HELIAL 1000/2000

TC3-400 Turbopack

Installation Manual

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RECORDING OF THE MODIFICATIONS

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1. INTRODUCTION

The purpose of this manual is give a complete overview of the installation, removal and replacement of TC3-400 turbines on **HELIAL 2000**.

The instructions must be read and applied by all individuals in charge of AIR LIQUIDE DTA helium refrigerators/liquefiers.

This manual contains important information on how to install, remove or replace TC3-400 turbines on **HELIAL 2000** helium liquefiers properly and safely. However, this manual is no substitute for on-the job training for operating personnel. If required AIR LIQUIDE DTA can provide all necessary training for this purpose on a contractual basis.

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2. RELATED DOCUMENTS

- TC3-400 details drawing
- PID **HELIAL 2000** Standard
- Turbine technical file

3. SAFETY INSTRUCTIONS

Always comply with the local safety regulation.

Any intervention on the expander must be approved by tha plant manager, or his representative.

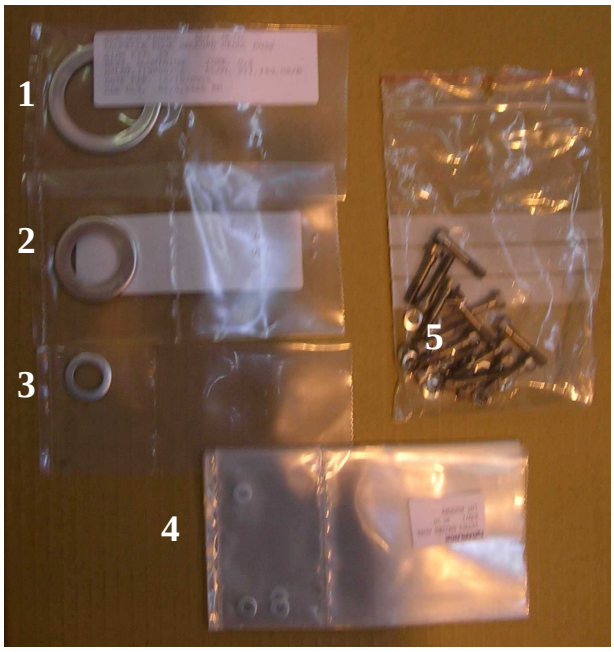
Unused spare parts must be stored in a clean area.

4. TC3-400 TURBOPACK BASIC PACKAGE

TC3-400 turbines are delivered in a wooden box.

On the brake side the turbine is protected by an aluminium sleeve (1), and gas process interfaces are closed by a double head cap (2). When unpacking the turbine control the washer of the protection cap and the sleeve are free from damage. When turbine is stored for a long period of time, it is advised to wrap in a plastic bag and inerted with nitrogen.

Reference of the complete protecting set for TC3-400 turbine is drawing Number E4004E009.

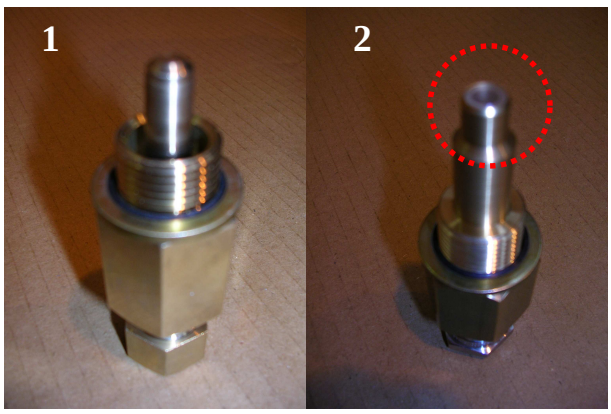


The parts you need in the accessory/maintenance set are for this operation are :

1. KENOL Seal DN32
2. KENOL Seal DN20
3. KENOL Seal DN12
4. KENOL Seal DN08
5. Special M5x26 screws and starlock washers

Some O-rings may be replaced during this operation if they are damaged.

Reference of the accessory/maintenance set for TC3-400 turbines is drawing Number E4004E009.



1. Two temperature thermowells
2. One speed sensor lense

When the dummy cartridges are in place temperature thermowells and speed sensor lense are replaced by caps

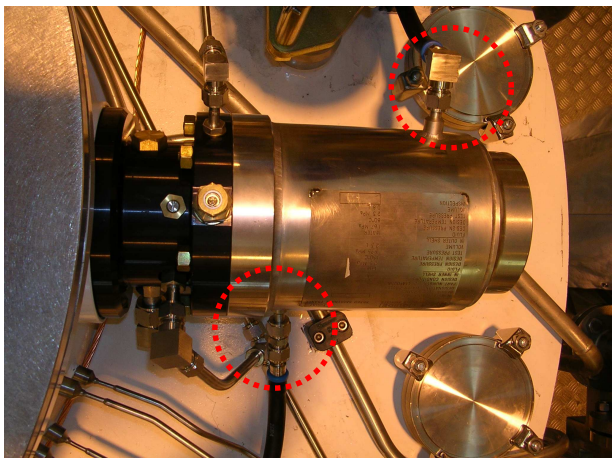
5. INSTALLATION OF A TURBINE

This procedure must be applied in the following cases :

- First installation of a turbine
- Replacement of a turbine
- Installation or removal of “dummy cartridges”

Go through the following steps to prepare the **HELIAL** for the intervention:

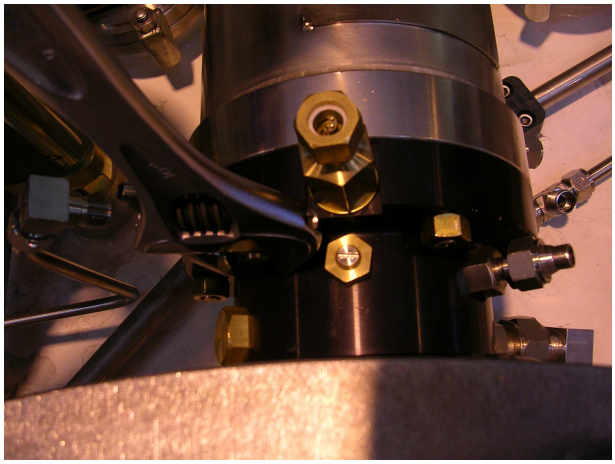
1. Fisrt of all, run the COLD BOX WARMING sequence
2. Realease the pressure on the circuits down to atmospheric pressure.
3. Isolate manually the turbines. Close the upstream and downstream valves.
4. Increase gradually the pressure of the cold box vacuum insulation up to atmospheric pressure. It should take an hour or so.



Close water cooling tap. Release pressure in the water pipes, purge the circuit when possible.

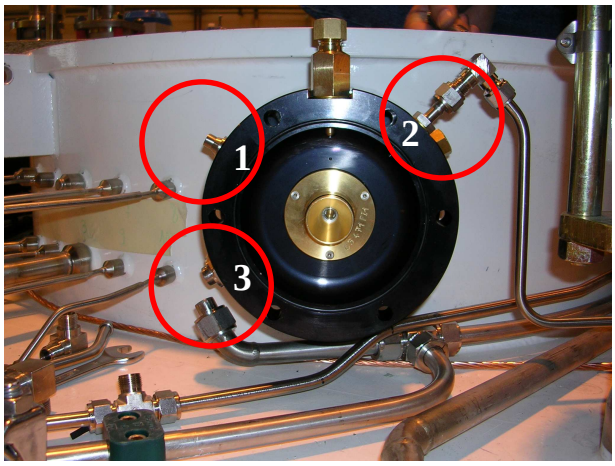
Disconnect water inlet and outlet flexibles on the turbine heat exchanger

Purge the water from the exchanger with compressed air.



Take apart the mounting nuts of the cooler.

Remove the cooler.

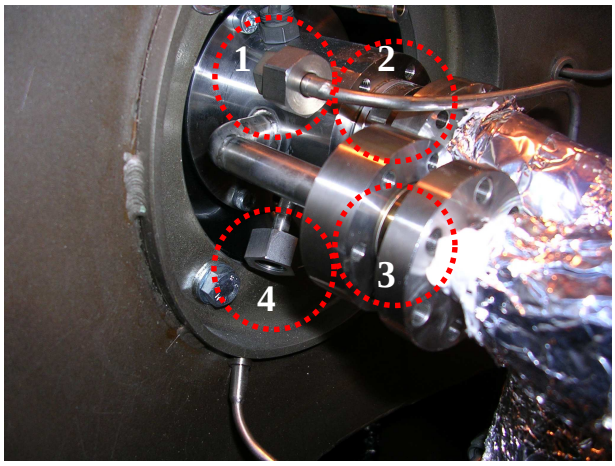


Disconnect the following pipework:

1. Bearing high pressure inlet connector
2. Pressurization feeding connector of the brake
3. Bearing low pressure outlet connector

Open, the top coverplate of the cold box using a crane

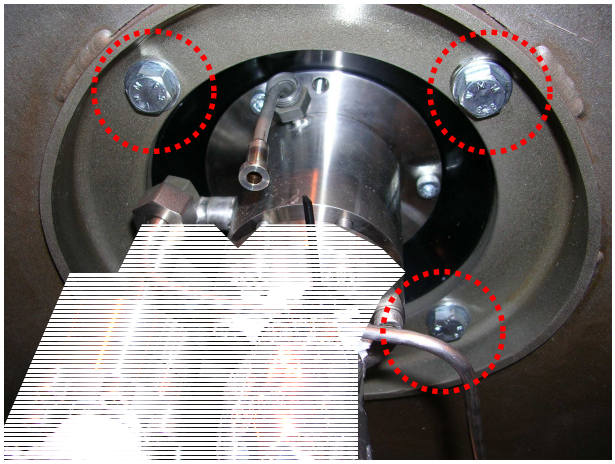
Remove the cover plate sealing during the operation.



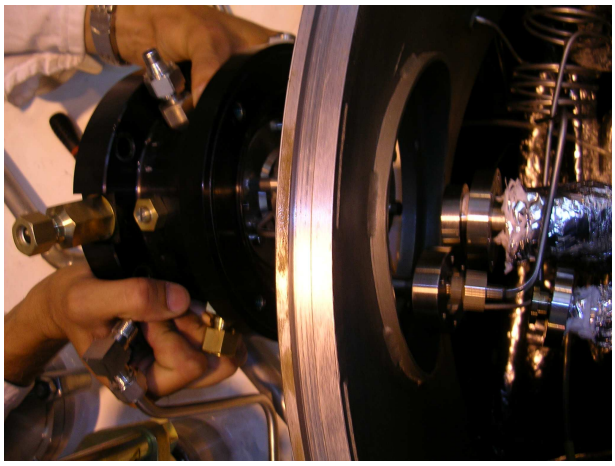
When the coverplate is removed be carefull not to drop any tools or parts into the cold box.

Disconnect the following pipework:

1. Pressurization feeding connector of the brake
2. Process gas low pressure outlet
3. Process gas high pressure inlet
4. Regulating pressure for tightness between process and bearings

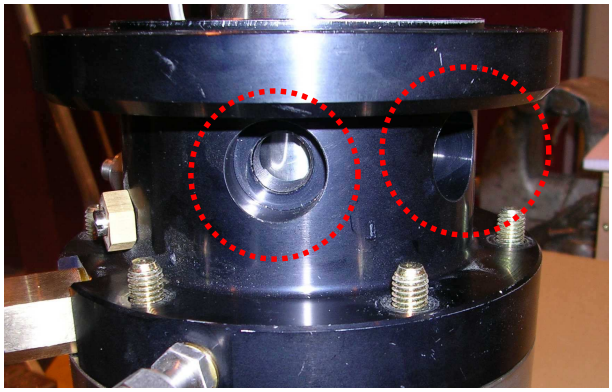


Remove tubine body screws.

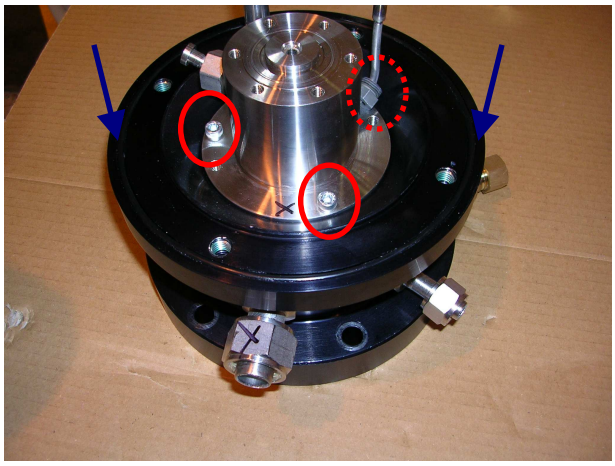


Remove the tubine body.

Be carefull not to drop the Kenol seals inside the cold box during this operation.



Remove the temperature thermowells and speed sensor lense before extracting the turbine from its body.



Put the turbine body on a clean bench, cover by a clean surface.

Mark the turbine radius position with the low pressure bearing outlet. Black cross on the picture.

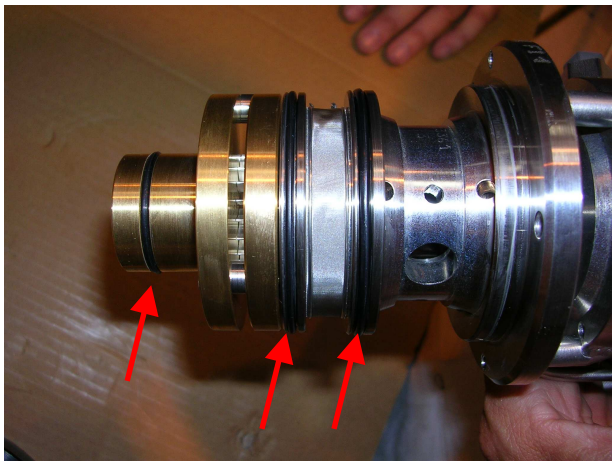
Remove the three mounted screws of the turbine. Circled in red.

Push the body down with two hands to extract the turbine. For the dummy cartridge you need to maintain the body on the bench and to pull the dumy out.

Check the turbine/body sealing is in place and free from damage.

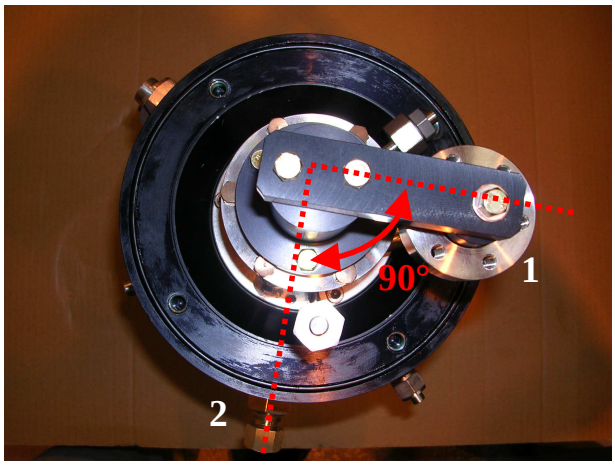
Install the body on the cooler verticaly on the bench.

Attach the body to the cooler with two nuts.



Remove the sleeve of the turbine.

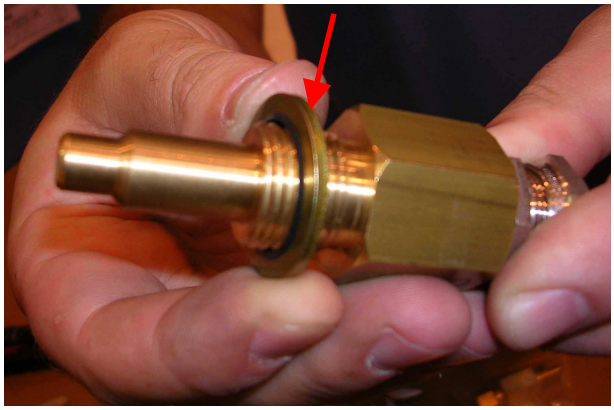
Check all sealings are in place and free from damage.



Insert the turbine into the body. Push it down slightly to insert the bottom of the turbine into the cooler.

Use the mark to place it at the right radius. If the turbine is not marked place the process gas low pressure outlet (1) at 90° of the bearing low pressure outlet (2).

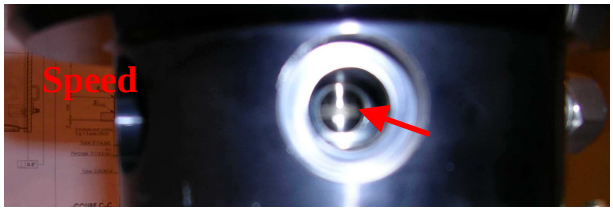
Tight the thee mounted screws.



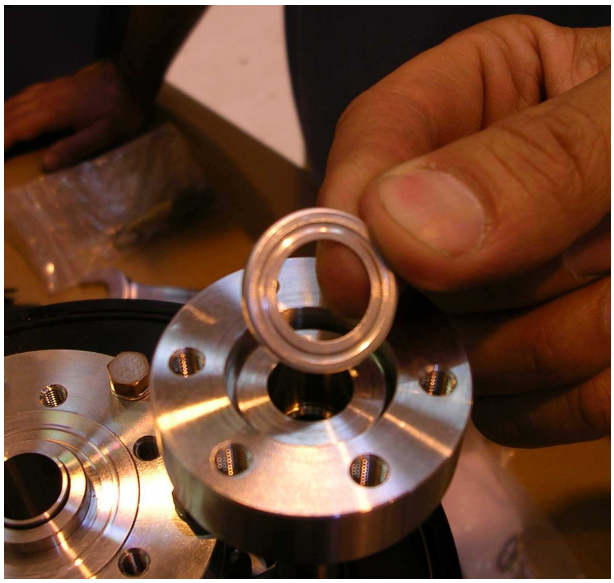
Put in place the temperature thermowells and speed sensor lense.

Do not forget the washers when you install the temperature thermowells and the speed sensor lense otherwise you will damage the turbine rotor.

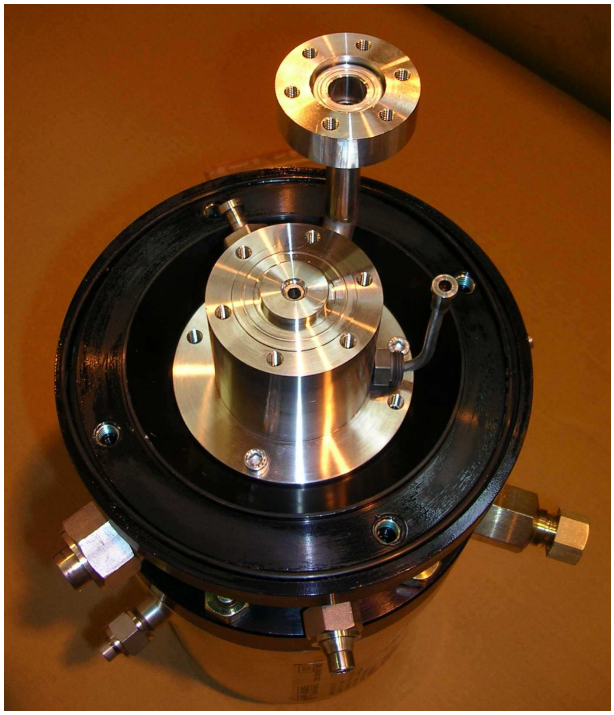
If you are installing the dummy cartridge, you need to put the caps in place of the thermowells and lense.



NB: The speed sensor lense goes on the hole through which you can see the rotor. Check the drawing in the turbine file for more details.

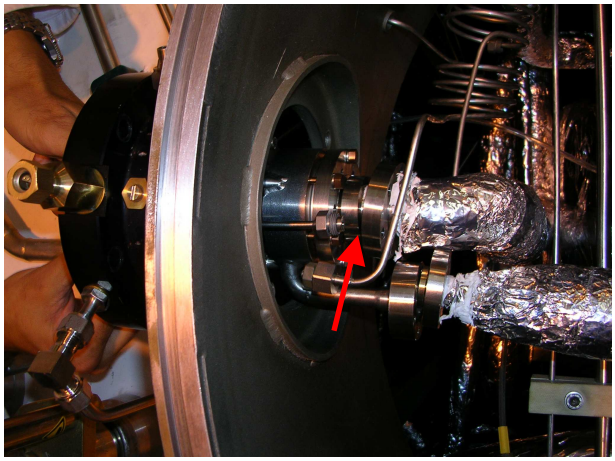


Place the Kenol sealing on the process gas low pressure outlet.



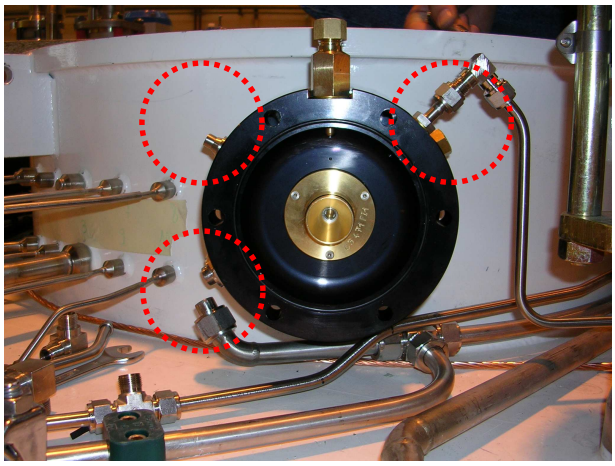
The turbine is now ready to be installed on the cold box..

Remove the nuts attaching the cooler to the body, and extract the body and turbine sub-assembly from the cooler.



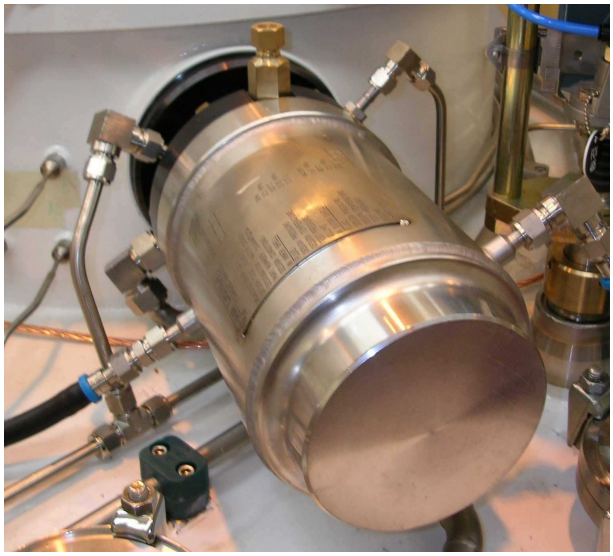
Put the body and turbine sub-assembly in place and insert the Kenol sealing on the process gas high pressure inlet.

Then reconnect the



Re-connect the following pipework:

1. Bearing high pressure inlet connector
2. Pressurization feeding connector of the brake
3. Bearing low pressure outlet connector



Put the cooler back in place and tight the mounting nuts.

Reconnect the water inlet and outlet flexibles.

When operation on turbine is finished, put sealing and the top coverplate back in place on the **HELIAL**.

Go through the following sequence in order to restart the turbines and the machine:

- Insulation vacuum pumping
- Conditionning
- Start

Refer to the Service Manual of your **HELIAL** for the detailed procedure to run these sequences from the operator interface.