



## K95400 LINCOLN VENTMETER

### *OPERATION AND INSTRUCTION MANUAL*

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Petroleum Testing & Analysis Instrumentation • Custom Design & Manufacturing



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## **1 Introduction**

The K95400 Lincoln Ventmeter measures the ventability of grease, which is useful in determining by consistency what types of greases can be used in an automatic centralized grease lubrication system. Furthermore, the diameter of the line and the supply line and in an automatic lubrication system can be accurately determined for a particular type of grease by measure of the grease ventability.

This manual provides important information regarding safety, technical reference, installation requirements, operating condition specifications, user facility resource requirements, and operating instructions for the K95400 Lincoln Ventmeter. 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**

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:**

- Draft Method: Determining Grease Suitability for Use in a Centralized Lubrication System by the Lincoln Ventmeter

## **1.3 Instrument Specifications**

Model:	K95400
Electrical Requirements:	none

## **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>.

## **3 Unpacking and Installation**

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**

- K95400 Lincoln Ventmeter with Lever Grease Gun

### **3.2 Unpacking**

Carefully unpack and place the instrument and accessories in a secure location. Ensure that all parts listed in previous section are present. Inspect the unit and all accessories for damage. If you find any damage, 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 Instrument Installation**

1. **Equipment Placement.** Place the apparatus on a firm, level table in an area with adequate ventilation or in a hood.
2. **Power.** The K95400 Lincoln Ventmeter does not require electric power for proper operation.

## **4 Operation**

This apparatus is designed for grease ventability determinations of bituminous materials in accordance with the ASTM draft test method. Please be sure to read the safety and hazard warnings, the installation procedure, and the standard test method before operating this instrument.

### **4.1 Testing Procedure**

A sample for one test requires about 400 grams of grease, and no specific preparation of the sample is necessary. If testing is performed at a temperature other than ambient, allow the grease sample and apparatus to acclimate to the temperature to be tested for four hours.

1. With valve 1 closed and valve 2 open, purge and charge system with sample of lubricant to be tested.
2. With pump/lever gun filled with the sample lubricant that is free of air pockets, couple it to the lubricant fitting.
3. Operate pump/lever gun until lubricant begins to flow from system.
4. Close valve 1 and 2.
5. Operate pump/lever gun and build up pressure to gauge reading of 1800 psig.
6. Place a receiving cup at outlet of valve 1, open the valve to vent pressure.
7. Gauge indicator will start to drop as soon as valve 1 is opened. Wait 30 seconds to take the reading of the indicator. Repeat test 3 times and take an average reading to determine the ventability of the grease.
8. Use the charts to determine appropriate supply line size and lengths. Table 1 is used for injectors with a venting pressure of 600 psig. Table 2 is used for injectors with a venting pressure of 200 psig. Table 3 is used for High Venting SL-V type injectors with a venting pressure of 1,000 psi. Ventmeter readings above 600 psig indicate that the test lubricant is not recommended for use in a centralized lubrication system.

## **4.2 Calculations**

To calculate the yield stress (Y) of the grease sample, perform the following calculation:

$$Y = [ P \pi R^2 / 2 \pi R L ] = P R / 2 L, \text{ where}$$

P is recorded value from ventmeter  
R = 0.125 inches (3 mm) of coiled tube  
L = 300 inches (762 cm)

Using the calculated value of the yield stress pressure (Y), a table is calculated from the yield stress equation to determine the maximum supply line length for a given ventmeter reading, supply line diameter and supply line length. The value of Y is constant for any type of system.

### **Example of Calculation and Use.**

An example of the calculation used in tables 1, 2 and 3 is shown here. A test sample was shown to have a ventmeter reading of 400 psig at 77 °F. Using that fact that the radius of the steel coil in the ventmeter is 0.125 inches and is 25 feet (300 inches) in length.

$$Y = [ P \pi R^2 / 2 \pi R L ] = P R / 2 L$$

$$Y = \frac{400 \text{ lbs/in}^2 \times 0.125 \text{ inches}}{2 \times 300 \text{ inches}} = 0.83 \text{ lbs/in}^2$$

A designer is proposing to use a centralized automatic system is using 0.5 inch of high pressure hose that uses injectors that specify a vent pressure of 600 psig. The supply line length is 68 feet maximum length, recalculation of the equation above solving for length using 0.5 inch diameter (0.250 inch radius) tubing and 600 psig venting pressure.

$$L = P R / 2 Y$$

$$L = \frac{600 \text{ lbs/in}^2 \times 0.250 \text{ inches}}{2 \times 0.83 \text{ lbs/in}^2} = 903 \text{ inches or } 75 \text{ ft}$$

Since 75 feet is greater than the 68 feet, the system will vent sufficiently and the lubrication system will operate properly.

As another example, after changing the temperature of interest to 50°F, the ventmeter test was conducted and found to be 550 psi. Following the same procedure to recalculate the yield stress gives

$$Y = [ P \pi R^2 / 2 \pi R L ] = P R / 2 L$$



$$Y = \frac{550 \text{ lbs/in}^2 \times 0.125 \text{ inches}}{2 \times 300 \text{ inches}} = 0.114 \text{ lbs/in}^2$$

To determine the maximum length at 50°F, then

$$L = P R / 2 Y$$

$$L = \frac{600 \text{ lbs/in}^2 \times 0.250 \text{ inches}}{2 \times 0.114 \text{ lbs/in}^2} = 657 \text{ inches or } 54 \text{ ft}$$

$$L = 657 \text{ inches or } 54 \text{ feet.}$$

Since 54 feet is less than the 68 feet of supply line, a lighter grade grease should be used in this case.

SL-1 & SL-11 Supply Line Chart			
N.L.G.I. Grease	Lincoln Ventmeter Reading ( psi)	Nominal Pipe Size or ID of Tube or Hose (In) *	Max Supply Line Length ( Ft )
#0	0 - 100	2.00	1100
	0 - 100	1.50	875
	0 - 100	1.25	700
	0 - 100	1.00	575
	0 - 100	0.75	430
	0 - 100	0.50	270
	0 - 100	0.38	200
	0 - 100	0.25	130
#1	100 - 200	2.00	500
	100 - 200	1.50	400
	100 - 200	1.25	350
	100 - 200	1.00	270
	100 - 200	0.75	210
	100 - 200	0.50	140
	100 - 200	0.38	110
	100 - 200	0.25	50
#2	200 - 300	2.00	350
	200 - 300	1.50	280
	200 - 300	1.25	235
	200 - 300	1.00	180
	200 - 300	0.75	140
	200 - 300	0.50	90
	200 - 300	0.38	70
	200 - 300	0.25	40

SL-1 & SL-11 Supply Line Chart			
N.L.G.I. Grease	Lincoln Ventmeter Reading (psi)	Nominal Pipe Size or ID of Tube or Hose (In) *	Max Supply Line Length ( Ft )
#2	300 - 400	2.00	280
	300 - 400	1.50	200
	300 - 400	1.25	175
	300 - 400	1.00	140
	300 - 400	0.75	100
	300 - 400	0.50	70
	300 - 400	0.38	50
	300 - 400	0.25	30
#3	400 - 500	2.00	230
	400 - 500	1.50	170
	400 - 500	1.25	140
	400 - 500	1.00	100
	400 - 500	0.75	80
	400 - 500	0.50	55
	400 - 500	0.38	40
	400 - 500	0.25	30
#3	500 - 600	2.00	190
	500 - 600	1.50	140
	500 - 600	1.25	120
	500 - 600	1.00	90
	500 - 600	0.75	65
	500 - 600	0.50	45
	500 - 600	0.38	36
	500 - 600	0.25	15

**Table 1.** Calculated length of supply line for SL-1 and SL-11 injectors with venting pressure of 600 psi.  
(\* Indicates that nominal ID dimension for pipe was used.)

SL-32 & SL-33 Supply Line Chart			
N.L.G.I. Grease	Lincoln Ventmeter Reading (psi )	Nominal Pipe Size or ID of Tube or Hose (In) *	Max Supply Line Length ( Ft )
#0	0 - 100	2.00	400
	0 - 100	1.50	300
	0 - 100	1.25	250
	0 - 100	1.00	200
	0 - 100	0.75	150
	0 - 100	0.50	100
	0 - 100	0.38	75
	0 - 100	0.25	50
#1	100 - 200	2.00	200
	100 - 200	1.50	150
	100 - 200	1.25	120
	100 - 200	1.00	100
	100 - 200	0.75	75
	100 - 200	0.50	50
	100 - 200	0.38	37
	100 - 200	0.25	25
#2	200 - 300	2.00	135
	200 - 300	1.50	100
	200 - 300	1.25	80
	200 - 300	1.00	66
	200 - 300	0.75	50
	200 - 300	0.50	32
	200 - 300	0.38	25
	200 - 300	0.25	16

SL-32 & SL-33 Supply Line Chart			
N.L.G.I. Grease	Lincoln Ventmeter Reading (psi)	Nominal Pipe Size or ID of Tube or Hose (In) *	Max Supply Line Length ( Ft )
#2	300 - 400	2.00	100
	300 - 400	1.50	75
	300 - 400	1.25	63
	300 - 400	1.00	50
	300 - 400	0.75	37
	300 - 400	0.50	25
	300 - 400	0.38	18
	300 - 400	0.25	12
#3	400 - 500	2.00	80
	400 - 500	1.50	60
	400 - 500	1.25	50
	400 - 500	1.00	40
	400 - 500	0.75	30
	400 - 500	0.50	20
	400 - 500	0.38	15
	400 - 500	0.25	10
#3	500 - 600	2.00	65
	500 - 600	1.50	50
	500 - 600	1.25	40
	500 - 600	1.00	32
	500 - 600	0.75	24
	500 - 600	0.50	NR
	500 - 600	0.38	NR
	500 - 600	0.25	NR

**Table 2.** Calculated length of supply line for SL-32 or SL-33 Injectors with a venting pressure of 200 psi.  
(\* Indicates that nominal ID dimension for pipe was used.)

SL-V Supply Line Chart			
N.L.G.I. Grease	Lincoln Ventmeter Reading (psi)	Nominal Pipe Size or ID of Tube or Hose (in)	Max Supply Line Length (ft.)
#0	0 - 100	2.00	2000
	0 - 100	1.50	1500
	0 - 100	1.25	1250
	0 - 100	1.00	1000
	0 - 100	0.75	750
	0 - 100	0.50	500
	0 - 100	0.38	375
	0 - 100	0.25	250
#1	100 - 200	2.00	1000
	100 - 200	1.50	750
	100 - 200	1.25	625
	100 - 200	1.00	500
	100 - 200	0.75	375
	100 - 200	0.50	250
	100 - 200	0.38	185
	100 - 200	0.25	125
#2	200 - 300	2.00	660
	200 - 300	1.50	500
	200 - 300	1.25	410
	200 - 300	1.00	330
	200 - 300	0.75	250
	200 - 300	0.50	160
	200 - 300	0.38	125
	200 - 300	0.25	80

SL-V Supply Line Chart			
N.L.G.I. Grease	Lincoln Ventmeter Reading (psi)	Nominal Pipe Size or ID of Tube or Hose (in)	Max Supply Line Length (ft.)
#2	300 - 400	2.00	500
	300 - 400	1.50	375
	300 - 400	1.25	310
	300 - 400	1.00	250
	300 - 400	0.75	185
	300 - 400	0.50	125
	300 - 400	0.38	90
	300 - 400	0.25	60
#3	400 - 500	2.00	400
	400 - 500	1.50	300
	400 - 500	1.25	250
	400 - 500	1.00	200
	400 - 500	0.75	150
	400 - 500	0.50	100
	400 - 500	0.38	75
	400 - 500	0.25	50
#3	500 - 600	2.00	330
	500 - 600	1.50	250
	500 - 600	1.25	200
	500 - 600	1.00	160
	500 - 600	0.75	125
	500 - 600	0.50	80
	500 - 600	0.38	60
	500 - 600	0.25	40

**Table 3.** Calculated length of supply line for SL-V Quick Venting Injectors with a venting pressure of 1000 psi.

### **4.3 Cleaning Procedure**

1. The ventmeter should be cleaned as soon as possible after each test, and the gauge checked for accuracy. Gauge must read zero psi when system is empty and clean. Recalibrate if necessary by resetting indicator to zero.
2. Remove grease from ventmeter by flushing petroleum solvent or other suitable solvent through ventmeter until solvent appears clean. Flush the ventmeter with solvent by opening valve 1 and 2. The solvent should be applied through valve 1 near the pump/lever gun.
3. With ventmeter full of clean solvent, let ventmeter stand for at least 1 hour. Flush solvent from ventmeter. **Caution:** The pressure must be vented from ventmeter before disconnection coupler.
4. Attach an air line to air nipple and pass air through the ventmeter until all solvent has been removed and ventmeter is dry.

### **5 Maintenance**

The K95400 Lincoln Ventmeter requires little routine maintenance to provide many years of continuous service.

### **6 Service**

Under normal operating conditions and with routine maintenance, the Lincoln Ventmeter 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: \_\_\_\_\_

## **7 Storage**

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.

## **8 Warranty**

We, at Koehler, would like to thank you for your equipment purchase, which is protected by the following warranty. If within one 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.

## **9 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.