



**HOWMET
AEROSPACE**

FLUID BOSS ADAPTERS AND INSERTS TOOLING



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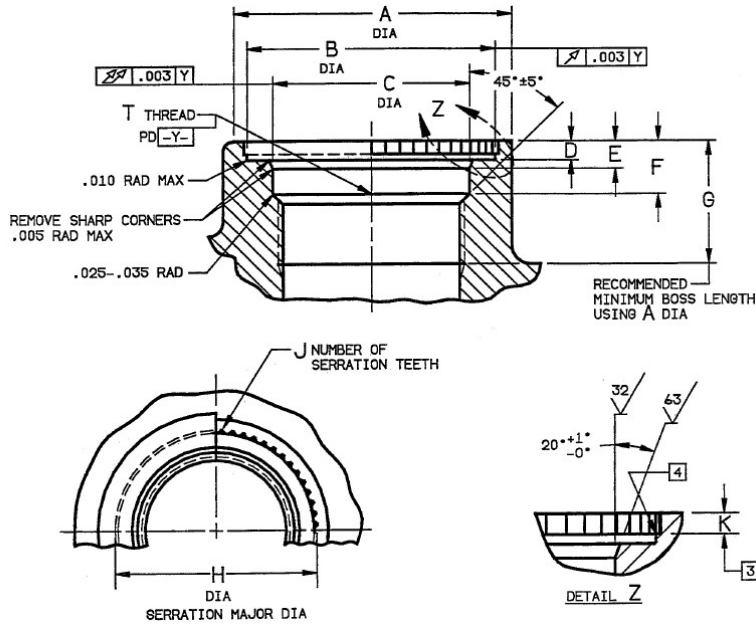
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SECTION 1

PORT PREPARATION AND SERRATION TOOLS



- PORTING TOOLS
- BROACH TOOLS
- CHIP REMOVAL TOOL
- SERRATION GAGES



| PORT NUMBER | AS I.D. NUMBER | T THREAD, MIL-S-8879 CLASS 3B | | A MIN BOSS DIA | B DIA +.003 -0.000 | C DIA +.002 -0.000 | D +.010 -0.000 | E +.005 -0.000 | F +.005 -0.000 | G MIN FULL THREAD DEPTH | H DIA MIN | J NUMBER OF TEETH | K MIN |
|-------------|----------------|-------------------------------|----------------------|----------------|--------------------|--------------------|----------------|----------------|----------------|-------------------------|-----------|-------------------|-------|
| | | THREAD SIZE | CONTROLLED MINOR DIA | | | | | | | | | | |
| PS10035-02 | AS1300-02 | .2160-28 UNJF | .1857 .1827 | .50 | .381 | .254 | .088 | .153 | .296 | .507 | .408 | 24 | .061 |
| PS10035-03 | AS1300-03 | .2500-28 UNJF | .2197 .2167 | .62 | .448 | .286 | .088 | .153 | .296 | .568 | .478 | 26 | .061 |
| PS10035-04 | AS1300-04 | .3125-24 UNJF | .2764 .2734 | .68 | .495 | .339 | .088 | .153 | .296 | .568 | .524 | 30 | .061 |
| PS10035-05 | AS1300-05 | .3750-24 UNJF | .3389 .3359 | .79 | .601 | .401 | .088 | .153 | .296 | .594 | .635 | 36 | .061 |
| PS10035-06 | AS1300-06 | .4375-20 UNJF | .3933 .3903 | .85 | .675 | .464 | .103 | .168 | .311 | .631 | .710 | 36 | .073 |
| PS10035-08 | AS1300-08 | .5625-18 UNJF | .5129 .5099 | 1.04 | .784 | .582 | .103 | .168 | .311 | .673 | .826 | 40 | .073 |
| PS10035-10 | AS1300-10 | .6875-24 UNJF | .6514 .6484 | 1.17 | 1.015 | .725 | .103 | .168 | .311 | .693 | 1.052 | 38 | .073 |
| PS10035-12 | AS1300-12 | .8125-20 UNJF | .7683 .7653 | 1.42 | 1.139 | .899 | .103 | .168 | .343 | .763 | 1.182 | 40 | .073 |
| PS10035-14 | AS1300-14 | .9375-20 UNJF | .8933 .8903 | 1.54 | 1.311 | 1.030 | .103 | .168 | .343 | .800 | 1.354 | 50 | .073 |
| PS10035-16 | AS1300-16 | 1.1250-18 UNJF | 1.0744 1.0714 | 1.67 | 1.427 | 1.162 | .103 | .168 | .343 | .806 | 1.471 | 36 | .073 |
| PS10035-20 | AS1300-20 | 1.3125-18 UNJF | 1.2629 1.2599 | 1.98 | 1.750 | 1.387 | .130 | .195 | .375 | .838 | 1.795 | 56 | .093 |
| PS10035-24 | AS1300-24 | 1.6250-18 UNJF | 1.5754 1.5724 | 2.23 | 2.005 2.000 | 1.664 | .130 | .195 | .375 | .877 | 2.045 | 81 | .093 |
| PS10035-32 | AS1300-32 | 2.1250-16 UNJF | 2.0657 2.0627 | 2.86 | 2.521 2.516 | 2.202 | .130 | .195 | .416 | .1050 | 2.561 | 102 | .093 |

PORT AND SERRATION PREPARATION TOOLS PS10035 (AS1300) PORT

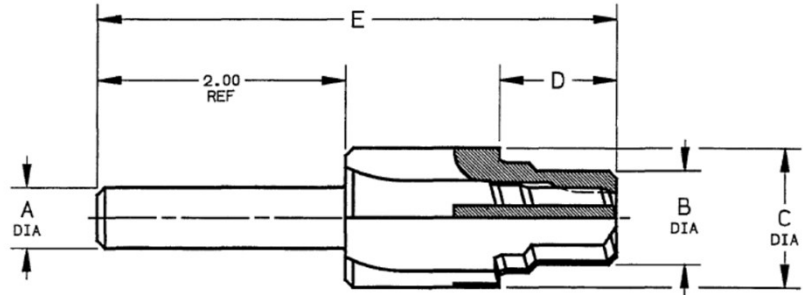
PORT PREPARATION

- 1 Tools in the table below are for preparation of ports for Adapter series RFK9800-13, RFK9802-13 and RF5000-13 as well as all products requiring PS10035 (AS1301) port preparation
- 2 Prepare boss and port per specifications on previous page. Drill thru or to depth specified on applicable drawing using a drill with a diameter .015-.030 smaller than that specified as the minor diameter. Follow with the RPT Porting Tool to finish the minor diameter of the port thread to the sizes required for piloting of the broach tool.
- 3 Use Broach Tool selected from table below to achieve the proper serrations to complete the port.
- 4 After serrations are broached, chip removal is required using RF()CRP tool from table below.

| PORT NUMER | TUBING O.D. (REF) | PORTING TOOL | SERRATION BROACH TOOLS (1 REQUIRED ONLY) | | | | CHIP REMOVAL TOOL NUMBER |
|------------|----------------------|--------------|--|-----------------|----------------------------------|--------------------------------|--------------------------|
| | | | HAND HELD | NON IMPACT 5 | EDM | WOBBLE 6 | |
| PS10035-02 | 1/8 | RPT02 | RFOPB5002 | RFOPB5002HDB | RFOPB5002ED3 OR RFOPB5002ED2 | RFOPB5002WB or RFOPB5002WBA | RF02CRP |
| PS10035-03 | 3/16 | RPT03 | RFOPB5003 | RFOPB5003HDB | RFOPB5003ED3 OR RFOPB5003ED2 | RFOPB5003WB or RFOPB5003WBA | RF03CRP |
| PS10035-04 | 1/4 | RPT04 | RFOPB5004 | RFOPB5004HDB | RFOPB5004ED3 OR RFOPB5004ED2 | RFOPB5004WB or RFOPB5004WBA | RF04CRP |
| PS10035-05 | 5/16 | RPT05 | RFOPB5005 | RFOPB5005HDB | RFOPB5005ED3 OR RFOPB5005ED2 | RFOPB5005WB or RFOPB5005WBA | RF05CRP |
| PS10035-06 | 3/8 | RPT06 | RFOPB5006 | RFOPB5006HDB | RFOPB5006ED3 OR RFOPB5006ED2 | RFOPB5006WB or RFOPB5006WBA | RF06CRP |
| PS10035-08 | 1/2 | RPT08 | RFOPB5008 | RFOPB5008HDB | RFOPB5008ED3 OR RFOPB5008ED2 | RFOPB5008WB or RFOPB5008WBA | RF08CRP |
| PS10035-10 | 5/8 | RPT10 | RFOPB5010 | RFOPB5010HDB | RFOPB5010ED3 OR RFOPB5010ED2 | RFOPB5010WB or RFOPB5010WBA | RF10CRP |
| PS10035-12 | 3/4 | RPT12 | RFOPB5012 | RFOPB5012HDB | RFOPB5012ED3 OR RFOPB5012ED2 | RFOPB5012WB or RFOPB5012WBA | RF12CRP |
| PS10035-14 | 7/8 | RPT14 | RFOPB5014 | RFOPB5014HDB | RFOPB5014ED3 OR RFOPB5014ED2 | RFOPB5014WB or RFOPB5014WBA | RF14CRP |
| PS10035-16 | 1 | RPT16 | RFOPB5016 | RFOPB5016HDB | RFOPB5016ED3 OR RFOPB50016ED2 | RFOPB5016WB or RFOPB5016WBA | RF16CRP |
| PS10035-20 | 1-1/4 | RPT20 | RFOPB5020 | RFOPB5020HDB | RFOPB5020ED3 OR RFOPB5020ED2 | RFOPB5020WB or RFOPB5020WBA | RF20CRP |
| PS10035-24 | 1-1/2 | RPT24 | RFOPB5024 | RFOPB5024HDB | RFOPB5024ED3 OR RFOPB50024ED2 | ----- | RF24CRP |
| PS10035-32 | 2 | RPT32 | RFOPB5032 | RFOPB5032HDB | RFOPB5032ED3 OR RFOPB5032ED2 | ----- | RF32CRP |

RPT() SERIES

STANDARD PORT CONTOUR CUTTER SHORT SERIES – CARBIDE TIPPED



| PORTING TOOL NUMBER | TUBING OD REF | A DIA +.0000 -.0003 | B DIA +.0000 -.0003 | C DIA +.0000 -.0003 | D ±.005 | E ±.030 | PORT THREAD MIL-S-8879 CLASS 3B REF | TO PRODUCE CONTOUR FOR PORT NUMBER |
|---------------------|---------------|---------------------------|---------------------------|---------------------------|------------|------------|--|------------------------------------|
| RPT02* | 1/8 | .3748 | .1842 | .3818 | .610 | 4.000 | .2160-28UNJF | PS10035-02 |
| RPT03* | 3/16 | .3748 | .2182 | .4488 | .670 | 4.000 | .2500-28UNJF | PS10035-03 |
| RPT04* | 1/4 | .4998 | .2749 | .4958 | .700 | 4.000 | .3125-24UNJF | PS10035-04 |
| RPT05 | 5/16 | .4998 | .3374 | .6018 | .725 | 3.475 | .3750-24UNJF | PS10035-05 |
| RPT06 | 3/8 | .4998 | .3918 | .6758 | .785 | 3.535 | .4375-20UNJF | PS10035-06 |
| RPT07 | 7/16 | .4998 | .4543 | .7478 | .780 | 3.780 | .5000-20UNJF | PS10048-07 |
| RPT08 | 1/2 | .4998 | .5114 | .7848 | .850 | 3.850 | .5625-18UNJF | PS10035-08 |
| RPT09 | 9/16 | .4998 | .5874 | .8608 | .770 | 3.780 | .6250-24UNJEF | PS10048-09 |
| RPT10 | 5/8 | .4998 | .6499 | 1.0158 | .810 | 3.810 | .6875-24UNJEF | PS10035-10 |
| RPT11 | 11/16 | .4998 | .7043 | 1.0738 | .810 | 3.81 | .7500-20UNJEF | PS10048-11 |
| RPT12 | 3/4 | .4998 | .7668 | 1.1398 | .950 | 4.200 | .8125-20UNJEF | PS10035-12 |
| RPT13 | 13/16 | .4998 | .8293 | 1.2818 | .920 | 4.00 | .8750-20UNJEF | N/A |
| RPT14 | 7/8 | .7498 | .8918 | 1.3118 | .987 | 4.240 | .9375-20UNJEF | PS10035-14 |
| RPT15 | 15/16 | .7498 | .9513 | 1.4278 | .950 | 3.75 | 1.000-20UNJEF | N/A |
| RPT16 | 1 | .7498 | 1.0729 | 1.4278 | 1.015 | 4.265 | 1.125-18UNJEF | PS10035-16 |
| RPT20 | 1-1/4 | .7498 | 1.2614 | 1.7508 | 1.090 | 4.520 | 1.3125-18UNJEF | PS10035-20 |
| RPT24 | 1-1/2 | .7498 | 1.5739 | 2.0008 | 1.205 | 4.560 | 1.6250-18UNJEF | PS10035-24 |
| RPT32 | 2 | .9998 | 2.0642 | 2.5185 | 1.480 | 4.765 | 2.1250-16UNJ | PS10035-32 |

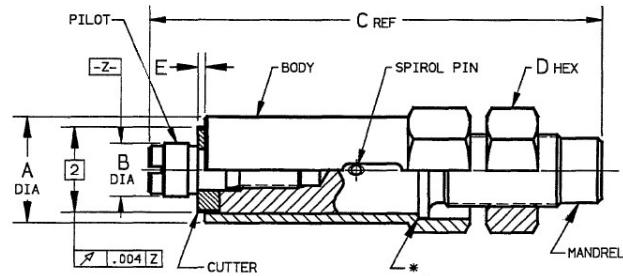
*SOLID CARBIDE

APPLICATION:

This tool counterbores, countersinks, provides a radius and produces a tap drill diameter in one pass. Countours are ground to insure concentricity. Cutter geometry permits the use of these tools with most common materials

RFOPB5000 SERIES

BROACH TOOL – HAND HELD PS10035 PORT SERRATIONS



| BROACH TOOL NUMBER | CUTTER NUMBER 1 | A DIA ±.015 | B DIA +.0000 -.0010 | C REF | D HEX REF | E ±.015 -.000 | TO PRODUCE SERRATIONS FOR PORT NUMBER |
|--------------------|--------------------|-------------------|------------------------------|----------|-----------------|---------------------|---------------------------------------|
| RFOPB5002 | RFOPB5002-3 | .600 | .1822 | 5.32 | .62 | .063 | PS10035-02 |
| RFOPB5003 | RFOPB5003-3 | .730 | .2162 | 5.32 | .75 | .063 | PS10035-03 |
| RFOPB5004 | RFOPB5004-3 | .790 | .2729 | 5.32 | .81 | .063 | PS10035-04 |
| RFOPB5005 | RFOPB5005-3 | .920 | .3354 | 5.34 | .94 | .063 | PS10035-05 |
| RFOPB5006 | RFOPB5006-3 | .980 | .3898 | 5.42 | 1.00 | .075 | PS10035-06 |
| RFOPB5007 | RFOPB5006-3 | 1.020 | .3898 | 5.44 | 1.06 | .075 | PS10035-07 |
| RFOPB5008 | RFOPB5008-3 | 1.070 | .5094 | 5.46 | 1.12 | .075 | PS10035-08 |
| RFOPB5009 | RFOPB5009-3 | 1.170 | .5094 | 5.46 | 1.19 | .075 | PS10035-09 |
| RFOPB5010 | RFOPB5010-3 | 1.290 | .6479 | 5.48 | 1.31 | .075 | PS10035-10 |
| RFOPB5011 | RFOPB5011-3 | 1.360 | .6479 | 5.48 | 1.38 | .075 | PS10035-11 |
| RFOPB5012 | RFOPB5012-3 | 1.420 | .7648 | 5.54 | 1.44 | .075 | PS10035-12 |
| RFOPB5013 | RFOPB5013-3 | 1.600 | .7648 | 5.59 | 1.62 | .075 | PS10035-13 |
| RFOPB5014 | RFOPB5014-3 | 1.600 | .8898 | 5.61 | 1.62 | .075 | PS10035-14 |
| RFOPB5015 | RFOPB5016-3 | 1.730 | .8898 | 5.62 | 1.75 | .075 | PS10035-15 |
| RFOPB5016 | RFOPB5016-3 | 1.730 | 1.0719 | 5.62 | 1.75 | .075 | PS10035-16 |
| RFOPB5020 | RFOPB5020-3 | 2.040 | 1.2594 | 5.64 | 2.25 | .095 | PS10035-20 |
| RFOPB5024 | RFOPB5024-3 | 2.300 | 1.5719 | 5.65 | 2.50 | .095 | PS10035-24 |
| RFOPB5032 | RFOPB5032-3 | 2.810 | 2.0647 | 5.65 | 2.88 | .095 | PS10035-32 |

NOTES: UNLESS OTHERWISE SPECIFIED

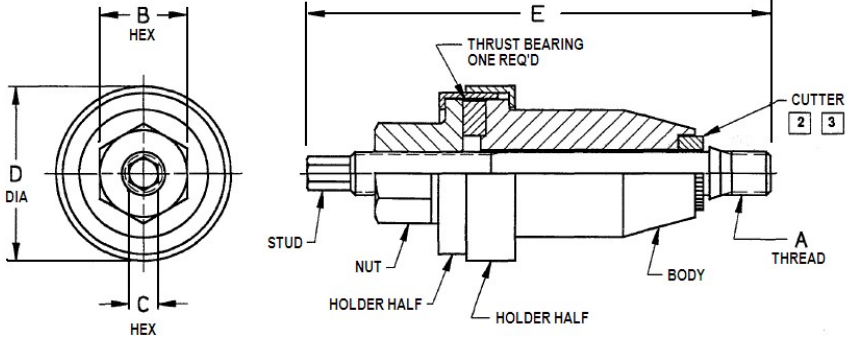
- 1 Replacement cutters may be purchased individually
- 2 Inspection of noted runout and use of controlled minor diameter per Rosan PS10035 port specification will provide an allowable maximum runout of .009 between serration major diameter and controlled minor diameter after broaching.

APPLICATION: This broach tool, when used in arbor, hydraulic presses or manually, is designed to produce serrations in the counterbore wall of ports prepared per PS10035. The tool will broach aluminum, magnesium, and many steels with hardness of 32 HRC or less. Successful broaching of harder or tougher material may be accomplished, but tool cutter wear is to be expected.

METHOD: The pilot is inserted into the tap drill hole of PS10035 port, and sufficient force applied to the top of the mandrel to allow the cutter to broach into the counterbore. When the external shoulder of the mandrel contacts the internal shoulder of the body*, broaching is complete. If cutter sticks in counterbore, turn the nut in a clockwise direction to extract the cutter. Caution: nut is for cutter removal only and is not a stop. Always back off nut when broaching. Hole can be tapped before or after broaching.

RFOPB5000HDB SERIES

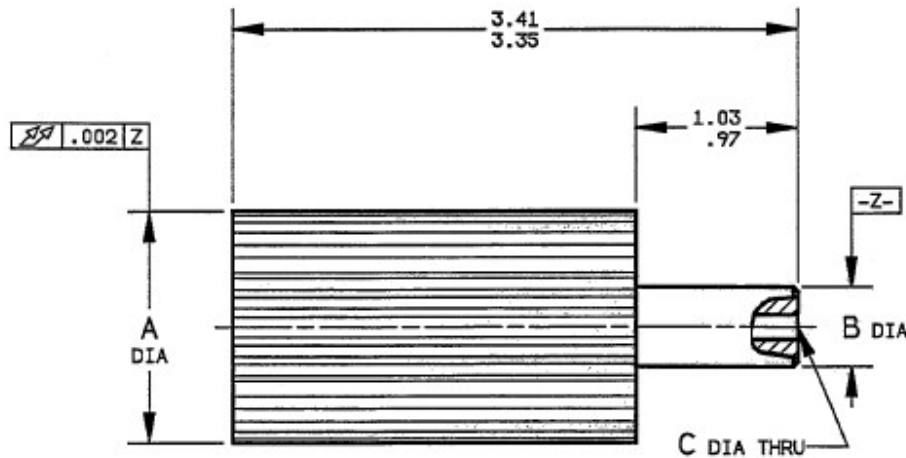
**BROACH TOOL – NON-IMPACT
PS10035 PORT SERRATIONS
(FOR MATERIAL UP TO 40 HRC)**



| BROACH TOOL NUMBER | CUTTER NUMBER 2 3 | STUD PART NUMBER 4 | THRUST BEARING PART NUMBER | A THREAD MIL-S-8879 CLASS 3A | B HEX REF | C HEX REF | D DIA MAX | E ±.03 | TO PRODUCE SERRATIONS FOR PORT NUMBER |
|--------------------|----------------------|-----------------------|----------------------------|---------------------------------------|-----------------|-----------------|-----------------|-----------|---------------------------------------|
| RFOPB5002HDB | RFOPB5002HDB5 | RFOPB5002HDB4 | AXK0619TN | .2160-28UNJF | .500 | .125 | 1.04 | 3.10 | PS10035-02 |
| RFOPB5003HDB | RFOPB5003HDB5 | RFOPB5003HDB4 | AXK0821TN | .2500-28UNJF | .625 | .172 | 1.14 | 3.58 | PS10035-03 |
| RFOPB5004HDB | RFOPB5004HDB5 | RFOPB5004HDB4 | K81102TN | .3125-24UNJF | .750 | .218 | 1.41 | 3.86 | PS10035-04 |
| RFOPB5005HDB | RFOPB5005HDB5 | RFOPB5005HDB4 | K81103TN | .3750-24UNJF | .750 | .250 | 1.53 | 4.00 | PS10035-05 |
| RFOPB5006HDB | RFOPB5006HDB5 | RFOPB5006HDB4 | K81104TN | .4375-20UNJF | 1.000 | .312 | 1.85 | 4.71 | PS10035-06 |
| RFOPB5008HDB | RFOPB5008HDB5 | RFOPB5008HDB4 | K81105TN | .5625-18UNJF | 1.000 | .375 | 2.04 | 4.96 | PS10035-08 |
| RFOPB5010HDB | RFOPB5010HDB5 | RFOPB5010HDB4 | K81206TN | .6875-24UNJEF | 1.000 | .500 | 2.32 | 4.54 | PS10035-10 |
| RFOPB5012HDB | RFOPB5012HDB5 | RFOPB5012HDB4 | K81206TN | .8125-20UNJEF | 1.125 | .625 | 2.32 | 4.73 | PS10035-12 |
| RFOPB5014HDB | RFOPB5014HDB5 | RFOPB5014HDB4 | K81208TN | .9375-20UNJEF | 1.250 | .750 | 3.01 | 5.51 | PS10035-14 |
| RFOPB5016HDB | RFOPB5016HDB5 | RFOPB5016HDB4 | K81208TN | 1.125-18UNJEF | 1.500 | .875 | 3.01 | 5.76 | PS10035-16 |
| RFOPB5020HDB | RFOPB5020HDB5 | RFOPB5020HDB4 | K81208TN | 1.3125-18UNJEF | 1.625 | 1.062 | 3.01 | 5.94 | PS10035-20 |
| RFOPB5024HDB | RFOPB5024HDB5 | RFOPB5024HDB4 | K89407TN | 1.6250-18UNJEF | 1.750 | 1.000 | 3.44 | 6.11 | PS10035-24 |
| RFOPB5032HDB | RFOPB5032HDB5 | RFOPB5032HDB4 | K89408TN | 2.1250-16UNJ | 2.000 | 1.125 | 3.88 | 6.61 | PS10035-32 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 Usage of tool is described in TSB52273. This tool will broach serrations into most materials with hardness up to 40 HRC.
- 2 Two extra cutters are provided with each tool.
- 3 Replacement cutters may be purchased individually
- 4 Replacement studs may be purchased individually
- 5 Use of this tool will provide an allowable maximum runout of .009 between serration major diameter and controlled minor diameter (REF: PS10035) after broaching.



| BROACH TOOL NUMBER | A DIA +.002 -.004 | NUMBER OF TEETH | B DIA +.002 | C DIA +.010 | TO PRODUCE SERRATIONS FOR PORT NUMBER |
|--------------------|----------------------------|-----------------|-------------------|-------------------|---------------------------------------|
| RFOPB5002ED2 | .399 | 24 | .312 | .109 | PS10035-02 |
| RFOPB5003ED2 | .468 | 26 | .375 | .125 | PS10035-03 |
| RFOPB5004ED2 | .514 | 30 | .375 | .125 | PS10035-04 |
| RFOPB5005ED2 | .624 | 36 | .500 | .156 | PS10035-05 |
| RFOPB5006ED2 | .699 | 36 | .500 | .156 | PS10035-06 |
| RFOPB5008ED2 | .814 | 40 | .500 | .156 | PS10035-08 |
| RFOPB5010ED2 | 1.040 | 38 | .500 | .156 | PS10035-10 |
| RFOPB5012ED2 | 1.170 | 40 | .750 | .156 | PS10035-12 |
| RFOPB5014ED2 | 1.341 | 50 | .750 | .156 | PS10035-14 |
| RFOPB5016ED2 | 1.456 | 36 | .750 | .156 | PS10035-16 |
| RFOPB5020ED2 | 1.782 | 56 | 1.000 | .156 | PS10035-20 |
| RFOPB5024ED2 | 2.032 | 81 | 1.500 | .156 | PS10035-24 |
| RFOPB5032ED2 | 2.548 | 102 | 1.500 | .156 | PS10035-32 |

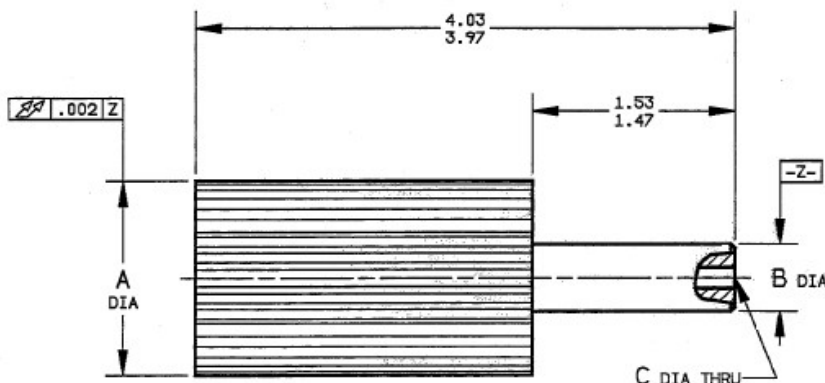
NOTES: UNLESS OTHERWISE SPECIFIED

- 1 MATERIAL: UNION POCO GRADE EDM-3 GRAPHITE, with option of alloy steel shank.
- 2 This tool is designed to provide approximately 10 times the life of tools made from brass (RFOPB5000ED Series).
- 3 When using this tool, the machine should be set to produce a burn which is .009 to .011 larger on the diameter than "A". This will allow the locking to fit into the serration produced with about .004 to .005 clearance. The applicable locking may be used to gage the port serration

CAUTION: Care must be taken when machining to provide the following requirements: A maximum runout of .009 must be maintained between serration major dia and controlled minor dia (specified in Rosan®PS10035 port specification) after machining.

RFOPB500ED3 SERIES

BROACH TOOL – COPPER TUNGSTEN ELECTRICAL DISCHARGE MACHINING PS10035 PORT SERRATIONS



| BROACH TOOL NUMBER | A DIA +.002 -.004 | NUMBER OF TEETH | B DIA ±.002 | C DIA ±.010 | TO PRODUCE SERRATIONS FOR PORT NUMBER |
|--------------------|-------------------------|-----------------|----------------|----------------|---------------------------------------|
| RFOPB5002ED3 | .411 | 24 | .312 | .109 | PS10035-02 |
| RFOPB5003ED3 | .480 | 26 | .375 | .125 | PS10035-03 |
| RFOPB5004ED3 | .526 | 30 | .375 | .125 | PS10035-04 |
| RFOPB5005ED3 | .637 | 36 | .500 | .156 | PS10035-05 |
| RFOPB5006ED3 | .712 | 36 | .500 | .156 | PS10035-06 |
| RFOPB5008ED3 | .826 | 40 | .500 | .156 | PS10035-08 |
| RFOPB5010ED3 | 1.054 | 38 | .500 | .156 | PS10035-10 |
| RFOPB5012ED3 | 1.184 | 40 | .500 | .156 | PS10035-12 |
| RFOPB5014ED3 | 1.356 | 50 | .500 | .156 | PS10035-14 |
| RFOPB5016ED3 | 1.473 | 36 | .500 | .156 | PS10035-16 |
| RFOPB5020ED3 | 1.797 | 56 | .500 | .156 | PS10035-20 |
| RFOPB5024ED3 | 2.047 | 81 | .500 | .156 | PS10035-24 |
| RFOPB5032ED3 | 2.563 | 102 | .500 | .156 | PS10035-32 |

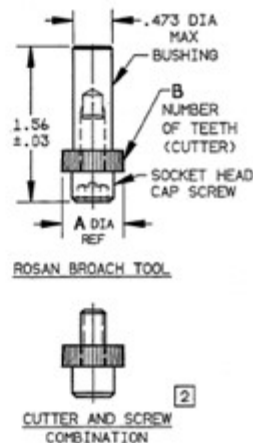
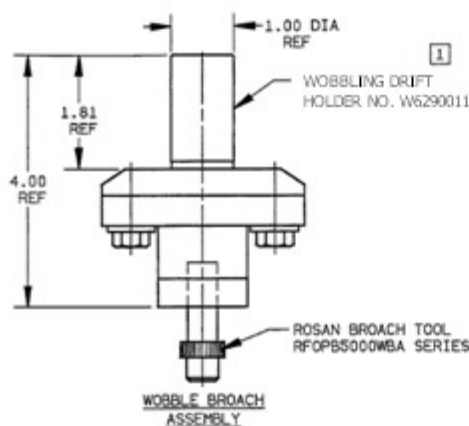
NOTES: UNLESS OTHERWISE SPECIFIED

- 1 MATERIAL: COPPER TUNGSTEN, with option of alloy steel shank.
- 2 When using this tool, the machine should be set to produce a burn which is .002 to .003 larger on the diameter than "A" Dia. This will allow the locking to fit into the serration produced with about .004 to .005 clearance. The applicable locking may be used to gage the port serration.

CAUTION: Care must be taken when machining to provide the following requirements: A maximum runout of .009 must be maintained between serration major dia and controlled minor dia (specified in Rosan PS10035 port specification) after machining.

RFOPB5000WBA SERIES

BROACH TOOL WOBBLE BROACH MACHINING PS10035 PORT SERRATIONS



| BROACH TOOL NUMBER | CUTTER AND SCREW COMBINATION NUMBER ² | A NUMBER OF TEETH | B DIA ±.002 | TO PRODUCE SERRATIONS FOR PORT NUMBER |
|--------------------|--|-------------------|-------------|---------------------------------------|
| RFOPB5002WBA | RFOPB5002WBA23 | 24 | .412 | PS10035-02 |
| RFOPB5003WBA | RFOPB5003WBA23 | 26 | .481 | PS10035-03 |
| RFOPB5004WBA | RFOPB5004WBA23 | 30 | .527 | PS10035-04 |
| RFOPB5005WBA | RFOPB5005WBA23 | 36 | .638 | PS10035-05 |
| RFOPB5006WBA | RFOPB5006WBA23 | 36 | .713 | PS10035-06 |
| RFOPB5008WBA | RFOPB5008WBA23 | 40 | .827 | PS10035-08 |
| RFOPB5010WBA | RFOPB5010WBA23 | 38 | 1.055 | PS10035-10 |
| RFOPB5012WBA | RFOPB5012WBA23 | 40 | 1.185 | PS10035-12 |
| RFOPB5014WBA | RFOPB5014WBA23 | 50 | 1.357 | PS10035-14 |
| RFOPB5016WBA | RFOPB5016WBA23 | 36 | 1.474 | PS10035-16 |
| RFOPB5020WBA | RFOPB5020WBA23 | 56 | 1.798 | PS10035-20 |
| RFOPB5024WBA | RFOPB5024WBA23 | 81 | 2.048 | PS10035-24 |
| RFOPB5032WBA | RFOPB5032WBA23 | 102 | 2.564 | PS10035-32 |

NOTES: UNLESS OTHERWISE SPECIFIED

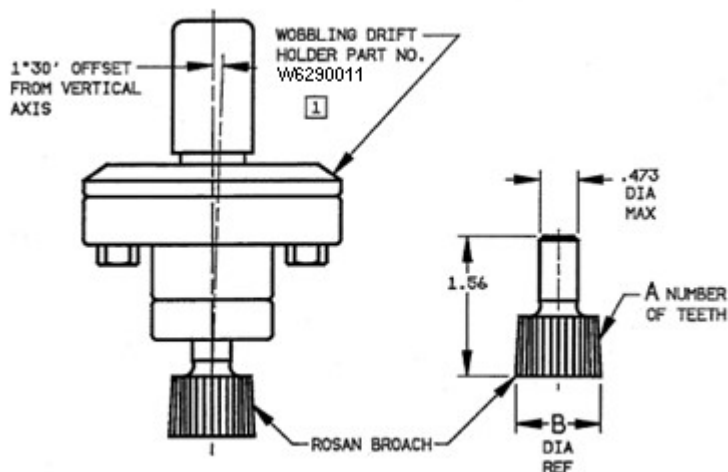
¹ Wobbling Drift Hold is ordered separately using part number W6290011

² Cutter and Screw combination can be ordered separately for spares or replacement

³ USAGE: These tools are designed to broach serrations into counterbore of ports PS10035 (AS1300) and PS10048 with parent material hardness up to 40HRC. For harder materials, electrical discharge broach tools are available.

RFOPB5000WB SERIES

BROACH TOOL WOBBLE BROACH MACHINING PS10035 PORT SERRATIONS

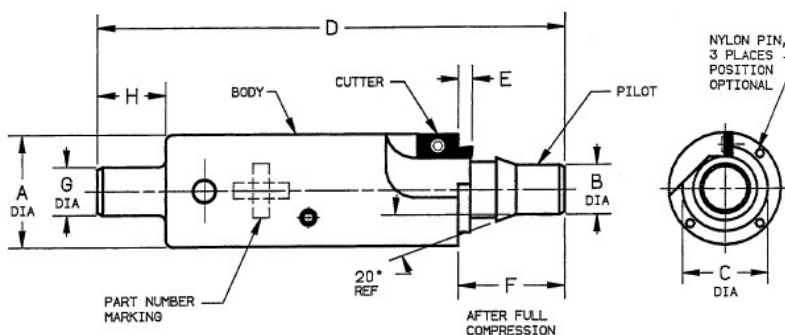


| BROACH TOOL NUMBER | A NUMBER OF TEETH | B DIA ±.002 | TO PRODUCE SERRATIONS FOR PORT NUMBER |
|--------------------|----------------------------|-------------------|--|
| RFOPB5002WB | 24 | .412 | PS10035-02 |
| RFOPB5003WB | 26 | .481 | PS10035-03 |
| RFOPB5004WB | 30 | .527 | PS10035-04 |
| RFOPB5005WB | 36 | .638 | PS10035-05 |
| RFOPB5006WB | 36 | .713 | PS10035-06 |
| RFOPB5008WB | 40 | .824 | PS10035-08 |
| RFOPB5010WB | 38 | 1.055 | PS10035-10 |
| RFOPB5012WB | 40 | 1.185 | PS10035-12 |
| RFOPB5014WB | 50 | 1.357 | PS10035-14 |
| RFOPB5016WB | 36 | 1.474 | PS10035-16 |
| RFOPB5020WB | 56 | 1.798 | PS10035-20 |

NOTES: UNLESS OTHERWISE SPECIFIED

1 Wobbling Drift Hold is ordered separately using part number W6290011

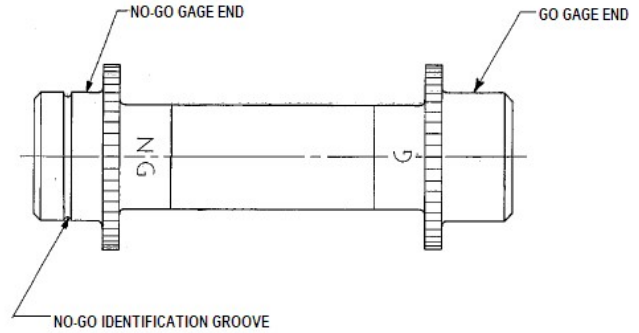
CAUTION: Care must be taken when machining to provide the following requirements: A maximum runout of .009 must be maintained between serration major dia and controlled minor dia (specified in Rosan PS10035 port specification) after broaching.



| CHIP REMOVAL TOOL NUMBER | CUTTER PART NUMBER | A | B | C | D | E | F | G | H |
|-----------------------------------|--------------------------|--------------|-----------------------|-----------------------|------|------|-------|--------------|-------|
| | | DIA ±.010 | DIA +.000 -.005 | DIA +.002 -.010 | REF | MIN | MAX | DIA ±.010 | ±.015 |
| RF02CRP | RF0206CRP-1 | .688 | .183 | .371 | 5.35 | .077 | .490 | .375 | 1.75 |
| RF03CRP | RF0206CRP-1 | .750 | .217 | .438 | 5.35 | .077 | .508 | .375 | 1.75 |
| RF04CRP | RF0206CRP-1 | .750 | .274 | .485 | 5.35 | .077 | .535 | .375 | 1.75 |
| RF05CRP | RF0206CRP-1 | .875 | .337 | .591 | 5.4 | .077 | .562 | .375 | 1.75 |
| RF06CRP | RF0206CRP-1 | .875 | .391 | .665 | 5.4 | .092 | .606 | .375 | 1.75 |
| RF08CRP | RF0832CRP-1 | 1.000 | .511 | .774 | 5.5 | .092 | .656 | .375 | 1.75 |
| RF10CRP | RF0832CRP-1 | 1.250 | .649 | 1.005 | 6.00 | .092 | .676 | .500 | 2.25 |
| RF12CRP | RF0832CRP-1 | 1.375 | .766 | 1.129 | 6.10 | .092 | .746 | .500 | 2.25 |
| RF14CRP | RF0832CRP-1 | 1.500 | .891 | 1.301 | 6.10 | .092 | .782 | .500 | 2.25 |
| RF16CRP | RF0832CRP-1 | 1.625 | 1.072 | 1.417 | 6.10 | .092 | .788 | .500 | 2.25 |
| RF20CRP | RF0832CRP-1 | 2.000 | 1.261 | 1.740 | 6.15 | .119 | .820 | .500 | 2.25 |
| RF24CRP | RF0832CRP-1 | 2.250 | 1.573 | 1.990 | 6.20 | .119 | .860 | .500 | 2.25 |
| RF32CRP | RF0832CRP-1 | 2.750 | 2.063 | 2.506 | 6.35 | .119 | 1.032 | .500 | 2.25 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 Usage of tool is described in bulletin TSB91-0128
- 2 Cutter is replaceable and can be ordered separately for spares. One spare cutter is supplied with each tool assembly.
- 3 The RF()CRA (sizes 04, 06 and 08) or RF()CR (sizes 02 thru 32) may also be used to clear chips from PS10035 Port. For further information refer to bulletins TSB89-0606 (CRA Series) or TSB85-0228 (CR Series)



| GAGE MODEL NUMBER | FOR CHECKING PORT SERRATIONS |
|-------------------|------------------------------|
| RFOPB02PSG | PS10035-02 |
| RFOPB03PSG | PS10035-03 |
| RFOPB04PSG | PS10035-04 |
| RFOPB05PSG | PS10035-05 |
| RFOPB06PSG | PS10035-06 |
| RFOPB08PSG | PS10035-08 |
| RFOPB10PSG | PS10035-10 |
| RFOPB12PSG | PS10035-12 |
| RFOPB14PSG | PS10035-14 |
| RFOPB16PSG | PS10035-16 |
| RFOPB20PSG | PS10035-20 |
| RFOPB24PSG | PS10035-24 |
| RFOPB32PSG | PS10035-32 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 Tool is a Go/No-Go Gage
- 2 Go end should fit snugly into serrations, otherwise they are undersize
- 3 No-Go end should not be able to fit into serrations, otherwise they are oversize

SECTION 2

FLUID BOSS ADAPTER INSTALLATION & REMOVAL



- O-RING INSTALLATION TOOL
- WRENCHES AND DRIVE TOOLS
- LOCKRING REMOVAL TOOL

FLUID BOSS ADAPTER INSTALLATION AND REMOVAL

TABLE I

| FLUID BOSS ADAPTER NUMBERS ¹ | | | ROSAN PORT NUMBER (REF) | O-RING INSTALLATION TOOL | CHOICE OF INDIVIDUAL WRENCH AND DRIVE TOOL COMBINATION TOOL ² | | | LOCKRING REMOVAL TOOL NUMBER | TOOL KIT PART NUMBER ³ |
|--|--|--|--------------------------------------|--------------------------------|---|--|--|---------------------------------------|---|
| RF5000 SERIES | RFK9800 SERIES | RFK9900 SERIES | | | WRENCH PART NUMBER | LOCKRING DRIVE TOOL PART NUMBER | COMBINATION WRENCH AND DRIVE TOOL | | |
| ----- | RF9804-02-13 RF9804-03-13 | RF9904-02-13 RF9904-03-13 | PS10035-04 | ORT312 | RF6904W | RF9804DEK | RF9804DW | RF04LPDE | KM18 |
| RF5005-04-13 | RF9805-04-13 | RF9905-04-13 | PS10035-05 | ORT375 | RF6905W | RF9805DEK | RF9805DW | RF05LPDE | KM29 |
| RF5006-04-13 RF5006-05-13 | RF9806-04-13 RF9806-05-13 | RF9906-04-13 RF9906-05-13 | PS10035-06 | ORT437 | RF6906W | RF9806DEK | RF9806DW | RF06LPDE | KM30 |
| RF5008-04-13 RF5008-05-13 RF5008-06-13 | RF9808-04-13 RF9808-05-13 RF9808-06-13 | RF9908-04-13 RF9908-05-13 RF9908-06-13 | PS10035-08 | ORT562 | RF6908W | RF9808DEK | RF9808DW | RF08LPDE | KM13 |
| RF5010-04-13 RF5010-06-13 RF5010-08-13 | RF9810-04-13 RF9810-06-13 RF9810-08-13 | RF9910-04-13 RF9910-06-13 RF9910-08-13 | PS10035-10 | ORT687 | RF6910W | RF9810DEK | RF9810DW | RF10LPDE | KM19 |
| RF5012-04-13 RF5012-05-13 RF5012-06-13 RF5012-08-13 RF5012-10-13 | RF9812-04-13 RF9812-05-13 RF9812-06-13 RF9812-08-13 RF9812-10-13 | RF9912-04-13 RF9912-05-13 RF9912-06-13 RF9912-08-13 RF9912-10-13 | PS10035-12 | ORT812 | RF6912W | RF9812DEK | RF9812DW | RF12LPDE | KM31 |
| ----- | RF9814-10-13 | ----- | PS10035-14 | ORT937 | RF6914W | RF9814DEK | RF9814DW | RF14LPDE | KM32 |
| RF5016-04-13 RF5016-10-13 RF5016-12-13 | RF9816-04-13 RF9816-10-13 RF9816-12-13 | RF9916-04-13 RF9916-10-13 RF9916-12-13 | PS10035-16 | ORT1125 | RF6916W | RF9816DEK | RF9816DW | RF16LPDE | KM14 |
| RF5020-04-13 RF5020-12-13 RF5020-16-13 | RF9820-04-13 RF9820-12-13 RF9820-16-13 | RF9920-04-13 RF9920-12-13 RF9920-16-13 | PS10035-20 | ORT1312 | RF6920W | RF9820DEK | RF9820DW | RF20LPDE | KM15 |
| RF5024-16-13 RF5024-20T13 | RF9824-16-13 RF9824-20-13 | RF9924-16-13 RF9924-20-13 | PS10035-24 | ORT1625 | RF6924W | RF9824DEK | RF9824DW | RF24LPDE | KM28 |

NOTES UNLESS OTHERWISE SPECIFIED:

- 1** Adapters shown are a sampling of common standard Adapters. For assistance in selecting tools for other Adapter or Inserts contact Howmet Customer Support or visit our website.
- 2** Select from individual Wrench and Lockring Drive Tool or a Combination Wrench and Drive Tool.
- 3** Kits consist of one of each tool specified on the common line in Table I.

FLUID BOSS ADAPTER INSTALLATION AND REMOVAL

PORT PREPARATION

1. Prepare boss and port per PS10035 specifications and instructions.

O-RING INSTALLATION

2. Place the O-Ring Installation Tool over the port end thread of the adapter. Submerge the tool and O-Ring in the fluid to be used in the working system, or a lubricant compatible with the system fluid. Slide the O-Ring over the tool and onto the adapter. Insure that the O-Ring is not twisted and is properly seated in the groove of the adapter. See figure 1.
3. Remove the O-Ring installation tool.

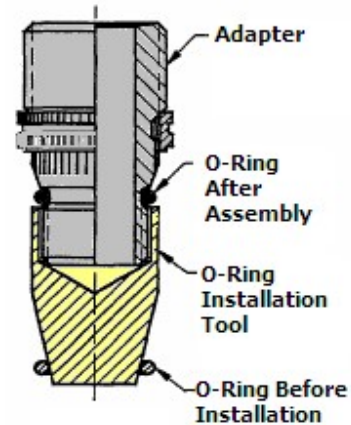


FIGURE 1

ADAPTER INSTALLATION

4. Lubricate the internal surfaces of the port and the entire adapter assembly using same fluid or lubricant as in note 2. Scratches, nicks or rough spots are not allowed in O-Ring contact area on the adapter or in the port.
5. Insert the O-Ring end of the adapter into port by hand in a clockwise direction until the adapter is seated. To avoid possible O-Ring damage, the adapter should not be rotated in a counterclockwise direction.
6. Using the applicable Combination Wrench or Wrench, engage the serrations of the tool with the external serrations of the adapter locking per figure 2. Place a torque wrench of the proper size over the hex of the wrench and apply a torque equal to the minimum value specified by the applicable size in Table I or II on the following page. Note the relationship of the serration of the locking with respect to the pre-broached serrations in the port. If they match, proceed to step 7. If the serrations do not match, continue to slowly torque the adapter toward the maximum value allowed in Table I and II until the serrations of the locking match the port serrations. This will normally take between 3° and 8° of turning and the maximum torque value need not be reached if the serrations align themselves prior to that value. Do not exceed the maximum torque values.

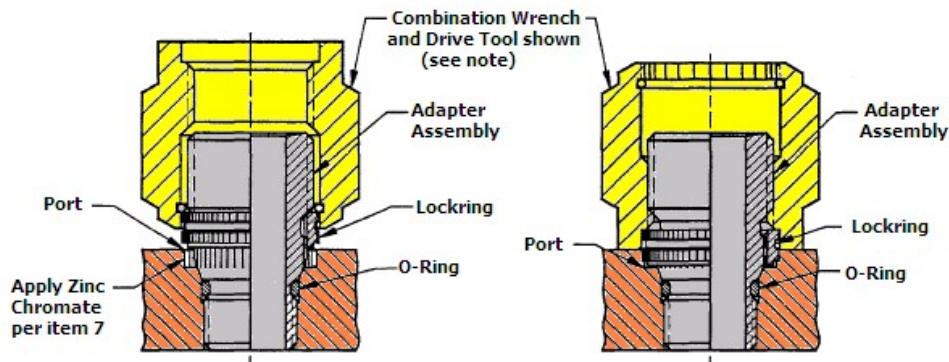


FIGURE 2
TORQUING ADAPTER ASSEMBLY

FIGURE 3
LOCKRING INSTALLATION

Continued-

FLUID BOSS ADAPTER INSTALLATION AND REMOVAL

-continued-

| ADAPTER BASIC NUMBER | O-RING NUMBER (REF) | INSTALLATION TORQUE in-lb | |
|----------------------------|---------------------------|---------------------------------|------|
| | | MIN | MAX |
| RF5002 | AS568-007 | 15 | 20 |
| RF5003 | AS568-008 | 29 | 36 |
| RF5004 | AS568-010 | 50 | 65 |
| RF5005 | AS568-011 | 100 | 125 |
| RF5006 | AS568-012 | 140 | 200 |
| RF5008 | AS568-014 | 270 | 375 |
| RF5010 | AS568-016 | 620 | 700 |
| RF5012 | AS568-116 | 855 | 945 |
| RF5014 | AS568-118 | 995 | 1105 |
| RF5016 | AS568-120 | 1140 | 1260 |
| RF5020T | AS568-123 | 1520 | 1680 |
| RF5024T | AS568-128 | 1900 | 2100 |

| ADAPTER BASIC NUMBER | O-RING NUMBER (REF) | INSTALLATION TORQUE in-lb | |
|----------------------------|---------------------------|---------------------------------|------|
| | | MIN | MAX |
| RFK9802 and RFK9902 | AS568-007 | 15 | 20 |
| RFK9803 and RFK9903 | AS568-008 | 29 | 36 |
| RFK9804 and RFK9904 | AS568-010 | 50 | 65 |
| RFK9805 and RFK9905 | AS568-011 | 100 | 125 |
| RFK9806 and RFK9906 | AS568-012 | 140 | 200 |
| RFK9808 and RFK9908 | AS568-014 | 270 | 375 |
| RFK9810 and RFK9910 | AS568-016 | 620 | 700 |
| RFK9812 and RFK9912 | AS568-116 | 855 | 945 |
| RFK9814 and RFK9914 | AS568-118 | 995 | 1105 |
| RFK9816 and RFK9916 | AS568-120 | 1140 | 1260 |
| RFK9820 and RFK9920 | AS568-123 | 1520 | 1680 |
| RFK9824 and RFK9924 | AS568-128 | 1900 | 2100 |

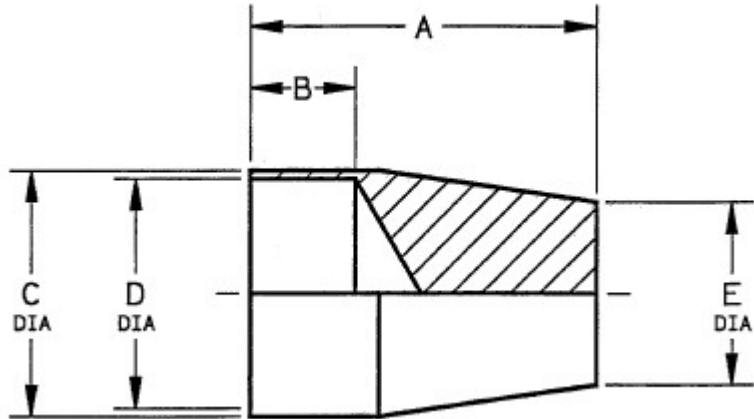
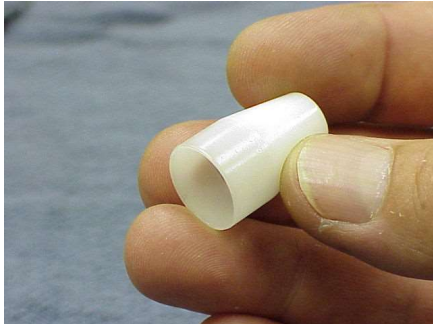
- Degrease and apply enough Zinc Chromate Primer (TT-P-1757) with a brush or small syringe to the counterbore area of the port and below the adapter locking so primer will be extruded out between external serrations of the locking and the serrations in the port when locking is installed. Note: Using design activity may specify another primer in place of or in addition to zinc chromate.
- If using a Combination Wrench, apply zinc chromate or sealant per item 7, install the locking by rotating the threaded end of the Combination Wrench clockwise on the adapter assembly until it touches the locking. Place an open end or socket wrench on the tool, turn the tool in a clockwise direction until it bottoms on the boss surface as shown in Figure 3 on the previous page. Observe that the tool has bottomed. (DO NOT OVER TORQUE – PORT DAMAGE CAN RESULT!) CAUTION: Any sudden increase in torque prior to bottoming may indicate that the locking serrations and the port serrations are not aligned. If this occurs, remove the wrench by turning counterclockwise. Lift the locking per locking removal instructions. Torque the adapter clockwise per Item 6 until serrations in port and the external serrations on the locking are aligned. Again attempt to install locking. Remove excess sealant on surface of boss and locking.

If using the separate Wrench and Lockring Drive Tool, place the proper size Drive Tool over the end of the adapter. When it is properly located it will rest on the locking. A hammer, arbor or hydraulic press may be used to press the locking into the boss. Installation is complete when the tool bottoms on the surface of the boss. Remove excess sealant on surface of boss and locking.

PRESSURE TESTING

- A proof pressure test of the unit may be conducted at this point. Place a pressure cap on the adapter. Pressurize the unit from another location on the unit to 1.5 times the operation pressure for three (3) minutes. There should be no leakage.

NOTE: Using design activity may require testing other than shown.



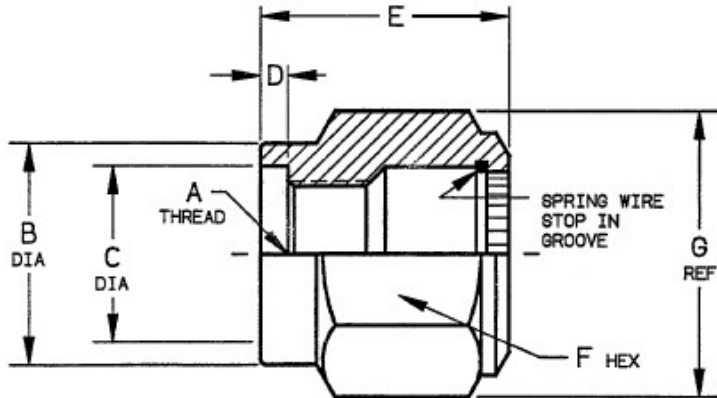
| O-RING INSTALLATION TOOL NUMBER | PORT SIZE | A ±.06 | B ±.05 -.01 | C DIA MAX | D DIA MIN | E DIA ±.040 |
|--|--------------|-----------|-------------------|-----------------|-----------------|-------------------|
| ORT216 | 02 | .71 | .19 | .283 | .218 | .100 |
| ORT250 | 03 | .79 | .23 | .322 | .252 | .130 |
| ORT312 | 04 | .83 | .23 | .385 | .315 | .109 |
| ORT375 | 05 | .86 | .25 | .445 | .377 | .250 |
| ORT437 | 06 | .90 | .28 | .505 | .440 | .310 |
| ORT500 | 07 | .94 | .33 | .565 | .506 | .400 |
| ORT562 | 08 | .98 | .33 | .635 | .565 | .435 |
| ORT687 | 10 | 1.05 | .39 | .755 | .690 | .550 |
| ORT750 | 11 | 1.09 | .41 | .817 | .755 | .645 |
| ORT812 | 12 | 1.12 | .49 | .885 | .815 | .670 |
| ORT875 | 13 | 1.16 | .52 | .945 | .880 | .760 |
| ORT937 | 14 | 1.19 | .55 | 1.010 | .940 | .795 |
| ORT1000 | 15 | 1.25 | .58 | 1.070 | 1.005 | .885 |
| ORT1125 | 16 | 1.25 | .58 | 1.205 | 1.127 | .920 |
| ORT1312 | 20 | 1.82 | .69 | 1.395 | 1.315 | .920 |
| ORT1625 | 24 | 1.94 | .78 | 1.715 | 1.627 | 1.420 |
| ORT2125 | 32 | 1.94 | 1.02 | 2.215 | 2.127 | 1.975 |

NOTES: UNLESS OTHERWISE SPECIFIED

1 MATERIAL: Teflon or Nylon

RF5000DW SERIES

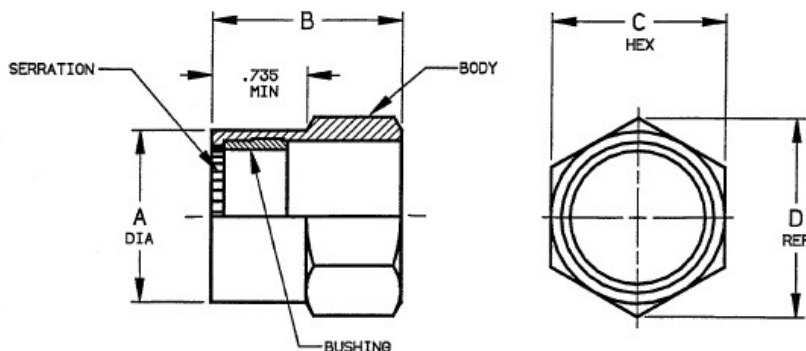
TOOL - COMBINATION DRIVE AND WRENCH



| COMBINATION WRENCH AND DRIVE TOOL NUMBER | A THREAD MIL-S-8879 CLASS 3B | B DIA ±.015 | C DIA ±.010 | D +.007 -.002 | E ±.015 | F HEX REF | G ACROSS CORNERS REF |
|---|---------------------------------------|-------------------|-------------------|---------------------|------------|-----------------|-------------------------------|
| RF5002DW | .3125-32UNJEF | .680 | .427 | .109 | 1.000 | .75 | .866 |
| RF5003DW | .3750-28UNJS | .750 | .496 | .109 | 1.000 | .75 | .866 |
| RF5004DW | .4375-24JUNJS | .800 | .542 | .109 | 1.000 | .81 | 9.38 |
| RF5005DW | .5000-24UNJS | .900 | .652 | .109 | 1.000 | .94 | 1.082 |
| RF5006DW | .5625-20UNJS | .980 | .727 | .115 | 1.120 | 1.00 | 1.155 |
| RF5007DW | .6562-20UNJS | 1.000 | .795 | .115 | 1.120 | 1.12 | 1.299 |
| RF5008DW | .7188-20UNJS | 1.100 | .842 | .115 | 1.120 | 1.12 | 1.299 |
| RF5009DW | .7812-18UNJS | 1.200 | .915 | .115 | 1.250 | 1.25 | 1.450 |
| RF5010DW | .8438-18UNJS | 1.320 | 1.070 | .115 | 1.250 | 1.38 | 1.588 |
| RF5011DW | .9375-16UNJ | 1.400 | 1.130 | .130 | 1.380 | 1.50 | 1.732 |
| RF5012DW | 1.0000-16UNJ | 1.450 | 1.200 | .130 | 1.380 | 1.50 | 1.732 |
| RF5013DW | 1.0625-16UNJ | 1.500 | 1.355 | .130 | 1.450 | 1.62 | 1.876 |
| RF5014DW | 1.1250-16UNJ | 1.580 | 1.373 | .130 | 1.450 | 1.62 | 1.876 |
| RF5015DW | 1.1875-16UNJ | 1.740 | 1.490 | .130 | 1.500 | 1.75 | 2.021 |
| RF5016DW | 1.2500-14UNJS | 1.740 | 1.490 | .130 | 1.500 | 1.75 | 2.021 |
| RF5020DW | 1.5156-14UNJS | 2.070 | 1.820 | .130 | 1.500 | 2.12 | 2.454 |
| RF5020TDW | 1.5781-14UNJS | 2.070 | 1.820 | .130 | 1.500 | 2.12 | 2.454 |
| RF5024DW | 1.7812-14UNJS | 2.340 | 2.070 | .130 | 1.600 | 2.50 | 2.886 |
| RF5024TDW | 1.8438-14UNJS | 2.340 | 2.070 | .130 | 1.600 | 2.50 | 2.886 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 This tool is used for standard RF5000 Series adapters only.



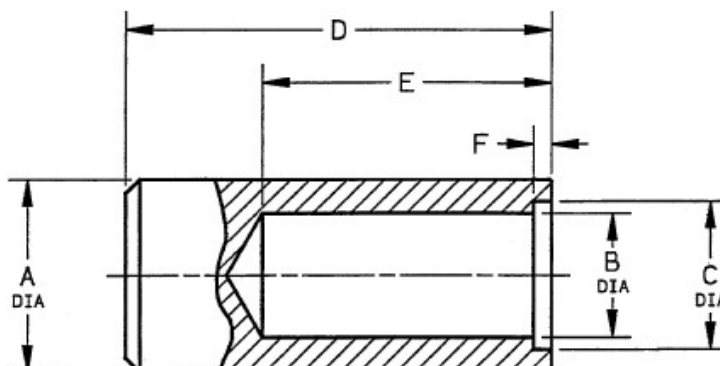
| WRENCH PART NUMBER | A DIA MAX | B + <u>.03</u> | C HEX | D ACROSS CORNERS REF | SERRATION NUMBER OF TEETH |
|--------------------------|-----------------|-------------------|----------|-------------------------------|---------------------------------|
| RF6902W | .572 | 1.50 | .56 | .649 | 24 |
| RF6903W | .698 | 1.50 | .69 | .794 | 26 |
| RF6904W | .760 | 1.50 | .75 | .866 | 30 |
| RF6905W | .760 | 1.50 | .75 | .866 | 36 |
| RF6906W | .885 | 1.50 | .88 | 1.010 | 36 |
| RF6908W | 1.010 | 1.50 | 1.00 | 1.155 | 40 |
| RF6910W | 1.198 | 1.50 | 1.19 | 1.371 | 38 |
| RF6912W | 1.385 | 1.50 | 1.38 | 1.588 | 40 |
| RF6914W | 1.635 | 1.50 | 1.62 | 1.876 | 50 |
| RF6916W ¹ | 1.760 | 1.50 | 1.75 | 2.021 | 36 |
| RF6920W | 2.010 | 1.50 | 2.00 | 2.309 | 56 |
| RF6924W | 2.260 | 1.50 | 2.25 | 2.598 | 81 |
| RF6932W ¹ | 2.885 | 1.75 | 2.88 | 3.320 | 102 |

NOTES: UNLESS OTHERWISE SPECIFIED

- ¹ Part number RF5332W will also be marked on RF6932W wrench; part number RF6915W will also be marked on RF6916W wrench.
- 2 These wrenches may be used to wrench in RF5000, RFH5000, RF75000, RFH7500, RF7700, RF9800, RFK9800, RF9900, RFH9900, RFK9900 series, as well as other adapters and check valves.

RF9800DEK SERIES

DRIVE TOOL - LOCKRING LIFT TYPE, ADAPTER

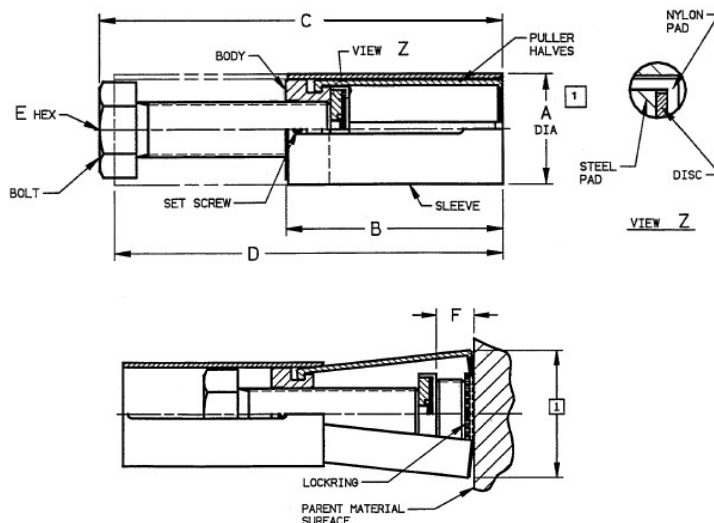


| LOCKRING DRIVE TOOL NUMBER | A DIA +.010 -.020 | B DIA +.007 -.001 | C DIA +.006 -.001 | D +.05 | E +.1 -.0 | F +.007 -.002 |
|-------------------------------------|----------------------------|----------------------------|----------------------------|-----------|-----------------|---------------------|
| RF9802DEK | .562 | .324 | .412 | 3.00 | 2.2 | .109 |
| RF9803DEK | .625 | .386 | .481 | 3.00 | 2.2 | .109 |
| RF9804DEK | .750 | .442 | .527 | 3.00 | 2.2 | .109 |
| RF9805DEK | .875 | .537 | .637 | 3.00 | 2.2 | .109 |
| RF9806DEK | 1.000 | .595 | .712 | 3.00 | 2.2 | .115 |
| RF9808DEK | 1.125 | .755 | .827 | 3.00 | 2.2 | .115 |
| RF9810DEK | 1.375 | .880 | 1.053 | 3.00 | 2.2 | .115 |
| RF9812DEK | 1.500 | 1.067 | 1.183 | 3.00 | 2.2 | .130 |
| RF9814DEK | 1.750 | 1.218 | 1.354 | 3.00 | 2.2 | .130 |
| RF9816DEK ⁴ | 1.875 | 1.327 | 1.469 | 3.00 | 2.2 | .130 |
| RF9820DEK | 2.125 | 1.630 | 1.795 | 3.00 | 2.2 | .130 |
| RF9824DEK | 2.375 | 1.880 | 2.045 | 3.00 | 2.2 | .130 |
| RF9832DEK | 2.875 | 2.505 | 2.561 | 4.00 | 2.2 | .130 |

NOTES: UNLESS OTHERWISE SPECIFIED

1 Lockring drive tool RF9800DEK supersedes RF9800D, RF9800DE and RF5000-02D

2 Part Number RF9815DEK will also be on RF9816DEK drive tool



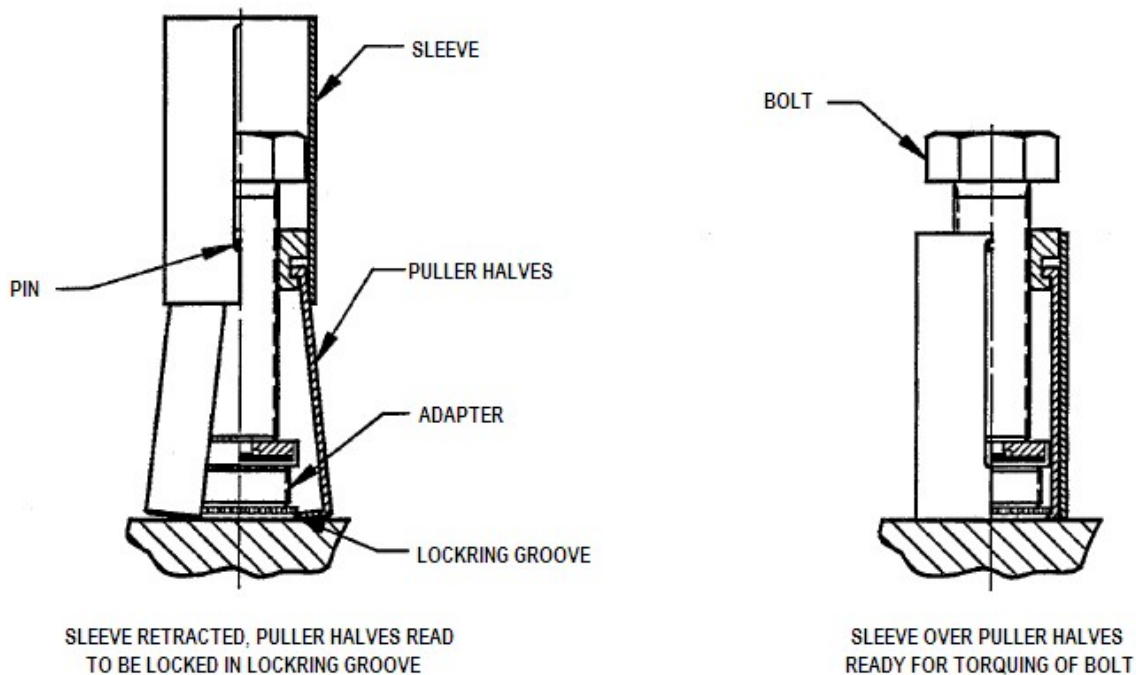
| LOCKRING REMOVAL TOOL NUMBER | A DIA MAX | B MAX | C MAX | D MAX | E HEX NOM | F | |
|---------------------------------------|-----------------|----------|----------|----------|-----------------|------|-------|
| | | | | | | MIN | MAX |
| RF02LPDE | .812 | 2.24 | 3.91 | 3.98 | .438 | .183 | 1.470 |
| RF03LPDE | .812 | 2.24 | 3.91 | 3.98 | .438 | .183 | 1.470 |
| RF04LPDE | .812 | 2.24 | 3.91 | 3.98 | .438 | .183 | 1.470 |
| RF05LPDE | .937 | 2.41 | 4.31 | 4.31 | .562 | .191 | 1.634 |
| RF06LPDE | 1.000 | 2.48 | 4.44 | 4.46 | .562 | .209 | 1.705 |
| RF08LPDE | 1.125 | 2.63 | 4.73 | 4.72 | .625 | .209 | 1.792 |
| RF10LPDE | 1.375 | 2.80 | 5.12 | 4.98 | .938 | .214 | 1.875 |
| RF12LPDE | 1.500 | 2.93 | 5.47 | 5.26 | 1.125 | .214 | 2.010 |
| RF14LPDE | 1.688 | 3.19 | 5.82 | 5.68 | 1.312 | .224 | 2.124 |
| RF16LPDE 4 | 1.812 | 3.34 | 6.18 | 6.01 | 1.312 | .224 | 2.238 |
| RF20LPDE | 2.250 | 3.60 | 6.72 | 6.52 | 1.312 | .204 | 2.490 |
| RF24LPDE | 2.500 | 4.02 | 7.35 | 7.18 | 1.312 | .225 | 2.795 |
| RF32LPDE | 3.125 | 4.81 | 8.83 | 8.76 | 1.312 | .245 | 3.545 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 Puller halves will engage locking groove when expanded to "A" diameter.
- 2 Range of adapter stand-off that removal tool will accommodate
- 3 RF()LPDE series supersedes RF9800LPD series and will remove all basic adapters, reducers, restrictors, filters and quick disconnects.
- 4 Part number RF15LPDE will also be on RF16LPDE removal tool.

ADAPTER REMOVAL

- 1 If a sealant has been used to cover locking, carefully remove sealant to expose locking
- 2 Select the proper size locking removal tool for your Adapter
- 3 Spread the puller halves apart by retracting the sleeve from the tool until the pin bottoms in the groove of the sleeve as shown below. Holding the puller halves apart, place the tool over the protruding adapter. Release the puller halves and locate in the groove of the locking. Adjustment up or down is achieved by turning the bolt head. Slide the sleeve over the puller halves and check for proper engagement of the puller halves in the locking groove.



LOCKRING RETRACTION

- 4 Place the wrench on the bolt head of the removal tool and turn in a clockwise direction while holding the sleeve with your other hand. This action will cause the locking to be jacked out of the port counterbore. When the external serrations of the locking are clear of the boss surface, the turning may be stopped. Remove the tool from the adapter by loosening the bolt and lifting the sleeve to free the puller halves.
- 5 Select the proper size drive wrench or combination wrench and drive tool from the installation tool section of this catalog. Engage the serrations of the wrench with those of the locking. Using an open end or socket wrench over the wrench hex, turn in a counterclockwise direction to disengage the adapter from the boss port. Plug the port minor diameter when cleaning out the cavity to avoid contamination of the fluid system.

ADAPTER, TOOL KITS

RF5000 SERIES

| KIT AND NATIONAL STOCK NUMBER | | | KIT CONTENTS (1 EACH) | | | |
|-------------------------------|-----------------|---------------------------------|---------------------------------|--|-----------------------|--------------------------|
| ADAPTER PART NUMBER REF | KIT PART NUMBER | KIT NATIONAL STOCK NUMBER (NSN) | O-RING INSTALLATION TOOL NUMBER | COMBINATION WRENCH AND DRIVE TOOL NUMBER | LOCKRING REMOVAL TOOL | KIT WEIGHT APPROX. (lbs) |
| RF5004-13 | KM9RF5004 | 5180-00-785-5062 | ORT312 | RF5004DW | RF5004LPD | 1.00 |
| RF5005-13 | KM9RF5005 | ----- | ORT375 | RF5005DW | RF5005LPD | 1.06 |
| RF5006-13 | KM9RF5006 | 5180-00-785-5063 | ORT437 | RF5006DW | RF5006LPD | 1.12 |
| RF5008-13 | KM9RF5008 | 5180-00-785-5068 | ORT562 | RF5008DW | RF5008LPD | 1.25 |
| RF5010-13 | KM9RF5010 | 5180-00-785-5069 | ORT687 | RF5010DW | RF5010LPD | 1.50 |
| RF5012-13 | KM9RF5012 | 5180-00-785-5073 | ORT812 | RF5012DW | RF5012LPD | 1.75 |
| RF5014-13 | KM9RF5014 | ----- | ORT937 | RF5014DW | RF5014LPD | 2.06 |
| RF5016-13 | KM9RF5016 | 5180-00-785-5080 | ORT1125 | RF5016DW | RF5016LPD | 2.25 |
| RF5020T13 | KM9RF5020T | 5180-00-782-7033 | ORT1312 | RF5020TDW | RF5020LPD | 3.00 |
| RF5024T13 | KM9RF5024T | ----- | ORT1625 | RF5024TDW | RF5024LPD | 3.75 |

RFK9800 and RFK9900

| KIT AND NATIONAL STOCK NUMBER | | | KIT CONTENTS (1 EACH) | | | |
|-------------------------------|-----------------|---------------------------------|---------------------------------|--|-----------------------|--------------------------|
| ADAPTER PART NUMBER REF | KIT PART NUMBER | KIT NATIONAL STOCK NUMBER (NSN) | O-RING INSTALLATION TOOL NUMBER | COMBINATION WRENCH AND DRIVE TOOL NUMBER | LOCKRING REMOVAL TOOL | KIT WEIGHT APPROX. (lbs) |
| RFK9804-13 RFK9904-13 | KM9RF9804 | 5180-00-008-5657 | ORT312 | RF9804DW | RF04LPDE | 1.00 |
| RFK9805-13 RFK9905-13 | KM9RF9805 | 5180-00-293-4647 | ORT375 | RF9805DW | RF05LPDE | 1.06 |
| RFK9806-13 RFK9906-13 | KM9RF9806 | 5180-00-008-5658 | ORT437 | RF9806DW | RF06LPDE | 1.13 |
| RFK9808-13 RFK9908-13 | KM9RF9808 | 5180-00-008-5659 | ORT562 | RF9808DW | RF08LPDE | 1.25 |
| RFK9810-13 RFK9910-13 | KM9RF9810 | 5180-00-008-5660 | ORT687 | RF9810DW | RF10LPDE | 1.63 |
| RFK9812-13 RFK9912-13 | KM9RF9812 | 5180-00-008-5661 | ORT812 | RF9812DW | RF12LPDE | 1.94 |
| RFK9914-13 | KM9RF9814 | ----- | ORT937 | RF9814DW | RF14LPDE | ----- |
| RFK9816-13 RFK9916-13 | KM9RF9816 | 5180-00-008-5637 | ORT1125 | RF9816DW | RF16LPDE | 2.38 |
| RFK9820-13 RFK9920-13 | KM9RF9820 | 5180-01-247-7341 | ORT1312 | RF9820DW | RF20LPDE | ----- |
| RFK9824-13 RFK9924-13 | KM9RF9824 | ----- | ORT1625 | RF9824DW | RF24LPDE | ----- |

GENERAL USAGE INSTALLATION AND REMOVAL TOOL KITS FOR USE WITH ADAPTERS, CHECK VALVES, FILTERS, QUICK DISCONNECTS AND REDUCERS

| ROSAN PORT END SIZE | KIT PART NUMBER | KIT NATIONAL STOCK NUMBER (NSN) | O-RING INSTALLATION TOOL NUMBER | WRENCH PART NUMBER | LOCKRING DRIVE TOOL NUMBER | LOCKRING REMOVAL TOOL NUMBER |
|---|--|---|--|--------------------------|-------------------------------------|---------------------------------------|
| -02 | KM35 | 5180-01-075-5690 | ORT216 | RF6902W | RF9802DEK | RF02LPDE |
| -03 | KM36 | 5180-01-077-1577 | ORT250 | RF6903W | RF9803DEK | RF03LPDE |
| -04 | KM18 | 5180-00-283-6999 | ORT312 | RF6904W | RF9804DEK | RF04LPDE |
| -05 | KM29 | 5180-01-075-0765 | ORT375 | RF6905W | RF9805DEK | RF05LPDE |
| -06 | KM30 2 KM22-640-2 | 5180-01-075-0766 5180-00-163-6640 | ORT437 | RF6906W | RF9806DEK | RF06LPDE |
| -08 | KM13 2 KM22-660-2 | 5180-00-283-6993 5180-00-163-6637 | ORT562 | RF6908W | RF9808DEK | RF08LPDE |
| -10 | KM19 2 KM22-680-2 | 5180-00-283-6989 5180-00-163-6633 | ORT687 | RF6910W | RF9810DEK | RF10LPDE |
| -12 | KM31 | 5180-01-077-1578 | ORT812 | RF6912W | RF9812DEK | RF12LPDE |
| -14 | KM32 | 5180-01-075-0767 | ORT937 | RF6914W | RF9814DEK | RF14LPDE |
| -16 | KM14 2 KM22-612-2 | 5180-00-283-6992 5180-00-179-0067 | ORT1125 | RF6916W | RF9816DEK | RF16LPDE |
| -20 | KM15 2 KM22-616-2 | 5180-00-283-6991 5180-00-163-6638 | ORT1312 | RF6920W | RF9820DEK | RF20LPDE |
| -24 | KM28 | 5180-01-075-0768 | ORT1625 | RF6924W | RF9824DEK | RF24LPDE |
| -32 | KM33 | 5180-01-075-5689 | ORT2125 | RF6932W | RF9832DEK | RF32LPDE |
| 3 | KM34 | 5180-01-263-9173 | See Following Page | | | |
| 3 | KM57 | | See Following Page | | | |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 Tools in these kits are universal since they will install and remove RF5000, RFH5000, RF5700, RF7500, RFH7500, RF7700, RF9800, RFK9800, RF9900, RFK9900 and RFH9000 series adapters, reducers, check valves, filters and quick disconnects.
- 2 Kits are identical and interchangeable except for part numbers and National Stock Numbers.
- 3 KM34 is a multi use kit containing tooling for port end sizes -04 thru -32. KM57 is for port end sizes 05 thru 12



KM34

Multi Use Installation and Removal Tool Kit

**Port Sizes
-04 thru -32**

KM57

Specialty Use Installation and Removal Tool Kit

**Port Sizes
-05 thru -12**

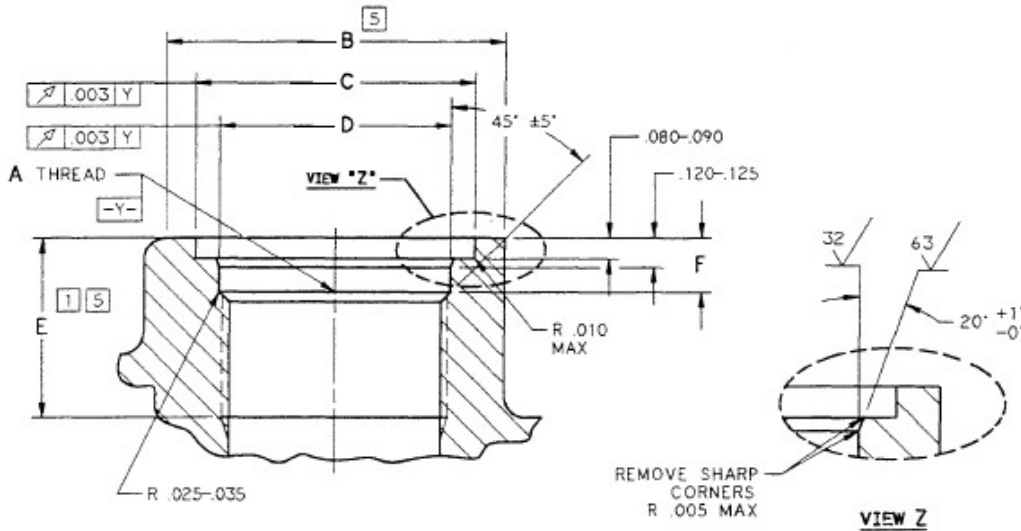


SECTION 3

FLUID BOSS INSERTS PORT SERRATION TOOLS



- PORTING TOOLS
- BROACH TOOLS



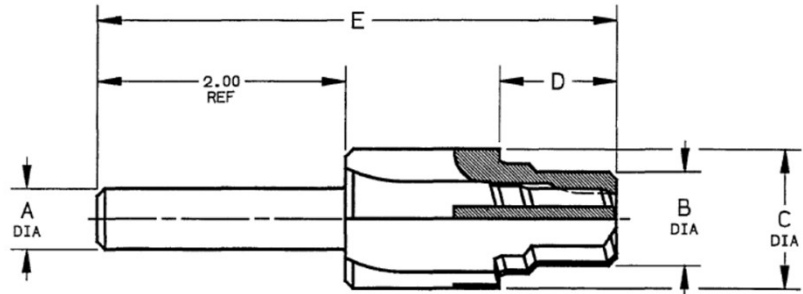
| ADAPTER NUMBER | AS I.D. NUMBER | A THREAD MIL-S-8879 CLASS 3B | B 5 MIN | C +.005 -.000 | D +.002 -.000 | E 5 MIN | F ±.005 |
|----------------|----------------|---------------------------------------|---------------|---------------------|---------------------|---------------|------------|
| PS10040-02 | AS1598-02 | .4375-28UNJEF | .80 | .670 | .473 | .550 | .225 |
| PS10040-03 | AS1598-03 | .5000-28UNJEF | .84 | .733 | .540 | .520 | .225 |
| PS10040-04 | AS1598-04 | .5625-24UNJEF | .92 | .795 | .603 | .565 | .225 |
| PS10040-05 | AS1598-05 | .6250-24UNJEF | .98 | .858 | .666 | .590 | .225 |
| PS10040-06 | AS1598-06 | .6875-24UNJEF | 1.03 | .905 | .728 | .620 | .225 |
| PS10040-08 | AS1598-08 | .9375-20UNJEF | 1.40 | 1.155 | .958 | .745 | .225 |
| PS10040-10 | AS1598-10 | 1.0625-18UNJEF | 1.60 | 1.280 | 1.083 | .830 | .225 |
| PS10040-12 | AS1598-12 | 1.2500-18UNJEF | 1.83 | 1.499 | 1.271 | .950 | .225 |
| PS10040-16 | AS1598-16 | 1.5000-18UNJEF | 2.20 | 1.765 | 1.521 | .950 | .225 |
| PS10040-20 | AS1598-20 | 1.8750-16UNJ | 2.80 | 2.155 | 1.922 | 1.000 | .265 |

NOTES UNLESS OTHERWISE SPECIFIED:

1. Recommended minimum full thread depth.
2. The drill and porting tool method of preparing the machined cavity is recommended. Refer to the RPT9500 series port contour cutter for available sizes.
3. When installing RF9500 series inserts into stainless steel or titanium or hardened ferrous materials the use of the RFPBT9500 or RFPBT9500HDB series broach tool is required.
4. When using the hand held piloted broach tool, the drill and porting method of preparing the machined cavity is mandatory.
5. The minimum port diameter "B" and port depth "E" are satisfactory for use in materials that exhibit a minimum shear strength of 14 KSI.

RPT9500 SERIES

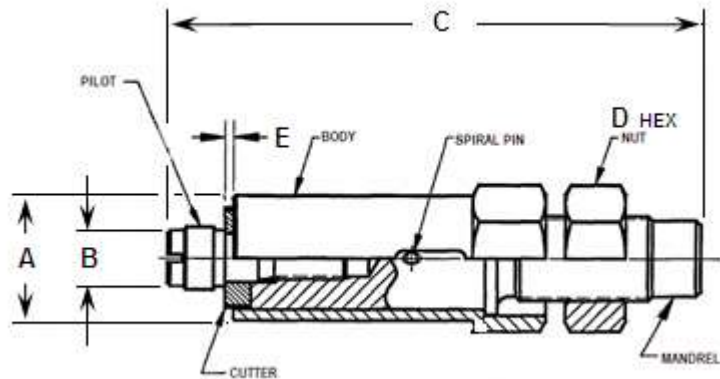
STANDARD PORT CONTOUR CUTTER SHORT SERIES – CARBIDE TIPPED PS10035 (AS1300) PORT



| PORTING TOOL NUMBER | A DIA +.0000 -.0003 | B DIA ±.0005 | C DIA ±.0003 | D ±.005 | E ±.030 | PORT THREAD MIL-S-8879 CLASS 3B REF | TO PRODUCE CONTOUR FOR PORT NUMBER |
|---------------------------|------------------------------|--------------------|--------------------|------------|------------|---|---|
| RPT9502 | .4998 | .4057 | .6725 | .700 | 3.450 | .4375-28UNJEF | PS 10040-02 |
| RPT9503 | .4998 | .4682 | .7355 | .645 | 3.645 | .5000-28UNJEF | PS 10040-03 |
| RPT9504 | .4998 | .5249 | .7975 | .750 | 3.750 | .5625-24UNJEF | PS 10040-04 |
| RPT9505 | .4998 | .5874 | .8605 | .750 | 3.750 | .6250-24UNJEF | PS 10040-05 |
| RPT9506 | .4998 | .6499 | .9075 | .800 | 3.800 | .6875-24UNJEF | PS 10040-06 |
| RPT9508 | .7498 | .8918 | 1.1575 | 1.005 | 4.255 | .9375-20UNJEF | PS 10040-08 |
| PRT9510 | .7498 | 1.0114 | 1.2825 | 1.120 | 4.370 | 1.0625-18UNJEF | PS 10040-10 |
| RPT9512 | .7498 | 1.1989 | 1.5015 | 1.240 | 7.740 | 1.2500-18UNJEF | PS 10040-12 |
| RPT9516 | .7498 | 1.4489 | 1.7675 | 1.240 | 4.740 | 1.5000-18UNJEF | PS 10040-16 |
| RPT9520 | .7498 | 1.8172 | 2.1575 | 1.330 | 4.830 | 1.875-16UNJ | PS 10040-20 |

APPLICATION:

This tool counterbores, countersinks, provides a radius and produces a tap drill diameter in one pass. Contours are ground to insure concentricity. Cutter geometry permits the use of these tools with most common materials



| BROACH TOOL NUMBER | CUTTER NUMBER 1 | A DIA | B DIA +0.0000 -0.0010 | C REF | D HEX REF | E +0.015 -0.000 | TO PRODUCE SERRATIONS FOR PORT NUMBER |
|--------------------|--------------------|----------|--------------------------------|----------|-----------------|-----------------------|---------------------------------------|
| RFPBT9502 | RFPBT9502-3 | 0.9800 | 0.4037 | 5.4000 | 0.6200 | .061 | PS10040-02 |
| RFPBT9503 | RFPBT9503-3 | TBD | TBD | TBD | TBD | TBD | PS10040-03 |
| RFPBT9504 | RFPBT9504-3 | 1.0700 | 0.5229 | 5.5500 | 0.8100 | .061 | PS10040-04 |
| RFPBT9505 | RFPBT9505-3 | 1.2900 | 0.5854 | 5.4800 | 0.9400 | .061 | PS10040-05 |
| RFPBT9506 | RFPBT9506-3 | TBD | TBD | TBD | TBD | TBD | PS10040-06 |
| RFPBT9508 | RFPBT9508-3 | 1.4500 | 0.8898 | 5.7000 | 1.1230 | .061 | PS10040-08 |
| RFPBT9510 | RFPBT9510-3 | TBD | TBD | TBD | TBD | TBD | PS10040-10 |
| RFPBT9512 | RFPBT9512-3 | TBD | TBD | TBD | TBD | TBD | PS10040-12 |
| RFPBT9516 | RFPBT9516-3 | TBD | TBD | TBD | TBD | TBD | PS10040-16 |
| RFPBT9520 | RFPBT9520-3 | TBD | TBD | TBD | TBD | TBD | PS10040-20 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 Replacement cutters may be purchased individually
- 2 Inspection of noted runout and use of controlled minor diameter per Rosan PS10040 port specification will provide an allowable maximum runout of .009 between serration major diameter and controlled minor diameter after broaching.

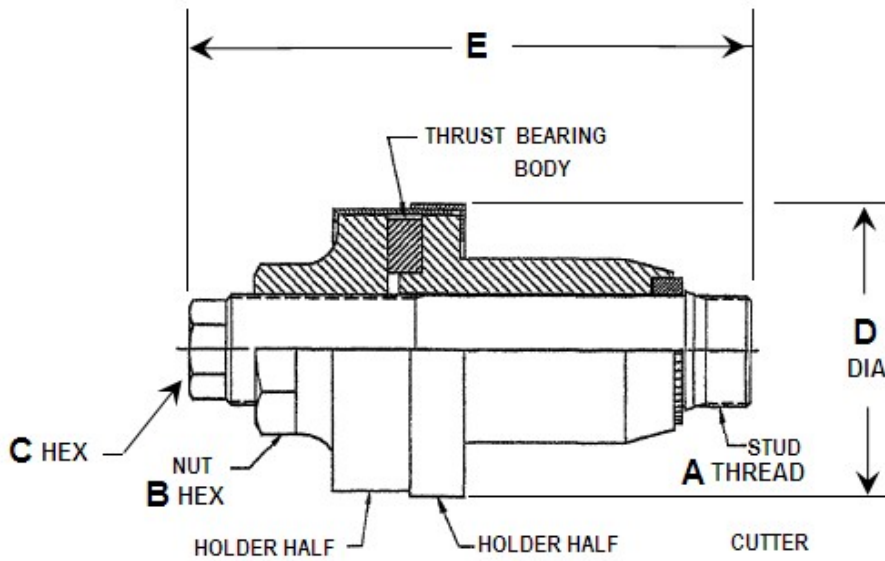
APPLICATION: This broach tool, when used in arbor, hydraulic presses or manually, is designed to produce serrations in the counterbore wall of ports prepared per PS10035. The tool will broach aluminum, magnesium, and many steels with hardness of 32 HRC or less. Successful broaching of harder or tougher material may be accomplished, but tool cutter wear is to be expected.

METHOD: The pilot is inserted into the tap drill hole of PS10040 port, and sufficient force applied to the top of the mandrel to allow the cutter to broach into the counterbore. When the external shoulder of the mandrel contacts the internal shoulder of the body*, broaching is complete. If cutter sticks in counterbore, turn the nut in a clockwise direction to extract the cutter. Caution: nut is for cutter removal only and is not a stop. Always back off nut when broaching. Hole can be tapped before or after broaching.

RFPBT9500HDB

SERIES

**BROACH TOOL – NON-IMPACT
PS10040 PORT SERRATIONS
(FOR MATERIAL UP TO 40 HRC)**



| BROACH TOOL NUMBER | CUTTER PART NUMBER | A THREAD MIL-S-8879 | B HEX REF | C HEX REF | D DIA MAX | E $\pm .03$ | SERRATIONS FOR PORT NUMBER |
|--------------------|--------------------|---------------------|-----------|-----------|-----------|-------------|----------------------------|
| RFPBT9502HDB | RFPBT9502HDB5 | .437-28UNJEF | 1.000 | 0.312 | 1.817 | 4.630 | PS10040-02 |
| RFPBT9503HDB | RFPBT9503HDB5 | .500-28UNJEF | 1.000 | 0.343 | 2.007 | 4.700 | PS10040-03 |
| RFPBT9504HDB | RFPBT9504HDB5 | .562-24UNJEF | 1.000 | 0.375 | 2.007 | 4.860 | PS10040-04 |
| RFPBT9505HDB | RFPBT9505HDB5 | .6250-24UNJEF | 1.000 | 0.438 | 2.287 | 4.470 | PS10040-05 |
| RFPBT9506HDB | RFPBT9506HDB5 | .6875-24UNJEF | 1.000 | 0.500 | 2.287 | 4.500 | PS10040-06 |
| RFPBT9508HDB | RFPBT9508HDB5 | .9375-20UNJEF | 1.250 | 0.750 | 2.977 | 5.500 | PS10040-08 |
| RFPBT9510HDB | RFPBT9510HDB5 | 1.0625-18UNJEF | 1.375 | 0.750 | 2.997 | 5.705 | PS10040-10 |
| RFPBT9512HDB | RFPBT9512HDB5 | 1.2500-18UNJEF | 1.625 | 1.000 | 2.997 | 6.120 | PS10040-12 |
| RFPBT9516HDB | RFPBT9516HDB5 | 1.5000-18UNJEF | 1.625 | 1.062 | 2.997 | 6.120 | PS10040-16 |
| RFPBT9520HDB | RFPBT9520HDB5 | 1.8750-16UNJ | 2.000 | 1.125 | 3.852 | 6.625 | PS10040-20 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 This tool will broach serrations into most materials with hardness up to 40 HRC.
- 2 Two extra cutters are provided with each tool.
- 3 Replacement studs may be purchased individually
- 4 Replacement cutters may be purchased individually
- 5 Use of this tool will provide an allowable maximum runout of .009 between serration major diameter and controlled minor diameter (REF: PS10040) after broaching.

SECTION 4

FLUID BOSS INSERTS INSTALLATION AND REMOVAL



- **INSTALLATION TOOLS**
- **LOCKRING REMOVAL TOOL**

RF9500 SERIES FLUID INSERTS INSTALLATION & REMOVAL

PORT PREPARATION

1. Prepare port per PS10040-() details

LOCKRING INSTALLATION

2. Slide the lockring over the insert thread and engage into insert serration such that the pilot of the lockring faces the thread. See Figure 1.

O-RING INSTALLATION

3. Place the O-ring installation tool over the outside thread of the insert. Submerge the insert, the lockring, the O-ring and the O-ring tool in the fluid to be used in the working system or a lubricant compatible with the system fluid.
4. Slide the O-ring over the O-ring tool and on to the insert. Be sure that the O-ring is not twisted and is properly seated in the seat.
5. Remove the O-ring installation tool.
Caution: To avoid possible O-ring damage, the insert should never be rotated in a counterclockwise direction. If this is done, replace the O-ring.

INSERT INSTALLATION

6. Lubricate the internal surfaces of the port and the entire insert assembly using the same fluid or lubricant as specified in paragraph 3. Scratches, nicks or rough spots are not allowed in O-Ring
7. Screw the drive wrench into the thread of the insert until the plastic collar touches the surface of the insert. See figure 2
8. Screw the insert assembly into the port by hand using clockwise rotation until the assembly is firmly set. See figure 2
9. Place the torque wrench of the proper size into the square of the drive wrench and apply a torque equal to the value specified in Table 1 on the following page. Remove the torque wrench and not the drive wrench.
10. Apply enough Zinc Chromate primer (TT-P-1757) with a brush or small syringe to the counterbore area of the port by lifting the lockring slightly by hand so primer will be extruded out between external serrations of the lockring and the port counterbore when lockring is installed. NOTE: Design activity may specify another primer in place of or in addition to Zinc Chromate.
11. While the primer is still wet, place the lockring drive tool over the drive wrench and let it rest on the lockring top surface, see figure 3. Apply a sufficient downward force to drive the lockring into the surface of the port counterbore until the face of the lockring drive tool touches the port surface, see figure 4. NOTE: Depending upon the component configuration, it may be necessary to support the port in order not to deform the internal configuration of the component.

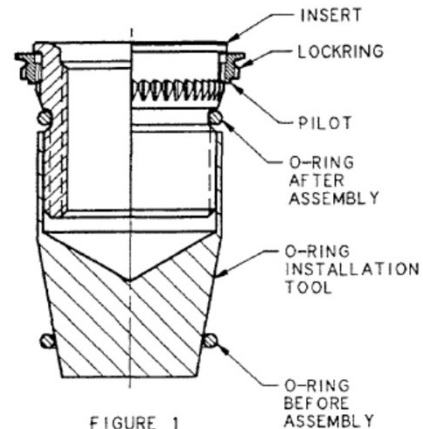


FIGURE 1

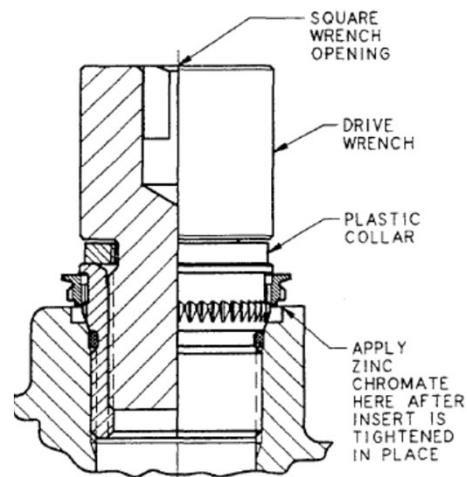
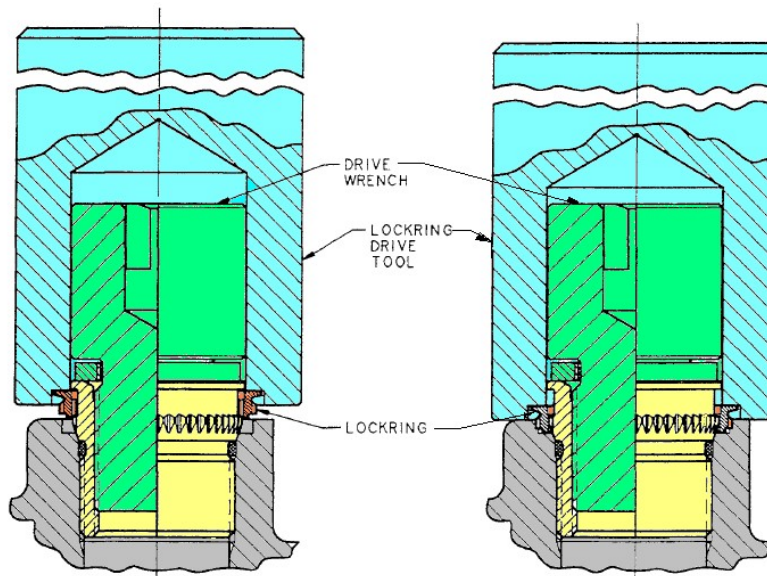


FIGURE 2

-continued-

RF9500 SERIES FLUID INSERTS INSTALLATION & REMOVAL

12. Remove the tools and excess primer that has formed on the surface of the port and locking
13. See locking removal instructions.

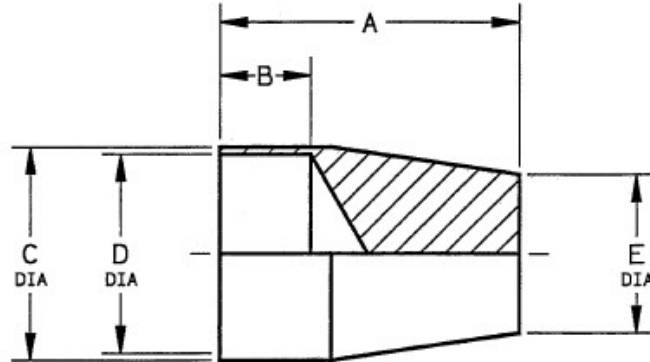
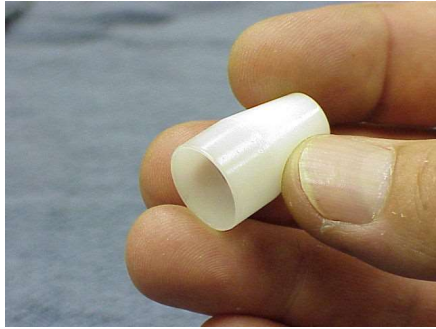


PLACEMENT OF LOCKRING DRIVE TOOL
FIGURE 3

LOCKRING INSTALLATION
FIGURE 4

TABLE I

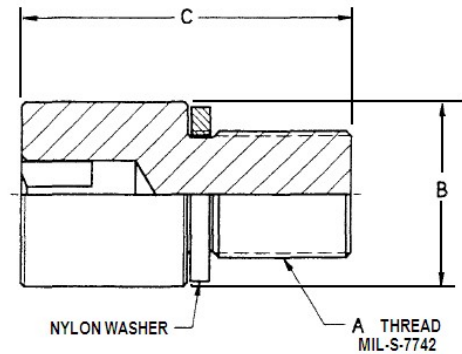
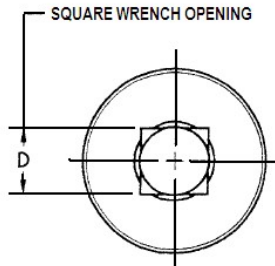
| INSERT ASSEMBLY NUMBER | PORT NUMBER REF | O-RING NUMBER REF | INSTALLATION TORQUE in-lb | |
|------------------------|--------------------|----------------------|------------------------------|------|
| | | | MIN | MAX |
| RF9502-6 | PS10040-02 | AS568-012 | 40 | 50 |
| RF9503-6 | PS10040-03 | AS568-013 | 65 | 84 |
| RF9504-6 | PS10040-04 | AS568-014 | 80 | 105 |
| RF9505-6 | PS10040-05 | AS568-015 | 120 | 150 |
| RF9506-6 | PS10040-06 | AS568-016 | 145 | 185 |
| RF9508-6 | PS10040-08 | AS568-019 | 350 | 400 |
| RF9510-6 | PS10040-10 | AS568-021 | 500 | 600 |
| RF9512-6 | PS10040-12 | AS568-024 | 700 | 800 |
| RF9516-6 | PS10040-16 | AS568-028 | 1200 | 1300 |
| RF9520-6 | PS10040-20 | AS568-132 | 1800 | 2000 |



| O-RING INSTALLATION TOOL NUMBER | A ±.06 | B ±.05 -.01 | C DIA MAX | D DIA MIN | E DIA ±.040 |
|--|-----------|-------------------|-----------------|-----------------|-------------------|
| ORT95-437 | .91 | .33 | .509 | .440 | .310 |
| ORT95-500 | .88 | .30 | .572 | .502 | .472 |
| ORT95-562 | .93 | .35 | .635 | .565 | .435 |
| ORT95-625 | .97 | .38 | .697 | .627 | .495 |
| ORT95-687 | 1.02 | .40 | .760 | .690 | .546 |
| ORT95-937 | 1.34 | .53 | 1.013 | .940 | .731 |
| ORT95-1062 | 1.44 | .61 | 1.143 | 1.065 | .856 |
| ORT95-1250 | 1.56 | .73 | 1.330 | 1.252 | 1.043 |
| ORT95-1500 | 1.60 | .73 | 1.590 | 1.502 | 1.290 |
| ORT95-1875 | 1.63 | .75 | 1.965 | 1.877 | 1.661 |

NOTES: UNLESS OTHERWISE SPECIFIED

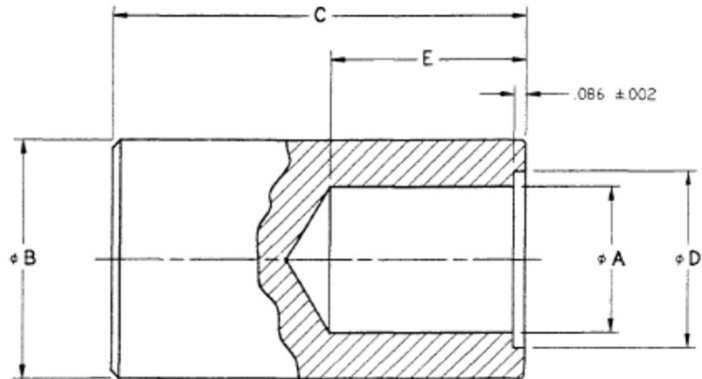
1 MATERIAL: Teflon or Nylon



| INSTALLATION WRENCH NUMBER | WASHER PART NUMBER | A THREAD MIL-S-7742 CLASS-3A | B MAX | C MAX | D NOMINAL |
|----------------------------------|--------------------------|---------------------------------------|----------|----------|--------------|
| | 1 | | | | |
| RF8502WA | RF8502WA1 | .3125-24 UNF | .617 | 1.47 | .25 |
| RF8503WA | RF8503WA1 | .3750-24UNF | .680 | 1.67 | .25 |
| RF8504WA | RF8504WA1 | .4375-20UNF | .745 | 1.72 | .25 |
| RF8505WA | RF8505WA1 | .5000-20UNF | .805 | 1.72 | .38 |
| RF8506WA | RF8506WA1 | .5625-18UNF | .870 | 1.77 | .38 |
| RF8508WA | RF8508WA1 | .7500-16UNF | 1.057 | 1.90 | .38 |
| RF8510WA | RF8510WA1 | .8750-14UNF | 1.180 | 2.02 | .50 |
| RF8512WA | RF8512WA1 | 1.0625-12UN | 1.430 | 2.16 | .50 |
| RF8516WA | RF8516WA1 | 1.3125-12UN | 1.680 | 2.50 | .75 |
| RF8520WA | RF8520WA1 | 1.6250-12UN | 1.995 | 2.55 | .75 |

NOTES: UNLESS OTHERWISE SPECIFIED

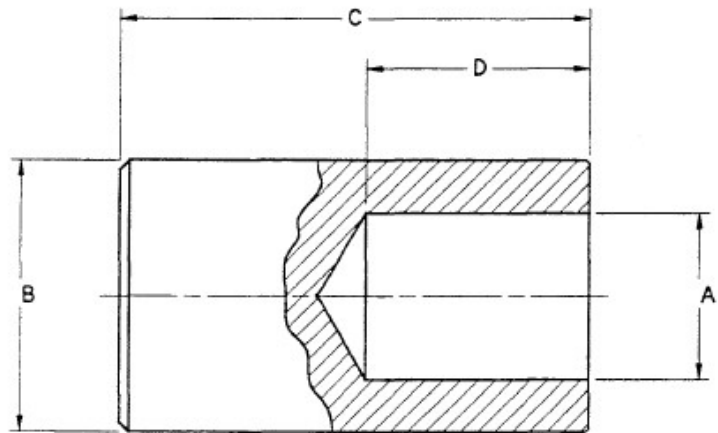
- 1 Nylon Washer can be purchased separately and must be used to insure tool can be removed freely



| LOCKRING DRIVE TOOL NUMBER | A DIA +.005 -.002 | B DIA +.010 -.030 | C +.05 | D +.010 | E MIN |
|-------------------------------------|----------------------------|----------------------------|-----------|------------|----------|
| RF9502DA | .627 | 1.18 | 3.00 | .805 | 1.39 |
| RF9503DA | .690 | 1.25 | 3.00 | .870 | 1.39 |
| RF9504DA | .753 | 1.31 | 3.00 | .930 | 1.39 |
| RF9505DA | .815 | 1.37 | 3.00 | .990 | 1.39 |
| RF9506DA | .872 | 1.42 | 3.00 | 1.040 | 1.39 |
| RF9508DA | 1.065 | 1.73 | 3.00 | 1.290 | 1.39 |
| RD9510DA | 1.190 | 1.86 | 3.00 | 1.420 | 1.45 |
| RF9512DA | 1.440 | 2.08 | 3.50 | 1.640 | 1.45 |
| RF9516DA | 1.690 | 2.34 | 3.50 | 1.900 | 1.79 |
| RF9520DA | 2.025 | 2.73 | 3.50 | 2.290 | 1.79 |

NOTES: UNLESS OTHERWISE SPECIFIED

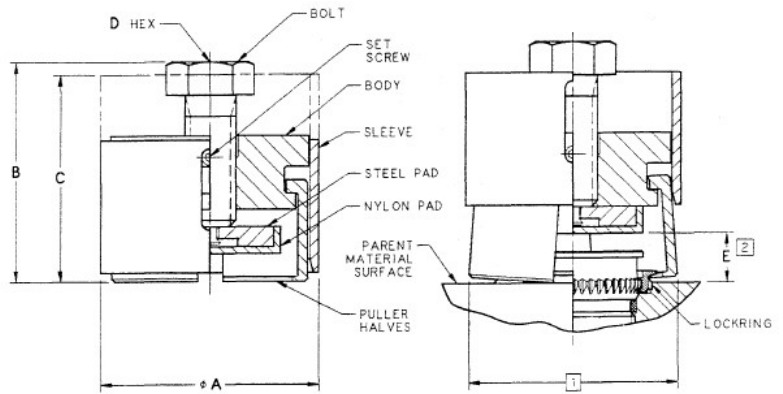
- 1 For use with RF9500 Series Fluid Inserts only



| LOCKRING DRIVE TOOL NUMBER | A DIA +.005 -.002 | B DIA +.010 -.030 | C <u>±.05</u> | D MIN |
|-------------------------------------|-----------------------------------|-----------------------------------|-------------------------|-----------------|
| RF8502DA | .627 | 1.00 | 3.00 | 1.27 |
| RF8503DA | .690 | 1.06 | 3.00 | 1.27 |
| RF8504DA | .753 | 1.12 | 3.00 | 1.27 |
| RF8505DA | .815 | 1.18 | 3.00 | 1.27 |
| RF8506DA | .872 | 1.25 | 3.00 | 1.27 |
| RF8508DA | 1.065 | 1.50 | 3.00 | 1.27 |
| RD8510DA | 1.190 | 1.62 | 3.00 | 1.33 |
| RF8512DA | 1.440 | 1.88 | 3.50 | 1.33 |
| RF8516DA | 1.690 | 2.12 | 3.50 | 1.67 |
| RF8520DA | 2.025 | 2.50 | 3.50 | 1.67 |

NOTES: UNLESS OTHERWISE SPECIFIED

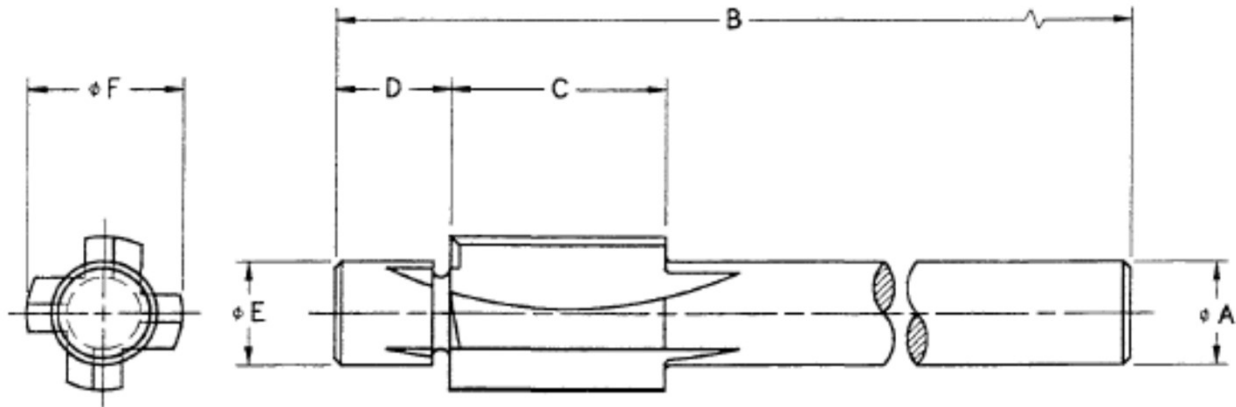
- 1 For use with RF8500 Series Fluid Inserts only



| LOCKRING REMOVAL TOOL NUMBER | A DIA MAX | B MAX | C MAX | D HEX MAX | E | |
|---------------------------------------|-----------------|----------|----------|-----------------|-----|-----|
| | | | | | MIN | MAX |
| RF9502LPD | 1.06 | 1.64 | 1.34 | .438 | .05 | .26 |
| RF9503LPD | 1.14 | 1.64 | 1.54 | .438 | .05 | .26 |
| RF9504LPD | 1.20 | 1.64 | 1.54 | .438 | .05 | .26 |
| RF9505LPD | 1.27 | 1.74 | 1.57 | .562 | .05 | .26 |
| RF9506LPD | 1.32 | 1.74 | 1.57 | .562 | .05 | .26 |
| RF9508LPD | 1.63 | 1.89 | 1.59 | .562 | .05 | .26 |
| RF9510LPD | 1.70 | 1.89 | 1.67 | .562 | .05 | .27 |
| RF9512LPD | 1.93 | 1.89 | 1.67 | .562 | .05 | .29 |
| RF9516LPD | 2.20 | 2.02 | 1.88 | .562 | .05 | .29 |
| RF9520LPD | 2.62 | 2.02 | 1.88 | .562 | .05 | .29 |

NOTES: UNLESS OTHERWISE SPECIFIED

- 1 Puller halves will engage lockring groove when expanded to "A" diameter.
- 2 Range of adapter stand-off that removal tool will accommodate



| LOCKRING REMOVAL TOOL NUMBER | A | B | C | D | E | F |
|---------------------------------------|------------|-----------|------------|------------|----------------------|------------|
| | $\pm .005$ | $\pm .03$ | $\pm .030$ | $\pm .015$ | $+ .001$ $- .002$ | $\pm .001$ |
| RF8502R | .500 | 3.75 | .937 | .500 | .404 | .635 |
| RF8503R | .500 | 3.75 | 1.000 | .500 | .467 | .698 |
| RF8504R | .500 | 4.12 | 1.125 | .500 | .524 | .760 |
| RF8505R | .500 | 4.12 | 1.125 | .500 | .586 | .823 |
| RF8506R | .500 | 4.12 | 1.125 | .500 | .649 | .870 |
| RF8508R | .625 | 4.38 | 1.25 | .625 | .891 | 1.120 |
| RF8510R | .625 | 4.5 | 1.25 | .750 | 1.010 | 1.245 |
| RF8512R | .750 | 4.75 | 1.25 | .750 | 1.198 | 1.464 |
| RF8516R | .750 | 4.75 | 1.25 | .750 | 1.448 | 1.730 |
| RF8520R | .750 | 4.75 | 1.25 | .750 | 1.816 | 2.120 |

INSERT PORT PREPARATION, INSTALLATION AND REMOVAL TOOL KITS



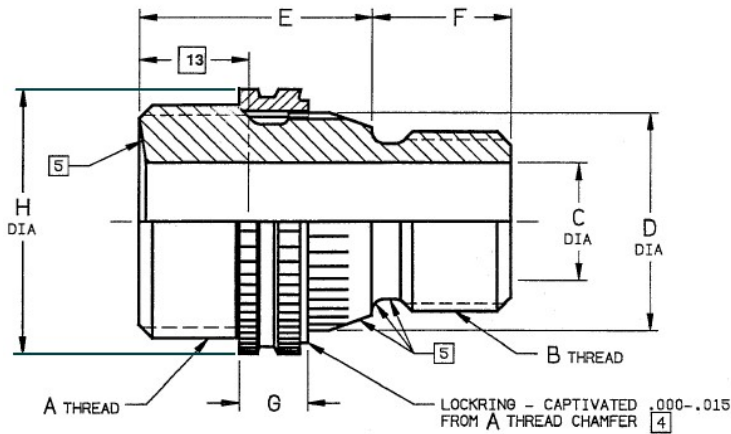
| INSERT ASSY NUMBER | KIT NUMBER | KIT CONTENTS | | | | | | |
|-----------------------|---------------|-----------------|------------------|--------------------------------|----------|---------------------------|-----------------------------|---------------------------|
| | | PORTING TOOL | BOTTOMING TAP | O-RING INSTALLATION TOOL | WRENCH | LOCKRING DRIVE TOOL | LOCKRING REMOVAL TOOL | INSERT REMOVAL TOOL |
| RF9502-6 | KM52RF9502 | RPT9502 | PS40-02BT | ORT95-437 | RF8502WA | RF9502DA | RF9502LPD | RF9502RT |
| RF9503-6 | KM52RF9503 | RPT9503 | PS40-03BT | ORT95-500 | RF8503WA | RF9503DA | RF9506LPD | RF9503RT |
| RF9504-6 | KM52RF9504 | RPT9504 | PS40-04BT | ORT95-562 | RF8504WA | RF9504DA | RF9504LPD | RF9504RT |
| RF9505-6 | KM52RF9505 | RPT9505 | PS40-05BT | ORT95-625 | RF8505WA | RF9505DA | RF9505LPD | RF9505RT |
| RF9506-6 | KM52RF9506 | RPT9506 | PS40-06BT | ORT95-687 | RF8506WA | RF9506DA | RF9506LPD | RF9506RT |
| RF9508-6 | KM52RF9508 | RPT9508 | PS40-08BT | ORT95-937 | RF8508WA | RF9508DA | RF9508LPD | RF9508RT |
| RF9510-6 | KM52RF9510 | RPT9510 | PS40-10BT | ORT95-1062 | RF8510WA | RF9510DA | RF9510LPD | RF9510RT |
| RF9512-6 | KM52RF9512 | RPT9512 | PS40-12BT | ORT95-1250 | RF8512WA | RF9512DA | RF9512LPD | RF9512RT |
| RF9516-6 | KM52RF9516 | RPT9516 | PS40-16BT | ORT95-1500 | RF8516WA | RF9516DA | RF9516LPD | RF9516RT |
| RF9520-6 | KM52RF9520 | RPT9520 | PS40-20BT | ORT95-1875 | RF8520WA | RF9520DA | RF9520LPD | RF9520RT |

SECTION 5

FLUID BOSS ADAPTERS, REDUCERS AND INSERTS



- **RF5000 FLUID BOSS ADAPTERS**
- **RFK9800 & RFK9000 FLUID BOSS ADAPTERS**
- **RF8500, RF9500, RFR9500 AND RFS9500 FLUID BOSS INSERTS**

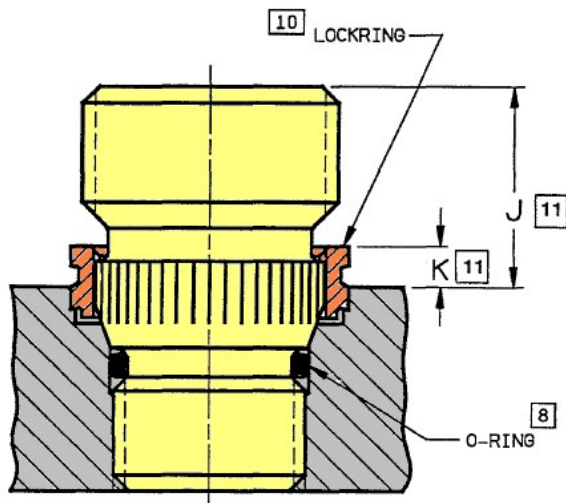


| ADAPTER NUMBER | AS I.D. NUMBER | TUBING OD | A THREAD MIL-S-8879 CLASS 3A | B THREAD MIL-S-8879 CLASS 3A | C DIA | D DIA REF | E DIA +.010 -0.005 | F +.000 -0.015 | G ±.007 | H DIA ±.005 |
|----------------|----------------|-----------|------------------------------|------------------------------|-----------|-----------|--------------------|----------------|---------|-------------|
| RF5002-13 | AS1986-02 | 1/8 | .3125-32UNJEF | .2160-28 UNJF | .090-.096 | .317 | .519 | .300 | .192 | .400 |
| RF5003-13 | AS1986-03 | 3/16 | .3750-28UNJS | .2500-28 UNJF | .122-.128 | .349 | .550 | .355 | .192 | .468 |
| RF5004-13 | AS1986-04 | 1/4 | .4375-24UNJS | .3125-24 UNJF | .169-.175 | .400 | .592 | .355 | .192 | .514 |
| RF5005-13 | AS1986-05 | 5/16 | .5000-24UNJS | .3750-24 UNJF | .231-.237 | .491 | .592 | .381 | .192 | .624 |
| RF5006-13 | AS1986-06 | 3/8 | .5625-20UNJS | .4375-20 UNJF | .294-.300 | .544 | .633 | .395 | .210 | .700 |
| RF5008-13 | AS1986-08 | 1/2 | .7188-20UNJS | .5625-18 UNJF | .398-.408 | .670 | .646 | .430 | .210 | .814 |
| RF5010-13 | AS1986-10 | 5/8 | .8438-18UNJS | .6875-24 UNJF | .493-.503 | .824 | .710 | .465 | .210 | 1.040 |
| RF5012-13 | AS1986-12 | 3/4 | 1.0000-16UNJ | .8125-20 UNJF | .604-.614 | .981 | .760 | .527 | .220 | 1.170 |
| RF5014-13 | AS1986-14 | 7/8 | 1.1250-16UNJ | .9375-20 UNJF | .729-.739 | 1.118 | .778 | .572 | .220 | 1.341 |
| RF5016-13 | AS1986-16 | 1 | 1.2500-14UNJS | 1.1250-18 UNJF | .839-.851 | 1.251 | .808 | .564 | .220 | 1.456 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. **MATERIAL:** Adapter: 6Al-4V titanium per AMS4928, AMS4965 or AMS4967, 130 KSI UTS min
Lockring: A286 corrosion resistant steel per AMS5731 or AMS5734, 34-40 HRC.
2. **FINISH:** Adapter: Anodic treatment per AMS2488, type 2
3. All interior packages are marked per MIL-STD-129 and durably marked with the complete Rosan® part number.
4. Lockring retained on adapter by controlled interference fit.
5. Sealing Surface, do not mar, take care in handling.

-continued-



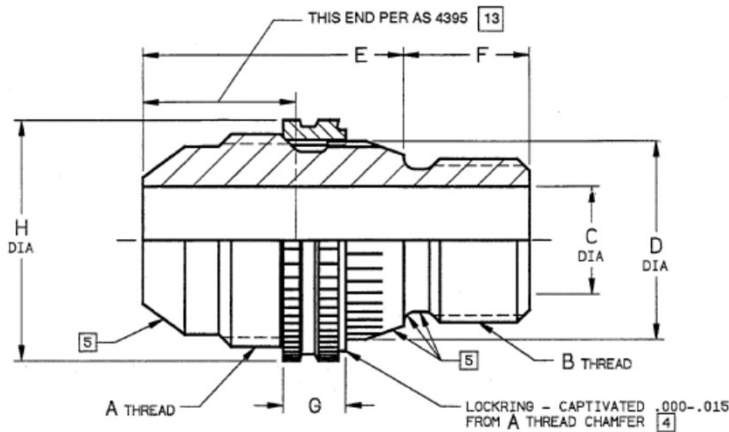
RF5000-13 ADAPTER
INSTALLED IN ROSAN PS10035 (AS1300) PORT
PER AS1301

| ADAPTER NUMBER | O-RING NUMBER 8 REF | J 11 ±.020 | H 11 MAX | ADAPTER WEIGHT lbs/100 PCS APPROX |
|----------------|---------------------------|------------------|----------------|---|
| RF5002-13 | AS568-007 | .358 | .124 | 0.72 |
| RF5003-13 | AS568-008 | .389 | .124 | 1.09 |
| RF5004-13 | AS568-010 | .431 | .124 | 1.32 |
| RF5005-13 | AS568-011 | .431 | .124 | 1.90 |
| RF5006-13 | AS568-012 | .457 | .130 | 2.44 |
| RF5008-13 | AS568-014 | .470 | .130 | 3.45 |
| RF5010-13 | AS568-016 | .534 | .130 | 5.78 |
| RF5012-13 | AS568-116 | .584 | .140 | 7.79 |
| RF5014-13 | AS568-118 | .602 | .140 | 10.03 |
| RF5016-13 | AS568-120 | .632 | .140 | 12.45 |
| RF5020T-13 | AS568-123 | .629 | .140 | 17.80 |
| RF5024T-13 | AS568-128 | .714 | .140 | 25.60 |

NOTES: (CONTINUED FROM PREVIOUS PAGE)

- 6. The RF5000-13 series provides a semi-permanent male adapter for use in any fluid system compatible with titanium.
- 7. Adapters will qualify to a 3000 PSI, 4000PSI and 5000PSI working pressure hydraulic system (-65F to +275°F depending on the type of O-Ring selected).
- 8. O-ring sizes per AS568 must be specified separately and shall be selected based on system fluid temperature and are not supplied by Howmet Fastening Systems.
- 9. These Adapters are installed in standard Rosan® ports per PS10035 or equivalent size.
- 10. The Lockring is driven into the port counterbore after adapter has been torqued. The locking eliminates adapter rotation in the port and prevents port damage at tubing installation due to torquing of nut. One wrench is used to install and remove coupling nuts.

- 11. Dimensions are given for design purposes only; they are not to be used for installation verification.
- 12. Adapter removal is accomplished by lifting the locking out of the port using a simple tool locking removal tool
- 13. Dimensions and finish of tubing end are per MIL-F-85720/1 except for RF5002-13 and flow hole diameters.

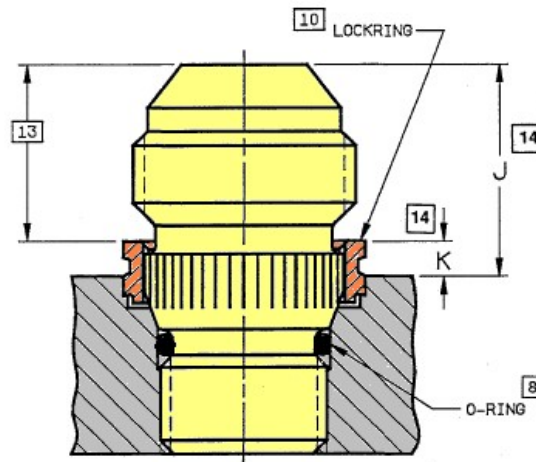


| ADAPTER NUMBER | AS I.D. NUMBER | TUBING OD | A THREAD MIL-S-8879 CLASS 3A | B THREAD MIL-S-8879 CLASS 3A | C DIA | D DIA REF | E DIA +.010 -0.005 | F +.000 -0.015 | G ±.007 | H DIA ±.005 |
|----------------|----------------|-----------|------------------------------|------------------------------|-------------|-----------|--------------------|----------------|---------|-------------|
| RFK9802-13 | AS1985-02 | 1/8 | .3125-24UNJF | .2160-28 UNJF | .058-.065 | .317 | .743 | .300 | .192 | .400 |
| RFK9803-13 | AS1985-03 | 3/16 | .3750-24UNJF | .2500-28 UNJF | .121-.128 | .349 | .774 | .355 | .192 | .468 |
| RFK9804-13 | AS1985-04 | 1/4 | .4375-20UNJF | .3125-24 UNJF | .168-.175 | .400 | .845 | .355 | .192 | .514 |
| RFK9805-13 | AS1985-05 | 5/16 | .5000-20UNJF | .3750-24 UNJF | .230-.237 | .491 | .845 | .381 | .192 | .624 |
| RFK9806-13 | AS1985-06 | 3/8 | .5625-18UNJF | .4375-20 UNJF | .293-.301 | .544 | .872 | .395 | .210 | .700 |
| RFK9808-13 | AS1985-08 | 1/2 | .7500-16UNJF | .5625-18 UNJF | .387-.395 | .670 | .973 | .430 | .210 | .814 |
| RFK9810-13 | AS1985-10 | 5/8 | .8750-14UNJF | .6875-24 UNJEF | .480-.488 | .824 | 1.074 | .465 | .210 | 1.040 |
| RFK9812-13 | AS1985-12 | 3/4 | 1.0625-12UNJ | .8125-20 UNJEF | .604-.614 | .981 | 1.190 | .527 | .220 | 1.170 |
| RFK9816-13 | AS1985-16 | 1 | 1.3125-12UNJ | 1.1250-18 UNJEF | .839-.851 | 1.251 | 1.237 | .564 | .220 | 1.456 |
| RFK9820-13 | AS1985-20 | 1-1/4 | 1.625-12UNJ | 1.3125-18 UNJEF | 1.073-1.086 | 1.466 | 1.311 | .569 | .240 | 1.782 |
| RFK9824-13 | AS1985-24 | 1-1/2 | 1.8750-12UNJ | 1.6250-18 UNJEF | 1.307-1.320 | 1.768 | 1.435 | .608 | .240 | 2.031 |
| RFK9832-13 | AS1985-32 | 2 | 2.5000-12UNJ | 2.1250-16UNJ | 1.776-1.791 | 2.311 | 1.726 | .730 | .240 | 2.548 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. **MATERIAL:** Adapter: 6Al-4V titanium per AMS4928, AMS4965 or AMS4967, 130 KSI UTS min
Lockring: A286 corrosion resistant steel per AMS5731, AMS5732, AMS5734 or AMS5737, 34-40 HRC.
2. **FINISH:** Adapter: Anodic treatment per AMS2488, type 2 (Tiodize TY II or equivalent).
Lockring: Passivate per QQ-P-35.
3. All interior packages are marked per MIL-STD-129 and durably marked with the complete Rosan® part number.
4. Lockring retained on adapter by controlled interference fit.
5. Sealing Surface, do not mar, take care in handling.

-continued-



RFK9800-13 ADAPTER
INSTALLED IN ROSAN PS10035 (AS1300) PORT
PER AS1301

| ADAPTER NUMBER | O-RING NUMBER 8 REF | J 14 ±.020 | K 14 MAX | ADAPTER WEIGHT lbs/100 PCS APPROX |
|----------------|---------------------------|------------------|----------------|---|
| RFK9802-13 | AS568-007 | .577 | .124 | 0.9 |
| RFK9803-13 | AS568-008 | .608 | .124 | 1.3 |
| RFK9804-13 | AS568-010 | .679 | .124 | 1.7 |
| RFK9805-13 | AS568-011 | .679 | .124 | 2.2 |
| RFK9806-13 | AS568-012 | .691 | .130 | 2.7 |
| RFK9808-13 | AS568-014 | .792 | .130 | 4.6 |
| RFK9810-13 | AS568-016 | .893 | .130 | 7.6 |
| RFK9812-13 | AS568-116 | 1.009 | .140 | 10.9 |
| RFK9816-13 | AS568-120 | 1.056 | .140 | 16.2 |
| RFK9820-13 | AS568-123 | 1.103 | .140 | 24.4 |
| RFK9824-13 | AS568-128 | 1.228 | .140 | 28.1 |
| RFK9832-13 | AS568-137 | 1.478 | .140 | 61.1 |

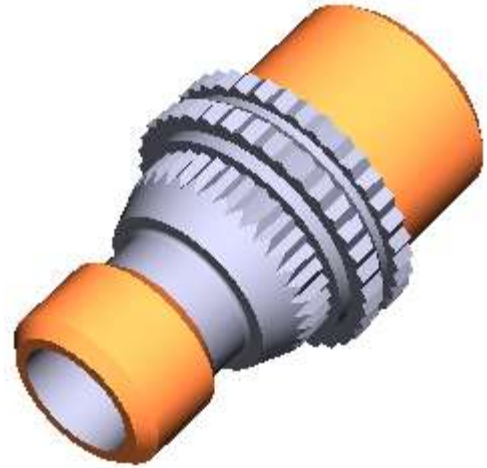
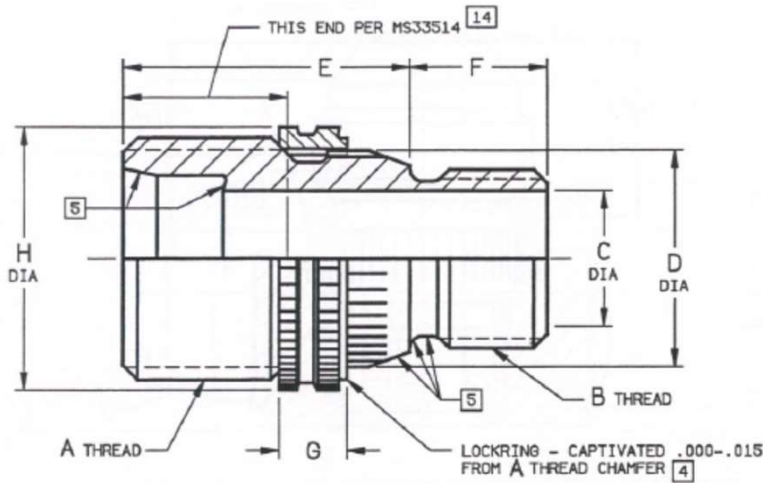
NOTES: (CONTINUED FROM PREVIOUS PAGE)

6. The RFK9800-13 series provides a semi-permanent male adapter for use in any fluid system compatible with titanium.
7. Adapters will qualify to a 3000 PSI and 4000 PSI working pressure hydraulic system (-65F to +450°F depending on the type of O-Ring selected).
8. O-ring sizes per AS568 must be specified separately and shall be selected based on system fluid and temperature and are not supplied by Howmet Fastening Systems.
9. These Adapters are installed in standard Rosan® ports per PS10035 or equivalent size.
10. The Lockring is driven into the port counterbore after adapter has been torqued. The locking eliminates adapter rotation in the port and prevents port damage at tubing installation due to over torquing. One wrench is used to install and remove coupling nuts.

11. Dimensions are given for design purposes only; they are not to be used for installation verification.
12. Coupling nuts (AN818) used with this adapter must have threads in accordance with MIL-S-8879
13. Adapter removal is accomplished by lifting the lockring out of the port using a simple lock ring removal tool
14. Dimensions and finish of tubing end are per MIL-F-85720/1 except for RF5002-13 and flow hole diameters.

RFK9900-13 SERIES

ADAPTER – FLUID CONNECTION ASSY FLARELESS TUBE END MS33514 OR AS4375 CAPTIVE LIFT-TYPE LOCKRING

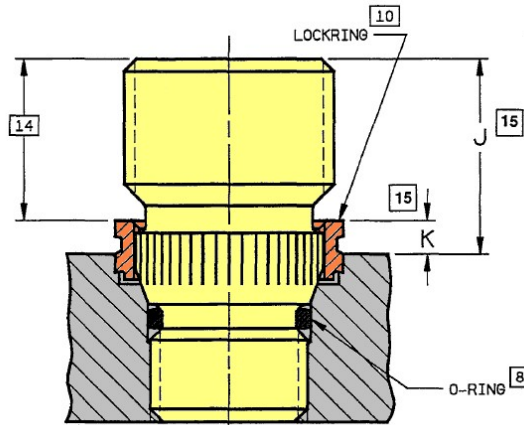


| ADAPTER NUMBER | AS I.D. NUMBER | TUBING OD | A THREAD MIL-S-8879 CLASS 3A | B THREAD MIL-S-8879 CLASS 3A | C DIA | D DIA REF | E DIA +.010 -0.005 | F +.000 -0.015 | G ±.007 | H DIA ±.005 |
|----------------|----------------|-----------|------------------------------|------------------------------|-------------|-----------|--------------------|----------------|---------|-------------|
| RFK9902-13 | AS4099-02 | 1/8 | .3125-24UNJF | .2160-28 UNJF | .090-.096 | .317 | .674 | .300 | .192 | .400 |
| RFK9903-13 | AS4099-03 | 3/16 | .3750-24UNJF | .2500-28 UNJF | .122-.128 | .349 | .721 | .355 | .192 | .468 |
| RFK9904-13 | AS4099-04 | 1/4 | .4375-20UNJF | .3125-24 UNJF | .13 | .400 | .752 | .355 | .192 | .514 |
| RFK9905-13 | AS4099-05 | 5/16 | .5000-20UNJF | .3750-24 UNJF | .231-.237 | .491 | .752 | .381 | .192 | .624 |
| RFK9906-13 | AS4099-06 | 3/8 | .5625-18UNJF | .4375-20 UNJF | .294-.300 | .544 | .789 | .395 | .210 | .700 |
| RFK9908-13 | AS4099-08 | 1/2 | .7500-16UNJF | .5625-18 UNJF | .419-.425 | .670 | .882 | .430 | .210 | .814 |
| RFK9910-13 | AS4099-10 | 5/8 | .8750-14UNJF | .6875-24 UNJEF | .497-.503 | .824 | .945 | .465 | .210 | 1.040 |
| RFK9912-13 | AS4099-12 | 3/4 | 1.0625-12UNJ | .8125-20 UNJEF | .653-.659 | .981 | 1.018 | .527 | .220 | 1.170 |
| RFK9914-13 | ----- | 7/8 | 1.1875-12UNJ | .9375-20UNJEF | .715-.721 | 1.118 | 1.018 | .552 | .220 | 1.341 |
| RFK9916-13 | AS4099-16 | 1 | 1.3125-12UNJ | 1.1250-18 UNJEF | .872-.878 | 1.251 | 1.018 | .564 | .220 | 1.456 |
| RFK9920-13 | AS4099-20 | 1-1/4 | 1.625-12UNJ | 1.3125-18 UNJEF | 1.090-1.096 | 1.466 | 1.045 | .569 | .240 | 1.782 |
| RFK9924-13 | AS4099-24 | 1-1/2 | 1.8750-12UNJ | 1.6250-18 UNJEF | 1.341-1.347 | 1.768 | 1.045 | .608 | .240 | 2.031 |
| RFK9932-13 | AS4099-32 | 2 | 2.5000-12UNJ | 2.1250-16UNJ | 1.810-1.816 | 2.311 | 1.086 | .730 | .240 | 2.548 |

NOTES: UNLESS OTHERWISE SPECIFIED

- MATERIAL:** Adapter: 6Al-4V titanium per AMS4928, AMS4965 or AMS4967, 130 KSI UTS min
Lockring: A286 corrosion resistant steel per AMS5731, AMS5732, AMS5734 or AMS5737, 34-40 HRC.
- FINISH:** Adapter: Anodic treatment per AMS2488, type 2 (Tiodize TY II or equivalent).
Lockring: Passivate per QQ-P-35.
- All interior packages are marked per MIL-STD-129 and durably marked with the complete Rosan® part number.
- Lockring retained on adapter by controlled interference fit.
- Sealing Surface, do not mar, take care in handling.

-continued-



RFK9800-13 ADAPTER
INSTALLED IN ROSAN PS10035 (AS1300) PORT
PER AS1301

| ADAPTER NUMBER | O-RING NUMBER 8 REF | J 15 +.020 | K 15 MAX | ADAPTER WEIGHT lbs/100 PCS APPROX |
|----------------|---------------------------|------------------|----------------|---|
| RFK9902-13 | AS568-007 | .509 | .124 | 0.8 |
| RFK9903-13 | AS568-008 | .556 | .124 | 1.2 |
| RFK9904-13 | AS568-010 | .587 | .124 | 1.4 |
| RFK9905-13 | AS568-011 | .587 | .124 | 2.1 |
| RFK9906-13 | AS568-012 | .609 | .130 | 2.5 |
| RFK9908-13 | AS568-014 | .702 | .130 | 3.8 |
| RFK9910-13 | AS568-016 | .765 | .130 | 6.3 |
| RFK9912-13 | AS568-116 | .838 | .140 | 8.3 |
| RFK9914-13 | AS568-118 | .838 | .140 | 11.3 |
| RFK9916-13 | AS568-120 | .838 | .140 | 12.8 |
| RFK9920-13 | AS568-123 | .838 | .140 | 18.8 |
| RFK9924-13 | AS568-128 | .838 | .140 | 24.7 |
| RFK9932-13 | AS568-137 | .838 | .140 | 41.0 |

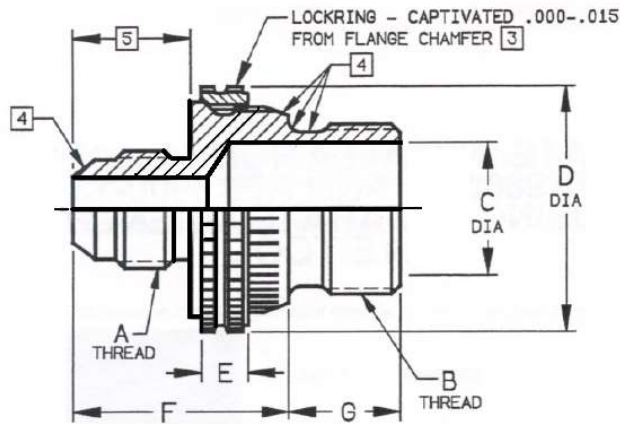
NOTES: (CONTINUED FROM PREVIOUS PAGE)

6. The RFK9900-13 series provides a semi-permanent male adapter for use in any fluid system compatible with titanium.
7. Adapters will qualify to a 3000 PSI and 4000 PSI working pressure hydraulic system (-65F to +450°F depending on the type of O-Ring selected).
8. O-ring sizes per AS568 must be specified separately and shall be selected based on system fluid and temperature and are not supplied by Howmet Fastening Systems.
9. These Adapters are installed in standard Rosan® ports per PS10035 or equivalent size.
10. The Lockring is driven into the port counterbore after adapter has been torqued. The lockring eliminates adapter rotation in the port and prevents port damage at tubing installation due to over torquing. One wrench is used to install and remove coupling nuts.

11. Adapter removal is accomplished by lifting the lockring out of the port using a simple lock ring removal tool
12. Coupling nuts (MS21921) used with this adapter must have threads in accordance with MIL-S-8879
13. Adapter "C" for RFK9904-13 is .184-.190 on MS33514 or AS4375 end and reduced to .169-.175 diameter on opposite end
14. Dimensions meet the requirements of Military Specification MS33514 or AS4375.
15. These Dimensions are for design purposes only. Do not use as installation data.

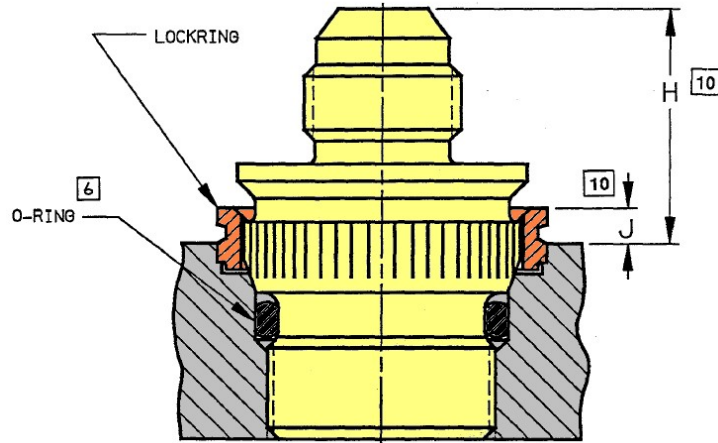
RF9800-()-13 SERIES

ADAPTER - REDUCER FLARED TUBE END AS4395 CAPTIVE LIFT-TYPE LOCKRING



| ADAPTER NUMBER | A THREAD MIL-S-8879 CLASS 3A | B THREAD MIL-S-8879 CLASS 3A | C DIA +.005 | D DIA +.005 | E +.007 | F +.000 -.015 | G +.000 -.015 |
|----------------|---------------------------------------|---------------------------------------|-------------------|-------------------|------------|---------------------|---------------------|
| RF9804-02-13 | .3125-24UNJF | .3125-24UNJF | .185 | .514 | .192 | .866 | .355 |
| RF9804-03-13 | .3750-24UNJF | .3125-24UNJF | .185 | .514 | .192 | .897 | .355 |
| RF9805-04-13 | .4375-20UNJF | .3750-24UNJF | .232 | .624 | .192 | .979 | .381 |
| RF9806-03-13 | .3750-24UNJF | .3125-24UNJF | .185 | .514 | .192 | .941 | .355 |
| RF9806-04-13 | .4375-20UNJF | .4375-20UNJF | .295 | .700 | .210 | 1.010 | .395 |
| RF9806-05-13 | .5000-20UNJF | .3125-24UNJF | .185 | .514 | .192 | 1.010 | .355 |
| RF9808-03-13 | .3750-24UNJF | .3125-24UNJF | .185 | .514 | .192 | .941 | .355 |
| RF9808-04-13 | .4375-20UNJF | .5625-18UNJF | .412 | .814 | .210 | 1.010 | .430 |
| RF9808-05-13 | .5000-20UNJF | .3125-24UNJF | .185 | .514 | .192 | 1.010 | .355 |
| RF9808-06-13 | .5625-18UNJF | .3125-24UNJF | .185 | .514 | .192 | 1.018 | .355 |
| RF9810-04-13 | .4375-20UNJF | .6875-24UNJEF | .498 | 1.040 | .210 | 1.010 | .465 |
| RF9810-06-13 | .5625-18UNJF | .6875-24UNJEF | .498 | 1.040 | .210 | 1.018 | .465 |
| RF9810-08-13 | .7500-16UNJF | .3125-24UNJF | .185 | .514 | .192 | 1.120 | .355 |
| RF9812-04-13 | .4375-20UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | 1.010 | .527 |
| RF9812-05-13 | .5000-20UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | 1.010 | .527 |
| RF9812-06-13 | .5625-18UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | 1.018 | .527 |
| RF9812-08-13 | .7500-16UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | 1.120 | .527 |
| RF9812-10-13 | .8750-14UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | 1.217 | .527 |
| RF9814-10-13 | .8750-14UNJF | .937520-UNJEF | .730 | 1.341 | .220 | 1.200 | .572 |
| RF9816-04-13 | .4375-20UNJF | 1.1250-18UNJEF | .861 | 1.456 | .220 | 1.021 | .564 |
| RF9816-10-13 | .8750-14UNJF | 1.1250-18UNJEF | .861 | 1.456 | .220 | 1.229 | .564 |
| RF9816-12-13 | 1.0625-12UNJ | 1.1250-18UNJEF | .861 | 1.456 | .220 | 1.335 | .564 |
| RF9820-04-13 | .4375-20UNJF | 1.3125-18UNJEF | 1.057 | 1.782 | .240 | 1.028 | .569 |
| RF9820-12-13 | 1.0625-12UNJ | 1.3125-18UNJEF | 1.057 | 1.782 | .240 | 1.342 | .569 |
| RF9820-16-13 | 1.3125-12UNJ | 1.3125-18UNJEF | 1.057 | 1.782 | .240 | 1.389 | .569 |
| RF9824-16-13 | 1.3125-12UNJ | 1.6250-18UNJEF | 1.297 | 2.031 | .240 | 1.410 | .608 |
| RF9824-20-13 | 1.6250-12UNJ | 1.6250-18UNJEF | 1.297 | 2.031 | .240 | 1.457 | .608 |

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RF9800-()-13 ADAPTER
INSTALLED IN ROSAN PS10035 (AS1300) PORT

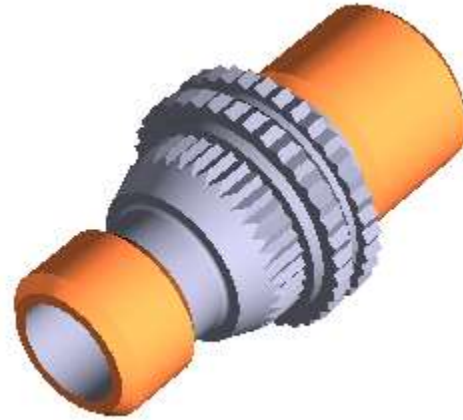
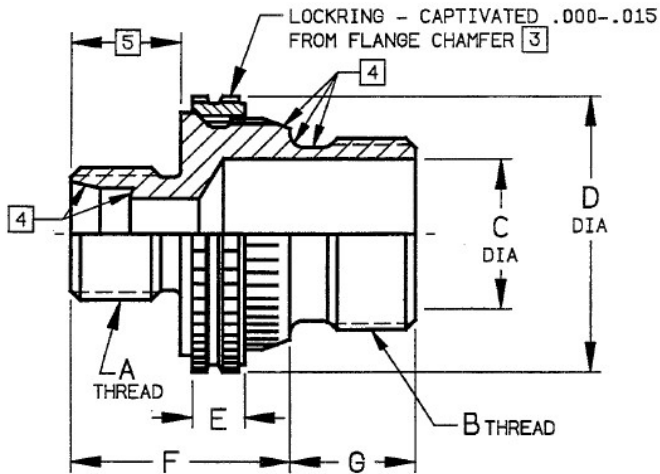
| ADAPTER NUMBER | O-RING NUMBER 6 REF | H | J |
|----------------|------------------------|----------|--------|
| | | 10 ±.020 | 10 MAX |
| RF9804-02-13 | AS568-010 | 0.701 | .124 |
| RF9804-03-13 | | 0.732 | |
| RF9805-04-13 | AS568-011 | 0.814 | .124 |
| RF9806-03-13 | AS568-012 | 0.761 | .130 |
| RF9806-04-13 | | 0.83 | |
| RF9806-05-13 | | 0.83 | |
| RF9808-03-13 | AS568-014 | 0.761 | .130 |
| RF9808-04-13 | | 0.83 | |
| RF9808-05-13 | | 0.83 | |
| RF9808-06-13 | | 0.838 | |
| RF9810-04-13 | AS568-016 | 0.83 | .130 |
| RF9810-06-13 | | 0.838 | |
| RF9810-08-13 | | 0.94 | |
| RF9812-04-13 | AS568-116 | 0.83 | .140 |
| RF9812-05-13 | | 0.83 | |
| RF9812-06-13 | | 0.838 | |
| RF9812-08-13 | | 0.94 | |
| RF9812-10-13 | | 1.037 | |
| RF9814-10-13 | AS568-118 | 1.02 | .140 |
| RF9816-04-13 | AS568-120 | 0.841 | .140 |
| RF9816-10-13 | | 1.049 | |
| RF9816-12-13 | | 1.155 | |
| RF9820-04-13 | AS568-123 | 0.821 | .140 |
| RF9820-12-13 | | 1.135 | |
| RF9820-16-13 | | 1.182 | |
| RF9824-16-13 | AS568-128 | 1.203 | .140 |
| RF9824-20-13 | | 1.25 | |

NOTES: UNLESS OTHERWISE SPECIFIED:

1. **MATERIAL:** Adapter: 6Al-4V titanium per AMS4928, AMS4965 or AMS4967, 130 KSI UTS min.
 Lockring: A286 corrosion resistant steel per AMS5731, AMS5732, AMS5734 or AMS5737, 34-40HRC
2. **Finish:** Adapter: Anadonic treatment per AMS2488, Type 2 (Tiodize TY ii or equivalent).
 Lockring: Passivate per QQ-P-35
3. Lockring retained on adapter by controlled interference fit.
4. Sealing surface, do not mar, take care in handling.
5. This end per AS4395 style "E".
6. O-rings must be specified separately and shall be selected based on system fluid and temperature and are not supplied by Howmet Fastening Systems. Dash numbers shown in the table conform to SAE standard (AS568) uniform dash numbering system.
7. Port preparation per Rosan® PS10035 (Ref:AS1300)
8. Coupling Nut (AN818) must have MIL-S-8879 thread.
9. See installation instructions in this catalog
10. These dimensions are for design purposes only. Do no use as installation data.

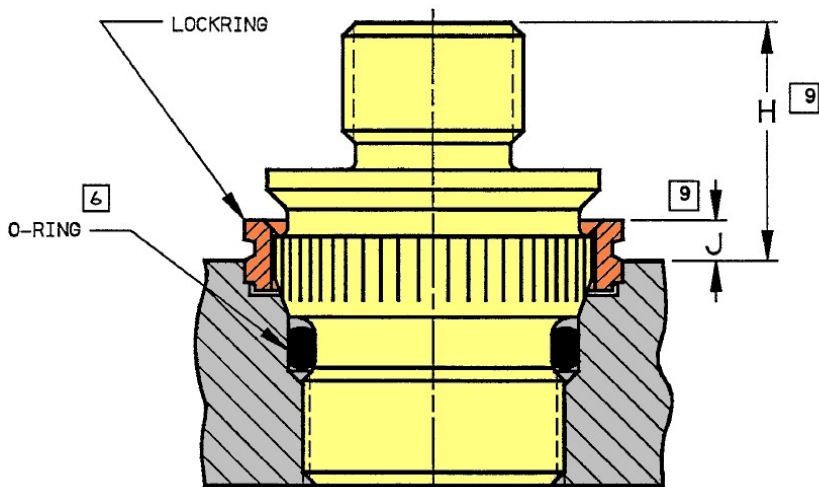
RF9900-()-13 SERIES

ADAPTER - REDUCER FLARELESS TUBE END MS33514 OR AS4375 CAPTIVE LIFT-TYPE LOCKRING



| ADAPTER NUMBER | A THREAD MIL-S-8879 CLASS 3A | B THREAD MIL-S-8879 CLASS 3A | C DIA ±.005 | D DIA ±.005 | E ±.007 | F +.010 -.005 |
|----------------|---------------------------------------|---------------------------------------|-------------------|-------------------|------------|---------------------|
| RF9904-02-13 | .3125-24UNJF | .3125-24UNJF | .185 | .514 | .192 | .792 |
| RF9904-03-13 | .3750-24UNJF | .3125-24UNJF | .185 | .514 | .192 | .840 |
| RF9905-04-13 | .4375-20UNJF | .3750-24UNJF | .232 | .624 | .192 | .882 |
| RF9906-03-13 | .3750-24UNJF | .3750-24UNJF | | | | .884 |
| RF9906-04-13 | .4375-20UNJF | .4375-20UNJF | .295 | .700 | .210 | .915 |
| RF9906-05-13 | .5000-20UNJF | .4375-20UNJF | .295 | .700 | .210 | .915 |
| RF9908-03-13 | .3750-24UNJF | .5625-18UNJF | .412 | .814 | .210 | .884 |
| RF9908-04-13 | .4375-20UNJF | .5625-18UNJF | .412 | .814 | .210 | .915 |
| RF9908-05-13 | .5000-20UNJF | .5625-18UNJF | .412 | .814 | .210 | .915 |
| RF9908-06-13 | .5625-18UNJF | .5625-18UNJF | .412 | .814 | .210 | .931 |
| RF9910-04-13 | .4375-20UNJF | .6875-24UNJEF | .498 | 1.040 | .210 | .915 |
| RF9910-06-13 | .5625-18UNJF | .6875-24UNJEF | .498 | 1.040 | .210 | .931 |
| RF9910-08-13 | .7500-16UNJF | .6875-24UNJEF | .498 | 1.040 | .210 | 1.025 |
| RF9912-04-13 | .4375-20UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | .915 |
| RF9912-05-13 | .5000-20UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | .915 |
| RF9912-06-13 | .5625-18UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | .931 |
| RF9912-08-13 | .7500-16UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | 1.025 |
| RF9912-10-13 | .8750-14UNJF | .8125-20UNJEF | .633 | 1.170 | .220 | 1.084 |
| RF9916-04-13 | .4375-20UNJF | 1.1250-18UNJEF | .861 | 1.456 | .220 | .924 |
| RF9916-10-13 | .8750-14UNJF | 1.1250-18UNJEF | .861 | 1.456 | .220 | 1.096 |
| RF9916-12-13 | 1.0625-12UNJ | 1.1250-18UNJEF | .861 | 1.456 | .220 | 1.159 |
| RF9916-14-13 | 1.1875-12UNJ | 1.1250-18UNJEF | .861 | 1.456 | .220 | 1.159 |
| RF9920-04-13 | .4375-20UNJF | 1.3125-18UNJEF | 1.057 | 1.782 | .240 | .931 |
| RF9920-12-13 | 1.0625-12UNJ | 1.3125-18UNJEF | 1.057 | 1.782 | .240 | 1.166 |
| RF9920-16-13 | 1.3125-12UNJ | 1.3125-18UNJEF | 1.057 | 1.782 | .240 | 1.166 |
| RF9924-16-13 | 1.3125-12UNJ | 1.6250-18UNJEF | 1.297 | 2.031 | .240 | 1.187 |
| RF9924-20-13 | 1.6250-12UNJ | 1.6250-18UNJEF | 1.297 | 2.031 | .240 | 1.187 |

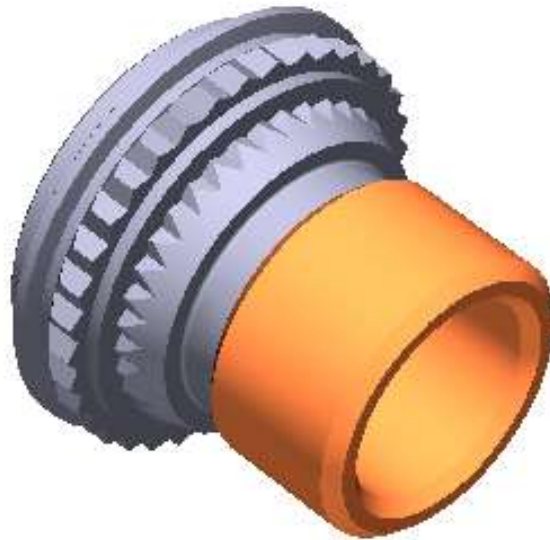
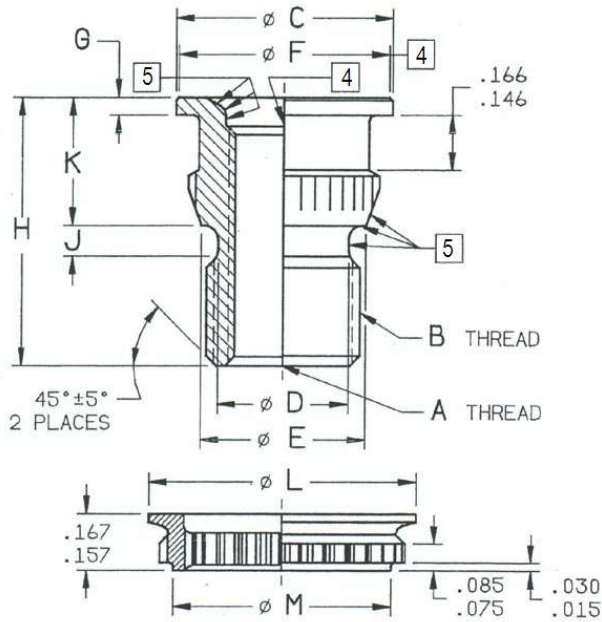
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| ADAPTER NUMBER | O-RING NUMBER 6 REF | H | J |
|----------------|---------------------------|------------|----------|
| | | 9 ±.020 | 9 MAX |
| RF9904-02-13 | AS568-010 | .628 | .124 |
| RF9904-03-13 | | .675 | |
| RF9905-04-13 | AS568-011 | .717 | .124 |
| RF9906-03-13 | AS568-012 | .704 | .130 |
| RF9906-04-13 | | .735 | |
| RF9906-05-13 | | .735 | |
| RF9908-03-13 | AS568-014 | .704 | .130 |
| RF9908-04-13 | | .735 | |
| RF9908-05-13 | | .735 | |
| RF9908-06-13 | | .751 | |
| RF9910-04-13 | AS568-016 | .735 | .130 |
| RF9910-06-13 | | .751 | |
| RF9910-08-13 | | .845 | |
| RF9912-04-13 | AS568-116 | .735 | .140 |
| RF9912-05-13 | | .735 | |
| RF9912-06-13 | | .751 | |
| RF9912-08-13 | | .845 | |
| RF9912-10-13 | | .904 | |
| RF9916-04-13 | | AS568-120 | |
| RF9916-10-13 | .916 | | |
| RF9916-12-13 | .979 | | |
| RF9916-14-13 | .979 | | |
| RF9920-04-13 | AS568-123 | .724 | .140 |
| RF9920-12-13 | | .959 | |
| RF9920-16-13 | | .959 | |
| RF9924-16-13 | AS568-128 | .980 | .140 |
| RF9924-20-13 | | .980 | |

NOTES: UNLESS OTHERWISE SPECIFIED:

1. **MATERIAL:** Adapter: 6Al-4V titanium per AMS4928, AMS4965 or AMS4967, 130 KSI UTS min.
Lockring: A286 corrosion resistant steel per AMS5731, AMS5732, AMS5734 or AMS5737, 34-40HRC
2. **Finish:** Adapter: Anadonic treatment per AMS2488, Type 2 (Tiodize TY ii or equivalent).
Lockring: Passivate per QQ-P-35
3. Lockring retained on adapter by controlled interference fit.
4. Sealing surface, do not mar, take care in handling.
5. This end per MS33514 or AS4375, style "E"
6. O-rings must be specified separately and shall be selected based on system fluid and temperature and are not supplied by Howmet Fastening Systems. Dash numbers shown in the table conform to SAE standard (AS568) uniform dash numbering system.
7. Port preparation per Rosan® PS10035 (Ref:AS1300).
8. See installation instructions in this catalog.
9. These dimensions are for design purposes only. Do no use as installation data.

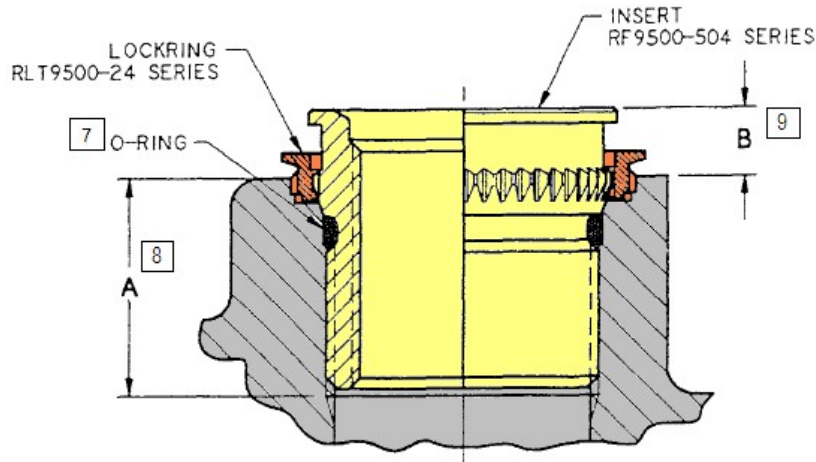


| INSERT ASSEMBLY NUMBER | TUBING OD | A | B | C | D | E | F | G | H | J | K | L | M | INSERT WEIGHT lb/100 PIECES APPROX |
|------------------------|-----------|-------------------------|-------------------------|-------|------------------|--------|-------|------------------|--------|------------------|--------|--------|-------|------------------------------------|
| | | THREAD AS-8879 CLASS 3B | THREAD AS-8879 CLASS 3A | MAX | +0.005 -0.002 | ±0.003 | MIN | +0.010 -0.004 | ±0.010 | +0.010 -0.005 | ±0.015 | ±0.010 | MAX | |
| RF9502-6 | 1/8 | .3125-24UNJF | .4375-28UNJEF | .622 | .373 | .469 | .602 | .047 | .761 | .082 | .364 | .765 | .630 | 2.19 |
| RF9503-6 | 1/5 | .3750-24UNJF | .5000-28UNJEF | .685 | .440 | .536 | .665 | .047 | .729 | .082 | .364 | .830 | .693 | 2.86 |
| RF9504-6 | 1/4 | .4375-20UNJF | .5625-24UNJEF | .748 | .503 | .599 | .728 | .047 | .777 | .082 | .364 | .890 | .755 | 2.85 |
| RF9505-6 | 1/3 | .5000-20UNJF | .6250-24UNJEF | .810 | .566 | .662 | .790 | .047 | .802 | .082 | .364 | .950 | .818 | 3.58 |
| RF9506-6 | 3/8 | .5625-18UNJF | .6875-24UNJEF | .867 | .628 | .724 | .852 | .047 | .830 | .082 | .364 | 1.000 | .865 | 3.59 |
| RF9508-6 | 1/2 | .7500-16UNJF | .9375-20UNJEF | 1.060 | .858 | .954 | 1.040 | .047 | .955 | .082 | .364 | 1.250 | 1.113 | 7.57 |
| RF9510-6 | 5/8 | .8750-14UNJF | 1.0625-18UNJEF | 1.185 | .983 | 1.079 | 1.165 | .057 | 1.051 | .082 | .374 | 1.380 | 1.238 | 9.79 |
| RF9512-6 | 3/4 | 1.0625-12UNJ | 1.2500-18UNJEF | 1.435 | 1.171 | 1.267 | 1.415 | .072 | 1.185 | .082 | .389 | 1.600 | 1.455 | 12.19 |
| RF9516-6 | 1 | 1.3125-12UNJ | 1.5000-18UNJEF | 1.685 | 1.421 | 1.517 | 1.665 | .072 | 1.185 | .082 | .389 | 1.860 | 1.716 | 18.36 |
| RF9520-6 | 1 1/4 | 1.6250-12UNJ | 1.8750-16UNJ | 2.020 | 1.760 | 1.918 | 1.978 | .072 | 1.237 | .122 | .389 | 2.250 | 2.111 | 27.96 |

Notes unless otherwise specified:

- MATERIAL:** A286 Cres per AMS5731, AMS5732, AMS5734 or AMS5737. These parts are also available in other materials. Contact technical support for other options.
- HEAT TREAT:** 130 KSI UTS min.
- FINISH:** Passivate per QQ-P-35
- Insert internal configurations and "F" Diameter per MS33649.**
- Sealing Surface:** No visible defects. To be protected for shipment

-continued-



| INSERT ASSEMBLY NUMBER | INSERT NUMBER | LOCKRING NUMBER | PORT NUMBER | O-RING SIZE 7 REF | A 8 | B + .000 -.045 |
|------------------------|---------------|-----------------|-------------|-------------------------|--------|----------------------|
| RF9502-6 | RF9502-504 | RLT9502-24 | PS10040-02 | AS568-012 | .550 | .255 |
| RF9503-6 | RF9503-504 | RLT9503-24 | PS10040-03 | AS568-013 | .520 | .255 |
| RF9504-6 | RF9504-504 | RLT9504-24 | PS10040-04 | AS568-014 | .565 | .255 |
| RF9505-6 | RF9505-504 | RLT9505-24 | PS10040-05 | AS568-015 | .590 | .255 |
| RF9506-6 | RF9506-504 | RLT9506-24 | PS10040-06 | AS568-016 | .620 | .255 |
| RF9508-6 | RF9508-504 | RLT9508-24 | PS10040-08 | AS568-019 | .745 | .255 |
| RF9510-6 | RF9510-504 | RLT9510-24 | PS10040-10 | AS568-021 | .830 | .265 |
| RF9512-6 | RF9512-504 | RLT9512-24 | PS10040-12 | AS568-024 | .950 | .280 |
| RF9516-6 | RF9516-504 | RLT9516-24 | PS10040-16 | AS568-128 | .950 | .280 |
| RF9520-6 | RF9520-504 | RLT9520-24 | PS10040-20 | AS568-132 | 1.000 | .280 |

NOTES CONTINUED FROM PREVIOUS PAGE:

6. The RF9500-6 series provides a semi-permanent hydraulic port primarily for use in 3000 PSI fluid systems.
7. O-rings must be specified separately and shall be selected based on system fluid and temperature and are not supplied by Howmet Fastening Systems. O-ring size per AS568.
8. Maximum insert installation depth or minimum recommended parent material thickness.
9. Dimension "B" is for design purpose only. Do not use as installation data.
10. These inserts and lockrings are installed in standard ports per PS10040 or equivalent size.



Howmet Fastening Systems

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