Koehler
INSTRUMENT COMPANY, INC.

KLA-3-TS
Automatic Cloud & Pour 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-3-TS Automatic Cloud & Pour Point Analyzer 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-3-TS conforms to the ASTM D97, D2500 test methods 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 Cloud & Pour 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 D97: Standard Test Method for Pour Point of Petroleum Products
   - ASTM D2500: Standard Test Method for Cloud Point of Petroleum Products

1.3 Instrument Specifications

Models:	KLA-3-TS KLA-3-TS(220) KLA-3-TS/2 KLA-3-TS/2(220)
Electrical Requirements:	115V ±15% 60Hz 230V ±15% 50/60Hz

Temperature Range (Single Stage):	+80°C to -40°C
Temperature Range (Double Stage):	+80°C to -90°C
Dimensions: lxwxh,in.(cm)	26x23x31 (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.

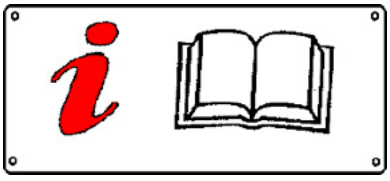
- The following information is written on the box:
  - o Handle with care (FRAGILE).
  - o The indication of the UP side of the box for a right handling of the box.
  - o Total weight.

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-3-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.

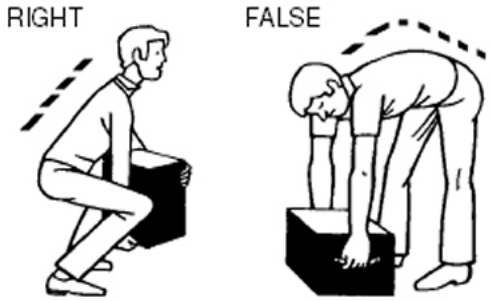
Unit Design. This equipment is specifically designed for use in accordance with the applicable standard test methods. The use of this equipment in accordance with any other test procedures, or for any other purpose, is not recommended and may be extremely hazardous.

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-3-TS Auto Cloud & Pour Point Analyzer 115V/230V 50/60 Hz
- Cloud & Pour Point head
- Cord cable without plug
- Test jar with silver bottom
- KLA-3-TS Cloud & Pour 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.
- Diagnostic panel with access to all inputs/outputs
- Analysis results automatically saved in Excel® compatible format.
- Guided probe calibration in 3 easy steps

4.2 Measuring Principle

4.2.1 ASTM D2500

Scope. This test method covers only petroleum products which are transparent in layers 40 mm in thickness, and with a cloud point below 49°C.

Summary of method. The sample is cooled at a specified rate and examined automatically. The temperature at which a cloud is first observed at the bottom of the test jar is recorded as the cloud point.

Significance and use. The cloud point of a petroleum product is an index of the lowest temperature of its utility for certain applications.

Test Procedure.

1. Bring the oil to be tested to a temperature at least 14°C above the approximate cloud point. Remove any moisture present by a method such as filtration through dry lintless filter paper until the oil is perfectly clear, but make such filtration at a temperature of at least 14°C above the approximate cloud point.

2. Pour in a calibrated glass test jar a filtered sample up to the level mark . Fix the test jar to the head assembly. Lift down the head in the cooling bath and press start/stop push button to start the analysis.

The KLA-3-TS will measure the light automatically and continuously until the cloud appear. The light detection is not affected by the colour of the sample.

If the sample reaches 27°C before the detection, the bath temperature will be controlled at 0°C.
If the sample reaches 9°C before the detection, the bath temperature will be controlled at -17°C.
If the sample reaches - 7°C before the detection, the bath temperature will be controlled at -34°C.
If the sample reaches -24°C before the detection, the bath temperature will be controlled at -51°C.
If the sample reaches -42°C before the detection, the bath temperature will be controlled at -68°C.

4.2.2 ASTM D97, IP15, ISO 3016

Scope. This test method covers and is intended for use on any petroleum oil.

Summary of method. After preliminary heating, the sample is cooled at a specific rate and examined at intervals of 3°C and a multiple of 3°C for flow characteristics. The lowest temperature at which movement of the oil is observed is recorded as the pour point.

Significance and use. The pour point of a petroleum product is an index of the lowest temperature of its utility for certain applications.

Test Procedure.

1. Pour accurately the oil into the test jar to the level mark. When necessary, heat the oil in a water bath until it is just sufficiently fluid to pour into the test jar. When it is known that a sample has been heated to a temperature higher than 45°C during the preceding 24 hours or when the thermal history of the sample is not known, keep the sample at room temperature for 24 hours before testing it.

It is possible to heat the sample inside the analyzer by using the methods "internal".

2. Fix the test jar to the head assembly. Press start/stop push button to start the analysis. The head is lowered down automatically into the cooling bath.

The sample is cooled down until the temperature, selected as the first tilt test (minimum 9°C above the expected pour point), is reached. When the first test is done, the head is lifted up and tilted automatically. If the test detects the sample pouring then the head is lowered down.

If the first test detects no pouring then the analyzer sets an alarm because the selected first tilt test temperature was too low.

This test procedure will continue every 3°C until the oil in the jar does not flow for 5 seconds when tilted in the horizontal position.

If the oil has not ceased to flow when its temperature has reached 27°C, the bath is controlled according the following schedule:

Oil is at +27°C, the bath temperature will be controlled at 0°C.
Oil is at +9°C, the bath temperature will be controlled at -18°C.
Oil is at -6°C, the bath temperature will be controlled at -33°C.
Oil is at -24°C, the bath temperature will be controlled at -51°C.
Oil is at -42°C, the bath temperature will be controlled at -69°C.

For black oil, cylinder stock and non distillate fuel oil, the result is obtained by the procedure described above. If required, determine the lower (minimum) Pour Point by heating the sample while stirring to 105°C, pouring it into the jar, and determining the Pour Point as described.

4.2.3 ASTM D5853, IP441

Scope. This test method is intended for use on any petroleum oil.

Summary of method. After preliminary heating, the sample is cooled at a specified rate and examined at intervals of 3°C and a multiple of 3°C for flow characteristics down to -36°C. The lowest temperature at which movement of the oil is observed is recorded as the pour point.

Significance and use. The pour point of a petroleum product is an index of the lowest temperature of its utility for certain applications.

Test Procedure.

1. The sample should be heated to a temperature up to 12°C above the expected pour point (but never above 60°C) then it should rest at room temperature (between 18 and 24°C) for at least 24 hours before the test.

2. Pour accurately the crude oil into the test jar to the level mark. When necessary, heat the oil in a water bath until it is just sufficiently fluid to pour into the test jar. Fix the test jar to the head assembly. Press start/stop push button to start the analysis. The head is lowered down automatically into the cooling bath once the bath has reached the proper temperature.

The sample is heated to a temperature up to 12°C above the expected pour point (but never above 60°C), then it is cooled down until the temperature, selected as the first tilt test (minimum 9°C above the expected pour point), is reached. Then the first test is done, the head is lift up and tilted automatically. If the test detects the sample pouring then the head is lifted down.

This test procedure will continue every 3°C until the oil in the jar does not flow for 5 seconds when tilted in the horizontal position or the sample reached -36°C without detection. If the oil has not ceased to flow when its temperature has reached 21°C, the bath is controlled according the following schedule:

Oil is at +30°C, the bath temperature will be controlled at 0°C.
Oil is at +9°C, the bath temperature will be controlled at -18°C.
Oil is at -6°C, the bath temperature will be controlled at -33°C.

For crude oils, the result is obtained by the procedure described above.

4.3 Instrument Controls and Connections

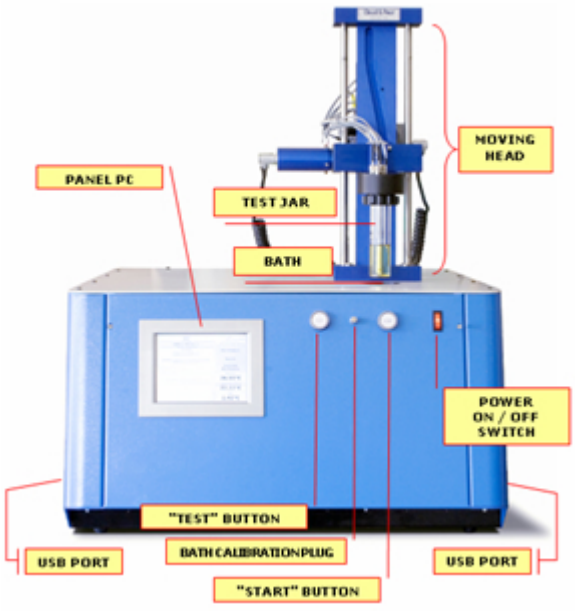


Figure 1: KLA-3-TS Control Descriptions

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

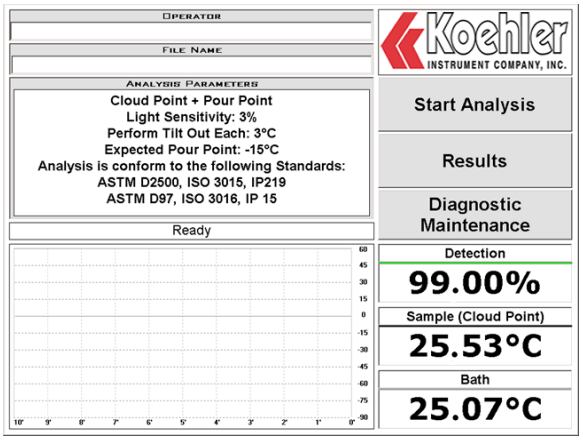
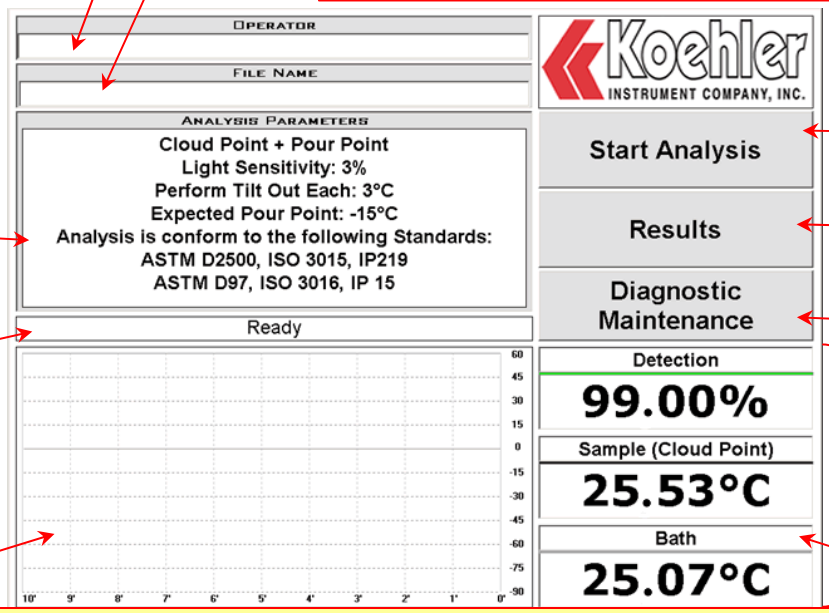


Figure 2: Main Software Screen

TOUCH THIS FIELD TO CHANGE THE OPERATOR'S NAME
The operator's name will be recorded in the results file.

TOUCH THIS FIELD TO CHANGE THE NAME OF THE ANALYSIS FILE
The analysis will be saved according to the text entered in this field: by the means of the "RESULTS" button, 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 "Oil 4 batch 1".



TOUCH THIS BUTTON TO START THE ANALYSIS

TOUCH THIS BUTTON TO ACCESS THE RESULTS JOURNAL

TOUCH THIS BUTTON TO ACCESS THE DIAGNOSTIC PANEL

TOUCH THIS FIELD TO SET THE ANALYSIS PARAMETERS

THIS FIELD SHOWS THE ANALYSIS STATUS

TOUCH THIS FIELD TO SWITCH VIEW FROM GRAPH TO DATA GRID
The sample's temperature will be shown as a black line, the bath will be shown as a gray line while it is idle, as a red line when the heater is active, as a blue line when it is cooling, also a small animated icon will appear next to the bath's temperature label during the heating or cooling. This field will always show the graph while in diagnostic mode; during the analysis it is possible to switch from graph to data grid: the data grid will be filled during the progress of the analysis.

Time	Temperature		Light	Detection
	Bath	Sample	Reference	
10:02:13 AM	10.58	53.36	96,03	99,00
10:02:14 AM	10.58	53.36	96,03	99,00
10:02:15 AM	10.58	53.36	96,03	99,00
10:02:16 AM	10.58	53.36	96,03	99,00
10:02:17 AM	10.58	53.36	96,03	99,00
10:02:18 AM	10.53	53.36	96,03	99,00
10:02:19 AM	10.53	53.36	96,03	99,00
10:02:20 AM	10.49	53.36	96,03	99,00
10:02:21 AM	10.49	53.36	96,03	99,00

The data grid will not be filled during the initial pre-cooling or pre-warming of bath or sample, so it will be shown as a blank field until the "active part" of analysis starts.

A smiley icon may appear for 1 minute each 10: if the analysis is idle, an automated procedure will cycle the cooling to prevent oil settling in gas circuit, this will ensure a greater lifetime to the cooling system.

THOSE FIELDS SHOW THE PROBES STATUS
When the cloud point has been detected, the graph will show a vertical grey line, also if a ionization is detected, a yellow vertical line is displayed in the graph and the field change to "YES", the ionization detector is always active even if no analysis is in progress.

Figure 3: Main Software Screen Descriptions

Diagnostic Panel

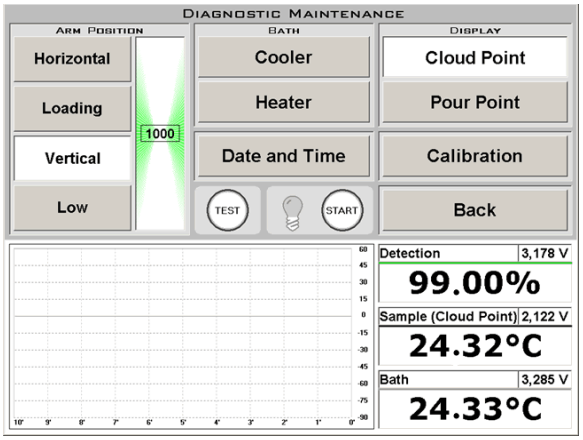


Figure 4: Diagnostic Panel

The **Arm Position** field features four button to control the arm of the analytical head and it's position: by selecting a position, the near field will change it's scale so that the value label (showing 1000 in the above picture) will move up and down according the head's actual position.

The **Bath** field allows the user 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 **Date and Time** button allows the user to change the actual date and time according your local time/date.

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

The **Display** field allows you the user to switch form **Cloud Point** to **Pour Point** and vice-versa, once selected, the "Detection" will change from **%** to **°C**, the "Sample" fields will change according to the selected machine behavior.

When **Cloud Point** is selected, the **Detection** is meant as Light percentage: the fibber optic will read the signal reflected by the test jar's silver bottom: by filling the test jar by a high transparent sample then moving the analytical head into the bath, the signal should remain close to 99%.

When **Pour Point** is selected, the **Detection** is meant as °C, but the temperature shown is not strictly related to the sample's temperature: the shown value is a magnification of the twin detection probes.

The **Calibration** button allows the user to access the calibration panel.

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

For troubleshooting purpose, while the diagnostic panel is open, the detection, sample, and bath fields will also show the probe's VOLT signal.

Calibration Panel

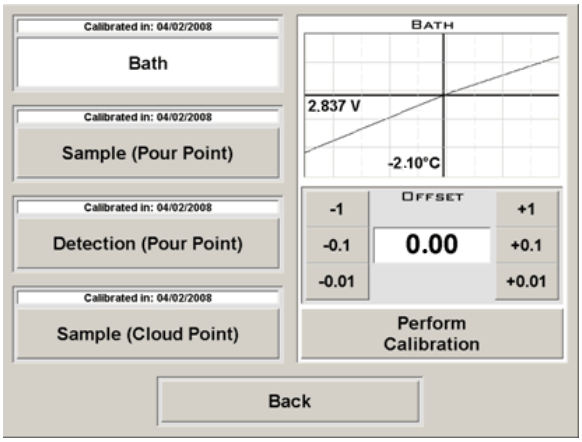


Figure 5: Calibration Panel

On the left side of the panel, the four buttons allow the user to select which probe will be displayed on the right side. Above each button, the last calibration date is shown.

Once a probe has been selected, the right side of the panel will display probe's calibration curve, the temperature and VOLTS signal read is displayed in real time. By the means of the **Perform Calibration** it is possible 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 a fine tuning of the calibration, Please 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

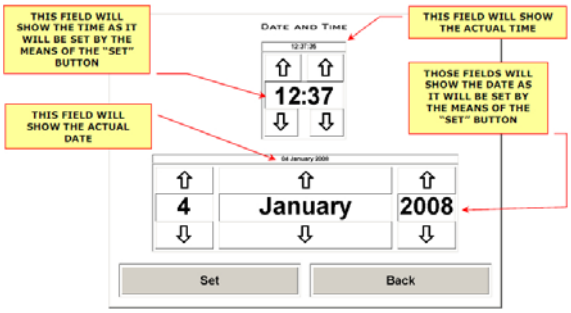


Figure 6: Date and Time Panel

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

6. Operation

6.1 Analysis Parameters

By touching the main screen's **OPERATOR** field or the **FILE NAME** field a standard keyboard will appear on the screen, you can insert the desired text and then push the **OK** button to confirm.

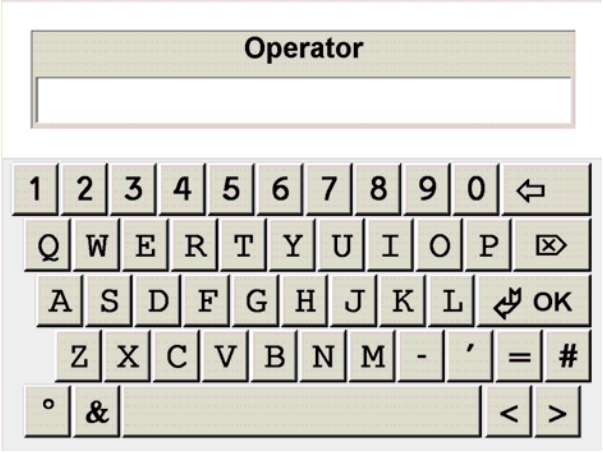


Figure 7: Keyboard Screen

By touching the main screen's **ANALYSIS PARAMETERS** field, the **Analysis Setup** panel pops up.

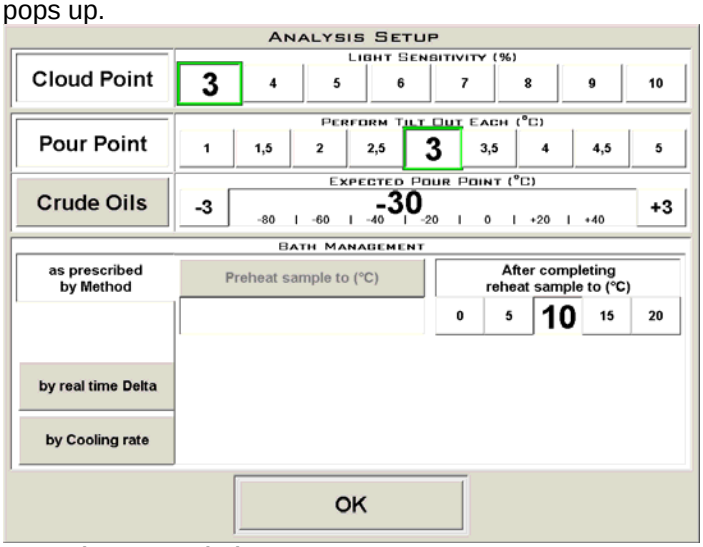


Figure 8: Analysis Parameter Set Up Screen

The three buttons on the top left let the user choose which kind of analysis will be performed. In Figure 8, the selected buttons **Cloud Point** and **Pour Point** are selected, the **Bath Management** is defined **as prescribed by Method** and the **After completing reheat sample to (°C)** is enabled: by touching the **OK** button the analyzer will be ready to perform both **Cloud Point** and **Pour Point** analysis in complete conformity with official methods. **Cloud Point** analysis will be performed, once Cloud Point has been obtained, the analyzer automatically switches to **Pour Point** mode in order to continue the analysis to obtain the Pour Point; once both analyses are completed, the

heater is activated to reheat the sample to the specified temperature.

As shown in Figure 8, the **Preheat sample to (°C)** is disabled: for safety reason it is enabled when the only chosen test method is **Pour Point**, it will be forced active by choosing **Crude Oils**.

The standard **Cloud Point** analysis is preset by a 3% of **Light Sensitivity**, by selecting a different value a notice panel will pop up as reminder: normally 3% is the best option, but for some low transparency/opaque samples it is possible to decrease the light sensitivity up to 10%. The **Light Sensitivity** will set the amount of light signal drop to determine the cloud point; it is expressed as percent because it is a relative value: prior to start the analysis the analyzer will check the sample's transparency, then from the obtained value the chosen **Light Sensitivity** percentage is applied; as example, the cloud point of a sample having a 90% of transparency, choosing 3% as **Light Sensitivity**, will be obtained once the light signal drops under 87.3%.

As mentioned, prior to start the analysis the analyzer will check the sample's transparency: if the sample's transparency is lower than 60%, the analyzer will warn you about possible need to clean the fiber optic's tip.

The **Pour Point** analysis is preset to **Perform Tilt Out Each 3°C**, however, it is possible to set the tilt out from 1 to 5 °C in 0,5°C steps, by selecting a tilt out different from 3°C the analysis result will not be conform as prescribed by the official methods, but can be useful for research purposes. The **Expected Pour Point** lets the user define where the tilt out begins; as prescribed in the official methods, the tilt out will begin at least 9°C prior the selected **Expected Pour Point**, according the chosen Perform Tilt Out Each: as example if the expected pour point is -30°C by a tilt out each 3°C, the first tilt out will be performed at -21°C; in a similar case, but by a tilt out each 4°C, the first tilt out will be performed at -22°C.

If both **Cloud Point** and **Pour Point** analysis are selected, supposing an obtained Cloud point below the **Expected Pour Point** selected, the first tilt out will be performed at the first available step below the obtained cloud point, by following normal scheduled sequence.

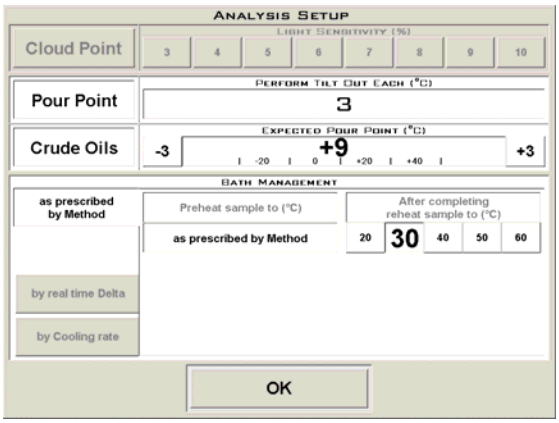


Figure 9: Analysis Setup: Pour Point of Crude Oils

The **Pour Point** of **Crude Oils** analysis cannot be performed together with Cloud Point analysis, the Tilt Out Each is fixed to 3°C: by selecting **Crude Oils** as test method the **Bath Management** is locked to **as Prescribed By Method** and the preheat is fixed enable as well for the **After Completing Reheat Sample**.

The **After Completing Reheat Sample** is useful for cleaning the analytical head and the probes after the analysis, from the sample's solidification point, it is suggested to set a temperature hot enough to liquefy the sample in order to easily remove any drop of the sample from the probes and the fiber optic tip.

Figure 10: Fiber Optic Tip

Please pay particular attention to the fiber optic's tip

The fiber optic is an optical device, the tip should be clean but avoid the removal of sample's residual by the means of scratching devices such as knives or sand paper, use a mild solvent instead.

Once an analysis has been completed, if the **After Completing Reheat Sample** is enabled, the heater will be activated to reheat the sample to the selected temperature.

If the **Bath Management** is defined **by Real Time Delta**, the bath's temperature will be related to the sample's temperature, supposing a delta of 20°C with a sample's 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 se to 10°C, the bath's temperature will be decreased by 1°C every 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 to the polar circle where ambient temperature may lose 30°C in an hour.

Final words about the analysis setup: The message **Analysis is conformed to the following standards** will enlist the methods conforming to the analysis setup chosen: for example, since ASTM method for Pour Point requires the tilt out of the sample each 3°C cooled in a bath, by choosing a different tilt out the message will not appear; also a bath management different from **as prescribed by Method** will not show the message (for both Cloud Point and Pour Point).

6.2 Cloud & Pour Point Analysis Step by Step

CLOUD POINT ASTM D2500 / ISO3015
Please verify that the silver-plated bottom of the test-tube is clean and not damaged. The tip of the optical sensor must be clean and lacking in residual.

1. Once the analysis has been setup as described in previous section, press the **Start Analysis** button, the panel shown in Figure 11 will pop up and the head will be moved to the loading position; the user can now easily remove the test jar, fill it as required then refix the test jar in its position.

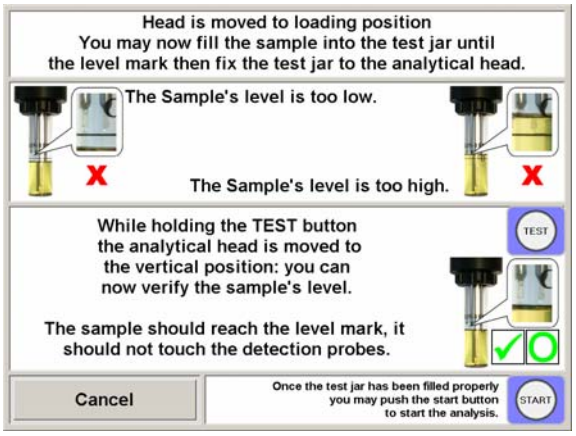


Figure 11: Start Analysis Panel

2. As described in Figure 11, **press and hold** the **TEST** button; while the **TEST** button is pressed, the head is moved to the vertical position to verify the sample's level: it should not touch the twins detection probes, by releasing the **TEST** button the head will return to the loading position: you may now correct the sample's level then again press and hold the test button and repeat the procedure as needed to obtain the proper sample's level.
3. Once the test jar has been properly filled, press the **START** button to begin analysis.

Note: If the chosen test method is **Cloud Point** only, a simpler panel is shown since the sample's level is not required to be as precise as needed for the Pour Point methods.

BE SURE THAT NOTHING OBSTRUCTS HEAD'S MOVEMENTS

6.2.1 Cloud Point Analysis

The sample is cooled at a specified rate and examined automatically. The temperature at which a cloud is first observed at the bottom of the test jar is recorded as the cloud point.

*When the **Cloud Point** is detected, the analysis data is stored, but if the selected method foresees both **Cloud Point** and **Pour Point** analysis, the analysis status show the Cloud Point results and the analyser will perform also the **Pour Point** analysis, an audible alert will be played once.*

6.2.2 Pour Point Analysis

If the analysis has been set-up as Pour Point only and a Preheat sample has been selected, the sample will be warmed to the selected temperature.

The sample is cooled as prescribed and the Pour Point test is repeated every 3°C (or *according the selected "Tilt Out Each")* from the start temperature of the analysis. The test procedure will continue every prescribed step until the oil in the jar doesn't flow for 5 seconds when tilted in the horizontal position.

When the Pour Point is detected, the analysis data is stored.

6.2.3 Pour Point Analysis of Crude Oils

As prescribed by the method, if the expected pour point is below 36°C, the sample will be heated to 45°C otherwise it will be heated 12°C over the expected pour point but never above 60°C, once the sample has reached the proper temperature, the analysis begin.

The sample is cooled as prescribed and the Pour Point test is repeated every 3°C from the start temperature of the analysis. The test procedure will continue every 3°C until the oil in the jar doesn't flow for 5 seconds when tilted in the horizontal position.

If the sample's temperature reaches -36°C without detection, the analysis will be interrupted.

When the Pour Point is detected, the analysis data is stored.

Once the analysis results have been obtained, a notice panel will appear, until the notice panel is shown, an audible alert will be played every 30"; if the analysis has been set up to reheat the sample, the heater will be activated until the sample has reached the prescribed temperature.

By releasing the **START** button while the analysis is in progress and no result has been obtained, the "analysis aborted by user" message will be shown in the status bar; however, the collected analysis data are saved.

Once the analysis results have been obtained, even if the heater is active, the **START** button may be released safely, this will not causes the loss of analysis results, but if the reheat procedure is in progress, it will be interrupted.

Once the analysis is complete, the analyzer will automatically lift out from the bath the analytical head to the vertical position: you can now safely release the "**START"** button, the analyzer is ready for the next test.

To remove the test jar and perform cleaning, you may use the **Diagnostic Maintenance** panel and move the analytical head to the loading position, if you plan to perform another test, you may proceed to setup the test and then hit the **Start Analysis** button so that the analyzer will lift the head to the loading position: you can now remove the test jar and perform cleaning, then fill the sample and start the analysis as usual, you can also hit the **Start Analysis** button just to remove the test jar and perform cleaning then use the provided **Cancel** button.

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.

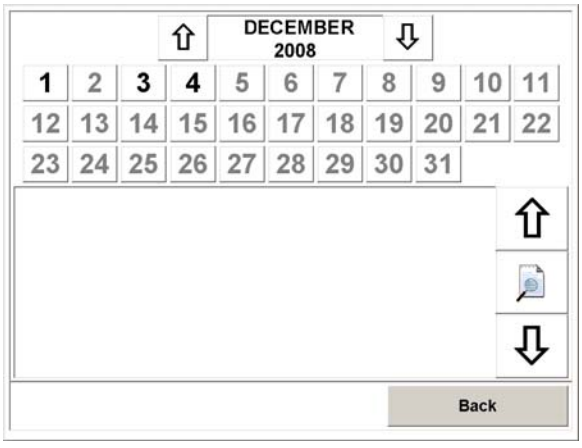


Figure 12: Results Browser Screen

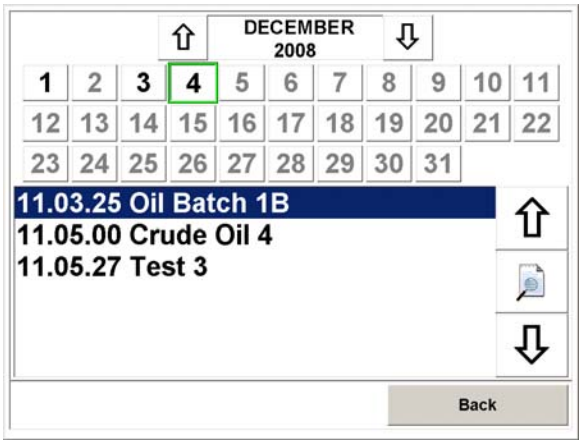


Figure 13: Results Screen 1-Day Result

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.

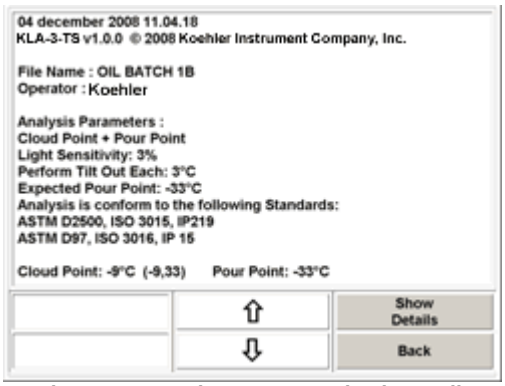


Figure 14: Results Screen - Selecting a File to See Result

A loaded analysis is shown in Figure 14. 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 15 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 16 below). The analysis data will be exported in a spreadsheet compatible format.

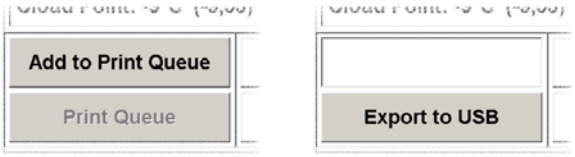


Figure 15 and 16: Export Data Functions

Figure 17 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.

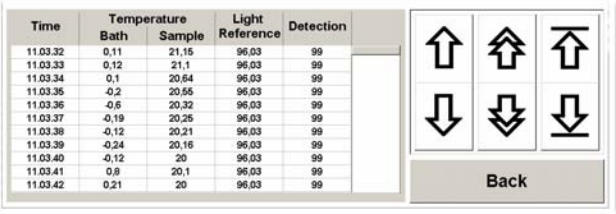


Figure 17: Results Screen - Detailed Data Analysis

7. Measuring Cell Diagram

General Scheme:

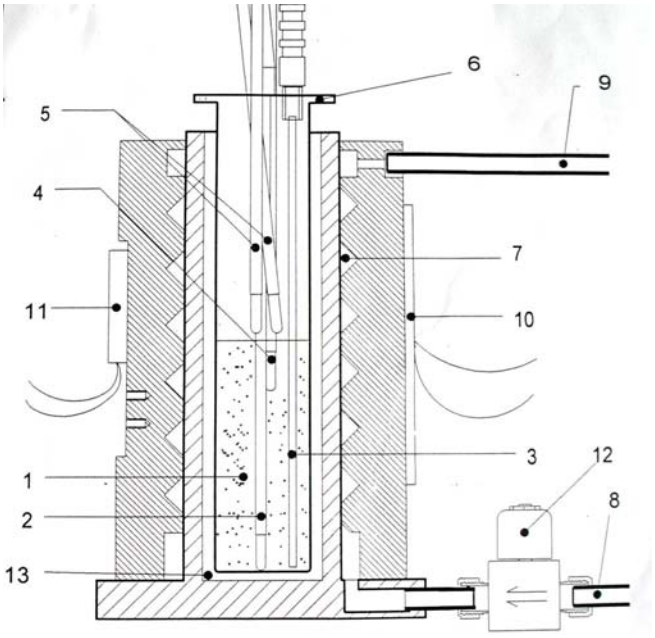


Figure 18: Cloud & Pour Point Measuring Cell

1. Sample
2.PT100 Sample Cloud
3. Fiber Optic
8. Cooling Gas In
9. Cooling Gas Out
10. Heater

Cloud
4.PT100 Sample Pour
5.PT100 Detection Pour
6. Test Jar
7. Cooling Gas
11. PT100 Bath
12. Solenoid Valve Gas
13. Air

System Description

1. Sample quantity corresponds with ASTM D97 and D2500 (± 1 mm height)
2. Measurement element of the sample temperature for Cloud Point.
3. Fiber optic for Cloud Point detection
4. Measurement element of the sample temperature for Pour Point
5. Measurement element for Pour Point detection
6. Test jar with bottom mirror
7. The analyzer is equipped with a solenoid valve, on cooling gas, activated by the application software

Note: The analyzer is equipped with a heater (10) which has two precise functions:
   a. re-heating at the end of the analysis
   b. regulation device of the cooling system

No. on Scheme	Art. Description	Article Number
2	Sample PT 100 (Cloud)	KLA-1S-008-12
3	Double fiber optic (Cloud)	KLA-1S-008-06
4	Sample PT 100 (Pour)	KLA-2S-008-12
5	2 x Detection PT 100 (Pour)	KLA-2S-008-13
6	Test Jar	KLA-1S-008-04
10	Heater	KLA-3S-005-03
11	Bath PT 100	KLA-3S-005-06
12	Solenoid Valve Cooling Fluid	KLA-3S-006-01

8. Troubleshooting

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

8.1 Replacement of Bath Heater/ Thermoswitch/PT 100

1. Disconnect the power cable from the bottom of the analyzer.
2. Disconnect the 12 pin connector and the motor connector from the head. Pull up the head.
3. Remove the screws from the main cover of the analyzer.
4. Remove the main cover.
5. Remove the black support from the top of the cooling bath.
6. 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.

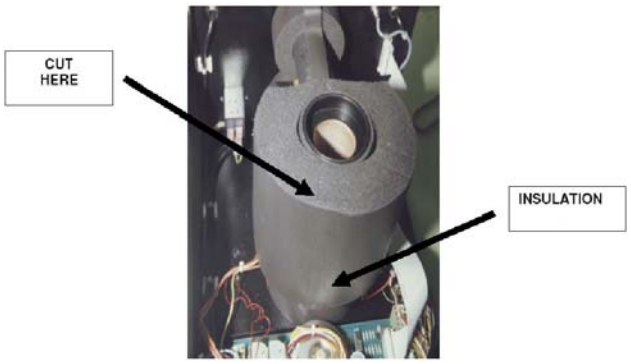


Figure 19: Insulation

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

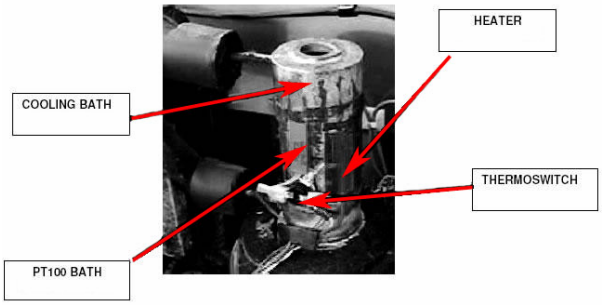


Figure 20: Heater/Thermoswitch/Cooling Bath/PT100 Bath

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. **For PT100 sample Pour Point:**
   PT100 must be immersed inside the sample. The top of the bubble must be at least 3mm below the surface of the sample.
   For PT100 detection Pour Point:
   PT100 must be 1mm above the surface of the sample.

5. Tighten the electrical gland.

6. Plug-in the white connector.

7. Check that the probe is working on the touch screen.

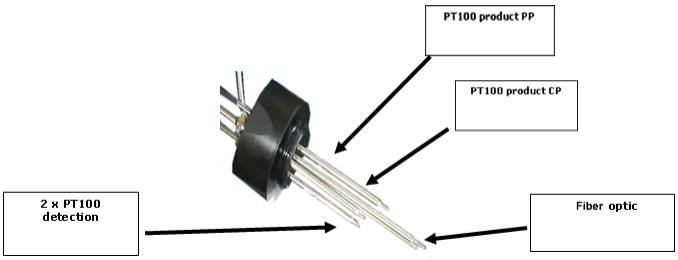


Figure 21: Sample Measuring Probe (PT100)

8.3 Adjustments

1. If the motor is running but the arm is not moving, it is necessary to tighten the clutch screw.

2. If the motor is noisy when running, it is necessary to adjust the head assembly to ensure that the position of the head is 90° with the arm. Do not tighten the screw too tightly to avoid blocking the linear bearing.

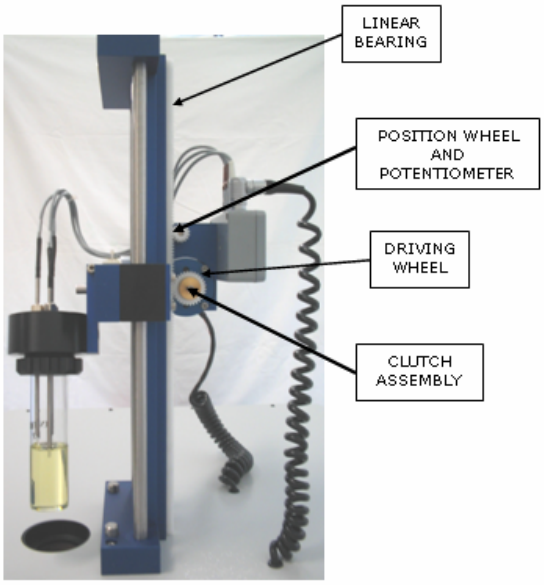


Figure 22: Head Assembly Adjustment

8.4 Connection Box

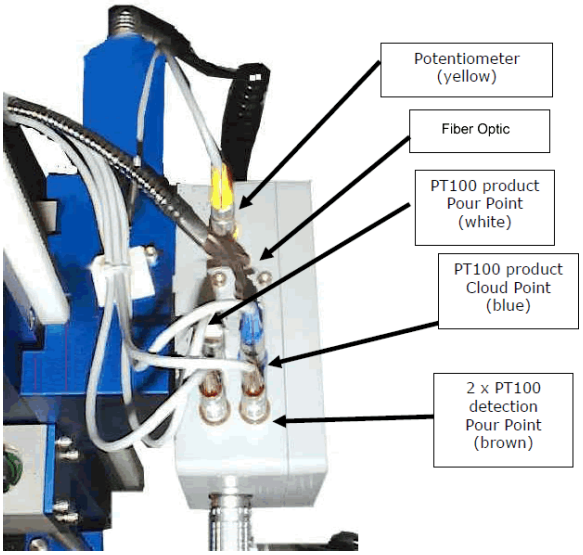


Figure 23: Connection Box

9. Maintenance and Precautions

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-3-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.

Notes

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