

KLA-4-TS
AUTOMATIC COLD FILTER PLUGGING POINT
ANALYZER WITH INTEGRATED PANEL PC

OPERATION AND INSTRUCTION MANUAL

REV A

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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing

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1. Introduction

The KLA-4-TS Automatic Cold Filter Plugging Point System with integrated panel PC is designed for use in the laboratory. What sets the KLA range apart from all competitive low temperature instrumentation is the cooling mode of the jacket.

In all other instruments existing on the market, the cooling is done through an external circulating bath. In an external circulating bath, a volume of medium (very often methanol) is cooled down with a coil. The gas running through this coil is compressed by either one or two stage compressors. The temperature of the gas decreases as it expands and the coils cool the medium. This medium is pumped to the analytical cell of the analyzer.

In the case of the KLA, the gas does not cool a medium, but directly cools the jacket (cooling cell). This unique system has several advantages:

- Requires less energy, Saving costs in electrical supply
- Less space taken by the assembly cooling unit / analyzer
- Fast cooling response. It takes approximately 15 minutes to reach about -60°C from the ambient temperature of +20°C. This allows the instrument to be powered OFF during the night.
- The start-up is very easy and requires only a 115/230V plug. There is no other fitting. This avoids the danger of pumping an inflammable fluid.

The KLA-4-TS conforms to the ASTM D6371 test method and related test specifications. This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Automatic Cold Filter Plugging Point Analyzer. This manual should also be used in conjunction with applicable published laboratory procedures. Information on these procedures is given in section 1.2.

1.1 Koehler's Commitment to Our Customers

Providing quality testing instrumentation and technical support services for research and testing laboratories has been our specialty for more than 50 years. At Koehler, the primary focus of our business is to provide you with the full support of your laboratory testing needs. Our products are backed by our staff of technically knowledgeable, trained specialists who are experienced in both petroleum products testing and instrument service to better understand your requirements and provide you with the best solutions. You can depend on Koehler for a full range of accurate and reliable instrumentation as well as support for your laboratory testing programs. Please do not hesitate to contact us at any time with your inquiries about equipment, tests, or technical support.

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1.2 Recommended Resources and Publications

1. American Society for Testing and Materials (ASTM)

100 Barr Harbor Drive West Conshohocken,
Pennsylvania 19428- 2959, USA

Tel: +1 610 832 9500

Fax: +1 610 832 9555

<http://www.astm.org>

email: service@astm.org

ASTM Publication:

- ASTM D6371: Standard Test Method for Cold Filter Plugging Point of Diesel and Heating Fluids

1.3 Instrument Specifications

Models: KLA-4-TS
KLA-4-TS(220)
KLA-4-TS/2
KLA-4-TS/2(220)

Electrical Requirements: 115V ±15% 60Hz
230V ±15% 50/60Hz

Temperature Range (Single Stage):	+30°C to -40°C
Temperature Range (Double Stage):	+30°C to -80°C
Dimensions: lxwxh,in.(cm)	26x24x31½ (66x60x80)
Net Weight:	176.5 lbs (80 kg)
Consumption:	2000 VA
Ambient Temperature:	5°C to 35°C
Admitted Moisture:	20% to 80 r.h.

1.5 Delivery Condition and Procedure of Instruments

Koehler Instrument Company, Inc. instrumentation is monitored according to our internal quality control procedures. Each component is tested for its specific function before assembling the instrument.

Once the instrument is assembled, it goes through a general functionality control test, to verify every device works properly in accordance with its expected functions.

Then the measurement devices are electronically calibrated according to the physical parameters that they must quantify and to the measurement scales defined for each application.

Finally the instrument is tested with a certified reference sample on the desired parameter. These tests are done according to our internal procedure. The test results are included in the manual delivered with the instrument.

The instrument is designed for the normalized methods where the nature of the product to be tested as well as the procedure to follow is clearly defined. The certified reference samples used for the final tests are in accordance with these methods.

We recommend performing the start-up only with one certified reference sample. Any discrepancy on the results found on other products must be done only on the basis of

certified reference sample. We kindly ask the customer to send us this sample with its certificate. Koehler Instrument Company, Inc. will immediately undertake an act procedure for the control and, if necessary, the correction.

Instrumentation is tested in a laboratory where the ambient temperature can vary from +15°C to +25°C. The power supply is 115 Volts ±10%, Hot, Neutral, Ground, uninterrupted, without electrical noise and perturbation, equipped with ground fault intensity devices (15 ma).

1.6 Assistance

Koehler Instruments are warranted for 12 months for mechanical parts and 6 months for electronic parts, at the condition that the use and the handling for each instrument are respected.

During this period, assistance is provided free of charge upon our head office in New York or upon our agent, if one is available in your area.

In a case of assistance to a customer site, the customer will be responsible for the call cost and the traveling expenses.

The intervention costs, during the warranty period also, are subordinated to our availability and to the eventual spare parts.

WARNING: Any changes or modifications made on the instrument without our express authorization will CANCEL the warranty.

1.7 Packing and Shipment

The complete instrument is carefully and properly packaged by the staff of Koehler Instrument Company, Inc. The packing procedure conforms to the specific standards of the company. We adhere to the following procedure:

- The glass cell is disassembled and the instrument is packed in a wooden box filled with anti-shock polyethylene-foam.
- The instrument documentation can change from contract to contract; it is inside the box or in an envelope fixed on the box. The documentation includes: packing identification, usual documents, packing numbers, and the whole customer's address.

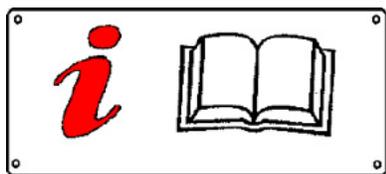
- The following information is written on the box:
 - Handle with care (FRAGILE).
 - The indication of the UP side of the box for a right handling of the box.
 - Total weight.

NOTE: The forwarder must take all the necessary actions to assure the stability of the shipment whatever is his speed, his accelerations, his direction changes and the journey characteristics. The forwarder must respect every note written on the packing.

It is important to ensure proper warehousing of the instrument in order to check if there is any deterioration before start up.

2. Safety Information and Warnings

General Safety Standards



It is essential to thoroughly read this manual in order to correctly and safely use the KLA-4-TS. Observe all safety standards and take note of the devices on the instrument to assure safe and successful use. Be sure only qualified staff use and handle the instrument. Before performing minimal handling or maintenance, then 115V/230V plug MUST be removed. The safety devices on the instrument must never be manipulated.

NOTE: In case of incorrect start up or inadequate use and handling, the person's safety will NOT be warranted. Koehler Instrument Company, Inc. declines all responsibilities for any incident or trouble resulting from operation inconsistent with intended use or in disregard to these instructions.

Safety Considerations. The use of this equipment may involve *hazardous* materials and operations. This manual does not purport to address all of the safety problems associated with the use of this equipment. It is the responsibility of any user of this equipment to investigate, research, and establish appropriate

safety and health practices and determine the applicability of regulatory limitations prior to use.

Safety Symbols Present on the Instrument



Symbol indicating danger due to electrical power ON.

Equipment Modifications and Replacement Parts. Any modification or alteration of this equipment from that of factory specifications is not recommended voids the manufacturer warranty, product safety, performance specifications, and/or certifications whether specified or implied, and may result in personal injury and/or property loss. Replacement parts must be O.E.M. exact replacement equipment.

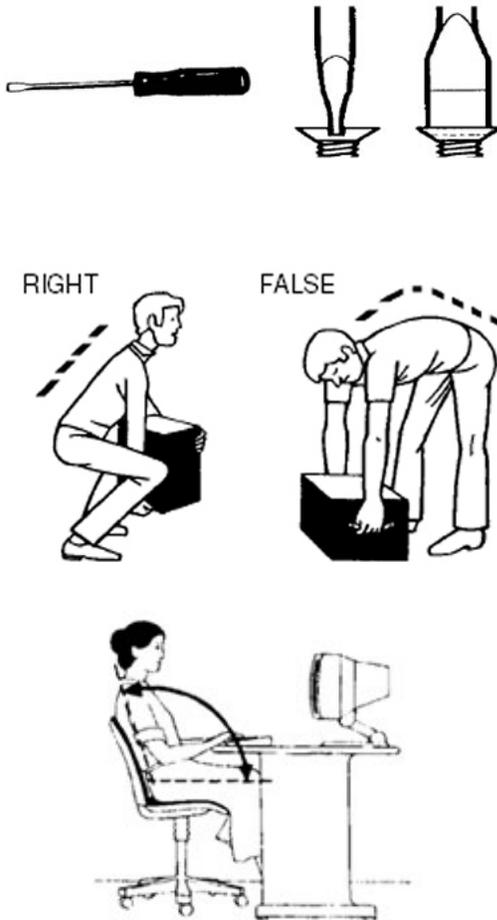
Unit Design. This equipment is specifically designed for use in accordance with the applicable standard test methods. The use of this equipment in accordance with any other test procedures, or for any other purpose, is not recommended and may be extremely hazardous.

Chemical Reagents Information. Chemicals and reagents used in performing the test may exhibit potential hazards. Any user must be familiarized with the possible dangers before use. We also recommend consulting the Material Data and Safety Sheet (MSDS) on each chemical reagent for additional information. MSDS information can be easily located on the internet at <http://siri.uvm.edu> or <http://www.sigma-aldrich.com>.

Conclusion of the Instrument Cycle. The instruments that Koehler manufactures do not include dangerous components. During Start-Up ensure that any operation of this instrument is performed by specialized and authorized companies. Claim copies of the prescribed authorization and keep them in appropriate records.

Assembly. Safety is very important during assembly and operation of this instrument.

Use only tools in good condition with insulating handles. Be sure there is a clear path when moving the instrument. The instrument must be placed on a strong support. The work position must respect ergonomics.



3. Getting Started

3.1 Packing List

The instructions for preparing the equipment assume that the user is aware of the contents of this document, which lists the warranty conditions and important precautions.

- KLA-4-TS CFPP Analyzer 115V/230V 50/60 Hz
- CFPP head
- Cord cable without plug
- Test jar
- Aspiration pipette with filter support

- KLA-4-TS-Manual KLA-4-TS Automatic Cold Filter Plugging Point Analyzer with Integrated Panel PC Operation and Instruction Manual

3.2 Unpacking

Carefully unpack and place the instrument and accessories in a secure location that will maintain an ambient temperature between 5°C and 35°C and relative humidity under 80% with a sufficient power supply.

Ensure that all parts listed on the packing list are present. Inspect the unit and all accessories for damage. If any damage is found, keep all packing materials and immediately report the damage to the carrier. We will assist you with your claim, if requested. When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment. Do not return goods to Koehler without written authorization.

4. Descriptions

4.1 Software Features

- User friendly interface
- Windows® based system
- Analytical progress and results recorded and stored
- Results Journal is accessible during analysis
- Analytical progress can be displayed in both graphical and numeric form.
- Customizable analysis parameters and methods
- Printable graph and results
- Self-identification of the typology of the analyzers connected
- Diagnostic panel with access to all inputs/outputs
- Built-in results browser
- Analysis results automatically saved in Excel® compatible format.
- Guided probe calibration in 3 easy steps
- Only a variable resistor calibration box needed
- Calibration data stored on hard-disk
- Last calibration date displayed for each probe.

4.2 Measuring Principle

According to the official method ASTM D6371 / IP 309 / EN 116.

Scope. This test method covers the determination of the low temperature operability

of distillate fuels (automotive diesel fuels and gas oils), including those containing a flow improving additive. The test may not be applicable to the determination of the low temperature operability of distillate fuels used in equipment with exposed paper filters in the fuel supply system.

Definition. The Cold Filter Plugging Point is defined as the highest temperature (expressed as a multiple of 1°C) at which the fuel, when cooled under the prescribed conditions, will not flow through the filter or requires more than 60 seconds for 20 ml to pass through or fails to return completely to the test jar before the next test step.

Summary of method. The fuel sample is cooled under specified conditions and, at intervals of 1°C, a vacuum of 20 mbar is then applied to draw the sample through a standardized wire mesh filter into the aspiration glass cell assembly. As the fuel cools below its cloud point, increasing amounts of wax crystals will be formed. These will cause the flow rate to decrease and eventually complete plugging of the filter will occur. If the sample takes more than 60 seconds to reach the higher barrier detector or the lower detector after a test, then the test is completed and the Cold Filter Plugging Point reached.

Test Procedure.

1. Pour filtered sample in the supplied glass test jar up to the level mark (45 ml). Fix the test jar to the head assembly.
2. Run the software and fill in the analysis parameters. Press the Start/Stop button. Follow the direction in the software when to lower the head in the cooling bath: the analysis will start.

The KLA-4-TS performs a preliminary aspiration test to see if all functionalities are correct: if the test is successful the analysis procedure continues.

The sample is cooled down until the temperature, selected as the first aspiration test, is reached. Then the first aspiration test is done. If the test is successful the KLA-4-TS will wait until the sample is cooled down by one more degree. Then a new test is performed.

The operation described above is repeated at 1°C intervals until the temperature at which either the sample ceases to flow through the filter or the pipette is not filled to the etched mark or fails to return completely to the test jar before the next test step. Upon test failure, the sample temperature is recorded.

If sample reaches -20°C before the test fails, the bath temperature will be controlled at the lowest reachable temperature.

Test Jar

- In accordance with the dimensions and volume specified in ASTM D6371/IP 309/EN 116 (CFPP)
- Level mark
- Small edge on the top part to fix the jar to the analytical head

Cooling Unit

- Integrated gas CFC free motor compressors:
 - Single Stage: Temperature down to -40°C
 - Double Stage: Temperature down to -80°C
- Equipped with over temperature protection

4.3 Instrument Controls and Connections

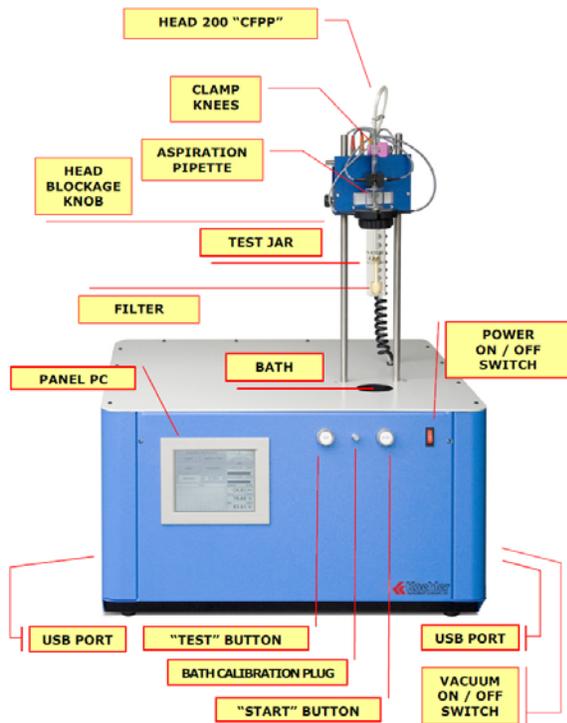


Figure 1: KLA-4-TS Control Descriptions

Connection Box:

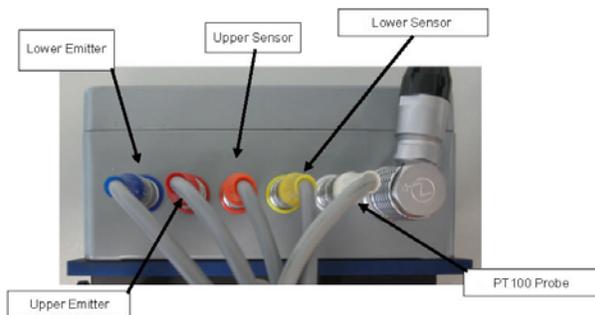


Figure 2: Cold Filter Plugging Point Connection Box Descriptions

4.4 Handling the CFPP Pipette

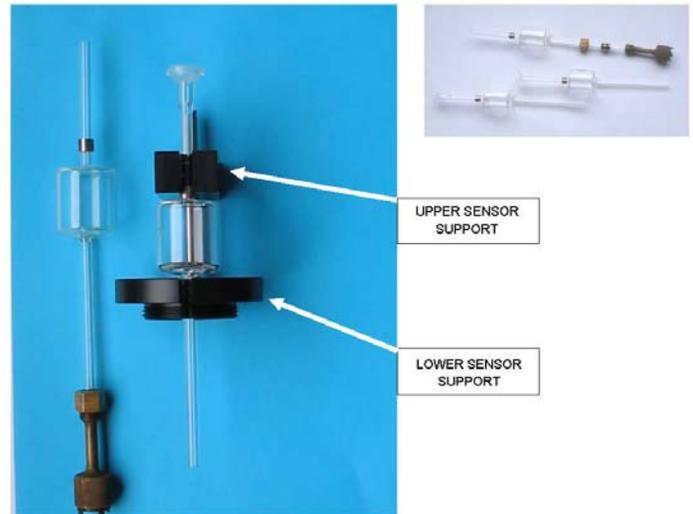


Figure 3: CFPP Pipettes with Supports (left) without Supports (right)

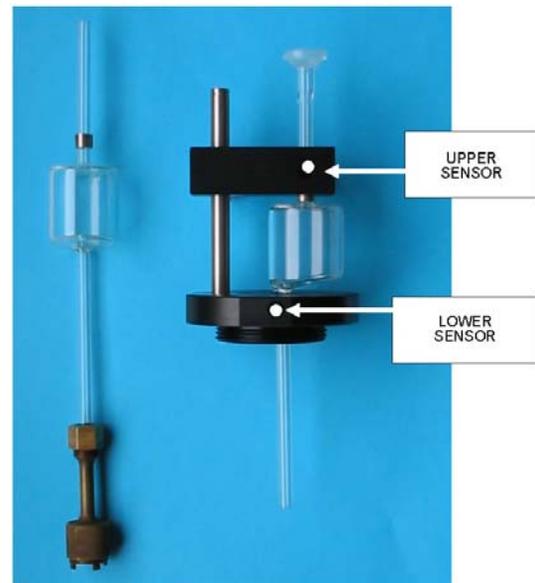


Figure 4: CFPP Pipettes Aligned with Sensors

Figure 4 shows the correct position of the pipette. Check that the glass tube of the pipette is aligned with the sensors. To install the pipette, refer to figures 5 through 7.



Figure 5: Step 1

1. Lift up the black support



Figure 6: Step 2

2. Gently place the pipette in the support.



Figure 7: Step 3

Lower the black support until it reaches the metal ring.

To remove the pipette:

1. Lift up the black support

2. Gently pull the pipette towards you.

5. Installation

5.1 Installing the Analyzer

1. Connect the cord cable 115/230V from the analyzer to a network in conformity with the specifications.
2. Switch ON the analyzer

5.2 Main Software Interface

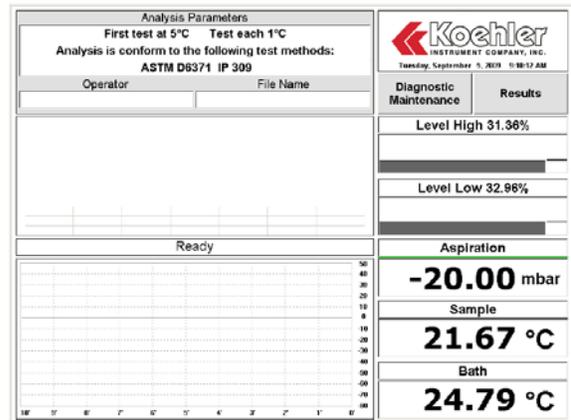


Figure 8: Main Software Screen

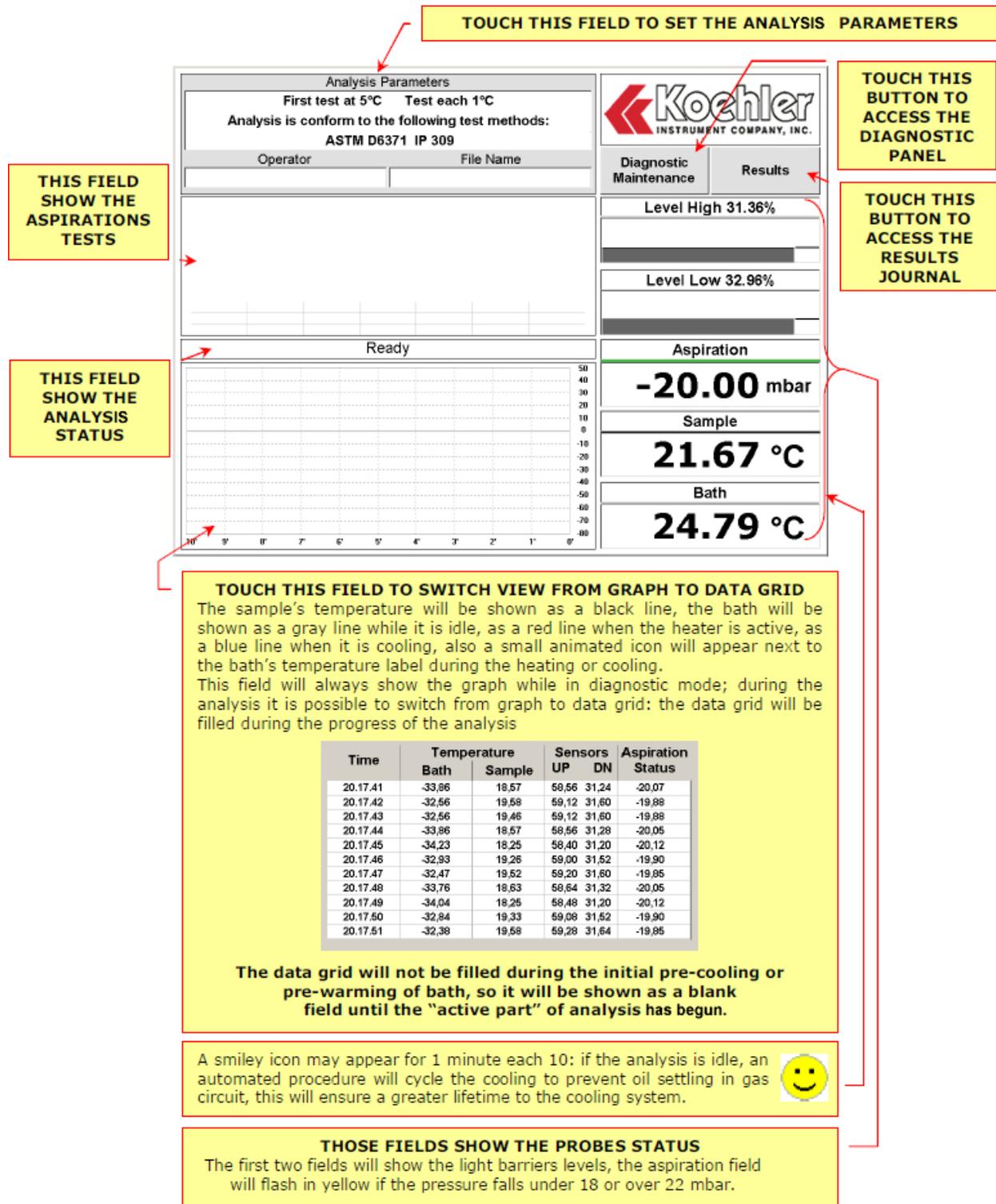


Figure 9: Main Software Screen Descriptions

Diagnostic Panel

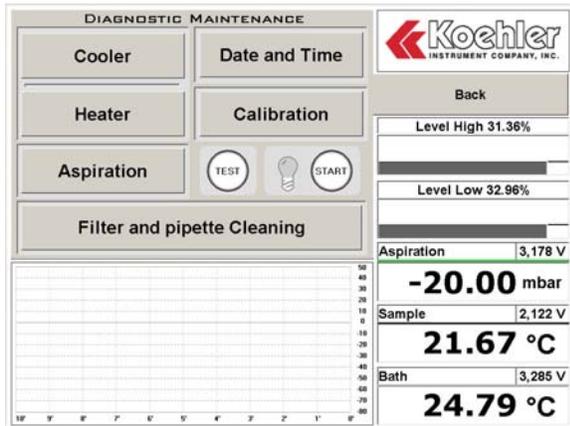


Figure 10: Diagnostic Panel

The Diagnostic Panel (Figure 10) is accessible only when the Analytical Head is not performing an analysis. The panels right side displays probe values. Click the square button on the right of each display to switch the value shown from the probe's temperature scale to a Volts scale for troubleshooting.

The **Bath** field allows to turn on/off the cooling or heating, note that they cannot be activated together, so by turning on the **Cooler** while the heater is active, then the heater will be automatically disengaged and vice-versa; since the instrument is equipped with a safety cut-off: despite the **Heater** status, the heating will be disabled if the bath reaches a temperature of 72°C or above.

The **Aspiration** button will engage the aspiration to the pipette.

WARNING: If the pipette has been filled by a very high volatile liquid (such as a solvent or cleaning liquid), unmonitored aspiration may cause the liquid to be sucked into the vacuum system, damaging the unit.

The **Filter and Pipette Cleaning** button will start an automated cleaning procedure, the cleaning fluid will be aspirated through the filter assembly into the pipette for 10 times: the procedure will check the upper light sensor in order to avoid the cleaning liquid to be sucked into the vacuum system.

The **Date and Time** button allows the user to change the date and time.

The round shaped **Test** and **Start** icons will show the analyzer's front panel button status, also by touching the **light bulb** icon next to the Start icon the Start buttons light will cycle on and off.

The **Calibration** button allows the user access to the Calibration Panel.

The **Back** Button will close the diagnostic panel.

Calibration Panel

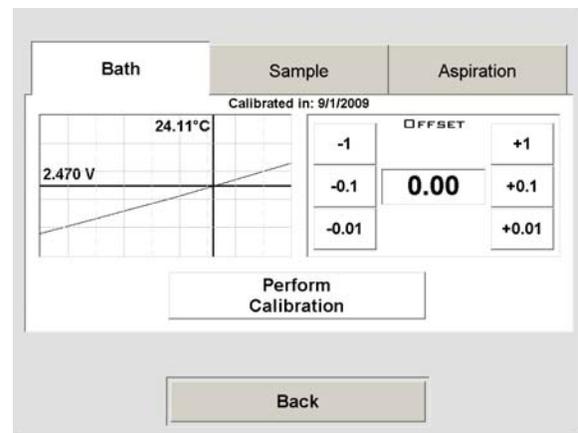


Figure 11: Calibration Panel

Three tabs located at the top of the calibration screen allow the user to select which probe to be displayed. The date of the probe's last calibration will be shown.

Once a probe has been selected, the panel will display the probe's calibration curve, the temperature and VOLTS signal read displayed in real time. Press the **Perform Calibration** button to perform the calibration of the selected probe, each calibration step will be shown in the screen as a guided procedure. The offset field allows for fine tuning of the calibration.

NOTE: If an offset has been entered, then the original calibration curves will be shown as a green line, the black line will move according the offset amount entered and the offset valued is applied in real time.

The **Back** button will close the calibration panel.

Date and Time Panel

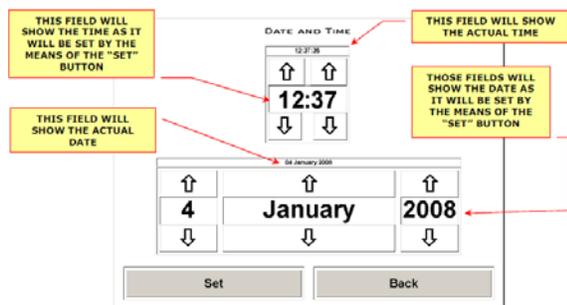


Figure 12: Date and Time Panel

By the means of the arrow buttons, the user may change the hour, minute, day, month and year; note that any change will be applied only by the means of the SET button.

The **Back** button will close the Date and Time Panel

5.3 Installing the External Vacuum System KLA-4-VPS (Optional)

The complete KLA-4-VPS vacuum generator system includes:

- Two glass bottles according to ASTM/IP/EN methods
- A glass cork with:
 - Flow regulating valve (manual)
 - Funnel
 - Connection to analyzer
 - Vacuum pump

No flow meter is necessary with the KLA-4-VPS. The vacuum is produced with the pump. Each bubble per second is equal to 3.5 L per hour. Adjust the flow rate with the regulating valve for the appropriate number of bubbles per second according to the test method.

No maintenance is required for the vacuum system.

Setup:

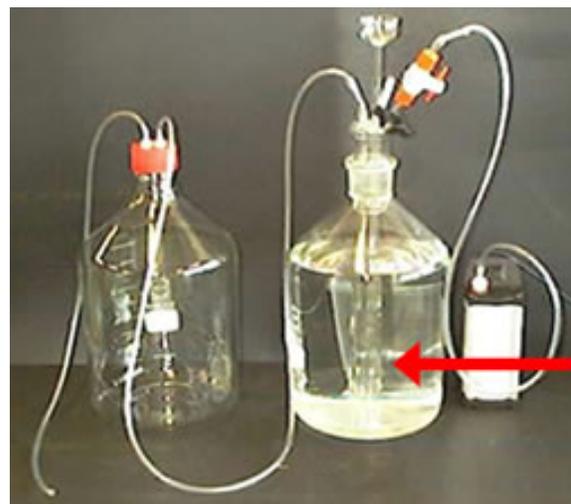


Figure 13: KLA-4-VPS Vacuum Generator System

1. Fill the bottle with approximately 4 liters of distilled water.
2. Fill the U-tube with distilled water up to the middle marks.
3. Insert the U-tube into the bottle.
4. Connect the vinyl tubes as shown in Figure 14.

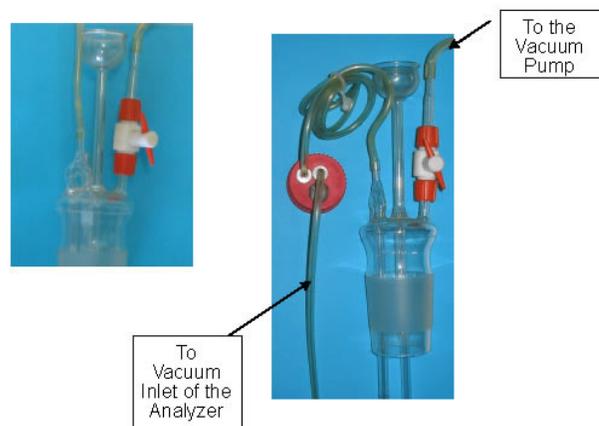


Figure 14: Vinyl Tube Connections

5. Please refer to Figure 15 for this step. Switch on the vacuum pump and check that the level of the water in the U-tube is correct. Column should reach the **F**, **A** marks. Fill the bottle through the **G** input.

NOTE: IT IS IMPERATIVE THAT THE LEVEL OF THE WATER IS REACHES THE F, A LEVEL MARK. IF IT DOES NOT, ADJUST IT BY ADDING OR REMOVING THE WATER FROM THE BOTTLE.

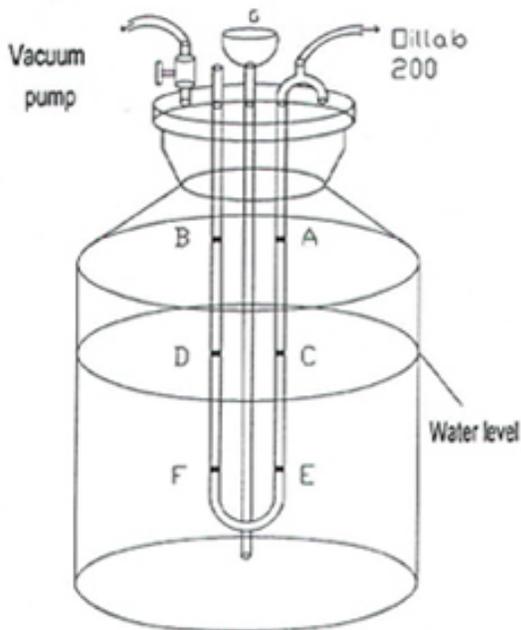


Figure 15: Schematic of System

6. Operation

6.1 Analysis Parameters

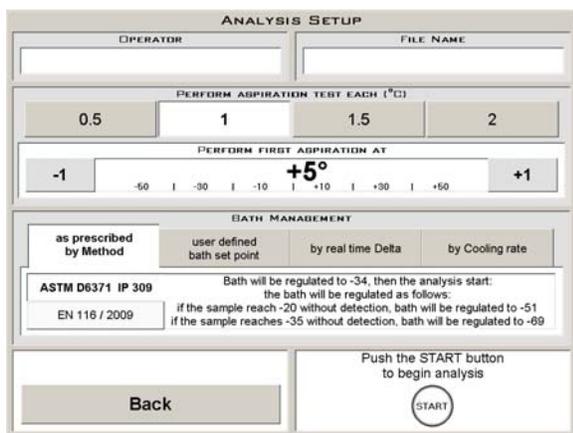


Figure 13: Analysis Parameter Set Up Screen

By touching the main screens **operator** or **file name** field a standard keyboard will appear on

the screen where the user can input the desired text and then push the OK button to confirm.



Figure 14: Keyboard Screen

The analysis will be saved according the text entered in FILE NAME field: by the means of the results browser, the text entered in this field will be shown next to the analysis completing time; so it is suggested to set as "file name" a clear refer to the sample's being tested, as example "Diesel 4 batch 1".

The 'Perform Aspiration Test Each' field provides four buttons to set the test interval: the official method requires to perform the aspiration each 1°C. The 'Perform First Aspiration At' field allows the user to choose when the first test should be done: the official method requires it to be performed 9°C before the expected result.

If the 'Bath Management' is defined 'as prescribed by method', the bath management will follow the procedure shown in figure 13 according the official methods ASTM D6371 and IP 309. By pressing the button 'EN 116 / 2009' the bath will then be set accordingly.

If the 'Bath Management' is defined as 'user defined bath set point', the bath will be controlled at the entered temperature until the sample reaches the bath's temperature plus 10°C, then the bath will be driven to the lowest temperature reachable.

If the 'Bath Management' is defined 'by real time Delta', the bath's temperature will be related to the sample's temperature, assuming a delta of 20°C with a sample temperature of 25°C, the bath will be controlled at 5°C, once the sample

reaches 24°C, the bath will be controlled at 4°C and so on, this analysis method can be useful to determine the behavior of the inner part of the sample when stored in large tanks.

If the 'Bath Management' is defined 'by Cooling Rate', the bath's temperature will be decreased time by time: supposing a cooling rate is set to 10°C, the bath's temperature will be decreased by 1°C each 6 minutes so that the bath will be lowered by 10°C each hour; this analysis method can be useful to determine the behavior of the sample when stored in critical ambient conditions such for regions near the arctic circle where ambient temperature may drop 30°C in an hour.

The **Back** button will close the panel.

When the analysis parameters are set, the analysis could be started by means of the analyzer's START button on the front panel.

6.2 CFPP Analysis Step by Step

1. Open the Analysis Setup panel. Set all required parameters as well as the operator and file name fields (if left blank, the analysis is saved automatically and named with a progressive number, hour and date of analysis).
2. Check that the push button **START/STOP** is on **STOP** position: if not, the analysis panel will display a warning and will refuse to start an analysis until it is in the correct position.
3. Be sure that the vacuum generator is running and producing a vacuum of -20mBar.
4. Refer to the vacuum system installation section 5.3 in this manual if using the external vacuum system KLA-4-VPS(220).
5. Fit the filter assembly. The filter must be perfectly clean. Fill the test jar with fresh sample until the mark. Fix the test jar to the head assembly. **Do not lower the head assembly into the bath.**
6. Press the "**START**" button on the analyzer to begin the test. The software shows the progress of the analysis and sensors status.

7. The scrolling table will be display probe and sensor values as follows:

TIME: current time

BATH: temperature of the bath

SAMPLE: current temperature of the sample

SENSORS: Level optical sensor located at the top of the pipette

ASPIRATION: Vacuum pressure during aspiration. A letter may appear next to the value shown:

- a: aspiration test is in progress
- b: reflow is in progress
- c: check

8. Once the bath temperature has been reached, please follow the prompts on the screen.

The operator must check inside of the bath to make sure the spacer has been correctly placed. Lower head assembly into the bath then press the TEST button. Once this is complete, the message on the screen will disappear, then release the test button.

9. The first aspiration test will now begin. This test however, will produce no result. The purpose of this test is to ensure the operator that the analytical filter assembly has been set up correctly. During this initial test the pressure falls under the minimum acceptable value and the aspiration field may flash. This also is by design, to verify the aspiration sensors.
10. The sample will be cooled to the test temperature. Then the aspiration test will begin: the sample will be aspirated through the filter into the aspiration pipette.
11. If during the aspiration time, the sample takes less than 60 seconds to fill the aspiration pipette through the two light beams, it will be cooled to the next temperature step* and another aspiration test will begin.

*next step = last aspiration test temperature minus the interval set in the **perform aspiration test** each field.

12. If the aspiration time took more than 60 seconds, the analysis is complete: the temperature of the sample at the time of the beginning of the aspiration test will be recorded as the result value.
13. If the sample reaches the next temperature step before the reflow is complete, the temperature of the sample at the time of the last aspiration test will be recorded as the result value.
14. A message displaying the result obtained will appear on the display. Release the "START" button, pull up the analytical head out of cooling bath and remove the sample. **Do not forget to clean filter assembly, jar and pipette.**

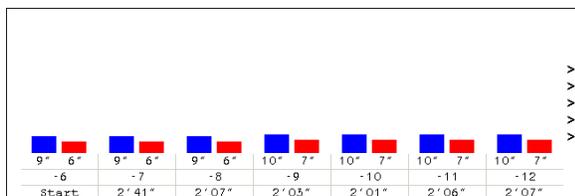


Figure 15: Sample Test Chart

15. The test chart (see Figure 15) will show the aspiration tests: the bars indicate the aspiration (blue) and reflow (red) time, if the reflow time is greater than 1min 20sec, a small arrow will appear atop the red bar.

The test temperature is shown under each test as well as for the time elapsed between each aspiration. In Figure 15 above, the 1st aspiration test was performed at -6 °C, the aspiration took 9 seconds and the reflow 6 seconds; the 2nd test (-7°C) has been performed 2 minutes and 41 seconds from the previous one (-6°C Start), the 3rd test has been performed 2 min 07sec after the -7°C test.

The test chart is locked during the analysis. When the analysis is completed or interrupted, the small arrows may appear on the sides of the chart, by touching the side of the chart you may scroll

Through the tests since all the aspiration tests are recorded and stored, if there is no data available, the small arrows do not appear.

6.3 Results Browser

The result browser may be accessed even while the analysis is in progress.

The Results browser allows the user to easily browse and display the performed analysis, in the top area you will see the selected month. By means of the arrow buttons you may select the desired month. If an analysis was performed on a certain day in a month, then the correspondent day will turn from grey to black as shown in Figure 16 below for December 1st, 3rd and 4th.

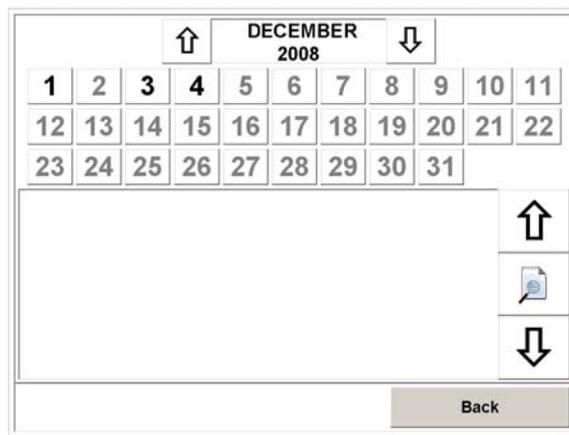


Figure 16: Results Browser Screen

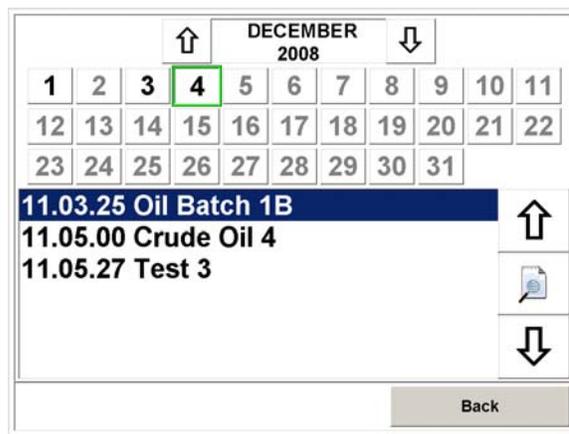


Figure 17: Results Screen 1-Day Result

By selecting a day, the analysis performed during the selected day will appear in the central area. The arrow buttons on the right allow the

user to choose the analysis to be displayed. The central button picturing a magnifying glass on a sheet of paper will load the selected analysis.

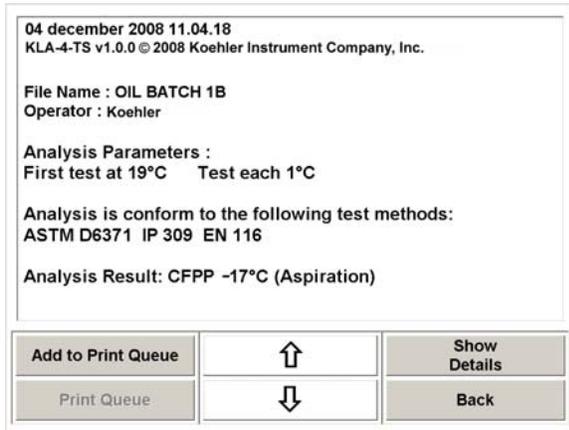


Figure 18: Results Screen - Selecting a File to See Result

A loaded analysis is shown in Figure 18. The arrow buttons allow the user to cycle through the analyses lists from the previous screen. The **Show Details** button will load the entire analysis allowing the user to browse through the entire analysis progress.

If a printer is installed, the **Add to Print Queue** and **Print Queue** buttons will turn from grey to black and be available for use (see Figure 19 below). By inserting an external mass storage device, such as a disk drive or flash drive the **Export to USB** button will be available to use (see Figure 20 below). The analysis data will be exported in a spreadsheet compatible format.



Figure 19 and 20: Export Data Functions

Figure 21 shows the Detailed Analysis screen. The arrow buttons on the right hand side allow the user to scroll through the analysis data. The single arrows will scroll one row at a time. The double arrows will scroll through the data 11 rows at a time and the arrows pointing to the horizontal line will allow the user to jump to either the first or last row of the data.

Time	Temperature		Sensors		Aspiration Status
	Bath	Sample	UP	DN	
16.38.16	-32.75	41	55.16	49.24	-19.88 r
16.38.17	-32.66	41	55.12	36.24	-19.88 r
16.38.18	-33.95	39.86	54.60	31.20	-20.07 c
16.38.19	-34.04	39.67	54.56	31.16	-20.10 c
16.38.20	-32.75	40.84	55.12	31.52	-19.88 c
16.38.21	-32.75	41	55.16	31.52	-19.88 c
16.38.22	-33.95	39.86	54.60	31.20	-20.07
16.38.23	-34.32	39.42	54.44	31.12	-20.15
16.38.24	-33.03	40.68	55.04	31.48	-19.9
16.38.25	-32.83	39.9	55.04	31.52	-19.88
16.38.26	-33.39	39.1	54.98	31.44	-19.95

Aspiration tests: ↑ ↑ ↑, ↓ ↓ ↓, Back

Figure 21: Results Screen - Detailed Data Analysis

The aspiration chart can be displayed by pressing the **Aspiration tests** button (see Figure 22). The arrow buttons allow the user to scroll through the collected analysis data. The single arrows will scroll through one test at a time. The double arrows will scroll through 7 tests at a time and the arrows pointing to the horizontal line will allow the user to jump to either the first or last test.

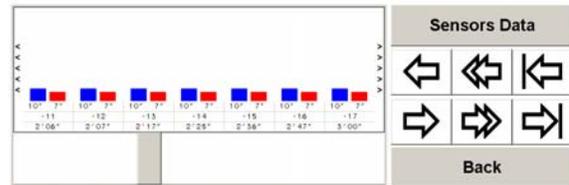


Figure 22: Results Screen – Aspiration Test Screen

7. Measuring Cell Diagram

General Scheme:

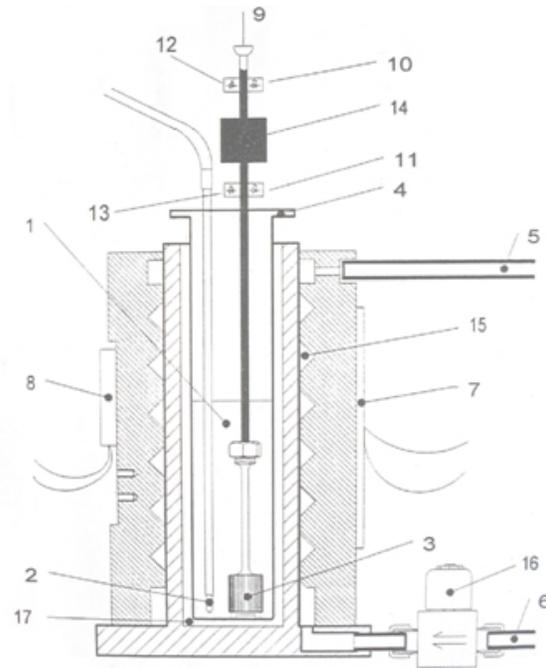


Figure 23: CFPP Measuring Cell

- | | |
|---------------|---------------------------|
| 1. Sample | 10. Upper Sensor (Orange) |
| 2. PT100 | 11. Lower Sensor (Yellow) |
| 3. Filter | 12. Upper Emitter (Red) |
| 4. Test Jar | 13. Lower Emitter (Blue) |
| 5. Gas Output | 14. Pipette |
| 6. Gas Input | 15. Gas |
| 7. Heater | 16. Gas Solenoid Valve |
| 8. PT100 Bath | 17. Air |
| 9. Vacuum | |

System Description

- Sample quantity corresponds with IP 309 (\pm 1 mm height)
- Measurement element of the sample temperature for CFFP.
- Filter according ASTM D6371/IP 309/EN 116.
- Glass test jar according ASTM D6371/IP 309/EN 116.
- The analyzer is equipped with a heater (10) which has two precise functions:
 - re-heating at the end of the analysis
 - regulation device of the cooling system
- Temperature sensor for cooling bath.
- 20mbar vacuum measured by sensor.
- The up level sensor is used for plugging point detection.
- The down level sensor is used for plugging point detection.
- The analyzer is equipped with a solenoid valve, on cooling gas, activated by the application software.

No. on Scheme	Art. Description	Article Number
2	PT 100	KLA-4S-008-12
3	Filter assembly	KLA-4S-013-01
4	Test Jar	KLA-4S-008-04
7	Heater	KLA-4S-005-03A
8	PT 100 bath	KLA-4S-005-06
10	Upper Sensor (orange)	KLA-4S-008-06
11	Lower Sensor (yellow)	KLA-4S-008-07
12	Upper Emitter (red)	KLA-4S-008-08
13	Lower Emitter (blue)	KLA-4S-008-09
14	Pipette	KLA-4S-008-13
16	Gas Solenoid Valve	

8. Troubleshooting

Use our set of specific keys and screw drivers for the following procedures:

8.1 Replacement of Bath Heater/Thermoswitch/PT 100

- Disconnect the power cable from the bottom of the analyzer.
- Disconnect the 12 pin connector and the motor connector from the head. Pull up the head.
- Remove the screws from the main cover of the analyzer.
- Remove the main cover.
- Remove the black support from the top of the cooling bath.
- Carefully cut the insulation on the back of the bath.

WARNING: Cut it slowly and do not touch the bath with the knife to avoid to cutting the heater or wires

7. Remove the insulation.
8. Disconnect and remove the defective item (Heater, Thermoswitch or PT100)

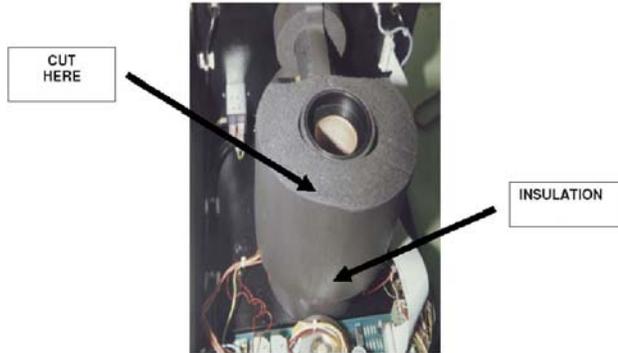


Figure 24: Insulation

9. Clean the cooling bath surface with solvent.
10. Dry the cooling bath surface with acetone.
11. **Heater:** Pull out the heater and replace with new one properly.

WARNING: Avoid air bubbles below the heater. In order to protect the heater, fix two insulation ribbon parts, side by side, on the heater.

PT 100: Pull out the PT 100, and properly attach the replacement

Thermoswitch: Unscrew the Thermoswitch and replace it
12. Put the insulation glue on both sides of the insulation tube and strongly press them together.
13. Connect the heater/PT100/Thermoswitch.
14. Test the OILLAB.
15. Use the opposite procedure to close the analyzer.

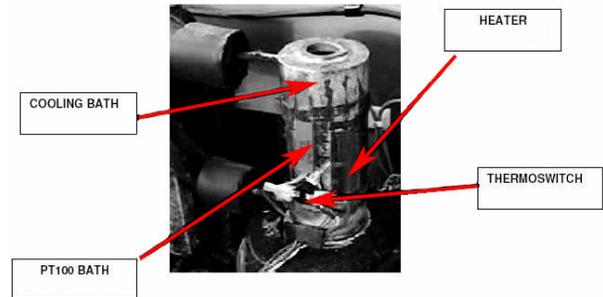


Figure 25: Heater/Thermoswitch/Cooling Bath/PT100 Bath

8.2 Replacement of the sample measuring probe (PT 100)

1. Remove the white probe connector from the back box of the head.
2. Unscrew the electrical gland maintaining the PT100 in the tight position.
3. Remove the temperature probe (PT100).
4. Place the new probe. It must be at 1 to 2 mm from the bottom of the test jar.
5. Tighten the electrical gland.
6. Plug-in the white connector.
7. Check that the probe is working on the touch screen.

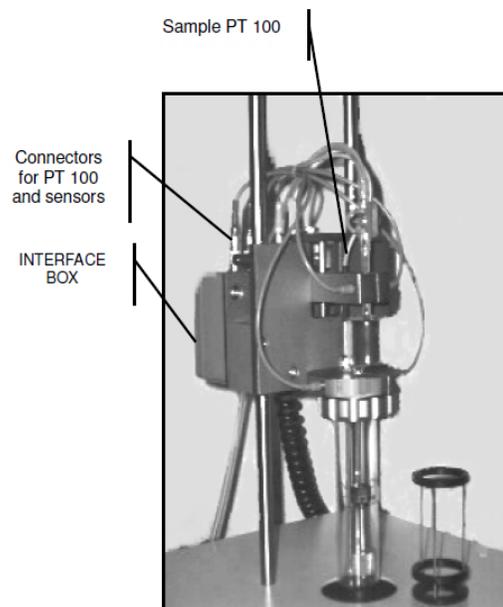


Figure 26: Sample Measuring Probe (PT100)

8.3 Replacement of emitters and sensors

Level detection assembly includes one emitter and one sensor (photo-diode). The procedure is the same for each element:

1. Remove the connector from the junction box.
2. Unlock the small screw and replace the faulty part.
3. With the pipette in place adjust the position of the item in order to have on the screen a signal above 20%.
4. Tighten the screw.
5. Fit the connector to the junction box.
6. Perform an aspiration test with standard sample to check the functionality.

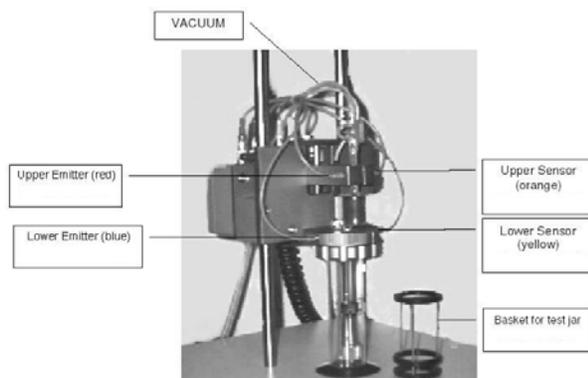


Figure 27: Emitters and Sensors

NOTE: In case of trouble with the signal value recorded on the screen, check the following points:

- The pipette is set properly and securely in place.
- Emitters, sensors and pipette must be clean. Be sure there is not residual sample.

8.4 Replacement of filter assembly

1. Put the head in the highest position.
2. Unscrew and remove the test jar and its support.

3. Unscrew tightening nut (top most nut on the support).
4. Remove the filter support.
5. Disassemble the new support and replace it in the following order (shown in the Figure 28):
 1. Tightening nut
 2. Retractor (angle to down position)
 3. Superior O-Ring
 4. Strut
 5. O-Ring
 6. Filter Support
6. Insert the filter support (6) into the glass tube.
7. Keep it in this position and slide all the elements against the support while pushing with the tightening nut.

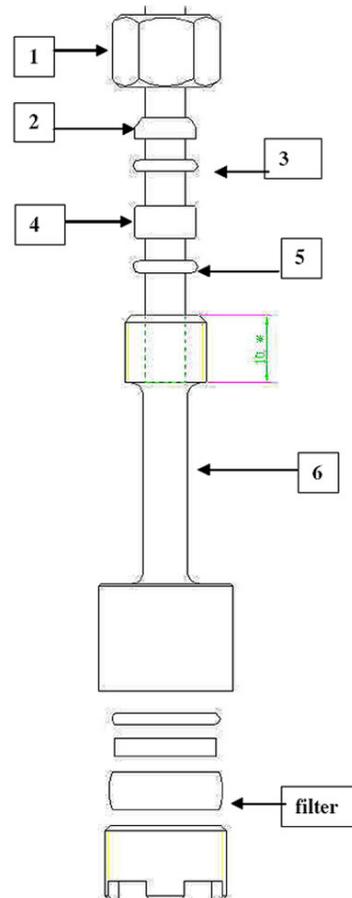


Figure 28: Filter Assembly

9. Maintenance and Precautions

WARNING: Switch OFF the main power switch and disconnect instrument from power supply before performing any maintenance.

Maintenance of the Filter

The aspiration filter must be cleaned very often.

1. Put the head in high position.
2. Unscrew and remove the test jar and its support.
3. Loosen and remove the O-ring (Part #5).
4. Remove the filter and clean it with alcohol.
5. Let it dry and check that there is no dirt on the links.
6. To have good results it is very important that the links are regularly spaced.
7. Reinstall the filter.
8. Moderately tighten the O-ring by hand.

Regular Maintenance

- Every year, check the elevation system of the analytical head.
- Regularly clean the fixation system of the test jar.
- Regularly clean the cooling tank.
- Do NOT analyze other products than those described in the method.
- Do NOT use solvent like acetone to clean any element of the analyzer.
- Do NOT leave the same sample in the test jar. For several days.
- Avoid shock from the PT100.

Maintenance Tools

Article Number	Designation
KLA-PT100-CAL	Calibration box for PT-100
KLA-DB-KIT	Calibration kit (Set of connectors and cables for calibration)

10. Service

Under normal operating conditions and with routine maintenance, the KLA-4-TS Analyzer does not require service. Any service problem can be quickly resolved by contacting Koehler's technical service department either by letter, phone, fax, or email. In order to assure the fastest possible service, please provide us with the following information.

Model Number: _____

Serial Number: _____

Date of Shipment: _____

11. Storage

This laboratory test instrument is equipped with electrical components. Storage facilities should be consistent with an indoor laboratory environment. This testing equipment should not be subjected to extremes of temperature and/or moisture. This equipment was shipped from the factory in a corrugated cardboard container. If long term storage is anticipated, re-packing the instrument in a water-resistant container is recommended to ensure equipment safety and longevity.

12. Warranty

We, at Koehler, would like to thank you for your equipment purchase, which is protected by the following warranty. If within one (1) year from the date of receipt, but no longer than fifteen (15) months from the date of shipment, Koehler equipment fails to perform properly because of defects in materials or workmanship, Koehler Instrument Company, Inc. will repair or, at its sole discretion, replace the equipment without charge F.O.B. its plant, provided the equipment has been properly installed, operated, and maintained. Koehler Instrument Company must be advised in writing of the malfunction and

authorize the return of the product to the factory. The sole responsibility of Koehler Instrument Company and the purchaser's exclusive remedy for any claim arising out of the purchase of any product is the repair or replacement of the product. In no event shall the cost of the purchaser's remedy exceed the purchase price, nor shall Koehler Instrument Company be liable for any special, indirect, incidental, consequential, or exemplary damages. KOEHLER INSTRUMENT COMPANY, INC. DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. Please save the shipping carton in the event the equipment needs to be returned to the factory for warranty repair. If the carton is discarded, it will be the purchaser's responsibility to provide an appropriate shipping carton.

13. Returned Goods Policy

To return products for credit or replacement, please contact Koehler Customer Service with your purchase order number, our packing list/invoice number, the item(s) to be returned and the reason for the return. You will be issued a Returned Authorization (RA) number, which must be prominently displayed on the shipping container when you return the material to our plant. Shipping containers without an RA number prominently displayed with will be returned to the sender. Goods must be returned freight prepaid. Returns will be subject to a restocking charge, the application of which will depend upon the circumstances necessitating the return. Some returns cannot be authorized, including certain products purchased from outside vendors for the convenience of the customer, products manufactured on special order, products shipped from the factory past ninety (90) days, and products which have been used or modified in such a way that they cannot be returned to stock for future sale.

