

Operation and Maintenance Manual

C and CF Series

Lobe Positive Displacement Pump

Group

Translation of the Original Instructions



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O.M.A.C. s.r.l.
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INTENDED USE

The C and CF Series Lobe Positive Displacement Pump Group, manufactured and marketed by O.M.A.C. s.r.l., which in this documentation will be indicated with the abbreviation LPDPG, has been designed and made to be assembled in industrial plants owned by third parties, to transfer volumes of fluids, compatible with the materials used during the construction of this machine: section 1.4.1 lists the recommended operational features of the LPDP, depending on the processed fluid.

The LPDPG requires compliance with all technical indications in this operation and maintenance manual, which in this documentation will be indicated with the abbreviation OMM, for its proper installation.

In general, the processed fluids must meet the following specifications:

Fluid properties and range of use:

- 1) TEMPERATURE: from **-35°C to +180°C**
- 2) VISCOSITY: Maximum **200'000cPs** with forced feeding
- 3) HARD PARTICLE SIZE: Maximum **80% of clearance between rotors** (see sect.1.3.4)

The LPDPG has been designed and made for two types of use:

- alimentary use;
- chemical use.



WARNING

The LPDPG, for alimentary use, has been made to ensure a hygienic standard equal to **LEVEL 3**, on the basis of **UNI EN 13951**.

The LPDPG for alimentary use and for chemical use has been designed to transfer volumes of fluids without altering the organoleptic properties nor the physical properties.



WARNING

The LPDPG is **E.H.E.D.G.** certified, with **Certificate nr. 13/2008** of **TUM Technische Universität München** of Freising, Weihenstephan - Germany



WARNING

During its normal use, the LPDPG for alimentary use and chemical use does not alter the organoleptic characteristics or the physical characteristics of the processed fluid.

Every LPDPG comes with a technical sheet indicating the operational features in relation to the processed fluid that must be handled (name of the fluid, viscosity range, capacity range, speed range, temperature range), as declared at the time of purchase by the Customer.

Section 1.3 shows a facsimile of the LPDPG technical sheet.

Every modification to what is indicated in the specific technical sheet or variation of the machine operating parameters must be authorised in writing by O.M.A.C. s.r.l.; the absence of such authorisation is deemed "improper use" and will void any warranty or liability under way between Manufacturer and Customer.



DANGER

Any use of the LPDPG in conditions other than those indicated in "Fluid properties and range of use" and in conditions other than those indicated in the machine technical sheet is forbidden, without explicit written authorisation, issued by O.M.A.C. s.r.l.

The LPDPG for alimentary use and for chemical use has NOT been designed nor built to handle pharmaceutical, explosive, etc. fluids, and in general fluids that do not comply with the indications of the specific technical sheet.

In addition, the LPDPG for alimentary use and chemical use has NOT been designed nor built to handle what is indicated in Regulation (EC) No. 1005/2009 of the European Parliament and the Council of 16 September, 2009, on substances that deplete the ozone layer.



ATTENTION

It is forbidden to use the LPDPG for alimentary use and chemical use to transfer the substances listed in Annex I of Regulation No. 1005/2009.

The pumping part of the LPDP is made up of the pump body, in which two rotors are housed (sect. 1.3.5 lists the types of rotors used), which rotate synchronised in the opposite direction to each other.

The rotorcase receives the process fluid from the suction inlet, originating from the plant of the Customer. During the operation of the LPDP, the cavities between the lobes of the rotors are filled with fluid and the counter-rotation of the rotors transfers the fluid to the delivery outlet of the pump body, channelling it in the plant where the LPDPG is installed.

(Declaration of conformity to be attached)
EC DECLARATION OF CONFORMITY
(Machinery Directive 2006/42/EC)

We, O.M.A.C. s.r.l., with registered office in Via Falcone n.8 - 42048 Rubiera (RE) – Italy, Tel. 0522/629371 - Fax. 0522/628980
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hereby declare under our exclusive responsibility that:
 Mrs Paola Zavaroni, Via Falcone, 8 - 42048 Rubiera (RE) Italy, is authorised to establish and
 keep the technical documentation relative to the machine called


“MOTORIZED C or CF SERIES LOBE POSITIVE DISPLACEMENT PUMP GROUP”
 or “MOTORIZED C or CF SERIES LOBE POSITIVE DISPLACEMENT PUMP GROUP WITH ELECTRIC PANEL”
 or “C or CF SERIES LOBE POSITIVE DISPLACEMENT PUMP GROUP complete with “TRANSMISSION DEVICE”

Model: _____ Serial No: _____ Specifications: _____

Date of issue: _____

designed and built for pumping, in a third party plant, a product (alimentary fluid / chemical fluid) to which this declaration refers to.

The machine is compliant with the safety requirements provided by Directive 2006/42/EC

with Regulation EC No.1935/2004 

and with Directives: 2006/95/EC – 2004/108/EC – 94/9/EC
 and in accordance with the provisions of the following harmonised standards:

*** REFERENCE STANDARDS***

This machine is equipped with:

Gear Unit/Speed Controller/Gear motor: _____	Supplier: _____	Specifications: _____
Electric motor/Hydraulic motor: _____	Supplier: _____	Specifications: _____
Flexible transmission coupling: _____	Supplier: _____	

NOTE: any modifications to the machine, to which this declaration refers to, to the processing fluid and conditions of use of the process fluid, specified in the relative technical sheet, will make this declaration null and void. O.M.A.C. s.r.l. does not assume any liability arising from the incompatibility between the process fluid and materials which make up the machine, subject of this declaration, if the customer does not specify the particulars of the process fluid and its physical characteristics.

RUBIERA (RE)

Date _____

The Legal Representative

Signature _____



HOW TO CONSULT AND KEEP THIS DOCUMENTATION

This OMM is a document written by O.M.A.C. s.r.l. and is relative to the installation, safe use and management (maintenance) of the LPDPG, in this sense, this documentation, complete with the use and maintenance manuals supplied by the manufacturers of the single components, is an integral part of the LPDPG.

The purpose of all the documentation mentioned above is to put the users of the LPDPG in the conditions to operate safely, thus putting in place clear rules of use; this documentation must be carefully read and understood by the users.

Please note that the specifications carried on all the use and maintenance manuals, with reference to this machine, are designed to ensure safety and health of the users and therefore they must carefully read, understand and apply the indications/procedures.

The compliance with these indications enables the safe use of the machine, as well as the implementation of appropriate interventions.

As indicated above, the declaration of conformity and all use and maintenance technical manuals concerning the LPDPG will accompany it in the event it is sold to other users.

This documentation must be kept with care until the final demolition of the same LPDPG and must be made available to the personnel appointed to operate.

It is good practice not to damage the manual and keep it properly, do not tear pages, dirty them or get them greasy, never expose them to sources of heat and always maintain the proper layout. This documentation and relative annexes must also be made available to the personnel authorised to operate on the LPDPG, in such a way that it can be consulted easily, to clear any doubts about its safe operation and/or about the execution of use and maintenance procedures.

What is contained in the technical manuals reflects the state of the art at the time of construction of the machine in question. The technical manuals cannot be considered inadequate, as a result of technological improvements of the LPDPG.

The technical documentation and relative annexes are completely confidential: reserves all rights related to this use and maintenance manual and with the object presented therein. The receiving party recognises these rights to O.M.A.C. s.r.l., in the person of its Legal Representative, Mrs Paola ZAVARONI, and undertakes, in the absence of an explicit written consent, not to make it accessible to others, either in whole or in part and, not to use it outside the purpose for which it was created. Violators will be prosecuted according to law.

SYMBOLS USED

Important information, regarding the technical reliability and safe use, are highlighted in this manual in the following way (these symbols always precede the text they refer to):



DANGER

The DANGER symbol draws attention to a procedure, practice or similar measure which, if not performed correctly, can result in injury. Do not proceed beyond a DANGER symbol until you have fully understood and satisfied the conditions specified.



WARNING

The WARNING symbol draws attention to an operating procedure, practice or other similar measure that is potentially dangerous, which may involve risk of serious injury, if the instructions are not followed scrupulously.



ATTENTION

The ATTENTION symbol draws attention to an operating procedure, practice or other similar measure, which if not correctly performed or observed, can damage or completely destroy the product. Do not proceed beyond an ATTENTION symbol until you have fully understood and satisfied the conditions specified.



NOTE

Refers to technical aspects for which the user of the equipment must pay particular attention.

KEEPING THE MANUAL

The technical manuals relating to the LPDPG is part of the same unit; therefore all the above mentioned technical documentation must accompany this machine even if it is sold.



WARNING

For the proper management of safety during use and maintenance of the LPDPG, all the technical documentation must accompany it even if it is sold.



DANGER

The technical manuals contain the information / procedures concerning the use and management of safe maintenance of the LPDPG, it must be kept in the vicinity of the place in which the machine operates, to which this documentation refers, in a place easily accessible by the operator responsible for its operation. The operator responsible for its operation and the maintenance engineer must be able to find and consult this documentation at all times.



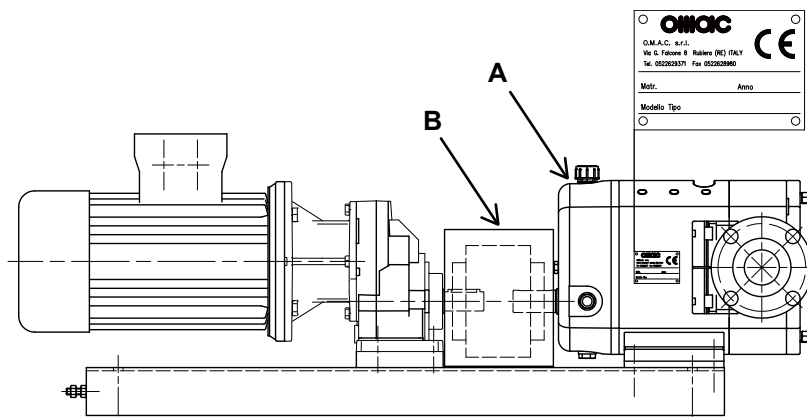
DANGER

All the technical documentation that refers to the LPDPG must be kept in an easily accessible place so that it can be consulted quickly. In addition, the personnel responsible for its use and maintenance must be informed where this documentation is kept.

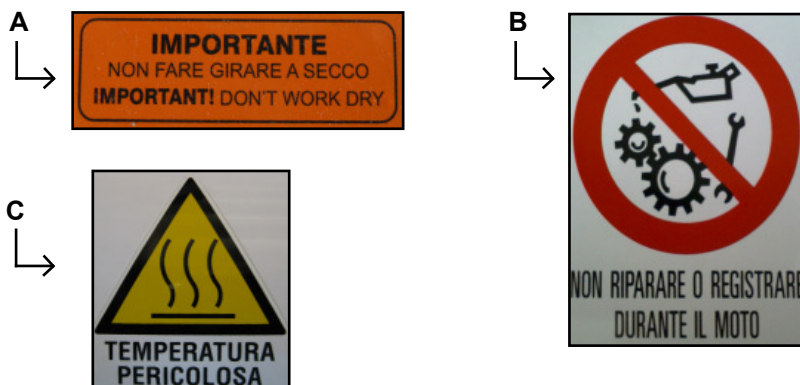
LABELS APPLIED

Throughout the LPDPG there are nameplates of the various components of the same unit.

The nameplate applied on the left side of the LPDP (left side of the pump looking at the rotors) carries the LPDPG serial number (the serial number starts with the letter "L" and is followed by six numbers), to which the item code of the LPDPG is uniquely associated to. The coding rule of the LPDPG item code is explained in section 1.2.2.



On the surfaces of the various components of the LPDPG, there are plates with the prohibition to operate the LPDP dry (plate **A**), placed on the bearings box of the LPDP, and the plate warns the operator of the presence of mobile parts under the butt strap (plate **B**). In the event of LPDPG is predisposed for pumping fluids at temperatures above 50°C, there is a signal placed on the same pump that warns the operators of the presence of high temperature surfaces, as shown in figure **C**:



NOTE

Please note that the markings / labels present along the LPDPG cannot be removed or altered for any reason.



WARNING

It is forbidden to use any O.M.A.C. item when it is without the nameplate. Should the item be without its nameplate it is compulsory for the customer to contact the O.M.A.C. Technical Office that will see to identify the item and re-issue the nameplate.

TERMS AND DEFINITIONS

OMM: Operation and Maintenance Manual.

LPDPG: C or CF Series Lobe Positive Displacement Pump Group (control unit, gear motor, speed controller, hydraulic motor, electric panel, support base, support base on trolley, etc. + mechanical transmission device (flexible transmission coupling) + LPDP.

LPDP: C or CF Series Lobe Positive Displacement Pump Unit.

DANGEROUS AREAS: any area inside and/or in proximity of a machine in which the presence of an exposed person constitutes a risk for the safety and health of this person.

EXPOSED PERSON: any person who finds himself entirely or in part in a dangerous area.

MACHINE: together of parts as defined by Article 2 of Directive 2006/42/EC of the European Parliament and the Council of 17 May, 2006

MANUFACTURER: O.M.A.C. s.r.l.

CUSTOMER: Physical or legal person on whose behalf the machine is built, upon prior written acceptance of an order confirmation.

CHAPTER 1: MACHINE AND PUMPED FLUID SPECIFICATIONS

1.1 Envisioned duration

Given the quality level of the materials and construction technologies used, if you strictly follow the instructions in this OMM (paying particular attention to chapters 3, 4 and 5, relating, respectively, to the installation, use and maintenance of the LPDPG), the expected duration of such subject matter is estimated to be 12 months from date of installation.

Please note that, during its expected life-span, the LPDPG must not be assembled and/or disassembled by unauthorised personnel and furthermore the instructions contained in this OMM must be followed scrupulously.

1.2 Technical description of the machine

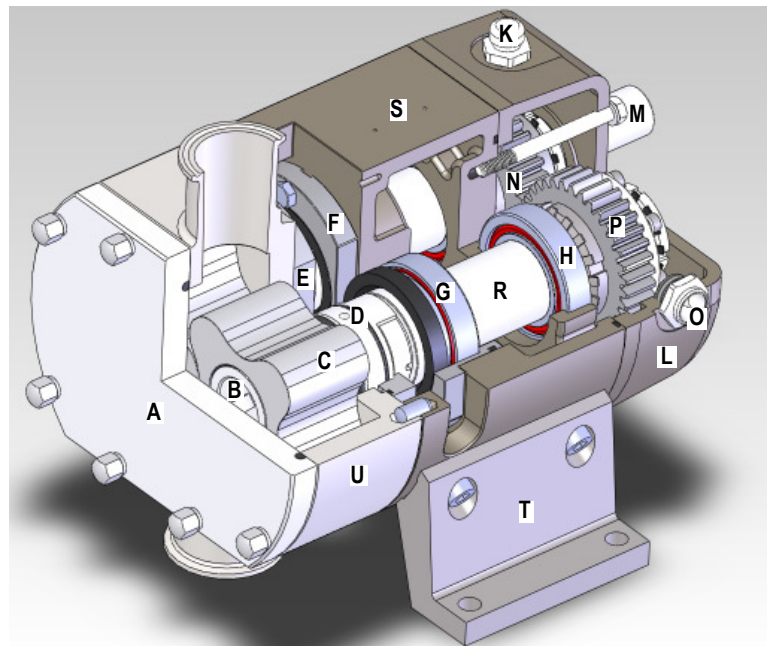
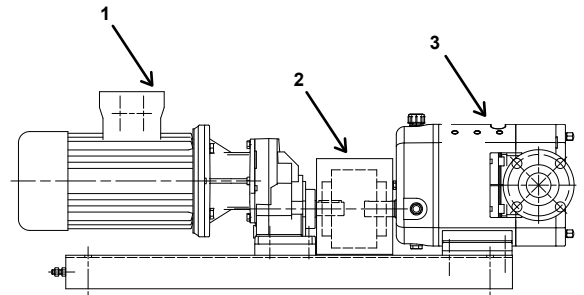
Below there is a brief description of the LPDPG, as well as a functional illustration of the LPDPG, in order to more easily identify the main construction details, mentioned in the description of use and maintenance of this document.

The LPDPG is made up of 3 macro-components:

- 1) control unit (gear motor, speed controller, hydraulic motor, electric panel, etc.);
- 2) mechanical transmission device (flexible transmission coupling);
- 3) LPDP;

The LPDP, identified with number 3) is made up as follows:

- A = ROTORCASE COVER
- B = LOCK NUT
- D = SEAL
- F = BEARING RETAINER RING
- G = FRONT BEARING
- H = REAR BEARING
- K = OIL VENT CAP
- L = REAR COVER
- M = DRIVE SHAFT
- N = FIXED GEAR
- O = OIL LEVEL CAP
- P = ADJUSTABLE GEAR
- R = DRIVEN SHAFT
- S = BEARING HOUSING
- T = FOOT
- U = ROTORCASE
- C = ROTOR
- E = BALANCING RING



1.2.1 Operation principle of the LPDP

The LPDPG, whose functional element is the LPDP, is equipped with a control unit that, depending on the version, can be fitted with a gear motor, an electric motor, a pneumatic motor or a hydraulic motor, with or without electric panel.

The capacity adjustment is achieved by increasing or decreasing the number of revolutions of the LPDPG, intervening directly on the revolutions output of the motor or acting on the actuators on the control panel (inverter), if fitted.

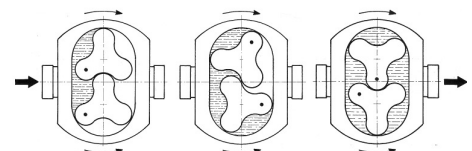
The LPDP is reversible: full performance can be achieved in both rotation directions of the pump rotors (section 1.3.5 of chapter 1 lists the types of rotors used).

The pumping action of the LPDP is achieved thanks to the counter-rotation of two rotors (letter "C" indicated in the figure in section 1.2, indicating one of the two rotors), housed inside the pumping chamber (letter "U" indicated in the figure in section 1.2 or see figure below). The rotors are assembled on rotating shafts supported by bearings (letters "G" and "H" shown in the figure in section 1.2), which are housed in the external gearbox (letter "S" shown in the figure in section 1.2). Via a couple of sprocket wheels (letters "N" and "P" indicated in the figure in section 1.2) one transfers motion from a drive shaft (letter "M" indicated in the figure in section 1.2) to a driven shaft (letter "R" indicated in the figure in section 1.2). The synchronism of the rotors is such that they rotate without coming into contact with each other: in these conditions "the rotors are in phase".

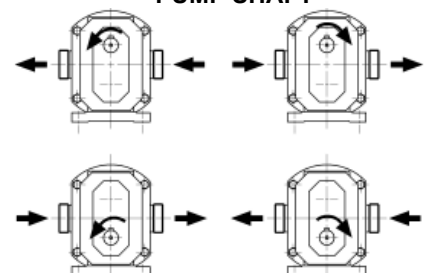
When the lobes of the rotors move away from each other, the volume between them increases, creating a decrease in pressure near the suction outlet: this enables a certain volume of fluid to enter (value of fluid transported identified in the table in section 1.3.1, in the "theoretical capacity" column, depending on the pump model size) into the pumping body. The fluid is transported along the internal of the pumping chamber, from the suction inlet to the delivery outlet of the pump body.

When the volume of fluid, trapped between the lobes and the external perimeter of the pumping chamber, reaches in proximity of the delivery outlet, the counter-rotation of the two rotors creates a sudden decrease of available volume and a consequent increase in pressure that pushes the fluid out of the pump body, by channelling it into the plant where the LPDPG is installed.

FRONTAL VIEW OF THE PUMP CHAMBER



REAR VIEW OF THE PUMP SHAFT



WARNING

If the control unit does not comply with the rotation direction indicated in the figure, the mechanical functionality of the LPDPG is not compromised, but will not supply any delivery capacity.

Failure to comply with the proper connection to the unit (suction inlet connected to the suction piping and delivery outlet connected to the unit delivery pipe) will cause improper installation of the LPDPG by the customer.

1.2.2 C and CF Series LPDPG coding

The LPDPG is identified by an item code, represented by a string of 18 alphanumeric characters that starts with "K" (the item code is detectable on the first line of the technical sheet of which there is an example in section 1.3) divided into the following structure:

K	1	1	2	3	4	5	6	7	7	7	8	8	9	V	V	V	V
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Fields 1-1: pump C series = **FO**;
pump CF series = **FF**;

Field 2: pump size

A = 100; **C** = 110; **D** = 115; **F** = 220; **G** = 270; **H** = 325; **I** = 330; **J** = 390; **S** = 570;

Field 3: seal type

3 = Single Mechanical Stainless Steel/Carbon;

8 = Single Mechanical Silicon carbide/Silicon carbide;

A = Single Mechanical Silicon carbide/Carbon;

Field 4: suction-discharge connections type

0 = GAS-BSP;

1 = flanged PN16 UNI EN 1092-1;

2 = DIN 11851;

3 = SMS;

4 = RJT (BS);

5 = IDF-ISS;

6 = TRI-CLAMP;

B = DIN 11864/1a;

C = DIN 11864/2a;

D = DIN 11864/3a;

E = DIN 11864/1b;

F = DIN 11864/2b;

G = DIN 11864/3b;

H = flanged PN40 UNI 6084-67/DIN 2501;

J = flanged ASME 150lb;

L = smooth for welding;

T = flanged FGN1;

Field 5: rotor type

0 = Quadrilobe Stainless Steel ST

2 = Bilobe Stainless Steel ST

4 = Pentalobe Stainless Steel ST

8 = Gear Stainless Steel ST

A = Bilobe CY5SnBIM(antiseiz.) ST

L = Quadrilobe/Gear CY5SnBIM(antiseiz.) SM

P = Bilobe CY5SnBIM(antiseiz.) PR

S = Bilobe Stainless Steel PR

1 = Quadrilobe/Gear Stainless Steel SM

3 = Bilobe Stainless Steel SM

7 = quadrilobe/Gear CY5SnBIM(antiseiz.) ST

9 = Pentalobe CY5SnBIM(antiseiz.) ST

D = Gear CY5SnBIM(antiseiz.) SM

N = Quadrilobe CY5SnBIM(antiseiz.) PR

R = Quadrilobe Stainless Steel PR

Y = Pentalobe Nitronic 60 ST

(ST= standard clearance version; SM = increased clearance version; PR = precise clearance version)

Field 6: rotorcase cover type

0 = standard;

3 = with pneumatic safety valve;

1 = with mechanical safety valve;

8 = with drainage;

2 = heated;

B = with mechanical safety valve and drainage;

Field 7-7-7: pump optional

B = O-ring in N.B.R. (Buna);

F = O-ring in Kalfon 72B™;

J = Pump in Titanium;

K = Kolsterizing treatment;

M = Pump in Monel;

N = Niploy treatment;

P = O-ring in Teflon;

U = O-ring pompa in E.P.D.M.;

V = O-ring in F.K.M. °VITON;

W = O-ring in Kalrez Spectrum6375;

X = Atex certification;

Y = Pump in Hastelloy;

Z = Pump in Hastelloy-Titanium;

1 = Cheniflon treatment;

3 = O-ring pump certified 3-A;

7 = with feet for vertical connections disposition;

0 = no optionals;

Field 8-8: pump optional groups

Q3 = Secondary mechanical seal in S.S.Aisi 316 L/Carbon;

Q8 = Secondary mechanical seal in Silicon Carbide/Silicon Carbide;

QA = Secondary mechanical seal in Silicio/Carbon;

Field 9: seal model

4 = Mechanical 1601 seal;

6 = Mechanical 8S/8S7 seal;

Fields V-V-V-V: progressive versioning number

Digital counter that versions the item code according to the type of accessories and type of LPDPG and according to the type of associated control unit.

1.3 Technical features

The technical data of the LPDPG is listed in the "technical sheet", of which there is an example below. The technical sheet is delivered to the Customer together with the LPDPG, in original and edited without the possibility of manual corrections.



ATTENTION

The technical sheet must not have any manual corrections or deletions.

The technical sheet lists the item code, which identifies the LPDPG, the serial number (detectable on the riveted nameplate on the bearings box of the LPDP), its functional features (processed fluid and its properties, pump speed, volumetric capacity, differential pressure,...) and the features of the LPDPG components.

The technical sheet below lists the technical data of the control unit (motorisation, gear motor, speed controller,...), of the flexible mechanical transmission coupling, that connects the LPDP to the motorisation, and the type of support on which the LPDP is fitted.

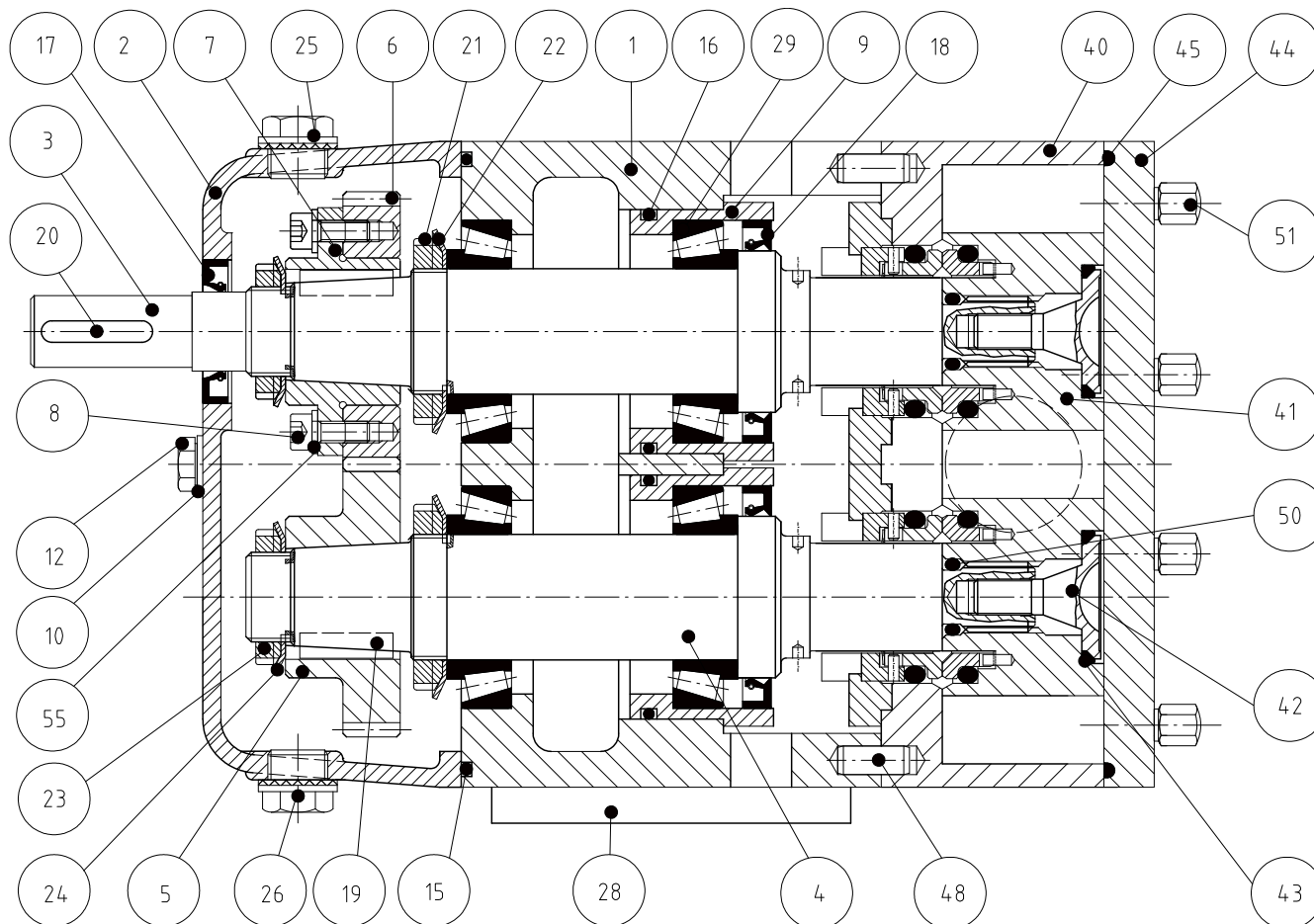
The exploded view below highlights the position numbers of some components of the LPDP which will be discussed later in this chapter.

SCHEDA TECNICA	
O.M.A.C. S.r.l. Via G. Falcone 8 42048 RUBIERA (RE) ITALY Tel/Fax: 0522-629371 / 62-9923 http://www.omacpompe.com E-mail: info@omacpompe.com	Codice Cliente: 000000000000 Tipo: A Numero: 0000000 Data:
Nostro Riferimento: Interstallato Ordine:	Vostro Riferimento: Destinatario Merce: Destinatario Ordine:

Riga	Descrizione	U.M.	Quantità	Q.ta Totale	Scarti	Importo	IVA	Consegna
5	KFC0000000000000000 POMPA C	NR						
	Matricole	L000000						
	CARATTERISTICHE TECNICHE COMPOSIZIONE PREZZO INFORMAZIONI PRODOTTO:							
	PRESTAZIONI RICHIESTE: PORTATA, PRESSIONE DIFFERENZIALE, VELOCITÀ POMPA, MOMENTO, POTENZA ASSORBITA POMPA: MODELLO, CORPO POMPA, FORMA ROTORI, MATERIALE E VERSIONE ROTORI, TIPO TENUTE, PARTE ROTANTE, PARTE FISSA, MODELLO, ELASTOMERI TENUTA, BOCCA DI ASPRAZIONE, BOCCA DI MANDATA, ATTACCHI, DISPOSIZIONE BOCCHE, GUARNIZIONI POMPA, POSIZIONE ALBERO, VERNICIATURA OPTIONALS COMPRESI: O-RING POMPA IN EPDM, CON PIEDI PER BOCCHE VERTICALI MOTORIZZAZIONE: TIPO, DATI TECNICI, FASIVOLT, POLI, FREQ.(HZ), CLASSE DI ISOLAMENTO, PROTEZIONE, SERVOMOTORE SUPPORTO: BASE STANDARD, TIPO DI GIUNTO, Ø FORI PER ALBERI (POMPA/MOTORE), PROTEZIONE NOTE: PIEDINI REGISTRABILI CON BASE STANDARD DOCUMENTAZIONE: MANUALE DI USO E MANUTENZIONE SERIE BB, DOCUMENTAZIONE MOTORIZZAZIONE, N° COPIE DOCUMENTAZIONE							

Informativa d.lgs 30.6.2003 n. 196 TU Privacy I suoi dati personali saranno trattati, nel rispetto delle idonee misure di sicurezza, per invio di comunicazioni commerciali, potrà esercitare i diritti previsti dalla legge e nelle modalità ivi contenute. Titolare del trattamento dati è O.M.A.C. S.r.l., sede legale: 42048 Rubiera in Via G.Falcone, 8. Per comunicazioni info@omacpompe.com. Per ulteriori informazioni www.omacpompe.com

The section below highlights the position numbers of some components which will be discussed later in this chapter.



1.3.1 Technical features of the LPDP

The table below shows the nominal features of the various dimensions of the LPDP, inserted in the LPDPG. The data that make up the table refer to the pump model, the capacity that each pump model (100, 110...) elaborates every 100 revolutions, the maximum operation speed of each pump size, the differential operating pressure, expressed in bar, and the standard dimensions of the opening couplings, expressed in millimetres and inches.

MODEL PUMP	THEORETIC FLOW-RATE	MAXIMUM SPEED	MAXIMUM POWER	MAXIMUM OPERATING PRESSURE (bar)		STANDARD CONNECTIONS	
				ST standard clearance with shafts in AISI 630	SM increased clearance with shafts in AISI 630	DN	INCHES
C100	3	1400	1.5	7	-	25	-
C110	17	1000	4	8	13	40	-
C115	21	1000	4	5	8	40	-
C220	30	800	7.5	8	13	40	-
C270	38	800	7.5	5	8	50	-
C325	63	700	18.5	13	17	65	-
C330	81	700	18.5	8	12	65	-
C390	100	700	18.5	5	8	80	-
C570	600	400	45	8	13	125	-

1.3.2 Variation of maximum operating pressure according to the temperature

The table below lists the maximum differential pressure values, processed by the LPDP, inserted in the LPDPG, according to the size of the pump (from C/CF100 to 570), according to the temperature of the processed fluid (from 0-70°C, 90°C, 110°C,...) and according to the type of rotors fitted: with clearances between rotor and ST standard pumping chamber, SM increased clearances or clearances for HP high pressures.

The values of these clearances between rotors and pumping chamber are shown in the section 1.3.4.

		TEMPERATURA °C											
		da 0°C a 70°C		90°C		110°C		120°C		140°C		160°C	
		ST	SM	ST	SM	ST	SM	ST	SM	ST	SM	ST	SM
MODEL PUMP	C100	see the technical sheet or please contact the Technical Dept.											
	C115												
	C220												
	C270												
	C325												
	C330												
	C390												
	C570												

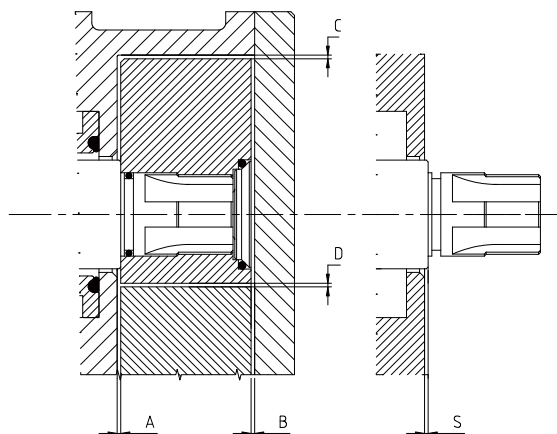
1.3.3 Motorization and transmission coupling technical features.

The mechanical features of the flexible transmission coupling and the performance features of the control unit (electrical, pneumatic, hydraulic), according to the type of operation chosen by the customer, are shown in the respective use and maintenance manuals; documents that are supplied with the LPDPG.

1.3.4 Rotor clearances

This section lists the nominal clearances (ST standard, SM increased), that are recorded between rotors and walls of the pumping chamber according to the material (AISI 316 L, anti-seizure alloy CY5SnBIM). The figure, on the next page, represents a rotor section, fitted in the pumping chamber, with indication of clearances, identified by letters A,B,C,D. The table below shows the entity of these clearances.

The "S" value represents the protrusion of the shaft compared to the wall of the pumping chamber.



	ROTORS IN S.S. AISI 316 L VERSION ST				ROTORS IN S.S. AISI 316 L VERSION SM				ROTORS IN CY5SnBIM				SHAFT PROTRUSION
	A	B	C	D	A	B	C	D	A	B	C	D	
C100													
C110													
C115													
C220													
C270													
C325													
C330													
C390													
C570													

Dimension in mm - Tolerances 0/+0.03

1.3.5 Rotor geometry

The table below shows the types of rotors, per type of construction material and geometric shape, available for every size of LPDP.

ROTOR TYPE	MODEL PUMP SIZE								
	C100	C110	C115	C220	C270	C325	C330	C390	C570
GEAR IN S.S. AISI 316 L	•								
GEAR IN CY5SnBIM antiseizure	•								
BILOBE IN S.S. AISI 316 L	•	•	•	•	•	•	•	•	•
BILOBE IN CY5SnBIM antiseizure	•	•	•	•	•	•	•	•	•
QUADRILOBE IN S.S. AISI 316 L		•	•	•	•	•	•	•	•
QUADRILOBE IN CY5SnBIM antiseizure		•	•	•	•	•	•	•	•

(*) Ingranaggio per C100

1.3.6 Tightening torque

This table shows the tightening torque values, to be used as reference during all assembly and disassembly operations of pump components, in one or more parts. The values mentioned in the table below relate to gear adjustment, rotor blocking, pumping body blocking, front cover blocking, bearing ring blocking and gear ring blocking.

MODEL PUMP	GEAR ADJUSTMENT (pos. 8, pag.3)			ROTOR LOCKING (pos. 42, pag.3)			ROTORCASE LOCKING (pos. 52, pag.3)			FRONT COVER LOCKING (pos. 51, pag.3)		
	Thread d x passo	Key type / Size [mm]	TORQUE [Nm]	Thread d x passo	Key type / Size [mm]	TORQUE [Nm]	Thread d x passo	Key type / Size [mm]	TORQUE [Nm]	Thread d x passo	Key type / Size [mm]	TORQUE [Nm]
C100	M4X0.7	A/7	3	M8X1	A/17	25	M6X1	A/10	10	M6X1	A/10	10
C110 C115	M5X0.8	B/4	5	M12X1	A/27	85	M8X1.25	A/13	30	M8X1.25	A/13	30
C220 C270	M6X1	B/5	10	M14X1.5	A/30	190	M10X1.5	A/17	50	M10X1.5	A/17	50
C325 C330 C390	M8X1.25	B/6	20	M20X1.5	A/38	305	M12X1.75	A/19	70	M10X1.5	A/17	50
C570	M16X2	A/24	170	M36X2	A/60	600	M14X2	A/22	115	M14X2	A/22	70

MODEL PUMP	BEARING RING NUT LOCKING (pos. 21, pag.3)			GEAR RING NUT LOCKING (pos. 42, pag.3)		
	Thread d x passo	Key type / Size [mm]	TORQUE [Nm]	Thread d x passo	Key type / Size [mm]	TORQUE [Nm]
C100	-	-	-	M20X1	HN4	50
C105 C110 C115	M30X1.5	HN6	90	M30X1.5	HN6	90
C215 C220 C270	M40X1.5	HN8	105	M35X1.5	HN7	90
C325 C330 C390	M50X1.5	HN10	115	M40X1.5	HN8	105
C430 C440	M70X2	HN14	220	M60X2	HN12	145
C470 C490	M80X2	HN16	400	M70X2	HN14	220
C550 C570 C590	-	-	-	M100X2	HN20	600

NOTE

The "A" type spanner - re. "spanner type" column - is a polygonal spanner; the C or CF type spanner - ref. "spanner type" column - is hexagonal (inbus or imbus).

With regard to the tightening torque value of the elements that make up the LPDP, please refer to the use and maintenance manuals (flexible transmission coupling, motorization).

1.3.7 Bearings

The table to the side shows, according to the pump size, the identity abbreviations of the bearings fitted on the transmission shafts of the LPDP, inserted in the LPDPG.

The front bearing has position number 29, whilst the rear bearing has position number 30, with reference to the exploded view of page 5 in this chapter.

- ⚠ The bearings of pump mod. 100 are ISO standard radial rollers type. The radial rear roller bearings combined with NATB 5904 oblique ball bearings, undergo an assembly adaptation to cancel the axial play.
- ⚠ The bearings of pump mod. 110 - 115 - 220 - 270 - 325 - 330 - 390 - 570 are made up of two metric bearings with a single row of conical rollers, by a spacer for the internal rings and by a spacer for the external rings. The assembly of the bearings is performed accurately by our technicians to ensure ideal rotation without play. For this reason, these bearings must be requested directly from O.M.A.C. s.r.l. that supplies them already pre-assembled with the right pre-load.
- ⚠ The duration of the bearings varies significantly according to the varying of the working conditions (speed, pressure, absorbed power) and therefore one cannot define it beforehand.

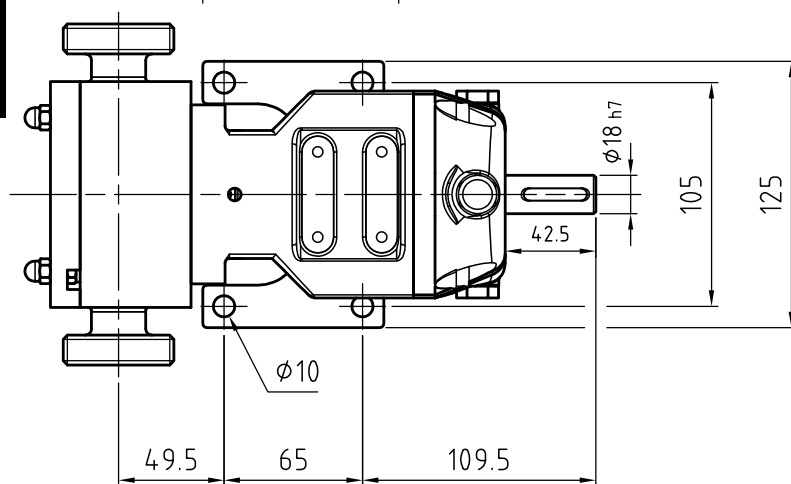
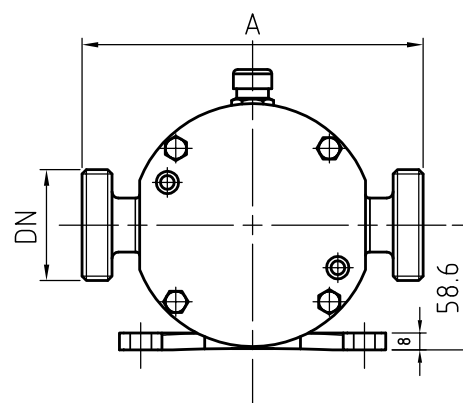
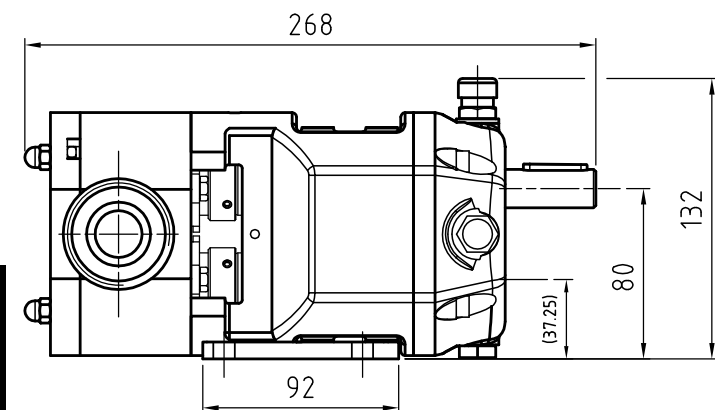
PUMP MODEL	BEARING CODES	
	FRONT	REAR
C100	2019M020	406FNATB5904
C105 C110 C115	32007X	
C215 C220	32009X	
C325 C330 C390	33210	
C570	33022	

1.3.8 Weights and dimensions table of the LPDP

The table below shows the dimensions of the LPDP, with reference to its size and according to the type of connections it is equipped with.

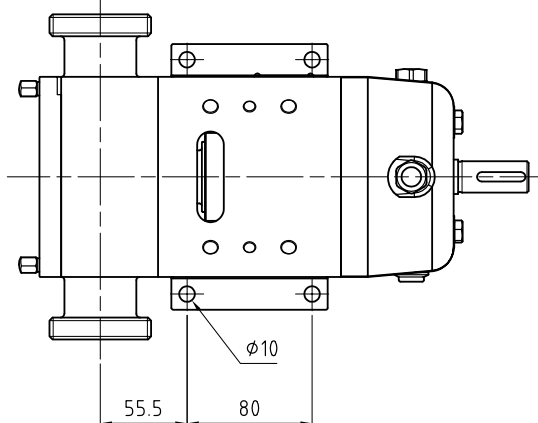
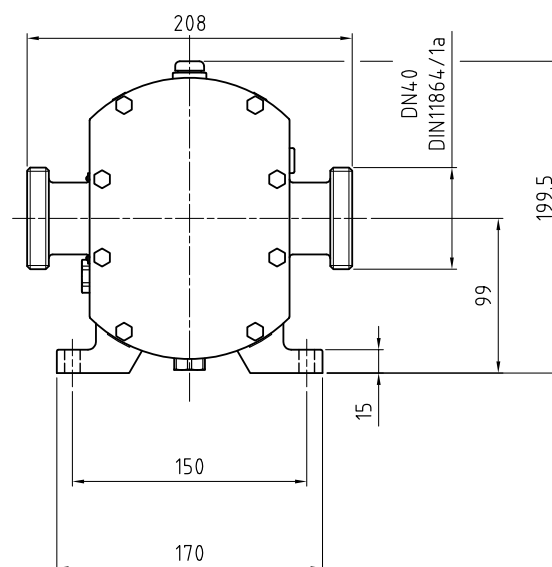
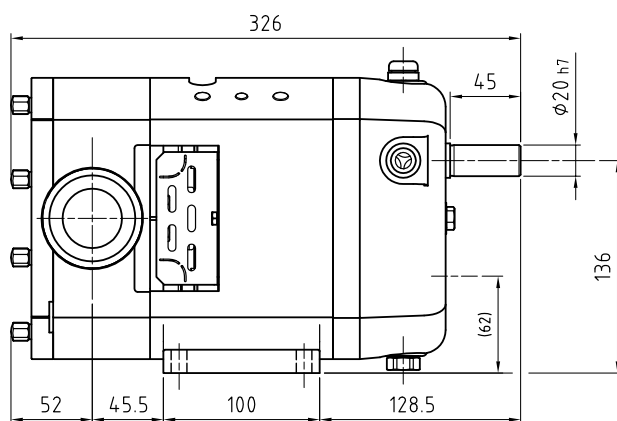
With regard to the dimensions of the LPDP, these vary according to the type of control unit supplied, therefore they must be expressly requested to the O.M.A.C. Technical Office.

C100

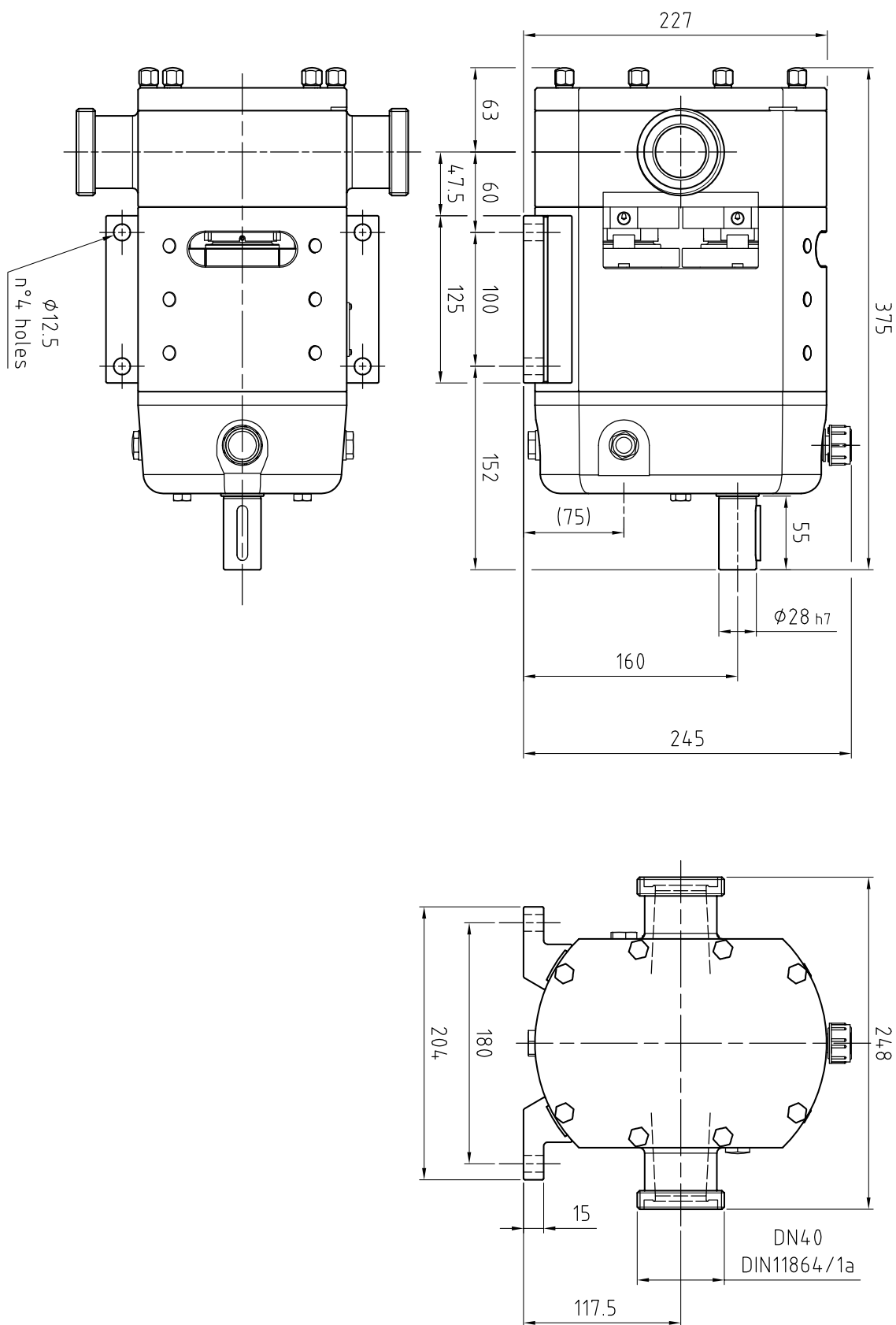


Raccordo / Ports	DN	A
DIN 11851	25	160
DIN 11864/1a	25	160
DIN 11864/3a	25	160
SMS	25	150
BS-RJT	25	157
ISS-IDF	25	153
TRI-CLAMP	1"	160

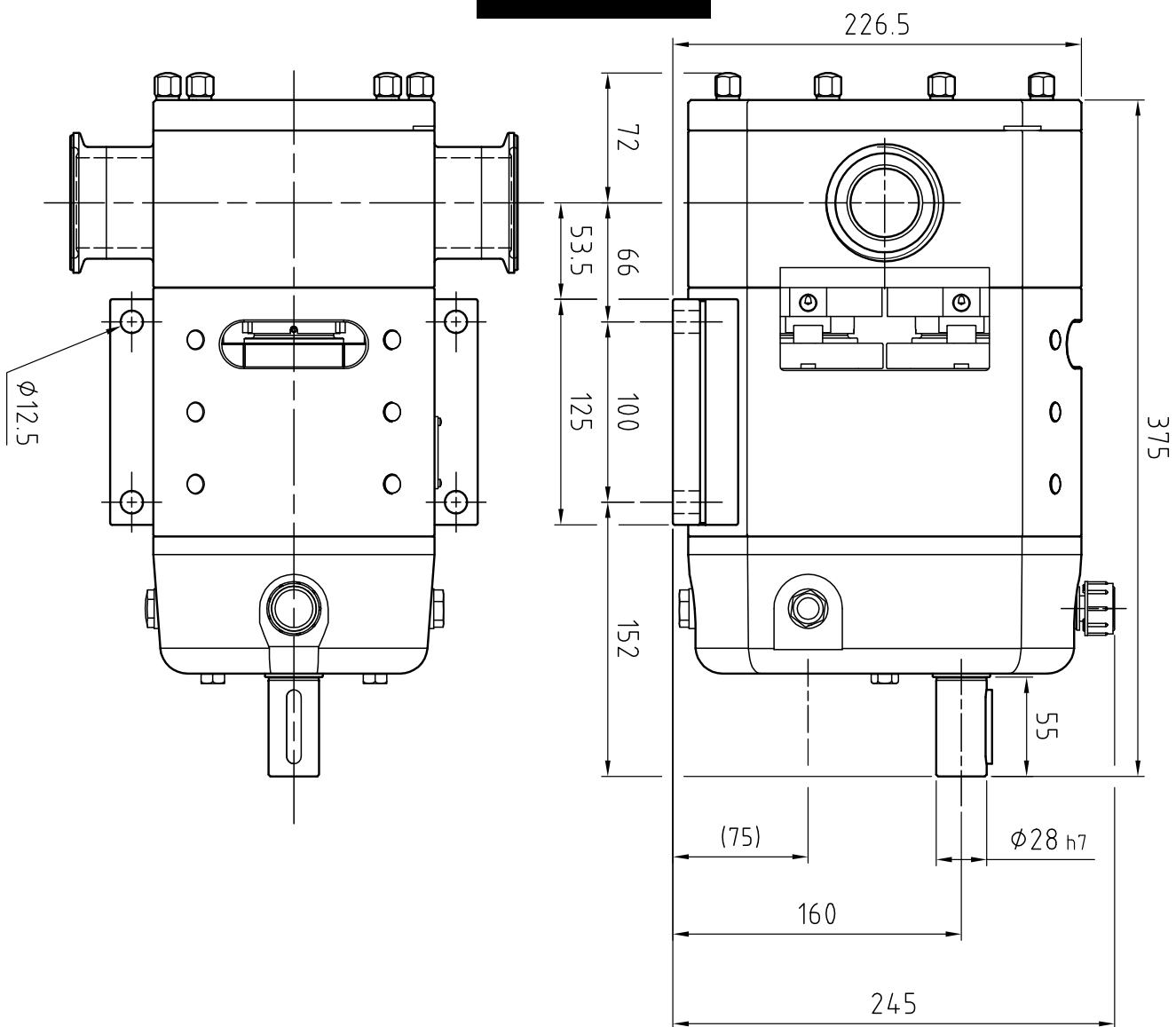
C115



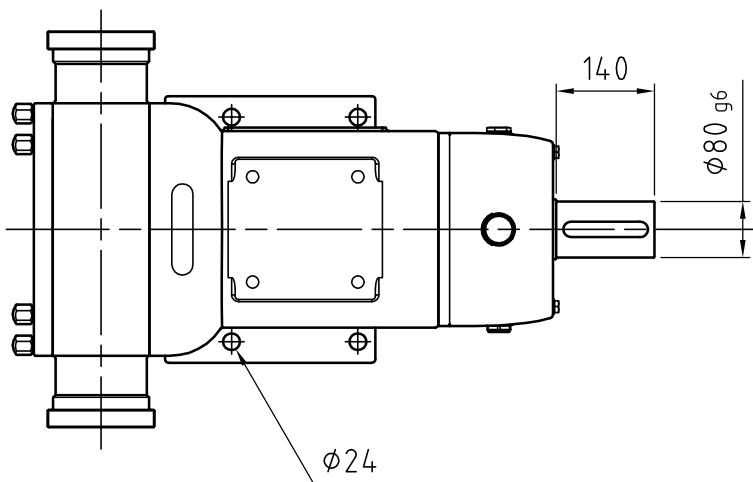
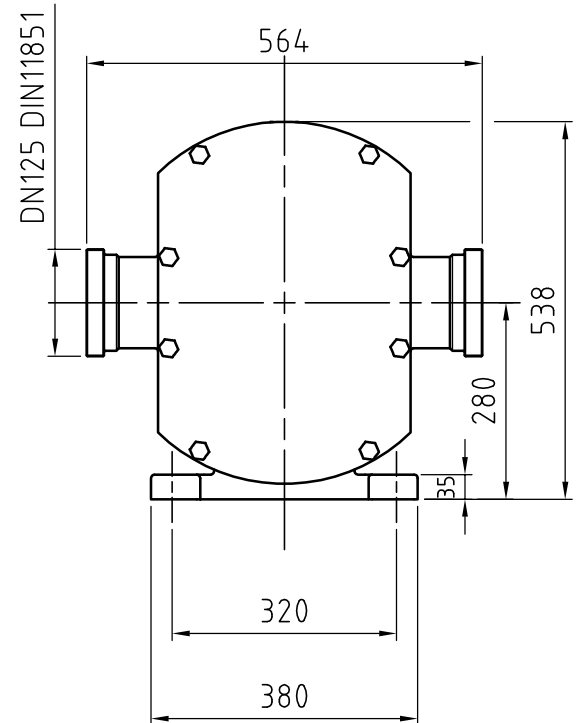
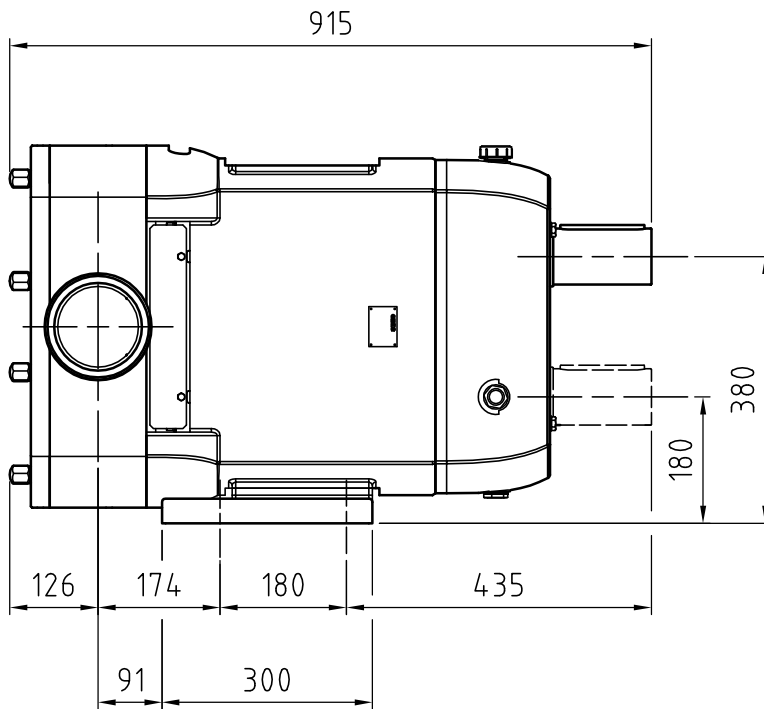
C220



C270



C570



Ports	DIN11851	DIN11864/2	DIN2576
	DN125	DN125	DN125
		DN150	DN150

1.3.9 Dimensions of the heating/cooling rotorcase cover connections and of the flushing seals connections.

At times the Customer may request, according to the production needs, to heat/cool the pumping chamber or to fit some flushed mechanical seals (for further information please refer to section 1.11).

The dimensions of the heating / cooling fluid inlet and outlet holes of the rotorcase and the dimensions of the flushing holes of the mechanical seals are shown in the following table and are divided per pump model.

Dimensions A, B and C are expressed in inches, dimensions D, E, F, G, L in millimetres.

POS.	DESCRIPTION	PUMP MODEL								
		C100	C110	C115	C220	C270	C325	C330	C390	C570
A	Seal flushing holes									
C	End cover heating fluid connections size									
D	Distance between end cover fluid connections		please contact the Technical Dept.							
E	Nut heigh									
F	End cover heating chamber thickness									
G	End cover heating chamber diameter									
L	Pump lenght									



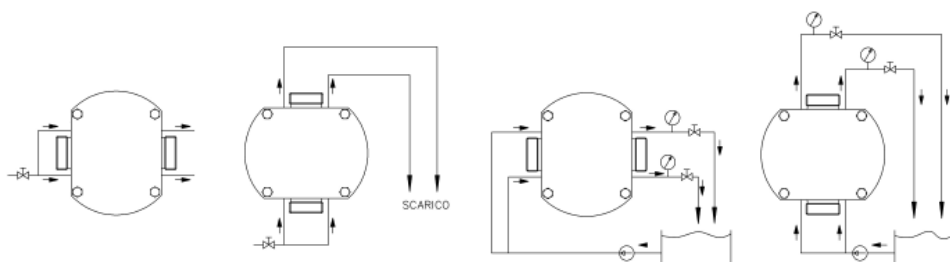
ATTENTION

The drawing on the right shows the connection method of the seals flushing system, with indication of the flushing liquid circulation direction. Carefully read and understand the flushing operation methods described in section 5.7.4

FLUSHING DISPOSABLE CIRCUIT

FLUSHING CIRCUIT WITH TANK

HEATING/COOLING COVER



1.3.10 Lubricants used and quantities

The three tables show the general features of lubricant oil that can be used to lubricate bearings and sprocket wheels.

Tables A and B show the type of oil to be used according to the temperature of the processed fluid (from -20°C to +90°C, and from +90°C to +150°C): table A only refers to lobe displacement pump models 100, 110, 115, 220, 270, 325, 330, 390, 570.

The lines of the table that refer to "BRAND" list a series of possible suppliers where the lubricant can be bought.

Table C shows the amount of lubricant, expressed in litres, to be inserted in the gear box, according to the pump size, and after having removed the previous exhausted oil, as described in chapter 5.

Should it be expressly requested by the customer, the LPDP can be equipped with alimentary type lubricant oil, NSF certified in H1 category.

PUMP MODEL	BRAND	WORKING TEMPERATURE	
		da -20°C a +90°C	da +90°C a +150°C
		(oil viscosity ISO VG 68)	(oil viscosity ISO VG 150)
C100 C110 C115 C220 C270 C325 C330 C390 C570	ESSO	SPARTAN EP 68	SPARTAN EP 150
	SHELL	OMALA OIL 68	OMALA OIL 150
	CASTROL	ALPHA SP 68	ALPHA SP 150
	BP	ENERGOL GR-XP 100	ENERGOL GR-XP 150
	MOBIL	MOBILGEAR 626	MOBILGEAR 629
	AGIP	BLASIA 68	BLASIA 150
	FINA	GIRAN 100	GIRAN 150

table A

PUMP MODEL	BRAND	WORKING TEMPERATURE
		da -20°C a +150°C
		(oil viscosity ISO VG 150)
C570	ESSO	SPARTAN EP 150
	SHELL	OMALA OIL 150
	CASTROL	ALPHA SP 150
	BP	ENERGOL GR-XP 150
	MOBIL	MOBILGEAR 629
	AGIP	BLASIA 150
	FINA	GIRAN 150

table B

PUMP MODEL	LIT
C100	0.2
C110 C115	0.5
C220 C270	1
C325 C330 C390	2.2
C570	15

table C

1.4 Intended use

The C and CF Series Lobe Positive Displacement Pump Group, manufactured and marketed by O.M.A.C. s.r.l., which in this documentation will be indicated with the abbreviation LPDPG, has been designed and made to be assembled in industrial plants owned by third parties, to transfer volumes of fluids, compatible with the materials used during the construction of this machine: section 1.4.1 lists the recommended operational features of the LPDP, depending on the processed fluid.

The LPDPG requires compliance with all technical indications in this operation and maintenance manual, which in this documentation will be indicated with the abbreviation OMM, for its proper installation.

In general, the processed fluids must meet the following specifications:

Fluid properties and range of use:

- 1) TEMPERATURE: from -35°C to +180°C
- 2) VISCOSITY: Maximum 200'000cPs with forced feeding
- 3) HARD PARTICLE SIZE: Maximum 80% of clearance between rotors (see sect.1.3.4)

The LPDPG has been designed and made for two types of use:

- alimentary use;
- chemical use.



WARNING

The LPDPG, for alimentary use, has been made to ensure a hygienic standard equal to **LEVEL 3**, on the basis of **UNI EN 13951**.

The LPDPG for chemical use and for chemical use has been designed to transfer volumes of fluids without altering the organoleptic properties nor the physical properties.

**WARNING**

The LPDPG is E.H.E.D.G. certified, with **Certificate nr. 13/2008** of **TUM Technische Universität München** of Freising, Weihenstephan - Germany

**WARNING**

During its normal use, the LPDPG for alimentary use and chemical use does not alter the organoleptic characteristics or the physical characteristics of the processed fluid.

Every LPDPG comes with a technical sheet indicating the operational features in relation to the processed fluid that must be handled (name of the fluid, viscosity range, capacity range, speed range, temperature range), as declared at the time of purchase by the Customer.

Section 1.3 shows a facsimile of the LPDPG technical sheet.

Every modification to what is indicated in the specific technical sheet or variation of the machine operating parameters must be authorised in writing by O.M.A.C. s.r.l.; the absence of such authorisation is deemed "improper use" and will void any warranty or liability under way between Manufacturer and Customer.

**DANGER**

Any use of the LPDPG in conditions other than those indicated in "Fluid properties and range of use" and in conditions other than those indicated in the machine technical sheet is forbidden, without explicit written authorisation, issued by O.M.A.C. s.r.l.

The LPDPG for alimentary use and for chemical use has NOT been designed nor built to handle pharmaceutical, explosive, etc. fluids, and in general fluids that do not comply with the indications of the specific technical sheet.

In addition, the LPDPG for alimentary use and chemical use has NOT been designed nor built to handle what is indicated in Regulation (EC) No. 1005/2009 of the European Parliament and the Council of 16 September, 2009, on substances that deplete the ozone layer.

**ATTENTION**

It is forbidden to use the LPDPG for alimentary use and chemical use to transfer the substances listed in Annex I of Regulation No. 1005/2009.

The pumping part of the LPDP is made up of the pump body, in which two rotors are housed (sect. 1.3.5 lists the types of rotors used), which rotate synchronised in the opposite direction to each other.

The rotorcase receives the process fluid from the suction inlet, originating from the plant of the Customer. During the operation of the LPDP, the cavities between the lobes of the rotors are filled with fluid and the counter-rotation of the rotors transfers the fluid to the delivery outlet of the pump body, channelling it in the plant where the LPDPG is installed.

1.4.1 Recommended use guidelines for the transfer of some type of some types of processed fluid

As an example, the following table lists some types of fluids that can be processed by the LPDP, part of the LPDPG; for each one, we suggest a value or range of viscosity, fluid temperature, pump rotation speed, O.M.A.C. identification code of materials for seals, gaskets and rotors (see coding section 1.2.2).

The application requested by the customer is examined by the O.M.A.C. s.r.l. Technical Office, which edits the technical sheet of the LPDPG, specifically for the requested application.

Therefore, in all cases and without any exceptions, one must comply with the technical specifications, shown in the technical sheet of the LPDPG, these specifications have absolute priority over the data shown in the next table.

**ATTENTION**

On the basis of the features of the processed fluid, O.M.A.C. identifies and uses materials compatible with the proper processability of the fluid, and these features are specifically mentioned in the **technical sheet** of the LPDPG.

PRODUCTS	VISCOSITY cP	TEMPERATURE °C	SPEED RPM	SEALS		O-RING	ROTORS	
				1°	2°		1°	2°
DAIRY PRODUCTS								
MILK	2	18	250-400	3	0	T	0	-
YOGHURT	50-150	20-40	250-350	6	3	T	0	-
BUTTER	50000	4	20-70	5	-	T	5	-
CREAM 30%	14	16	250-350	3	0	T	0	-
CURD	20-500	10	50-200	3	0	T	0	5
CONDENSED MILK	40-80	40	250-450	3	0	T	0	-
CONDENSED MILK 75% S.S.	2000	20	200-400	5	3	T	0	-
MELTED BUTTER	40	50	300-400	5	-	T	0	-
PROCESSED CHEESE	30000-6500	18-80	200-400	5	-	T	0	5
COTTAGE CHEESE	30000	18	50-150	5	-	T	0	5
WHEY	1	20	300-500	3	0	T	0	-
MILK ENZYMES	5	10	250-300	3	0	T	0	-
FOOD PRODUCTS								
ICE-CREAM	400	10	200-300	5	0	T	0	5
BROTH	1-400	20	250-450	5	3	T	0	-
COCOA BUTTER	50-0.5	60-100	300-400	5	-	T	0	-
ANIMAL FATS	60	40	250-400	3	-	T	0	-
MEAT EXTRACT	10000	65	200-350	5C	-	T	0	-
ICE-CREAM	400	10	200-300	5	0	T	0	5
BROTH	1-400	20	250-450	5	3	T	0	-
COCOA BUTTER	50-0.5	60-100	300-400	5	-	T	0	-
ANIMAL FATS	60	40	250-400	3	-	T	0	-
MEAT EXTRACT	10000	65	200-350	5C	-	T	0	-

MAYONNAISE		20000	20	200-300	5	-	T	0	-
MALT EXTRACT		3000-9500	18-60	200-300	5	1	T	0	-
SUGAR CANDY		30000	20	150-250	5C	1	T	0	5
MOLASSES		280-15000	40	150-300	5	1	T	0	5
JAM		8000	16	200-350	5	-	T	0	5
HONEY		1500	40	250-350	5	-	T	0	-
WHOLE EGGS		150	4	200-350	6	5C	T	0	-
BREWER'S YEAST		350	18	300-400	5	-	T	0	-
SOYA LECITHIN		6000	50	200-300	5	-	T	0	-
OLIVE OIL		40	38	250-350	5	3	T	0	-
VARIOUS SEED OIL		20-60	20	250-350	5	3	T	0	-
MINCED MEAT		100000	30	20-150	5	1	T	5	-
PECTIN		300	30	300-400	3	5	T	0	-
MAIZE PORRIDGE		100	100	100-200	1	0	T	0	-
COOKIE PASTRY		5000-10000	18	50-150	5	-	T		0
CHOCOLATE		200-2000	18-40	50-150	0	1	T	0	-
ICING		500-2000	18	100-300	5	-	T	5	0
BRINE		1	20	300-450	6	5	T	0	-
TOMATO SAUCE		10	20	200-300	5	-	T	0	-
DICED TOMATO		10	20	50-200	5	-	T	5	-
TOMATO PURRÉE		7000	20	150-250	5	-	T	0	-
TOMATO TRIPLE PURRÉE		12000	18	150-250	5	-	T	0	-
TOMATO PASTE		200	18	200-300	5	-	T	0	-
KETCHUP		1000	30	200-300	5	-	T	0	-
DRINKS									
GLUCOSE		4300-8600	25-30	200-300	5C	-	T	0	-
SORBITOL		200	20	250-350	5	-	T	0	-
SUGAR SOLUTIONS	30° BRIX	4	10	300-400	5	-	T	0	-
	40° BRIX	10	10	300-400	5	-	T	0	-
	50° BRIX	25	10	300-400	5		T	0	-
	60° BRIX	60	18	300-400	5	-	T	0	-
	70° BRIX	550	18	250-350	5	-	T	0	-
	80° BRIX	6000	30	200-300	5	-	T	0	-
VINEGAR		15	20	300-500	3	-	T	0	-
WINE		1	18	350-750	3	-	T	0	-
SPIRITS		10-100	20	250-400	5	-	T	0	-
ALCOHOL		1	18	300-500	3	-	T	0	-
GRAPE JUICE		1	18	350-450	5	-	T	0	-
BEER		1	18	300-400	3	-	T	0	-
POTATO PURÉE		400-4000	18	150-300	5	-	T	0	5
FRUIT JUICE		20-80	18	250-400	5	-	T	0	-
CONCENTRATED ORANGE JUICE		5000-500	5-20	200-300	5	-	T	0	-
COSMETICS AND PHARMACEUTICAL PRODUCTS									
DODECILBENZENSULPHONIC ACID		6000	18	300-400	5	-	V	0	-
DETERGENTS		100-4000	18	250-400	5	3	V	0	-
HAND CREAM		800-35000	20	150-350	5	3	V	0	-
SHAMPOO		2000	20	250-350	5	3	T	0	-
HAIR GEL		5000	20	250-350	5	3	T	0	-
NAIL POLISH		10000	20	250-350	5	-	P	0	-
SOAP		3000	20	150-250	1	-	V	0	-
TOOHPASTE		100000	18	50-150	5	1	V	0	-
HYDROGEN PEROXIDE		1		300-400	7	5	V	0	-
GLYCERINE		600	18	250-350	6	4	T	0	-
VASELINE		30000-500	10-40	40-350	5	-	T	0	-
INDUSTRIAL PRODUCTS									
CITRIC ACID		1	20	300-450	3	-	T	0	-
SULPHONIC ACID		125	30	250-400	5	6	V	0	-
NEUTRALIZED ETHOXYL ALCOHOLS		200-600	60-30	300-400	5	-	P	0	-
ISOPROPYL ALCOHOL		1	20	300-400	3	-	U	0	-
FLAVOUR FOR TOBACCO		30/09/00	20	300-450	5	3	T	0	-
FERMENTATION SOUP		20	20	250-350	3	-	T	0	-
CELLULOSE		6000-15000	18	250-350	5C	-	P	0	-
WAX		500	93	200-300	5	-	T	0	-
VINYL GLUE		1500	18	200-300	5C	1	V	0	-
UREIC PHENOLIC GLUE		600	20	200-300	5C	1	P	0	-
LATEX EMULSION		200	20	300-400	5C	-	P	0	-
PARAFFIN EMULSION		3000	18	250-350	5	-	V	0	-
ETHYLENE		20	20	250-400	3	-	T	0	-
ETHYLENE GLYCOL		10	20	250-400	3	-	T	0	-
PRINTING INK		500-2000	35	300-500	6	-	V	0	-
FLUID SILICONS		500	40	300-400	5C	-	P	0	-
DYES		1-200	20	300-500	6	-	V	0	-
ACRYLIC RESIN		5000	20	200-300	5C	1	P	0	-
ALKYL RESIN		180-900	5-40	250-350	5C	1	V	0	-
VINYL RESIN		5500	20	200-300	5C	1	V	0	-

1.5 Material specifications

Below, listed per each component (bearings box, rear cover, rotorcase,...) of the LPDP, inserted in the LPDPG, are the materials the components can be made of.

COMPONENT	USED MATERIALS
BEARING BOX	CAST IRON GG25
GEAR COVER B1 B2 B3 B4 SERIES	ALLOY
GEAR COVER B5 B6 SERIES	CAST IRON GG25
PUMPING CASE	AISI 316 L or in optional: HASTELLOY C276; TITANIO GRADO 5; DUPLEX SAF 2507
SHAFTS	AISI 316 L or in optional: HASTELLOY C276; TITANIO GRADO 5; DUPLEX SAF 2507
ROTORS WITH STANDARD CLEARANCES	AISI 316 L or in optional: HASTELLOY C276; TITANIO GRADO 5; lega antifrizione CY5SnBIM
ROTORS WITH INCREASED CLEARANCES	AISI 316 L or in optional: HASTELLOY C276; TITANIO GRADO 5; lega antifrizione CY5SnBIM
RUBBER COATED ROTORS	Soul in AISI 316 L + optional one of the following elastomers: N.B.R., E.P.D.M., "VITON (F.K.M.)

1.6 Occupied workplaces

The LPDPG does not occupy any operator in a fixed manner. The operator occupies an occasional workplace and checks its proper operation as per the inspection and checking activity of the productive line the LPDPG is part of.

1.7 Indication of the safety systems

In order to reduce the risks associated with malfunctions or misuse, the LPDPG is equipped with the following security systems that are able to prevent / manage situations of danger for the operator:

- ⚠ fixed joint transmission guards;
- ⚠ emergency stop button;
- ⚠ seal protections (excluding the LPDP version with flushed mechanical seals or double mechanical seals).

As an optional feature, the LPDPG can come with the full fairing. Below there are the above mentioned safety systems.

1.7.1 Flexible transmission coupling protection

The flexible transmission coupling is protected by a removable mechanical transmission device, made up of an even coverage, accurately shaped and made of AISI 304 or aluminium, which protects the operators from contact with the rotating parts.



DANGER

It is absolutely forbidden to operate the LPDPG if the safety devices have been removed.

1.7.2 Emergency stop

The emergency stop is a safety system made up of a red button, in the shape of a mushroom, on a yellow background and fitted on the electric panel, eventually supplied with the LPDPG. These buttons, when present and pressed, block the work cycle of the LPDP, stopping every movement in a few seconds: therefore they have no effect on stopping the work cycle of the plant the LPDPG is connected to. Therefore, to stop the operation of the plant, upstream and downstream from the pump, one must act on the plant emergency stop buttons.



DANGER

This emergency stop button IS NOT THE PLANT EMERGENCY STOP BUTTON.

To stop the operation of the plant, upstream and downstream from the pump, one must act on the plant emergency stop buttons. The emergency stop button can only be used in situations of severe and immediate danger, which require the immediate stop of all parts. Once the button has been pressed it will stay blocked until the operator performs its manual unblocking (by rotating it in the direction indicated by the arrow printed on the control), thus maintaining the LPDPG in a state of emergency.



DANGER

It is absolutely forbidden to operate the LPDPG if the safety devices have been removed. Damaged safety devices must be replaced immediately. Never neutralise the safety devices.

1.7.3 Seals protections

The seals protections, re. position 239, section 1.3, are laminations made of AISI 304 or resistant plastic and are applied with screws on the bearings box to protect the operator from contact with the rotating parts of the pump: in particular they cover the rear area of the pump body where the seals supports are fitted.



DANGER

It is absolutely forbidden to operate the LPDPG if the safety devices have been removed.

1.7.4 Optional features: full fairing

The full fairing of the LPDPG is made up of a cover made of AISI 304 shaped appropriately, according to the dimensions of the unit, and fully covers the transmission parts during their operation, in order to protect the operators present on the plant layout, where possible, from the accidental contact with the parts.



DANGER

It is absolutely forbidden to operate the LPDPG if the safety devices have been removed.

1.7.5 Optional features: Electric safety devices and pressure limiters

Upon specific request of the customer company it is possible to equip the LPDPG with two kinds of safety systems:

- pressure;
- electrical;

In particular the electrician called by the customer to perform this connection and qualified for the job, must design and make the electrical connections in compliance with the electrical regulations in force.

The electrician called by the customer to carry out the connections above must also envision a general reset function after the activation of the emergency state.



DANGER

It is absolutely forbidden to perform maintenance or repairs interventions on the LPDPG, without having worn the PPE.



DANGER

It is absolutely forbidden to operate the LPDPG after the occurrence of faults or malfunctions of the pump or equipment or devices connected to it. Damaged safety devices must be replaced immediately. Never neutralise the safety devices.

Never carry out any type of maintenance intervention directly, always contact the maintenance manager. Only this person is qualified to carry out maintenance operations professionally and in safety conditions. Before carrying out maintenance activities on the LPDPG, ensure that there are no danger situations and that the machine and plant it is connected to are in emergency stop conditions.

1.8 Noise and vibrations emitted

In the envisioned conditions and methods, the sound level test was carried out to define the noise value emitted by the LPDP. The sound level test of the LPDP was performed using water as process fluid, and using the O.M.A.C. pumps testing plant.

The sound level values detected were determined applying standard EN12639 and adopting the measuring specifications of ISO 3746, and are the following:

- ▲ Sound power level equivalent to 2 meters distance in work: 65 dB(A).

1.9 Use of the personal protection equipment

During the LPDPG assembly and disassembly operations, as during its routine and extraordinary maintenance, one must wear the personal protection equipment, according to the operation and risk connected to the activity performed by the appointed operator.



DANGER

It is absolutely forbidden to perform maintenance or repairs interventions on the LPDPG, without having worn the PPE.

PPE	RISK	USE	EXPOSED PERSONNEL
Shoes with reinforced toe caps and non-slip soles	Lower limbs crushing	always	maintenance operator / operator
Coated safety gloves	cuts and abrasions to upper limbs	during installation or use of the unit	maintenance operator / operator
Safety goggles	Dust	during installation or use of the unit	maintenance operator / operator
Filtering face mask	exposure to chemical agents	maintenance or cleaning	maintenance operator
Neoprene safety gloves	exposure to chemical agents	maintenance or cleaning	maintenance operator
Work clothes	Dust, entangling	always	maintenance operator / operator
Ear plugs	Noise	use of the pump unit	operator



ATTENTION

To prevent mechanical risks, such as dragging, entrapment and other, do not wear accessories such as bracelets, watches, wings or chains.

1.10 Personnel training

The LPDPG is made in such a manner to enable use directly by qualified personnel, for this reason one does not envision training periods, however the user, before performing any activities, must:

- carefully read this use and maintenance manual, paying attention to chapter 4, "Use of the machine",
- supervise routine maintenance operations;
- supervise the proper use of the LPDPG;
- check the protection devices work.



DANGER

Children, disabled persons, persons with by-passes or cardiac problems are not admitted as operators.

Therefore it is up to the customer to train the personnel appointed to use the machine, before it is commissioned.

The operator must have a technical professional qualification, as well as suitable knowledge of general safety standards.

During the training course, the training level of the operator must be supervised by the customer company, which has the technical and organisational knowledge necessary to carry out such task.

As provided by the current regulatory framework on health and safety at work, the training process should be formalised directly by the customer.



1.11 LPDP optional features

1.11.1 LPDP with rotocase cover heating/cooling chamber

In the event one wishes to maintain the pumped fluid at a constant temperature one can apply a cavity on the rotorcase cover for heating / cooling liquid circulation to all the pumps of the range (excluding C/CF 100). Typical cases are the transfer of glucose, chocolate, melted fats, butter, margarine, and others. For the dimensions of holes and the circuit diagram, consult the table in section 1.3.9.

The pipes and couplings for the circuit are not supplied with the pump.

1.11.2 LPDP with mechanical safety valve on rotorcase cover

One of the possible versions of the LPDP envisions the possibility to fit a mechanical safety valve on the rotorcase cover, which intercepts and dampens any pressure peaks over the limit for which the valve is set.

- The safety valve, fitted directly on the front cover of the pump, is reversible and activated by a spring compressed by a regulator;
- The setting of the safety valve must be carried out on site by the Customer, because the entity of the recycling depends on the pump speed, on the specific weight and product viscosity.
- To prevent continuous vibrations, the safety valve must be adjusted in such a way that it starts working at a pressure 10% higher than the working pressure.

1.11.3 LPDP with pneumatic safety valve on the rotorcase cover

One of the possible versions of the LPDP envisions the possibility to fit a pneumatic safety valve on the rotorcase cover, which intercepts and dampens any pressure peaks over the limit for which the valve is set. The valve is fitted on the rotorcase cover and is made up of a cylindrical casing in which a piston slides. The fluid pressure (FP) acts on the piston face, whilst the pressure of the pneumatic plant (PP) acts on a plate fixed to the piston.

When the force that the air exercises on the plate is higher than that exercised by the liquid on the piston, the valve stays closed, otherwise the piston moves opening discharge volumes in the pumping chamber, that enable pressure balancing. Calibrating the by-pass means supplying the air chamber with a pressure value that keeps the valve closed until the pressure limit value in the pump reaches the desired value.

1.11.4 LPDP with external mechanical bridge safety valve

The external safety valve is made up of a spring valve positioned on a pipe bridge that connects delivery and suction and can also be used as a by-pass to recycle all or part of the pumped liquid. On this valve, the adjustment of the tightness pressure is up to a spring that can be more or less compressed. The system composed in this manner is one-way so if one inverts the direction of the pump, it is essential to invert the positioning of the valve as well that, in any case, must always be on the delivery side.

One can choose various kinds of springs according to the working pressure. The adjustment must be carried out manually on site on the appropriate adjustment ring.

1.12 LPDPG optional features

1.12.1 Motorized LPDPG on fixed base

For customer needs, the motorized LPDPG can be assembled on a base made of AISI 304 or metal, to then be fixed, via bolts, to the floor.

The motorised LPDPG on a fixed base is made up as follows:

- ⤴ Support base made of press-moulded sheet metal;
- ⤴ LPDP fixed to the base;
- ⤴ Speed controller / gear motor / direct electric motor / hydraulic motor / pneumatic motor fixed to the base;
- ⤴ Flexible mechanical transmission coupling;
- ⤴ Flexible mechanical transmission coupling protection;
- ⤴ Seals protections (excluding the flushed mechanical or double mechanical seals);
- ⤴ Fairing (when envisioned in the pump unit supply, in this special version the mechanical transmission coupling protection is not installed).

1.12.2 Motorized LPDPG on trolley base

For customer needs, the motorised LPDPG can be assembled on a base made of AISI 304 or metal, equipped with polyamide or pneumatic wheels and trolley transportation handle.

The motorised LPDPG on a trolley base is made up as follows:

- ⤴ Trolley for unit transportation;
- ⤴ LPDP fixed to the trolley;
- ⤴ Speed controller / gear motor / direct electric motor / hydraulic motor / pneumatic motor fixed to the base.
- ⤴ Flexible mechanical transmission coupling;
- ⤴ Flexible mechanical transmission coupling protection;
- ⤴ Seals protections (excluding the flushed mechanical or double mechanical seals);
- ⤴ Fairing (when envisioned in the pump unit supply, in this special version the mechanical transmission coupling protection is not installed);
- ⤴ Electric control panel (not present in the version shown in the figure).

CHAPTER 2: TRANSPORTATION

In order to ensure safety of personnel involved and considering the peculiar features of the LPDPG, this can be handled only by personnel used to deal with heavy material and with the suitable hoisting equipment, complete with the relative hoisting accessories. For this reason only these people can recognise and exclude dangers for third parties and/or for the handled material.

Below there is a table illustrating the mass of the various LPDPG models.

LPDPG MODEL	WEIGHT (Kg.)	TYPE OF BELTS FOR LIFTING
C100	40	CHECK THE WEIGHT TO BE LIFTED
C110	80	
C115	80	
C220	130	
C270	130	
C325	220	
C330	220	
C390	220	
C570	1100	



DANGER

The LPDPG has dimensions and weights that change according to its version and size. Take great care when handling and transporting. In particular, carefully follow all instructions for correct weight distribution.



ATTENTION

Pay the most attention during the pump unpacking operations, described further on.

2.1 Hoisting and transportation

The LPDPG is delivered to the customer inside a wooden crate (pack closed with screws; for further information please refer to section 2.4 of this operation and maintenance manual).

On the basis of the weight table indications, at the beginning of this chapter, crate handling can be carried out only with a forklift with suitable capacity, supplied by the customer and driven by personnel appointed by the customer, with the requirements needed to perform all operations in safety conditions. In addition the personnel must be used to handle delicate high-tech loads.



DANGER

It is absolutely forbidden to handle the LPDPG without a forklift with suitable capacity and driven by a person authorised by the customer, with the appropriate legal requirements.



ATTENTION

The crate containing the LPDPG will be hoisted exclusively with a forklift.

To handle the crate, proceed as follows:

- ⤴ place the forks of the forklift in correspondence of the slits between the feet of the handled crate base; slowly position under the base of the crate, ensuring that the centre-line of the forklift corresponds to the centre-line of the crate;
- ⤴ hoist the LPDPG carefully by about 50 millimetres, checking it is parallel compared to the lorry bed;
- ⤴ reverse slowly, but evenly, until the whole crate is completely out of the way of the lorry bed;
- ⤴ lower immediately (very slowly and avoiding sudden stops when lowering) until the forks of the forklift are about 50 millimetres from the ground;
- ⤴ proceeding very slowly and carefully, put it in position.

Once the crate has been handled, one must place it near the LPDPG installation area, in order to reduce any risks deriving from the manual handling of weights.



DANGER

During hoisting and transportation operate with great caution, in order to prevent damage to people or things.



DANGER

During hoisting and transportation ensure that there are no exposed persons in a dangerous area.

2.2 Delivery and unpacking

a. Delivery

All the material supplied to the customer is accurately checked by O.M.A.C. s.r.l. before shipment. Upon receipt of the LPDPG ensure that the material has not been damaged during transport and that the package has not been tampered with resulting in removal of parts from the inside. If one finds the package is damaged, immediately notify the carrier and O.M.A.C. s.r.l. producing photographic documentation.

**WARNING**

With reference to the table at the beginning of this chapter, the weight of the LPDPG can vary according to its version and dimensions of the products it is made up of. The units must be handled using hoisting equipment, complete with the relative accessories.

b. Unpacking

Take utmost care during the unpacking operations of the LPDPG and complete the following steps:

- ⤴ Open the crate, using an electric screwdriver to remove the fixing screws of the crate lid;
- ⤴ Carefully remove the packaging from the LPDPG;
- ⤴ Check if the LPDPG has any visible signs of damage;
- ⤴ Place the packaging in the warehouse;
- ⤴ Ensure that there are the protective plastic caps closing the connections openings;
- ⤴ Ensure that the equipment supplied with the LPDPG is not damaged.

In the event there is damage or parts are missing, immediately notify the carrier and O.M.A.C. producing photographic documentation.

Unless otherwise indicated the LPDPG is shipped fully assembled, protected by a nylon sheet and set in a wooden crate. Fixing is achieved with four wood screws (see table in section 2.4); positioned in the appropriate pre-drilled holes on the LPDPG support base. Should the user need to transport the LPDPG one must restore the conditions described above.

**WARNING**

Keep the LPDPG packaging with care, during its entire operating period. The original packaging is needed for a possible transfer of the LPDPG, after its first installation.

2.3 Conditions for storage or extended interruptions of service

The LPDPG has been designed for immediate use, however if the machine down time conditions should occur for long periods, one must:

- ⤴ disconnect the LPDPG from the electrical mains;
- ⤴ following the instructions in this OMM, disconnect the LPDPG from the plant it is connected to; close the suction inlets and delivery outlets with the supplied closure plugs.
- ⤴ with reference to chapter 5 remove the seals and see to cleaning and sanitising them;
- ⤴ lubricate and clean the seals, the pump body and the parts contained;
- ⤴ put the LPDPG back in its original packaging, as instructed in section 2.4, covering the electric supply and control panels with particular care;
- ⤴ place the LPDPG on scaffolding with suitable capacity to support the weight of the LPDPG, avoiding putting weights on top of the machine;
- ⤴ store the LPDPG in a dry place, in its original packaging, positioning it according to the instructions shown on the crate;
- ⤴ store it at a room temperature above +5°C and below +30°C, and keep it in a sheltered place away from weather or other.

**WARNING**

Place the LPDPG back on the scaffolding with suitable capacity to support the weight of the LPDPG.

**WARNING**

In order to keep the features of the LPDPG unvaried, one must comply with all the instructions above and it is recommended to avoid particularly damp environments.

2.4 Packaging composition for future handling

In the event of transferring the LPDPG, after its first installation, one must use its original transportation crate.

**ATTENTION**

To transport the LPDPG, use the original O.M.A.C. transportation crate.

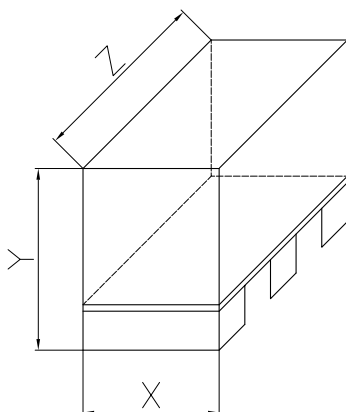
Fix the LPDPG with the appropriate fixing screws, to the wooden base, placing a nylon sheet between the wooden base and the unit.

**ATTENTION**

Place the nylon sheet between the wooden base and the LPDPG, to protect the machine from dust.

Subsequently, fit the external panels and lid on the sides of the base, which will make up the transportation packaging of the LPDPG. Below in the figure there is a typical example of the LPDPG packaging.

In cases where the legislation in force requires it, one must use wooden crates that have undergone fumigation treatment.

**TYPICAL PACKAGING DELIVERED**

LENGHT X WIDTH X HEIGHT of the CRATE(rif. Draw. Z x X x Y)	WEIGHT (kg)
36 X 26 X 39	5
45 X 35 X 44	7
65 X 43 X 54	10
76 X 42 X 64	13
86 X 61 X 74	19
100 X 42 X 53	16
120 X 80 X 117	45
130 X 53 X 64	20
160 X 63 X 74	31
160 X 63 X 135	41
200 X 71 X 104	51
230 X 72 X 95	61



2.5 Handling the LPDPG without packaging



ATTENTION

If the LPDPG is equipped with the full fairing, before carrying out hoisting operations one must "disassemble" the fairing by unscrewing the hexagon screws that fix it to the support base.

To handle and hoist the LPDPG without packaging, it is recommended to use hoisting equipment, complete with the relative accessories, with minimum capacity suitable for the machine to be hoisted (for weights consult the table below). Hoist and handle the pump Unit as indicated in the figure.

Only the BA BB BF100 model LPDPG can be handled and hoisted by hand as its maximum weight is 30 Kg. To carry out the mentioned operations use belts with adequate capacity (not supplied).



DANGER

It is forbidden to use worn hoisting belts.

All LPDPG handling operations must be carried out by personnel authorised by the customer. The authorised personnel must know how to use the hoisting equipment. He must:

- ⤴ use hoisting belts that are not worn;
- ⤴ arrange and wrap the belt around the LPDPG, as indicated in the figure on the following page;
- ⤴ stretch the belts delicately;
- ⤴ ensure that the belts do not strain and that their position around the LPDPG does not move when hoisting; in the event there is a speed controller fitted, make sure that the belts do not strain on the control hand-wheel;
- ⤴ hoist the LPDPG from the ground by about 20 - 25 cm and move it to installation place.

The position of the centre of mass is indicative because it depends on the configuration of the LPDPG.



WARNING

It is absolutely forbidden to hoist the LPDPG with methods other than those indicated.

CHAPTER 3: INSTALLATION

Before carrying out any intervention on the LPDPG, read and understand this chapter in full. The operators responsible for the assembly/installation activities must have good familiarity with this type of equipment and possess recognised technical skills acquired in at least three years of similar activities, this experience is essential to limit and reduce the risks involved in assembly/installation activities.

Good knowledge of the systems and components of the LPDPG is essential before carrying out any operation.



DANGER

Assembly and disassembly operations of the LPDPG, performed incorrectly and/or differently from the instructions herein, could be extremely dangerous and cause injuries.

Only use the tools and utensils listed in this manual; furthermore during assembly and disassembly operations one must wear personal protection equipment, listed in section 1.9 of chapter 1.

3.1 Destination an intended environments

In order to ensure maintaining the hygienic levels required by the customer, one must install the LPDPG in closed work environments, whose features comply with the requirements of this manual; the floor must be level, made of concrete, without bumps and solid enough not to collapse.

In the event the LPDPG is supplied for alimentary use, the work environment must meet specific hygiene regulations requirements.



ATTENTION

The LPDPG must be installed in closed work environments, not exposed to weather.



ATTENTION

Installation of the LPDPG for alimentary use and its place of use must comply with the hygienic and sanitary standards required by the legislation in force.

In order to facilitate installation, use, sanitisation and maintenance of the LPDPG, the Customer must prepare a space free from obstacles, with a free area of at least 3 m².



ATTENTION

A work space below 3 m² may lead to incorrect installation of the LPDPG as well as non-functional and easy maintenance.

3.2 Environmental conditions

The LPDPG gives maximum performance when used in work environments that meet the following work conditions:

RELATIVE HUMIDITY BELOW 50%

ROOM TEMPERATURE BETWEEN +5°C AND +40°C



ATTENTION

IT IS FORBIDDEN TO USE THE LPDPG IN ENVIRONMENTAL CONDITIONS OTHER THAN THOSE INDICATED ABOVE.



ATTENTION

ONE PROHIBITS ALIMENTARY USE OF THE LPDPG IN ENVIRONMENTS THAT DO NOT MEET THE HYGIENIC AND SANITARY STANDARDS REQUIRED BY THE LEGISLATION IN FORCE.

3.2.1 Room lighting

The Customer must ensure suitable lighting of the work area, as required by EU Directives and the work legislation in force.

So not to cause reflections that can distract and dazzle workers or prevent, even partially, reading the control panels and signals, when provided by the LPDPG configuration, we recommend using a diffused light.



NOTE

For maintenance and repairs interventions on the machine it is recommended to use a portable battery torch, which can be orientated in the most appropriate direction depending on the kind of intervention.

3.3 Installation and assembly

The assembly and installation of the LPDPG must be performed only by qualified personnel, authorised by the Customer in compliance with the standards in force, as well as observing the instructions supplied below.



ATTENTION

Depending on its use, it is responsibility of the Customer to equip the installation room in order to comply with the safety and hygiene standards in force.

To operate, the LPDPG needs to be connected to some utilities, such as for example:

TYPE OF UTILITY	USE
Company electrical system	electrical panel and control panel (if present) + earthing
	electric motor (in absence of control panel)
Hydraulic unit	optional features such as: hydraulic motor, seals flushing circuit
Pneumatic system	optional features such as: operation of the pneumatic safety valve
Customer plant	transfer of processed fluid

3.3.1 Notes for the installer

Before proceeding with the installation operations of the LPDPG, the installer responsible for these operations must make sure that the plant of the Customer has previously been cleaned with a piping washing cycle. during this cycle, the suction connection inlet of the plant must be connected directly to the delivery outlet of the plant, in order to carry out the preliminary washing and cleaning cycle.

This operation enables to eliminate all solid residues (dust, processing or welding scraps, etc.), produced during the pipes assembly stages, which may lead to malfunctioning of the LPDPG, such as possible rotor seizing.

Please note that the machine supplied by O.M.A.C. s.r.l. does not require preventive cleaning before use.



NOTE

The pipes cleaning and washing operation must be carried out whenever the Customer appoints the installer to perform changes on the plant, such as inserting manometers on the line, fittings or other, in order to ensure the elimination of solid particles that would lead to malfunctioning of the LPDPG. THE LPDPG MUST NOT UNDERGO THIS CLEANING CYCLE, MEANING THAT THE INSTALLER MUST CONNECT THE UNIT SUCTION PIPING DIRECTLY TO THE DELIVERY PIPING, THUS EXCLUDING THE LOBE POSITIVE DISPLACEMENT PUMP.

In addition, before production it is essential to carry out cleaning activities, as described in section 3.4.

3.3.2 Preliminary checks

To start installation activities, one must carry out some preliminary checks, relating to the work environment (with reference to section 3.2) and to the integrity of the product (with reference to section 2.2).

If this inspection should highlight the non compliance with the requirements, the Customer must:

- ⚠ in the event of environment inadequacy, proceed to meet the requirements;
- ⚠ if there is damage or non-compliance with the order, immediately notify O.M.A.C. s.r.l., producing photographic documentation;
- ⚠ make sure that the utilities, listed above, are near the LPDPG installation place and that they meet the requirements of section 1.3 and what is contained in the technical sheet.



ATTENTION

Failure to comply with the indications of section 1.3 and the technical sheet, may lead to anomalous operation of the LPDPG (excessive noise, vibrations, etc...) or malfunctioning that can cause mechanical damages.

The Customer is responsible for the installation and proper operation of the LPDPG as well as compliance with the indications of section 1.3 and the technical sheet.

- ⚠ ensure one can connect the LPDPG to a plant that meets at least the hygienic standard of the LPDPG, as shown in the declaration of conformity attached to this manual;
- ⚠ ensure that the Customer plant is, from the dimensional point of view, satisfactory for the requirements of the LPDPG (suction-delivery openings dimensions, piping diameter, height from the ground, unit dimensions, adequate N.P.S.H. (Net Positive Suction Head) available, linear piping to prevent back-flow, etc.);
- ⚠ make sure that the paving or metallic structure on which the LPDPG will be installed has a suitable capacity for supporting the weight of the unit;
- ⚠ make sure there is enough work space, free from obstacles, with a free area of at least 3 m² that ensures the execution of all needed operations in complete safety conditions for the operator.

3.3.3 Installation

Below there are the activities that one must carry out, for safe and efficient installation. In particular, the instructions are divided in simple stages, as described below:

STAGE 1: PLACEMENT

Following the provisions of section 3.3.1 - Preliminary checks - and on the basis of the indications of chapter 2 of this use and maintenance manual, the operators must see to harness and handle the LPDPG to place it in the position required by the Customer and specified in the plant layout.

During this stage, one will need to use a forklift with suitable capacity, driven by personnel appointed by the Customer, as per chapter 2. One must pay utmost attention in placing the LPDPG in the envisioned position without intervening on the unit piping.

In the LPDPG version with adjustable feet, the operators will see to measuring the height of the suction and delivery piping of the unit, after having positioned the machine. Then they must adjust the height of the unit openings at the measured height, acting on the adjustable feet. Once the second operation is complete, they can free the unit from the harnesses and proceed with stage 2 - fixing and installation, hooking the openings of the unit pumping part by screwing them onto the plant piping.



ATTENTION

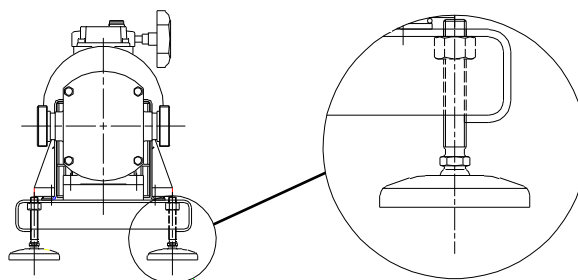
Check that there are the special non-slip rubber rings in the feet.



ATTENTION

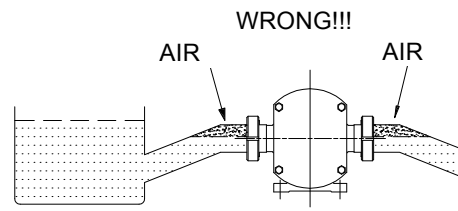
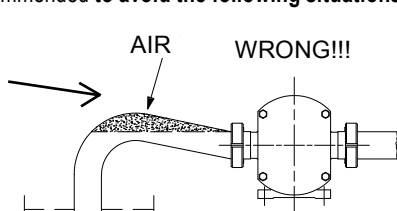
Ensure the Customer plant is aligned properly with the suction and delivery openings of the LPDPG.

When installing the LPDPG it is essential to leave a enough space for maintenance and possible removal.

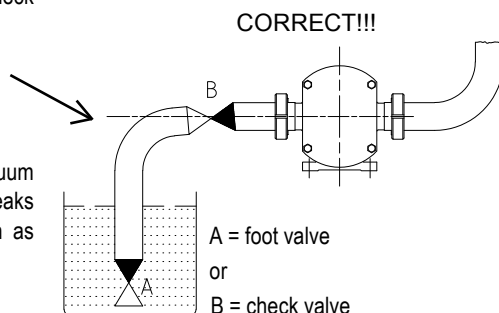


During **STAGE 1** relating to **POSITIONING** it is recommended to avoid the following situations:

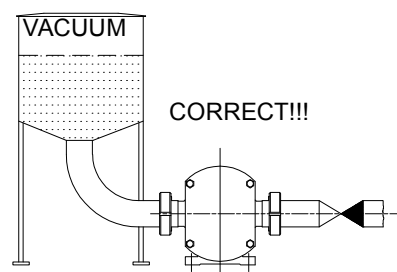
- in the event there are horizontal tracts of suction piping, make sure these are slightly inclined upwards to prevent air pockets from forming which would inhibit perfect priming of the LPDPG;



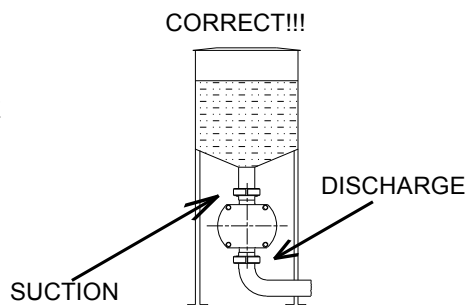
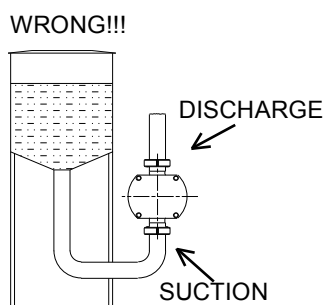
- if the LPDPG is not under the head, in the suction tract provide a foot or check valve to maintain priming; **PIC 4**
 - A = foot valve
 - B = check valve



- if the LPDPG is connected to a vacuum tank, one must reduce the load leaks due to the suction piping as much as possible;



- install a check valve on the delivery tract to prevent the back-flow of air or liquid during interruptions of service in order to maintain the pipes completely full and to facilitate starting when loaded.



- when applying in vertical position avoid connecting the suction inlet to the lower side and the delivery outlet to the upper side. The proper configuration consists in connecting the suction pipe to the upper side and the delivery pipe to the lower side.

STAGE 2: FIXING AND INSTALLATION ON SITE

Once the LPDPG has been positioned and aligned to the Customer plant, proceed to fix and install in the plant. Since fixing between the plant and the LPDPG involves the suction inlet and delivery outlet of the pumping body, listed below are the maximum values of forces and moments, indicated with EF and EM, which the pump body and consequently the LPDPG, of which it is a part, can sustain, as maximum values, during standard operation.

PUMP TYPE	FORCES [N]				TORQUES [Nm]			
	Fx	Fy	Fz	EF	Mx	My	Mz	EM
C / CF 100								
C / CF 110 115								
C / CF 220								
C / CF 220								
C / CF 325								
C / CF 330 C / CF 390								
C / CF 570								

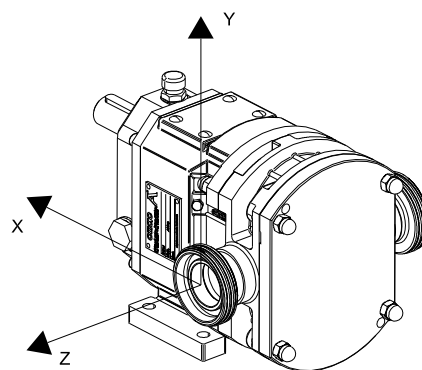
STAGE 3: CONNECTION TO THE PLANT

The suction inlet and delivery outlet of the LPDP, included in the LPDPG, are sized for the passage of even very viscous products, consequently the pipes do not necessarily need to be proportionate to them.

The suction and delivery pipes must be sized according to the calculations indicated in the O.M.A.C. technical manual, in relation to capacity, viscosity and pressure loss that one wants to achieve.

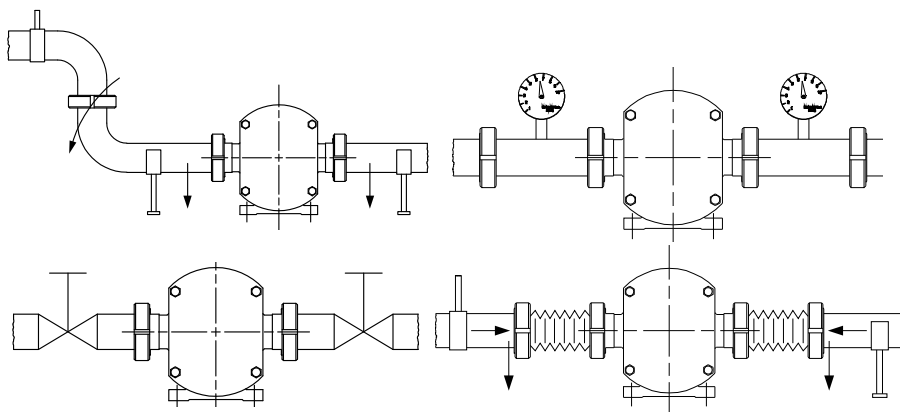
Displacement pumps can operate with significant pressure losses in delivery, but not in suction where it is recommended to use pipes as large and short as possible to maintain the NPSH required by the pump, part of the LPDPG, lower than the NPSH available in the plant of the Customer.

The LPDPG must always be installed as close as possible to the source from which it must suck up.



During **STAGE 3** relating to **CONNECTION TO THE PLANT** it is recommended to avoid the following situations:

- ✧ reduce the amount of bends and narrowing as much as possible all along the line;
- ✧ using long range bends avoiding to use "T" fittings and avoid unnecessary runs.
- ✧ check the complete air tightness of the suction fittings in order not to decrease the suction power of the pump.
- ✧ The weight of the piping must not rest on the pump body and it must be connected without using force to prevent overload and distortion of the pump body.
- ✧ In the case of very long piped, install a gate on the inlet and one on the outlet of the pump, to facilitate inspection without emptying the whole unit uselessly.
- ✧ it is recommended to fit manometers and vacuum gauges as close as possible to the pump. They will be very useful to check the standard operation conditions of the pump and diagnose any inconveniences such as: pressure overloads, absence of fluid, work conditions instability, cavitation.
- ✧ protect the pump from hard solid bodies entering. Where possible install a suction filter: the filtering area must not be less than 4-5 times the pipe section to minimise pressure losses.
- ✧ where possible, fit flexible expansion joints to reduce vibrations and prevent forcing due to thermal dilations of the pipes.



STAGE 4: FIXING THE LINE AND COMPLEMENTARY PROTECTIONS

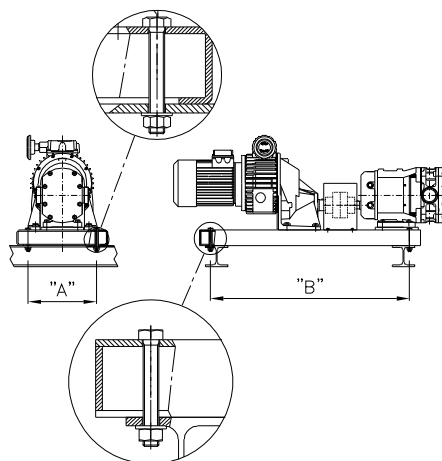
The LPDPG can be fixed in three ways, described below:



ATTENTION

If the LPDPG has been supplied in the full fairing version and the fairing, or other parts of the unit, have been removed to facilitate on site positioning operations of the LPDPG, one must re-fit these parts on the LPDPG before completing the fixing operations of the unit.

SUPPORT SIZE	A	B	DOWEL SIZE
0	220	590	M12
1	220	590	M12
2	270	720	M12
3	330	920	M16
4	400	1100	M20
5	500	1400	M20
6	500	1400	M20
7	180	460	M10
8	450	1250	M20



a) Fixing onto a metallic structure.

If one must fix the LPDPG to a metallic structure, use the special pre-drilled holes on the support base. With ref. to the following drawings, for the distances between the holes and the dimensions of bolted connections to use, see the table below, where for every kind of base size and its measurements "A" and "B", there are the sizes of the bolts for fixing to the metal structure



ATTENTION

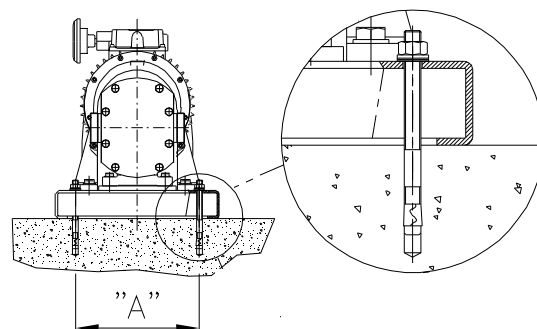
In the case the LPDPG is installed at a height, one must provide a containment tank for any loss of fluid or lubricant liquid, due to malfunctioning.

b) Fixing on a concrete base.

If one needs to fix the LPDPG on a concrete base use the special pre-drilled holes on the support base. For the distance between holes and the dowels to use, see the table below and the instructions supplied by the dowels manufacturer.

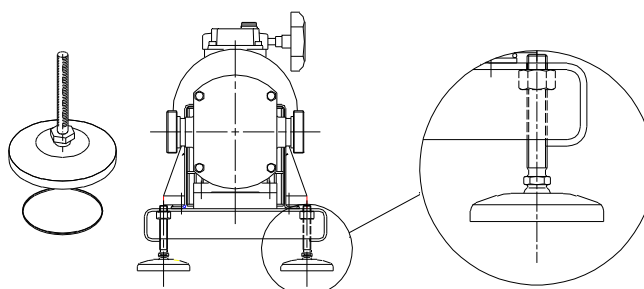
c) Support with adjustable feet

Upon explicit request of the user, the LPDPG can be supplied with four adjustable feet fixed to the support base.



ATTENTION

Check that there are the special non-slip rubber rings in the feet.



3.3.4 Accessories fitting

The LPDPG can come with the following optional accessories:

- a) mechanical safety valve on the cover of the pumping body (suitable for alimentary use);
- b) pneumatic safety valve on the cover of the pumping body (suitable for alimentary use);
- c) external bridge mechanical safety valve (suitable for alimentary use);
- d) seals flushing circuit;
- e) heating/cooling circuit on the cover of the rotorcase.

When the LPDP is for alimentary use the assembly or replacement operations of the accessories, listed above, must mandatorily be followed by the sanitisation procedures described in section 3.4 of this chapter, in order to restore the hygiene and safety level required (Lev. 3 of EN 14159).

These optional features must be order together with the LPDP becoming an integral part of it. Chapter 1 gives the technical specifications of the optional features listed above, below there are the methods for adjusting or connecting the LPDP to the relative supply circuits. These operations must always be carried out after installation (re. section 3.3.2) and therefore the indications below assume proper installation and connection to the energy sources.



ATTENTION

The adjustment of the mechanical and pneumatic safety valves, described below, must be carried out by the operator in charge, before commissioning the LPDP.

A) MECHANICAL SAFETY VALVE AND ADJUSTMENT

The mechanical safety valve is made up of a cylindrical shaft in which a piston slides, on which a load spring is fitted.

The mechanical safety valve is fitted directly onto the front cover of the pump (pump body cover) and its purpose is to intercept pressure peaks of the fluid in suction, allowing part of the processed fluid to recirculate in the pumping chamber.

The adjustment of the safety valve is achieved by adjusting compression of the spring (pos. 71) and on the adjustment screw (pos. 59). The adjustment of the spring establishes the pressure value at which the mechanical safety valve opens and this adjustment must be carried out on site, as the recycle entity depends on the pump speed, on the specific weight of the fluid, as well as its viscosity.

To prevent continuous vibrations, the safety valve must be adjusted in such a way that it starts working at a pressure 10% higher than the working pressure.



ATTENTION

It is recommended to adjust the mechanical safety valve at an opening pressure 10% higher than the LPDP working pressure.



ATTENTION

The adjustment of the mechanical safety valve must be carried out on site by the Customer, since the recycle entity depends on the LPDPG speed, on the specific weight of the fluid, as well as its viscosity.

To adjust the mechanical safety valve one must follow the instructions below:

1. Completely unscrew the adjustment screw (pos. 59) in order to disable the valve.
2. Insert a thin rod in the inspection hole on the valve cover, pos. 58, until touching the ring.
3. Start the LPDPG with the safety valve spring loosened, i.e. not under pressure.
4. Using a screwdriver gradually tighten the adjustment screw (pos. 59 in the figure to the right), compressing the spring and checking that the pressure in the delivery outlet of the LPDPG does not exceed the allowed pressure.

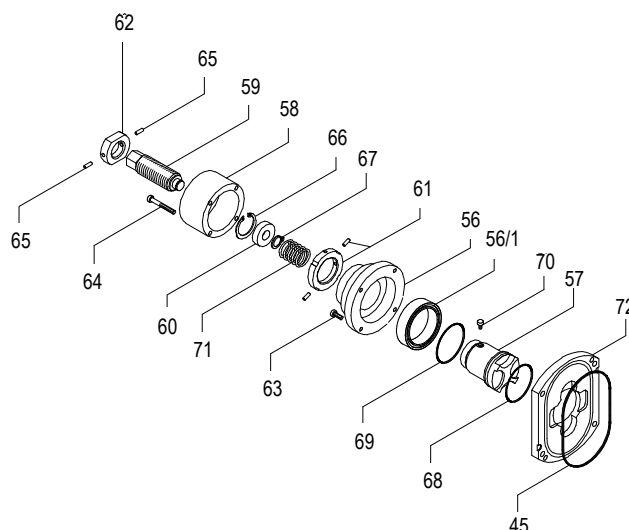
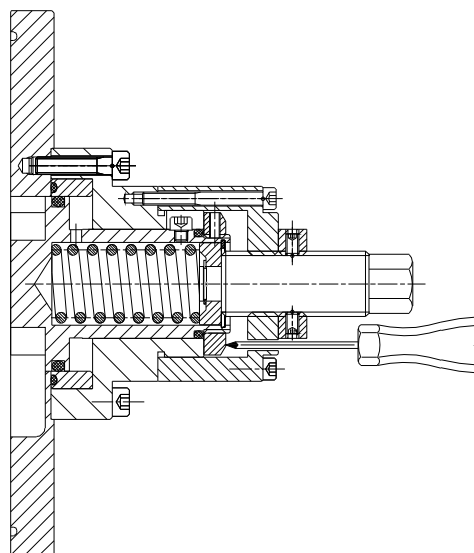


ATTENTION

With reference to section 3.3.3, in order to calibrate the spring there must be appropriate manometers on the suction and delivery pipes that indicate the pressure in

5. Tighten the adjustment screw until the thin rod starts to move.
6. Compress the spring by 1/4 screw turn past the critical opening point to prevent vibrations.
7. Position the regulator retainer (pos. 62 in the figure below) and block it with the appropriate hexagon hollow bolt (pos. 65 in the figure below).

The mechanical safety valve can also be used in manual mode, to adjust the capacity: unscrew the adjustment screw (pos. 59), release the spring pressure until moving the piston away (pos. 57) from the pumping chamber, allowing part of the pumped liquid to return into the suction chamber. This operation is not allowed for volatile fluids, such as for example solvents and fluids sensitive to temperature increase, due to continuous recirculation of the same product. For products viscosity above 15000 cPs, if one must recycle all the pumped liquid it is recommended to install a by-pass on the line, adequately proportionate, in order to allow the passage of the entire flow of the LPDP.

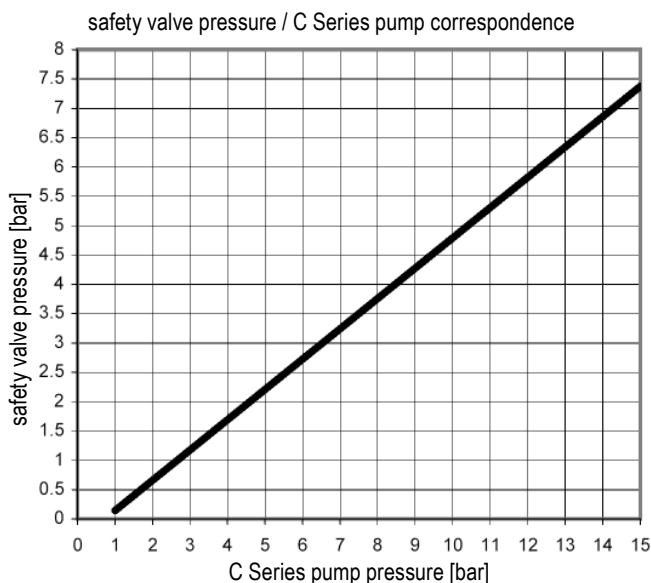
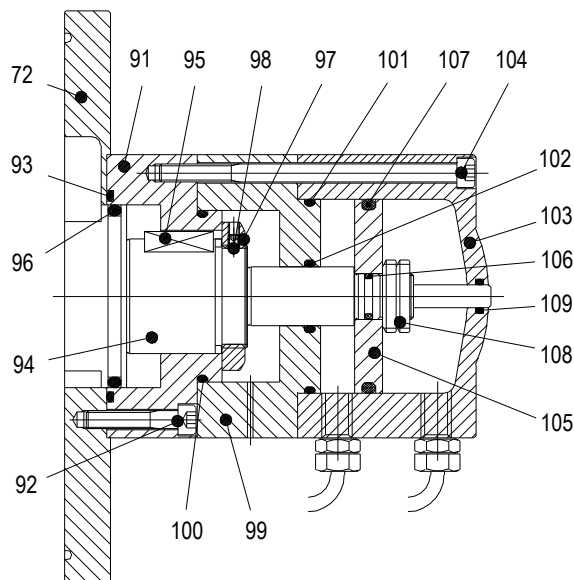


B) PNEUMATIC SAFETY VALVE AND ADJUSTMENT

The pneumatic safety valve is made up of a cylindrical shaft in which a piston slides and it is fitted directly onto the front cover of the pump (pump body cover). Its purpose is to intercept pressure peaks of the fluid in suction, allowing a part of the processed fluid to recirculate in the pumping chamber. The safety valve is in contact, on one side, with the processed fluid, whilst inside it is balanced with the pressure from the pneumatic circuit.

The adjustment of the pneumatic safety valve is carried out on site because it must be connected directly to the compressed air circuit on site. To adjust it is recommended to use, as reference for the pressure and sizing of the compressed air unit, the graph below showing the correspondence between the pressure inside the pump and the pressure in the valve. To prevent continuous vibrations, the safety valve must be adjusted in such a way that it starts working at a pressure 10% higher than the working pressure.

When the force the pneumatic circuit exercises on the valve is higher than that exercised by the fluid, the valve stays closed; on the contrary the valve is activated generating discharge volumes that enable balancing of forces, inside the pumping chamber.



Before calibrating the pneumatic safety valve, one must calibrate the pneumatic circuit of the Customer, with a pressure value as follows:

- ⚠ on the basis of the data carried in the LPDPG technical sheet, detect the unit working pressure;
- ⚠ with this data consult the graph shown on the next page to obtain the pressure value with which the safety valve must be calibrated.

Once one has obtained these values, proceed as indicated below:

- ⚠ start the LPDPG with the safety valve connected to the compressed air circuit;
- ⚠ with reference to the indications on the manometer on the suction duct in proximity to the LPDP suction inlet, acting on the pneumatic pressure regulator, manually increase or decrease the pressure value of the pneumatic circuit until reaching the critical balance value, i.e. the value obtained from the graph.

To prevent continuous vibrations, the safety valve must be adjusted in such a way that it starts working at a pressure 10% higher than the working pressure.



ATTENTION

The adjustment of the mechanical safety valve must be carried out on site by the Customer, since the recycle entity depends on the LPDPG speed, on the specific weight of the fluid, as well as its viscosity.



ATTENTION

The operations described herein require at least two manometers, for pressure values, installed on the suction and delivery pipes, near the LPDPG openings that connect it to the plant of the Customer.

C) EXTERNAL BRIDGE MECHANICAL SAFETY VALVE AND ADJUSTMENT

The external mechanical safety valve is made up of a spring valve positioned on a pipe bridge that connects delivery and suction and can also be used as a by-pass to let all or part of the processed fluid flow back.

To adjust the external bridge safety valve act on the spring compression regulation, located on the upper part of the valve body. The system composed in this manner is one-way so if one inverts the direction of the LPDPG, it is essential to invert the positioning of the valve as well that, in any case, must always be on the delivery side. One can choose various kinds of springs according to the working pressure. The adjustment must be carried out on site, acting manually on the special adjustment ring.



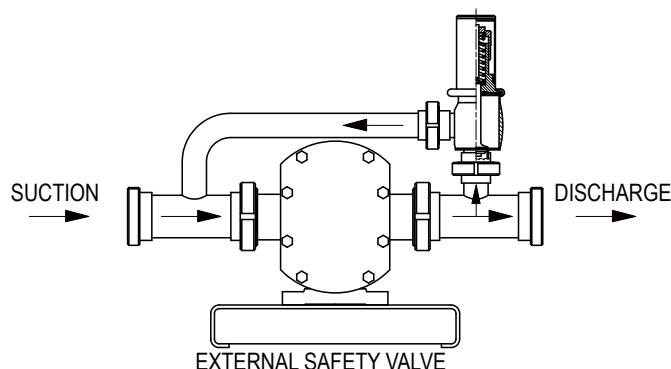
ATTENTION

The system composed in this manner is one-way so if one inverts the direction of the pump, it is essential to invert the positioning of the valve as well that, in any case, must always be on the delivery side.



ATTENTION

The adjustment of the external bridge mechanical safety valve must be carried out on site by the Customer, since the recycle entity depends on the LPDPG speed, on the specific weight of the fluid, as well as its viscosity.



D) MECHANICAL SEALS FLUSHING CIRCUIT

The purpose of flushing mechanical seals is generally to cool down and lubricate the sliding faces of the mechanical seal, via forced circulation of a flushing liquid.

The flushing liquid and its distribution circuit must be provided by the Customer. **The Customer must also check, through his Technical Office, the compatibility between the flushing liquid and the process fluid, as well as the compatibility between the flushing liquid and the components of the LPDP in close contact (pumping chamber material, seals material, working temperature, etc.)**

Once this requirement has been checked and validated, the Technical Office of the Customer will see to expressly authorise the operator responsible for the installation of the LPDPG to fit the flushing circuit on the seals flushing chamber and commission it, before starting the LPDPG for the first time.



ATTENTION

The operator responsible for the flushing circuit must be expressly authorised by his Technical Office to connect the flushing circuit to a system that uses "flushing liquid" compatible with the process fluid.

O.M.A.C. s.r.l. is not responsible for improper use of the flushing liquid or for damages deriving from contamination of the process fluid.



DANGER

The improper use of the flushing system can cause breakage of mechanical seals resulting in damage to the LPDPG and contamination of the process fluid. O.M.A.C. s.r.l. is not responsible for improper use of the flushing system.

The operator designated by the Customer must connect the flushing circuit joints to the input and output holes of the seals flushing chambers and adjust the temperature and pressure according to the type of seal fitted on the displacement pump, as described below:

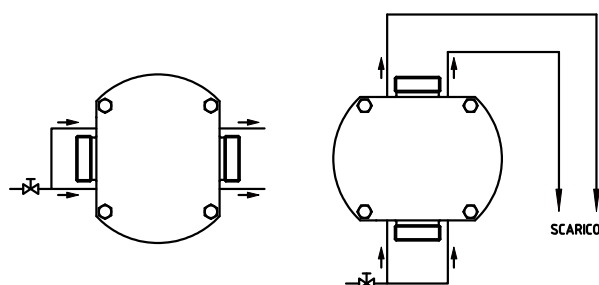
- ⤴ in case of single mechanical seals the flushing pressure must be about 1.5 - 2 bar and a flow-rate of 0.5-1 l/min;
- ⤴ in the case of double mechanical seals the flushing pressure must be equal to the working pressure or higher by 1 bar, to ensure that the film created between the sliding faces of the seals is made up of the flushing liquid and not by the process fluid, which according to its chemical composition may crystallise and solidify after machine down time and generate, upon restarting the unit, a "sticking" phenomenon of the faces, causing their breakage.

The flushing temperature must be established according to the type of processed fluid and to the flushing utility: generally using liquid at room temperature - about 15° - 20° - is necessary to disperse the heat generated by friction of the seals faces, or vice-versa, using liquid at higher temperatures, for example 80° - 90°, can be useful for melting, removing, cleaning and lubricating the seals faces.

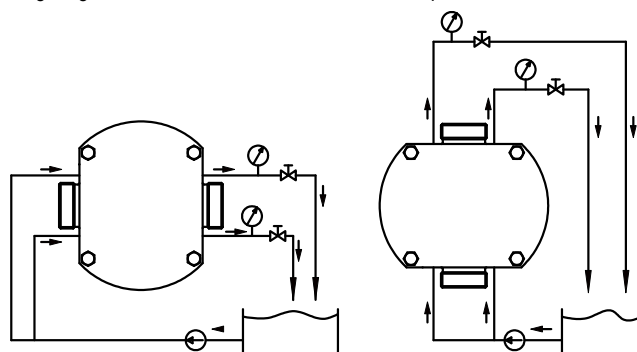
The dimensions of the inlet and outlet holes joints of the flushing circuit are listed in the table in section 1.3.9 in chapter 1.

Below there is an illustration of the two kinds of flushing:

flushing diagram for low pressure seals



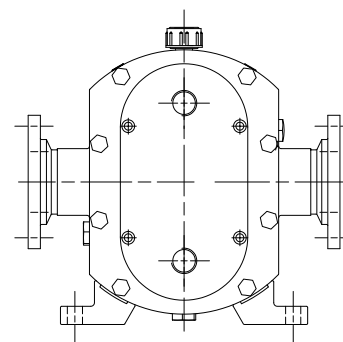
flushing diagram for double seals with circuit under pressure



E) ROTORCASE COVER HEATING/COOLING CIRCUIT

The heating / cooling circuit must be connected to the auxiliary circuit of the plant in which the LPDPG is located and must be commissioned by the designated operator before starting the plant concerned by the process fluid, in order to adapt (raise, if the intent is to heat or lower, if the intent is to cool down) the temperature of the components of the LPDP, affected by contact with the process fluid at the temperature of the same process fluid.

The dimensions of the inlet and outlet holes joints of the heating / cooling circuit of the cover and pumping chamber are listed in the table in section 1.3.9 in chapter 1.



3.4 Cleaning and hygiene of the LPDPG

Listed below are the methods for cleaning the LPDPG according to its operation environment: alimentary with hygiene level 3 or chemical.

3.4.1 LPDPG for alimentary use

To ensure hygiene and healthiness of the processed alimentary fluid, installation and start-up of the LPDPG requires preventive cleaning and sanitisation activities, these activities must take into account the particular features of the processed alimentary fluid, as well as reaction times defined by the manufacturer of the detergent and sanitising product used and mentioned in the technical sheet. For this reason the cleaning and sanitisation activities described in this section must be carried out in each of the following situations:

- ⤴ after the installation of the LPDPG;
- ⤴ after a long down time of the LPDPG;
- ⤴ before every change of processed alimentary fluid;
- ⤴ at the end of a work shift;
- ⤴ when otherwise required by the characteristics of perishable processed alimentary fluid (short machine down times, changes of temperature, etc.);

- ⚠ after routine/extraordinary maintenance.

Once it has been installed in the plant of the Customer, the LPDPG becomes an integral part both of the process unit and of the scheduled cleaning system. In any case, as required by UNI EN standards for cleaning / sanitising this product, the level of hygiene of the LPDPG can be identified as LEVEL 3, so the activities described below are conducted to restore the same level of hygiene.

Generally the products used for cleaning and sanitising are of the following types:

- ⚠ descaling detergents (cleaning of surfaces in contact with alimentary fluid after a long machine down time);
- ⚠ degreasing detergents (external cleaning, cleaning of surfaces in contact with alimentary fluid);
- ⚠ sodium hypochlorite based detergents in aqueous solution (5%) (sanitisation of surfaces in contact with alimentary fluid after a long machine down time);
- ⚠ detergents with quaternary ammonium salts in aqueous solution (5%) (sanitisation of surfaces in contact with alimentary fluid after a long machine down time);
- ⚠ please note that the LPDPG requires cleaning and sanitising after a long machine down time or routine/extraordinary maintenance, one must precede these activities by washing with a descaler, to be left to act according to the times indicated by the manufacturer.

Cleaning activities must be carried out by the operators in charge of running the plant in which the LPDPG is integrated, therefore they must be read, understood and carried out carefully by these operators.

Cleaning activities, if manual, must be carried out with the plant switched off and insulated from its energy sources.



ATTENTION

Cleaning activities must be carried out by the operators in charge of running the plant, therefore they must be read, understood and carried out carefully by these operators.



ATTENTION

The hygiene level of the LPDPG can be identified as LEVEL 3, according to UNI/EN standards, therefore the activities described below are carried out in order to restore the same hygiene level.

Cleaning and sanitising activities that concern the LPDPG are divided according to two different contexts:

- external: DO NOT affect surfaces in contact with alimentary fluid;
- internal: affect surfaces in contact with alimentary fluid.

Below are the descriptions of the cleaning and sanitisation methods mentioned above.

3.4.1.1 External cleaning instructions

The activities described herein must be carried out with the unit switched off and insulated from its energy sources and are intended to be performed by the operators responsible for running the plant of which the LPDPG is an integral part, therefore they must be read, understood and performed carefully by these operators.

These cleaning activities are carried out manually, using the instruments needed to enact them, provided by the Customer and indicated below:

- ⚠ pressure washer connected to waterworks under pressure;
- ⚠ NON aggressive detergent with degreasing surfactants;
- ⚠ wear the P.P.E. already provided by the Customer and Manufacturer of the plant in which the LPDPG becomes an integral part, PPE that must take into account what is indicated in the safety sheet of the detergent used.

After having put the detergent in the pressure washer and before going any further, cover the electric control panel, the electric motor and machine wiring, paying particular attention to the cables input into the shunt/connection boxes, with nylon sheets, fastened securely.

Paying attention to NOT direct the water jet onto parts covered with nylon sheets and indicated above, switch on the pressure washer and proceed with the cleaning the LPDPG, orientating the water jet under pressure only towards the external surfaces of the pump, part of the LPDPG, as well as the fixing base on which the pump is fixed.



ATTENTION

DO NOT direct the jet onto parts covered with the nylon sheets such as: electric control panel, electric motor and wiring in the machine. Pay almost attention to NOT wet the cables input into the shunt/connection boxes.

if required by the manufacturer of the detergent used and if specified on the relative information sheet, rinse using cold water only.

3.4.1.2 Internal cleaning instructions

The cleaning and sanitisation activities of the surfaces in contact with alimentary products develops according to the following diagram, following the indicated frequency:

WASHING STAGES	DETERGENT AGENT	WHEN TO USE	PERIODICITY
STAGE 1	DESCALING	FOLLOWING LONG MACHINE DOWN TIME	EVERY 3 MONTHS
STAGE 2	DEGREASING	TO REMOVE RESIDUES OF PROCESS FLUID IN CONTACT WITH THE PROCESS FLUID	ALWAYS
STAGE 3	SODIUM HYPOCHLORITE BASE	AFTER STAGE 2, TO SANITISE SURFACES	ALWAYS
STAGE 4	WATER	TO ELIMINATE RESIDUES OF DETERGENT	ALWAYS
STAGE 5	STEAM	TO STERILISE THE COMPONENTS IN CONTACT WITH THE PROCESS FLUID	ALWAYS

Cleaning the surfaces in contact with the transferred process fluid articulates further into two different methods, as shown below:

- ⚠ CIP/SIP;
- ⚠ manual cleaning.

Below the two methods are explained better.

3.4.1.2.1 Internal cleaning: CIP (Cleaning In Place) / SIP (Sterilising In Place)

As well known, the CIP/SIP is a cleaning method of the entire plant that does NOT require the disassembly of parts and/or accessories inside the same plant. The CIP/SIP is therefore a cleaning and sanitisation activity of the plant of which the LPDPG is an integral part and therefore in turn affected by it.



ATTENTION

Before carrying out CIP/SIP one must perform each of the operations described below.

If the LPDPG has been supplied with one or more accessories listed in section 3.3.3. of this OMM, before starting CIP/SIP, check the following:

- ⤴ adjust the pressure of the safety valves (re. section 3.3.3 letters a,b,c) at a pressure value below the maximum pressure of the same CIP/SIP, thus ensuring opening of the valve when washing the plant;
- ⤴ ensure that the auxiliary units (flushing unit, cover heating and aseptic circuit), if present, are connected to the pump and work;
- ⤴ if the customer envisions the LPDPG to actively participate in the CIP/SIP, activate operation of the same LPDPG.

On the basis of the indications given by the plant manufacturer, activate the CIP/SIP.

The duration of CIP/SIP depends on the type of process fluids treated. In order to ensure sanitisation of the LPDPG, O.M.A.C. s.r.l. recommends the CIP/SIP to last at least 1 hour.



ATTENTION

At the end of the CIP/SIP, but before restarting the plant, the safety valves must be re-set at the working pressure value, this activity must follow what is indicated in section 3.3.3 of this OMM.

3.4.1.2.2 Internal cleaning: manual cleaning

Manual cleaning activities must be carried out with the plant switched off and insulated from its energy sources; in addition the operator must wear P.P.E. as indicated in chapter 1, section 9.

Manual cleaning activities entail:

- a) disassembly of mechanical elements;
- b) treated alimentary process fluids removal/extraction operations;
- c) washing and sanitisation activities;
- d) rinsing;
- e) sterilisation;
- f) reassembly of the previously removed mechanical elements.

Wear the P.P.E. as per Chapter 1, Section 9, paying attention to identify, on the basis of the thermal features of the treated process fluids, the gloves to wear;



ATTENTION

Cleaning activities must be carried out by the operators in charge of running the plant, therefore they must be read, understood and carried out carefully by these operators.



DANGER

Cleaning and sanitisation activities must be carried out with the plant switched off and insulated from its energy sources: electrical, pneumatic, hydraulic. The operator in charge of this activity is obliged to wear the P.P.E. indicated in chapter 1, section 9, in order to ensure their safety.

a) The disassembly activities refer to the following mechanical elements:

- ⤴ front cover;
- ⤴ rotor blocking nuts;
- ⤴ rotors;
- ⤴ gaskets;
- ⤴ any optional features (mechanical or pneumatic safety valve).

These elements must be disassembled following the indications contained in chapter 5, section 5.8, 5.9, 5.10 of this OMM.



ATTENTION

During disassembly and assembly operations of the components listed under letter a), strictly follow the indications in sections 5.8, 5.9, 5.10.

b) The alimentary process fluids removal activities consist in manually removing most of the fluid present and seeing to its disposal.

c) Washing and sanitisation activities concern the previously disassembled single components, as well as the pumping chamber. Using a water and degreasing detergent solution, wash the single components and the pumping chamber, paying particular attention to the seals area and shafts threaded area.

d) Wash with plenty of aqueous solution until the visible process alimentary fluid is completely removed.

Once the alimentary process fluid has been removed from the contact surfaces, sanitise all the components that come into contact with the fluid. To do this:

- ⤴ prepare aqueous solution of sodium hypochlorite (5%);
- ⤴ sanitise all surfaces in contact with the alimentary process fluid carrying out the operation for at least 15 minutes



ATTENTION

Sanitise all surfaces in contact with the alimentary product proceeding for at least 15 minutes

- ⤴ with cold running water, rinse all the previously sanitised surfaces, making sure all traces of sanitiser are removed.

e) Sterilise the previously sanitised surfaces with water steam.

f) Reassemble the previously removed mechanical elements following the indications contained in Chapter 5, section 5.8, 5.9, 5.10 of this OMM.

After having assembled the clean and sanitised pump components, remove the protective sheets, placed on the electric panel, electric motor and cable shunt/connection boxes and subsequently connect to the energy sources, disconnected before starting manual cleaning.

3.4.2 LPDPG for chemical use

To ensure cleaning the process chemical fluid, LPDPG installation and starting requires prior cleaning activity.

The cleaning activities described herein must be carried out in each of the following situations:

- ⤴ after the installation of the LPDPG;
- ⤴ after a long down time of the LPDPG;
- ⤴ before every change of processed chemical fluid;
- ⤴ at the end of a work shift;
- ⤴ when otherwise required by the characteristics of perishable processed chemical fluid (short machine down times, changes in temperature, etc);
- ⤴ after routine/extraordinary maintenance.

Once it has been installed in the plant of the Customer, the LPDPG becomes an integral part both of the process unit and of the scheduled cleaning system.

Generally the products used for cleaning are of the following types:

- ⤴ descaling detergents (cleaning of surfaces in contact with alimentary fluid after a long machine down time);
- ⤴ degreasing detergents (external cleaning, cleaning of surfaces in contact with chemical fluid);
- ⤴ sodium hypochlorite based detergents in aqueous solution (5%) (sanitisation of surfaces in contact with chemical fluid after a long machine down time);
- ⤴ detergents with quaternary ammonium salts in aqueous solution (5%) (sanitisation of surfaces in contact with chemical fluid after a long machine down time);
- ⤴ please note that the LPDPG requires cleaning and sanitising after a long machine down time or routine/extraordinary maintenance, one must precede these activities by washing with a descaler, to be left to act according to the times indicated by the manufacturer.

Cleaning activities must be carried out by the operators in charge of running the plant in which the LPDPG is integrated, therefore they must be read, understood and carried out carefully by these operators.

Cleaning activities, if manual, must be carried out with the plant switched off and insulated from its energy sources.



ATTENTION

Cleaning activities must be carried out by the operators in charge of running the plant, therefore they must be read, understood and carried out carefully by these operators.

The cleaning activities that concern the LPDPG are divided according to two different contexts:

- ⤴ external: DO NOT affect surfaces in contact with chemical fluid;
- ⤴ internal: affect surfaces in contact with chemical fluid.

Below are the descriptions of the cleaning methods mentioned above.

3.4.2.1 External cleaning instructions

The activities described herein must be carried out with the unit switched off and insulated from its energy sources and are intended to be performed by the operators responsible for running the plant of which the LPDPG is an integral part, therefore they must be read, understood and performed carefully by these operators.

These cleaning activities are carried out manually, using the instruments needed to enact them, provided by the Customer and indicated below:

- ⤴ pressure washer connected to waterworks under pressure;
- ⤴ NON aggressive detergent with degreasing surfactants;
- ⤴ wear the P.P.E. already provided by the Customer and Manufacturer of the plant in which the LPDPG becomes an integral part, PPE that must take into account what is indicated in the safety sheet of the detergent used.

After having put the detergent in the pressure washer and before going any further, cover the electric control panel, the electric motor and machine wiring, paying particular attention to the cables input into the shunt/connection boxes, with nylon sheets, fastened securely.

Paying attention to NOT direct the water jet onto parts covered with nylon sheets and indicated above, switch on the pressure washer and proceed with the cleaning the LPDPG, orientating the water jet under pressure only towards the external surfaces of the pump, part of the LPDPG, as well as the fixing base on which the pump is fixed.



ATTENTION

DO NOT direct the jet onto parts covered with the nylon sheets such as: electric control panel, electric motor and wiring in the machine.

Pay almost attention to NOT wet the cables input into the shunt/connection boxes.

If required by the manufacturer of the detergent used and if specified on the relative information sheet, rinse using cold water only.

3.4.2.2 Internal cleaning instructions

The cleaning and sanitisation activities of the surfaces in contact with alimentary products develops according to the following diagram, following the indicated frequency:

WASHING STAGES	DETERGENT AGENT	WHEN TO USE	PERIODICITY
STAGE 1	DESCALING	FOLLOWING LONG MACHINE DOWN TIME	EVERY 3 MONTHS
STAGE 2	DEGREASING	TO REMOVE RESIDUES OF PROCESS FLUID IN CONTACT WITH THE PROCESS FLUID	ALWAYS
STAGE 3	SODIUM HYPOCHLORITE BASE	AFTER STAGE 2, TO SANITISE SURFACES	ALWAYS
STAGE 4	WATER	TO ELIMINATE RESIDUES OF DETERGENT	ALWAYS

Cleaning the surfaces in contact with the transferred process fluid articulates further into two different methods, as shown below:

- ⤴ CIP;
- ⤴ manual cleaning.

Below the two methods are explained better.

3.4.2.2.1 Internal cleaning: CIP (Cleaning In Place)

As well known, the CIP/SIP is a cleaning method of the entire plant that does NOT require the disassembly of parts and/or accessories inside the same plant. The CIP is therefore a cleaning activity of the plant of which the LPDPG is an integral part and therefore in turn affected by it.



ATTENTION

Before carrying out CIP one must perform each of the operations described below.

If the LPDPG has been supplied with one or more accessories listed in section 3.3.3 of this OMM, before starting CIP, check the following:

- ⤴ adjust the pressure of the safety valves (re. section 3.3.3 letters a,b,c) at a pressure value below the maximum pressure of the same CIP, thus ensuring opening of the valve when washing the plant;
- ⤴ ensure that the auxiliary units (flushing unit, cover heating and aseptic circuit), if present, are connected to the pump and work;
- ⤴ if the customer envisions the LPDPG to actively participate in the CIP, activate operation of the same LPDPG.

On the basis of the indications given by the plant manufacturer, activate the CIP.

The duration of CIP depends on the type of process fluids treated. In order to ensure sanitisation of the LPDPG, O.M.A.C. s.r.l. recommends the CIP to last at least 1 hour.



ATTENTION

At the end of the CIP, but before restarting the plant, the safety valves must be re-set at the working pressure value, this activity must follow what is indicated in section 3.3.3 of this OMM.

3.4.2.2.2 Internal cleaning: manual cleaning

Manual cleaning activities must be carried out with the plant switched off and insulated from its energy sources; in addition the operator must wear P.P.E. as indicated in chapter 1, section 9. Manual cleaning activities entail:

- a) disassembly of mechanical elements;
- b) chemical process fluid removal/extraction operations;
- c) washing and sanitisation activities;
- d) rinsing;
- e) reassembly of the previously removed mechanical elements.

Wear the P.P.E. as per Section 1.9 of Chapter 1, paying attention to identify, on the basis of the thermal features of the process fluids, the gloves to wear;



ATTENTION

Cleaning activities must be carried out by the operators in charge of running the plant, therefore they must be read, understood and carried out carefully by these operators.



DANGER

Manual cleaning activities must be carried out with the plant switched off and insulated from its energy sources: electrical, pneumatic, hydraulic. The operator in charge of this activity is obliged to wear the P.P.E. indicated in chapter 1, section 9, in order to ensure their safety.

a) The disassembly activities refer to the following mechanical elements:

- ⤴ front cover;
- ⤴ rotor blocking nuts;
- ⤴ rotors;
- ⤴ gaskets;
- ⤴ any optional features (mechanical or pneumatic safety valve).

These elements must be disassembled following the indications contained in chapter 5, section 5.8, 5.9, 5.10 of this OMM.



ATTENTION

During disassembly and assembly operations of the components listed under letter a), strictly follow the indications in sections 5.8, 5.9, 5.10.

- b) The chemical process fluids removal activities consist in manually removing most of the fluid present and seeing to its disposal.
- c) Washing and sanitisation activities concern the previously disassembled single components, as well as the pumping chamber. Using a water and degreasing detergent solution, wash the single components and the pumping chamber, paying particular attention to the seals area and shafts threaded area.
- d) Wash with plenty of aqueous solution until the visible process chemical fluid is completely removed.

Once the chemical process fluid has been removed from the contact surfaces, clean all the components that come into contact with the fluid. To do this:

- ⤴ prepare aqueous solution of sodium hypochlorite (5%);
- ⤴ clean all surfaces in contact with the chemical process fluid carrying out the operation for at least 15 minutes;



ATTENTION

Sanitise all surfaces in contact with the chemical product proceeding for at least 15 minutes.

- ⤴ with cold running water, rinse all the previously cleaned surfaces, making sure all traces of sanitiser are removed.

e) Reassemble the previously removed mechanical elements following the indications contained in Chapter 5, section 5.8, 5.9, 5.10 of this OMM. After having assembled the clean pump components, remove the protective sheets, placed on the electric panel, electric motor and cable shunt/connection boxes and subsequently connect to the energy sources, disconnected before starting manual cleaning.

3.5 Connection to energy sources

Below there are the procedures for connecting the LPDPG to the energy sources, needed for its proper operation.

3.5.1 Connection to the electrical system

Connection to the electrical mains must be carried out by the operator responsible for the assembly/installation activities, in compliance with the strictest technical standards, the connection must be carried out after the hydraulic connection. This personnel must have full knowledge of the rules for use and operation of electrical equipment supplied with the LPDPG.

The Customer must organise the plant layout so as to provide:

- ⤴ a manual supply sectioning device,
- ⤴ over-current and overload protection,
- ⤴ devices that prevent spontaneous restarting.
- ⤴ Before carrying out the connection one must ensure that:
- ⤴ the frequency and voltage of the Customer plant corresponds to the data carried in the "technical sheet" of the LPDPG;
- ⤴ The material used for the electrical connection has an IP degree suitable for the environment in which it is installed, in order to prevent the conductors from overheating.

The connection of cables to the terminal board can be carried out both in triangle or star, complying with the data carried on the motor nameplate according to the mains voltage.

The connection of electric wiring can take place as follows:

- 1) LPDPG with electric panel;
- 2) LPDPG without electric panel;

In particular, in case 1), in presence of the electric panel, the operator must carry out the following operations:

- ⤴ section the electric mains in order to insulate the sockets from the industrial electricity supply;
- ⤴ connect the plug;
- ⤴ power the electricity sockets;

this way even the LPDPG electric control panel is powered.



ATTENTION

Operate with caution: the LPDPG and the control actuators are powered electrically.

In case 2), in absence of the electric panel, the operator must see to power the electric motor on the basis of the indication contained in the electric motor Use and Maintenance Manual (OMM available in electronic version on the Internet websites of the relative manufacturers).

One must also provide earthing for the motor, using the jack provided on the motor and an adequate section conductor: the connection must be carried out with a NO7V/k type 35 mm² section stranded wire with yellow-green insulation and crimped wire heads.



ATTENTION

Before carrying out any operation, check that the features of the distribution network (voltage and frequency) correspond to the data on the motor plate or electric panel.



ATTENTION

O.M.A.C. s.r.l. is NOT responsible for damages caused by incorrect installation of the electric energy supply, in case of failure to comply with the technical standards in force.

3.5.2 Connection to the hydraulic system

Before going further one must check compliance with the indications of section 3.3.2 of this chapter.

If the indications above have been observed, one can proceed with the following activities:

- a) connection of mechanical seals flushing;
- b) connection of pumping chamber cover heating/cooling;



ATTENTION

It is essential, as indicated in section 3.3.1, before carrying out the hydraulic connections, to wash the plant - in order to clean the pump -, and the hydraulic connection lines, from dirt residues such as dust, sand, process scraps, etc.

- a) with reference to the drawing to the side and the dimensions of the threaded joints, shown in the table in section 1.3.9, identify the flushing connection points on the LPDPG as well as the types of fittings to use.

flushing method with "disposable" fluid - flushing method with fluid recycle

- b) connection of pumping chamber cover heating/cooling;



ATTENTION

The Customer, on the basis of the table in section 1.3.9 must identify the proper kind of fittings to be used to connect the hydraulic unit. Any errors can generate leaks of flushing/cooling/heating fluid not attributable to O.M.A.C. s.r.l.

To start assembly activities, the pipes used to compose the flushing/cooling/heating circuit must have fittings free to rotate at their ends in order to screw onto the flushing chamber and cooling/heating chambers.



ATTENTION

Check that the ends of the fittings are free to rotate. If they are fixed to the pipe it will no longer be possible to screw them on and one must provide new pipes of the same kind.

On the basis of the diagrams above, proceed with assembly, taking care to tighten the fittings.

Switch on the flushing unit and the cooling / heating unit that belong to the Customer in order to check there are no leaks of fluid, i.e. check the operations above have been carried out properly.

**ATTENTION**

The Customer must ensure that the flushing unit is always started before starting the LPDPG.

In case of brief or extended machine down times during the production period, in which the process fluid remains in contact with the internal parts of the pumping body (e.g. transfers of vinyl glue in industrial use), the flushing unit must remain in constant operation, to not jeopardize the operation of the pumping body sealing parts.

If one should find leaks, switch off the flushing unit and repeat the operations described above.

3.5.3 Connection to the pneumatic system

Connection to the pneumatic system assumes that the Customer provides connection to a pneumatic lubricated compressed air unit: the capacity and pressure (bar) values of this unit are indicated in the attached technical sheet.

**ATTENTION**

The technical sheet carries the pressure and capacity values the LPDPG needs to operate properly.

**ATTENTION**

Before going any further, ensure to comply with the indications of section 3.3.1 of this chapter.

In order to connect the LPDPG to the pneumatic distribution network in safety conditions, observe and perform the following operations in sequence:

- ⌘ close the valve the LPDPG will be connected to;
- ⌘ connect the light blue pipes with threaded fittings to the compressed air distribution unit;
- ⌘ close the connection between the pipe and unit securely;
- ⌘ connect the light blue pipes with the threaded fittings to the LPDPG;
- ⌘ close the connection between the pipe and the LPDPG securely;
- ⌘ open the general valve and check the connection has been carried out properly.

3.6 Use of lubricants

The LPDPG is delivered to the Customer complete with lubricant oil as per section 1.3.12. This oil is contained in the bearings box and is essential for the lubrication of bearings and motion transmission gears. Please note that the LPDPG has other mechanical elements that during maintenance require lubrication. In chapter 5 there is further information regarding these operations.

3.7 Installation and pre-start check: operation test

After installation and connection to the energy sources, but before starting production, one must check the rotors rotate properly inside the pumping body, compared to the flow direction of the fluid to be handled. To do this one must:

- ⌘ check all earthing connections of the LPDPG have been carried out;
- ⌘ power the LPDPG electrically;
- ⌘ open the suction valve of the Customer plant;
- ⌘ open the delivery valve of the Customer plant;
- ⌘ wait for a few seconds (about 15 seconds) so that the fluid fills the pumping chamber;
- ⌘ move the selector from position 0, off, to position 1, on (the on warning light will light up);
- ⌘ press the START button;
- ⌘ with the LPDPG on, check that on the manometer on the delivery pipe there is pressure inside the same pipe;
- ⌘ stop the LPDPG by pressing the STOP button on the electric panel supplied with the machine or in the plant of the Customer.

CHAPTER 4 – USE

The LPDPG is intended to be used by operators in charge of running it; therefore:

- ⤴ the operators in charge of using the LPDPG must have good familiarity with this type of equipment and possess recognised technical skills acquired in at least three years of similar activities;
- ⤴ the operator in charge of running the unit is directly and formally named by the Customer company management;
- ⤴ the instruction described in this chapter and relative to the LPDPG must be read, understood and carried out carefully by these operators in charge.



ATTENTION

Knowledge of the following instructions and the experience of the operator in charge of running the plant of the customer are essential in order to limit and reduce the risks associated with using the same production line.

4.1 Intended use

The C and CF Series Lobe Positive Displacement Pump Group, manufactured and marketed by O.M.A.C. s.r.l., which in this documentation will be indicated with the abbreviation LPDPG, has been designed and made to be assembled in industrial plants owned by third parties, to transfer volumes of fluids, compatible with the materials used during the construction of this machine: section 1.4.1 lists the recommended operational features of the LPDP, depending on the processed fluid.

The LPDPG requires compliance with all technical indications in this operation and maintenance manual, which in this documentation will be indicated with the abbreviation OMM, for its proper installation.

In general, the processed fluids must meet the following specifications:

Fluid properties and range of use:

- 1) TEMPERATURE: **from -35°C to +180°C**
- 2) VISCOSITY: Maximum **200'000cPs** with forced feeding
- 3) HARD PARTICLE SIZE: Maximum **80% of clearance between rotors** (see sect.1.3.4)

The LPDPG has been designed and made for two types of use:

- ⤴ alimentary use;
- ⤴ chemical use.



WARNING

The LPDPG, for alimentary use, has been made to ensure a hygienic standard equal to **LEVEL 3**, on the basis of **UNI EN 13951**.

The LPDPG for alimentary use and for chemical use has been designed to transfer volumes of fluids without altering the organoleptic properties nor the physical properties.



WARNING

The LPDPG is **E.H.E.D.G.** certified, with **Certificate nr. 13/2008** of **TUM Technische Universität München** of Freising, Weihenstephan - Germany



WARNING

During its normal use, the LPDPG for alimentary use and chemical use does not alter the organoleptic characteristics or the physical characteristics of the processed fluid.

Every LPDPG comes with a technical sheet indicating the operational features in relation to the processed fluid that must be handled (name of the fluid, viscosity range, capacity range, speed range, temperature range), as declared at the time of purchase by the Customer.

Section 1.3 shows a facsimile of the LPDPG technical sheet.

Every modification to what is indicated in the specific technical sheet or variation of the machine operating parameters must be authorised in writing by O.M.A.C. s.r.l.; the absence of such authorisation is deemed "improper use" and will void any warranty or liability under way between Manufacturer and Customer.



DANGER

Any use of the LPDPG in conditions other than those indicated in "Fluid properties and range of use" and in conditions other than those indicated in the machine technical sheet is forbidden, without explicit written authorisation, issued by O.M.A.C. s.r.l.

The LPDPG for alimentary use and for chemical use has NOT been designed nor built to handle pharmaceutical, explosive, etc. fluids, and in general fluids that do not comply with the indications of the specific technical sheet.

In addition, the LPDPG for alimentary use and chemical use has NOT been designed nor built to handle what is indicated in Regulation (EC) No. 1005/2009 of the European Parliament and the Council of 16 September, 2009, on substances that deplete the ozone layer.



ATTENTION

It is forbidden to use the LPDPG for alimentary use and chemical use to transfer the substances listed in Annex I of Regulation No. 1005/2009.

The pumping part of the LPDP is made up of the pump body, in which two rotors are housed (sect. 1.3.5 lists the types of rotors used), which rotate synchronised in the opposite direction to each other.

The rotorcase receives the process fluid from the suction inlet, originating from the plant of the Customer. During the operation of the LPDP, the cavities between the lobes of the rotors are filled with fluid and the counter-rotation of the rotors transfers the fluid to the delivery outlet of the pump body, channelling it in the plant where the LPDPG is installed.

4.2 Controls

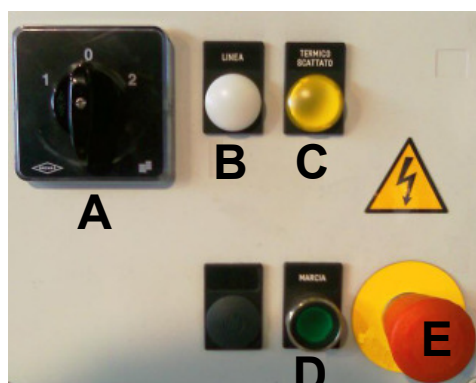
The LPDPG can be equipped, upon request of the Customer and as an additional optional feature, with an electric control panel, where the “control actuators” are positioned for its operation.

All control, signalling and adjustment devices are marked with symbols and codes that enable to quickly understand their functions, as described below. The same devices are marked with different colours: each colour has a specific meaning.

COLOURS FOR LUMINOUS INDICATORS	MEANING
RED	DANGER / ALARM
YELLOW	ATTENTION
GREEN	SICUREZZA
WHITE	NEUTRAL
BLUE	ACCORDING TO NEEDS

CONTROLS	MEANING
RED	EMERGENCY ACTION (STOP / DISABLING)
YELLOW	INTERVAL
GREEN	START / ENABLING

Below there is the illustration of the basic composition of an electric panel:



In the figure to the side one can identify:

A MAIN SWITCH

B LINE WARNING LIGHT

C CIRCUIT BREAKER TRIPPED WARNING LIGHT

D ON BUTTON + ON WARNING LIGHT

E EMERGENCY STOP BUTTON

The main switch, marked with letter **A**, is for powering or insulating the machine electric unit, position “0” indicates the absence of voltage, position “1” indicates the presence of voltage with the pump that operates with a certain rotation direction, position “2” indicates the presence of voltage with the pump that operates with the rotation direction opposite to that of position “1”.

When main switch **A** is in position “1” or in position “2”, one cannot open the electric panel because in this position opening is inhibited by an interlock. One can open the control panel only by putting the switch in “0” position.

The indicator light, marked with letter **B**, when on indicated that the electric panel is “under voltage”. this condition occurs only if button **A** is in position “1” or in position “2”.

The emergency stop button, marked with letter **E**, has the function to block the operation of the LPDPG with immediate effect, in emergency conditions. . However it can be used to stop operation of the LPDPG even in case of normal functioning, when switch **A** is not present.



NOTE

The particular “mushroom” shape of the button enables easy and quick intervention of the operator, in addition a mechanical retention blocks it in pressed position.

Only after having released the button can one restore the normal operation conditions of the LPDPG. One can rearm the button by slightly rotating the knob anti-clockwise.

The on button, marked with letter **D**, is for starting the LPDPG in normal and continuous operation mode. The

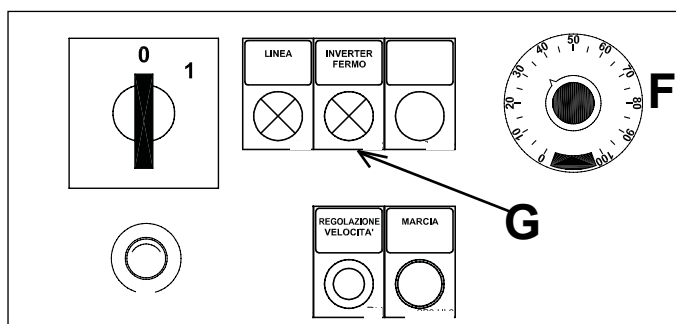
on and off conditions are signalled by the green light incorporated in the button: when the warning light is on it indicates that the LPDPG is on, when it is switched off it indicates that it is off.

The indicator light, marked with letter **C**, which indicates “CIRCUIT BREAKER TRIPPED”, lights up for an operation anomaly of the LPDPG, the electric motor is in overload. To reset normal operation conditions one must restore the “circuit breaker” as specified in the use and maintenance instructions of the electrical supply.

The electric control panel can be equipped with an **inverter**, as an additional optional feature: it can be identified, in the figure below, with letter **G**, which indicates the operation warning light, and with letter **F**, which indicates **speed adjustment potentiometer**, which is needed to set the electric power supply voltage manually.

An inverter is in fact an electronic device able to vary the rotation speed of electric motors, which is directly associated with the supply voltage frequency.

Section 4.2.1.1 shows a simple mathematical formula for calculating the power supply frequency, knowing the number of output revolutions of the control unit.



4.3 LPDPG volumetric capacity adjustment methods

On the basis of the production needs of the Customer, one can adjust the power supplied by the LPDPG. The adjustment of the volumetric capacity of the LPDPG can be carried out in two ways:

- ⤴ acting on the inverter adjustment, if the LPDPG is equipped with an inverter;
- ⤴ acting on the speed controller hand-wheel adjustment, if the LPDPG is equipped with a mechanical speed controller.

4.3.1 Adjustment of the volumetric capacity with the inverter

This operation, i.e. the variation of the electric motor speed via inverter, must be carried out by the operator in charge of running the plant: he must rotate the speed adjustment potentiometer knob on the electric panel, setting it on the desired frequency value, expressed in Hz.

The result of the frequency adjustment, with the potentiometer, translates in a speed variation of the electric motor revolutions and consequently in a capacity variation of the LPDPG.

The operator must read the consequent volumetric capacity variation on the meter placed on the delivery piping near the LPDPG (see stage 2 section 3.3.3).

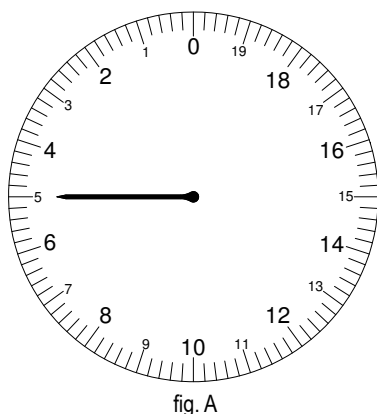
Frequency calculation.

It is assumed one has an electric motor that supplies a current number of output revolutions, N_{current} at the national electric network frequency, equal to 50 [Hz] and that we will indicate more in general with F_{current} . Assuming one wants to obtain a different number of output revolutions, N_{new} , the frequency with which the inverter must be set, f_{new} , will be equal to: $f_{\text{new}} = (F_{\text{current}} * N_{\text{new}}) / N_{\text{current}}$

4.3.2 Adjustment of volumetric capacity via mechanical speed controller

This operation, i.e. the speed variation of the speed controller, must be carried out by the operator in charge of running the plant:

he must act on the mechanical speed controller hand-wheel, only after having started the LPDPG.



WARNING

Adjust the mechanical speed controller hand-wheel, only after having started the LPDPG. The adjustment of the speed controller must not be carried out with the machine off as it can cause the breakage and malfunctioning of the speed controller.

Before adjusting the hand-wheel, read the value the speed controller is set on, in the hand-wheel panel. The hand-wheel panel is shown in figure A. Below, in the table placed to the side as an example, one can obtain the value of the LPDPG revolutions.

For example, if we are in presence of a size "10" speed controller and the hand-wheel (figure A) has the arrow on 5, simply trace a vertical line, starting from the column corresponding to the "10" size, until 5, indicated by the hand-wheel, to then proceed horizontally, towards the left until reading the corresponding number of revolutions at which the speed controller operates, i.e. 450 RPM.

	03	05	10	20	30-50	100
1000		12	15	17	21.5	25
950		11			21	24
900	9	10	14	16	20	23
850			13	15	19	22
800	8	9	12	14	18	21
750			11	13	17	20
700	7	8	10	12	16	19
650			9	11	15	18
600	6	7	8	10	14	17
550			7	9	13	16
500	5	6	6	8	12	15
450	4	5	5	7	11	14
400			4	6	10	13
350	3	3	4	5	9	12
300			3	4	8	11
250	2	2	3	3	7	10
200			2	2	6	9
150	1	1	2	1	5	8
100	0	0	1	0	4	7
			0	0	3	6
					2	5
					1	4
					0	3
						2
						1
						0

QUANTITIES REFERRED TO MOTOVARIO/ SPAGGIARI SPEED CONTROLLERS

4.4 Work cycle description

The LPDPG, whose functional element is the LPDP, is equipped with a control unit that, depending on the version, can be fitted with a speed controller, a gear motor, an electric motor, a pneumatic motor or a hydraulic motor, with or without electric panel.

The capacity adjustment is achieved by increasing or decreasing the number of revolutions of the LPDP, intervening directly on the revolutions output of the motor mentioned above or acting on the actuators on the control panel (inverter), if fitted.

The LPDPG is reversible: full performance can be achieved in both rotation directions of the pump rotors (section 1.3.5 lists the types of rotors used).

The pumping action of the LPDP is achieved thanks to the counter-rotation of two rotors (letter "C" indicated in the figure in section 1.2, indicating one of the two rotors), housed inside the pumping chamber (letter "U" indicated in the figure in section 1.2 or see figure below). The rotors are assembled on rotating shafts supported by bearings (letters "G" and "H" shown in the figure in section 1.2), which are housed in the external gearbox (letter "S" shown in the figure in section 1.2). Via a couple of sprocket wheels (letters "N" and "P" indicated in the figure in section 1.2) one transfers motion from a drive shaft (letter "M" indicated in the figure in section 1.2) to a driven shaft (letter "R" indicated in the figure in section 1.2). The synchronism of the rotors is such that they rotate without coming into contact with each other: in this conditions "the rotors are in phase".

When the lobes of the rotors move away from each other, the volume between them increases, creating a decrease in pressure near the suction outlet: this enables a certain volume of fluid to enter (value of fluid transported identified in the table in section 1.3.1, in the "theoretical capacity" column, depending on the pump model size) into the pumping body. The fluid is transported along the internal of the pumping chamber, from the suction inlet to the delivery outlet of the pump body. When the volume of fluid, trapped between the lobes and the external perimeter of the pumping chamber, reaches in proximity of the delivery outlet, the counter-rotation of the two rotors creates a sudden decrease of available volume and a consequent increase in pressure that pushes the fluid out of the pumping body, by channelling it into the plant where the LPDPG is installed.

4.5 Cycle start instructions

The start of the LPDPG work cycle is supervised and activated by the operator in charge of running the plant, after having carried out the following preliminary checks.

4.5.1 Preliminary operations: check list

Before commissioning the LPDPG check the following:

- ⤴ if the LPDPG has suffered damages, contact the O.M.A.C. s.r.l. Technical Office immediately as described in chapter 2;
- ⤴ make sure that all the bolted connections are tightened properly and that the installation of the LPDPG has been carried out properly in accordance with the requirements of this use and maintenance manual;
- ⤴ ensure continuity of the equipotential protection circuit and that it is connected, as per section 3.5.1.1 of this use and maintenance manual;
- ⤴ ensure that all hydraulic connections, where required by the configuration of the LPDPG, are carried out properly, as described in chapter 3;
- ⤴ make sure, as a preventive measure, that there is lubricant oil, visible via the oil level cap placed on the side of the pump gear box, part of the LPDPG: please bear in mind that all pumps fitted in the LPDPG are already supplied with the proper amount of lubricant oil.



DANGER

Incorrect lubrication or lubrication with lubricant products incompatible with the materials used in the construction and completion of the LPDPG can lead to premature wear or breakage of the sealing elements or other parts in contact with the process fluid.



ATTENTION

O.M.A.C. s.r.l. is not liable for any damage caused by improper use of lubricants incompatible with the materials used in the construction and completion of LPDPG or with the process fluid:

- ⤴ ensure that the power supply voltage of the LPDPG is that required as shown on the electric motor data plate or electric panel; it is reminded that the electric connection must be carried out by skilled personnel and compliant with the electric motor data plate, both for the connection of the terminal board and for the thermal calibration in accordance with the maximum admitted absorption;
- ⤴ ensure that the pipes have been washed with clean water, to remove foreign bodies, cinders, dust or scraps from processes carried out on the plant;
- ⤴ with reference to chapter 3 ensure that a CIP/SIP cleaning and/or sanitisation cycle has been carried out, as per section 3.4;
- ⤴ if there is a mechanical safety valve on the front cover or a bridge one on the external cover of the LPDPG, check that the spring has been adjusted, as indicated in section 3.3.3;
- ⤴ if there is a pneumatic safety valve on the front cover of the LPDPG, check that the auxiliary pneumatic unit pressure has been adjusted, as indicated in section 3.3.3;
- ⤴ make sure that all gates in suction and delivery are completely open, in order to ensure the suction pipes are full of process fluid;



ATTENTION

The LPDPG must not be used to process fluids other than that / those for which it has been selected and sold, with reference to the intended use. If in doubt, contact the O.M.A.C. s.r.l. Technical Office. Fluids incompatible with the materials used in the construction and completion of the LPDPG can damage the same Unit, other parts of the unit and cause injuries and damages to the operators in charge of running the plant.

4.5.2 First start-up



ATTENTION

The B series lobe displacement pump part of the LPDPG can also operate when empty because the moving parts are not in contact with each other, except for the sliding faces of the seals that, especially at high speeds, tend to overheat. For this reason, it is recommended to never let the B Series lobe displacement pump operate dry for long periods so not to cause premature wear of the sealing parts.

The allowed dry operation period depends on the rotation speed and materials of the sliding faces of the seals but, in any case, it is recommended not to exceed 5-10 minutes for soft materials and 10-15 seconds for hard carbides.

- ⤴ start the LPDPG possibly on reduced speed to then increase up to working speed, checking any anomalies (pump over-pressure, piping leaks, cavitation, vibration, etc.);
- ⤴ if the working speed is very high it is normal for the temperature of the pump gear box to reach 50°C - 60°C, especially in the first hours of operation;

4.6 Stopping instructions

When the LPDPG stops one must intervene on the electric control panel, present on the machine or on the plant of the Customer, and intervene on:

- ⤴ emergency stop, if a situation of danger is occurring;
- ⤴ general selector, for a machine stop.

Once one of the two buttons has been pressed, one must:

- ⤴ disconnect power and block the power device so that the LPDPG cannot be operated;
- ⤴ close the valves placed on the suction and discharge side;
- ⤴ de-pressurise, if present on the LPDPG, the pneumatic safety valve on the front cover;
- ⤴ empty and de-pressurise the pump and suction and delivery piping system connected to the LPDPG;

**DANGER**

If the process fluid is very hot, or in any case above room temperature, one must let the LPDPG cool down, with particular reference to the pump and parts in direct contact with the process fluid, until reaching room temperature.

- ⚠ carefully read Chapter 5 relating to assembly and disassembly of the LPDPG, before carrying out any maintenance or inspection operation of the LPDPG;
- ⚠ clean the outside of the pump before disassembly, as per section 3.4.1.1.

4.7 Instructions for restarting after a stop

In order to restart the LPDPG one must:

- ⚠ open the valves placed on the suction and discharge side;
- ⚠ pressurise, if present on the LPDPG, the pneumatic safety valve on the front cover;
- ⚠ intervene on the electric control panel, present on the machine or plant of the Customer, and:
 - ⚠ move the selector from position "0" to position "1" or "2", according to the rotation direction;
 - ⚠ press the START button.

4.8 Switch-off

To switch off the LPDPG one must press the STOP key on the electric control panel present on the machine or on the plant of the Customer.

4.9 Emptying

To empty the LPDPG, after machine down time, one must operate in the machine as described below:

- ⚠ stop the plant, as described in section 4.6;
- ⚠ use a hex spanner to remove the screws of the front the front cover and move the cover away from the pumping chamber;
- ⚠ let the remaining fluid drain into a container to dispose of it according to the existing regulatory framework.

Once the excess fluid has drained from the pump body, fully remove the cover and continue with the required operations (maintenance, parts replacement, dismantling, etc.).

4.10 Residual risks

Listed below are the main residual risks that may occur in the LPDPG, deriving from the incorrect execution of one of the operations described in this OMM.

CAUSES THAT MAY GENERATE RESIDUAL RISKS	RESIDUAL RISKS
Removal of the front cover / Emptying / Leakage of fluid	Contact with dangerous process fluid
Incorrect earthing	Electric shock
Breakage of piping / Breakage of mechanical components	Ejection of process fluid
Incorrect or incomplete fixing of the pump Unit / Incorrect tightening of screws	Support vibrations and movements / Misalignment between pump Unit and piping of Customer plant
Incorrect calculation of performances (capacity, pressure, speed)	Rotors seizure, possible piping breakage
Incorrect closure of a valve upstream or downstream of the pump Unit	Water hammer with projection of cover
Presence of metallic cinders in the plant of the Customer	Possible seizure of rotors
Incorrect CIP/SIP	Contamination of process fluid
Leakage from sealing parts	Ejection of process fluid

4.11 Dangers generated by use

Incorrect use of the LPDPG, generated by failure to comply in full or in part with the use and maintenance instructions contained in this OMM, can cause technical dangers in the operation of the Customer plant.

Listed below are the incorrect ways to use the LPDPG .

INCORRECT USE	ARISING DANGERS
Use of the LDPU for transfers of fluid in different conditions of hygienic level than those for which it has been of its organoleptic designed(*)	Contamination of process fluid or degradation of the organoleptic specifications
Incorrect execution of CIP/SIP	Possible contamination of process fluid
Failure to use personal protection equipment	Danger for health of operators in charge of using the plant of the Customer
Failure to comply with the procedures described in chapters 3 and 4 of this manual	Malfunctioning of the plant of the Customer / Risks for the health of operators

(*) The LPDPG for alimentary use has been designed to ensure hygiene Level 3, in accordance with EN 14159.

4.12 Prohibited use

The unintended uses of the LPDPG for chemical use or alimentary use are all those that are NOT covered under sections 1.4 and section 4.1.

**ATTENTION**

O.M.A.C. s.r.l. forbids any use not expressly indicated in this OMM and is not liable for any damage caused by unauthorised improper use of the LPDPG or with the process fluid.

4.13 Management of emergency situations

In the event of an emergency situation connected directly or indirectly to the LPDPG, one must stop machine operation, intervening on the electric control panel, present on the machine or plant of the Customer.

One can stop operation by pressing the emergency button, marked with letter "E" in section 4.2 of this chapter (red mushroom button on circular yellow base).



CHAPTER 5 – MAINTENANCE

Where provided, the contents of this chapter is specifically addressed to the **internal company maintenance operator**. This person, named directly and formally by the Customer company management; has at least two years experience in this role and has the required technical abilities for operating in safety conditions and interpret the technical indications contained in the above mentioned documentation properly.



DANGER

Before disconnecting the LPDPG from its energy supplies, make sure that the plant or part of it is contained in complies with the following conditions:

- ⚠ absence of product and eventually washing;
- ⚠ absence of residual pressure;
- ⚠ temperature of contact surfaces not dangerous.

Before carrying out any maintenance operation on the LPDPG pump, ensure one has carried out the pump and plant stopping operations, described in section 4.5 "Use of the line: stopping instructions"

During the LPDPG assembly and disassembly operations, as during its routine and extraordinary maintenance, one must wear the personal protection equipment, according to the operation and risk connected to the activity performed by the appointed operator, as described in section 1.9.

5.1 Troubleshooting and solving problems

FAILURE: HIGH POWER ABSORPTION BY GPVL

POSSIBLE CAUSES:	REMEDIES:
Excessive medium viscosity	Decrease the speed of the pump, increase the temperature of the medium
Low medium temperature	Increase the temperature of the medium, heat the pumping case (within the limits given by the manufacturer)
Excessive back-pressure	Remove possible obstructions in the outlet piping, increase the piping diameter, reduce its lenght and the number of the bends
Too tight packing gland	Loosen the packing gland and tighten it rightly (see instructions)
Excessive pump speed	Decrease the speed of the pump
Piping press on pumping case	Check the piping alignment, if necessary fit flexible expansion joints, and fix the piping on the plant structure
Not aligned joint	Check the alignment between pump and drive device
Worn out bearings	Replace the bearings by the manufacturer
Worn out or untimed gears	Replace the gears or time them according to the instructions
Wrong quantity / quality of gears oil	Act according to the manufacturer's instructions
Parts in contact in the pumping case	Check the design pressure coincides with the operating pressure
Worn out rotors	Replace rotors

FAILURE: GPVL JUST STARTING BLOCK

POSSIBLE CAUSES:	REMEDIES:
Excessive medium viscosity	decrease the speed of the pump, increase the temperature of the medium
Low media temperature	increase the temperature of the medium, heat the pumping case (within the limits given by the manufacturer)
Excessive back-pressure	Remove possible obstructions in the outlet piping, increase the piping diameter, reduce its lenght and the number of the bends
Worn out or untimed gears	replace the gears or time them according to the instructions
Parts in contact in the pumping case	Check the design pressure coincides with the operating pressure

FAILURE: UNPRIMED OF THE PUMP

POSSIBLE CAUSES:	REMEDIES:
Insufficient N.P.S.H (Net Positive Suction Head)	Increase the head, the piping inlet diameter, reduce the suction piping lenght and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Medium evaporates in inlet	Increase the head, the piping inlet diameter, reduce the suction piping lenght and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Air enters in inlet	Check and tighten suction piping connections, tighten the packing glands and, if necessary, replace them
Presence of air in the suction	Fill pumping case and feeding piping with liquid, expelling air
Not enough liquid level in the tank in the suction	Increase medium level, lower suction opening position
Dirty or blocked valve or suction filter	Clean filters
Excessive medium viscosity	Decrease the speed of the pump, increase the temperature of the medium
Too loose packing gland	Tighten the packing gland rightly (see instructions)
Excessive pump speed	Decrease the speed of the pump

FAILURE: SEIZURE OF THE PUMP

POSSIBLE CAUSES:	REMEDIES:
Excessive medium temperature	Decrease the temperature of the medium, cool the pumping case
Presence of suspended particles in the medium	Clean suction piping and install a filter on it
Excessive back-pressure	Remove possible obstructions in the outlet piping, increase the piping diameter, reduce its length and the number of the bends
Too tight packing gland	Loosen the packing gland and tighten it rightly (see instructions)
Piping press on pumping case	Check the piping alignment, if necessary fit flexible expansion joints, and fix the piping on the plant structure
Worn out bearings	Replace the bearings by the manufacturer
Worn out or untimed gears	Replace the gears or time them according to the instructions
Wrong quantity / quality of gears oil	Act according to the manufacturer's instructions
Parts in contact in the pumping case	Check the design pressure coincides with the operating pressure

FAILURE: NO FLOW-RATE

POSSIBLE CAUSES:	REMEDIES:
Wrong rotation direction	Invert the rotation direction
Unprimed pump	Fill pumping case and feeding piping with liquid, expelling air
Insufficient N.P.S.H (Net Positive Suction Head)	Increase the head, the piping inlet diameter, reduce the suction piping length and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Presence of air in the suction	Increase medium level, lower suction opening position
Dirty or blocked valve or suction filter	Clean filters
The relief valve leaks	Check the relief valve setting, clean sealing parts, substitute worn parts

FAILURE: LDPU LOW FLOW-RATE

POSSIBLE CAUSES:	REMEDIES:
Insufficient N.P.S.H (Net Positive Suction Head)	Increase the head, the piping inlet diameter, reduce the suction piping length and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Medium evaporates in inlet	Increase the head, the piping inlet diameter, reduce the suction piping length and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Air enters in inlet	Check and tighten suction piping connections, tighten the packing glands and, if necessary, replace them
Presence of air in the suction	Fill pumping case and feeding piping with liquid, expelling air
Not enough liquid level in the tank in the suction	Increase medium level, lower suction opening position
Dirty or blocked valve or suction filter	Clean filters
Insufficient medium viscosity	Increase pump speed, decrease the temperature of the medium
Excessive medium temperature	Decrease the temperature of the medium, cool the pumping case
Excessive back-pressure	Remove possible obstructions in the outlet piping, increase the piping diameter, reduce its length and the number of the bends
Too loose packing gland	Tighten the packing gland rightly (see instructions)
Insufficient pump speed	Increase pump speed
Transmission belt slips	Stretch the belt
Worn out rotors	Replace rotors
The relief valve leaks	Check the relief valve setting, clean sealing parts, substitute worn parts
The relief valve is wrongly set	Check the relief valve setting and the spring compression in the way that the spring will open at a 10% more of the operating pressure
The relief valve vibrates	Check the relief valve setting, check and clean the valve

FAILURE: PORTATA IRREGOLARE

POSSIBLE CAUSES:	REMEDIES:
Insufficient N.P.S.H (Net Positive Suction Head)	Increase the head, the piping inlet diameter, reduce the suction piping length and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Medium evaporates in inlet	Increase the head, the piping inlet diameter, reduce the suction piping length and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Air enters in inlet	Check and tighten suction piping connections, tighten the packing glands and, if necessary, replace them

**FAILURE: IRREGULAR FLOW-RATE (follows)**

POSSIBLE CAUSES:	REMEDIES:
Presence of air in the suction	Fill pumping case and feeding piping with liquid, expelling air
Not enough liquid level in the tank in the suction	Increase medium level, lower suction opening position
Dirty or blocked valve or suction filter	Clean filters
Too loose packing gland	Tighten the packing gland rightly (see instructions)
Excessive pump speed	Decrease the speed of the pump

FAILURE: NOISE PUMP AND LDPU VIBRATION

POSSIBLE CAUSES:	REMEDIES:
Insufficient N.P.S.H (Net Positive Suction Head)	Increase the head, the piping inlet diameter, reduce the suction piping lenght and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Medium evaporates in inlet	Increase the head, the piping inlet diameter, reduce the suction piping lenght and the number of the bends, decrease the speed of the pump and the temperature of the medium, check that the increase (caused by the decreasing temperature) is suitable to the motor power
Air enters in inlet	Check and tighten suction piping connections, tighten the packing glands and, if necessary, replace them
Presence of air in the suction	Fill pumping case and feeding piping with liquid, expelling air
Not enough liquid level in the tank in the suction	Increase medium level, lower suction opening position
Dirty or blocked valve or suction filter	Clean filters
Excessive medium viscosity	Decrease the speed of the pump, increase the temperature of the medium
Excessive medium temperature	Decrease the temperature of the medium, cool the pumping case
Presence of suspended particles in the medium	Pulire la tubazione di alimentazione, installare un filtro di alimentazione
Too loose packing gland	Tighten the packing gland rightly (see instructions)
Excessive pump speed	Decrease the speed of the pump
Piping press on pumping case	Check the piping alignment, if necessary fit flexible expansion joints, and fix the piping on the plant structure
Not aligned joint	Check the alignment between pump and drive device
Pump or drive device not fixed on the base	Tighten bolts and re-check the alignment between pump, device and joint
Worn out bearings	Replace the bearings by the manufacturer
Worn out or untimed gears	Replace the gears or time them according to the instructions
Wrong quantity / quality of gears oil	Act according to the manufacturer's instructions
Parts in contact in the pumping case	Check the design pressure coincides with the operating pressure
The relief valve vibrates	Controllare la regolazione della valvola, ispezionare e pulire la valvola
The relief valve is wrongly set	Check the relief valve setting and the spring compression in the way that the spring will open at a 10% more of the operating pressure

FAILURE: OVERHEATING OF THE PUMP

POSSIBLE CAUSES:	REMEDIES:
Excessive medium viscosity	Decrease the speed of the pump, increase the temperature of the medium
Excessive medium temperature	Decrease the temperature of the medium, cool the pumping case
Excessive back-pressure	Remove possible obstructions in the outlet piping, increase the piping diameter, reduce its lenght and the number of the bends
Too tight packing gland	Loosen the packing gland and tighten it rightly (see instructions)
Piping press on pumping case	Check the piping alignment, if necessary fit flexible expansion joints, and fix the piping on the plant structure
Not aligned joint	Check the alignment between pump and drive device
Worn out bearings	Replace the bearings by the manufacturer
Worn out or untimed gears	Replace the gears or time them according to the instructions
Wrong quantity / quality of gears oil	Act according to the manufacturer's instructions
Parts in contact in the pumping case	Check the design pressure coincides with the operating pressure
The relief valve leaks	Check the relief valve setting, clean sealing parts, substitute worn parts

FAILURE: OVERHEATING OF THE MOTORIZATION

POSSIBLE CAUSES:	REMEDIES:
Low medium temperature	Increase the temperature of the medium, heat the pumping case (within the limits given by the manufacturer)
Excessive medium viscosity	Decrease the speed of the pump, increase the temperature of the medium
Excessive back-pressure	Remove possible obstructions in the outlet piping, increase the piping diameter, reduce its lenght and the number of the bends

FAILURE: OVERHEATING OF THE MOTORIZATION

POSSIBLE CAUSES:	REMEDIES:
Too tight packing gland	Loosen the packing gland and tighten it rightly (see instructions)
Excessive pump speed	Decrease the speed of the pump
Piping press on pumping case	Check the piping alignment, if necessary fit flexible expansion joints, and fix the piping on the plant structure
Not aligned joint	Check the alignment between pump and drive device
Worn out bearings	Replace the bearings by the manufacturer
Worn out or untimed gears	Replace the gears or time them according to the instructions
Wrong quantity / quality of gears oil	Act according to the manufacturer's instructions
Parts in contact in the pumping case	Check the design pressure coincides with the operating pressure
Worn out rotors	Replace rotors

FAILURE: FAST ROTORS WEAR

POSSIBLE CAUSES:	REMEDIES:
Excessive medium temperature	Decrease the temperature of the medium, cool the pumping case
Presence of suspended particles in the medium	Clean suction piping and install a filter on it
Excessive back-pressure	Remove possible obstructions in the outlet piping, increase the piping diameter, reduce its length and the number of the bends
Piping press on pumping case	Check the piping alignment, if necessary fit flexible expansion joints, and fix the piping on the plant structure
Worn out bearings	Replace the bearings by the manufacturer
Worn out or untimed gears	Replace the gears or time them according to the instructions
Parts in contact in the pumping case	Check the design pressure coincides with the operating pressure

FAILURE: FAST SEALS WEAR

POSSIBLE CAUSES:	REMEDIES:
Presence of suspended particles in the medium	Clean suction piping and install a filter on it
Too tight packing gland	Loosen the packing gland and tighten it rightly (see instructions)
Insufficient flushing seal liquid level	Check the flushing seal liquid and, if necessary, increase its flow-rate

5.2 Instruction for carrying out checks

Before any maintenance intervention one must provide all the security measures that comply with the accident prevention regulations in force. In particular inhibit operation of all electric utilities and discharge any residual energy.

The instruments and tools needed for good maintenance are those normally supplied as standard to a technician with assembly/maintenance tasks.

In the case the machine is positioned above ground level it is up to the Customer to make the machine accessible to the operator in order to permit adjustment, maintenance, repair, etc. operations possible, in safety conditions.

- ⚠ In the case the process fluid is subject to easy drying, crystallisation or sedimentation, it is essential to wash the pump and pipes at the end of each operation, i.e. at the beginning of extended machine down time.
- ⚠ The reversibility of the rotation direction, common feature of all OMAC pumps, offers the possibility to recall the process fluid, completely emptying the delivery pipes and putting the product in storage.
- ⚠ If the LPDPG is not use for a long period of time, when starting check that the sealing parts are not blocked by turning the pump shaft manually.
- ⚠ If the process fluid is subject to freezing or solidification, ensure before starting, that the pipes and the pump body are not obstructed by solid parts of fluid, formed during inactivity.

The references below, with position number, are to intended as the exploded view drawing of the LPDP indicated in section 1.3.

5.2.1 Daily checks

- ⚠ Visual inspection of all sealing parts and of the general operation of the LPDPG.
- ⚠ If one experiences a loss of mechanical seals, see to replace them as soon as possible, to prevent the process fluid from entering the bearings box or stagnating on the ground.

5.2.2 Weekly checks

- ⚠ Check the oil level of the pump and motor unit, eventually top-up with oil of the kind indicated by the manufacturers, after having checked the proper amount and the degree of viscosity on the respective use and maintenance manuals.
- ⚠ Inspect the pumping chamber and free it from any scaling due to the kind of process fluid.
- ⚠ Check that there is no seizing between the rotors and the static surfaces of the pumping body.
- ⚠ Check that the mechanical safety valve on the cover, when provided, is not blocked by a long period of inactivity. To check simply remove the adjustment screw completely (pos.59 page 29) and then adjust the calibrations of the spring again.

5.2.3 Six monthly checks

- ⚠ If the LPDPG works constantly at high temperatures, above 120°C, check the integrity of the pump lubricant oil; if it has gone dark in colour, see to its replacement. The same goes for the motorisation unit; keep to the instructions of the manufacturer.
- ⚠ Check that the distribution gears have not reached such a play to enable the rotors to come into contact; in this case replace the worn gears.
- ⚠ Check the stiffness of the shafts: if there is even minimal axial or radial play, see to the replacement of the bearings.

**NOTE**

By systematically following these checks, the pump will maintain its original performances unchanged for many years.



5.3 Periodic checks of the safety and emergency devices

When the LPDPG is fitted with an electric control panel, one must carry out weekly checks for the correct operation of the actuators and operation of the relative warning lights.

5.4 Indication of dangerous temperature

In the event of pumps predisposed for pumping products at high temperatures up to 150°C, there is a signal placed on the same pump that warns the operators of the presence of high temperature surfaces, as shown in figure:



5.5 Oils present

- ⚠ Check the oil level placed on the side of the pump daily; it must always be completely full when the pump is switched off.
- ⚠ If needed, restore the level by adding oil with reference to section 1.3.12 of this OMM, relating to the degree of viscosity and the proper amount, expressed in litres, for every LPDPG size.
- ⚠ If the pump is used with vertical openings, check the proper position of the vent cap and level and if needed invert them.
- ⚠ Oil replacement must take place after a run-in period of about 150 working hours, subsequently every 2500 hours.
- ⚠ If the gear box works constantly at temperatures above 90°C, lubricate with oil with a higher degree of viscosity (see section 1.3.12) and replace it every 1000 working hours.

5.6 Tests and checks

Listed below are the checks to be performed, at predetermined intervals, on the LPDPG.

5.6.1 Lubrication

The LPDPG has other mechanical elements that during maintenance require lubrication: these components are the sealing parts.

In assembly and disassembly operations there are the specifications relating to the surfaces to be lubricated with grease and the stages in which this operation must be carried out.

5.6.2 Single mechanical seals

- ⚠ Mechanical seals do not require any maintenance.
- ⚠ When there is a leak, caused by wear and contact surfaces, see to replace the whole seals (see disassembly instructions).
- ⚠ In case of extended operation with worn seals, check that some process fluid leaks outside the pumping body.

IMPORTANT: it is recommended to not let the mechanical seals turn when dry.

5.6.3 Double mechanical seals

- ⚠ Double mechanical seals (flushed), as simple mechanical seals, do not require any maintenance;
- ⚠ With flushing connected adequately, the pump can operate even in absence of the product to be pumped, because the seals do not risk overheating;
- ⚠ Check that flushing is always efficient, when the pump is operating, in order not to damage the auxiliary seals (connection diagram section 3.5.2);
- ⚠ To disassemble the flushed mechanical seals, follow the instructions of the simple mechanical seals, described in this chapter;
- ⚠ To remove the fixed part of the mechanical seal, disassemble the chamber (pos. 22) from the pumping body;
- ⚠ When assembling, before inserting the rotating part of the mechanical seal on the shaft, position the rotating ring properly (pos. 224) and fit the auxiliary sealing ring adequately (pos. 223) in its housing on the chamber (pos. 220), as per the section drawings in chapter 7, in the sections relative to the sealing parts.

The purpose of flushing mechanical seals is generally to cool down and lubricate the sliding faces of the mechanical seal, via forced circulation of a flushing liquid.

The flushing liquid and its distribution circuit must be provided by the Customer. **The Customer must also check, through his Technical Office, the compatibility between the flushing liquid and the process fluid, as well as the compatibility between the flushing liquid and the components of the LPDP in close contact (pumping chamber material, seals material, working temperature, etc.)**

Once this requirement has been checked and validated, the Technical Office of the Customer will see to expressly authorise the operator responsible for the installation of the LPDPG to fit the flushing circuit on the seals flushing chamber and commission it, before starting the LPDPG for the first time.



ATTENTION

The operator responsible for fitting the flushing circuit must be expressly authorised by the Technical Office of the Customer to connect the same flushing circuit to a system that uses "flushing liquid" compatible with the process fluid.

O.M.A.C. s.r.l. is not responsible for improper use of the flushing liquid nor for damages deriving from contamination of the process fluid.



DANGER

Improper use of the flushing system can cause breakage of the mechanical seals with consequent damage of the LPDPG and contamination of the process fluid.

O.M.A.C. s.r.l. is not responsible for improper use of the flushing system.

The operator designated by the Customer must connect the flushing circuit joints to the input and output holes of the seals flushing chambers and adjust the temperature and pressure according to the type of seal fitted on the displacement pump, as described below:

- ⚠ in case of single mechanical seals the flushing pressure must be about 1.5 - 2 bar and a flow-rate of 0.5-1 l/min ;
- ⚠ in the case of double mechanical seals the flushing pressure must be equal to the working pressure or higher by 1 bar, to ensure that the film created between the sliding faces of the seals is made up of the flushing liquid and not by the process fluid, which according to its chemical composition may crystallise and solidify after machine down time and generate, upon restarting the unit, a "sticking" phenomenon of the faces, causing their breakage.

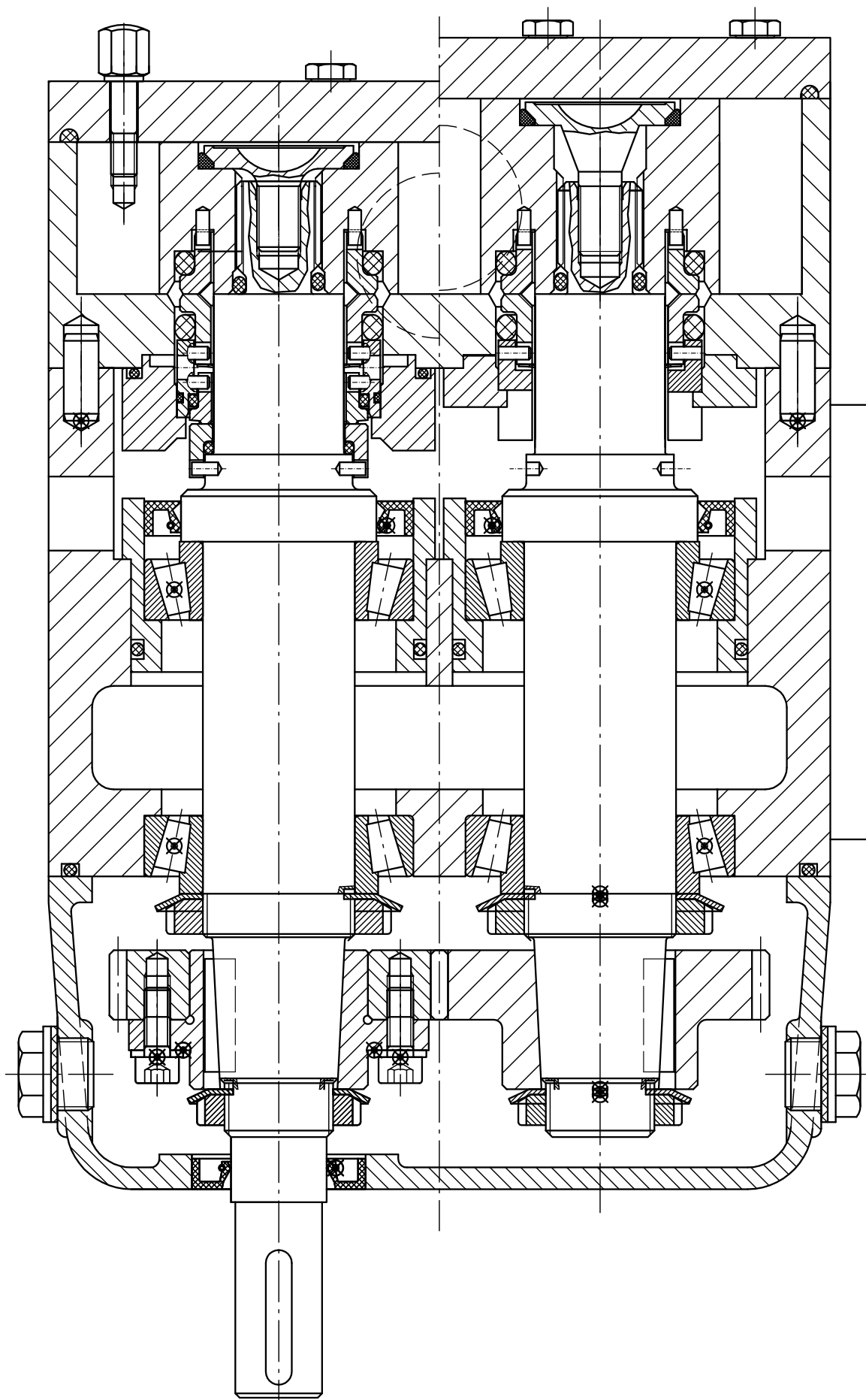
The flushing temperature must be established according to the type of processed fluid and to the flushing utility: generally using liquid at room temperature - about 15° - 20° - is necessary to disperse the heat generated by friction of the seals faces, or vice-versa, using liquid at higher temperatures, for example 80° - 90°, can be useful for melting, removing, cleaning and lubricating the seals faces.

The dimensions of the inlet and outlet holes joints of the flushing circuit are listed in the table in section 1.3.9 in chapter 1.

5.7 Disassembly and assembly operations of C / CF 100 110 115 220 270 325 330 390 570 size lobe pump.

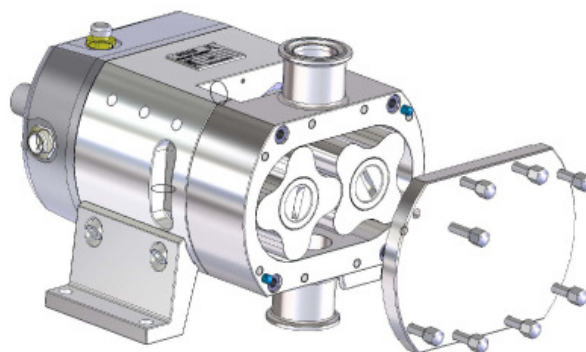
This section lists the disassembly / assembly operations of the C / CF 100 110 115 220 270 325 330 390 570 size lobe pump.

C / CF 100 110 115 220 270 325 330 390 570 Section

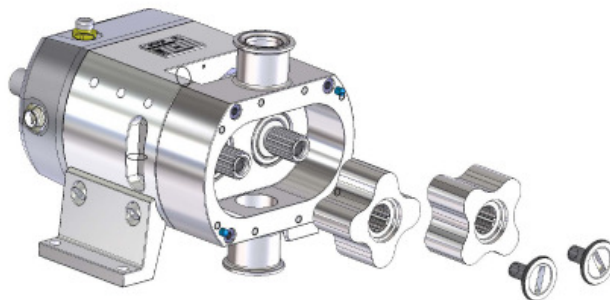


5.7.1 Disassembly of the mechanical seal

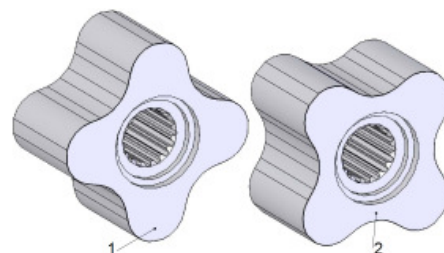
1 Remove the front nuts and exert leverage in the provided slots on cover



2 Unscrew anticlockwise the rotor nuts, interposing a non metal element between the rotors, making them stop rolling

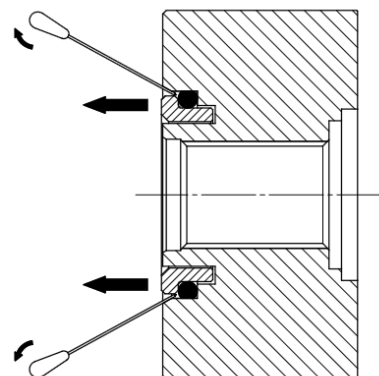


3 Take care of the reference marked on rotors and shafts (1-2) so that you will set them rightly while reassembling

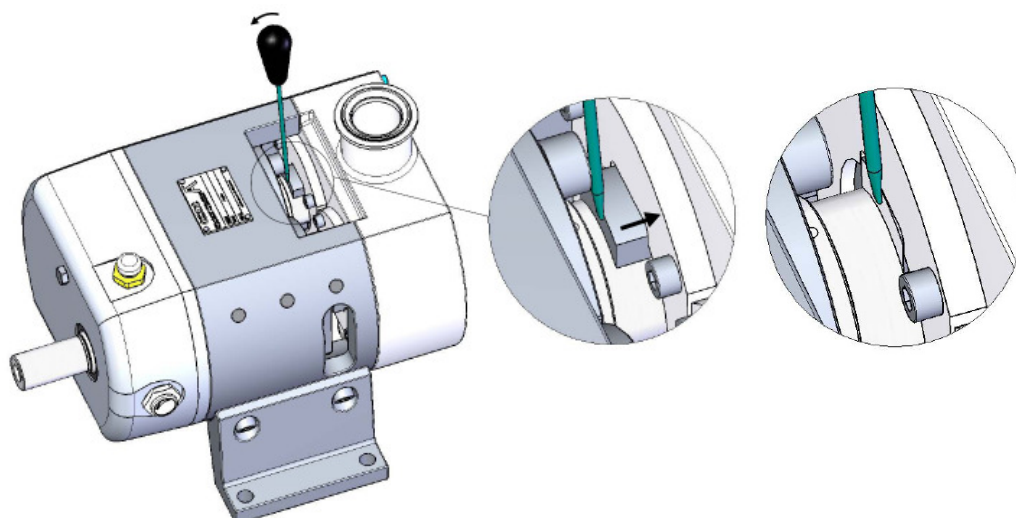


4 Using two screwdrivers leverages the interstices to dismantle the seal and the gasket by the rotor.

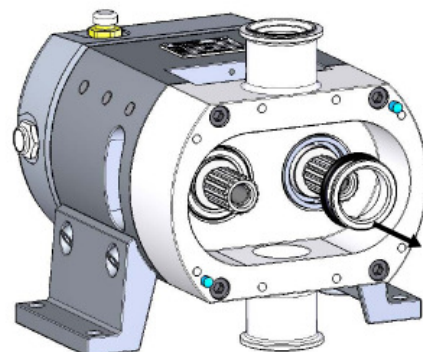
make attention to not scratch the seals face



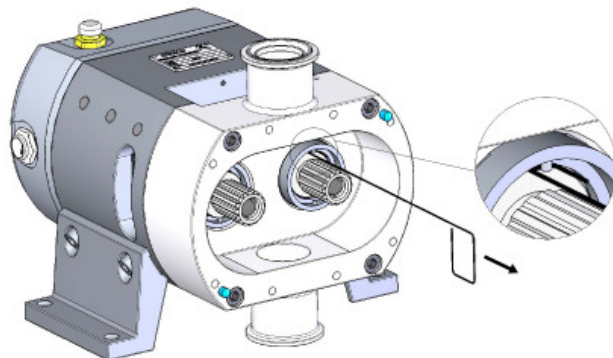
5 Using a screwdriver, move forward the wings of the stationary ring support, as in the figures



6 Extract the stationary part of the mechanical seal from rotor case and its o-ring



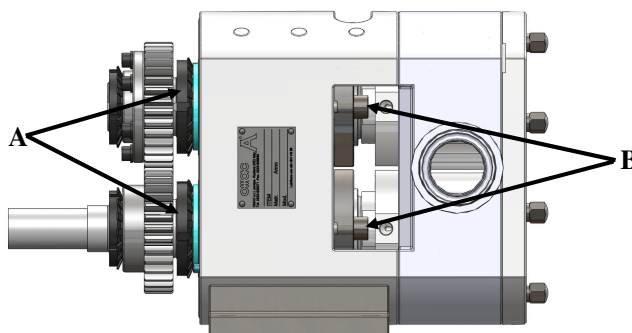
7 Finally using an eye-hook, extract the stationary ring support.



5.7.2 Registration of the axial bearing adjustment.

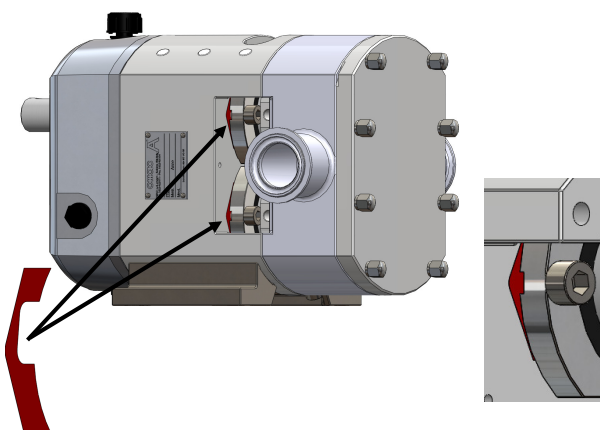
In case of rotors or rotors case replacement, the clearance must be restored as indicated in chapter 1.

For the axial adjustment, you must interpose the appropriate calibrate spacers between the gear case and the bearing supports.



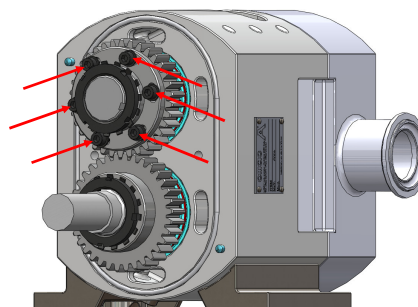
In order to remove the back cover is necessary to empty completely the pump from the oil.

Unscrew the two ring nuts (A) and the four screws (B); only in this case will be possible insert the spacers in order to achieve the correct axial adjustment.



If you have questions, please contact our technical Dept. before operate

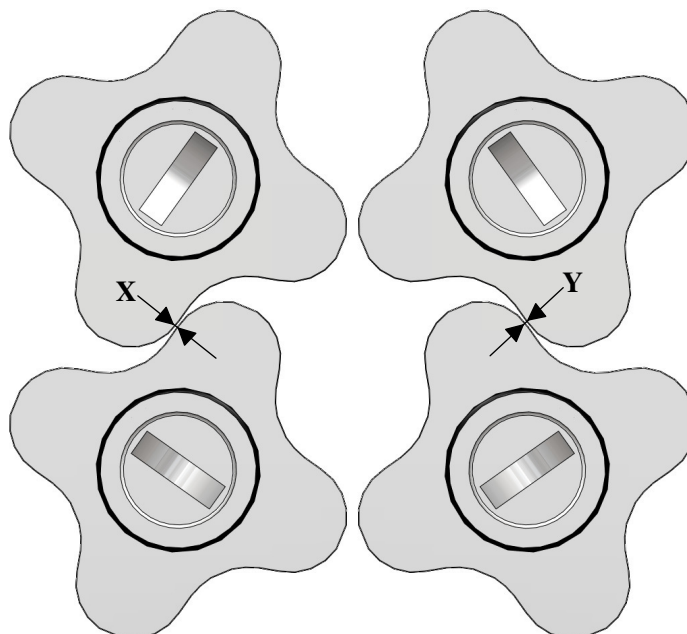
For the rotors timing you must unscrew the six screws on the adjustable gear and place the rotors in order to subdivide fairly the clearance as indicated in the picture.



$$X=Y$$

Every time you make a new timing of the rotors, the plane washer must be replaced

When you have obtained the correct timing put a metal wedge between the two gears and bolt the screws.



Remember to remove the wedge after operation.

Then get on the back cover and restore the oil level.



5.8 Post maintenance check

After maintenance activities, one must carry out tests to ensure the proper operation of the LPDPG, before restarting the unit. To carry out these tests refer to the check-list of section 4.5.1 of this OMM.

CHAPTER 6 – DECOMMISSIONING

Where provided, the contents of this chapter is specifically addressed to the internal company maintenance engineer. This person, named directly and formally by the Customer company management; has at least two years experience in this role and has the required technical abilities for operating in safety conditions and understand and interpret the technical indications contained in the above mentioned documentation properly.

During assembly and disassembly operations of the LPDPG, as in occasion of its routine and extraordinary one must wear the personal protection equipment, according to the operation and risk connected to the activity performed by the appointed operator, as described in section 1.9.

6.1 Disconnection from energy sources



DANGER

Before disconnecting the LPDPG from its energy supplies, make sure that the plant or part of it is contained in complies with the following conditions:

- ⚠ absence of process fluid and eventually washing of parts in contact with process fluid;
- ⚠ absence of residual pressure;
- ⚠ temperature of contact surfaces not dangerous.

As already highlighted inside this use and maintenance manual, the LPDPG must be disconnected from the energy sources:

- ⚠ electric (motorisation);
- ⚠ hydraulic (driving force, flushing and/or aseptic unit when present);
- ⚠ pneumatic (driving force, pneumatic safety valve, when present).

Disconnection of the LPDPG from the energy sources requires strict compliance with the indications below:

- ⚠ with reference to Chapter 4, stop operation of the LPDPG (of every component) and consequently stop operation of the plant;
- ⚠ once operation of the LPDPG has been stopped, put every main switch in the plant in position "0", so that every part of the line is insulated from the power network (electric, etc.);
- ⚠ make sure that the various "presence of voltage" warning lights are switched off;
- ⚠ if an aseptic system and/or flushing system are present, make sure that the auxiliary liquid supply hydraulic control unit is switched off;
- ⚠ when the LPDPG requires compressed air to operate (presence of pneumatic safety valve), move the compressed air supply/discharge tap lever in close/discharge position and wait for a few minutes. This way the machine is insulated from the pneumatic supply network and furthermore the residual energy present inside the pneumatic circuit is discharged;



DANGER

Before disconnecting the lobe pump from its energy supplies, make sure that the upstream energy supply has been interrupted, that the hydraulic supply has been interrupted, that the compressed air has been interrupted and there is no residual energy (i.e. for example: that the compressed air present in the pneumatic plant has been discharged). Also check that the compressed air supply tap of your plant is closed.

- ⚠ in case of electric supply, making sure that you do not have any parts of your body near the damp areas, remove the plug from the electric system of the machine, from the electricity socket;
- ⚠ if pneumatic supply is present, free the fixing of the pneumatic supply pipe;
- ⚠ if hydraulic supply is present, free the fixing of the hydraulic supply pipe;
- ⚠ pay utmost attention to possible leaks of remaining liquids. These leaks must be dried immediately in order to prevent slipping.

It is reminded that the operations needed to disconnect the LPDPG from its energy supplies, for the complexity of the numerous checks / tests to be carried out, must be performed by skilled personnel only.

Please be reminded that to operate the LPDPG may need electricity, hydraulics and compressed air; connections that need to be disconnected carefully, taking care to verify the absence of stored residual energy in addition to water leaks.



DANGER

if not formally authorised, do not attempt to disassemble parts of the LPDPG. O.M.A.C. S.r.l. is not liable for damages to things or persons during disassembly carried out by unauthorised personnel.

6.2 Disassembly

With reference to chapter 3, using PPE and the tools described herein, free the pump from its fixings, following the indications, in section 3.3 (installation), in reverse order



ATTENTION

- ⚠ use the proper P.P.E.;
- ⚠ use the adequate tools;
- ⚠ follow the procedure described in section 3.3 in reverse order;
- ⚠ first of all disassemble the any optional features present on the pump;
- ⚠ unscrew the suction and delivery connections from the plant;
- ⚠ remove the fixing screws from the base;
- ⚠ extract the LPDPG from its position, using hoisting equipment.



DANGER

Considering the mass of the lobe pump, the hoisting and transfer stages must only be carried out by skilled personnel and under the direct supervision of technical personnel headed by the respective manufacturers.

- ⚠ using a clean cloth that does not leave any fluff, clean the external parts accurately (both externally and the easily accessible internal parts);

**WARNING**

For cleaning, only use a clean cloth that does not leave any fluff.

- ⤴ free the LPDPG from its anchoring;
- ⤴ the unit is now free from its anchoring and ready to be handled, as defined in chapter 2 of this UMM.

6.3 Storage after its use

After the disconnection and cleaning operations, put the LPDPG in its original packaging, fixing it and trying to ensure good stability.

Using appropriate hoisting means, put the packed LPDPG in a dry sheltered place at room temperature.

6.4 Demolition and disposal

Following the indications of the European Community Directives in force at the time of demolition, the user must take care of the disposal of the materials that make up the machine.

It is good practice for the user, before demolishing the lobe pump, to communicate all the data carried on the nameplates and relating to the components that will be demolished to the relative manufacturers.

The LPDPG is made with materials that are not subject to specific obligations for toxicity and / or harmfulness and therefore do not require particular disposal procedures, except for the oils present (with reference to section 5.6); substances that must be disposed of in compliance with the legislative obligations in force, as indicated in the relative safety sheet, with reference to sections 5.7, 5.8.

**WARNING**

The LPDPG presents some substances that must be disposed of in compliance with the legislative obligations in force.

DO NOT DISPOSE OF THESE MATERIALS IN THE ENVIRONMENT

In case of demolition, the user, in accordance with the local law regulations, must take special precautions regarding the disposal of significant materials from the environmental point of view, such as:

- ⤴ plastic materials of pneumatic pipes (when present)
- ⤴ coated electric cables (when present)
- ⤴ any remaining toxic or corrosive substances
- ⤴ Lubricant oil of the gear box.

CHAPTER 7 – SPARE PARTS

Throughout his life, the LPDPG may require the replacement of consumed or worn parts. To simplify the recognition of its consumption elements, O.M.A.C. S.r.l. completes this manual with specifications defined for the identification of spare parts.

They are mainly spare parts that, if required, must be replaced only by skilled technical personnel authorised by O.M.A.C.



WARNING

Only skilled personnel authorised by O.M.A.C. S.r.l. can carry out extraordinary maintenance replacement interventions, performing the replacement interventions of the components described below.

Do not try to replace parts without authorisation.

In case of replacing constructive mechanical parts that compose the LPDPG, some of these need long manufacture time that can take a few months.

It is advisable to have enough of the components described above in the amounts deemed necessary to limit machine down time.



DANGER

Only skilled personnel authorised by O.M.A.C. s.r.l. can carry out extraordinary maintenance interventions; do not try to replace parts of the machine if unauthorised. O.M.A.C. s.r.l. is not liable for damages to persons, animals or things deriving from unauthorised interventions.

7.1 List of spare parts and section drawings of the lobe displacement pump

Below the LPDPG will be presented in its various sizes, complete with exploded view construction drawing and bill of materials table.

For each component, the tables below indicate the position in the exploded view drawing, the description, the needed amount and, depending on the model, the item code to order as spare part.

In the "amounts" column there may be one or more values present: where there are two amounts, the value marked with the asterisk only refers to the code marked with an asterisk, present on the same line, with reference to the pump model that one possesses.



WARNING

If, to replace spare parts, one needs to remove the front cover of the pump (pos. 44), it is essential to restore the pump hygiene level before putting it back into service. It is reminded that in case the LPDPG has been configured for the treatment of alimentary products, level 3 hygiene must be ensured.

7.2 Recommended spare parts

It is advisable for the Customer, in order to ensure the shortest plant down time, to stock up on spare parts relating to sealing parts complete with gaskets.

The codes relating to these components can be found in section 7.4.1.3 - 7.4.2.3 - 7.4.3.3 - 7.4.4.3 - 7.4.5.3, depending on the size of the C /CF Series LPDP, part of the LPDPG.

7.3 How to order spare parts

With reference to the previous sections, the single parts that compose the LPDP are marked with an internal O.M.A.C. code.

This code is of vital importance when communicating with our spare parts department.

In order to have the spare parts delivered quickly you must communicate the following data to us, even via a purchase order:

- ▲ machine model (*)
- ▲ serial number (*)
- ▲ component description
- ▲ component reference code (refer to the attachments of the manual)
- ▲ desired amount.

(*) information that can be found on the machine, on the nameplate

Contacts:

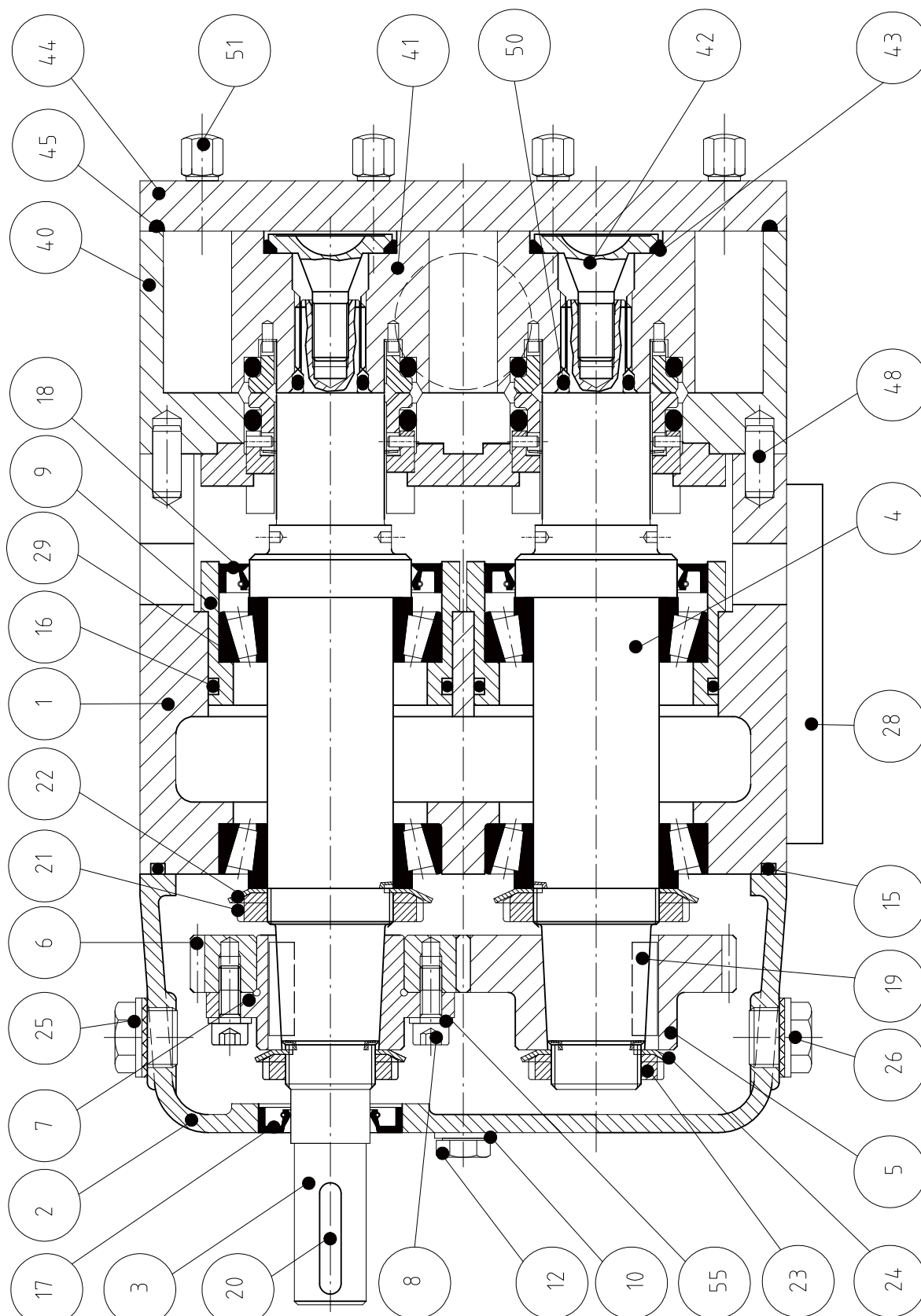
Tel.: 0522/629371 or 0522/629923 and ask for the "spare parts" department

Fax: 0522/628980

E-mail: info@omacpompe.com

7.4 Spare parts for C/CF100

7.4.1 C/CF100 pump exploded view drawing



POS.	DESCRIPTION	Q.TY	CODE
-	OIL ISO VG 68 STANDARD	0.2 lt	06OILVG68
-	OIL ISO VG 68 ALIMENTARY NSF H1	0.2 lt	06OIL68ALIM
-	LABEL	1	44301028
-	CAP M10	4	44301022
-	CAP M6	4	44301040



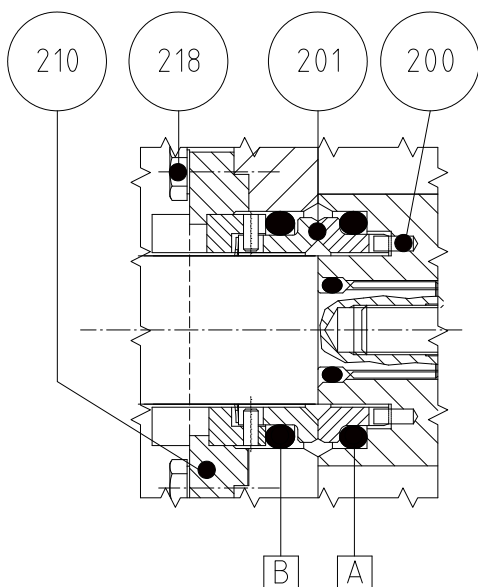
7.4.2 Spare parts codes

POS.	DESCRIPTION	Q.TY	CODE
1	BEARING BOX	1	2001G010N
2	BEARING BOX COVER	1	2001L030N
3	DRIVING SHAFT	1	2004DA450
4	DRIVEN SHAFT	1	2004DA460
5	FIXED GEAR	1	2008M013
6	ADJUSTABLE GEAR	1	2008M017
7	ADJUSTABLE GEAR BUSH	1	2008M038
8	SCREW FOR POS.7	6	410F04X10
9	SEEGER	2	421F37I
10	PLANE WASHER	4	412F06G17
11	BEARING SPACER	2	2014M030
12	SCREW FOR POS.2	4	411A06X35
13	SCREW FOR BEARING	4	411F06X12SZ
15	O-RING 3350 FOR POS.2	1	404T3350
17	OIL SEAL RING FOR POS.1	1	403Y18307D
18	OIL SEAL RING FOR POS.1	2	403Y25377D
19	KEY FOR POS.6	2	418F06X18
20	KEY FOR POS.3	1	418F06X30
21	PIN FOR POS.2	2	417A06X10
23	GEAR RING NUT	2	415F20AUT
25	OIL VENT CAP 1/4"	1	407L14S
26	CAP 1/4"	2	407L14T
27	OIL LEVEL CAP 1/4"	1	407L14L
28	PLANE WASHER FOR CAPS 1/4"	4	407L14R
29	FRONT BEARING + BUSH	2	2019M020
30	REAR BEARING	2	406FNATB5904
31	FOOT FOR VERTICAL CONNECTIONS DISPOSITION	2	2001A299
40	ROTORCASE	1	23...B30
41	GEAR ROTOR S.S. AISI 316 L VERSION ST	2	2005B300
41	BI-LOBE ROTOR S.S. AISI 316 L VERSION ST	2	-
41	RUBBERED FIVE-LOBE ROTOR BUNA-N.B.R.	2	-
41	GEAR ROTOR CY5SnBIM (ANTISEIZURE) VERSION ST	2	2005&300
41	BI-LOBE ROTOR CY5SnBIM (ANTISEIZURE) VERSION ST	2	-
42	LOCKING NUT FOR POS.41	2	2004B107
43	O-RING 3075 FOR POS.42	2	404T3075
44	STANDARD ROTORCASE COVER	1	2006B211
45	O-RING 4337 FOR POS.44	1	404T4337
47	STUD	4	419A06X80
48	PIN FOR POS.40	2	417A08X16
50	O-RING 2050 FOR POS.41	2	404T2050
51	CAP NUT FOR PRO.44	4	414A06
52	NUT	2	413A06
55	PLANE WASHER	6	412F04

POS.	DESCRIPTION	Q.TY	CODE
80	FOOT FOR HORIZONTAL CONNECTIONS DISPOSITION	1	2001G100N
81	SCREW FOR POS.80 OR POS.31	4	411A06X16S
111	HEATING/COOLING ROTORCASE COVER	1	2006B058
113	ROTORCASE COVER JACKET	1	2006B167
114	SCREW FOR POS.113	4	411A06X16
115	O-RING 176 FOR POS.113	1	404T176
239	SEAL PROTECTIONS	2	4034Y005
302	SCREW FOR POS.239	2	410A05X10
304	NAME PLATE	1	4034A102
305	RIVET	4	44301027

7.4.3 Drawing section and seal spare parts

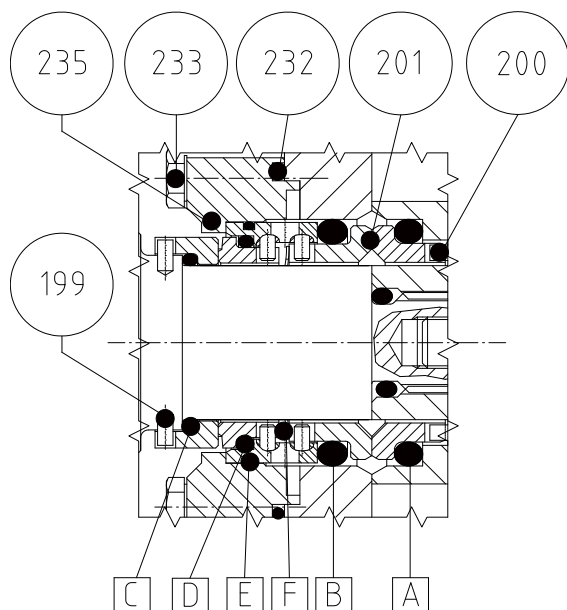
SINGLE MECHANICAL SEAL 8S



SINGLE MECHANICAL SEAL 8S			
POS.	DESCRIPTION	Q.TY	CODE
200	SEAL STOP PIN	4	430A02X08
201	MECH. SEAL 8S AISI 316 L/CARBON/E.P.D.M	2	4U0208S-XZ7
201	MECH. SEAL 8S SILICON CARB./CARBON/E.P.D.M	2	4U0208S-KZ7
201	MECH. SEAL 8S SILICON CARB./SILICON CARB./E.P.D.M	2	4U0208S-KK7
210	MECH. SEAL SUPPORT	2	2014A270
218	SCREW M6X10 FOR POS.210	8	410A06X10
A	O-RING ROTATING PART	2	OR4100
B	O-RING STATIONARY PART	2	OR25X4.5

O-Rings **A** e **B** are parts of pos.201.
If you order pos. nr. 201, it will already contain o-rings A and B.

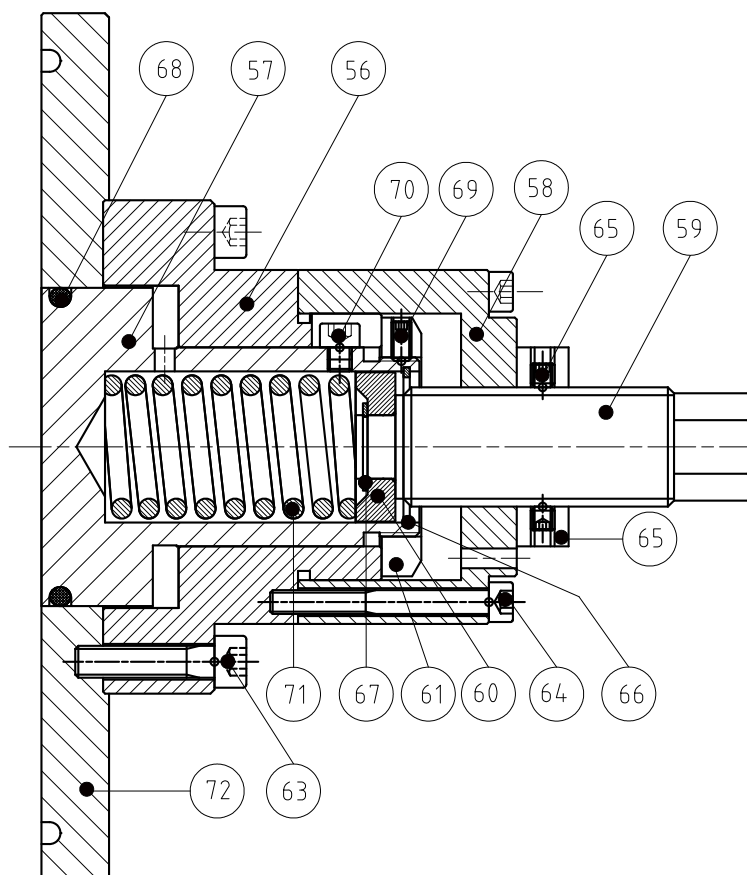
DOUBLE MECHANICAL SEAL 8S7



DOUBLE MECHANICAL SEAL 8S7			
POS.	DESCRIPTION	Q.TA'	CODICE
199	SEAL STOP PIN	4	430A2.5X06
200	SEAL STOP PIN	4	430A02X08
201	MECH. SEAL 8S7 SILICON CARB./SILICON CARB./E.P.D.M. (SECONDARY) S.S.AISI 316 L/ CARBON/E.P.D.M	2	4U0208S7KK7-XZ7
201	MECH. SEAL 8S7 SILICON CARB./CARBON/ E.P.D.M. (SECONDARY) S.S.AISI 316 L/ CARBON/E.P.D.M	2	4U0208S7KZ7-XZ7
232	O-RING 3137 FOR POS.235 (N.B.R or E.P.D.M.)	2	404U3137
233	SCREW TE M6X20 FOR POS. 235	8	410A06X20
235	DOUBLE MECH. SEAL SUPPORT	2	2014B260
A	O-RING PRIMARY ROTATING PART	2	OR4100
B	O-RING PRIMARY STATIONARY PART	2	OR25X4.5
C	O-RING SECONDARY ROTATING PART	2	OR3081
D	O-RING SECONDARY STATIONARY PART	2	OR132
E	O-RING FOR ARMOR	2	OR2112
F	SPRING	1	-

O-Rings **A, B, C, D, E** and the spring **F** are parts of pos.201.
If you order pos. nr. 201, it will already contain parts A,B,C,D,E,F.

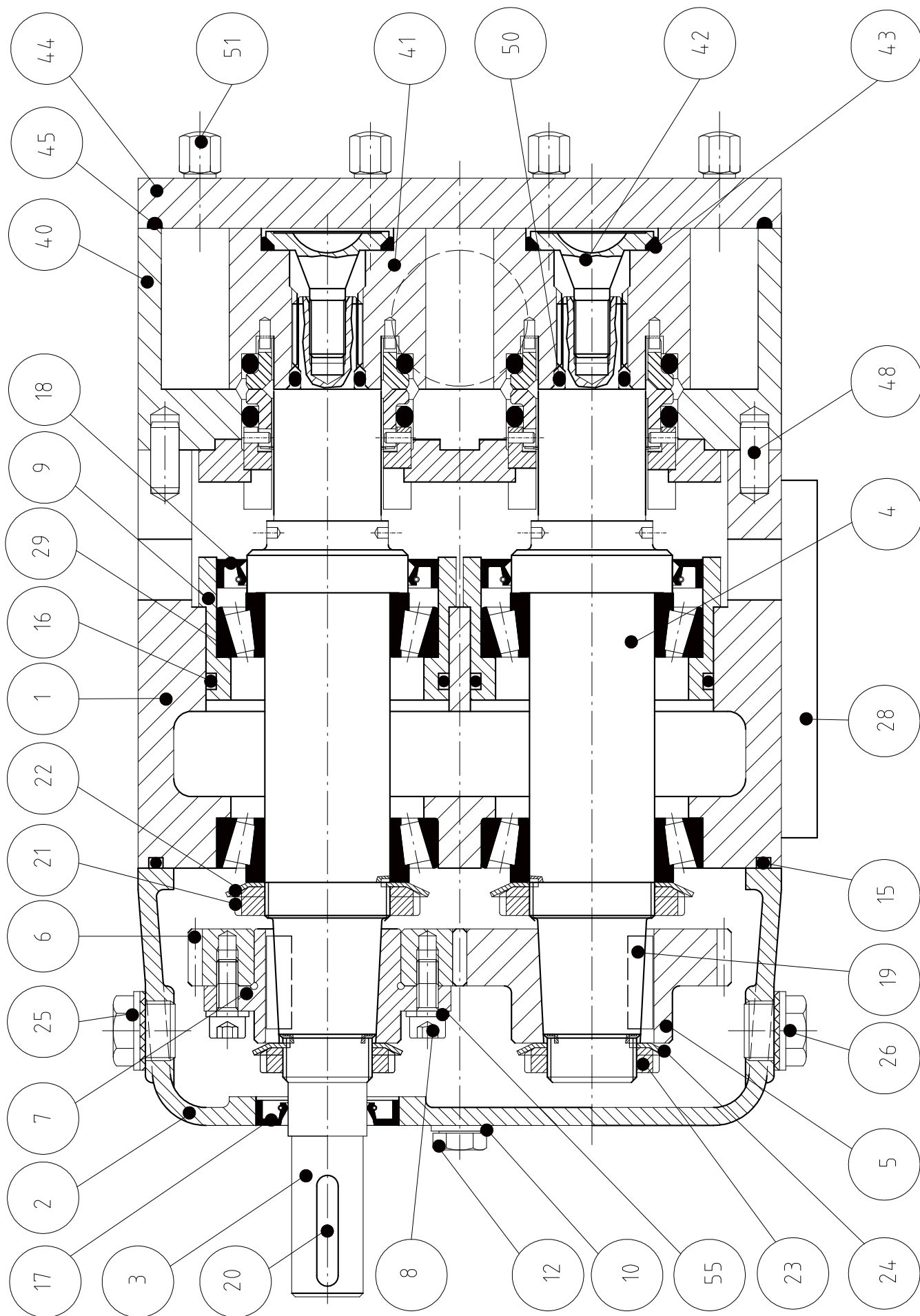
7.4.4 Drawing section and spare parts code for the mechanical safety valve



POS.	DESCRIPTION	Q.TY	CODE
56	SUPPORT	1	
57	PISTON	1	
58	COVER	1	
59	ADJUSTMENT SCREW	1	
60	THRUST WASHER	1	
61	ADJUSTMENT RING NUT	1	
62	ADJUSTMENT RETAINER	1	
63	SCREW	4	
64	SCREW	4	
65	SREW	2	
66	SPLIT RING SEEGER	1	
67	SPLIT RING SEEGER	1	
68	O-RING FOR POS.57	1	
69	DOWEL	2	
70	LOCK	1	
71	SPRING	1	see par. 7.6
72	COVER	1	

7.5 Spare parts for C/CF110 115

7.5.1 C/CF110 115 pump exploded view drawing





7.5.2 Spare parts codes

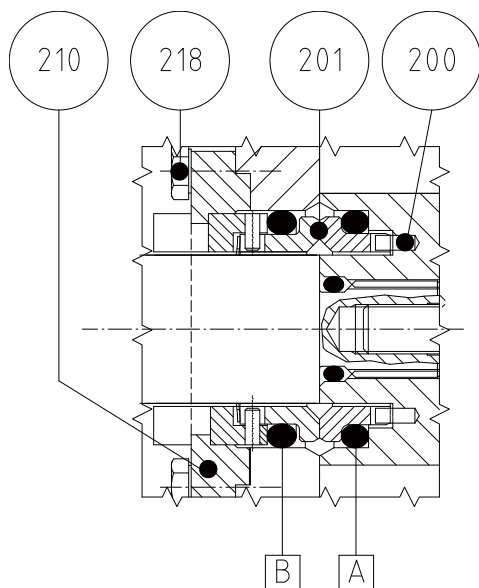
C110 C115

POS.	DESCRIPTION	Q.TY	CODE C110	CODE C115
1	NICHEL PLATED BEARING BOX	1	2001G049	
2	NICHEL PLATED BEARING BOX COVER	1	2001G061	
3	DRIVING SHAFT	1	2004DA451	
4	DRIVEN SHAFT	1	2004DA461	
5	FIXED GEAR	1	2008M021	
6	ADJUSTABLE GEAR	1	2008M020	
7	ADJUSTABLE GEAR BUSH	1	2008M041	
8	SCREW FOR POS.6	6	411F06X16	
9	FRONT BEARING SUPPORT	2	2001A281	
10	PLANE WASHER FOR POS.2	2	412P08	
11	KIT BEARING SPACERS	6	443R001	
12	SCREW FOR POS.2	2	410A08X90	
13	PIN FOR POS.2	2	417A06X16	
14	SCREW FOR BEARING SUPPORT	4	410A06X25	
15	O-RING 4550 FOR POS.2	1	404T4550	
16	O-RING 164 FOR BEARING SUPPORT	2	404T164	
17	OIL SEAL RING	1	403Y22407	
18	OIL SEAL RING	2	403Y45628	
19	GEAR KEY	2	418F08X25	
20	SHAFT KEY	1	418F06X30	
21	BEARING RING NUT	2	415F35	
22	WASHER	2	416F35	
23	GEAR RING NUT	2	415F25	
24	WASHER	2	416F25	
25	OIL VENT CAP 3/8"	1	407L38S	
26	CAP 3/8"	2	407L38P	
27	OIL LEVEL CAP 3/8"	1	407L38L	
28	FOOT FOR HORIZONTAL CONNECTIONS DISPOSITION	2	2001A096	
29	BEARING 32007X	4	406F32007X	
30	PIN FOR FOOT	2	430A06X12	
31	FOOT FOR VERTICAL CONNECTIONS DISPOSITION	2	2001A097	
40	ROTORCASE	1	2300B..	2300B..
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2	2005B301	2005B302
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2	-	-
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2	-	-
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2	-	-
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2	-	-
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2	-	-
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2	-	-
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2	-	-
42	LOCKING NUT FOR ROTOR	2	2004B140	2004B141
43	O-RING 4118 FOR POS.42	2	404U4118	404U4118
44	ROTORCASE COVER	1	2006B211	
45	O-RING 4550 FOR POS.44	1	404U4550	
46	SCREW FOR POS.40	4	411A08X60	411A08X70
48	PIN FOR POS.40/POS.1	2	417A08X20	
49	PIN FOR POS.40/POS.44	2	417A08X16	
50	O-RING 4061 FOR POS.42 (E.P.D.M.)	2	404U4061	
51	SCREW FOR POS.44	8	410ASP06X22	
55	PLANE WASHER FOR POS.6	6	412F06	
89	SCREW FOR POS.28 or POS.31	4	411A08X20	
239	SEAL PROTECTION	2	4034A011	
302	SCREW M5X8 FOR POS.239	2	410A05X08	

POS.	DESCRIPTION	Q.TY	CODE C110	CODE C115
303	CAP	4	44301020	
303/1	CAP	2	44301041	
304	NAME PLATE	1	44301026	
305	RIVET	4	441301027	
-	KEY FOR LOCKING NUT ROTOR	1	2004C145	

7.5.3 Drawing section and seal spare parts

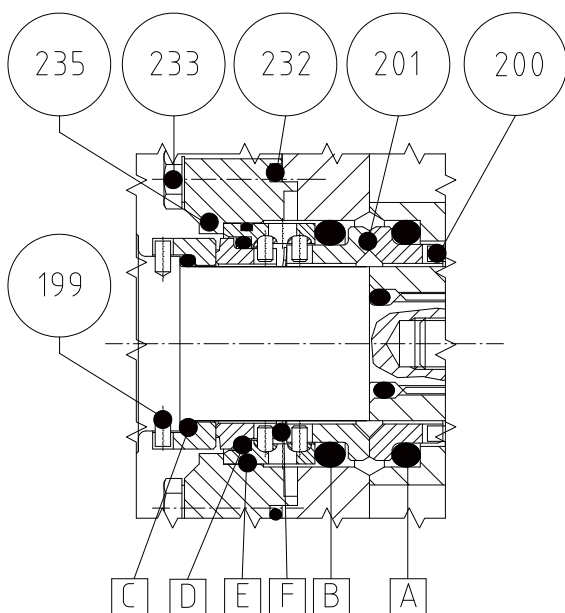
SINGLE MECHANICAL SEAL 8S



SINGLE MECHANICAL SEAL 8S				
POS.	DESCRIPTION	Q.TY	CODE C110	CODE C115
200	SEAL STOP PIN	4	430A03X08	
201	MECH. SEAL 8S AISI 316 L/CARBON/E.P.D.M	2	4U0308S-XZ7	
201	MECH. SEAL 8S SILICON CARB./CARBON/E.P.D.M	2	4U0308S-KZ7	
201	MECH. SEAL 8S SILICON CARB./SILICON CARB./E.P.D.M	2	4U0308S-KK7	
210	MECH. SEAL SUPPORT	2	2014A271	
218	SCREW M6X10 FOR POS.210	8	410A06X14	
A	O-RING ROTATING PART	2	OR38X5.3	
B	O-RING STATIONARY PART	2	OR38X5.3	

O-Rings **A** e **B** are parts of pos.201.
If you order pos. nr. 201, it will already contain o-rings A and B.

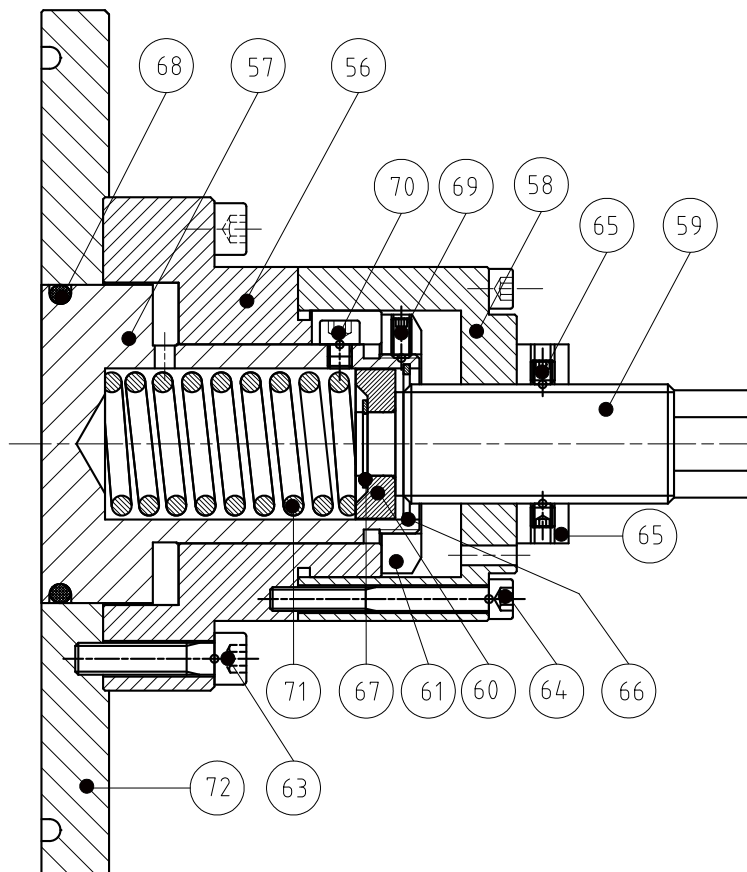
DOUBLE MECHANICAL SEAL 8S7



DOUBLE MECHANICAL SEAL 8S7				
POS.	DESCRIPTION	Q.TY	CODE C110	CODE C115
199	SEAL STOP PIN	4	430A03X08	
200	SEAL STOP PIN	4	430A03X08	
201	MECH. SEAL 8S7 SILICON CARB./SILICON CARB./E.P.D.M. (SECONDARY) S.S.AISI 316 L/ CARBON/E.P.D.M	2	4U0308S7KK7-XZ7	
201	MECH. SEAL 8S7 SILICON CARB./CARBON/E.P.D.M. (SECONDARY) S.S.AISI 316 L/ CARBON/E.P.D.M	2	4U0308S7KZ7-XZ7	
232	O-RING 3137 FOR POS.235 (N.B.R or E.P.D.M.)	2	404U3250	
233	SCREW TE M6X20 FOR POS. 235	8	410A06X25	
235	DOUBLE MECH. SEAL SUPPORT	2	2014B261	
A	O-RING PRIMARY ROTATING PART	2	OR38X5.3	
B	O-RING PRIMARY STATIONARY PART	2	OR38X5.3	
C	O-RING SECONDARY ROTATING PART	2	OR3118	
D	O-RING SECONDARY STATIONARY PART	2	OR3143	
E	O-RING FOR ARMOR	2	OR2174	
F	SPRING	1	-	

O-Rings **A, B, C, D, E** and the spring **F** are parts of pos.201.
If you order pos. nr. 201, it will already contain parts A,B,C,D,E,F.

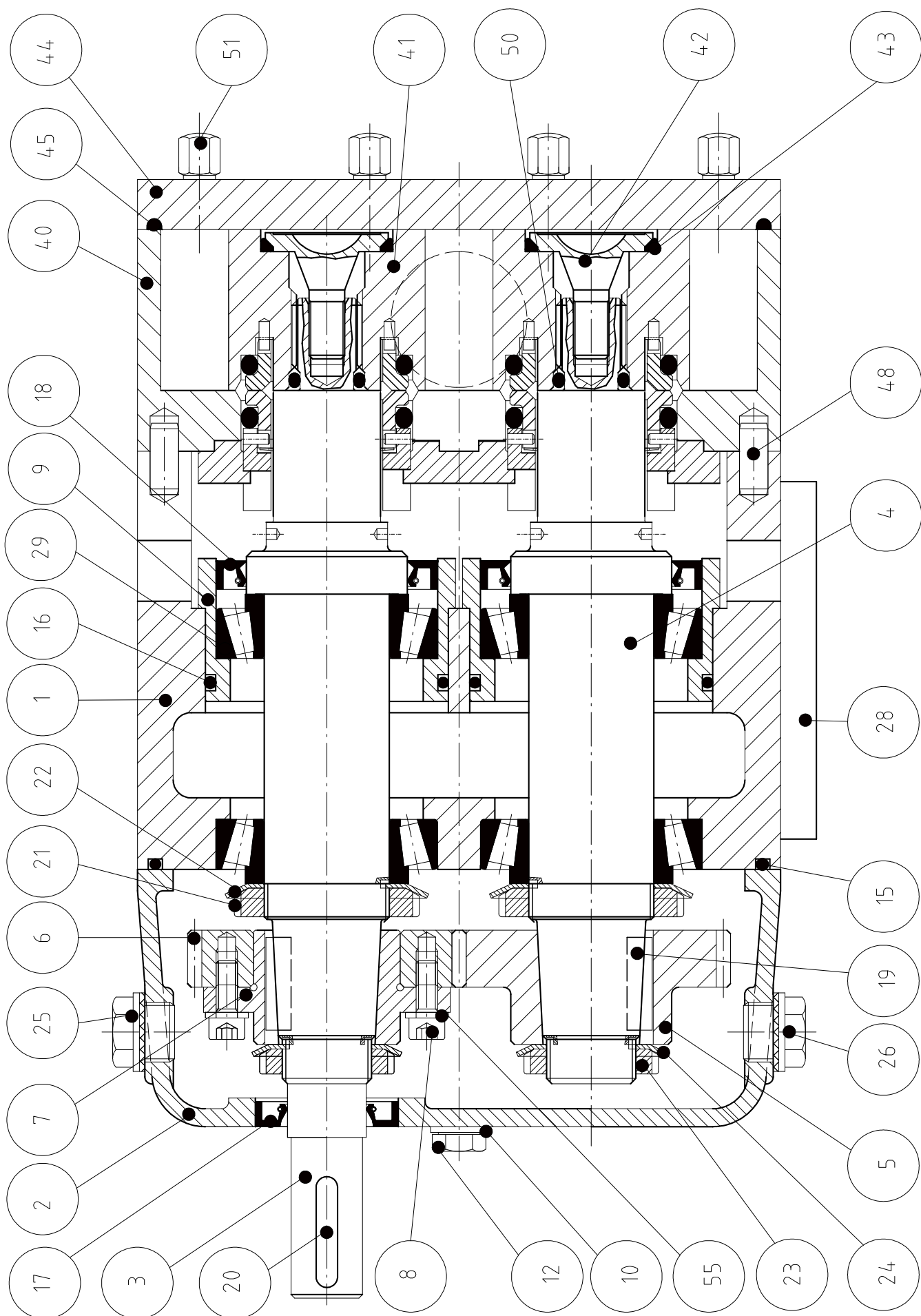
7.5.4 Drawing section and spare parts code for the mechanical safety valve



POS.	DESCRIPTION	Q.TY	CODE
56	SUPPORT	1	
57	PISTON	1	
58	COVER	1	
59	ADJUSTMENT SCREW	1	
60	THRUST WASHER	1	
61	ADJUSTMENT RING NUT	1	
62	ADJUSTMENT RETAINER	1	
63	SCREW	4	
64	SCREW	4	
65	SREW	2	
66	SPLIT RING SEEGER	1	
67	SPLIT RING SEEGER	1	
68	O-RING FOR POS.57	1	
69	DOWEL	2	
70	LOCK	1	
71	SPRING	1	see par. 7.6
72	COVER	1	

7.6 Spare parts for C/CF220 270

7.6.1 C/CF220 270 pump exploded view drawing





7.6.2 Spare parts codes

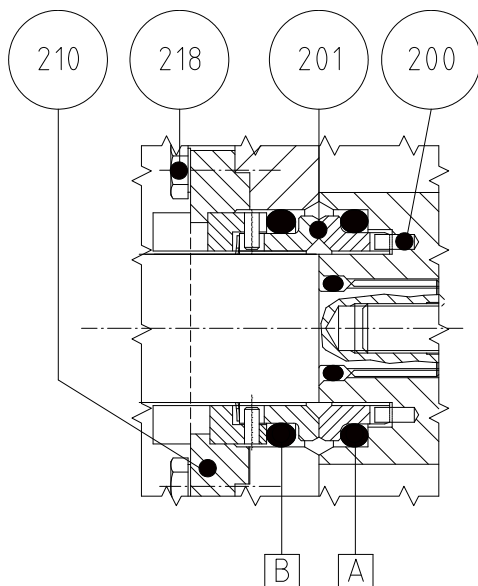
POS.	DESCRIPTION	Q.TY	CODE C220	CODE C270
1	NICHEL PLATED BEARING BOX	1	2001G050	
2	NICHEL PLATED BEARING BOX COVER	1	2001G062	
3	DRIVING SHAFT	1	2004DA452	
4	DRIVEN SHAFT	1	2004DA462	
5	FIXED GEAR	1	2008M022	
6	ADJUSTABLE GEAR	1	2008M023	
7	ADJUSTABLE GEAR BUSH	1	2008M042	
8	SCREW FOR POS.6	6	411F06X16	
9	FRONT BEARING SUPPORT	2	2001A282	
10	PLANE WASHER FOR POS.2	2	412P08	
11	KIT BEARING SPACERS	6	443R002	
12	SCREW FOR POS.2	2	410A08X90	
13	PIN FOR POS.2	2	417A06X16	
14	SCREW FOR BEARING SUPPORT	4	410A08X25	
15	O-RING 4675 FOR POS.2	1	404T4675	
16	O-RING 177 FOR BEARING SUPPORT	2	404T177	
17	OIL SEAL RING	1	403Y32457	
18	OIL SEAL RING	2	403Y557510D	
19	GEAR KEY	2	418F10X25	
20	SHAFT KEY	1	418F08X40	
21	BEARING RING NUT	2	415F45	
22	WASHER	2	416F45	
23	GEAR RING NUT	2	415F35	
24	WASHER	2	416F35	
25	OIL VENT CAP 3/8"	1	407L12S	
26	CAP 3/8"	2	407L12T	
27	OIL LEVEL CAP 3/8"	1	407L12L	
28	FOOT FOR HORIZONTAL CONNECTIONS DISPOSITION	2	2001A098	
29	BEARING 32009X	4	406F32009X	
30	PIN FOR FOOT	2		
31	FOOT FOR VERTICAL CONNECTIONS DISPOSITION	2	2001A099	
40	ROTORCASE	1	2300...	2300...
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2	2005B304	
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2		
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2	2005B314	
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2		
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2		
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2		
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2		
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2		
42	LOCKING NUT FOR ROTOR	2	2004B142	
43	O-RING 4162 FOR POS.42	2	404U4162	
44	ROTORCASE COVER	1	2006B212	
45	O-RING 6625 FOR POS.44	1	404U6625	
46	SCREW FOR POS.40	4	411A10X70	411A10X80
48	PIN FOR POS.40/POS.1	2	417A10X20	
49	PIN FOR POS.40/POS.44	2	417A08X16	
50	O-RING 4100 FOR POS.42 (E.P.D.M.)	2	404U4100	
51	SCREW FOR POS.44	8	410ASP08X27	
55	PLANE WASHER FOR POS.6	6	412F06	
89	SCREW FOR POS.28 or POS.31	4	411A10X16	
239	SEAL PROTECTION	2	4034A010	
302	SCREW M5X8 FOR POS.239	2	410A05X08	

C220 C270

POS.	DESCRIPTION	Q.TY	CODE C220	CODE C270
303	CAP M10	4	44301022	
303/1	CAP M6	2	44301040	
304	NAME PLATE	1	44301026	
305	RIVET	4	441301027	
-	KEY FOR LOCKING NUT ROTOR	1	2004C145	

7.6.3 Drawing section and seal spare parts

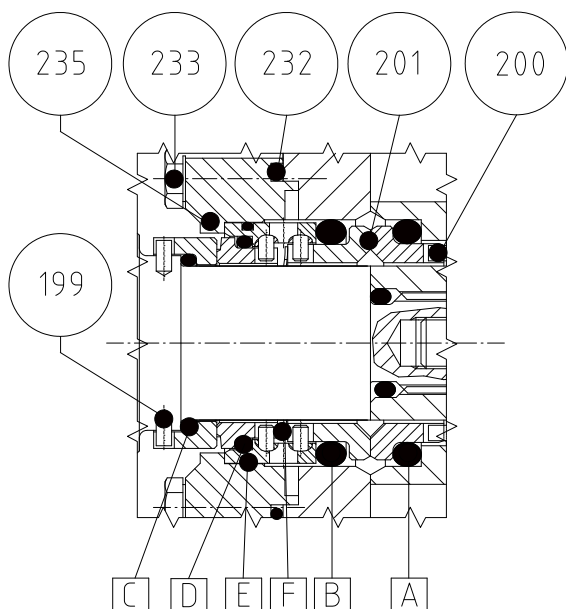
SINGLE MECHANICAL SEAL 8S



SINGLE MECHANICAL SEAL 8S				
POS.	DESCRIPTION	Q.TY	CODE C220	CODE C270
200	SEAL STOP PIN	4	430A03X08	
201	MECH. SEAL 8S SILICON CARB./CARBON /F.K.M.(°VITON)	2	4U0408S-KZY	
201	MECH. SEAL 8S SILICON CARB./CARBON/E.P.D.M	2	4U0408S-KZ7	
201	MECH. SEAL 8S SILICON CARB./SILICON CARB. /E.P.D.M	2	4U0408S-KK7	
201	MECH. SEAL 8S S.S.AISI 316 L/CARBONE /E.P.D.M	2	4U0408S-XZ7	
201	MECH. SEAL 8S SILICON CARB./SILICON CARB./ F.K.M.(°VITON)	2	4U0408S-KKY	
210	MECH. SEAL SUPPORT	2	2014A272	
218	SCREW M6X10 FOR POS.210	8	411A06X10	
A	O-RING ROTATING PART	2	OR6187	
B	O-RING STATIONARY PART	2	OR6187	

O-Rings **A** e **B** are parts of pos.201.
If you order pos. nr. 201, it will already contain o-rings A and B.

DOUBLE MECHANICAL SEAL 8S7

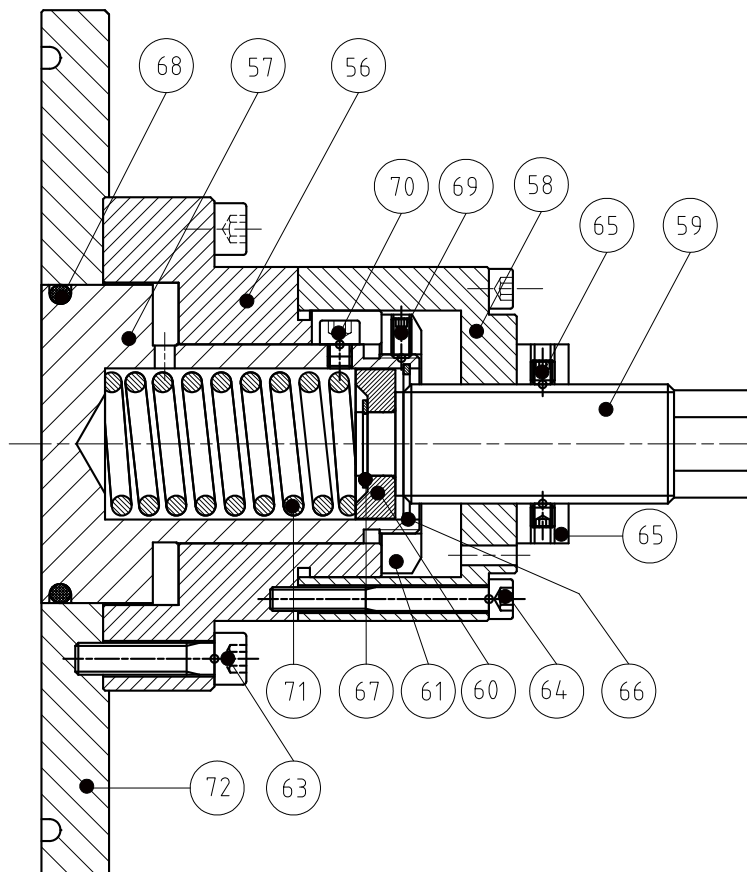


DOUBLE MECHANICAL SEAL 8S7				
POS.	DESCRIPTION	Q.TY	CODE C220	CODE C270
199	SEAL STOP PIN	4	430A03X08	
200	SEAL STOP PIN	4	430A03X08	
201	MECH. SEAL 8S AISI 316 L/CARBON/E.P.D.M - S.S. AISI 316 L/CARBON/E.P.D.M	2	4U0408S7DXZ7	
201	MECH. SEAL 8S S.S. AISI 316 L/CARBON/E.P.D.M - S.S. AISI 316 L/CARBON/E.P.D.M	2	4U0408S7KZ7-XZ7	
201	MECH. SEAL 8S7 SILICON CARB./SILICON CARB./ E.P.D.M - S.S. AISI 316 L/CARBON/E.P.D.M.	2	4U0408S7KK7-XZ7	
201	MECH. SEAL 8S7 SILICON CARB./SILICON CARB./ F.K.M.(°VITON) - S.S. AISI 316 L/CARBON/ F.K.M.(°VITON)	2	4U0408S7KKY-XZY	
232	O-RING 3137 FOR POS.235 (N.B.R or E.P.D.M.)	2	404U3281	
233	SCREW TE M6X16 FOR POS. 235	8	411A06X16	
235	DOUBLE MECH. SEAL SUPPORT	2	2014B262	
A	O-RING PRIMARY ROTATING PART	2	OR6187	
B	O-RING PRIMARY STATIONARY PART	2	OR6187	
C	O-RING SECONDARY ROTATING PART	2	OR3156	
D	O-RING SECONDARY STATIONARY PART	2	OR3187	
E	O-RING FOR ARMOR	2	OR22121	
F	SPRING	1	-	

O-Rings **A, B, C, D, E** and the spring **F** are parts of pos.201.
If you order pos. nr. 201, it will already contain parts A,B,C,D,E,F.



7.6.4 Drawing section and spare parts code for the mechanical safety valve

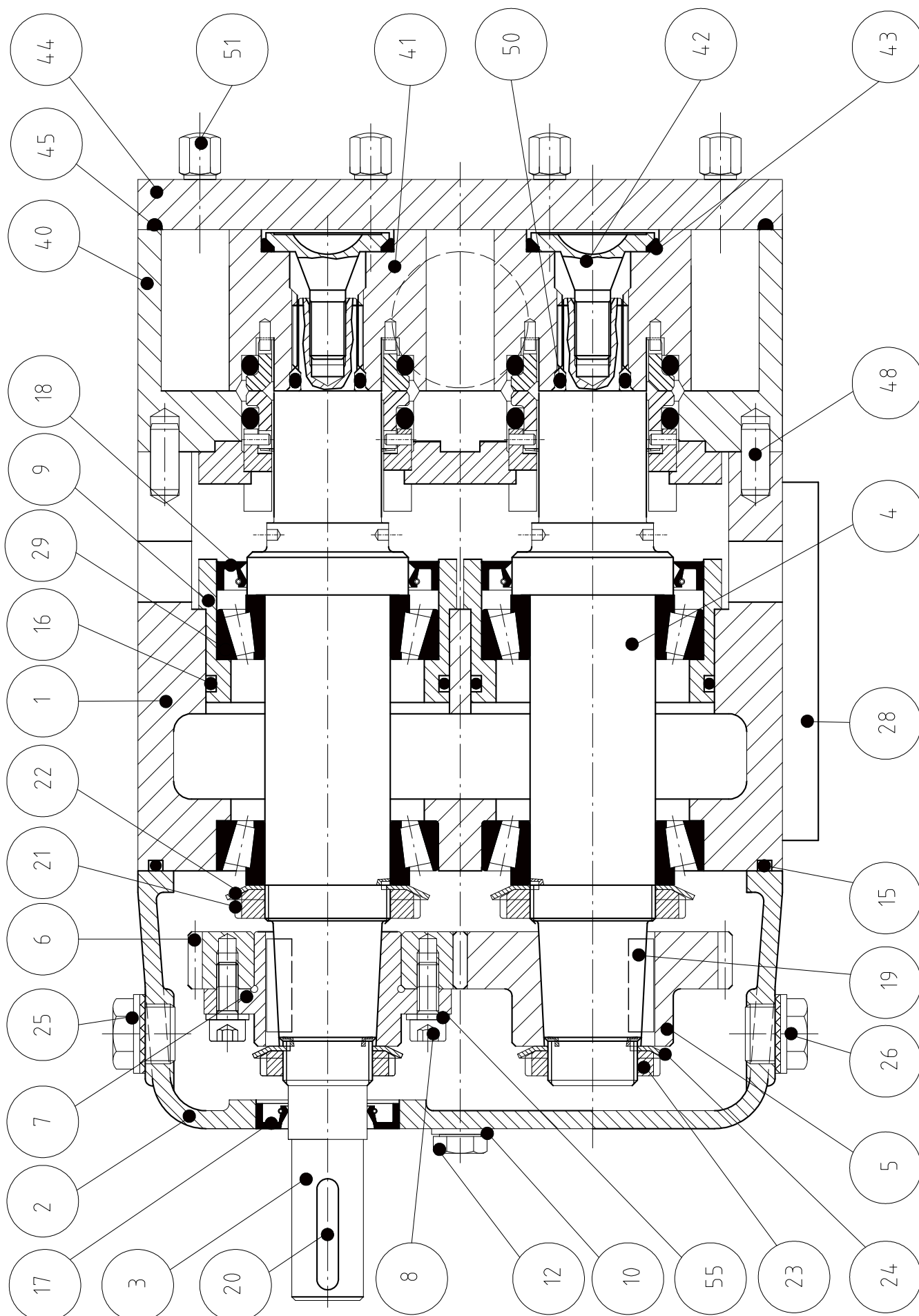


POS.	DESCRIPTION	Q.TY	CODE
56	SUPPORT	1	2013L016
57	PISTON	1	2013B132
58	COVER	1	2013L029
59	ADJUSTMENT SCREW	1	2013B031
60	THRUST WASHER	1	2013L032
61	ADJUSTMENT RING NUT	1	2013B034
62	ADJUSTMENT RETAINER	1	2013L036
63	SCREW	4	411A08X35
64	SCREW	4	411A06X55
65	SREW	2	420A06X06
66	SPLIT RING SEEGER	1	421A38I
67	SPLIT RING SEEGER	1	421A16E
68	O-RING FOR POS.57	1	404U6275
69	DOWEL	2	420A05X06
70	LOCK	1	411A06X10
71	SPRING	1	see par. 7.6
72	COVER	1	2006B222

C220 C270

7.7 Spare parts for C/CF325 330 390

7.7.1 C/CF325 330 390 pump exploded view drawing





7.7.2 Spare parts codes

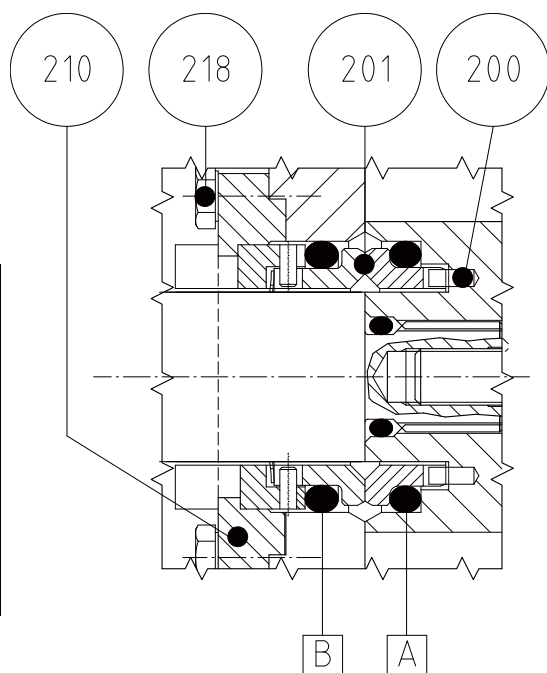
POS.	DESCRIPTION	Q.TY	CODE C325	CODE C330	CODE C390
1	NICHEL PLATED BEARING BOX	1		2001G048	
2	NICHEL PLATED BEARING BOX COVER	1		2001G063	
3	DRIVING SHAFT	1	2004DA453	2004DA454	
4	DRIVEN SHAFT	1	2004DA463	2004DA464	
5	FIXED GEAR	1		2008M026	
6	ADJUSTABLE GEAR	1		2008M027	
7	ADJUSTABLE GEAR BUSH	1		2008M043	
8	SCREW FOR POS.6	6		411F08X25	
9	FRONT BEARING SUPPORT	2		2001A283	
10	PLANE WASHER FOR POS.2	2		412P08	
11	KIT BEARING SPACERS	6		443R003	
12	SCREW FOR POS.2	2		410A08X110	
13	PIN FOR POS.2	2		417A06X16	
14	SCREW FOR BEARING SUPPORT	4		410A10X30	
15	O-RING 4850 FOR POS.2	1		404T4850	
16	O-RING 4362 FOR BEARING SUPPORT	2		404T4362	
17	OIL SEAL RING	1		403Y37528	
18	OIL SEAL RING	2		403Y659010D	
19	GEAR KEY	2		418F12X30	
20	SHAFT KEY	1		418F10X50	
21	BEARING RING NUT	2		415F50	
22	WASHER	2		416F50	
23	GEAR RING NUT	2		415F40	
24	WASHER	2		416F40	
25	OIL VENT CAP 3/8"	1		407L12S	
26	CAP 3/8"	2		407L12T	
27	OIL LEVEL CAP 3/8"	1		407L12L	
28	FOOT FOR HORIZONTAL CONNECTIONS DISPOSITION	2		2001A094	
29	BEARING 33210	4		406F33210	
30	PIN FOR FOOT	2		430A08X16	
31	FOOT FOR VERTICAL CONNECTIONS DISPOSITION	2		2001A095	
40	ROTORCASE	1	2300...	2300...	2300...
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2	2005B309	2005B310	2005B311
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2			
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2			
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2			
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2			
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2			
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2			
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2			
42	LOCKING NUT FOR ROTOR	2	2014B145	2014B146	
43	O-RING 158 FOR POS.42	2		404U158	
44	ROTORCASE COVER	1		2006B213	
45	O-RING 205X5 FOR POS.44	1		404U205X5	
46	SCREW FOR POS.40	4	411A12X80	411A12X90	411A12X110
48	PIN FOR POS.40/POS.1	2		417A12X25	
49	PIN FOR POS.40/POS.44	2		417A08X16	
50	O-RING 4137 FOR POS.42 (E.P.D.M.)	2		404U4137	
51	SCREW FOR POS.44	8		410ASP10X32	
55	PLANE WASHER FOR POS.6	6		412F08	
89	SCREW FOR POS.28 or POS.31	4		411A12X30	
239	SEAL PROTECTION	2		4034A012	

C325 C330 C390

POS.	DESCRIPTION	Q.TY	CODE C325	CODE C330	CODE C390
302	SCREW M5X8 FOR POS.239	2		410A05X08	
303	CAP M8	4		44301020	
303/1	CAP M12	2		44301023	
304	NAME PLATE	1		44301026	
305	RIVET	4		441301027	
-	KEY FOR LOCKING NUT ROTOR	1		2004C146	

7.7.3 Drawing section and seal spare parts

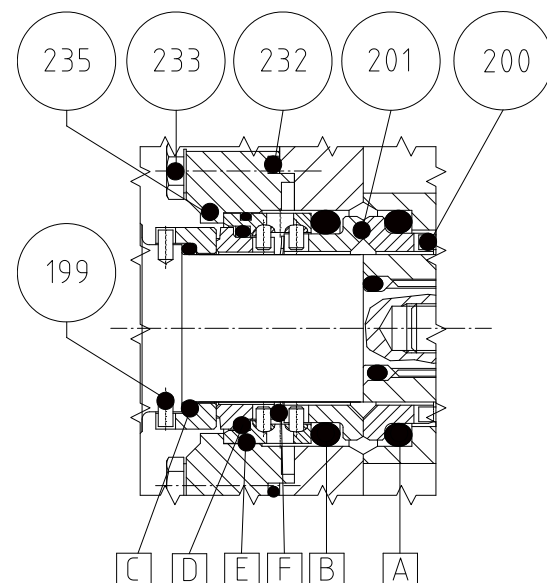
SINGLE MECHANICAL SEAL 8S



SINGLE MECHANICAL SEAL 8S					
POS.	DESCRIPTION	Q.TY	CODE C325	CODE C330	CODE C390
200	SEAL STOP PIN	4		430A03X08	
201	MECH. SEAL 8S S.S.AISI 316 L/ CARBONE/E.P.D.M	2		4U0508S-XZ7	
201	MECH. SEAL 8S SILICON CARB./ CARBON/E.P.D.M	2		4U0508S-KZ7	
201	MECH. SEAL 8S SILICON CARB./ SILICON CARB./E.P.D.M	2		4U0508S-KK7	
210	MECH. SEAL SUPPORT	2		2014A273	
218	SCREW M8X16 FOR POS.210	8		410A08X16	
A	O-RING ROTATING PART	2			
B	O-RING STATIONARY PART	2			

O-Rings **A** e **B** are parts of pos.201.
If you order pos. nr. 201, it will already contain o-rings A and B.

DOUBLE MECHANICAL SEAL 8S7

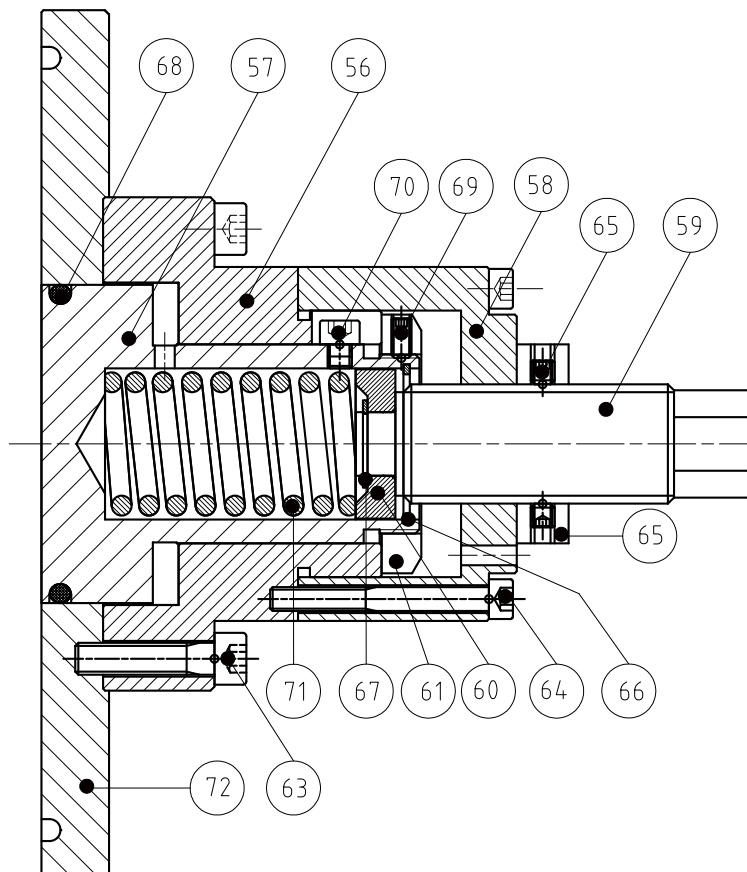


DOUBLE MECHANICAL SEAL 8S7					
POS.	DESCRIPTION	Q.TA'	CODE C325	CODE C330	CODE C390
199	SEAL STOP PIN	4		430A03X08	
200	SEAL STOP PIN	4		430A03X08	
201	MECH. SEAL 8S7 SILICON CARB./SILICON CARB./E.P.D.M - S.S. AISI 316 L/CARBON/E.P.D.M.	2		4U0508S7KK7-XZ7	
201	MECH. SEAL 8S7 SILICON CARB./CARBON/ E.P.D.M - S.S. AISI 316 L/CARBON/E.P.D.M.	2		4U0508S7KZ7-XZ7	
232	O-RING 4337 FOR POS.235 (N.B.R or E.P.D.M.)	2		404U4337	
233	SCREW TE M6X16 FOR POS. 235	8		411A08X16	
235	DOUBLE MECH. SEAL SUPPORT	2		2014B263	
A	O-RING PRIMARY ROTATING PART	2			
B	O-RING PRIMARY STATIONARY PART	2			
C	O-RING SECONDARY ROTATING PART	2			
D	O-RING SECONDARY STATIONARY PART	2			
E	O-RING FOR ARMOR	2			
F	SPRING	1		-	

O-Rings **A, B, C, D, E** and the spring **F** are parts of pos.201.
If you order pos. nr. 201, it will already contain parts A,B,C,D,E,F.



7.7.4 Drawing section and spare parts code for the mechanical safety valve

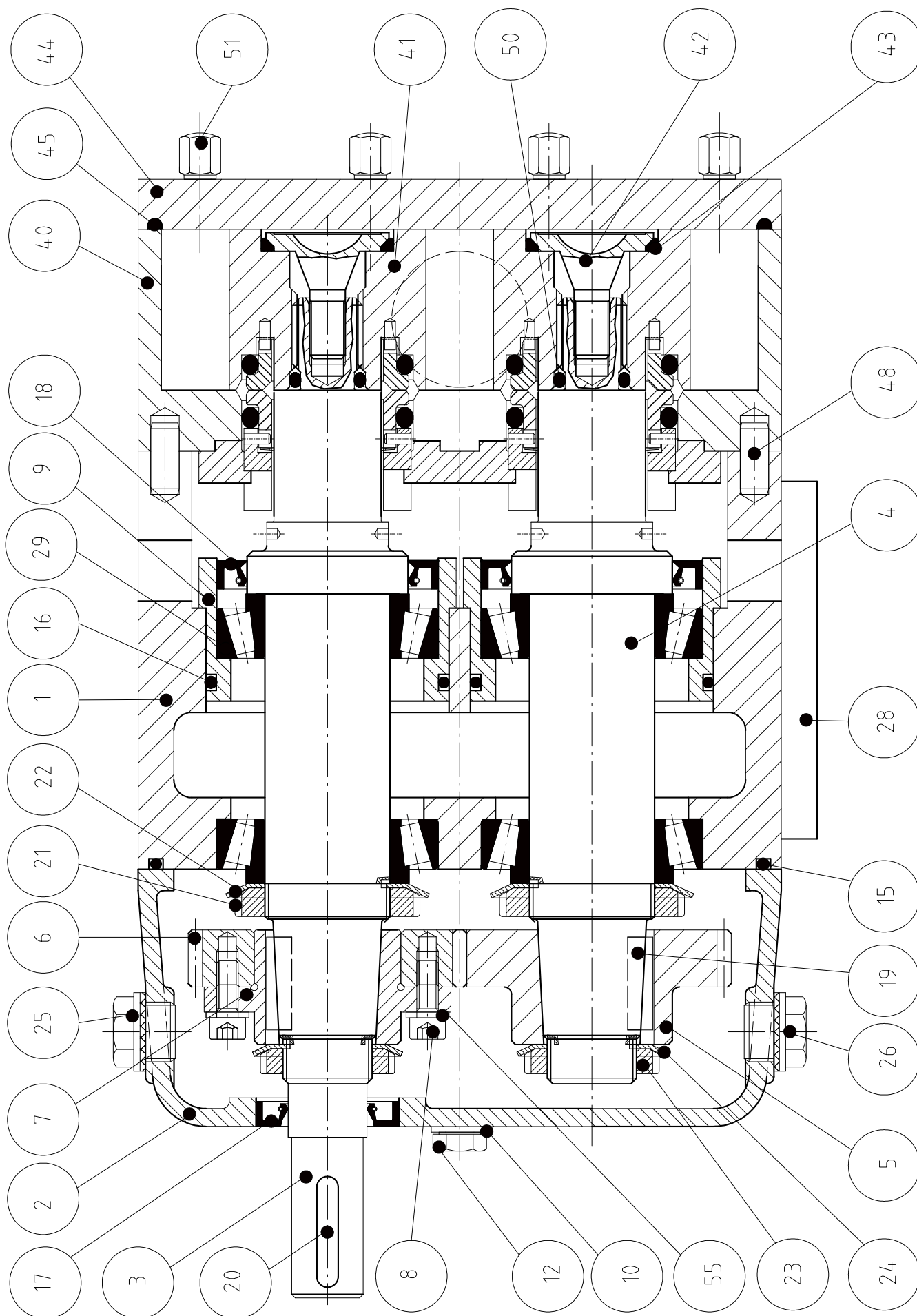


POS.	DESCRIPTION	Q.TY	CODE
56	SUPPORT	1	
57	PISTON	1	
58	COVER	1	
59	ADJUSTMENT SCREW	1	
60	THRUST WASHER	1	
61	ADJUSTMENT RING NUT	1	
62	ADJUSTMENT RETAINER	1	
63	SCREW	4	
64	SCREW	4	
65	SREW	2	
66	SPLIT RING SEEGER	1	
67	SPLIT RING SEEGER	1	
68	O-RING FOR POS.57	1	
69	DOWEL	2	
70	LOCK	1	
71	SPRING	1	see par. 7.6
72	COVER	1	

C325 C330 C390

7.8 Spare parts for C/CF570

7.8.1 C/CF570 pump exploded view drawing



C570

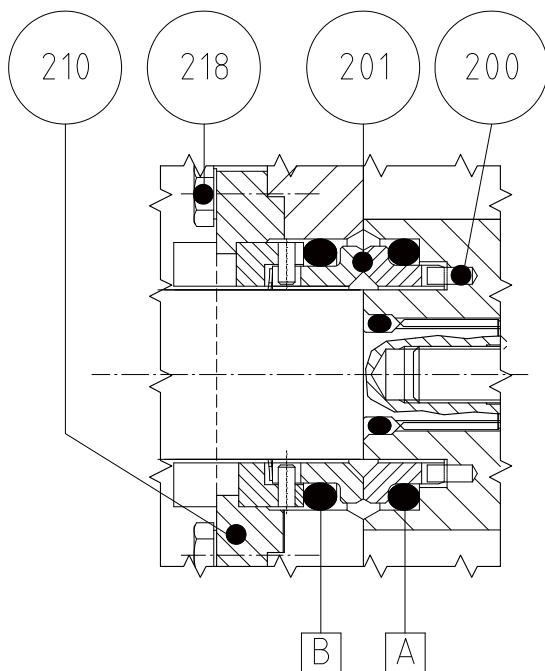
7.8.2 Spare parts

POS.	DESCRIPTION	Q.TA'	CODICE C570
1	NICHEL PLATED BEARING BOX	1	2001G051
2	NICHEL PLATED BEARING BOX COVER	1	2001L018
3	DRIVING SHAFT	1	2004DA457
4	DRIVEN SHAFT	1	2004DA467
5	FIXED GEAR	1	2008M024
6	ADJUSTABLE GEAR	1	2008M025
7	ADJUSTABLE GEAR BUSH	1	2008M044
8	SCREW FOR POS.6	6	411F16X40
9	FRONT BEARING SUPPORT	2	2001C049
10	PLANE WASHER FOR POS.2	2	412P10
11	KIT BEARING SPACERS	6	443R004
12	SCREW FOR POS.2	2	410A10X180
13	PIN FOR POS.2	2	417A10X20
14	SCREW FOR BEARING SUPPORT	4	410A16X40
15	O-RING 61500 FOR POS.2	1	404T61500
16	O-RING 6700 FOR BEARING SUPPORT	2	404T6700
17	OIL SEAL RING	1	403Y8511012D
18	OIL SEAL RING	2	403Y13017012D
19	GEAR KEY	2	418F25X70
20	SHAFT KEY	1	418F22X14X120
21	BEARING RING NUT	2	415F110
22	WASHER	2	416F110
23	GEAR RING NUT	2	415F90
24	WASHER	2	416F90
25	OIL VENT CAP 3/8"	1	407L34S
26	CAP 3/8"	2	407L34T
27	OIL LEVEL CAP 3/8"	1	407L34L
28	FOOT FOR HORIZONTAL CONNECTIONS DISPOSITION	1	2001G115
29	BEARING 33022	4	406F33022
31	FOOT FOR VERTICAL CONNECTIONS DISPOSITION	1	2001G116
40	ROTORCASE	1	2300...
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2	2005B307
41	QUADRI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2	2005B308
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION ST	2	2005B317
41	BI-LOBE ROTOR S.S.AISI 316 L VERSION SM	2	2005B319
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2	-
41	QUADRI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2	-
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION ST	2	-
41	BI-LOBE ROTOR CY5SnBIM (antiseizure) VERSION SM	2	-
42	LOCKING NUT FOR ROTOR	2	2004B144
43	O-RING 185 FOR POS.42	2	404U185
44	ROTORCASE COVER	1	2006B214
45	O-RING 81600 FOR POS.44	1	404U81600
46	SCREW FOR POS.40	4	411A20X140
48	PIN FOR POS.40/POS.1	2	417A16X40
49	PIN FOR POS.40/POS.44	2	417A12X30
50	O-RING 168 FOR POS.42 (E.P.D.M.)	2	404U168
51	SCREW FOR POS.44	8	410ASP16X45
55	PLANE WASHER FOR POS.6	6	412F16X30X4
89	SCREW FOR POS.28 or POS.31	4	411A20X50
239	SEAL PROTECTION	2	4034A009
302	SCREW M6X8 FOR POS.239	2	410A06X08
303	CAP M20	4	44301025

POS.	DESCRIPTION	Q.TY	CODE C570
303/1	CAP M10	2	44301022
304	NAME PLATE	1	44301026
305	RIVET	4	441301027
306	EYEBOLT	1	432F10GOL
308	HANDLE FOR ROTORCASE COVER	2	44301050
-	KEY FOR DISASSEMBLYING LOCKING NUT	1	-

7.8.3 Drawing section and seal spare parts

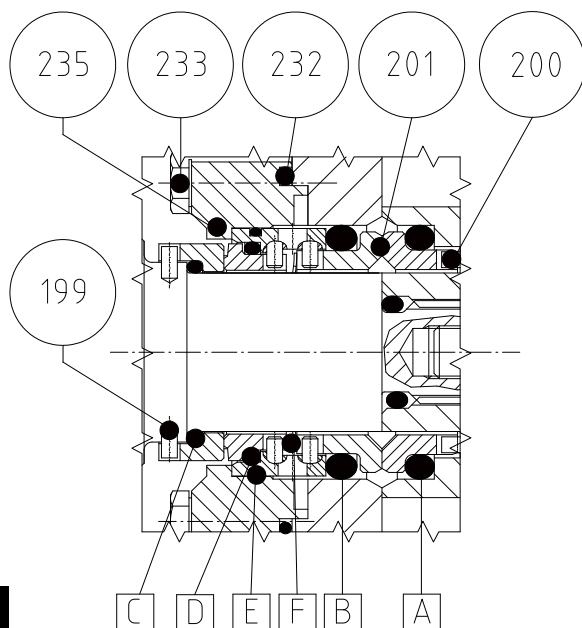
SINGLE MECHANICAL SEAL 8S



SINGLE MECHANICAL SEAL 8S			
POS.	DESCRIPTION	Q.TA'	CODE C570
200	SEAL STOP PIN	4	417A04X12
201	MECH. SEAL 8S SILICON CARB./ CARBON/E.P.D.M	2	4U0908S-KZ7
201	MECH. SEAL 8S SILICON CARB./ SILICON CARB./E.P.D.M	2	4U0908S-KK7
210	MECH. SEAL SUPPORT	2	2014A274
218	SCREW M8X16 FOR POS.210	8	410A10X25
A	O-RING ROTATING PART	2	OR102.5X7
B	O-RING STATIONARY PART	2	OR102.5X7

O-Rings **A** e **B** are parts of pos.201.
If you order pos. nr. 201, it will already contain o-rings A and B.

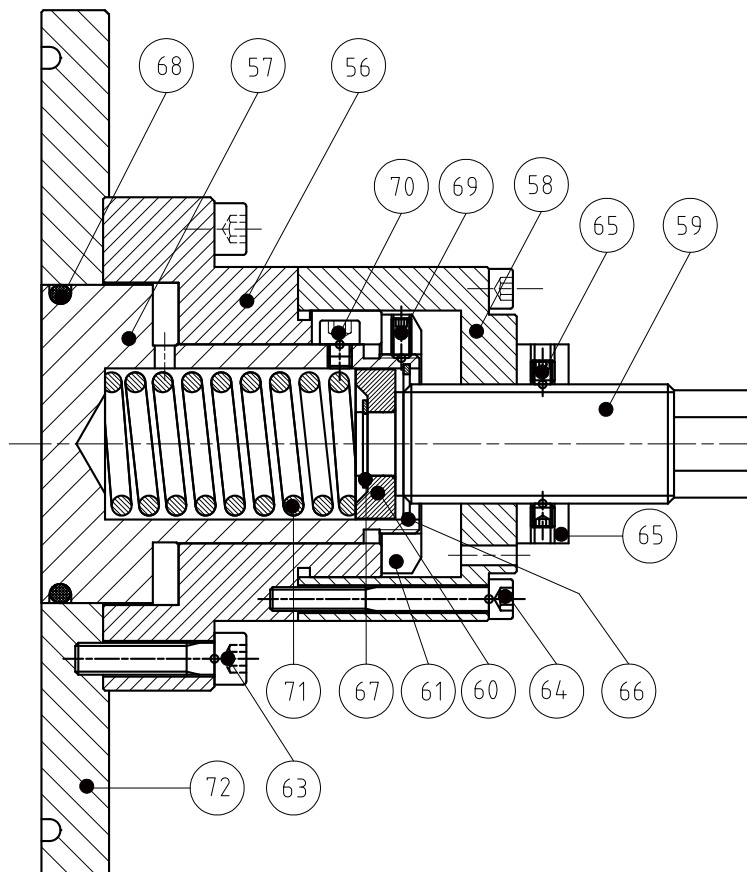
DOUBLE MECHANICAL SEAL 8S7



DOUBLE MECHANICAL SEAL 8S7			
POS.	DESCRIPTION	Q.TY	CODE C570
199	SEAL STOP PIN	4	430A04X10
200	SEAL STOP PIN	4	417A04X12
201	MECH. SEAL 8S7 SILICON CARB./ SILICON CARB./E.P.D.M - S.S. AISI 316 L/CARBON/E.P.D.M.	2	4U0908S7KZ7-X7
201	MECH. SEAL 8S7 SILICON CARB./ CARBON/E.P.D.M - S.S. AISI 316 L/CARBON/E.P.D.M.	2	4U0908S7KK7-XZ7
232	O-RING 4575 FOR POS.235 (N.B.R or E.P.D.M.)	2	404V4575
233	SCREW TE M10X35 FOR POS. 235	8	410A10X35
235	DOUBLE MECH. SEAL SUPPORT	2	2014B264
A	O-RING PRIMARY ROTATING PART	2	OR102.5X7
B	O-RING PRIMARY STATIONARY PART	2	OR102.5X7
C	O-RING SECONDARY ROTATING PART	2	
D	O-RING SECONDARY STATIONARY PART	2	
E	O-RING FOR ARMOR	2	
F	SPRING	1	-
-	KEY FOR DISASSEMBLYING MECH. SEAL	1	2004C132
-	TOOL FOR DISASSEMBLYING MECH. SEAL	1	2004Y126

O-Rings **A, B, C, D, E** and the spring **F** are parts of pos.201.
If you order pos. nr. 201, it will already contain parts A,B,C,D,E,F.

7.8.4 Drawing section and spare parts code for the mechanical safety valve



POS.	DESCRIPTION	Q.TY	CODE
56	SUPPORT	1	
57	PISTON	1	
58	COVER	1	
59	ADJUSTMENT SCREW	1	
60	THRUST WASHER	1	
61	ADJUSTMENT RING NUT	1	
62	ADJUSTMENT RETAINER	1	
63	SCREW	4	
64	SCREW	4	
65	SREW	2	
66	SPLIT RING SEEGER	1	
67	SPLIT RING SEEGER	1	
68	O-RING FOR POS.57	1	404U221
69	DOWEL	2	
70	LOCK	1	
71	SPRING	1	see par. 7.6
72	COVER	1	2006B030

7.9 Codes of the springs used in the mechanical safety valve

The table below list the identification codes of the springs used in the mechanical safety valves (see ref. section 3.3.3), codes that can be used to order any spare parts.

PUMP	SPRING CODE		
	(0 ÷ 5 bar)	(1 ÷ 7 bar)	(2 ÷ 10 bar)
C100	VL 12.5 X 25 code 422F015	VL 12.5 X 25 codice 422F016	-
C110 C115	Ø5 36X53 codice 422F010	-	SL 38X50 codice 422F001
C220 C270	Ø5 36X53 codice 422F010	-	SL 38X50 codice 422F001
C325 C330 C390	SL 38X63 codice 422F003	HL 38X63 codice 422F004	H 38X63 codice 422F005
C570			

7.10 Codes of the springs used in the external bridge mechanical safety valve

The table below lists the kinds of springs used in the external bridge mechanical safety valves (see ref. section 3.3.3): depending on the adjustment pressure and valve diameter one can recognise the spring identification letter: "A", "B", "C", "D", "E".

VALVE DIMENSION	PRESSIONE DI REGOLAZIONE (BAR)				
	SPRING "A"	SPRING "B"	SPRING "C"	SPRING "D"	SPRING "E"
DN 25	0.5 ÷ 2 bar	1 ÷ 3.5 bar	1 ÷ 6.5 bar	1 ÷ 9 bar	1 ÷ 10 bar
DN 32	0.5 ÷ 2 bar	1 ÷ 3.5 bar	1 ÷ 6.5 bar	1 ÷ 9 bar	1 ÷ 10 bar
DN 40	0.5 ÷ 2 bar	1 ÷ 3.5 bar	1 ÷ 6.5 bar	1 ÷ 9 bar	1 ÷ 10 bar
DN 50		0.5 ÷ 2 bar	1 ÷ 3.7 bar	1 ÷ 6 bar	1 ÷ 10 bar
DN 65			0.5 ÷ 2 bar	0.5 ÷ 3.3 bar	1 ÷ 7.7 bar
DN 80			0.5 ÷ 1.7 bar	0.5 ÷ 2.3 bar	1 ÷ 5 bar
DN 100				0.5 ÷ 1.3 bar	0.5 ÷ 4 bar

7.11 Name and codes of pumping bodies

This naming refers to position n. 40 (rotorcase) of the construction exploded view drawings and identifies the item code to order as a spare part.

Example: code 23102B07

Code 23102B07 identifies the finished body, with heated chamber, for mechanical seals, for DIN11851 openings, made of AISI 316 L material, for the size of the LDPU.

2	3	1	0	2	B	0	7
A	B	C	D	E	F	G	G

The code of the pump bodies is made up as follows:

A	B	C	D	E	F	G	G
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A	CODIFY	2 = FINISHED PART	5 = SEMIFINISHED PART	6 = CAST PART
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B	FAMIGLIA	3 = FAMILY MEMBERSHIP
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C	VERSION	0 = STANDARD	1 = HEATED PUMP BODY	2 = ASEPTIC	3 = HEATED ASEPTIC
		4 = HIGH PRESSURE	5 = HIGH PRESSURE + HEATED PUMP BODY	6 = ENLARGED INLET PORT	7 = ENLARGED INLET PORT + HEATED PUMP BODY

D	HOUSING TYPE SEALS	0 = MECHANICAL AND LIP SEAL	1 = PACKING GLAND SEAL	9 = SPECIAL
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E	CONNECTIONS	0 = THREAD GAS-BSP	1 = FLANGE PN 16 UNI2278	2 = DIN11851	3 = SMS	4 = RJT
		5 = IDF-ISS	6 = TRI-CLAMP	7 = GAS	8 = ENOLOGIC	9 = SPECIAL

F	MATERIAL	B	H	I	J	R
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G-G	Numerical order in relation to the size					
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NOTES



CHAPTER 8 – ASSISTANCE

O.M.A.C. S.r.l. has a customer after-sales assistance service that can solve any problem in relation to the LPDPG.

In the case there are anomalies in the LPDPG used, contact our after-sales assistance service which will see to solve the problem.

Contacts:

- Tel.: 0522/629371 or 0522/629923 and ask for the "assistance" department
- Fax: 0522/628980
- E-mail: info@omacpompe.com

Only O.M.A.C. S.r.l. technical personnel is qualified to carry out extraordinary maintenance activities that the LPDPG requires.



CAPITOLO 9 – GARANZIA

O.M.A.C. S.r.l. grants a warranty for twenty-four months from the date of delivery for new LPDPG that have been subjected to normal work of eight hours a day, while if they will be subjected to a double or triple work shift, during the day, the warranty term will be respectively reduced by half (in the case of a double work shift) or by a third (in the case of a triple work shift).

Unless otherwise agreed, the warranty is only for new LPDPG manufactured by the seller and used as described in the attached technical sheet, thus excluding LPDPG used in unintended manners, overhauled LPDPG and those parts of LPDPG built by other companies for which the warranties of the respective manufacturers apply (electrical panel, bridge By-Pass, etc.).

The warranty consists in repairing or replacing all pieces that are possibly defective in terms of materials or processing, returned free port to the headquarters of OMAC s.r.l.

The warranty does not extend to failures resulting from improper installation, inexperience in the running the LPDPG, from poor maintenance, negligence, when changes have been made to the LPDPG or non-original spare parts have been used, without the written consent of OMAC s.r.l. Electrical components are always excluded from the warranty.

Under no circumstances can the manufacturer be charged for damages due to non-compliance with our requirements, or manipulations carried out by untrained personnel. Under no circumstances can we replace for free those pieces whose failure or breakage depends on normal wear and tear, misuse, or in inappropriate use conditions or use of the LPDPG other than what was agreed in the sale contract.

Any assistance required during the warranty period must be carried out solely by OMAC s.r.l. skilled technicians. In the case this LPDPG is used for abrasive/corrosive products, this warranty is reduced to 2 months.

If the LPDPG is tampered with by unauthorised personnel the warranty is voided.

All repairs or replacements of pieces for failures not attributable to manufacture defects or poor quality of the material will be charged in full to the Customer.

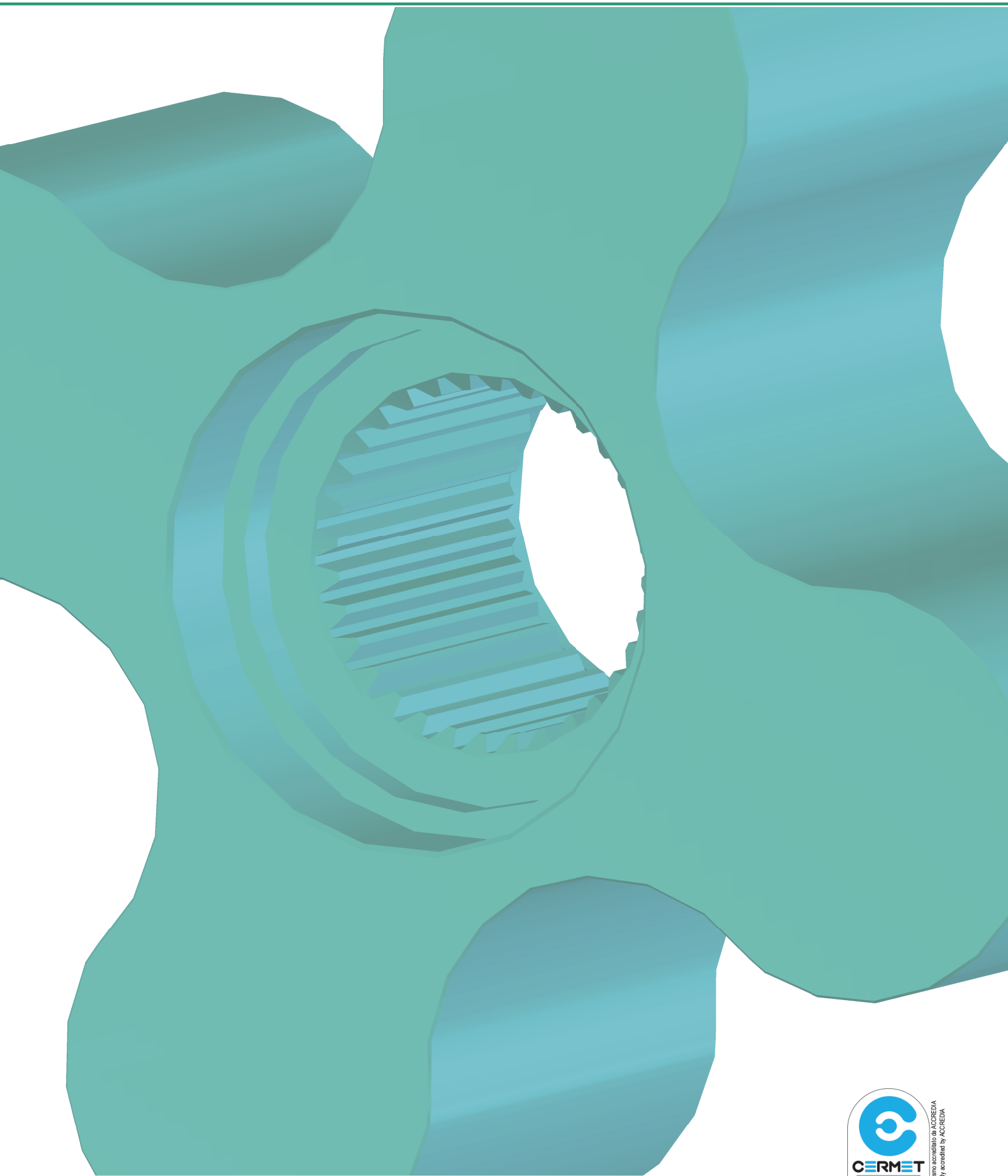
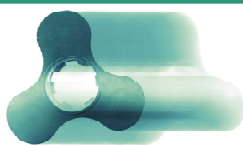


WARNING

An installation other than that indicated in chapter, a use other than that indicated in chapter 4, the possible seizure of rotors, caused by foreign bodies, such as pipe process scraps, welding cinders, dust, etc. will void the warranty.



OMAC



O.M.A.C. S.R.L.

Via G. Falcone nr. 8 – 42048 RUBIERA (RE) – ITALY (UE)

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