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Cleaning of the F-Theta Lens Protective Crystal

Cleaning of the F-Theta Lens Protective Crystal Overview



The proper functioning of the PBF-LB system depends on many factors, although one of its most critical aspects is the correct condition of all the elements that make up the optical system, which ensures the proper supply of power and laser direction towards the material particles.

The outermost element of this system is the protective crystal (the window) of the F-Theta lens, a lens that performs the function of focusing the laser and is in direct contact with the manufacturing camera.

The use of the equipment can lead to dirt or deterioration of this crystal. Scratches or dirt on this protective crystal can reduce the effectiveness of the laser.

Therefore, the protective crystal of the F-Theta lens must always be cleaned before starting each job.



EOS M280

Cleaning of the F-Theta Lens Protective Crystal Personal Protective Equipment (PPE)



The cleaning of the protective crystal would ideally be carried out as part of the process of cleaning the process chamber, between manufacturing jobs, or between material changes. In this regard, the required personal protective equipment (PPE) is as follows:

- Disposable protective gloves
- Respiratory mask with P3 filter
- Closed protective hood made of flame-resistant material
- Closed protective clothing made of flame-resistant material
- ESD safety shoes EN 61340-4-3

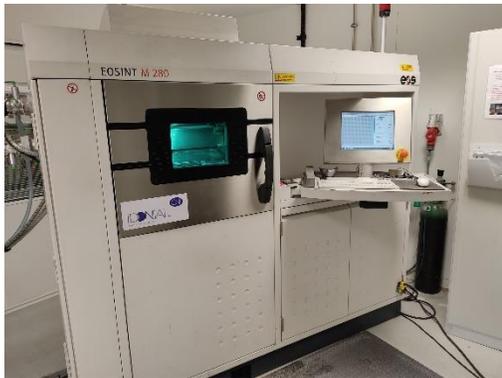


Cleaning of the F-Theta Lens Protective Crystal

Location of the Protective Crystal



The training scenario could begin by giving an overview of the machine and location of the build chamber, as well as an introduction to different components in the process chamber.



EOS M280



EOS M280 Build Chamber



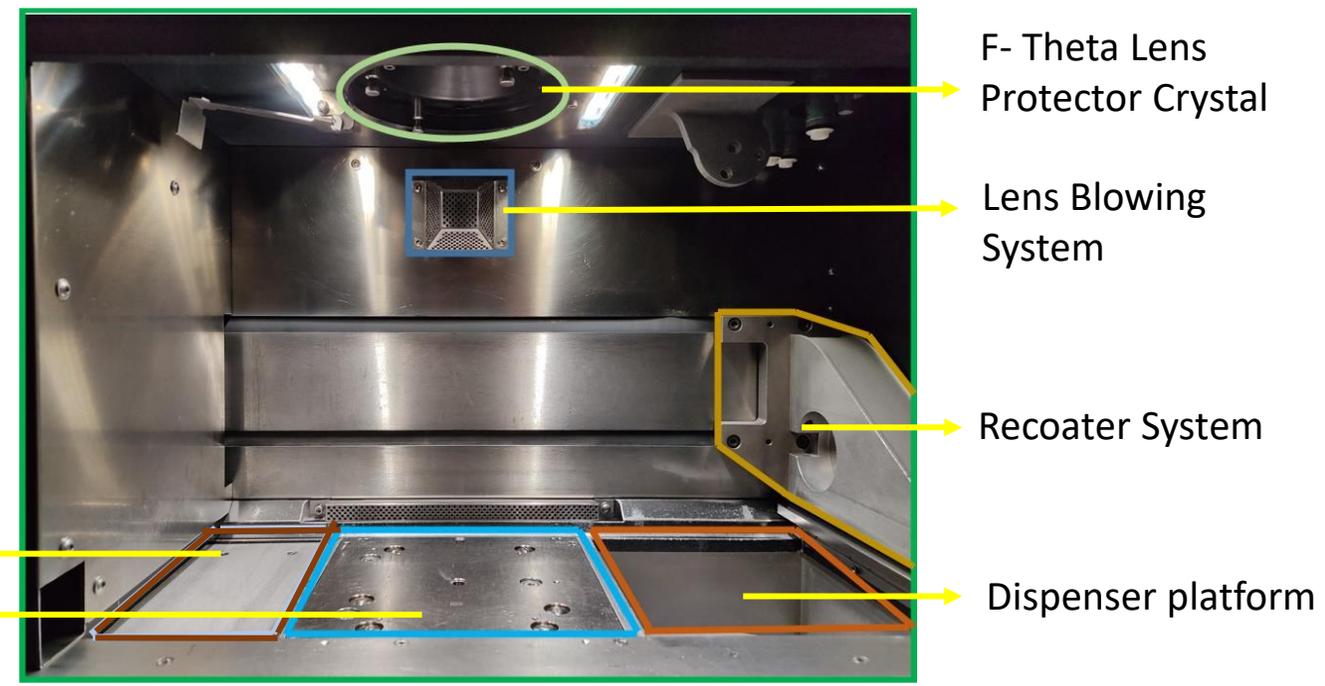
Inside of EOS M280
Build Chamber

Cleaning of the F-Theta Lens Protective Crystal

Location of the Protective Crystal



It could be important to highlight at this point that this training scenario covers the general procedure for cleaning laser protective crystal for a specific, mono-laser machine, EOS M280. Basic methodology won't differ too much between different machines, but specific actions could be done differently or demand slightly different sub-tasks.



EOS M280 Process Chamber

Cleaning of the F-Theta Lens Protective Crystal

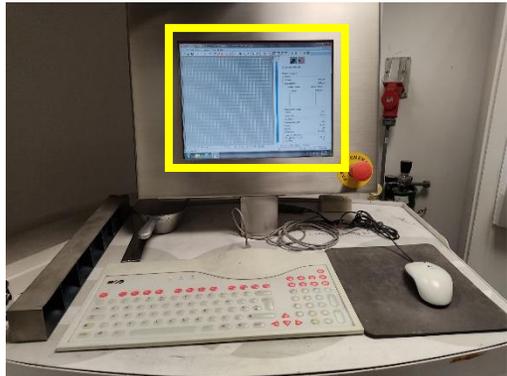
Step 1 – Software - Disconnecting Lens Blowing System



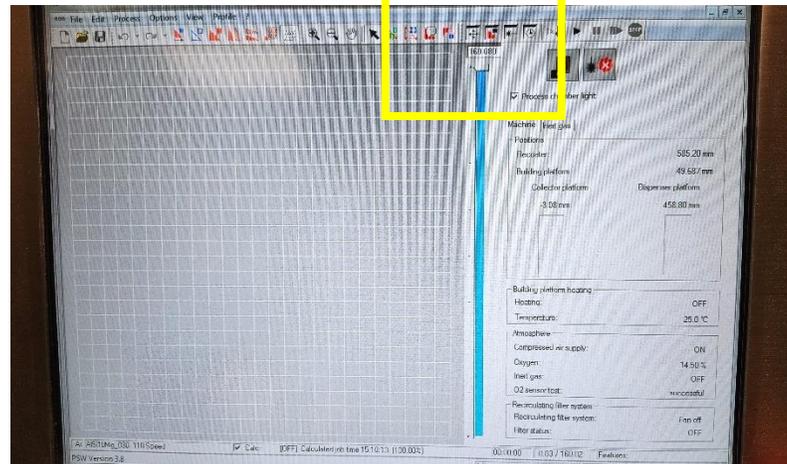
First step is to assure that the blowing system that prevents the deposition of dust over the optical system is switch off.

1. On the PSW Main Screen, select the “adjust” icon

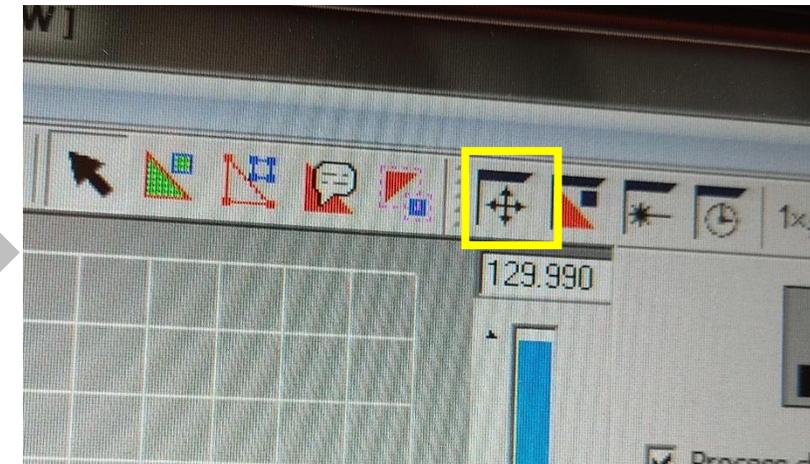
2. PSW Adjust Screen



EOS M280 HMI



EOS M280 HMI – Adjust Icon



EOS M280 HMI – Adjust Icon

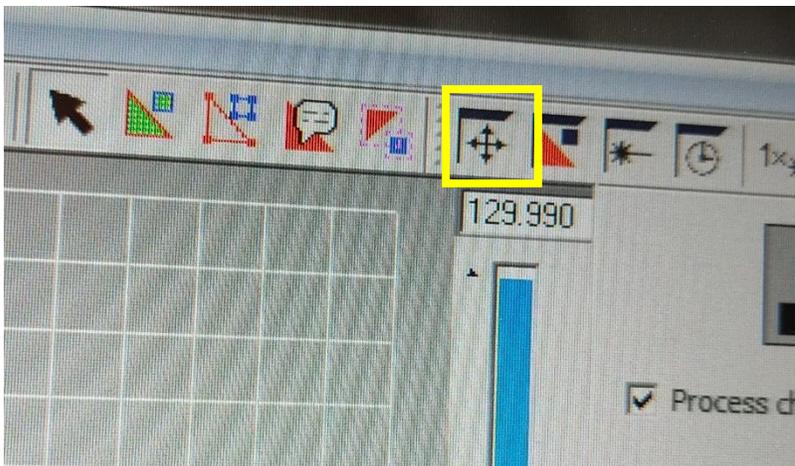
Cleaning of the F-Theta Lens Protective Crystal

Step 1 – Software - Disconnecting Lens Blowing System

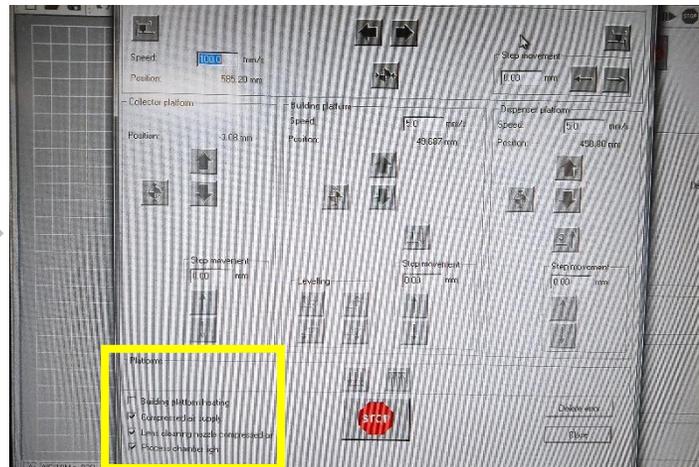
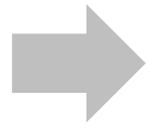


On this specific training scenario, the disconnection of the blowing system is achieved through specific software options, that are applicable to the example machine, but that could vary between different machines.

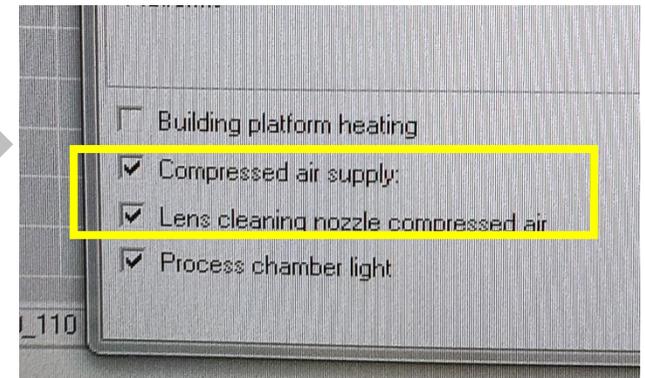
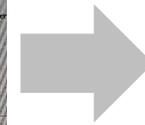
3. On the PSW Adjust Screen
Deselect: “Compressed air supply” & “Lens cleaning nozzle compressed air”



EOS M280 HMI – Adjust Icon



EOS M280 HMI Adjust Screen



On EOS M280 HMI Adjust Screen Deselect the Following

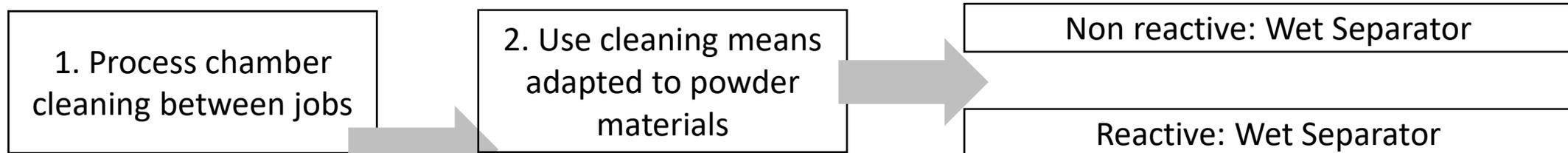


Cleaning of the F-Theta Lens Protective Crystal

Step 2 – Cleaning Dirt in the Adjacent Area of the Nozzle Ring Covering Protective Crystal



More than a specific cleaning of the zone surrounding the crystal, all the process chamber will be cleaned between Jobs and/or powder material change. The cleaning of the protective crystal is then a part of the overall cleaning and maintenance activities.



EOS M280 F-Theta Lens Protector Crystal



Wet Separator

Take extra care when around the crystal, don't directly touch it with the Separator!



Cleaning of the F-Theta Lens Protective Crystal

Step 3 – Cleaning of Nozzle Ring Covering Protective Crystal



The following steps are often carried out at a point of build set up, after the first layer of powder is set up so the lens is clean of any powder before starting the build. The protective crystal is placed in this case after a protective ring. This ring has to be extracted and cleaned, before doing the cleaning of the crystal.

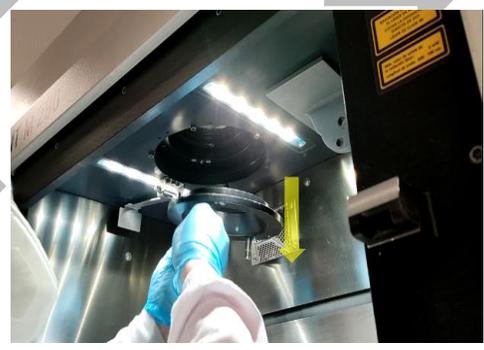
- 1. Open Process Chamber
- 2. Take the protective ring with two hands
- 3. Turn the protective ring anti-clockwise
- 4. Protective ring is out



EOS M280 F-Theta Lens Protector
Crystal Protective Ring



Removing Protective Ring



Removing Protective Ring



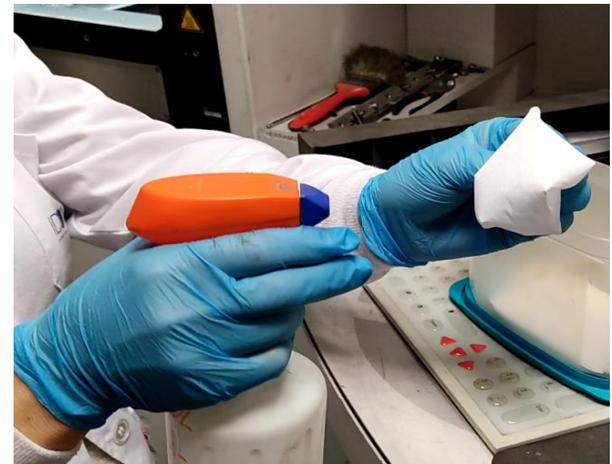
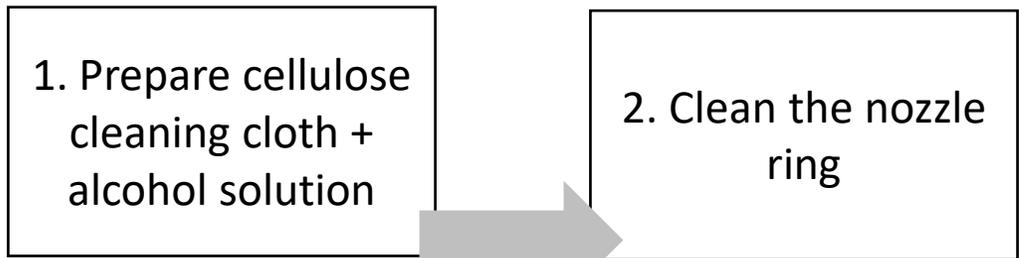
Removing Protective Ring

Cleaning of the F-Theta Lens Protective Crystal

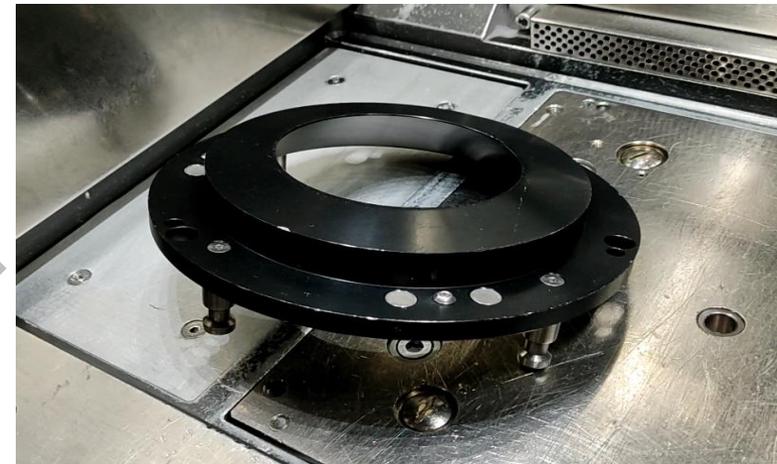
Step 4 – Cleaning of Nozzle Ring Covering Protective Crystal



To clean the protective ring use an alcoholic solution >99,9% (e.g. isopropanol).



Soaking cellulose cleaning cloth with an alcohol solution



Cleaned Nozzle Ring



Cleaning of the F-Theta Lens Protective Crystal

Step 5 – Checking and Cleaning Protective Crystal



When the protective ring is extracted, the protective crystal will be exposed and ready for its cleaning. A new cleaning cloth will be prepared. Using lint free lens paper and isopropanol clean the protective lens covers in the process station in a spiral motion starting from the centre of the glass. Ensure there is no powder residue on any of the lenses. Don't use the same cloth that was used to clean the protective ring, prepare a new one!

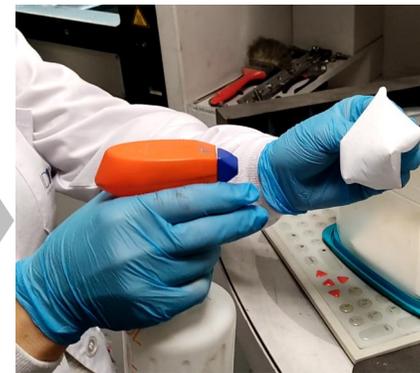
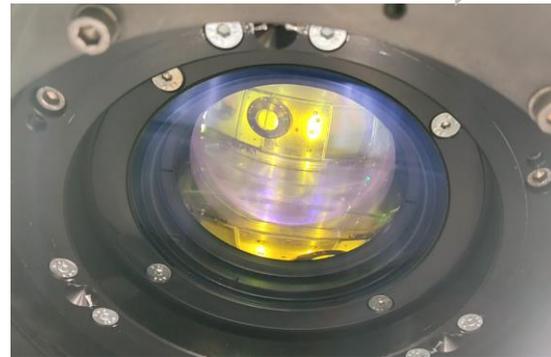
- 1. Check protective crystal integrity
- 2. Prepare cellulose cleaning cloth + alcohol solution
- 3. Clean the protective crystal



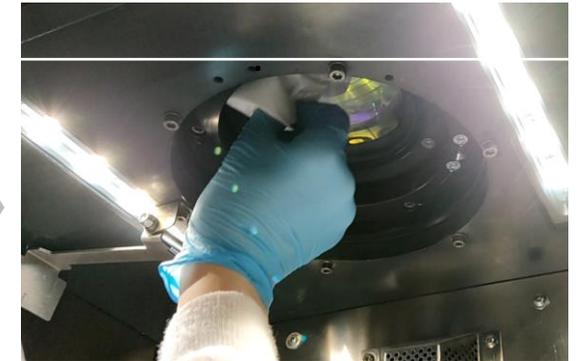
Clean the protective crystal as stated in the manufacturer's manual. Special cloth needs to be used and crystal needs to be cleaned in a specified motion to prevent scratching the lens



EOS M280 F-Theta Lens Protector Crystal



Cleaning of the Theta Lens Protector Crystal



Cleaning of the F-Theta Lens Protective Crystal

Step 6 – Putting Back Nozzle Ring Covering Protective Crystal



When the crystal is clean, the protective ring can be put on its place again.

1. Take the protective ring with two hands

2. Turn the protective ring clockwise against its housing

3. Protective ring is put back



Putting back nozzle ring covering protective crystal

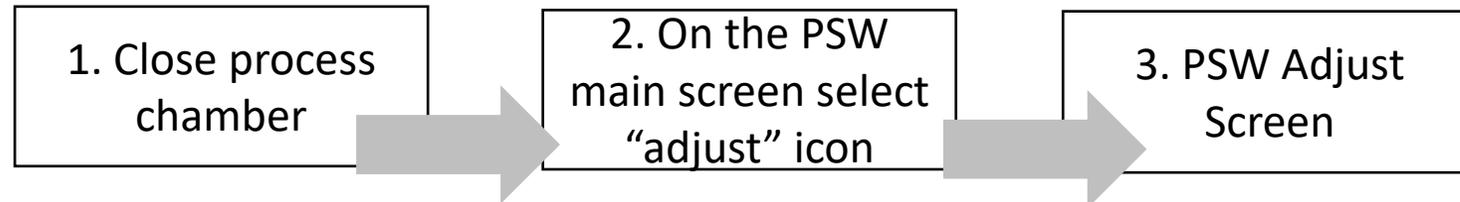
Cleaning of the F-Theta Lens Protective Crystal

Step 7 – Re-connecting Gas Supply

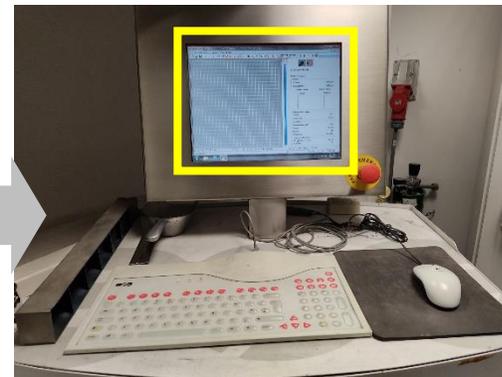


The blowing system can be switched on again.

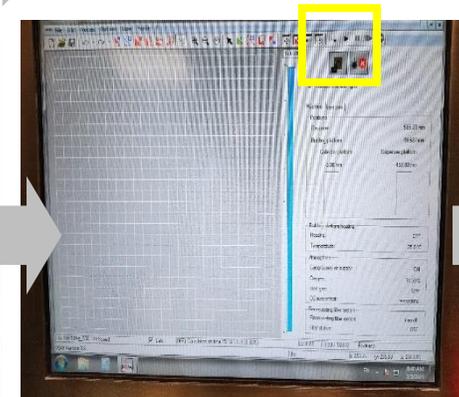
Close the process chamber doors and turn “Compressed air supply” and “Lens cleaning nozzle compressed air” options.



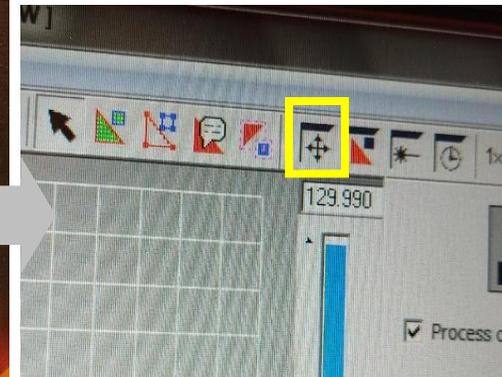
EOS M280 Process Chamber



EOS M280 HMI



EOS M280 HMI – Adjust Icon



Cleaning of the F-Theta Lens Protective Crystal

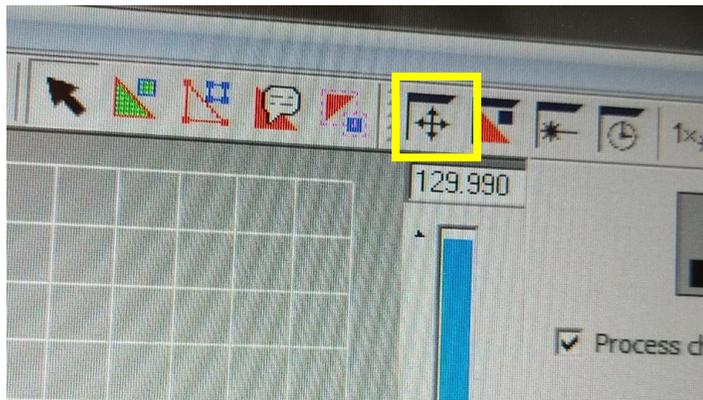
Step 7 – Re-connecting Gas Supply



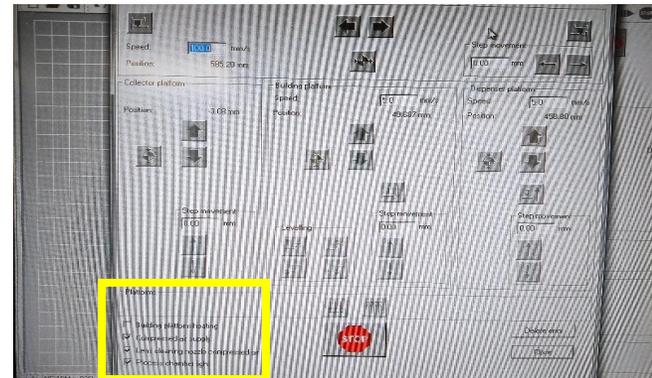
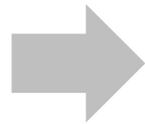
The blowing system can be switched on again.

Close the process chamber doors and turn “Compressed air supply” and “Lens cleaning nozzle compressed air” options.

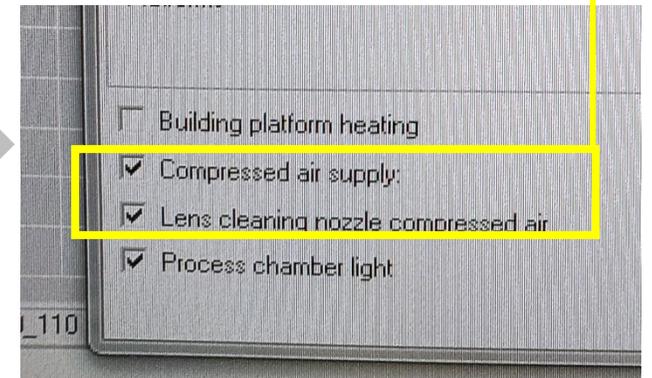
4. PSW Adjust screen select: “Compressed air supply” & “Lens cleaning nozzle compressed air”



EOS M280 HMI – Adjust Icon



EOS M280 HMI Adjust Screen



On EOS M280 HMI Adjust Screen Deselect the Following



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Any questions?

Thank you!

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