Thrif-T Luber Low-Pressure Orifice Lubrication System

COST-EFFECTIVE LOW-PRESSURE ORIFICE LUBRICATION SYSTEM

- For new equipment or replacement of any existing low-pressure orifice system
- Simple, versatile and reliable
- With sales, parts and service - worldwide

FEATURES/BENEFITS

Thrif-T Luber Orifice Systems offer an efficient method of applying lubricant, resulting in less machine downtime, increased productivity, and a safer work environment. Thrif-T Luber Systems go beyond these advantages to provide:

- Easy system design and modification.
- Inexpensive components and installation.
- Fast payback! Savings in lube maintenance; man-hours usually pays for the system within the first year.
- Manual or Electric pumps available to fit a wide variety of applications.
- Both Manual and Electric pumps feature adjustable outputs. This allow two pumps to service small to large systems.
- Orifice fittings have only one moving part and it flexes rather than moves.
- Sintered bronze filters will not shred or clog as can happen with felt filters.

SYSTEM DESCRIPTION

The Thrif-T Luber Orifice System is a single line resistance type. When the timer, controller, or operator activates the pump, lubricant is forced down a single main line to manifolds, and from there through individual orifice fittings and lines to the lube points. If lube point mounted orifice fittings are used, tee fittings and manifolds are used to provide multiple branch lines that are then connected to the orifice fittings.

Thrif-T Luber Orifice Systems utilize one of two types of pumps. A single stroke hand operated pump, where the stroke length and frequency determine the lube delivery volume to the system, or an electric gear motor driven pump where the pump running time and frequency as established by the built in timer, a remote timer, or the machine PLC determine the volume of lubricant delivered to the system. In either case, the individual orifice fittings proportion

pump flow to the individual lube points. Various accessories are available to simplify installation. An optional pressure gauge may be added to monitor pump operation.

SYSTEM COMPONENTS

Pumps

One hand-operated pump and one electric motor driven pump, each with a 1/2 gallon plastic reservoir, and adjustable output, allow the system to be designed precisely for the applications needs.

Timer

The built in Solid State Timer can be set to control pump run duration and initiate lube intervals from 30 seconds to 32 hours. Where desired, optional remote timers, can be used to control the lube interval and pump run time.

Manifolds and Orifice Fittings

One manifold can be used to distribute lubricant to as many as nine (9) lube points. Orifice Fittings come in three (3) types and ten (10) flow ranges to meet various lube requirements. Bearing point Orifice Fittings are fed directly from the pump through individual branch lines.

Tubing, Fittings and Accessories

Thrif-T Luber Orifice Systems utilize 4mm (5/32 inch) nylon tubing and brass fittings to connect the system components. Accessories such as the line filter and pressure gauge enhance reliability and provide the user with a method to monitor pump operation.

SYSTEM OPERATION

As shown in Figure 1, when the operator actuates the handle, or when the electric motor receives a signal from the timer, the pump is activated. The pump dispenses lubricant either into the mainline tubing which distributes the lubricant to the manifolds, feeding each Orifice Fitting or lines supplying bearing point Orifice Fittings. Each Orifice Fitting is sized to dispense the proper amount of lubricant based on the requirements of the bearing. Details of the operation of each component are included in this bulletin.

Interchangeability

Trabon components are functionally interchangeable with other commonly used single-line, resistance (orifice) systems. Mounting dimensions of the components are very close to those of other systems, and for some components there is a direct interchangeability in form and fit as well as function.

Applications

Trabon Thrif-T Luber Systems are ideal for small to medium size machine tools and other equipment requiring economical, intermittent, oil lubrication.

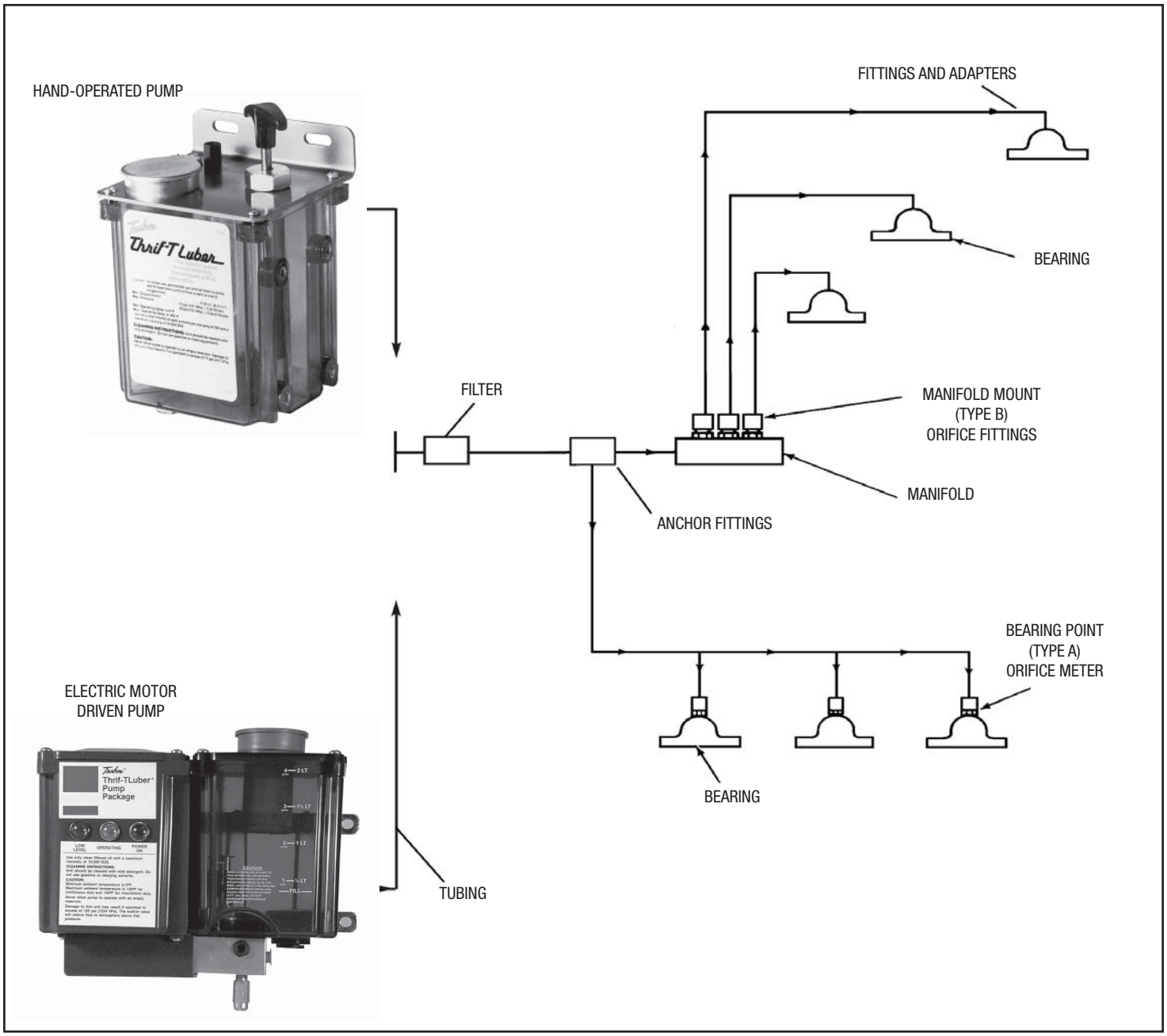

Figure 1: Thrif-T Luber System Diagram

THRIF-T LUBER MANUAL PUMP

Figure 2

DESCRIPTION/OPERATION

The Thrif-T Luber Manual Pump (Fig 2) is a positive displacement single stroke pump that delivers 8.2 cc (0.50 cu.in.) of oil per stroke, or 3.6 cc (0.22 cu.in.) per stroke.

As the pump handle is pulled up, the return spring is compressed and the inlet check ball unseats allowing oil to enter and fill the piston chamber. When the handle is released, the return spring drives the piston down, the inlet check ball re-seats and oil is forced out of the pump outlet and through the connecting lines and orifice fittings (not shown) to the friction surfaces on the machine.

SPECIFICATIONS	
Pump Output	Factory Set – 0.5 cu.in. (8.2 cm^3/stroke)
Lubricant Viscosity Limits	100 SUS to 10,000 SUS, (system is designed only for oil lubrication)
Reservoir Capacity	0.5 gallon (1.89 liters), 116 cu.in. (1,890 cm^3)
Operating Temperatures	0ºF to 140ºF (-17.8ºC to 60ºC)
Max Operating Pressure	75 psi (5 bar)

GENERAL INSTRUCTIONS

- Fill reservoir with clean, filtered oil. Never allow the pump to operate on an empty reservoir. Minimum oil viscosity is 100 SUS, maximum is 10,000 SUS.
- Maximum pump pressure is 75 psi at full stroke, 20 psi at end of stroke.
- To drain reservoir, remove the rubber plug from the bottom of the reservoir.
- Cleaning should be done with a mild detergent. **Do not use gasoline or cleaning solvents.**

ORDERING INFORMATION		
Description	**Part No.**	**Old Part No.**
Thrif-T Luber Manual Pump, TLMP-00	564012	384-000-000

DIMENSIONS Inches (mm)

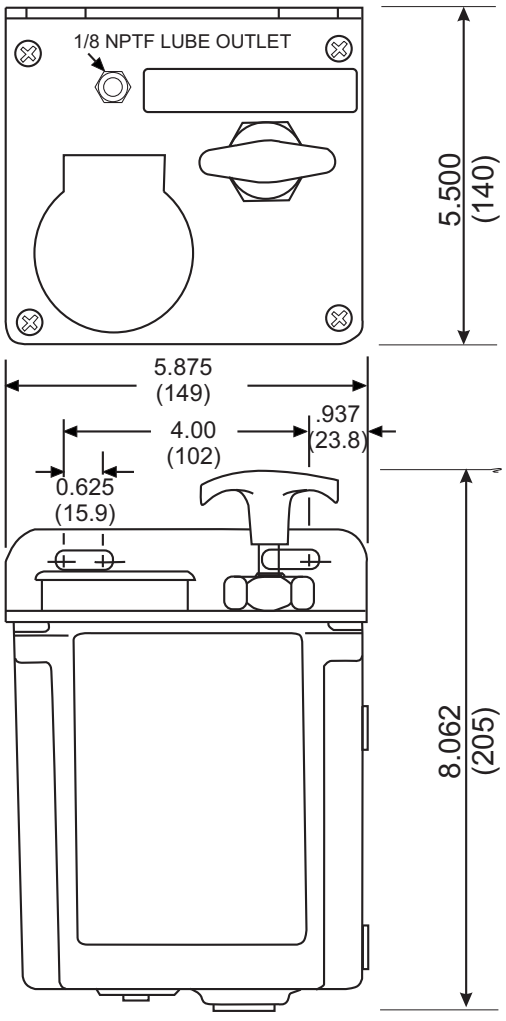

Figure 3

THRIF-T LUBER MANUAL PUMP (CONT'D)

PUMP STROKE ADJUSTMENT

The standard Thrif-T Luber Manual Pump is factory set for a lube output of 8.2 cc (0.5 cu.in.) per stroke. To determine if the pump output needs to be reduced, multiply the total system volume requirement by the lube interval in hours. Pump output should be equal to, or greater than this amount. If a much lower output is required (44%), lift pump handle (A) to its fully extended position. Remove retaining ring from slot (D) and reinstall in slot (E).

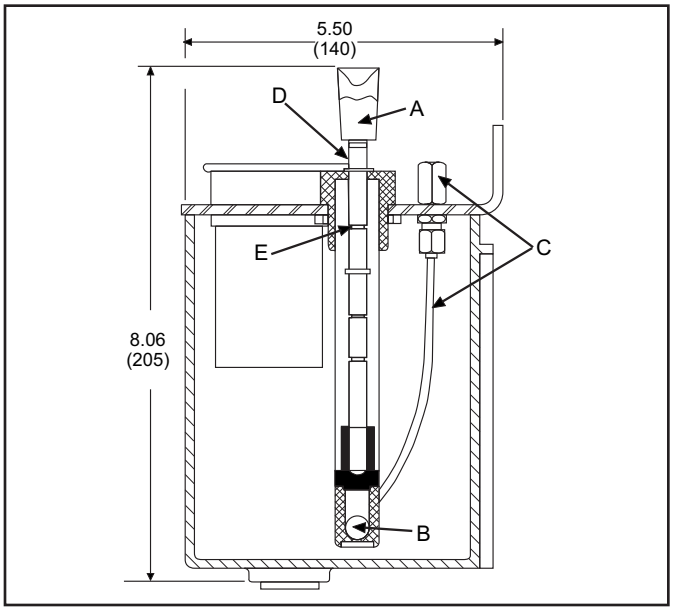

Figure 4

THRIF-T LUBER ELECTRIC PUMP

DESCRIPTION

The Thrif-T Luber Electric Pump (Fig. 5) is a positive displacement electric gear motor driven piston pump that delivers .572 cc (0.035 cu.in.) per stroke (6.9 cc 0.42 cu.in.) per minute. It is available with two (2) control options that allow the user to select a model which best suits his needs. The "Time Control" schedules lube frequency in either hours or minutes. The "Remote Control" option allows lube frequency to be scheduled from the machine PLC, or a remote mounted timer.

SPECIFICATIONS	
Pump Output	0.035 cu.in. (0.572 cm^3/per stroke), 0.42 in^3/min (6.9 cc); For Time Control (60 Hz) - adjustable from 0.070 to 25.2 in^3/hr (1.14 to 413.03 cm^3/hr); Output determined by system control
Lubricant Viscosity Limits (oil only)	100 SUS to 10,000 SUS
Reservoir Capacity	0.5 gallon (1.89 liters), 116 in^3 (1,890 cm^3)
Operating Temperature	
Min	0ºF (-17.8ºC)
Max Continuous	120ºF (48.8ºC)
Max Intermittent	140ºF (60ºC), 50% duty cycle or less
Max Operating Temperature	150 psi (10 bar)
Pump Gearmotors	115 VAC, 50/60 Hz, Shaded pole, 12 rpm @ 60 Hz, 10 rpm @ 50 Hz, 0.13 amp running current, 0.185 amp inrush current
Reservoir Low Level Switch	1115 VAC, 10 watt load

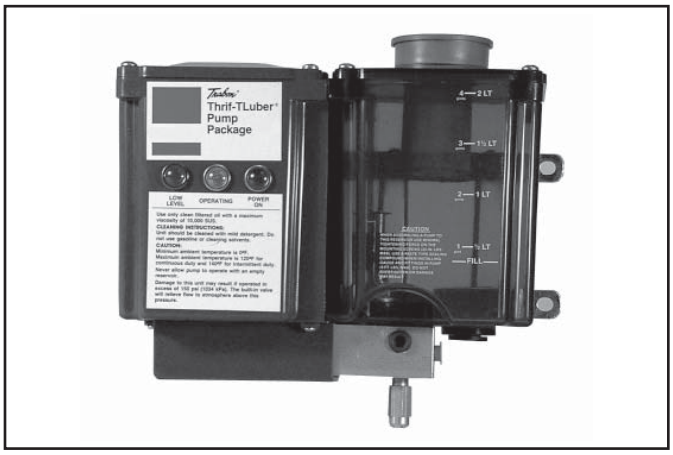

Figure 5

ORDERING INFORMATION		
Description	**Part No.**	**Old Part No.**
TLEP-10, 115V Time Control	564068	521-500-930
TLEP-11, 115V Remote Control	564067	521-500-840
Pressure Gauge, 0-300 psi (0-21 bar) – TLPG-00	558296	493-020-199
Timer Replacement Board	558031	572-142-590
Replacement Relief Valve	563162	508-310-015
Replacement Pump	564065	521-500-720
Replacement Reservoir & Motor Housing	564439	560-002-140
Replacement Gearmotor, 115 VAC	557641	521-500-650
Replacement Low Level Switch	557826	541-603-002

THRIF-T LUBER ELECTRIC PUMP (CONT'D)

OPERATION

The electric gearmotor drives an eccentric (A) which reciprocates the piston (B) in the pump body (C). The lubricant is discharged past an internal check valve through the outlet (D). If lube system pressure exceeds 10 bar(150 psi), the relief vale (E) automatically opens.

INSTALLATION

Connecting the pump for Remote Control using the machine "PC" or some other external control - Input power may be brought into the pump through either of the conduit holes on the left side of the motor compartment. Subsequent electrical connection directions are provided above. When these connections are made, the pump motor's "On time" or output will be determined by the machine or external system control.

For 60 Hz service, pump output will be 6.9 cm^3 (.420 $in.^3$) per minute; on 50 Hz, it will be 5.7 cm^3) (.350 $in.^3$) per minute. For most applications, we recommend that the pump operate a minimum of one stroke (five seconds "On") per lubrication cycle. When in doubt, consult the factory.

Connecting the pump for Time Control -

Set the slide switch to either minutes or hours for cycle time. Next, set the desired pump "On time" using a screwdriver in the slotted head of the scale marked "On time minutes". Then in a similar fashion, set the specific interval at which lube cycles are to occur using the appropriate scale under "total cycle time".

To find "On time" in minutes = Total Output Required Per Cycle Time (cu.in.) divided by .42 (60 Hz) or .35 (50 Hz).

When power is applied, the timer activates the lube pump motor and simultaneously begins timing of the "On time" and "Total cycle time".

When the "On time" is completed, the timer shuts off the pump motor but continues timing the "total cycle time" until the next cycle and "On time".

Activation of the manual run button resets the cycle time to zero and starts a lube cycle.

Input power may be brought in to the terminal strip through either of two conduit holes on the left side of the compartment. Subsequent electrical connection directions are provided above.

For more details, contact your Thrif-T Luber System distributor or the factory.

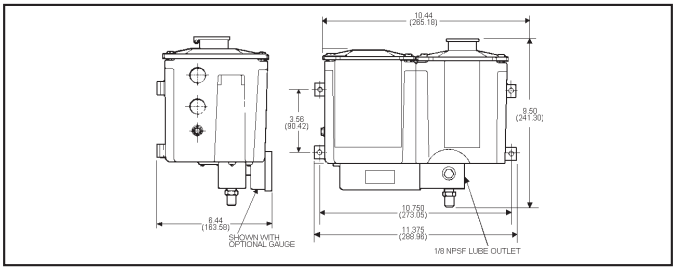

Figure 6

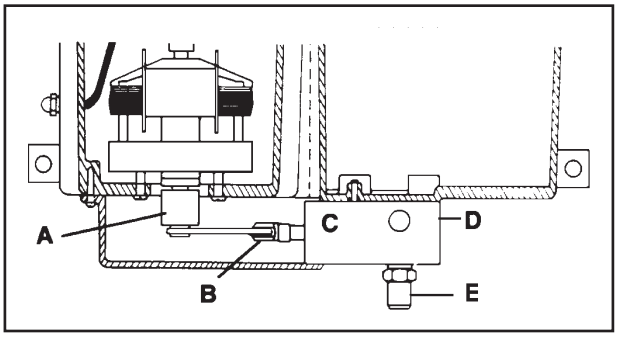

Figure 7

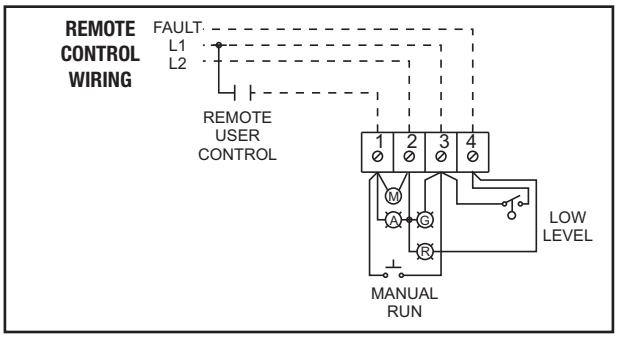

Figure 8

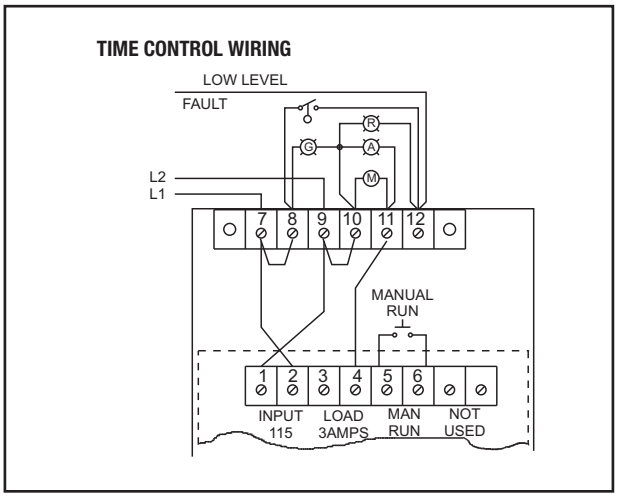

Figure 9

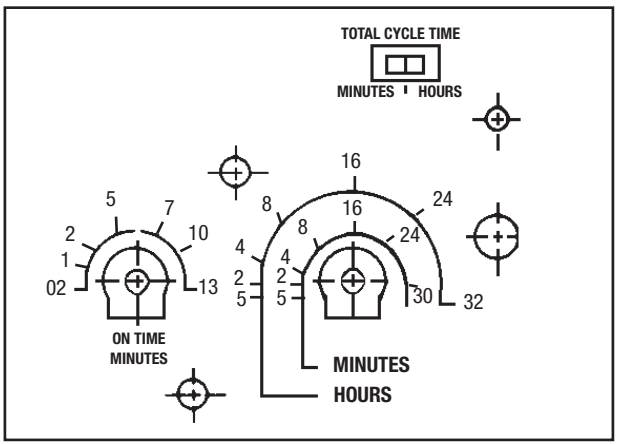

Figure 10

THRIF-T LUBER ORIFICES

DESCRIPTION/OPERATION

The Thrif-T Luber Orifice Fittings are available in three (3) configurations and 10 size ranges. Each size (5/0 is smallest, 5 is largest) passes twice as much flow as the size below it. Each is equipped with a sintered bronze filter, tapered spiral orifice pin and built in check valve. The sintered bronze filter and tapered spiral orifice pin makes the units more resistant to blockage from contamination than the designs used by competitive units.

When oil from the pump reaches the elastomeric ring that functions as a check valve, the ring flexes in the direction of flow as a result of pressure 0.1 bar (2 psi cracking pressure). When pump flow stops, the ring resumes its original shape and blocks back flow toward the pump. The spiral grove in the tapered pin is used to accurately meter the volume of oil delivered to each bearing.

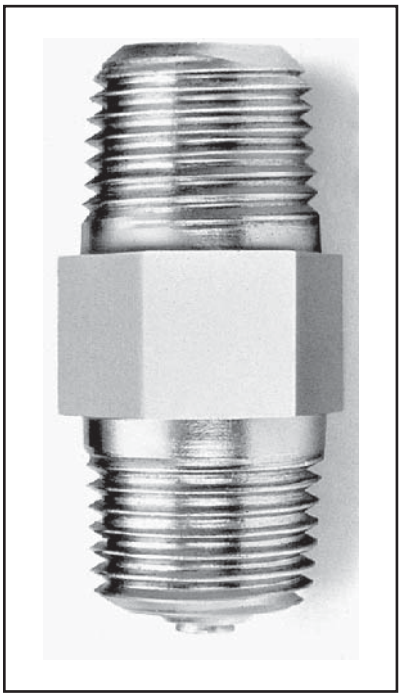

Figure 11

SPECIFICATIONS	
Body and Orifice Pin Material	Brass
Check Valve Disk	Buna-N
Filter	Sintered Bronze (40 micron)
Lubricant	Oil, 100 SUS to 10,000 SUS
Temperature	0ºF to 180ºF (-18ºC to 82ºC)
Pressure	150 psi (10 bar)

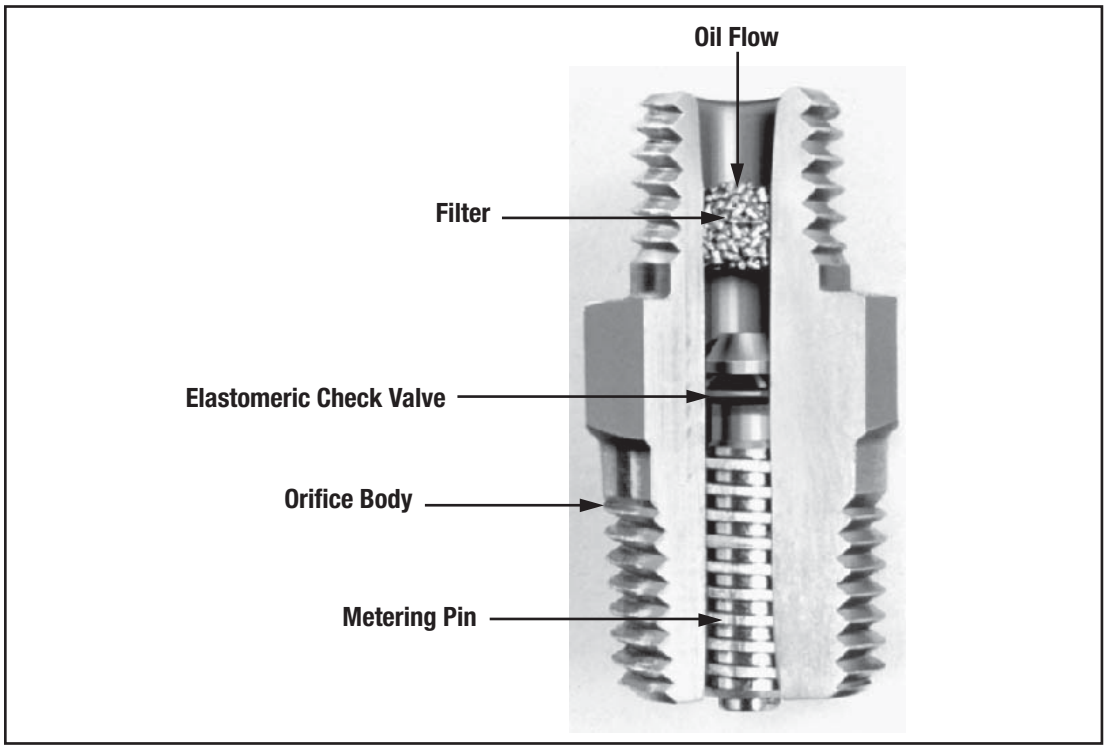

Figure 12

Thrif-T Luber Orifices (Cont'd)

TYPE A - FIGURE 13		
Description	**Part No.**	**Old Part No.**
TLOA-50, size 5/0	564028	464-010-050
TLOA-40, size 4/0	564027	464-010-040
TLOA-30, size 3/0	564026	464-010-030
TLOA-20, size 2/0	564025	464-010-020
TLOA-0, size 0	564019	464-010-000
TLOA-1, size 1	564020	464-010-001
TLOA-2, size 2	564021	464-010-002
TLOA-3, size 3	564022	464-010-003
TLOA-4, size 4	564023	464-010-004
TLOA-5, size 5	564024	464-010-005

This configuration is used when the orifice (metering unit) is mounted directly at the bearing point, at the end of the pressure line.

TYPE B - FIGURE 14		
Description	**Part No.**	**Old Part No.**
TLOB-50, size 5/0	564047	464-030-050
TLOB-40, size 4/0	564046	464-030-040
TLOB-30, size 3/0	564045	464-030-030
TLOB-20, size 2/0	564044	464-030-020
TLOB-0, size 0	564038	464-030-000
TLOB-1, size 1	564039	464-030-001
TLOB-2, size 2	564040	464-030-002
TLOB-3, size 3	564041	464-030-003
TLOB-4, size 4	564042	464-030-004
TLOB-5, size 5	564043	464-030-005

This configuration is used when the orifice (metering unit) is mounted into "Tee" heads or manifold bars, and then connected to the bearing point by tubing.

TYPE C - FIGURE 15		
Description	**Part No.**	**Old Part No.**
TLOC-50, size 5/0	564037	464-020-050
TLOC-40, size 4/0	–	464-020-040
TLOC-30, size 3/0	564036	464-020-030
TLOC-20, size 2/0	564035	464-020-020
TLOC-0, size 0	564029	464-020-000
TLOC-1, size 1	564030	464-020-001
TLOC-2, size 2	564031	464-020-002
TLOC-3, size 3	564032	464-020-003
TLOC-4, size 4	564033	464-020-004
TLOC-5, size 5	564034	464-020-005

This configuration is used when the orifice (metering unit) is to be mounted directly at the bearing point, and used in conjunction with a "Tee" head to provide for two or more tube connections.

DIMENSIONS mm (Inches)

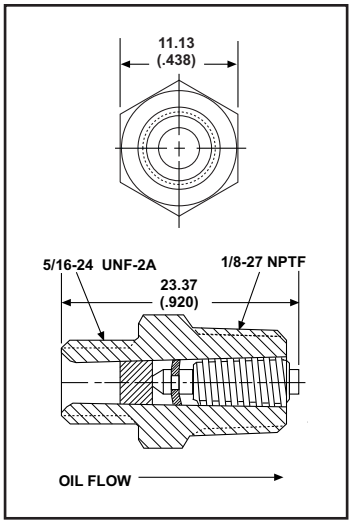

Figure 13

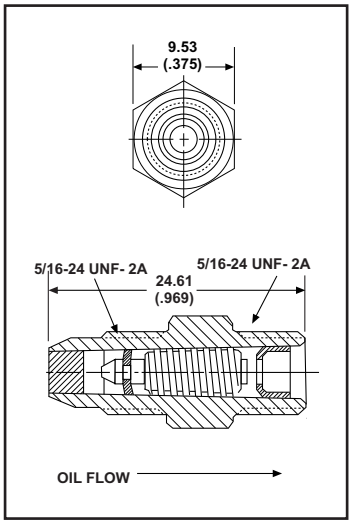

Figure 14

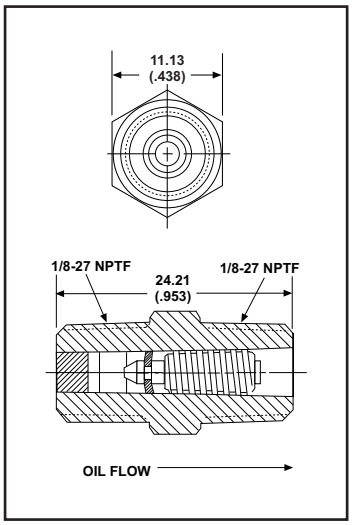

Figure 15

THRIF-T LUBER ACCESSORIES & HARDWARE

Pressure Gauge for use with Thrif-T Luber Electric Pump has plastic case with 50.8 mm (2-in.) diameter dial and 0 to 21 bar (0 to 300 psi) range. Has 1/4-18 NPTF center back mount.

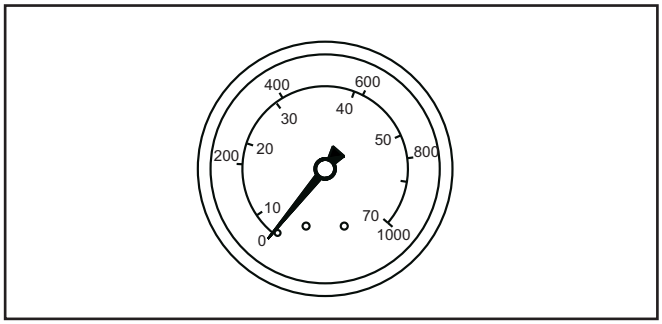

Figure 16

Tube Clips–Standard clips for 1, 2, 3, or 4 tubes are plated steel. Four sizes.

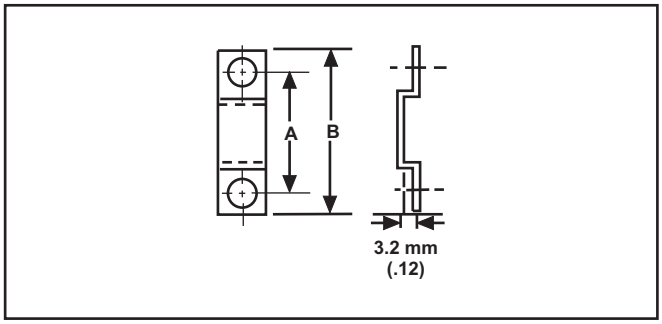

Figure 17

In-Line Filter - Helps keep contaminants that get past the pump's screen/strainer from clogging orifice filters. Comes complete with filter body, 25-micron filter element, gaskets and closure plug. Measures 52.4 mm (2.06 in.) long, 25.4 mm (1.00 in.) deep and 31.8 mm (1.25 in.) high.

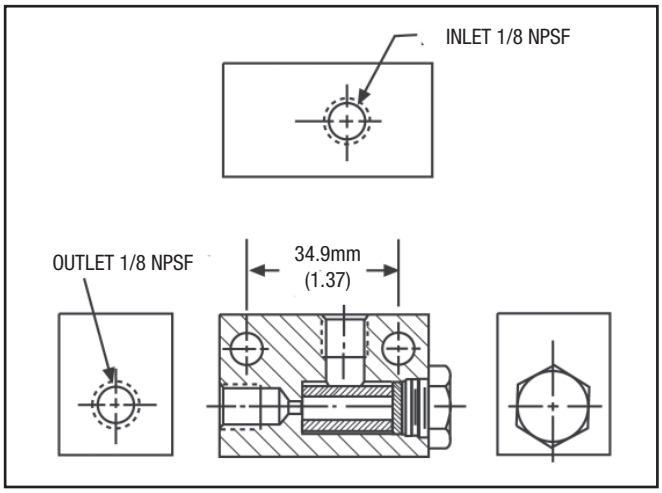

Figure 18

Nylon Tube–Has 4 mm (5/32-in.) O.D., and is burst rated at 69 bar (1000 psi). Comes in 7.62 m (25 ft.) coiled lengths.

Figure 19

Manifold Bars–Have tapped 5/16-in. holes for 4 mm (5/32-in.) tubing connections. Four sizes.

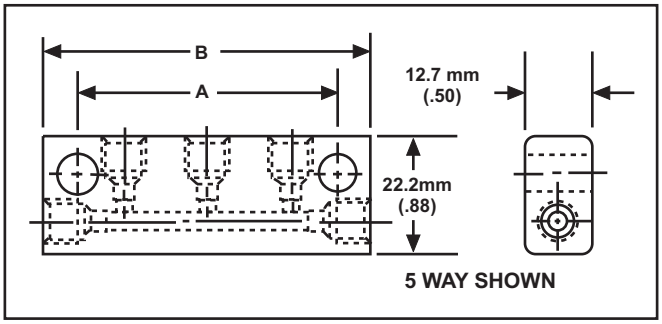

Figure 20

Anchor Block–Can also serve as a two-way manifold bar with 4 mm (5/32-in.) tube connection to 1/8 in. female pipe. Measures 28.4 x 15.9 x 25.4 mm (1.19 x 0.62 x 1.00 inches).

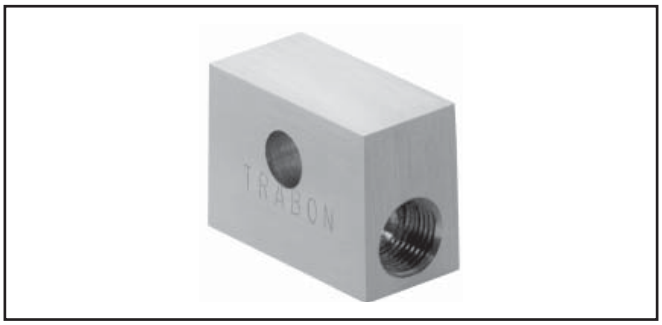

Figure 21

THRIF-T LUBER ACCESSORIES & HARDWARE (CONT'D)

Tee Fitting–For use with two 4 mm (5/32-in.) tube outlets and 1/8-in. pipe. Measures 28.4 x 25.4 x 15.9 mm (1.12 x 1.00 x 0.62 inches).

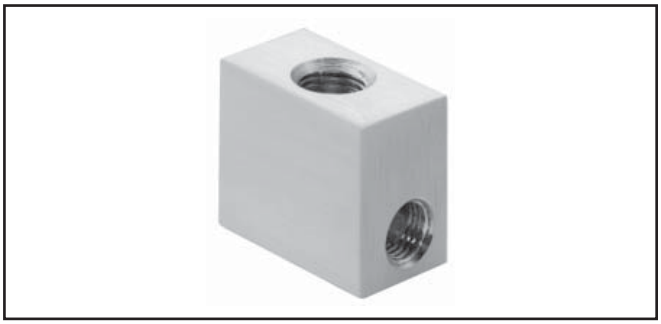

Figure 22

Inverted Nut—Brass tube nut to attach 4 mm (5/32-in.) tube to manifold.

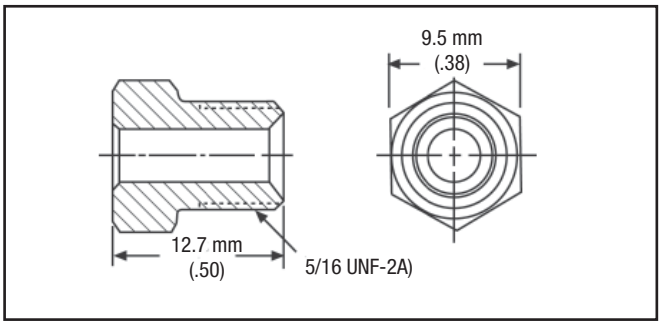

Figure 23

Bearing Fitting—Used in 1/8 NPT bearing tap or manifold to attach 4 mm (5/32-in.) tubing.

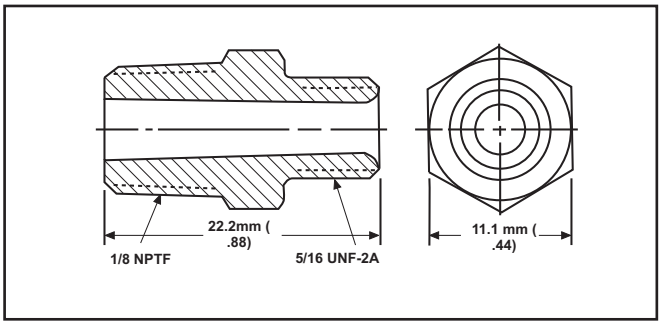

Figure 23

Compression Nut–Brass tube nut for bearing fitting with 5/16-24 thread for 4 mm (5/32-in.) tubing.

Figure 25

Compression Sleeve–For 4 mm (5/32-in.) tubing. **Note:** Can be used with inverted nut, or bearing fitting.

Figure 26

Closure Plug –Has 7.9 mm (5/16-in.) UNF-2A full thread to within 1.6 mm (0.06-in.) of hex head. **Note:** Used to plug unwanted manifold ports.

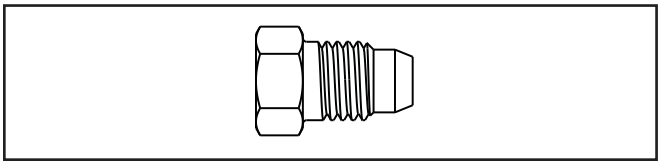

Figure 27

THRIF-T LUBER ACCESSORIES & HARDWARE		
Description	**Part No.**	**Old Part No.**
Pressure Gauge, TLPG-00	558296	493-020-199
Tube Clip, TLTC-01	558156	435-710-010
Tube Clip, TLTC-02	558157	435-710-020
Tube Clip, TLTC-03	558158	435-710-030
Tube Clip, TLTC-04	558159	435-710-040
In-Line Filter, TLLF-00	564053	473-000-232
Nylon Tube, TLTP-25	561143	400-132-060
Manifold Bar, TLMB-04	561217	482-000-351
Manifold Bar, TLMB-05	561218	482-000-353
Manifold Bar, TLMB-08	561219	482-000-355
Manifold Bar, TLMB-10	–	482-000-657
Anchor Block, TLAB-00	561216	482-000-348
Tee Fitting, TLTF-00	561215	482-000-347
Inverted Nut, TLIF-00	558190	435-702-268
Bearing Fitting, TLBF-00	558220	464-100-100
Compression Nut, TLCN-00	558189	435-390-070
Compression Sleeve, TLCF-00	558188	435-380-080
Closure Plug, TLCP-00	561155	435-702-267

System Design & Component Selection

Guide to System Design & Component Selection for low-pressure, orifice type lubrication systems.

NOTE: In using this guide, you will be referring to Design Charts shown on page fourteen (14). Additional copies of Design Chart A are available from your Thrif-T Luber distributor or by contacting Graco.

STEP ONE: All bearing data should be recorded on a copy of Design Chart A.

- Note bearing name or location in column 1.
- List bearing size in column 2A and bearing type in column 2B.
- List the lube taps per bearing in column 3.

STEP TWO: Calculate hourly bearing lube replacement requirements.

- Using formulas given in Design Chart B, calculate and enter in column 4.
- Multiply the value in column 4 by the lube factor of three and enter in column 5. This figure is the lube volume.
- Divide the figure in column 5 by the number of taps (column 3) and enter this figure in column 6. This is the calculated lube volume — cubic inches per hour per tap.

STEP THREE: Determine lube ratio.

- Select lowest volume requirement in column 6 and assign base ratio of 1 . Enter in column 7.
- Divide all other volumes in column 6 by the lowest volume requirement (see preceding point). Enter the results as the remaining base ratios, in column 7. Refer to Design Chart C for base ratio combinations. Choose the base ratio number that is closest to your exact calculation result.

STEP FOUR: Select orifice Size.

- Determine maximum-to-minimum base ratio number from column 7.
- Locate the appropriate vertical column from Design Chart C. This is done by finding the maximum base ratio from Design Chart C that is nearest in number to the maximum base ratio you have just determined.
- The bearing(s) with the smallest volume requirement becomes the base orifice and is assigned the smallest number in column 1 .
- Using the same vertical column from Design Chart C, select orifice sizes to meet all base ratios in column 7.

  Note: Select orifice size in same vertical column that is nearest in number to base ratio (when in doubt, use next larger size).
- Enter all orifice sizes in column 8 on Design Chart A.
- Using “flow value” column from Design Chart C, enter each flow value for corresponding orifice size in column 9 of Design Chart A.

STEP FIVE: Determine system flow value.

- Multiply each flow value from column 9 by number of taps in column 3. Enter in column 10.
- Add up the total flow values in column 10. Enter at bottom of column 10. This is total system flow value (Q).

STEP SIX: Make a pump selection.

- **Manual Pump:**

  1. Determine approximate operating oil viscosity (V) from Design Chart E.
  2. Divide V by total system flow value (Q) from column 10 of Design Chart A.
  3. $V/_Q$ should = 1,000 or less.

     If the result exceeds 1,000, use a larger orifice size (5/0 is the smallest and 5 is the largest size in terms of flow) for the base orifice, and re-select all the remaining orifice sizes accordingly, until $V = {}^{1,000}/_Q$ or less.

     Example: if base orifice is "2/0" and V is greater than 1,000, try “0” orifice as base.

- **Electric Pump:**

  1. Determine approximate operating viscosity (V) from Design Chart E.
  2. Determine total system flow (Q) from column 10 of Design Chart A.
  3. Using Design Chart D, plot coordinates of V and Q on chart. If the point falls within shaded area of Chart D, the system is compatible with electric pump.
  4. If the coordinates fall above the shaded area (below 20 psi), select base orifice with lower base ratio and re-select all remaining orifice sizes accordingly.

     Example: If base orifice is “210”, try “3/0” orifice. This will double system pressure. Repeat until coordinates fall within shaded area.
  5. If the coordinates fall below shaded area (above 150 psi), select base orifice with higher base ratio and re-select remaining orifice sizes accordingly.

     Example: If base orifice is “2/0”, try “0” orifice. This will decrease system pressure by **1/2.** Repeat until coordinates fall within shaded area.
  6. To assist in pump selection, the actual system pressure can be determined by solving for P in the formula

     $$P = \frac{F \times V}{Q}$$

     Where: P = System Operating Pressure PSI
     F = Pump Flow Velocity Rating (.40)
     V = Viscosity of Oil @ Operating Temp.
     Q = Total System Flow

System Design & Component Selection Cont'd

EXAMPLE: Milling Machine, 7200 SUS Oil, 60^{0}F Operating Temperature, Automatic System 24 Lube Points

Bearings:

1. Feed Screw — ball screw — 1 .5 pitch dia. x 8 rows, 2 lube points
2. Vertical Slide Drive — ball screw — 1 .5 pitch dia. x 8 rows, 2 lube points
3. Vertical Slide — 9" wide x 18" long, 2 lube points
4. Horizontal Slide — 9" wide x 18" long, 2 lube points
5. Vertical Slide Ways — 1 .5" wide x 18" long, 4 lube points
6. Horizontal Slide Ways — 1.5" wide x 18" long, 4 lube points
7. Spindle — 2 double-row, anti-friction, 2" shaft dia., 1 lube point on each pair
8. Drive Shaft — 2 anti-friction, 1 .5" shaft dia., 1 lube point each
9. Change Gears — 4 gears, 4" 1.D. x 3/4" wide, 2 lube points total
10. Motor Drive Shaft — 1 anti-friction, 1 .5" Dia., 1 lube point each

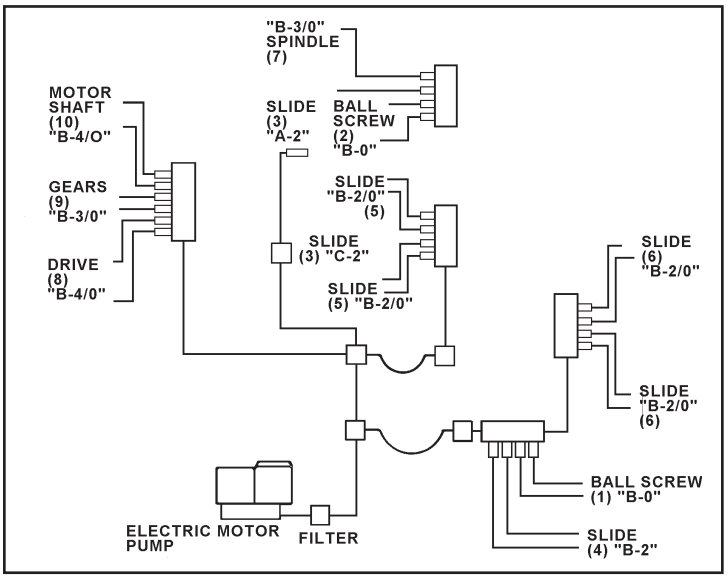

Figure 28

CUSTOMER ABC MACH. TYPE OF SYSTEM: MANUAL ☐ AUTOMATIC ☒ FILE NO. 1001

MACHINE OR EQUIPMENT MILLING MACHINE OIL VISCOSITY 7200 OPERATING TEMP. 60 °F. DATE XX/XX/XX

PAGE 1 OF 1

1 REF. NO.	1 LOCATION OR NAME OF BEARING	2 BEARING SIZE (A)	2 BEARING TYPE (B)	3 NO. OF TAPS	4 BRG. REQ. CU. IN./HR.	FACTOR	5 LUBE VOLUME CU. IN./HR. (D)	6 LUBE VOLUME PER TAP (E)	7 BASE RATIO (C)	8 ORIFICE SIZE (C)	9 FLOW VALUE (C)	10 TOTAL FLOW VALUE
1	Feed Screw	1.5 P.D. X 8 Rows	Ball Screw	2	.038	3	.114	.057	8	3	2.443	4.886
2	Vertical Slide Drive	1.5 P.D. X 8 Rows	Ball Screw	2	.038	3	.114	.057	8	3	2.443	4.886
3	Vertical Slide	9"X18"	Slide	2	.162	3	.486	.243	32	5	9.752	19.504
4	Horizontal Slide	9"X18"	Slide	2	.162	3	.486	.243	32	5	9.752	19.504
5	Vertical Slide	1.5"X18"	Slide	4	.027	3	.081	.020	4	2	1.219	4.876
6	Horizontal Slide	1.5"X18"	Slide	4	.027	3	.081	.020	4	2	1.219	4.876
7	Spindle	2"X2 Rows	A.F.	2	.008	3	.024	.012	2	1	.612	1.224
8	Drive Shaft	1.5"X1Row	A.F.	2	.004	3	.012	.006	1	0	.305	.610
9	Change Gears	4" P.D.X 3/4"W	Gear	2	.009	3	.027	.014	2	1	.612	1.224
10	Motor Drive Shaft	1.5"X1Row	A.F.	2	.004	3	.012	.006	1	0	.305	.610
11						3						
12						3						
13						3						
14						3						
	SYSTEM TOTAL		—	24	.479IN^3	—	1.437IN^3	—	—	—	—	THIS NO. EQUALS Q 62.2

(A) DIAMETER AND WIDTH OF CYLINDRICAL BEARINGS — LENGTH AND WIDTH OF SLIDES — SHAFT DIAMETER OF ANTI-FRICTION BEARINGS AND NUMBER OF ROWS.
(B) TYPE OF SURFACE — SLIDING, PLAIN OR TYPE OF ANTI-FRICTION BEARING.
(C) FROM CHART "C"
(D) BEARING REQUIREMENT x NUMBER OF TAPS x FACTOR (3)
(E) LUBE SUPPLY VOLUME ÷ NUMBER OF TAPS

P = PRESSURE PSI
F = PUMP FLOW
V = OIL VISCOSITY
Q = TOTAL FLOW VALUE

$P = \frac{F \times V}{Q}$

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SYSTEM DESIGN & COMPONENT SELECTION CONT'D

Orifice Selection

1. Select orifice size based on flow requirements.
2. From our example, we would have 24 total lube points. (Bottom of column 3, Design Chart A). They are in five sizes, as follows:
   - (4) Size "0"
   - (4) Size "2"
   - (8) Size "2/0"
   - (4) Size "3/0"
   - (4) Size "4/0"
3. Select orifice type based on orifice function.
   - **Type "A" Orifice –** These orifices are used when metering unit is mounted directly at the bearing point and at the end of the pressure line.
   - **Type "B" Orifice –** These orifices are used when metering unit is mounted into "tee" heads, or junction bars, and then connected to bearing point by 4 mm (5/32 in.) O.D. tubing.
   - **Type "C" Orifice –** These orifices are used when metering unit is mounted directly at the bearing point, and used in conjunction with "tee" head to provide for two (2) or more tube connections.
4. For the example, we would then select:
   - (4) Type "TLO-B-0"
   - (1) Type "TLO-A-2"
   - (2) Type "TLO-B-2"
   - (1) Type "TLO-C-2"
   - (8) Type "TLO-B-210"
   - (4) Type "TLO-B-3/0"
   - (4) Type "TLO-B-4/0"

Pump Selection

1. Select Type of pump — Manual or Electric. Consider:
   - Cost
   - Preference
   - Size of System
2. If manual pump is chosen, select output. Multiply the value in column 5, Chart A (lube volume cu.in./hr.) by number of hours between lube applications. Set pump output equal to or greater than this total.

   If, in the example, we were using a manual pump (system is realistically too large for manual pump), the pump output is factory set @ .50 Cu.in./stroke. To lubricate machine twice per shift (every 4 hours), we would multiply 1.437 (total lube volume cu.in./hr) by 4 (hours between lube applications). The result would be 5.748 cu.in. Pump would therefore require 11.5 or 12 full strokes $\frac{\text{5.748 req.}}{\text{.50 output}}$ every four hours.
3. If an electric pump is chosen, determine the type control needed.
   - **Remote Control –** The pump motor would have to be actuated to provide sufficient "On time" to meet total lube volume requirements. Pump output is 6.9 cc (.420 cu.in.) per minute at 60 Hz and 5.77 cc (.350 cu.in.) per minute at 50 Hz.

     In our example, at 60 Hz the pump would have to be actuated to run 3.4 minutes per hour:
     $$\frac{\text{(1.437 lube req.)}}{\text{.420 output}}$$
   - **Time Control –** Set volume control of the pump to the total system requirement.

     In the example, we chose the Time Control Pump. The timer would be set at 3.42 minutes "On time" with one hour cycle time at 60 Hz which would delivery 1.437 cubic inches.

Accessories

1. Select as required:
   - Gauge (Electric Pump)
   - In-Line Filter (Electric Pump)
   - Anchor Blocks
   - Fittings
   - Manifold Bars
   - Tube Clips
   - Tubing

SYSTEM DESIGN & COMPONENT SOLUTION

Plumbing —

Lubricant flow velocity within this system is relatively low. To assure accurate proportioning through the various orifices in the system, it's important that velocity remain low. Significant pressure drop through long delivery lines may affect the volume of oil delivered by the orifice fitting at the end of that line. For general application, 4 mm (5/32 in.) tubing is recommended. Where applicable this tubing may be:

- 4 mm (5/32 in.) dia. x .64 mm (.025 in.) wall nylon (where flexibility is required)
- 4 mm (5/32 in.) dia. x .51 mm (.020 in.) wall steel tubing
- 4 mm (5/32 in.) dia. x .64 mm (.025 in.) wall copper tubing (where ease of installation is required)
- 3.18 mm (1/8 in.) dia. hose (where movement and flexibility are required.

Automatic (Electric Pump) Systems —

The selection of the tubing for the main line may affect the orifice selection in an automatic cyclic system which is in- tended to operate with a pump pressure between 20 and 150 psi. Main line pressure drop may affect the orifice proportioning if the fluid viscosity exceeds 3,000 SUS at operating temperature. Main line pressure drop (psi) should not exceed 15 percent of system pressure. Main line pressure drop may be calculated by first determining the Q value of the line with the following formula:

$$Q = \frac{53{,}192{,}000\ xd^4}{L}$$

where:
- d = inside diameter of the main line
- L = the length of line (in inches)

For 5/32-in. tubing with 025-in. wall, the formula is:
- Q = 560 ÷ length of line (in feet)

The pressure drop of the line can be determined by: $P = \frac{F \times V}{Q}$

where:
- P = line pressure drop
- F = pump flow rate (.40 for the Thrif-T Luber Electric Pump)
- V = viscosity of fluid at operating temperature
- Q = the flow value of the tubing (see preceding)

When the main line exceeds 10 feet, or the fluid viscosity exceeds 5,000 SUS at operating temperature, consult the factory.

Prefilling the System —

The system and all of its delivery lines must be filled with oil prior to initial operation of the equipment to be lubricated. Also, the system should be filled after a substantial machine shutdown period. This assures immediate lube supply to the bearings. The prefill volume may be as little as 1.0 cubic inch or as much as 3.0 cubic inches in larger systems.

In Thrif-T Luber Electric Pump supplied systems...

Prepriming may require several minutes of pump operation for small systems. Larger systems may require six to eight minutes of pump operation. The manual run button may be used to override the normal pump setting.

The system can be considered adequately preprimed when oil flow is observed at the most remote point of the system, or (if pump has gauge accessory) when gauge pressure reaches the planned pressure level.

In Thrif-T Luber Manual Pump supplied systems...

Prefilling may require several operations of the pump handle. The system is adequately preprimed when the pump handle recedes slowly.

Design Chart A

CUSTOMER _____ TYPE OF SYSTEM: MANUAL ☐ AUTOMATIC ☐
MACHINE OR EQUIPMENT _____ OIL VISCOSITY _____ OPERATING TEMP. F° _____
FILE NO. _____
DATE _____
PAGE ___ OF ___

REF. NO.	1 LOCATION OR NAME OF BEARING	2 BEARING SIZE (A)	2 BEARING TYPE (B)	NO. OF TAPS	3 BRG. REQ. CU.IN./HR.	4 FACTOR	5 LUBE VOLUME CU.IN./HR. (D)	6 LUBE VOLUME PER TAP (E)	7 BASE RATIO (C)	8 ORIFICE SIZE (C)	9 FLOW VALUE (C)	10 TOTAL FLOW VALUE
1						3						
2						3						
3						3						
4						3						
5						3						
6						3						
7						3						
8						3						
9						3						
10						3						
11						3						
12						3						
13						3						
14						3						
	SYSTEM TOTAL	—				—		—	—	—	—	THIS NO. EQUALS Q

(A) DIAMETER WIDTH OF CYLINDRICAL BEARINGS - LENGTH AND WIDTH OF SLIDES - SHAFT DIAMETER OF ANTI-FRICTION BEARINGS AND NUMBER OF ROWS.
(B) TYPE OF SURFACE - SLIDING, PLAIN OR TYPE OF ANTI-FRICTION BEARING
(C) FROM CHART "C"
(D) BEARING REQUIREMENT X NUMBER OF TAPS X FACTOR (3)
(E) LUBE SUPPLY VOLUME ÷ NUMBER OF TAPS

P = PRESSURE PSI
F = PUMP FLOW
V = OIL VISCOSITY
Q = TOTAL FLOW VALUE

$P = \frac{F \times V}{Q}$

DESIGN CHART B

Plain Bearing	Area = π x D x L D = shaft diameter L = length of bearing
Slide, Gibs & Ways	A = width x length + travel
Anti-Friction	Area = shaft diameter^2 x number of rows
Gears (calculated each gear in train)	Area = π x Pd x W Pd = pitch diameter W = width of gear
Ball Screw	Area = π x Pd x rows x travel Pd = pitch diameter of ball race Rows = number of rows in engagement with shaft
Note	π = 3.14

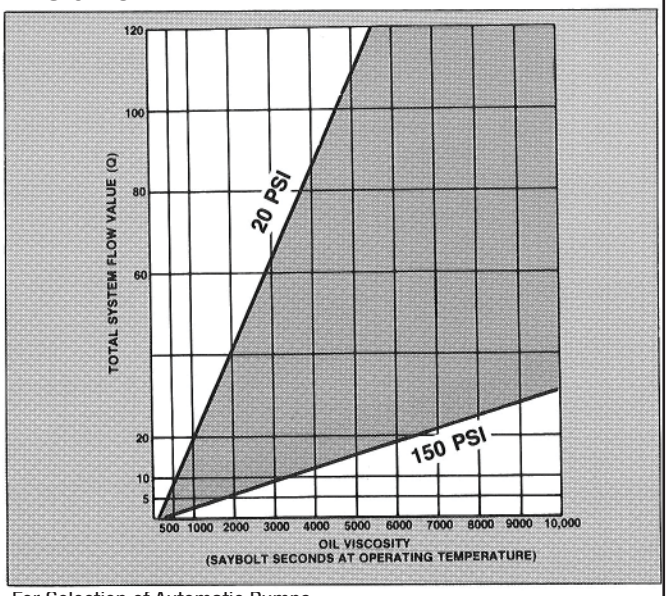
Suggested Lube Replenishment Guidelines. The replenishment lube value in cubic inches per hour = Area x .001

DESIGN CHART C

Orifice Size	A Max: Min 512-:1	B 256:1	C 128:1	D 64:1	E 32:1	F 16:1	G 8:1	H 4:1	I 2:1	Flow Value
5/0	1	—	—	—	—	—	—	—	—	0.018
4/0	2	1	—	—	—	—	—	—	—	0.037
3/0	4	2	1	—	—	—	—	—	—	0.074
2/0	8	4	2	1	—	—	—	—	—	0.153
0	16	8	4	2	1	—	—	—	—	0.305
1	32	16	8	4	2	1	—	—	—	0.612
2	64	32	16	8	4	2	1	—	—	1.219
3	128	64	32	16	8	4	2	1		2.443
4	256	128	64	32	16	8	4	2	1	4.876
5	512	256	128	64	32	16	8	4	2	9.752

Orifice Selection Columns A-1 are Max: Min Base Ratios

DESIGN CHART D



For Selection of Automatic Pumps

DESIGN CHART E

Approximate SUS Oil Viscosities for SAE Number System at Various Temperatures (^{0}F)

	50^0	60^0	70^0	80^0	100^0	210^0
SAE 70	17,000	10,000	6,500	4,000	1,850	130
SAE 60	11,500	7,000	4,500	3,000	1,400	110
SAE 50	8,500	4,600	3,000	2,000	985	90
SAE 40	4,700	3,000	1,900	1,350	680	75
SAE 30	3,100	2,000	1,350	950	490	65
SAE 20	2,000	1,300	900	650	350	57
SAE 10	850	600	420	310	185	46

Trabon® Thrif-T Luber®

Design Chart A

CUSTOMER _____ TYPE OF SYSTEM: MANUAL ☐ AUTOMATIC ☐

MACHINE OR EQUIPMENT _____ OIL VISCOSITY _____ OPERATING TEMP. F° _____

FILE NO. _____

DATE _____

PAGE ___ OF ___

REF. NO.	1 LOCATION OR NAME OF BEARING	2 BEARING SIZE (A)	BEARING TYPE (B)	NO. OF TAPS	3 BRG. REQ. CU.IN./HR.	4 FACTOR	5 LUBE VOLUME CU.IN./HR. (D)	6 LUBE VOLUME PER TAP (E)	7 BASE RATIO (C)	8 ORIFICE SIZE (C)	9 FLOW VALUE (C)	0 TOTAL FLOW VALUE
1						3						
2						3						
3						3						
4						3						
5						3						
6						3						
7						3						
8						3						
9						3						
10						3						
11						3						
12						3						
13						3						
14						3						
	SYSTEM TOTAL		—			—		—	—	—	—	THIS NO. EQUALS Q

(A) DIAMETER WIDTH OF CYLINDRICAL BEARINGS - LENGTH AND WIDTH OF SLIDES - SHAFT DIAMETER OF ANTI-FRICTION BEARINGS AND NUMBER OF ROWS.
(B) TYPE OF SURFACE - SLIDING, PLAN OR TYPE OF ANTI-FRICTION BEARING
(C) FROM CHART "C"
(D) BEARING REQUIREMENT X NUMBER OF TAPS X FACTOR (3)
(E) LUBE SUPPLY VOLUME + NUMBER OF TAPS

P = PRESSURE PSI
F = PUMP FLOW
V = OIL VISCOSITY
Q = TOTAL FLOW VALUE

$$P = \frac{F \times V}{Q}$$

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