibly interact.

VII-2 Priming

The pump and the inlet pipes must always be completely filled.

VII-3 Checking before getting started

Verifications should include the following.

(See last checks before commissioning Chat VI-12)

VII-3 Start-up


To start the pump or group, follow these instructions:

- Open the suction valve completely.
- Close almost completely the one to the repression.
- Start the engine.
- Purge the stuffing box, if applicable (*see chapter V-3-4-3*)
- Check the pressure gauge on the discharge side; if the pressure does not increase gradually with the speed of rotation, stop the engine and carry out a new degassing of the pump.

When the motor has reached its speed, set the operating point using the discharge valve (*closed valve operation is only possible if a by-pass ensures a minimum flow*) or using the frequency converter (*recommended frequency 20 to 60 hz*).

VII-4 Operating control

During the first few minutes in operation, check the following points:

- The mechanical seal ensures a good seal (*a slight leak is possible during the first start-up, allow 30 minutes for the elements to take up their positions*) **ATTENTION** in case the leak persists and if it is important stop the pump as soon as possible and contact **POMPES GROSCLAUDE**.
- The intensity absorbed by the motor does not exceed the intensity indicated on the motor plate (*the power absorbed by the pump increases proportionally to the density of the liquid carried*)
- The rotation speed and the discharge pressure.
- Monitor that the pump runs smoothly.
- Check the fluid levels in the suction tank.
- Check the temperature at the pump bearing (*maximum 80 ° C*) and at the surface of the pump casing, it must not be higher than that indicated on the rating plate. Chap III.
- Observe the appendix of this marked insert  (NCPAE 19b-02).
- The permissible operating limits (*pressure, temperature, rotation speed*) are indicated on the technical specifications of the technical file supplied with the pump.

VII-5 Shutdown

Before shutting down, it is advisable to close the outlet valve.

As soon as the pump is stopped, close all the valves.

The starting frequency depends on the maximum permitted temperature rise of the motor (*motor <100 kW, 10 starts per hour ... for more details refer to the instructions supplied with the motor*)



If there is a risk of frost and / or prolonged shutdown, drain the pump and the cooling / heating envelopes.

The installed standby pumps must be started regularly to ensure their good condition (*ideally once a month*).



BEFORE PROCEEDING WITH ANY OPERATIONS, MAKE SURE THE ELECTRICAL POWER SUPPLY IS TURNED OFF.



Alignment

For high-temperature pumps, they have to be run at their service temperatures, and then shut down and their alignment immediately checked.

- Make sure that the half couplings are not in contact
- Check that the “needle” screws are tightened correctly

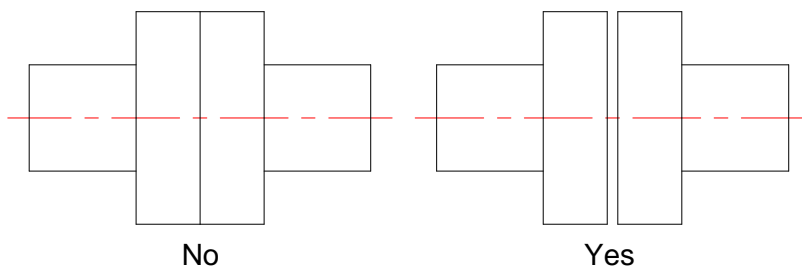


Fig 25

- For realignment after operation, refer to *section 6.9 – Alignment*

VIII MAINTENANCE

VIII-1 Safety



All work on the unit should only be undertaken after disconnecting it from the power grid. Take all necessary measures to prevent accidental engagement.

All work mentioned below must be carried out by competent and authorized personnel.



Pumps carrying products that are harmful to health must be decontaminated.

Please respect the legal provisions in force, so as not to endanger the health of the workers.

VIII-2 Bearing bracket lubrication

The pump is equipped with ball bearings greased for life or lubricated with oil.

LUBED-FOR-LIFE BEARING

These bearings are maintenance-free and must be replaced according to the table below.

		1500 min-1	3000 min-1
Palier 71	(6202 2RS)	10 000 heures	8 000 heures
Palier 90	(6204 2RS)	10 000 heures	8 000 heures

OIL LUBRICATED BEARINGS

On delivery, the pumps equipped with oil level indicator are filled with oil, a level control is required at startup by the indicator light V

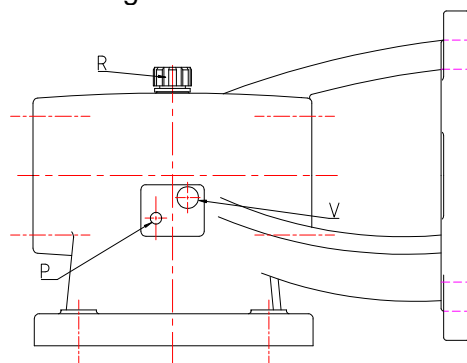


Fig 26

Pumps equipped with an oiler are delivered empty bearing. The filling is done through the hole rep. R fig26. The level is reached when the oil appears in the bowl of the threaded end. Fill the tank by tilting it on its articulation, repeat the operation until a stable level is reached. In use ensure that the tank is never empty, it automatically restores the level as part of its normal consumption, or leaks.

The operating temperature of the bearings must never be higher than 85 ° C.

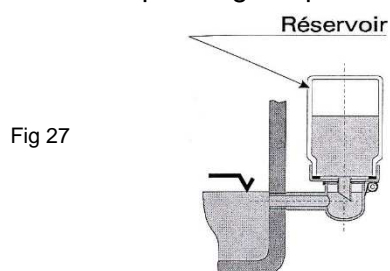


Fig 27

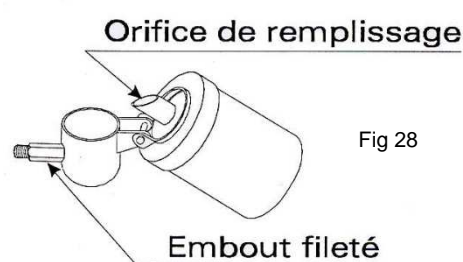


Fig 28

Oil changes

Min-1	First oil change (Hours)	Susequent oil change (Hours)
<1800	200	5 000
1800-3600	200	3 500

Oil changes should be more frequently carried out under severe operating conditions. The lubricant must be evacuated in compliance with the legal provisions in force.

Oil quantities

Bearing type	Oil quantity dm3
112	0,30
132	0,45
160	0,60

Oil type

Min.start up temperature	Max. start up temperature	Characteristics	Example
-20°C	+60°C	Viscosité cinématique 67,7 mm²/s	EXTRA68S
-40°C	+85°C	Viscosité cinématique 45,6 mm²/s	RENOLIN EQUIMA ME

Abnormal noises or vibrations often arise from wear or deterioration of the ball bearings. In this case, it is of utmost importance to replace the ball bearings in order to not risk seizing or "sparking" inside the roller bearing or the motor enclosure.

VIII-3 Electric motor

Maintenance according to the motor manufacturer's indications.

VIII-4 Mechanical seal

The tightness of the liquid conveyed is obtained by the sliding of 2 perfectly smooth and flat surfaces. Under normal operating conditions (*should only work in the presence of liquid*), this type of seal does not show any leaks. Periodic inspection is necessary, **dry running even for a short time damages the friction faces**. If the mechanical seal leaks, stop the pump immediately to replace the mechanical seal.



VIII-5 Magnetic coupling

The maintenance of the shaft is ensured by a smooth bearing lubricated by the fluid conveyed. Under normal operating conditions (*should only work in the presence of liquid*). Periodic inspection is necessary, **dry running even for a short time damages the plain bearing**. If the bearing makes noise or causes vibrations, stop the pump immediately for service on the inner bearing and refer to the specific instructions for magnetic drive pumps *MG-LG 19b-02*.



VIII-6 Packing

After approximately 2500 hours or if all the rings when stacked, you must replace them.

VIII-7 Coupling and coupling protection

Check the elastic coupling element for wear and tighten the coupling sleeve on the shaft

In an explosive atmosphere, the coupling protection is made of an anti-spark material.



IX DISASSEMBLING

IX-1 Safety

Repairs must only be performed by qualified personnel.

The pump must be at room temperature, without pressure and drained. The draining of the pumped liquid is done by the plug rep 15 on the pump body, it must be evacuated and collected without presenting a danger for the people and the environment.

In the case of a very toxic liquid, the pump must be rinsed thoroughly due to any residual liquid pumped.

In case of liquid whose residues can become corrosive in contact with the air or ignite on contact with oxygen, it must be rinsed, neutralized, dried, by blowing an inert gas free of water.

Spare parts used must be of manufacturer origin or approved by the latter (*see Chapters II-7*). Otherwise, the company **POMPES GROSCLAUDE** disclaims any liability for damage resulting from the use of spare parts other than the original or unapproved parts.

The order of disassembly operations can be deduced from the overall plan.

IX-2 Disassembling

Shut down the pump (*see section 7.5*)

Close the inlet and outlet valves.



In the case of work on the motor, observe the instructions and instructions of the motor manufacturer in its instructions.

Wait until the temperature of the body allows its handling without risk and in comfort.

Drain the pump by removing the plug. 15.

For oil bearings, drain through the plug.

The oil or any other liquids drained must be recycled or stored according to the rules in force



If the pump is carrying harmful, toxic or dangerous products, the parts in contact with the fluid being transported must be cleaned and decontaminated before dismantling.

If necessary / applicable, dismantle measuring and control devices

Unfasten the coupling and motor protection mounting screws and slide it so that there is sufficient space to disassemble the hydraulic block

Before dismantling, it is advisable to locate the parts.

For pumps equipped with a magnetic drive, refer to the instructions for magnetic drive pumps MG-LG 19b-02

Disassemble the pump casing by unscrewing the volute nuts, separate the volute from the rest of the pump.

Loosen the wheel nut, remove the wheel which can be screwed or keyed (*see sectional drawing*)

Unscrew the trim box.

Remove the tray 2

Raise the seam (s) of the mechanical seal.

Unscrew the bolts or packing stops, remove them from the shaft. For type / S pumps, go through the hole of the bleed screw.

Remove the case.

Remove the bearing flanges, or the bearing flanges (*multiple screws*)

Remove the circlip (s).

Drive the drive side shaft with its bearings

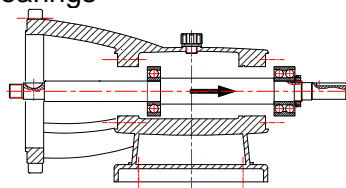


Fig 29

X AFTER-DISASSEMBLING WORK

Perform the following work:

- First of all, clean all the parts, rings and joint / seal planes with an appropriate solvent or cleaning product.

- Check for wear and surface condition of the shaft and impellers.
- Check the concentricity of the shaft (*and shaft sleeve*)
- Check the condition of the joint's supporting surface and the housing of the fixed grains (*body, plate, box*)
- Check the bearing bracket's bored holes (*ball bearing race*)

XI RE-ASSEMBLING

The pump is reassembled by reversing the order in which it was dismantled, the assembly drawing and the parts list used for reference.

A set of new seals, joints and gaskets will have to systematically opened and used to replace those in service since the latter items may be used only once.

Replace damaged parts with original manufacturer's spare parts or under the responsibility of the user of the equipment (*as indicated by Euopump Guideline Part II - § 5*). The company **POMPES GROSCLAUDE** declines any responsibility for the damages resulting from the use of spare parts other than the parts of origin or not authorized.

XI-1 Re-assembling the bearings

- If the bearings have to be replaced, heat them to 80 ° C before putting them on the shaft
- Reassemble the shaft in the bearing and replace the flanges equipped with lip ring (*observe the position*)

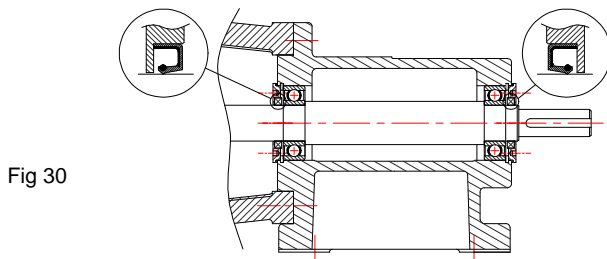


Fig 30

Greased for life bearing frame

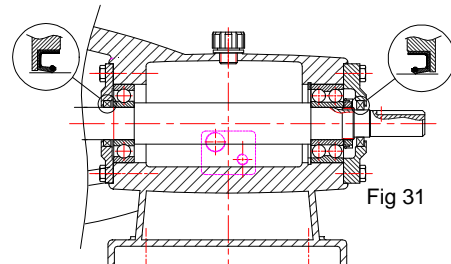


Fig 31

Oil bath frame

- Check the shaft's concentricity (*0.02 mm*) and axial movement (*0.05 to 0.15 mm*).

XI-2 Re-assembling the mechanical seal

This operation must be carried out by trained, specialized personnel with knowledge of the fittings. Damaged mechanical seals must be replaced as a whole.

It is recommended to avoid installing new parts with other used or repaired ones.

Renovations of fittings must be carried out by the manufacturer alone and only if he deems it possible.

After dismantling the damaged packing and its components (rotating parts on the shaft and fixed in their housing) proceed as follows:

- Energetically clean tree and fix grain housing
- Check that the faces show no sign of corrosion or erosion and that the surface of the shaft under the lining of the liner is perfectly smooth.



- Unpack the new trim with great care especially at the friction surfaces. Take care not to put them in contact with dirty, greasy or abrasive objects.
- The assembly of fixed and rotating parts should be done without lubricant but with alcohol or soapy water.
- Reassemble the fixed seed (s) in the housing (s).
- Before coming in contact with each other, the friction faces should be clean and dry.
- Reposition the mechanical seals on the shaft to the original ribs (see disassembly). Attention, the edge of the tree or the shirt must be perfectly chamfered
- Reassemble the plate, bring the housing into contact, screw.

XI-3 Re-assembling the packing

Regardless of the braided seal, follow the recommendations listed below:

- Control of the tree or shirt.
- Assembly ring after ring.
- 90° cutting offset.
- Ensure that the first ring is resting on the bottom of the case
- In the clamping phase of the gland (screw the nuts by hand), the shaft must be turned by hand.
- For the break-in of the cable gland, wait for the temperature to stabilize and check the existence of the liquid thread during this phase. Wait 10 to 15 minutes before acting on tightening the cable gland. **It is imperative that a leak exists.**

XI-4 Re-assembling the impeller

- Engage the impeller on the shaft (*screw or pin*); reinstall the impeller nut and apply a few drops of locking compound to lock it in place.
- Check the CLEARANCES in front and behind the impeller (*see Fig. 2*).



N.B. : Too large a clearance will cause a decrease in pump performance, while too small a clearance will cause an increase in absorbed power and a risk of contact between the fixed parts and rotating parts.

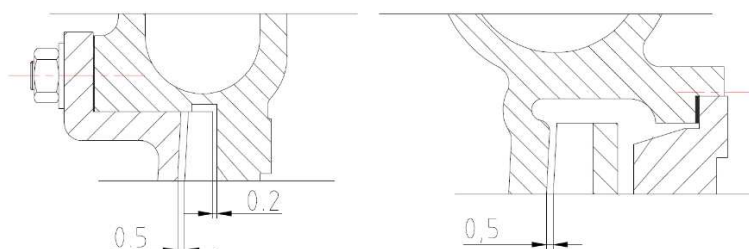


Fig 32

XI-5 Tightening torque

Screw dia	M6	M8	M10	M12
Torque value	8 Nm	12 Nm	25 Nm	40 Nm

It is particularly important to pay attention to the respect of the indications above in case of presence of vibration or ultrasonic sources in the installations.



XII ABNORMALITIES (causes and remedies)

XII-1 Malfunctions / failures

Defects	Possibles causes
The pump does not deliver any liquid	1-2-3-4-6-11-14-16-17-22-45
Flow rate insufficient	2-3-4-5-6-7-8-9-10-11-12-14-17-20-22-27-45
Pressure gauge height insufficient	5-14-16-17-20-22-27
The pump "unprimes" after start-up	2-3-5-6-7-8-11
The pump heats	1-4-21-22-25-26-32-33-38-46
The pump vibrates or makes noise	2-3-4-9-10-11-21-24-25-26-27-32-33-38-39-40-41-42-43-44-45-46-47
The mechanical packing leaks	24-30-31-32-33-37
The braided packing has an excessive leak	13-24-28-29-31-33-35-36-37
Reduced lifetime of the mechanical packing	11-23-24-31-37
Reduced lifetime of the braided packing	23-24-29-31-34-37
Reduced lifetime of the bearings	24-25-26-32-33-38-39-40-41-42-43-44-46
Reduced lifetime of the coupling	46
The absorbed power is excessive	15-16-17-18-19-20-24-25-29-34-45-47

XII-2 Potential causes and remedies

	Causes	Remèdes
1	The pump is not primed	Fill up the pump
2	The pump or the inlet pipes are not completely filled with liquid	Fill up
3	The inlet height is excessive	- Correct the pumped liquid level ;
4	- Open wide the inlet valve ;	
5	- Change the inlet pipe (load loss too great) ;	
6	- Check the filters.	
7	The variation between the inlet pressure and the vapor tension is insufficient	
8	The liquid contains too much air or gas	
9	There are air pockets in the inlet pipe	Purge the installation
10	The inlet pipe is not air tight ; there are infiltrations	Check all the seals and joints
11	There are air infiltrations through the stuffing box	Replace the packing
12	The shut-off valve on the inlet pipe is too small	
13	The shut-off valve is partially clogged	
14	The inlet pipe is not sufficiently immersed	
15	The Lubrification pipe is clogged	Eliminate the deposits
16	The tressed stuffing box "bulb" is badly positioned	
17	The rotating speed is too low	Consult us
18	The rotating speed is too high	Consult us
19	The rotating direction is not good	Invert 2 feed phases
20	The height necessary for the installation is higher than the height supplied with the pump	Adjust the outlet valve
21	The height necessary for the installation is lower than the height supplied with the pump	Adjust the outlet valve
22	The pumped liquid's density is greater than that expected	
23	The pumped liquid's viscosity is different from that provided for	See the pump specification ; Consult us
24	The flow rate at the pump's operating point is too low	
25	The pump is not adapted to work in parallel	
26	The quantity and/or pressure of the Lubrification liquid are insufficient	Fill up the lubricant level
27	The shaft is bent	Replace it



28	The rotating parts come in contact with the fixed parts	Shut down the pump/motor unit ; return to workshop for dismounting and inspection
29	The bearings are worn	Replace them
30	The impeller is damaged	Replace it
31	The shaft or the shaft sleeve under the stuffing box are worn	Replace it
32	The stuffing box's rammer is badly installed	
33	The mechanical packing is worn or damaged	Replace it
34	The braid rings or mechanical packing are not compatible with the pumped liquid	Replace them
35	The shaft is off centered due to bad alignment of the roller bearing or because the ball bearings are worn	Dismount and inspect
36	The rotating part is unbalanced due to vibrations	Check coupling alignment
37	The stuffing box's rammer is too tight ; as a result, lubrication is rendered insufficient	Loosen the stuffing box nuts
38	Cooling liquid leak in the stuffing box	
39	The first braid ring penetrates into the pump because the radial clearance between the box bottom and the shaft is too high	
40	The shaft or sleeve are worn due to an injection of loaded Lubrification liquid	Replace the shaft or sleeve ;
41	Clean the Lubrification liquid	
42	Too much thrust caused by stress forces due to the mechanical packing or the hydraulic balancing system	
43	Bearings heat due to an excess of Lubrification oil	
44	Oil leak	
45	Bad installation or wrong type of bearings (damages caused during assembly)	
46	Bearings dirty	Replace them
47	Corrosion of ball bearings related to presence of water in the roller bearing	Replace them

XIII SPARE PARTS LIST

Whenever you order spare parts, please indicate the pump type and the serial number.

Example : Pump type : EX109X-xxx-0,37-2A

Serial n°: 30100

This information is indicated on the nameplate of the pump.

XIII-1 Recommended spare parts for a 2-year service after start-up.

- A set of gasket
- A set of mechanical seal(s)
- A set of ball bearing

XIII-2 Recommended spare parts for a service according to ISO

- A set of gasket
- A set of mechanical seal(s)
- An impeller
- A shaft
- A set of ball bearing

XIII NOMENCLATURE

Repère	Désignation	Quantité
1	Corps	1
2	Flasque (fig 3) Plateau (fig 4)	1
4	Arbre	1
5	Roue	1
6	Ecrou de roue	1
7	Bagues à lèvres	2
8	Joint de corps	1
8a	Joint de corps	1
8b	Joint de corps	1
9	Bâti	1
10	Roulement à billes	2
11	Bride de roulement	2
14	Joint torique	2
15	Vis de purge	1
15a	Joint de purge	1
16	Entretoise	1
17	Diffuseur	1
19	Flasque multicellulaire	1
20	Roue multicellulaire	1
23	Roue multicellulaire	1
25	Arbre multicellulaire	1
27	Corps multicellulaire	1
28	Joint de boîtier	1
29	Boîtier	1
42	Circlips	2
46	Ecrou	1
47	Rondelle	1
50	Garniture mécanique	1
95	Bouchon remplissage bâti	1
96	Regard d'huile bâti	1
97	Bouchon de vidange bâti	1
99	Déflexeur	1
50	Garniture mécanique	1
A	Tubulure de lubrification	1
B	Lubrification interne	1