

# CDC-35

TRANSLATION OF ORIGINAL INSTRUCTIONS  
CAREFULLY READ THIS MANUAL BEFORE USING OR REPAIRING THIS PRODUCT

CDR Double with Cartridge Mechanical Seal

## Installation, Operating and Maintenance Manual



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This manual provides the users of the mechanical seal unit of C.D.R. Pompe S.r.l. with the information required for correct installation, operation and maintenance under safety conditions as established by EC standards.

Please read this manual carefully before installation and make it available at any time to anyone using the machine.

The user is liable for damage resulting from not observing the operation conditions agreed at Order confirmation.

The Purchaser has the responsibility to:

- Check that the mechanical seal unit and any accessory are suitable for the working environment.
- Provide suitable personal protective equipment to the operators.
- Inform users of the allowed use.

C.D.R. Pompe S.r.l. may update or edit this manual at any time and without previous notice to correct typos, inaccurate information or updated products.

These changes must be added to new editions of the manual.

C.D.R. Pompe S.r.l. has no obligation to install any modification of design or improvement of the products to previously delivered units.

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Any use other than the operation described in the manual is considered improper use and therefore C.D.R. Pompe S.r.l. will not be held responsible in this case.

C.D.R. Pompe S.r.l. is a leader in designing, manufacturing, selling and servicing centrifugal pumps for the treatment of dangerous and corrosive liquids in the chemical and pharmaceutical industries and in other industrial processes.

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## 1. Introduction

This manual provides the user of UCL series pumps all necessary information to install, operate and maintain the mechanical seals; therefore the operator must read the manual thoroughly so that the product is used correctly, as well as the the manual of the pump on which the mechanical seal is installed.

### 1.1 Product description

The CDC-35 series seals are balanced and stationary twin facing type and are installed in a conical stuffing box housing.

This mechanical seal is suitable to be used with the following pressurisation systems of the barrier fluid: PLAN 53A-54; furthermore, it is ready for connection to the pressurised buffer.

Materials used for wet parts can be plastic (e.g. fluoropolymers) or sintered (e.g. silicon carbide).

SPECIFICATIONS	DESCRIPTION
Type of seal	Twin facing cartridge seal
Wet part materials	Carbon / SiC / RS- SiC FKM / EPDM / FFKM
Seal materials, air side	Carbon / SiC FKM / EPDM / FFKM HC / SS304 / SS316
Temperature range	See UCL / UCL-B series pump manual
Operating pressure limits	See UCL / UCL-B series pump manual

### 1.2 Limit temperature for elastomers

The following table shows the lower and upper operating temperature (in degree Celsius [°C ]) for conventional O-rings (elastomers and non-elastomers):

ELASTOMER		RANGE T [°C ]	Notes
Ethylene-Propylene Diene Monomer (EPDM)	E62	- 40 ÷ + 140	non-resistant to greases and mineral oils
Fluorocarbon (FPM)	E63	- 20 ÷ + 180	water heated to max 120°C
Perfluoroelastomer (FFKM)	E93	- 20 ÷ + 270	att. swelling with fluoroelastomer solvents
Fluorocarbon enc FEP (FKM enc FEP)	E66	- 20 ÷ + 180	rigid gasket
Silicon enc FEP (VMQ enc PFA)	E65	- 50 ÷ + 200	
Teflon (PTFE)	F44	- 200 ÷ + 260	

**WARNING!** The temperature range of elastomers shown in the table must always be related to the nature of the pumped liquid.

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## 2. Safety

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Use of this manual is subject and connected to the UCL series pump manual.

All provisions for safe installation, operation and maintenance are in chapter 4 of the UCL series pump manual.

Non compliance with safety instructions may cause danger for persons, the environment and the machine, voiding any claim against C.D.R. Pompe S.r.l.

### 2.1 Expected use

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Mechanical seals for UCL series pumps can usually be used for corrosive, toxic or flammable liquids.

The mechanical seal must be completely wet under any operating condition. Do not run the mechanical seal dry at any time, not even for short intervals.

The instructions in the installation, operation and maintenance manual or in the data sheet and/or contractual documentation must be strictly followed; if in doubt please contact C.D.R. Pompe S.r.l.

Please read the following instructions thoroughly. Installation in compliance with the following instructions facilitate long-lasting and efficient operation of the mechanical seal. For all seal auxiliary systems (buffers, exchangers, etc.) see the specific instructions provided separately.

### 2.2 Improper use

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**Improper use, even for short periods, may seriously damage the unit (pump and mechanical seal) and in highly-explosive environment it may cause an additional potential ignition source (due to overheating, static currents, sparks, lack of lubrication, etc.): please always follow the pump and seal manual instructions closely.**

### 2.3 Operation in an explosive environment

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The CDC-35 mechanical seal is a standard seal, therefore it must be considered a machine element. The machine elements are excluded from the provisions of Directive 94/9/EC (ATEX 95 product directive) since they are considered integral parts of a larger machinery (pump, agitator). This exception was confirmed both by the ATEX permanent committee of the EC and by the European Sealing Association (ESA).

See the following web pages:

EC ATEX permanent committee: <http://ec.europa.eu/enterprise/atex/rotating.htm>

ESA opinion: <http://www.europeansealing.com/statements.html>

The manual of the pump in which the seal is installed and this manual are complementary.

See the ATEX section in the pump manual for the allowed temperature limits.



**Take particular care when the unit is installed in potentially explosive areas. Avoid any incorrect or improper operation!**

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## 3. First supply/Start-up

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### 3.1 Connecting piping

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Please refer to the assembly drawing of the seal to identify the connections.

Always check that piping is connected to the correct fittings of the seal, to avoid dangerous situations.

For the support systems, buffer and accessories, read the relevant installation, operation and maintenance manual thoroughly.

It is a good practice to limit the quantity of bends and fittings used for the connection; furthermore, try to minimise any kinking, particularly for closed circuit installations (type Plan 53A).

### 3.2 Seal - Buffer connection (API-Plan 53)

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The piping connecting the seal to the buffer must be vertical, so that the barrier liquid, venting and draining are facilitated.

Always ensure the circuit is free from vapour or air bubbles

If not otherwise directed, the buffers must always be installed at least 50-60 cm above the highest connection (inlet or outlet) on the sealing flange: in this way the thermal siphon circulation is activated when the pump is in stand-by.

Indeed, to enable thermal siphon circulation the seal must always be below (or at the same level of) the outlet connection.

### 3.3 Flushing system

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This system must be always activated before running the pump for seals with quenching system, external flushing (pressurised or not pressurised) and/or cooling.

### 3.4 Installation of twin seal with pressurised buffer (PLAN 53A) or pressurised external system (PLAN 54)

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In applications with twin seal, the barrier fluid is usually pressurised at approximately 1-2 bar (15-30 psig) above the pressure of the stuffing box housing, i.e. near the mechanical seal.

The reference value for the stuffing box housing pressure is usually equal to 2/3 of the delivery pressure with no flow.

This is the reference value since this is the maximum that can be achieved when operating the pump, even under conditions normally not allowed (all close).

To calculate the barrier fluid pressure, proceed as follows:

- 2/3 delivery pressure at 0 m<sup>3</sup>/h (theoretical pressure in stuffing box housing)
- + suction pressure (equivalent to the suction liquid column at 0 m<sup>3</sup>/h)
- + 1-2 bar of safety margin

Or, if a measuring point is not available on the system, see the pump characteristic curve. To obtain the values in bar, use the following formula:

$$P \text{ (bar)} = H \text{ (m H}_2\text{O)} \times \rho \text{ (Kg/dm}^3\text{)} / 10.2$$

P = pressure

H = water column

$\rho$  = fluid density

In the event of fluctuations of the process liquid pressure due to the system, installation or operation of the pump, always take into account these conditions, adjusting the barrier fluid pressure toward the worse limit case.

Take all necessary precautions and follow normal safety procedures before starting the equipment.

### **3.5 Running the pump**

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Even if tested by C.D.R. Pompe S.r.l. during the pump operational test, a small leak could still occur during start-up. After a short initial test run, necessary for the seal sliding faces to settle, the leak will gradually decrease.

**IMPORTANT!** Start the pump as described in the UCL series pump manual.

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## 4. Operation and maintenance

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The instructions in the pump manual and those in this manual are complementary.

The static part of the CDC-35 seal is secured to the stuffing box housing by means of 4 stud bolts, to which the fastening nuts are screwed: periodically check that the nuts are tightened by comparing them with the data under "Screw tightening torque table" in the UCL series pump manual.

Please always check the correct position of the rotating seal ring (472) on the shaft sleeve (523) before tightening the self-locking bolt (920.2) on the tie (917) of the pump shaft. This operation must be performed before fastening the volute casing.

Handle the seal rings with utmost care. The silicon carbide and graphite seal rings are extremely fragile. A light impact from a metal object or an accidental fall may be sufficient to chip them beyond repair.

Installation with Buffer - Barrier fluid under pressure (PLAN 53A)

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Keep the buffer always under pressure until process liquid is present inside the pump and until the pump has been fully isolated and depressurised. See chapter "**Installation of twin seal with pressurised buffer (PLAN 53A) or pressurised external system (PLAN 54)**".

If the barrier fluid pressure drops excessively, the fluid could be polluted by the process liquid. Therefore, before operating on the buffer ensure that the barrier fluid minimum pressure is always maintained. Otherwise, take all necessary precautions in order to avoid coming into contact with the process liquid.

Excessive pressure of the barrier fluid could cause a malfunction of the mechanical seal; therefore the pump must be stopped to let the pressure drop and to proceed to inspect the pump.

### 4.1 Seal disassembly

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Observe the following general provisions in addition to the instructions in the UCL manual and the regulations of the plant, as a non comprehensive example:

- Wear the relevant personal protective equipment.
- Check that the machine is grounded.
- Cut-off power supply to the pump motor.
- Check that the pump is not under pressure.
- Close the connecting valves of the system.

After disassembling the UCL pump as specified in the relevant manual, proceed as follows:

- 1) Secure the stuffing box housing (451) to the support frame (346), fastening it with safety screws (914.2).
- 2) Engage the centring rings (935) on the reference ring of the auxiliary shaft sleeve (drive collar).
- 3) Undo the 3 locking dowels of the auxiliary sleeve (drive collar) of the seal on the shaft (210)
- 4) After removing the impeller as described in the UCL pump manual, proceed to remove the key (940.1).
- 5) Hold the stuffing box housing (451) in position with one hand and undo the safety screws (914.2) at the same time.

- 6) Remove the stuffing box housing (451), mechanical seal (433) and shaft sleeve (523) together.
- 7) Place the stuffing box housing (451) with the seal facing upward.
- 8) Undo the seal cover (471) fastening screws and remove the cover.
- 9) Remove the mechanical seal (433) from the stuffing box housing (451), undoing the relevant locking nuts.

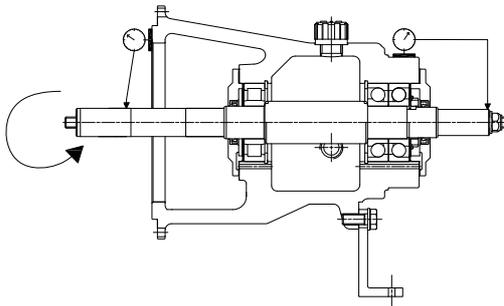
## 4.2 Seal assembly

Please always see the provisions in the seal manufacturer's manual (if not manufactured by C.D.R. Pompe S.r.l.) and perform an accurate examination to ensure components are not corroded. Otherwise, replace the pump shaft or shaft sleeve.

### 4.2.1 Checks on pump

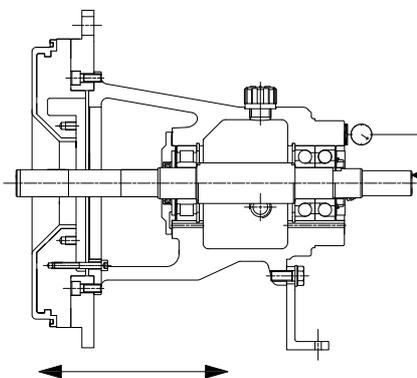
- Ensure that all surfaces that may come into contact with the seal are free from burrs and/or sharp edges.
- Check that all junction points are rounded.
- Ensure that edges are blunted.
- Check that the shaft sleeve is not damaged and/or scored.

### 4.2.2 Checks on pump shaft



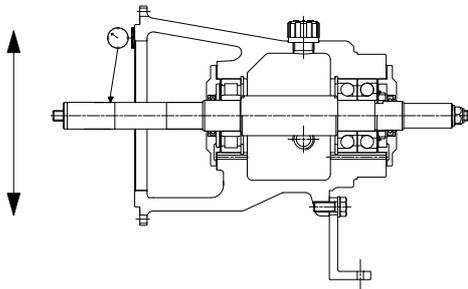
**Fig. 1** Shaft radial oscillation.

Radial oscillation of the shaft must not exceed 0.05 mm, both for ball bearings and roller bearings; if the shaft cannot be disassembled, inspection must be performed in the area where the mechanical seal seats. The value shown (0.05 mm) applies to 1000-3600 rpm rotation speeds.



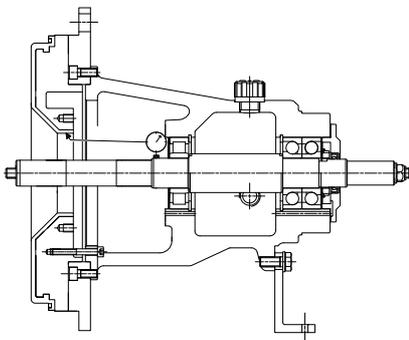
**Fig. 2** Shaft axial clearance.

The shaft axial clearance after assembly inside the bearing bracket must not exceed 0.25 mm, regardless of the type of thrust bearing installed.



The shaft radial clearance after assembly inside the bearing bracket must not exceed 0.10 mm, regardless of the type of thrust bearing installed.

**Fig. 3** Shaft radial clearance.



Concentricity between the shaft and the stuffing box housing hole must not exceed 1% of the shaft diameter.

**Fig. 4** Concentricity between shaft and stuffing box housing.

#### 4.2.3 Checks on seal

- Check the conditions of the seal rings and gaskets.
- Do not use worn or non compliant parts.
- Ensure that springs are still naturally elastic.
- To avoid any possible seizing, ensure the sliding faces are not polluted by grease, oil or dirt of any kind.

#### 4.2.4 Precautions during installation

- 1) Before assembly always check the size and cross-section drawings of the pump, the seal assembly drawing and the parts list.
- 2) Ensure the seal is in good conditions when removing it from the box.
- 3) Seal assembly must be performed in dry conditions in a dust free environment.
- 4) Do not use oil or grease during assembly.
- 5) Before assembly, check that the seal faces are completely clean; otherwise, clean them with a solvent (e.g. alcohol) which does not leave residues on the faces. **DO NOT LUBRICATE IN ANY WAY!**
- 6) If installation is difficult, wet the seal seat or shaft with denatured alcohol (or water with detergent), taking care not to pollute the seal faces.

- 7) To set the seal onto the shaft sleeve, use an insertion cone or a pad made of a material that cannot damage the seal (e.g. PTFE). Only for CSS/CDC 35 series seals, the rotating seal ring with gaskets must be set by means of a pad made of a material that would not damage the ring.
- 8) To facilitate assembly, lubricant may be used for gaskets. The lubricant usually used is silicone, but check it is compatible with the process fluid before using it.

#### **4.2.5 Seal installation**

**Follow the procedure in chapter "Seal disassembly" in reverse order.**

Before assembly, ensure that the seal faces are completely clean, otherwise clean them with a solvent (e.g. alcohol) which does not leave residues on the faces. **DO NOT LUBRICATE IN ANY WAY!**

Improper tightening of screws/dowels may cause a dangerous situation, since the mechanical seal may move inside the seal chamber when under pressure.

## 5. Machine stop or storage

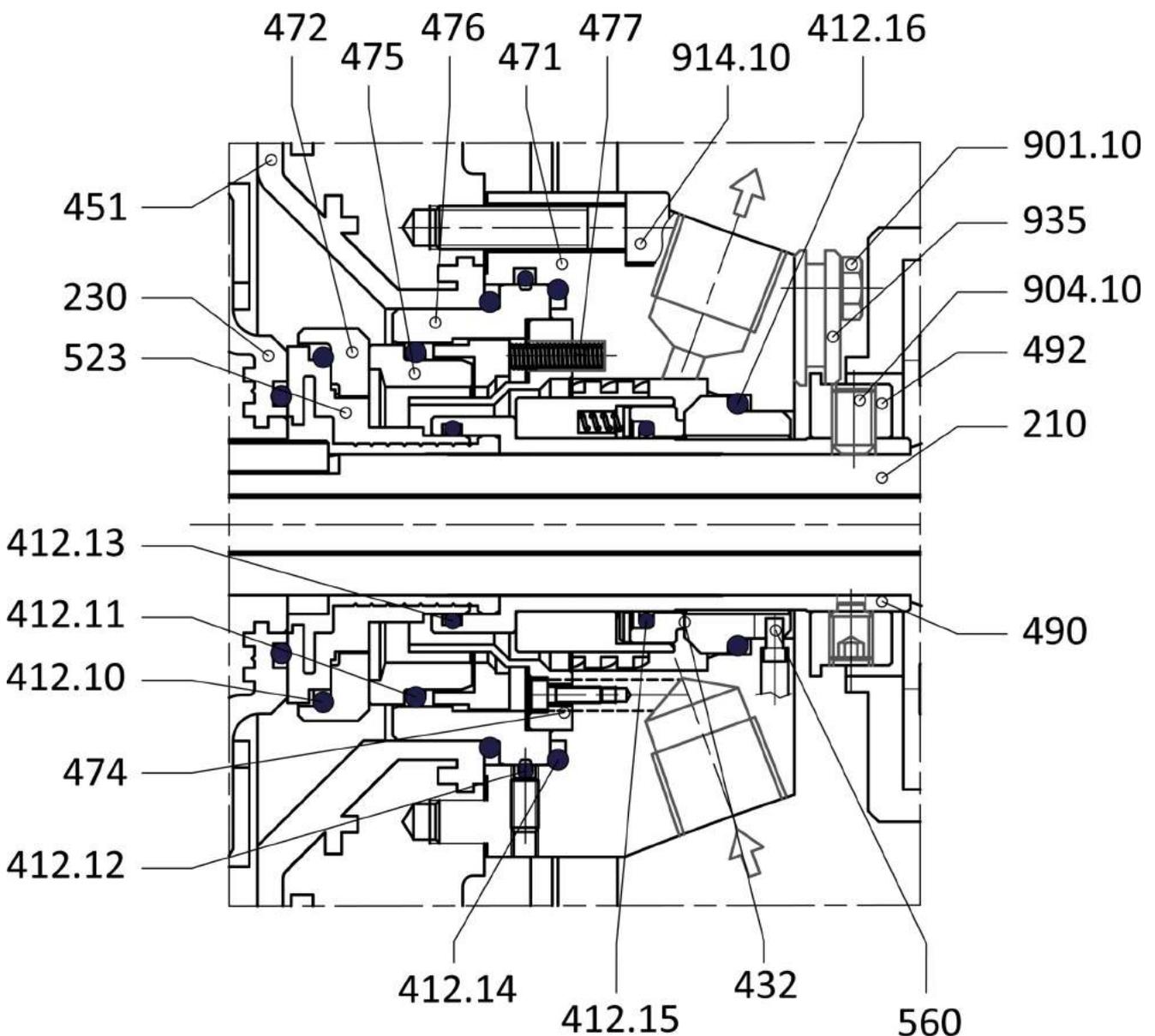
The storage environment must have a relative humidity lower than 70% and optimal temperature of approximately 25°C. In any case, the storage temperature range must not exceed the following limits: -20°C / +45°C

When storing the pump with the mechanical seal installed, the storing substance must not affect the function of the mechanical seal. Gaskets must not stick, harden or swell.

After storage for 2-3 years the mechanical seal must be checked to verify that its functional characteristics have not changed. This applies particularly to:

- sealing faces,
- auxiliary sealing elements,
- elasticity and lack of damage of the gaskets.

Inspection must be performed by C.D.R. Pompe S.r.l. or other party authorised by C.D.R. Pompe S.r.l.



**Fig. 5 CDC35**

<b>DIN Cod.</b>	<b>DESCRIPTION</b>
210	Shaft
230	Impeller
451	Stuffing Box Housing
523	Shaft Sleeve
412.10	O-Ring
412.11	O-Ring
412.12	O-Ring
412.13	O-Ring
412.14	O-Ring
412.15	O-Ring
412.16	O-Ring
432	Auxiliary Seal
471	Seal cover
472	Rotating Seal (Face) ring
474	Thrust Ring
475	Static Seal (Face) ring
476	Stationary Seal Ring Body
477	Spring
490	Cartridge shaft sleeve
492	Centering Set Ring
523	Shaft Sleeve
560	Dowel Pin
901.10	Hexagon Head Bolt
904.10	Grub Screw
914.10	Socket Head cap screw
935	Locking Setting Ring







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