

satisloh[®]

ART-Deblocker-2



Service

-CONFIDENTIAL INFORMATION-

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Foreword

Dear customer,

This Service Manual contains instructions for making adjustments on the Satisloh ART-Deblocker 2.

Please take the time to read this manual carefully. Please also observe the instructions to this manual on the following page.

Always keep this manual in the immediate vicinity of the machine. It will then be readily available for consultation.

In addition to the service manual, the user documentation is comprised of the following:

- Transport and installation manual Satisloh ART-Deblocker 2
- Operating manual Satisloh ART-Deblocker 2
- Software manual Satisloh ART-Deblocker 2
- Maintenance manual Satisloh ART-Deblocker 2
- Spare parts Satisloh ART-Deblocker 2

We wish you every success and good results with the Satisloh ART-Deblocker 2

Satisloh GmbH

Instructions for this manual

Symbols used

The following signs indicate safety or general instructions throughout the text:



Imminent danger which can cause loss of life, serious injuries or extensive damage.



Potentially dangerous situation which may cause loss of life, serious injuries or damage.



Potentially dangerous situation which may cause injuries or damage.



Application instructions and other useful or important information.

Validity of the documentation

This documentation is based on the following software version:

- valid from version 1.0.1.3

1 General

1.1 General

This Service Manual describes the adjustment of the axes and calibration of the machine components.

Correct adjustment and calibration is done in the factory before the machine is put into initial operation. Proper initial start-up of the ART-Deblocker 2 at the customer's location should take place prior to every adjustment or calibration.

Readjustment and calibration only need to be done, if

- the axes have been exchanged or adjusted,
- satisfactory work results cannot be achieved.
- The adjustment and calibration jobs must only be done by duly trained and qualified personnel!
- Proceed with extreme caution when doing work on the installed optical components.



1.2 Adjusting Tools

The following tools are needed for adjustment purposes:

Fig. 1-1 Adjustment tools



1. Adjustment bolt (05-077-203)
2. Tray
3. Adjustment piece (05-077-536)
4. Adjustment plate (05-065-095)
5. Adjustment piece (05-077-360)

6. Adjustment piece (05-069-750)
7. Adjustment piece ()
8. Fastening screw
9. Drum key (056-077-465)

2 Factory settings

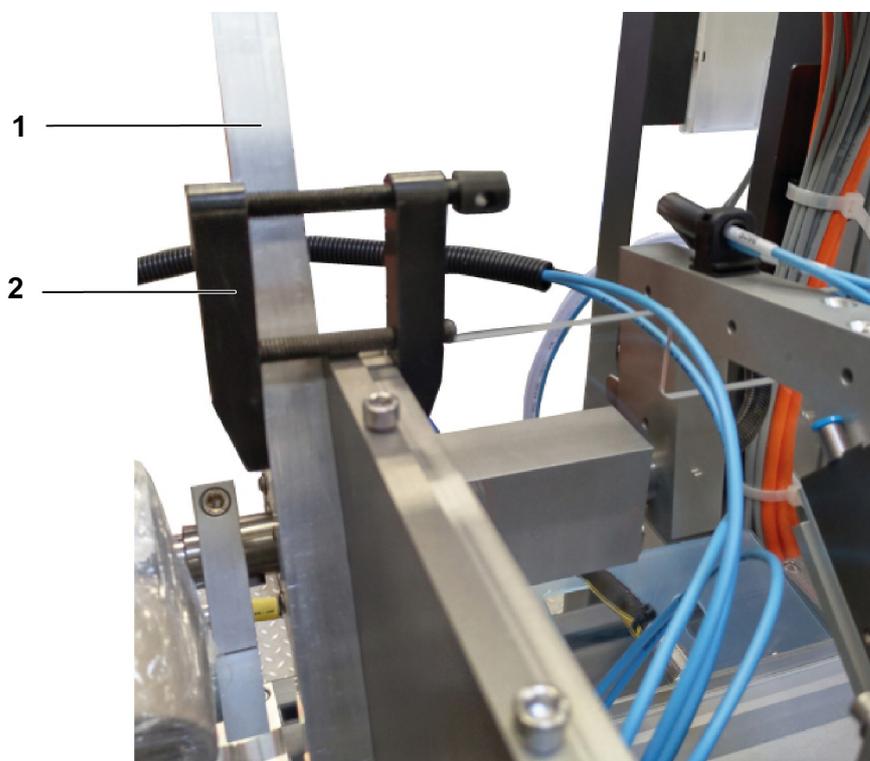
2.1 Settings at the drum

First, set the parallel alignment of the loader to the drum.

To do this, proceed as follows:

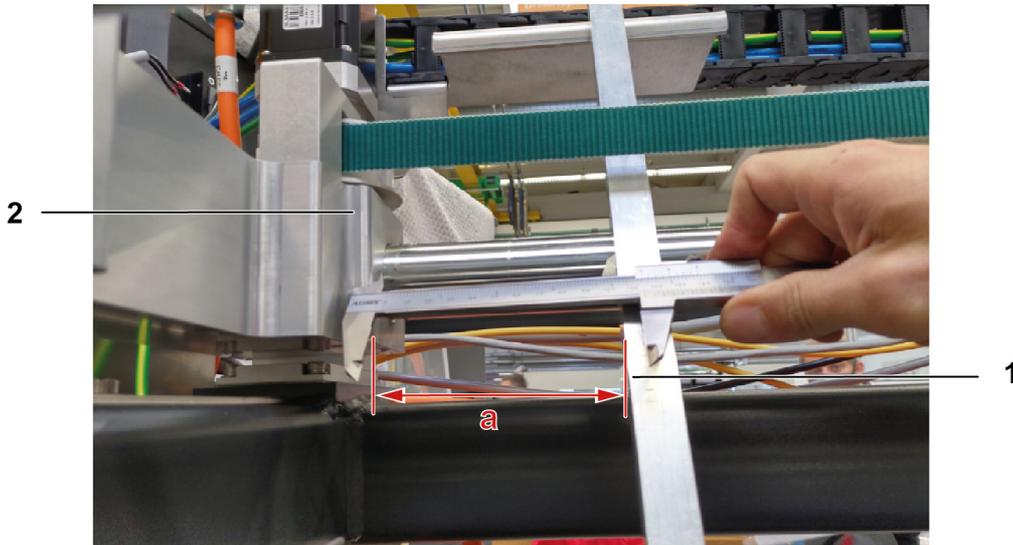
- ▶ Remove the cover located on the top of the drying chamber on the back of the drum.
- ▶ Using a screw clamp (see Fig. 2-1, Item 2), attach the alignment rail (see Fig. 2-1, Item 1) to the side face on the back of the drum.

Fig. 2-1 Alignment rail at the back of the drum.



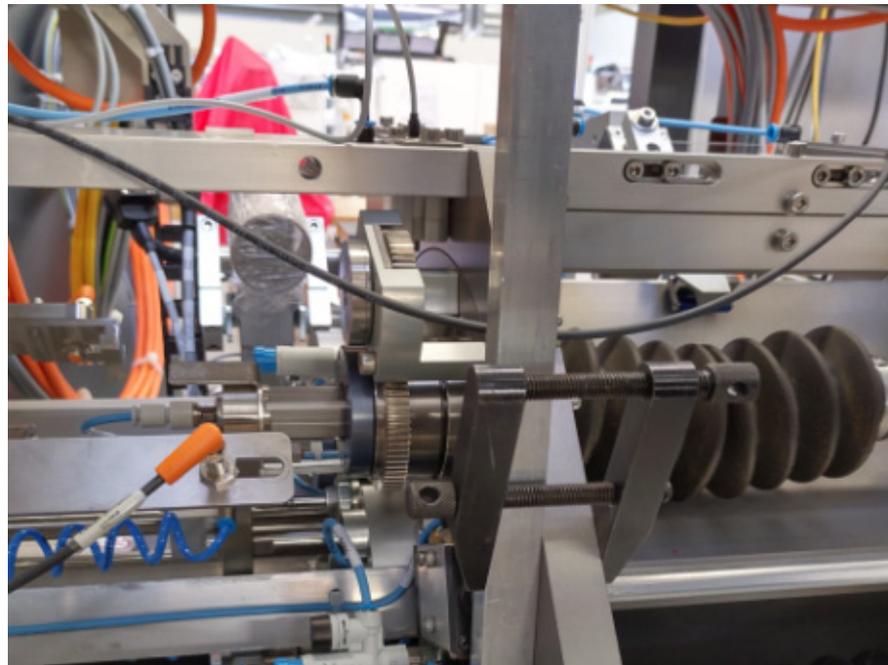
- ▶ Switch the machine to manual mode.
- ▶ Move the loader so that it is in the opposite position to the mounted alignment rail.
- ▶ Using a suitable measuring device (e.g. a caliper gauge), measure the distance (a) between the left outer edge of the alignment rail (see Fig. 2-2, Item 1) and the right outer edge of the loader (see Fig. 2-2, Item 2). The loader and the alignment rail should already be almost parallel to each other.

Fig. 2-2 Distance measurement loader - alignment rail (at the back of the drum)



- ▶ Now attach the alignment rail to the side face on the front of the drum using the screw clamp.

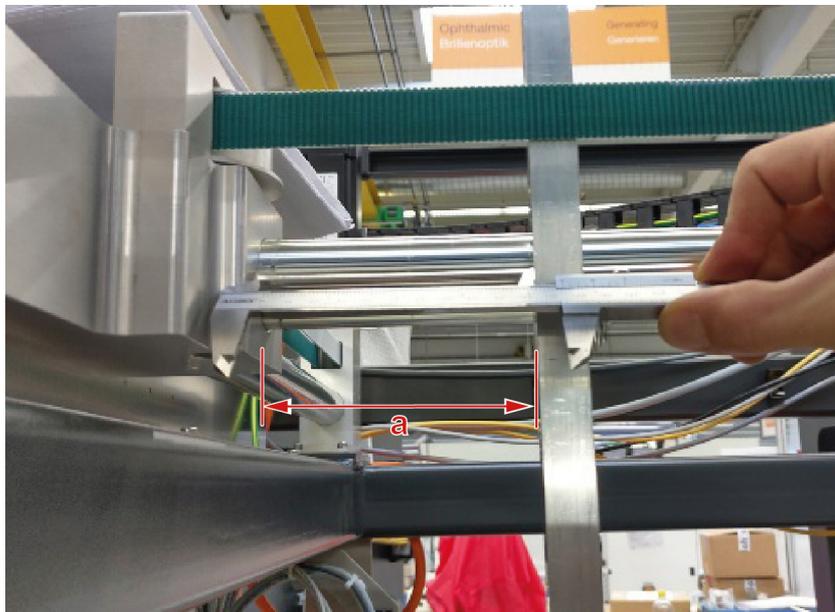
Fig. 2-3 Alignment rail at the front of the drum



- ▶ Again, move the loader so that it is in the opposite position to the mounted alignment rail.
- ▶ Again, use the caliper gauge to measure the distance (a) between the left outer edge of the alignment rail and the right outer edge of the loader.

The loader and the alignment rail should already be almost parallel to each other.

Fig. 2-4 Distance measurement loader - alignment rail (at the front of the drum)



- ⦿ Compare the two measured values and move the drum position with respect to the loader until, after re-measuring, the two measured values are almost the same. The tolerance is 0.2 mm.
- ⦿ After alignment, remove the alignment rail and remount the cover on top of the drying chamber.

2.2 Machine axis and lens cylinder settings



The machine must be switched off for the adjustment work described below.

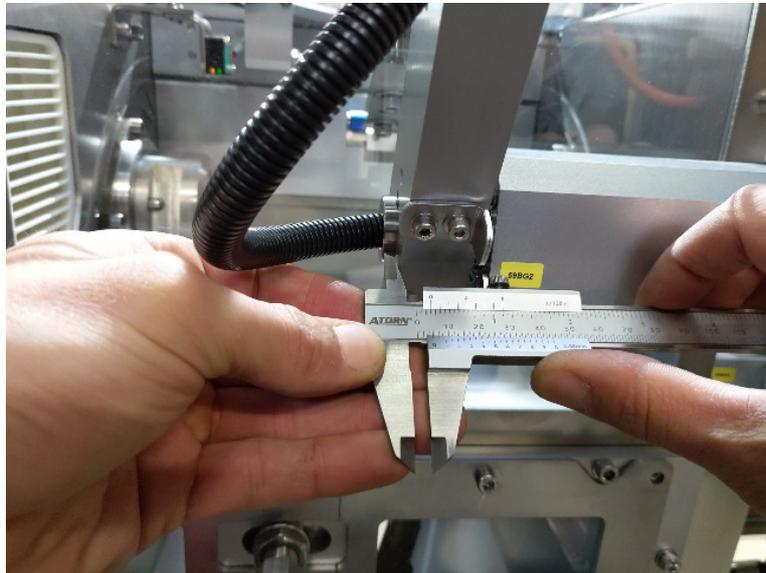
- ⦿ Switch off the machine at the main switch.
- ⦿ Open the rear of the machine.

2.2.1 Alignment of the drying loading arm to the parallel gripper on the shaft of the E4 axis (lens drying).

- ⦿ Gently push the loader arm onto the shaft, making sure that the spline fits into the keyway.

- ▶ Slide the loader arm onto the shaft until you can measure a distance of 5 mm \pm 0.1 between the side face of the loader arm and the end of the shaft.

Fig. 2-5 Distance loader arm - E4 axis shaft



- ▶ After mounting the loader arm of the parallel gripper, make sure that the parallel gripper can be easily inserted into the drying chamber and does not touch the plastic cover (even if the adjustment device is mounted on the parallel gripper).
- ▶ Switch the machine on at the main switch.
- ▶ Press the <HOMING> button on the starting screen and move the axes to their home position before proceeding with the alignment of the grippers for the blocked lenses and the parallel gripper.

2.2.2 Alignment of the first stopper on the lens cylinder to the blocked lens.

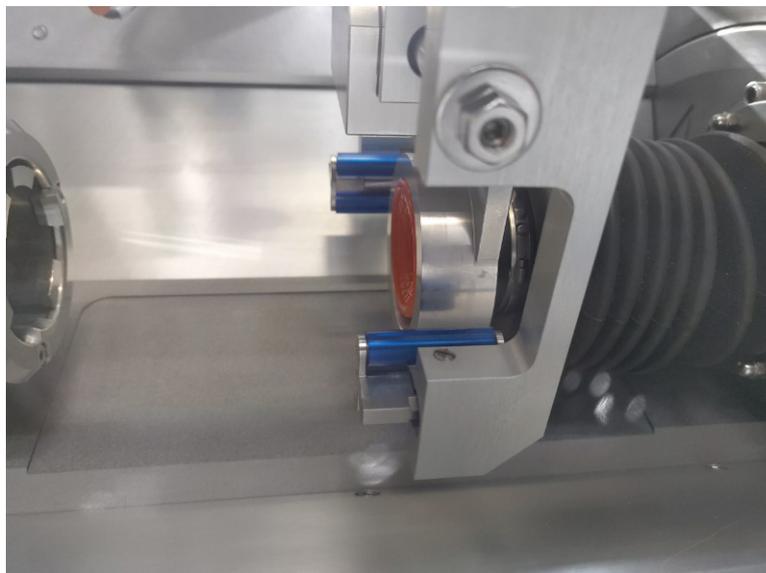
- ▶ Switch off the machine at the main switch.
- ▶ Open the service door on the left side of the machine (as seen from the operator's perspective).
- ▶ Mount the adjustment device (XXXX) on the parallel gripper.

Fig. 2-6 Adjustment device on the parallel gripper



- ▶ Push the parallel gripper into the drying chamber until it reaches the lens transfer position (from the suction cup to the parallel gripper).
- ▶ Then manually push the lens cylinder forward in the drying chamber until the suction cup lies flat against the front of the adjustment device.

Fig. 2-7 Lens cylinder - adjustment device on the parallel gripper



- ▶ Readjust the position of the front stopper of the lens cylinder. When doing so, make sure that the sensor is in the correct position to give the correct signal.

Fig. 2-8 Adjusting the stopper on the lens cylinder



- ▶ Then tighten all the screws.
- ▶ Push the lens cylinder manually to its rear position.
- ▶ Switch on the machine at the main switch.
- ▶ Then perform a homing and a reset.

3 Machine calibration and teaching of the axes

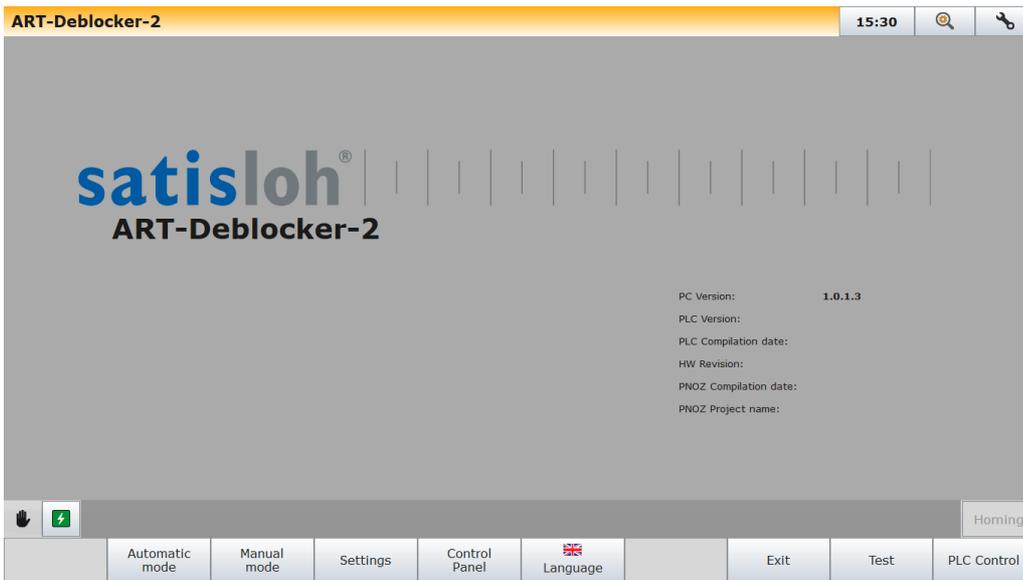
3.1 Set the encoder offsets

3.1.1 Preparations

- ▶ Switch on the machine at the main switch.

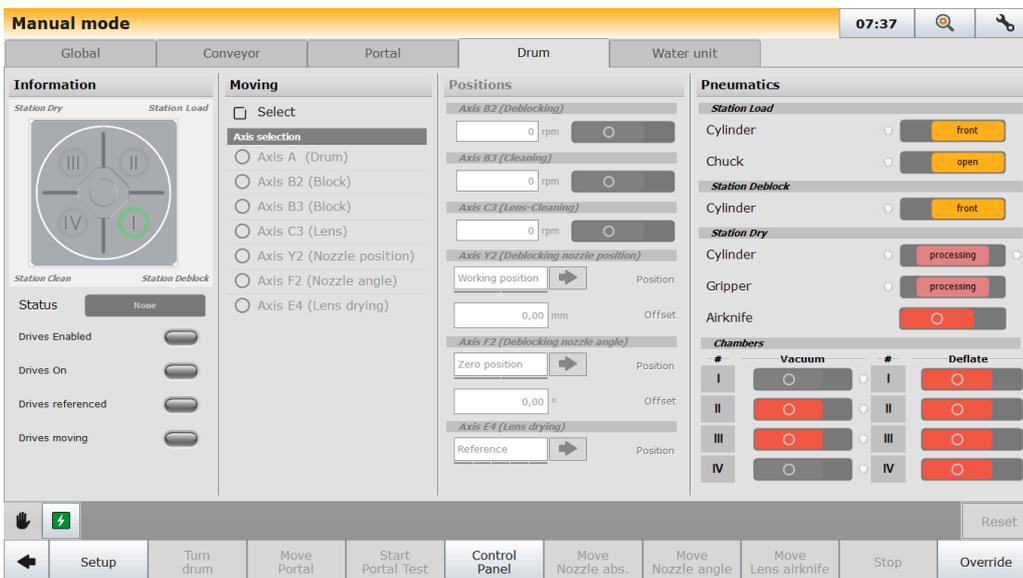
When the machine is ready for operation, the starting screen appears on the control panel.

Fig. 3-1 Starting Screen



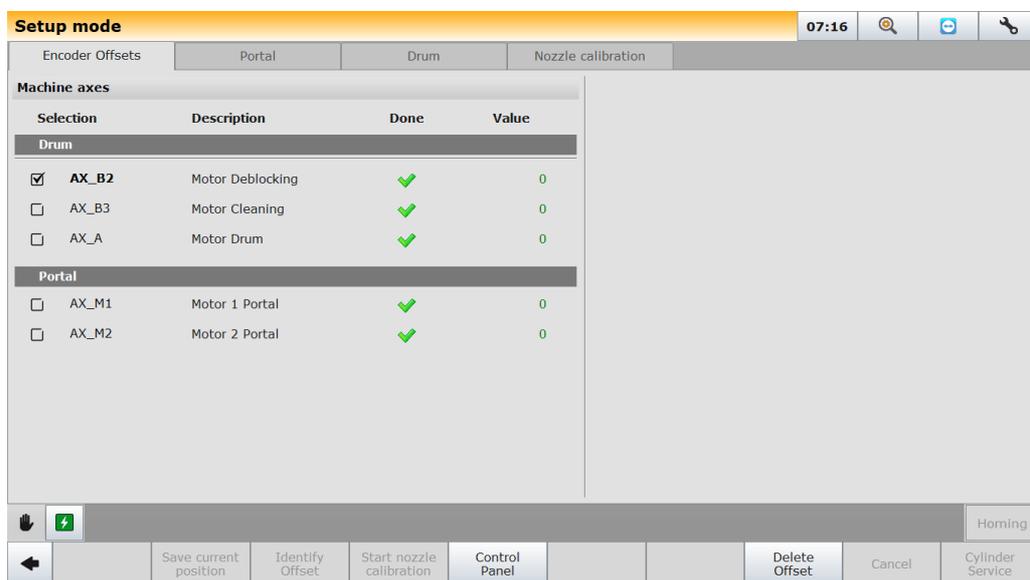
- ▶ Press the button <MANUAL>. The screen *Manual* appears.

Fig. 3-2 Screen Manual, tab panel Drum



- ▶ Press the <SETUP> button and select the *Encoder Offsets* tab.

Fig. 3-3 Setup mode screen, Encoder Offset tab



3.1.1.1 Delete the encoder offset values

- ▶ First, delete all the offset values of the machine axes that have been determined so far.
- ▶ To do this, activate the checkbox of the machine axis for which you want to delete the offset value (e.g. AX_B2) and then press the button <DELETE OFFSET>.
- ▶ Confirm by pressing the <YES> button in the confirmation dialog that appears. The offset value for the axis is deleted.
- ▶ Repeat this procedure for all machine axes (portal and drum).

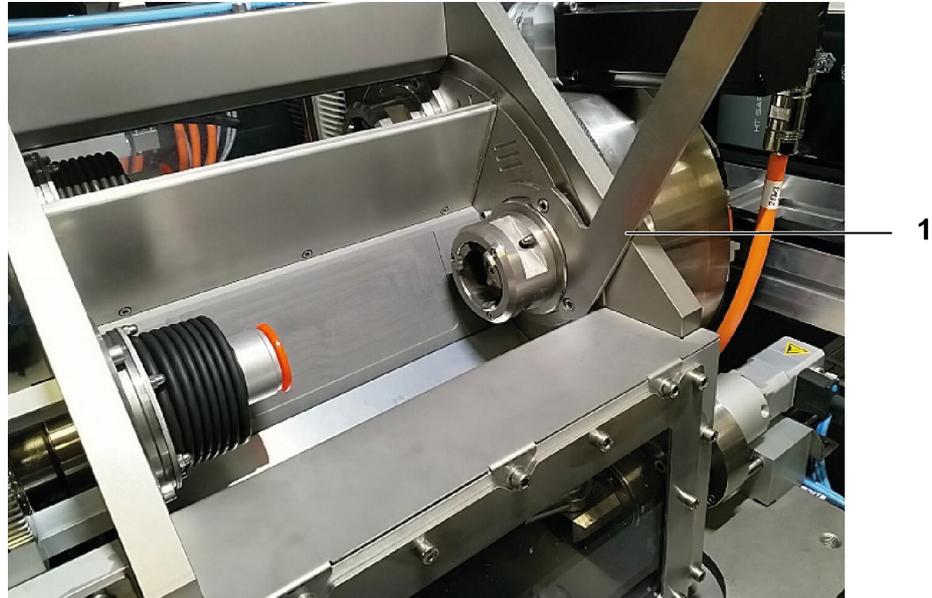


When the machine is put into operation for the first time or the offset values are determined for the first time, no values are displayed on this tab panel. Therefore, it is not necessary to delete the values. The button cannot be selected.

3.1.2 Determination of the B-axis encoder offset values

- ▶ Open the front machine cover.

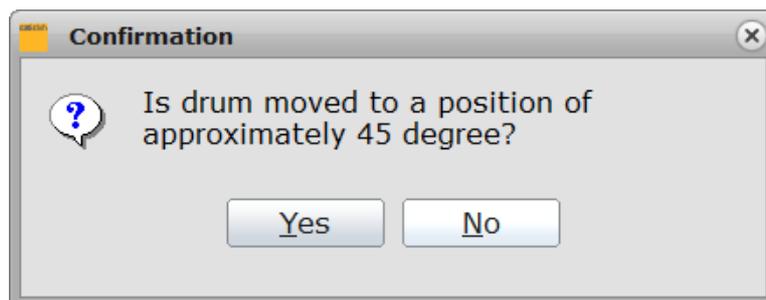
Fig. 3-4 Drum key



- ▶ Plug the drum key (05-077-465) (see Fig. 3-4, Item 1) onto the drum.
- ▶ Using the drum key, rotate the drum forward to approximately 30-45°.
- ▶ Close the maintenance access doors.
- ▶ Now, on the *Encoder offsets* (see Fig. 3-3) tab panel, activate the checkbox for the machine axis (AX_B2) for which you want to determine the offset value.
- ▶ Press the button <IDENTIFY OFFSET>.

A confirmation dialog appears asking whether the drum has been rotated to the required position of about 45°.

Fig. 3-5 Confirmation dialog box

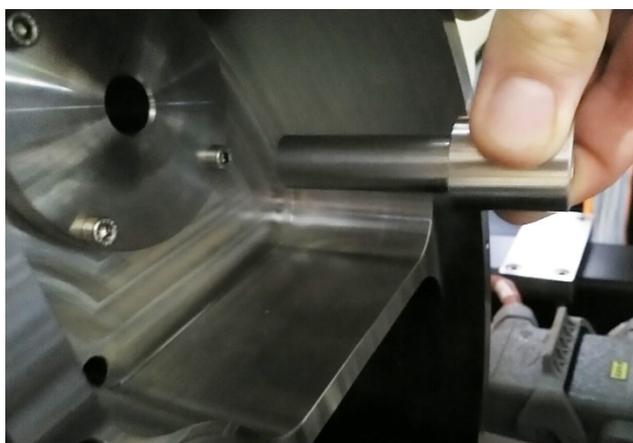


- ▶ If so, confirm this by pressing the <YES> button.
Another confirmation dialog appears asking whether the determined encoder offset value should be saved.
- ▶ Confirm the query by pressing the <YES> button.
A checkmark appears and the determined offset value is displayed.
- ▶ Proceed in the same way for the determination of axis B3 (checkbox AX_B3).

3.1.3 Determination of the A-axis encoder offset value

- ▶ Open the front machine cover.
- ▶ Using the drum key(05-077-465) , rotate the drum just slightly out of the 90° or 0° position.
- ▶ To do this, first turn the drum forwards by approx. 10° - 15° to take out the backlash of the gearwheel.
- ▶ Then slowly turn the drum back again until the adjustment bolt (05-077-203) fits into the center hole.

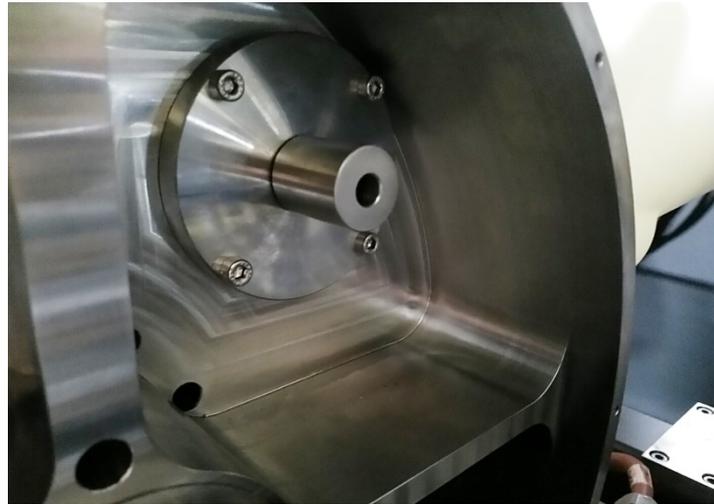
Fig. 3-6 Adjustment bolt



If you have missed the position where the adjustment bolt fits into the hole while turning the drum backwards, you must turn the drum forwards again by 10° - 15° to take out the backlash of the gear.

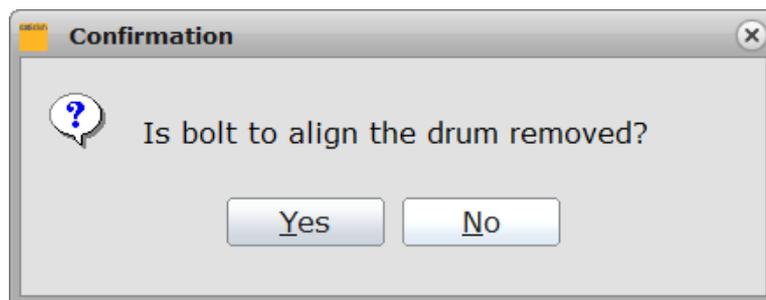
- ▶ Insert the adjustment bolt into the center hole on the right side of the drum and push it in slowly.

Fig. 3-7 Adjustment bolt in the drum



- ▶ Using the drum key, slowly rotate the drum back to the 90° or 0° position until the adjustment bolt engages.
- ▶ Remove the adjustment bolt.
- ▶ Close the machine hood.
- ▶ Now activate the checkbox for the A-axis (AX_A) on the *Encoder Offsets* (see Fig. 3-3) tab panel.
- ▶ Press the button <IDENTIFY OFFSET>. A confirmation dialog appears asking whether the adjustment bolt has been removed.

Fig. 3-8 Confirmation dialog box



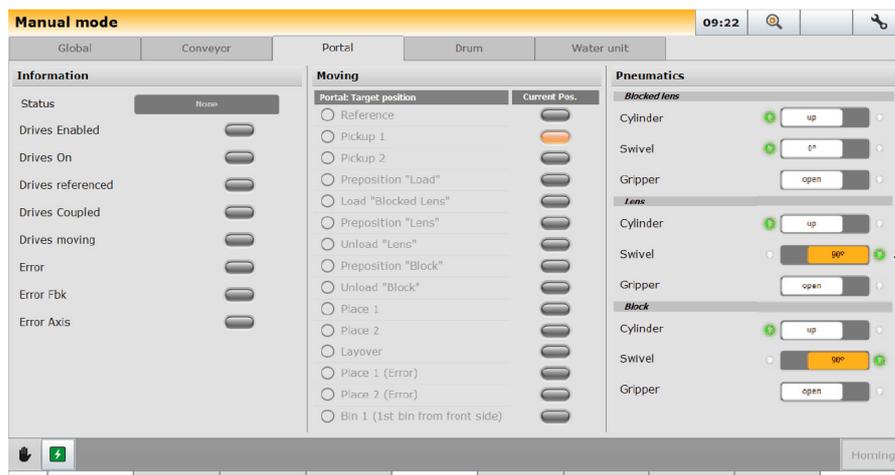
- ▶ If so, confirm this by pressing the <YES> button. Another confirmation dialog appears asking whether the determined encoder offset value should be saved.
- ▶ Confirm the query by pressing the <YES> button.

A checkmark appears and the determined offset value is displayed.

3.1.4 Determination of the M-axis encoder offset values

- ▶ Open the *Manual mode* screen and select the *Portal* tab.

Fig. 3-9 Screen *Manual*, tab panel *Portal*



- ▶ In the “Lens” field of the “Pneumatics” box, switch the function »SWIVEL« to the “0°” setting using the slider (see Fig. 3-9, Item 1).
- ▶ Open the machine hood.
- ▶ Manually move the portal in the X and Y directions to the left front outer position.
- ▶ Close the machine hood.
- ▶ Now, on the *Encoder offsets* (see Fig. 3-3) tab panel, activate the checkbox for the motor axis (e.g. AX_M1) for which you want to determine the offset value.
- ▶ Press the button <IDENTIFY OFFSET>.

A confirmation dialog appears asking whether the determined encoder offset should be saved.
- ▶ Confirm the query by pressing the <YES> button.

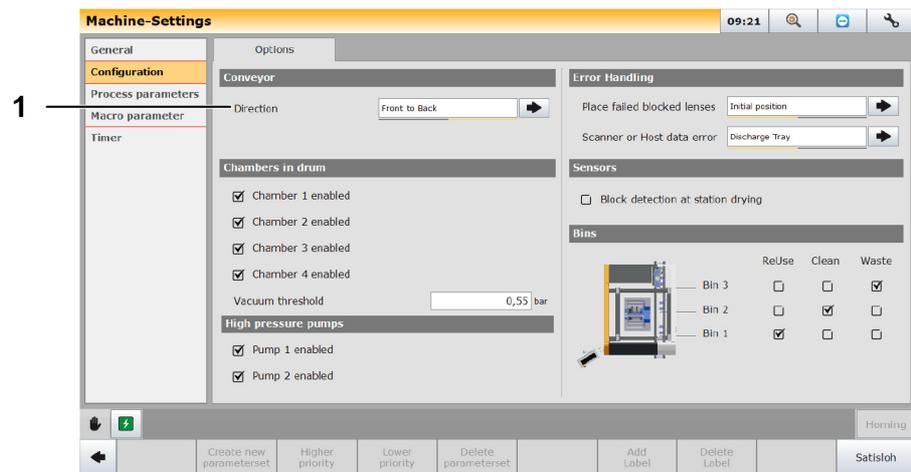
A checkmark appears and the determined offset value is displayed.
- ▶ Proceed in the same way to determine the M2 axis (AX_M2 checkbox).

3.2 Change the direction of travel of the conveyor belt

Before aligning the portal, check and set the direction of travel of the loading conveyor. To do this, proceed as follows:

- ▶ Switch on the machine.
- ▶ Open the *Machine Settings* screen (*Starting screen* → <SETTINGS> → <MACHINE>).
- ▶ Choose the *Configuration* sub-menu here.

Fig. 3-10 *Machine Settings screen, Configuration sub-menu*



- ▶ In the »DIRECTION« field (see Fig. 3-10, Item 1) of the “Conveyor” box, select the conveyor direction by pressing the <TOGGLE> button.
- ▶ Return to the starting screen by repeatedly pressing the <BACK> button.

3.3 Aligning the portal and the loader

The steps for aligning the portal and the loader are described below.

3.3.1 Alignment preparations

- ▶ Switch on the machine at the main switch and wait until it is ready for operation.
- ▶ Switch the drives on.
- ▶ Move the machine to its home position by pressing the <HOMING> button on the starting screen.
- ▶ Switch off the drives.
- ▶ Open the machine hood.

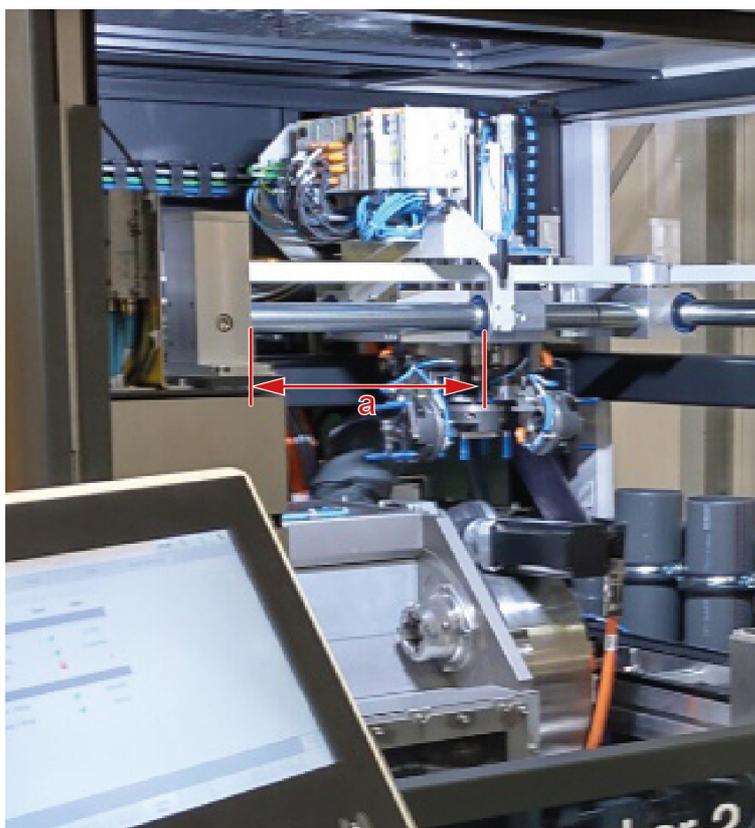


To switch the valves and move the axes, all doors, covers and the machine hood must be closed.

3.3.2 Teaching the reference positions

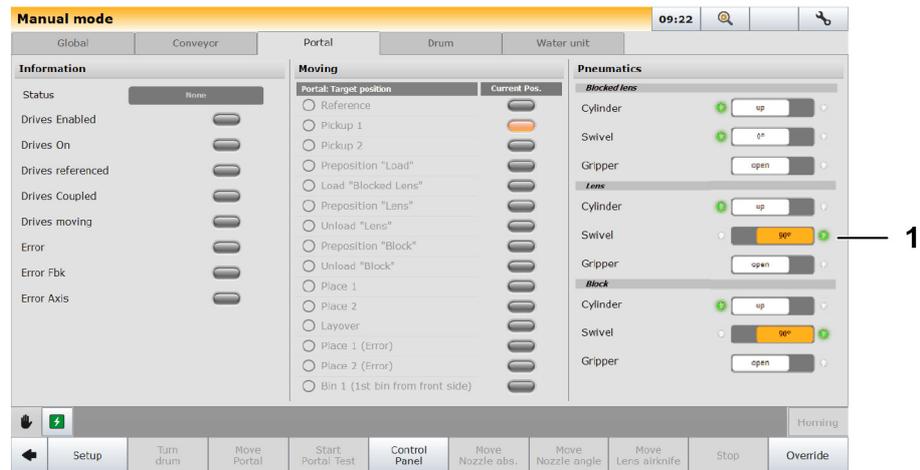
- ▶ Manually move the loader on the portal approx. 200 mm to the right in the X direction (seen from the front) (see Fig. 3-11, Item a).

Fig. 3-11 Loader at reference position



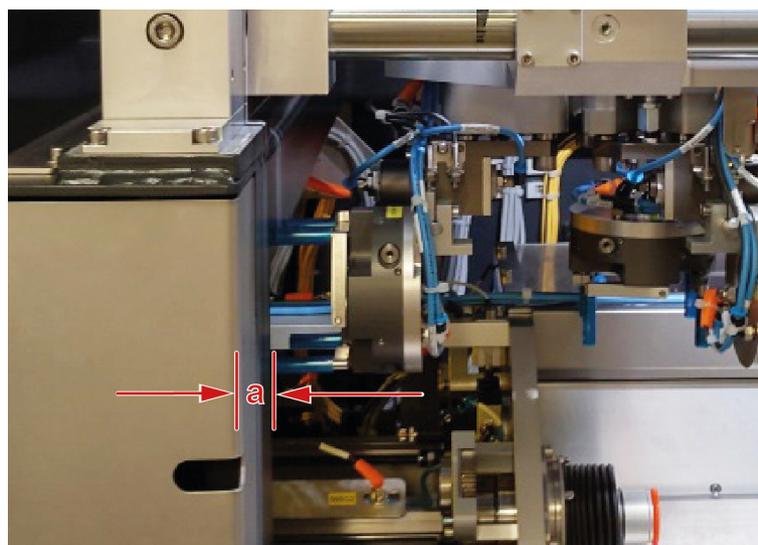
- ▶ Close the maintenance access doors.
- ▶ Open the *Manual mode* screen with the *Portal* tab.

Fig. 3-12 Screen Manual, tab panel Portal



- ① In the “Lens” field of the “Pneumatics” function box, select “90°” for the »SWIVEL« function (see Fig. 3-12, Item 1).
- ② Open the machine hood.
- ③ Slide the portal forward in the Y direction until it reaches the limit stop.
- ④ Then slide it in the X direction. Make sure that the gripper fingers do not touch the machine frame. A distance of about 3 mm should remain (see Fig. 3-13, Item a).

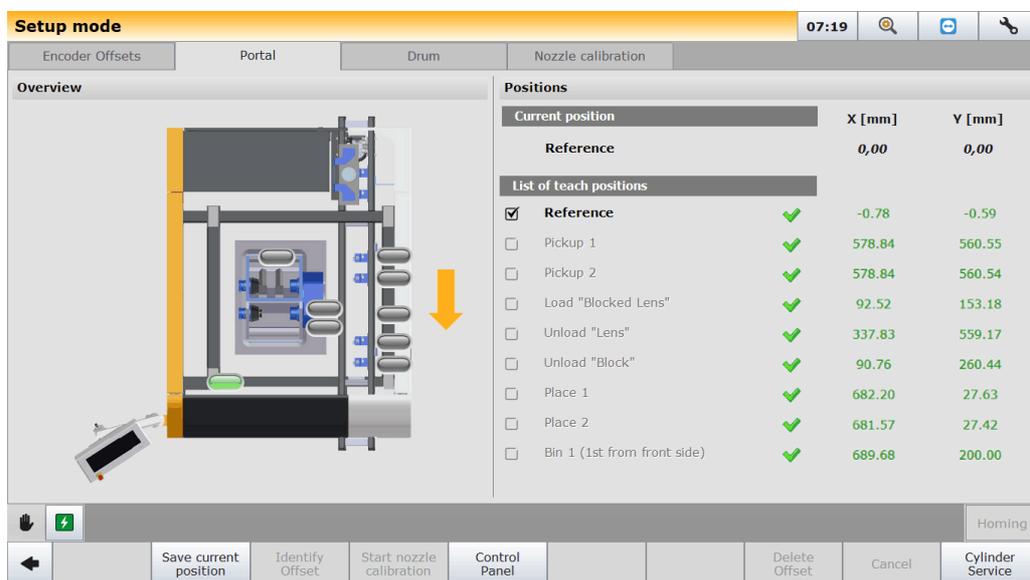
Fig. 3-13 Portal position



- ⑤ Close the maintenance access doors.

- ▶ On the *Manual mode* screen, press the <SETUP> button, and on the *Setup mode* screen, select the <PORTAL> tab.

Fig. 3-14 Setup screen, Portal tab

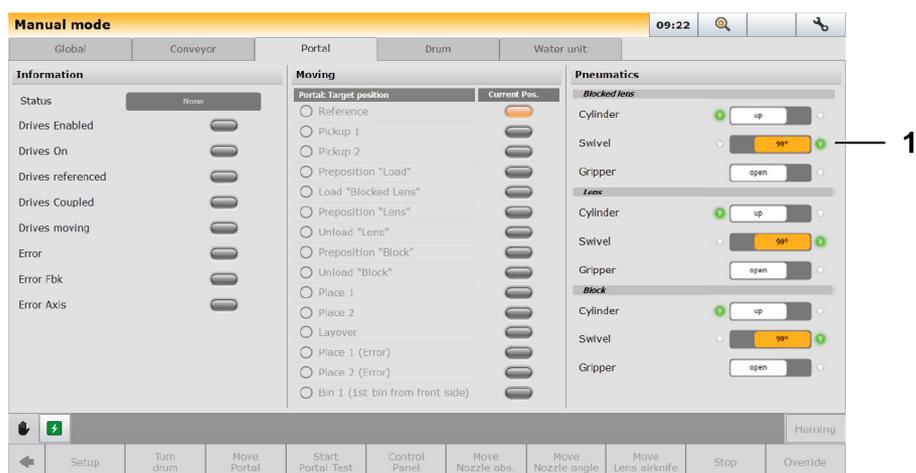


- ▶ In the “List of positions” box, select the position that you want to reference by activating the checkbox.
- ▶ Press the <SAVE POSITION> button.

3.3.3 Align gripper - blocked lens

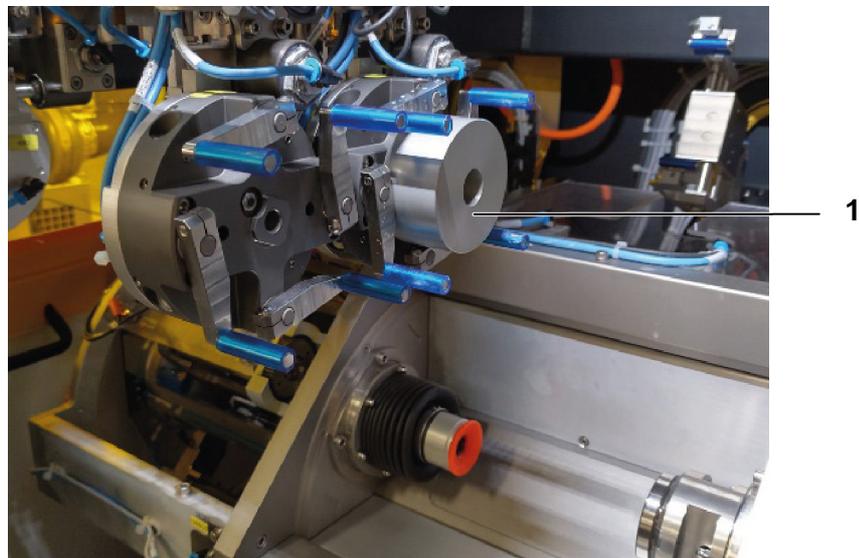
- ▶ Move the machine to its home position ([see Section 3.3.1: “Alignment preparations”](#)).
- ▶ Open the *Manual mode* screen with the *Portal* tab.

Fig. 3-15 Screen Manual, tab panel Portal



- ⦿ In the “Blocked lens” field of the “Pneumatics” function box, select “90°” for the »SWIVEL« function (see Fig. 3-15, Item 1).
- ⦿ Open the machine hood.
- ⦿ Remove the $\frac{1}{8}$ " dummy plug from the center of the gripper using a size 5 Allen key.
- ⦿ Mount the adjustment piece (05-077-536) (see Fig. 1-1, Item 3) in the center of the gripper for the “blocked lens” using the corresponding fastening screw (see Fig. 1-1, Item 8) from the adjustment accessories.

Fig. 3-16 Adjustment piece in the “blocked lens” gripper



- ⦿ Clamp the adjustment plate (05-065-095) (see Fig. 1-1, Item 4) in the gripper by moving the slider to “closed” (function box “Pneumatics”, “Blocked lens” field, function »GRIPPER«).

Fig. 3-17 Adjustment piece in the collet chuck



- ▶ Move the portal forward in the Y-direction until it reaches the stop and then move it in the X-direction so that the lens cylinder (blocked lens) is approximately in the center of the work area.
- ▶ In the “Blocked lens” field of the “Pneumatics” function box, select the setting “Down” for the »CYLINDER« function using the slider (see Fig. 3-15).
The cylinder moves downwards.
- ▶ Move the gantry so that the gripper or the adjustment piece is in front of the collet chuck or the adjustment plate.

Fig. 3-18 Gripper in front of the collet chuck



- ▶ Check whether the two surfaces of the adjustment pieces are parallel to each other.
If this is not the case, the horizontal tilt of the gripper must be adjusted.
- ▶ To do this, loosen the nut with a size 20 Allen key on the left side (see Fig. 3-19).

Fig. 3-19 Horizontal alignment of the gripper



- ▶ Then adjust the stop screw with a size 14 Allen key (see Fig. 3-20).

Fig. 3-20 Stop screw



- ▶ Tighten it by countering.
- ▶ If the gripper needs to be aligned vertically, you may need to adjust the position of the Z-axis cylinder.
- ▶ To do this, loosen the screws of the Z-axis with a size 10 Allen key or a size 13 Allen key and turn the gripper in vertical direction parallel to the collet chuck until the two surfaces of the adjustment pieces are aligned.
- ▶ To align the two adjustment pieces, move the loader out in the X and Y directions until the two adjustment pieces are level and centered in relation to each other.

Fig. 3-21 Alignment of the adjustment pieces in relation to each other



- ▶ To do this, adjust the limit stop ([see Fig. 3-22](#)) of the other two cylinders of the Z axis in the same way as the cylinder for the blocked lens. Use a size 19 or size 11 Allen key for this purpose.

Fig. 3-22 Z axis cylinder limit stop



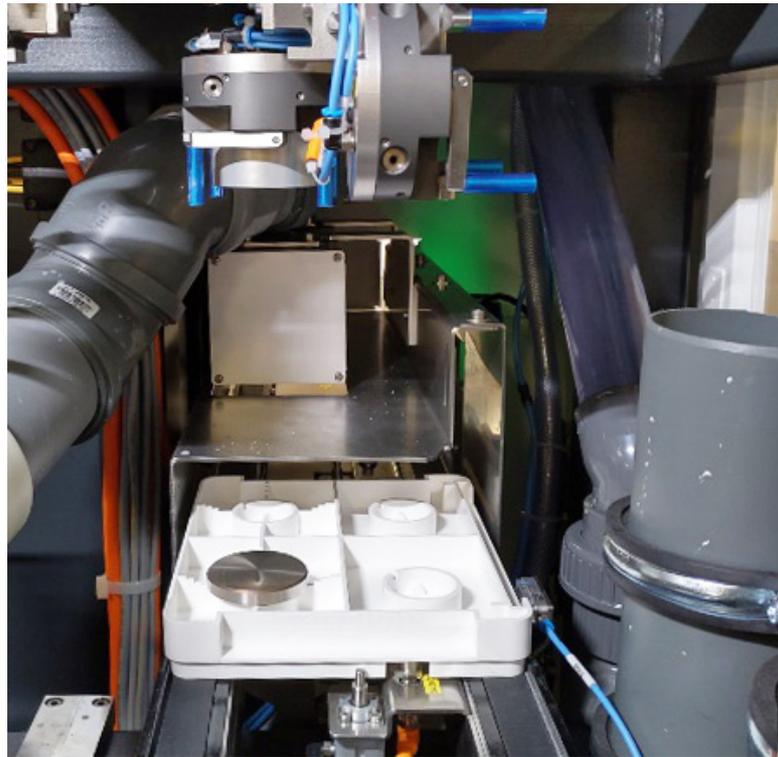
- ▶ Check the position of the limit stops for all Z-axis cylinders and adjust them if necessary.
- ▶ On the *Manual mode* screen, press the <SETUP> button and on the *Setup mode* screen, select the <PORTAL> tab (see Fig. 3-14).
- ▶ In the “List of positions” box, activate the checkbox for the »LOAD "BLOCKED LENS"« position.
- ▶ Press the <SAVE POSITION> button.
- ▶ Move the portal out of the working area.
- ▶ Close the machine hood.
- ▶ Open the *Manual mode* screen page with the *Portal* tab activated (see Fig. 3-12).
- ▶ In the “Blocked lens” field of the “Pneumatics” function box, select “Up” for the »CYLINDER« function and “0°” for the »SWIVEL« function.
- ▶ Remove the adjustment plate (05-065-095) (see Fig. 1-1, Item 4) from the collet chuck by moving the slider to “open” (function box “Pneumatics”, “Blocked lens” field, »GRIPPER« function).
- ▶ Place the adjustment plate in the removal (pickup) position in the tray

Fig. 3-23 Adjustment plate in the removal (pickup) position in the tray



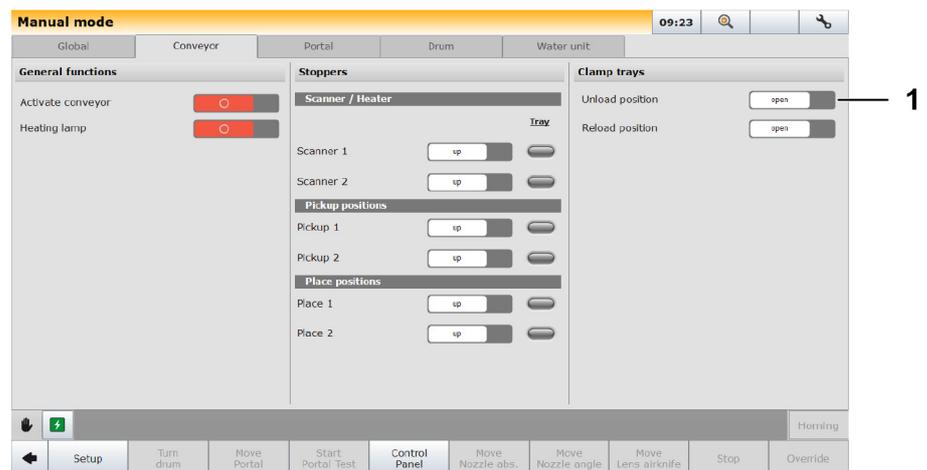
- ④ Place the lens tray on the conveyor against the first stopper.

Fig. 3-24 Lens tray at the unloading position on the conveyor



- ▶ Clamp the lens tray at the unloading position. To do this, open the *Manual mode* screen with the *Conveyor* tab activated.

Fig. 3-25 Screen *Manual*, tab panel *Conveyor*



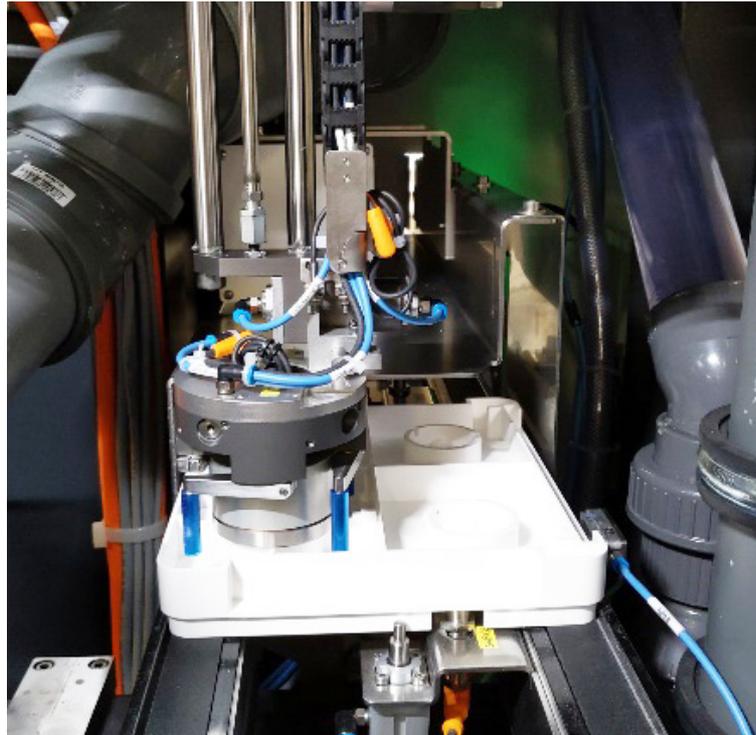
- ▶ In the function box “Clamp trays” move the slider for the function »UNLOAD POSITION« to the “close” position (see Fig. 3-26, Item 1).



For the initial alignment of the conveyor, it should be in its down position.

- ▶ Now move the portal manually so that the gripper with the adjustment piece is exactly above the position of the adjustment plate in the lens tray (see Fig. 3-26).

Fig. 3-26 Gripper above the adjustment plate



- ▶ Open the *Manual mode* screen with the *Portal* tab activated (see Fig. 3-12) and move the cylinder down (Function box “Pneumatics” → “Blocked lens” field → »CYLINDER« function).
- ▶ Now check that the two faces of the adjustment pieces are parallel to each other.
If this is not the case, the gripper must be adjusted.
- ▶ To do this, loosen the nut on the right side with a size 20 Allen key and adjust the stop screw with a size 14 Allen key.
- ▶ Lock the nut again.
- ▶ By manually moving the portal in the X and Y direction, align the two adjustment pieces centrally and parallel to each other. The two surfaces must touch.

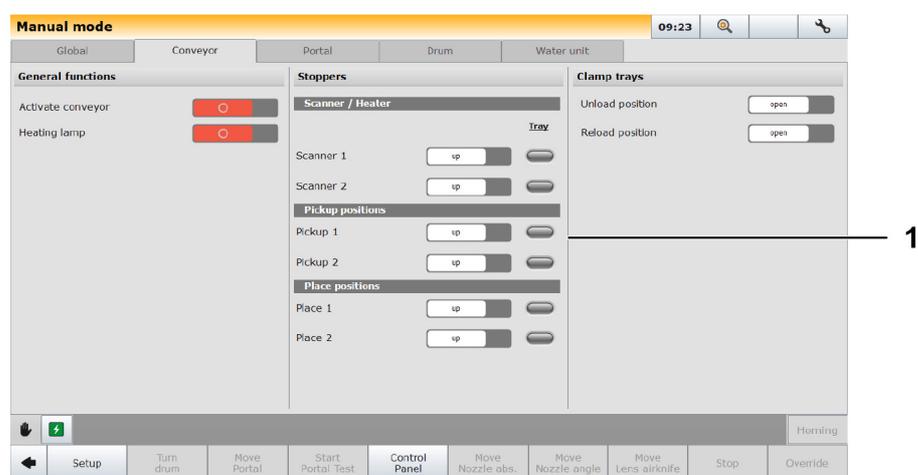
If the two flat surfaces of the adjustment pieces do not touch or the limit stop of the Z-axis is not at the limit stop, the loading belt must be raised or lowered slightly. To do so:

- ▶ To do this, loosen the fastening screws of the conveyor and raise or lower the belt using the set screws.

To ensure that the loader belt is parallel to the loader, proceed as follows:

- ▶ Open the *Manual mode* screen with the *Conveyor* tab activated.

Fig. 3-27 Screen *Manual*, tab panel *Conveyor*



- ▶ Move the stoppers down using the sliders (Function box “Stoppers” → “Pickup positions” field, → function »PICKUP 1« and »PICKUP 2« as well as the “Place positions” field → »PLACE 1« (see Fig. 3-27) function.

- ▶ Manually move the lens tray with the adjustment plate and the portal with the gripper as far as possible to the other side of the conveyor.

- ▶ Move the cylinder down again.

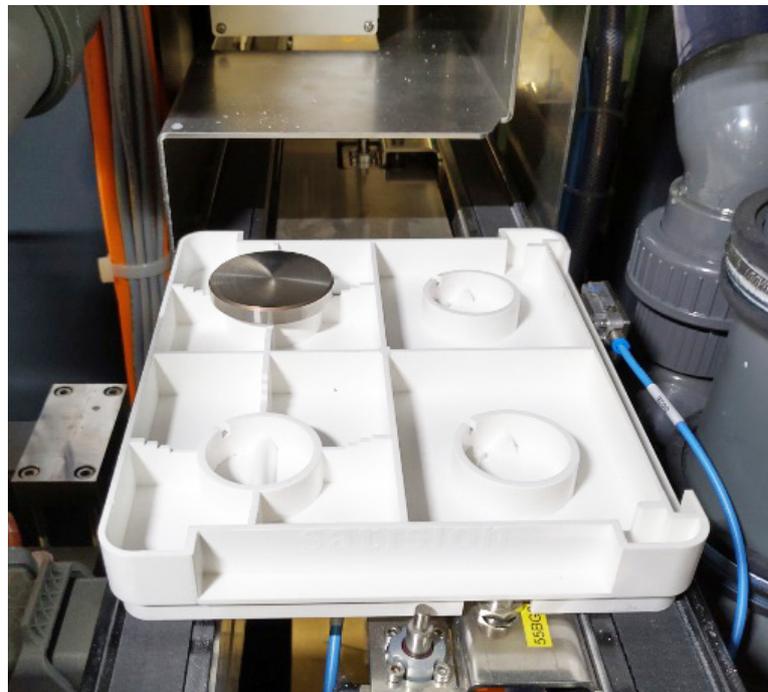
If the surfaces of the two adjustment pieces touch uniformly at both sides of the loader belt, the loader belt is aligned parallel to the portal.

- ▶ Tighten the fastening screws of the conveyor again.

- ▶ On the *Manual mode* screen, press the <SETUP> button and on the *Setup mode* screen, select the <PORTAL> tab (see Fig. 3-14).

- ▶ In the “List of positions” box, activate the checkbox for the position »PICKUP 1«.
- ▶ Press the <SAVE POSITION> button.
- ▶ Slide the lens tray against the unload stopper 1.
- ▶ Open the *Manual mode* screen with the *Portal* tab activated (see Fig. 3-12) and move the cylinder up (Function box “Pneumatics” → “Blocked lens” field → »CYLINDER« function).
- ▶ Next, select the *Conveyor* tab (see Fig. 3-25) and in the “Clamp trays” function box, move the slider to “open” for the »UNLOAD POSITION« function (see Fig. 3-26, Item 1) to unclamp the tray.
- ▶ Position the lens tray with the adjustment plate against the second unload stopper and clamp the tray again.
- ▶ Place the adjustment plate in the lens tray at the second pickup position.

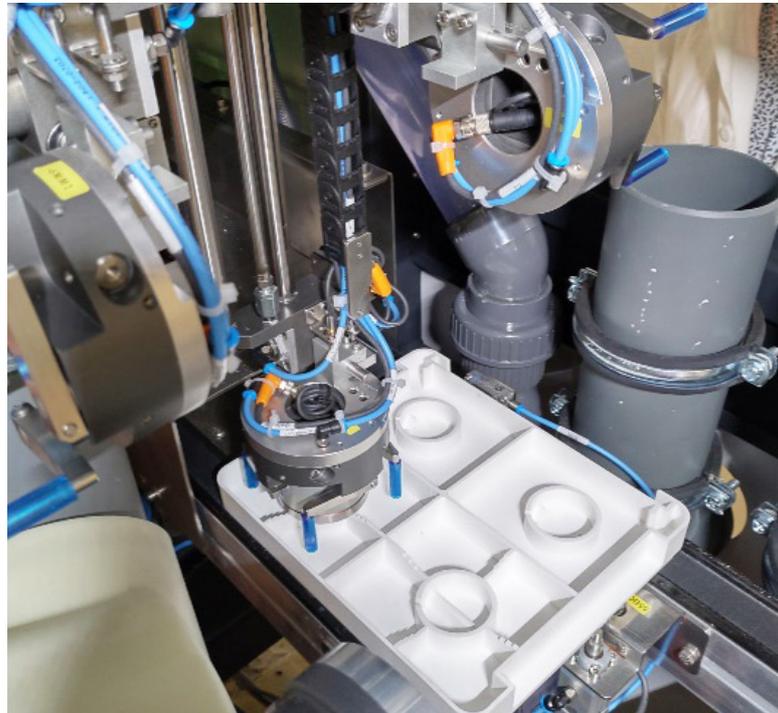
Fig. 3-28 Adjustment plate at the second pickup position in the lens tray



- ▶ In the “Blocked lens” box, move the cylinder down (see Fig. 3-12).

- ▶ Manually move the portal in the X and Y directions to align the two adjustment pieces (in the gripper and in the lens tray) concentric to each other.

Fig. 3-29 Alignment of the two alignment pieces (gripper - lens tray)

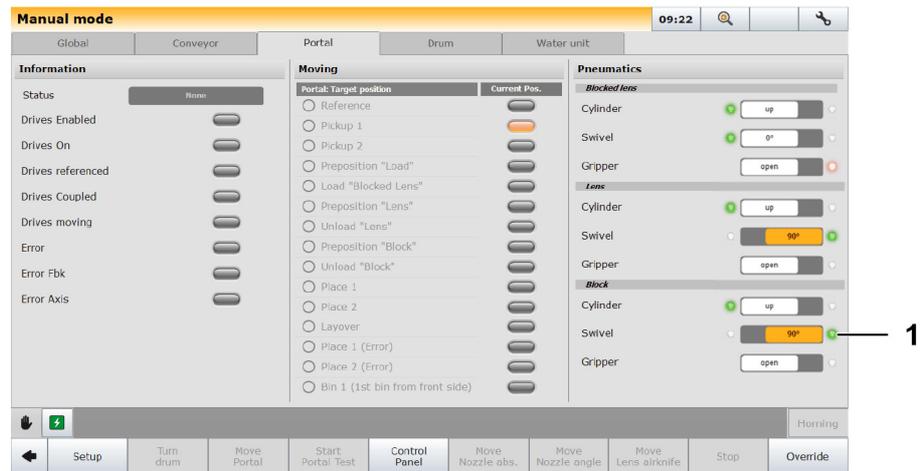


- ▶ Open the *Setup mode* screen with the <PORTAL> tab activated (see Fig. 3-14).
- ▶ In the “List of positions” box, activate the checkbox for the »PICKUP 2« position.
- ▶ Press the <SAVE POSITION> button.
- ▶ Now, activate the *Portal* tab panel on the *Manual mode* screen (see Fig. 3-12) and move the cylinder upward (Function box “Pneumatics” → “Blocked lens” field → »CYLINDER« function).
- ▶ If the alignment jobs have been completed at this point, remove the adjustment piece from the gripper and reinsert the dummy plug.
The adjustment piece can remain in the gripper for the next alignment jobs to be performed.
- ▶ Remove the lens tray from the loader conveyor.

3.3.4 Gripper - block piece alignment

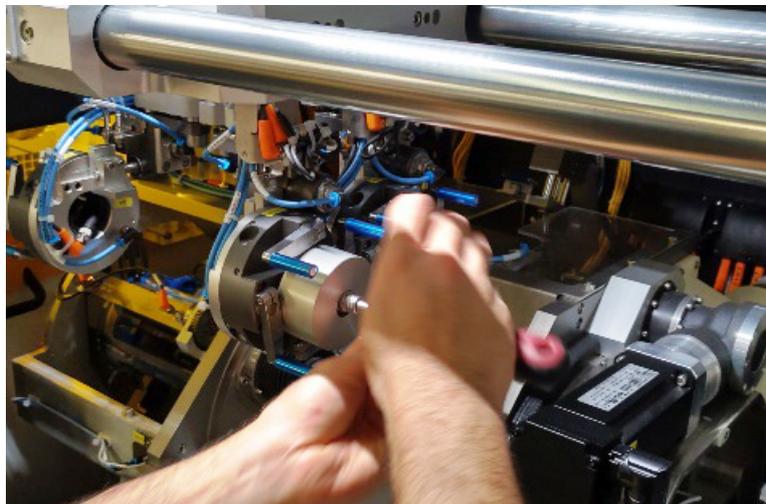
- ① Move the machine to its home position (*see Section 3.3.1: "Alignment preparations"*).
- ① On the *Manual mode* screen, activate the *Portal* tab.
- ① In the "Block" field of the function box "Pneumatics" select the setting "90°" for the function »SWIVEL« (*see Fig. 3-30, Item 1*).

Fig. 3-30 Screen Manual, tab panel Portal



- ① If necessary, remove the $\frac{1}{8}$ " dummy plug from the center of the gripper using a size 5 Allen key and insert the adjustment piece (05-077-536) (*see Fig. 1-1, Item 3*) into the center of the gripper with the corresponding fastening screw (*see Fig. 1-1, Item 8*) from the adjustment accessories.

Fig. 3-31 Adjustment piece in the "Block" gripper



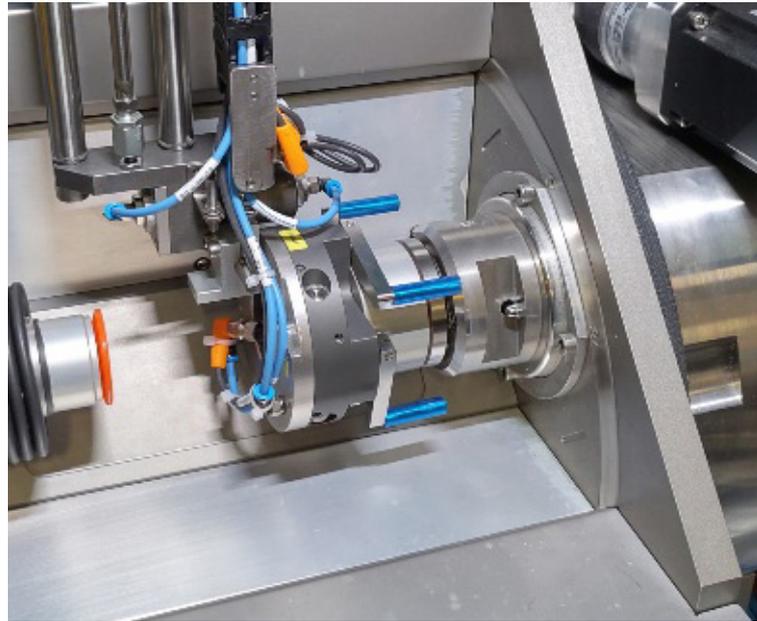
- ▶ Clamp the adjustment plate (05-065-095) (see Fig. 1-1, Item 4) into the collet chuck.

Fig. 3-32 Adjustment piece in the collet chuck



- ▶ Move the portal forward in Y-direction until it reaches the limit stop and then center it in X-direction so that the cylinder block is approximately in the middle of the working area.
- ▶ In the “Block” field of the function box “Pneumatics” select the setting “down” for the function »CYLINDER« (see Fig. 3-31).
The cylinder moves downwards.
- ▶ Move the gantry so that the gripper or the adjustment piece is in front of the collet chuck or the adjustment plate.

Fig. 3-33 Gripper in front of the collet chuck



- ▶ Check whether the flat surface of the adjustment piece of the gripper is perpendicular to the adjustment plate in the collet chuck.
If this is not the case, the horizontal tilt of the gripper must be adjusted.
- ▶ To do this, loosen the nut on the left side with a size 20 Allen key and adjust the stop screw with a size 14 Allen key.
- ▶ Lock the nut again.



If the Z-axis must be adjusted for vertical alignment, proceed as previously described ([see Section 3.3.4: "Gripper - block piece alignment"](#)).

- ▶ By manually moving the portal in the X and Y directions and adjusting the Z-axis limit stop (with a size 19/11 Allen key), align the two adjustment pieces concentric and parallel to each other. The two surfaces must touch.
- ▶ Open the *Setup mode* screen with the <PORTAL> tab activated ([see Fig. 3-14](#)).
- ▶ In the "List of positions" box, activate the checkbox for the »UNLOAD "BLOCK"« position.
- ▶ Press the <SAVE POSITION> button.

- ▶ Now on the *Manual mode* screen, activate the *Portal* tab (see [Fig. 3-12](#)) and move the cylinder upwards (Function box “Pneumatics” → “Block” field → function »CYLINDER«).
- ▶ Then, in the “Block” field of the function box “Pneumatics” → select the position “0°” for the »SWIVEL« function.
- ▶ Place the lens tray including adjustment plate on the loading conveyor against the first stopper.

Fig. 3-34 Lens tray at the first stopper



- ▶ Remove the adjustment plate from the collet chuck (see [Fig. 3-32](#)) and place it in the first loading (place) position in the lens tray.
 - ▶ Clamp the lens tray at the unloading position. To do this, open the *Manual mode* screen with the *Conveyor* tab activated (see [Fig. 3-25](#)).
 - ▶ In the function box “Clamp trays” move the slider for the function »UNLOAD POSITION« to the the “close” position (see [Fig. 3-26, Item 1](#)).
- The lens tray will now be clamped in this position.
- ▶ Move the portal manually until the gripper with the adjustment piece is above the adjustment plate in the lens tray.
 - ▶ Move the cylinder down on the *portal* (see [Fig. 3-12](#)) tab.

- ▶ Now use the two flat surfaces of the adjustment pieces to check whether the gripper is parallel to the lens tray in the horizontal plane.
If this is not the case, the gripper swivel unit must be adjusted.
- ▶ To do this, loosen the nut on the right side with a size 20 Allen key and adjust the end limit stop with the size 14 Allen key.
- ▶ Lock the nut again.

Fig. 3-35 Lens tray at the first stopper



- ▶ Manually move the portal in the X and Y directions so that the two adjustment pieces are centered and level with each other.
- ▶ Open the *Setup mode* with the tab <PORTAL> activated (see Fig. 3-14).
- ▶ In the “List of positions” box, activate the checkbox for the position »PLACE 1«.
- ▶ Press the <SAVE POSITION> button.
- ▶ On the *Manual mode* screen, activate the *Portal* tab (see Fig. 3-12) and move the cylinder upwards (Function box “Pneumatics” → “Block” field → function »CYLINDER«).

- ▶ Then activate the *Conveyor* tab and in the “Clamp trays” function box, move the »UNLOAD POSITION« slider to the “open” setting, to unclamp the lens tray.
- ▶ Place the lens tray including adjustment plate on the conveyor against the second stopper and clamp it with the Clamp tray function.

Fig. 3-36 Lens tray at the second stopper



- ▶ Move the cylinder for the blockpiece down on the *portal* (see [Fig. 3-12](#)) tab.
- ▶ Move the portal manually in the X and Y direction so that the two adjustment pieces are centered one above the other.

Fig. 3-37 Gripper over adjustment plate

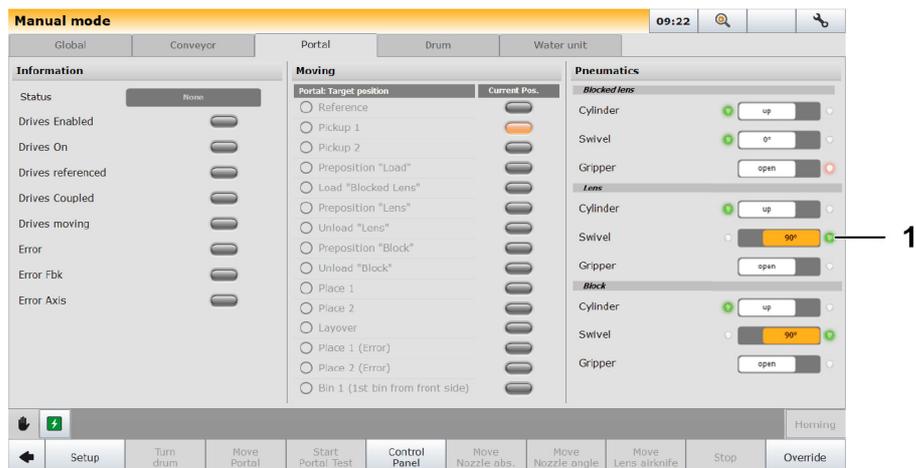


- ▶ If necessary, align the two adjustment pieces as previously described.
- ▶ On the *Setup mode* screen with the <PORTAL> (see Fig. 3-14) tab activated, activate the checkbox for the »PLACE 2« position in the “List of positions” box.
- ▶ Press the <SAVE POSITION> button.
- ▶ Now remove the adjustment piece from the gripper and re-insert the dummy plug.
- ▶ Remove the lens tray from the loader conveyor.

3.3.5 Alignment of the 4-Finger Gripper

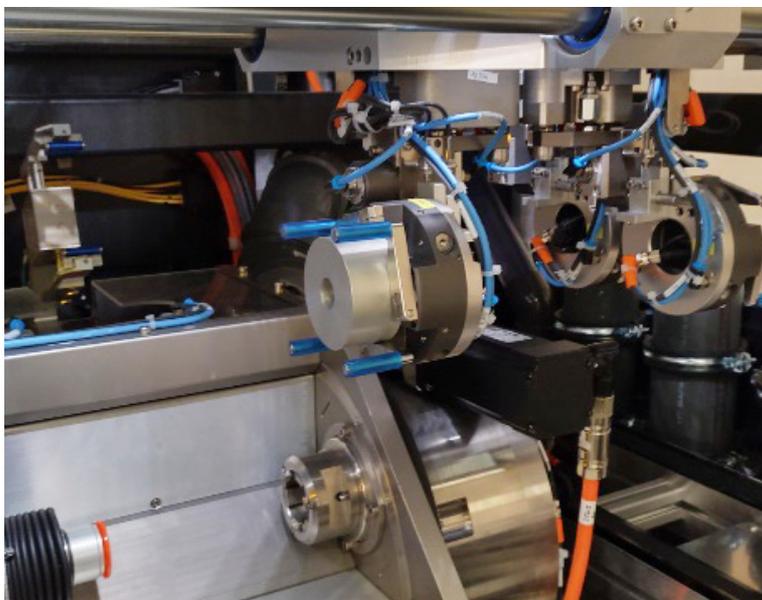
- ▶ Move the machine to its home position (see Section 3.3.1: “Alignment preparations”).
- ▶ On the *Manual mode* screen, activate the *Portal* tab.
- ▶ In the “Lens” field of the “Pneumatics” function box, select the setting “90°” for the »SWIVEL« function (see Fig. 3-38, Item 1).

Fig. 3-38 Screen Manual, tab panel Portal



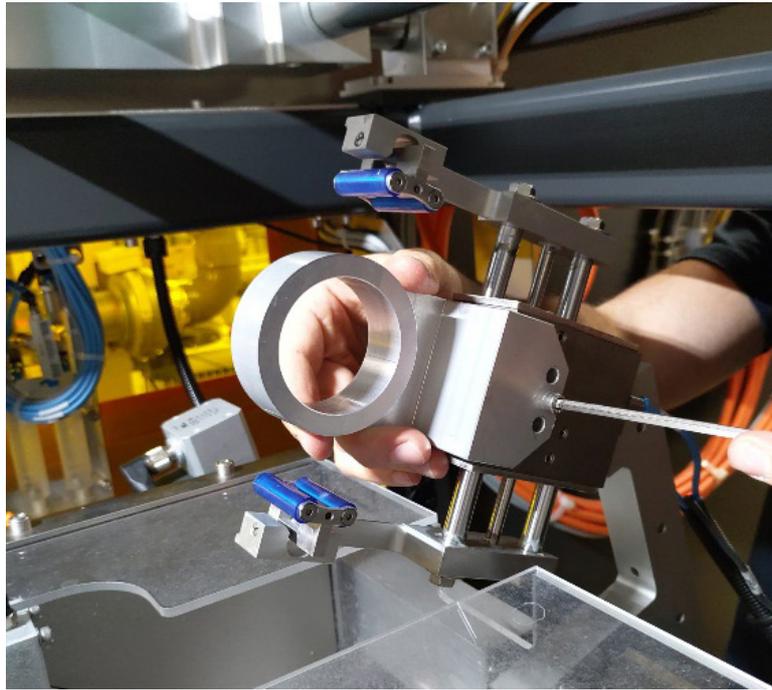
- Remove the $\frac{1}{8}$ " dummy plug from the center of the 4-finger gripper using a size 5 Allen key and insert the adjustment piece (05-077-536) (see Fig. 1-1, Item 3) with the corresponding fastening screw (see Fig. 1-1, Item 8) from the adjustment accessories into the center of the gripper.

Fig. 3-39 Adjustment piece in the 4-finger gripper



- Now mount the loader adjustment piece (05-075-909) (see Fig. 1-1, Item 6) onto the parallel gripper using the centering sleeves and the M5x12 screw.

Fig. 3-40 Adjustment piece in the parallel gripper

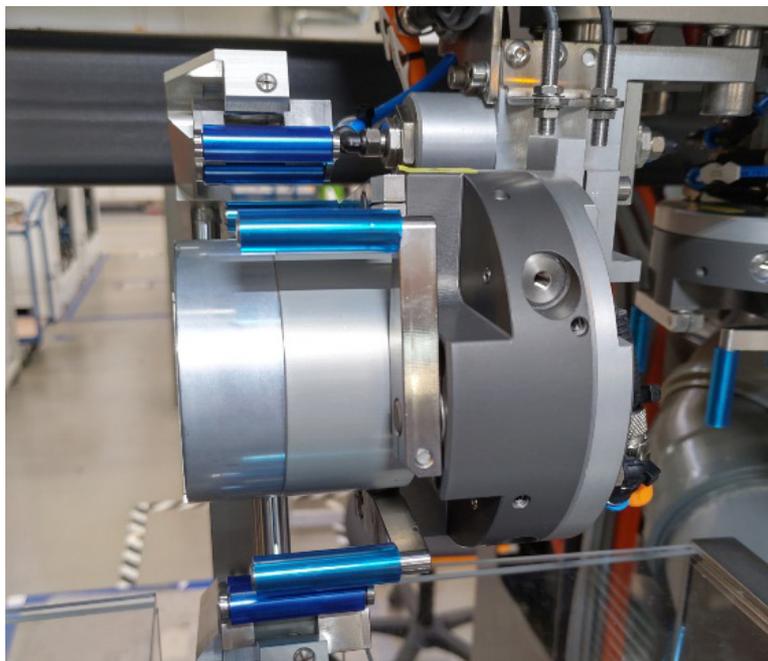


Attention!

Do **not** insert the alignment device for the lens drying nozzles!

- ▶ Move the portal and either the motor E4 (4-finger gripper) or the parallel gripper manually so that the two alignment pieces (parallel gripper and 4-finger gripper) are facing each other.

Fig. 3-41 Adjustment pieces parallel gripper and 4-finger gripper



- ▶ Now use the right flat surface of the adjustment piece for the parallel gripper and the flat surface of the adjustment piece in the 4-finger gripper to check whether they are horizontally parallel to each other.
If this is not the case, the horizontal tilt of the gripper must be adjusted.
- ▶ To do this, loosen the nut on the right-hand side with a size 20 Allen key and adjust the stop screw with a size 15 Allen key.
- ▶ Lock the nut again.



If the Z-axis must be adjusted for vertical alignment, proceed as previously described ([see Section 3.3.4: "Gripper - block piece alignment"](#)).

- ▶ Align the two adjustment pieces by moving the portal in the X and Y direction so that they are level and centered to each other. The two surfaces must touch each other.

Fig. 3-42 Alignment of the two adjustment pieces



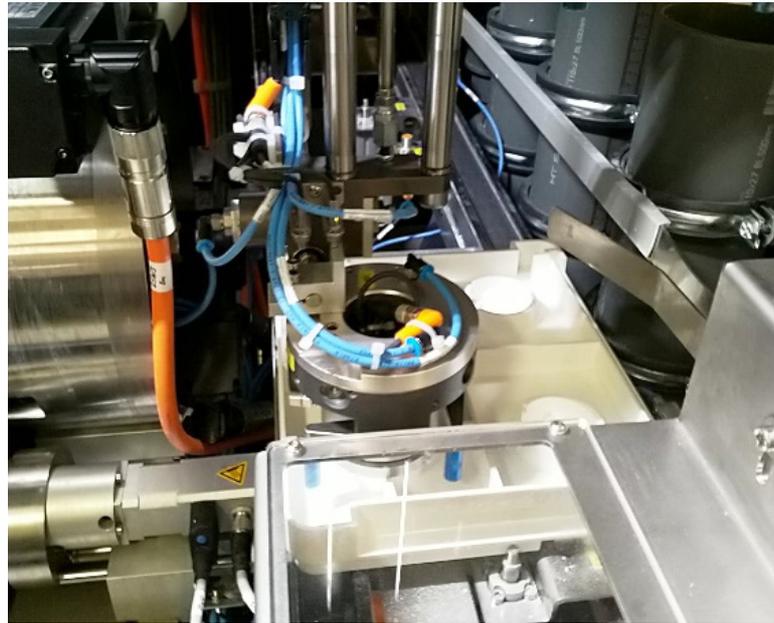
- ▶ Open the *Setup mode* with the tab <PORTAL> activated (see Fig. 3-14).
- ▶ In the “List of positions” box, activate the checkbox for the »UNLOAD "LENS"« position.
- ▶ Press the <SAVE POSITION> button.
When saving is done, the unload position of the portal position for the drying arm (motor E4) is also saved.
- ▶ Manually move the portal over the conveyor.
- ▶ On the *Manual mode* screen, activate the *Portal* tab (see Fig. 3-38) and swivel the lens to 0° (Function box “Pneumatics” → “Lens” field → function »SWIVEL«).
- ▶ Place the lens tray on the conveyor against the first stopper.
- ▶ Activate the tray clamping
- ▶ Place the adjustment plate (05-065-095) (see Fig. 1-1, Item 4) at the first pickup or place position in the lens tray.

Fig. 3-43 Lens tray at the first stopper



- ▶ Move the portal manually so that the gripper is above the adjustment piece in the lens tray.
- ▶ Now select the *Portal* tab on (see Fig. 3-38) the *Manual mode* screen and move the cylinder for the lens down (Function box “Pneumatics” → “Lens” field → function »CYLINDER«).
- ▶ Using the two flat surfaces of the adjustment devices (gripper - lens tray), check whether the gripper is parallel to the adjustment plate in the lens tray in the horizontal plane. If this is not the case, the gripper must be adjusted.
- ▶ To do this, loosen the nut with the size 20 Allen key on the left side and adjust the stop screw with the size 14 Allen key.

Fig. 3-44 Adjusting the gripper



- ▶ Lock the nut again.
- ▶ Move the cylinder for the lens up again (Function box “Pneumatics” → “Lens” field → function »CYLINDER«).
- ▶ Remove the adjustment piece from the 4-finger gripper and insert the $\frac{1}{8}$ dummy plug.
- ▶ On the *Manual mode* screen, activate the *Portal* tab (see Fig. 3-38) and close the 4-finger gripper (Function box “Pneumatics” → “Lens” field → function »GRIPPER«).
- ▶ Move the cylinder for the lens down.
The gripper fingers should rest on the adjustment plate in the lens tray and the limit stop of the Z axis should be pressed against the stop.
- ▶ If this is not the case, adjust the limit stop using your size19 wrench and a size11 Allen key.
- ▶ Move the cylinder of the lens back up.
- ▶ Deactivate the tray clamping.
- ▶ Remove the lens tray from the conveyor.
- ▶ Remove the loader adjustment piece with the centering sleeves from the parallel gripper.

This concludes the adjustment of the portal and the gripper.

3.4 Alignment of axis E4 (lens drying) - pickup and drying of the lens

3.4.1 Alignment preparations

- ▶ Switch on the machine at the main switch and wait until it is ready for operation.
- ▶ Switch the drives on.
- ▶ Move the machine to its home position by pressing the <HOMING> button on the starting screen.



To switch the valves and move the axes, all doors, covers and the machine hood must be closed.

3.4.2 Alignment of the transfer position suction cup - parallel gripper

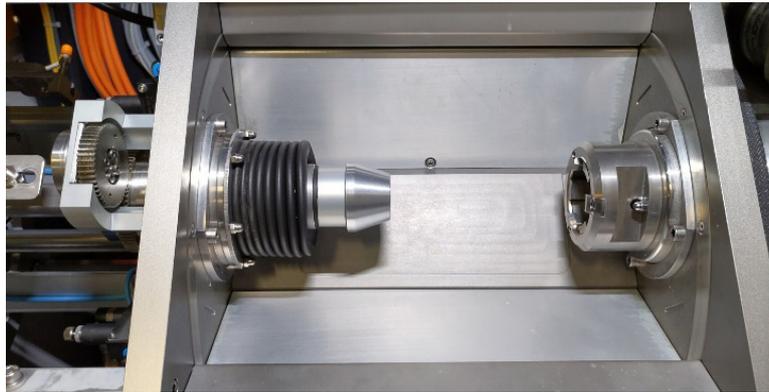
- ▶ Remove the suction cup from chamber 1 of the drum.

Fig. 3-45 Removal of the suction cup from the drying chamber



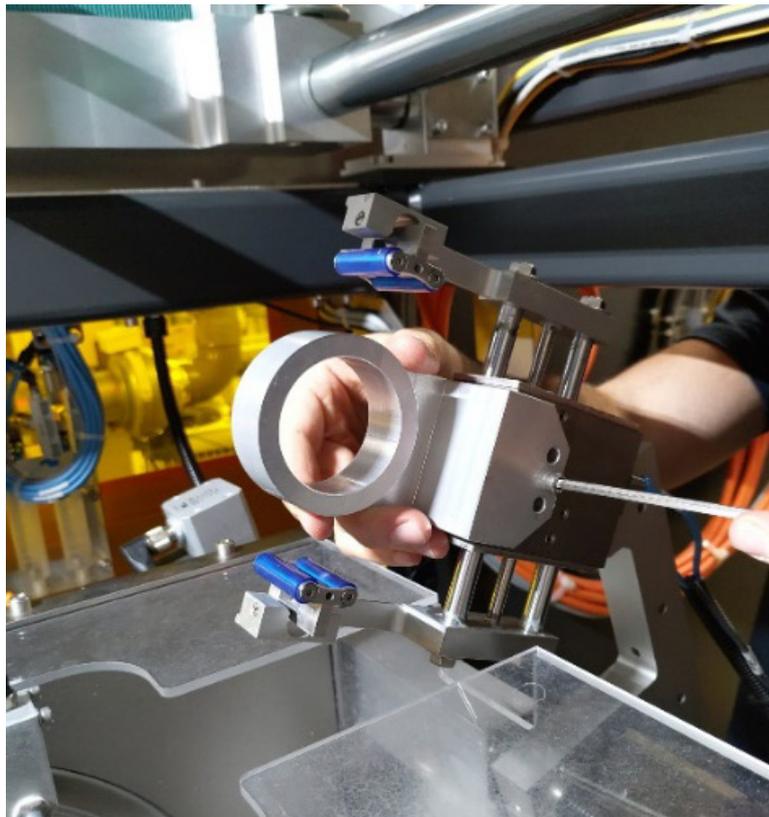
- ▶ Mount the lens transfer adjustment piece (05-077-584) hand-tight in the suction cup holder.

Fig. 3-46 Adjustment piece in the suction cup holder



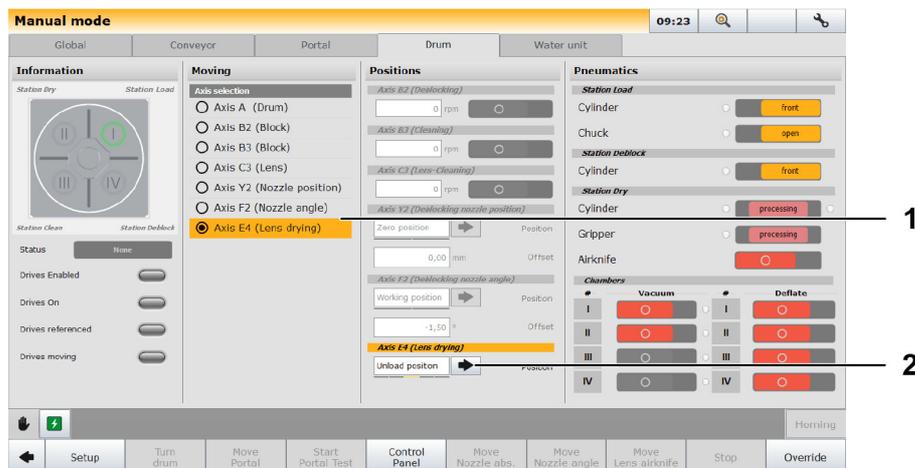
- ④ Mount the pickup adjustment piece (02-069-750) in the parallel gripper using the centering sleeves and the M5x12 screw.

Fig. 3-47 Adjustment piece in the parallel gripper



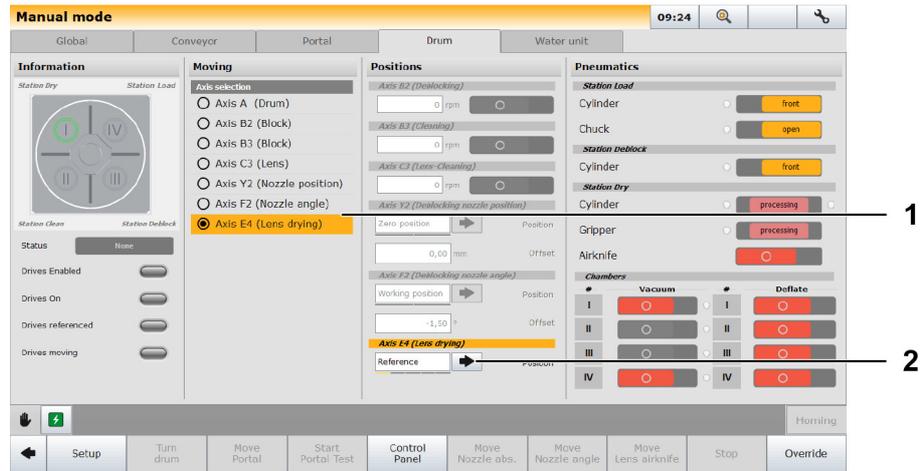
- ④ On the *Manual mode* screen, activate the *Drum* tab.

Fig. 3-48 Screen Manual, tab panel Drum



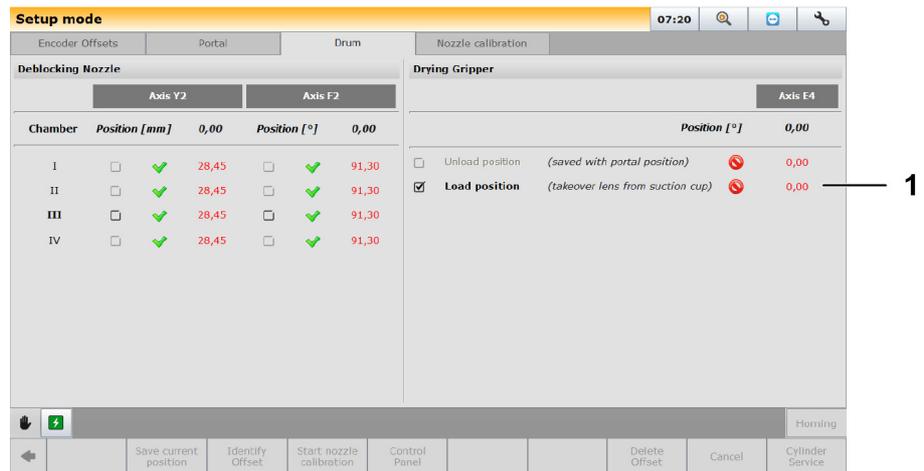
- ▶ In the “Moving” function box, select »AXIS E4 (LENS DRYING)« (see Fig. 3-48, Item 1) and in the “Positions” function box, select the setting “Pickup position” (see Fig. 3-48, Item 2) for the activated axis.
- ▶ Press the <MOVE AXIS> button.
The E4-axis swivels out of the drum.
- ▶ In the “Moving” function box, select »AXIS A (DRUM)« (see Fig. 3-48) and press the <MOVE AXIS> button.
The drum turns 90° to the next station every time the <MOVE AXIS> button is pressed.
- ▶ Keep turning the drum in this way until chamber 1 with the adjustment piece is in the drying station.
- ▶ In the “Moving” function box, select »AXIS E4 (LENS DRYING)« and in the “Positions” function box, select the setting “Place position” for the activated axis.
- ▶ Switch off the drives.
- ▶ On the *Manual mode* screen, activate the *Drum* tab and move the cylinder in the drying station (see Fig. 3-49, Item 1) forwards.

Fig. 3-49 Screen Manual, tab panel Drum



- ▶ Open the *Setup mode* screen with the *Drum* tab activated.

Fig. 3-50 Screen Setup, tab panel Drum



- ▶ Activate the checkbox “Place position” (see Fig. 3-50, Item 1) for the axis E4.
- ▶ Press the <SAVE POSITION> button.
The determined value is displayed
- ▶ Open the *Manual mode* screen again with the *Drum* tab activated, and move the cylinder in the drying station (see Fig. 3-49, Item 1) backwards.
- ▶ Switch the drives on.
- ▶ Swivel the E4 axis out of the drum.
- ▶ Remove the pickup adjustment piece (see Fig. 3-47).



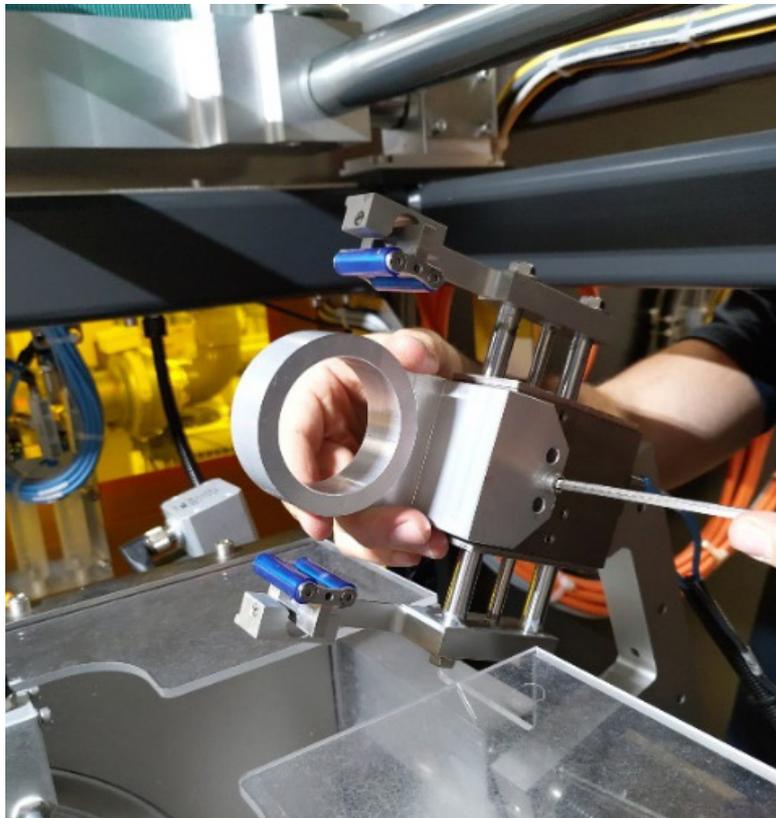
If the adjustments have not yet been completed, the adjustment piece can remain mounted for the next adjustment step.

- ▶ Switch the drives on.
- ▶ In the “Moving” function box, select »AXIS A (DRUM)« (see Fig. 3-48) and keep pressing the <MOVE AXIS> button until chamber 1 with the adjustment piece is located in the loading station.
- ▶ Remove the lens transfer adjustment piece from the suction cup holder (see Fig. 3-46).
- ▶ Install the suction cup into the suction cup holder

3.4.3 Alignment of the Lens Drying Position

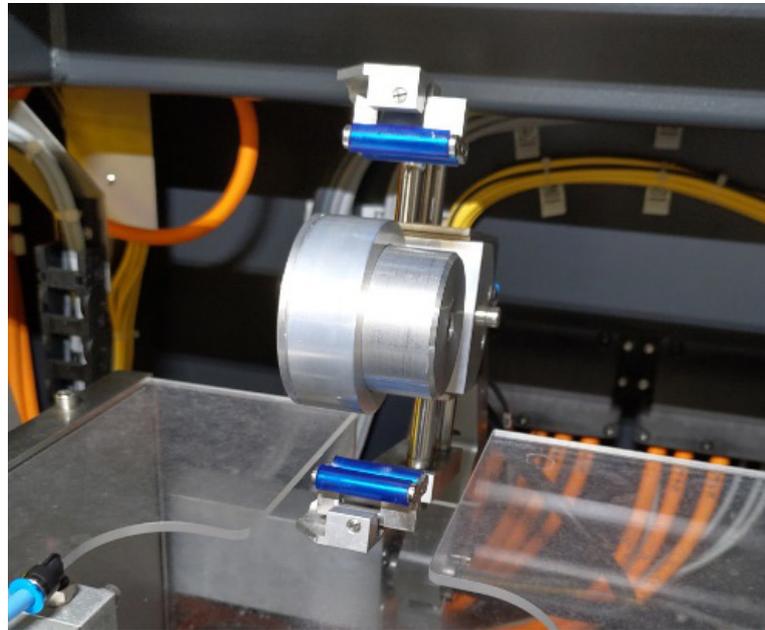
- ▶ Move the machine to its home position (see Section 3.4.1: “Alignment preparations”).
- ▶ If necessary, install the pickup adjustment piece (02-069-750) with the centering sleeves and the M5x12- screw in the parallel gripper.

Fig. 3-51 Adjustment piece in the parallel gripper



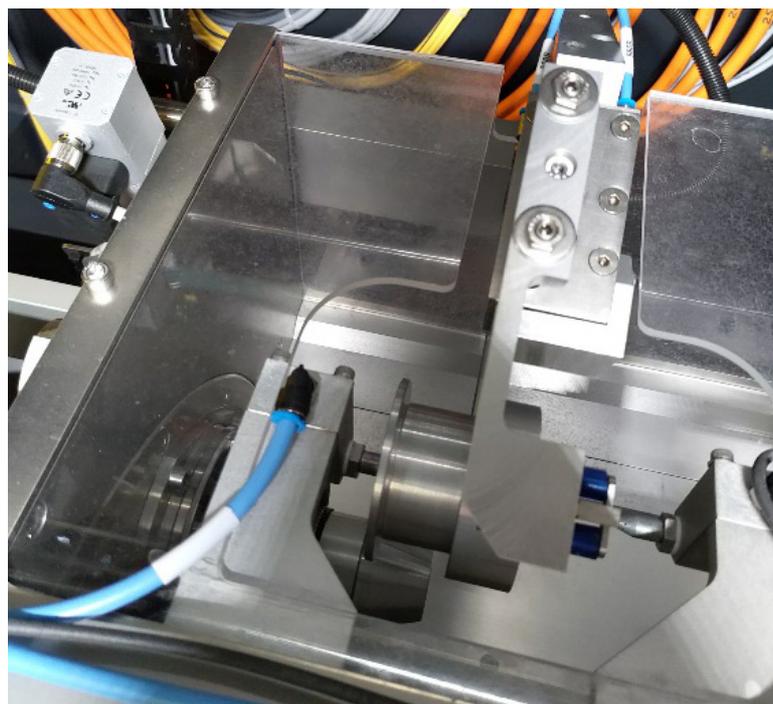
- ▶ Insert the left centering piece (xx-xxx-xxx) into the pickup adjustment piece

Fig. 3-52 Centering piece in the pickup adjustment piece



- ▶ Manually turn or swivel the parallel gripper (E4 axis) into the drum so that the centering piece on the left hand side can be pushed over the drying nozzle.

Fig. 3-53 Parallel gripper in the drum



- ▶ Open the *Setup mode* screen with the *Drum* tab activated (see Fig. 3-50).
- ▶ Activate the checkbox “Drying position” for the E4 axis.
- ▶ Press the <SAVE POSITION> button.
The determined value is saved.
- ▶ Push the centering piece from the drying nozzle and swivel the parallel gripper out of the drum.
- ▶ Remove the centering piece and remove the pickup adjustment piece from the parallel gripper.

3.5 Deblocking Nozzle

3.5.1 Alignment preparations

- ▶ Switch on the machine at the main switch and wait until it is ready for operation.
- ▶ Switch the drives on.
- ▶ Move the machine to its home position by pressing the <HOMING> button on the starting screen.
- ▶ Switch off the drives.
- ▶ Open the machine hood.



To switch the valves and move the axes, all doors, covers and the machine hood must be closed.

3.5.2 Adjustment of the F2 Axis (Nozzle Angle)

- ▶ Clamp the adjustment piece (05-065-095) (see Fig. 1-1, Item 4) in the collet chuck by sliding the slider to the “close” position (*Manual mode* → *Drum* tab → function box “Pneumatics”, “Station Load” field, function »CHUCK«).

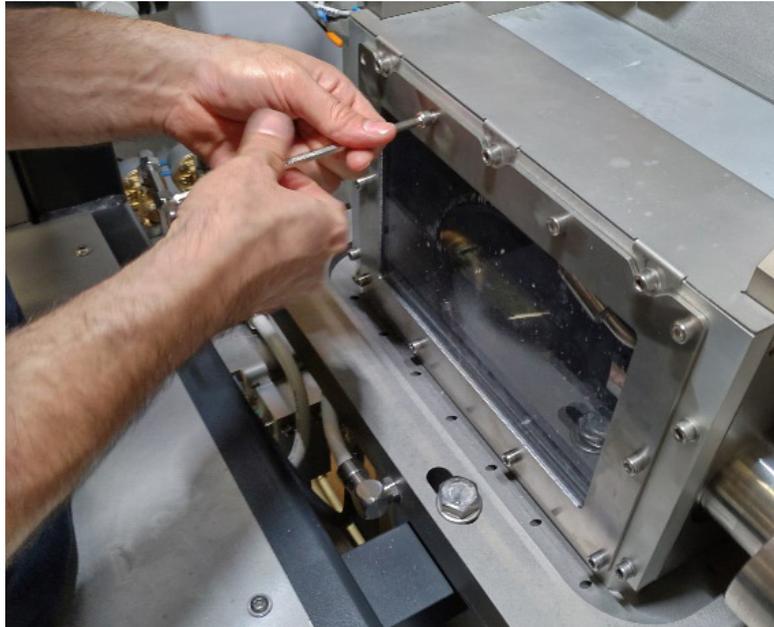
Fig. 3-54 Adjustment piece in the collet chuck



Clamping and unclamping of the adjustment piece is only possible in the loading station.

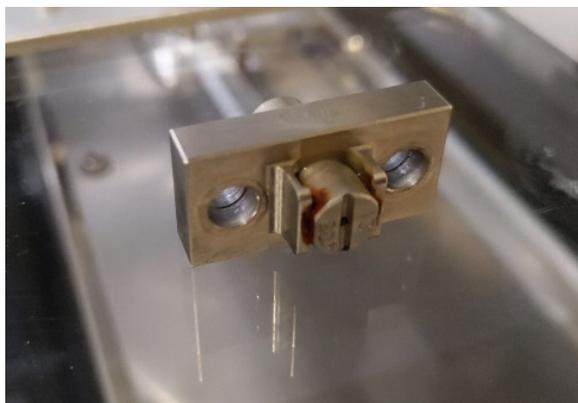
- ▶ Remove the splashguard at the front of the deblocking station.
- ▶ To do this, unscrew the ten M6x10 screws in the splashguard mounting frame.

Fig. 3-55 Removal of the mounting frame



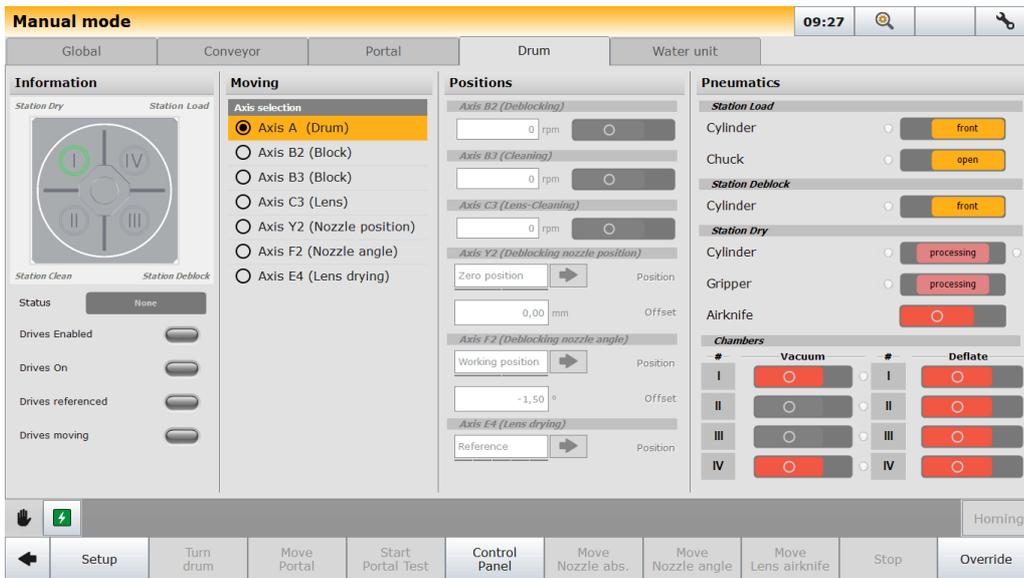
- ▶ Remove the nozzle head by unscrewing the two fastening screws (Allen screw M5x16).

Fig. 3-56 Removed nozzle head



- ▶ On the *Manual mode* screen, activate the *Drum* tab.

Fig. 3-57 Screen Manual, tab panel Drum



- ▶ In the “Moving” function box, select »AXIS E4 (LENS DRYING)« (see Fig. 3-48, Item 1) and in the “Positions” function box, select the setting »PICKUP POSITION« (see Fig. 3-48, Item 2) for the activated axis
- ▶ Press the <MOVE AXIS> button.
The E4-axis swivels out of the drum.
- ▶ In the “Moving” function box, select »AXIS A (DRUM)« (see Fig. 3-57) and press the <MOVE AXIS> button.
The drum turns 90° to the next station every time the <MOVE AXIS> button is pressed.
- ▶ Use a measuring device for angle measurement to determine the angle between the flat surface of the adjustment piece and the remaining fastening screw of the nozzle head.
This must be 90°!

Fig. 3-58 Measuring the nozzle angle



- ▶ Push the hose of the deblocking nozzle towards the machine (see Fig. 3-58, Item arrow) so that the nozzle moves in the direction of the alignment piece mounted in the chuck.

Hold the hose in this position while measuring the nozzle angle of the deblocking nozzle.

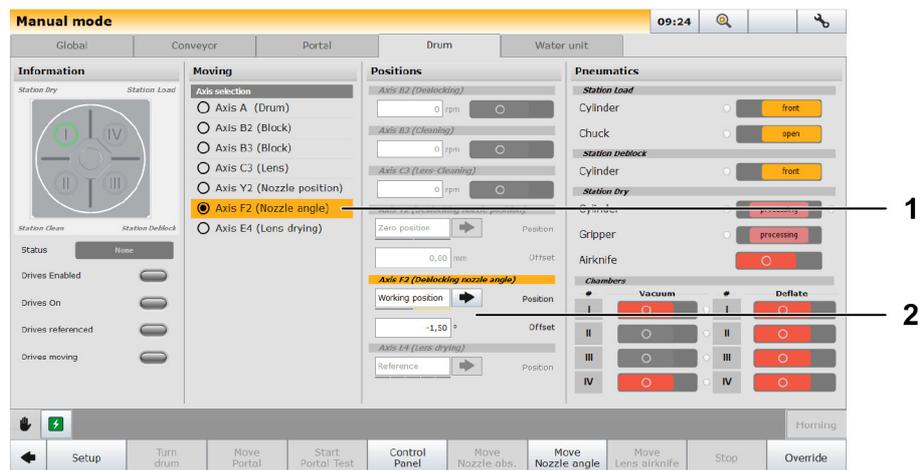
This should eliminate the backlash in the gear of the deblocking nozzle. If this is not possible, proceed as follows:

Fig. 3-59 Check the nozzle angle



- ▶ Open the *Manual mode* screen with the *Drum* tab activated and in the Moving box, select »AXIS F2 (NOZZLE ANGLE)« (see Fig. 3-60, Item 1), then in the box “Positions” select the setting »WORKING POSITION« (see Fig. 3-48, Item 2) for the activated axis.

Fig. 3-60 Screen Manual, tab panel Drum



- ▶ In the »OFFSET« field, enter the difference between the set value and the measured value of the nozzle angle.

Example: Set value 90° - measured value 91.5° = input value 1.5°

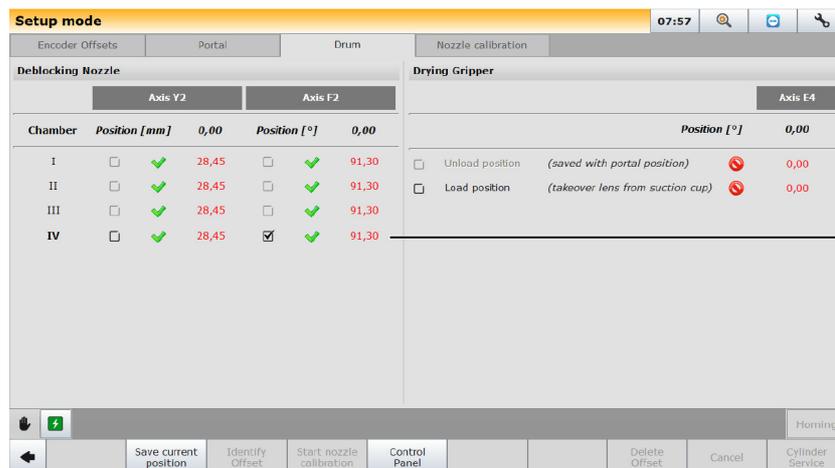
If the measured value is **greater** than the set value, enter the difference with a **negative** preceding sign. If the measured value is **lower** than the set value, enter the difference with a **positive** preceding sign



If there is already a value in the »OFFSET« field, it must be added to the calculated input value!

- ▶ Press the <SAVE POSITION> button.
The nozzle head swivels by the determined value.
If the value is greater than zero, the nozzle head swivels counterclockwise. If it is lower than zero, it swivels clockwise.
- ▶ Check the nozzle angle again with the measuring device. It should now be 90°
- ▶ Open the *Setup mode* screen with the *Drum* tab activated.

Fig. 3-61 Screen Setup, tab panel Drum



- ▶ Activate the checkbox “Position” for the Axis F2 (deblocking nozzle) (see Fig. 3-61, Item 1).
- ▶ Press the <SAVE POSITION> button.
The determined value is saved.



The checkboxes for those axes that are in the deblocking station can now be activated!

- ▶ Remove the adjustment piece from the collet chuck (see Fig. 3-54).
- ▶ Perform the described adjustment steps for all chucks and nozzle angles in the same way.
- ▶ After completing the adjustment of the nozzle angle, remount the nozzle head and the splashguard with the mounting frame. If further adjustment work is to be carried out in the deblocking station, the nozzle head and the splashguard, including the mounting frame, can remain removed.

3.5.3 Alignment of the Y2 Axis (deblocking position)

- ▶ Move the machine to its home position (see Section 3.5.1: “Alignment preparations”).
- ▶ Clamp the adjustment piece (05-065-095) (see Fig. 1-1, Item 4) in the collet chuck (see Fig. 3-54).

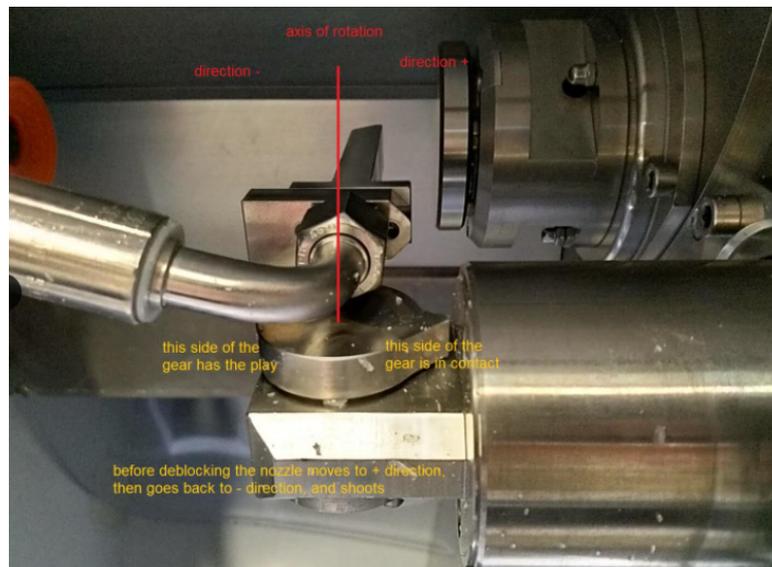


Clamping and unclamping of the adjustment piece is only possible in the loading station.

- ▶ If necessary, remove the mounting frame and the splash-guard (see Fig. 3-55).
- ▶ If necessary, remove the nozzle head (see Fig. 3-56).
- ▶ On the *Manual mode* screen, activate the *Drum* tab and in the function box "Moving" select »AXIS A (DRUM)« (see Fig. 3-57)
- ▶ Press the button <MOVE AXIS>.

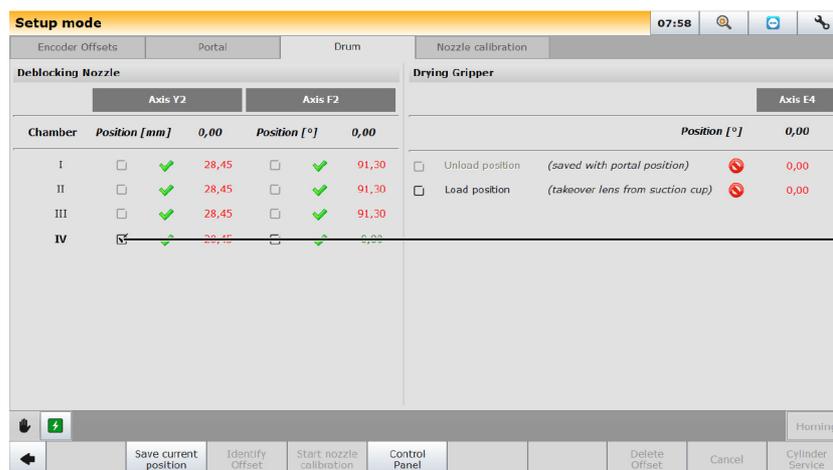
The drum turns 90° to the next station every time the <MOVE AXIS> button is pressed.
- ▶ Install the adjustment piece (05-077-360) for the Y2 axis (see Fig. 1-1, Item 5) in the screw thread of the nozzle holder with two M5x16 Allen screws.
- ▶ Manually move the axis using the adjustment piece until it lightly touches the flat surface of the adjustment piece in the chuck.
- ▶ When moving the Y2 axis, make sure that the front tip of the adjustment piece pushes in the direction of the collet chuck. This should help eliminate the backlash at the left side of the drive.

Fig. 3-62 Installed adjustment piece of the Y2 axis and the collet chuck



- ▶ Open the *Setup mode* screen with the *Drum* tab activated.

Fig. 3-63 Screen Setup, tab panel Drum



- ▶ Activate the checkbox “Position” for the Y2 axis (deblocking nozzle) (see Fig. 3-63, Item 1) .
- ▶ Press the <SAVE POSITION> button.
The determined value is saved.



The checkboxes for those axes that are in the deblocking station can now be activated!

- ▶ Remove the adjustment piece for the Y2 axis



Risk of collision and machine damage!

The adjustment piece for the Y2 axis must be removed before moving an axis.

- ▶ On the *Manual mode* screen, activate the *Drum* tab and in the function box “Moving” select »AXIS A (DRUM)« (see Fig. 3-57)
- ▶ Press the button <MOVE AXIS>.
The drum turns 90° to the next station every time the <MOVE AXIS> button is pressed.
- ▶ Remove the adjustment piece from the collet chuck (see Fig. 3-54).
- ▶ Perform the described adjustment steps for all chucks and nozzle angles in the same way.
- ▶ After completing the adjustment work, remount the nozzle head and the splashguard with the mounting frame.

3.5.4 Alignment of the Y2 axis (deblocking) to the Water Jet Offset

The offset calibration block (05-080-187) is used to align the water jet offset.

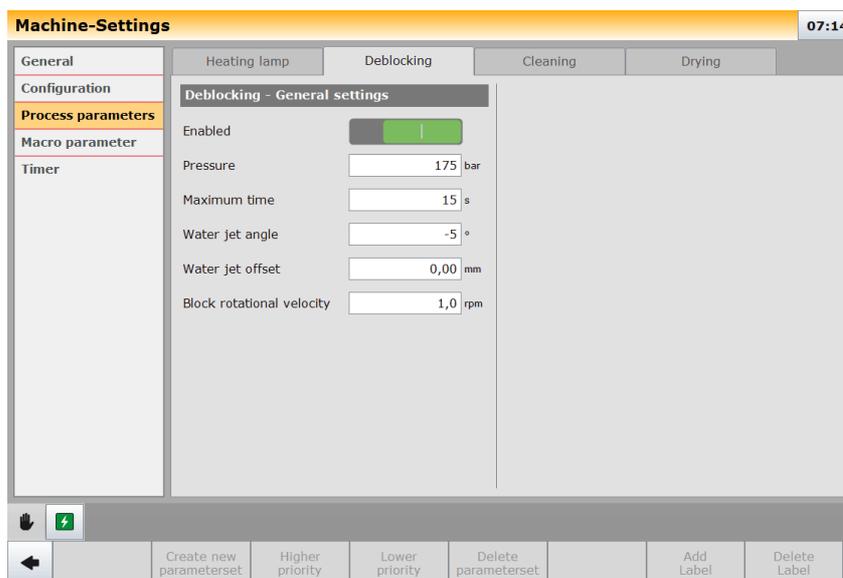
Fig. 3-64 Calibration block (05-080-187) with calibration lines



On this calibration block there are two marked lines (see Fig. 3-64, Item 1 and 2) between which the water jet should shoot during the deblocking process. These two calibration lines can be used to determine the water jet offset.

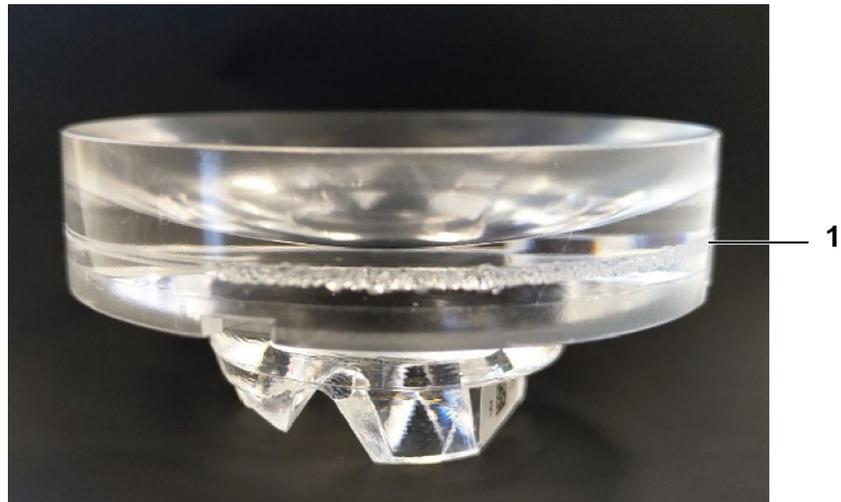
- ▶ First print out the offset calibration job ticket for BP -75.
- ▶ Attach the job ticket to the lens tray and place the calibration block in the lens tray.
- ▶ Open the *Machine settings* screen (*Starting screen* → <SETTINGS> → <MACHINE>) and select the sub-menu *Process parameters* there.
- ▶ Activate the *Deblock* tab panel.

Fig. 3-65 Screen Machine.Settings, Tab panel Deblocking



- ▶ Set the parameters to the following values:
 - »ACTIVE«: On
 - »PRESSURE« 175
 - »MAXIMUM TIME«: 15
 - »WATER JET ANGLE«: -5
 - »WATER JET OFFSET«: 0
 - »BLOCK ROTATIONAL VELOCITY«: 1,0
- ▶ Switch the drives on.
- ▶ Move the machine to its home position ([see Section 3.5.1: "Alignment preparations"](#)).
- ▶ Switch to Automatic mode and start it.
Move the lens tray in Automatic mode to get the current position of the water jet during deblocking.
- ▶ Open the *Automatic* screen (*Starting screen* → <AUTOMATIC>).
- ▶ Stop Automatic mode and return to the *Machine Settings* screen with the *Deblock* ([see Fig. 3-65](#)) tab activated.
- ▶ Now use the two calibration lines to check the current position of the water jet made on the calibration block.
There are three possible results here:
 1. The position of the water jet ([see Fig. 3-66, Item 1](#)) is **between** the two calibration lines.

Fig. 3-66 Water jet between the calibration lines



The water jet offset does not need to be adjusted.

2. The position of the water jet (*see Fig. 3-67, Item 1*) is **above** the two calibration lines.

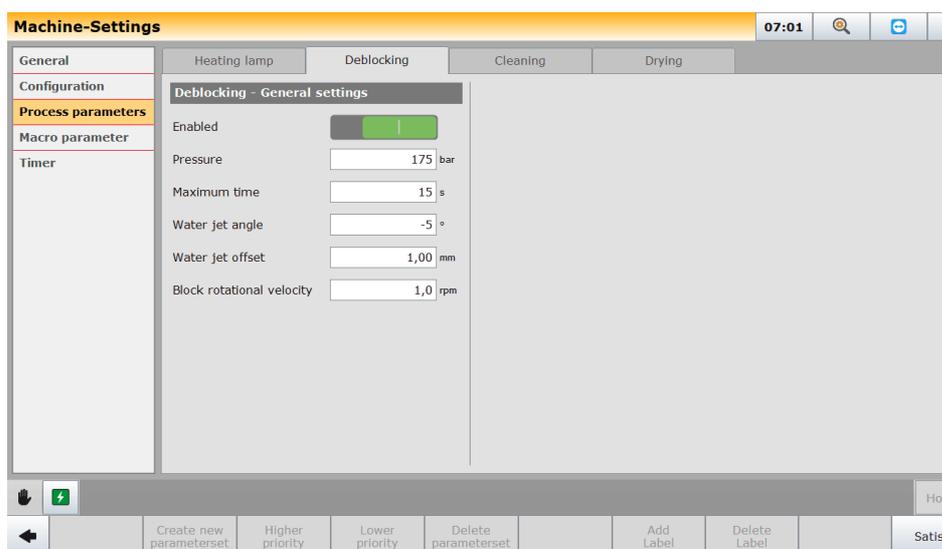
Fig. 3-67 Water jet above the calibration lines



The water jet offset needs to be adjusted.

- ▶ Measure the distance between the center of the two calibration lines and the center of the current water jet position using a suitable measuring device (caliper gauge).
- ▶ Enter the measured value with a **positive preceding sign** in the »WATER JET OFFSET« (*see Fig. 3-68*) field.

Fig. 3-68 Screen Machine.Settings, Tab panel Deblocking



If a value is already entered in this field, add the measured value to it.

3. The position of the water jet is **below** the two calibration lines.

The water jet offset needs to be adjusted.

- ▶ Again, measure the distance between the calibration lines and the water jet position.
- ▶ Enter the measured value with a **negative preceding sign** in the »WATER JET OFFSET« (see Fig. 3-68) field.

If a value is already entered in this field, subtract the measured value from it.

- ▶ Rotate the calibration block in the lens tray by 180° and perform another deblocking process.
- ▶ Check the position of the water jet in relation to the calibration lines again.

If the setting is correct, no further adjustment of the water jet offset is necessary.

- ▶ If the distances are still not correct, perform a new calibration with a new calibration block.

3.6 Sensors

3.6.1 Alignment preparations

- ▶ Switch on the machine at the main switch and wait until it is ready for operation.
- ▶ Switch the drives on.
- ▶ Move the machine to its home position by pressing the <HOMING> button on the starting screen.



To switch the valves and move the axes, all doors, covers and the machine hood must be closed.

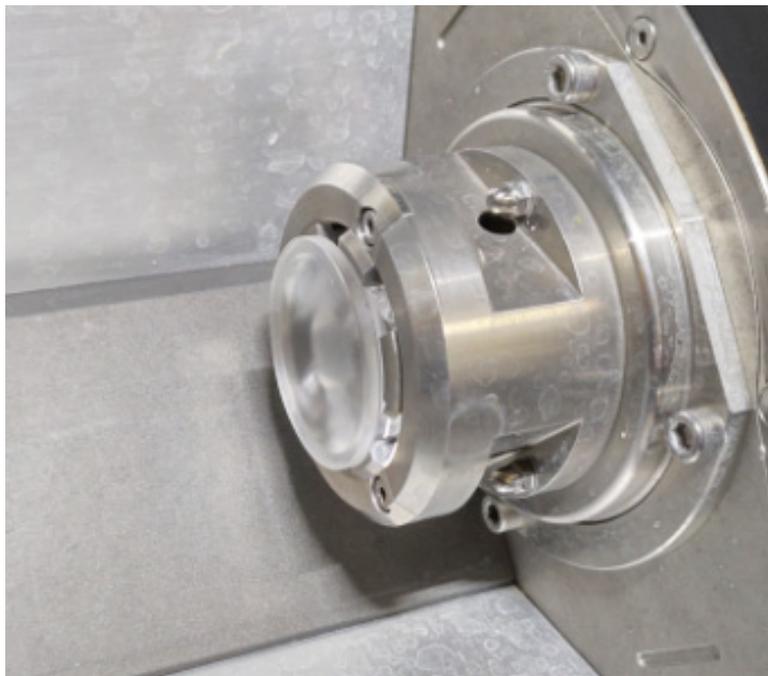
3.6.2 Alignment of the Sensor for Block Detection

- ▶ Insert the calibration block 1 (05-079-545) with a diameter of 50mm into the collet chuck at chamber 1.

Fig. 3-69 Insert calibration block 1



Fig. 3-70 Calibration block 1 in chamber 1



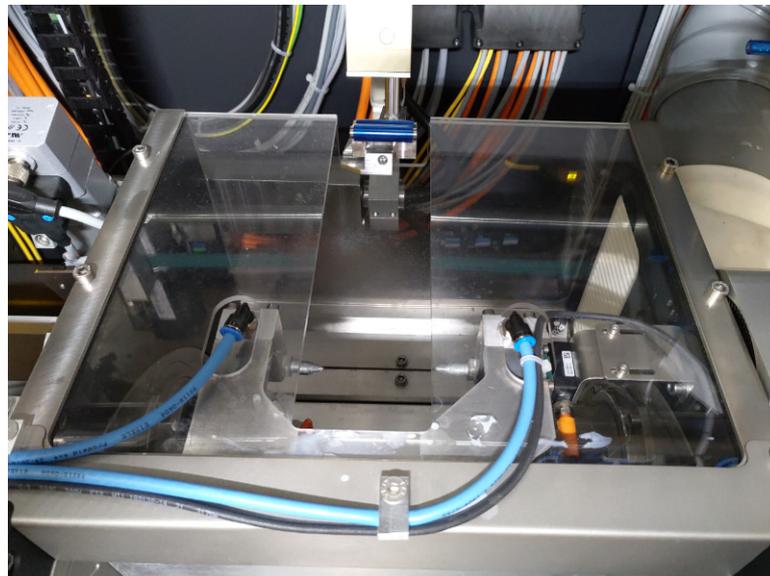
- ▶ Open the *Manual mode* screen with the *Drum* tab activated and in the “Moving” function box, select »AXIS A (DRUM)« (see Fig. 3-57) and
- ▶ Press the button <MOVE AXIS> three times until chamber 1 with the adjustment piece is in the drying station. The inserted calibration piece is now in the drying station directly adjacent to the block detection.

Fig. 3-71 Calibration block 1 in chamber 4



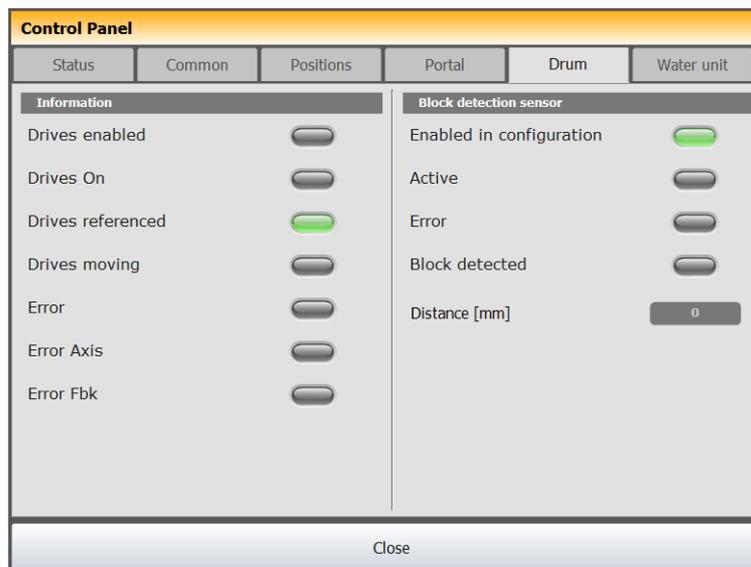
- Remove the plastic cover in the drying chamber. To do so, loosen the three screws at both sides.

Fig. 3-72 Plastic cover



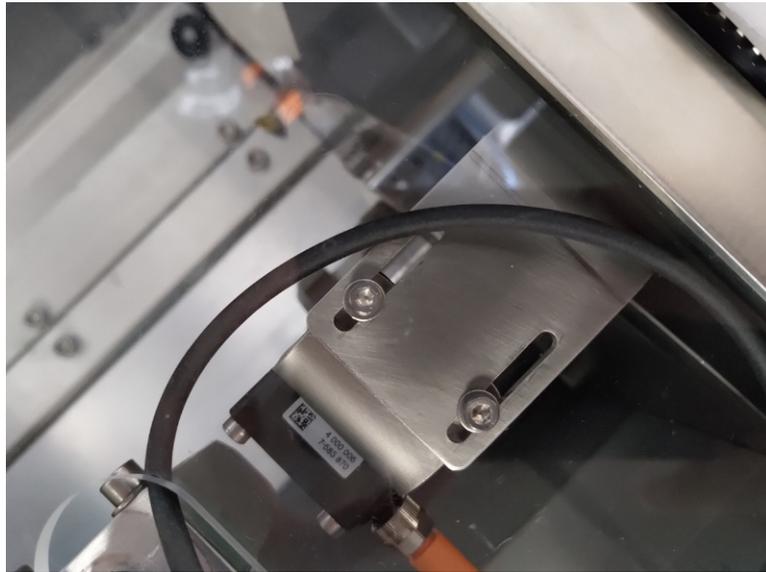
- Press the <CONTROL PANEL> button on any screen.
- Select the *Drum* tab here.

Fig. 3-73 Control Panel, Drum tab



- ▶ Align the block piece detection sensor so that the sensor receives a signal while it conducts a detection of the leading edge of the calibration block. The leading edge is the side of the calibration block facing into the machine interior.
- ▶ Look at the Control Panel to see if a signal appears in the »BLOCK DETECTED« field while the sensor is being adjusted.
- ▶ To adjust the sensor, loosen the two upper screws with an Allen key and slide the sensor to the position where a green signal is displayed in the »BLOCK DETECTED« field.

Fig. 3-74 Adjusting the sensor



- ▶ Tighten the two screws again.
- ▶ After completing the sensor adjustment for chamber 1, proceed in the same way for chambers 2, 3, and 4 as described. This ensures that the block piece is detected in all chambers.
- ▶ Then remove the block piece from the respective chuck.
- ▶ If the calibration block 1 was correctly detected in all 4 chambers, carry out the adjustment of the block piece detection for block piece 2 (05-079-547) with a diameter of 75 mm as well.

Fig. 3-75 Calibration block 2 in chamber 1



- ▶ Make sure that the fastening screws of the sensors are securely tightened after the adjustment.
- ▶ Finally, reinstall the plastic cover in the drying chamber ([see Fig. 3-72](#)).
- ▶ Make sure that all calibration pieces are removed from the machine after completing the adjustment work.

Service
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satisloh[®]

Satisloh GmbH

Office address:

Delivery address:

Postfach 20 69
D-35573 Wetzlar
Germany

Wilhelm-Loh-Str. 2-4
D-35578 Wetzlar
Germany

Phone: +49(6441) 912-0
Fax: +49(6441) 912-130
E-Mail: info@satisloh.com