



## **K45XXX**

### **FRONT VIEW DISTILLATION APPARATUS**

## ***OPERATION AND INSTRUCTION MANUAL***

REV B

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PETROLEUM TESTING & ANALYSIS INSTRUMENTATION • CUSTOM DESIGN & MANUFACTURING



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# CERTIFICATE OF CONFORMANCE

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## Manual Front View Distillation Apparatus K45XXX

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This certificate verifies that part number K45XXX, Manual Front View Distillation Apparatus, was manufactured in conformance with the applicable standards set forth in this certification.

**Specifications:**

ASTM D86  
ASTM D216  
ASTM D233  
ASTM D447  
ASTM D850  
ASTM D1078  
ASTM E133  
IP 123  
IP 195  
ISO 3405  
DIN 51751  
FTM 791-1001  
FTM 791-1015  
NF M 07-002

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



## Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>2</b>
1.1	<i>Koehler's Commitment to Our Customers .....</i>	2
1.2	<i>Recommended Resources and Publications .....</i>	2
1.3	<i>Instrument Specifications .....</i>	3
<b>2</b>	<b>Safety Information and Warnings .....</b>	<b>3</b>
<b>3</b>	<b>Getting Started .....</b>	<b>4</b>
3.1	<i>Packing List .....</i>	4
3.2	<i>Accessories for Running Tests .....</i>	4
3.3	<i>Unpacking .....</i>	4
3.4	<i>Setup .....</i>	4
<b>4</b>	<b>Descriptions .....</b>	<b>5</b>
4.1	<i>Assembling Test Equipment .....</i>	6
<b>5</b>	<b>Operation .....</b>	<b>6</b>
<b>6</b>	<b>Maintenance .....</b>	<b>6</b>
6.1	<i>Routine Maintenance .....</i>	6
6.2	<i>Spare Parts .....</i>	6
6.2.1	<i>Spare Parts for K45000/ K45100/ K45090/ K45190 (Groups 1-3) .....</i>	6
6.2.2	<i>Spare Parts for all 8 Units (including Group 4) .....</i>	6
<b>7</b>	<b>Troubleshooting .....</b>	<b>7</b>
<b>8</b>	<b>Service .....</b>	<b>7</b>
8.1	<i>Heater Replacement Procedure .....</i>	7
8.2	<i>Procedure for Removing Roll Pin on Pinion Shaft Assembly .....</i>	7
<b>9</b>	<b>Heater Assembly Drawings .....</b>	<b>8</b>
<b>10</b>	<b>Wiring Diagrams .....</b>	<b>9</b>
10.1	<i>K45000 (Group 1-3, 115V, Right Hand Model) .....</i>	9
10.2	<i>K45090 (Groups 1-3, 220-240V, Right Hand Model) .....</i>	10
10.3	<i>K45200 (Group 4, 115V, Right Hand Model) .....</i>	11
10.4	<i>K45290 (Group 4, 220-240V, Right Hand Model) .....</i>	12
<b>11</b>	<b>Storage .....</b>	<b>13</b>
<b>12</b>	<b>Warranty .....</b>	<b>13</b>
<b>13</b>	<b>Returned Goods Policy .....</b>	<b>13</b>
<b>Notes</b>	<b>.....</b>	<b>14</b>

## 1 Introduction

The Koehler K45XXX Front View Distillation Apparatus is the latest design for distillation of petroleum products. The standard front view distillation apparatus is used for distillation of Groups 1, 2 and 3 category products including motor and aviation gasolines, aviation turbine fuels, naphthas, kerosenes, distillate fuels, natural gasoline, hydrocarbon mixtures and other petroleum products. The K45000 is the right hand 115V model while the K45100 is the left hand 115V model. In the same respect, the K45090 is the right hand 220-240V model while the K45190 is the left hand 220-240V model.

The Group 4 front view distillation apparatus is used for testing of Grade No. 2 fuel oil, Grade No 2-diesel fuel oil, gas oils and other distillates requiring condenser bath temperatures of up to 140°F (60°C). It is also suitable for gasolines, aviation turbine fuels, naphthas, kerosenes and other liquid petroleum products. The Group 4 apparatus is available with a right or left hand heater unit. It can also run distillations for petroleum products characterized as Groups 1, 2 and 3. The K45200 is the right hand Group 4 115V model while the K45300 is the left hand 115V model. The K45290 is the right hand Group 4 220-240V model while the K45390 is the left hand 220-240V model.

The Koehler K45XXX conforms to the ASTM D86 test method and related test specifications. This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the Front View Distillation 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 to provide you with the full support of your laboratory testing needs. Our products are backed by our staff of technically knowledgeable, trained specialists who are experienced in both petroleum products testing and instrument service to better understand your requirements and provide you with the best

solutions. You can depend on Koehler for a full range of accurate and reliable instrumentation as well as support for your laboratory testing programs. Please do not hesitate to contact us at any time with your inquiries about equipment, tests, or technical support.

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**Fax: +1 631 589 3815**

**Email: [info@koehlerinstrument.com](mailto: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](mailto:service@astm.org)

#### ASTM Publication:

- ASTM D86: Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure
- ASTM D216: Method of Test for Distillation of Natural Gasoline
- ASTM D233: Standard Test Methods of Sampling and Testing Turpentine
- ASTM D447: Test method for Distillation of Plant Spray Oils
- ASTM D850: Standard Test Method for Distillation of Industrial Aromatic Hydrocarbons and Related Materials
- ASTM D1078: Standard Test Method for Distillation Range of Volatile Organic Liquids
- ASTM E133: Standard Specification for Distillation Equipment

2. International Organization for Standardization (ISO)  
1, rue de Varembe  
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 3405: Petroleum Products- Determination of Distillation Characteristics at Atmospheric Pressure

3. Deutsche International Norm (DIN)  
<http://www.din.de>

**DIN Publication:**

- DIN 51751: Distillation of Petroleum Products at Atmospheric Pressure

4. Federal Test Method (FTM)

**FTM Publication:**

- FTM 791-1001: Distillation
- FTM 791-1015: Distillation

5. 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 123: Petroleum Products- Determination of Distillation Characteristics
- IP 195: Determination of distillation characteristics of volatile organic liquids

6. National Fuel Marketing (NFM)  
7979 East Tufts Avenue Parkway Suite 815  
Denver, Colorado 80237  
Office: 303-796-0325  
Fax: 303-796-0151

**NFM Publication:**

- NFM 07-002

### 1.3 Instrument Specifications

**Models:** K45000, K45100,  
K45090, K45190

K45200, K45300,  
K45290, K45390

**Electrical Requirements:** 115V 60Hz  
220-240V 50/60Hz

115V 60Hz  
220-240V 50/60Hz

**Capacity:** One (1) Sample

**Dimensions:** 15 ¼ x 18 ¼ x 19 ½ "  
(39 x 46 x 50 cm)

**Gross Weight:** 65 lbs (29.5kg)

## 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 because it 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. Repairs should only be carried out by authorized personnel.

**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>. Dispose of all chemicals according to local and national regulations.

### 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

- K45000/K45100/K45090/K45190 (Groups 1-3)  
Front View Distillation Apparatus  
OR:  
K45200/K45300/K45290/K45390 (Group 4)  
Front View Distillation Apparatus
- K45410 Flask Support Board A  
(see Figure 4)
- K45430 Flask Support Board C  
(see Figure 4)
- Graduate Support Block (see #1 Figure 1)

#### 3.2 Accessories for Running Tests

Catalog No.	Type	Capacity
332-003-006	Flask A	100mL
332-003-001	Flask B	125mL
332-003-002	Flask C	200mL
332-003-005	Flask D	250mL
332-002-013	Graduate A	25mL
332-002-003	Graduate B	100mL
332-002-014	Graduate C	200mL
K45410	Flask Support Board A	1 ¼"
K45420	Flask Support Board B	1 ½"
K45430	Flask Support Board C	2"
K45440	Flask Support Board D	2 ¾"
K45500	Centering Stopper	For a 125mL flask
K45520	Centering Stopper	For a 200mL flask

#### 3.3 Unpacking

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.

This unit comes packed upright in a corrugated carton. Lift the back unit condenser from the carton first and place on a firm level bench. Lift the heater section from the carton. Position the heater unit on the condenser by lifting the heater and placing the unit on the protruding hangers welded on the condenser. Remove all tie-downs and crumpled paper from the condenser section. Unpack the styrofoam wrappings from around the heater section and generally clean all wrappings from the units. Unpack the 1 ¼" and 2" secondary flask support boards and the wooden graduated cylinder support and place in a safe location.

#### 3.4 Setup

**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.

**Ventilation.** A fume hood or exhaust system is required when operating the unit. 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. The unit location should also be prevented from drafts.

**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.

**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

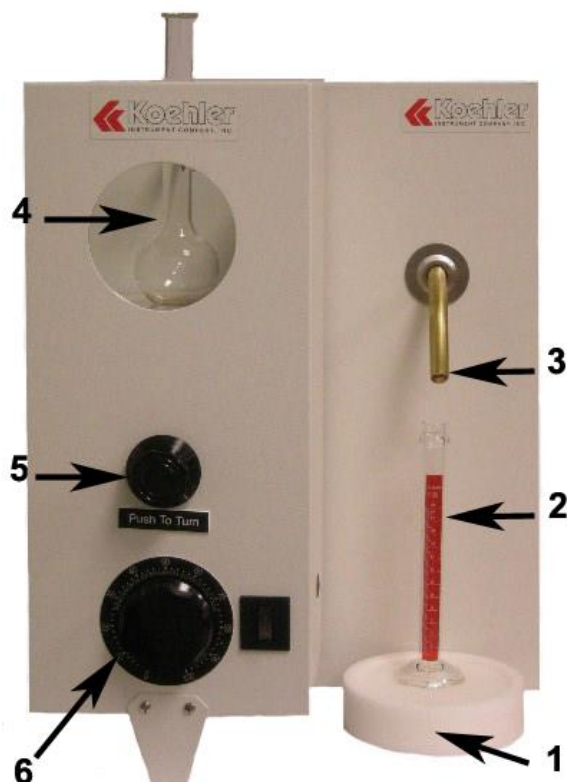


Figure 1: Apparatus (Front)

- 1) Graduated Cylinder Base
- 2) Graduated Cylinder (Receiving)
- 3) Condenser Tube
- 4) Distillation Flask
- 5) Black Knob: used to adjust the height of the elevator platform to fit the flask.
- 6) Temperature Dial

Figures 2 through 4 show additional parts used with the instrument.



Figure 2: Distillation Flask



Figure 3: Centering Stopper



Figure 4: Flask Support Board

#### 4.1 Assembling Test Equipment

1. Position the heater plate to lay flat on the adjustable elevator plate.
2. Plug the line cord into a properly fused and grounded receptacle of the correct voltage, as marked on the information plate.
3. Adjust the front leg on the heater unit to level the apparatus if the table is uneven.
4. Fill the condenser unit in accordance with the ASTM D86 or related test specifications listed in Section 1.2.
5. For the Group 4 units, attach the small connector cable coming from the heater unit to the connector on the bottom of the condenser unit.

### 5 Operation

1. Adjust the height of the elevator platform to fit the flask by pushing in the black knob and turning.
2. Turn the power switch to ON and adjust the variable transformer to the desired temperature. Allow the temperature to stabilize.
3. For the Group 4 units, turn the switch to ON in the condenser unit and adjust the thermoregulator to the desired temperature as per method.
4. Place the secondary flask support under the flask and adjust the plate in accordance with the ASTM D86 or one of the test specifications listed in Section 1.2.
5. Proceed to test according to the method.

### 6 Maintenance

**WARNING.** Disconnect power to the unit before servicing to avoid exposure to high voltages and/or temperatures which may result in personal injury or death. If you have any questions about maintaining your equipment, please do not hesitate to contact the Koehler technical service department.

#### 6.1 Routine Maintenance

The K45XXX Front View Distillation Apparatus requires little routine maintenance to provide many years of continuous service. However, over the course of time, some instrument parts may need to be replaced. When ordering replacement part(s), please provide the model number, serial number, and product shipment date of your equipment so that we can ensure you will receive the proper replacement part(s).

#### 6.2 Spare Parts

##### 6.2.1 Spare Parts for K45000/ K45100/ K45090/ K45190 (Groups 1-3)

Part No.	Description
K450-0-3B	Window
K450-0-14	Heater Transite
K450-0-15	Platform Transite
K450-0-19	Blotting Paper Holder
K450-0-20	Graduated Cylinder Base
K45410	Flask Support Board, 1 1/4" diameter hole
K45430	Flask Support Board, 2" diameter hole
K450-0-29	Cover Gasket
K450-1-30A	Rack and Pinion Housing Assembly
225-115-003	Heater, 1250W, 115V
225-230-003	Heater, 1250W, 230V
280-115-002	Variable Transformer
280-230-001	Variable Transformer
050-002-001	Switch

##### 6.2.2 Spare Parts for all 8 Units (including Group 4)

The following spare parts are used for mechanical refrigeration to maintain condenser temperature for all 8 units (Groups 1-4)

Part No.	Description
	RC 1/3 Refrigeration Unit
030-104-02B	¼ MPT x 3/8 Brass Hose Barb
020-308-00B	3/8 x ¼ Brass Pipe Bushing
020-104-00B	¼ Brass Pipe Coupling Hex
020-108-00B	1/8 x ¼ Brass Pipe Bushing 8 ft 3/8 ID Reinforced Rubber Hose
	5/8 – 7/8 Hose Clamps Grainger #5X443

## 7 Troubleshooting

**WARNING:** Troubleshooting procedures involve working with high voltages and/or temperatures which may result in personal injury or death, and should only be performed by trained personnel. Please do not hesitate to contact Koehler for assistance.

## 8 Service

Under normal operating conditions and with routine maintenance, the K45XXX Front View Distillation 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: \_\_\_\_\_

### 8.1 Heater Replacement Procedure

(See Heater Assembly Drawing A and B)

1. Remove (2) #8-32 x 5/8 large screws ("B" Assembly Drawing) from the top insulator (-14) and (1) holder (-13) from the top insulator.
2. Disconnect heater wires and remove heater, install new heater to the wires using the double nut arrangement.
3. Reinstall the (-13) holder and top insulator (-14) with the (2) #8-32 x 5/8 large screws to the standoffs, this completes the heater

installation procedure. Consult the assembly drawing for added information.

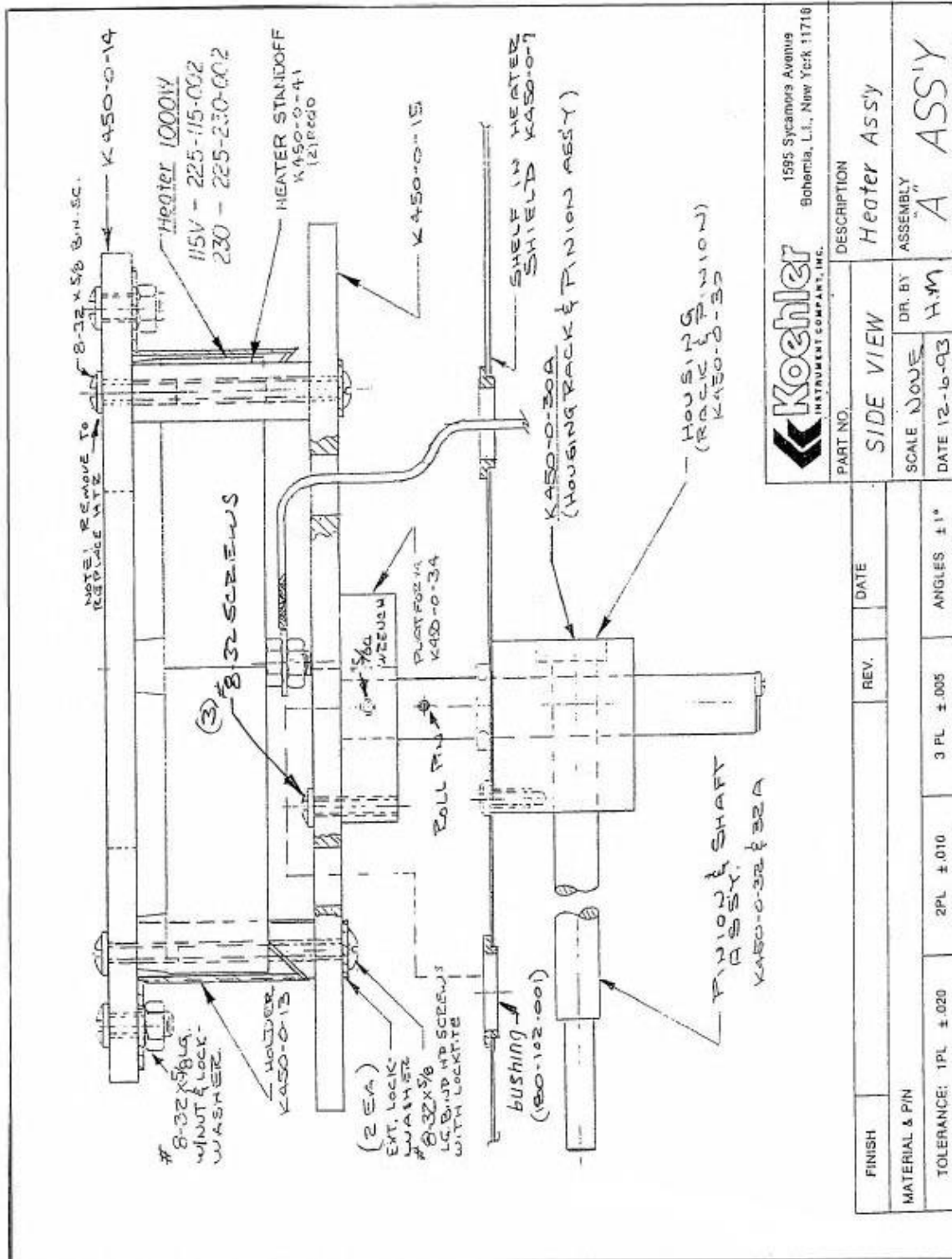
### 8.2 Procedure for Removing Roll Pin on Pinion Shaft Assembly

(See Assembly Drawing A and B)

1. Remove (2) #8-32 x 5/8 large screws from top insulator (-14) as shown in assembly drawing "B."
2. Lift up heater assembly and remove (3) 8-32 screws holding platform (-34) to bottom insulator (-15). Lift up bottom insulator (-15) and using a 5/64 Allen wrench, loosen the set screw on (-34) and remove from the shaft.
3. Using a pair of diagonal cutters or pliers, remove the roll pin from the shaft and discard. See the assembly drawing for more information.

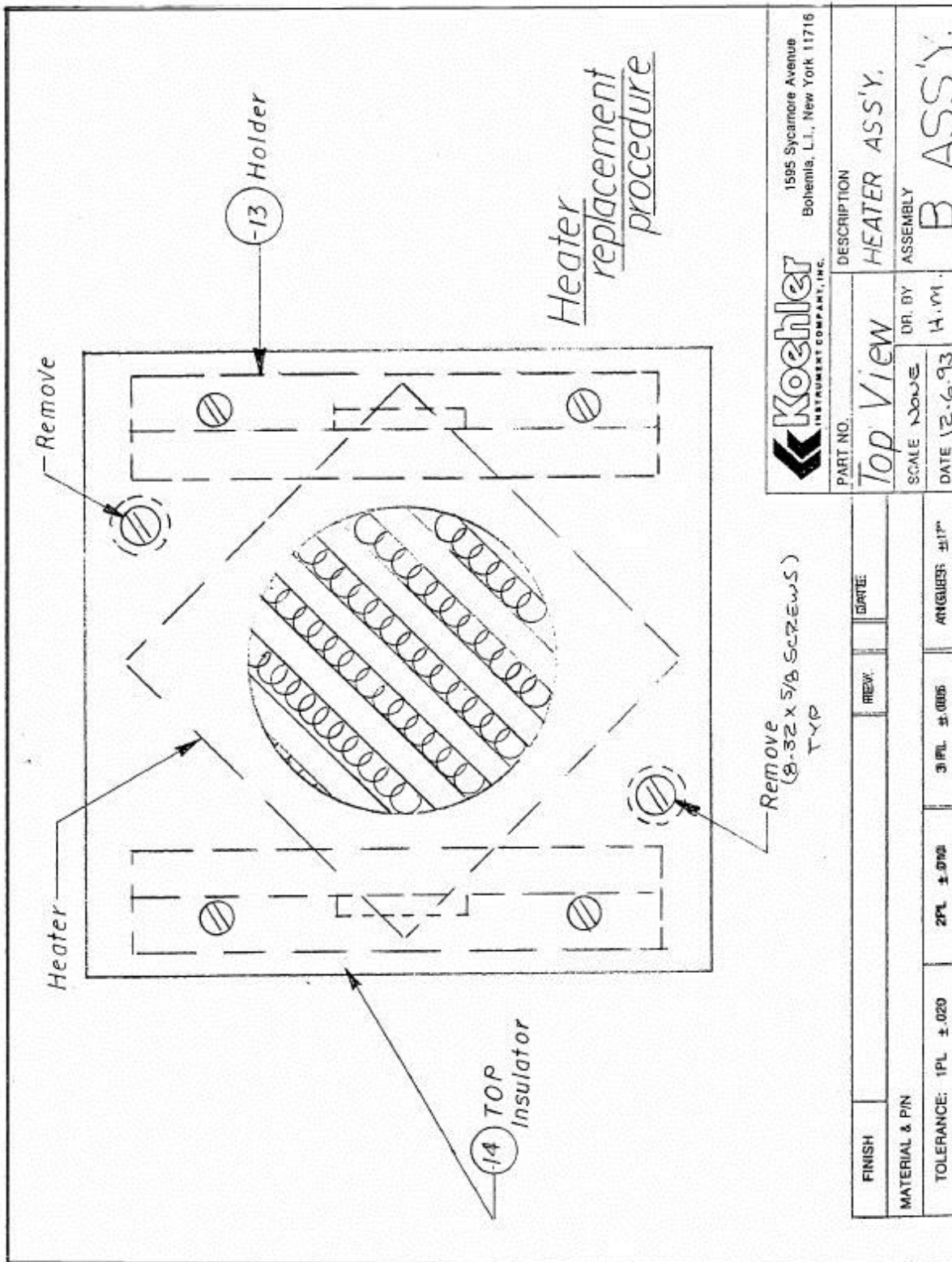
## 9 Heater Assembly Drawings

### "Drawing A" Side View

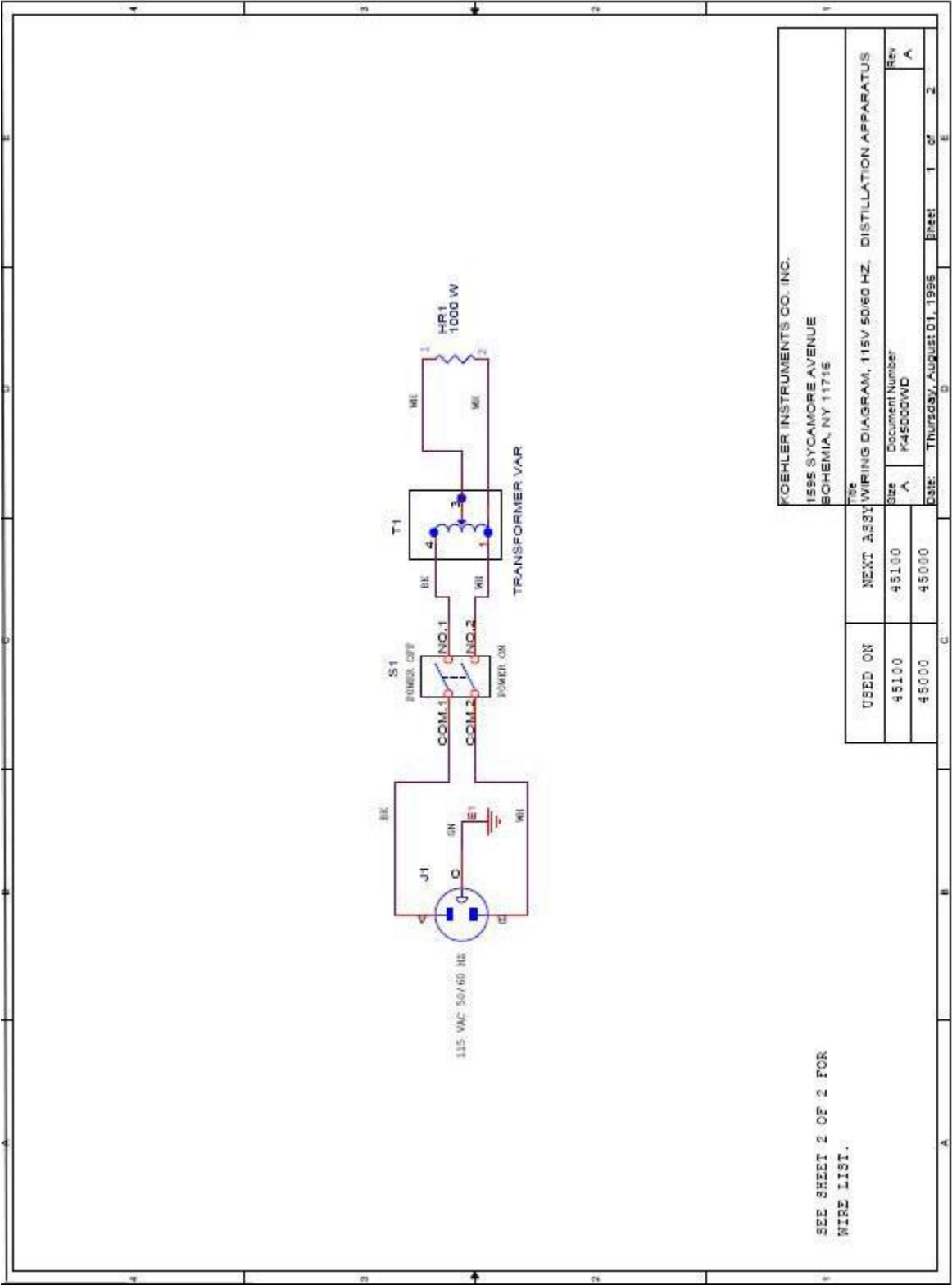




**"Drawing B" Top View**



10 Wiring Diagrams  
10.1 K45000 (Group 1-3, 115V, Right Hand Model)



230 VAC 50/60 HZ

J1

1000W

H1

T1

TRANSFORMER VAR.

1000W

H2

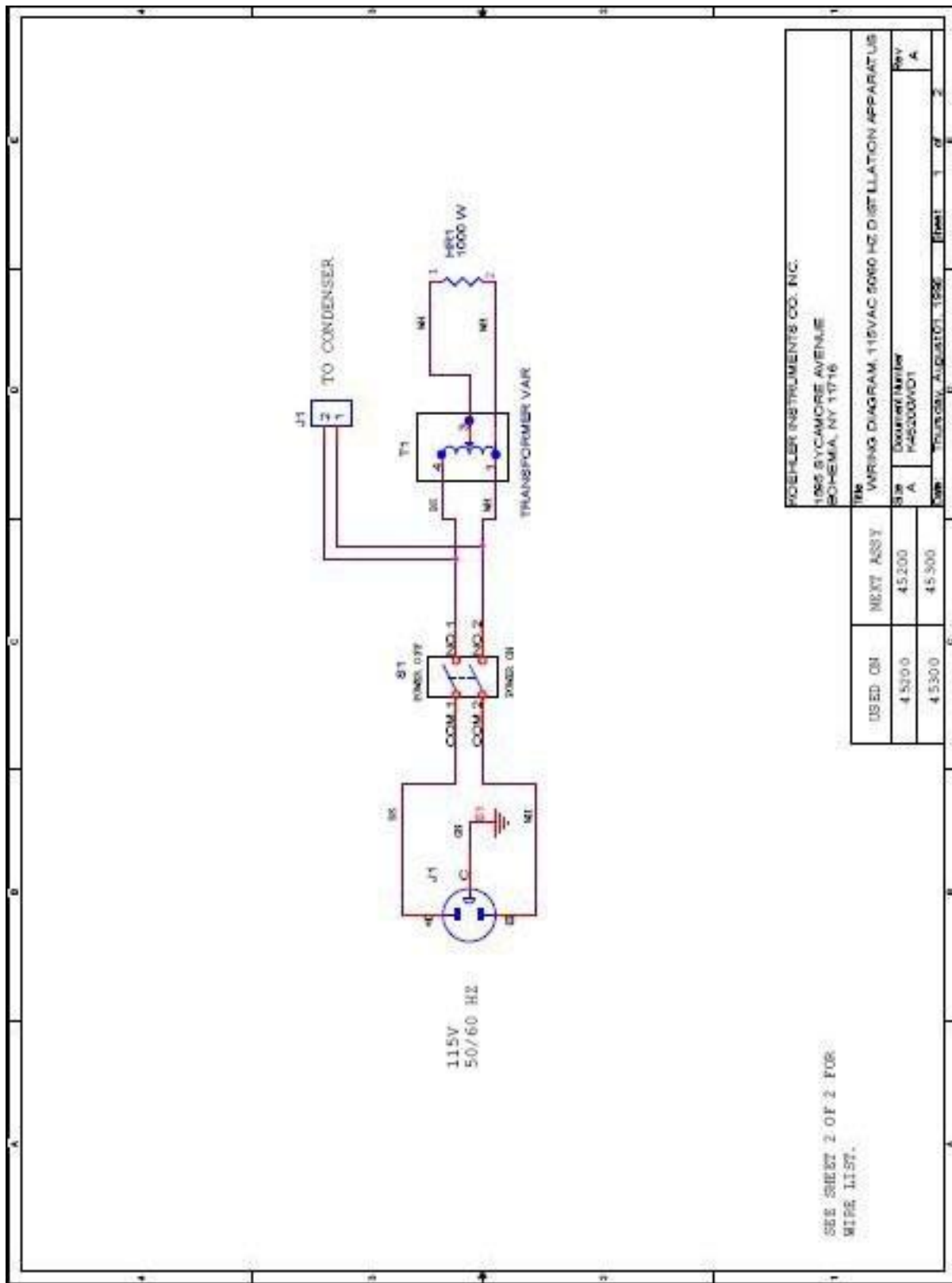
1000W

H3

1000W

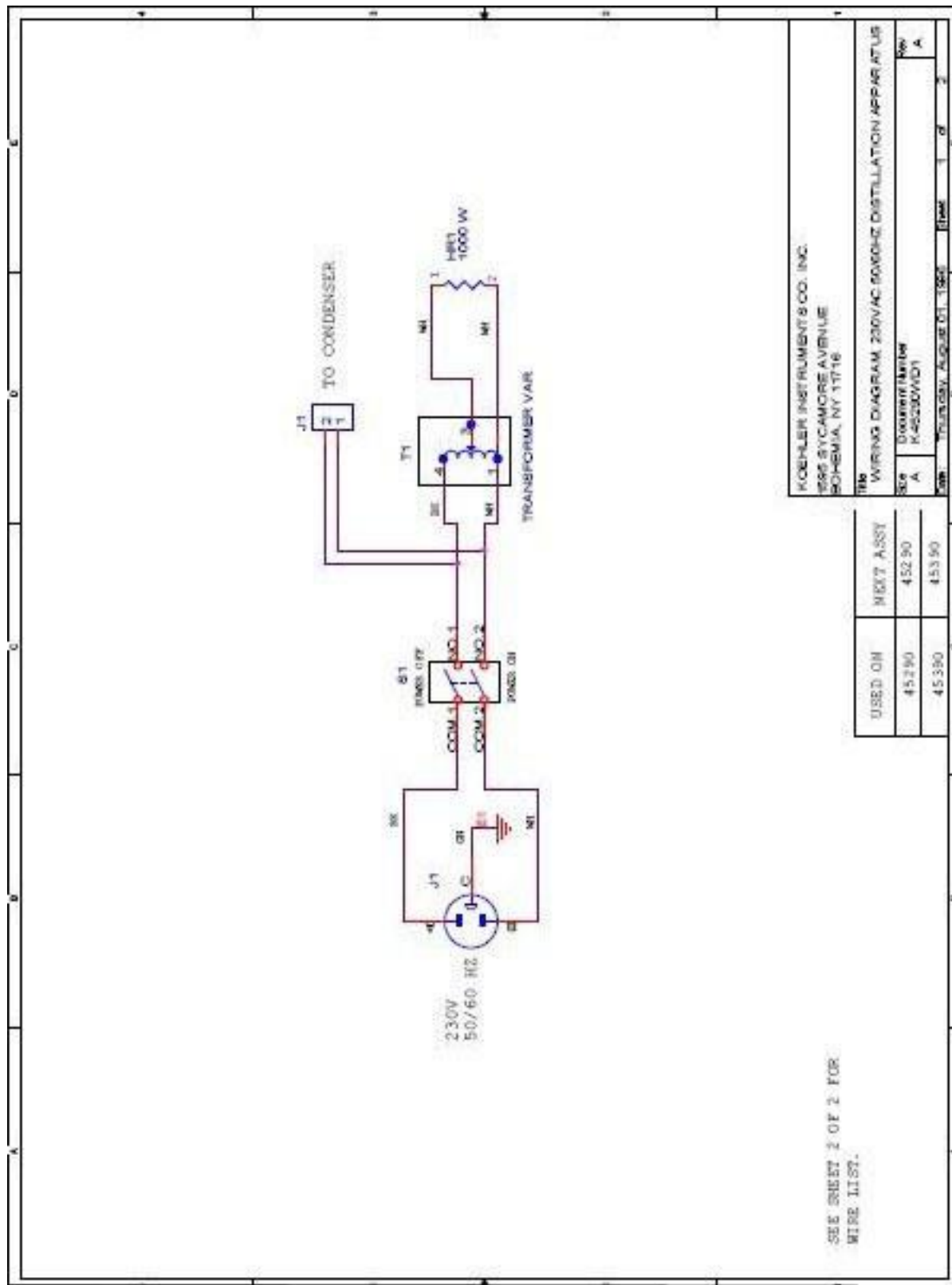
H4

### 10.3 K45200 (Group 4, 115V, Right Hand Model)





### 10.4 K45290 (Group 4, 220-240V, Right Hand Model)



## **11 Storage**

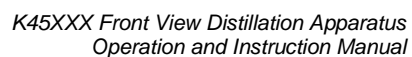
This laboratory test instrument is equipped with electrical components. Storage facilities should be consistent with an indoor laboratory environment. This testing equipment should not be subjected to extremes of temperature and/or moisture. This equipment was shipped from the factory in a corrugated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

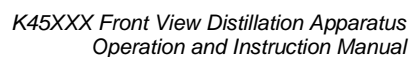
## **12 Warranty**

We, at Koehler, would like to thank you for your equipment purchase, which is protected by the following warranty. If within one (1) year from the date of receipt, but no longer than fifteen (15) months from the date of shipment, Koehler equipment fails to perform properly because of defects in materials or workmanship, Koehler Instrument Company, Inc. will repair or, at its sole discretion, replace the equipment without charge F.O.B. its plant, provided the equipment has been properly installed, operated, and maintained. Koehler Instrument Company must be advised in writing of the malfunction and authorize the return of the product to the factory. The sole responsibility of Koehler Instrument Company and the purchaser's exclusive remedy for any claim arising out of the purchase of any product is the repair or replacement of the product. In no event shall the cost of the purchaser's remedy exceed the purchase price, nor shall Koehler Instrument Company be liable for any special, indirect, incidental, consequential, or exemplary damages. KOEHLER INSTRUMENT COMPANY, INC. DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. Please save the shipping carton in the event the equipment needs to be returned to the factory for warranty repair. If the carton is discarded, it will be the purchaser's responsibility to provide an appropriate shipping carton.

## **13 Returned Goods Policy**

To return products for credit or replacement, please contact Koehler Customer Service with your purchase order number, our packing list/invoice number, the item(s) to be returned and the reason for the return. You will be issued a Returned Authorization (RA) number, which must be prominently displayed on the shipping container when you return the material to our plant. Shipping containers without an RA number prominently displayed 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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