

K47500/K47590 WICKBOLD APPARATUS

OPERATION AND INSTRUCTION MANUAL

REV B

Koehler Instrument Company, Inc.

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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing

CERTIFICATE OF CONFORMANCE

Wickbold Combustion Apparatus K475XX

This certificate verifies that part number K475XX, Wickbold Combustion Apparatus, was manufactured in conformance with the applicable standards set forth in this certification.

Specifications:	ASTM D2384
	ASTM D2784
	GPA 2140
	IP 243
	ISO 4260
	DIN EN 41
	NF T 60-142

This unit is tested before it leaves the factory, to ensure total functionality and compliance to the above specifications and ASTM standards. Test and inspection records are on file for verification.



Jesse Kelly
Application Engineer
Koehler Instrument Company

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).

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1 Introduction

The Koehler K47500 and K47590 Wickbold Apparatus determine the total sulfur in LP gases and also in liquid petroleum products by the Wickbold oxy-hydrogen burner method. This unit is also suitable for burning butane-butene mixtures to determine trace amounts of chloride.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Wickbold Apparatus. 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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Email: info@koehlerinstrument.com
<http://www.koehlerinstrument.com>

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 D2384: Traces of Volatile Chlorides in Butane-Butene Mixtures
- ASTM D2784: Sulfur in LP Gases, Oxy-hydrogen Burner or Lamp

2. 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 243: Determination of Sulfur Content – Wickbold Combustion Method

3. ISO International Standards (ISO)
1, Rue de Varembe
Case Postale 56
CH-1211 Geneva 20 Switzerland
Tel: +1 41 22 749 0111

ISO Publication:

- ISO 4260

4. Deutsche International Norm (DIN)

DIN Publication:

- DIN EN41

5. Gas Processors Association (GPA)

GPA Publication:

- GPA 2140

1.3 Instrument Specifications

Model No	Voltage	Frequency	Amps	Amps
K47500	115V	50/60 Hz	1.0	5-15
K47590	220-240V	50/60 Hz	0.5	6-15

2 Safety Information and Warnings

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.

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 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.

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>.

Acetone:



WARNING: Flammable liquid.

- Keep away from heat, sparks, open flames or other sources of ignition.
- Keep container closed and use with adequate ventilation.
- Irritant. May cause eye irritation and transient injury; may cause skin irritation; may cause respiratory tract irritation.
- Avoid inhalation of vapors.

Oxygen:



WARNING: Oxygen vigorously accelerates combustion.

- Keep oil and water away. Do not use oil or grease on regulators, gages, or control equipment.
- Keep combustibles away from oxygen and eliminate ignition sources.
- Do not drop cylinder. Make sure cylinder is secured at all times.
- Keep cylinder valve closed when not in use.

Nitrogen:



WARNING: Compressed has under pressure. Use with adequate ventilation.

- Gas reduces oxygen available for breathing.
- Keep cylinder out of sun and away from heat.
- Do not drop cylinder. Make sure cylinder is secured at all times.
- Keep cylinder valve closed when not in use.

Hydrogen:



WARNING: Extremely flammable (liquefied) gas under pressure.

- Use with adequate ventilation. Do not inhale.
- Keep away from heat, sparks, and open flames.
- Do not drop cylinder. Make sure cylinder is secured at all times.
- Keep cylinder valve closed when not in use.

Carbon Dioxide:



WARNING: Compressed gas under pressure. Use with adequate ventilation.

- Gas reduces oxygen available for breathing.
- Keep cylinder out of sun and away from heat.
- Do not drop cylinder. Make sure cylinder is secured at all times.
- Keep cylinder valve closed when not in use.

Mercury:

WARNING: Poison. May be harmful or fatal if inhaled or swallowed.

- Vapor harmful. Do not heat. Emits toxic fumes when heated.
- Keep container closed. Use with adequate ventilation.
- Do not throw in sink or garbage.

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

- K47500/K47590 Wickbold Apparatus
- K47510 Sample Capillary
- K47520 Sample Reservoir
- K47530 Combustion Chamber
- K47540 Absorber
- K47550 Spray Trap
- K47560 Cooling Bulb

Additional Accessories (To be purchased separately):

- K47570 Stainless Steel Burner
- K47580 Gas Sample Adapter

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 insert.
4. Extract instrument and place on suitable cart for transportation to work area / lab bench.
5. Lift instrument from cart and place on bench.
6. Carefully unpack and place the instrument and accessories in a secure location. 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 Installation Instructions

Equipment Placement. Place the instrument 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. Carefully remove and unpack the glassware from the separate carton. Remove all wrappings from the unit and accessories. Be sure to clean the glassware prior to assembly.

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

- No / Low Dust
- No direct sunlight
- Not near heating or AC ventilation ducts
- No Vibrations
- Clearance from other instruments
- Temperature Range: 5 to 40°C
- Elevation to 2000 meters
- Relative Humidity: < 80%

Power. Prior to connecting the line cord, check the alignment of the ignitor wires by depressing the ignitor handle on the left-hand side of the unit. If the ignitor wires have been mis-aligned during shipment, realign the ignitor wires by bending the wires, by hand, slightly and gently until they are in the same plane with a ¼" gap.

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.



WARNING: For safety, disconnect the power when performing any maintenance and/or cleaning..



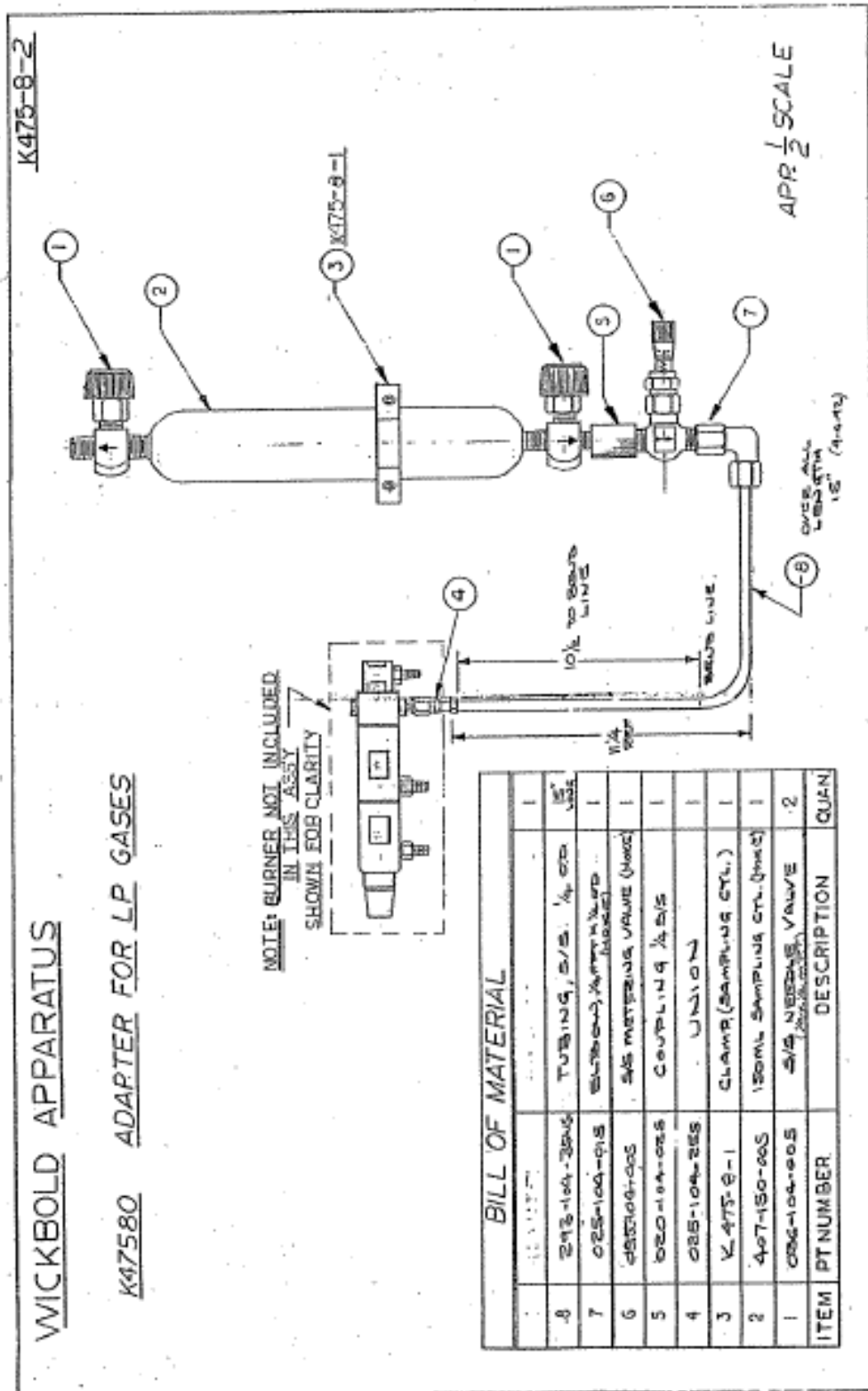
NOTE: Before beginning any testing, arrange a platform under the absorber to allow for any gap that might exist between the absorber and the combustion chamber. This must be done to ensure that there is no stress applied while attaching the absorber.

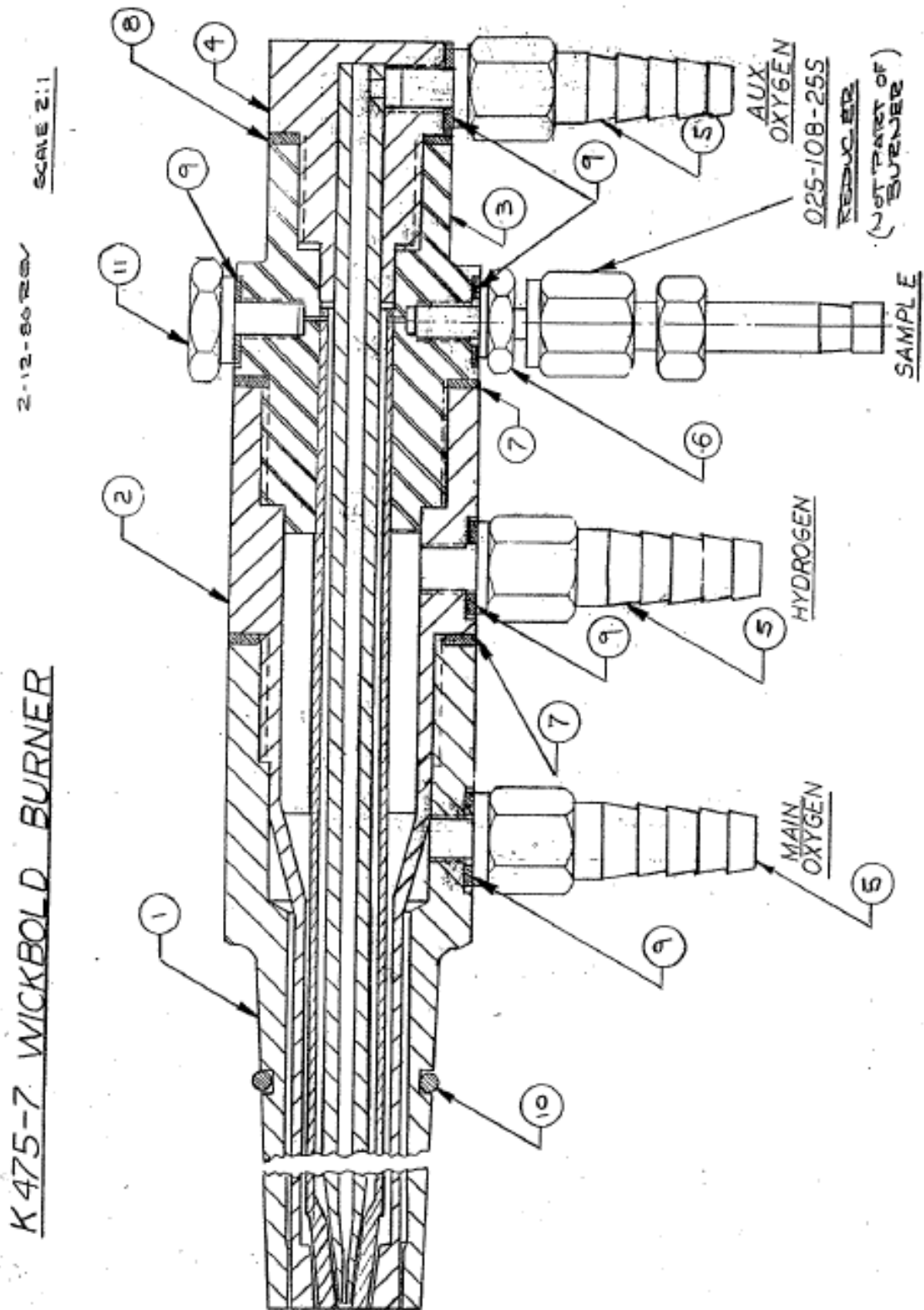
Gas Sources. Connect the gas sources (oxygen, hydrogen, nitrogen) to the back of the unit. Do not allow the gas cylinder pressure to exceed 100 psi. Be sure to connect the hoses from the tanks to the correct gas inputs. Open the toggle valves located in the front of the unit and check that the gases flow from each

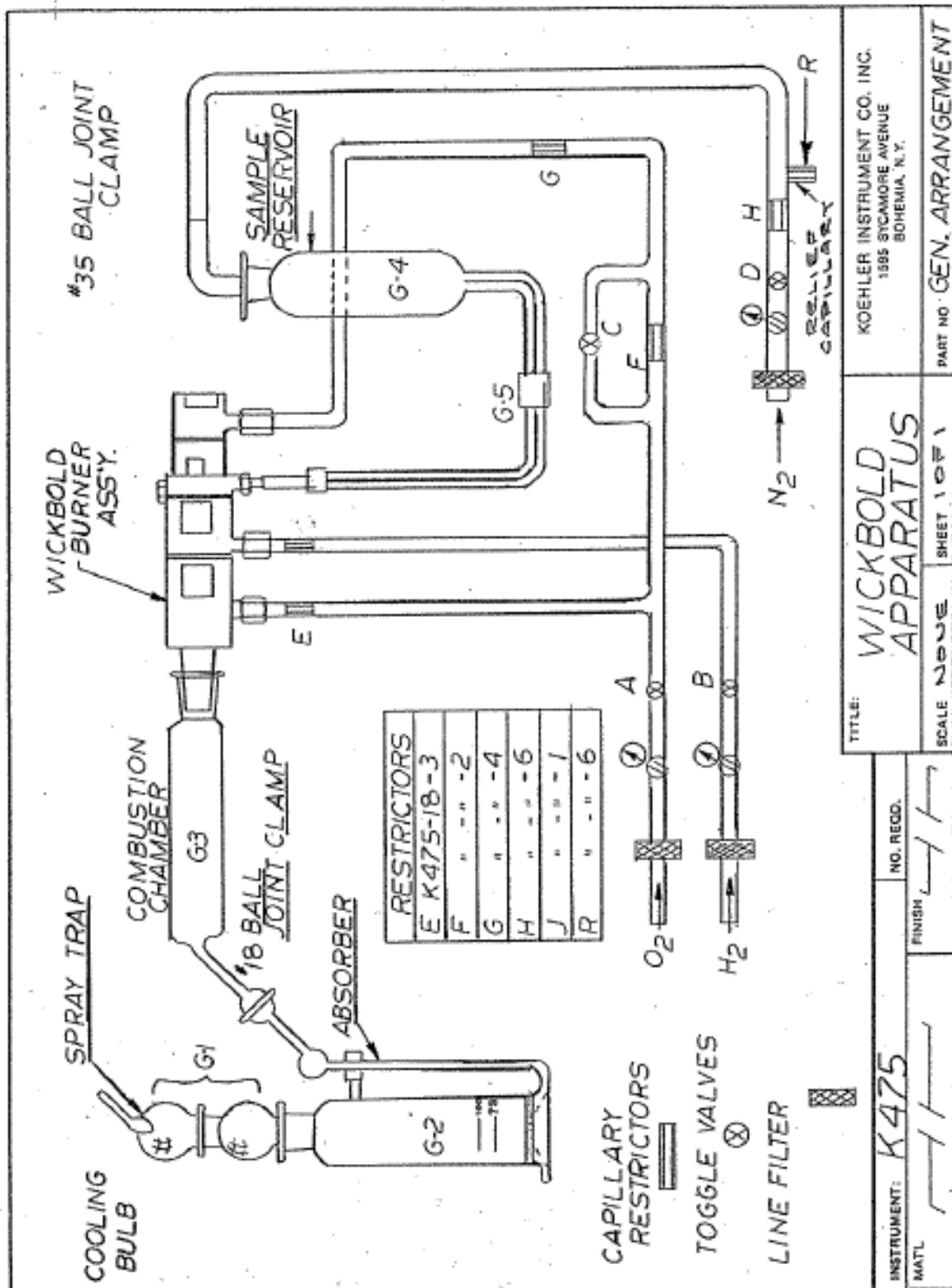
connection (where the burner is attached) and from the relief capillary. After this, close the toggle valves and clamp the burner placing the hydrogen inlet between the two bottom fingers of the clamp.

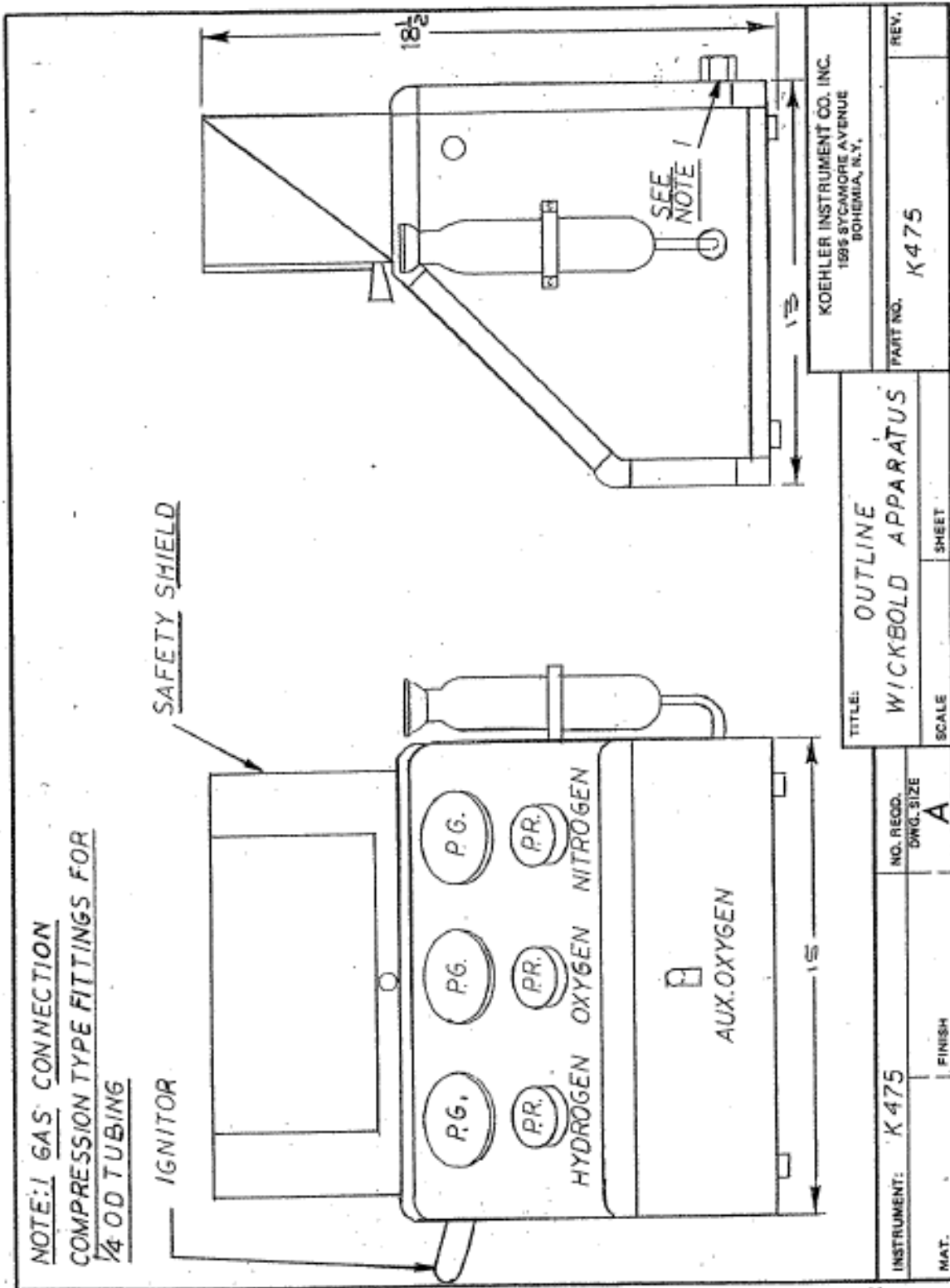
Connect the gas lines with 3/16" I.D. Tygon Tubing. Plug the sample inlet fitting with glass wool and connect the sample to the burner and to the sample reservoir. Connect the pressure cap on the reservoir to the nitrogen outlet on the side of the instrument with 3/16" I.D. Tygon tubing.

4 Descriptions / Assembly Drawings









5 Operation

1. Be sure to read the safety and hazard warnings, the installation procedure, and any of the standard test methods mentioned in the introduction of this manual before operating this instrument.
2. Put on safety glasses or goggles and a safety face shield.

3. Burning Liquids:

Place an appropriate amount of sample into the sample reservoir, close the lid and attach the clamp to secure the lid. DO NOT attach the combustion chamber, absorber, cooling bulb or spraying trap yet.

Open the oxygen and hydrogen knobs to 3 to 4 psi. Open the oxygen and hydrogen toggle switches simultaneously. Ignite the burner by pressing the wood handle on the left side of the unit. Hold down the handle until the burner light. Be sure the safety shield is down when lighting the burner.

Once the burner is lit, lift the safety screen and attach the combustion chamber. Use a pot holder (mitt) when attaching the combustion chamber. When fitting the combustion chamber to the burner assembly, make sure that the burner assembly is fitted straight in the three-prong holder and tightened securely. Then fit the combustion chamber to the burner by making it snug around the burner O-ring, NOT TIGHT! Put down the safety shield.

Open the nitrogen and auxiliary oxygen toggle switches simultaneously. SLOWLY increase the nitrogen to achieve a blue flame. Allow the sample to burn for a few seconds to eliminate any possible residue.

Attach the absorber carefully to the combustion chamber. Be sure to place the platform support under the absorber so that no strain will be placed on it. Connect the clamp to hold the combustion chamber and absorber together. Then attach the spray trap and cooling bulb.



NOTE: It is desirable to avoid undue dilution of the absorber liquid so that it may be transferred conveniently to another vessel. If the cooling bulb is not attached, heat affects are such that the water formed in the combustion chamber will just about compensate for that loss by evaporation and the volume in the absorber will remain reasonably constant.

Adjust the psi of each gas, making sure to burn the sample SLOWLY. The average range of the gases should be between 3 and 4 psi. Always increase the psi of each gas very slowly and NEVER go above 5 psi. Adjust the gases until there is a blue flame burning smoothly. The burning rate of the sample will vary according to the sample being burned. The approximate rate is 100 mL per hour.

4. Burning Gases:

Weigh the sample vessel to the nearest 0.1g. Attach the needle valve to the bottom of the main valve. Attach suitable fittings and rubber tubing to convey the gas to the sample inlet. Do NOT attach the combustion chamber, absorber, cooling bulb or spraying trap yet.

Open the oxygen and hydrogen knobs to 3 to 4 psi. Open the oxygen and hydrogen toggle switches simultaneously. Ignite the burner by pressing the wood handle on the left side of the unit. Hold down the handle until the burner lights. Be sure the safety shield is down when lighting the burner.

Once the burner is lit, lift the safety shield and attach the combustion chamber. Use a pot holder (mitt) when attaching the combustion chamber. When fitting the combustion chamber to the burner, make sure that the burner assembly is fitted straight in the three-prong holder and tightened securely. Then fit the combustion chamber to the burner by making it snug around the burner O-ring, not tight! Put down the safety shield.

Open the nitrogen and auxiliary oxygen toggle switches simultaneously. SLOWLY increase the nitrogen to achieve a blue flame. Allow the sample to burn for a few seconds to eliminate any possible residue.

Attach the absorber carefully to the combustion chamber. Be sure to place the platform support under the absorber so that no strain will be placed on it. Connect the clamp to hold the combustion chamber and absorber together. Then attach the spray trap and cooling bulb.



NOTE: It is desirable to avoid undue dilution of the absorber liquid so that it may be transferred conveniently to another vessel. If the cooling bulb is not attached, heat effects are such that the water formed in the combustion chamber will just about compensate for that loss by evaporation and the volume in the absorber will remain reasonably constant.

Adjust the psi of each gas, making sure to burn the sample SLOWLY. The average range for the gases should be between 3 and 4 psi. Always increase the psi of each gas very slowly and NEVER go above 5 psi. Adjust the gases until there is a blue flame burning smoothly.

Open the main sample vessel valve and then open the needle valve slowly. Adjust the needle valve slowly, until the gas is burning at a satisfactory rate (about 50 to 75g per hour).

5. Shutting Down:

When a sufficient amount of sample has been burned or reaches the bottom of the reservoir, lower the nitrogen to about 1 psi or until there is no blue flame. Then close the nitrogen and auxiliary oxygen toggle valves simultaneously. Close the nitrogen knob until the gauge reads zero. Then use a pot holder (mitt) and carefully remove the clamp holding the absorber and move the absorber, cooling bulb, and spray trap away from the combustion chamber. Then shut the oxygen and hydrogen toggle valves until they read zero. Then, using a pot holder (mitt), remove the combustion chamber carefully.



WARNING: Should the burner flame extinguish at any time, turn off the Hydrogen toggle valve immediately. Then turn off the

Nitrogen toggle valve to stop sample flow. Finally, turn off oxygen and auxiliary oxygen toggle valves. Wait for the chamber to cool before raising the safety shield. Abandon the determination and start over.



WARNING: If the Oxygen and Hydrogen toggle valves are closed before the Nitrogen toggle valve is closed, and all of the sample is not clear of the burner, the flame will go out. The hot combustion chamber will cause the continuing sample to flow to explode causing the combustion chamber to break.

6. For full details on the testing procedure, proceed to any of the standard test methods listed in section 1.2 of this manual.

6 Service

Under normal operating conditions and with routine maintenance, the K475XX Wickbold Apparatus 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: _____

7 Replacement Parts

7.1 K47500/K47590

Part Number	Replacement Part
K475-10-10	Clear Window
K475-12-1	Observation Window (Blue)
K475-14-1	Ignition Wires
K475-18-1	Hydrogen Restrictors
K475-18-2	Auxiliary Oxygen By-Pass Restrictors
K475-18-3	Main Oxygen Restrictors
K475-18-4	Auxiliary Oxygen Restrictors
K475-18-5	Nitrogen Restrictors

K475-18-6	Nitrogen Bleeder Restrictor
311-015-003	Gauge
290-010-001	Pressure Regulator
354-115-001	Ignition Coil
K475-0-13	Micro Clamp
050-001-012	Mercury Switch
037-108-00B	Toggle Valve
261-104-001	In-Line Filter

7.2 Glassware

Part Number	Replacement Part
K47510	Sample Capillary (G5)
K47520	Sample Reservoir (G4)
K47530	Combustion Chamber (G3)
K47540	Absorber (G2)
K47550	Spray Trap (G1)
K47560	Cooling Bulb (G1)

7.3 Burner

Part Number	Replacement Part
K475-7-0-6	Adapter
K475-7-0-7	Gasket
K475-7-0-8	Gasket
K475-7-0-9	Gasket
K475-7-0-11	Plug
AS568-015	O-Ring
025-108-25S	1/8 Tube x 1/4 S/S Adapter



NOTE: The burner assembly should be returned to the factory for repair.

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

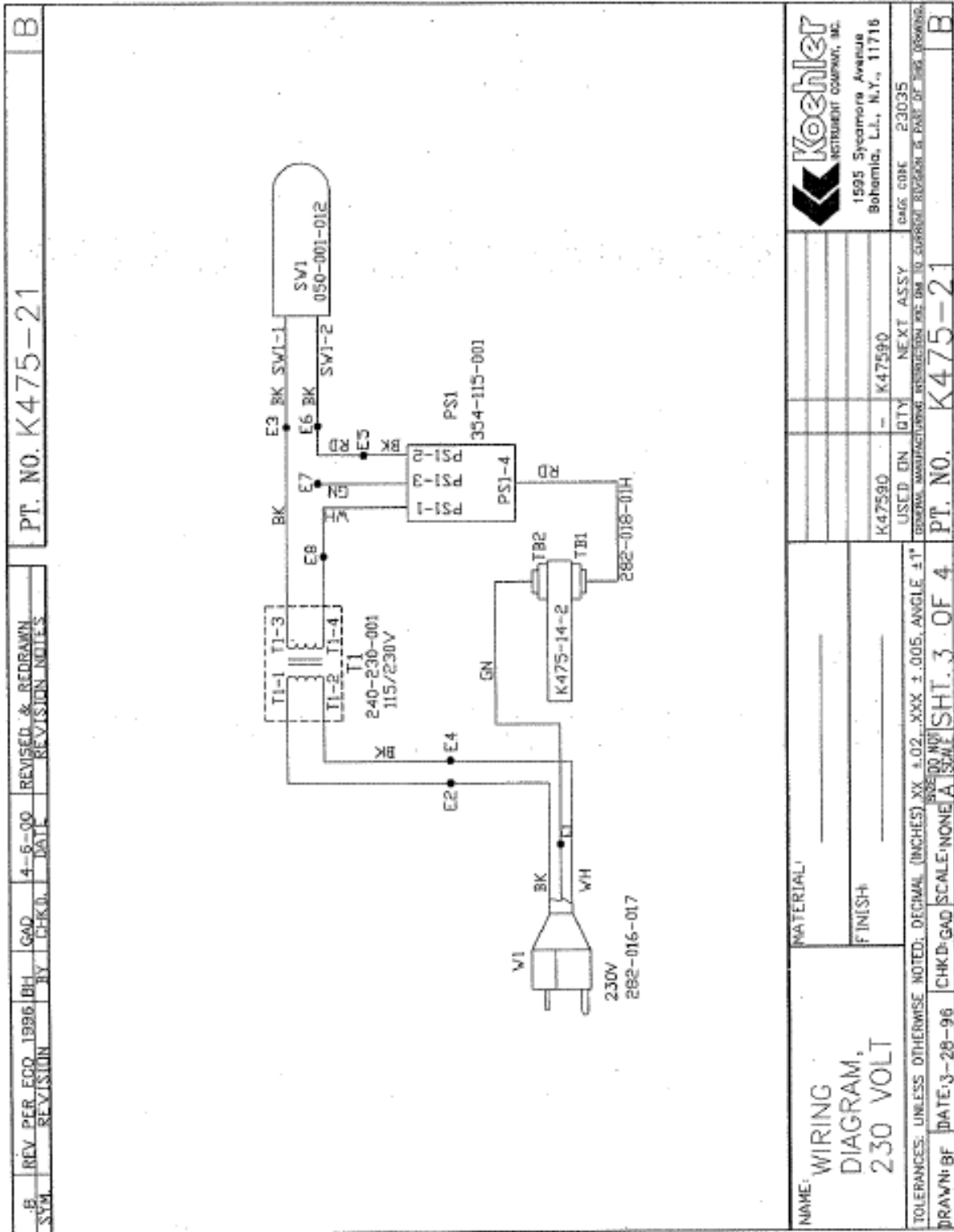
We, at Koehler, would like to thank you for your equipment purchase, which is protected by the following warranty. If within one (1) year from the date of receipt, but no longer than fifteen (15) months from the date of shipment, Koehler equipment fails to perform properly because of defects in materials or workmanship, Koehler Instrument Company, Inc. will repair or, at its sole

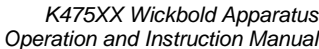
discretion, replace the equipment without charge F.O.B. its plant, provided the equipment has been properly installed, operated, and maintained. Koehler Instrument Company must be advised in writing of the malfunction and authorize the return of the product to the factory. The sole responsibility of 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.

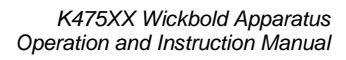
10 Returned Goods Policy

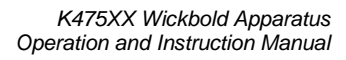
To return products for credit or replacement, please contact Koehler Customer Service with your purchase order number, our packing list/invoice number, the item(s) to be returned and the reason for the return. You will be issued a Returned Authorization (RA) number, which must be prominently displayed 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.



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