PROCESS SPECIFICATION 203

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Design Criteria and Installation and Extraction Procedures for Lee Plug® Expansion Plugs

Innovation in Miniature

The Lee Company

PROCESS SPECIFICATION 203

Revision L2

Design Criteria and Installation and Extraction Procedures for Lee Plug® Expansion Plugs

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INTRODUCTION

This technical report is a comprehensive design and procedural guide in the use of Lee Plugs. Section I, entitled Design Information, gives extensive information and recommendations to aid in safely designing Lee Plugs into systems. This section includes recommendations to aid in selecting the right plug for the application, the recommended installation hole parameters, as well as a discussion on boss stresses and how to prevent stress corrosion cracking. Section II, Inspection And Handling, discusses Lee Quality Control procedures, certifications, and important handling requirements. The third and final section describes the installation and extraction techniques for Lee Plugs and R.F.O. Lee Plugs. The part numbers for all pertinent installation and extraction tools may be found in these sections.

The information found here is more extensive than that provided by the *Lee Technical Hydraulic Handbook*. Compliance with the procedures and recommendations in this report will ensure the maximum performance of Lee Plugs.

The Principle of Lee Plug Performance

The Lee Plug is a cylindrical plug with a tapered hole part way through its center and numerous small grooves on its outside diameter. It is slipped into a reamed counterbore in the product. A tapered pin is then driven into the plug until the ends of the pin and the plug are flush with each other. Controlled expansion causes the lands and grooves of the plug to “bite” into the surrounding material forming independent seals and retaining rings. This results in a positive, reliable, leak and trouble-free seal for both liquids and gases.

The Lee Plug is simply the most successful method to seal drilled holes for critical applications. Over 100 million are in use on aircraft, missiles, spacecraft, automobiles, machine tools, down hole oil tools, molds – anything that requires a permanent leak-proof seal.

SECTION I - Design Information

Selecting the Proper Lee Plug

Like Materials

The proof pressures listed in the Appendix for all Lee Plugs are for plugs installed in bosses of the same material as the plug. Bosses of considerably higher strengths than the plug may cause low blowout pressures and high pin installation forces. Bosses of considerably lower strengths may also cause low blowout pressures and will make the extractability much more difficult.

Proof Pressure

To assist designers in the proper selection of Lee Plugs, we give a "proof pressure" for all sizes of Lee Plugs and for three hole tolerances (Classes I, II, III). Note: High Strength Plugs are the exception, which have only one class. The Lee Plug proof pressure is the highest hydrostatic pressure that may be applied in the course of routine production acceptance testing.

For high pressure systems, The Lee Company has developed the High Strength Plug. The design has been optimized for use in the high strength/high hardness materials such as the precipitation hardenable steels and titanium commonly found in high pressure systems.

Lee Plugs should be selected conservatively. This will provide an additional safety margin for chance situations where the installation process might fail to meet specification or where pressure transients or other factors are unexpectedly severe. As a general guideline to designers, we recommend the PROOF PRESSURE of the chosen Lee Plug exceed the BURST PRESSURE of the hydraulic system.

Table I below lists the proof and burst pressures for Lee Plugs. These pressures are per SAE AS 5440 and MIL-H-8891.

TABLE I

Proof and Burst Pressures

Nominal System Pressure	3,000 psid	4,000 psid	5,000 psid	8,000 psid
System Peak Pressure	4,050 psid	5,400 psid	6,750 psid	9,600 psid
Proof Pressure	6,000 psid	8,000 psid	10,000 psid	16,000 psid
Burst Pressure	12,000 psid	16,000 psid	20,000 psid	24,000 psid

Temperature Limits

It is necessary to closely match the coefficient of thermal expansions in applications where the plugs may be exposed to temperatures less than -65ºF (-54ºC) or greater than 275ºF (135ºC). Aluminum Lee Plugs are not recommended for use above 275ºF (135ºC). Plugs of 416 stainless steel are good to a temperature of 500ºF (260ºC). If the temperature is expected to exceed 500ºF (260ºC), then more information on the housing material and the overall application would have to be considered. Call your local sales office for assistance.

Installation Hole Parameters

The Lee Plug is purposely designed to perform well under adverse conditions. Therefore, if the specifications outlined in this section are not followed precisely, the Lee Plug may still perform adequately, but the margin of safety will be reduced relative to the degree to which the installation hole is out of specification. Of real concern is an installation hole with many parameters not within the specifications, or when any one parameter is grossly out of specification.
Note: Throughout this section it will be necessary to refer to the drawings and tabulated data of Appendix B.

Surface Finish

The reamed installation hole should be clean and dry. Its finish should be approximately 16 to 63 micro inches (0,4 - 1,6 micrometers) circular lay with no longitudinal scratch marks. A smoother bore may result in a reduction in proof pressure capability while a rougher bore may not permit positive sealing.

Surface Treatment

Proof pressure data for Lee components is given for installations in bosses without any surface treatment having been applied. Passivating stainless steel installation holes per MIL-S-5002 or ASTM-A967 has no effect on the performance of Lee components. For aluminum we recommend untreated installation holes. However, anodized holes per MIL-A-8625 Type II are generally acceptable. Anodizing aluminum alloy installation holes per MIL-A-8625 Type III (hard coat anodizing) is not approved as it degrades proof pressure and can cause leakage. We do not approve the use of some proprietary surface treatments, which include the deposition of solid lubricants such as Teflon. *

** (Teflon is a registered trademark of E.I. Dupont de Nemours Co., Inc.)*

Class of Fit

The proof pressure for Lee Plugs is given in Appendix B for three installation hole tolerances (Classes I, II, III). Note: High Strength Plugs are the exception, which have only one class. All Classes for each plug have the same lower limit for the installation hole diameter. As the class number decreases, the installation hole tolerance increases, and thus the corresponding proof pressures decreases.

Note that the selection of a Class I fit does not ensure less interference of the expanded plug and the reamed hole. It merely indicates that the interference may be as much, or somewhat less than, the interference in Class II or Class III holes. On the other hand, the Class III hole always ensures the maximum interference. In cases of thin walled bosses or brittle materials (less than 3% elongation), the installation hole diameter should be controlled toward the maximum hole size of a Class I.

Boss Size

The amount of material surrounding the plugged hole is very important in its effects on plug performance, and therefore must be taken into account. When installing a Lee Plug into a boss of similar material to that of the plug, at least 2.5 times the plug outside diameter (d) should be allowed as a mounting boss diameter (D) to obtain the proof pressures tabulated in Appendix B (see Figure 1 on Sheet 9). The graph in Figure 2 on Sheet 9 represents the various recommended D/d ratios for Lee Plugs in dissimilar boss materials. Figure 3 on Sheet 10 is a reference graph used to estimate the percentage of proof pressure for varying D/d ratios. **Installation of plugs into boss materials that have a D/d of less than that recommended in Figures 2 or 3 should be substantiated by testing. During testing the expected conditions should be duplicated.**

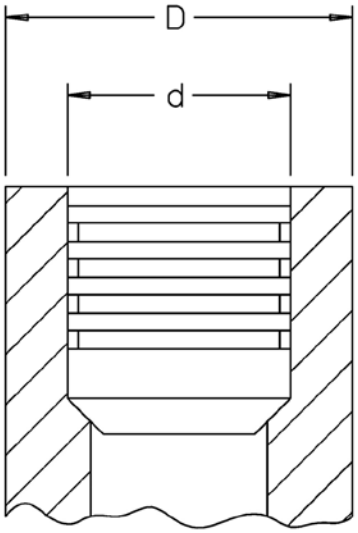


FIGURE 1

Housing Wall Thickness

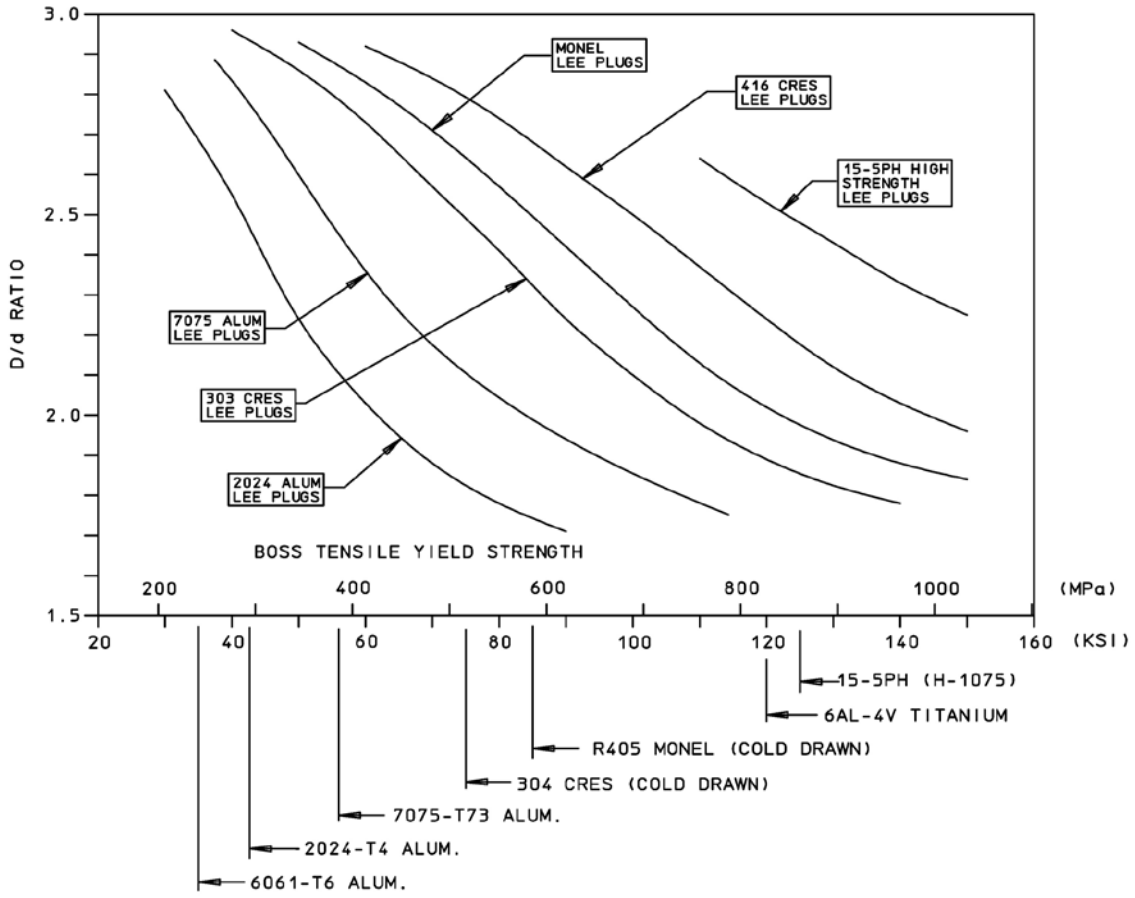


FIGURE 2

Minimum Recommended D/d Ratio For Lee Plugs for Dissimilar Materials

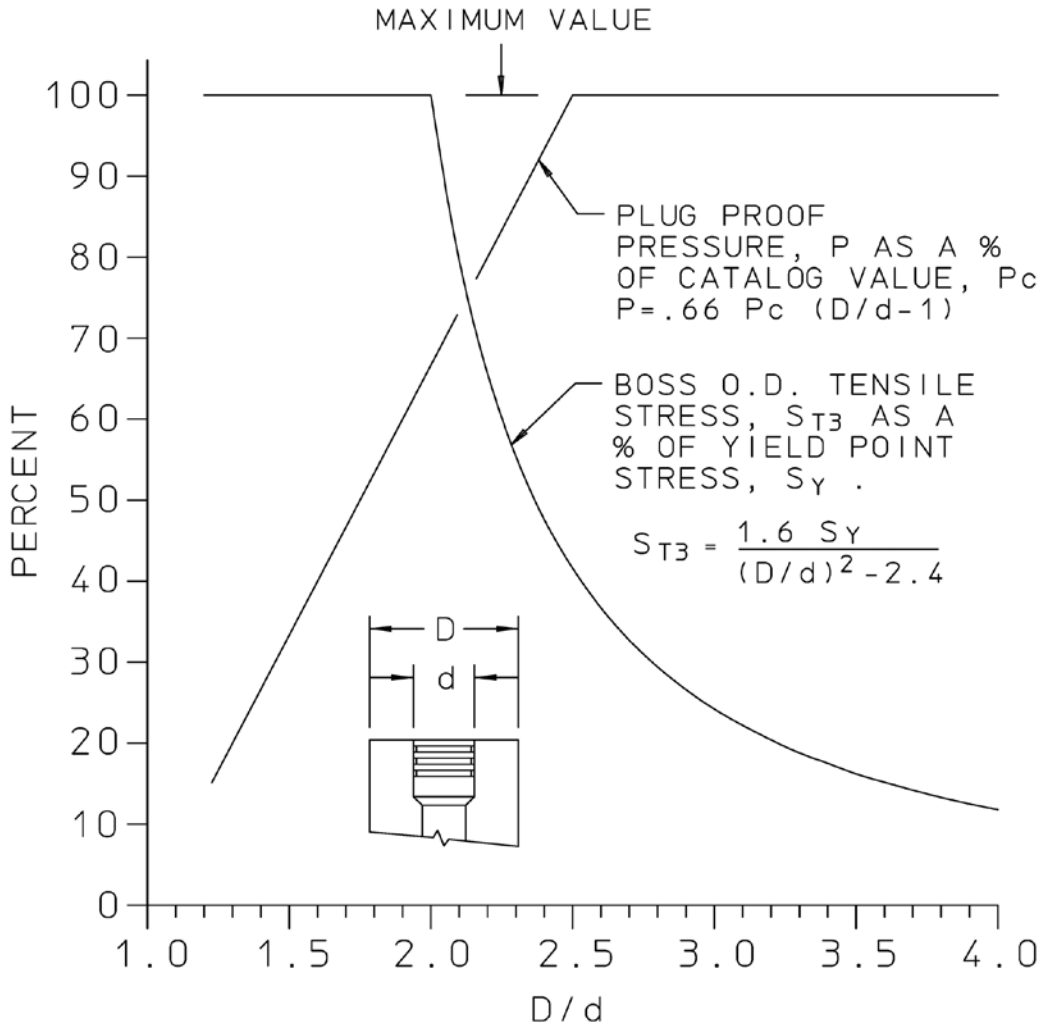


FIGURE 3

The Effect of D/d on Proof Pressures and Stresses for Plug and Boss Materials with Similar Mechanical Properties.

Support Shoulder

The support shoulder against which the plug is to be driven should be 45º, otherwise the plug may move past the seat upon driving the pin. This may result in low proof pressures and/or high installation forces. The minimum allowable width of the support shoulder for Lee Plugs is 0.013 inch (0,33 mm). For High Strength Plugs it is 0.015 inch (0,38 mm). This is necessary to resist the axial force transmitted while driving the pin (See Figure 4).

Web Thickness

The web thickness (the amount of material directly below the 45º shoulder) should be capable of withstanding the force transmitted by driving the pin into the plug. Generally, a minimum of 0.125 inch (3,2 mm) should be allowed for aluminum housings and a minimum of 0.063 inch (1,6 mm) for steel housings. Larger allowances should be made for weaker materials or special situations (See Figure 4).

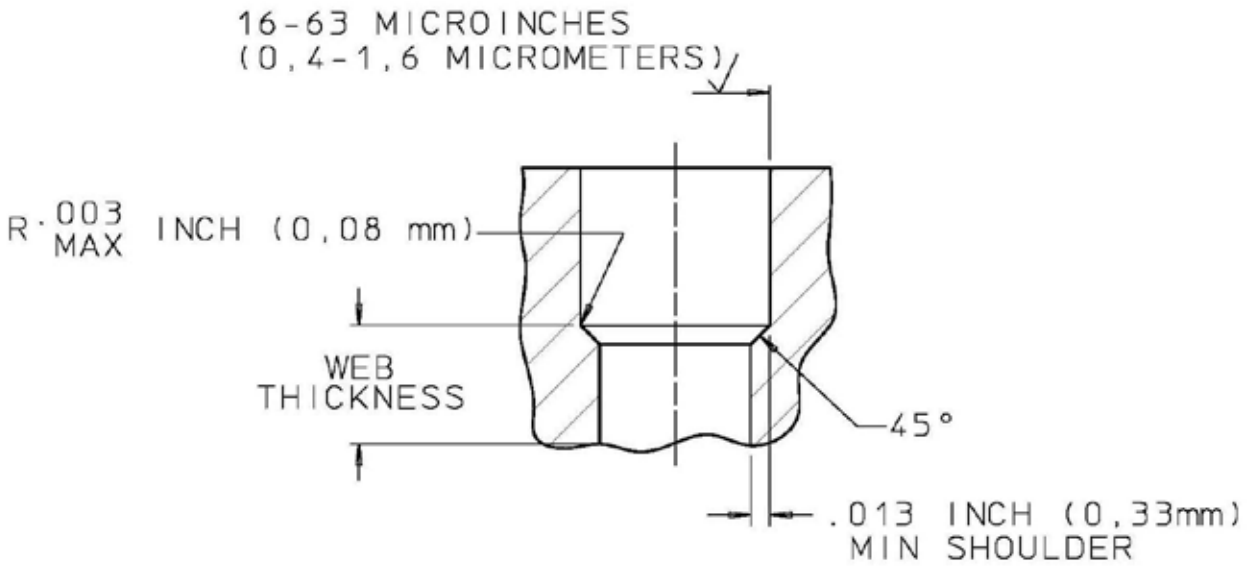


FIGURE 4

Installation Hole

Cylindricity

Oversize, tapered, or "bell-mouthed" holes may result in low installation forces and reduced proof pressures. A hole larger at the bottom may result in leakage although the plug maintains its rated proof pressure. Cylindricity of the installation hole should be held to 0.0003 inch (0,008 mm) for Class I and Class II holes.

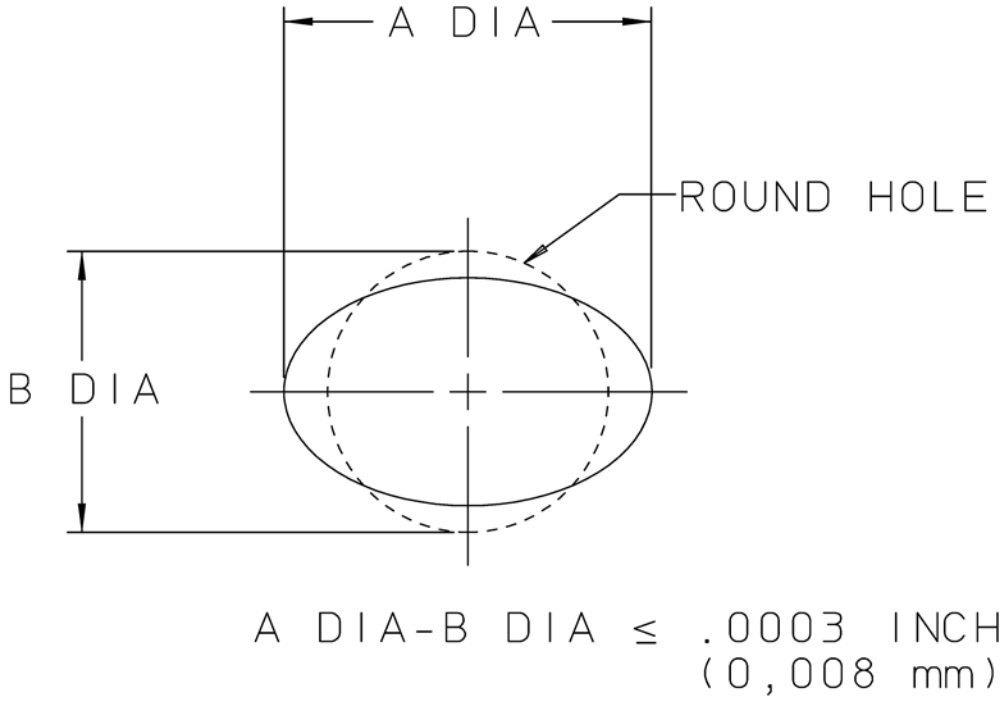


FIGURE 5

Out of Roundness

Depth of Plug

The minimum depth of the reamed hole recommended for achieving the maximum pressure holding capability (dimension "A") is tabulated in Appendix B. When working to this dimension, the exposed end of the plug and pin will be at least 0.010 inch (0,25 mm) below the surface of the boss material. This allows the last plug "land" to contribute to the plug's holding capability. Some users may put a radius on the top of the installation hole as part of their machining process. If this is the case, the minimum "A" dimension must be maintained below that radius to ensure the maximum pressure holding capability.

Flush Mounting

The cosmetic appearance of the plugged material can be improved by making the depth of the reamed hole equal to the "M" dimension plus 0.010 inch shown for each plug size in Appendix B. This will allow the plug to be flush with the surface or near flush, depending on the difference between the actual "M" dimension of the plug and the ream depth. If a continuous surface is desired, The Lee Company can supply plugs with unvented pins for this purpose. This flush configuration will result in an approximate 20% reduction in proof pressure for short Lee Plugs and an approximate 15% reduction for long Lee Plugs.

(Note: Flush mounts are not recommended for High Strength Plugs.)

Boss Stresses

Elongation

The expansion of a Lee Plug causes the boss material to be deformed, resulting in radial growth of the boss I.D. and O.D. In order to accommodate this growth, some consideration must be given to the ductility of the boss material. Generally, the boss material should have an elongation of at least 3%.

A typical Lee Plug installation will expand the boss I.D. by approximately 0.003 inch. Since this expansion remains relatively constant for all sizes of plugs, the smallest sizes are therefore subject to the greatest percentage of deformation. The worst case is 0.093 inch diameter plug which will be expanded to 0.096 inch in a boss, or 3%. Thus, if the boss material has an elongation of over 3%, the boss will not crack from installation of the Lee Plug.

Stress Corrosion Cracking

The control of stresses at the I.D. of a Lee Plug boss is of little concern to the designer, provided that the housing material has an elongation of 3% or greater. Housings that fall into this category will not crack due to the installation of a Lee Plug. The control of boss stresses on the O.D. is important in those applications where Stress Corrosion Cracking (SCC) can be a problem. SCC is a failure caused by the combined action of a corrosive agent and a tensile stress. Although most alloys are susceptible to SCC, each material has a threshold stress value below which cracking does not occur. (The threshold value is a function of the material and the application.) Therefore, a control of boss stresses below this threshold value will eliminate SCC.

The expansion of a Lee Plug into an installation hole causes an increase in the I.D. of the boss and thus induces a tensile tangential stress on the O.D. of the boss. Factors which influence the magnitude of the boss stresses are the class of fit, the plug material, the boss material, and the O.D. of the boss (See Installation Hole Parameters on Sheet 7). The Lee Plug is not subject to stress corrosion since it is in compression throughout.

When the pin is driven into the plug, the plug expands causing the I.D. of the boss to be plastically deformed. If the boss diameter (D) is relatively small compared to the plug diameter (d), the plastic region will extend to the O.D. of the boss. If the boss diameter is larger, the plastic region extends only partially through the boss and the remainder is elastically deformed.

TABLE 2

Materials Highly Resistant* to Stress Corrosion Cracking

ALLOY	CONDITION	YIELD STRESS (MIN)	% ELONG. (MIN)
2024 Alum	T851	58 ksi	5
6061 Alum (a)	T6	35 ksi	10
7075 Alum	T73	56 ksi	8
355, 356 Cast Alum	T6	17 ksi	3
15-5PH Cres (b)	H1075	125 ksi	13
300 Series Cres (a)	Cold Drawn	75 ksi typ.	35 typ.
4130 Cast Steel	Quenched &Tempered	85 ksi	16
6AL-4V Titanium (a)	Annealed	120 ksi	10
Monel Alloys (a)	Cold Drawn	85 ksi typ.	20 typ.
Inconel Alloy 600	Annealed	35 ksi	30

a) All conditions are highly resistant to SCC.
b) Condition H1000 and above is highly resistant to SCC.
* The following alloys have low resistance to SCC, and are generally not recommended for Lee Plug bosses (partial list): Alum: 2024-T3 & T4, 7075-T6, Cres: 440C (all conditions).

Calculation Of Boss Stresses

The boss stresses, both tangential tensile and the radial compressive, vary throughout the boss. The radial stress reaches a maximum at the hole I.D. and drops to zero at the O.D. of the boss. The tangential stress (assuming a plastic/elastic situation) is low at the boss's I.D., reaches its maximum at the plastic/elastic interface, and drops to some intermediate value at the O.D. of the boss. Figure 3 on Sheet 10 presents a plot of boss O.D. tangential tensile stress and plug proof pressure versus boss/plug diameter ratio for plug and boss materials with similar mechanical properties and having Class III fits. A D/d ratio of 2.5 is the minimum recommended by The Lee Company for cases in which the plug and boss are of similar materials. When a Lee Plug is installed in a boss material of dissimilar mechanical properties, the catalog proof pressure of the plug will be maintained by observing the D/d ratios shown in Figure 2 on Sheet 9 and the stress on the O.D. of the boss will be below 40% of the tensile yield strength of the boss material. In most cases, the factor limiting the boss diameter will be the proof pressure requirements and not the stresses. Figures 2 and 3 pertain to round bosses only.

Stresses In Non-Uniform Bosses

The stress situation is different for bosses having non-uniform wall thicknesses. Installing plugs in this type of boss results in a stress concentration adjacent to the minimum wall thickness. This occurs because the thicker (and therefore stiffer) section of the boss resists deformation, thus concentrating the effects of plug expansion in the thinner section of the boss. See Figure 6 on Sheet 16.

For wall thickness T and plug diameter d, the minimum recommended T/d ratios for several boss configurations are shown on the following page.

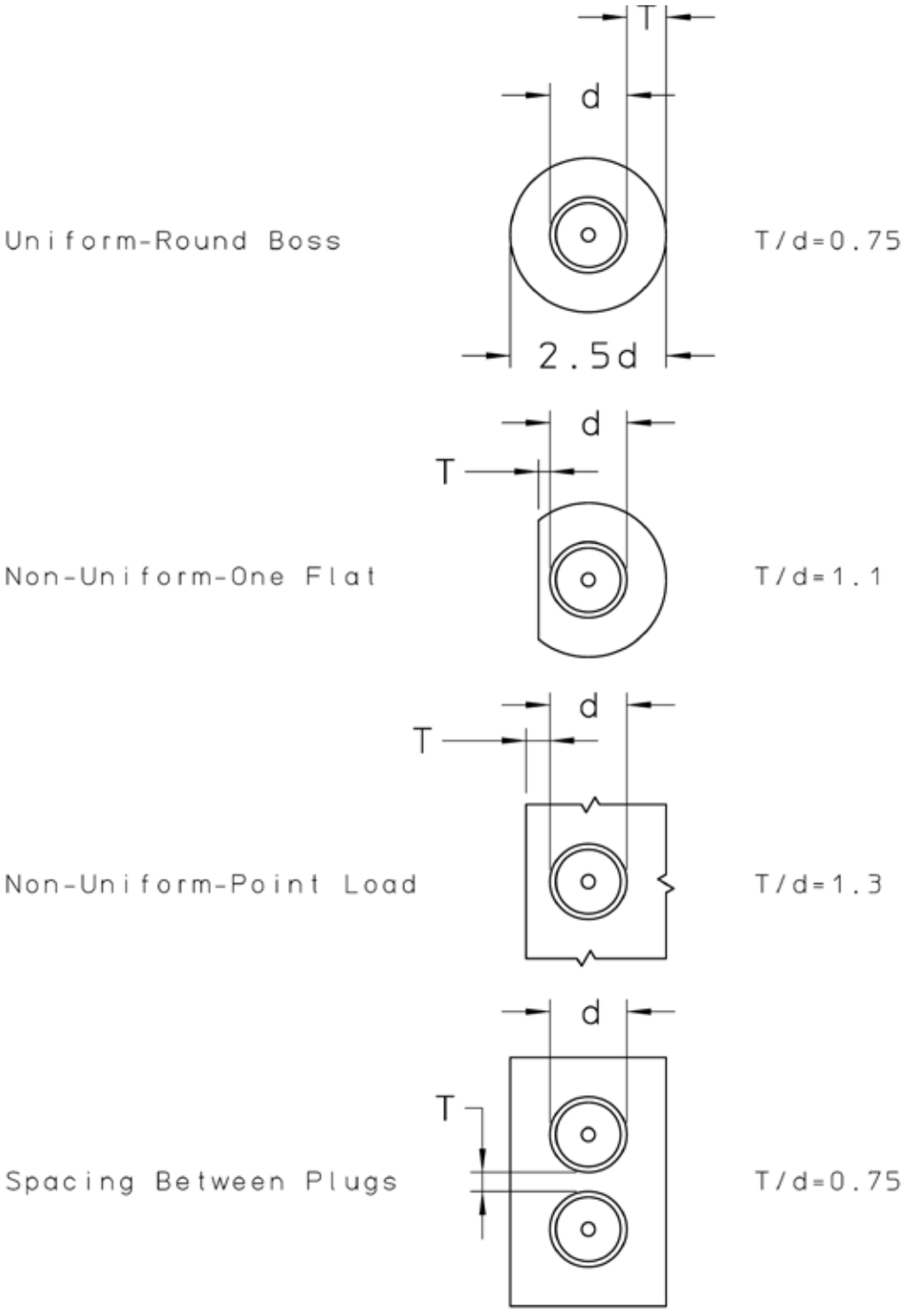


FIGURE 6

Non-Uniform Bosses

Unsymmetrical Boss Stresses

For bosses that are not round, the analysis is more complex, and thus a formula has been developed to aid in the solution of this difficult problem. The following formula allows a stress concentration factor, K, to be calculated as a function of certain boss geometric parameters. The formula is reasonably accurate, somewhat conservative, and applies to the stress in the plug boss at the minimum wall thickness area.

$$K = \frac{1}{B/360\ [1 + A\ (360 - B)/B]}$$

$$A = \frac{1}{1.65\ (r - 0.97)^{1/7}} \qquad B = a_t\ [1 + 0.3SIN\ (a_t/2)]$$

r = Boss wall thickness ratio (T/t) a_t = angle of thin wall sector (deg.)

T/t Ratio : This is the ratio of the maximum boss wall thickness to the minimum wall thickness. It is an indication of the nonsymmetry of the boss, and has a value of 1.0 for a round boss.

Angle: The angle is that sector of the boss which is at the minimum wall thickness. A round boss would have an angle of 360 degrees.

D/d Ratio: This is the ratio of the boss outside diameter at its minimum radius, to the plug outside diameter.

See Figure 7 on Sheet 18 for examples of how the geometric parameters apply to real Lee Plug bosses and Figure 8 on Sheet 19 for a plot of the formula results. A typical problem is solved by using the round boss solution method with the D/d ratio as described above. The calculated stress is then multiplied by a stress concentration factor as determined from the formula.

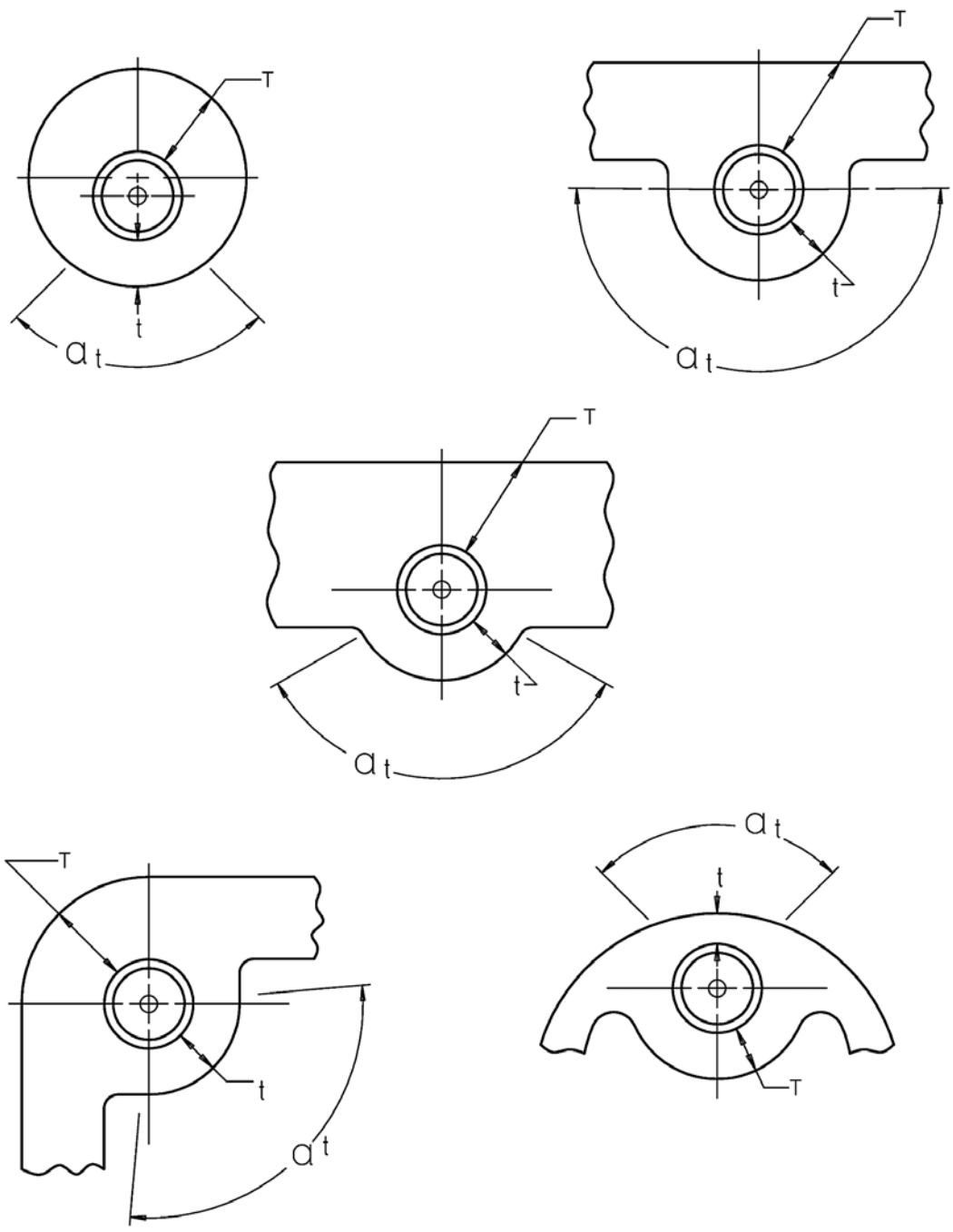


FIGURE 7

Typical Unsymmetrical Bosses

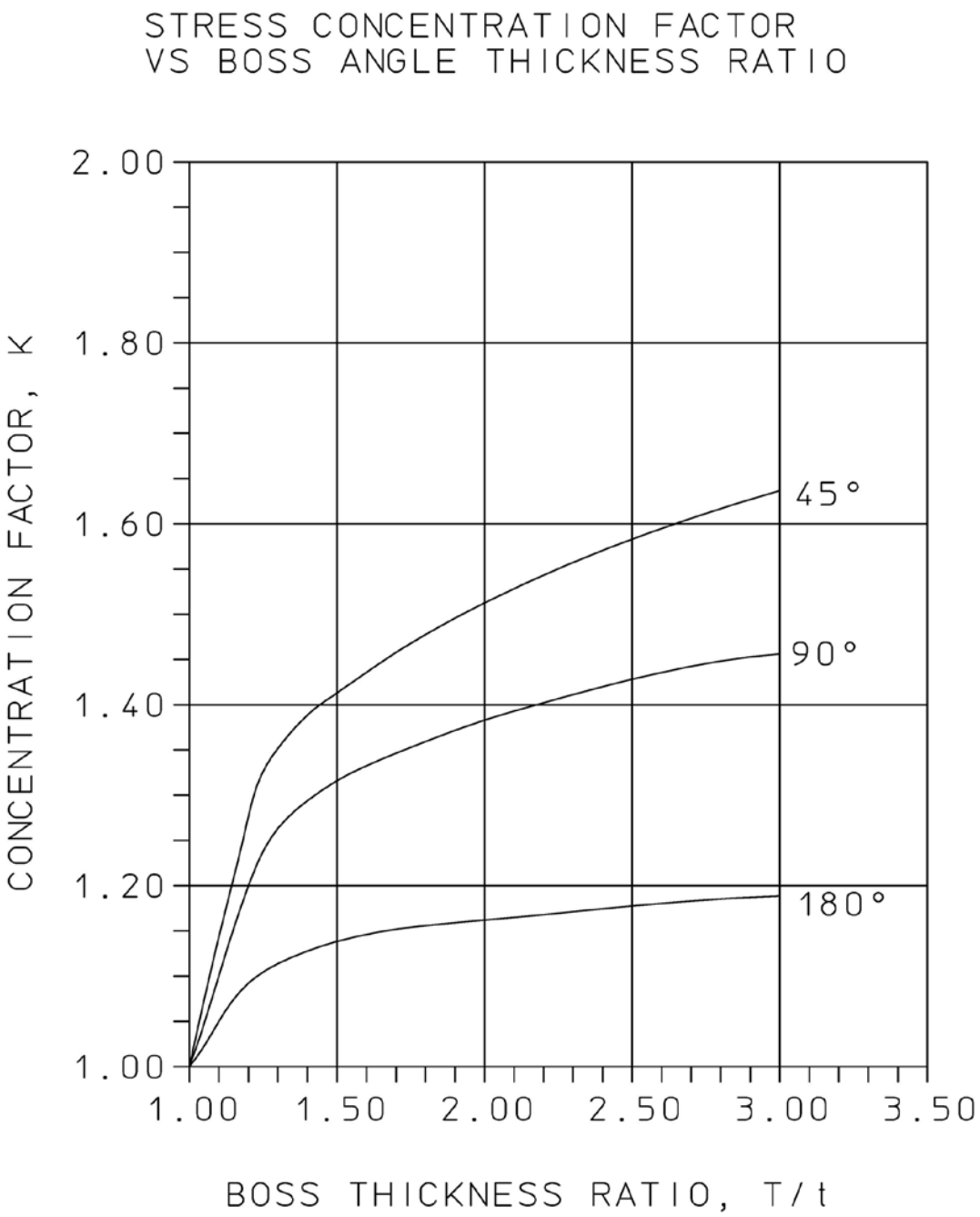


FIGURE 8

Stress Concentration Factor vs. Boss Angle and Thickness Ratio

SECTION II - INSPECTION AND HANDLING

Lee Q.C. Procedures

The final inspection of plugs at The Lee Company is comprehensive and includes a 100% inspection of all pin and plug outside dimensions, and a 100% visual inspection for surface defects. All other dimensions are inspected per ANSI-ASQ Z1.4 LEVEL II.

Checking O.D.

All diametrical measurements of the Lee Plug should be made on the front or solid end of the plug to eliminate false readings due to permissible groove burrs.

Color-Coding

All Lee Plugs are clearly identified by the marking on the packaging. In addition to this, Aluminum Lee Plugs are color coded. Standard 2024-T4 aluminum plugs are green, oversize 2024-T4 aluminum plugs are red, and metric 2024-T4 aluminum plugs are brown. Standard 7075-T6 aluminum plugs are purple.

Lot Control and Certification

All Lee Pins and Plugs are manufactured and controlled by lots. These lot numbers are marked on the pin and plug packages and can be traced to the material certifications from the mill. The material lot numbers and certificates of material certification are kept on file. A certification of conformance accompanies each lot of pins and plugs. Customers should maintain lot control when pins and plugs are taken into inventory (see example page in Appendix A).

Performance Certification

In addition to customary dimensional inspection, every lot of Lee Pins and Plugs is performance tested, with a representative sample of the mating pin or plug, to a Lee Company process specification. Plugs are tested for installation, leakage, pin retention, proof pressure, and thermal stability. Two certificates of performance (one for the pin lot and one for the plug lot) accompany every shipment of Lee Plugs (see example page in Appendix A). Pins and plugs are not used in matched sets. Example: a 0.343 inch diameter short steel pin may be used with any 0.343 inch diameter short steel plug.

Wax Coating

Lee Plug pins are coated with a wax that produces a thin solid lubricating film. This film has proven to reduce friction and prevent galling and seizing sufficiently to permit the pin to be driven flush with the Lee Plug. The handling of pins should be kept to a minimum. In addition, Lee Plug sets are not to be stored at temperatures exceeding 150ºF (65ºC). **Do not degrease the pins as this voids our warranty and this may render the pin uninstallable.**

The Lee Company absolutely prohibits customers from rewaxing pins or using lubricants of any kind in assembling pins and plugs. Adding any additional lubrication will invalidate the above mentioned certificates of performance. Although the taper angles of pins and plugs are small, the coefficient of friction can be reduced sufficiently by additional lubricants to cause properly installed pins to back out of the plug. Pin backout is a critical situation and must be avoided. Installation forces for pins are high by design.

PART NUMBERING SYSTEM

PLGA 093 0 01 0 A

Product Code
- **PLGA** = Standard Lee Plug
- **PLGM** = Metric Lee Plug
- **PLHA** = High Strength Plug
- **PLRA** = R.F.O. Plug
- **PLPA** = Quick Installation Plug

Plug Outside Diameter

Length Code
- **0** = Short
- **1** = Long

Material Code
- **01** = 2024-T4 Aluminum
- **02** = 416 CRES
- **03** = 303 CRES
- **06** = 7075-T6 Aluminum
- **24** = 15-5 PH CRES/Chromium Composite
- **40** = Monel R405

Model Code

Lee Expansion Plugs are stocked in five materials in English sizes (2024-T4 or T351 Aluminum, 416 CRES, 303 CRES, R405 Monel in long sizes and 7075-T6 or T651 Aluminum) and three materials in the metric sizes (2024-T4 or T351 Aluminum, 416 CRES, and 303 CRES). In addition, Lee Plugs are available in 2024-T6 Aluminum, 6061-T6 Aluminum, 304 CRES, 316 CRES and 6AL-4V Titanium.

SECTION III - INSTALLATION AND EXTRACTION OF LEE PLUGS

The multiple sealing and retaining rings created by the controlled expansion of the plug is the principle behind Lee Plug performance. Therefore, it is important that proper care is taken during installation. Of equal importance, the proper extraction procedure may allow the user to avoid the high cost of having housings reworked.

Lee Plug Installation

Pins may be driven into the plugs using an arbor press, hydraulic press, or hammer. If a hydraulic or other type of press is used, adjust the stroke by setting a mechanical stop to press the pin to the flush position. For experimental or prototype work, The Lee Company recommends using a properly sized hammer. Applying a few heavy blows quickly sets the pin, whereas a succession of light blows tends to mushroom, or deform the pin.

The following procedure should be followed when installing Lee Plugs (see Figure 9 on Sheet 23).

1. The installation hole and O.D. of the plug should be clean and dry.

2. Firmly support the item to be plugged.

3. Slip the plug into the hole until it is firmly seated on the support shoulder in the mounting hole. **Lightly tap** the back of the plug with the installation tool or a punch that bottoms on the flat portion at the base of the plug's I.D. This is a technique that will ensure firm seating. If this is not done, the plug may slide forward while the pin is being driven and cause longitudinal scratch marks in the reamed hole. **Do not** apply any more than a few pounds of force to the bottom of the plug in an attempt to ensure a more firm seat.

4. Start the pin, **small end first**, into the tapered hole of the plug. **Avoid tilting the pin**. Press or drive the pin with the proper installation tool (see Table 3 on Sheet 24 or Table 4 on Sheet 25) until the end of the pin is flush with the end of the plug within the tolerances indicated in Table 6 on Sheet 29. The Lee Plug Installation Gauge may be used to measure flushness (see Figure 11 on Sheet 29).

Pre-Assembly

It is not advisable to partially insert the pin into the plug as a pre-assembly before installing the plug in the reamed hole. This has a tendency to expand the plug, and on insertion cause longitudinal scratch marks in the reamed hole, which can cause undesirable leakage.

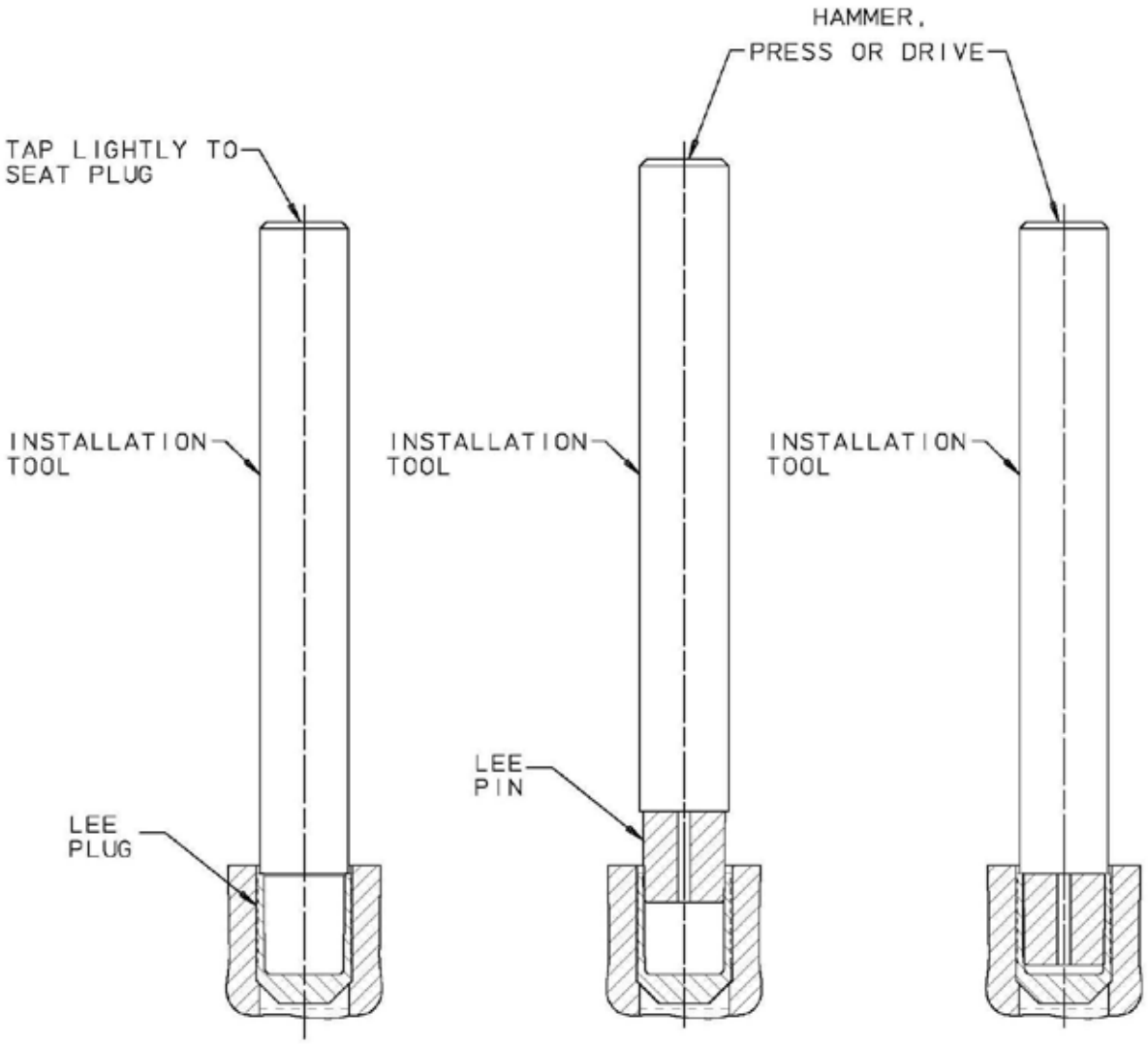


FIGURE 9

Installation Method For Lee Plugs

TABLE 3
Standard Lee Plug Installation Tools & Gauges

Applicable Lee Plug Size (in)	Tool	Gauge
0.093/0.103	CUTA0930203A	CUTA0931103A
0.125/0.135	CUTA1250203A	CUTA1251103A
0.156/0.166	CUTA1560203A	CUTA1561103A
0.187/0.197	CUTA1870203A	CUTA1871103A
0.218/0.228	CUTA2180203A	CUTA2181103A
0.250/0.260	CUTA2500203A	CUTA2501103A
0.281/0.291	CUTA2810203A	CUTA2811103A
0.312/0.322	CUTA3120203A	CUTA3121103A
0.343/0.353	CUTA3430203A	CUTA3431103A
0.406/0.416	CUTA4060303A	CUTA4061103A
0.468/0.478	CUTA4680203A	CUTA4681103A
0.531/0.541	CUTA5310203A	CUTA5311103A
0.656/0.666	CUTA6560203A	CUTA6561103A

TABLE 4
Metric Lee Plug Installation Tools & Gauges

Applicable Metric Lee Plug Size (mm)	Tool	Gauge (mm)
2,5	CUTA0930203A	CUTM0251103A
3,0	CUTM0300203A	CUTM0301103A
3,5	CUTM0350203A	CUTM0351103A
4,0	CUTA1560203A	CUTM0401103A
4,5	CUTM0450203A	CUTM0451103A
5,0	CUTA1870203A	CUTM0501103A
5,5	CUTA2180203A	CUTM0551103A
6,0	CUTM0600203A	CUTM0601103A
6,5	CUTA2500203A	CUTM0651103A
7,0	CUTA2810203A	CUTM0701103A
7,5	CUTM0750203A	CUTM0751103A
8,0	CUTA3120203A	CUTM0801103A

Installing Lee Quick Installation Plugs

The following procedure should be followed when installing Lee Quick Installation Plugs (see Figure 10 on Sheet 27).

1. The installation hole and O.D. of the plug should be clean and dry.
2. Firmly support the item to be plugged.
3. Slip the pre-assembled pin and plug into the hole. **Lightly push or tap** the back of the plug with the seating tool (see Table 5 on Sheet 28) until it is firmly seated on the support shoulder in the mounting hole. This is a technique that will ensure firm seating. If this is not done, the plug may slide forward while the pin is being driven and cause longitudinal scratch marks in the reamed hole. **Do not** apply any more than a few pounds of force to ensure a more firm seat.
4. Press or drive the pin with the proper installation tool (see Table 3 on Sheet 24) until the end of the pin is flush with the end of the plug within the tolerances indicated in Table 6 on Sheet 29. The Lee Plug Installation Gauge may be used to measure flushness (see Figure 11 on Sheet 29).

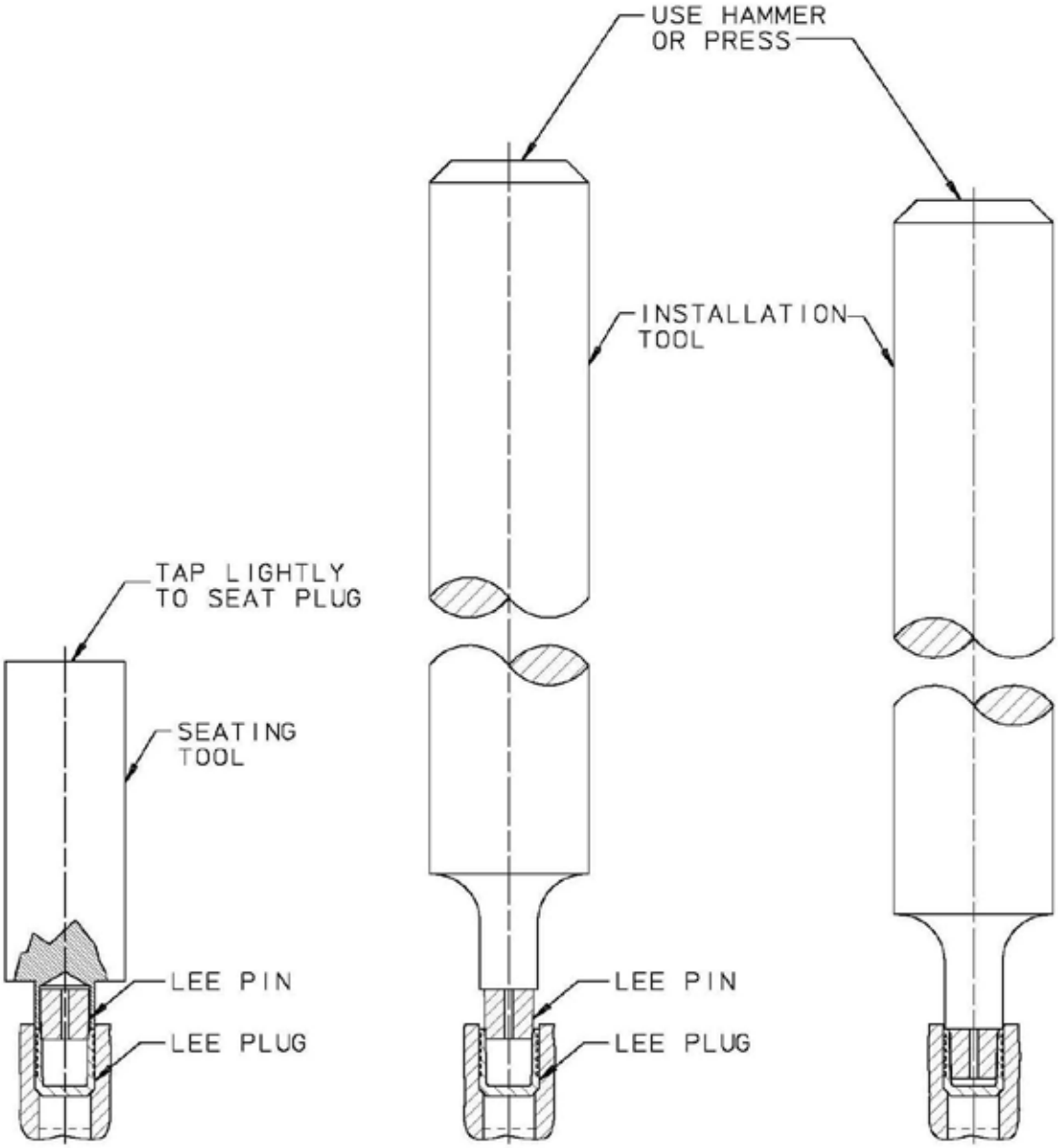


FIGURE 10

Installation Method For Lee Quick Installation Plugs

TABLE 5

Lee Quick Installation Plug Seating Tools

Applicable Lee Plug Size (in)	Tool
0.093/0.103	CUTA0930303A
0.125/0.135	CUTA1250303A
0.156/0.166	CUTA1560303A
0.187/0.197	CUTA1870303A

TABLE 6

Pin-Plug Flushness Tolerance For Lee Plug Installation

Long Series Lee Plug		Short Series Lee Plug	
Into Plug	0.010 inch (0,25 mm)	Into Plug	0.003 inch (0,08 mm)
Out of Plug	0.005 inch (0,13 mm)	Out of Plug	0.005 inch (0,13 mm)

Lee Plug Installation Gauge

The Lee Plug Installation Gauge provides an easy method of inspecting the pin flushness. Adjust the face such that the gauge reads zero when pushed against a flat surface. Now by inserting the gauge into the installation hole until it bottoms against the back of the plug, the pin flushness can be read from the gauge. See Tables 3 and 4 on Sheets 24 and 25 for a list of the Lee Plug Installation Gauge part numbers. See Table 6 (above) for the pin and plug flushness tolerance.

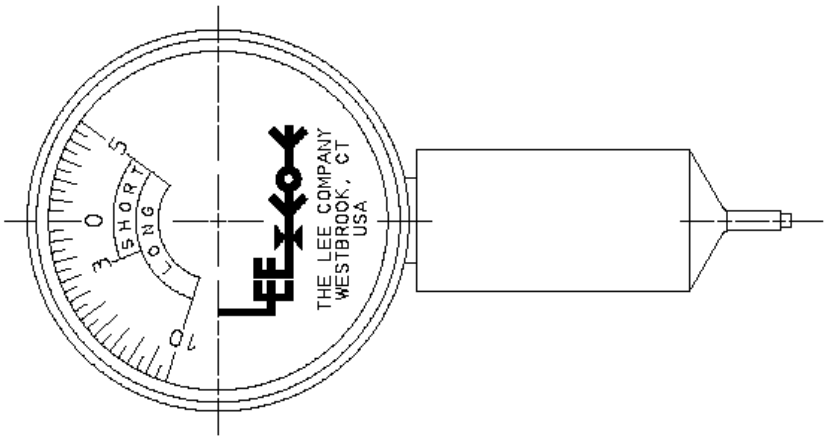


FIGURE 11

Lee Plug Installation Gauge

TABLE 7

Installation Forces

Typical Pin Installation Forces Thickwall - Class III Fit								
Lee Plug Part Number	**(Lbf.)**	**(N)**	**Lee Plug Part Number**	**(Lbf.)**	**(N)**	**Lee Plug Part Number**	**(Lbf.)**	**(N)**
PLGA0930010A PLGA0931010A	450 500	2000 2220	PLGA0930020A PLGA0931020A	600 650	2670 2890	PLHA0931241A	1000	4450
PLGA1250010A PLGA1251010A	600 620	2670 2890	PLGA1250020A PLGA1251020A	1150 1200	5115 5340	PLHA1251241A	1200	5340
PLGA1560010A PLGA1561010A	700 950	3110 4225	PLGA1560020A PLGA1561020A	1200 1300	5340 5780	PLHA1561241A	1500	6670
PLGA1870010A PLGA1871010A	800 1000	3560 4890	PLGA1870020A PLGA1871020A	2300 2300	10230 10230	PLHA1871241A	2100	9340
PLGA2180010A PLGA2181010A	1000 1450	4450 6450	PLGA2180020A PLGA2181020A	2200 2400	9790 10675	PLHA2181241A	1900	8450
PLGA2500010A PLGA2501010A	1300 1800	5780 8010	PLGA2500020A PLGA2501020A	2500 3500	11120 15570	PLHA2501241A	2700	12010
PLGA2810010A PLGA2811010A	1500 2500	6670 11120	PLGA2810020A PLGA2811020A	2500 4000	11120 17790	PLHA2811241A	3500	15570
PLGA3120010A PLGA3121010A	1400 2100	6225 9340	PLGA3120020A PLGA3121020A	2600 2900	11565 12900	PLHA3121241A	4200	18680
PLGA3430010A PLGA3431010A	2300 2500	10230 11120	PLGA3430020A PLGA3431020A	3750 5000	16680 22240	PLHA3431241A	4800	21350
PLGA4060010A PLGA4061010A	2000 2300	8900 10230	PLGA4060020A PLGA4061020A	4800 6100	21350 27130			
PLGA4680010A PLGA4681010A	3100 2600	13790 11565	PLGA4680020A PLGA4681020A	6500 7700	28910 34250			
PLGA5310010A PLGA5311010A	3800 3000	16900 13345	PLGA5310020A PLGA5311020A	7500 9725	33360 43260			
PLGA6560010A PLGA6561010A	2600 3800	11565 16900	PLGA6560020A PLGA6561020A	7500 9000	33360 40030			

TABLE 6

Trouble Shooting Guide

Problem	Probable Cause
High Installation Forces	• Hole out of round.
Pin Deformation	• Pin inserted upside down. • Pin mushroomed due to too many light taps. • Base material much harder than plug material. • Insufficient or incorrect support shoulder. • No wax on pin.
Low Installation Forces	• Oversize or tapered hole. • Wall section too thin. • Use of a high film strength lubricant. • Hole out of round.
Leakage and/or Low Proof Pressure	• Oversize or tapered hole. • Cylindricity not maintained. • Longitudinal scratch marks in reamed bore. • Too smooth a reamed bore (smoother than 16 micro inches RMS (0,4 micrometer)). • Plug wall crushed due to oversized pin driving tool. • Wall section too thin. • Plug not bottomed on support shoulder. • Base material much harder than plug material. • Improper anodize or surface treatment on installation hole. • Thermally mismatched plug and base material in large temperature variation application. • Use of a lubricant on installation hole.
Pin Backout	• Use of high film strength lubricant. • Oversize installation hole. • Flat bottom support shoulder.
Leakage Through Vent Hole	• Pin is overdriven. • Plug fatigue due to excess pressure transients.

Lee Plug Extraction

It is sometimes necessary to remove a Lee Plug for inspecting, cleaning, or gaining access to interior passages. The following procedure may permit removal of Lee Plugs without requiring rework of the housing or contamination of the passages.

1. Drill and tap the pin (select the proper drill and taps from Table 9 on Sheets 35-38 or on Table 10 on Sheets 39-40).
2. Remove the pin with the appropriate bolt and striker (see Figure 12 on Sheet 34, and Table 9 on Sheets 35-38, or Table 10 on Sheets 39-40).
3. Tap the plug (using taps listed in Table 9 or Table 10).
4. Remove the plug with the appropriate bolt and striker.

In some instances, it may be difficult to remove the pin from the plug because the pin and plug surfaces have mechanically locked together due to galling of the materials. In these cases, an optional (and somewhat simplified) procedure can be used to remove the installed plug from the housing.

1. Drill out the pin using a tap drill recommended for use with the plug tap of that set. This will remove most or all of the pin. Exercise care not to break through the plug bottom when drilling out the pin.
2. Tap the plug using taps in Table 9 on Sheets 35-38, or Table 10 on Sheets 39-40.
3. Remove the plug with the appropriate bolt and striker.

The Lee Company stocks extraction sets for all standard diameters of Lee Plugs. Each set consists of a bolt for the pin, a bolt for the plug, a tap set for the pin, a tap set for the plug, and striker(s).

Wherever possible, The Lee Company has selected standard taps, and therefore standard bolt thread sizes. However, because of the thin wall on the plug, certain sizes require special tap sizes. Please note that many of the tools can be used for the extraction of more than one size Lee Plug or Pin. Oversize Lee Plugs use the same extraction sets as the standard Lee Plugs.

To prevent stripping extraction threads during the extraction process, use both the plug type and bottoming type taps. For this same reason, bolts should be threaded in snugly by hand before using the striker.

When drilling the pin, ensure that the depth of the tap drill hole is made slightly less than the overall length of the pin. This prevents the tap from passing through the pin and bottoming against the plug where further rotation of the tap will then either jack the pin out onto the tap or snap the tap.

Ensure that the striker is not pushed sideways, as this may bend or break the bolt.

After plug removal, examine the hole for roughness. Experience indicates that new plugs can be replaced in mounting holes up to 5 or 6 times without rework of the hole. However, the hole should always be inspected prior to reinstallation and proof pressure testing should always follow plug installation in new and used holes. The hole will gradually become too rough and oversized to provide a positive seal. Subsequent plugging must be done with oversized plugs after resizing the installation hole.

Pins and plugs are not reusable, only new units may be installed in the installation hole.

Oversize plugs (0.010 inch larger diameter) are stocked by The Lee Company for each of the standard sizes. These oversize plugs use the standard pin for each respective standard size. The proof pressures for each class fit are the same as its standard size, and the installation hole for each size is also 0.010 inch larger in diameter. The oversize plugs use the same installation and extraction tools as the standard size plugs.

For example, a Class III installation hole for a PLGA2810020A has a diameter of 0.2812 - 0.2817 inch. The oversize version, PLGA2910020A, has a diameter of 0.2912 - 0.2917 inch (0.010 inch added to the standard diameter of 0.2812 - 0.2817 inch). Both plugs use the pin for the PLGA2810020A.

Metric Lee Plugs have no oversize plug; therefore, the use of the next size plug is recommended. For this reason, metric plugs are manufactured in diameter increments of 0,5 mm.

A complete Lee Plug extraction tool kit, Lee Part Number CUTX0361000B, includes all the parts listed in Table 9 on Sheets 35-38. Individual items may be ordered by appropriate part numbers.

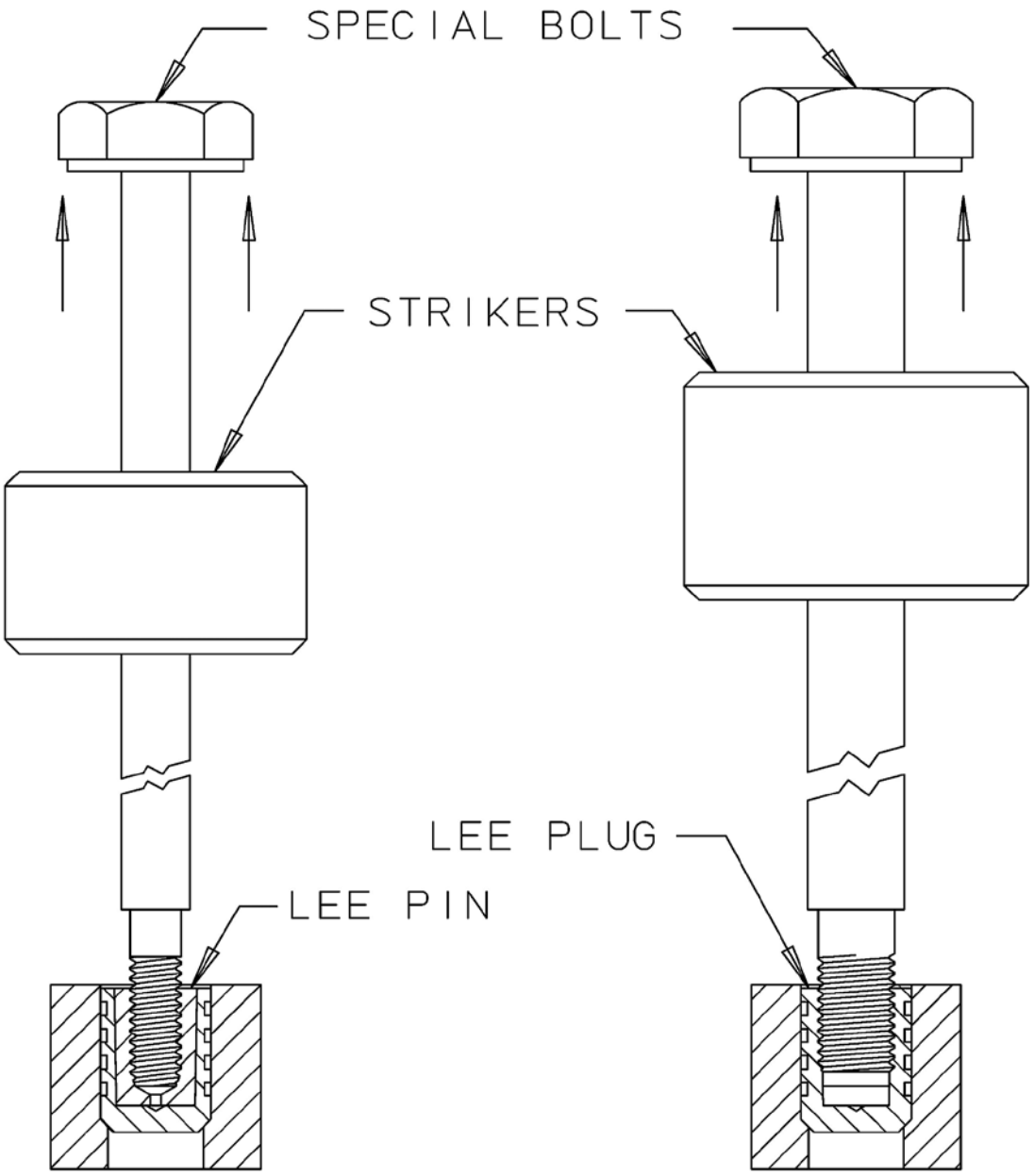


FIGURE 12

Extracting The Pin And Plug

TABLE 9
Standard Lee Plug Extraction Tools

Applicable Lee plug Sets	Complete Extraction Set	Striker	Bolt		Taps: Starting and Bottoming		Thread Size		Tap Drill Size For Pin
PLGA0930010A PLGA0930020A PLGA0930030A PLGA0931010A	CUTA0930103B	CUTA1015403B	Pin	CUTA2014403B	Pin	CUTA3014403B CUTA3514403B	Pin	1.4 X 0.3 UNM-6G*	# 57 Drill
PLGA0931020A PLGA0931030A PLGA0931400A PLHA0931241A PLPA0930010A			Plug	CUTA2035503B	Plug	CUTA3035503B CUTA3535503B	Plug	0.073-64 UNC	N/a
PLGA1250010A PLGA1250020A PLGA1250020A PLGA1251010A	CUTA1250103B	CUTA1015403B	Pin	CUTA2024403B	Pin	CUTA3024403B CUTA3524403B	Pin	0.060-80 UNF	3/64 Drill
PLGA1251020A PLGA1251030A PLGA1251400A PLHA1251241A PLPA1250010A			Plug	CUTA2055503B	Plug	CUTA3055503B CUTA3555503B	Plug	0.112-40 UNC (O.D. Ground to 0.105 max.)	N/a
PLGA1560010A PLGA1560020A PLGA1560030A PLGA1561010A	CUTA1560103B	CUTA1015403B	Pin	CUTA2044403B	Pin	CUTA3044403B CUTA3544403B	Pin	0.086-56 UNC	#51 Drill
PLGA1561020A PLGA1561030A PLGA1561400A PLHA1561241A PLPA1560010A			Plug	CUTA2075503B	Plug	CUTA3075503B CUTA3575503B	Plug	0.138-40 UNF (O.D. Ground to 0.132 max.)	N/a

***Metric Size**

TABLE 9 (Continued)
Standard Lee Plug Extraction Tools

Applicable Lee plug Sets	Complete Extraction Set	Striker	Bolt		Taps: Starting and Bottoming		Thread Size		Tap Drill Size For Pin
PLGA1870010A PLGA1870020A PLGA1870030A PLGA1871010A	CUTA1870103B	CUTA1015403B	Pin	CUTA2064403B	Pin	CUTA3064403B	Pin	0.112-40 UNC	#44 Drill
						CUTA3564403B			
PLGA1871020A PLGA1871030A PLGA1871400A PLHA1871241A PLPA1870010A			Plug	CUTA2095503B	Plug	CUTA3095503B	Plug	0.164-36 UNF	N/a
						CUTA3595503B			
PLGA2180010A PLGA2180020A PLGA2180030A PLGA2181010A	CUTA2180103B	CUTA1015403B	Pin	CUTA2084403B	Pin	CUTA3084403B	Pin	0.138-40 UNF	#33 Drill
						CUTA3584403B			
PLGA2181020A PLGA2181030A PLGA2181400A PLHA2181241A			Plug	CUTA2105403B	Plug	CUTA3105403B	Plug	0.190-32 UNF	N/a
						CUTA3605403B			
PLGA2500010A PLGA2500020A PLGA2500030A PLGA2501010A	CUTA2500103B	CUTA1015403B	Pin	CUTA2084403B	Pin	CUTA3084403B	Pin	0.138-40 UNF	#33 Drill
						CUTA3584403B			
PLGA2501020A PLGA2501030A PLGA2501400A PLHA2501241A			Plug	CUTA2115503B	Plug	CUTA3115503B	Plug	0.250-20 UNC (O.D. Ground to 0.230 max.)	N/a
						CUTA3615503B			

TABLE 9 (Continued)
Standard Lee Plug Extraction Tools

Applicable Lee plug Sets	Complete Extraction Set	Striker	Bolt		Taps: Starting and Bottoming		Thread Size		Tap Drill Size For Pin
PLGA2810010A PLGA2810020A PLGA2810030A PLGA2811010A PLGA2811020A PLGA2811030A PLGA2811400A PLHA2811241A	CUTA2810103B	CUTA1015403B	Pin	CUTA2105403B	Pin	CUTA3105403B CUTA3605403B	Pin	0.190-32 UNF	#22 Drill
			Plug	CUTA2405503B	Plug	CUTA3135503B CUTA3635503B	Plug	#16-22 (0.268 O.D.)	N/a
PLGA3120010A PLGA3120020A PLGA3120030A PLGA3121010A PLGA3121020A PLGA3121030A PLGA3121400A PLHA3121241A	CUTA3120103B	CUTA1025403B	Pin	CUTA2105403B	Pin	CUTA3105403B CUTA3605403B	Pin	0.190-32 UNF	#22 Drill
			Plug	CUTA3121003B	Plug	CUTA3205403B CUTA3705403B	Plug	0.3125-24 UNF (O.D. Ground to 0.294 max.)	N/a
PLGA3430010A PLGA3430020A PLGA3430030A PLGA3431010A PLGA3431020A PLGA3431030A PLGA3431400A PLHA3431241A	CUTA3430103B	CUTA1015403B	Pin	CUTA2105403B	Pin	CUTA3105403B CUTA3605403B	Pin	0.190-32 UNF	#22 Drill
			Plug	CUTA2415503B	Plug	CUTA3145503B CUTA3645503B	Plug	0.3125-24 UNF	N/a

TABLE 9 (Continued)
Standard Lee Plug Extraction Tools

Applicable Lee plug Sets	Complete Extraction Set	Striker	Bolt		Taps: Starting and Bottoming		Thread Size		Tap Drill Size For Pin
PLGA4060010A PLGA4060020A PLGA4060030A PLGA4061010A	CUTA4060103B	CUTA1015403B	Pin	CUTA2124403B	Pin	CUTA3124403B CUTA3624403B	Pin	0.2540-20 UNC	#8 Drill
		CUTA1025403B	Plug	CUTA2425403B	Plug	CUTA3155403B CUTA3655403B	Plug	0.375-24 UNF	N/a
PLGA4061020A PLGA4061030A PLGA4061400A	CUTA4060203B	CUTA1015403B	Pin	CUTA2124403B	Pin	CUTA3124403B CUTA3624403B	Pin	0.250-20 UNC	#8 Drill
		CUTA1035503B	Plug	CUTA2505503B	Plug	CUTA3165503B CUTA3665503B	Plug	10 X 1*	N/a
PLGA4680010A PLGA4680020A PLGA4680030A PLGA4681010A PLGA4681020A PLGA4681030A PLGA4681400A	CUTA4680103B	CUTA1015403B	Pin	CUTA2124403B	Pin	CUTA3124403B CUTA3624403B	Pin	0.250-20 UNC	#8 Drill
		CUTA1035503B	Plug	CUTA2515503B	Plug	CUTA3175503B CUTA3675503B	Plug	0.4375-20 UNF	N/a
PLGA5310010A PLGA5310020A PLGA5310030A PLGA5311010A PLGA5311020A PLGA5311030A PLGA5311400A	CUTA5310103B	CUTA1025403B	Pin	CUTA2425403B	Pin	CUTA3155403B CUTA3655403B	Pin	0.375-24 UNF	Q Drill
		CUTA1045403B	Plug	CUTA2605404B	Plug	CUTA3185403B CUTA3685403B	Plug	0.500-20 UNF	N/a
PLGA6560010A PLGA6560020A PLGA6560030A PLGA6561010A PLGA6561020A PLGA6561030A PLGA6561400A	CUTA6560103B	CUTA1045403B	Pin	CUTA2605403B	Pin	CUTA3185403B CUTA3685403B	Pin	0.500-20 UNF	29/64 Drill
		CUTA1055503B	Plug	CUTA2705503B	Plug	CUTA3195503B CUTA3695503B	Plug	0.625-18 UNF	N/a

*** Metric Size**

TABLE 10
Metric Lee Plug Extraction Tools

Applicable Lee plug Sets	Complete Extraction Set	Striker	Bolt		Taps: Starting and Bottoming		Thread Size		Tap Drill Size For Pin
PLGM0250010A PLGM0250020A	CUTM0250103B	CUTA1015403B	Pin	CUTM5014403B	Pin	CUTM4014403B CUTM4514403B	Pin	1.4 X 0.3	1.10 Drill
			Plug	CUTM5035403B	Plug	CUTM4035403B CUTM4535403B	Plug	2.2 X 0.45	N/a
PLGM0300010A PLGM0300020A	CUTM0300103B	CUTA1015403B	Pin	CUTM5024403B	Pin	CUTM4024403B CUTA4524403B	Pin	1.6 X 0.35	1.25 Drill
			Plug	CUTM5045503B	Plug	CUTM4045503B CUTM4545503B	Plug	2.5 X 0.45	N/a
PLGM0350010A PLGM0350020A	CUTM0350103B	CUTA1015403B	Pin	CUTM5024403B	Pin	CUTM4024403B CUTM4524403B	Pin	1.6 X 0.35	1.25 Drill
			Plug	CUTM5055403B	Plug	CUTM4055403B CUTM4555403B	Plug	3.0 X 0.50	N/a
PLGM0400010A PLGM0400020A PLGM0401010A PLGM0401020A	CUTM0400103B	CUTA1015403B	Pin	CUTM5035403B	Pin	CUTM4035403B CUTM4535403B	Pin	2.2 X 0.45	1.75 Drill
			Plug	CUTM5065503B	Plug	CUTM4065503B CUTM4565503B	Plug	3.5 X 0.60	N/a
PLGM0450010A PLGM0450020A PLGM0451010A PLGM0451020A	CUTM0450103B	CUTA1015403B	Pin	CUTM5055403B	Pin	CUTM4055403B CUTM4555403B	Pin	3.0 X 0.50	2.50 Drill
			Plug	CUTM5075403B	Plug	CUTM4075403B CUTM4575403B	Plug	4.0 X 0.70	N/a
PLGM0500010A PLGM0500020A PLGM0501010A PLGM0501020A	CUTM500103B	CUTA1015403B	Pin	CUTM5055403B	Pin	CUTM4055403B CUTM4555403B	Pin	3.0 X 0.50	2.50 Drill
			Plug	CUTM5085503B	Plug	CUTM4085503B CUTM4585503B	Plug	4.5 X 0.75	N/a
PLGM0550010A PLGM0550020A PLGM0551010A PLGM0551020A	CUTM0550103B	CUTA1015403B	Pin	CUTM5075403B	Pin	CUTM4075403B CUTM4575403B	Pin	4.0 X 0.70	3.30 Drill
			Plug	CUTM5095403B	Plug	CUTM4095403B CUTM4595403B	Plug	5.0 X 0.80	N/a

TABLE 10 (Continued)

Metric Lee Plug Extraction Tools

Applicable Lee plug Sets	Complete Extraction Set	Striker	Bolt		Taps: Starting and Bottoming		Thread Size		Tap Drill Size For Pin
PLGM0600010A PLGM0600020A	CUTM0600103B	CUTA1015403B	Pin	CUTM507403B	Pin	CUTM4075403B CUTM4575403B	Pin	4.0 X 0.70	3.30 Drill
PLGM0601010A PLGM0601020A			Plug	CUTM5105503B	Plug	CUTM4105503B CUTM4605503B	Plug	5.5 X 0.90	N/a
PLGM0650010A PLGM0650020A	CUTM0650103B	CUTA1015403B	Pin	CUTM5095403B	Pin	CUTM4095403B CUTM4595403B	Pin	5.0 X 0.80	4.20 Drill
PLGM0651010A PLGM0651020A			Plug	CUTM5115403B	Plug	CUTM4115403B CUTM4615403B	Plug	6.0 X 1.0 (O.D. Ground to 5.87 max)	N/a
PLGM0700010A PLGM0700020A	CUTM0700103B	CUTA1015403B	Pin	CUTM5095403B	Pin	CUTM4095403B CUTM4595403B	Pin	5.0 X 0.80	4.20 Drill
PLGM0701010A PLGM0701020A		CUTA1025403B	Plug	CUTM5405503B	Plug	CUTM4125503B CUTM4625503B	Plug	7.0 X 1.0 (O.D. Ground to 6.45 max.)	N/a
PLGM0750010A PLGM0750020A	CUTM0750103B	CUTA1015403B	Pin	CUTM5115403B	Pin	CUTM4115403B CUTM4615403B	Pin	6.0 X 1.0 (O.D. Ground to 5.87 max.)	5.00 Drill
PLGM0751010A PLGM0751020A		CUTA1025403B	Plug	CUTM5415503B	Plug	CUTM4135503B CUTM4635503B	Plug	7.0 X 1.0 (O.D. Ground to 6.78 max.)	N/a
PLGM0800010A PLGM0800020A	CUTM0800103B	CUTA1015403B	Pin	CUTM5115403B	Pin	CUTM4115403B CUTM4615403B	Pin	6.0 X 1.0 (O.D. Ground to 5.87 max.)	
PLGM0801010A PLGM0801020A		CUTA1025403B	Plug	CUTM5425403B	Plug	CUTM4145503B	Plug	8.0 x 1.25 (O.D. Ground to 7.44 max.)	N/a

SECTION IV - INSTALLATION AND EXTRACTION OF R.F.O. LEE PLUGS

The R.F.O. Lee Plug (Radial Force Only) has capabilities of sealing openings in thin shell and fragile materials. It is designed to fit into the passage without the use of a support shoulder. The R.F.O. Lee Plug is installed using The Lee Company Hydraulic Installation Tool CUTX0100000B and removed with the appropriate bolt and striker.

Installation of R.F.O. Lee Plugs

R.F.O. Lee Plugs are installed with Lee R.F.O. Hydraulic Installation Tool CUTX0100000B (see Figure 13 below) and the appropriate installation tool set (see Table 11 on Sheet 42). The proper installation method is as follows:

1. Select the proper drive sleeve and stud for the R.F.O. plug being installed (see Table 11 on Sheet 42). Thread the stud into the piston until bottomed snugly. Slide the drive sleeve over the stud.
2. Slide R.F.O. pin onto stud, small end out.
3. Thread R.F.O. plug onto stud until finger tight (approximately 7 turns).
4. Insert plug into hole to be sealed while driving piston is hand held to locate plug at proper depth (see Figure 14 on Sheet 43).
5. Operate hand pump to drive pin into plug. Drive until rear surface of pin is flush with exposed face of plug.
6. Release pressure on pump and push pins will retract.
7. To disengage stud, rotate driving piston assembly counterclockwise (swivel fitting prevents hose from twisting) until threads are disengaged. Withdraw entire assembly.

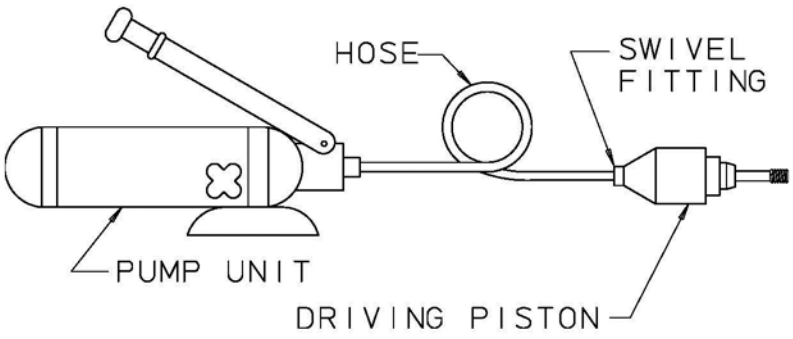


FIGURE 13

Lee R.F.O. Hydraulic Installation Tool CUTX0100000B and Components

TABLE 11

R.F.O. Lee Plug Installation Tools

(Used With Tool CUTX0100000B)

Part Number	Set*	Drive Sleeve	Stud	Thread Size
PLRA1560010A	CUTA1565205A	CUTA1565305A	CUTA1565405A	0.086-64 UNF-2A
PLRA1870010A	CUTA1875205A	CUTA1875305A	CUTA1875405A	0.099-56 UNF-2A
PLRA2180010A	CUTA2185205A	CUTA2185305A	CUTA2185405A	0.112-48 UNF-2A
PLRA2500010A	CUTA2505205A	CUTA2505305A	CUTA2505405A	0.13840 UNF-2A
PLRA2810010A	CUTA2815205A	CUTA2815305A	CUTA2815405A	0.164-36 UNF-2A
PLRA3430010A	CUTA3435205A	CUTA3435305A	CUTA3435405A	0.190-32 UNF-2A
PLRA4060010A	CUTA4065205A	CUTA4065305A	CUTA4065405A	0.190-32 UNF-2A
PLRA4680010A	CUTA4685205A	CUTA4685305A	CUTA4685405A	0.216-28 UNF-2A
PLRA5000010A	CUTA5005205A	CUTA5005305A	CUTA5005405A	0.216-28 UNF-2A
PLRA5310010A	CUTA5315205A	CUTA5315305A	CUTA5315405A	0.216-28 UNF-2A
PLRA6560010A	CITA6565205A	CUTA6565305A	CUTA6565405A	0.250-28 UNF-2A
PLRA7500010A	CUTA7505205A	CUTA7505305A	CUTA7505405A	0.250-28 UNF-2A
PLRA8750010A	CUTA8755205A	CUTA8755305A	CUTA8755405A	0.3125-24 UNF-2A

***Each tool set consists of one drive sleeve and one stud.**

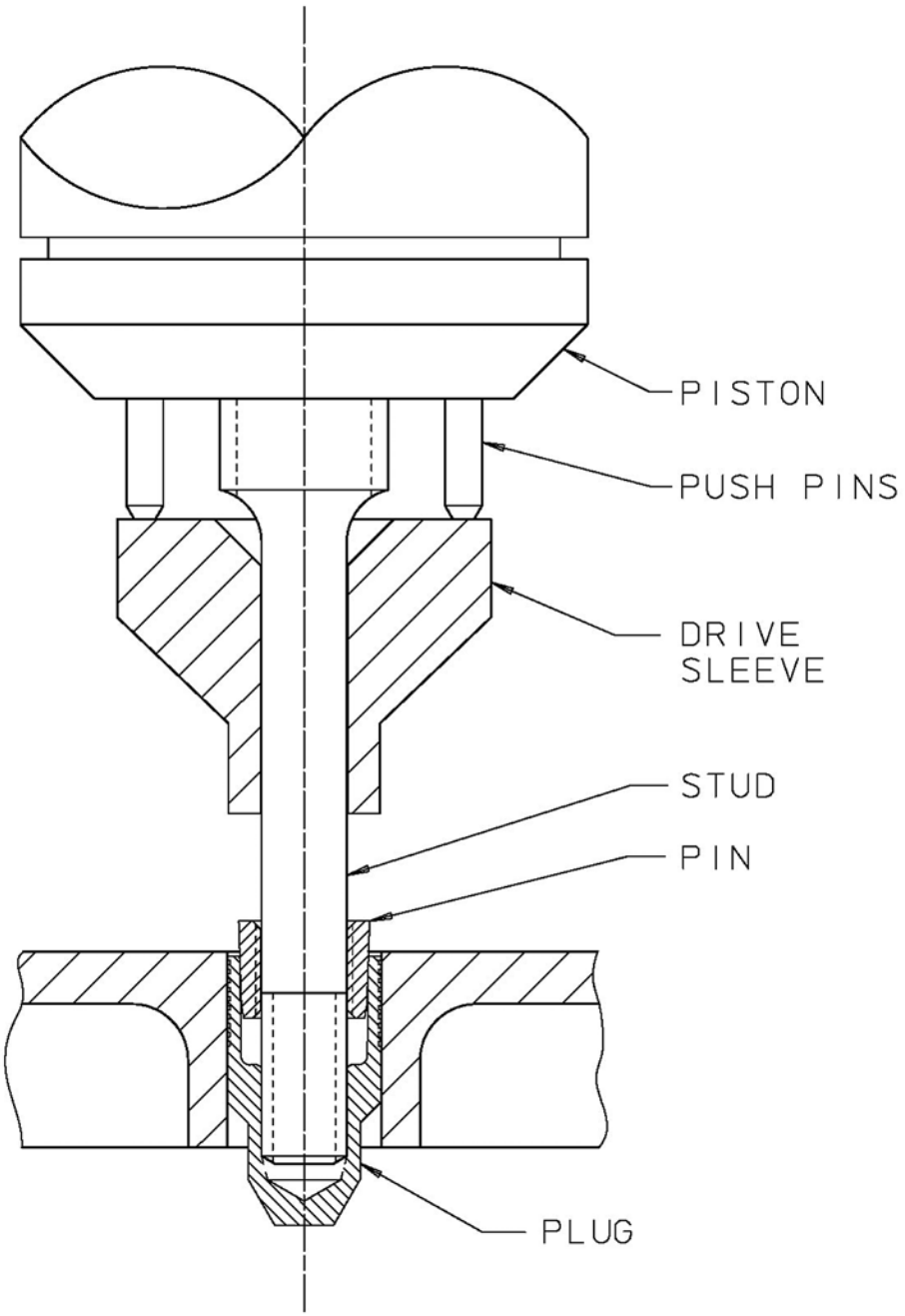


FIGURE 14
Installation Method for R.F.O. Lee Plugs

Extraction of R.F.O. Lee Plugs

It is sometimes necessary to remove an R.F.O. Lee Plug for inspecting, cleaning, or gaining access to interior passages. The following procedure may permit removal of R.F.O. Lee Plugs without requiring rework of the housing and without contaminating the passages.

R.F.O. Lee Plugs can be extracted with Lee R.F.O. Hydraulic Installation Tool CUTX0100000B and the appropriate extraction tool set (see Table 12 on Sheet 45).

1. Tap the pins on plug diameters of 0.156 - 0.260 inch (select the proper tap from Table 12 on Sheet 45).

2. Select the proper extraction sleeve and stud for the R.F.O. Lee Plug being removed. (See Table 12 on Sheet 45).

3. After sliding the extraction sleeve onto the stud, thread the stud into the piston assembly until bottomed snugly.

4. Thread the other end of the stud fully into the R.F.O. Pin. The swivel fitting prevents the hose from twisting.

5. Operate the pump to extract the pin.

6. Thread the bolt with the striker fully into the R.F.O. Plug and remove the plug by tapping the striker against the bolt head.

TABLE 12
R.F.O. Lee Plug Extraction Tools
(Used With Tool CUTX0100000B)

Part Number	Set*	Extraction Sleeve	Stud	Bolt	Striker	Bottoming Tap	Thread Size
PLRA1560010A	CUTA1566205B	CUTA1566305B	CUTA2185405B	CUTA2135505B	CUTA1015403B	CUTA3705505B	0.112-48 UNF-2A Pin 0.086-64 UNF-2A Plug
PLRA1870010A	CUTA1876205B	CUTA1876305B	CUTA1876405B	CUTA2145505B	CUTA1015403B	CUTA3715505B	0.125-44 UNF-2A Pin 0.099-56 UNF-2A Plug
PLRA2180010A	CUTA2186205B	CUTA2186305B	CUTA2505405B	CUTA2155505B	CUTA1015403B	CUTA3584403B	0.138-40 UNF-2A Pin 0.112-48 UNF-2A Plug
PLRA2500010A	CUTA2506205B	CUTA2506305B	CUTA2815405B	CUTA2084403B	CUTA1015403B	CUTA3595503B	0.164-36 UNF-2A Pin 0.138-40 UNF-2A Plug
PLRA2810010A	CUTA2816205B	CUTA2816305B	CUTA3435405B	CUTA2095503B	CUTA1015403B		0.190-32 UNF-2A Pin 0.164-36 UNF-2A Plug
PLRA3430010A	CUTA3436205B	CUTA3436305B	CUTA4685405B	CUTA2105403B	CUTA1015403B		0.216-28 UNF-2A Pin 0.190-32 UNF-2A Plug
PLRA4060010A	CUTA4066205B	CUTA4066305B	CUTA4685405B	CUTA2105403B	CUTA1015403B		0.216-28 UNF-2A Pin 0.190-32 UNF-2A Plug
PLRA4680010A	CUTA4686205B	CUTA4686305B	CUTA6565405B	CUTA2501306C	CUTA1015403B		0.250-28 UNF-2A Pin 0.216-28 UNF-2A Plug
PLRA5000010A	CUTA5006205B	CUTA5006305B	CUTA6565405A	CUTA2501306C	CUTA1015403B		0.250-28 UNF-2A Pin 0.216-28 UNF-2A Plug
PLRA5310010A	CUTA5316205B	CUTA5316305B	CUTA6565405A	CUTA2501306C	CUTA1015403B		0.250-28 UNF-2A Pin 0.216-28 UNF-2A Plug
PLRA6560010A	CUTA6566205B	CUTA6566305B	CUTA8755405A	CUTA2435505B	CUTA1025403B		0.312-24 UNF-2A Pin 0.250-28 UNF-2A Plug
PLRA7500010A	CUTA7506205B	CUTA7506305B	CUTA8755405A	CUTA2435505B	CUTA1025403B		0.375-16 UNC-2A Pin 0.250-28 UNF-2A Plug
PLRA8750010A	CUTA8756205B	CUTA8756305B	CUTA9375405A	CUTA2415503B	CUTA1025403B		0.375-16 UNC-2A Pin 0.3125-24 UNF-2A Plug

***Each tool set consists of one extraction sleeve, one bolt, one stud, one striker, and may include one tap.**

CONCLUSION

Adherence to the guidelines and procedures presented in this document will result in plug installations that are highly reliable, strong, and leak-free. Due to the multitude of environments and conditions to which Lee Plugs may be exposed, proof pressure testing by Lee Plug users is an essential part of the Lee Plug installation process. Proof pressure testing should be conducted at a pressure at least 50% higher than the normal working pressure. This 100% testing serves to verify the integrity of the unit and indicates any plugs that may have been improperly installed. Installations must be fully shielded during testing in case an improperly installed plug should fail.

For any additional help or information, please feel free to contact a Lee Sales Engineer at any of the locations listed on the next pages.

Lee Company U.S. Sales Offices

THE LEE COMPANY
Technical Center
P. O. Box 424, 2 Pettipaug Road
Westbrook, CT 06498-0424

Tel: (860) 399-6281
(800) 533-7584 (LEE PLUG)
Fax: (860) 399-7058 Order Entry
(860) 399-7037 Technical Information
(860) 399-2270 Advertising
Web: **www.theleeco.com**

THE LEE COMPANY
1511 N. Westshore Blvd.
Suite 200
Tampa, FL 33607
Tel: (813) 287-9293
Fax: (813) 287-9295

THE LEE COMPANY
8600 W. Bryn Mawr Ave.
Suite 160-N
Chicago, IL 60631-3505
Tel: (773) 693-0880
Fax: (773) 693-1015

THE LEE COMPANY
7755 Center Ave.
Suite 1020
Huntington Beach, CA 92647
Tel: (714) 899-2177
Fax: (714) 899-2176

THE LEE COMPANY
3000 Town Center
Suite 2580
Southfield, MI 48075
Tel: (248) 827-0981
Fax: (860) 399-7058

THE LEE COMPANY
545 E. John Carpenter Fwy.
Suite 875
Irving, TX 75062
Tel: (972) 791-1010
Fax: (972) 791-1717

THE LEE COMPANY
4900 Woodway Dr.
Suite 660
Houston, TX 77056
Tel: (972) 791-1010
Fax: (972) 791-1717

International Sales Offices and Distributors

Subsidiary for the United Kingdom and Ireland **LEE PRODUCTS LIMITED (LPL)** 3 High Street, Chalfont St. Peter, Gerrards Cross Buckinghamshire SL9 9QE ENGLAND Tel: + 44 1 753-886664 Fax: + 44 1 753-889588 sales@leeproducts.co.uk	*Subsidiary for Denmark, Sweden, Norway, Finland and Russia* **THE LEE COMPANY SCANDINAVIA AB** Pajalagatan 56 SE-162 65 Vällingby SWEDEN Tel: + 46 8 579 701 70 Fax: + 46 8 875252 sales@theleeco.se Helsinki, Finland Tel: + 358 44 0111 246 Fax: + 358 19 331 890 marko.koskinen@theleeco.net
Subsidiary for Germany, Austria, Eastern Europe and German speaking Switzerland **LEE HYDRAULISCHE MINIATURKOMPONENTEN, GmbH** Am Limespark 2 65843 Sulzbach / Taunus GERMANY Tel: + 49 6196-77369-0 Fax: + 49 6196-77369-69 info@lee.de Bonn Office: Tel: + 49 22 44 871263 Fax: + 49 22 44 871264	*Subsidiary for Italy & Italian speaking Switzerland* **LEE SRL. (LPI)** Centro Direzionale Caldera Park, Via Caldera 21 20153 Milano ITALY Tel: + 39 02 43981750 Fax: + 39 02 461050 sales@leesrl.it
Subsidiary for France, Spain and French speaking Switzerland **LEE COMPANY S. A. (LPF)** 44 rue Jean Bart 78960 Voisins-le-Bretonneux FRANCE Tel: +33 1 30 64 99 44 Fax: +33 1 30 64 91 26 info@leecompany.fr Toulouse Office: Tel: +33 5 67 31 00 92 Fax: +33 5 34 60 50 40 h.reberga@leecompany.fr Madrid Office: SPAIN & PORTUGAL Tel: +34 913 010 572 p.sanchez.martin@leecompany.fr	*Distributor for Australia and New Zealand* **CGB PRECISION PRODUCTS PTY LTD** Unit 9, 32 Silkwood Rise Carrum Downs VIC 3201 AUSTRALIA Tel: + 61 3 9775 1125 Fax: + 61 3 9770 8844 info@cgb.com.au

International Sales Offices and Distributors (continued)

Agent for South America **TRUSTY COMÉRCIO E REPRESENTAÇÕES LTDA.** Av. J.K. de Oliveira 580 Sala: 41, Guaratinguetá, Sáo Paulo, 12505-300 BRAZIL Tel: + 55 12 3132-3418 Fax: + 55 12 3132-3560 rui@tcr-brazil.com.br	*Distributor for Belgium, Netherlands & Luxemburg* **DENIS DE PLOEG BV** Geneindestraat 33 6301 HC Valkenburg (L) NETHERLANDS Tel: + 31 43 820 0250 Fax: + 31 43 820 0251 bs.deploeg@ddp.nl
Agent for Israel **ENL ENGINEERING AND LOGISTICS LTD.** 35/8 Hasaifan Street P. O. Box 1074 Ramat-Hasharon 47100 ISRAEL Tel: + 972 3 549 3644 Fax: + 972 3 540 0262 enleng@netvision.net.il	*Agent for Singapore, Indonesia, Thailand and Malaysia* **WINOVA PTE LTD.** 31 Toh Guan Road East #05-08 LW Technocentre SINGAPORE 608608 Tel: + 65 6425 2116 Mobile: + 65 9655 9910 Fax: + 65 6425 1109 sales@winova.com.sg
Agent for India **HIND INDUSTRIAL AND MERCANTILE CORP. PVT. LTD.** 22, Neo Corporate Plaza, Ramchandra Lane - Ext. Kachpada, Malad-West, Mumbai 400 064 INDIA Tel: + 91 22 2882 2075/76 sales@hindco.in	*Distributor for Taiwan* **LOOP LINK ENTERPRISE, INC.** 6F-7, No. 171, Sec. 5 Ming Shen E. Road Taipei, TAIWAN 10589 REPUBLIC OF CHINA Tel: + 886 2 2762 9614 Fax: + 886 2 2761 3407 looplink@ms9.hinet.net
Distributor for Japan **JUPITOR CORPORATION** 3-17-4 Minami Aoyama Minato-Ku, Tokyo 107-0062 JAPAN Tel: + 81 33 403 1315 Fax: + 81 33 403 1319 lee-sales@jupitor.co.jp	*Distributor for Korea* **MIN SUNG GC CORPORATION** Minsung Building, Jegi-Dong 89 Yangnyeongjungang – Ro, Dongdaemun – gu, Seoul, KOREA Tel: + 822 961 7833 Fax: + 822 961 6249 minsung@minsunggc.com

International Sales Offices and Distributors (continued)

Distributor for People's Republic of China and Hong Kong **EBS FLOW CONTROL LTD.** Room 4202, Nexus Center No. 19A East 3rd Ring North Road Chaoyang District Beijing, China 100020 Tel: + 86 10 8472 1177 Fax: + 86 10 8472 1263 info@ebshk.com.cn	

APPENDIX A

CERTIFICATION, PERFORMANCE, AND LOT CONTROL

The Lee Company

PIN/PLUG CERTIFICATE OF CONFORMANCE

S.O.:

INV:

DATE:

This is to certify that the Lee Pins/Plugs delivered against the subject order are in conformance with Lee Company drawings, specifications, and requirements of the purchase order. Inspection Records and Material Certifications are on file and traceable to the lot numbers stated below.

Inspection procedures and Q.C. systems are per The Lee Company Hydraulics Quality Management System. The Lee Company is certified to ISO9001 and AS9100.

Sample Lee Pins/Plugs from the lots stated below have been assembled into the appropriate mating parts. Performance testing has been performed in accordance with Internal Lee Company specifications. Test results were satisfactory.

Part Number: Line Item #:

Customer Order Number: Quantity:

Customer Part Number: Country of Origin: USA

Pin Lot Number: Plug Lot Number:

TEST PERFORMED	LIMIT	RESULT
PROOF PRESSURE	MIN.	PASS
HYDRAULIC LEAKAGE AT PROOF	NONE	PASS
THERMAL CYCLE	200 °F MIN.	PASS

Tests are performed in class #3 installation holes with parts and fixtures of like materials. The combination of Pin and Plug lot numbers used in this test need not be used together as a matched set during Lee Plug® assembly. The data is representative of the performance of this Pin lot with any other mating Plug lot and likewise, of this Plug lot with any other Mating Pin lot.

Bruce N. Hecklinger
Quality Assurance Manager

THE LEE COMPANY
Westbrook, CT 06498-0424

Form 310 Rev. F-1

THE LEE COMPANY
P.O. BOX 424
2 Pettipaug Road
Westbrook, CT 06498
(860) 399-6281

Date:

This is to certify that the dimensional, functional requirements, special surface treatments, and all blueprint notes of The Lee Company drawings have been inspected and are in conformance to all applicable specification requirements.

We further certify that physical and chemical test reports demonstrating conformance to applicable specifications of the material used in the manufacturing of these units, listed below, shipped to you on your order # _____ are on file at The Lee Company and are available for your review.

Lee Co. P/N: Customer P/N: Item:

Signed: _____
Quality Control Manager
THE LEE COMPANY

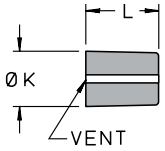
Lee Form No. 195

APPENDIX B

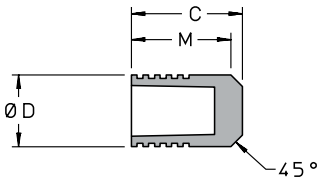
DIMENSIONAL AND PROOF PRESSURE DATA

Aluminum Lee Plug

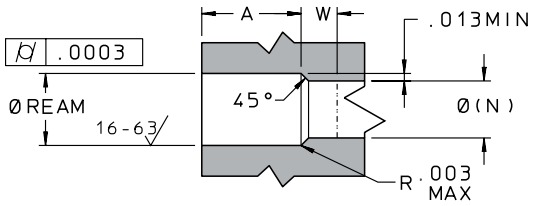
PIN



PLUG



INSTALLATION HOLE



LEE PART NUMBER	093 SHORT PLGA 0930010A	093 LONG PLGA 0931010A	125 SHORT PLGA 1250010A	125 LONG PLGA 1251010A
D Max.	.0937	.0937	.1250	.1250
D Min.	.0928	.0928	.1241	.1241
C Nom.	.098	.143	.128	.193
M Nom.	.078	.123	.108	.173
K Nom.	.069	.069	.095	.095
L Nom.	.062	.095	.086	.125
Weight (gr.)	.03	.04	.06	.10
	PROOF PRESSURE (psi x 1000)			
CLASS 1	6	10	6	10
CLASS 2	8	13	8	13
CLASS 3	10	16	10	16
	REAM DIAMETERS			
CLASS 1	.0937 – .0962		.1250 – .1275	
CLASS 2	.0937 – .0952		.1250 – .1265	
CLASS 3	.0937 – .0942		.1250 – .1255	
A Min.	.097	.145	.125	.195
N Dia. Ref.	.062	.062	.093	.093
W Min.	.125	.125	.125	.125

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type II B

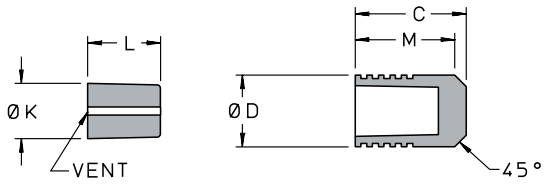
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L8.

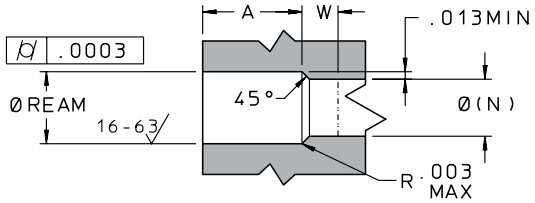
LEE PART NUMBER	156 SHORT PLGA 1560010A	156 LONG PLGA 1561010A	187 SHORT PLGA 1870010A	187 LONG PLGA 1871010A
D Max.	.1562	.1562	.1875	.1875
D Min.	.1553	.1553	.1866	.1866
C Nom.	.125	.245	.160	.260
M Nom.	.110	.215	.135	.235
K Nom.	.118	.123	.154	.154
L Nom.	.078	.165	.114	.181
Weight (gr.)	.10	.20	.19	.31
	PROOF PRESSURE (psi x 1000)			
CLASS 1	8	10	8	10
CLASS 2	9	13	9	13
CLASS 3	12	16	10	15
	REAM DIAMETERS			
CLASS 1	.1562 – .1587		.1875 – .1900	
CLASS 2	.1562 – .1577		.1875 – .1890	
CLASS 3	.1562 – .1567		.1875 – .1880	
A Min.	.130	.250	.152	.253
N Dia. Ref.	.125	.125	.156	.156
W Min.	.125	.125	.125	.125

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L8.

Aluminum Lee Plug





LEE PART NUMBER	218 SHORT PLGA 2180010A	218 LONG PLGA 2181010A	250 SHORT PLGA 2500010A	250 LONG PLGA 2501010A
D Max.	.2187	.2187	.2500	.2500
D Min.	.2178	.2178	.2491	.2491
C Nom.	.187	.307	.225	.365
M Nom.	.167	.277	.193	.333
K Nom.	.179	.182	.212	.212
L Nom.	.145	.218	.160	.265
Weight (gr.)	.30	.51	.46	.80
	PROOF PRESSURE (psi x 1000)			
CLASS 1	8	9	8	9
CLASS 2	9	12	9	12
CLASS 3	10	15	10	14
	REAM DIAMETERS			
CLASS 1	.2187 – .2212		.2500 – .2525	
CLASS 2	.2187 – .2202		.2500 – .2515	
CLASS 3	.2187 – .2192		.2500 – .2505	
A Min.	.187	.312	.212	.352
N Dia. Ref.	.187	.187	.218	.218
W Min.	.125	.125	.125	.125

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L9.

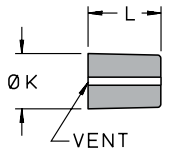
LEE PART NUMBER	281 SHORT PLGA 2810010A	281 LONG PLGA 2811010A	312 SHORT PLGA 3120010A	312 LONG PLGA 3121010A
D Max.	.2812	.2812	.3124	.3124
D Min.	.2803	.2803	.3115	.3115
C Nom.	.255	.370	.282	.436
M Nom.	.230	.340	.252	.406
K Nom.	.245	.247	.268	.270
L Nom.	.193	.280	.204	.308
Weight (gr.)	.69	1.0	.91	1.4
	PROOF PRESSURE (psi x 1000)			
CLASS 1	8	9	8	9
CLASS 2	9	12	9	12
CLASS 3	10	14	10	14
	REAM DIAMETERS			
CLASS 1	.2812 – .2837		.3124 – .3149	
CLASS 2	.2812 – .2827		.3124 – .3139	
CLASS 3	.2812 – .2817		.3124 – .3129	
A Min.	.250	.375	.269	.423
N Dia. Ref.	.250	.250	.281	.281
W Min.	.125	.125	.125	.125

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type II B

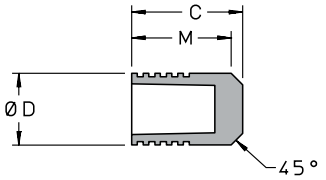
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L9.

Aluminum Lee Plug

PIN



PLUG

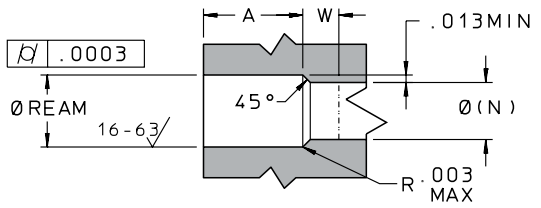


LEE PART NUMBER	343 SHORT PLGA 3430010A	343 LONG PLGA 3431010A	406 SHORT PLGA 4060010A	406 LONG PLGA 4061010A
D Max.	.3437	.3437	.4062	.4062
D Min.	.3428	.3428	.4053	.4053
C Nom.	.307	.500	.365	.565
M Nom.	.272	.410	.305	.465
K Nom.	.290	.294	.357	.357
L Nom.	.216	.335	.256	.397
Weight (gr.)	1.2	2.0	2.0	3.0
	PROOF PRESSURE (psi x 1000)			
CLASS 1	6	8	6	8
CLASS 2	8	11	8	10
CLASS 3	10	14	10	13
	REAM DIAMETERS			
CLASS 1	.3437 – .3462		.4062 – .4087	
CLASS 2	.3437 – .3452		.4062 – .4077	
CLASS 3	.3437 – .3442		.4062 – .4067	
A Min.	.295	.437	.325	.500
N Dia. Ref.	.312	.312	.375	.375
W Min.	.125	.125	.125	.125

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

INSTALLATION HOLE

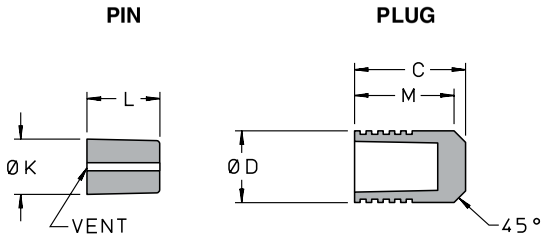


LEE PART NUMBER	468 SHORT PLGA 4680010A	468 LONG PLGA 4681010A	531 SHORT PLGA 5310010A	531 LONG PLGA 5311010A
D Max.	.4687	.4687	.5312	.5312
D Min.	.4678	.4678	.5303	.5303
C Nom.	.390	.620	.520	.680
M Nom.	.330	.530	.460	.590
K Nom.	.427	.419	.486	.482
L Nom.	.285	.460	.375	.522
Weight (gr.)	2.9	4.5	4.9	6.3
	PROOF PRESSURE (psi x 1000)			
CLASS 1	6	7	6	6
CLASS 2	8	10	8	8
CLASS 3	10	12	10	12
	REAM DIAMETERS			
CLASS 1	.4687 – .4712		.5312 – .5337	
CLASS 2	.4687 – .4702		.5312 – .5327	
CLASS 3	.4687 – .4692		.5312 – .5317	
A Min.	.350	.562	.486	.625
N Dia. Ref.	.437	.437	.500	.500
W Min.	.125	.125	.125	.125

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

Aluminum Lee Plug



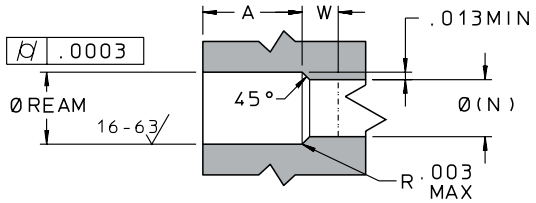
LEE PART NUMBER	656 SHORT PLGA 6560010A	656 LONG PLGA 6561010A		
D Max.	.6562	.6562		
D Min.	.6553	.6553		
C Nom.	.550	.750		
M Nom.	.470	.660		
K Nom.	.598	.601		
L Nom.	.390	.590		
Weight (gr.)	7.8	11.0		
	PROOF PRESSURE (psi x 1000)			
CLASS 1	3	4		
CLASS 2	4	7		
CLASS 3	5	10		
	REAM DIAMETERS			
CLASS 1	.6562 – .6587			
CLASS 2	.6562 – .6577			
CLASS 3	.6562 – .6567			
A Min.	.490	.685		
N Dia. Ref.	.625	.625		
W Min.	.125	.125		

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type II B

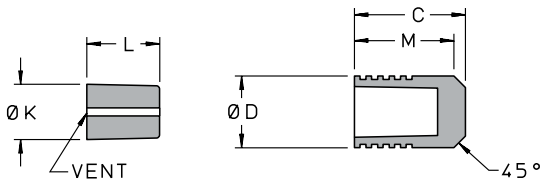
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

Stainless Steel Lee Plug

INSTALLATION HOLE



PIN **PLUG**



LEE PART NUMBER	093		125	
	SHORT PLGA 0930020A	LONG PLGA 0931020A	SHORT PLGA 1250020A	LONG PLGA 1251020A
D Max.	.0937	.0937	.1250	.1250
D Min.	.0928	.0928	.1241	.1241
C Nom.	.098	.143	.128	.193
M Nom.	.078	.123	.108	.173
K Nom.	.069	.069	.095	.095
L Nom.	.062	.095	.086	.125
Weight (gr.)	.07	.11	.17	.26
	PROOF PRESSURE (psi x 1000)			
CLASS 1	10	18	14	18
CLASS 2	13	20	16	20
CLASS 3	15	24	20	24
	REAM DIAMETERS			
CLASS 1	.0937 – .0962		.1250 – .1275	
CLASS 2	.0937 – .0952		.1250 – .1265	
CLASS 3	.0937 – .0942		.1250 – .1255	
A Min.	.097	.145	.125	.195
N Dia. Ref.	.062	.062	.093	.093
W Min.	.063	.063	.063	.063

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L8.

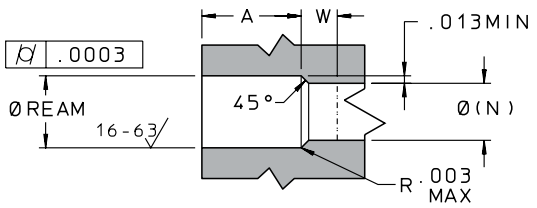
LEE PART NUMBER	156		187	
	SHORT PLGA 1560020A	LONG PLGA 1561020A	SHORT PLGA 1870020A	LONG PLGA 1871020A
D Max.	.1562	.1562	.1875	.1875
D Min.	.1553	.1553	.1866	.1866
C Nom.	.125	.245	.160	.260
M Nom.	.110	.215	.135	.235
K Nom.	.116	.118	.154	.154
L Nom.	.078	.175	.114	.181
Weight (gr.)	.28	.56	.51	.82
	PROOF PRESSURE (psi x 1000)			
CLASS 1	8	18	12	18
CLASS 2	9	24	14	24
CLASS 3	10	28	16	28
	REAM DIAMETERS			
CLASS 1	.1562 – .1587		.1875 – .1900	
CLASS 2	.1562 – .1577		.1875 – .1890	
CLASS 3	.1562 – .1567		.1875 – .1880	
A Min.	.130	.250	.152	.253
N Dia. Ref.	.125	.125	.156	.156
W Min.	.063	.063	.063	.063

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

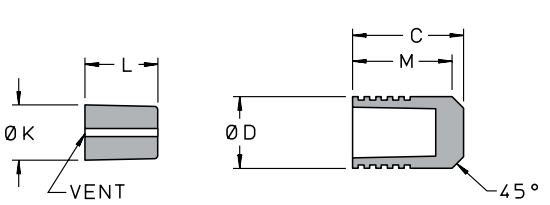
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L8.

Stainless Steel Lee Plug

INSTALLATION HOLE



PIN **PLUG**



LEE PART NUMBER	218 SHORT PLGA 2180020A	218 LONG PLGA 2181020A	250 SHORT PLGA 2500020A	250 LONG PLGA 2501020A
D Max.	.2187	.2187	.2500	.2500
D Min.	.2178	.2178	.2491	.2491
C Nom.	.187	.307	.225	.365
M Nom.	.167	.277	.193	.333
K Nom.	.179	.181	.212	.212
L Nom.	.145	.218	.160	.265
Weight (gr.)	.83	1.4	1.3	2.2
	PROOF PRESSURE (psi x 1000)			
CLASS 1	10	16	12	16
CLASS 2	12	22	14	22
CLASS 3	14	26	16	25
	REAM DIAMETERS			
CLASS 1	.2187 – .2212		.2500 – .2525	
CLASS 2	.2187 – .2202		.2500 – .2515	
CLASS 3	.2187 – .2192		.2500 – .2505	
A Min.	.187	.312	.212	.352
N Dia. Ref.	.187	.187	.218	.218
W Min.	.063	.063	.063	.063

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

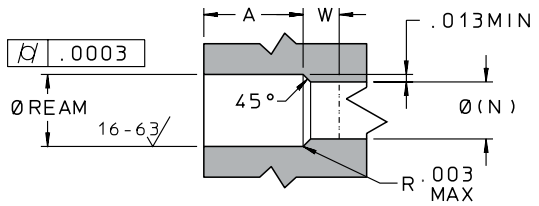
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L9.

LEE PART NUMBER	281 SHORT PLGA 2810020A	281 LONG PLGA 2811020A	312 SHORT PLGA 3120020A	312 LONG PLGA 3121020A
D Max.	.2812	.2812	.3124	.3124
D Min.	.2803	.2803	.3115	.3115
C Nom.	.255	.370	.280	.436
M Nom.	.230	.340	.252	.406
K Nom.	.245	.244	.275	.276
L Nom.	.193	.280	.204	.308
Weight (gr.)	1.9	2.7	2.5	3.9
	PROOF PRESSURE (psi x 1000)			
CLASS 1	12	18	12	18
CLASS 2	14	20	14	20
CLASS 3	16	24	16	24
	REAM DIAMETERS			
CLASS 1	.2812 – .2837		.3124 – .3149	
CLASS 2	.2812 – .2827		.3124 – .3139	
CLASS 3	.2812 – .2817		.3124 – .3129	
A Min.	.250	.375	.269	.423
N Dia. Ref.	.250	.250	.281	.281
W Min.	.063	.063	.063	.063

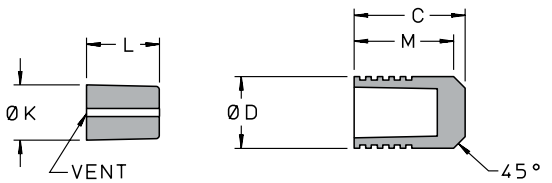
MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

Stainless Steel Lee Plug

INSTALLATION HOLE



PIN **PLUG**



LEE PART NUMBER	343		406	
	SHORT PLGA 3430020A	LONG PLGA 3431020A	SHORT PLGA 4060020A	LONG PLGA 4061020A
D Max.	.3437	.3437	.4062	.4062
D Min.	.3428	.3428	.4053	.4053
C Nom.	.307	.500	.365	.565
M Nom.	.272	.410	.305	.465
K Nom.	.305	.308	.363	.370
L Nom.	.216	.335	.256	.397
Weight (gr.)	3.2	5.0	5.4	7.9
	PROOF PRESSURE (psi x 1000)			
CLASS 1	10	18	10	16
CLASS 2	12	20	12	18
CLASS 3	14	22	14	21
	REAM DIAMETERS			
CLASS 1	.3437 – .3462		.4062 – .4087	
CLASS 2	.3437 – .3452		.4062 – .4077	
CLASS 3	.3437 – .3442		.4062 – .4067	
A Min.	.295	.437	.325	.500
N Dia. Ref.	.312	.312	.375	.375
W Min.	.063	.063	.063	.063

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

LEE PART NUMBER	468		531	
	SHORT PLGA 4680020A	LONG PLGA 4681020A	SHORT PLGA 5310020A	LONG PLGA 5311020A
D Max.	.4687	.4687	.5312	.5312
D Min.	.4678	.4678	.5303	.5303
C Nom.	.390	.620	.520	.680
M Nom.	.330	.530	.460	.590
K Nom.	.436	.433	.494	.495
L Nom.	.285	.460	.375	.522
Weight (gr.)	7.9	12.0	13.0	17.0
	PROOF PRESSURE (psi x 1000)			
CLASS 1	10	16	10	14
CLASS 2	12	18	12	16
CLASS 3	14	20	14	18
	REAM DIAMETERS			
CLASS 1	.4687 – .4712		.5312 – .5337	
CLASS 2	.4687 – .4702		.5312 – .5327	
CLASS 3	.4687 – .4692		.5312 – .5317	
A Min.	.350	.562	.486	.625
N Dia. Ref.	.437	.437	.500	.500
W. Min.	.063	.063	.063	.063

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

Stainless Steel Lee Plug

INSTALLATION HOLE

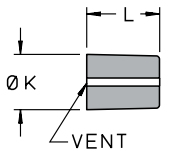
LEE PART NUMBER	656 SHORT PLGA 6560020A	656 LONG PLGA 6561020A		
D Max.	.6562	.6562		
D Min.	.6553	.6553		
C Nom.	.550	.750		
M Nom.	.470	.660		
K Nom.	.598	.601		
L Nom.	.390	.590		
Weight (gr.)	22.0	29.0		
PROOF PRESSURE (psi x 1000)				
CLASS 1	6	10		
CLASS 2	8	14		
CLASS 3	10	16		
REAM DIAMETERS				
CLASS 1	.6562 – .6587			
CLASS 2	.6562 – .6577			
CLASS 3	.6562 – .6567			
A Min.	.490	.685		
N Dia. Ref.	.625	.625		
W Min.	.063	.063		

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

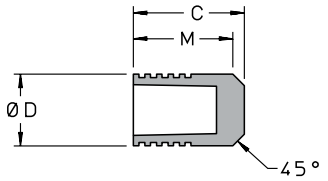
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

Monel Lee Plug

PIN



PLUG

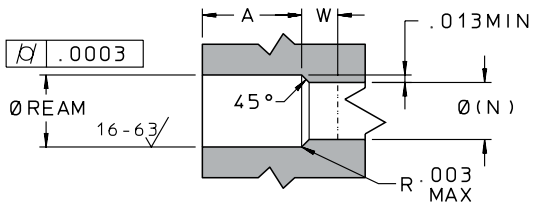


LEE PART NUMBER	093 LONG PLGA 0931400A	125 LONG PLGA 1251400A	156 LONG PLGA 1561400A	187 LONG PLGA 1871400A
D Max.	.0937	.1250	.1562	.1875
D Min.	.0928	.1241	.1553	.1866
C Nom.	.143	.193	.245	.260
M Nom.	.123	.173	.215	.235
K Nom.	.069	.095	.118	.154
L Nom.	.095	.125	.175	.181
Weight (gr.)	.11	.26	.64	.95
	PROOF PRESSURE (psi x 1000)			
CLASS 1	18	18	18	18
CLASS 2	20	20	24	24
CLASS 3	24	24	28	28
	REAM DIAMETERS			
CLASS 1	.0937 - .0962	.1250 - .1275	.1562 - .1587	.1875 - .1900
CLASS 2	.0937 - .0952	.1250 - .1265	.1562 - .1577	.1875 - .1890
CLASS 3	.0937 - .0942	.1250 - .1255	.1562 - .1567	.1875 - .1880
A Min.	.145	.195	.250	.253
N Dia. Ref.	.062	.093	.125	.156
W Min.	.063	.063	.063	.063

MATERIALS
PIN & PLUG: R405 Monel per QQ-N-281
FINISH
PIN: Wax
PLUG: None

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L8.

INSTALLATION HOLE



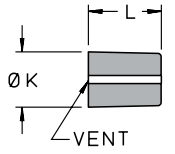
LEE PART NUMBER	218 LONG PLGA 2181400A	250 LONG PLGA 2501400A	281 LONG PLGA 2811400A	312 LONG PLGA 3121400A
D Max.	.2187	.2500	.2812	.3124
D Min.	.2178	.2491	.2803	.3115
C Nom.	.307	.365	.370	.436
M Nom.	.277	.333	.340	.406
K Nom.	.181	.212	.244	.276
L Nom.	.218	.265	.280	.308
Weight (gr.)	1.6	2.6	3.1	4.5
	PROOF PRESSURE (psi x 1000)			
CLASS 1	16	16	18	18
CLASS 2	22	22	20	20
CLASS 3	26	25	24	23
	REAM DIAMETERS			
CLASS 1	.2187 - .2212	.2500 - .2525	.2812 - .2837	.3124 - .3149
CLASS 2	.2187 - .2202	.2500 - .2515	.2812 - .2827	.3124 - .3139
CLASS 3	.2187 - .2192	.2500 - .2505	.2812 - .2817	.3124 - .3129
A Min.	.312	.352	.375	.423
N Dia. Ref.	.187	.218	.250	.281
W Min.	.063	.063	.063	.063

MATERIALS
PIN & PLUG: R405 Monel per QQ-N-281
FINISH
PIN: Wax
PLUG: None

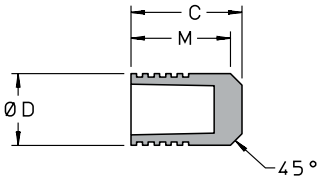
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L9-L10.

Monel Lee Plug

PIN



PLUG

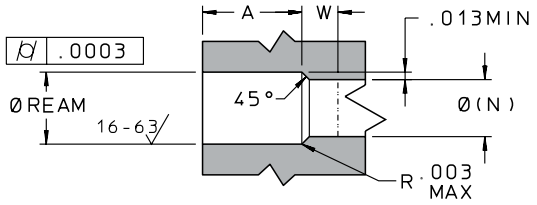


LEE PART NUMBER	343 LONG PLGA 3431400A	406 LONG PLGA 4061400A	468 LONG PLGA 4681400A	
D Max.	.3437	.4062	.4687	
D Min.	.3428	.4053	.4678	
C Nom.	.500	.565	.620	
M Nom.	.410	.465	.530	
K Nom.	.308	.370	.433	
L Nom.	.335	.397	.460	
Weight (gr.)	5.7	9.0	14.0	
	PROOF PRESSURE (psi x 1000)			
CLASS 1	18	16	16	
CLASS 2	20	18	18	
CLASS 3	22	21	20	
	REAM DIAMETERS			
CLASS 1	.3437 - .3462	.4062 - .4087	.4687 - .4712	
CLASS 2	.3437 - .3452	.4062 - .4077	.4687 - .4702	
CLASS 3	.3437 - .3442	.4062 - .4067	.4687 - .4692	
A Min.	.437	.500	.562	
N Dia. Ref.	.312	.375	.437	
W Min.	.063	.063	.063	

MATERIALS
PIN & PLUG: R405 Monel per QQ-N-281
FINISH
PIN: Wax
PLUG: None

For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

INSTALLATION HOLE



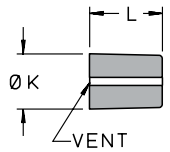
LEE PART NUMBER	531 LONG PLGA 5311400A	656 LONG PLGA 6561400A		
D Max.	.5312	.6562		
D Min.	.5303	.6553		
C Nom.	.680	.750		
M Nom.	.590	.660		
K Nom.	.495	.601		
L Nom.	.522	.590		
Weight (gr.)	20.0	34.0		
	PROOF PRESSURE (psi x 1000)			
CLASS 1	14	10		
CLASS 2	16	14		
CLASS 3	18	16		
	REAM DIAMETERS			
CLASS 1	.5312 - .5337	.6562 - .6587		
CLASS 2	.5312 - .5327	.6562 - .6577		
CLASS 3	.5312 - .5317	.6562 - .6567		
A Min.	.625	.685		
N Dia. Ref.	.500	.625		
W Min.	.063	.063		

MATERIALS
PIN & PLUG: R405 Monel per QQ-N-281
FINISH
PIN: Wax
PLUG: None

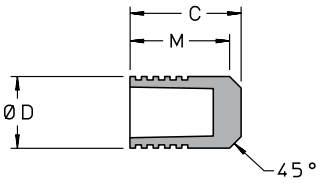
For installation/extraction procedure see page L4 – L7. For tool set & oversize part numbers see page L10.

Aluminum Metric Lee Plug

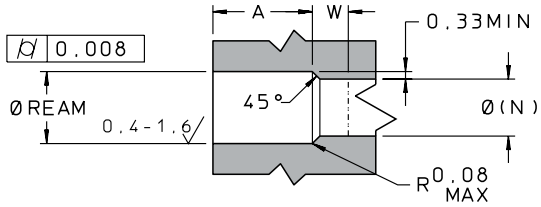
PIN



PLUG



INSTALLATION HOLE



LEE PART NUMBER	2,50 SHORT PLGM 0250010A	3,00 SHORT PLGM 0300010A	3,50 SHORT PLGM 0350010A	
D Max.	2,50	3,00	3,50	
D Min.	2,48	2,98	3,48	
C Nom.	2,75	3,20	3,66	
M Nom.	2,24	2,65	3,00	
K Nom.	1,88	2,26	2,56	
L Nom.	1,89	2,27	2,66	
Weight (gr.)	0,04	0,06	0,09	
	PROOF PRESSURE (MPa)			
CLASS 1	49	49	49	
CLASS 2	59	69	59	
CLASS 3	69	88	88	
	REAM DIAMETERS			
CLASS 1	H11* 2,50-2,56	H10* 3,00-3,06	H10* 3,50-3,56	
CLASS 2	H9* 2,50-2,54	H9* 3,00-3,04	H9* 3,50-3,54	
CLASS 3	H7* 2,50-2,51	H7* 3,00-3,01	H7* 3,50-3,51	
A Min.	2,7	3,1	3,4	
N Dia. Ref.	1,7	2,2	2,7	
W Min.	3,2	3,2	3,2	

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Brown per MIL-A-8625 Type II B

For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L11.
*DIN 7154 tolerances fall within ream tolerances.

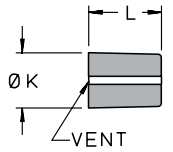
LEE PART NUMBER	4,00 SHORT PLGM 0400010A	4,00 LONG PLGM 0401010A	4,50 SHORT PLGM 0450010A	4,50 LONG PLGM 0451010A
D Max.	4,00	4,00	4,50	4,50
D Min.	3,98	3,98	4,48	4,48
C Nom.	4,09	6,63	4,55	7,19
M Nom.	3,40	6,10	3,81	6,61
K Nom.	3,08	3,07	3,58	3,57
L Nom.	2,96	5,48	3,29	6,03
Weight (gr.)	0,13	0,22	0,18	0,30
	PROOF PRESSURE (MPa)			
CLASS 1	49	69	49	69
CLASS 2	59	88	59	88
CLASS 3	83	102	69	102
	REAM DIAMETERS			
CLASS 1	H10* 4,00 - 4,06		H10* 4,50 - 4,56	
CLASS 2	H9* 4,00 - 4,04		H9* 4,50 - 4,54	
CLASS 3	H7* 4,00 - 4,01		H7* 4,50 - 4,51	
A Min.	3,9	6,6	4,3	7,1
N Dia. Ref.	3,2	3,2	3,7	3,7
W Min.	3,2	3,2	3,2	3,2

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Brown per MIL-A-8625 Type II B

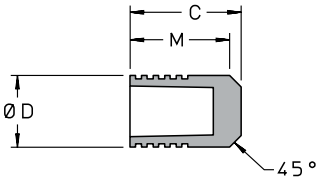
For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L11.
*DIN 7154 tolerances fall within ream tolerances.

Aluminum Metric Lee Plug

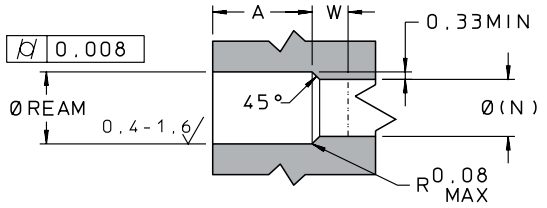
PIN



PLUG



INSTALLATION HOLE



LEE PART NUMBER	5,00		5,50	
	SHORT PLGM 0500010A	LONG PLGM 0501010A	SHORT PLGM 0550010A	LONG PLGM 0551010A
D Max.	5,00	5,00	5,50	5,50
D Min.	4,98	4,98	5,48	5,48
C Nom.	4,98	7,75	5,36	8,31
M Nom.	4,22	7,12	4,60	7,62
K Nom.	4,08	4,07	4,59	4,57
L Nom.	3,72	6,47	4,08	6,87
Weight (gr.)	0,25	0,39	0,33	0,51
	PROOF PRESSURE (MPa)			
CLASS 1	49	69	49	64
CLASS 2	59	88	59	83
CLASS 3	69	102	69	102
	REAM DIAMETERS			
CLASS 1	H10* 5,00 - 5,06		H10* 5,50 - 5,56	
CLASS 2	H9* 5,00 - 5,04		H9* 5,50 - 5,54	
CLASS 3	H7* 5,00 - 5,01		H7* 5,50 - 5,51	
A Min.	4,7	7,6	5,1	8,1
N Dia. Ref.	4,2	4,2	4,7	4,7
W Min.	3,2	3,2	3,2	3,2

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Brown per MIL-A-8625 Type II B

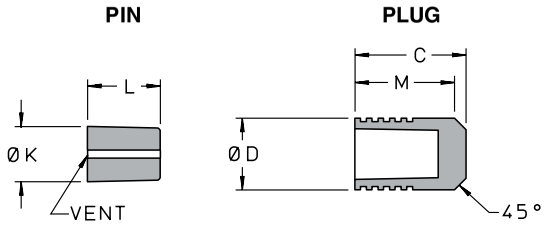
For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L11.
*DIN 7154 tolerances fall within ream tolerances.

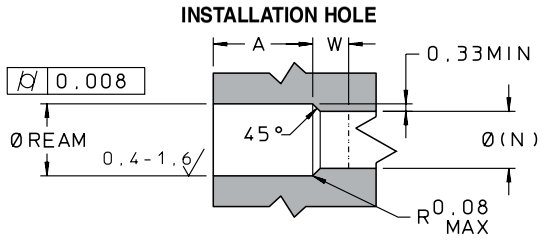
LEE PART NUMBER	6,00		6,50	
	SHORT PLGM 0600010A	LONG PLGM 0601010A	SHORT PLGM 0650010A	LONG PLGM 0651010A
D Max.	6,00	6,00	6,50	6,50
D Min.	5,98	5,98	6,48	6,48
C Nom.	5,77	8,84	6,30	9,40
M Nom.	5,01	8,11	5,52	8,62
K Nom.	5,08	5,07	5,59	5,57
L Nom.	4,28	7,24	4,69	7,49
Weight (gr.)	0,43	0,64	0,53	0,81
	PROOF PRESSURE (MPa)			
CLASS 1	49	64	49	64
CLASS 2	59	83	59	83
CLASS 3	69	98	69	98
	REAM DIAMETERS			
CLASS 1	H10* 6,00 - 6,06		H10* 6,50 - 6,56	
CLASS 2	H9* 6,00 - 6,04		H9* 6,50 - 6,54	
CLASS 3	H6* 6,00 - 6,01		H6* 6,50 - 6,51	
A Min.	5,5	8,6	6,0	9,1
N Dia. Ref.	5,2	5,2	5,7	5,7
W Min.	3,2	3,2	3,2	3,2

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Brown per MIL-A-8625 Type II B

For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L12.
*DIN 7154 tolerances fall within ream tolerances.

Aluminum Metric Lee Plug





LEE PART NUMBER	7,00 SHORT PLGM 0700010A	7,00 LONG PLGM 0701010A	7,50 SHORT PLGM 0750010A	7,50 LONG PLGM 0751010A
D Max.	7,00	7,00	7,50	7,50
D Min.	6,98	6,98	7,48	7,48
C Nom.	6,73	9,93	7,19	10,49
M Nom.	5,92	9,12	6,30	9,61
K Nom.	6,06	6,06	6,53	6,53
L Nom.	5,04	8,13	5,39	8,51
Weight (gr.)	0,66	1,0	0,81	1,2
	PROOF PRESSURE (MPa)			
CLASS 1	49	64	39	64
CLASS 2	59	83	54	83
CLASS 3	69	98	69	98
	REAM DIAMETERS			
CLASS 1	H10* 7,00 - 7,06		H10* 7,50 - 7,56	
CLASS 2	H9* 7,00 - 7,04		H9* 7,50 - 7,54	
CLASS 3	H6* 7,00 - 7,01		H6* 7,50 - 7,51	
A Min.	6,4	9,6	6,8	10,1
N Dia. Ref.	6,2	6,2	6,7	6,7
W Min.	3,2	3,2	3,2	3,2

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Brown per MIL-A-8625 Type II B

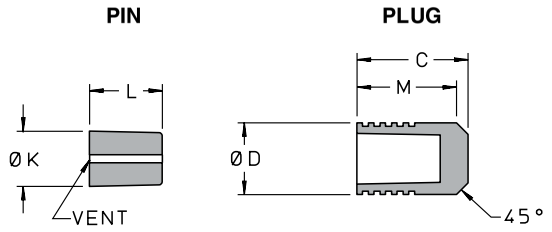
For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L12.
*DIN 7154 tolerances fall within ream tolerances.

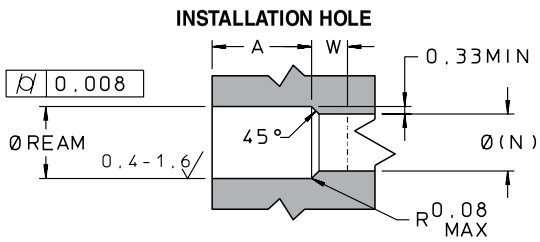
LEE PART NUMBER	8,00 SHORT PLGM 0800010A	8,00 LONG PLGM 0801010A		
D Max.	8,00	8,00		
D Min.	7,98	7,98		
C Nom.	7,62	11,05		
M Nom.	6,74	10,11		
K Nom.	7,05	7,05		
L Nom.	5,69	9,02		
Weight (gr.)	0,99	1,5		
	PROOF PRESSURE (MPa)			
CLASS 1	39	59		
CLASS 2	54	79		
CLASS 3	69	98		
	REAM DIAMETERS			
CLASS 1	H10* 8,00 - 8,06			
CLASS 2	H9* 8,00 - 8,04			
CLASS 3	H6* 8,00 - 8,01			
A Min.	7,2	10,6		
N Dia. Ref.	7,2	7,2		
W Min.	3,2	3,2		

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Brown per MIL-A-8625 Type II B

For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L12.
*DIN 7154 tolerances fall within ream tolerances.

Stainless Steel Metric Lee Plug





LEE PART NUMBER	2,50 SHORT PLGM 0250020A	3,00 SHORT PLGM 0300020A	3,50 SHORT PLGM 0350020A	
D Max.	2,50	3,00	3,50	
D Min.	2,48	2,98	3,48	
C Nom.	2,75	3,20	3,66	
M Nom.	2,24	2,65	3,00	
K Nom.	1,86	2,24	2,64	
L Nom.	1,89	2,27	2,66	
Weight (gr.)	0,11	0,16	0,24	
	PROOF PRESSURE (MPa)			
CLASS 1	98	98	98	
CLASS 2	113	113	113	
CLASS 3	137	137	137	
	REAM DIAMETERS			
CLASS 1	H11* 2,50-2,56	H10* 3,00-3,06	H10* 3,50-3,56	
CLASS 2	H9* 2,50-2,54	H9* 3,00-3,04	H9* 3,50-3,54	
CLASS 3	H7* 2,50-2,51	H7* 3,00-3,01	H7* 3,50-3,51	
A Min.	2,7	3,1	3,4	
N Dia. Ref.	1,7	2,2	2,7	
W Min.	1,6	1,6	1,6	

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L11.
*DIN 7154 tolerances fall within ream tolerances.

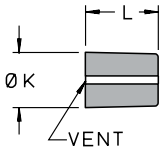
LEE PART NUMBER	4,00 SHORT PLGM 0400020A	4,00 LONG PLGM 0401020A	4,50 SHORT PLGM 0450020A	4,50 LONG PLGM 0451020A
D Max.	4,00	4,00	4,50	4,50
D Min.	3,98	3,98	4,48	4,48
C Nom.	4,09	6,63	4,55	7,19
M Nom.	3,40	6,10	3,81	6,61
K Nom.	3,14	3,15	3,64	3,62
L Nom.	2,96	5,48	3,29	5,15
Weight (gr.)	0,36	0,61	0,51	0,84
	PROOF PRESSURE (MPa)			
CLASS 1	83	123	83	123
CLASS 2	98	167	98	167
CLASS 3	113	196	113	196
	REAM DIAMETERS			
CLASS 1	H10* 4,00 - 4,06		H10* 4,50 - 4,56	
CLASS 2	H9* 4,00 - 4,04		H9* 4,50 - 4,54	
CLASS 3	H7* 4,00 - 4,01		H7* 4,50 - 4,51	
A Min.	3,9	6,6	4,3	7,1
N Dia. Ref.	3,2	3,2	3,7	3,7
W Min.	1,6	1,6	1,6	1,6

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

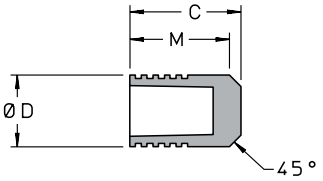
For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L11.
*DIN 7154 tolerances fall within ream tolerances.

Stainless Steel Metric Lee Plug

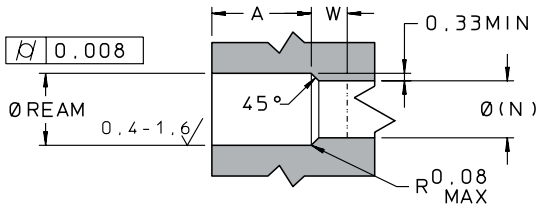
PIN



PLUG



INSTALLATION HOLE



LEE PART NUMBER	5,00		5,50	
	SHORT PLGM 0500020A	LONG PLGM 0501020A	SHORT PLGM 0550020A	LONG PLGM 0551020A
D Max.	5,00	5,00	5,50	5,50
D Min.	4,98	4,98	5,48	5,48
C Nom.	4,98	7,75	5,36	8,31
M Nom.	4,22	7,12	4,60	7,62
K Nom.	4,15	4,15	4,65	4,64
L Nom.	3,72	6,47	4,08	6,87
Weight (gr.)	0,71	1,1	0,92	1,4
	PROOF PRESSURE (MPa)			
CLASS 1	83	123	69	108
CLASS 2	98	167	83	147
CLASS 3	113	196	98	177
	REAM DIAMETERS			
CLASS 1	H10* 5,00 - 5,06		H10* 5,50 - 5,56	
CLASS 2	H9* 5,00 - 5,04		H9* 5,50 - 5,54	
CLASS 3	H7* 5,00 - 5,01		H7* 5,50 - 5,51	
A Min.	4,7	7,6	5,1	8,1
N Dia. Ref.	4,2	4,2	4,7	4,7
W Min.	1,6	1,6	1,6	1,6

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L11.
*DIN 7154 tolerances fall within ream tolerances.

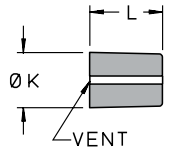
LEE PART NUMBER	6,00		6,50	
	SHORT PLGM 0600020A	LONG PLGM 0601020A	SHORT PLGM 0650020A	LONG PLGM 0651020A
D Max.	6,00	6,00	6,50	6,50
D Min.	5,98	5,98	6,48	6,48
C Nom.	5,77	8,84	6,30	9,40
M Nom.	5,01	8,11	5,52	8,62
K Nom.	5,14	5,14	5,64	5,64
L Nom.	4,28	7,24	4,69	7,49
Weight (gr.)	1,2	1,8	1,5	2,3
	PROOF PRESSURE (MPa)			
CLASS 1	69	108	69	108
CLASS 2	83	147	83	147
CLASS 3	98	177	98	172
	REAM DIAMETERS			
CLASS 1	H10* 6,00 - 6,06		H10* 6,50 - 6,56	
CLASS 2	H9* 6,00 - 6,04		H9* 6,50 - 6,54	
CLASS 3	H6* 6,00 - 6,01		H6* 6,50 - 6,51	
A Min.	5,5	8,6	6,0	9,1
N Dia. Ref.	5,2	5,2	5,7	5,7
W Min.	1,6	1,6	1,6	1,6

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

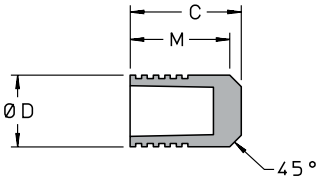
For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L12.
*DIN 7154 tolerances fall within ream tolerances.

Stainless Steel Metric Lee Plug

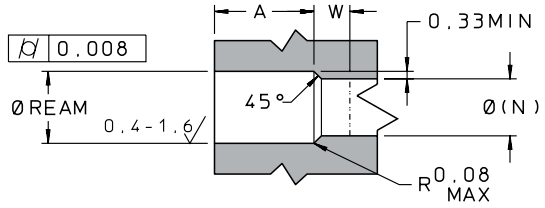
PIN



PLUG



INSTALLATION HOLE



LEE PART NUMBER	7,00 SHORT PLGM 0700020A	7,00 LONG PLGM 0701020A	7,50 SHORT PLGM 0750020A	7,50 LONG PLGM 0751020A
D Max.	7,00	7,00	7,50	7,50
D Min.	6,98	6,98	7,48	7,48
C Nom.	6,73	9,93	7,19	10,49
M Nom.	5,92	9,12	6,30	9,61
K Nom.	6,14	6,14	6,64	6,64
L Nom.	5,05	8,13	5,39	8,51
Weight (gr.)	1,8	2,8	2,2	3,4
	PROOF PRESSURE (MPa)			
CLASS 1	69	98	69	98
CLASS 2	83	137	83	137
CLASS 3	98	167	98	167
	REAM DIAMETERS			
CLASS 1	H10* 7,00 - 7,06		H10* 7,50 - 7,56	
CLASS 2	H9* 7,00 - 7,04		H9* 7,50 - 7,54	
CLASS 3	H6* 7,00 - 7,01		H6* 7,50 - 7,51	
A Min.	6,4	9,6	6,8	10,1
N Dia. Ref.	6,2	6,2	6,7	6,7
W Min.	1,6	1,6	1,6	1,6

MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L12.
*DIN 7154 tolerances fall within ream tolerances.

LEE PART NUMBER	8,00 SHORT PLGM 0800020A	8,00 LONG PLGM 0801020A		
D Max.	8,00	8,00		
D Min.	7,98	7,98		
C Nom.	7,62	11,05		
M Nom.	6,74	10,11		
K Nom.	7,14	7,10		
L Nom.	5,69	9,02		
Weight (gr.)	2,8	4,1		
	PROOF PRESSURE (MPa)			
CLASS 1	69	98		
CLASS 2	83	123		
CLASS 3	98	152		
	REAM DIAMETERS			
CLASS 1	H10* 8,00 - 8,06			
CLASS 2	H9* 8,00 - 8,04			
CLASS 3	H6* 8,00 - 8,01			
A Min.	7,2	10,6		
N Dia. Ref.	7,2	7,2		
W Min.	1,6	1,6		

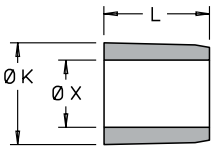
MATERIALS
PIN & PLUG: 416 CRES Per QQ-S-763C, R_c 20-34
FINISH
PIN: Passivated & Wax
PLUG: Passivated

For installation/extraction procedure see page L4 – L7. For tool set part numbers see page L12.
*DIN 7154 tolerances fall within ream tolerances.

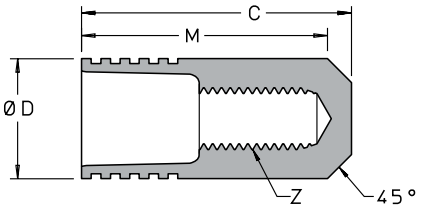
Process Specification 203
Revision L2
March 19, 2020

R.F.O. Lee Plug

PIN



PLUG

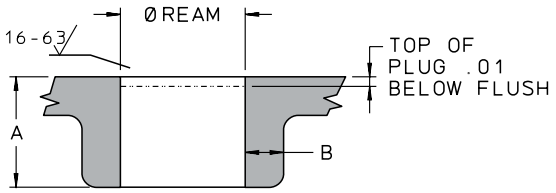


LEE PART NUMBER	156 PLRA 1560010A	187 PLRA 1870010A	218 PLRA 2180010A	
D Max.	.1562	.1875	.2187	
D Min.	.1553	.1866	.2178	
C Nom.	.417	.500	.500	
M Nom.	.380	.460	.460	
K Nom.	.125	.154	.180	
L Nom.	.115	.150	.150	
X	.090	.105	.117	
Z	.086-64	.099-56	.112-48	
Weight (gr.)	.30	.57	.80	
	PROOF PRESSURE (psi)			
CLASS 2	5000	5000	5000	
CLASS 3	6000	6000	6000	
	REAM DIAMETERS			
CLASS 2	.1562 - .1577	.1875 - .1890	.2187 - .2202	
CLASS 3	.1562 - .1567	.1875 - .1880	.2187 - .2192	
A Min.	.16	.17	.17	
B Min.	.06	.07	.08	

MATERIALS
PIN: 416 Cres per QQ-S-763C
PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Passivated
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L15 – L17. For tool set part numbers see page L18.

INSTALLATION HOLE



LEE PART NUMBER	250 PLRA 2500010A	281 PLRA 2810010A		
D Max.	.2500	.2812		
D Min.	.2491	.2803		
C Nom.	.562	.562		
M Nom.	.510	.510		
K Nom.	.212	.245		
L Nom.	.220	.193		
X	.144	.190-32		
Z	.138-40	.164-36		
Weight (gr.)	1.1	1.3		
	PROOF PRESSURE (psi)			
CLASS 2	4000	3000		
CLASS 3	5000	4000		
	REAM DIAMETERS			
CLASS 2	.2500 - .2515	.2812 - .2827		
CLASS 3	.2500 - .2505	.2812 - .2817		
A Min.	.23	.24		
B Min.	.08	.09		

MATERIALS
PIN: 416 Cres per QQ-S-763C
PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Passivated
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L15 – L17. For tool set part numbers see page L18.

Process Specification 203
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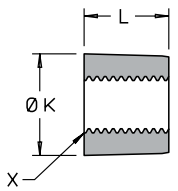
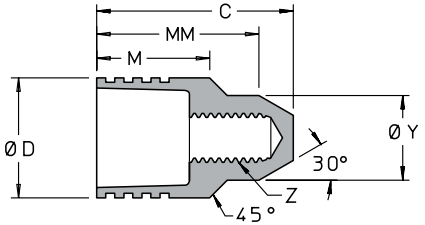
R.F.O. Lee Plug

PIN



PLUG

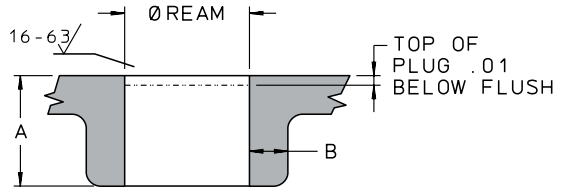


LEE PART NUMBER	343			
	PLRA 3430010A			
D Max.	.3437			
D Min.	.3428			
C Nom.	.600			
M Nom.	.320			
MM Nom.	.500			
K Nom.	.291			
L Nom.	.216			
X	.216-28			
Y Max.	.260			
Z	.190-32			
Weight (gr.)	1.8			
	PROOF PRESSURE (psi)			
CLASS 2	3000			
CLASS 3	4000			
	REAM DIAMETERS			
CLASS 2	.3437 - .3452			
CLASS 3	.3437 - .3442			
A Min.	.32			
B Min.	.09			

MATERIALS
PIN: 416 Cres per QQ-S-763C
PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Passivated
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L15 – L17. For tool set part numbers see page L18.

INSTALLATION HOLE



LEE PART NUMBER	406	468	500	531
	PLRA 4060010A	PLRA 4680010A	PLRA 5000010A	PLRA 5310010A
D Max.	.4062	.4687	.5000	.5312
D Min.	.4053	.4678	.4991	.5303
C Nom.	.700	.800	.870	.870
M Nom.	.400	.450	.500	.500
MM Nom.	.550	.640	.720	.720
K Nom.	.357	.428	.451	.485
L Nom.	.256	.355	.415	.375
X	.216-28	.250-28	.250-28	.250-28
Y Max.	.330	.390	.390	.390
Z	.190-32	.216-28	.216-28	.216-28
Weight (gr.)	2.4	3.7	4.6	5.2
	PROOF PRESSURE (psi)			
CLASS 2	2500	2500	2500	2500
CLASS 3	3500	3500	3500	3500
	REAM DIAMETERS			
CLASS 2	.4062 - .4077	.4687 - .4702	.5000 - .5015	.5312 - .5327
CLASS 3	.4062 - .4067	.4687 - .4692	.5000 - .5005	.5312 - .5317
A Min.	.40	.40	.40	.40
B Min.	.10	.10	.11	.13

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541
PLUG: Anodize Green per MIL-A-8625 Type II B

For installation/extraction procedure see page L15 – L17. For tool set part numbers see page L18.

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R.F.O. Lee Plug

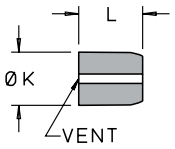
LEE PART NUMBER	656 PLRA 6560010A	750 PLRA 7500010A	875 PLRA 8750010A
D Max.	.6562	.7500	.8750
D Min.	.6553	.7491	.8741
C Nom.	1.000	1.160	.960
M Nom.	.600	.700	.500
MM Nom.	.830	1.100	.720
K Nom.	.599	.676	.801
L Nom.	.514	.590	.370
X	.3125-24	.3125-24	.375-24
Y Max.	.420	.560	.680
Z	.250-28	.250-28	.3125-24
Weight (gr.)	9.2	13.0	16.0
PROOF PRESSURE (psi)			
CLASS 2	2500	2000	1500
CLASS 3	3500	3000	2500
REAM DIAMETERS			
CLASS 2	.6562 - .6577	.7500 - .7515	.8750 - .8765
CLASS 3	.6562 - .6567	.7500 - .7505	.8750 - .8755
A Min.	.51	.70	.51
B Min.	.13	.13	.15

MATERIALS
PIN & PLUG: 2024-T4 or T351 aluminum per SAE AMS-QQ-A-225/6
FINISH
PIN: Alodine Yellow per MIL-DTL-5541
PLUG: Anodize Green per MIL-A-8625 Type II B

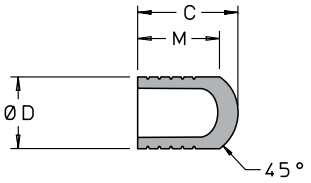
For installation/extraction procedure see page L15– L17. For tool set part numbers see page L18.

High Strength Lee Plug

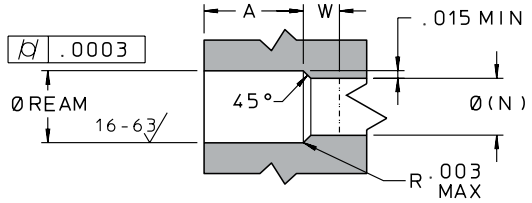
PIN



PLUG



INSTALLATION HOLE



LEE PART NUMBER	093 PLHA 0931241A	125 PLHA 1251241A	156 PLHA 1561241A	187 PLHA 1871241A
D Max.	.0937	.1250	.1562	.1875
D Min.	.0928	.1241	.1553	.1866
C Nom.	.134	.174	.214	.254
M Nom.	.106	.142	.178	.218
K Nom.	.067	.092	.122	.152
L Nom.	.083	.111	.139	.166
Weight (gr.)	.09	.24	.45	.79
	PROOF PRESSURE (psi x 1000)			
	32	32	32	32
	REAM DIAMETERS			
	.0937 - .0947	.1250 - .1260	.1562 - .1572	.1875 - .1885
A Min.	.122	.161	.198	.233
N Dia. Ref.	.062	.093	.125	.156
W Min.	.060	.060	.060	.060

LEE PART NUMBER	218 PLHA 2181241A	250 PLHA 2501241A	281 PLHA 2811241A	312 PLHA 3121241A
D Max.	.2187	.2500	.2812	.3124
D Min.	.2178	.2491	.2803	.3115
C Nom.	.290	.331	.369	.407
M Nom.	.248	.285	.320	.355
K Nom.	.182	.211	.241	.272
L Nom.	.194	.222	.250	.278
Weight (gr.)	1.2	1.8	2.6	3.5
	PROOF PRESSURE (psi x 1000)			
	32	32	32	32
	REAM DIAMETERS			
	.2187 - .2197	.2500 - .2510	.2812 - .2822	.3124 - .3134
A Min.	.268	.305	.340	.375
N Dia. Ref.	.187	.218	.250	.281
W Min.	.060	.060	.060	.060

MATERIALS
PIN & PLUG: 15-5 PH CRES per AMS 5659
FINISH
PIN: Passivated & Wax
PLUG: Passivated/Chromium Composite

For installation/extraction procedure see page L4 – L7. For oversize Lee Plugs see page L8.

MATERIALS
PIN & PLUG: 15-5 PH CRES per AMS 5659
FINISH
PIN: Passivated & Wax
PLUG: Passivated/Chromium Composite

For installation/extraction procedure see page L4 – L7. For oversize Lee Plugs see page L9.

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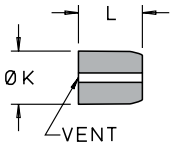
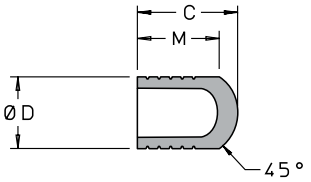
High Strength Lee Plug

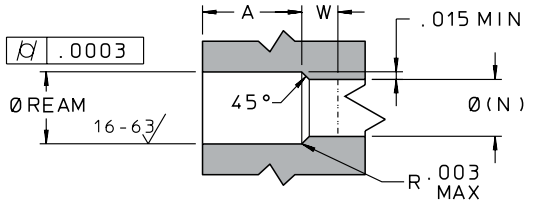
PIN



PLUG



INSTALLATION HOLE



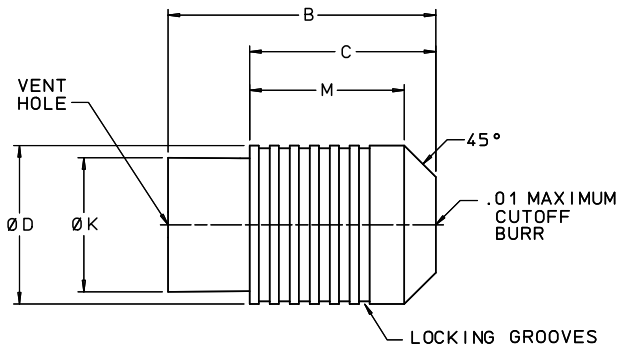
LEE PART NUMBER	343	
	PLHA 3431241A	
D Max. D Min. C Nom. M Nom. K Nom. L Nom. Weight (gr.)	.3437 .3428 .445 .390 .302 .305 4.7	
	PROOF PRESSURE (psi x 1000)	
	32	
	REAM DIAMETERS	
	.3437 - .3447	
A Min. N Dia. Ref. W Min.	.410 .312 .060	

MATERIALS
PIN & PLUG: 15-5 PH CRES per AMS 5659
FINISH
PIN: Passivated & Wax
PLUG: Passivated/Chromium Composite

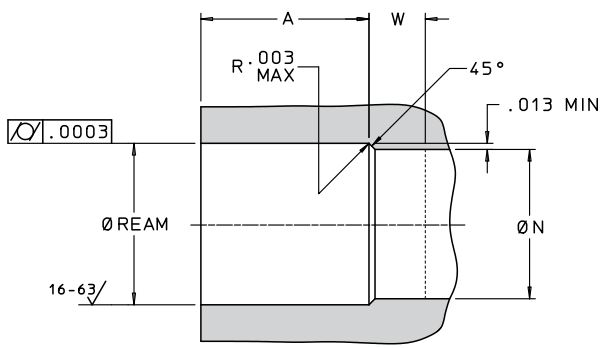
For installation/extraction procedure see page L4 – L7. For oversize Lee Plugs see page L10.

Quick Installation Lee Plug

PLUG ASSEMBLY



INSTALLATION HOLE



LEE PART NUMBER	093	125	156	187
	PLPA 0930010A	PLPA 1250010A	PLPA 1560010A	PLPA 1870010A
D Max.	0.0937	0.1250	0.1562	0.1875
D Min.	0.0928	0.1241	0.1553	0.1866
B Nom.	0.178	0.245	0.288	0.335
C Nom.	0.123	0.160	0.185	0.210
M Nom.	0.103	0.140	0.170	0.185
K Nom.	0.069	0.095	0.118	0.154
Weight (gr.)	0.025	0.066	0.150	0.200
	PROOF PRESSURE (psi x 1000)			
CLASS 1	6	6	8	8
CLASS 2	8	8	9	9
CLASS 3	10	10	12	10
	REAM DIAMETERS			
CLASS 1	.0937 – .0962	.1250 – .1275	.1562 – .1587	.1875 – .1900
CLASS 2	.0937 – .0952	.1250 – .1265	.1562 – .1577	.1875 – .1890
CLASS 3	.0937 – .0942	.1250 – .1255	.1562 – .1567	.1875 – .1880
A Min.	0.118	0.158	0.186	0.201
N Dia. Ref.	0.062	0.093	0.125	0.156
W Min.	0.125	0.125	0.125	0.125

MATERIALS
PIN & PLUG: 2024-T4 Aluminum per SAE AMS-QQ-A-225/6 and AMS 4120

FINISH
PIN: Alodine Yellow per MIL-DTL-5541 & Wax
PLUG: Anodize Green per MIL-A-8625 Type IIB

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