Aeroquip

RYNGLOK®

FITTING SYSTEM

INSTALLATION GUIDE

Aeroquip

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RYNGLOK® Fitting Installation Guide

1.0 INITIAL PREPARATION

1.1 CUTTING TUBES

Tubes may be cut using any appropriate cutting tool whether by hand or by a production method Tube ends should be reasonably square, recognizing that any out of squareness condition will detract from the amount of positioning tolerance allowed (See paragraph 1 4)

1.2 TUBE END PREPARATION

The tube ends should be deburred with appropriate deburring tools on the O D and I D to prevent damage of the fitting I D during tube insertion and to prevent FOD from entering and contaminating the fluid system

1.2.1 PAINTED TUBE END PREPARATION

Painted tube ends shall be deburred in accordance with paragraph 1 2 Painted tube ends do **not** require the paint to be removed when the tubing O D is in accordance with Table 1 The max tubing O D (dim A) must be held a min distance (dim B) per Table 1 for proper fitting installation If paint removal is necessary, the tube shall be sanded in a radial direction using a mild grit paper Care should be taken to prevent longitudinal marks It will be necessary to reclean and remark tube ends It is recommended to repaint the exposed tubing after installation Please contact Aeroquip Ryngiok Engineering Group if there are any questions **(517) 787-8121**

1.3 PREAPPLIED TUBE END MARKING

A pair or pairs of marks, (positioning marks and inspection marks) as shown in Figure 1, should be preapplied with the given dimensions from Table 1 to each prepared tube end prior to fitting installation A suitable method such as ink stamp, electro-etch, laser, etc may be used Should the tube ends be unmarked, the appropriate marks should be applied using Aeroquip tube marking gage P/N RTSG0-01-SIZE as shown in Figure 2, and using a suitable permanent ink felt tipped pen

NOTICE: Due to the possibility of contaminating titanium tubing, inks which contain lead or free halogens should not be used for marking

FIGURE 1

Tube Marking Using Electro-etch, Ink Stamp, or Laser Marking

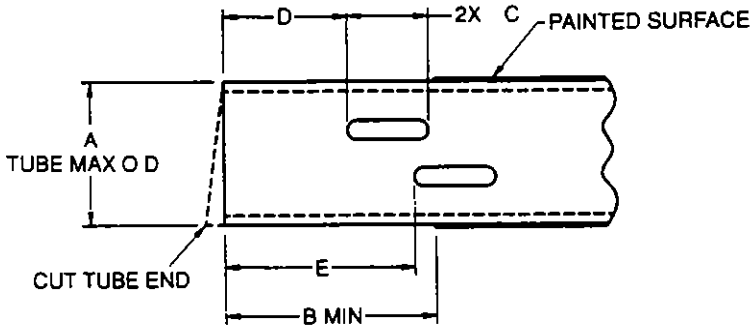


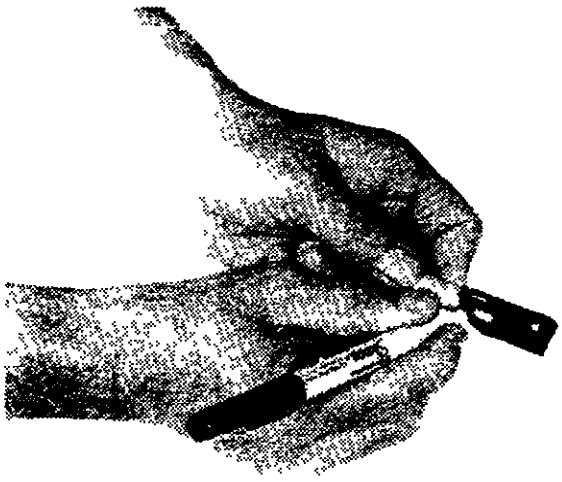
TABLE 1

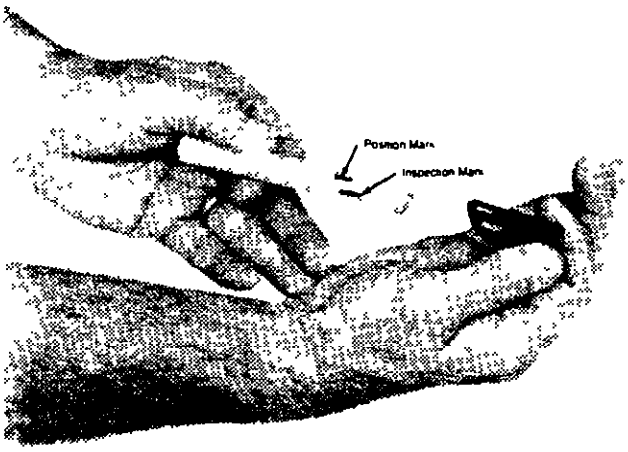
Dimensions for Electro-etch, Ink Stamp, or Laser Marking

DASH SIZE	A Max	B Min	C± 005	D± 005	E± 005
-03	190	453	300	453	644
-04	254	525	300	525	717
-05	316	588	300	588	780
-06	379	656	300	656	843
-07	441	730	300	730	918
-08	505	773	350	773	963
-09	567	836	350	836	1 026
-10	630	899	350	899	1 088
-11	692	983	350	983	1 175
-12	755	1 042	350	1 042	1 232
-13	817	1 110	350	1 110	1 303
-14	880	1 178	350	1 178	1 369
-15	942	1 249	400	1 249	1 448
-16	1 006	1 299	400	1 299	1 498
-20	1 256	1 572	400	1 572	1 781
-24	1 507	1 862	400	1 862	2 086

FIGURE 2

Application of Tube Insertion Marks Using RTSG0-01-SIZE Marking Gage and Pen





1.4 MARKING GAGE POSITIONING

The RTSG0-01-SIZE series of marking gages is common for all pressure classes of Aeroquip Ryniok fittings The marking gage should be bottomed on the end of the cut tube If an out of square condition exists the marking gage should be positioned toward the end that is most square This is only for fittings which require shared insertion. such as in the case of a union fitting This allows minimum tube insertion on the opposite end of a union configuration should the skew end be inserted to the maximum tube insertion condition (See paragraph 4 1 1 and Figure 7)

(All tubes should be marked prior to assembly to insure proper tube insertion)

2.0 FITTING INSTALLATION

2.1 POSITIONING MARK

The Installer must use this positioning mark to position the edge of the unswaged fitting "Ring" over the mark as shown in Figure 3 The length of the positioning mark is the amount of positioning tolerance allowed The edge of the fitting "Ring" may be anywhere along the length of the positioning mark

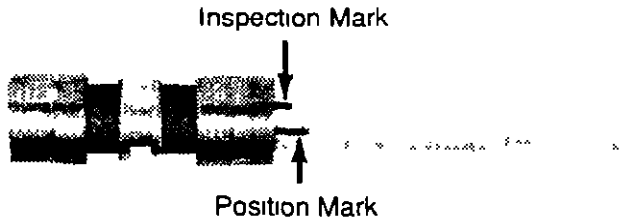


FIGURE 3

Fitting Position for Tube Insertion

2.1.1 END FITTINGS

In general, end fittings are designed to have the tube end bottomed into the fitting, and do not have as much positioning allowance See Figure 4 Even with this condition the tube end should be marked for inspection purposes to verify that the tube was inserted to at least the minimum insertion depth Refer to section 7 0 when installing fittings of this type

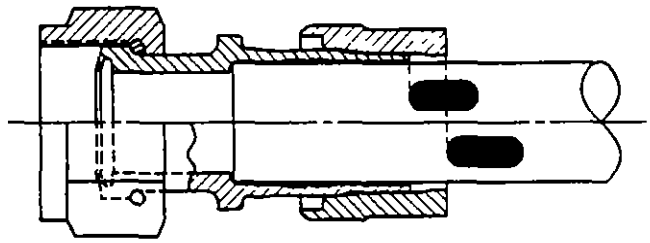


FIGURE 4

End Fitting Tube Positioning
(**Note:** That tube is bottomed into fitting)

3.0 FITTING ASSEMBLY

3.1 ASSEMBLY TOOL SELECTION

Select the correct size tool (noted on face of tool) and pressure class assembly tool (denoted by color, see Table 2), P/N RTSTX-01-SIZE, where the X denotes the pressure class of the fitting The Installer must note the color coding of the fitting "Ring' and match this with the color of the movable jaw on the assembly tool

TABLE 2

Color Code

Maximum Fitting Operating Pressure	Tool Jaw and Fitting Ring
'8 - 8000 psig	Silver (no color code)
'5' - 5000 psig	Blue
4 - 4000 psig	Black
'2 - 2500 psig	Green

3.2 ASSEMBLY TOOL PRESSURE CONNECTION

Attach the flexible hose with the mating quick disconnect coupling to the nipple at the bottom of the tool, and the nipple end of the hose to the mating quick disconnect coupling on the portable pump The pump may be a hand pump, Aeroquip P/N 10-00400A a foot-operated air/hydraulic intensifer Aeroquip P/N 10-00401A or a switch operated air/hydraulic intensifier Aeroquip P/N 10-00402

3.3 TOOL INSTALLATION

With the fitting positioned onto the tube as described in Para 2 0 align the assembly tool to one leg of the fitting with the "Ring" nestled into the movable jaw of the tool and the front opening of the tool bottomed into the fitting body as shown in Figure 5A The tool is designed to access the fitting leg from any radial angle as required by the space available

3.4 TOOL PRESSURIZATION

Apply 8000 - 8500 psig hydraulic pressure to the tool to advance the fitting ring to complete the assembly process as shown in Figure 5B Tool pressure is **8000 - 8500 psig, regardless of fitting size or pressure class**

Note: Fitting must always be fully nested into tool to maximize tool life

Note: See Section 6 2 for special consideration in swaging pressures when using special Reversed Tools with reducer/expander fittings

FIGURE 5A

Tool Position Before Pressurization

FIGURE 5B

Tool Position During Pressurization

3.4.1 PRESSURE LEVEL

If using the hand pump, Aeroquip P/N 10-00400A the 8000 - 8500 psig pressure level is assured by the pressure gage reading If using a foot-operated air/hydraulic intensifier, Aeroquip P/N 10-00402 the intensifier will automatically stop when 8000 - 8500 psig is reached

Note See Para 6 2 for special considerations in swaging pressures when using special "Reversed Tools" with reducer/expander fittings

When the pressure is released, the movable jaw will return to it s original position

4.0 ASSEMBLED FITTING INSPECTION

4.1 RING ADVANCEMENT INSPECTION

After fitting installation, ring advancement should be verified using the inspection gage part number RTSG0-51-Size The inspection gage should fit over the ring area as shown in Figure 6A Figure 6B shows an incomplete/incorrect swage

FIGURE 6A

Complete Ring Advancement Inspection

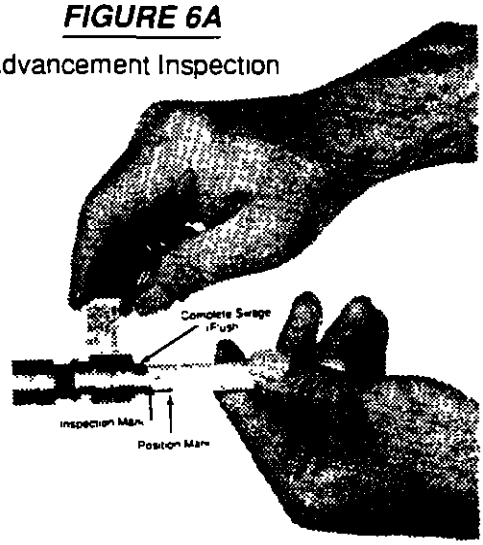
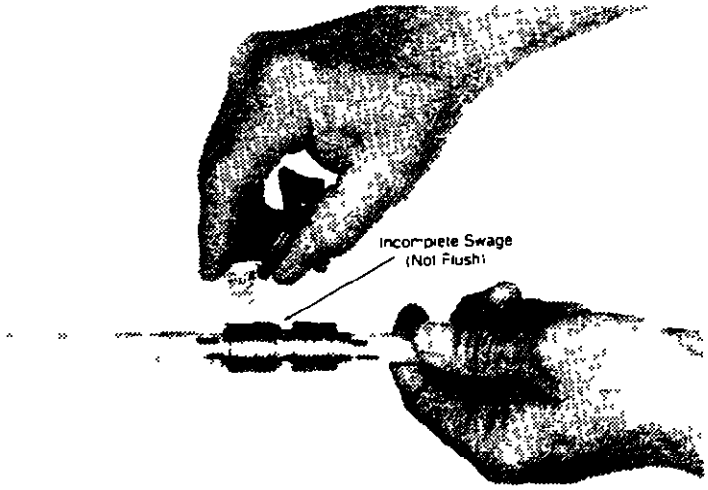


FIGURE 6B

Incomplete Ring Advancement Inspection



4.1.1 INSERTION INSPECTION MARK POSITION

The Inspector should verify that the edge of the fitting is touching or over the insertion inspection marks after assembly as shown in Figure 6A This is to ensure that the tube was inserted to the required depth

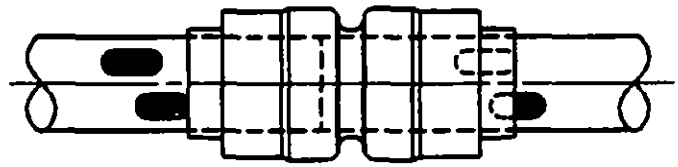
4.2 SHARED INSERTION - UNIONS

In the case of unions the tube insertion allowance is shared by each leg of the union If one tube end is inserted to maximum depth then the opposite tube end can only be inserted to a minimum depth as shown in Figure 7 This shared insertion condition is only applicable to unions, which have a through bore to allow placement onto cut lines during repair All other fittings have a positive stop in each leg and the entire positioning length is available for each leg

Note. Under maximum insertion conditions it will not be possible to see the inspection mark until after swage

FIGURE 7

Shared Insertion Conditions



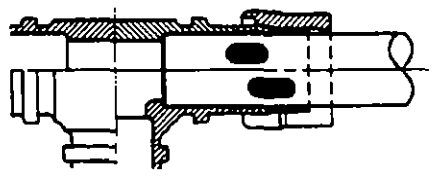
4.2.1 OVER INSERTION CONDITION - FITTINGS OTHER THAN UNIONS

All fittings other than unions are designed with a positive tube stop or bottoming feature which prevents over insertion of the tube end during assembly as shown in Figure 8 The exceptions are special bulkhead fittings configurations of fittings with deep bores to save weight special repair and penetration fittings etc In these circumstances, the tube insertion guidelines and marking must be strictly adhered to in accordance with Figure 6A to ensure proper inspection procedures

Note It is necessary that tube marking procedures be adhered to for all Ryglok Fittings

FIGURE 8

Fittings With Over Insertion Conditions



5.0 TUBING REPAIR WITH RYNGLOK UNIONS

5.1 SINGLE UNION REPAIR

Repair of a tubing defect can be made by using a single union fitting provided that the length of the defect in the tube as shown in Figure 9 is within the limits specified in Table 4

FIGURE 9

Defect Length

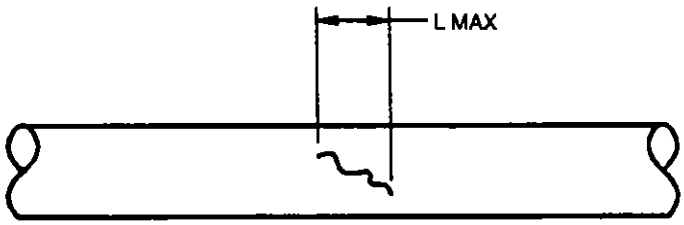


TABLE 4

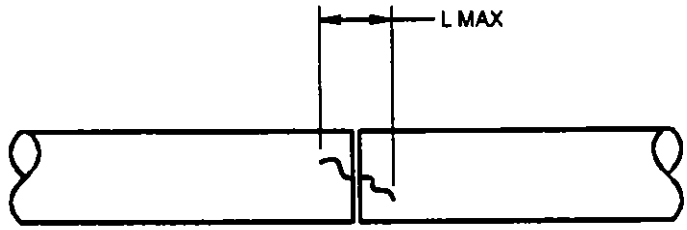
Dash Size	Tube Size	L Max.
-03	0 1875	0 300
-04	0 2500	0 300
-05	0 3125	0 300
-06	0 3750	0 300
-07	0 4375	0 300
-08	0 5000	0 350
-09	0 5625	0 350
-10	0 6250	0 350
-11	0 6875	0 350
-12	0 7500	0 350
-13	0 8125	0 350
-14	0 8750	0 350
-15	0 9375	0 350
-16	1 0000	0 400
-20	1 2500	0 400
-24	1 5000	0 400

5.1.1 CUTTING THROUGH CENTER OF DEFECT

As shown in Figure 10A, a single cut may be made through the defect and the tube ends prepared as per Para 1 0

FIGURE 10A

Cutting Through Defect



Note. While this method is not considered an ideal repair, it may be preferred in some circumstances Please note there is a possibility of defect propagation, and for this reason, the union should be positioned equally over the positioning marks of each tube end when the tube ends are in a "butted" condition since the tube insertion inspection marks are made from the end of the tube, not from the ends of the defect

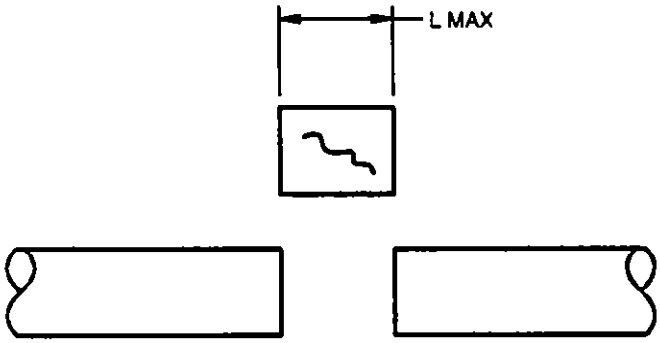
5.1.2 CUTTING OUT DEFECT

Figure 10B shows the preferred method for a single fitting repair where the defect is completely removed, provided the length of the defect is less than "L Max" in Table 4 The tube ends should then be prepared per Paragraph 1 0

Note Because of the amount of tubing being removed, this amount will decrease the amount of tube float available for the Installer, i.e , if the maximum permissible amount of tubing is cut out, the position of the union over the positioning marks will be in the minimum insertion condition for both fitting ends of the union

FIGURE 10B

Cutting Out Defect



5.2 TWO UNION REPAIR

When the length of the defect exceeds "L Max " from Table 4, repairs must be made by cutting out the defective section of tubing, plus additional tubing as shown in Figure 11 The minimum length of tubing to be removed is length "M Min " from Table 5 The removed tubing must be replaced by and equal or slightly shorter length of similar tubing, and installed using two Ryngiok unions Prepare each tube end per Para 1 0

FIGURE 11

Tube Section Removal

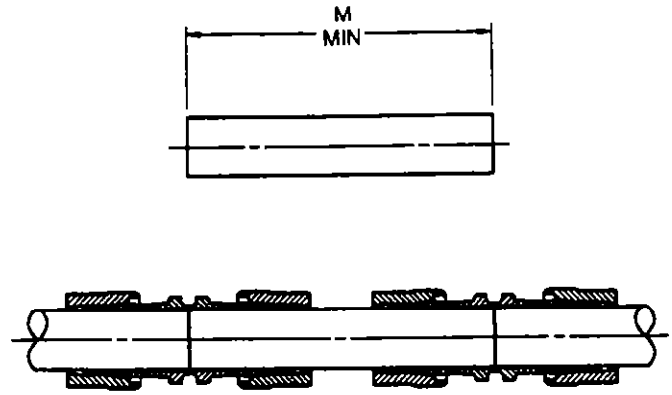


TABLE 5

Dash Size	Tube Size	M Min.
-03	0 1875	2 14
-04	0 2500	2 38
-05	0 3125	2 51
-06	0 3750	2 64
-07	0 4375	2 77
-08	0 5000	2 92
-09	0.5625	3 05
-10	0 6250	3 18
-11	0 6875	3 44
-12	0 7500	3 56
-13	0 8125	3 71
-14	0 8750	3 88
-15	0 9375	3 99
-16	1 0000	4 15
-20	1 2500	4 81
-24	1 5000	5 42

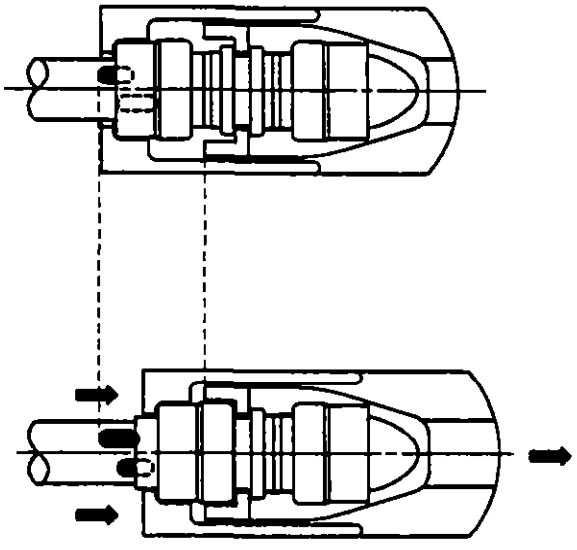
6.0 SPECIAL CONSIDERATIONS

6.1 USING THE "REVERSED TOOL"

When using the RTST(X)R-01-SIZE "Reversed Tool", care must be taken in positioning the tool properly onto the fitting and in positioning the fitting onto the tube because of the relative movement of the movable tool jaw See Figure 12 The "Reversed Tool" is used in situations where an installation is required at or near a bulkhead or an adjacent fitting or structural member where the "Standard Tool" does not fit This tool allows the Installer the opportunity to swage the fitting end as close as possible to adjacent members

FIGURE 12

Tool Positon Before Advancing the Ring
(Note tool/tool jaw/fitting position)



Tool Position After Advancing the Ring

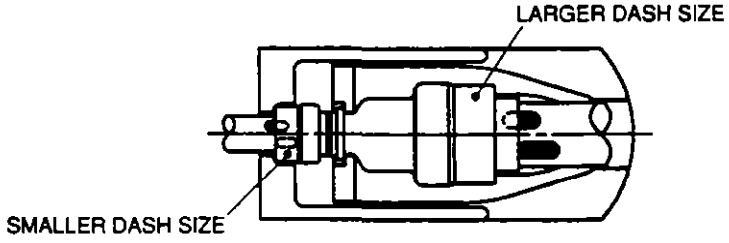
Caution: Note relative movement of the whole tool with respect to the fitting

6.2 SPECIAL CONSIDERATION WHEN USING THE "REVERSED TOOL"

When using the "Reversed Tool" with reducer/expander fittings, a special RTST(X)R-51-SIZE "Reversed Tool" is required The standard "Reversed Tool" is to be used with standard non-reducer/expander fitting configurations, while the special "Reversed Tool" is intended to be used where there is an opposite fitting end or forging body size **greater** than the dash size of the fitting end being swaged as shown in Figure 13 These special "Reversed Tools" will be marked with a colored band and the required swage pressures identified on the tool body

FIGURE 13

Using the Special "Reversed Tool"



Warning: The swage pressures listed on the special "Reversed Tools" must be strictly adhered to, in order to prevent excessive tonnage applied to the fitting which may result in a damaged fitting or fitting failure

6.3 SPECIAL CONSIDERATIONS WHEN USING THE -20 AND -24 TOOLS

When using the size -20 and -24 standard and reversed swage tools, a swage bridge attachment is used in conjunction with the standard hand swage tool, see Figures 14A and 14B The swage bridge is to be oriented and bottomed into the swage tool detents after the insertion of the fitting The swaging operation shall then proceed as normal For the standard hand swage tool, the swage bridge is inserted into the tool body while for the reversed tool, the swage bridge is inserted into the movable jaw
Note The swage bridge is connected to the hand swage tool via a flexible lanyard and should not be separated Proper orientation is noted by the "Front" arrow stamped on top of the swage bridge and by "click" of the detents when the swage bridge is sitting flush on the reliefs on top of the swage tool

FIGURE 14A

Swage Bridge Prior to Placement

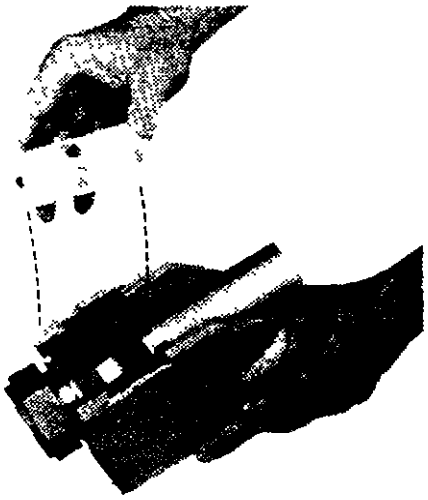
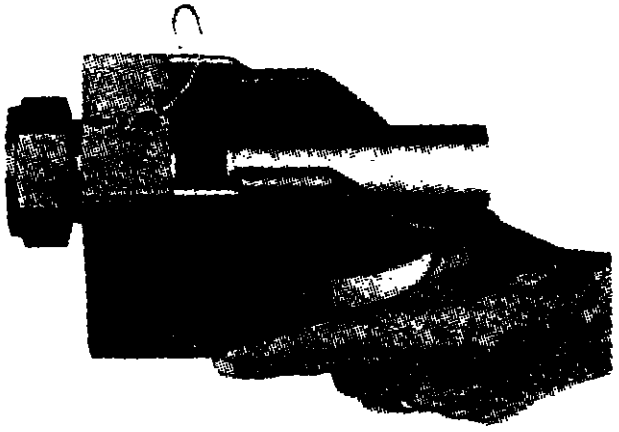


FIGURE 14B

Correct Placement of Swage Bridge on Tool



7.0 TUBE CUT DIMENSIONS

When replacing/repairing separable connections with Rynglok fittings the following dimensions should be used for factoring tube cut length

7.1 FEMALE ARCSEAL FITTING

Tube cut dimension, as shown in Figure 15, shall use dimensions per Table 6 for proper fitting installation

FIGURE 15

Female ArcSeal Tube Cut Dimensions

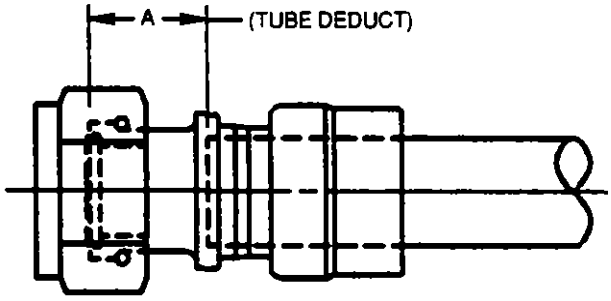


TABLE 6

PART NO.	"A' +.030	PART NO.	"A" +.030
R81101T03	0 463	R81101T10	682
R81101T04	0 496	R81101T12	754
R81101T05	0 513	R81101T16	837
R81101T06	0 528	R81101T20	883
R81101T08	0 596	R81101T24	1 023

7.2 FEMALE FLARELESS FITTING

Tube cut dimension, as shown in Figure 16, shall use dimensions per Table 7 for proper fitting installation

FIGURE 16

Female Flareless Tube Cut Dimensions

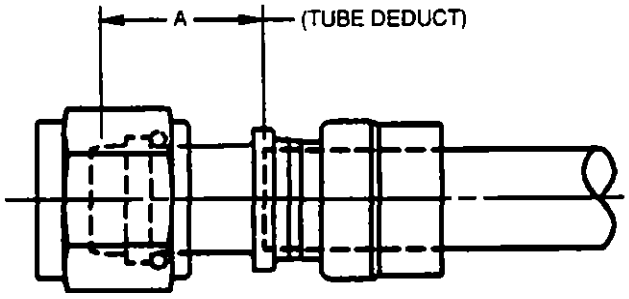


TABLE 7

PART NO.	"A" +.030	PART NO.	"A" +.030
R82101T03	0 602	R82101T10	0 979
R82101T04	0 616	R82101T12	1 004
R82101T05	0 695	R82101T16	1 135
R82101T06	0 726	R82101T20	1 165
R82101T08	0 837	R82101T24	1 395

7.3 FEMALE FLARED FITTING

Tube cut dimension, as shown in Figure 17, shall use dimensions per Table 8 for proper fitting installation

FIGURE 17

Female Flared Tube Cut Dimensions

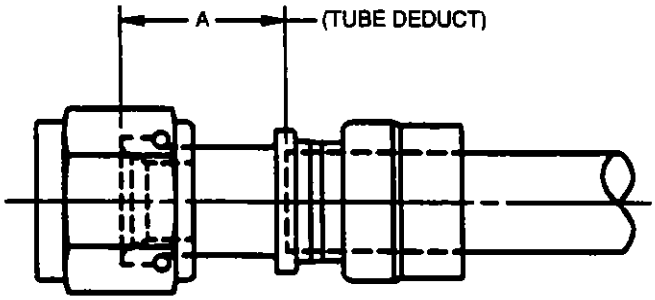


TABLE 8

PART NO.	"A" +.030	PART NO.	"A" +.030
R83101T03	0 662	R83101T10	1 045
R83101T04	0 701	R83101T12	1 085
R83101T05	0 748	R83101T16	1 214
R83101T06	0 779	R83101T20	1 298
R83101T08	0 920	R83101T24	1 477

8.0 FITTING SELECTION CHART

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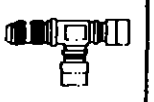
		PERMANENT TO LIPSEAL			PERMANENT TO "MS" FLARELESS			PERMANENT TO "AN" FLARED		
	PERMANENT TO PERMANENT	MALE	MALE BULKHEAD	FEMALE ArcSeal	MS33514	MS33515	NAS 1760 MODIFIED	MS33656	MS33657	AS1708
UNION										
Non-Reducer	R80101T( )	R81121T( )	R81141T( )	R81101T( )	R82121T( )	R82141T( )	R82101T( )	R83121T( )	R83141T( )	R83101T( )
Reducer	R80151T( )( )	R81171T( )( )	R81191T( )( )	R81151T( )( )	R82171T( )( )	R82191T( )( )	R82151T( )( )	R83171T( )( )	R83191T( )( )	R83151T( )( )
45° ELBOW										
Non-Reducer	R80102T( )	R81122T( )	R81142T( )	R81102T( )	R82122T( )	R82142T( )	R82102T( )	R83122T( )	R83142T( )	R83102T( )
Reducer	R80152T( )( )	R81172T( )( )	R81192T( )( )	R81152T( )( )	R82172T( )( )	R82192T( )( )	R82152T( )( )	R83172T( )( )	R83192T( )( )	R83152T( )( )
90° ELBOW										
Non-Reducer	*R80103T( )*	*R81123T( )*	*R81143T( )*	*R81103T( )*	*R82123T( )*	*R82143T( )*	*R82103T( )*	*R83123T( )*	*R83143T( )*	*R83103T( )*
Reducer	R80153T( )( )	R81173T( )( )	R81193T( )( )	R81153T( )( )	R82173T( )( )	R82193T( )( )	R82153T( )( )	R83173T( )( )	R83193T( )( )	R83153T( )( )
TEE (Separable on Run)										
Non-Reducer	R80104T( )	R81124T( )	R81144T( )	R81104T( )	R82124T( )	R82144T( )	R82104T( )	R83124T( )	R83144T( )	R83104T( )
Reducer	R80154T( )( )	R81174T( )( )( )	R81194T( )( )( )	R81154T( )( )( )	R82174T( )( )( )	R82194T( )( )( )	R82154T( )( )( )	R83174T( )( )( )	R83194T( )( )( )	R83154T( )( )( )
TEE (Separable on Side)										
Non-Reducer		R81126T( )	R81146T( )	R81106T( )	R82126T( )	R82146T( )	R82106T( )	R83126T( )	R83146T( )	R83106T( )
Reducer		R81176T( )( )( )	R81196T( )( )( )	R81156T( )( )( )	R82176T( )( )( )	R82196T( )( )( )	R82156T( )( )( )	R83176T( )( )( )	R83196T( )( )( )	R83156T( )( )( )