Koehler
INSTRUMENT COMPANY, INC.

K71000
Automatic PMCC Flash Point Analyzer

Operation and Instruction Manual

REV A

Koehler Instrument Company, Inc.
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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing

WEEE Directive Compliance Statement

Background

The goal of the WEEE Directive is to encourage design of environment-friendly products that increase reuse, recycling and other forms of recovery to reduce waste streams and applies to listed Electronic and Electrical Equipment (EEE) and Koehler's equipment falls broadly into Appendix 1A; Section 9 Monitoring and Control Equipment: Measuring, weighing or adjusting appliances for household or as laboratory equipment.

Any associated non-embedded equipment such as Lighting (Saybolt Color) and PCs/Printers also fall under WEEE. If provided with an order these ancillary items must be WEEE compliant. For these and other reasons (printer cartridges are regionalized) the equipment must be supplied through a third party supplier in Europe.

The WEEE Directive applies to electrical and electronic equipment falling under the categories set out in Annex IA provided that the equipment concerned is not part of another type of equipment that does not fall within the scope of this Directive. Annex IB contains a list of products which fall under the categories set out in Annex IA.

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:037:0024:0038:en:PDF

We do not qualify for any of the 10 exemption categories.
http://www.dpa-system.dk/en/WEEE/Products/Exemptions

Professional use

For equipment defined for 'professional use' local authorities have no role to play. Producers and importers are basically responsible for collection of WEEE recyclables from the professional user and for subsequent management. A separate statement is given cataloging the items that require separation from the equipment along with basic information on subsequent processing or recycling prior to disposal of the equipment.
http://www.dpa-system.dk/en/WEEE/Products/Private-or-professional-use

Responsibility for Registration and Annual Reporting:

Koehler will not sell directly to end users in the EU and so has no responsibility to register within each EU state and to make annual reports. Koehler declares that this responsibility is born by the importer who is the first level of the distribution chain and is subject to producer responsibility. We will communicate this in writing to our distributor/importers in the EU stating they are responsible to satisfy WEEE registration and reporting requirements in the EU states where they conduct sales activities.

It is illegal to market electrical and electronic equipment covered by producer responsibility without being registered.

http://www.dpa-system.dk/en/WEEE/Producers/Whoissubjecttoproducerresponsibility

Product Design

Koehler's designs allow for complete disassembly to a modular level which usually allows for standard recycling. A qualified refrigeration system technician must be consulted when disassembling and de-commissioning any equipment with refrigeration systems.

Koehler's scientific testing equipment is robustly designed to function over a long service life and are typically repaired many times over the course of years rather than being replaced. We believe that re-use and refurbishment is the very best form of re-cycling.

All batteries must be readily removable not soldered in place.

Recycling instructions

In the event that replacement becomes necessary, we will include instructions, particularized to each instrument that informs the customer of their recycling responsibilities and giving them guidance in doing

this. All Koehler equipment has been placed on the market since 13th August 2005 and so Koehler is defined as a "new WEEE producer". As such we must provide information on refurbishment, treatment, and re-use.

Our instrument manual will include this compliance statement and indicate that any collection of materials will be handled by their authorized distributor. In the event that the distributor is unreachable or is no longer a distributor for Koehler Instrument, Co., other arrangements may be made including accepting the materials directly.

Recycling is free of charge. Shipping is the responsibility of the end users. Whether shipping to a distributor or to Koehler directly, safe, properly declared, and labeled packaging and shipping expenses are the sole responsibility of the end user.

WEEE Marking

Since Koehler products are subject to the WEEE Directive we must display the WEEE symbol shown above in accordance with European Standard EN 50419 on the equipment. It must be indelible, at least 5mm in height, and clearly legible. If the equipment is too small the mark must be in the product literature, guarantee certificate, or on the packaging. Rules on marking are established in section 49 of the WEEE Order.

Koehler Instrument Company, Inc.
c/o RECYCLING
1595 Sycamore, Ave.
Bohemia, NY 11716

As a minimum the following substances, preparations and components have to be removed from any separately collected WEEE:
- Mercury containing components, such as switches or backlighting lamps (compact fluorescent lamps, CFL),
- Batteries
- Printed circuit boards if the surface of the printed circuit board is greater than 10 square centimeters (about 4 sq in.),
- Toner cartridges, liquid and pasty, as well as color toner,
- Chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC)
- Liquid crystal displays (together with their casing where appropriate) of a surface greater than 100 square centimeters and all those back-lighted with gas discharge lamps,
- External electric cables
- Components containing refractory ceramic fibers as described in Commission Directive 97/69/EC of 5 December 1997 adapting to technical progress Council Directive 67/548/EEC relating to the classification, packaging and labeling of dangerous substances (2),
- Electrolyte capacitors containing substances of concern (height > 25 mm, diameter > 25 mm or proportionately similar volume)

2. The following components of WEEE that is separately collected have to be treated as indicated:
- Equipment containing gases that are ozone depleting or have a global warming potential (GWP) above 15, such as those contained in foams and refrigeration circuits: the gases must be properly extracted and properly treated. Ozone-depleting gases must be treated in accordance with Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer (4).

Table of Contents

Intellectual Property

Liability

This manual was competently reviewed prior to issue, however, no express or implied liability whatsoever is assumed for losses or consequential damages or losses arising from the use information contained in or omitted from this manual.

Koehler Instrument Co. assumes no liability for losses arising from the negligent or improper use of our equipment nor for losses arising from the improper use or use other than intended. Only deliberate action or gross negligence are grounds for any claim.

Due care has been exercised in the development of the software program controlling this instrument, however, Koehler Instrument Co. assumes no liability nor makes any guarantee for any consequences arising from the use of the program. We explicitly, and above all, disclaim any guarantee of economic success, missed earnings, consequential damages and deficiently consequential damages.

Neither the computer software provided, nor can the operating system software, nor can the underlying integrated circuits function flawlessly under any usual or unusual set of operating conditions due to limitations in the current state of software and hardware engineering.

1 Introduction

The Koehler model K71000 Automated Pensky-Martens Closed Cup Flash Point Analyzer is the latest design for performing the ASTM D93 test method and related test specifications.

The K71000 determines the flash points of distillate fuels (diesel, biodiesel blends, kersosene, heating oil, turbine fuels), new and in-use lubricating oils, residual fuel oils, cutback residua, used lubricating oils, mixtures of, petroleum liquids containing suspended solids and petroleum liquids that tend to form a surface film during testing and biodiesel (B100). It determines the flash points of a wide range of products by a closed cup method with stirring of the sample.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the K71000 Automated Pensky-Martens Closed Cup Flash 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 providing 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 D93: Flash Point by Pensky-Martens Flash Point Tester

2. International Organization for Standardization (ISO)
   1, rue de Varembé
   Case postale 56
   CH-1211 Geneva 20, Switzerland
   Tel: 41 22 749 01 11
   Fax: 41 22 733 34 30
   http://www.iso.org

   ISO Publication:
   - ISO 2719: Petroleum Products and Lubricants - Determination of Flash Point - Pensky-Martens Closed Cup Method

3. Energy Institute (IP)
   61 New Cavendish Street
   London, WIM 8AR, United Kingdom
   Tel: 44 (0)20 7467 7100
   Fax: 44 (0)20 7255 1472
   http://www.energyinstpubs.org.uk/

   IP Publication:
   - IP 34: Determination of closed flash point – Pensky-Martens method

4. Deutsche International Norm (DIN)
   http://www.din.de

   DIN Publication:
   - DIN 51758: Testing of liquid petroleum products and other combustible liquids; determination of flash point by Pensky-Martens closed tester

- DIN EN 22719: Petroleum products and lubricants; determination of flash point; Pensky-Martens closed cup method (withdrawn)

5. Federal Test Method (FTM)

   FTM Publication:
   - FTM 791-1102: Flash Point by Pensky-Martens Closed Tester

6. American Association of State Highway and Transportation Officials (AASHTO)
   444 North Capitol Street N.W., Suite 249
   Washington, DC 20001
   Phone: +1 202 624-5800
   Fax: +1 202 624-5806
   E-mail: info@aashto.org

   AASHTO Publication:
   - AASHTO T73-811

7. Association Française de Normalisation (AFNOR)
   http://www.afnor.fr

   AFNOR Publication:
   - NF M 07-019

8. Japanese Industrial Standards(JIS)
   http://www.jisc.go.jp

   JIS Publication:
   - JIS K2265

1.3 Pensky-Martens Flash Point Method Scope and Summary

The K71000 Automatic Pensky-Martens Flash Point Analyzer determines the lowest flash point temperature of fuels, lubricating oils, and homogenous liquids (ASTM D93 A), or liquids containing suspended solids as well as liquids that tend to form a surface film during testing (ASTM D93 B), and the determination of the flash point of biodiesel in the temperature range of 60 to 190°C (ASTM D93 C).

Method Scope:

The scope of the method covers the analysis of products in the temperature range of 40 to 360°C but this automated apparatus extends the range from dew point + 10°C to 400°C.

Internet Link to Summary: ASTM D93 PM Flash Standard Method Scope and Summary

Method Summary:

Flash Point is the lowest temperature (barometrically corrected to standard atmospheric pressure of 101.3 kPa (760 Torr) at which the vapors of a combustible liquid will ignite and the flame front propagate across the head-space of the sample cup under the conditions specified by the test method.

Flash point tests are conducted by filling the test cup to the full indication mark, placing the flash cup into the test sample chamber then locking the cup cover into position.

Next, the user selects a predefined or user programmed test method, types in or accepts the expected flash point (EFP), optionally selects a product type, then hits the start button.

A Quick Test feature allows for determination of flash points of unknown materials beginning the test from ambient and proceeding with the test at an accelerated heating rate.

The unit is equipped with a differential Pt-100 RTD probe designed to duplicate the response time of a mercury-in-glass thermometer as per ASTM D93-02a and E1-03a. If a flash is not detected 30°C above the expected flash point or at 405°C, then the test is automatically aborted for safety.

Once analysis is complete the results are displayed to the screen and saved to the instrument hard disk drive. The results may be opened in a report generation program like MS Word or Excel and sent to a local or network printer. Once the results have been reviewed and accepted by the operator the results may be sent directly to a network folder for processing and direct entry into LIMS.

Once analysis is complete the instrument actuates the rapid cool-down system. The cool-down system is capable of reducing the temperature of the sample from 300 to 30°C in about 8 minutes in a laboratory with ambient conditions at 20°C. User can also manually switch to standard air cooling. Cooling the system will take a longer period of time however fan noise will be reduced.

1.4 Instrument Specifications

Models:	K71000
Electrical Requirements:	115/230VAC 50/60Hz User selectable via switch located at the back of the analyzer
Temperature Measuring Range:	Ambient to 405°C (761°F)
Flash Detection System:	Differential Thermocouple, Ionization Detection
Stirring Speed:	0 to 300 RPM
Heating Rate:	In accordance to ASTM D93 procedure A, B, C Quick Test (≈12°C/min)
Ignition Source:	Gas and Electric Igniter both equipped on cover assembly: - Software Selectable - User-Friendly Manual Switching
Mechanical Lift:	Three (3) position mechanical lift system of cover / motor assembly, software selectable: Open – Clean – Test
Cleaning:	Cover / Motor assembly lift features convenient cleaning position. At this position the user can easily remove the cover assembly and clean with appropriate solvent between tests.
Ignition Test Frequency:	User selectable on per method basis
Cooling:	Integrated Dual Fan System: First (1) directly to cup, Second (2) to cool environment around test cup
Barometric Pressure Correction:	Automatic Barometric Pressure Transducer for Flash Temperature Correction
Interface Port:	RS232:1 USB:2 (1–Front, 1–Back) Ethernet:1 (LIMS)
Gas Supply / Connection:	Ignition Gas: LP Gas (Propane / Butane) or Natural Gas. Min. 3.45kPa (0.5psi). Max. 6.90kPa (1.0psi)
Display:	8.4" LCD Touch Screen
Temperature Sensor:	PT-100 in S/S sheath,
User Programmable Methods & Data Storage:	Capable of storing unlimited data runs and test methods

Temperature Calibration:	Three (3) Types available: - 2 Point Sample Temperature (Standard) - Multipoint (>2) Temperature Calibration (Available as Option) - CRM Calibration – Built-In Software function to automatically correct as per CRM tested
Security:	Three level password protection
Key Safety Features:	- Collision / Interference Detection: Analyzer can sense user position around moveable parts and stop its motion - Fire suppression detection: Equipped with second gas line for connection to CO_2 or Nitrogen gas. Gas disbursement ring around test cup/cover saturated area with extinguishing gases.
Ambient Temperature Range:	10 to 35°C
Altitude:	Rated for use below 2000m
Environmental Conditions:	As per section 1.4.1 of IEC 61010
Dimensions: (in.(cm))	Width: 10 7/8” (27.63cm) Depth: 17.5” (44.45cm) Height: - Closed Test Position – 20” (50.8cm) - Fully Open Position – 26” (66.04cm)
Net Weight:	60 lbs (27.22 kg)

2 Safety Information and Warnings

2.1 Safety Considerations

The most important safety consideration is that people are operating this piece of equipment. The laboratory staff and management are responsible to assure that only authorized, trained and competent personnel use this equipment.

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.

Test results from ASTM D93 flash point test are used along with other data to assess the flammable hazards of a material. By its very nature a flash point analysis is the performance of a hazardous activity (waving a flame above a heated flammable material in the presence of excess air) under carefully controlled conditions (limited small amount of material, ability to remove ignition source, ability to remove oxidizer). Still there are conditions that can cause operating problems during testing. Among the most well known are samples contaminated with water or light ends, and less commonly, samples which foam and cause overflow. Samples may also contain or be contaminated with acutely toxic materials or materials that when combusted pose a health hazard.

2.2 Unit Design

This equipment is specifically designed for use in accordance with the applicable standard test methods listed in section 1.2 of this manual. 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.

WARNING: The K71000 Automatic Pensky-Martens Flash Point Analyzer was designed to be the safest flash point instrument in the marketplace, however, there are safety concerns and hazards, which this instrument is not designed to address. The purchase and

acceptance of this instrument signifies that the purchasing company and their agents, the end users, are responsible for establishing all safety and health practices and assumes full responsibility for safely using the K71000 Automatic PMCC Flash Point Analyzer.

2.3 Contaminated Samples

Samples contaminated with light ends (highly volatile petroleum products) may light and continue burning when the expected flash point is set above the fire point of the material. In addition, burning material may be ejected through the ignition aperture in the test cup cover. For this reason, the most recent updates to ASTM D93 require a first application of ignition at ambient temperature (<24°C below EFP) and every 10°C. This helps when the contaminant flashes at room temperature but does not address all contamination situations.

Samples contaminated with water can bump and eject hot and flammable material from the test cup.

At all times, refrain from leaning or bending over the test cup when the test is being carried out. An unexpected flash can cause serious injury to exposed body parts that are in close proximity to the test area. Ejected material may cause serious harm.

2.4 Safe Quick Test Method

The K71000 has a quick test option that begins testing at ambient then heats the sample at an accelerated pace while applying the igniter at 3°C increments. The detected flash is an estimate of the expected flash point which is then used in a subsequent run (under prescribed standard test conditions) to safely arrive at the flash point. The only disadvantage of this screening method is that it requires additional time and material to complete a safe analysis. The Maximum Quick Test Temperature is 370 °C.

NOTE: The user must set this prescribed end point prior to running a quick test. The set maximum run temperature is solely at the user's discretion.

We recommend this method of screening for ALL samples.

2.5 Fire Detection / Suppression and Draft Shield / Dome System

The K71000 comes standard with a fire detection and inert gas fire suppression system. This system is designed to flood the sample cup area with an inert gas, extinguishing sample based fires. The system is triggered when a high temperature event melts the thermal fuse. The open circuit condition triggers the flame suppression system. The electronics are extremely fast relying solely on electronic logic (no software). The flame suppression system also shuts off the ignition gas source, closes the cup cover by de-energizing the motor, and de-energizes the electric igniter if in use.

WARNING: Never operate the instrument without the draft shield make it difficult to inadvertently touch hot working surfaces.

2.6 Equipment Modification and Replacement Parts

Any modification or alteration of this equipment from that of factory specifications is not recommended and 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.

2.7 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.

2.8 Additional Important Safety Information

WARNING: As an important safety precaution, **NEVER** use unregulated gas with the K71000 Pensky-Martens Closed Cup Flash Point Analyzer!

Use in an area that is adequately ventilated, preferably with an exhaust tube / pipe to remove

any fumes that may be emitted during the test. Conduct tests behind a safety shield, especially if you are not sure of the flash point or the ignition temperature. Wear appropriate personal protective equipment (PPE) during testing.

NOTE: ASTM D93 specifically notes that a hood should not be operated during testing as excessive drafts can cause erroneous results!

Exercise caution in removing and replacing the cup in the furnace. Hot surfaces and substances may cause injury if they come in contact with the operator.

All connections should be properly made and tested for leaks prior to carrying out the tests.

The ignition gas source should be equipped with a proper safety regulator capable of delivering a maximum of 5 psi of pressure to the test flame assembly. Some propane regulators give pressure in inches of water (inH_20) at 60°F. A standard 11 inches of water (inH_20) regulator should give sufficient gas for normal use. Minimum pressure required is about 7 kPa or 1.0 psi.

The flame suppression (inert gas) source should be regulated to between 20 and 30 psi for safe use.

2.9 Other Important Hazards

Working surfaces on the instrument may become hot enough to produce severe burns even with momentary contact.

Open flames and electrically heated resistance elements are present. Direct momentary contact can cause severe burns.

The draft shield around the sample area also functions as a mechanical guard. The instrument should never be used if this guard is removed.

WARNING: Electrical hazards exist inside the instrument case. Lethal voltages and current are present. Only factory authorized or otherwise qualified personnel may repair or service this instrument. Only original parts may be used for repair. No substitution parts or alterations to this equipment are allowed; doing so may void the warranty.

PC Motherboard WARNINGS

- Due to high voltages inside the instrument, under no circumstances should the instrument be opened or access covers removed while energized.
- Lethal voltages are present inside power supplies. Under no circumstances should Power Supply covers be removed. Power Supply warranties are voided once the cover is removed.
- For indoor use only. Please operate the power supply in a safe and dry environment.
- Do not insert any objects into the open ventilation or fan grill area of the power supply.

3 Getting Started

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.

3.1 Packing List

- K71000 Automatic PMCC Flash Point Analyzer, 115/230V 50/60Hz
- Brass Test Cup with Handle
- Combination Gas/Electric Igniter
- Stirrer Shaft and Blade Assembly
- PT-100 Temperature Probe / Thermal Detector
- Ionization Detector
- Cover Assembly
- Draft Shield
- Stylus
- Temperature Calibration Cable
- Power Cords, 115V & 230V
- K71000-Manual K71000 Automatic PMCC Flash Point Analyzer Operation and Instruction Manual

Installed in the K71000

- Panel PC and Microprocessor Controllers
- Operating Software, Instruction Manual PDF, Recovery Software on Hard Disk Drive
- Thermocouple and Ionization Detection
- Fire Sensing and Suppression System
- Collision / Interference Detection
- Mechanical Lift System
- Dual Fan Cooling System

On Outside of Instrument

- Identification Plate
  - Model Number
  - Serial Number
  - Voltage / Hz / Phase / Amp
  - Company Contact Information

Optional Accessories (purchased separately):

- Calibration Decade Box
- Stainless Steel Test Cup
- USB Printer
- Certified Reference Material

3.2 Unpacking

1. Check Shock Watch Label on Cardboard Box for indication of rough handling and possible damage.

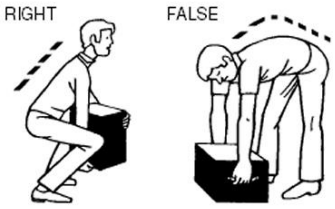
2. Check labeling for correct orientation of instrument. (e.g. This Side Up)

3. Carefully open top of box with box cutter and remove packing foam.

4. Make two additional vertical cuts, using box cutter, along length of two sides of the box and remove packing foam.

5. Extract instrument and place on suitable cart for transportation to work area / lab bench.

WARNING: Be sure two or more individuals are available for extracting and lifting instrument from box to cart and from cart to bench. Individuals must lift in accordance to proper technique. See accompanying figure.



6. Lift instrument from cart and place on bench.

7. 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.

3.3 Setup

Equipment Placement: Make sure the instrument in placed on a firm, level table in an area with adequate ventilation or in a hood. The unit may be leveled by making minor turning adjustments to the feet located at the base of the unit. Please note that Koehler does not supply a level with this equipment.

The instruments dimensions are:
Width: 10 7/8” (27.63cm)
Depth: 17.5” (44.45cm)
Height:
- Closed Test Position – 20” (50.8cm)
- Fully Open Position – 26” (66.04cm)

For proper operation the instrument requires adequate ventilation.

- It is recommended that approximately 15 cm (6 inches) of space be provided on either side of the instrument. This recommendation is dependent upon the lab environment and samples typically run. Samples with a higher flash point require increasing the heater temperature to high values.
- About 15 cm (6 inches) clearance is required behind the instrument for connecting gasses and utilities.
- The instrument is on feet and draws air from the bottom, exhausting to the top and sides. The bottom must not be obstructed. Dust must not be allowed to accumulate beneath the instrument.

Environmental Conditions: The instrument environment must comply with the following conditions for proper setup:

- No / Low Dust

NOTE: Electronics lifetime may be reduced due to heat build-up resulting from dust contamination

- Distilled fuel must be wiped off of instrument work surfaces and not be allowed to collect. This is a flammability hazard and collects dust.
- Free of Corrosive Fumes
- No Direct Sunlight
- Not near heating or AC ventilation ducts
- No Vibrations
- Clearance from other instruments so as to not influence instruments ambient conditions
- Height of bench top must allow for easy viewing and use
- Temperature Range:15 to 35°C (59 to 95°F)
- Maximum Rate of Change: 6°C (10°F) / hr
- Elevation to 2000 meters
- Relative Humidity: < 80%, non-condensing

NOTE: No warranty provision is made to cover instrument failure due to environmental conditions outside the above mentioned criteria. No warranty is provided that the instrument will produce acceptable results outside the above mentioned criteria.

Ventilation. A fume hood or exhaust system is required after performing a test. Flammable vapors and/or steam are generated during operation and must not be permitted to accumulate. A canopy-style hood may be used if the height from the top of the unit to the canopy is 5 feet or less. The exhaust blower should have a rating of 1000 C.F.M. or greater.

Power: Connect the line cords to properly fused and grounded receptacles with the correct voltage as indicated in section 1.3 or on the back of the unit. A switch located on the back of the unit allows the user to switch the input voltage to either 115VAC or 230VAC.

WARNING: Ensure the voltage type selected on the back of the unit matches the plug type used when powering the instrument.

WARNING: For safety, disconnect the power when performing any maintenance and/or cleaning. Do **NOT** turn the power on unless the bath is filled with the proper medium; otherwise, damage may occur to the unit and the warranty will be void.

4 Descriptions

4.1 Front of Instrument

Figure 1: Instrument Descriptions_Front

1. **Power Button:** This button allows the user to turn the instrument on and off from the front side. The main power switch at the back of the unit **(Figure 2, Item 12)** must be switched ON prior to pressing on the power button.

2. **Emergency Fire Suppression Button:** Pressing this button initiates the integrated Fire Suppression System. While depressed, turning the button clockwise will release button and reset.

   NOTE: Inert Gas must be connected to secondary gas port located at the back of the instrument for fire suppression system to function properly.

3. **USB Connection Port:** For connection of USB device to export test results, save software screenshots and upload factory software updates.

4. **Touch Screen Control Panel:** Main control point of instrument. Please refer to section _._ for full operational details.

5. **Leveling Feet:** To make adjustments to instrument level for proper operation.

6. **Ignitor Flame Adjustment Knob:** Controls gas flow to ignitor Flame for fine tuning flame size in accordance to test method.

7. **Pilot Flame Adjustment Knob:** Control gas flow to pilot flame for fine tuning pilot flame size. Pilot flame is designed to ensure ignitor flame remains lit during entire testing procedure.

8. **Ignitor Connection Port:** For connection of gas / electric ignitor assembly to instrument

9. **Spill Guard:** To prevent sample from spilling or leaking on Touch Screen Control Panel

10. **Draft Shield:** Provides user protection from test area. Protects test flame from external draft source

11. **Test Cup:** Brass test cup equipped with heat resistant handle. Test cup locks in place for sample stabilization during testing.

4.2 Back of Instrument

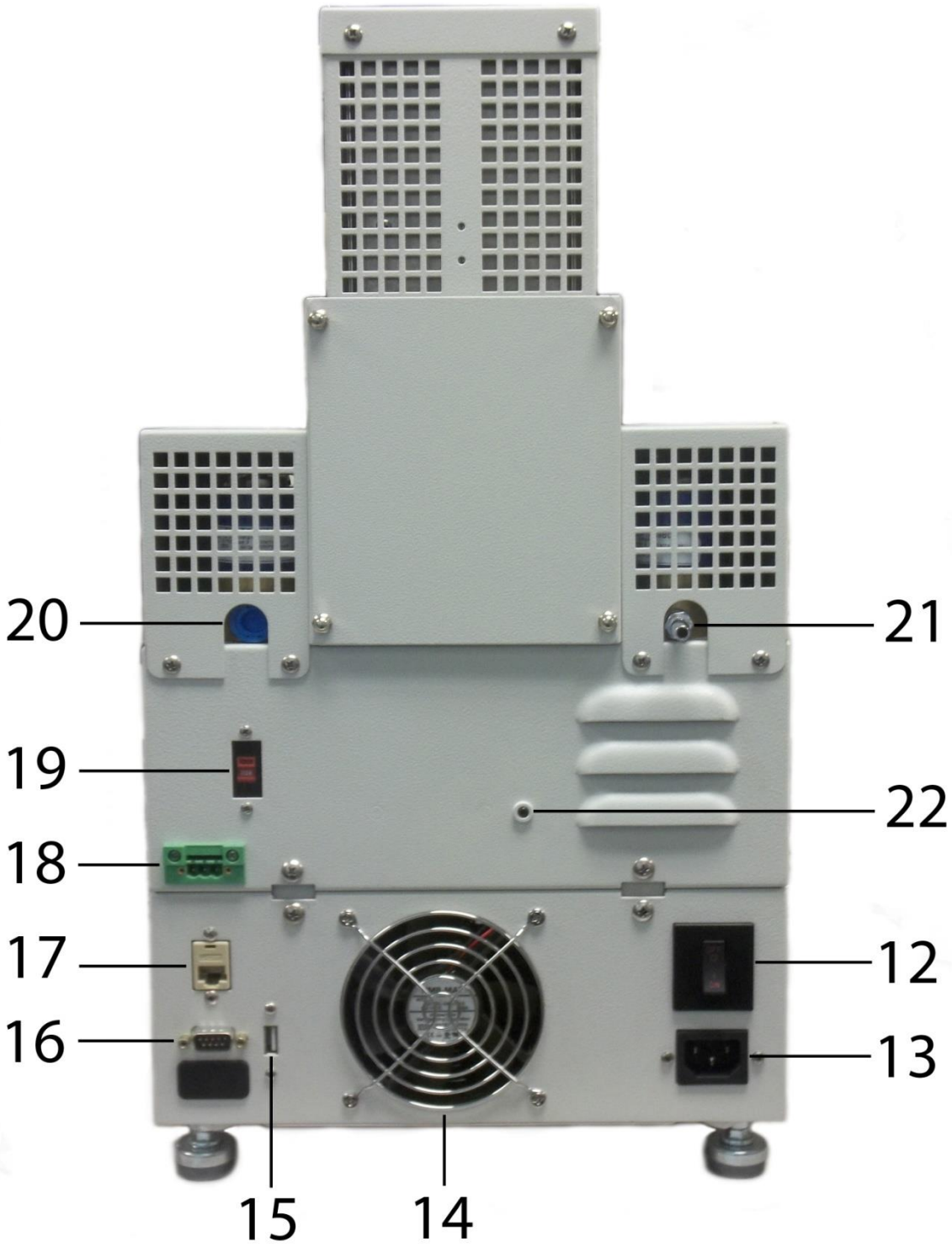


Figure 2: Instrument Descriptions_Back

12. **Power Switch:** Controls power to the entire unit. To power on the instrument, first press the Power Switch to ON then press the Power Button **(Figure 1, Item 1)** on the front on the analyzer.

13. **AC Outlet:** The analyzer has been designed with an integrated C13 line socket in order to easily change plug types (115V or 230V). Internal voltage can be switch using the Voltage switch **(Figure 2, Item 19)**.

14. **Cooling Fan:** Integrated cooling fan is capable of operating at two speed for either standard or rapid cooling. The user may change the fan speed using the touch screen control panel.

15. **USB Port:** For connection to Keyboard or Mouse.

16. **RS232 Port:** For connection to external PC

17. **Ethernet Port:** For connection to LIMS system.

18. **CPU Port:** For programming of internal CPU. **FOR FACTORY USE ONLY**

19. **Voltage Switch:** The user may easily switch the internal voltage compatibility by switching up or down. The voltage type will be displayed on the switch accordingly.

20. **Inert Gas Inlet:** For connection of external inert gas source, typically Nitrogen. Analyzer must be connected to gas source for the integrated Fire Extinguishing System to be utilized properly.

21. **LPG or Natural Gas Inlet:** For connection to Natural Gas Source or Bottled Gas (LPG - Propane or Butane is typically used).

22. **Barometric Pressure Sensor:** Point where internal automatic barometric pressure adjustment system senses atmospheric pressure. No user function.

4.3 Cover Assembly

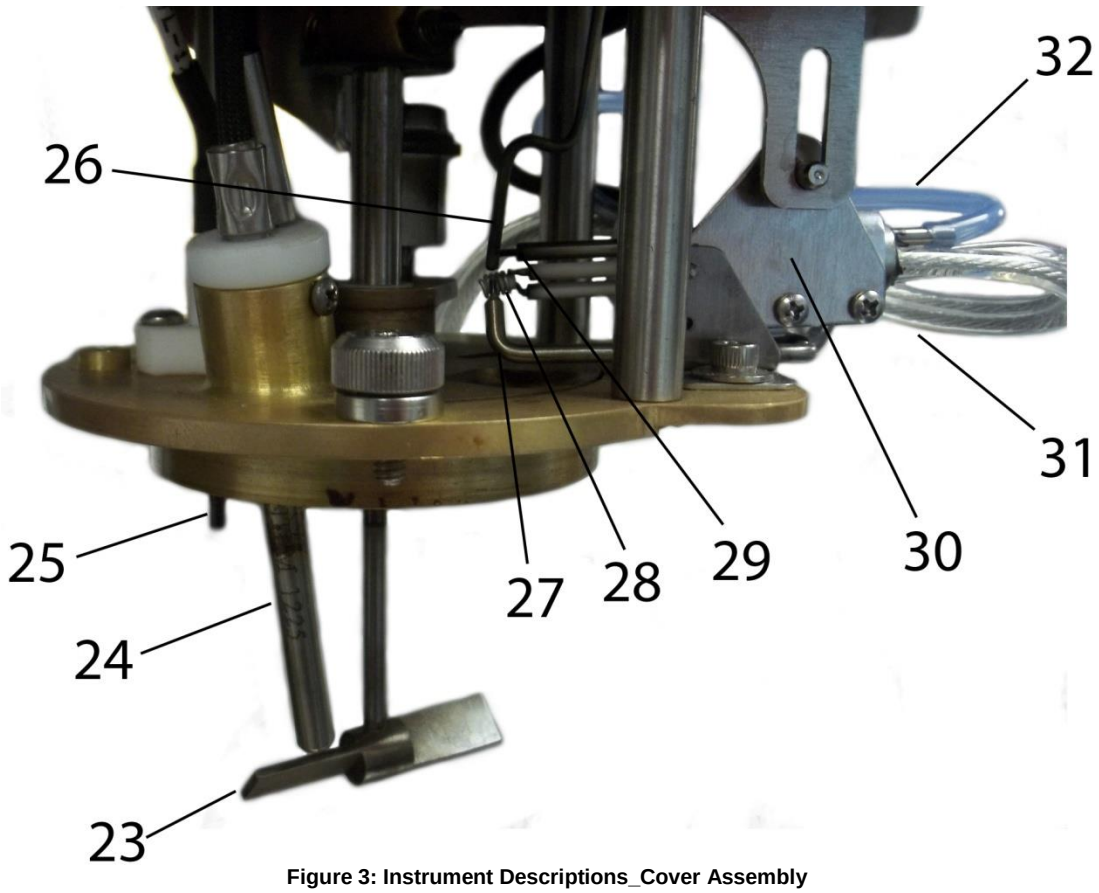


Figure 3: Instrument Descriptions_Cover Assembly

23. **Stirring Propeller:** To maintain sample homogeneity throughout the duration of the test.

24. **Sample Temperature Probe:** Measures sample temperature during testing.

25. **Ionization Detector:** For automatic detection of the sample's flash point.

26. **Flame Detection Thermocouple:** For continuous monitoring of pilot flame during testing. In the event the test flame goes out, the Flame detection thermocouple will automatically detect this and initiate re-lighting of the flame.

27. **Pilot Flame:** The pilot flame ensures the test flame is lit prior to each test dip.

28. **Electric Ignitor:** Alternative means for applying heat source to initiate a flash point. The electric ignitor is also used to light the pilot flame.

29. **Gas Ignitor:** Referee means for applying heat source to initiate a flash point.

30. **Application Mechanism:** Houses gas / electric ignitor assembly. Automatically lowers ignitor into test cup at intervals in accordance to the prescribed test method.

31. **Electric Ignitor Cable:** Reinforced cable for connecting to Ignitor Connection Port **(Figure 1, Item 8)**.

32. **Gas Tubing:** Provides means for gas source to reach gas ignitor.

5 Operation

1. **User Login -** Upon turning on the instrument the user will be prompted to select the desired user log in level. There are four levels to choose from. Factory preset pass codes for Levels 1, 2, and 3 are listed below:

   Level 1 – 1234
   Level 2 – 2345
   Level 3 – 3

   Levels 1, 2, and 3 can be custom configured by pressing the Set Access Priorities Key. The fourth or factory level is designed for administrative purposes only and specifically allows for access to the factory settings menu. From this screen, the user can also Change User Password, Set Access Priorities, Turn off Security and Contact Koehler.

Figure 4: User Login Screen

2. **Change User Password -** Clicking on the **Change User Password** button will bring up a screen that will allow the user to change the password of any of the four user levels. Choose the desired user level by clicking on the **Select User Level** pull down tab. Then type in the **Current Password** for that level, the **New Password,** then click **Save**.

Figure 5: Change User Password Screen

3. **Set Access Priorities -** Clicking on the Set Access Priorities button will allow the user to select the which operations they want a particular user level to have access to. The user can choose to turn on or off access to the **Diagnostics**, **Calibration** and **Custom Test** Menus. Click **Save** when complete.

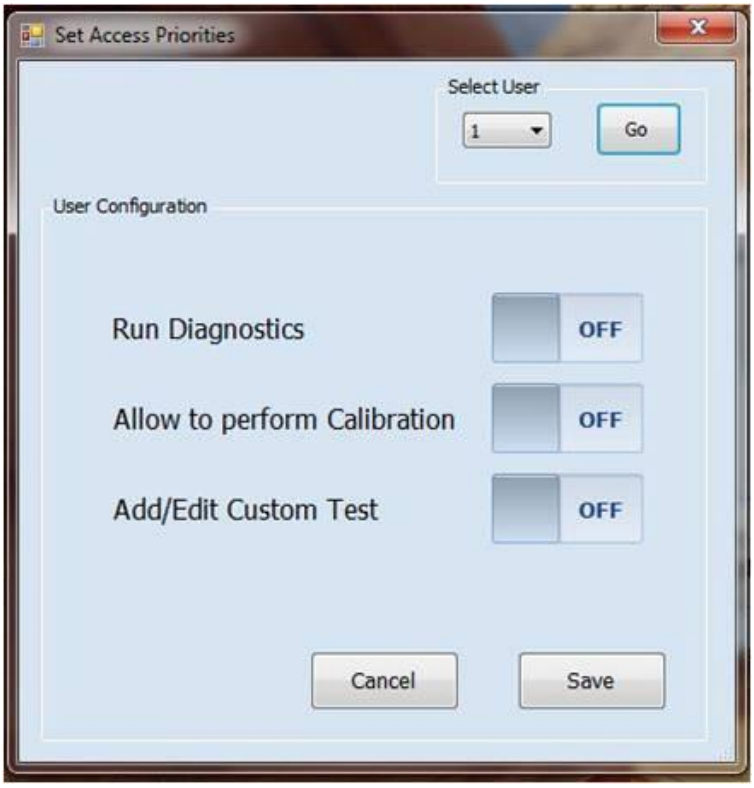


Figure 6: Set Access Priorities Screen

4. **Last Global Parameter -** Reverting back to the User Login Screen, After choosing your login preference you will be asked, "Do you want to load the last global parameter setting? Clicking **Yes** will

automatically load all parameters that the user input in the global parameters menu from the previous login. Clicking **No** will automatically reset all global parameter settings back to the factory default.

Figure 7: Last Global Parameter Pop Up

5. **Main Home Screen -** After clicking **Yes** or **No** to the Last Global Parameter pop up, the user will be brought to the Main Home Screen. The Main Home Screen is comprised of four sections: An Upper Tab Section, a Lower Tab Section, a Side Bar and the Main Display section. Descriptions for each Section are given below:

Figure 8: Main Menu Screen

Side Bar - Test Parameters Section:

The **Test Parame**ters section can be accessed by pressing the side bar on the far left side of the screen. In this section the user can input the **Expected Flash Point, Operator Name, Sample Name / ID.** and the Test Method. After all parameters are entered, Press the **START** button to initiate the test.

Main Display Section:

This section displays the current temperature as measured by the stainless steel PT100 probe located in the cover assembly. Buttons for positioning the automatic lift system and checking the dip mechanism of the igniter are also found in this section.

a. **Test Position -** Lowers lift to place cover assembly on test cup
b. **Change Position -** Raises (or lowers) lift to middle position for ease of changing test sample cup
c. **Clean Position -** Raises lift to highest position where is it easy to disassemble cover for cleaning
d. **Stop Lift -** Pressing this button stops lift while in motion
e. **Check Dip -** Pressing this button checks the operability of the dipping mechanism

Upper Tab Section:

a. **Home:** The Home tab is comprised of six (6) subsections:
- Parameters: Displays current Heater Temperature, Pressure, and Heater Ramp Rate
- Quick Test: Clicking the Quick test button will immediately start a test using the default quick test parameters. This mode is to aid in determining the flash point of an unknown sample. Details on this mode can be found in **Section 2.4** of this document.
- LIMS: This function is only accessible when the user is in the results database screen. Data can be exported to a Laboratory LIMS system by clicking this button.
- Print: This function is only accessible when the user is in the results database screen. Data can be sent to a printer by clicking this button.
- Save to USB: This function is only accessible when the user is in the results database screen. Data can be exported to a USB by clicking this button.
- Screenshot: This function is only accessible when a USB is connected to the analyzer. Clicking this button will automatically take a screen shot of the analyzer's display screen and send an image file to the USB device connected

b. **Global Parameters:** The Global Parameters tab is comprised of six (6) subsections:
- **Temp Unit:** Toggle between Temperature Units of Celsius or Fahrenheit
- **Sensor Selection:** To activate Thermocouple or Ionization Detection or Both
- Ignition Method: Toggle between Gas or Electric Ignition
- **Test Method:** Toggle between Standard test methods (ASTM D93 Procedure A, B and C or Custom Test Method. Available test methods will be displayed in the **Test Parameters - Side Bar** section in the **Select Test Method** pull down menu.
- Product Type Go-No-Go: This subsection serves as a database for any number of types of products. All product types created are stored and can be accessed in the pull down menu. To add a product type click on the **Add New** button. This brings up a pop up screen that allows for the user to input the name of the product, the unit of measure (in °C or °F), and a minimum and maximum flash point temperature limit. Clicking the **Remove** button brings up the same pop up screen and allows the user to select a product type from the pull down menu and delete it. Clicking the **Set Prd - None** button resets the product type in the pull down menu to the left.
- **Lift Sound -** Turns **On** or **Off** the audible sound alarm while the mechanical lift is descending.

Figure 9: Global Parameters Tab

c. Setup: The Setup tab is comprised of five (5) subsections:
- **Quick Test Setup:** Change / Save maximum Quick Test (QT) run temperature. Maximum Quick Test Temperature is 370 °C. **NOTE:** The user must set this prescribed end point prior to running a quick test. The set maximum run temperature is solely at the user's discretion.
- **LIMS Port Setup:** Change / Save the type of port, either RS232 or Ethernet, to connect to LIMS
- **LIMS Path Setup:** Change / Save path in which to export data to LIMS
- **Standard Test Parameters:** Change / Save minimum temperature in which the instrument lift can open safely and the temperature in which the cooling fan can be turned off
- **Inst ID Setup:** Change / Save Instrument ID

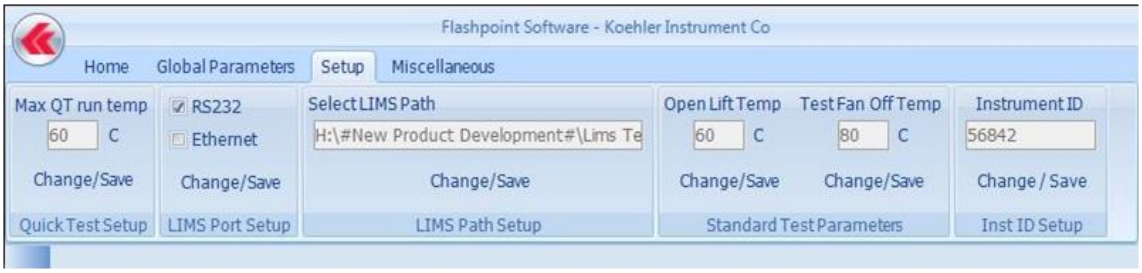


Figure 10: Setup Tab

d. Miscellaneous: The Miscellaneous tab is comprised of five (5) subsections:
- **Access Factory Setting:** Allows access to Factory Setting Menu. This function is only activated when logged in under Factory Login. Details on the Factory Menu can be found in section ___.
- **Software Update:** This function is only activated when a USB is connected to the analyzer with a software update file. Software can be updated to most current version when this function is accessed
- Instrument:
- Help:
- **Version:** Displays the Model number, Firmware Version and PC Software Version

Figure 11: Miscellaneous Tab

6. **Graph Screen -** Pressing on the Graph Tab in the Lower Tab Section of the Main Menu allows the user to see a graphical interpretation of the sample temperature and heating rate during a test. **Sample Temperature**, **Heater Temperature** and **Ramp Rate** are displayed at the right hand side of the screen. Accessing the graph screen will also add an additional tab to the Upper Tap Section titled **Graph Tools.** The Graph screen features the following functions:

   a. **Zoom In**

   b. **Zoom Out**

   c. **Pan XY -** Provides cursor that can be moved along graph and display data

   d. **Restore -** Resets X and Y Axis to default position

   e. **Refresh -** Manual update of graph

   f. **Clear -** Pressing this button will clear out the graph and the data will begin collecting again from the origin

   g. **Save Graph -** Function is only activated when a USB is connected to the Analyzer. Clicking on button will upload current graphical data to the connected USB.

   h. **Rate Graph Tab -** The Rate Graph Tab will display Heating Rate vs Time

   i. **Sample Graph Tab -** The Sample Graph Tab will display Sample Temperature vs Time

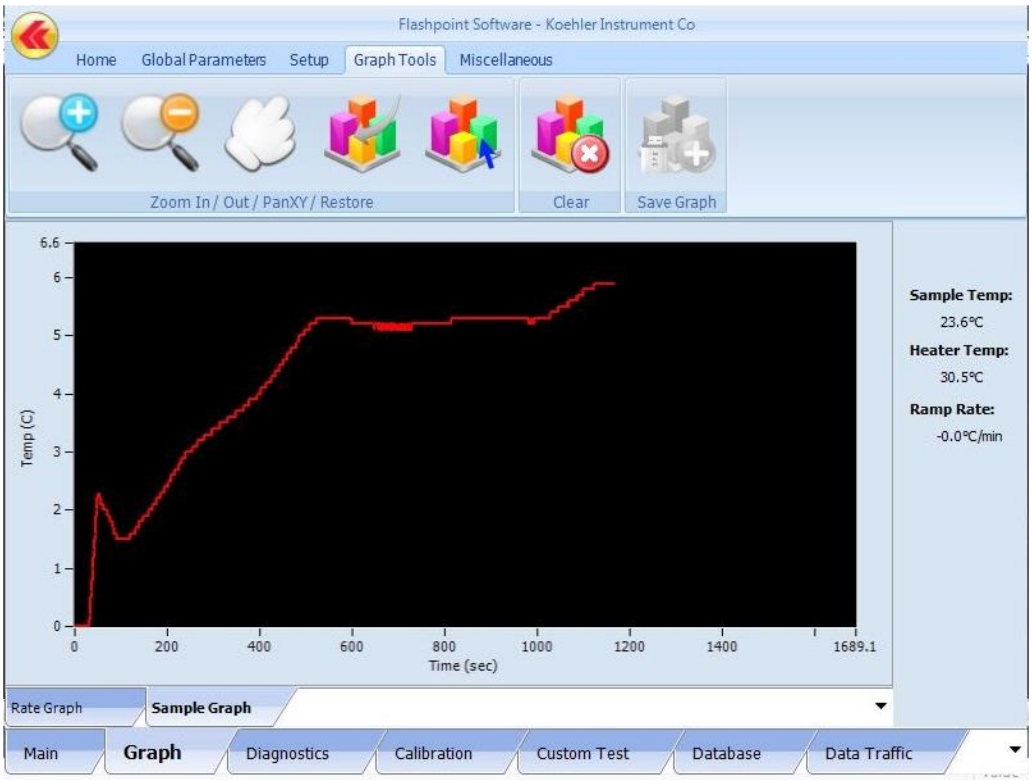


Figure 12: Graph Screen

7. **Diagnostic Screen -** Clicking on the Diagnostics Tab located at the Lower Tab Section of the Main Menu will bring up the K71000 Diagnostic Screen. The Diagnostics screen allows the user to check proper functioning of the following components by toggling an On/Off Switch:

   a. **Heater**
   b. **Ignitor -** Note also that there is an indicator below that displays the intensity of the ignitor in Amps
   c. **Gas Solenoid**
   d. **CO_2 Solenoid**
   e. **Fan -** For cooling electrical components
   f. **Fan2 -** High Powered fan for cooling heating block after test
   g. **Dip**

   The Diagnostics Screen also allows the user to test the functionality of the numerous mechanical functions of the analyzer. See descriptions below:

   a. **Find Dip Home -** Brings flame dip mechanism to home position
   b. **Find Lift Home -** Brings mechanical lift to Home Position (also considered test position)
   c. **Clean Position -** Brings mechanical lift to Clean Position (highest position)
   d. **Change Position -** Brings mechanical lift to Change Position (middle position)
   e. **Test Position -** Brings mechanical lift Test Position (home position)
   f. **Stirrer 105 RPM** - Rotates Stirrer Motor at 105 RPM (ASTM D93, Procedure A)
   g. **Stirrer 250 RPM -** Rotates Stirrer Motor at 250 RPM (ASTM D93, Procedure B)
   h. **Stirrer 300 RPM -** Rotates Stirrer Motor at 300 RPM (Maximum RPM)
   i. **All Motor Stop -** Stops Stirrer Motor

   A Sensor Status bar can also be found on the right hand side of the Diagnostic Screen. The lights change from Red to Green when that particular sensor is activated. For example when the Collision Sensor is activated by an object coming in contact with the mechanical lift during descent, the light will briefly change from Red to Green.

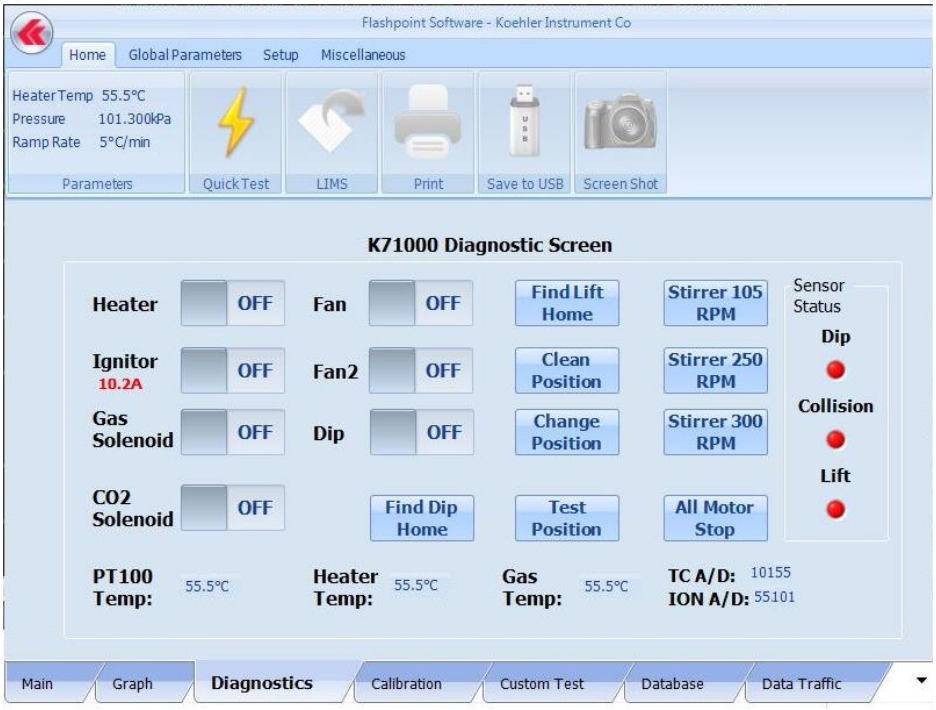


Figure 13: Diagnostic Screen

8. **Calibration Screen -** Clicking on the Calibration Tab located at the Lower Tab Section of the Main Menu will bring up the Calibration Screen. The Calibration Screen is comprised of three calibration submenus: PT-100 Calibration, Pressure Calibration and Igniter Offset Calibration>

   a. **PT100 Calibration** - Three types of PT100 Calibration can be performed:
      - Two Point Calibration
      - RTD Correction Table
      - User CRM Calibration

      Two Point Calibration as shown in **Figure 14** below is performed using an external PT100 Simulator Box **(Available as an Additional Accessory)**.

      1. Remove the PT100 ground plug from the side of the cover assembly
      2. Insert the PT100 Simulator Box Connector
      3. Set the Simulator Box to 0°C by turning the dial to the 0°C position
      4. Click the **Press to Calibrate at 0°C** button
      5. Set the Simulator Box to 400°C by turning the dial to the 400°C position
      6. Click the **Press to Calibrate at 400°C** button
      7. Click the **Save Changes** button

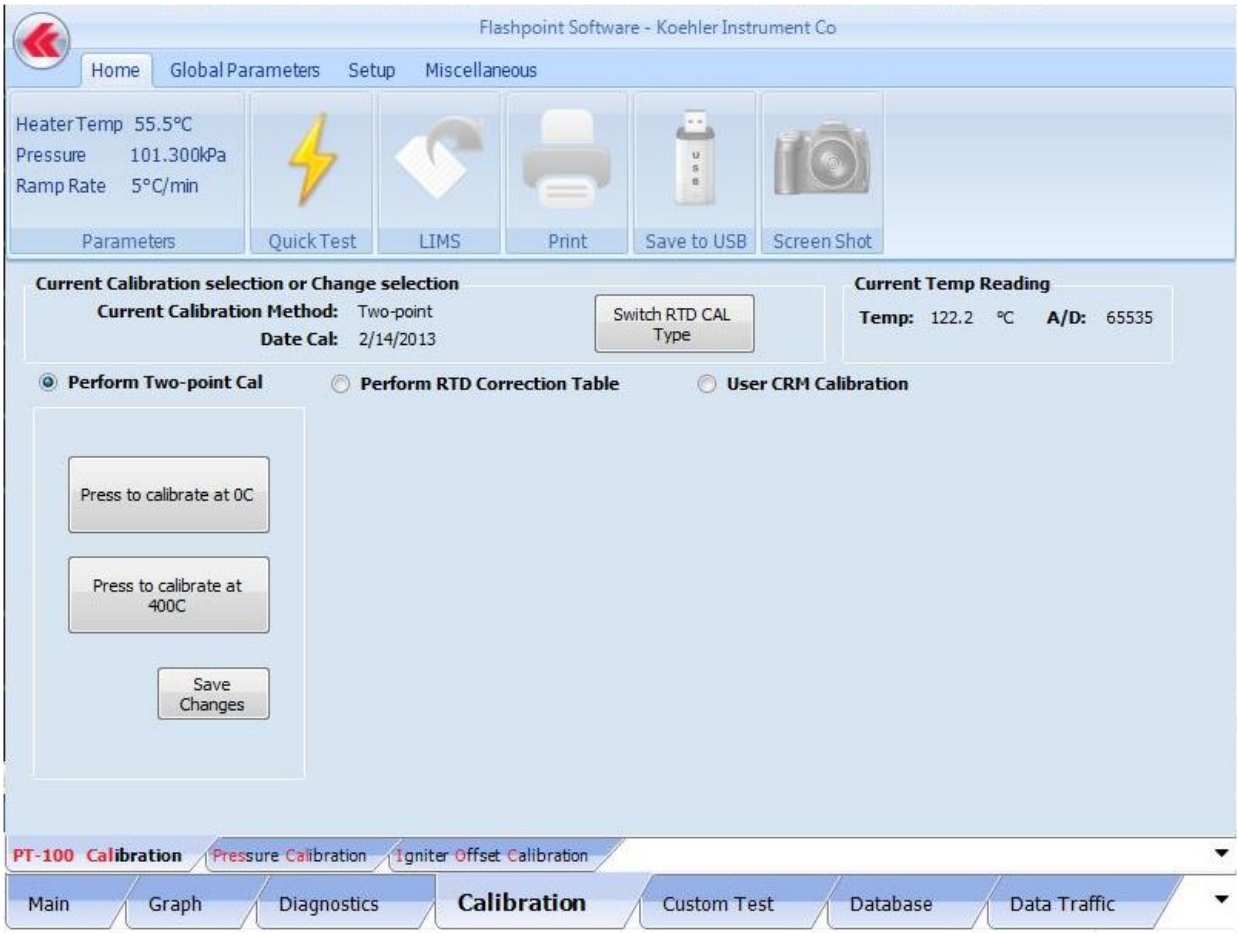


Figure 14: Calibration Screen_Two Point Calibration

RTD Correction Table Calibration as shown in **Figure 15** below is performed in conjunction with external certified temperature measuring devices. This table lists 21 fields in which the user can input offset values for any of temperature values shown. This table is particularly convenient for those with Certified Digital Contact Thermometers or Certified Liquid in Glass Thermometers and are interested in offsetting the analyzer at one or more temperature values of their choice. Simply enter the offset value in the corresponding field and click **Save Changes** to implement the offset.

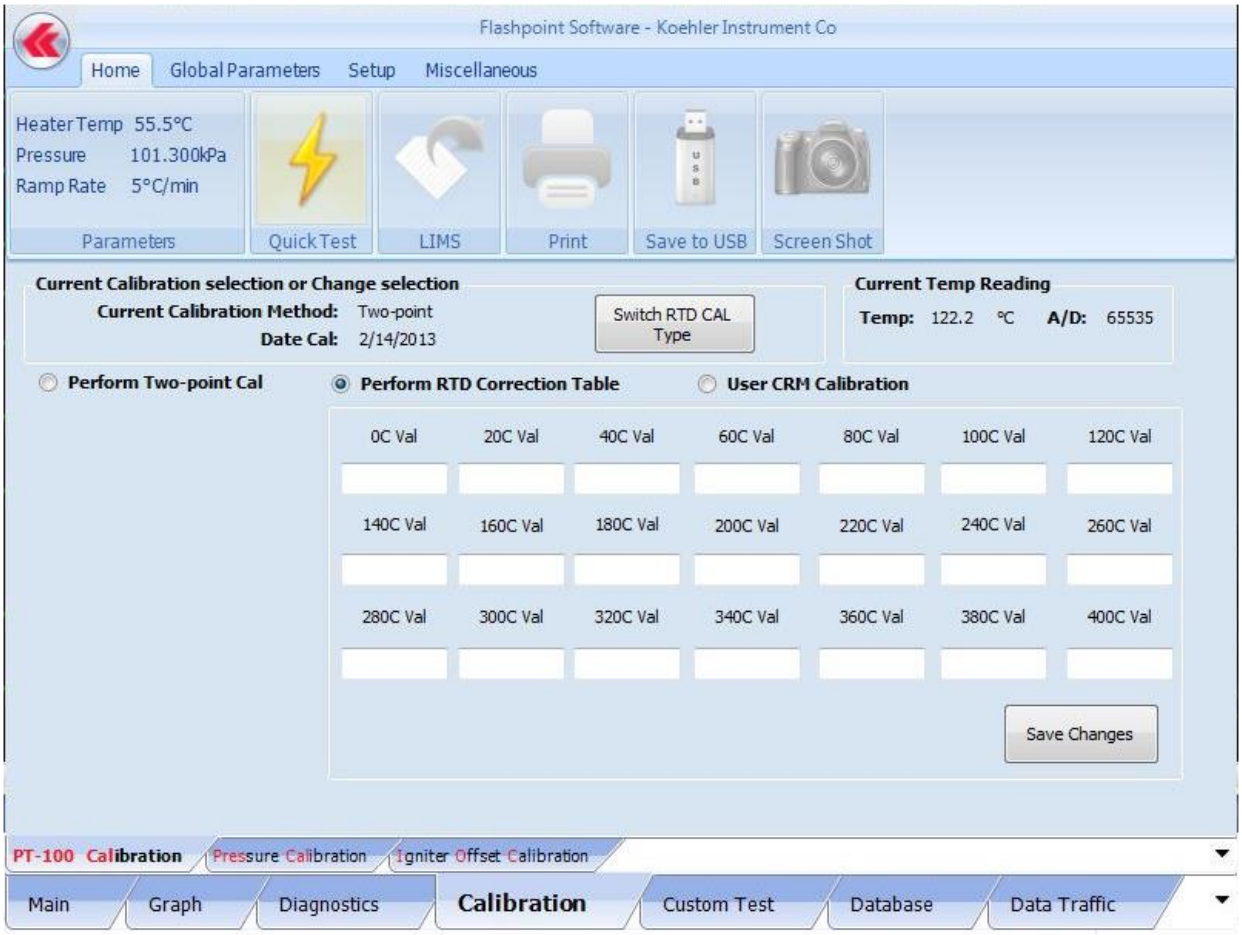


Figure 15: Calibration Screen_RTD Correction Table

User CRM Calibration_Gas CRM Calibration as shown in **Figure 16** below is a user defined table that allows for the input of flash point values of up to four (4) Certified Reference Material (CRM) samples using a Gas Ignition source.

1. Input the certified flash point value from the CRM bottle label or test certificate into the first column titled **CRM Flash Value**
2. Perform a series of four flash point tests with the analyzer using the CRM sample
3. Input the Flash Point Value as determined by the Analyzer into each **Run Column 1 - 4**
4. Click the **Save Changes** button to confirm the instrument calibration

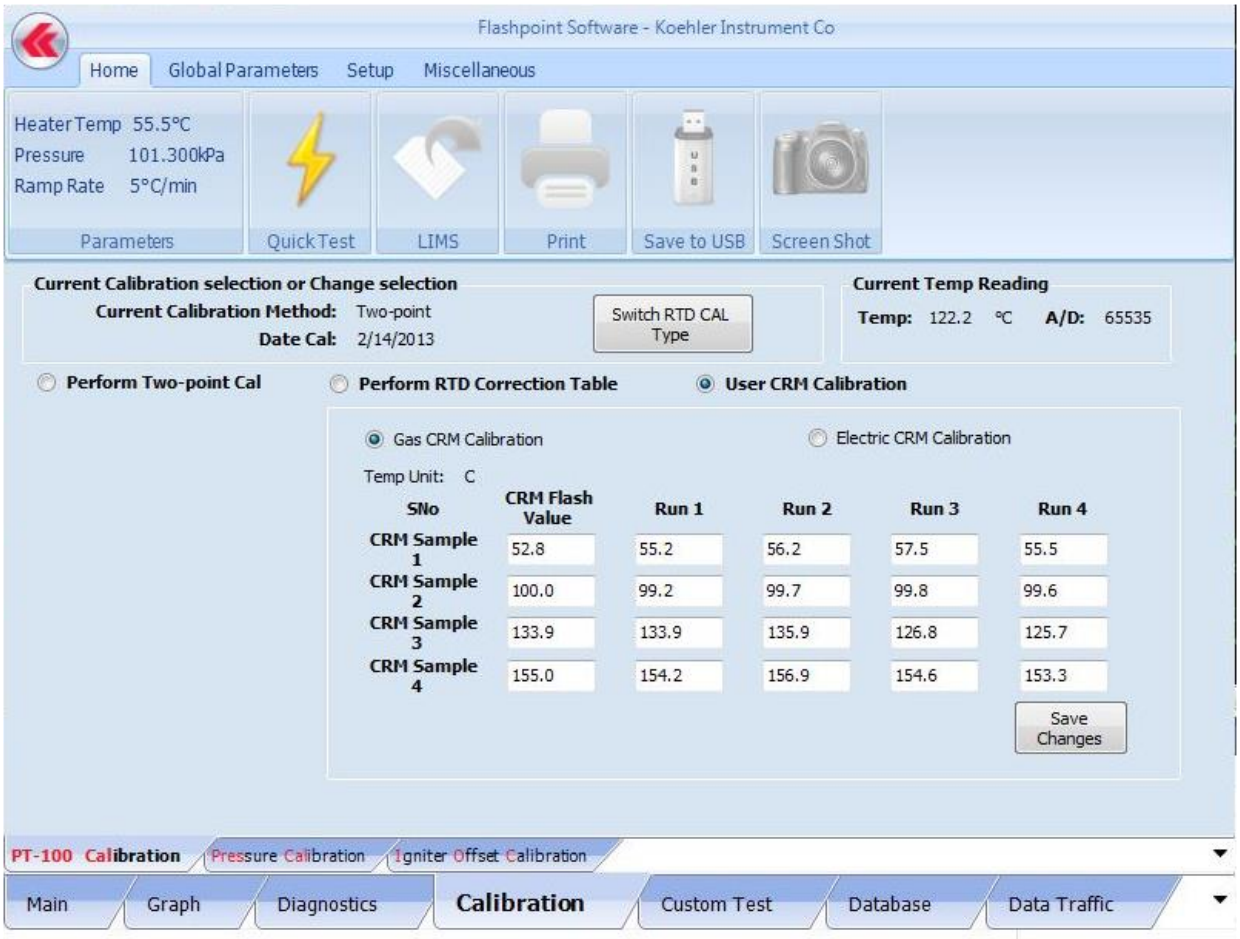


Figure 16: Calibration Screen_Gas CRM Calibration

User CRM Calibration_Electric CRM Calibration as shown in **Figure 17** below is a user defined table that allows for the input of flash point values of up to four (4) Certified Reference Material (CRM) samples using the Electrical Ignition Source.

1. Input the certified flash point value from the CRM bottle label or test certificate into the first column titled **CRM Flash Value**
2. Perform a series of four flash point tests with the analyzer using the CRM sample
3. Input the Flash Point Value as determined by the Analyzer into each **Run Column 1 - 4**
4. Click the **Save Changes** button to confirm the instrument calibration

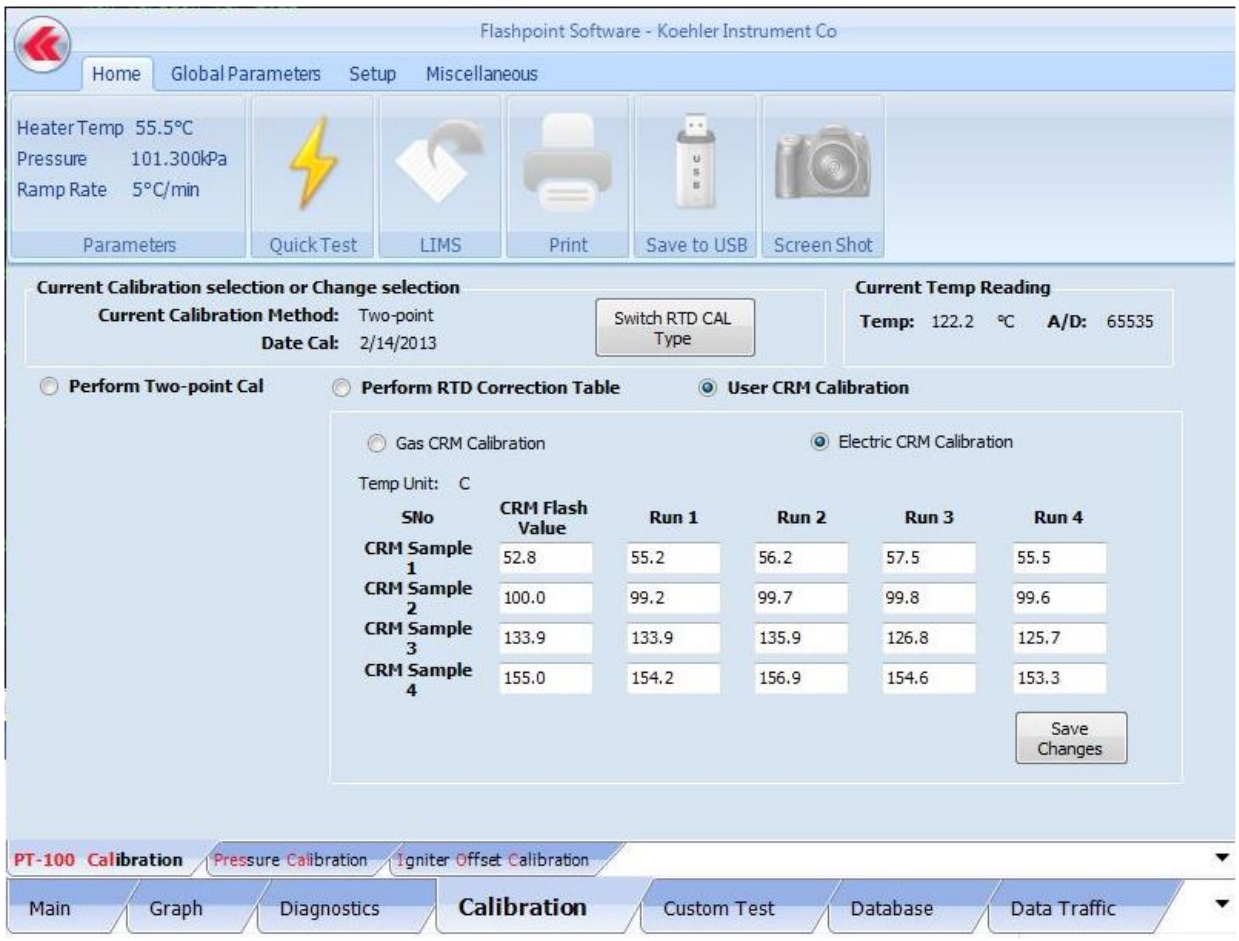


Figure 17: Calibration Screen_Electric CRM Calibration

b. Pressure Calibration - The Flash Point Analyzer is equipped with an Atmospheric Barometric Pressure Correction Feature. As pictured in **Figure 18** below the user can **Enter Atmospheric Pressure** in Kilopascals (kPa) into the empty field. The **Measured Barometric Pressure** is determined by the analyzers integrated barometer. Clicking Save Calibration Parameters will enter the Pressure Correction and update the **Date Calibrated**.

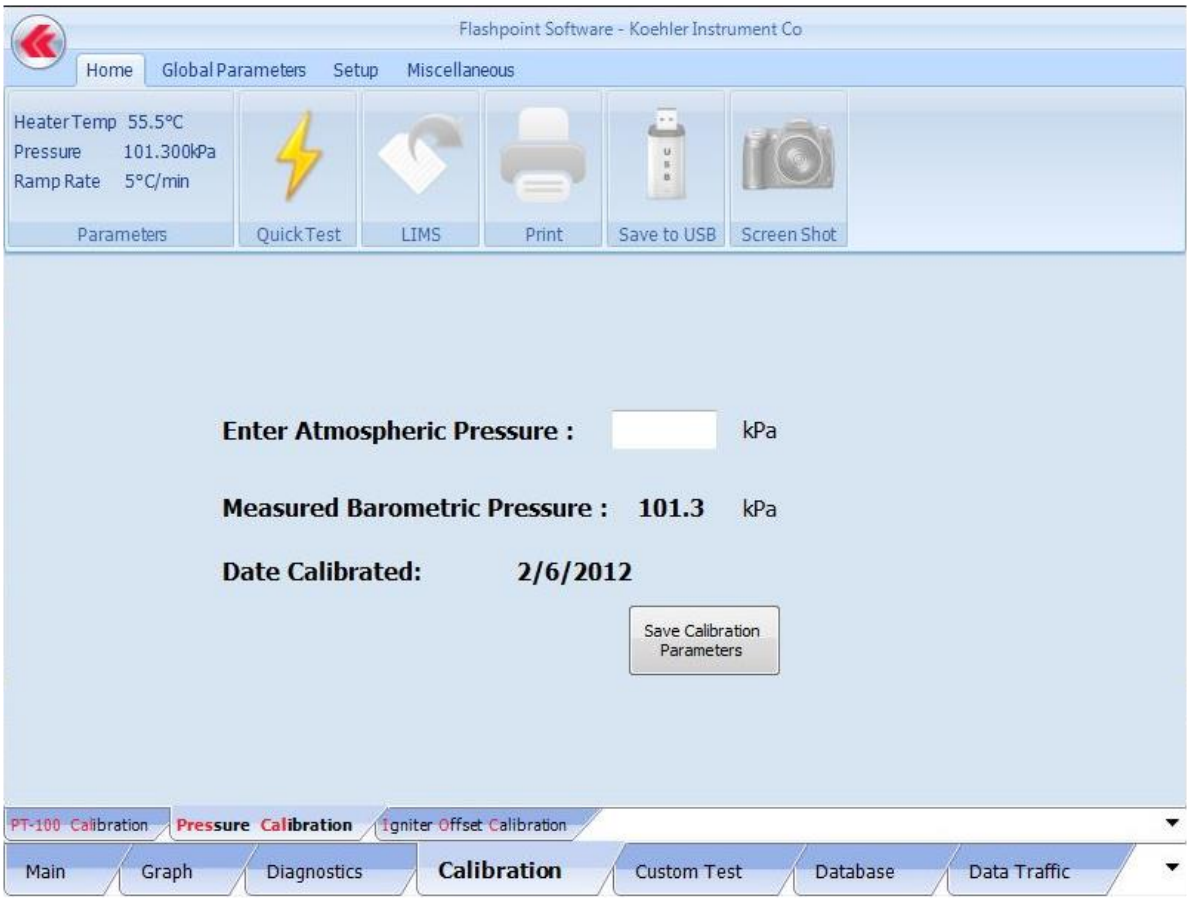


Figure 18: Calibration Screen_Pressure Calibration

c. Igniter Offset Calibration - An Electrical Igniter offset can be entered as a deg Celsius (°C) value as pictured in Figure 19 below. This method of calibration is useful when a material of known flash point is tested and the analyzer is displaying a value greater than the known value, e.g. known value is 53°C, Analyzer displays 55°C. Entering a 2°C value in the field will offset the analyzer measurement to display 53°C.

Figure 19: Calibration Screen_Igniter Offset Calibration

9. **Custom Test Screen** - Clicking on the Custom Test Tab located at the Lower Tab Section of the Main Menu will bring up the Custom Test Method Parameters Menu as shown in **Figure 20**:

   a. To set up a Custom Test Method:

   1. Input **Method Name**
   2. Input Test Method Parameters
      - Start Dip Temperature (Expected Flash Point (EFP) - X) (°C)
      - Dip Frequency (°C)
      - Motor Speed (RPM)
      - Heating Rate (°C/min)
      - End Test Temperature (EFP + X) (°C)
      - Fan Off Temperature (°C)
      - Pre-Heat Limit Temperature (°C)
      - Pre-Heat Ramp Rate (°C/min)
      - Open Lift Temperature (°C)
      - Soak Temperature (°C) (Typically used only for Asphalt / Bitumen Applications)
      - Soak Time (°C) (Typically used only for Asphalt / Bitumen Applications)
      - Apply Pressure Correction (YES/NO)
   3. Click **Add Method** button

   b. The Custom Test Method Screen can also be used to View, Clear, Edit and Delete Custom Test Methods. Select a Test Method from the **Select Program Name** pull down tab and click on the appropriate action button to the right to apply: **View**, **Clear**, **Edit**, **Delete**

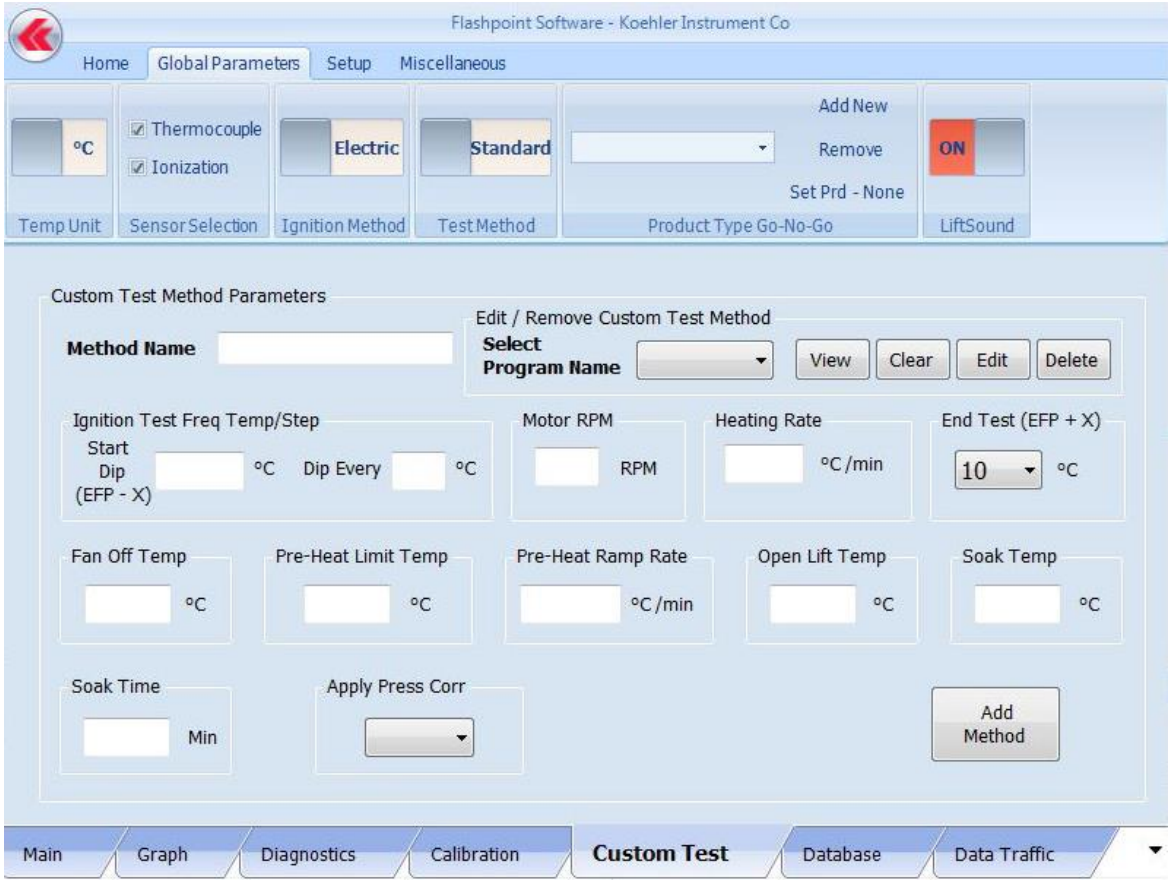


Figure 20: Custom Test Method Screen

10. **Database Screen -** Clicking on the Database tab will display the Analyzers Database as shown in **Figure 21** below. A maximum of 50 results will be accessible in this menu, the excess of which will be sent to an archive folder in the PCs hardware.

    After a test is complete the result and corresponding test input and parameter data will automatically be sent to the database. Each test is listed in a single row with the information separated by column.

    The user also has the option to delete or update the database list by clicking the **Delete** or **Update** buttons.

    In addition, the user can also export selected data to **LIMS**, sent to **Print** or **Save to USB** from the Database Screen. Please note that each Icon will only become active (illuminate) if the respective external hardware is connected to the analyzer. E.g. the **LIMS** Icon will illuminate when the Ethernet or RS232 cable is connected to the Analyzer.

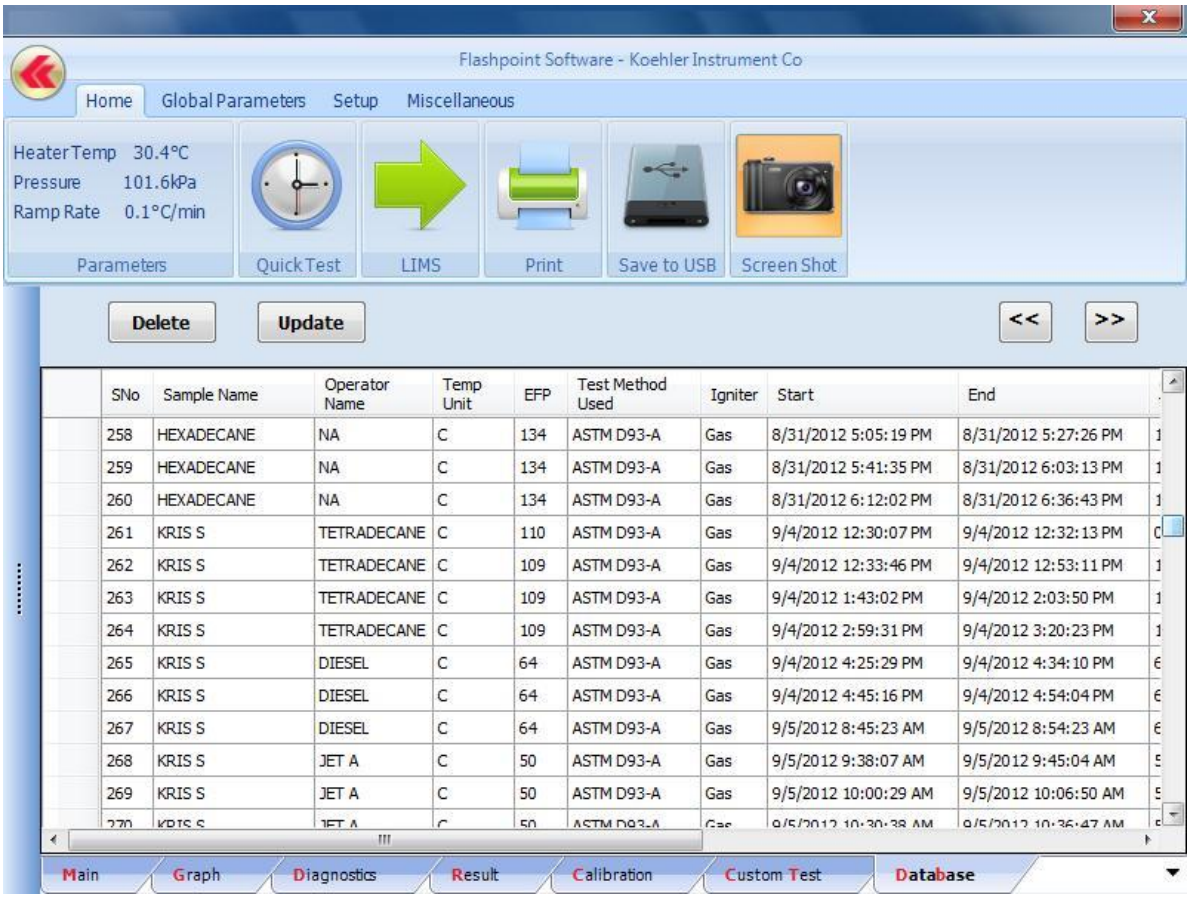


Figure 21: Database Screen

Highlighting a data set and clicking on the **Print** button will cause a temporary **Print Result** Screen to appear followed by a **Printer Options** Menu. See **Figures 22** and **23** below. Once the appropriate printer is selected, click the **Print** button to send the test result to the Printer.

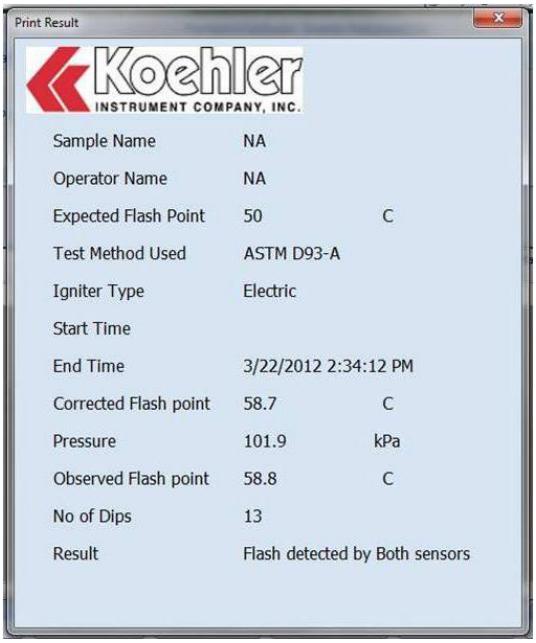


Figure 22: Print Result Screen

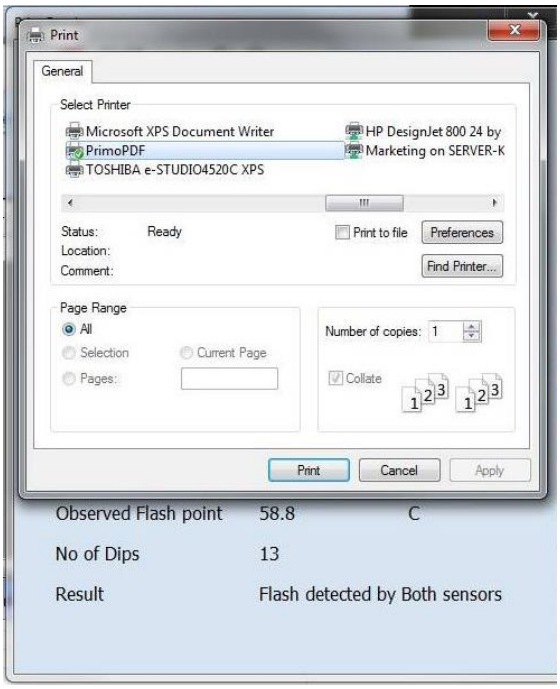


Figure 23: Printer Options Screen

11. **Data Traffic -** Clicking on the Data Traffic Tab will display the analyzers platform for showing the data traffic or communication data between the systems PC and Microprocessor as shown in **Figure 24** below. When the user first enters this menu, the display screen will be blank. Clicking on the **Monitor Traffi**c box will begin displaying the data communication. At this time, a screenshot can be taken of the current data being displayed. The user can also insert a USB drive at this time and click the **Record Traffic** box. This function is useful in a troubleshooting situation. A file containing a record of the data traffic can be useful for a Koehler Technician for diagnosing a problem.

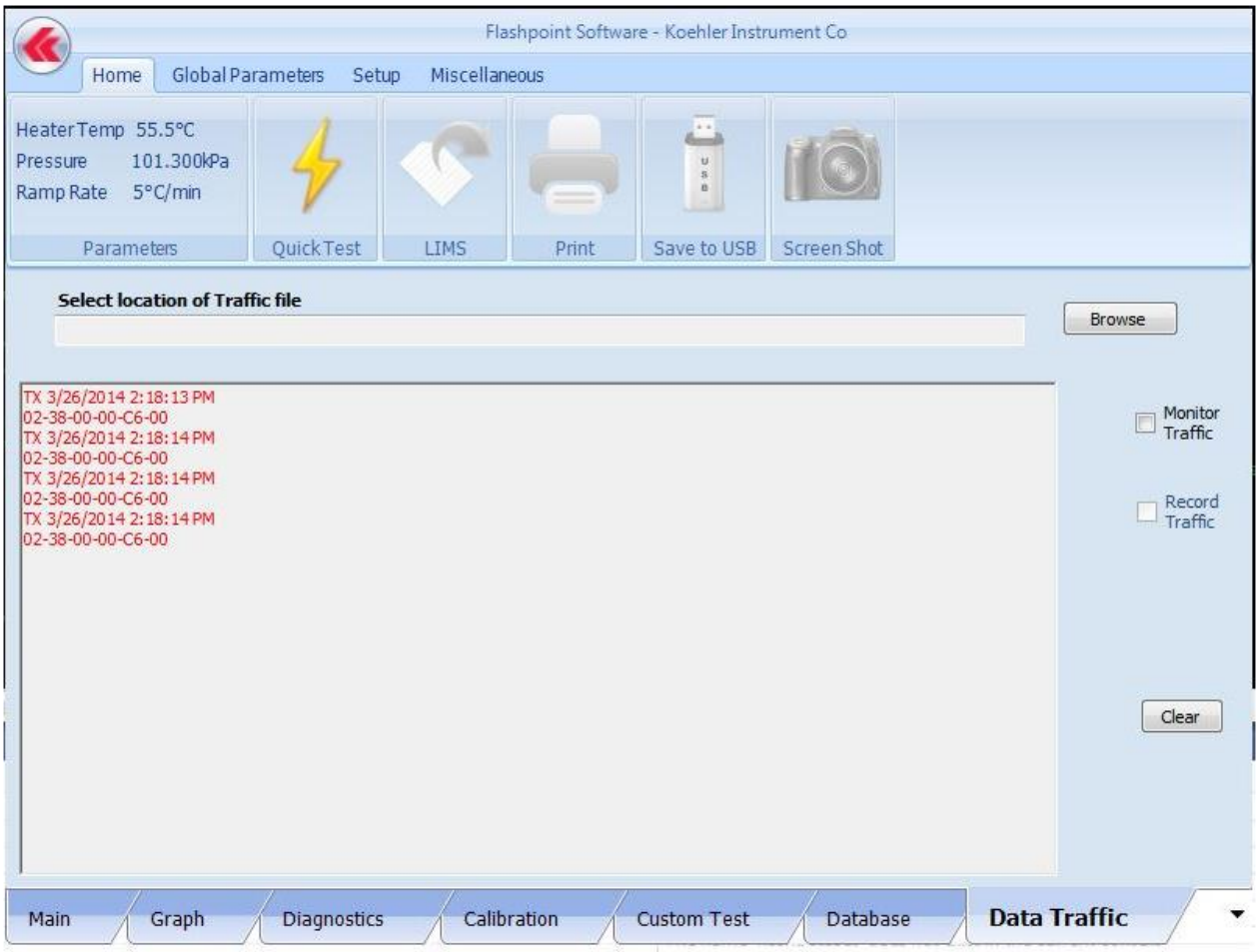


Figure 24: Data Traffic Screen

12. **Factory Settings -** The Factory Settings Menu can only be accessed when logged into the Analyzer under the **Factory** Login. The Factory settings menu is shown in **Figure 25** below. In the Factory Settings Menu, the user or administrator is capable of adjusting parameters such as the Dip Mechanism, Lift Mechanism and Electrical Igniter Intensity. Please note that these parameters have been preset at the Koehler Factory for Optimal performance of the Analyzer.

    a. **Adjust Dip Mechanism:** Pressing the **Up** and **Down** Arrows will adjust the level at which the igniter will dip into the shutter assembly during testing. The **Find Dip Home** button will automatically bring the Dip Mechanism to the Home Position (Highest Position), acting as a reset for making future adjustments. The **Check Dip** Button will activate the Dip Mechanism for a Test Dip. The **Dip** On/Off Switch will activate or deactivate the dipping mechanism.

    b. **Adjust Lift Mechanism:** Pressing the **Up** and **Down** Arrows will adjust the level at which the Lift Mechanism will be in relation to the analyzer base. The **Find Lift Home** button will bring the lift to the Home (Lowest Position). The **Test Position** Button will bring the lift to the Test Position (Low Position on Test Cup). The **Change Position** Button will bring the lift to the change position (Middle). The **Clean Position** button will bring the lift to the Clean Position (Upper). The **Stop Lift** button will automatically stop lift from moving.

    c. **Set Electrical Igniter Intensity:** The Intensity of the Electrical Ignitor can be adjusted as a percentage both for when the Igniter is intensifying for a **Test Dip** as well as for when the Igniter is being used to **Re-light** the gas flame in the event the flame goes out while using gas ignition. Enter the desired intensity from (0 - 100) % and click the **Save** button. The Electrical and Gas Igniter can also be turned Off or On by pressing the toggle switch shown.

Figure 25: Factory Settings Screen

13. **Result Screen -** After a Flask Point Test is complete, the Results Screen will be displayed. See **Figure 26** below. The corrected flash point value is prominently displayed at the center of the screen. Additionally, the **Type of Ignition** used to perform the test is displayed as well as the **Sensor Type** which detected the flash, the **Number of Test Dips** that occurred throughout the duration of the test, and the **Barometric Pressure** measured during the test.

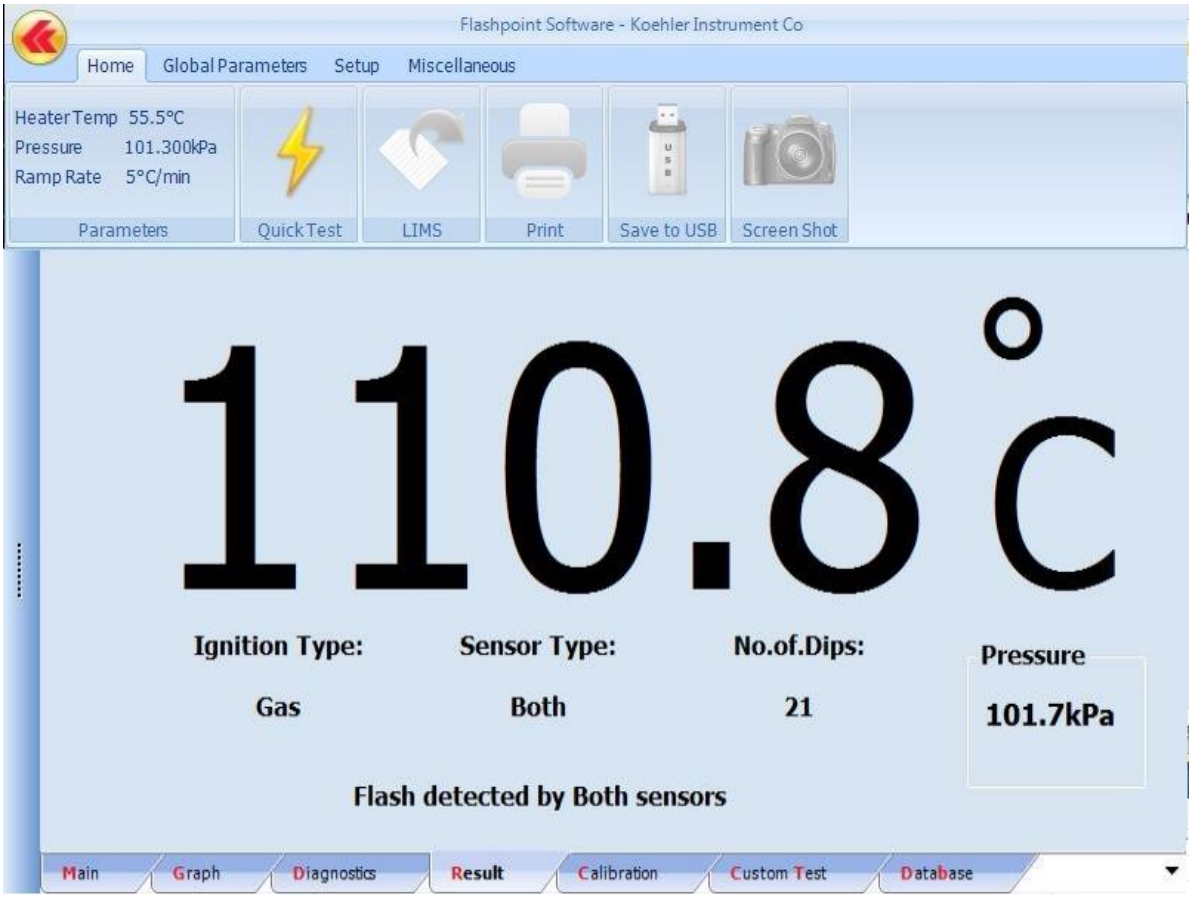


Figure 26: Result Screen

7 Service

Under normal operating conditions and with routine maintenance, the K71000 Automatic Pensky-Martens Flash Point Analyzer should 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: _____

8 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.

9 Warranty

Koehler Instrument Company 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.

10 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

Notes

Notes