



EDWARDS



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SERVICE TOOL KIT

nEXT 730D/930D/1230H

INSTRUCTION MANUAL

Official Distributor in Australia



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Vacuum and Thin Film Technology

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We accept no liability for loss of profit, loss of market or any other indirect or consequential loss whatsoever.

Product warranty and limit of liability are dealt with in our standard terms and conditions of sale or negotiated contract under which this document is supplied.

You must use this product as described in this manual. Read the manual before you install, operate, or maintain the product.

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1. Safety and compliance

1.1 Definition of Warnings and Cautions

NOTICE:

For safe operation from the start, read these instructions carefully before you install or commission the equipment and keep them safe for future use.



Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions. The equipment must only be operated and maintained by trained personnel in the proper condition and as described in this instruction manual.

Obey local and state requirements and regulations. If you have any questions about safety, operation or maintenance of the device, please contact our nearest subsidiary.

Important safety information is highlighted as warning and caution instructions. Obey these instructions.

WARNING:



If you do not obey a warning, there is a risk of injury or death. Different symbols are used according to the type of hazard.

CAUTION:



If you do not obey a caution, there is a risk of minor injury, damage to equipment, related equipment or process.

NOTICE:



Information about properties or instructions for an action which, if ignored, will cause damage to the equipment.

We reserve the right to change the design and the stated data. The illustrations are not binding.

Keep the instructions for future use.

1.2 Trained personnel

For the operation of this equipment "trained personnel" are:

- skilled workers with knowledge in the fields of mechanics, electrical engineering, pollution abatement and vacuum technology and
- personnel specially trained for the operation of vacuum pumps

1.3 Safety symbols

The safety symbols on the products show the areas where care and attention is necessary.

The safety symbols that follow are used on the product or in the product documentation.

	Warning/Caution An appropriate safety instruction must be followed or caution to a potential hazard exists.
	Warning - Dangerous voltage Identifies possible hazards from dangerous voltages.
	Warning - Hot surfaces Identifies a potential hazard from a hot surface.
	Warning - Protective earth (ground) Earth point for electrical equipment.
	Warning - Use protective equipment Use appropriate protective equipment for the task.
	Warning - Risk of explosion There is a risk of explosion when you do the task.

2. Important safety information

WARNING: EJECTION OF PARTS

If the mounting is not sturdy enough, a pump blockage could cause the pump to break loose. Internal pump components could be thrown in all directions.



Attach the pump firmly to the vacuum chamber. Never operate the pump without proper flanging to the vacuum chamber (in bench testing, for example). In case of rotor destruction a sudden twisting of the entire pump is possible. The vacuum chamber must be able to absorb the torque of max. 10 kNm around the rotor's axis of rotation in the event of sudden rotor destruction.

CAUTION: CUTTING AND CRUSHING

When reaching into open flanges there is a risk of cutting and crushing your fingers.

Do not operate the vacuum pump with open flanges. Do not reach into the pump.



When installing the vacuum pump, first mechanically connect the inlets and outlets and then make the electrical connections.

Disconnect the vacuum pump from the power supply before servicing the pump. Only use trained service personnel.

Before servicing, ensure that gas cannot flow through the pump. Only open the pump system when it is under atmospheric pressure.

CAUTION: BURNS



Touching hot surfaces may lead to burns.

Handle the pump only when ventilated and cooled down.

Wear suitable protective equipment.

3. Description

This manual provides step by step instructions for the removal and insertion of the mechanical bearing on the nEXT730D/930D/1230H pump.

3.1 Supplied equipment

Bearing exchange video training is available on the Edwards Vacuum Channel on YouTube.

nEXT730/930D Bearing kit part no. B8J200827

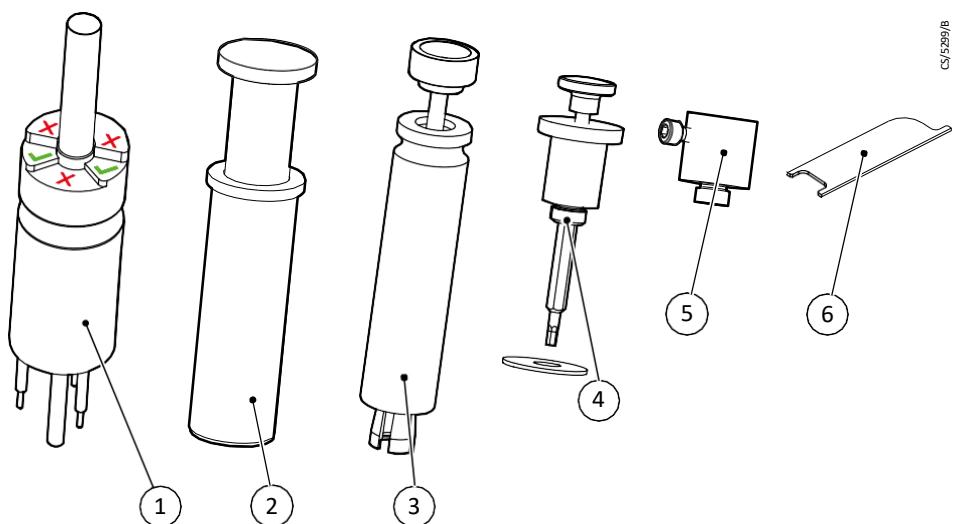
nEXT1230H Bearing kit part no. B8M200827

- Grooved ball bearing 8x23x15
- O-Ring 35x3 FKM
- Grease syringe with 0.4 ml LVO 821 grease

nEXT730/930D Bearing exchange tool kit part no. B8J200845

nEXT1230H Bearing exchange tool kit part no. B8M200845

Figure 1 Special Tools

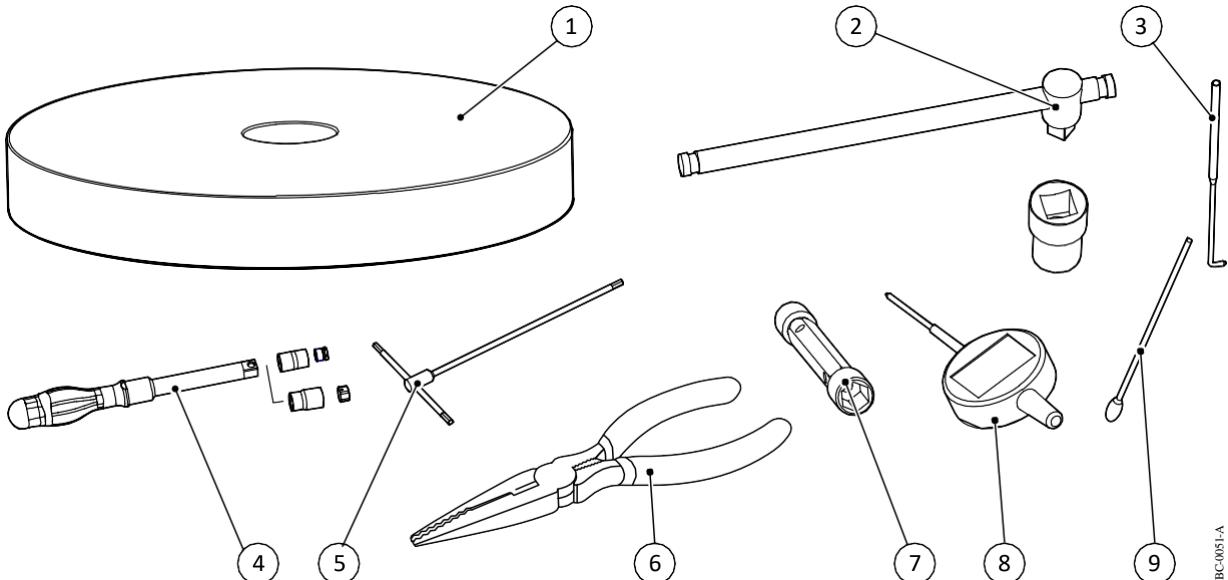


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No.	Special tools
1	Bearing preload measurement and setting tool
2	Bearing press bolt
3	Bearing extractor
4	Rotor fixation tool incl. rubber pad, Ø approx. 45 mm, approx. 2 mm thick, with a hole in the center Ø approx. 13 mm
5	Gauge holder for measuring the axial play
6	Reset tool

3.2 Additional tools and items required

Figure 2 Additional tools



No.	Additional tools
1	Foam plastic pad Ø approx. 400 mm, approx. 80 mm thick, with a hole in the center Ø approx. 50 mm
2	22 mm hex socket wrench
3	Hook tool with 90° end
4	Torque screwdriver with 12 mm and 14 mm hex socket (1/4" square), torque range 2 to 6 Nm
5	4 mm T-bar
6	Long nose pliers, 200 mm
7	13 mm hex socket wrench ISO 2236
8	Dial gauge with 50 mm extension
9	Polyester clean swab stick
N/A	Scissors
N/A	Lint-free cloth
N/A	Latex gloves

4. Preload check

WARNING:



Allow the pump rotor to stop before you remove the pump from your vacuum system for maintenance procedures.

NOTICE:



If the pump has suffered any damage (i.e. the rotor does not spin freely or quietly), it is recommended that the service is not carried out. Contact local service centre for advice.

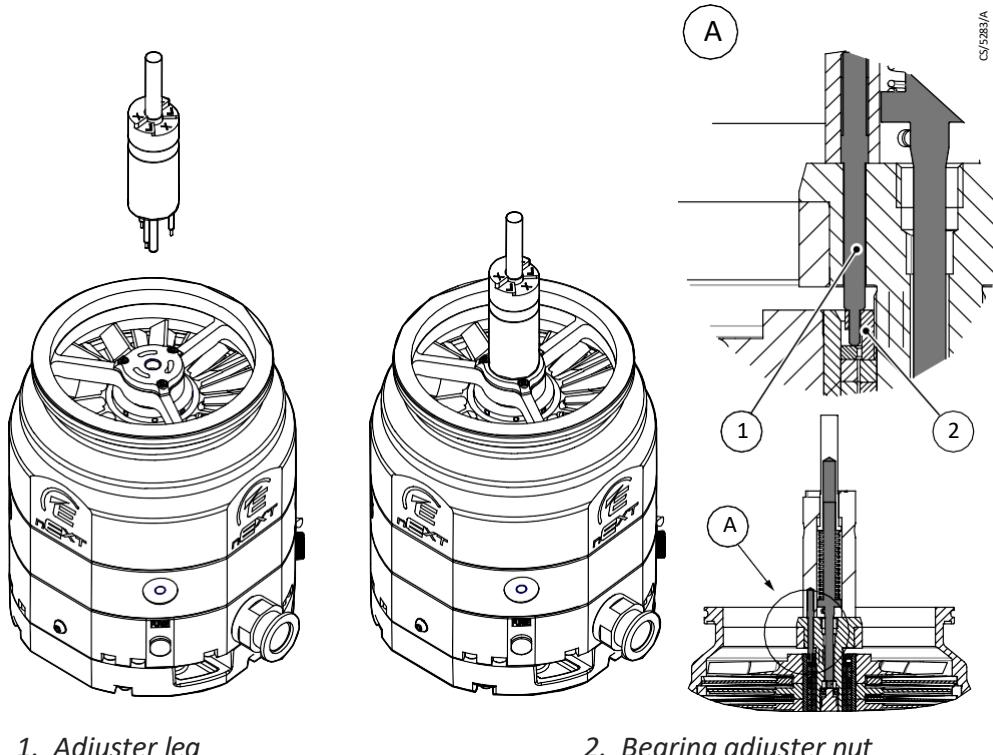
Ensure all tools are clean and free of dirt and grease to avoid contamination of the rotor.

After the bearing change the bearing preload must be checked. To become familiar with how to check bearing preload, we recommend you perform a check at first.

Preload is the process where a permanent thrust load is applied to the mechanical bearing. Thrust is applied by the misalignment between the inner static and the outer rotating passive magnetic bearing located at the inlet of the pump.

Place the pump in the vertical position.

Figure 3 Check the bearing preload



1. Adjuster leg

2. Bearing adjuster nut

Place the preload tool onto the inlet of the turbomolecular pump. The force probe must be located in the centre of the pump inlet with the adjuster legs engaged on the

magnetic bearing adjuster nut. Supporting the preload tool body in position while performing the preload check is recommended.

Apply pressure by pushing the test plunger until a change in preload can be detected. Releasing the test plunger will return the preload to its original position. Pressing and releasing the test plunger slowly while performing this check is recommended.

Detection of the bearing preload can be recognised by a distinct sound. This may be accompanied by a sensory feel through the tool and pump body. If a change in preload cannot be detected, it may be possible to carry on with the service but with caution.

Only for nEXT1230H

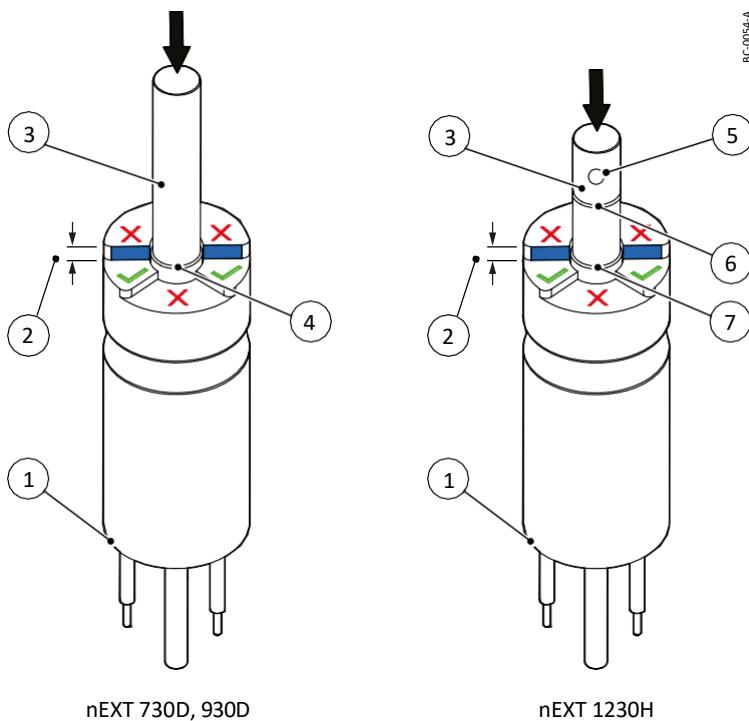
If no sound can be detected at the nEXT1230H, a multi meter can be used to detect the change of the preload.

Put one banana plug connected to the multi meter in the hole of the test plunger and connect the other wire of the multi meter to the pump housing e.g. by connecting it with the earth screw of the housing. Measure the electrical resistance.

When the force applied at the test plunger is lower than the preload there is no electrical connection between the test plunger and the housing.

When the force applied at the test plunger is bigger than the preload there is an electrical connection between the test plunger and the housing.

The set preload is measured at the moment when it changes from no electrical connection to electrical connection.

Figure 4 Preload tool

nEXT 730D, 930D

nEXT 1230H

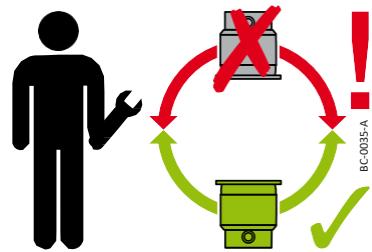
1	Sleeve: the sleeve must be in contact with the spider of the pump while pressing down the test plunger
2	Correct adjustment
3	Test plunger
4	Marker: the marker must be within the correct adjustment area when hearing the distinct sound. nEXT730D/930D: only one marker for all pump models.
5	Hole for banana plug
6	Upper marker for pump models with part nos without "INV" (mounted with the high-vacuum flange on top, preload = 50 N): The marker must be within the correct adjustment area when hearing the distinct sound.
7	Lower marker for pump models with part nos with "INV" (mounted with the high-vacuum flange on the bottom, preload = 25 N): The marker must be within the correct adjustment area when hearing the distinct sound.

4.1 Mounting orientation

nEXT730D and 930D pumps can be mounted in any orientation,
nEXT1230H pumps can be mounted

- horizontally or vertically, with the high-vacuum flange *on top* and in any orientation in between or

Figure 5 Mounting orientation for nEXT1230H



- horizontally or vertically, with the high-vacuum flange *on the bottom* and in any orientation in between (INV versions)

Figure 6 Mounting orientation for nEXT1230H INV



NOTICE: PUMP DAMAGE

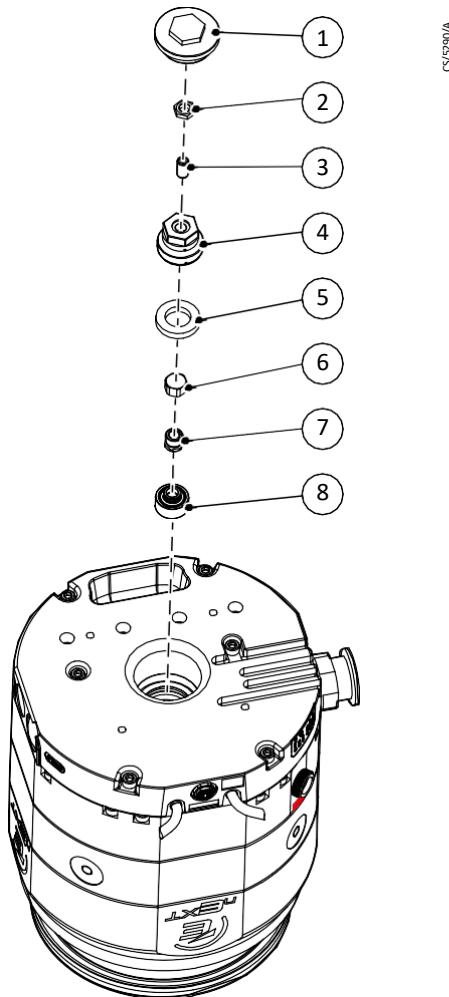


The pump can be damaged if it is operated in the incorrectly installed orientation.

Observe the sticker on the pump and install the pump only in the permitted orientation.

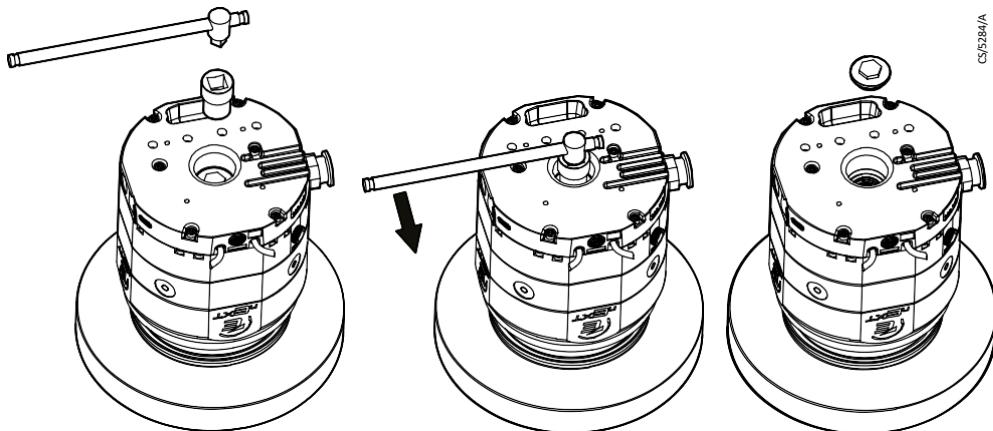
5. Disassembly

Figure 7 Overview- Bearing in the nEXT pump



1. Bearing cover
2. Hexagon nut ISO 8675 - M8x0.5 A4-035
3. Ball pressed screw M8 x 0.5 x 17.2-A2
4. Axial limiter
5. Axial disc
6. Counter nut M12x1
7. Nut M8x1
8. Groove ball bearing 8x23x15 install ready

Figure 8 Disassembly 1 (bearing lid)



1. Put the pump upside down on the foam plastic pad.
2. Use the 22 mm hex socket wrench to unfasten the bearing lid.
3. Open the pump by removing the bearing lid.
4. Use the 22 mm hex socket wrench to unfasten the axial limiter and remove it.

Figure 9 Disassembly 2 (axial limiter) as figure 6

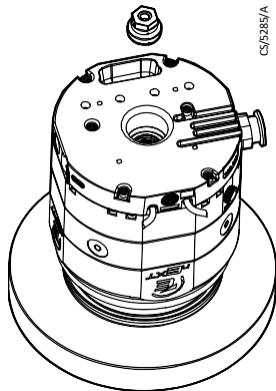
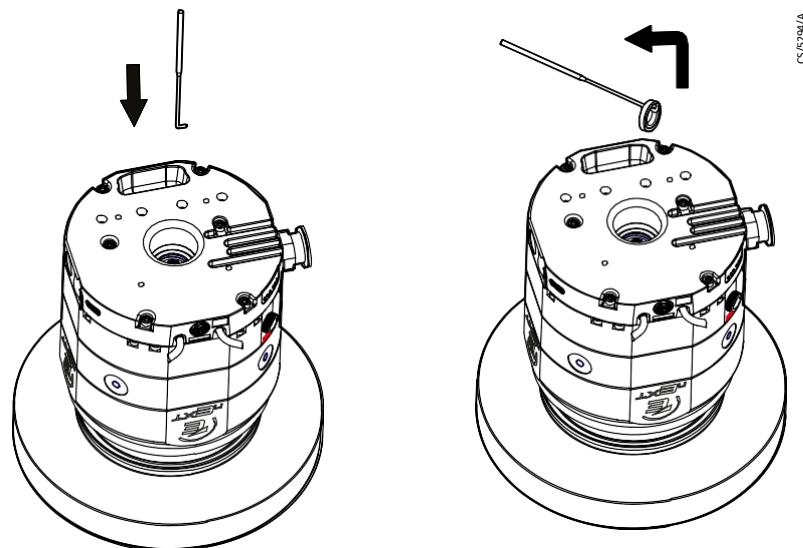
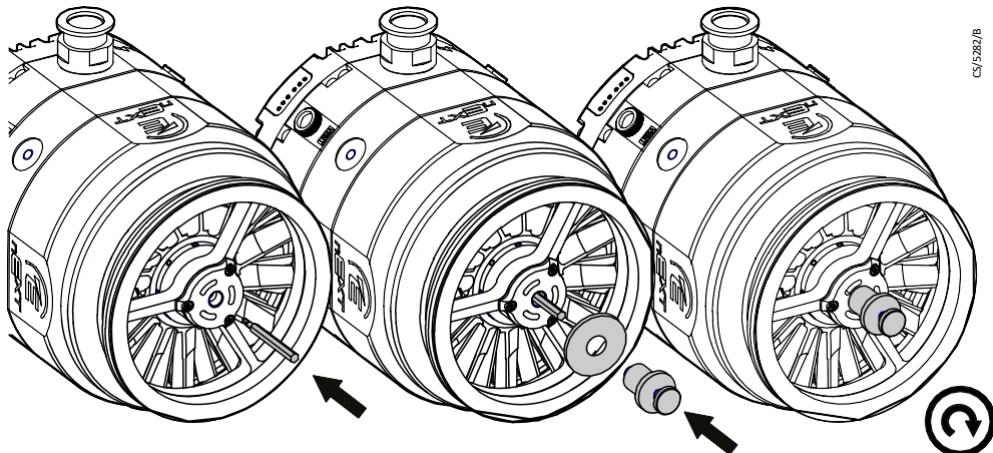


Figure 10 Remove the axial disc

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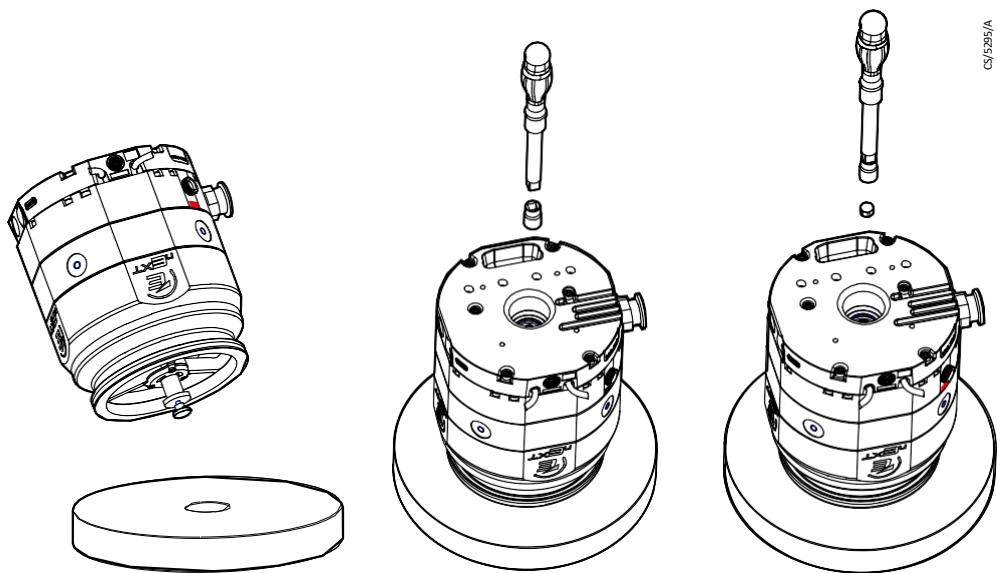
Insert the hook tool with the 90° end into the opening and remove the axial disc.

Figure 11 Block the rotor

CS/528/B

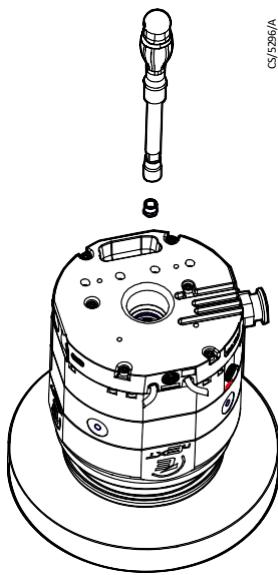
1. Put the pump in the horizontal position on the foam.
2. Insert the hexagonal shaft through the spider into the rotor shaft. (You can no longer turn the rotor)
3. Turn the knurled screw nearly out of the upper part.
4. Put the rubber pad on the spider. (To prevent scratches)
5. Put the upper part on the hexagonal shaft and screw it into the spider on the block.
6. Turn the knurled screw carefully in the pump direction until you hear the noise when it changes to the opposite direction.

Figure 12 Remove the counter nut

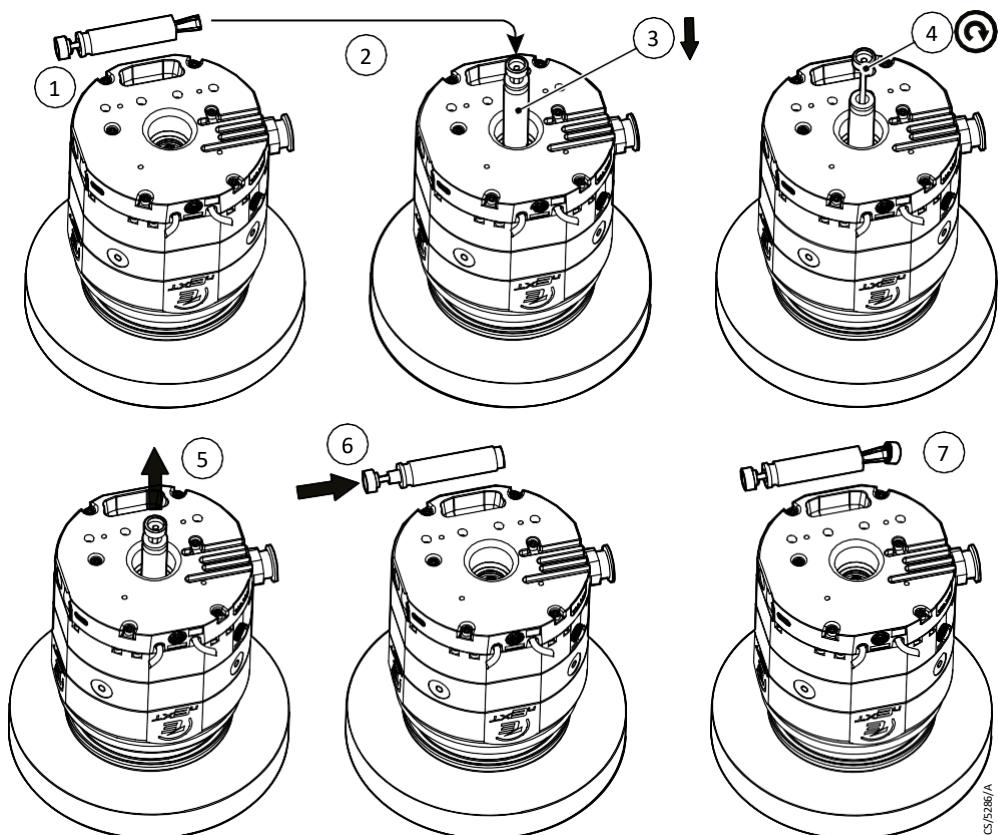


1. Put the pump upside down on the foam (optionally, put it in the horizontal position).
2. Use the torque driver with 14 mm hex socket to remove the counter nut.

Figure 13 Remove the M8x1 nut



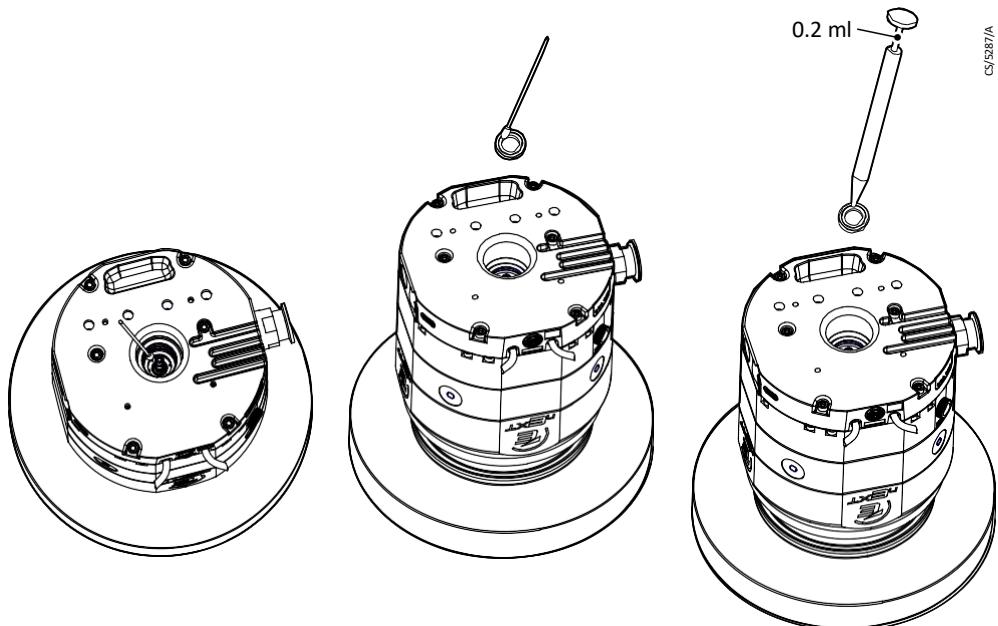
Use the torque driver with 12 mm hex socket to remove the M8x1 nut.

Figure 14 Extract the bearing

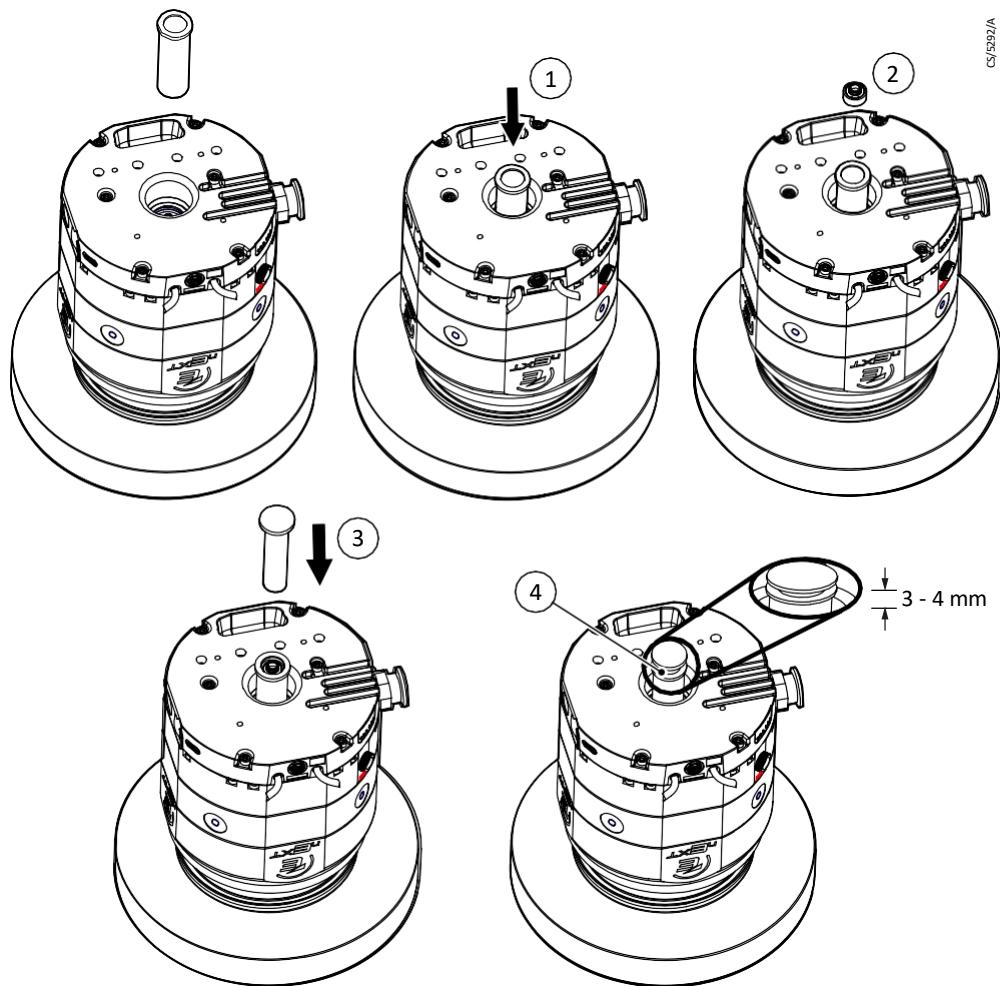
1. Take the ball bearing extractor tool and turn the knurled screw out by approx. 20 mm. Press the claws out of the plastic sleeve and spread the claws.
2. Insert the ball bearing extractor tool into the pump until it blocks.
3. Push the plastic sleeve down until it blocks.
4. Turn the knurled screw until the bearing is pulled off the shaft.
5. Remove the bearing.
6. Push the knurled screw into the plastic sleeve.
7. Take the bearing away.

6. Assembly

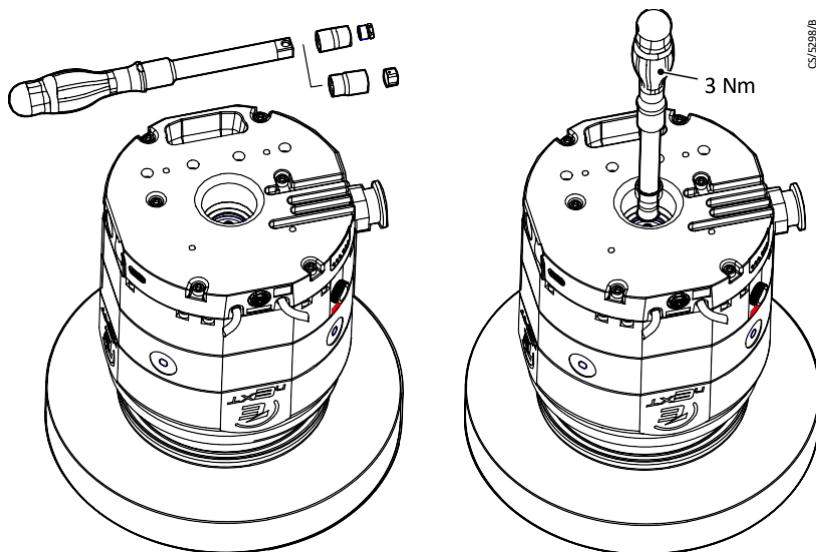
Figure 15 Grease the axial disc



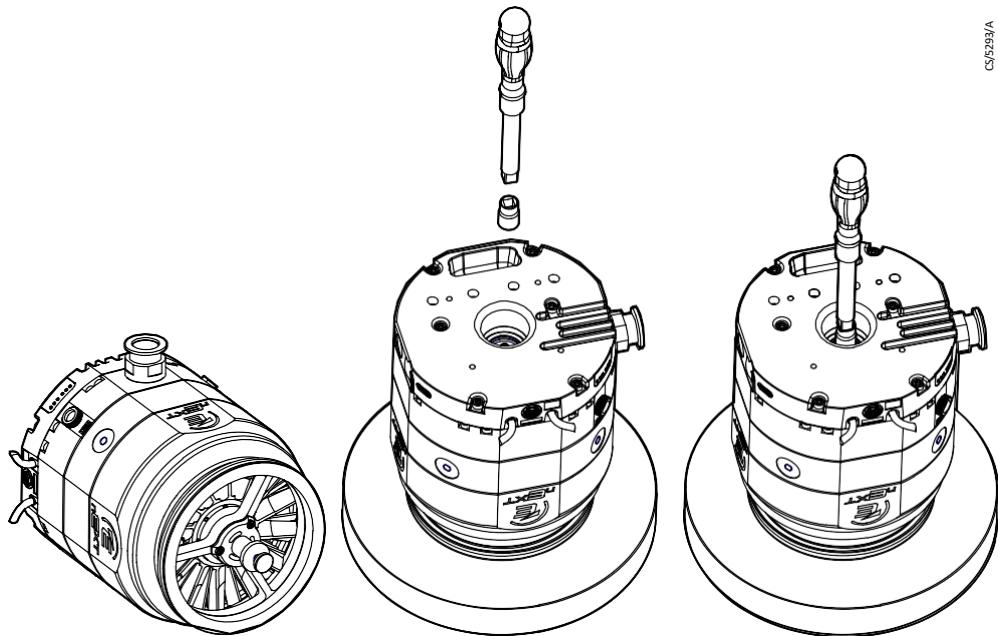
1. Use a polyester clean swab stick to clean the contact area of the axial disc in the pump and remove the old grease from the axial disc.
2. Grease the axial disc again with 0.2 ml new grease from the syringe of the service kit.

Figure 16 Press in the bearing

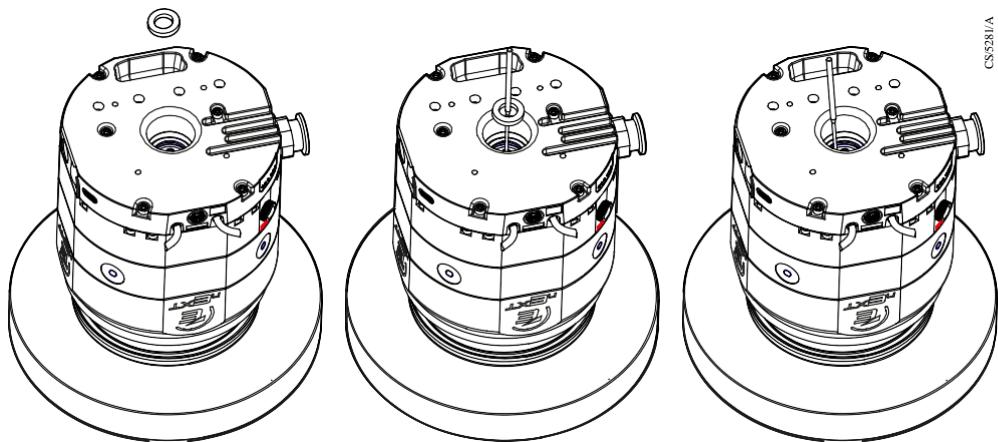
1. Insert the bearing retainer into the pump.
2. Remove the new bearing from the plastic bag. Take the new bearing at the inner ring and push it in the bearing retainer.
3. Insert the press bolt and press the bearing onto the shaft.
4. The bearing is in its final position when the gap between the bearing retainer and the head of the press bolt is about 3 to 4 mm.

Figure 17 Screw in the M8x1 nut and the counter nut

1. Use the torque driver with 12 mm hex socket to fix the M8x1 nut, torque 3 Nm.
2. Use the torque driver with 14 mm hex socket to fix the counter nut, torque 3 Nm.

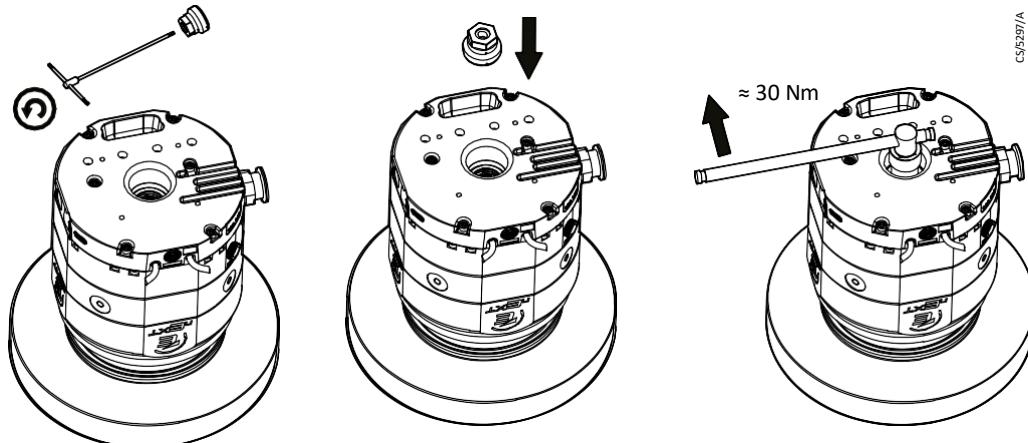
Figure 18 Press the rotor into its position

1. Put the pump in the horizontal position on the foam.
2. Remove the rotor fixation tool.
3. Turn the pump upside down on the foam. Use the torque driver to press the rotor back in position on the spider until you hear that it has changed its position.

Figure 19 Assemble the axial disc

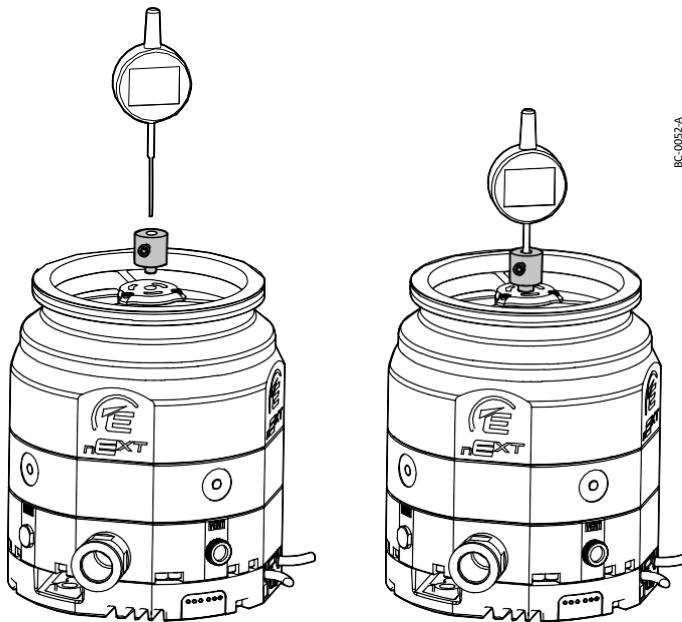
CS5281/A

1. Assemble the axial disc with the new grease (grease showing to the bearing). We recommend that you move the hook tool through the axial disc and touch the counter nut while inserting the axial disc.
2. Check the position with the hook.

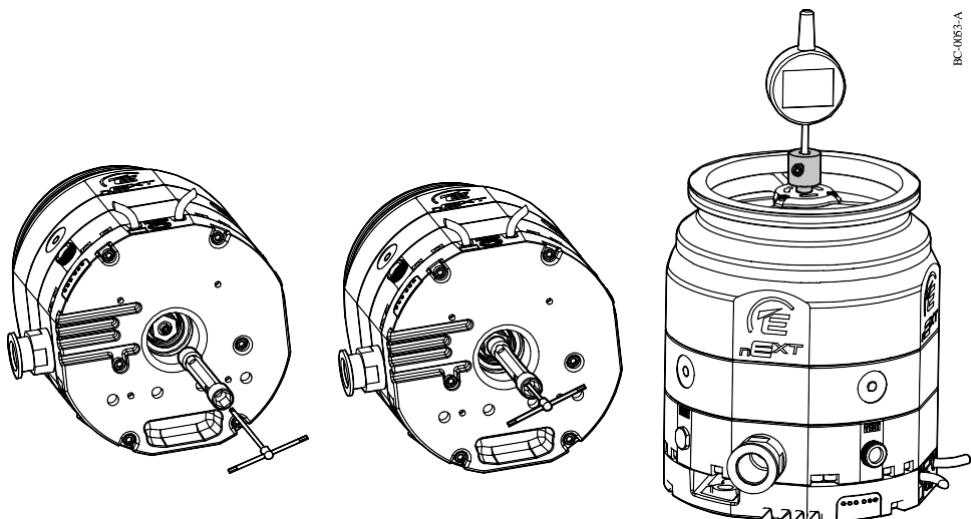
Figure 20 Screw in the axial limiter

CS5291/A

1. Use the T-bar to turn the headless screw of the axial limiter by a half turn counter-clockwise.
2. Insert the axial limiter and install the 22 mm hex socket on the inserted axial limiter.
3. Use the wrench to fasten the axial limiter.

Figure 21 Insert the gauge - Measure the axial play

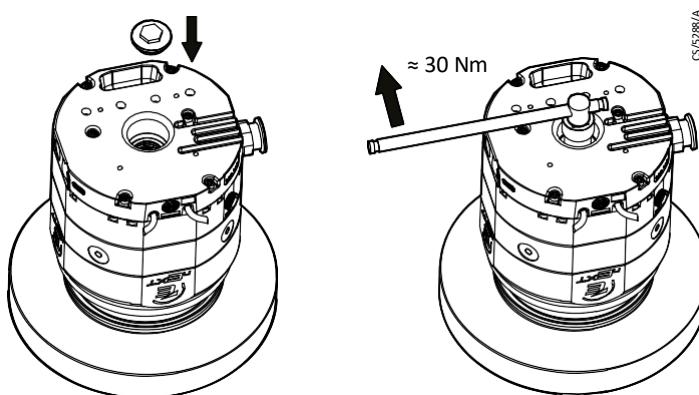
1. Put the pump in the upright position.
2. Screw the gauge holder into the spider.
3. Fit the 50 mm extension to the dial gauge, engage it to the holder and fasten it. Reset the display to 0.000.
4. Make a control measurement by pressing the rotor into the pump and take the value. This is the axial play at the beginning, which must be adjusted in this position
 - to 0.04 to 0.06 mm for the nEXT730/930D or
 - to 0.035 to 0.055 mm for the nEXT1230H.
5. When you release the rotor it must come back (if not, pull the rotor back to the original position). Adjust the axial play as follows.

Figure 22 Adjust the axial play

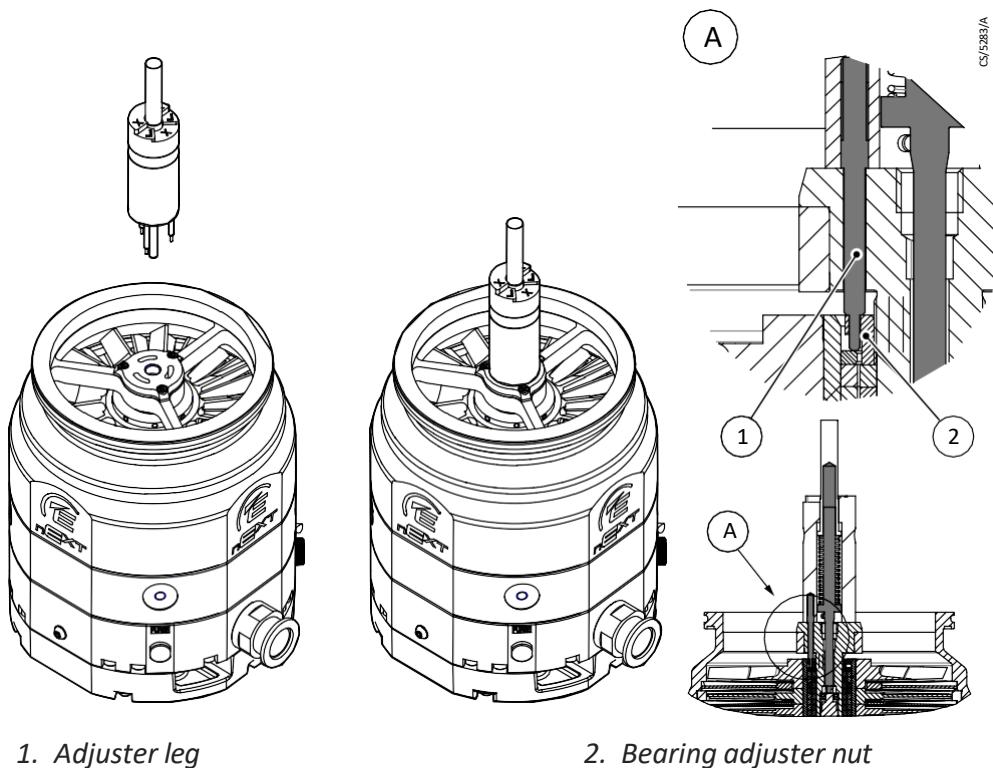
1. Put the pump in the horizontal position on the foam.
2. Insert the 13 mm hex socket wrench. Insert the T-bar through the wrench into the headless screw of the axial limiter.
3. Hold the socket wrench and turn the T-bar clockwise. Every full turn clockwise reduces the axial play by 0.5 mm.
4. Turn the T-bar carefully and check the axial play several times to avoid pushing the headless screw on block. Put the pump each time in the upright position when you check the axial play.

The bearing is embedded in O-rings. Therefore the axial play must be measured in upright position. The axial play must be in the range of

- 0.04 to 0.06 mm for the nEXT730/930D or
- 0.035 to 0.055 mm for the nEXT1230H.

Figure 23 Insert the bearing lid

1. Remove the dial gauge, the wrench with the T-bar and the hex socket.
2. Put the pump upside down on the foam plastic pad.
3. Take the bearing lid and replace the O-ring with the new O-ring from the service kit.
4. Insert the bearing lid and fasten it using the wrench.

Figure 24 Check the bearing preload

6.1 Bearing preload check



NOTICE:

Failure to ensure a correct preload on the bearing may shorten the service life of the pump.

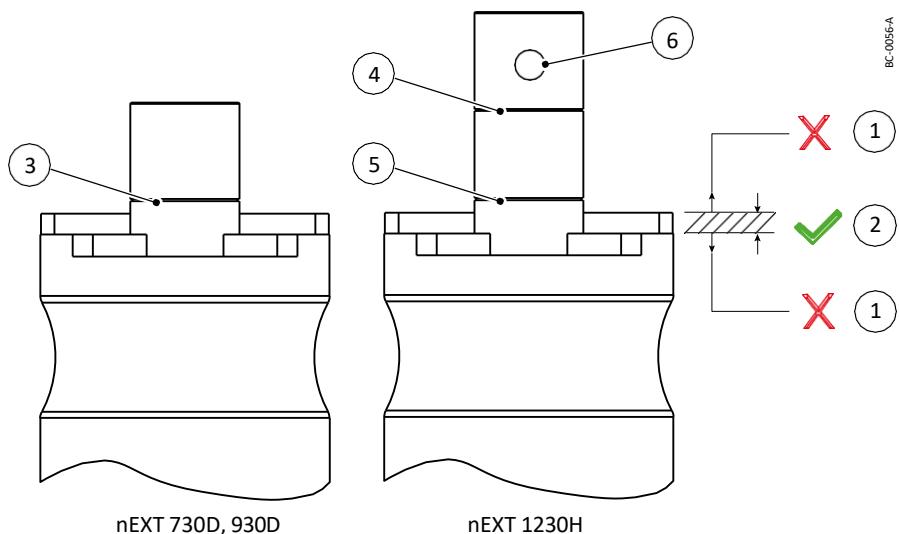
Fit and use the preload tool. While performing this check, record the position of the test indicator when a change in preload transition occurs.

If the test indicator falls within the pass limit, no further action is required.

If the test indicator falls above or below the pass limit when a change in preload transition occurs, adjust the bearing preload force. Using the preload tool body, rotate the magnetic bearing adjuster nut (viewed from top) clockwise if the test indicator is above the pass limit, or counter-clockwise if the test indicator is below the pass limit.

We recommend that you monitor the preload force using the preload tool test plunger between 1 mm rotational increments. Continue this process until the test indicator falls within the pass limit.

If no preload is detected, slowly turn the preload tool body clockwise until preload is established. When the preload has been verified, measure the preload force by following the corresponding instructions above.

Figure 25 Preload tool (pass/fail indication)

1. Fail
2. Pass
3. Pass/ Fail test indicator (only one marker for all pump models)
4. Pass/ Fail test indicator (upper marker for pump models with part nos without "INV")
5. Pass/ Fail test indicator (lower marker for pump models with part nos with "INV")
6. Hole for banana plug

6.2 Clearance check

Before installation check the pump clearance.

Use the end of a pen or a similar tool to carefully rotate the rotor. While the rotor is turning listen out for any clashing between the rotating and static parts. Ensure the rotor turns freely. If the rotor does not turn freely, contact your supplier.

6.3 Bearing monitoring and conditioning system

To ensure maximum reliability and bearing life nEXT pumps have an integrated system to manage the bearing condition. The status is indicated by a blue LED on the pump.

The pumps have an integrated battery-backed real time clock that is constantly monitoring pump storage time.

The TMP motor controller when powered uses its processor and when unpowered the real time battery backed clock to monitor the TMP inactivity time. Inactivity time refers to both when the TMP is unpowered and when the TMP is powered but at rest. When inactivity time exceeds:

- the pre-defined period of 12 months, a bearing conditioning is required and "Bearing Run in Mode" (BRIM) will commence at the next pump start.
- the pre-defined period of 3 years, a bearing replacement is required. The customer will be alerted by the major service due indicator on the STATUS LED (yellow) and on the Bearing LED (blue). Once the bearing is replaced and the major service reset, a bearing conditioning will be required and will commence at the next pump start.

When the BRIM process completes, the TMP runs to full speed and normal TMP process can resume.

You can check the TMP inactive time (storage duration) and reset BRIM status via:

- TIC – browsing to the „Service menu“, „Brg Inactive“ will display the TMP inactive time. See TIC user manual for more details
- nST2 – See nST2 user manual for more details.

The purpose of recording the inactive bearing time is to maximize the life of the installed ball bearing. If the bearings are inactive for a long time, the homogeneity of the grease distribution deteriorates, which leads to short-term local overheating of the grease in the bearing when the pump is directly started up to nominal speed. This can lead to decomposition or evaporation of the grease. This grease is then no longer available for the running time of the bearing and ultimately leads to earlier failure of the ball bearing. The Bearing Run In Mode (BRIM), on the other hand, restores the homogeneity of the grease distribution by gently restarting the pump.

6.4 Bearing run in mode

Bearing run in mode (BRIM) is a start-up sequence for the pump designed to precondition the bearing to optimise bearing life. The pump goes through a number of speed steps before reaching full speed.

The BRIM process last around 4.3 hours and the LED indicates when this is running.

BRIM mode can be cancelled by sending a stop signal and then start signal to a pump currently running the BRIM process. This is NOT recommended and may invalidate the warranty.

BRIM mode is either triggered:

- automatically by the pump
- manually through nST2
- manually through the TIC, or
- by pressing both speed adjustment push buttons (located behind the service cover) simultaneously for 2s on the pump.

Table 1 Bearing LED

LED is not lit while pump is powered on	No bearing conditioning required
LED is flashing 0.25 s ON and 0.75 s OFF	Pump has been stored for more than 12 months, BRIM is required and will start on the next pump start
LED is permanently ON	BRIM is running
LED is flashing 0.25 s ON and 0.25 s OFF	Pump has been stored for more than 3 years, bearing replacement is required

7. Service counter reset

After completing a bearing change, reset the service interval to schedule the next service and reset the status LED. 4 options are available to perform a service counter reset.

WARNING: AUTOMATIC START-UP



Following a service counter reset the pump may enter a short setup routine including movement of the rotor. This can injure people. Install the pump in the vacuum system before connecting the pump to the power supply.

7.1 Reset the service interval using a Turbo Instrument Controller (TIC)

1. Starting from the top level view screen, push the MENU button to enter the MAIN menu.
2. Use the DOWN button to scroll down to the "Turbo Status" option. Push the SELECT button to enter the TURBO STATUS menu.
3. Use the DOWN button to scroll down to the "Service menu - enter" option. Push the SELECT button to enter the nEXT SERVICE menu.
4. Use the DOWN button to scroll down to the "Reset Service Due . . ." option. Push the SELECT button to enter the nEXT SERVICE RESET menu.
5. Use the DOWN button to scroll down to the "Reset bearing due" option. Push the SELECT button to reset the bearing service schedule.
6. To confirm that the service reset has been successful, push the MENU button to return to the nEXT SERVICE menu. Check that the "run" and "until" hours have been reset. Check that the status LED has been reset and is no longer flashing.
7. Once the service counter reset has been completed, a power cycle must be performed to complete the process.

7.2 Reset the service interval using a PC serial command

- To reset the bearing service interval following a bearing change, send the following command over the serial communications link:

Command	!	C	8	8	5	sp	1	cr
---------	---	---	---	---	---	----	---	----

The reply received will be as follows:

Command	*	C	8	8	5	sp	1	cr
---------	---	---	---	---	---	----	---	----

- To confirm that the service reset has been successful, check that the status LED has been reset and is no longer flashing.
- Once the service counter reset has been completed, a power cycle must be performed to complete the process.

7.3 Reset the service interval using a nST PC program

The nST PC program is PC-based software that can be used with the nEXT pump, either via the serial interface or via the USB service port.

This software is available from www.upgrades.edwardsvacuum.com.

Currently, nST software requires a free license to be used. To obtain a free license follow the on screen instructions, fill out the user data form and then send the automatically generated email to Edwards.

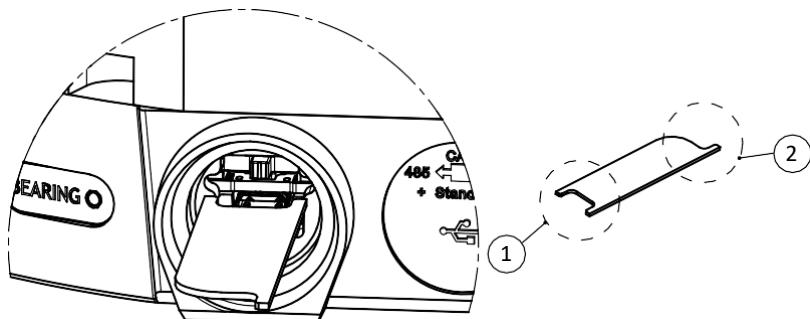
First time users are recommended to refer to the nST Support Toolkit instruction manual D396-49-880.

To confirm that the service reset has been successful, check that the status LED has been reset and is no longer flashing. Once the service counter reset has been completed, a power cycle must be performed to complete the process.

7.4 Reset the service interval using the turbo drive standby speed control buttons

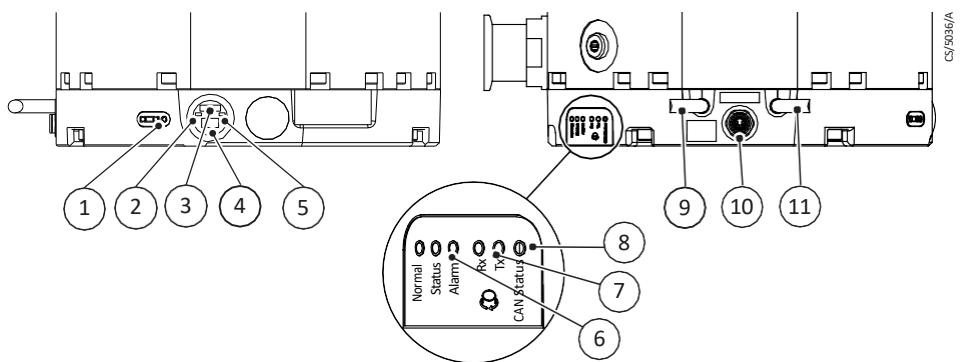
- Ensure the drive is powered. Using a suitable tool, e.g. the reset tool, press and hold the increase and decrease standby speed buttons simultaneously for more than 5 seconds.
- To confirm that the service reset has been successful, check that the status LED has been reset and is no longer flashing. Once the service counter reset has been completed a power cycle must be performed to complete the process.

Figure 26 Use the reset tool



1. Use to reset the service counter

2. Use to operate the standby increase or decrease button

Figure 27 Controller view

1. Bearing LED (indicates when bearing service is recommended)
2. Standby increase button
3. RS485/CAN/RS232 slide switch
4. USB connector
5. Standby speed decrease button
6. Pump status LEDs
7. Serial receive/transmit LEDs
8. CAN status LED
9. nEXT pump power supply interface
10. Accessory connector
11. nEXT pump logic interface

