Sample Cell Troubleshooting Guide and Additional Information

- **Polarimeter TempTrol Temperature problems**
  Placement of TempTrol Cell: Make sure the sample cell TempTrol surface is flat against the Polarimeter's TempTrol Trough Surface.

  Damage to the TempTrol Surface: Make sure both surfaces free from damage.
  Surface pitting can be caused by 6M HCl.

  Dry Surfaces: Make sure both surfaces are dry; sample does not remain on the outside, cell is not leaking.

  Any gap allowing space between the surfaces will interfere with temperature control.

- **Sample Rotation/Measurement Result not as expected**
  Cell Assembly: Sample Cell must be assembled in the proper order. See diagram SD00121 below. End Glass not properly assembled will interfere with the sample cell length and will affect results.

  End Glass/Washer Consumables: Glass must be clean. Glass should regularly be cleaned or replaced. Dirty glass reduces light reaching the detector and can cause Birefringence, adding noise to optical rotation measurement result.

  A demonstration of Rudolph Sample Cell Cleaning can be found on our website:
  https://rudolphresearch.com/videos/rudolph-polarimeter-cell-cleaning/

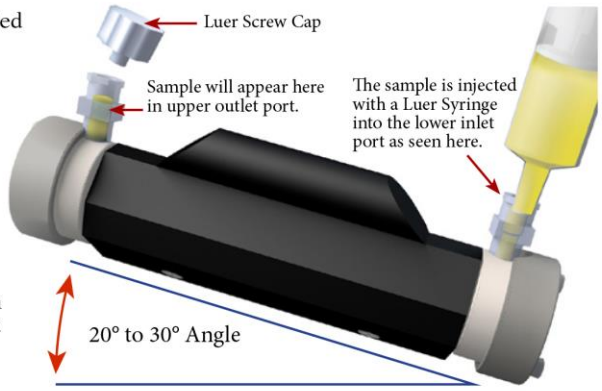
How to fill cells manually

Designed for syringe loading

Rudolph Research Polarimeter Sample Cells are designed to be easily filled and cleaned with a Luer syringe.

When held at the correct angle and filled using the lower inlet port, the cell is filled with almost no possibility of leaving an air bubble in the cell. Filling from the lower inlet port forces any air bubbles up and out of the upper outlet port.

Rudolph cells are unlike other manufacturers cells as they are uniquely designed to keep small air bubbles out of the light path. Filling the cell is as simple as holding the cell at a slight upward angle and filling from the bottom inlet using a Luer Syringe. When the sample appears near the top outlet port, simply place the Luer cap on the upper port and then lower port. Your cell is now filled, capped and air bubble free. Cells must be clean and dry to ensure proper filling with minimum sample.



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Cleaning Instructions and Ordering Information

Use of Strong Acids or Bases:

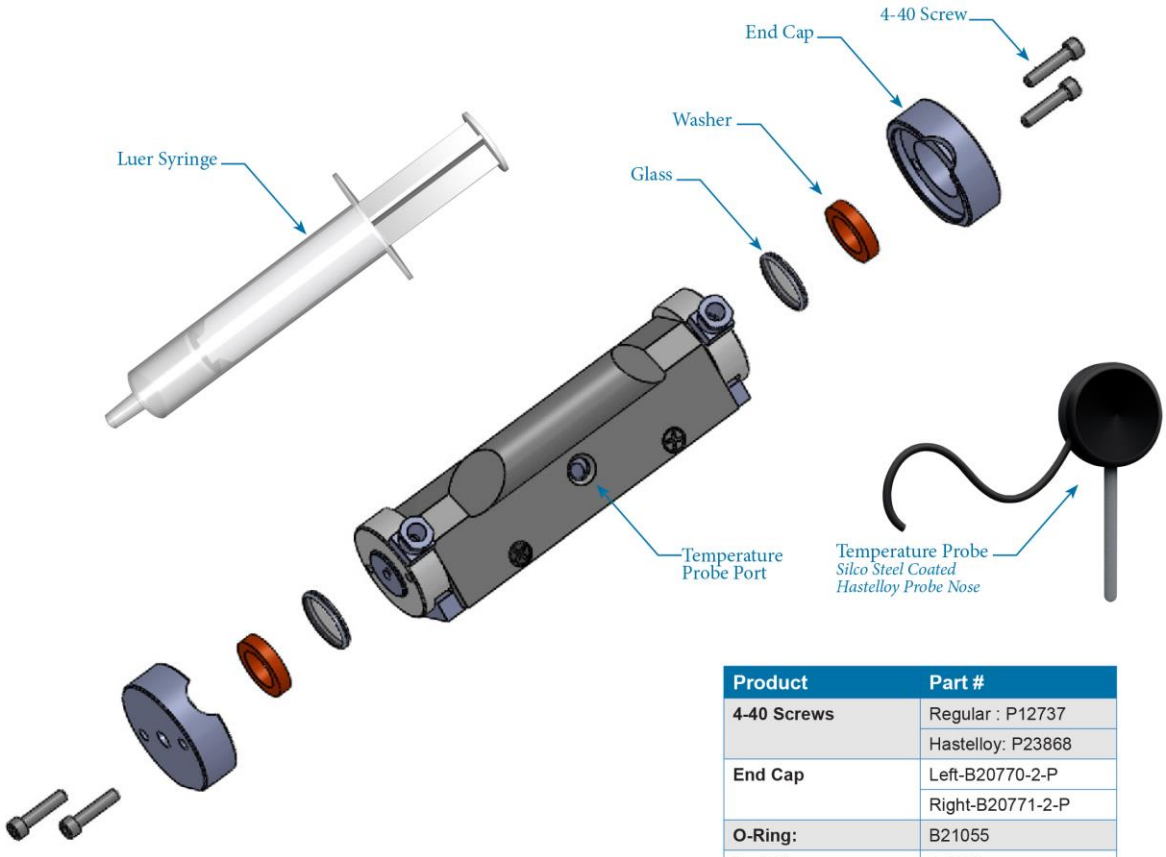
If 1-6 Molar HCL is used please make sure your cell is made with Hastelloy indicated by a dash "H" at the end of the part number. In addition the Simplified Cleaning procedure should involve water and a base to neutralize the acid. Cleaning should be done twice to ensure all acid is neutralized. Advanced Cleaning should be done regularly.

Simplified Cleaning Procedure:

Step 1: Flush cell with solvent i.e., Acetone, Alcohol, DSMO or similar solvent through inlet or outlet port.
Step 2: Dry with compressed air (nitrogen) through inlet or outlet port.

Advanced Cleaning Procedure:

Note: This cleaning method is only necessary when the simplified Cleaning Procedure still results in residue left by the solute. The frequency of this level of cleaning will be determined by each customer's unique application i.e., use of 1-6 HCl should result in daily or weekly advanced cleaning.
Step 1: Remove (4) screws at ends of tube using allen wrench provided.
Step 2: Disassembly cell ends
Step 3: Clean "wetted" pieces with Acetone, Alcohol, DSMO or similar solvent. Dry with lint free paper.
Step 4: Reassemble cell ends and tighten screws with allen wrench provided.



Product	Part #
4-40 Screws	Regular : P12737
	Hastelloy: P23868
End Cap	Left-B20770-2-P
	Right-B20771-2-P
O-Ring:	B21055
End Glass	A1280
Syringe	P20324
Temperature Probe	A20720

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Overtightening of parts:
a) Finger tighten the sample cell end caps, luers, or connections. Over tightening may cause stress on the end glass, causing birefringence, which may affect optical rotation measurement results.
b) Overtightening connections and luers can cause damage to the cell, resulting in leaking.

Polarimeter Cell Length Settings: Polarimeters with the option to set cell length should be set properly:
a) Optical Rotation Cell Length and b) Multiplier set accordingly.

Dark Sample: If the sample is dark, it makes it difficult for the light to pass through.
1) Dilute the sample; 2) Use a shorter pathlength sample cell; 3) Remove turbidity by additional filtering; 4) Check lamp for proper emission using trough target.

Temperature Correction: Temperature Correction should be off for measuring samples. Temperature Correction to Quartz or Sucrose should only be turned on when verifying optical rotation with a Quartz Control Plate or Sucrose Standard.

Compressed Air: Drying the assembled sample cell with compressed air overtime may affect the washers. It is suggested that End Glass or Washers be replaced periodically if regular cleaning on unassembled sample cells is not performed.

Sample Cell Filling: It is very common for people to try to fill the cell using a pipette and the cell is not designed to be filled with a pipette. Using syringes and properly filling a cell will eliminate the possibility of air bubbles entering the cell and causing inconsistent readings and dark sample readings. Use a syringe or the Mobile Fill Station for sample cell filling.

We recommend filling the 40T sample cells with syringes and capping the cell.
It is also important after filling the cell to cap both ends of the cell. The key to filling the cell is to ensure that there is no air in the syringe, just the liquid to be measured. Place the syringe into the luer tip nose, fitting it tightly into the luer inlet, hold the cell on a 30° angle with the open luer facing the ceiling. Inject the sample slowly into the cell until there is a small amount of the liquid showing in the luer inlet facing the ceiling. Put a twist cap on the end without the syringe, remove the syringe from the other luer inlet by twisting it counter-clockwise and twist a cap on that end. The cell is now ready for the instrument. It is also important that no liquid has spilled outside the cell and that the end glass windows are clear of liquid.

Sample Volume-Bore Size
Choosing a sample cell with a smaller bore size will concentrate the beam of light; therefore, a smaller volume of sample is required.

A demonstration of Rudolph 40T Cell Filling and use can be found on our website:
https://rudolphresearch.com/videos/how-to-make-a-measurement-with-a-rudolph-research-autopol-polarimeter/

A demonstration of Rudolph Sample Cell Cleaning can be found on our website:
https://rudolphresearch.com/videos/rudolph-polarimeter-cell-cleaning/

A demonstration of Rudolph of the Mobile Fill Station can be found on our website:
https://rudolphresearch.com/videos/polarimeter-cell-fill-station/

The Rudolph FillStation™

Fill Rudolph Polarimeter Cells reliably outside of the instrument

How to use the FillStation™

For users who prefer not to hold the cell while working with highly acidic or basic samples, the Rudolph Cell FillStation™ is simple and easy to use, just follow the steps below:

1

By design, the FillStation™ will hold the cell at a suitable angle.

2

Place a 2.5mm or 5.0mm bore Polarimeter cell into the Rudolph FillStation™.

3

Turn the FillStation™ light on. The light will turn off automatically after a few minutes.

4

Make sure the cell is always clean and dry. Use compressed air and acetone for this process. Fill the cell from the lower inlet port with a Luer Syringe only.

As the cell becomes filled and sample begins to appear at the upper inlet, cap off the upper, then lower inlet port. Your cell is now filled and air bubble free.

5

The FillStation™ creates a light image that will go from darker to a bright white circle when the cell is filled and air-bubble free. A bubble free cell shows an illuminated white circle as shown on the right.

Please Note:

Filling a Rudolph Polarimeter cell is easy and you can be assured of an air bubble free sample cell. It is important to note that when using highly acidic or basic solutions samples the cell should not be filled in the Polarimeter, doing so may allow spillage into the instrument which over time may damage the instrument.

The Rudolph Polarimeter Cell FillStation™ accessory is available for all Rudolph Autopol Polarimeters and included free of charge with Autopol V, Autopol V PLUS, and Autopol VI Polarimeter Models.

Reading Your FillStation™

Today's laboratories and cGMP procedures demand that noxious fumes, strong acids and other caustic materials are filled in a designated safe area where a fume hood is used and there is minimal operator exposure. Instruments are now located in clean areas or a laboratory separate from the wet area. Rudolph addresses these concerns with its FillStation™ so that cells can be easily filled and capped inside the safe wet area.

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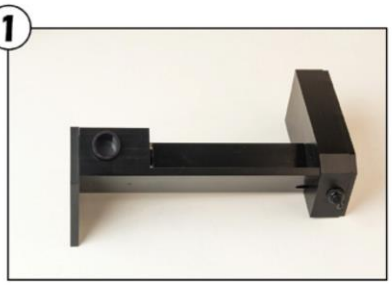

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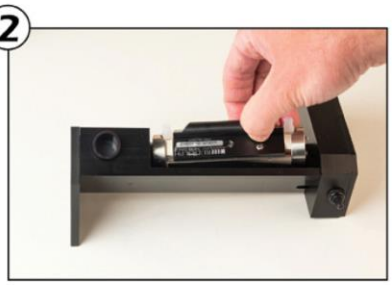

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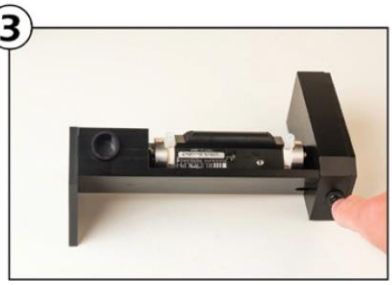

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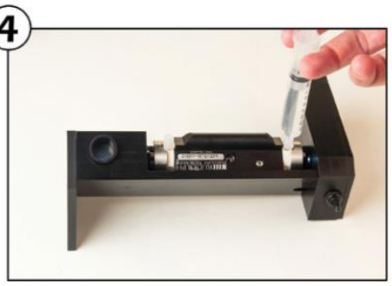

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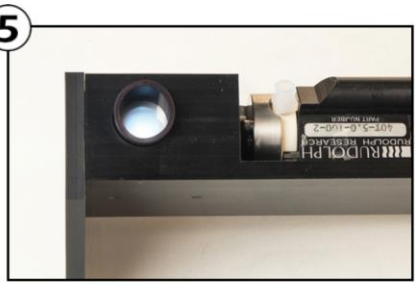

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Reading Your FillStation™

Empty Cell

Cell Being Filled

Air Bubbles detected during filling process

Cell filled and free of air bubbles*

Use with Acidic and Strong Base Solvents: Using our standard 40T Sample cells for strong acids and bases will reduce the lifetime of the cells and cause various types of discoloring including blackening of the stainless steel. Our standard cells are made with 316 stainless and will react with HCL.

For 1M-6M HCl applications, as well as samples with strong base solvents or Riboflavin, we recommend our Ceramic Cells. However, the cell must be properly cleaned and maintained to protect the investment of the cell. Some of our high volume users, who use 6M HCl for their peptides and amino acids on a daily basis, and do not have a dedicated regimen of cleaning and neutralizing, replace their 316 stainless cells on a yearly basis. Customers who are less frequent HCl users and have a regimented clean and neutralizing process seldom replace their cells. **Acid resistant does not mean acid proof**. A selection of additional Ceramic TempTrol Sample Cells are available.

It is important to remember that only the wetted parts of the sample cells are resistant to acids and bases – those parts designed specifically to have direct contact with the sample. This does NOT mean the entire assembly is resistant. *Care must be taken to properly fill the cell, neutralize the cell, and clean the cell to protect the sample cell and prolong the life of the sample cell.*

If the cell TempTrol passive surface which has a protective coating is exposed regulary to HCl, a black discoloring of the cell may occur. This should not interfere with the TempTrol Temperature Control, as

long as the procedures are followed properly in respect to the TempTrol surfaces being clean and the cells properly placed against the cell chamber TempTrol surface.

Rudolph's Lifetime Warranty on Stainless Steel, 40T, 41T and 60T style cells is documented in our Warranty Policy, CD00083. Highlights are as follows:

- If stainless steel or 40T/41T cells are dropped or mishandled and result in damage, Rudolph will repair or replace under warranty. This warranty is only against breakage and manufacturing defects.
- Our quotes refer to lifetime warranty against breakage and that breakage can be due to mishandling. However, Rudolph does not cover damage to cells caused by the use of incompatible acids or bases.
- Ceramic Quartz style cells are the only cells that have a lifetime warranty due to mishandling and wetted parts exposure to strong acids or bases.

The sample cell must be sent to the Factory for Warranty assessment and repair. Please contact Factory for Return Material Authorization Number (RMA).
http://rudolphresearch.com/resources/service

Depending on the condition of the sample cell, we may be able to offer a refurbishment service. To arrange for an evaluation, please let us know and we can provide an RMA for the cell's return to Factory for evaluation.

Reference Documents to supplement this Information:
SD00121 Sample Cell Cleaning and Assembly Instructions
CD00083 Warranty Policy

Rudolph Research Analytical Service Guarantee

The Rudolph Service Pledge:

Earning your loyalty everyday, through our commitment to exceptional service and attentive customer focus.

Integrity, Quality, and Innovation with a Global Reach.

Rudolph Research Analytical manufactures automatic Density Meters, Refractometers, Polarimeters, Saccharimeters and Automation Solutions for a wide variety of industries. With over 8,000 laboratory instruments installed in demanding applications worldwide and thousands still in use which were manufactured in the 70's, 80's and 90's, Rudolph Research Analytical has established itself as a premier vendor well known for its quality, reliability and innovation.

Rudolph's entire line of instruments carry its exclusive 20 Year Service and Support Guarantee.

Rudolph Research Analytical offers a comprehensive range of Preventive Maintenance and Service Programs. Rudolph has demonstrated a commitment to its customers by keeping installed instruments operational, not only for 20 years, but in some cases for over 40 years. This long-term commitment to keeping our instruments running makes the cost of ownership, over the life of a Rudolph Instrument, one of the lowest in the laboratory market segment. At the date this document was published, there is no other laboratory instrument manufacturer guaranteeing service and technical support for 20 years.

Daniel Basaly, QC Manager at G & W Labs (Shown Center Left) in New Jersey, picking up his Rudolph Research Polarimeter manufactured in 1977.

Christina Says:
"Maximize your up time with a preventative maintenance plan designed for the way you work."

Heidi Says:
"Our Customer support team is dedicated to providing you with an exceptional customer experience."

Rudolph stands behind each instrument purchase with a 20 year support guarantee. Rudolph is still repairing instruments it manufactured in the 1970's.

Author: Richard Spanier
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