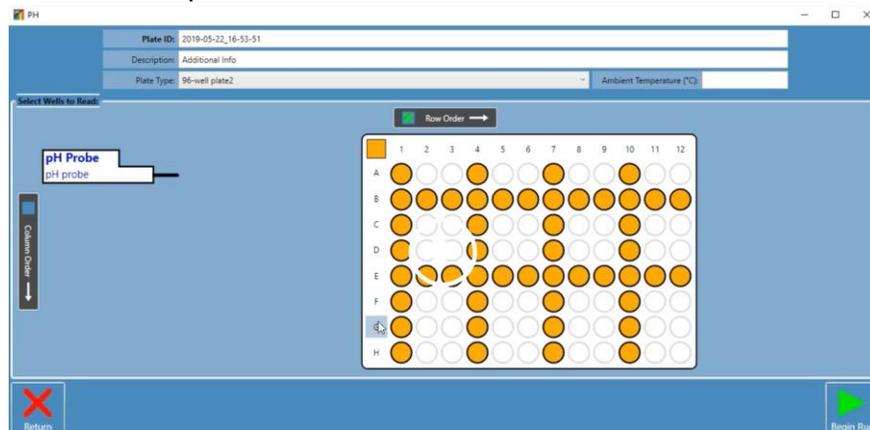


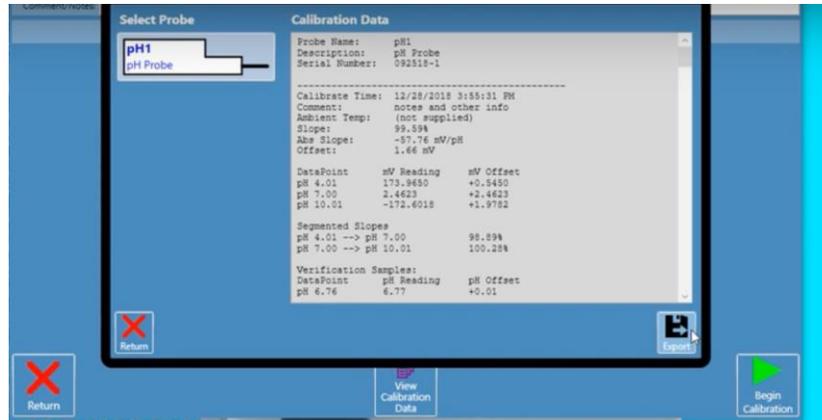
Similar automation process:

- Rapid_pH device: [\[1\]](#)[\[2\]](#)[\[3\]](#)

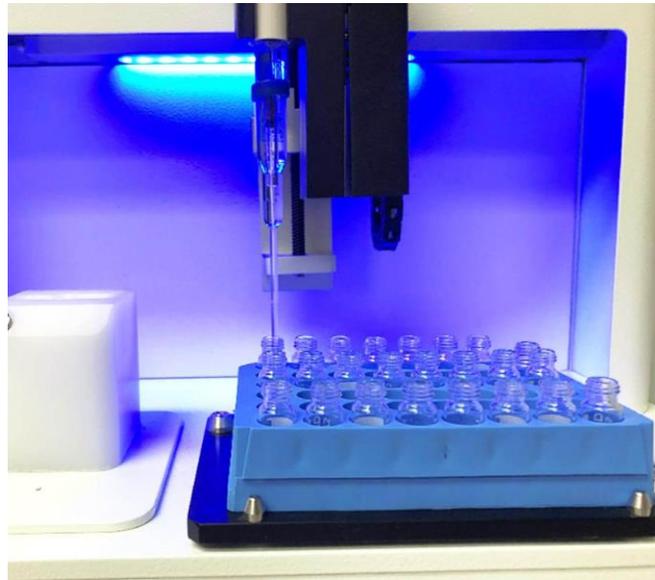


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- It uses a Mettler Toledo Micro probe when not in use,
- The robot moves linearly in distilled water to clean the probe,
- There is a section for blowing air to dry the probe,
- There is a matrix of vials, and for measurement, the robot moves linearly to insert the probe in a vial.
- There is an easy-to-use GUI very similar to no-code software. At first, the size of vials is selected, then by clicking on each graphic vial, the user can determine which one should be used for calibration and which one for measurement. Also, the user can add the pH value for calibration vials.





- The prob has a Cartesian motion in XYZ without angles.
- The gripper has a fixed design:

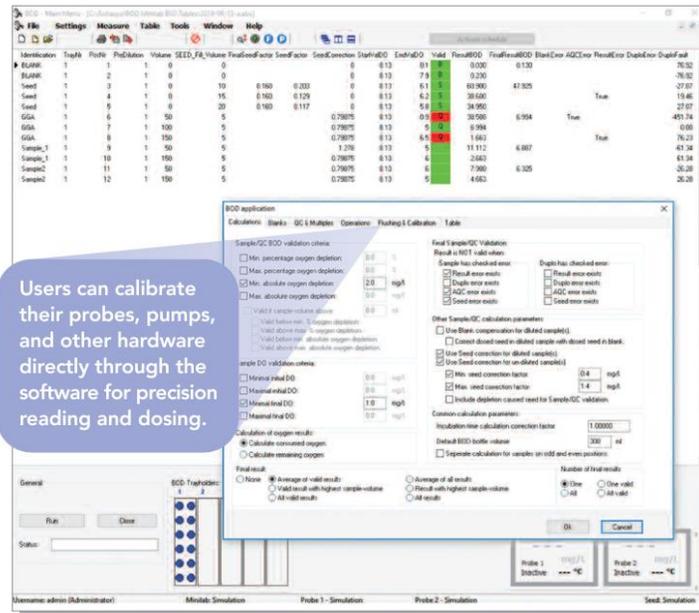


- Minilab automates pH: [\[1\]](#) [\[2\]](#)
 - The device has a Cartesian design (XYZ without Euler angles)



- It can work 24/7

- The software is available for controlling, calibration and measurement



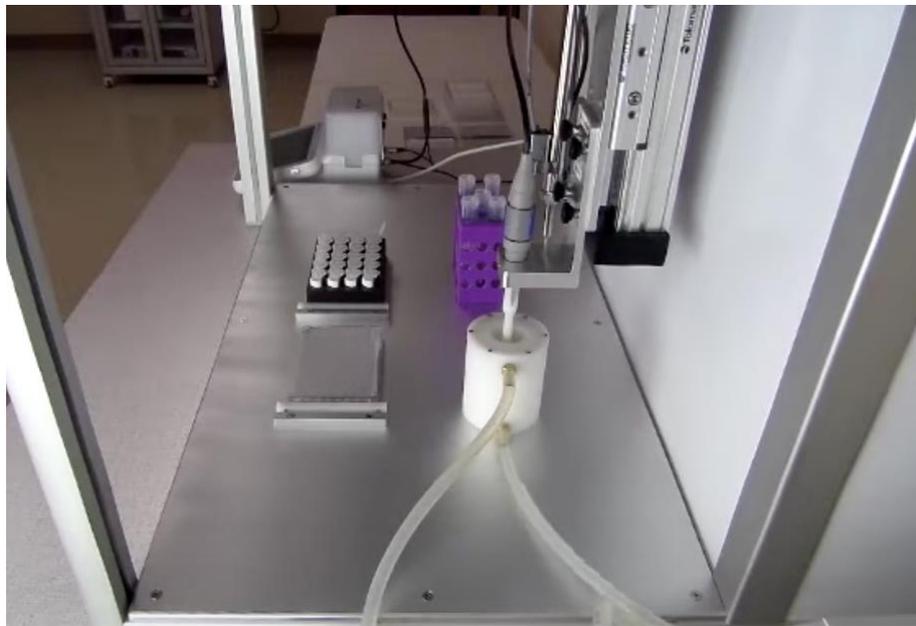
- Skalar device:

- It has linear motions in XYZ with a fixed perpendicular angle.
- It has its own software, and data can be imported or exported via Excel format
- The gripper design:

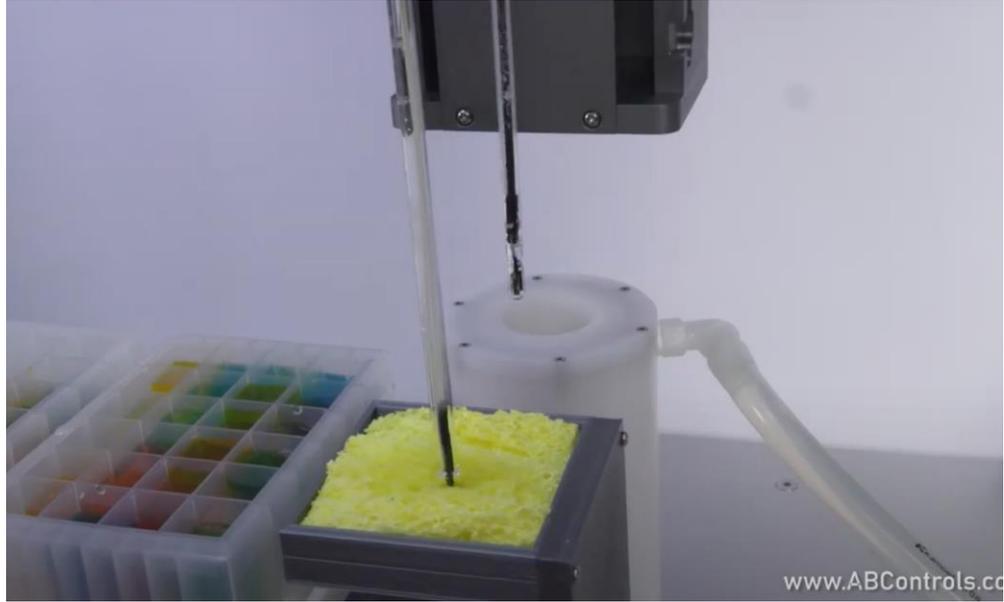




- - A sample pH device: [\[1\]](#)
 - The process of washing and drying is automatic
 - Automatic opening and closing of lids (like colour pots in ex company)
 - XYZ linear motions



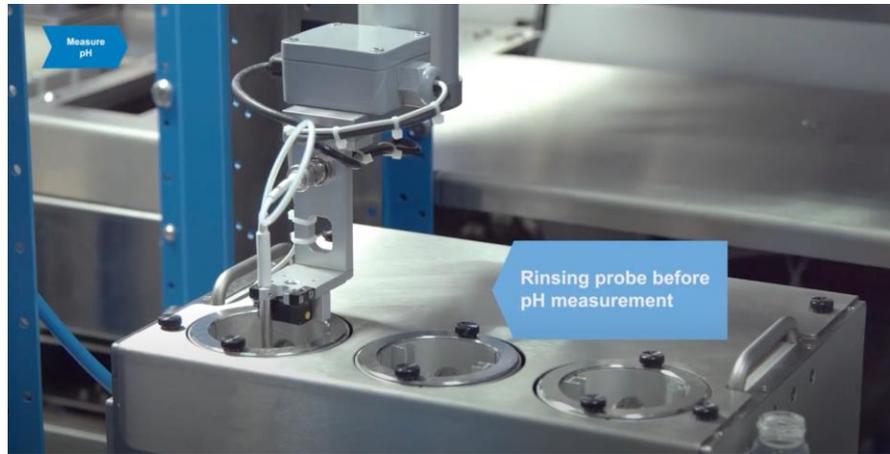
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- [Ref:](#)
 - Considering a design of rotation for vials



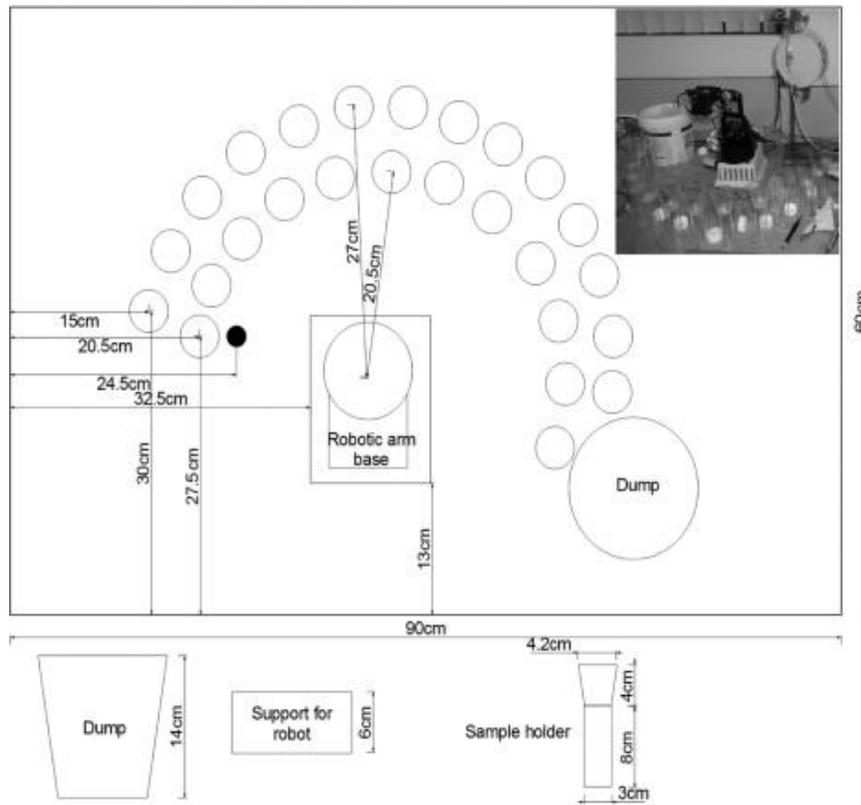
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- [Ref:](#)
 - Similar to drag-and-drop software
 - Cleaning and drying in a special place:



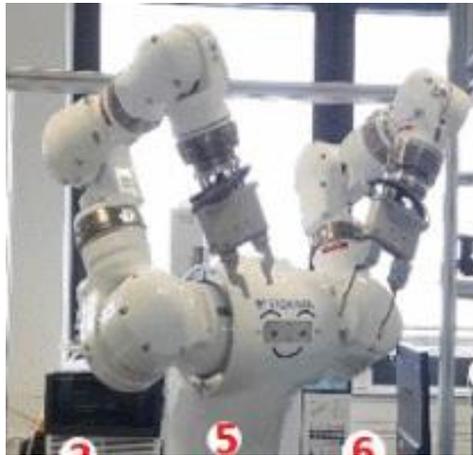
- Measuring pH by shaking in the vial



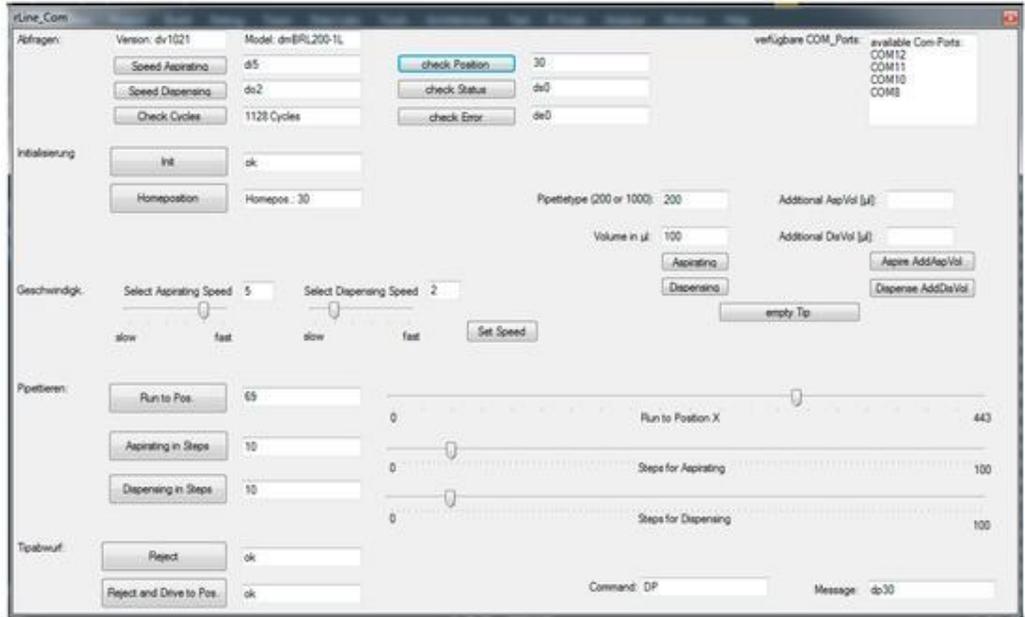
- [Ref:](#)



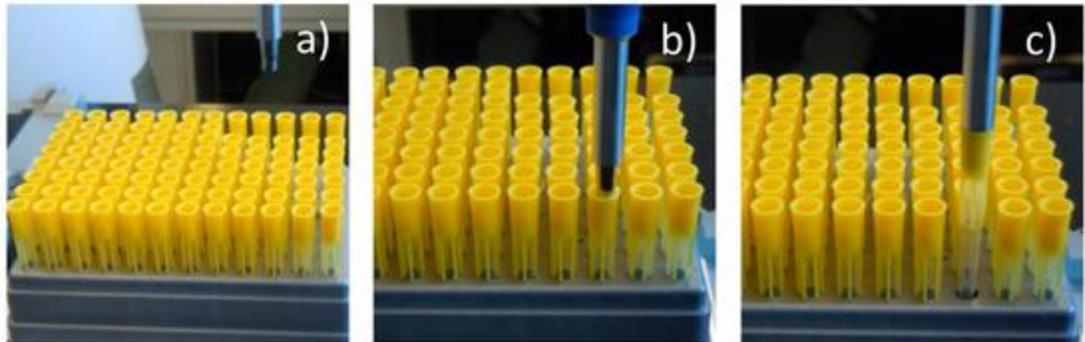
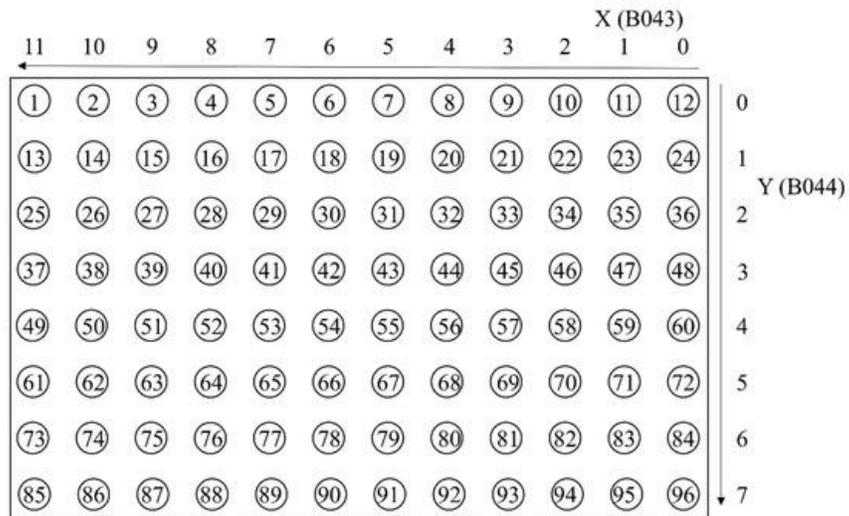
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- Ref [\[1\]](#) [\[2\]](#)
 - Using a dual-arm robot.



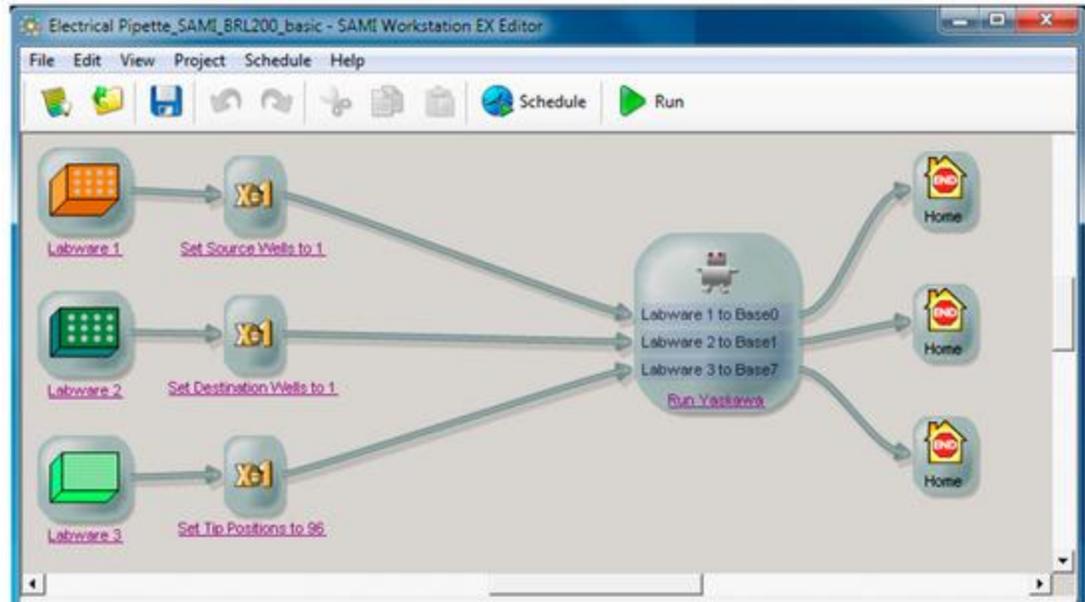
- Using a GUI:



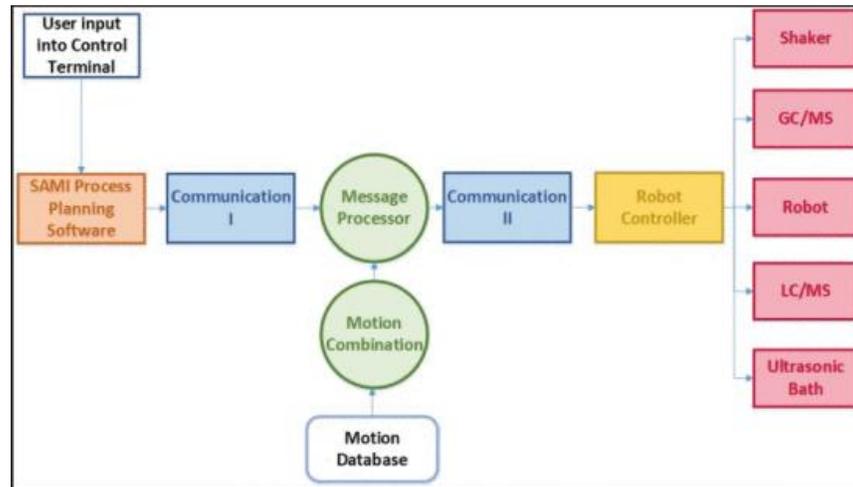
- o Arrangement of pipette:



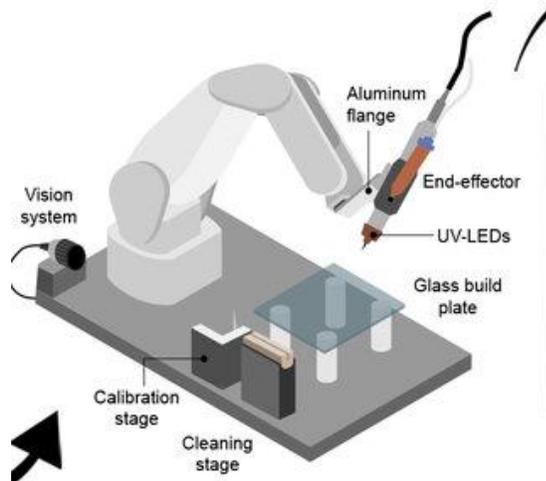
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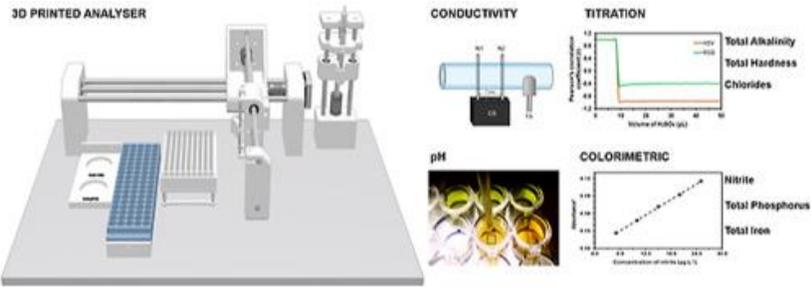
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- Architecture:



- Some gripper designs:



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○ [Ref:](#)

