

FLUID FITTING ENGINEERING STANDARDS

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February 11, 2015

ENGINEERING DEVELOPMENT DIRECTORATE

National Aeronautics and
Space Administration

John F. Kennedy Space Center



**FLUID FITTING
ENGINEERING STANDARDS**

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February 11, 2015

JOHN F. KENNEDY SPACE CENTER, NASA

RECORD OF REVISIONS/CHANGES

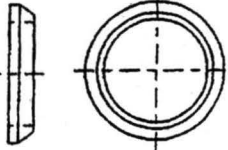
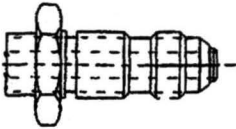
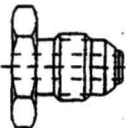
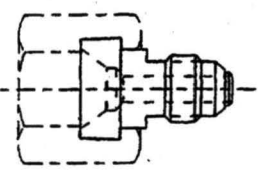
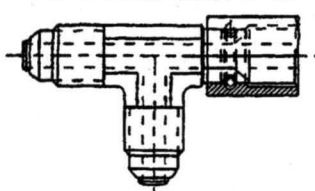
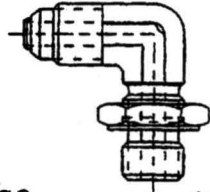
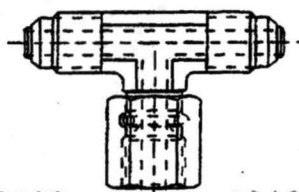
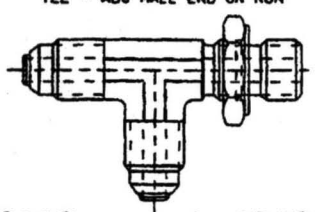
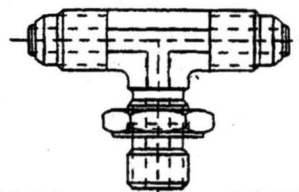
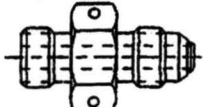
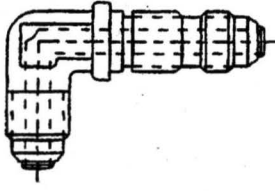
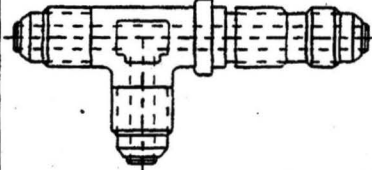
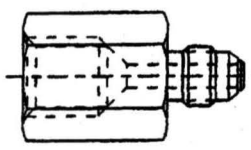
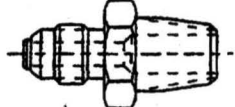
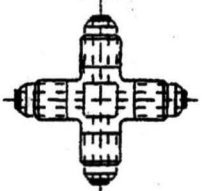
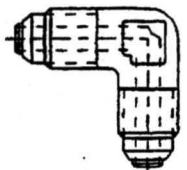
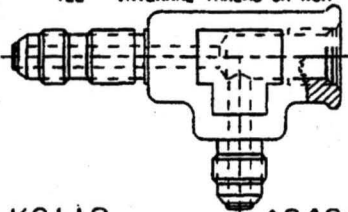
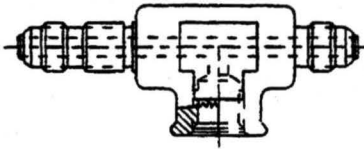
REV LTR	CHANGE NO.	DESCRIPTION	DATE
F		General Revision of entire document	August 1, 1990
	1	None	Not released
	2	Updated introduction, indexes, KC150, KC164	January 2, 1991
	3	Updated KC143, KC154, KC170, KC174, KC176	April 10, 1991
	4	Updated KC149, KC155 thru KC160, KC162, KC166 thru KC168, KC175	October 2, 1992
G		<ol style="list-style-type: none"> 1. Incorporated Amendments 1 thru 4 2. Added Nongovernmental Equivalent Standards to various KC Fluid Fitting Standards 3. Updated KC104, KC105, KC115, KC118, KC131, KC144, KC150, KC152, KC164, KC175, and KC176 	September 8, 1997
	1	Updated KC142, KC143, KC145, KC146, KC147, KC148, KC149, KC151 and KC152	May 1, 2007
	2	<ol style="list-style-type: none"> 1. Updated cover page, indexes, approval page, record of revisions, KC116 and KC152 2. Added Appendix A and B; Change Justification Reports 	February 6, 2009
	3	1. Updated cover page, Approval page, Record of Revisions, List of Effective Pages (iii/iv), and KC160	May 30, 2012
	4	Added Appendix C	February 11, 2015

LIST OF EFFECTIVE PAGES

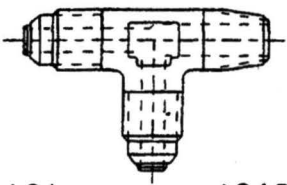
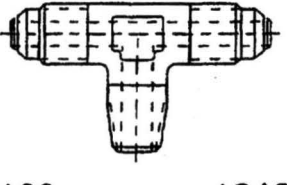
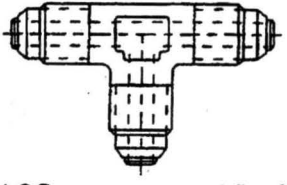
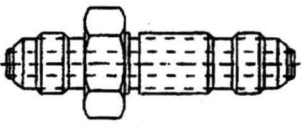
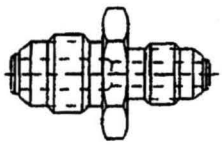
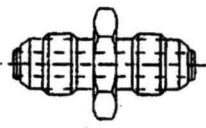
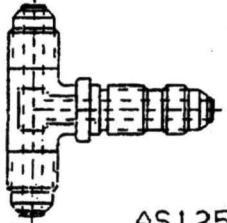
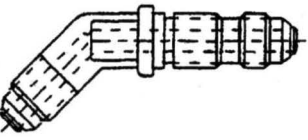
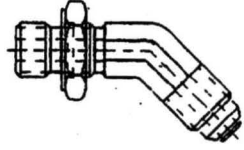
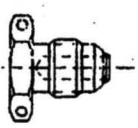
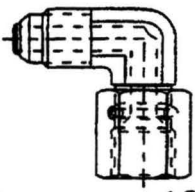
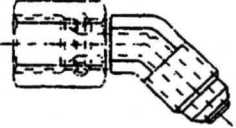
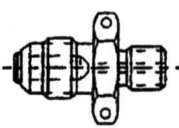
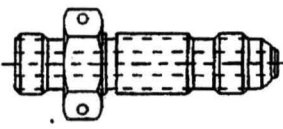
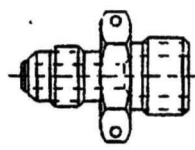
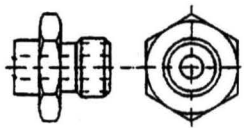
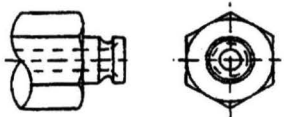
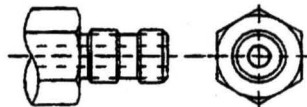
TOTAL NUMBER OF PAGES IN THIS DOCUMENT IS 139, CONSISTING OF:

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v thru xi.....	September 8, 1997
xii (blank).....	September 8, 1997
1 thru 19.....	September 8, 1999
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21 (KC116 sheet 2).....	February 6, 2009
22 thru 52.....	September 8, 1997
53 (KC142 sheet 1).....	May 1, 2007
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123 (Appendix cover).....	February 6, 2009
124 (Appendix A).....	February 6, 2009
125 (Appendix B).....	February 6, 2009
126 (Appendix B cont.).....	February 6, 2009
127 (Appendix C).....	February 11, 2015

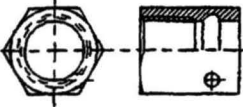
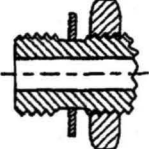
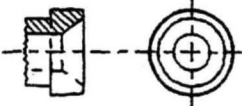
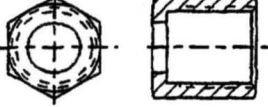
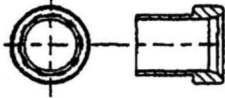
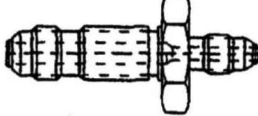
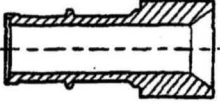
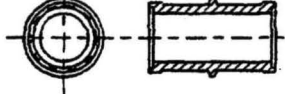
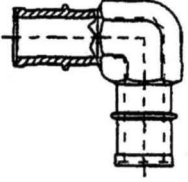
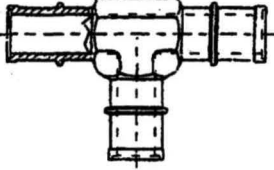
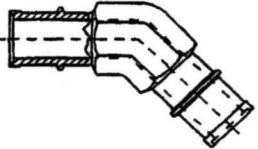
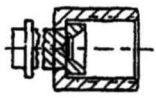
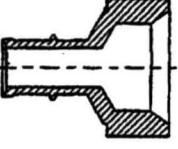
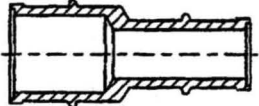
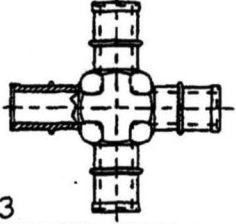


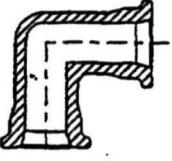
PICTORIAL INDEX

<p>SEAL RING</p>  <p>KC103 AS1097</p>	<p>BULKHEAD - FLARED TUBE</p>  <p>KC104 AS1099</p>	<p>FITTING END - FLARED TUBE</p>  <p>KC105 AS1098</p>
<p>REDUCER - ADAPTER</p>  <p>KC106 AS4301</p>	<p>TEE - ♀ FEMALE SWIVEL ON RUN</p>  <p>KC107 AS4302</p>	<p>ELBOW - 90° ADJ MALE END</p>  <p>KC108 AS4303</p>
<p>TEE - FEMALE SWIVEL ON LEG</p>  <p>KC109 AS4304</p>	<p>TEE - ADJ MALE END ON RUN</p>  <p>KC110 AS4305</p>	<p>TEE - ADJ MALE END ON LEG</p>  <p>KC111 AS4306</p>
<p>ADAPTER - BOSS TO TUBE</p>  <p>KC112 AS4307</p>	<p>ELBOW - 90° BULKHEAD</p>  <p>KC113 AS1366</p>	<p>TEE - BULKHEAD ON RUN</p>  <p>KC114 AS1365</p>
<p>BUSHING - EXPANDER</p>  <p>KC115 AS4308</p>	<p>NIPPLE - TUBE TO PIPE</p>  <p>KC116 AS4309</p>	<p>CROSS</p>  <p>KC117 AS1367</p>
<p>ELBOW - 90°</p>  <p>KC118 AS1250</p>	<p>TEE - INTERNAL THREAD ON RUN</p>  <p>KC119 AS4310</p>	<p>TEE - INTERNAL</p>  <p>KC120 AS4311</p>

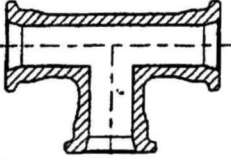

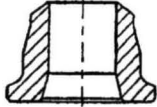

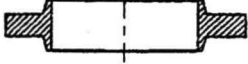
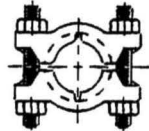
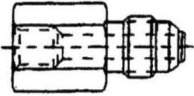
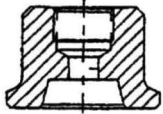
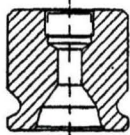
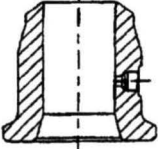
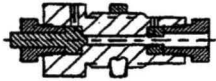
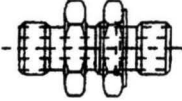
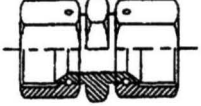
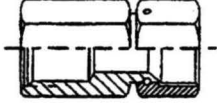
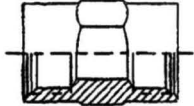
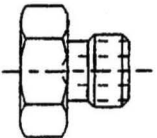
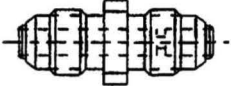
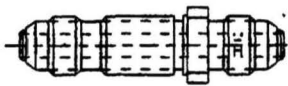
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INTRODUCTION

1. PURPOSE

The purpose of this document is to establish uniform engineering practices and methods for fluid fittings and to:

- a. Increase component interchangeability and reliability.
- b. Simplify procurement, storage, inspections, and environmental limitations.
- c. Expedite design by eliminating time spent on routine items for which design has already been accomplished.

2. SCOPE

This document is a compilation of standard fluid fitting parts and design standards used in the design of hydraulic and pneumatic systems used at the John F. Kennedy Space Center, Florida.

3. RECOGNITION

Standards originated for use at Kennedy Space Center are identified by a "KC" standard drawing number prefix. The coordination status for these standards is indicated at the lower left portion of the design standard sheet page. KC standards consist of both standard parts and design standards.

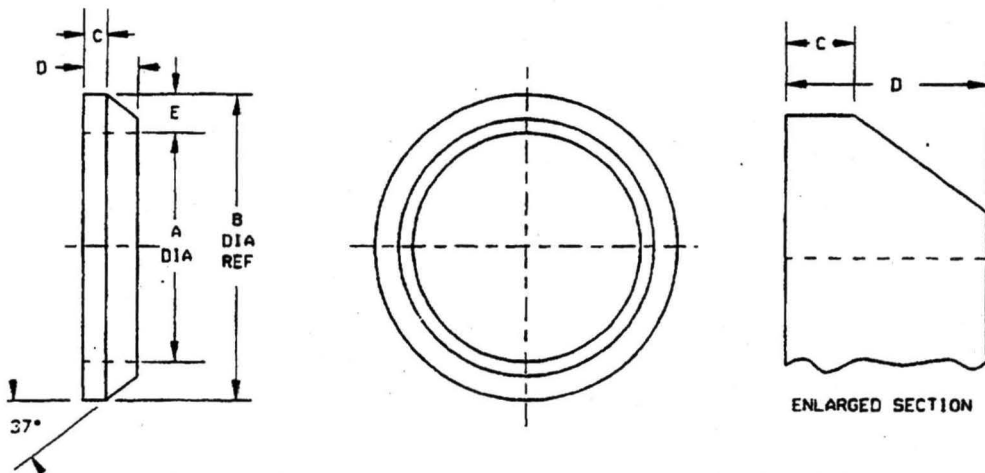
4. NONGOVERNMENTAL STANDARDS

Nongovernmental standards that are equivalent to KC standards are shown in this document as preferred standards for fluid fitting parts and design. These nongovernmental standards are published by the Society of Automotive Engineers (SAE). Application for copies of these standards should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

The nongovernment standards shown in this document are interchangeable with "KC" fittings and are preferred for new design. "KC" fittings shall be utilized until existing stocks are depleted. New procurements of fluid fittings equivalent to "KC" fittings shall use the preferred nongovernmental standards.



FED SUP CLASS
5330



DASH NO.	TUBE OD REF	NOTE 2				
		A DIA.	B DIA. REF	C DIM. ±.0015	D DIM. +.003 -.001	E DIM. ±.001
-4	¼	.210	.251	.0364	.0523	.018
-6	⅜	.326	.391			
-8	½	.440	.505			
-10	⅝	.545	.610	.0335	.0673	.030
-12	¾	.670	.735			
-16	1	.953	1.018			
-20	1¼	1.180	1.261	.0256	.070	.038
-24	1½	1.430	1.511			
-28	1¾	1.660	1.765			
-32	2	1.910	2.015	.0319	.0890	.048

MATERIAL:-----TETRAFLUOROETHYLENE RESIN (TEFLON)
 FINISH:-----
 INSPECTION:-----
 PACKAGING & MARKING:----- } PER MIL-R-8791

- NOTES:
1. DIMENSIONS ARE IN INCHES, TOLERANCES AS SPECIFIED, AND ANGLE ±1/2°.
 2. DIMENSIONS ARE FREE STATE DIMENSIONS.
 3. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 4. THIS STANDARD TAKES PRECEDENCE OVER DOCUMENTS SPECIFIED HEREIN.

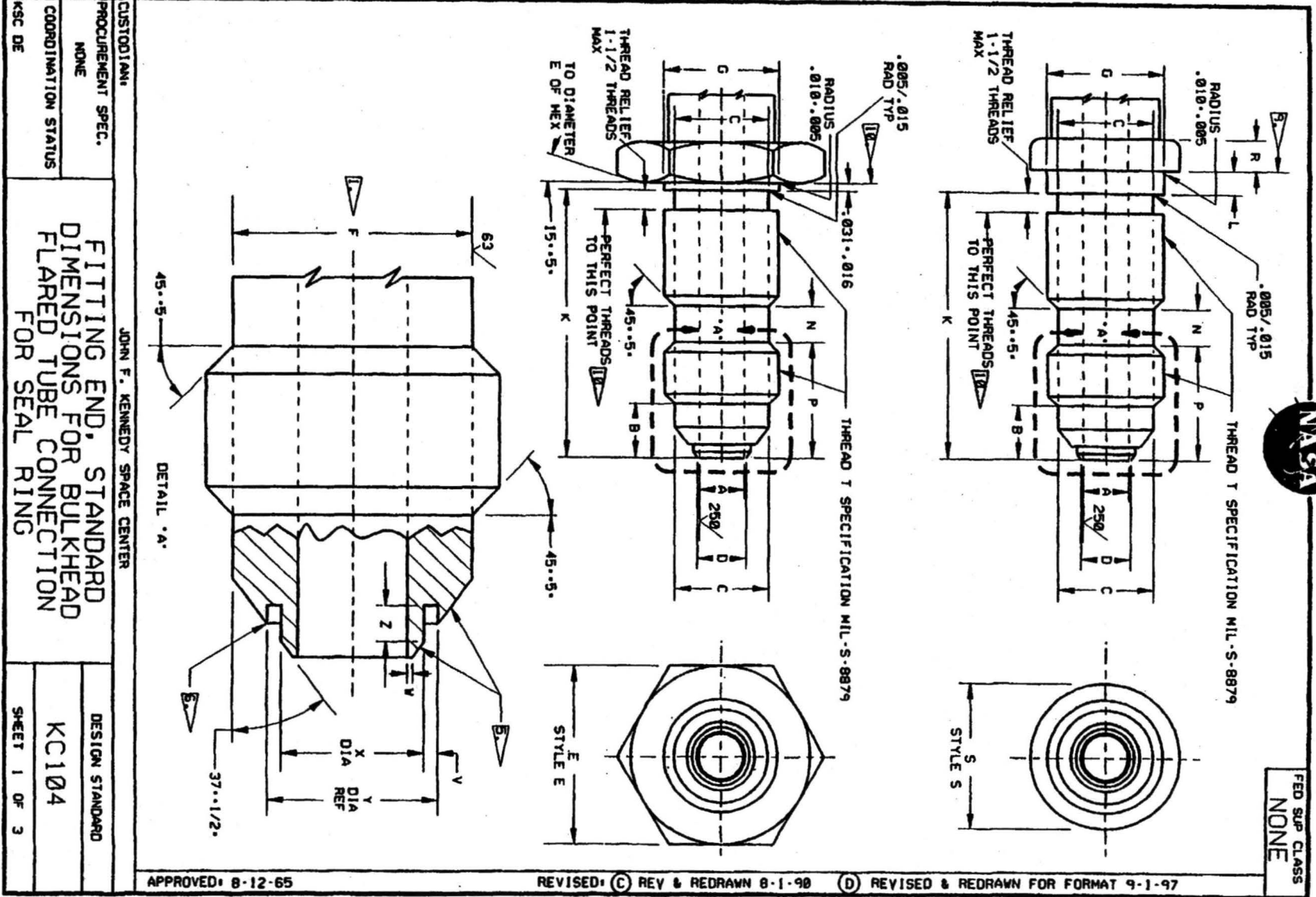
EXAMPLE OF PART NO. KC103-4 SEAL RING FOR -4 (¼") FITTING END

REVISED: (E) REV & REDRAWN 8-1-90
APPROVED: 5-10-65

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CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. SEE NOTES	SEAL RING	STANDARD PART	
COORDINATION STATUS		KC103	
KSC DE		SHEET 1 OF 1	

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NONE

CUSTOMER:	JOHN F. KENNEDY SPACE CENTER
PROCUREMENT SPEC.	NONE
COORDINATION STATUS	
KSC DE	
FITTING END, STANDARD DIMENSIONS FOR BULKHEAD FLARED TUBE CONNECTION FOR SEAL RING	
DESIGN STANDARD	KC104
SHEET	1 OF 3

APPROVED: 8-12-65 REVISED: (C) REV & REDRAWN 8-1-90 (D) REVISED & REDRAWN FOR FORMAT 9-1-97



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DASH NO.	TUBE OD REF	THREAD T MIL-S-8879	A DIA	B .000 .045	C .000 .005 DIA	D .003 DIA	E	F .002 .003		G		
								MIN	MAX	MIN	MAX	
-4	1/4	.4375-20-UNJF-3A	.172	.003 .004	.208	.359	.193	.688	.003 .004	.364	.429	.438
-6	3/8	.5625-18-UNJF-3A	.297	.004	.213	.476	.318	.813		.481	.554	.562
-8	1/2	.7500-16-UNJF-3A	.391		.268	.654	.426	1.000		.668	.741	.750
-10	5/8	.8750-14-UNJF-3A	.484		.281	.767	.539	1.125		.773	.865	.875
-12	3/4	1.0625-12-UNJ-3A	.609	.005	.330	.938	.664	1.375	.945	1.051	1.062	
-16	1	1.3125-12-UNJ-3A	.844	.007 .005		1.188	.913	1.625	.016	1.195	1.301	1.312
-20	1 1/4	1.6250-12-UNJ-3A	1.078	.008 .005	.382	1.501	1.147	1.875	.020	1.507	1.614	1.625
-24	1 1/2	1.8750-12-UNJ-3A	1.312	.010 .005	.393	1.758	1.381	2.125	1.756	1.864	1.875	
-28	1 3/4	2.2500-12-UNJ-3A	1.547		.466	2.125	1.646	2.500	2.131	2.239	2.250	
-32	2	2.5000-12-UNJ-3A	1.781		.476	2.375	1.888	2.750	2.381	2.489	2.500	

DASH NO.	TUBE OD REF	K .000 .045	L .016	N .018 .000	P .000 .045	R .016	S DIA .016	V .0015 .0010	W MIN	X .002	Y REF	Z .001
-4	1/4	1.026	.094	.140	.448	.125	.562	.020	.0075	.220	.261	.0533
-6	3/8	1.184		.156	.481	.141	.688	.032	.007	.336	.401	.0683
-8	1/2	1.268		.187	.570	.156	.875		.014	.450	.515	
-10	5/8	1.401		.219	.628	.172	1.000	.024	.560	.625		
-12	3/4	1.572	.125	.737	.188	1.188	.023	.685	.750			
-16	1					1.438	.968	1.033				
-20	1 1/4	1.619		.789		1.750	.029	1.200	1.201	.071		
-24	1 1/2	1.635		.800		2.000	1.450	1.531				
-28	1 3/4	1.791	.873	2.375	.050	.044	1.690	1.790	.090			
-32	2	1.916	.883	2.625	1.940	2.040						

APPROVED: 8-12-65 REVISED: (C) REV & REDRAWN 8-1-90 (D) REVISED & REDRAWN FOR FORMAT 9-1-97

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. NONE	FITTING END, STANDARD DIMENSIONS FOR BULKHEAD FLARED TUBE CONNECTION FOR SEAL RING	DESIGN STANDARD
COORDINATION STATUS KSC DE		KC104
		SHEET 2 OF 3



FED SUP CLASS
NONE

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- NOTES:
- 1. GROOVE FORMED SHALL BE SMOOTH AND FREE OF ALL THREAD MARKS.
 - 2. ON STYLE S FITTING END THE L DIMENSION PROVIDES FOR A WASHER TO FORM BACKING FACE AGAINST BULKHEAD AND A .031 INCH LAND FOR POSITIONING IN BULKHEAD. ON STYLE E FITTING END NO WASHER IS REQUIRED.
 - 3. REMOVE ALL BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - 4. DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
 - 5. THIS SURFACE SHALL BE FREE OF BURRS, LONGITUDINAL AND SPIRAL TOOL MARKS AND SHALL BE SMOOTH. EXCEPT THAT ANNULAR TOOL MARKS WILL BE ALLOWED TO 64 MICROINCHES AA MAX.
 - 6. LEAVE GROOVE CORNERS AND EDGES .005 MAXIMUM RADIUS. FINISH GROOVE TO 64 MICROINCHES AA MAX.
 - 7. DIMENSIONS C, D, F, AND X SHALL BE CONCENTRIC WITH EACH OTHER AND WITH ALL ELEMENTS OF THE 37° ANGLE CONICAL SURFACE MEASURED AND CALCULATED AS INCLUDED ANGLES WITHIN .005 T.I.R.
 - 8. T (THREAD PITCH DIA.) SHALL BE CONCENTRIC TO DIMENSION "C" WITHIN .015 T.I.R.
 - 9. SQUARENESS BETWEEN THREAD PITCH DIAMETER AND FACE OF HEX ON STYLE E OR FACE OF SHOULDER ON STYLE S FITTING ENDS SHALL NOT EXCEED .005 FOR SIZES DASH 10 AND SMALLER OR .008 FOR LARGER SIZES. WHEN MEASURED AT THE OUTER DIAMETER OF THE FACE.
 - 10. CHAMFER 45° x .5° OPTIONAL.
 - 11. ROUGHNESS OF MACHINED SURFACES SHALL BE 125AA MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.

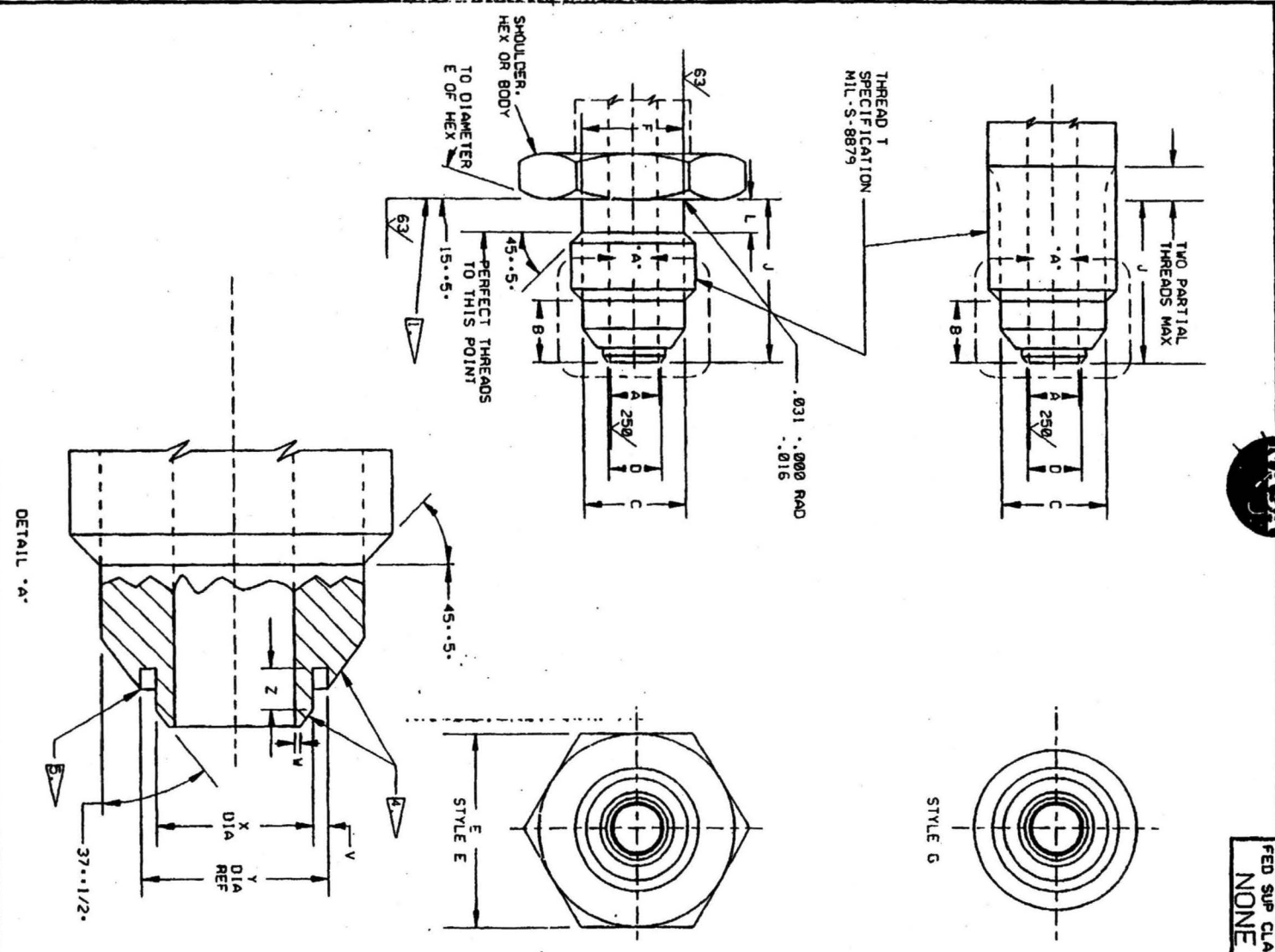
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CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC.	FITTING END, STANDARD DIMENSIONS FOR BULKHEAD FLARED TUBE CONNECTION FOR SEAL RING	DESIGN STANDARD	KC104
NONE			
COORDINATION STATUS			
KSC DE		SHEET 3 OF 3	

KSC FORM 32-85 (CG 4/92)



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CUSTOMER: JOHN F. KENNEDY SPACE CENTER	DESIGN STANDARD KC105
PROCUREMENT SPEC. NONE	SHEET 1 OF 2
COORDINATION STATUS	
FITTING END, STANDARD DIMENSIONS FOR FLARED TUBE CONNECTION FOR SEAL RING	

KSC DE
KSC FORM 32-85 (CC 4/92)

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

KSC FORM 32-85 (CG 4/92)

CUSTODIAN: NONE	PROCUREMENT SPEC.	FITTING END, STANDARD DIMENSIONS FOR FLARED TUBE CONNECTION FOR SEAL RING
	COORDINATION STATUS	
KSC DE	DESIGN STANDARD	SHEET 2 OF 2
	KC105	

JOHN F. KENNEDY SPACE CENTER

DASH NO.	TUBE OD REF	THREAD T MIL-S-8879	A DIA	B .000 DIA	C .000 DIA	D .003 DIA	E	F .002 DIA	J .000 DIA	L .015 DIA	V .0015 DIA	W MIN	X .002 DIA	Y REF	Z .001	
.4	¼	.4375-20-UNJF-3A	.172	.003 -.004	.208	.359	.193	.688	.364	.565	.075	.020	.0075	.220	.261	.0533
.6	⅜	.5625-18-UNJF-3A	.297		.213	.476	.318	.813	.481	.571	.083		.007	.336	.401	
.8	½	.7500-16-UNJF-3A	.391	.004	.268	.654	.426	1.000	.660	.672	.094		.014	.450	.515	
.10	⅝	.8750-14-UNJF-3A	.484		.281	.767	.539	1.125	.773	.773	.107	.032	.024	.560	.625	.0683
.12	¾	1.0625-12-UNJ-3A	.609	.005		.938	.664	1.375	.945	.879			.023	.685	.750	
.16	1	1.3125-12-UNJ-3A	.844	.007 -.005	.330	1.188	.913	1.625	1.195	.926				.968	1.033	
.20	1¼	1.6250-12-UNJ-3A	1.078	.008 -.005	.382	1.501	1.147	1.875	1.507	.973			.029	1.200	1.281	.071
.24	1½	1.8750-12-UNJ-3A	1.312		.393	1.750	1.381	2.125	1.756	1.098	.125	.040		1.450	1.531	
.28	1¾	2.2500-12-UNJ-3A	1.547	.010 -.005	.466	2.125	1.646	2.500	2.131	1.223		.050	.044	1.690	1.790	.090
.32	2	2.5000-12-UNJ-3A	1.781		.476	2.375	1.880	2.750	2.381	1.348				1.940	2.040	

NOTES:

1. SQUARENESS BETWEEN THREAD PITCH DIAMETER AND FACE OF HEX SHALL NOT EXCEED .005 FOR SIZES DASH 10 AND SMALLER OR .008 FOR LARGER SIZES, WHEN MEASURED AT THE OUTER DIAMETER OF THE FACE.
2. BREAK SHARP EDGES UNLESS OTHERWISE NOTED. REMOVE BURRS AND SLIVERS.
3. DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
4. THIS SURFACE SHALL BE FREE OF BURRS, LONGITUDINAL AND SPIRAL TOOL MARKS AND SHALL BE SMOOTH EXCEPT THAT ANNULAR TOOL MARKS WILL BE ALLOWED TO 64 MICROINCHES AA MAX.
5. LEAVE GROOVE CORNERS AND EDGES .005 MAX RADIUS. FINISH GROOVE TO 64 MICROINCHES AA MAX.
6. DIMENSIONS C, D, F, AND X SHALL BE CONCENTRIC WITH EACH OTHER AND WITH ALL ELEMENTS OF THE 37° ANGLE CONICAL SURFACE MEASURED AND CALCULATED AS INCLUDED ANGLES WITHIN .005 T.I.R.
7. T (THREAD PITCH DIA.) SHALL BE CONCENTRIC TO DIMENSION 'C' WITHIN .015 T.I.R.
8. ROUGHNESS OF MACHINED SURFACES SHALL BE 125AA MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.

APPROVED: 5-10-65

REVISED: (C) REVISED AND REDRAWN 8-1-90 (D) REVISED & REDRAWN FOR FORMAT 9-1-97

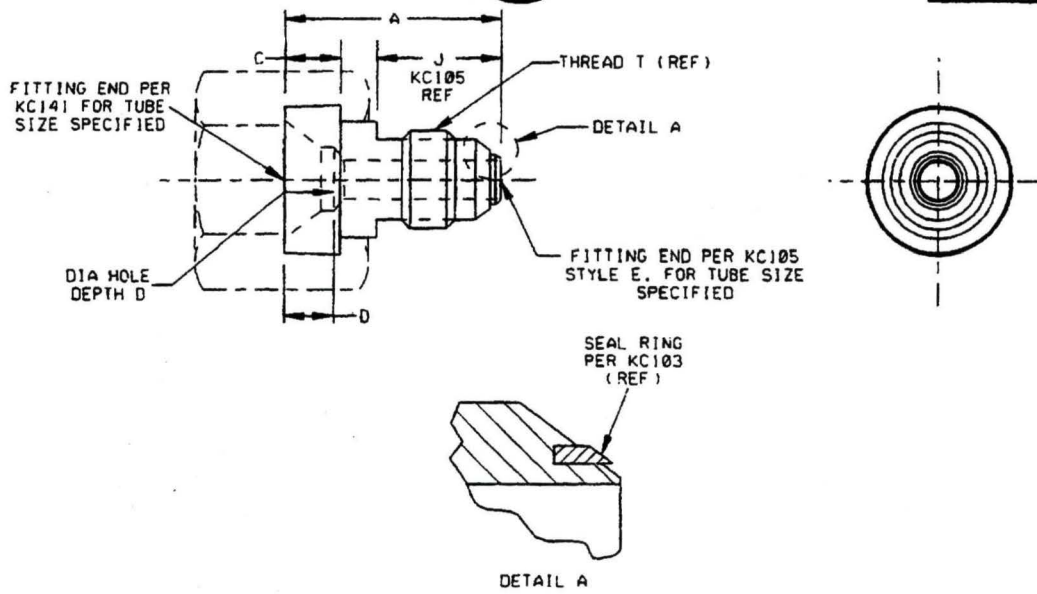


FED SUP CLASS
NONE

GP-425



FED SUP CLASS
4730



DASH NO.		CONICAL END MATES WITH FITTING FOR TUBE OD	TUBE END		A +.000 -.075	C REF	D REF
CRE STEEL	AL ALLOY		TUBE OD	THREAD T REF			
K6-4	06-4	3/8	1/4	7/16-20	.974	.172	.219
K8-4	08-4	1/2		3/8	9/16-18	1.005	.219
K8-6	08-6		3/8		9/16-18	1.036	.234
K10-6	010-6	3/4	1/4	7/16-20	1.099	.266	.313
K12-4	012-4		3/8	9/16-18			
K12-6	012-6		1/2	3/4-16			
K12-8	012-8	1	3/8	1-1/16-12	1.271	.281	.344
K16-8	016-8				1.474		
K16-12	016-12	1-1/4	1/2	3/4-16	1.411	.313	.438
K20-8	020-8		3/4	1-1/16-12	1.536		.375
K20-12	020-12		1	1-5/16-12	1.599		.438
K20-16	020-16	1-1/2	3/4	1-1/16-12	1.630	.344	.406
K24-12	024-12		1	1-5/16-12			
K24-16	024-16		1-1/4	1-5/8-12			
K24-20	024-20	2	1	1-5/16-12	2.036	.406	.625
K32-16	032-16		1-1/4	1-5/8-12	1.786		.469
K32-20	032-20		1-1/2	1-7/8-12	1.911		.531

REVISID: (E) REVISED AND REDRAWN 8-1-90
APPROVED: 5-10-65

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	REDUCER-ADAPTER, CONICAL END FITTING AND FLARED TUBE FOR SEAL RING	KC106
COORDINATION STATUS KSC DE		SHEET 1 OF 2



FED SUP CLASS
4730

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MATERIAL: SEE PROCUREMENT SPECIFICATION; ALUMINUM ALLOY, 2024-T6, CODE 'D'; CORROSION RESISTANT STEEL (CLASS 316), CODE 'K' (WAS CODE 'C')
FINISH: SEE PROCUREMENT SPECIFICATION
SCREW THREAD: SEE PROCUREMENT SPECIFICATION.
NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

EXAMPLE OF PART NOS.
 KC106K8-6 = REDUCER-ADAPTER - FOR 1/2 OD TUBE CONICAL FITTING
 END TO 3/8 OD TUBE, CORROSION RESISTANT STEEL
 KC106D12-4 = REDUCER-ADAPTER - FOR 3/4 OD TUBE CONICAL FITTING
 END TO 1/4 OD TUBE, ALUMINUM ALLOY

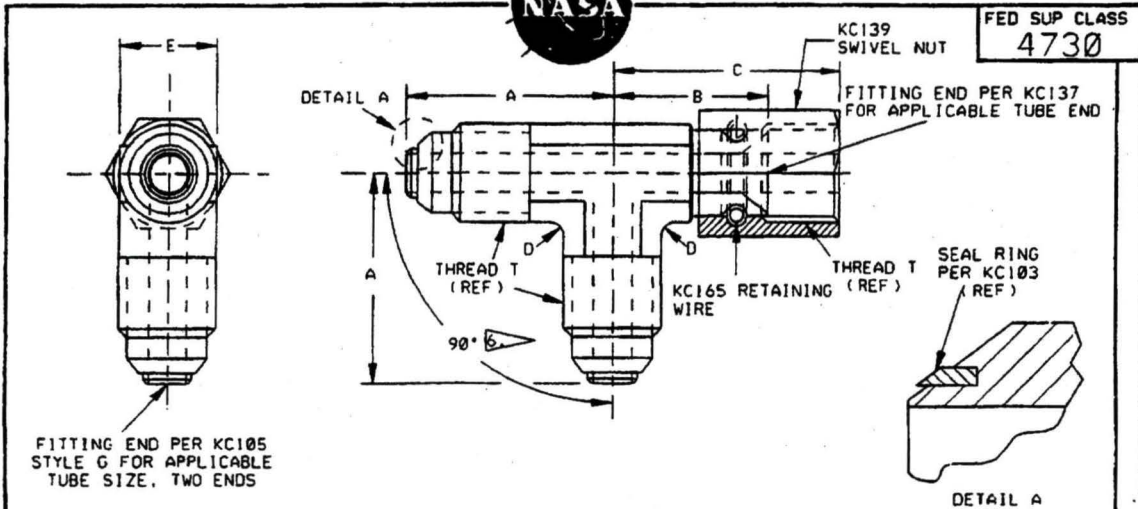
APPROVED: 5-10-65
 REVISED: (E) REVISED AND REDRAWN 8-1-90

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	REDUCER-ADAPTER, CONICAL END FITTING AND FLARED TUBE FOR SEAL RING	STANDARD PART	
COORDINATION STATUS		KC106	
KSC DE		SHEET 2 OF 2	

KSC FORM 32-85 (CG 4/92)



NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



FED SUP CLASS
4730

DASH NO.	TUBE OD REF	THREAD T REF	A DIM. +.000 - .063	B DIM. +.000 - .063	C DIM REF	D RAD ±.03	E PAD DIM.	SWIVEL NUT KC139		RETAINING WIRE	
								CRE STEEL	AL ALLOY		
K4	D4	1/4	7/16-20	.906	.704	1.000	.063	.438	K4	D4	KC165-4
K6	D6	3/8	9/16-18	1.078	.891	1.250	.094	.563	K6	D6	KC165-6
K8	D8	1/2	3/4-16	1.266	.969	1.375		.750	K8	D8	KC165-8
K10	D10	5/8	7/8-14	1.469	1.141	1.625		.875	K10	D10	KC165-10
K12	D12	3/4	1-1/16-12	1.672	1.204	1.750	.125	1.063	K12	D12	KC165-12
K16	D16	1	1-5/16-12	1.828	1.422	2.000		1.313	K16	D16	KC165-16
K20	D20	1 1/4	1-5/8-12	2.078	1.704	2.313	.188	1.625	K20	D20	KC165-20
K24	D24	1 1/2	1-7/8-12	2.344	1.875	2.594		1.875	K24	D24	KC165-24
K28	D28	1 3/4	2-1/4-12	2.828	2.063	2.900	.250	2.250	K28	D28	KC165-28
K32	D32	2	2-1/2-12	3.078	2.454	3.375		2.500	K32	D32	KC165-32

- MATERIAL:** SEE PROCUREMENT SPECIFICATION, ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
- FINISH:** SEE PROCUREMENT SPECIFICATION.
- SCREW THREAD:** SEE PROCUREMENT SPECIFICATION.
- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
- TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".
- EXAMPLE OF PART NOS.** KC107K8 = TEE WITH SWIVEL END ON RUN, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC107D12 = TEE WITH SWIVEL END ON RUN, 3/4" OD TUBING, ALUMINUM ALLOY

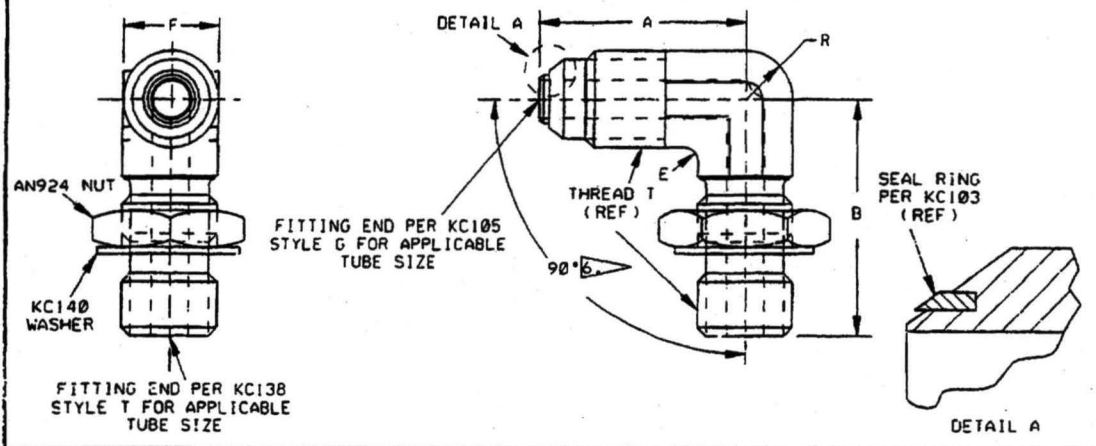
REVISED: (E) REV & REDRAWN B-1-90
 APPROVED: 5-10-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	STANDARD PART KC107
COORDINATION STATUS	SHEET 1 OF 1
KSC DE	

TEE-ASSY, FLARED TUBE
 FEMALE SWIVEL END ON
 RUN, FOR SEAL RING



FED SUP CLASS
4730



DASH NO.	TUBE OD REF	THREAD REF	A DIM. +.000 -.063	B DIM. +.000 -.063	E RAD +.03 -.03	R RAD +.03 -.03	F PAD DIM. +.016 -.016	BULKHEAD NUT		WASHER		
								FOR CRE STEEL ASSY *	FOR AL ALLOY ASSY	FOR CRE STEEL ASSY	FOR AL ALLOY ASSY	
K4	D4	1/4	7/16-20	.906	1.063	.063	.242	.438	AN924-K4	AN924-D4	KC140C4	KC140D4
K6	D6	3/8	9/16-18	1.078	1.281	.094	.317	.563	AN924-K6	AN924-D6	KC140C6	KC140D6
K8	D8	1/2	3/4-16	1.266	1.485		.414	.750	AN924-K8	AN924-D8	KC140C8	KC140D8
K10	D10	5/8	7/8-14	1.469	1.735		.484	.875	AN924-K10	AN924-D10	KC140C10	KC140D10
K12	D12	3/4	1-1/16-12	1.672	1.969		.586	1.063	AN924-K12	AN924-D12	KC140C12	KC140D12
K16	D16	1	1-5/16-12	1.828	2.078	.125	.719	1.313	AN924-K16	AN924-D16	KC140C16	KC140D16
K20	D20	1 1/4	1-5/8-12	2.078	2.281		.875	1.625	AN924-K20	AN924-D20	KC140C20	KC140D20
K24	D24	1 1/2	1-7/8-12	2.344	2.422		1.031	1.875	AN924-K24	AN924-D24	KC140C24	KC140D24
K28	D28	1 3/4	2-1/4-12	2.828	2.913		1.125	2.250	AN924-K28	AN924-D28	KC140C28	KC140D28
K32	D32	2	2-1/2-12	3.078	2.922	.188	1.383	2.500	AN924-K32	AN924-D32	KC140C32	KC140D32

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T5, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")
*AN924 CRES NUTS MAY BE EITHER 304, CODE "J" OR 316, CODE "X".

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.

EXAMPLE OF PART NOS.
KC108K8 = ELBOW, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC108D12 = ELBOW, 3/4" OD TUBING, ALUMINUM ALLOY

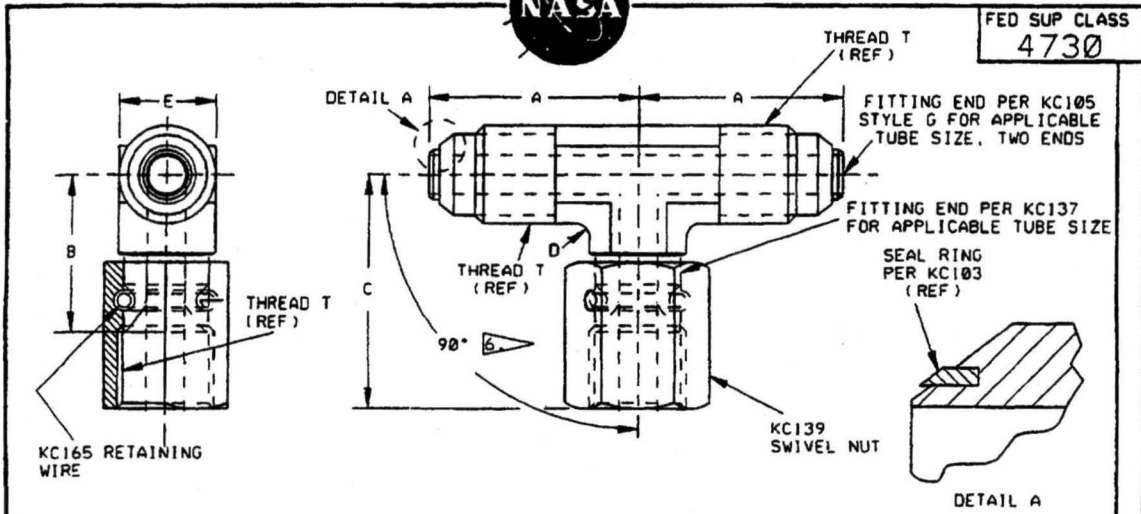
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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	ELBOW ASSY, 90°, FLARED TUBE & MALE ADJUSTABLE END, FOR SEAL RING		KC108
COORDINATION STATUS			SHEET 1 OF 1
KSC DE			

REVISED: (C) REV & REDRAWN 8-1-90
APPROVED: 5-10-65



NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



DASH NO.		TUBE OD REF	THREAD T REF	A DIM. +.000 -.063	B DIM. +.000 -.031	C DIM REF	D RAD ±.03	E PAD DIM.	SWIVEL NUT KC139		RETAINING WIRE
CRE STEEL	AL ALLOY								CRE STEEL	AL ALLOY	
K4	D4	1/4	7/16-20	.906	.704	1.000	.063	.438	K4	D4	KC165-4
K6	D6	3/8	9/16-18	1.078	.891	1.250	.094	.563	K6	D6	KC165-6
K8	D8	1/2	3/4-16	1.266	.969	1.375		.750	K8	D8	KC165-8
K10	D10	5/8	7/8-14	1.469	1.141	1.625		.875	K10	D10	KC165-10
K12	D12	3/4	1-1/16-12	1.672	1.204	1.750		1.063	K12	D12	KC165-12
K16	D16	1	1-5/16-12	1.828	1.422	2.000	.125	1.313	K16	D16	KC165-16
K20	D20	1 1/4	1-5/8-12	2.078	1.704	2.313	.188	1.625	K20	D20	KC165-20
K24	D24	1 1/2	1-7/8-12	2.344	1.875	2.594		1.875	K24	D24	KC165-24
K28	D28	1 3/4	2-1/4-12	2.828	2.063	2.900		2.250	K28	D28	KC165-28
K32	D32	2	2-1/2-12	3.078	2.454	3.375		2.500	K32	D32	KC165-32

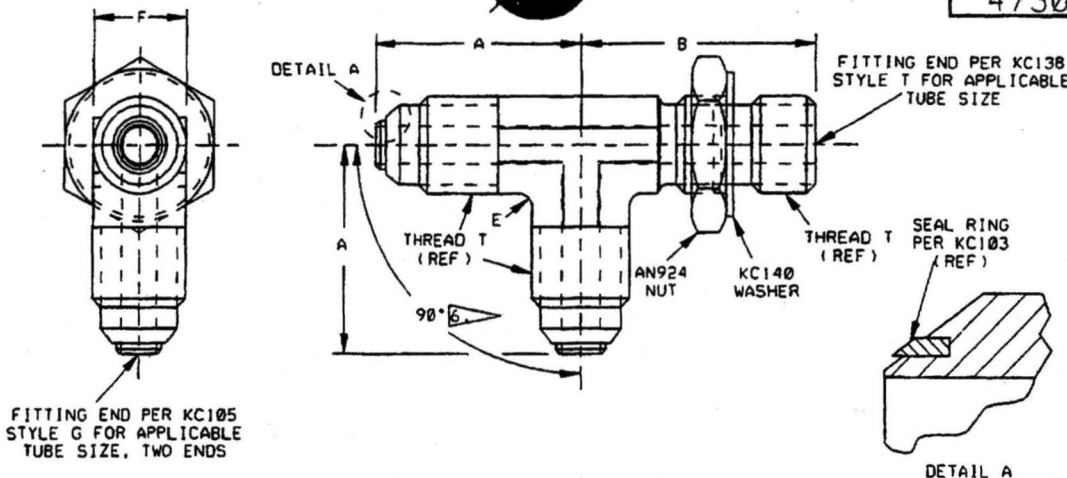
- MATERIAL:** SEE PROCUREMENT SPECIFICATION, ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")
- FINISH:** SEE PROCUREMENT SPECIFICATION.
- SCREW THREAD:** SEE PROCUREMENT SPECIFICATION.
- NOTES:**
 - REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
- TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".
- EXAMPLE OF PART NOS.** KC109K8 = TEE WITH SWIVEL END ON OUTLET, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC109D12 = TEE WITH SWIVEL END ON OUTLET, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. KSC-F-124	TEE ASSY, FLARED TUBE, FEMALE SWIVEL END ON OUTLET, FOR SEAL RING	STANDARD PART
COORDINATION STATUS		KC109
KSC DE		SHEET 1 OF 1

REVISED: (E) REV & REDRAWN 8-1-90
 APPROVED: 5-10-65



FED SUP CLASS
4730



DASH NO.		TUBE OD REF	THREAD T REF	A DIM. +.000 -.063	B DIM. +.000 -.063	E RAD +.03 -.03	F PAD DIM. +.016 -.016	BULKHEAD NUT		WASHER	
CRE STEEL	AL ALLOY							FOR CRE STEEL ASSY +	FOR AL ALLOY ASSY	FOR CRE STEEL ASSY	FOR AL ALLOY ASSY
K4	D4	1/4	7/16-20	.906	1.063	.063	.438	AN924-K4	AN924-D4	KC140C4	KC140D4
K6	D6	3/8	9/16-18	1.078	1.281	.094	.563	AN924-K6	AN924-D6	KC140C6	KC140D6
K8	D8	1/2	3/4-16	1.266	1.485		.750	AN924-K8	AN924-D8	KC140C8	KC140D8
K10	D10	5/8	7/8-14	1.469	1.735	.125	.875	AN924-K10	AN924-D10	KC140C10	KC140D10
K12	D12	3/4	1-1/16-12	1.672	1.969		1.063	AN924-K12	AN924-D12	KC140C12	KC140D12
K16	D16	1	1-5/16-12	1.828	2.078		1.313	AN924-K16	AN924-D16	KC140C16	KC140D16
K20	D20	1 1/4	1-5/8-12	2.078	2.281		1.625	AN924-K20	AN924-D20	KC140C20	KC140D20
K24	D24	1 1/2	1-7/8-12	2.344	2.422		1.875	AN924-K24	AN924-D24	KC140C24	KC140D24
K28	D28	1 3/4	2-1/4-12	2.828	2.813		2.250	AN924-K28	AN924-D28	KC140C28	KC140D28
K32	D32	2	2-1/2-12	3.078	2.922	.188	2.500	AN924-K32	AN924-D32	KC140C32	KC140D32

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
*AN924 CRES NUTS MAY BE EITHER 304, CODE "J" OR 316, CODE "K".

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.

EXAMPLE OF PART NOS.
KC110K8 = TEE, ADJ. END ON RUN, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC110D12 = TEE, ADJ. END ON RUN, 3/4" OD TUBING, ALUMINUM ALLOY

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. KSC-F-124	TEE ASSY, FLARED TUBE, MALE ADJUSTABLE END ON RUN, FOR SEAL RING	STANDARD PART
COORDINATION STATUS KSC DE		KC110
		SHEET 1 OF 1

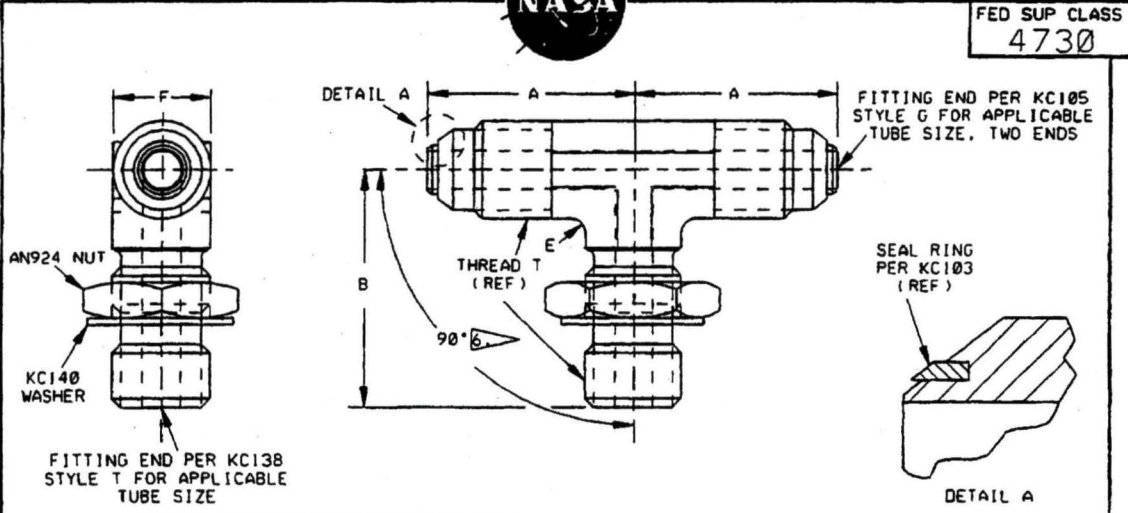
KSC FORM 32-85 (CG 4/92)

REVISED: (C) REV 8 REDRAWN 8-1-90
APPROVED: 5-10-65



FED SUP CLASS
4730

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FITTING END PER KC138
STYLE T FOR APPLICABLE
TUBE SIZE

FITTING END PER KC105
STYLE G FOR APPLICABLE
TUBE SIZE, TWO ENDS

SEAL RING
PER KC103
(REF)

DETAIL A

DASH NO.	TUBE OD REF	THREAD T REF	A DIM. +.000 -.063	B DIM. +.000 -.063	E RAD +.03 -.03	F PAD DIM. +.016 -.016	BULKHEAD NUT		WASHER	
							FOR CRE STEEL ASSY *	FOR AL ALLOY ASSY	FOR CRE STEEL ASSY	FOR AL ALLOY ASSY
K4	D4	1/4	7/16-20	1.063	.063	.438	AN924-K4	AN924-D4	KC140C4	KC140D4
K6	D6	3/8	9/16-18	1.281	.094	.563	AN924-K6	AN924-D6	KC140C6	KC140D6
K8	D8	1/2	3/4-16	1.485	.125	.750	AN924-K8	AN924-D8	KC140C8	KC140D8
K10	D10	5/8	7/8-14	1.735	.125	.875	AN924-K10	AN924-D10	KC140C10	KC140D10
K12	D12	3/4	1-1/16-12	1.969	.125	1.063	AN924-K12	AN924-D12	KC140C12	KC140D12
K16	D16	1	1-5/16-12	2.078	.125	1.313	AN924-K16	AN924-D16	KC140C16	KC140D16
K20	D20	1 1/4	1-5/8-12	2.281	.125	1.625	AN924-K20	AN924-D20	KC140C20	KC140D20
K24	D24	1 1/2	1-7/8-12	2.422	.125	1.875	AN924-K24	AN924-D24	KC140C24	KC140D24
K28	D28	1 3/4	2-1/4-12	2.813	.125	2.250	AN924-K28	AN924-D28	KC140C28	KC140D28
K32	D32	2	2-1/2-12	2.922	.188	2.500	AN924-K32	AN924-D32	KC140C32	KC140D32

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
*AN924 CRES NUTS MAY BE EITHER 304, CODE "J" OR 316, CODE "K".

FINISH: SEE PROCUREMENT SPECIFICATION.
SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".

EXAMPLE OF PART NOS. KC111K8 = TEE, ADJ. END ON OUTLET, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC111D12 = TEE, ADJ. END ON OUTLET, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	STANDARD PART KC111
COORDINATION STATUS KSC DE	
TEE ASSY, FLARED TUBE MALE ADJUSTABLE END ON OUTLET, FOR SEAL RING	
SHEET 1 OF 1	

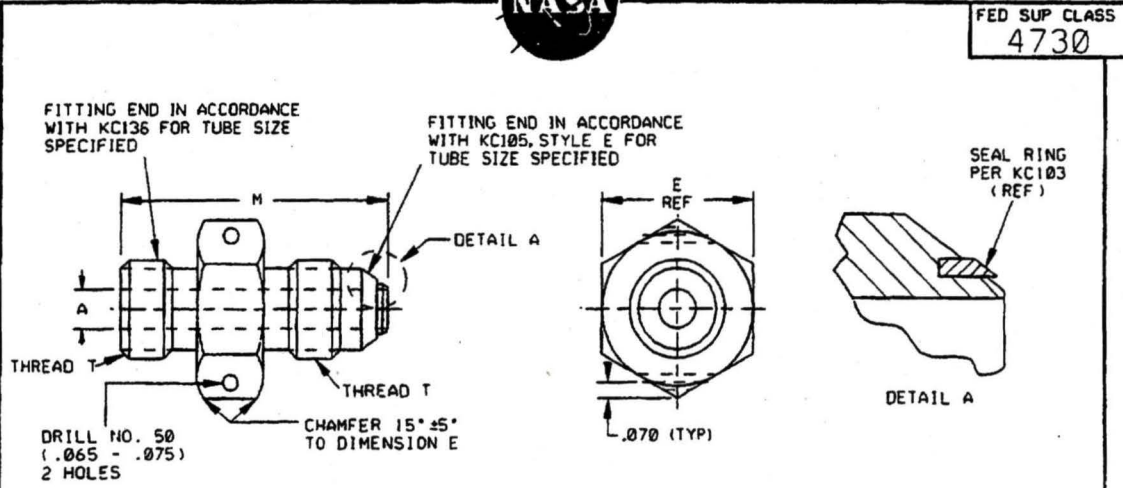
KSC FORM 32-85 (CG 4/92)

REVISED: (G) REV & REDRAWN 8-1-90
APPROVED: 5-10-65



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



DASH NO.		TUBE OD REF	THREAD T REF	A (REF)	E (REF)	M +.000 -.063
CRE STEEL	AL ALLOY					
K4	D4	¼	7/16-20	.172	.688	1.234
K6	D6	⅜	9/16-18	.297	.813	1.328
K8	D8	½	3/4-16	.391	1.000	1.516
K10	D10	⅝	7/8-14	.484	1.125	1.687
K12	D12	¾	1-1/16-12	.609	1.375	1.922
K16	D16	1	1-5/16-12	.844	1.625	1.969
K20	D20	1¼	1-5/8-12	1.078	1.875	2.094
K24	D24	1½	1-7/8-12	1.312	2.125	2.266
KK8	D28	1¾	2-1/4-12	1.546	2.500	2.547
K32	D32	2	2-1/2-12	1.780	2.750	2.766

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
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EXAMPLE OF PART NOS. KC112K4 = ADAPTER, ¼ OD TUBING, CORROSION RESISTANT STEEL
KC112D8 = ADAPTER, ½ OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	ADAPTER, FLARED TUBE & BOSS FOR SEAL RING	KC112
COORDINATION STATUS KSC DE		SHEET 1 OF 1

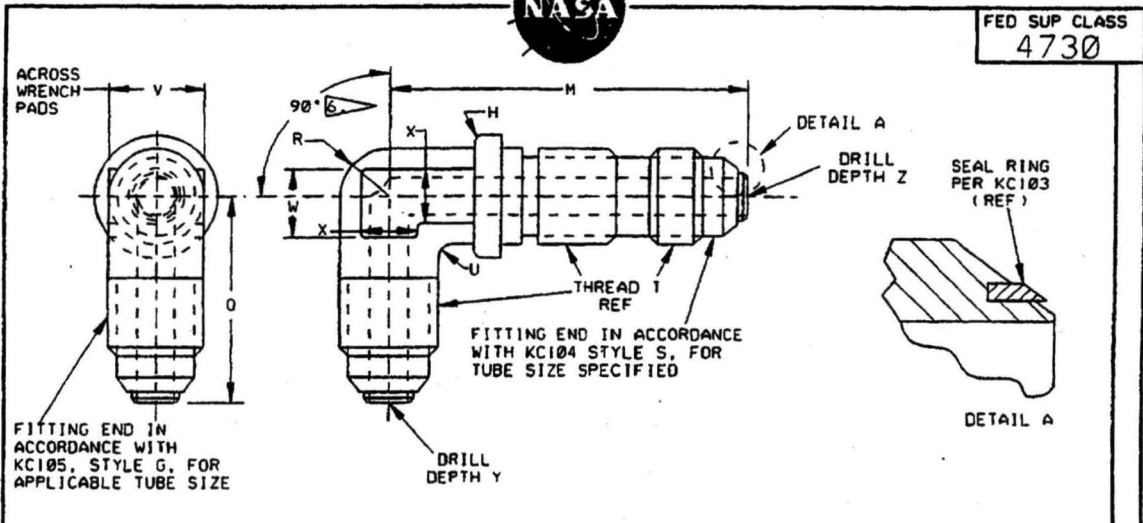
KSC FORM 32-85 (CG 4/92)

REVISED: (E) REV & REDRAWN 8-1-90 APPROVED: 5-10-65



FED SUP CLASS
4730

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DASH NO.	CRE STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	H RAD	M	O	R	U	V	W	X	Y	Z
						+0.00 -0.07	+0.00 -0.07	RAD	RAD		APPROX	APPROX	+0.07 -0.00	+0.07 -0.00
K4	D4	1/4	7/16-20	.063	1.625	1.000	.219	.063	.438	.375	.250	.984	1.609	
K6	D6	3/8	9/16-18	.094	1.844	1.125	.261	.094	.563	.500	.313	1.109	1.828	
K8	D8	1/2	3/4-16		2.141	1.391	.375		.750	.625	.438	1.375	2.125	
K10	D10	5/8	7/8-14		2.422	1.594	.438		.875	.750	.438	1.641	2.469	
K12	D12	3/4	1-1/16-12		2.703	1.813	.531	.125	1.063	.875	.500	1.859	2.750	
K16	D16	1	1-5/16-12		2.828	1.969	.656		1.313	1.063	.625	2.016	2.875	
K20	D20	1 1/4	1-5/8-12		3.156	2.203	.813	.188	1.625	1.250	.750	2.281	3.234	
K24	D24	1 1/2	1-7/8-12		3.453	2.375	.938		1.875	1.438	.875	2.484	3.609	
K28	D28	1 3/4	2-1/4-12		3.828	2.641	1.125		2.250	1.750	1.063	2.781	4.063	
K32	D32	2	2-1/2-12		4.141	2.922	1.250		2.563	1.938	1.188	2.938	4.453	

MATERIAL: SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
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TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.

EXAMPLE OF PART NOS. KC113K8 = ELBOW, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC113D12 = ELBOW, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	ELBOW - FLARED TUBE BULKHEAD UNIVERSAL 90° FOR SEAL RING
COORDINATION STATUS KSC DE	
STANDARD PART KC113	
SHEET 1 OF 1	

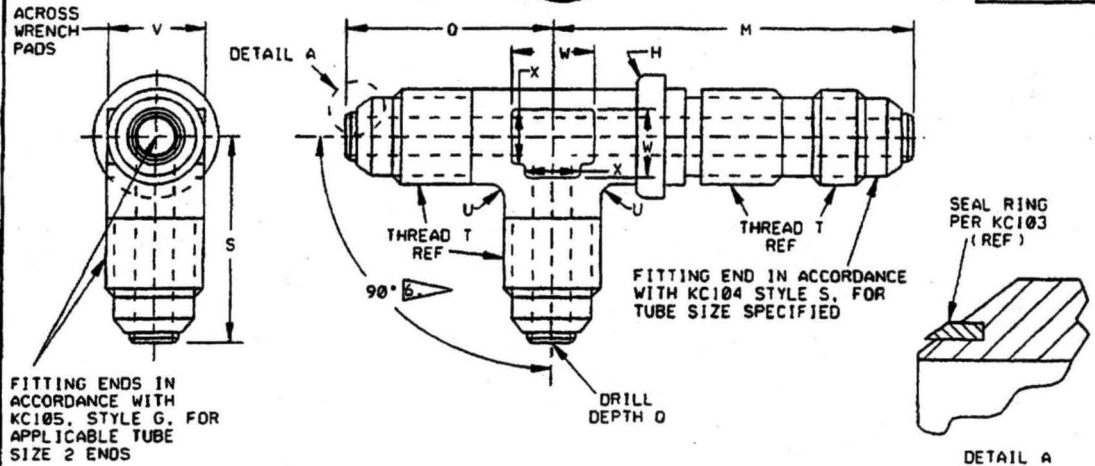
KSC FORM 32-85 (CG 4/92)

REVISED: (F) REV & REDRAWN 8-1-90

APPROVED: 5-10-65



FED SUP CLASS
4730



DASH NO.	TUBE OD REF	THREAD T REF	H RAD	M	D	S	U RAD	V	W APPROX	X APPROX	
											CRE STEEL
K4	D4	1/4	7/16-20	.063	1.625	.938	.953	.063	.438	.375	.250
K6	D6	3/8	9/16-18	.094	1.844	1.109	1.078	.094	.563	.500	.313
K8	D8	1/2	3/4-16		2.141	1.297	1.344		.750	.688	.438
K10	D10	5/8	7/8-14		2.422	1.500	1.547	.125	.875	.781	.438
K12	D12	3/4	1-1/16-12		2.703	1.703	1.766		1.063	.906	.500
K16	D16	1	1-5/16-12		2.828	1.859	1.922		1.313	1.094	.625
K20	D20	1 1/4	1-5/8-12		3.156	2.109	2.156	.188	1.625	1.313	.750
K24	D24	1 1/2	1-7/8-12		3.453	2.375	2.328		1.875	1.500	.875
K28	D28	1 3/4	2-1/4-12		3.828	2.859	2.594		2.250	1.781	1.063
K32	D32	2	2-1/2-12		4.141	3.109	2.875		2.563	2.031	1.188

MATERIAL: SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
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TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.

EXAMPLE OF PART NOS. KC114K8 = TEE, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC114D12 = TEE, 3/4" OD TUBING, ALUMINUM ALLOY

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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	TEE - FLARED TUBE BULKHEAD ON RUN, FOR SEAL RING	KC114
COORDINATION STATUS KSC DE		SHEET 1 OF 1

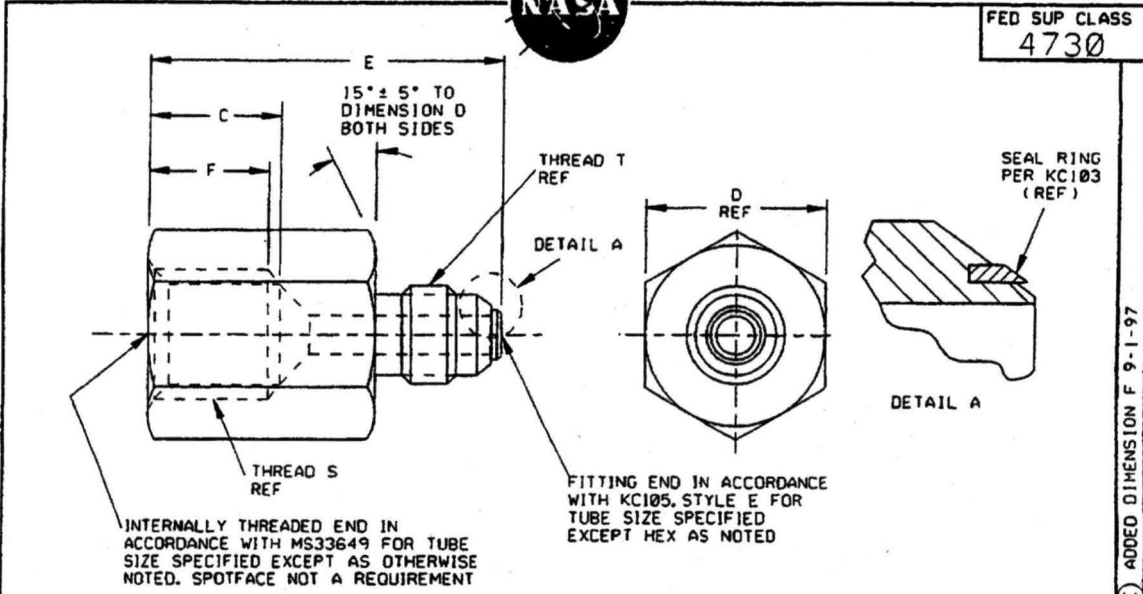
KSC FORM 32-85 (CG 4/92)

REVISED: (E) REV & REDRAWN 8-1-90
APPROVED: 5-10-65



FED SUP CLASS
4730

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DASH NO.		INTERNALLY THREADED END				EXTERNALLY THREADED END		D REF	E +.000 -.076
CRES STEEL	AL ALLOY	TUBE OD	THREAD S REF	C	F MIN 6	TUBE OD	THREAD T REF		
K6-4	D6-4	3/8	9/16-18	.609	.482	1/4	7/16-20	.813	1.406
K8-4	D8-4	1/2	3/4-16	.734	.593	1/4	7/16-20	1.000	1.594
K8-6	D8-6				.593	3/8	9/16-18		1.562
K10-4	D10-4	3/4	7/8-14	.797	.638	1/4	7/16-20	1.125	1.687
K10-6	D10-6				.638	3/8	9/16-18		1.656
K10-8	D10-8				.638	1/2	3/4-16		1.766
K12-6	D12-6	1	1-1/16-12	.922	.656	3/8	9/16-18	1.375	1.828
K12-8	D12-8				.656	1/2	3/4-16		1.937
K12-10	D12-10				.656	3/4	7/8-14		2.031
K16-6	D16-6	1	1-5/16-12	.953	.687	3/8	9/16-18	1.625	1.937
K16-8	D16-8				.687	1/2	3/4-16		2.047
K16-10	D16-10				.687	3/4	7/8-14		2.125
K16-12	D16-12				.687	1-1/16-12	2.219		
K20-8	D20-8	1 1/4	1-5/8-12	1.000	.734	1/2	3/4-16	1.875	2.187
K20-10	D20-10				.734	3/8	7/8-14		2.266
K20-12	D20-12				.734	1-1/16-12	2.344		
K20-16	D20-16				.734	1	1-5/16-12		2.312

APPROVED: 5-10-65
 REVISED: (D) REV & REDRAWN 8-1-90 (E) ADDED DIMENSION F 9-1-97

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	BUSHING - SCREW THREAD EXPANDER FOR SEAL RING	STANDARD PART	
COORDINATION STATUS KSC DE		KC115	
		SHEET 1 OF 2	



FED SUP CLASS
4730

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MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.



F MIN IS THE FULL THREAD DEPTH REQUIREMENT.

EXAMPLE OF PART NOS.

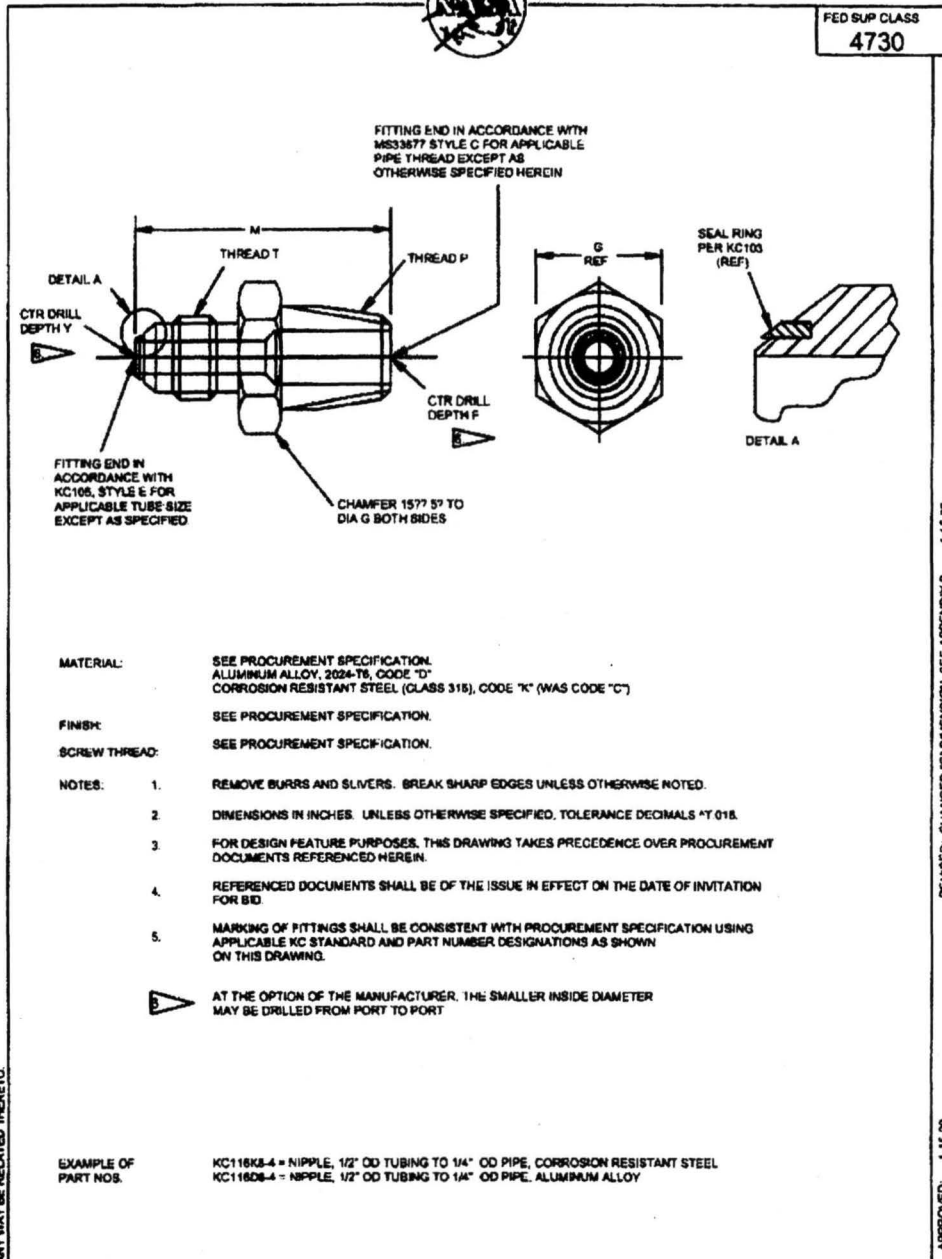
KC115K8-6 = BUSHING, 1/2" BOSS TO 3/8" TUBE, CORROSION RESISTANT STEEL.
KC115D8-6 = BUSHING, 1/2" BOSS TO 3/8" TUBE, ALUMINUM ALLOY.

REVISED: (D) REV & REDRAWN 8-1-90 (E) ADDED FLAG NOTE 6 9-1-97

APPROVED: 5-10-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	BUSHING - SCREW THREAD EXPANDER FOR SEAL RING
COORDINATION STATUS KSC DE	
STANDARD PART	
KC115	
SHEET 2 OF 2	

KSC FORM 32-85 (CG 4/92)



MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T8, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ± 0.18 .
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

AT THE OPTION OF THE MANUFACTURER, THE SMALLER INSIDE DIAMETER MAY BE DRILLED FROM PORT TO PORT

EXAMPLE OF PART NOS.

KC116K8-4 = NIPPLE, 1/2" OD TUBING TO 1/4" OD PIPE, CORROSION RESISTANT STEEL
KC116D8-4 = NIPPLE, 1/2" OD TUBING TO 1/4" OD PIPE, ALUMINUM ALLOY

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY FOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE PATENTED OR MAY BE PATENTING THE INVENTION, OR OTHER DATA NOT REPRODUCED BY REPLICATION OR OTHERWISE AS IN THIS DRAWING, DOES NOT CONSTITUTE AN ENDORSEMENT OR RECOMMENDATION BY THE GOVERNMENT OF ANY OTHER PERSON OR CORPORATION, OR CONFERRING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THEREIN.

APPROVED: 1-15-09
REVISED: CHANGED "G" DIMENSION, SEE APPENDIX B 1-15-09

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-P-124	NIPPLE - FLARED TUBE & PIPE THREAD FOR SEAL RING
COORDINATION STATUS KSC DE	
STANDARD PART KC116	
SHEET 1 OF 2	



GP425G AMEND 2

FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

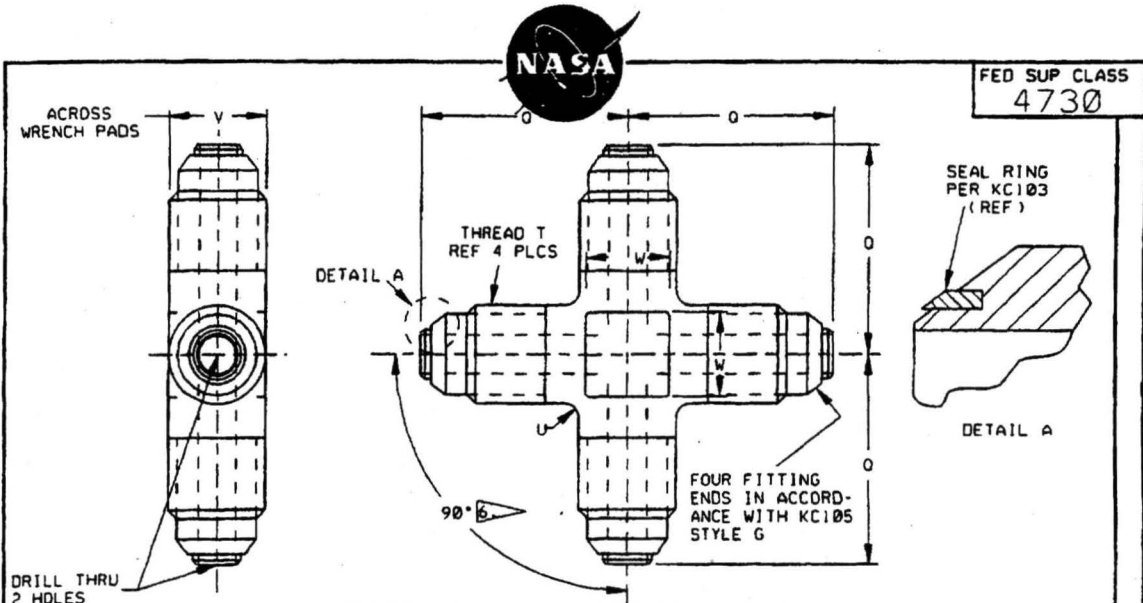
DASH NO.		TUBE OD REF	THREAD T REF	THREAD P ANPT	M + .000 -.076	F	Y	G
CRS STEEL	AL ALLOY							
K4-2	D4-2	1/4	7/16-20	1/8-27	1.125	.489		.500
K4-4	D4-4			1/4-18	1.391	.688		.583
K6-2	D6-2	3/8	9/16-18	1/8-27	1.203		.688	.625
K6-4	D6-4			1/4-18	1.391	.688		.625
K6-6	D6-6			3/8-18	1.422	.688		.750
K6-8	D6-8			1/2-14	1.641	.875		.875
K8-4	D8-4	1/2	3/4-16	1/4-18	1.516		.844	.813
K8-6	D8-6			3/8-18	1.618	.866		.813
K8-8	D8-8			1/2-14	1.735	.875		.875
K10-4	D10-4	5/8	7/8-14	1/4-18	1.722		.844	.938
K10-6	D10-6			3/8-18	1.656	.812		
K10-8	D10-8			1/2-14	1.844	.906		
K10-12	D10-12			3/4-14	1.869	.906		
K12-4	D12-4	3/4	1-1/16-12	1/4-18	1.643		1.046	1.125
K12-6	D12-6			3/8-18	1.850		1.000	
K12-8	D12-8			1/2-14	1.989		1.083	
K12-12	D12-12			3/4-14	1.969	.906		
K12-16	D12-16	1	1-5/16-12	1-11/16	2.203	1.083		1.375
K16-8	D16-8			1/2-14	2.015		.906	
K16-12	D16-12			3/4-14	2.047		1.094	
K16-16	D16-16	1 1/4	1-5/8-12	1-11/16	2.234	1.126		1.688
K20-12	D20-12			3/4-14	2.140		1.031	
K20-16	D20-16			1-11/16	2.344		1.250	
K20-20	D20-20	1 1/2	1-7/8-12	1 1/2-11 1/2	2.375	1.188		2.000
K24-12	D24-12			3/4-14	2.203		1.031	
K24-16	D24-16			1-11/16	2.483		1.156	
K24-20	D24-20			1 1/2-11 1/2	2.562		1.344	
K24-24	D24-24	1 3/4	2-1/4-12	1 1/2-11 1/2	2.593	1.631		2.375
K28-16	D28-16			1-11/16	2.797		1.125	
K28-20	D28-20			1 1/2-11 1/2	2.812		1.900	
K28-24	D28-24	2	2 1/2-12	1 1/2-11 1/2	2.844		1.438	2.825
K32-20	D32-20			1 1/2-11 1/2	3.079		1.500	
K32-24	D32-24			1 1/2-11 1/2	3.094		1.438	
K32-32	D32-32			2-11/16	3.125	1.438		

APPROVED: 1-15-09
 REVISED: CHANGED 'G' DIMENSION, SEE APPENDIX B 1-15-09

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	NIPPLE - FLARED TUBE & PIPE THREAD FOR SEAL RING	KC116
COORDINATION STATUS KSC DE		SHEET 2 OF 2

KSC FORM 32-85 (CG 4/82)

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



FED SUP CLASS
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DASH NO.	TUBE OD REF	THREAD T REF	O +.000 -.047	U RAD	V	W APPROX
K4	D4	1/4	7/16-20	.906	.063	.438 .375
K6	D6	3/8	9/16-18	1.078	.094	.563 .500
K8	D8	1/2	3/4-16	1.266		.750 .688
K10	D10	5/8	7/8-14	1.469		.875 .781
K12	D12	3/4	1-1/16-12	1.672		1.063 .906
K16	D16	1	1-5/16-12	1.828	.125	1.313 1.094
K20	D20	1 1/4	1-5/8-12	2.078		1.625 1.313
K24	D24	1 1/2	1-7/8-12	2.344		1.875 1.500
K28	D28	1 3/4	2-1/4-12	2.828		2.250 1.781
K32	D32	2	2-1/2-12	3.078	.188	2.563 2.563

MATERIAL: SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2014-T6, CODE 'D' CORROSION RESISTANT STEEL (CLASS 316), CODE 'K' (WAS CODE 'C')

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

TOLERANCE UP TO AND INCLUDING -.6 SIZE ±2-1/2" ABOVE -.6 SIZE ±1-1/2".

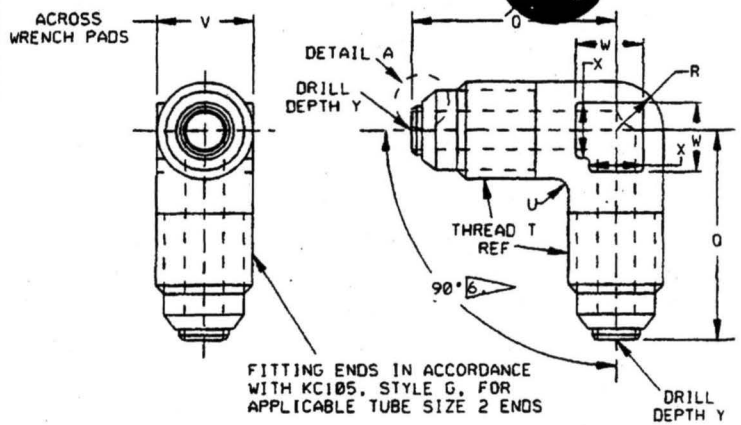
EXAMPLE OF PART NOS. KC117K8 = CROSS, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC117D12 = CROSS, 3/4" OD TUBING, ALUMINUM ALLOY

REVISED: (E) REV & REDRAWN 8-1-90 APPROVED: 5-10-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	CROSS - FLARED TUBE FOR SEAL RING
COORDINATION STATUS KSC DE	
STANDARD PART KC117	
SHEET 1 OF 1	



FED SUP CLASS
4730



DASH NO.	TUBE OD REF	THREAD T REF	D +0.000 -0.047	R RAD	U RAD	V	W APPROX	X APPROX	Y +0.047 -0.000	
										CRE STEEL
K4	D4	1/4	7/16-20	.936	.219	.063	.438	.375	.250	.937
K6	D6	3/8	9/16-18	1.108	.281	.094	.563	.500	.313	1.125
K8	D8	1/2	3/4-16	1.296	.375		.750	.625	.438	1.312
K10	D10	5/8	7/8-14	1.499	.438		.875	.750	.438	1.515
K12	D12	3/4	1-1/16-12	1.702	.531		1.063	.875	.500	1.718
K16	D16	1	1-5/16-12	1.858	.656	.125	1.313	1.063	.625	1.937
K20	D20	1 1/4	1-5/8-12	2.108	.813		1.625	1.250	.750	2.187
K24	D24	1 1/2	1-7/8-12	2.374	.938		1.875	1.438	.875	2.484
K28	D28	1 3/4	2-1/4-12	2.858	1.125		2.250	1.750	1.063	2.937
K32	D32	2	2-1/2-12	3.108	1.250	.250	2.563	2.000	1.188	3.250

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
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TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".
V DIMENSION FOR -32 SIZE EQUAL TO 2.500" IS ACCEPTABLE BUT 2.563" IS PREFERRED.

EXAMPLE OF PART NOS.
 KC118K8 = ELBOW, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC118D12 = ELBOW, 3/4" OD TUBING, ALUMINUM ALLOY

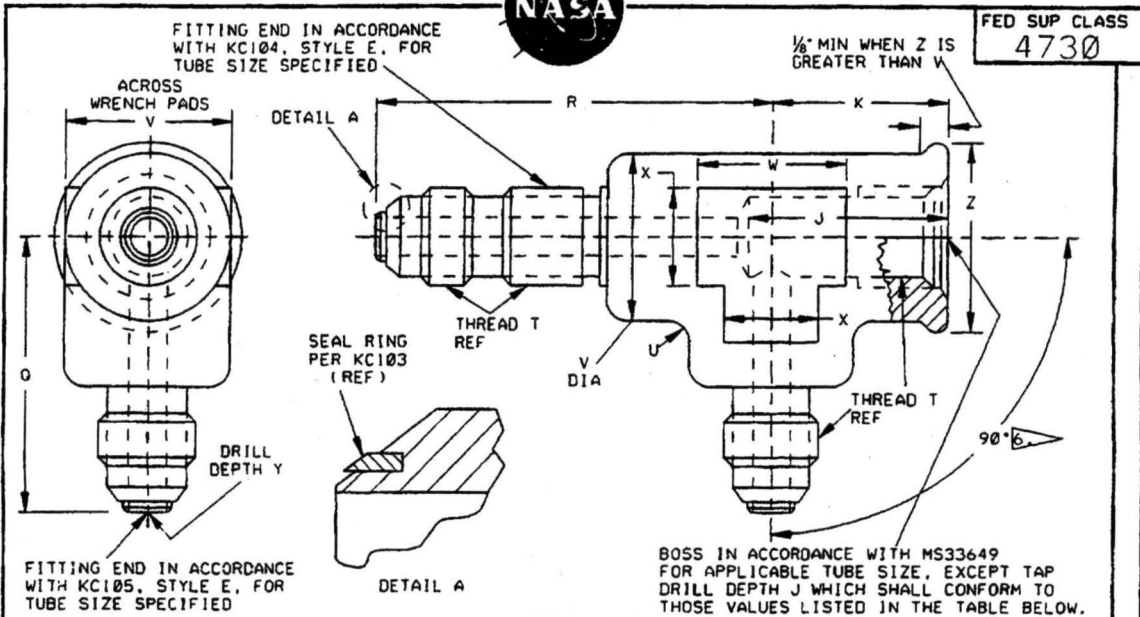
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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	ELBOW - FLARED TUBE 90°, FOR SEAL RING
COORDINATION STATUS KSC DE	
STANDARD PART KC118	
SHEET 1 OF 1	

APPROVED: 5-10-65 REVISED: (D) REV 8 REDRAWN 8-1-90 (E) ADDED NOTE 7, 7-24-97



NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



FED SUP CLASS
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DASH NO.		TUBE OD REF	THREAD T REF	J +.047 -.000	K +.000 -.047	Q +.000 -.047	R +.000 -.047	U RAD	V	W APPROX	X APPROX	Y +.047 -.000	Z DIA
K4	D4	1/4	7/16-20	.906	.797	1.235	1.797	.094	.750	.688		1.188	.750
K6	D6	3/8	9/16-18	1.031	.860	1.297	2.047		.875	.781	.438	1.281	.875
K8	D8	1/2	3/4-16	1.250	1.047	1.485	2.203		1.063	.906	.500	1.469	1.063
K10	D10	5/8	7/8-14	1.469	1.203	1.672	2.422	.125	1.313	1.094	.625	1.875	1.438
K12	D12	3/4	1-1/16-12	1.750	1.391	1.860	2.672		1.625	1.313	.750	2.094	1.688
K16	D16	1	1-5/16-12	2.063	1.578	2.110	2.891		1.875	1.500	.875	2.250	2.000
K20	D20	1 1/4	1-5/8-12	2.313	1.766	2.297	3.078						

- MATERIAL:** SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
- FINISH:** SEE PROCUREMENT SPECIFICATION.
- SCREW THREAD:** SEE PROCUREMENT SPECIFICATION.
- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
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 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
- TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".**
- EXAMPLE OF PART NOS.**
 KC119K8 = TEE, INTERNAL THREAD ON RUN, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC119D12 = TEE, INTERNAL THREAD ON RUN, 3/4" OD TUBING, ALUMINUM ALLOY

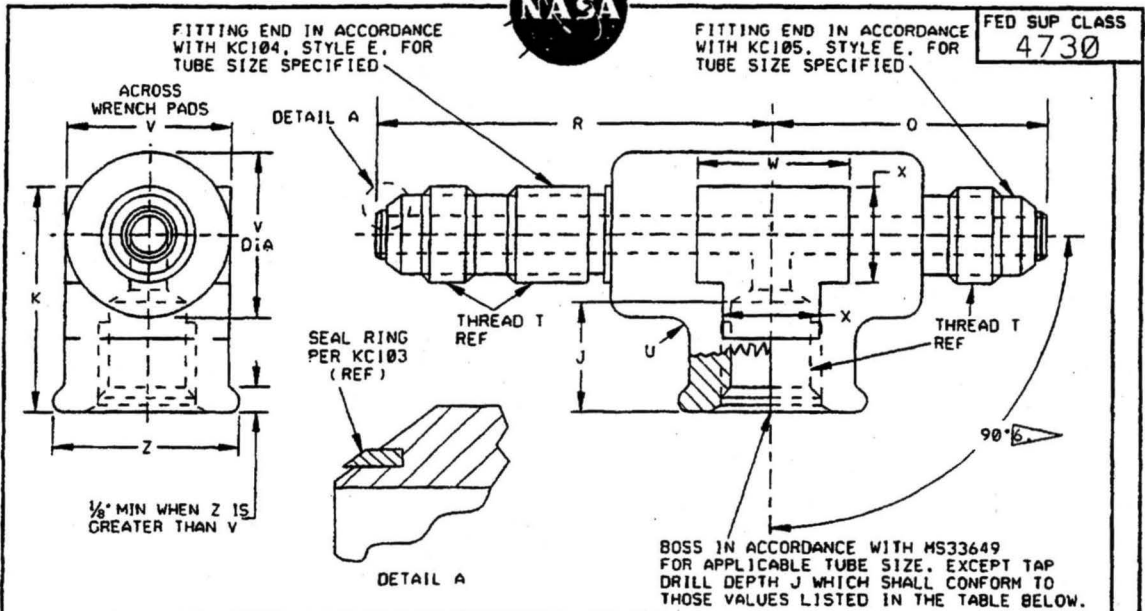
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	TEE - FLARED TUBE, INTERNAL THREAD ON RUN, FOR SEAL RING		KC119
COORDINATION STATUS KSC DE			SHEET 1 OF 1

KSC FORM 32-85 (CG 4/92)

APPROVED: 5-10-65
 REVISED: (E) REV & REDRAWN 8-1-90



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DASH NO.	TUBE OD REF	THREAD T REF	J	K	O	R	U	V	W	X	Z	
												CRE STEEL
K4	D4	1/4	7/16-20	.750	.797	1.235	1.797	.094	.750	.688	.438	.750
K6	D6	3/8	9/16-18	.813	.860	1.297	2.047		.875	.781		.875
K8	D8	1/2	3/4-16	1.000	1.047	1.485	2.203		1.063	.906	.500	1.063
K10	D10	5/8	7/8-14	1.156	1.203	1.672	2.422	.125				1.188
K12	D12	3/4	1-1/16-12	1.344	1.391	1.860	2.672		1.313	1.094	.625	1.438
K16	D16	1	1-5/16-12	1.531	1.578	2.110	2.891		1.625	1.313	.750	1.688
K20	D20	1 1/4	1-5/8-12	1.719	1.766	2.297	3.078		1.875	1.500	.875	2.000

- MATERIAL:** SEE PROCUREMENT SPECIFICATION, ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")
- FINISH:** SEE PROCUREMENT SPECIFICATION.
- SCREW THREAD:** SEE PROCUREMENT SPECIFICATION.
- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
- TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.**

EXAMPLE OF PART NOS. KC120K8 = TEE, INTERNAL THREAD ON SIDE, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC120D12 = TEE, INTERNAL THREAD ON SIDE, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	TEE - FLARED TUBE, INTERNAL THREAD ON SIDE, FOR SEAL RING	KC120	
COORDINATION STATUS		SHEET 1 OF 1	
KSC DE			

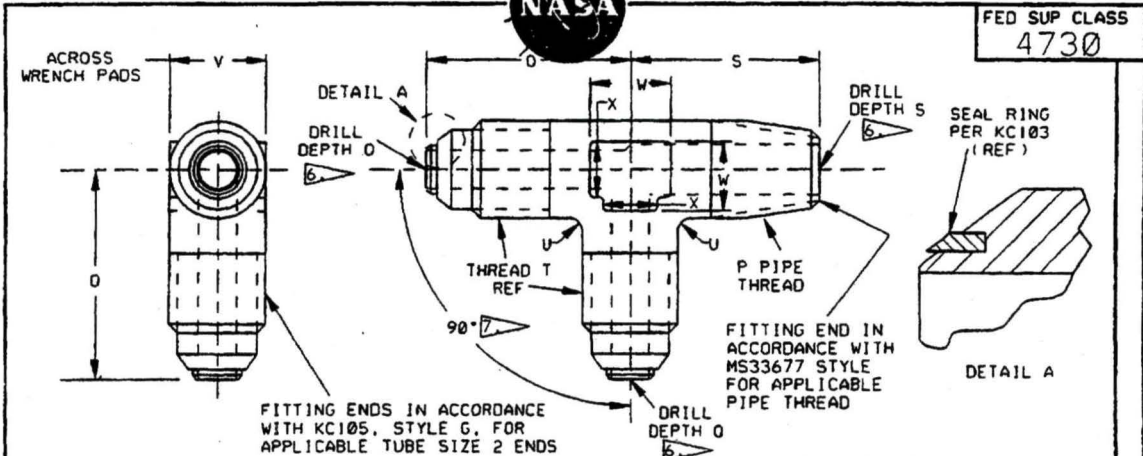
KSC FORM 32-85 (CG 4/92)

REVISED: (E) REV & REDRAWN 8-1-90
 APPROVED: 5-10-65



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THERETO.



DASH NO.	CRES STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	PIPE THREAD END		U RAD	V	W APPROX	X APPROX	
					THREAD P ANPT	MS33677 STYLE					
K4-2	D4-2	1/4	7/16-20	1/8-27	A	.906	.797	.063	.438	.375	.250
K6-4	D6-4	3/8	9/16-18	1/4-18	A	1.078	1.109		.563	.562	.313
K8-6	D8-6	1/2	3/4-16	3/8-18	A	1.266	1.234		.750	.688	.313
K10-8	D10-8	5/8	7/8-14	1/2-14	A	1.469	1.484	.094	.875	.750	.438
K12-12	D12-12	3/4	1-1/16-12	3/4-14	A	1.672	1.609		1.063	.875	.438
K16-12	D16-12	1	1-5/16-12	3/4-14	B	1.828	1.734		1.313	1.063	.500
K16-16	D16-16	1	1-5/16-12	1-11/2	B	1.828	1.984		1.313	1.125	.625
K20-16	D20-16	1 1/4	1-5/8-12	1-11/2	A	2.078	2.391	.125	1.625	1.313	.750
K20-20	D20-20	1 1/4	1-5/8-12	1 1/4-11 1/2	B	2.078	2.141		1.625	1.313	.750
K24-20	D24-20	1 1/2	1-7/8-12	1 1/4-11 1/2	A	2.344	2.516		1.875	1.438	.875
K28-24	D28-24	1 3/4	2-1/4-12	1 1/2-11 1/2	A	2.828	2.799	.188	2.250	1.625	1.063
K32-32	D32-32	2	2-1/2-12	2-11 1/2	A	3.078	3.016	.250	2.563	1.875	1.188

MATERIAL: SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
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- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

AT THE OPTION OF THE MANUFACTURER, THE SMALLER DIAMETER MAY BE DRILLED THROUGH THE FITTING FROM PORT TO PORT OR CENTERLINE OF RUN.

TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.

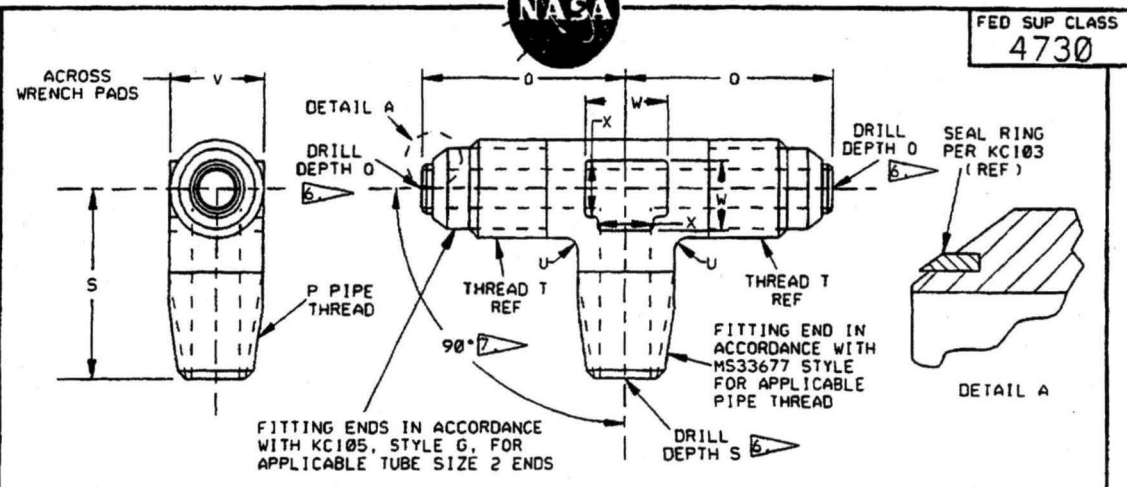
EXAMPLE OF PART NOS. KC121K8-6 = TEE, 1/2" OD TUBING AND 3/8" PIPE THREAD, CORROSION RESISTANT STEEL
 KC121D8-6 = TEE, 1/2" OD TUBING AND 3/8" PIPE THREAD, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	TEE - FLARED TUBE WITH PIPE THREAD ON RUN, FOR SEAL RING		KC121
COORDINATION STATUS KSC DE			SHEET 1 OF 1

REVISED: (E) REV & REDRAWN 8-1-90
 APPROVED: 5-10-65



FED SUP CLASS
4730



DASH NO.		TUBE OD REF	THREAD T REF	PIPE THREAD END		U RAD	V	W APPROX	X APPROX		
CRES STEEL	AL ALLOY			THREAD P ANPT	MS33677 STYLE					0 +.000 -.047	S +.000 -.047
K4-2	D4-2	1/4	7/16-20	1/8-27	A	.906	.797	.063	.438	.375	.250
K6-4	D6-4	3/8	9/16-18	1/4-18		1.078	1.109		.563	.562	.313
K8-6	D8-6	1/2	3/4-16	3/8-18		1.266	1.234		.750	.688	.313
K10-8	D10-8	3/4	7/8-14	1/2-14		1.469	1.484	.094	.875	.750	.438
K12-12	D12-12	1	1-1/16-12	3/4-14		1.672	1.609		1.063	.875	
K16-12	D16-12	1	1-5/16-12	3/4-14		1.828	1.734		1.313	1.063	.500
K16-16	D16-16			1-11/2		B	1.984		1.125	1.125	.625
K20-16	D20-16	1/4	1-5/8-12	1-11/2		2.078	2.391	.125	1.625	1.313	.750
K20-20	D20-20			1/4-11/2		B	2.141		1.875	1.438	.875
K24-20	D24-20	1/2	1-7/8-12	1/4-11/2		2.344	2.516		2.250	1.625	1.063
K28-24	D28-24	3/4	2-1/4-12	1/2-11/2	2.828	2.799	.188	2.563	1.875	1.188	
K32-32	D32-32	2	2-1/2-12	2-11/2	3.078	3.016	.250				

MATERIAL: SEE PROCUREMENT SPECIFICATION, ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

6. AT THE OPTION OF THE MANUFACTURER, THE SMALLER DIAMETER MAY BE DRILLED THROUGH THE FITTING FROM PORT TO PORT OR CENTERLINE OF RUN.

7. TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".

EXAMPLE OF PART NOS. KC122K8-6 = TEE, 1/2" OD TUBING AND 3/8" PIPE THREAD, CORROSION RESISTANT STEEL
KC122D8-6 = TEE, 1/2" OD TUBING AND 3/8" PIPE THREAD, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	TEE - FLARED TUBE WITH PIPE THREAD ON SIDE, FOR SEAL RING		KC122
COORDINATION STATUS			SHEET 1 OF 1
KSC DE			

KSC FORM 32-85 (CG 4/92)

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY MANNER SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

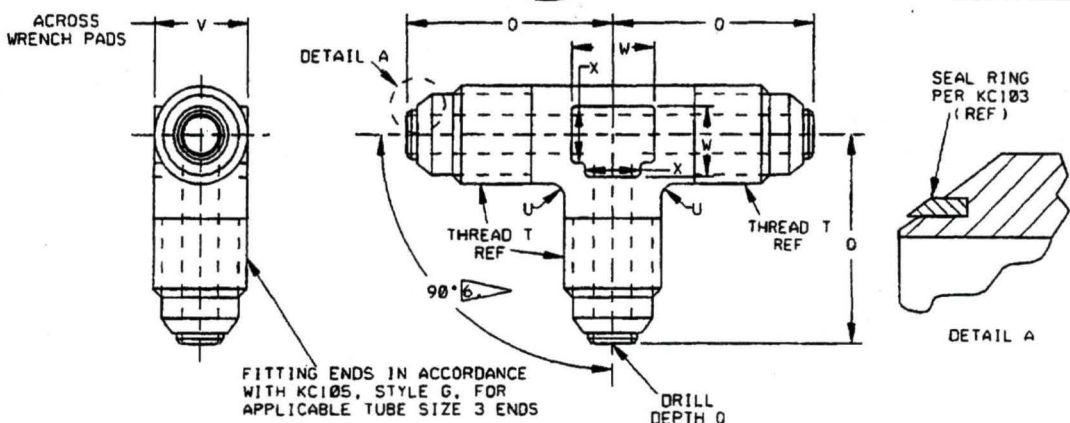
REVISED: ① REV & REDRAWN 8-1-90

APPROVED: 5-10-65



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



DASH NO.	CRE STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	O +.000 -.047	U RAD	V	W APPROX	X APPROX
K6	D6	3/8	9/16-18	1.078	.094	.563	.500	.313	
K8	D8	1/2	3/4-16	1.266		.750	.688	.438	
K10	D10	5/8	7/8-14	1.469	.125	.875	.781	.438	
K12	D12	3/4	1-1/16-12	1.672		1.063	.906	.500	
K16	D16	1	1-5/16-12	1.828		1.313	1.094	.625	
K20	D20	1 1/4	1-5/8-12	2.078		1.625	1.313	.750	
K24	D24	1 1/2	1-7/8-12	2.344		1.875	1.500	.875	
K28	D28	1 3/4	2-1/4-12	2.828	2.250	1.781	1.063		
K32	D32	2	2-1/2-12	3.078	.188	2.563	2.031	1.188	

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
- TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.

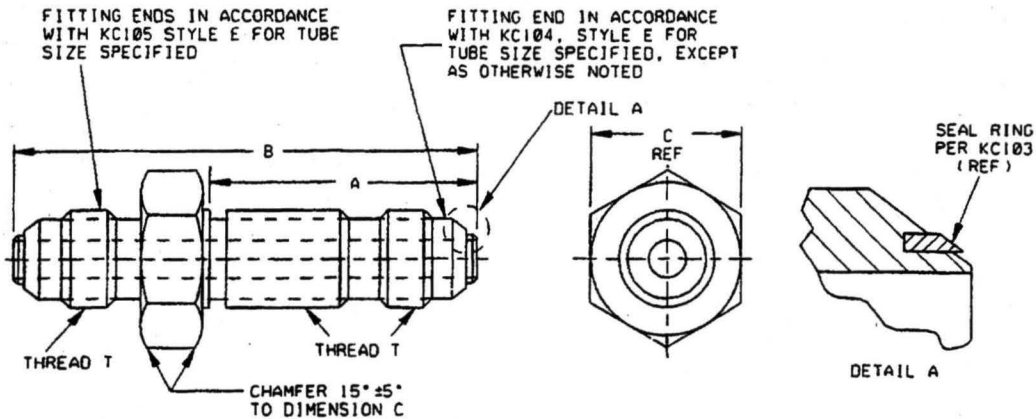
EXAMPLE OF PART NOS. KC123K8 = TEE, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC123D12 = TEE, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	TEE - FLARED TUBE FOR SEAL RING	KC123
COORDINATION STATUS KSC DE		SHEET 1 OF 1

REVISED: (U) REV & REDRAWN 8-1-90
 APPROVED 15-10-65



FED SUP CLASS
4730



DASH NO.		TUBE OD REF	THREAD T REF	A +.000 -.045	B +.000 -.090	C REF
CRE STEEL	AL ALLOY					
K4	D4	1/4	7/16-20	1.219	2.062	.688
K6	D6	3/8	9/16-18	1.297	2.234	.813
K8	D8	1/2	3/4-16	1.453	2.469	1.000
K10	D10	5/8	7/8-14	1.594	2.734	1.125
K12	D12	3/4	1-1/16-12	1.766	3.047	1.375
K16	D16	1	1-5/16-12	1.766	3.094	1.625
K20	D20	1 1/4	1-5/8-12	1.812	3.172	1.875
K24	D24	1 1/2	1-7/8-12	1.828	3.328	2.125
K28	D28	1 3/4	2-1/4-12	1.984	3.594	2.500
K32	D32	2	2-1/2-12	2.110	3.844	2.750

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

EXAMPLE OF PART NOS.
KC124K4 = UNION, 3/8" BULKHEAD, 1/4" OD TUBING, CORROSION RESISTANT STEEL
KC124D8 = UNION, 1/2" BULKHEAD, 1/2" OD TUBING, ALUMINUM ALLOY

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY MANNER SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THERETO.

REVISED: © REV & REDRAWN 8-1-90

APPROVED: 5-10-65

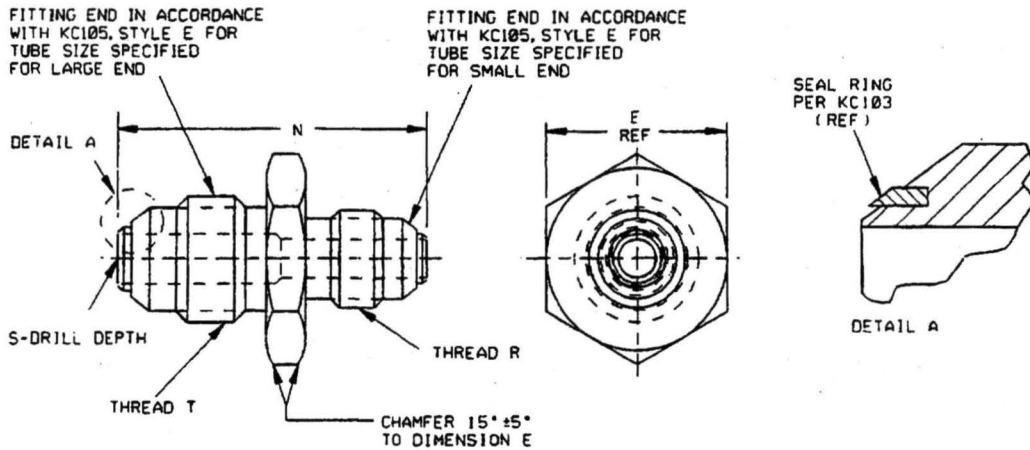
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	UNION, FLARED TUBE 3/8" BULKHEAD AND UNIVERSAL FOR SEAL RING	KC124
COORDINATION STATUS KSC DE		SHEET 1 OF 1

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

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MATERIAL: SEE PROCUREMENT SPECIFICATION.
 ALUMINUM ALLOY, 2024-T6, CODE "D"
 CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.
SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

AT THE OPTION OF THE MANUFACTURER, THE SMALLER INSIDE DIAMETER DIMENSION MAY BE DRILLED FROM PORT TO PORT.

EXAMPLE OF PART NOS.
 KC125K8-4 = REDUCER, 1/2" OD TO 1/4" OD TUBING, CORROSION RESISTANT STEEL
 KC125D8-4 = REDUCER, 1/2" OD TO 1/4" OD TUBING, ALUMINUM ALLOY

APPROVED: 8-12-65
 REVISED: (F) REV & REDRAWN 8-1-90

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	STANDARD PART KC125
COORDINATION STATUS KSC DE	SHEET 1 OF 2
REDUCER - EXTERNAL THREAD FLARED TUBE FOR SEAL RING	

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.		LARGE END		SMALL END		S MAX 6°	N +.000 -.090	E REF
CRES STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	TUBE OD REF	THREAD R REF			
K6-4	D6-4	3/8	9/16-18	1/4	7/16-20	.457	1.422	.813
K8-4	D8-4	1/2	3/4-16	1/4	7/16-20	.538	1.547	1.000
K8-6	D8-6			3/8	9/16-18			
K10-4	D10-4	5/8	7/8-14	1/4	7/16-20	.618	1.672	1.125
K10-6	D10-6			3/8	9/16-18			
K10-8	D10-8			1/2	3/4-16			
K12-4	D12-4	3/4	1-1/16-12	1/4	7/16-20	.703	1.813	1.375
K12-6	D12-6			3/8	9/16-18			
K12-8	D12-8			1/2	3/4-16			
K12-10	D12-10			5/8	7/8-14			
K16-4	D16-4	1	1-5/16-12	1/4	7/16-20	.741	1.860	1.625
K16-8	D16-8			1/2	3/4-16			
K16-10	D16-10			5/8	7/8-14			
K16-12	D16-12			3/4	1-1/16-12			
K20-4	D20-4	1 1/4	1-5/8-12	1/4	7/16-20	.778	1.907	1.875
K20-12	D20-12			3/4	1-1/16-12			
K20-16	D20-16			1	1-5/16-12			
K24-16	D24-16	1 1/2	1-7/8-12	1-1/4	1-5/8-12	.878	2.375	2.125
K24-20	D24-20						2.422	
K28-20	D28-20	1 3/4	2-1/4-12	1-1/2	1-7/8-12	.978	2.598	2.500
K28-24	D28-24						2.723	
K32-24	D32-24						2.848	
K32-28	D32-28	2	2-1/2-12	1-3/4	2-1/4-12	1.078	2.973	2.750

APPROVED: 8-12-65 REVISED: (E) REY & REDRAWN 8-1-90

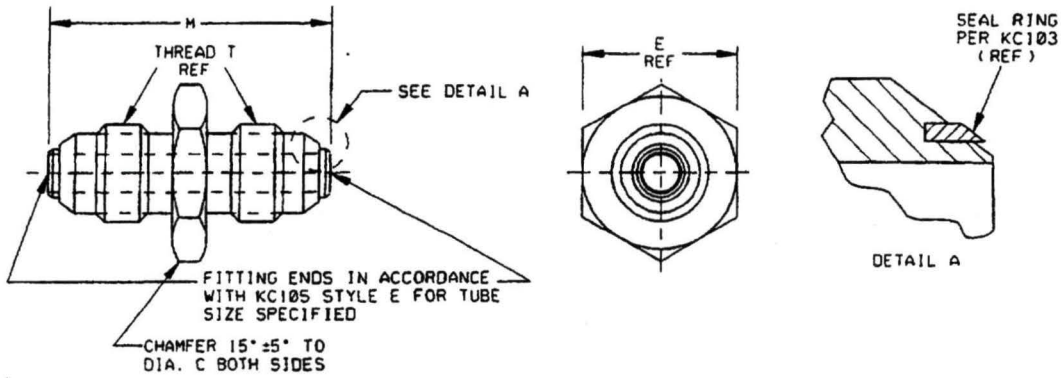
CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	REDUCER - EXTERNAL THREAD FLARED TUBE FOR SEAL RING	STANDARD PART	
COORDINATION STATUS KSC DE		KC125	
		SHEET 2 OF 2	

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

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DASH NO.		TUBE OD REF	THREAD T REF	M +.000 -.090	E REF
CRE STEEL	AL ALLOY				
K4	D4	¼	7/16-20	1.266	.688
K6	D6	⅜	9/16-18	1.391	.813
K8	D8	½	3/4-16	1.578	1.000
K10	D10	⅝	7/8-14	1.844	1.125
K12	D12	¾	1-1/16-12	2.125	1.375
K16	D16	1	1-5/16-12	2.203	1.625
K20	D20	1¼	1-5/8-12	2.297	1.875
K24	D24	1½	1-7/8-12	2.547	2.125
K28	D28	1¾	2-1/4-12	2.828	2.500
K32	D32	2	2-1/2-12	3.078	2.750

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

EXAMPLE OF PART NOS. KC126K8 = UNION, ½" OD TUBING, CORROSION RESISTANT STEEL
KC126D12 = UNION, ¾" OD TUBING, ALUMINUM ALLOY

REVISED: (D) REV & REDRAWN 8-1-90

APPROVED: 5-10-65

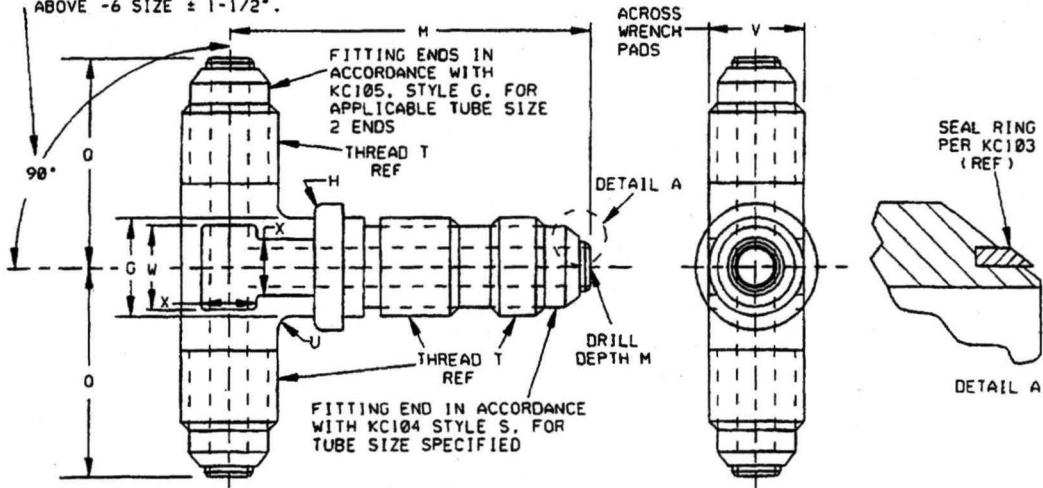
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	UNION, FLARED TUBE FOR SEAL RING
COORDINATION STATUS KSC DE	
STANDARD PART KC126	
SHEET 1 OF 1	

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

TOLERANCE UP TO AND INCLUDING -6 SIZE ± 2-1/2"
ABOVE -6 SIZE ± 1-1/2"



DASH NO.	CRE STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	G DIA	H RAD	M	D	U RAD	V	W APPROX	X APPROX
							+0.000 -0.047	+0.000 -0.047				
K4		D4	1/4	7/16-20	.438	.063	1.625	1.000	.063	.438	.375	.250
K6		D6	3/8	9/16-18	.563		1.844	1.125		.563	.500	.313
K8		D8	1/2	3/4-16	.750		2.141	1.391	.094	.750	.625	.438
K10		D10	5/8	7/8-14	.875		2.422	1.594		.875	.750	.438
K12		D12	3/4	1-1/16-12	1.063		2.703	1.813	.125	1.063	.875	.500
K16		D16	1	1-5/16-12	1.313	.094	2.828	1.969		1.313	1.063	.625
K20		D20	1 1/4	1-5/8-12	1.625		3.156	2.203		1.625	1.250	.750
K24		D24	1 1/2	1-7/8-12	1.875		3.453	2.375		1.875	1.438	.875
K28		D28	1 3/4	2-1/4-12	2.250		3.828	2.641	.188	2.250	1.750	1.063
K32		D32	2	2-1/2-12	2.563		4.141	2.922		2.563	1.938	1.188

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
 - WHEN USED AGAINST BULKHEAD USE WASHER AN960 TO FORM BACKING FACE.

EXAMPLE OF PART NOS. KC127K8 = TEE, BULKHEAD ON LEG, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC127D12 = TEE, BULKHEAD ON LEG, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	TEE - FLARED TUBE & BULKHEAD UNIVERSAL ON SIDE FOR SEAL RING
COORDINATION STATUS	
KSC DE	STANDARD PART KC127
	SHEET 1 OF 1

KSC FORM 32-85 (CG 4/92)

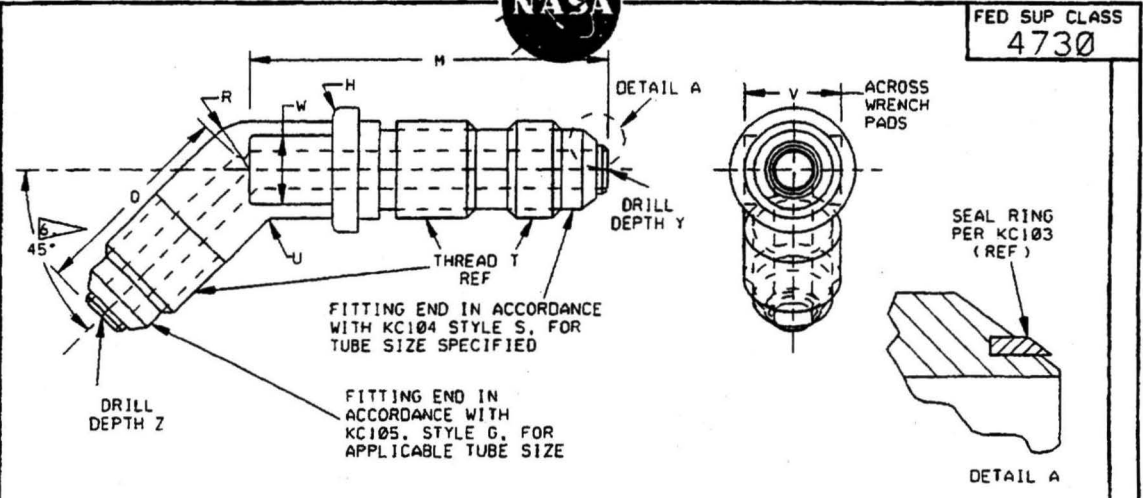
NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY MANNER SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THERETO.

REVISED: (E) REF & REDRAWN B-1-90
APPROVED: 5-10-65



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



DASH NO.		TUBE OD REF	THREAD T REF	H RAD	M +.000 -.063	D +.000 -.063	R RAD	U RAD	V	W APPROX	Y +.047 -.000	Z +.047 -.000
CRE STEEL	AL ALLOY											
K4	D4	1/4	7/16-20	.063	1.578	.750	.219	.063	.438	.313	1.594	.766
K6	D6	3/8	9/16-18	.094	1.719	.860	.261	.094	.563	.375	1.750	.891
K8	D8	1/2	3/4-16		1.985	1.016	.375		.750	.500	2.031	1.063
K10	D10	5/8	7/8-14		2.219	1.141	.438	.875	.625	2.281	1.203	
K12	D12	3/4	1-1/16-12		2.485	1.313	.531	1.063	.813	2.563	1.391	
K16	D16	1	1-5/16-12		2.610	1.500	.656	.125	1.313	1.000	2.734	1.625
K20	D20	1 1/4	1-5/8-12		2.703	1.625	.813	1.625	1.250	2.875	1.797	
K24	D24	1 1/2	1-7/8-12		2.719	1.813	.938	1.875	1.500	2.938	2.031	
K28	D28	1 3/4	2-1/4-12		2.797	2.000	1.125	.188	2.250	1.750	3.078	2.266
K32	D32	2	2-1/2-12		2.953	2.250	1.250	.250	2.563	2.000	3.031	2.578

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".

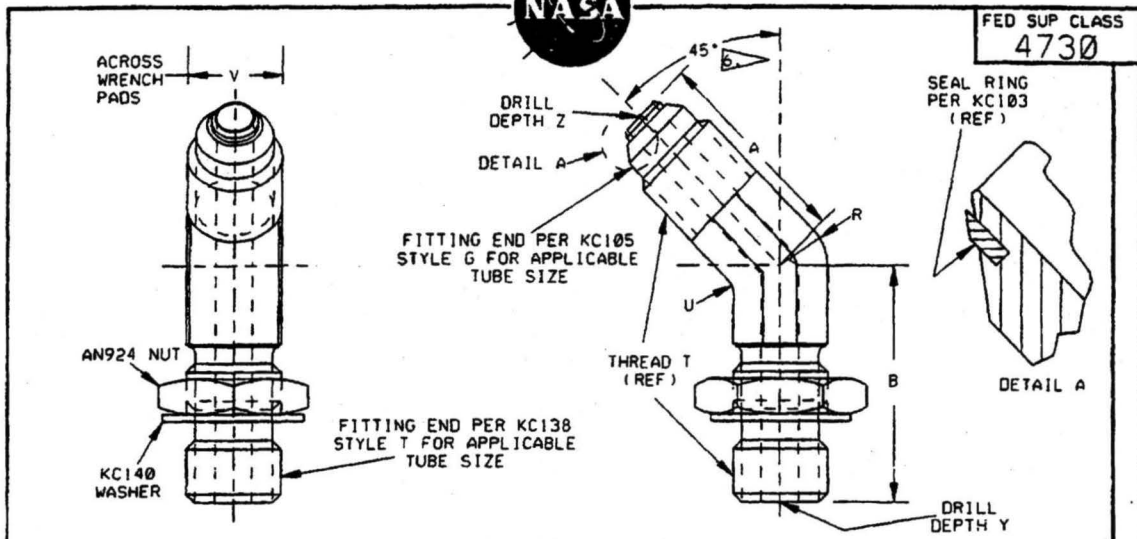
EXAMPLE OF PART NOS. KC128K8 = ELBOW, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC128D12 = ELBOW, 3/4" OD TUBING, ALUMINUM ALLOY

REVISED: (E) REV & REDRAWN 8-1-90
 APPROVED: 5-10-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. KSC-F-124	ELBOW - FLARED TUBE BULKHEAD UNIVERSAL, 45°, FOR SEAL RING	STANDARD PART
COORDINATION STATUS KSC DE		KC128
		SHEET 1 OF 1



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DASH NO.	TUBE OD REF	THREAD T REF	A DIM. +.000 - .063	B DIM. +.000 - .063	U RAD ±.03	R RAD ±.03	F PAD DIM. ±.016	BULKHEAD NUT		WASHER			
								FOR CRE STEEL ASSY #	FOR AL ALLOY ASSY	FOR CRE STEEL ASSY	FOR AL ALLOY ASSY		
K4	D4	1/4	7/16-20	.750	1.078	.063	.242	.438	AN924-K4	AN924-D4	KC140C4	KC140D4	
K6	D6	3/8	9/16-18	.860	1.172	.094	.317	.563	AN924-K6	AN924-D6	KC140C6	KC140D6	
K8	D8	1/2	3/4-16	1.016	1.328		.414	.750	AN924-K8	AN924-D8	KC140C8	KC140D8	
K10	D10	5/8	7/8-14	1.141	1.547	.125	.484	.875	AN924-K10	AN924-D10	KC140C10	KC140D10	
K12	D12	3/4	1-1/16-12	1.313	1.766		.586	1.063	AN924-K12	AN924-D12	KC140C12	KC140D12	
K16	D16	1	1-5/16-12	1.500	1.891		.719	1.313	AN924-K16	AN924-D16	KC140C16	KC140D16	
K20	D20	1 1/4	1-5/8-12	1.625	1.938	.150	.875	1.625	AN924-K20	AN924-D20	KC140C20	KC140D20	
K24	D24	1 1/2	1-7/8-12	1.813			1.031	1.875	AN924-K24	AN924-D24	KC140C24	KC140D24	
K28	D28	1 3/4	2-1/4-12	2.000	1.891	.150	.188	1.125	2.250	AN924-K28	AN924-D28	KC140C28	KC140D28
K32	D32	2	2-1/2-12	2.250			.250	1.383	2.500	AN924-K32	AN924-D32	KC140C32	KC140D32

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2014-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
*AN924 CRES NUTS MAY BE EITHER 304, CODE "J" OR 316, CODE "K".

FINISH: SEE PROCUREMENT SPECIFICATION.
SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
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TOLERANCE UP TO AND INCLUDING -6 SIZE ± 2-1/2"; ABOVE -6 SIZE ± 1-1/2".

EXAMPLE OF PART NOS. KC129K8 = 45° ELBOW ASSY, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC129D12 = 45° ELBOW ASSY, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. KSC-F-124	ELBOW ASSY, 45°, FLARED TUBE & MALE ADJUSTABLE END, FOR SEAL RING	STANDARD PART
COORDINATION STATUS KSC DE		KC129
		SHEET 1 OF 2

KSC FORM 32-85 (CG 4/92)

REVISED: (E) REV 8 REDRAWN 8-1-90
 APPROVED: 5-10-65



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.		TUBE OD REF	THREAD T REF	Y DIM.	Z DIM.
CRE STEEL	AL ALLOY			+ .047 - .000	+ .047 - .000
K4	D4	1/4	7/16-20	1.094	.766
K6	D6	3/8	9/16-18	1.203	.891
K8	D8	1/2	3/4-16	1.375	1.063
K10	D10	5/8	7/8-14	1.609	1.203
K12	D12	3/4	1-1/16-12	1.844	1.391
K16	D16	1	1-5/16-12	2.016	1.625
K20	D20	1 1/4	1-5/8-12	2.109	1.797
K24	D24	1 1/2	1-7/8-12	2.156	2.031
K28	D28	1 3/4	2-1/4-12	2.016	2.266
K32	D32	2	2-1/2-12		2.578

REVISED: (E) REV & REDRAWN 8-1-90

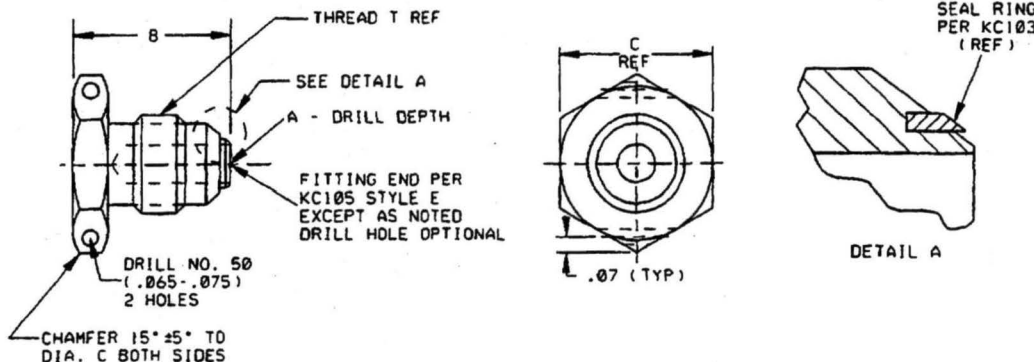
APPROVED: 5-10-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	ELBOW ASSY, 45°, FLARED TUBE & MALE ADJUSTABLE END, FOR SEAL RING	KC129	
COORDINATION STATUS KSC DE		SHEET 2 OF 2	

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730



DASH NO.	TUBE OD REF	THREAD T REF	A	B	C	
						CRE STEEL
K4	D4	1/4	7/16-20	.531	.750	.688
K6	D6	3/8	9/16-18	.563	.828	.813
K8	D8	1/2	3/4-16	.625	.953	1.000
K10	D10	5/8	7/8-14	.766	1.125	1.125
K12	D12	3/4	1-1/16-12	.813	1.219	1.375
K16	D16	1	1-5/16-12		1.297	1.625
K20	D20	1 1/4	1-5/8-12	.750	1.375	1.875
K24	D24	1 1/2	1-7/8-12	.813	1.500	2.125
K28	D28	1 3/4	2-1/4-12	.781	1.625	2.500
K32	D32	2	2-1/2-12	.828	1.750	2.750

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE 'D'
CORROSION RESISTANT STEEL (CLASS 316), CODE 'K' (WAS CODE 'C')

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
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EXAMPLE OF PART NOS.
KC130K8 = PLUG, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC130D12 = PLUG, 3/4" OD TUBING, ALUMINUM ALLOY

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REVISED: (E) REV & REDRAWN 8-1-90

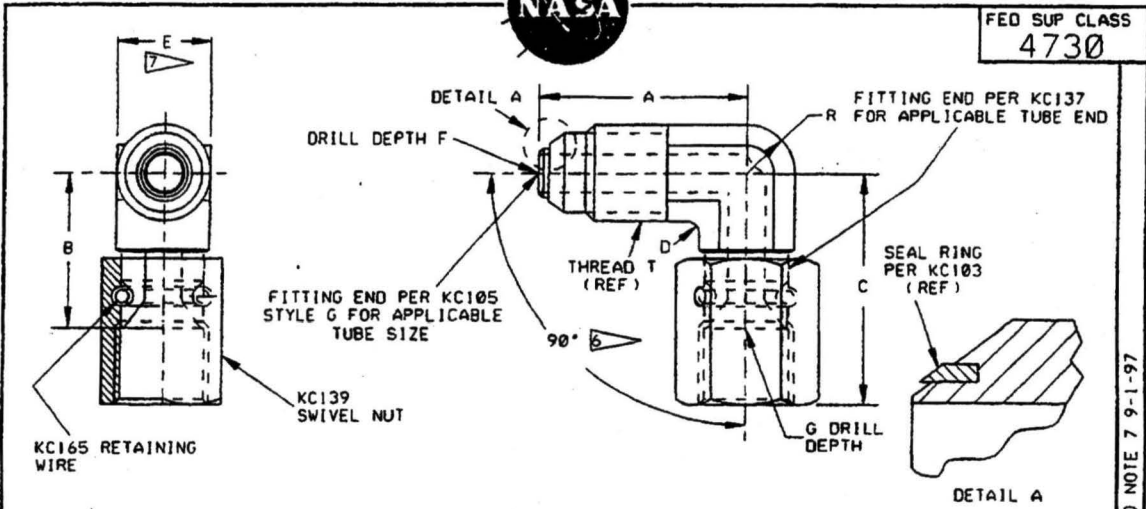
APPROVED: 8-12-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	PLUG, FLARED TUBE FOR SEAL RING	KC130
COORDINATION STATUS KSC DE		SHEET 1 OF 1



FED SUP CLASS
4730

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DASH NO.		TUBE OD REF	THREAD T REF	A DIM.	B DIM	C DIM	D RAD	R RAD	E PAD DIM.	F DIM	G DIM	SWIVEL NUT KC139		RETAINING WIRE
CRE STEEL	AL ALLOY			+.000 -.063	+.000 -.031	DIM REF	±.03	±.03 -.03		+.047 -.011	+.016 -.011	CRE STEEL	AL ALLOY	
K4	D4	1/4	7/16-20	.906	.704	1.000	.063	.242	.438	.906	.734	K4	D4	KC165-4
K6	D6	3/8	9/16-18	1.078	.891	1.250	.094	.317	.563	1.094	.933	K6	D6	KC165-6
K8	D8	1/2	3/4-16	1.266	.969	1.375		.414	.750	1.281	1.016	K8	D8	KC165-8
K10	D10	5/8	7/8-14	1.469	1.141	1.625		.484	.875	1.484	1.188	K10	D10	KC165-10
K12	D12	3/4	1-1/16-12	1.672	1.204	1.750	.125	.586	1.063	1.688	1.250	K12	D12	KC165-12
K16	D16	1	1-5/16-12	1.828	1.422	2.000		.719	1.313	1.906	1.531	K16	D16	KC165-16
K20	D20	1 1/4	1-5/8-12	2.078	1.704	2.313	.188	.875	1.625	2.156	1.812	K20	D20	KC165-20
K24	D24	1 1/2	1-7/8-12	2.344	1.875	2.594		1.031	1.875	2.609	2.172	K24	D24	KC165-24
K28	D28	1 3/4	2-1/4-12	2.860	2.063	2.900		1.188	2.250	2.931	2.212	K28	D28	KC165-28
K32	D32	2	2-1/2-12	3.078	2.454	3.375	.250	1.383	2.563	3.219	2.673	K32	D32	KC165-32

MATERIAL: SEE PROCUREMENT SPECIFICATION, ALUMINUM ALLOY, 2014-16, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
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TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2" ABOVE -6 SIZE ±1-1/2".

E DIMENSION FOR -32 SIZE EQUAL TO 2.500" IS ACCEPTABLE BUT 2.563" IS PREFERRED

EXAMPLE OF PART NOS. KC131K8 = ELBOW WITH SWIVEL END, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC131D12 = ELBOW WITH SWIVEL END, 3/4" OD TUBING, ALUMINUM ALLOY

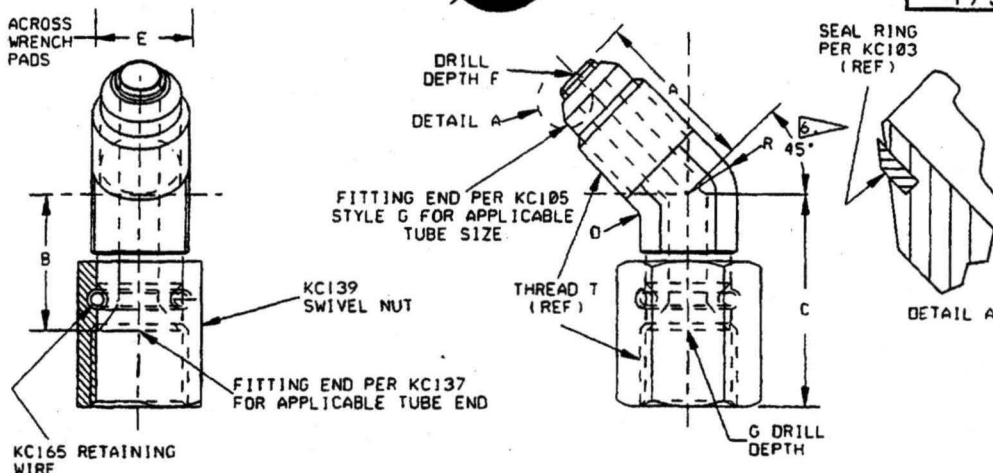
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC. KSC-F-124	ELBOW ASSY, 90°, FLARED TUBE & FEMALE SWIVEL END, FOR SEAL RING	STANDARD PART
COORDINATION STATUS KSC DE		KC131
		SHEET 1 OF 1

REVISED: (E) REV & REDRAWN 8-1-90 (F) ADDED NOTE 7 9-1-97
 APPROVED: 8-12-65



FED SUP CLASS
4730



DASH NO.	TUBE OD REF	THREAD T REF	A DIM. +.000 -.063	B DIM +.000 -.031	C DIM REF	D RAD ±.03	R RAD +.03 -.03	E PAD DIM.	F DIM +.047 -.011	G DIM +.016 -.011	SWIVEL NUT KC139		RETAINING WIRE	
											CRE STEEL	AL ALLOY		
K4	D4	1/4	7/16-20	.750	.610	.9380	.063	.242	.438	.766	.656	K4	D4	KC165-4
K6	D6	3/8	9/16-18	.860	.766	1.125	.094	.317	.563	.891	.828	K6	D6	KC165-6
K8	D8	1/2	3/4-16	1.016	.875	1.281	.125	.414	.750	1.063	.953	K8	D8	KC165-8
K10	D10	5/8	7/8-14	1.141	.954	1.438	.125	.484	.875	1.203	1.047	K10	D10	KC165-10
K12	D12	3/4	1-1/16-12	1.313	.954	1.500	.125	.586	1.063	1.391	1.063	K12	D12	KC165-12
K16	D16	1	1-5/16-12	1.500	1.172	1.750	.125	.719	1.313	1.625	1.328	K16	D16	KC165-16
K20	D20	1 1/4	1-5/8-12	1.625	1.422	2.031	.125	.875	1.625	1.797	1.625	K20	D20	KC165-20
K24	D24	1 1/2	1-7/8-12	1.813	1.532	2.250	.125	1.031	1.875	2.031	1.781	K24	D24	KC165-24
K28	D28	1 3/4	2-1/4-12	2.000	1.766	2.619	.188	1.125	2.250	2.266	2.031	K28	D28	KC165-28
K32	D32	2	2-1/2-12	2.250	1.985	2.906	.250	1.383	2.500	2.578	2.313	K32	D32	KC165-32

MATERIAL: SEE PROCUREMENT SPECIFICATION, ALUMINUM ALLOY, 2014-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
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▶ TOLERANCE UP TO AND INCLUDING -6 SIZE ±2-1/2° ABOVE -6 SIZE ±1-1/2°.

EXAMPLE OF PART NOS. KC132K8 = 45° ELBOW WITH SWIVEL END, 1/2" OD TUBING, CORROSION RESISTANT STEEL
KC132D12 = 45° ELBOW WITH SWIVEL END, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
KSC-F-124

COORDINATION STATUS
KSC DE

ELBOW ASSY, 45°, FLARED
TUBE & FEMALE SWIVEL
END, FOR SEAL RING

STANDARD PART

KC132

SHEET 1 OF 1

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THERE TO.

KSC FORM 32-85 (CG 4/92)

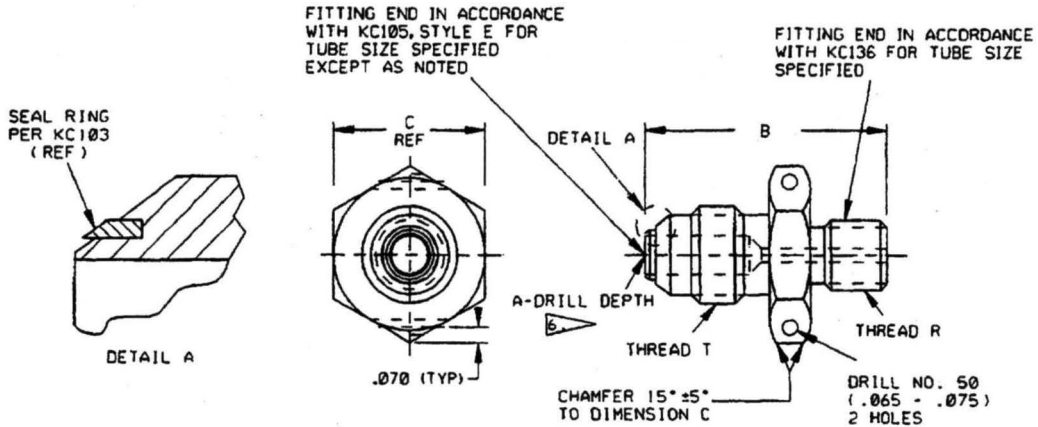
REVISED: (D) REV 8 REDRAWN 8-1-99

APPROVED: 8-12-65



FED SUP CLASS
4730

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MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
- AT THE OPTION OF THE MANUFACTURER, THE SMALLER INSIDE DIAMETER DIMENSION MAY BE DRILLED FROM PORT TO PORT.

EXAMPLE OF PART NOS. KC133K8-4 = REDUCER-ADAPTER, 1/2" OD TUBING TO 1/4" BOSS END, CORROSION RESISTANT STEEL
 KC133D12-8 = REDUCER-ADAPTER, 3/4" OD TUBING TO 1/2" BOSS END, ALUMINUM ALLOY

APPROVED: 8-12-65 REVISED: (E) REV & REDRAWN 8-1-90

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	REDUCER - ADAPTER FLARED TUBE TO BOSS FOR SEAL RING
COORDINATION STATUS KSC DE	STANDARD PART KC133
	SHEET 1 OF 2



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.

DASH NO.		FLARED TUBE END		BOSS END		A MAX 6	B +.020 -.060	C REF
CRES STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	TUBE OD REF	THREAD R REF			
K4-2	D4-2	1/4	7/16-20	1/8	5/16-24	.452	1.100	.688
K4-3	D4-3			3/8	3/8-24		1.066	
K6-2	D6-2	3/8	9/16-18	1/8	5/16-24	.457	1.242	.813
K6-3	D6-3			3/8	3/8-24		1.208	
K6-4	D6-4			1/4	7/16-20		1.335	
K6-5	D6-5			3/8	1/2-20			
K8-2	D8-2	1/2	3/4-16	1/8	5/16-24	.538	1.357	1.000
K8-3	D8-3			3/8	3/8-24		1.323	
K8-4	D8-4			1/4	7/16-20		1.450	
K8-5	D8-5			3/8	1/2-20		1.445	
K8-6	D8-6			3/8	9/16-18			
K10-4	D10-4	5/8	7/8-14	1/4	7/16-20	.618	1.533	1.125
K10-6	D10-6			3/8	9/16-18		1.528	
K10-8	D10-8			1/2	3/4-16		1.567	
K12-4	D12-4	3/4	1-1/16-12	1/4	7/16-20	.703	1.686	1.375
K12-5	D12-5			3/8	1/2-20			
K12-6	D12-6			3/8	9/16-18		1.681	
K12-8	D12-8			1/2	3/4-16		1.719	
K12-10	D12-10			3/8	7/8-14		1.616	
K16-4	D16-4	1	1-5/16-12	1/4	7/16-20	.741	1.722	1.625
K16-8	D16-8			1/2	3/4-16		1.809	
K16-10	D16-10			3/8	7/8-14		1.852	
K16-12	D16-12			3/4	1-1/16-12		1.912	
K20-4	D20-4	1 1/4	1-5/8-12	1/4	7/16-20	.778	1.965	1.875
K20-12	D20-12			3/4	1-1/16-12		2.202	
K20-16	D20-16			1	1-5/16-12			
K24-16	D24-16	1 1/2	1-7/8-12			.878	2.159	2.125
K24-20	D24-20						2.154	
K28-20	D28-20	1 3/4	2-1/4-12	1/4	1-5/8-12	.978	2.373	2.500
K28-24	D28-24						2.404	
K32-24	D32-24			1 1/2	1-7/8-12		2.529	
K32-28	D32-28	2	2-1/2-12			1.078	2.684	2.750
				1 3/4	2-1/4-12			

REVISED: (E) REV & REDRAWN 8-1-90

APPROVED: 8-12-65

CUSTODIAN:

JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
KSC-F-124

COORDINATION STATUS

KSC DE

REDUCER - ADAPTER
FLARED TUBE TO BOSS
FOR SEAL RING

STANDARD PART

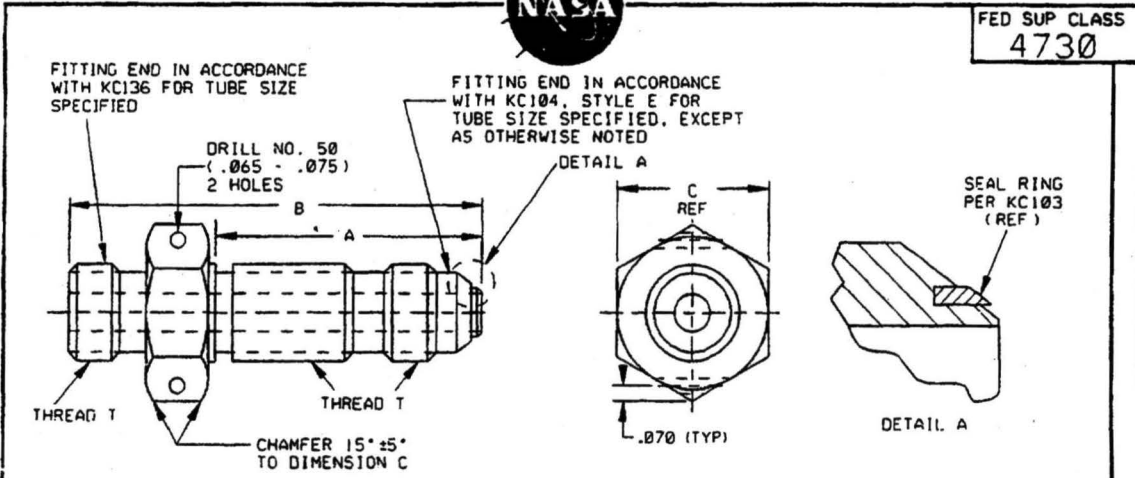
KC133

SHEET 2 OF 2



FED SUP CLASS
4730

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DASH NO.	TUBE OD REF	THREAD T REF	A	B	C REF	
						CRE STEEL
K4	D4	1/4	7/16-20	1.213	1.881	.688
K6	D6	3/8	9/16-18	1.291	2.078	.813
K8	D8	1/2	3/4-16	1.447	2.312	1.000
K10	D10	5/8	7/8-14	1.588	2.523	1.125
K12	D12	3/4	1-1/16-12	1.760	2.797	1.375
K16	D16	1	1-5/16-12	1.760	2.834	1.625
K20	D20	1 1/4	1-5/8-12	1.807	2.956	1.875
K24	D24	1 1/2	1-7/8-12	1.822	3.018	2.125
K28	D28	1 3/4	2-1/4-12	1.979	3.314	2.500
K32	D32	2	2-1/2-12	2.104	3.467	2.750

MATERIAL: SEE PROCUREMENT SPECIFICATION.
 ALUMINUM ALLOY, 2024-T6, CODE "D"
 CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED. TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

EXAMPLE OF PART NOS.
 KC134K4 = ADAPTER, BOSS TO BULKHEAD, 1/4" OD TUBING, CORROSION RESISTANT STEEL
 KC134DB = ADAPTER, BOSS TO BULKHEAD, 1/2" OD TUBING, ALUMINUM ALLOY

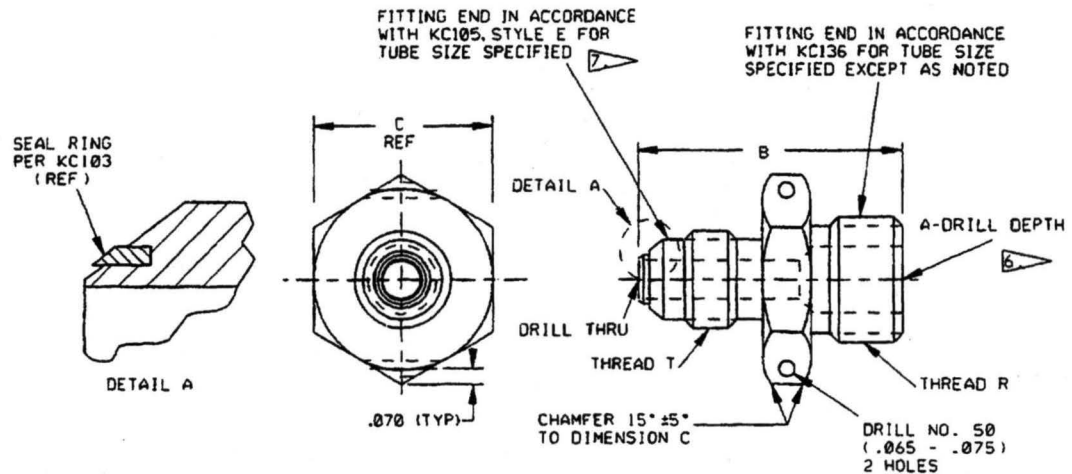
REVISED: (E) REV & REDRAWN 8-1-98
 APPROVED: 8-12-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	STANDARD PART
COORDINATION STATUS	KC134
KSC DE	SHEET 1 OF 1



FED SUP CLASS
4730

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MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLDY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
- AT THE OPTION OF THE MANUFACTURER, THE SMALLER INSIDE DIAMETER DIMENSION MAY BE DRILLED FROM PORT TO PORT.
- FOR -.2, -.3, & -.5 TUBE SIZES, FITTING END SHALL BE IN COMPLIANCE WITH MS33656.

EXAMPLE OF PART NOS.

KC135K6-8 = EXPANDER-ADAPTER, 3/8" OD TUBING TO 1/2" BOSS END, CORROSION RESISTANT STEEL

KC135D8-10 = EXPANDER-ADAPTER, 1/2" OD TUBING TO 3/8" BOSS END, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER			
PROCUREMENT SPEC. KSC-F-124	EXPANDER - ADAPTER FLARED TUBE TO BOSS, FOR SEAL RING	STANDARD PART	
COORDINATION STATUS		KC135	
KSC DE		SHEET 1 OF 2	

KSC FORM 32-85 (CG 4/92)

APPROVED: 8-12-65
 REVISED: (E) REV & REDRAWN 8-1-90



FED SUP CLASS
4730

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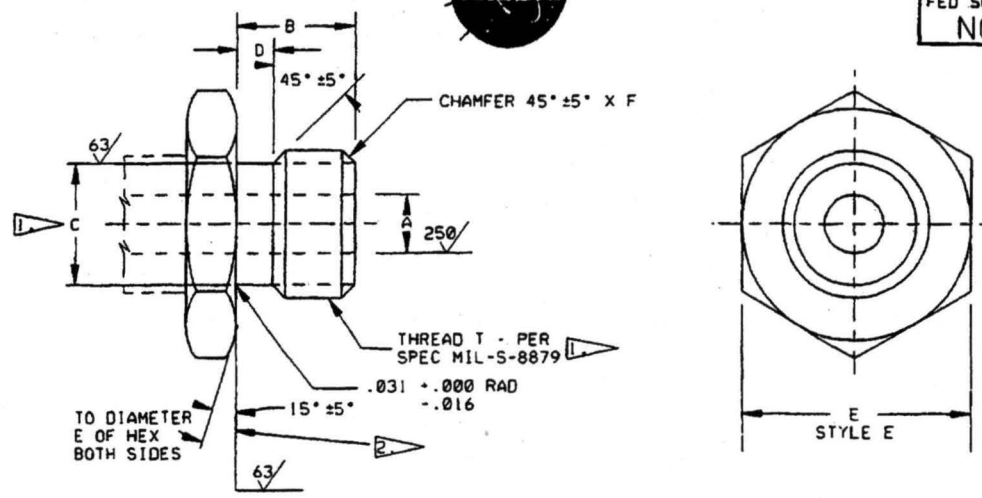
DASH NO.		FLARED TUBE END		BOSS END		A MAX 	B +.000 -.060	C REF
CRES STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	TUBE OD REF	THREAD R REF			
K2-4	D2-4	1/8	5/16-24	1/4	7/16-20	.311	1.084	.688
K3-4	D3-4	3/16	3/8-24				1.115	
K2-6	D2-6	1/8	5/16-24	3/8	9/16-18	.336	1.163	.813
K3-6	D3-6	3/16	3/8-24				1.194	
K4-6	D4-6	1/4	7/16-20				1.265	
K2-8	D2-8	1/8	5/16-24	1/2	3/4-16	.417	1.285	1.000
K3-8	D3-8	3/16	3/8-24				1.315	
K4-8	D4-8	1/4	7/16-20				1.390	
K5-8	D5-8	3/8	1/2-20				1.392	
K4-10	D4-10	1/4	7/16-20	3/4	7/8-14	.454	1.460	1.125
K6-10	D6-10	3/8	9/16-18				1.560	
K8-10	D8-10	1/2	3/4-16				1.668	
K4-12	D4-12	1/4	7/16-20	1	1-1/16-12	.509	1.560	1.375
K5-12	D5-12	3/8	1/2-20				1.567	
K6-12	D6-12	3/8	9/16-18				1.668	
K8-12	D8-12	1/2	3/4-16				1.769	
K10-12	D10-12	3/4	7/8-14				1.597	
K4-16	D4-16	1/4	7/16-20	1	1-5/16-12	.538	1.603	1.625
K6-16	D6-16	3/8	9/16-18				1.704	
K8-16	D8-16	1/2	3/4-16				1.805	
K10-16	D10-16	3/4	7/8-14				1.911	
K12-16	D12-16	1	1-1/16-12				1.693	
K4-20	D4-20	1/4	7/16-20	1 1/4	1-5/8-12	.610	1.693	1.875
K12-20	D12-20	3/4	1-1/16-12				2.007	
K16-20	D16-20	1	1-5/16-12				2.054	
K16-24	D16-24	1	1-5/16-12	1 1/2	1-7/8-12	.635	2.095	2.125
K20-24	D20-24	1 1/4	1-5/8-12				2.142	
K20-28	D20-28	1 1/4	1-5/8-12	1 3/4	2-1/4-12	.759	2.297	2.500
K24-28	D24-28	1 1/2	1-7/8-12				2.422	
K24-32	D24-32	1 1/2	1-7/8-12	2	2-1/2-12	.782	2.516	2.750
K28-32	D28-32	1 3/4	2-1/4-12				2.641	

APPROVED: 8-12-65
 REVISED: (E) REV & REDRAWN 8-1-90

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	EXPANDER - ADAPTER FLARED TUBE TO BOSS, FOR SEAL RING	KC135	
COORDINATION STATUS KSC DE		SHEET 2 OF 2	



FED SUP CLASS
NONE



DASH NO.	TUBE OD REF	THREAD T MIL-S-8879	A DIA	B +.000 -.015	C DIA +.002 -.003	D +.015 -.000	E DIA	F	
								MIN	MAX
-2	1/8	.3125-24UNJF-3A	.062	.351	.250	.063	.563	.031	.052
-3	3/16	.3750-24UNJF-3A	.125	.355	.312	.075	.625	.038	.063
-4	1/4	.4375-20UNJF-3A	.172	.389	.364	.075	.688	.042	.069
-5	5/16	.5000-20UNJF-3A	.234	.411	.426	.083	.750	.047	.078
-6	3/8	.5625-18UNJF-3A	.297	.420	.481	.094	1.000	.054	.089
-8	1/2	.7500-16UNJF-3A	.391	.521	.660	.107	1.125		
-10	5/8	.8750-14UNJF-3A	.484	.567	.773	.125	1.375		
-12	3/4	1.0625-12UNJ-3A	.609	.636	.945		1.625	.063	.104
-16	1	1.3125-12UNJ-3A	.844	.672	1.195		1.875		
-20	1 1/4	1.6250-12UNJ-3A	1.078		1.507		2.125		
-24	1 1/2	1.8750-12UNJ-3A	1.312	.720	1.756		2.500		
-28	1 3/4	2.2500-12UNJ-3A	1.547	.772	2.131		2.750		
-32	2	2.5000-12UNJ-3A	1.781	.887	2.381				

- NOTES:
- DIAMETER C AND T THREAD (PITCH DIA) SHALL BE CONCENTRIC WITHIN .015 FULL INDICATOR READING.
 - SQUARENESS BETWEEN THREAD T PITCH DIAMETER AND FACE OF HEX SHALL NOT EXCEED .005 FOR SIZES DASH 10 AND SMALLER OR .008 FOR LARGER SIZES, WHEN MEASURED AT THE OUTER DIAMETER OF THE FACE.
 - DIMENSIONS IN INCHES, TOLERANCES NOTED.
 - ROUGHNESS OF MACHINED SURFACES SHALL BE 125 AA MAX PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.
 - BREAK ALL SHARP EDGES UNLESS OTHERWISE NOTED. REMOVE BURRS AND SLIVERS.
 - THIS STANDARD TAKES PRECEDENCE OVER DOCUMENTS REFERENCED HEREIN.

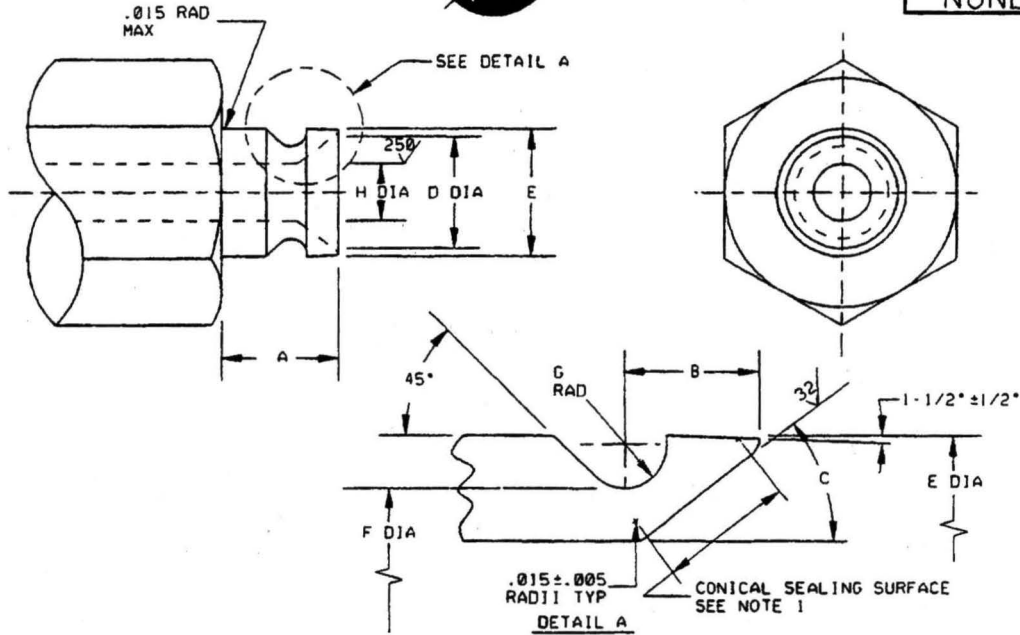
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REVISED: (F) REV & REDRAWN 8-1-90
 APPROVED: 8-12-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		DESIGN STANDARD
PROCUREMENT SPEC. NONE	STANDARD DIMENSIONS FOR FITTING END, STRAIGHT THREAD	KC136
COORDINATION STATUS		SHEET 1 OF 1
KSC DE		



FED SUP CLASS
NONE



DASH NO.	TUBE OD REF	A ±.016	B	C DEG ±30°	D DIA	E DIA +.005 -.005	F DIA +.000 -.005	G RAD +.005 -.003	H DIA
-4	¼	.370	.140	39 ½	.295	.383	.278	.044	+.003 -.004
-6	⅜	.465	.156		.435	.502	.397		.297
-8	½	.454	.188		.572	.682	.565	.050	±.004
-10	⅝	.454	.188		.680	.797	.681		.484
-12	¾	.512	.219	37	.850	.972	.824	.066	±.005
-16	1	.579	.250		1.075	1.224	1.072		.844
-20	1¼	.672	.344		1.410	1.536	1.382	1.078	±.008 -.005
-24	1½	.721	.381		1.625	1.786	1.636		1.312
-28	1¾	.829	.394	2.034	2.178	2.027	1.546	1.781	+.010 -.005
-32	2	.406	.406						2.284

- NOTES:
1. THE CONICAL SEALING SURFACE SHALL BE CONCENTRIC WITH E DIA WITHIN .005 FULL INDICATOR READING.
 2. MACHINED SURFACE ROUGHNESS, UNLESS OTHERWISE SPECIFIED, SHALL NOT EXCEED 63/1000 PER ANSI B46.1.
 3. DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED; DECIMALS ±.005 ANGLES ±5°.
 4. BREAK ALL SHARP EDGES UNLESS OTHERWISE NOTED. REMOVE BURRS AND SLIVERS.
 5. THIS STANDARD TAKES PRECEDENCE OVER DOCUMENTS REFERENCED HEREIN.

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISED: (F) REV & REDRAWN 8-1-90
 APPROVED: 8-12-65

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC.	FITTING END, SWIVEL FLARED TUBE CONNECTOR, STANDARD DIMENSIONS FOR	DESIGN STANDARD	
NONE		KC137	
COORDINATION STATUS		SHEET 1 OF 1	
KSC DE			

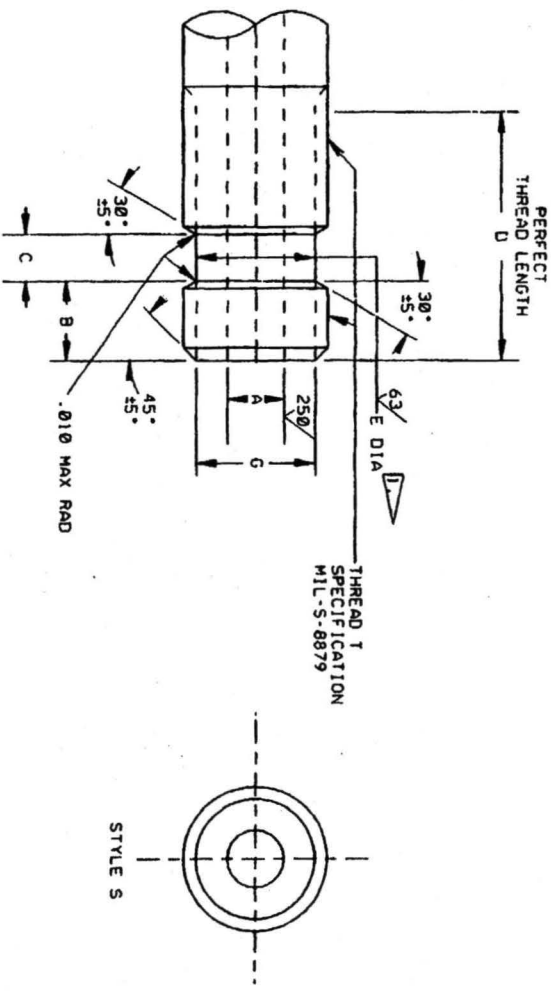
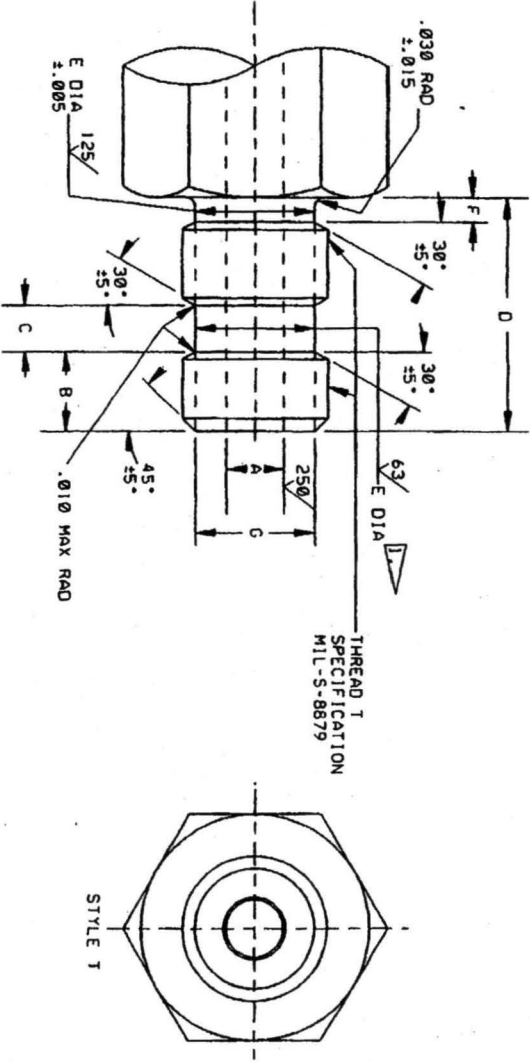
KSC FORM 32-85 (CG 4/92)

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FED SUP CLASS
NONE

GP-425



APPROVED: 8-12-65 REVISED: (D) REV & REDRAWN 8-1-90

CUSTODIAN: PROCUREMENT SPEC. NONE		JOHN F. KENNEDY SPACE CENTER	
COORDINATION STATUS KSC DE		FITTING END, ADJUSTABLE, STANDARD DIMENSIONS FOR	
		DESIGN STANDARD KC138	
		SHEET 1 OF 2	

KSC FORM 32-65 (CG 4/92)



FED SUP CLASS
NONE

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DASH NO.	TUBE OD REF	THREAD T MIL-S-8879	A DIA	B DIM	C DIM -.010 -.000	D DIM ±.016	E +.002 -.003	F +.015 -.000	G DIA ±.016			
-4	¼	.4375-20-UNJF-3A	.172	±.004	.281	.140	.703	.364	.075	.359		
-6	⅜	.5625-18-UNJF-3A	.297		.312	.156	.766	.482	.083	.484		
-8	½	.7500-16-UNJF-3A	.391		.344	.187	.875	.660	.094	.656		
-10	⅝	.8750-14-UNJF-3A	.484		.391	.219	1.016	.773	.107	.766		
-12	¾	1.0625-12-UNJ-3A	.609	±.005	.469	.234	1.156	.945	.125	.938		
-16	1	1.3125-12-UNJ-3A	.844					±.007 -.005		1.195	1.507	1.188
-20	1¼	1.6250-12-UNJ-3A	1.078					±.008 -.005		1.756	1.500	
-24	1½	1.8750-12-UNJ-3A	1.312					1.756		1.750		
-28	1¾	2.2500-12-UNJ-3A	1.547					±.010 -.005		2.131	2.125	
-32	2	2.5000-12-UNJ-3A	1.781					2.381		2.375		

- NOTES:
1. E DIAMETER GROOVE SHALL BE SMOOTH AND FREE OF ALL THREAD MARKS.
 2. SURFACE FINISH OF DRILLED HOLE SHALL BE 250 PER ANSI B46.1.
 3. MACHINED SURFACE ROUGHNESS, UNLESS OTHERWISE SPECIFIED, SHALL NOT EXCEED 100 PER ANSI B46.1.
 4. DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED, TOLERANCES: DECIMALS ±.005.
 5. THIS STANDARD TAKES PRECEDENCE OVER DOCUMENTS REFERENCED HEREIN.

REVISED: ① REV & REDRAWN 8-1-90

APPROVED: 8-12-65

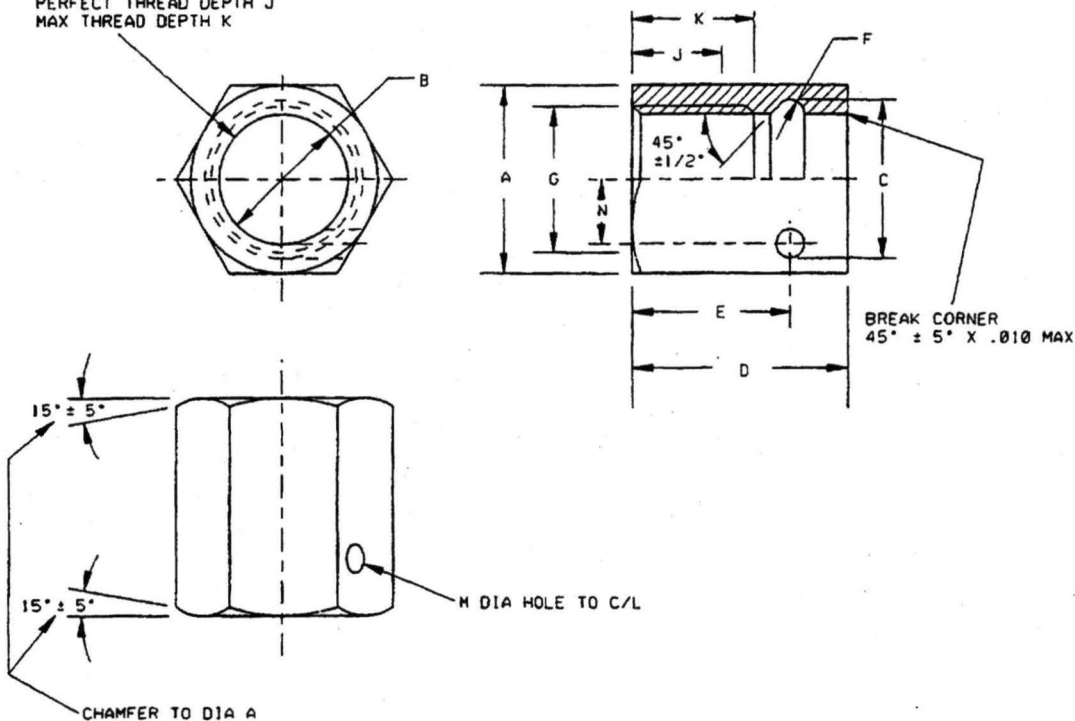
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. NONE	FITTING END, ADJUSTABLE, STANDARD DIMENSIONS FOR	DESIGN STANDARD
COORDINATION STATUS KSC DE		KC138
		SHEET 2 OF 2

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

C SINK 90° X DIA G
THREAD T PER MIL-S-8879
PERFECT THREAD DEPTH J
MAX THREAD DEPTH K



MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION

SCREW THREAD: SEE PROCUREMENT SPECIFICATION

- NOTES:
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

EXAMPLE OF PART NOS.
KC139K8 = SWIVEL NUT, 1/2" TUBE FITTING, CORROSION RESISTANT STEEL
KC139D12 = SWIVEL NUT, 3/4" TUBE FITTING, ALUMINUM ALLOY

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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
KSC-F-124

COORDINATION STATUS

KSC DE

SWIVEL NUT,
FLARED TUBE FITTING

STANDARD PART

KC139

SHEET 1 OF 2

KSC FORM 32-85 (CG 4/92)

REVISED: (C) REV & REDRAWN 8-1-90

APPROVED: 8-12-65



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.		TUBE OD REF	THREAD T MIL-S-8879	A HEX	B DIA +.005 -.000	C +.005 -.000	D DIM ±.016	E DIM ±.003	F RAD +.005 -.003	G DIA ±.005	J DIM MIN		
CRE STEEL	AL ALLOY												
K4	D4	¼	.4375-20UNJF-3B	.563	±.003 -.004	.388	.474	.656	.484	.044	.438	.300	
K6	D6	⅜	.5625-18UNJF-3B	.688		.508	.593	.781	.531		.563	.333	
K8	D8	½	.7500-16UNJF-3B	.875		.688	.785	.828	.609		.750	.375	
K10	D10	⅝	.8750-14UNJF-3B	1.000		.804	.901	.875	.687	.050	.875	.461	
K12	D12	¾	1.0625-12UNJ-3B	1.250		.979	1.108	1.016	.781		1.063	.469	
K16	D16	1	1.3125-12UNJ-3B	1.500		1.229	1.361	1.094	.844		1.313	.563	
K20	D20	1¼	1.6250-12UNJ-3B	2.000		±.016	1.541	1.670	1.219	.969	.066	1.625	
K24	D24	1½	1.8750-12UNJ-3B	2.250		1.791	1.920	1.297	1.015	1.875		.661	
K28	D28	1¾	2.2500-12UNJ-3B	2.625		±.020	2.183	2.314	1.513	1.247		2.250	.730
K32	D32	2	2.5000-12UNJ-3B	2.875		2.416	2.546	1.656	1.344	2.500		.844	

DASH NO.	TUBE OD REF	K DIM MAX	M DIA ±.005	N DIM ±.003	
CRE STEEL					AL ALLOY
K4	D4	¼	.450	.093	.193
K6	D6	⅜	.500		.253
K8	D8	½	.563	.102	.343
K10	D10	⅝	.675		.401
K12	D12	¾	.719	.134	.488
K16	D16	1	.813		.613
K20	D20	1¼	.911		.769
K24	D24	1½	.911		.894
K28	D28	1¾	.980		1.091
K32	D32	2	1.094		1.207

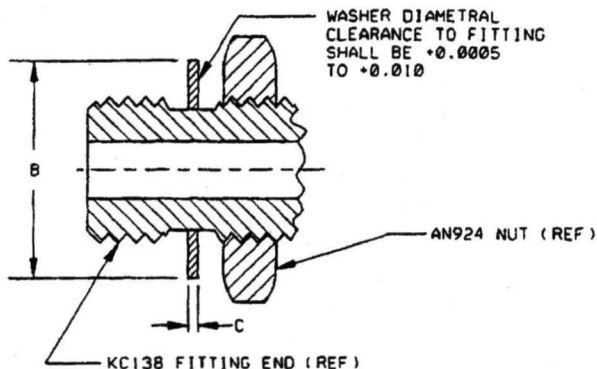
APPROVED: 8-12-65
REVISED: (C) REV & REDRAWN 8-1-90

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	SWIVEL NUT, FLARED TUBE FITTING	STANDARD PART	
COORDINATION STATUS KSC DE		KC139	
		SHEET 2 OF 2	



FED SUP CLASS
NONE

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DASH NO.		C DIM STOCK THK ±.003	FINAL ASSY DIM. FOR B ±.015	FLATNESS TOL "D" B
CRE STEEL	AL ALLOY			
C4	D4	.031	.650	.015
C6	D6		.794	
C8	D8	.040	1.010	.020
C10	D10	.050	1.155	.025
C12	D12		1.444	
C16	D16		1.732	
C20	D20		2.165	
C24	D24		2.454	
C28	D28	2.868		
C32	D32	3.160		

MATERIAL: ALUMINUM ALLOY, CODE "D"; TYPE 2024-T3 OF SPECIFICATION QQ-A-250/4; CORROSION RESISTANT STEEL (CLASS 302 OR 304) CONDITION A OF SPECIFICATION QQ-S-766.

- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES; TOLERANCES NOTED.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON DATE OF INVITATION FOR BID.

WASHER SHALL BE FLAT WITHIN "D" AFTER INSTALLATION ON FITTING END.

EXAMPLE OF PART NOS.

KC140C4 = CORROSION RESISTANT STEEL WASHER FOR 1/4" OD TUBE ADJ END FITTING

KC140D6 = ALUMINUM ALLOY WASHER FOR 1/2" OD TUBE ADJ END FITTING

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	WASHER FLARED TUBE FITTING ADJUSTABLE END	STANDARD PART	
COORDINATION STATUS		KC140	
KSC DE		SHEET 1 OF 1	

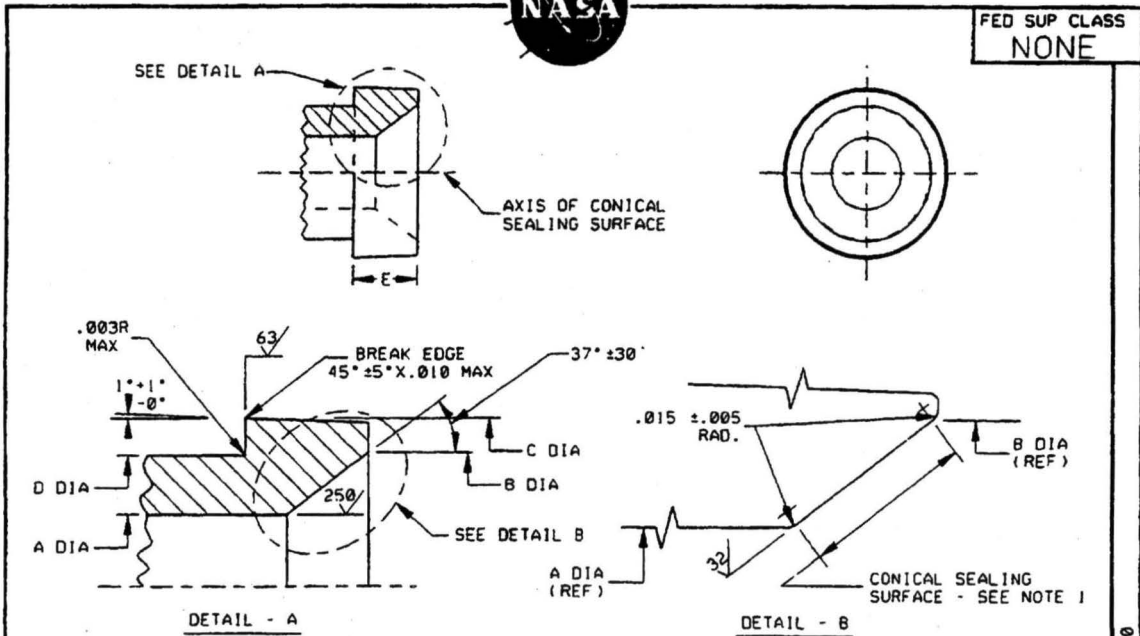
KSC FORM 32-85 (CG 4/92)

APPROVED: 8-12-65
 REVISED: (C) REV & REDRAWN 8-1-90



FED SUP CLASS
NONE

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.



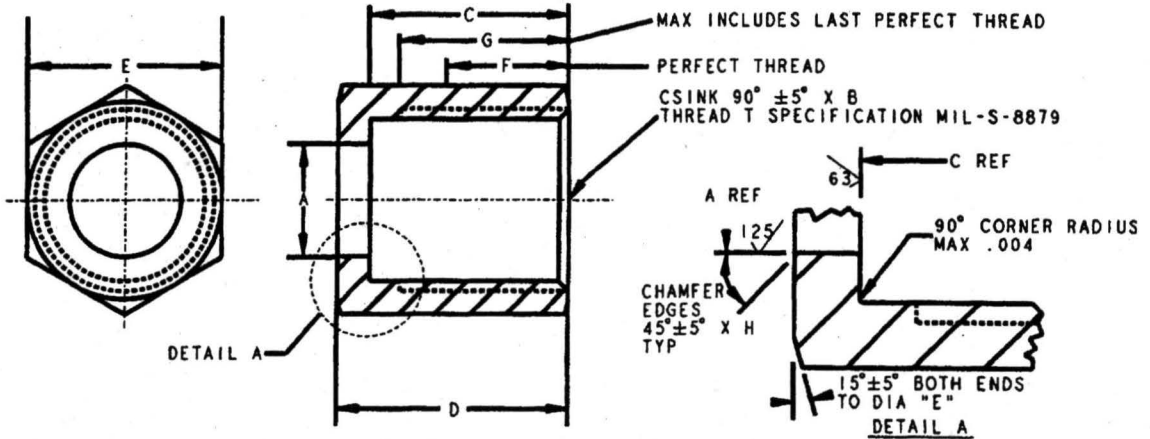
DASH NO.	TUBE OD REF	A DIA ±.005	B DIA ±.005	C DIA +.003 -.000	D DIA ±.001	E DIM
-4	¼	.162	.302	.380	.296	.141 ±.005
-6	⅜	.286	.442	.499	.431	.171 ±.007
-8	½	.388	.582	.679	.561	.218 ±.010
-10	⅝	.474	.720	.794	.689	.234 ±.010
-12	¾	.583	.862	.969	.825	.266 ±.015
-16	1	.786	1.110	1.219	1.080	.281 ±.015
-20	1¼	1.036	1.428	1.533	1.338	.312 ±.015
-24	1½	1.281	1.685	1.783	1.608	.344 ±.015
-28	1¾	1.578	2.073	2.158	1.881	.375 ±.015
-32	2	1.750	2.245	2.408	2.158	.406 ±.015

- NOTES:
1. THE CONICAL SEALING SURFACE SHALL BE CONCENTRIC WITH D DIAMETER WITHIN .005 FULL INDICATOR READING.
 2. MACHINED SURFACE ROUGHNESS, UNLESS OTHERWISE SPECIFIED, SHALL NOT EXCEED 63 PER ANSI B46.1.
 3. DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED; ANGLES ±5°.
 4. BREAK ALL SHARP EDGES UNLESS OTHERWISE NOTED. REMOVE BURRS AND SLIVERS.
 5. THIS STANDARD TAKES PRECEDENCE OVER DOCUMENTS REFERENCED HEREIN.

APPROVED: 8-12-65
 REVISED: (E) REV & REDRAWN 8-1-90

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		DESIGN STANDARD
PROCUREMENT SPEC. NONE	CONICAL END, STANDARD DEMINSIONS FOR	KC141
COORDINATION STATUS		SHEET 1 OF 1
KSC DE		

KSC FORM 32-85 (CG 4/92)



DASH NO.			TUBE OD REF	THREAD T MIL-S-8879	A DIA +.003 -.000	B DIA ±.005	C DIM ±.005	D DIM ±.005	E DIM	F MIN	G MAX	H +.005 -.000	
316 STEEL	AL ALLOY	AL6XN											
K2	D2	L2	1/8	.3125-24UNJF-3B	.180	.313	.460	.542	.375	.251	.376	.005	
K3	D3	L3	3/16	.3750-24UNJF-3B	.242	.375	.506	.604	.438	.282	.407		
K4	D4	L4	1/4	.4375-20UNJF-3B	.305	.438	.532	.620	.563	.300	.450		
K5	D5	L5	5/16	.5000-20UNJF-3B	.374	.500	.579	.683	.625	.331	.481		
K6	D6	L6	3/8	.5625-18UNJF-3B	.440	.563	.603	.729	.688	.333	.500		
K8	D8	L8	1/2	.7500-16UNJF-3B	.570	.750	.723	.854	.875	.375	.563	.010	
K10	D10	L10	5/8	.8750-14UNJF-3B	.698	.875	.817	.979	1.000	.461	.675		
K12	D12	L12	3/4	1.0625-12UNJF-3B	.834	1.063	.868	1.026	1.250	.469	.719		
K16	D16	L16	1	1.3125-12UNJF-3B	1.089	1.313	.962	1.136	1.500	.563	.813		
K20	D20	L20	1-1/4	1.6250-12UNJF-3B	1.347	1.625	1.017	1.229	2.000	±.016	.661	.911	.015
K24	D24	L24	1-1/2	1.8750-12UNJF-3B	1.617	1.875	1.170	1.417	2.250	±.020	.730	.980	
K28	D28	L28	1-3/4	2.2500-12UNJF-3B	1.890	2.250	1.316	1.563	2.625	±.020	.844	1.094	
K32	D32	L32	2	2.5000-12UNJF-3B	2.167	2.500	1.462	1.734	2.875				

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691

FINISH: SEE PROCUREMENT SPECIFICATION

SCREW THREAD: SEE PROCUREMENT SPECIFICATION

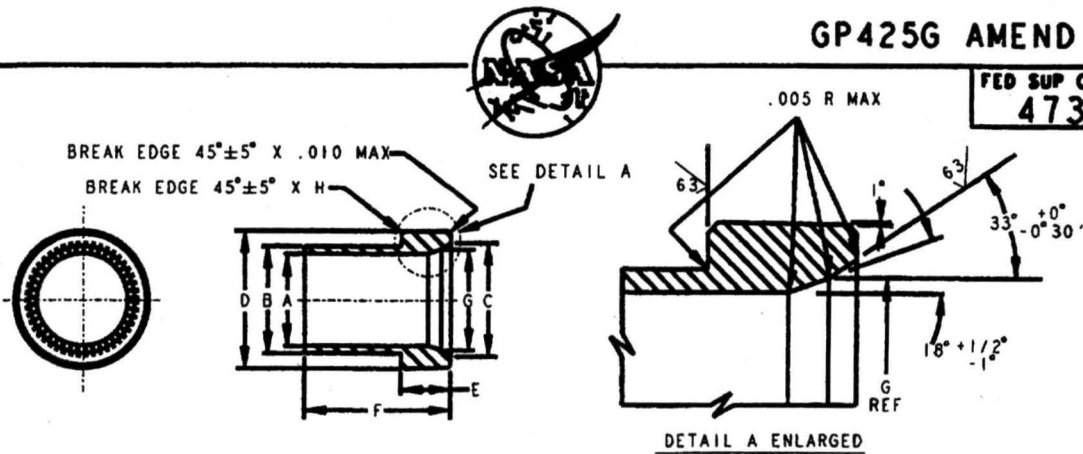
- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
 - DIMENSION A AND THREAD T (PITCH DIAMETER) TO BE CONCENTRIC WITHIN .005 FULL INDICATOR READING.
 - AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF PART NOS.
KC142K8 = NUT, COUPLING, 1/2" TUBE FITTING, TYPE 316 SS
KC142D12 = NUT, COUPLING, 3/4" TUBE FITTING, ALUMINUM ALLOY
KC142L16 = NUT, COUPLING, 1" TUBE FITTING, AL6XN

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. RSC-F-124	NUT, COUPLING	KC142	
COORDINATION STATUS RSC DC		SHEET 1 OF 1	

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APPROVED: 8-12-65
 REVISED: ADDED CODE "L" MATERIAL AND NOTE 7 5-1-67



DASH NO.			TUBE OD REF	A DIA +.003 -.000	B DIA +.000 -.003	C DIA ±.002	D DIA +.000 -.003	E ±.005	F ±.016	G DIA +.000 -.005	H	
316 STEEL	AL ALLOY	AL6XN									MAX	MIN
K2	D2	L2	1/8	.130	.172	.205	.267	.125	.344	.178	.010	
K3	D3	L3	3/16	.193	.234	.267	.329	.141	.406	.240		
K4	D4	L4	1/4	.255	.297	.315	.383	.141	.406	.280		
K5	D5	L5	5/16	.318	.366	.375	.445	.156	.438	.348		
K6	D6	L6	3/8	.380	.432	.441	.502	.172	.500	.406		
K8	D8	L8	1/2	.506	.562	.589	.682	.219	.562	.538		
K10	D10	L10	5/8	.631	.690	.705	.797	.234	.656	.663	.005	
K12	D12	L12	3/4	.756	.826	.880	.972	.266	.688	.794		
K16	D16	L16	1	1.006	1.081	1.130	1.222	.281	.781	1.050		
K20	D20	L20	1-1/4	1.260	1.339	1.412	1.534	.312	.906	1.310		
K24	D24	L24	1-1/2	1.510	1.609	1.630	1.784	.344	1.125	1.564		
K28	D28	L28	1-3/4	1.762	1.882	1.945	2.159	.375	1.125	1.818		
K32	D32	L32	2	2.014	2.159	2.195	2.409	.406	1.188	2.070		

- MATERIAL:** SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691
- FINISH:** SEE PROCUREMENT SPECIFICATION.
- SCREW THREAD:** SEE PROCUREMENT SPECIFICATION.
- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016. ANGLES ±1/2°.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
 - SURFACE ROUGHNESS VALUES NOT INDICATED ON DRAWING SHALL NOT EXCEED 125 PER ANSI B46.1.
 - DIMENSIONS A, B, C, AND D SHALL BE CONCENTRIC WITHIN .005 FULL INDICATOR READING FOR TUBE SIZES UP TO AND INCLUDING 3/4" AND .010 FULL INDICATOR READING FOR SIZES 1" AND ABOVE.
 - AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF PART NOS. KC143K8 = SLEEVE, 1/2" OD TUBING, TYPE 316 SS
KC143D12 = SLEEVE, 3/4" OD TUBING, ALUMINUM ALLOY
KC143L16 = SLEEVE, 1" OD TUBING, AL6XN

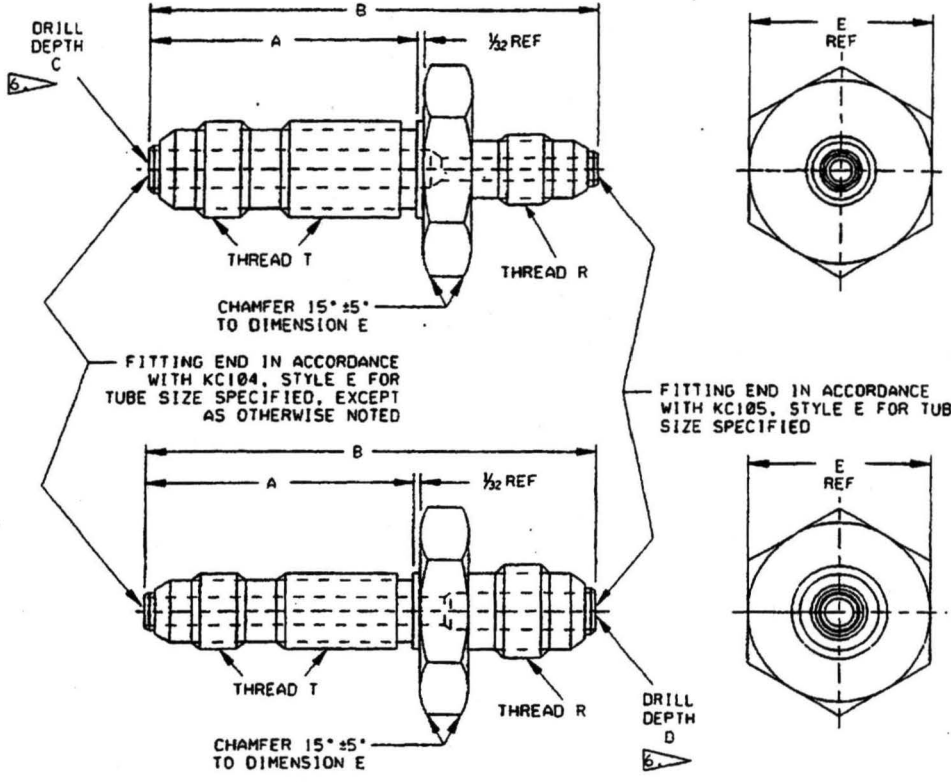
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. RSC-F-124	SLEEVE, FLARED TUBE FITTING	KC143
COORDINATION STATUS		SHEET 1 OF 1
RSC DC		

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REVISED: ADDED CODE "L" MATERIAL AND NOTE 8 3-1-07
APPROVED: 8-12-65



FED SUP CLASS
4730



MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

6. AT THE OPTION OF THE MANUFACTURER, THE SMALLER INSIDE DIAMETER DIMENSION MAY BE DRILLED FROM PORT TO PORT

EXAMPLE OF PART NOS.

KC14410-6 • REDUCER, BULKHEAD END: 3/8" TUBING SHORT END: 3/8" TUBING
CORROSION RESISTANT STEEL.

KC144D12-8 • REDUCER, BULKHEAD END: 3/4" TUBING SHORT END: 1/2" TUBING
ALUMINUM ALLOY.

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REVISED: (E) REV & REDRAWN 8-1-90 (F) REV. SH. 2 9-1-97
 APPROVED: 8-12-65

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	REDUCER, FLARED TUBE 3/8" BULKHEAD AND UNIVERSAL FOR SEAL RING		KC144
COORDINATION STATUS			SHEET 1 OF 3
KSC DE			

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

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DASH NO.		BULKHEAD END		SHORT END		A +.000 -.045	B +.000 -.090	C MAX	D MAX	E REF
CRES STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	TUBE OD REF	THREAD R REF					
K4-6	D4-6	1/4	7/16-20	3/8	9/16-18	1.208	2.147	.457	.813	
K4-8	D4-8			1/2	3/4-16		2.225	.538	1.000	
K4-10	D4-10			5/8	7/8-14		2.350	.618	1.125	
K4-12	D4-12			3/4	1-1/6-12		2.491	.703	1.375	
K4-16	D4-16			1	1-5/16-12		2.538	.741	1.625	
K4-20	D4-20			1-1/4	1-5/8-12	2.569	.778	1.875		
K6-4	D6-4	3/8	9/16-18	1/4	7/16-20	1.286	2.219	.883	.813	
K6-8	D6-8			1/2	3/4-16		2.303	.538	1.000	
K6-10	D6-10			5/8	7/8-14		2.428	.618	1.125	
K6-12	D6-12			3/4	1-1/16-12		2.569	.703	1.375	
K8-4	D8-4	1/2	3/4-16	1/4	7/16-20	1.442	2.352	1.008	1.000	
K8-6	D8-6			3/8	9/16-18		2.358	1.008		
K8-10	D8-10			5/8	7/8-14		2.584	.618	1.125	
K8-12	D8-12			3/4	1-1/16-12		2.725	.703	1.375	
K8-16	D8-16			1	1-5/16-12		2.772	.741	1.625	
K10-4	D10-4	3/4	7/8-14	1/4	7/16-20	1.583	2.517	1.121	1.125	
K10-6	D10-6			3/8	9/16-18		2.523	1.121		
K10-8	D10-8			1/2	3/4-16		2.624	1.121		
K10-12	D10-12			3/4	1-1/16-12		2.866	.703	1.375	
K10-16	D10-16	1	1-5/16-12	2.913	.741	1.625				
K12-4	D12-4	3/4	1-1/6-12	1/4	7/16-20	1.755	2.723	1.258	1.375	
K12-6	D12-6			3/8	9/16-18		2.729	1.258		
K12-8	D12-8			1/2	3/4-16		2.830	1.258		
K12-10	D12-10			5/8	7/8-14		2.931	1.258		
K12-16	D12-16			1	1-5/16-12		3.004	.741	1.625	
K12-20	D12-20	1 1/4	1-5/8-12	3.115	.778	1.875				
K16-4	D16-4	1	1-5/16-12	1/4	7/16-20	1.755	2.723	1.258	1.625	
K16-8	D16-8			1/2	3/4-16		2.830	1.258		
K16-10	D16-10			3/4	7/8-14		2.931	1.258		
K16-12	D16-12			1	1-1/16-12		3.037	1.258		
K16-20	D16-20			1 1/4	1-5/8-12		3.115	.778	1.875	
K16-24	D16-24			1 1/2	1-7/8-12		3.256	.878	2.125	

APPROVED: 8-12-65
 REVISED: REV & REDRAWN 8-1-90
 REV. DIM. C ON -4 & -6 9-1-97

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	REDUCER, FLARED TUBE 3/8" BULKHEAD AND UNIVERSAL FOR SEAL RING	KC144	
COORDINATION STATUS KSC DE		SHEET 2 OF 3	



FED SUP CLASS
4730

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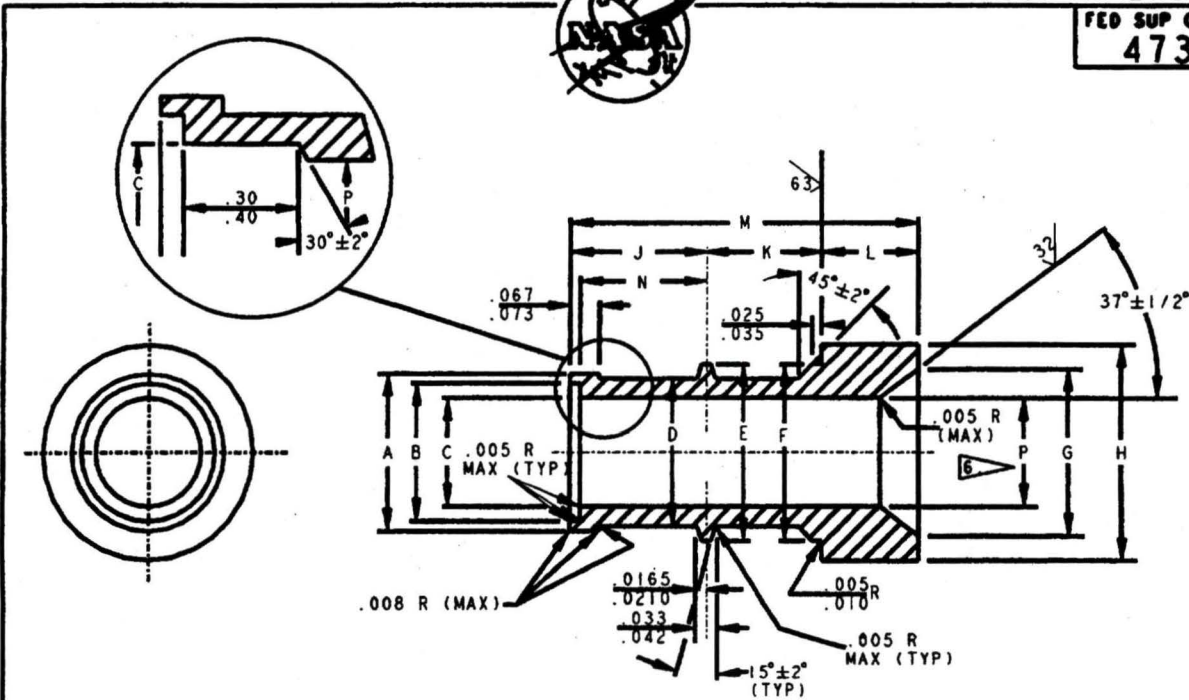
DASH NO.		BULKHEAD END		SHORT END		A	B	C	D	E
CRES STEEL	AL ALLOY	TUBE OD REF	THREAD T REF	TUBE OD REF	THREAD R REF	+0.008 -.045	+0.008 -.090	6. MAX	6. MAX	REF
K20-4	D20-4	1/4	1-5/8-12	1/4	7/16-20	1.802	2.754	1.295		1.875
K20-12	D20-12			3/8	1-1/16-12		3.068	1.295		
K20-16	D20-16			1	1-5/16-12		3.015	1.295		
K20-24	D20-24			1 1/2	1-7/8-12		3.303	.878		
K24-16	D24-16	1/2	1-7/8-12	1	1-5/16-12	1.817	3.147	1.308		2.125
K24-20	D24-20			1/4	1-5/8-12		3.194	1.308		
K28-20	D28-20	1/4	2-1/4-12	1/4	1-5/8-12	1.973	3.379	1.433		2.500
K28-24	D28-24			1/2	1-7/8-12		3.504	1.433		
K32-24	D32-24	2	2-1/2-12	1/2	1-7/8-12	2.098	3.629	1.533		2.750
K32-28	D32-28			1 3/4	2-1/4-12		3.754	1.533		

APPROVED: 8-12-65 REVISED: (E) REV & REDRAWN 8-1-90 (E) REV. SH. 2 9-1-97

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	3/8" REDUCER, FLARED TUBE BULKHEAD AND UNIVERSAL FOR SEAL RING	KC-144	
COORDINATION STATUS KSC DE		SHEET 3 OF 3	

KSC FORM 32-85 (CG 4/92)

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SCHEDULE:

ADD "A"	AFTER DASH NUMBER TO DENOTE	.035" TUBE WALL.
ADD "B"	AFTER DASH NUMBER TO DENOTE	.049" TUBE WALL.
ADD "C"	AFTER DASH NUMBER TO DENOTE	.058" TUBE WALL.
ADD "D"	AFTER DASH NUMBER TO DENOTE	.065" TUBE WALL.
ADD "E"	AFTER DASH NUMBER TO DENOTE	.072" TUBE WALL.
ADD "F"	AFTER DASH NUMBER TO DENOTE	.095" TUBE WALL.
ADD "G"	AFTER DASH NUMBER TO DENOTE	.109" TUBE WALL.
ADD "H"	AFTER DASH NUMBER TO DENOTE	.120" TUBE WALL.
ADD "J"	AFTER DASH NUMBER TO DENOTE	.134" TUBE WALL.
ADD "K"	AFTER DASH NUMBER TO DENOTE	.156" TUBE WALL.
ADD "L"	AFTER DASH NUMBER TO DENOTE	.188" TUBE WALL.

MATERIAL: SEE PROCUREMENT SPECIFICATION.
CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691

- FINISH:** SURFACE SHALL BE 125 RMS MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.
NOTES:
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
 - DIAMETER "P" APPLICABLE TO KC145K20B AND KC145K24B ONLY.
 - ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.I.R.
 - FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT).
 - AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF PART NOS. KC145K4A = SPUD, BUTTWELD TUBE, FOR 1/4" X .035 WALL TUBING, TYPE 316 SS.
 KC145L6C = SPUD, BUTTWELD TUBE, FOR 3/8" X .058 WALL TUBING, AL6XN.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. RSC-F-124	SPUD, BUTTWELD TUBE	KC145
COORDINATION STATUS		SHEET 1 OF 2
RSC DE		

REVISED: ADDED CODE "L" MATERIAL AND NOTE 9 5-1-07
 APPROVED: 5-1-90



FED SUP CLASS
4730

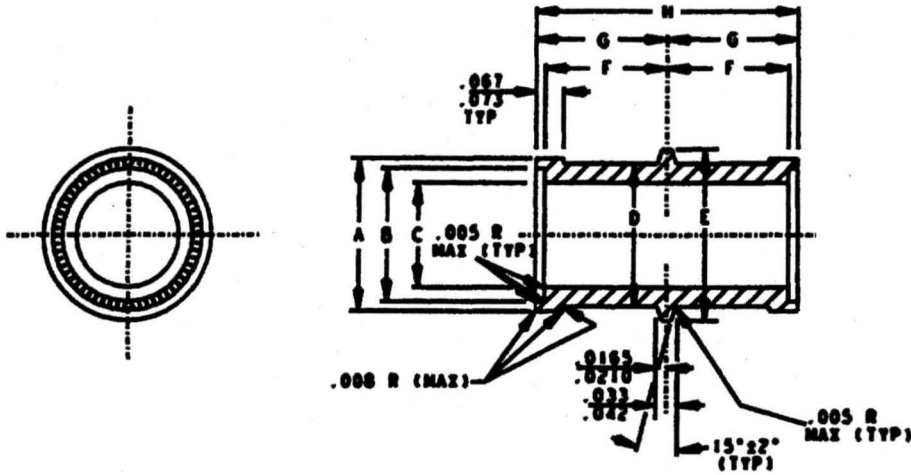
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DASH NO.	TUBE SIZE REF	A ±.003	B ±.005 ±.000	C ±.003	D ±.005 ±.000	E ±.003	F ±.004	G ±.005	H ±.000 ±.003	J ±.005	K ±.005	L ±.005	M (REF)	N ±.005	P ±.000 ±.003	
K4A	L4A	1/4"x.035	.285	.255	.172	.258	.297	.299	.315	.383	.385	.328	.165	.878	.350	-
K6A	L6A	3/8"x.035	.410	.380	.297	.383	.428	.434	.441	.502	.385	.395	.245	1.025	.350	-
K6C	L6C	3/8"x.058	.410	.380	.251	.383	.428	.434	.441	.502	.385	.395	.245	1.025	.350	-
K8B	L8B	1/2"x.049	.546	.506	.393	.509	.554	.564	.589	.682	.385	.405	.280	1.070	.350	-
K8E	L8E	1/2"x.072	.546	.506	.347	.509	.554	.564	.589	.682	.385	.405	.280	1.070	.350	-
K12D	L12D	3/4"x.065	.816	.756	.611	.759	.804	.828	.880	.972	.535	.405	.300	1.240	.500	-
K12E	L12E	3/4"x.109	.816	.756	.523	.759	.804	.828	.880	.972	.535	.405	.300	1.240	.500	-
K16F	L16F	1"x.095	1.066	1.006	.801	1.009	1.054	1.083	1.130	1.222	.535	.405	.400	1.340	.500	-
K16H	L16H	1"x.120	1.066	1.006	.751	1.009	1.054	1.083	1.130	1.222	.535	.405	.400	1.340	.500	-
K20G	L20G	1-1/4"x.049	1.330	1.256	1.143	1.259	1.304	1.341	1.412	1.536	.535	.475	.400	1.410	.500	1.134
K20J	L20J	1-1/4"x.134	1.330	1.256	.973	1.259	1.304	1.341	1.412	1.536	.535	.475	.400	1.410	.500	-
K24B	L24B	1-1/2"x.049	1.605	1.511	1.398	1.514	1.559	1.611	1.630	1.786	.535	.485	.475	1.495	.500	1.378
K24J	L24J	1-1/2"x.134	1.605	1.511	1.218	1.514	1.559	1.611	1.630	1.786	.535	.485	.475	1.495	.500	-
K24R	L24R	1-1/2"x.136	1.605	1.511	1.174	1.514	1.559	1.611	1.630	1.786	.535	.485	.475	1.495	.500	-
K24L	L24L	1-1/2"x.188	1.605	1.511	1.120	1.514	1.559	1.611	1.630	1.786	.535	.485	.475	1.495	.500	-
K32D	L32D	2"x.065	2.105	2.011	1.866	2.014	2.059	2.161	2.195	2.411	.535	.635	.540	1.710	.500	-
K32L	L32L	2"x.108	2.105	2.011	1.620	2.014	2.059	2.161	2.195	2.411	.535	.635	.540	1.710	.500	-

REVISED: 5-1-90
APPROVED: 5-1-90
"L" MATERIAL DASH NO. 5-1-01

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	SPUD, BUTTWELD TUBE	KC145	
COORDINATION STATUS KSC DE		SHEET 2 OF 2	

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SCHEDULE:	ADD "A" AFTER DASH NUMBER TO DENOTE .035" TUBE WALL.
	ADD "B" AFTER DASH NUMBER TO DENOTE .049" TUBE WALL.
	ADD "C" AFTER DASH NUMBER TO DENOTE .058" TUBE WALL.
	ADD "D" AFTER DASH NUMBER TO DENOTE .065" TUBE WALL.
	ADD "E" AFTER DASH NUMBER TO DENOTE .072" TUBE WALL.
	ADD "F" AFTER DASH NUMBER TO DENOTE .093" TUBE WALL.
	ADD "G" AFTER DASH NUMBER TO DENOTE .109" TUBE WALL.
	ADD "H" AFTER DASH NUMBER TO DENOTE .126" TUBE WALL.
	ADD "J" AFTER DASH NUMBER TO DENOTE .134" TUBE WALL.
	ADD "K" AFTER DASH NUMBER TO DENOTE .156" TUBE WALL.
	ADD "L" AFTER DASH NUMBER TO DENOTE .188" TUBE WALL.

MATERIAL: SEE PROCUREMENT SPECIFICATION.
CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691

FINISH: SURFACE SHALL BE 125 RMS MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.

- NOTES:**
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ± 0.016 .
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE NC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
 - ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.I.R.
 - FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT).
 - AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6. EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF
PART NOS.

KC146K4A = UNION, BUTTWELD TUBE, FOR 1/4" x .035 WALL TYPE 316 SS TUBING.
KC146L12G = UNION, BUTTWELD TUBE, FOR 3/4" x .109 WALL AL6XN TUBING.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. RSC-F-124	UNION, BUTTWELD TUBE	KC146
COORDINATION STATUS		SHEET 1 OF 2
RSC DE		

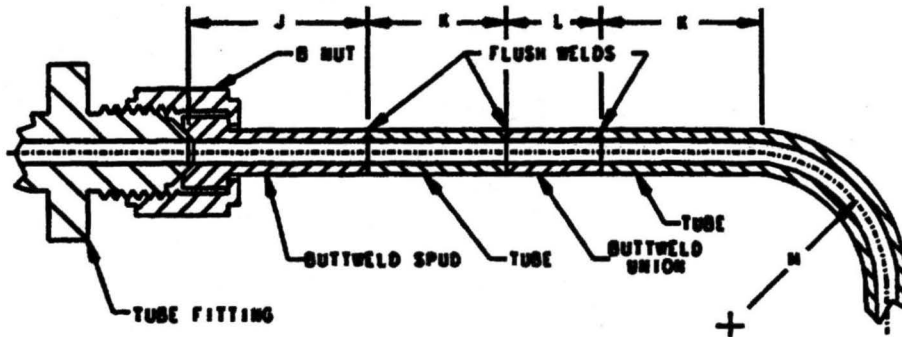
REVISED: ADDED CODE "L" MATERIAL AND NOTE 8 5-1-87

APPROVED: 5-1-88



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DASH NO.	316 STEEL ALGEM	TUBE SIZE REF	A	B	C	D	E	F	G	H
			±.003	±.005 ±.000	±.003	±.005 ±.000	±.003	±.005	±.005	(REF)
K4A	L4A	1/4"X.035	.205	.255	.172	.250	.297	.350	.305	.770
K6A	L6A	3/8"X.035	.410	.300	.297	.303	.420	.350	.305	.770
K6C	L6C	3/8"X.050	.410	.300	.251	.303	.420	.350	.305	.770
K80	L80	1/2"X.049	.546	.506	.393	.509	.554	.500	.535	.770
K8E	L8E	1/2"X.072	.546	.506	.347	.509	.554	.500	.535	.770
K120	L120	3/4"X.065	.816	.756	.611	.759	.804	.500	.535	1.070
K126	L126	3/4"X.109	.816	.756	.523	.759	.804	.500	.535	1.070
K16F	L16F	1"X.095	1.066	1.006	.801	1.009	1.054	.500	.535	1.070
K16H	L16H	1"X.120	1.066	1.006	.751	1.009	1.054	.500	.535	1.070
K200	L200	1-1/4"X.049	1.330	1.256	1.143	1.259	1.304	.500	.535	1.070
K20J	L20J	1-1/4"X.134	1.330	1.256	.973	1.259	1.304	.500	.535	1.070
K240	L240	1-1/2"X.049	1.605	1.511	1.390	1.514	1.559	.500	.535	1.070
K24J	L24J	1-1/2"X.134	1.605	1.511	1.210	1.514	1.559	.500	.535	1.070
K24K	L24K	1-1/2"X.156	1.605	1.511	1.174	1.514	1.559	.500	.535	1.070
K24L	L24L	1-1/2"X.180	1.605	1.511	1.120	1.514	1.559	.500	.535	1.070
K320	L320	2"X.065	2.105	2.011	1.866	2.014	2.059	.500	.535	1.070
K32L	L32L	2"X.100	2.105	2.011	1.620	2.014	2.059	.500	.535	1.070



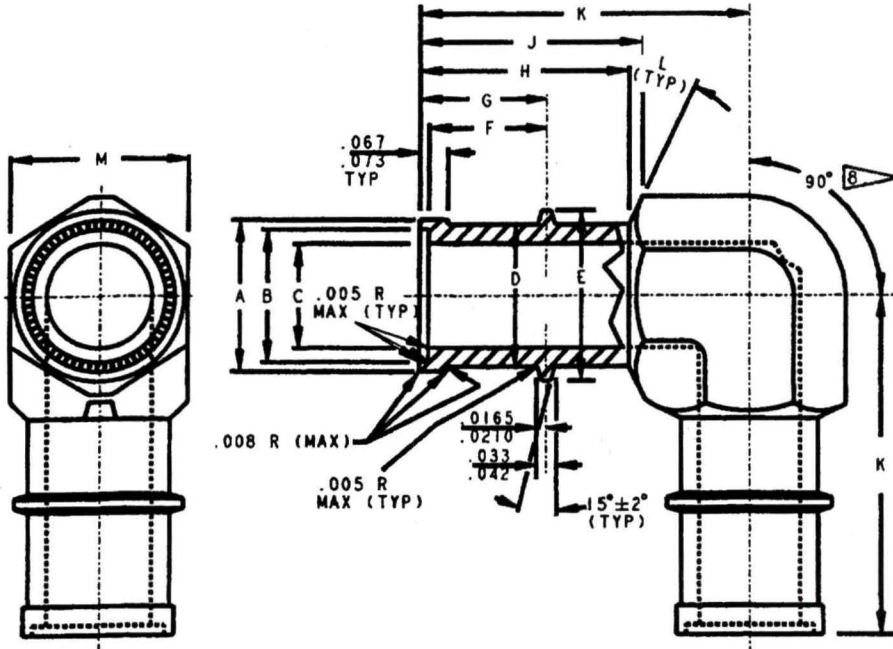
TUBE SIZE REF	J	K (MIN)	L	M (MIN)
1/4"	.71	1.44	.70	.56
3/8"	.70	1.44	.70	.94
1/2"	.80	1.44	.70	1.25
3/4"	1.12	1.44	1.00	1.75
1"	1.19	1.44	1.00	3.00
1-1/4"	1.22	1.63	1.00	3.75
1-1/2"	1.31	1.63	1.00	4.50
2"X.065	1.41	1.75	1.00	6.00
2"X.100	1.41	4.25	1.00	6.00

BUTTWELDED UNION APPLICATION DATA

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	UNION, BUTTWELDED TUBE	KC146
COORDINATION STATUS		SHEET 2 OF 2
KSC DE		

REVISED: ADDED CODE "L" MATERIAL DASH NO. 5-1-87

APPROVED: 5-1-90



SCHEDULE:

- ADD "A" AFTER DASH NUMBER TO DENOTE .035" TUBE WALL.
- ADD "B" AFTER DASH NUMBER TO DENOTE .049" TUBE WALL.
- ADD "C" AFTER DASH NUMBER TO DENOTE .058" TUBE WALL.
- ADD "D" AFTER DASH NUMBER TO DENOTE .065" TUBE WALL.
- ADD "E" AFTER DASH NUMBER TO DENOTE .072" TUBE WALL.
- ADD "F" AFTER DASH NUMBER TO DENOTE .095" TUBE WALL.
- ADD "G" AFTER DASH NUMBER TO DENOTE .109" TUBE WALL.
- ADD "H" AFTER DASH NUMBER TO DENOTE .120" TUBE WALL.
- ADD "J" AFTER DASH NUMBER TO DENOTE .134" TUBE WALL.
- ADD "K" AFTER DASH NUMBER TO DENOTE .156" TUBE WALL.
- ADD "L" AFTER DASH NUMBER TO DENOTE .188" TUBE WALL.

MATERIAL:

SEE PROCUREMENT SPECIFICATION.
CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691

FINISH:

SURFACE SHALL BE 125 RMS MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.

NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
6. ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.I.R.
7. FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT).
8. FOR TUBE SIZES UP TO AND INCLUDING .375" OD, TOLERANCE IS ±2-1/2". FOR ALL OTHERS, TOLERANCE IS ±1-1/2".
9. AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF
PART NOS.

KC147K4A = ELBOW, 90° BUTTWELD TUBE, FOR 1/4" X .035 WALL TUBING, TYPE 316 SS.
KC147L6C = ELBOW, 90° BUTTWELD TUBE, FOR 3/8" X .058 WALL TUBING, AL6XN.

CUSTODIAN:

JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
RSC-F-124

STANDARD PART

COORDINATION STATUS

ELBOW, 90° BUTTWELD TUBE

KC147

RSC DE

SHEET 1 OF 2

RSC FORM 32-85 (CG 4/82)

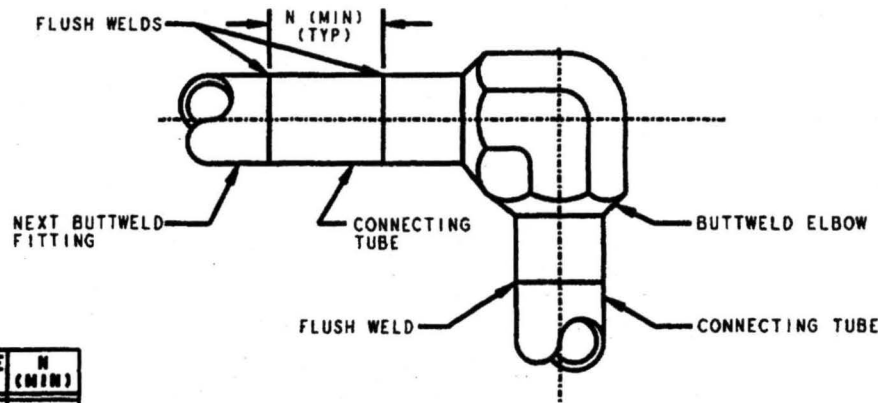
REVISED: ADDED CODE "L" MATERIAL AND NOTE 9 5-1-90

APPROVED: 5-1-90

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.		TUBE SIZE REF	A	B	C	D	E	F	G	H	J	K	L	M	R
316 STEEL	AL6XN		±.003	±.005 -.000	±.003	±.005 -.000	±.003	±.005	±.005	±.005	±.015 -.005	(REF)	±.016	(REF)	(REF)
K4A	L4A	1/4" X .035	.285	.255	.172	.258	.297	.350	.385	.656	.680	.920	15	.438	.030
K6A	L6A	3/8" X .035	.410	.380	.297	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K6C	L6C	3/8" X .058	.410	.380	.251	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K8B	L8B	1/2" X .049	.546	.506	.393	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K8E	L8E	1/2" X .072	.546	.506	.347	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K12D	L12D	3/4" X .065	.816	.756	.611	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K12G	L12G	3/4" X .109	.816	.756	.523	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K16F	L16F	1" X .095	1.066	1.006	.801	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K16H	L16H	1" X .120	1.066	1.006	.751	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K20B	L20B	1-1/4" X .049	1.330	1.256	1.143	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K20J	L20J	1-1/4" X .134	1.330	1.256	.973	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K24B	L24B	1-1/2" X .049	1.605	1.511	1.398	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24J	L24J	1-1/2" X .134	1.605	1.511	1.218	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24K	L24K	1-1/2" X .156	1.605	1.511	1.174	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24L	L24L	1-1/2" X .188	1.605	1.511	1.120	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K32D	L32D	2" X .065	2.105	2.011	1.866	2.014	2.059	.500	.535	1.055	1.298	3.060	45	2.500	.375
K32L	L32L	2" X .188	2.105	2.011	1.620	2.014	2.059	.500	.535	1.055	1.298	3.060	45	2.500	.375



TUBE SIZE REF	N (MIN)
1/4"	1.44
3/8"	1.44
1/2"	1.44
3/4"	1.44
1"	1.44
1-1/4"	1.63
1-1/2"	1.63
2" X .065	1.75
2" X .188	4.25

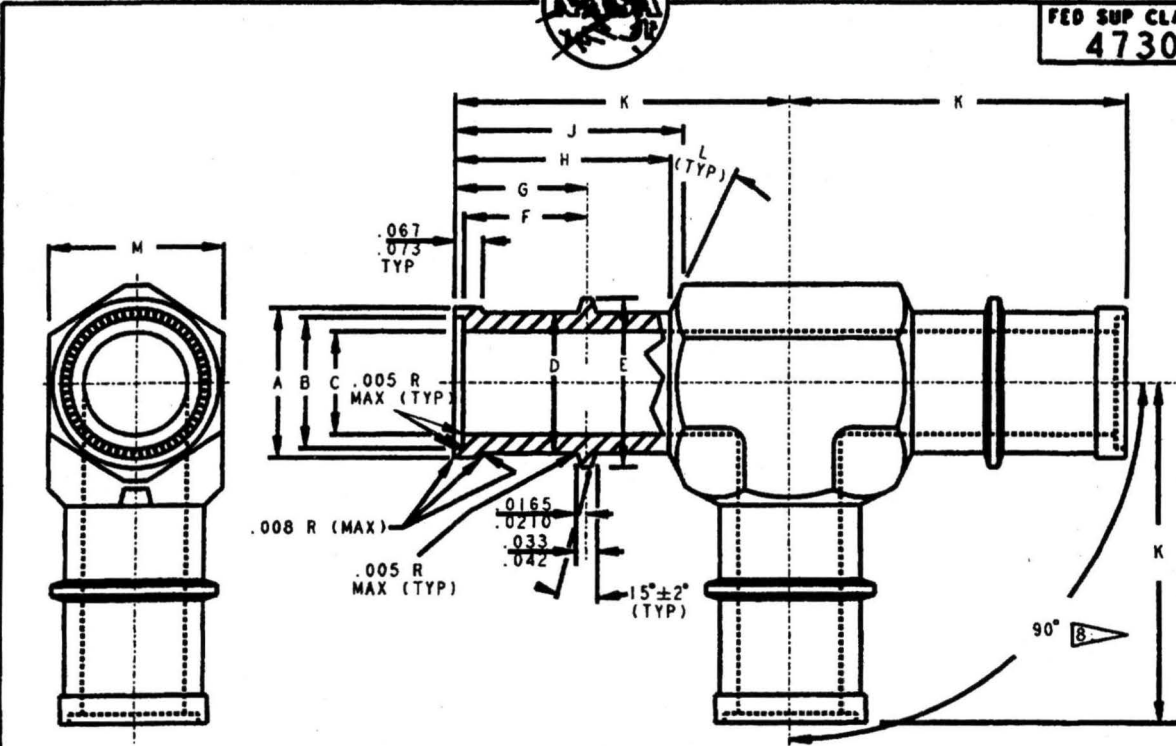
BUTTWELD ELBOW
APPLICATION DATA

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	ELBOW, 90° BUTTWELD TUBE	KC147
COORDINATION STATUS KSC DC		SHEET 2 OF 2

REVISED: 5-1-99
APPROVED: 5-1-99
"L" MATERIAL DASH NO. 5-1-07



NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY FOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONFERRING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



SCHEDULE:

ADD "A" AFTER DASH NUMBER TO DENOTE .035" TUBE WALL.
 ADD "B" AFTER DASH NUMBER TO DENOTE .049" TUBE WALL.
 ADD "C" AFTER DASH NUMBER TO DENOTE .058" TUBE WALL.
 ADD "D" AFTER DASH NUMBER TO DENOTE .065" TUBE WALL.
 ADD "E" AFTER DASH NUMBER TO DENOTE .072" TUBE WALL.
 ADD "F" AFTER DASH NUMBER TO DENOTE .095" TUBE WALL.
 ADD "G" AFTER DASH NUMBER TO DENOTE .109" TUBE WALL.
 ADD "H" AFTER DASH NUMBER TO DENOTE .120" TUBE WALL.
 ADD "J" AFTER DASH NUMBER TO DENOTE .134" TUBE WALL.
 ADD "K" AFTER DASH NUMBER TO DENOTE .156" TUBE WALL.
 ADD "L" AFTER DASH NUMBER TO DENOTE .188" TUBE WALL.

MATERIAL:

SEE PROCUREMENT SPECIFICATION.
 CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
 CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691

FINISH:

SURFACE SHALL BE 125 RMS MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.

NOTES:

1. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ± .016.
2. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
3. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
4. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
5. ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.I.R.
6. FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT).
7. FOR TUBE SIZES UP TO AND INCLUDING .375" OD, TOLERANCE IS ±2-1/2". FOR ALL OTHERS, TOLERANCE IS ±1-1/2".
8. AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF PART NOS.

KC148K4A = TEE, BUTTWELD TUBE, FOR 1/4" X .035 WALL TUBING, TYPE 316 SS.
 KC148L6C = TEE, BUTTWELD TUBE, FOR 3/8" X .058 WALL TUBING, AL6XN.

CUSTODIAN:

JOHN F. HENNEDEY SPACE CENTER

PROCUREMENT SPEC.

NSC-F-124

STANDARD PART

COORDINATION STATUS

TEE, BUTTWELD TUBE

KC148

NSC DE

SHEET 1 OF 2

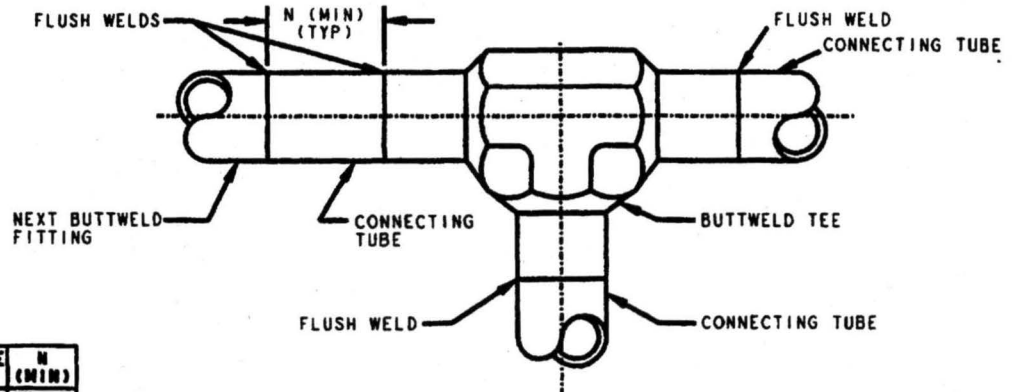
REVISED: ADDED CODE "L" MATERIAL AND NOTE 9 5-1-07

APPROVED: 5-1-90

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, PUBLISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE CONSTRUED AS AN IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



DASH NO.	TUBE SIZE REF	A ±.003	B ±.005 -.000	C ±.003	D ±.005 -.000	E ±.003	F ±.005	G ±.005	H ±.015 -.005	J (REF)	K ±.016	L (REF)	M (REF)	R ±.005	
K4A	L4A	1/4"X.035	.285	.255	.172	.258	.297	.350	.385	.656	.680	.920	15	.438	.030
K6A	L6A	3/8"X.035	.410	.380	.297	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K6C	L6C	3/8"X.058	.410	.380	.251	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K8B	L8B	1/2"X.049	.546	.506	.393	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K8E	L8E	1/2"X.072	.546	.506	.347	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K12D	L12D	3/4"X.065	.816	.756	.611	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K12G	L12G	3/4"X.109	.816	.756	.523	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K16F	L16F	1"X.095	1.066	1.006	.801	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K16H	L16H	1"X.120	1.066	1.006	.751	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K20B	L20B	1-1/4"X.049	1.330	1.256	1.143	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K20J	L20J	1-1/4"X.134	1.330	1.256	.973	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K24B	L24B	1-1/2"X.049	1.605	1.511	1.398	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24J	L24J	1-1/2"X.134	1.605	1.511	1.218	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24K	L24K	1-1/2"X.156	1.605	1.511	1.174	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24L	L24L	1-1/2"X.188	1.605	1.511	1.120	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K32D	L32D	2" X .065	2.105	2.011	1.866	2.014	2.059	.500	.535	1.055	1.298	3.060	45	2.500	.375
K32L	L32L	2" X .188	2.105	2.011	1.620	2.014	2.059	.500	.535	1.055	1.298	3.060	45	2.500	.375



TUBE SIZE REF	N (MIN)
1/4"	1.44
3/8"	1.44
1/2"	1.44
3/4"	1.44
1"	1.44
1-1/4"	1.63
1-1/2"	1.63
2" X .065	1.75
2" X .188	4.25

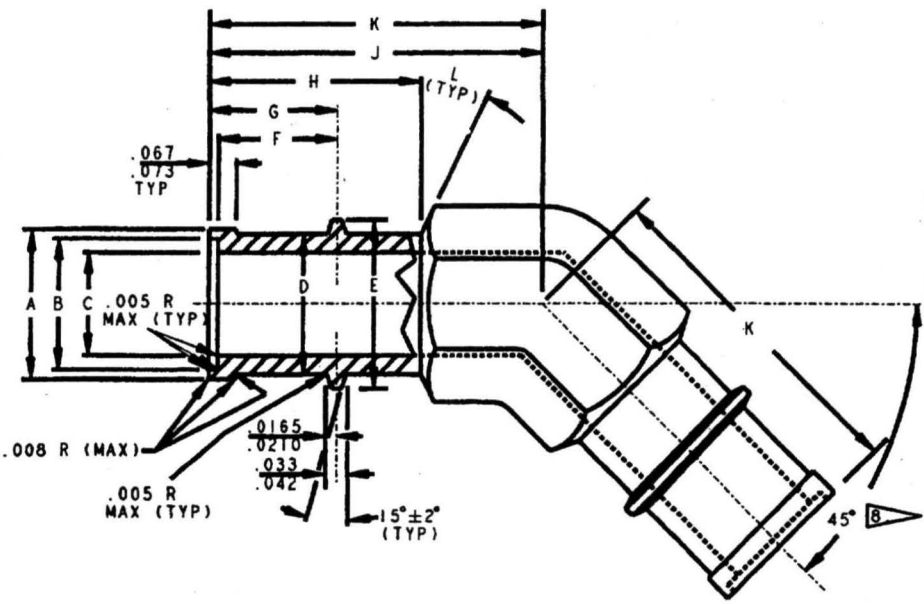
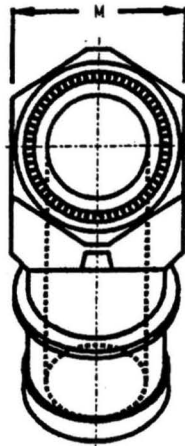
BUTTWELD TEE
APPLICATION DATA

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. RSC-F-124	TEE, BUTTWELD TUBE	KC148
COORDINATION STATUS		SHEET 2 OF 2
RSC DE		

APPROVED: 3-1-89
 REVISED: ADDED CODE "L" MATERIAL DASH NO. 3-1-87



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SCHEDULE:

- ADD "A" AFTER DASH NUMBER TO DENOTE .035" TUBE WALL.
- ADD "B" AFTER DASH NUMBER TO DENOTE .049" TUBE WALL.
- ADD "C" AFTER DASH NUMBER TO DENOTE .058" TUBE WALL.
- ADD "D" AFTER DASH NUMBER TO DENOTE .065" TUBE WALL.
- ADD "E" AFTER DASH NUMBER TO DENOTE .072" TUBE WALL.
- ADD "F" AFTER DASH NUMBER TO DENOTE .095" TUBE WALL.
- ADD "G" AFTER DASH NUMBER TO DENOTE .109" TUBE WALL.
- ADD "H" AFTER DASH NUMBER TO DENOTE .120" TUBE WALL.
- ADD "J" AFTER DASH NUMBER TO DENOTE .134" TUBE WALL.
- ADD "K" AFTER DASH NUMBER TO DENOTE .156" TUBE WALL.
- ADD "L" AFTER DASH NUMBER TO DENOTE .188" TUBE WALL.

MATERIAL:

SEE PROCUREMENT SPECIFICATION.
 CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
 CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691

FINISH:

SURFACE SHALL BE 125 RMS MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.

NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED. TOLERANCE DECIMALS ±.016.
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
6. ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.I.R.
7. FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT).
8. FOR TUBE SIZES UP TO AND INCLUDING .375" OD, TOLERANCE IS ±2-1/2". FOR ALL OTHERS, TOLERANCE IS ±1-1/2".
9. AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF PART NOS.

KC149K4A = ELBOW, 45° BUTTWELD TUBE, FOR 1/2" X .035 WALL TUBING, TYPE 316 SS.
 KC149L6C = ELBOW, 45° BUTTWELD TUBE, FOR 3/8" X .058 WALL TUBING, AL6XN.

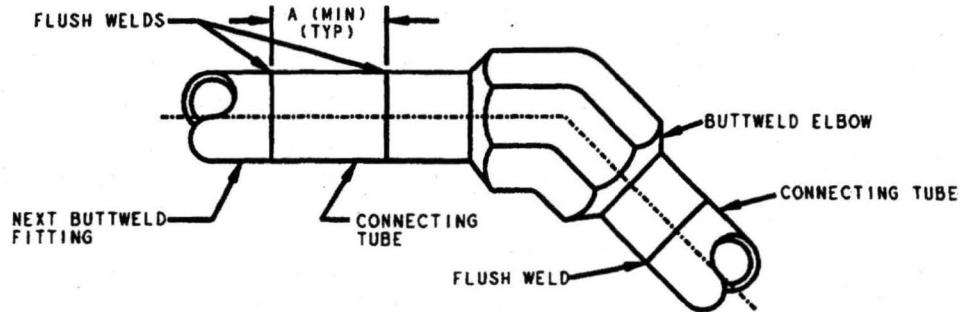
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	ELBOW, 45° BUTTWELD TUBE	KC149
COORDINATION STATUS KSC DE		SHEET 1 OF 2

REVISED: ADDED CODE "L" MATERIAL AND NOTE 9 3-1-87

 APPROVED: 8-1-99

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.	TUBE SIZE REF	A ±.003	B ±.005 -.000	C ±.003	D ±.005 -.000	E ±.003	F ±.005	G ±.005	H ±.015 -.005	J (REF)	K ±.016 (REF)	L (REF)	M (REF)	R ±.005	
CRE STEEL	AL6XN														
K4A	L4A	1/4"X.035	.285	.255	.172	.258	.297	.350	.385	.656	.680	.920	15	.438	.030
K6A	L6A	3/8"X.035	.410	.380	.297	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K6C	L6C	3/8"X.058	.410	.380	.251	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K8B	L8B	1/2"X.049	.546	.506	.393	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K8E	L8E	1/2"X.072	.546	.506	.347	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K12D	L12D	3/4"X.065	.816	.756	.611	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K12G	L12G	3/4"X.109	.816	.756	.523	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K16F	L16F	1"X.095	1.066	1.006	.801	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K16H	L16H	1"X.120	1.066	1.006	.751	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K20B	L20B	1-1/4"X.049	1.330	1.256	1.143	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K20J	L20J	1-1/4"X.134	1.330	1.256	.973	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K24B	L24B	1-1/2"X.049	1.605	1.511	1.398	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24J	L24J	1-1/2"X.134	1.605	1.511	1.218	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24K	L24K	1-1/2"X.156	1.605	1.511	1.174	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24L	L24L	1-1/2"X.188	1.605	1.511	1.120	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K32D	L32D	2"X.065	2.105	2.011	1.866	2.014	2.059	.500	.535	1.055	1.298	3.060	30	2.500	.375
K32L	L32L	2"X.188	2.105	2.011	1.620	2.014	2.059	.500	.535	1.055	1.298	3.060	30	2.500	.375



TUBE SIZE REF	A (MIN)
1/4"	1.44
3/8"	1.44
1/2"	1.44
3/4"	1.44
1"	1.44
1-1/4"	1.63
1-1/2"	1.63
2" X .065	1.75
2" X .188	4.25

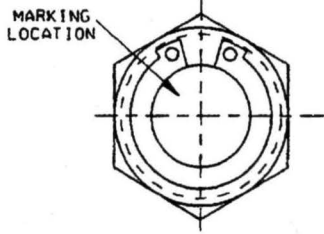
BUTTWELD ELBOW APPLICATION DATA

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. RSC-F-124	ELBOW, 45° BUTTWELD TUBE	KC149
COORDINATION STATUS		SHEET 2 OF 2
RSC DE		

APPROVED: 8-1-90
 REVISED: ADDED CODE "L" MATERIAL DASH NO. 5-1-87



FED SUP CLASS
4730

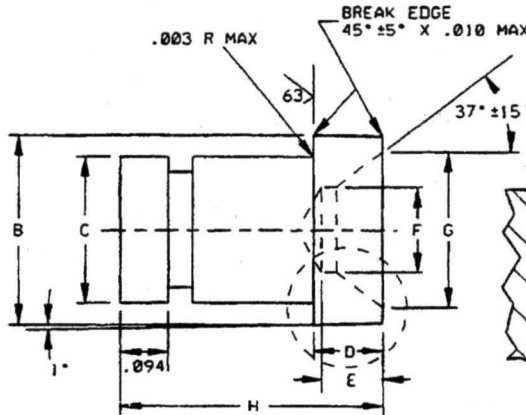
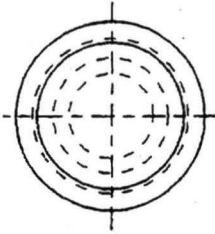


MS16624 RETAINING RING (GROOVE PER MS16624)

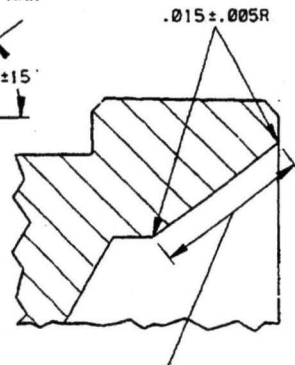
KC150 CAP

KC142 NUT

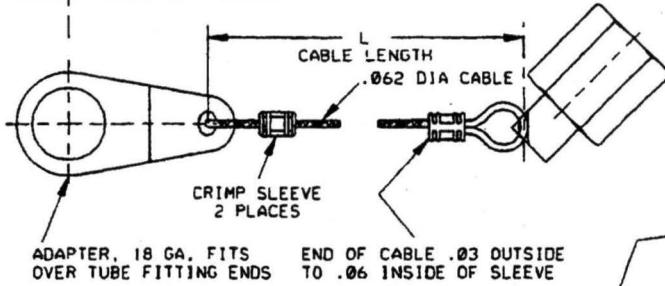
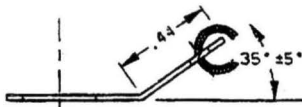
BASIC CAP ASSEMBLY



KC150 CAP DETAILS

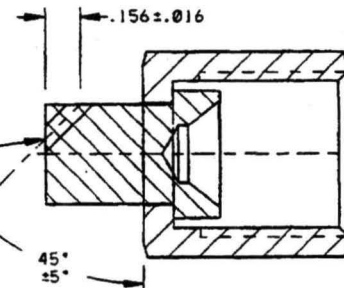


DETAIL A



ALTERNATE CAP ASSEMBLY

DRILL NO. 45 (.082)



CABLE HOLE DETAILS FOR ALTERNATE CAP ASSEMBLY

REVISED: (F) 8-1-90 (G) DASH NUMBER CHANGE 1-2-91 (H) DIM D & E 7-24-97
APPROVED: 3-23-66

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THERETO.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. NONE	CAP, CAP ASSEMBLY PRESSURE SEAL FLARED TUBE FITTING	KC150	
COORDINATION STATUS KSC DE		SHEET 1 OF 2	



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.		TUBE OD REF	B DIA +.000 -.003	C DIA +.000 -.003	D DIM	E DIM	F DIA	G DIA	H DIM	L CABLE LENGTH ±.25	KC142 NUT		MS16624 RETAINING RING DASH NO.
CRE STEEL	AL ALLOY										CRE STEEL	AL ALLOY	
K4	D4	¼	.383	.297	.203	.125	.172	.315	.531	7	K4	D4	-4028
K6	D6	⅜	.502	.432	.266	.156	.297	.441	.625		K6	D6	-4043
K8	D8	½	.682	.562	.313	.172	.391	.589	.750		K8	D8	-4056
K10	D10	⅝	.797	.690	.281	.250	.438	.705	.875		K10	D10	-4068
K12	D12	¾	.972	.826							.313	.563	.880
K16	D16	1	1.222	1.081	.297	.313	.813	1.130	.875				
K20	D20	1-1/4	1.534	1.339	.375					1.078	1.412	1.000	.875
K24	D24	1-1/2	1.784	1.609	.406	.375	1.313	1.630	1.125				
K28	D28	1-3/4	2.159	1.882	.500	.375	1.547	1.945	1.375	11	K28	D28	-4187
K32	D32	2	2.409	2.159	.578	.500	1.781	2.195	1.438		K32	D32	-4215

CAP ASSY : SEE PROCUREMENT SPECIFICATION.
 MATERIAL ALUMINUM ALLOY, 2024-T6, CODE "D". CABLE SHALL BE 300 SERIES SST. CORROSION RESISTANT STEEL (CLASS 316), CODE "X" (WAS CODE "C"). CABLE SHALL BE 300 SERIES SST.

FINISH: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED. TOLERANCE DECIMALS ±.016, ANGLES ±1/2°.
- MACHINED SURFACE ROUGHNESS, UNLESS OTHERWISE SPECIFIED, SHALL NOT EXCEED 125/ OR 125 RMS PER ANSI B46.1.
- THE CONICAL SEALING SURFACE SHALL BE CONCENTRIC WITH G DIA WITHIN .005 FULL INDICATOR READING.
- DIAMETERS B, C, AND G TO BE CONCENTRIC WITHIN .005 FULL INDICATOR READING FOR TUBE SIZE UP TO AND INCLUDING ¾" OD AND .010 FULL INDICATOR READING FOR 1" OD AND ABOVE.
- CAP ASSEMBLY SHALL CONSIST OF A KC142 NUT, A RETAINING DEVICE FOR THE BASIC CAP ASSEMBLY ONLY, AND A CAP.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

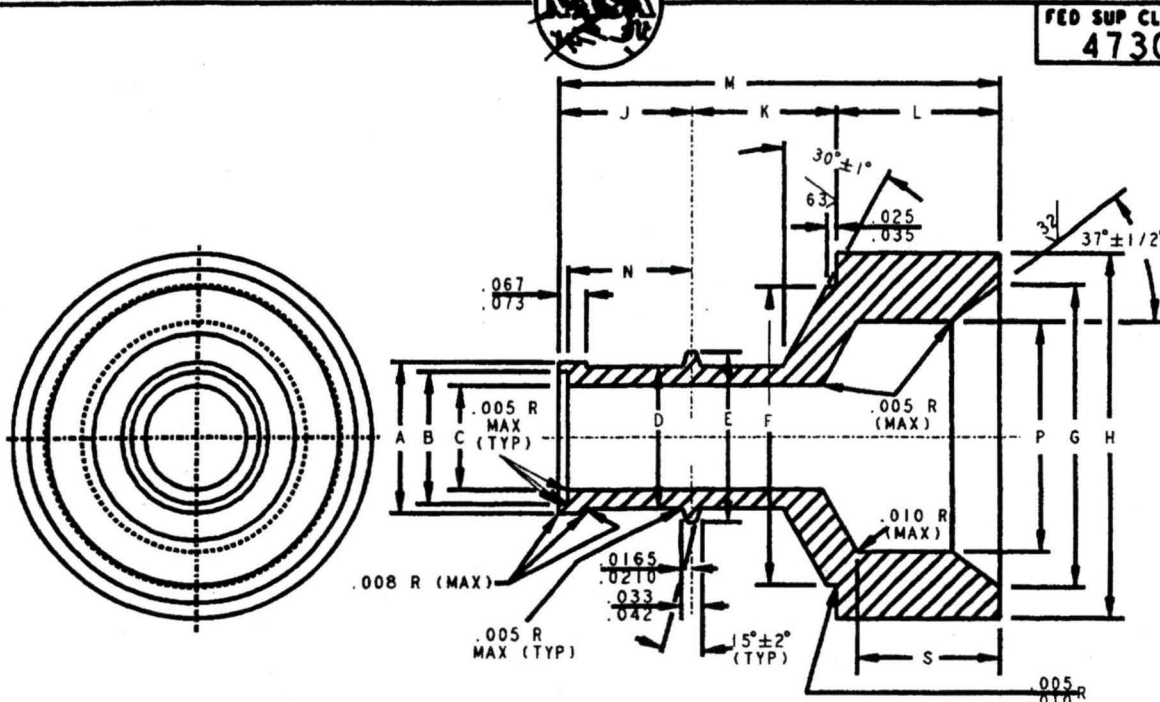
CODE: "A" AFTER DASH NUMBER INDICATES ALTERNATE CAP ASSEMBLY WITH DRILLED CAP AND RETAINING CABLE.

EXAMPLE OF PART NOS. KC150KB = CAP ASSEMBLY, ½" OD TUBE, CORROSION RESISTANT STEEL
 KC150D12A = ALTERNATE CAP ASSEMBLY, ¾" OD TUBE, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	CAP, CAP ASSEMBLY PRESSURE SEAL FLARED TUBE FITTING
COORDINATION STATUS	
KSC DE	STANDARD PART KC150
	SHEET 2 OF 2

KSC FORM 32-85 (CG 4/92)

REVISED: (F) 8-1-90 (G) DASH NUMBER CHANGE 1-2-91 (H) DIM D & E SHEET 1 7-24-97
 APPROVED:



SCHEDULE:

- ADD "A" AFTER DASH NUMBER TO DENOTE .035" TUBE WALL.
- ADD "B" AFTER DASH NUMBER TO DENOTE .049" TUBE WALL.
- ADD "C" AFTER DASH NUMBER TO DENOTE .058" TUBE WALL.
- ADD "D" AFTER DASH NUMBER TO DENOTE .065" TUBE WALL.
- ADD "E" AFTER DASH NUMBER TO DENOTE .072" TUBE WALL.
- ADD "F" AFTER DASH NUMBER TO DENOTE .095" TUBE WALL.
- ADD "G" AFTER DASH NUMBER TO DENOTE .109" TUBE WALL.
- ADD "H" AFTER DASH NUMBER TO DENOTE .120" TUBE WALL.
- ADD "J" AFTER DASH NUMBER TO DENOTE .134" TUBE WALL.
- ADD "K" AFTER DASH NUMBER TO DENOTE .156" TUBE WALL.
- ADD "L" AFTER DASH NUMBER TO DENOTE .188" TUBE WALL.

MATERIAL:

SEE PROCUREMENT SPECIFICATION.
CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
CORROSION RESISTANT STEEL (AL6XN), CODE "L" PER ASTM -B691

FINISH:

SURFACE SHALL BE 125 RMS MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.

NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
6. ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.I.R.
7. FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT).
8. AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.

EXAMPLE OF
PART NOS.

- KC151K4A-8 = SPUD, BUTTWELD TUBE, REDUCER-ADAPTER, FOR 1/4" X .035 WALL TUBING TO 1/2" TUBE SIZE, TYPE 316 SS.
- KC151L6C-8 = SPUD, BUTTWELD TUBE, REDUCER-ADAPTER, FOR 3/8" X .058 WALL TUBING TO 1/2" TUBE SIZE, AL6XN.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. KSC-F-124	SPUD, BUTTWELD TUBE REDUCER - ADAPTER	STANDARD PART
COORDINATION STATUS		KC151
KSC DE		SHEET 1 OF 2

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISED: 9-1-90
 APPROVED: 9-1-90
 ADDED CODE "L" MATERIAL AND NOTE 8 5-1-87

GP425G AMEND I



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT HAS HAD FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED AS IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE USER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED IN-VENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.	TUBE SIZE	FITTING END TUBE SIZE	COORDINATION STATUS		PROCUREMENT SPEC.	CUSTOMER:											
			316 STEEL	ALUMN													
K4A-6	1/4 X .035	3/8	.285	.255	.172	.258	.297	.434	.441	.502	.385	.382	.245	1.012	.350	.297	.238
K4A-8	1/4 X .035	1/2	.285	.255	.172	.258	.297	.564	.589	.682	.385	.420	.280	1.085	.350	.393	.282
K4A-12	1/4 X .035	3/4	.285	.255	.172	.258	.297	.820	.880	.972	.385	.496	.300	1.181	.350	.611	.315
K6A-8	3/8 X .035	1/2	.410	.380	.297	.383	.428	.564	.589	.682	.385	.446	.280	1.111	.350	.393	.282
K6A-12	3/8 X .035	3/4	.410	.380	.297	.383	.428	.820	.880	.972	.385	.522	.300	1.207	.350	.611	.315
K6C-8	3/8 X .035	1/2	.410	.380	.251	.383	.428	.564	.589	.682	.385	.446	.280	1.111	.350	.393	.255
K6C-12	3/8 X .035	3/4	.410	.380	.251	.383	.428	.820	.880	.972	.385	.522	.300	1.207	.350	.611	.288
K8B-12	1/2 X .049	3/4	.546	.508	.393	.509	.554	.820	.880	.972	.385	.548	.300	1.233	.350	.611	.299
K8B-16	1/2 X .049	1	.546	.508	.393	.509	.554	1.083	1.130	1.222	.385	.621	.400	1.406	.350	.801	.417
K8E-16	1/2 X .072	1	.546	.508	.347	.509	.554	1.083	1.130	1.222	.385	.621	.400	1.412	.350	.801	.391
K12D-16	3/4 X .065	1	.816	.756	.611	.759	.804	1.083	1.130	1.222	.535	.456	.400	1.391	.500	.801	.399
K12D-20	3/4 X .065	1-1/4	.816	.756	.611	.759	.804	1.341	1.412	1.536	.535	.530	.400	1.465	.500	1.184	.362
K12D-24	3/4 X .065	1-1/2	.816	.756	.611	.759	.804	1.611	1.630	1.786	.535	.608	.475	1.618	.500	1.444	.440
K12G-16	3/4 X .109	1	.816	.756	.523	.759	.804	1.083	1.130	1.222	.535	.456	.400	1.391	.500	.801	.348
K12G-20	3/4 X .109	1-1/4	.816	.756	.523	.759	.804	1.341	1.412	1.536	.535	.530	.400	1.465	.500	1.184	.312
K12G-24	3/4 X .109	1-1/2	.816	.756	.523	.759	.804	1.611	1.630	1.786	.535	.608	.475	1.618	.500	1.444	.389
K16F-20	1 X .095	1-1/4	1.066	1.006	.801	1.009	1.054	1.341	1.412	1.536	.535	.458	.400	1.393	.500	1.184	.328
K16F-24	1 X .095	1-1/2	1.066	1.006	.801	1.009	1.054	1.611	1.630	1.786	.535	.536	.475	1.546	.500	1.444	.406
K16H-24	1 X .120	1-1/2	1.066	1.006	.751	1.009	1.054	1.611	1.630	1.786	.535	.536	.475	1.546	.500	1.444	.377
K20B-24	1-1/4 X .049	1-1/2	1.330	1.256	1.143	1.259	1.304	1.611	1.630	1.786	.535	.526	.475	1.536	.500	1.444	.459
K20J-24	1-1/4 X .134	1-1/2	1.330	1.256	.973	1.259	1.304	1.611	1.630	1.786	.535	.526	.475	1.536	.500	1.444	.361
K24B-32	1-1/2 X .049	2	1.605	1.511	1.398	1.514	1.559	2.161	2.195	2.411	.535	.611	.540	1.686	.500	1.856	.564
K24L-32	1-1/2 X .188	2	1.605	1.511	1.218	1.514	1.559	2.161	2.195	2.411	.535	.611	.540	1.686	.500	1.856	.404

REVISION: ADDED CODE - L - MATERIAL DASH NO. 3-1-87

APPROVED: 3-1-98

JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
KSC-F-124

STANDARD PART

SPUD, BUTTWELD TUBE
REDUCER - ADAPTER

KC151

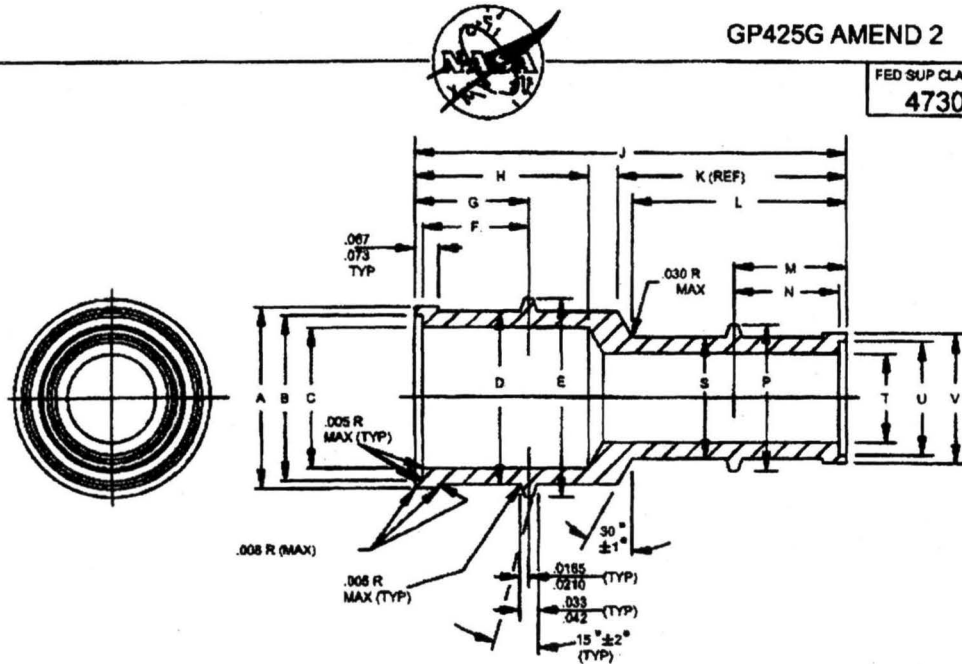
SHEET 2 OF 2

ESC 9C

ESC FORM 32-85 (CG 4/92)

GP425G AMEND 2

FED SUP CLASS
4730



SCHEDULE:

ADD "A" AFTER DASH NUMBER TO DENOTE .035" TUBE WALL.
 ADD "B" AFTER DASH NUMBER TO DENOTE .049" TUBE WALL.
 ADD "C" AFTER DASH NUMBER TO DENOTE .058" TUBE WALL.
 ADD "D" AFTER DASH NUMBER TO DENOTE .065" TUBE WALL.
 ADD "E" AFTER DASH NUMBER TO DENOTE .072" TUBE WALL.
 ADD "F" AFTER DASH NUMBER TO DENOTE .085" TUBE WALL.
 ADD "G" AFTER DASH NUMBER TO DENOTE .105" TUBE WALL.
 ADD "H" AFTER DASH NUMBER TO DENOTE .120" TUBE WALL.
 ADD "J" AFTER DASH NUMBER TO DENOTE .134" TUBE WALL.
 ADD "K" AFTER DASH NUMBER TO DENOTE .166" TUBE WALL.
 ADD "L" AFTER DASH NUMBER TO DENOTE .186" TUBE WALL.

MATERIAL:

SEE PROCUREMENT SPECIFICATION.
 CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
 CORROSION RESISTANT STEEL (AL60X), CODE "L" PER ASTM -8681

FINISH:

1. SURFACE SHALL BE 125 RMS MAXIMUM PER ANSI B46.1 UNLESS OTHERWISE SPECIFIED.

NOTES:

2. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
3. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
4. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
5. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
6. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
7. ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.L.R.
8. FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT). AFTER MACHINING, THE CODE L FITTINGS SHALL BE PICKLED IN ACCORDANCE WITH ASTM A380 CODE B AND THEN PASSIVATED IN ACCORDANCE WITH SAE-AMS-2700 METHOD 1 TYPE 6, EXCEPT THAT 20% TO 25% NITRIC ACID SOLUTION SHALL BE USED. A TEST FOR SURFACE PASSIVITY SHALL BE DONE IN ACCORDANCE WITH SAE-AMS-2700 TEST METHOD 102 - COPPER SULFATE TEST.
9. DO NOT USE SIZES MANUFACTURED PRIOR TO GP425 REV G AMEND 2
10. THE INTERNAL DIAMETER SHALL END IN A CONICAL END OF 115 DEGREE MINIMUM INCLUDED ANGLE.

EXAMPLE OF
PART NOS.

KC152K88-4A = UNION, BUTTWELD REDUCER, 1/2" X .049 WALL TUBE TO 1/4" X .035
 WALL TUBE, TYPE 316 SS.
 KC152L6C-4A = UNION, BUTTWELD REDUCER, 3/8" X .058 WALL TUBE TO 1/4" X .035
 WALL TUBE, AL60X.

CUSTODIAN:

JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.

KSC-F-124

STANDARD PART

COORDINATION STATUS

UNION, BUTTWELD REDUCER

KC152

KSC DE

SHEET 1 OF 3

KSC FORM 32-88 (CG 4/82)

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISED, CHANGED "Y" DIMENSION AND ADDED NOTE 9. SEE APPENDIX A 2-6-09

APPROVED: 2-6-09

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

CUSTOMER:
PROCUREMENT SPEC.
KSC-F-124
COORDINATION STATUS
KSC DE
KSC FORM 32-58 (CG 4-82)

UNION, BUTTWELD REDUCER

JOHN F. KENNEDY SPACE CENTER

STANDARD PART
KC152
SHEET 2 OF 3

DASH NO.		TUBE SIZE LARGE END	TUBE SIZE SMALL END	A ±.003	B +.005 -.000	C ±.003	D +.005 -.000	E ±.003	F ±.005	G ±.005	H ±.005	J ±.005	K (REF)	L ±.005	M ±.005	N ±.005	P ±.003	S +.005 -.000	T ±.003	U +.005 -.000	V ±.003
316 STEEL	AL6XN																				
K8A-4A	L8A-4A	3/8"x.035	1/4"x.035	410	.288	.297	.363	.428	.350	.385	.568	1.285	.692	.656	.385	.350	.297	.258	.172	.255	.285
K8C-4A	L8C-4A	3/8"x.038	1/4"x.038	410	.380	.251	.363	.428	.350	.385	.536	1.285	.892	.668	.385	.350	.297	.258	.172	.255	.285
K8B-4A	L8B-4A	1/2"x.049	1/4"x.035	546	.508	.383	.509	.554	.350	.385	.804	1.384	.728	.656	.385	.350	.297	.258	.172	.255	.285
K8B-5A	L8B-5A	1/2"x.049	3/8"x.035	546	.508	.383	.509	.554	.350	.385	.804	1.409	.754	.718	.385	.350	.428	.383	.297	.380	.410
K8E-4A	L8E-4A	1/2"x.072	1/4"x.035	546	.508	.347	.509	.554	.350	.385	.584	1.383	.728	.656	.385	.350	.297	.258	.172	.255	.285
K8E-5C	L8E-5C	1/2"x.072	3/8"x.038	546	.508	.347	.509	.554	.350	.385	.584	1.409	.754	.718	.385	.350	.428	.383	.251	.380	.410
K12D-4A	L12D-4A	3/4"x.065	1/4"x.035	816	.758	.611	.759	.804	.500	.535	.804	1.689	.901	.656	.385	.350	.297	.258	.172	.255	.285
K12D-6A	L12D-6A	3/4"x.085	3/8"x.035	816	.758	.611	.759	.804	.500	.535	.804	1.695	.827	.718	.385	.350	.428	.383	.297	.380	.410
K12D-8B	L12D-8B	3/4"x.065	1/2"x.049	816	.756	.611	.758	.804	.500	.535	.804	1.720	.852	.780	.385	.350	.554	.509	.393	.505	.546
K12G-4A	L12G-4A	3/4"x.109	1/4"x.035	816	.758	.523	.758	.804	.500	.535	.685	1.689	.901	.758	.385	.350	.297	.258	.172	.255	.285
K12G-6C	L12G-6C	3/4"x.109	3/8"x.038	816	.758	.523	.758	.804	.500	.535	.766	1.685	.827	.718	.385	.350	.428	.383	.251	.380	.410
K12G-8E	L12G-8E	3/4"x.109	1/2"x.072	816	.758	.523	.758	.804	.500	.535	.768	1.720	.852	.780	.385	.350	.554	.509	.347	.506	.548
K16F-4A	L16F-4A	1"x.095	1/4"x.035	1.066	1.006	.801	1.009	1.054	.500	.535	.778	1.741	.873	.806	.385	.350	.297	.258	.172	.255	.285
K16F-6A	L16F-6A	1"x.095	3/8"x.035	1.066	1.006	.801	1.009	1.054	.500	.535	.778	1.787	.899	.718	.385	.350	.428	.383	.297	.380	.410
K16F-8B	L16F-8B	1"x.095	1/2"x.049	1.066	1.006	.801	1.009	1.054	.500	.535	.778	1.782	.924	.780	.385	.350	.554	.509	.393	.508	.548
K16F-12D	L16F-12D	1"x.095	3/4"x.065	1.066	1.006	.801	1.009	1.054	.500	.535	.778	1.808	.940	.858	.535	.500	.804	.759	.611	.756	.816
K16H-4A	L16H-4A	1"x.120	1/4"x.035	1.088	1.006	.751	1.009	1.054	.500	.535	.755	1.741	.873	.696	.385	.350	.297	.258	.172	.255	.285
K16H-6E	L16H-6E	1"x.120	1/2"x.072	1.066	1.006	.751	1.009	1.054	.500	.535	.755	1.792	.924	.780	.385	.350	.554	.509	.347	.506	.546
K16H-12G	L16H-12G	1"x.120	3/4"x.109	1.088	1.006	.751	1.009	1.054	.500	.535	.755	1.808	.940	.868	.535	.500	.804	.769	.523	.756	.816
K20B-4A	L20B-4A	1-1/4"x.049	1/4"x.035	1.330	1.256	1.143	1.259	1.304	.500	.535	.880	1.875	.945	.656	.385	.350	.297	.258	.172	.255	.285
K20B-12D	L20B-12D	1-1/4"x.049	3/4"x.065	1.330	1.256	1.143	1.259	1.304	.500	.535	.880	1.942	1.012	.868	.536	.500	.804	.759	.611	.756	.816
K20B-16F	L20B-16F	1-1/4"x.049	1-1/2"x.095	1.330	1.256	1.143	1.259	1.304	.500	.535	.880	1.870	.940	.868	.536	.500	1.054	1.009	.801	1.006	1.066
K20J-4A	L20J-4A	1-1/4"x.134	1/4"x.035	1.330	1.256	.973	1.259	1.304	.500	.535	.804	1.875	.945	.656	.385	.350	.297	.258	.172	.255	.285
K20J-6E	L20J-6E	1-1/4"x.134	1/2"x.072	1.330	1.256	.973	1.259	1.304	.500	.535	.804	1.827	.897	.780	.385	.350	.554	.509	.347	.506	.546
K20J-12G	L20J-12G	1-1/4"x.134	3/4"x.109	1.330	1.256	.973	1.258	1.304	.500	.535	.804	1.842	1.012	.868	.535	.500	.804	.758	.523	.756	.816



GP425G AMEND 2

FED SUP CLASS
4730

APPROVED: 2-6-09

REVISED: CHANGED "H" DIMENSION AND ADDED NOTE 9, SEE APPENDIX A 2-6-09

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

CUSTOMER:
PROCUREMENT SPEC.
KSC-F-124

COORDINATION STATUS:
KSC DE

KSC FORM 32-8B (CG 4/82)

UNION, BUTTWELD REDUCER

JOHN F. KENNEDY SPACE CENTER

STANDARD PART
KC152
SHEET 3 OF 3

DASH NO.	TUBE SIZE LARGE END	TUBE SIZE SMALL END	A ±.003	B +.005 -.008	C ±.003	D +.005 -.008	E ±.003	F ±.005	G ±.003	H ±.005	J ±.005	K (REF)	L ±.005	M ±.005	N ±.005	P ±.003	S +.005 -.008	T ±.003	U +.005 -.008	V ±.003
K23J-16H	L20J-16H	1-14"x134	1.330	1.256	.973	1.238	1.204	.900	.635	.804	1.870	.940	.868	.535	.500	1.054	1.008	.751	1.005	1.008
K24B-4A	L24B-4A	1-12"x1048	1.805	1.511	1.398	1.514	1.558	.500	.535	.880	1.949	1.019	.855	.385	.350	.287	.258	.172	.285	.285
K24B-12D	L24B-12D	1-12"x1049	1.800	1.511	1.398	1.514	1.558	.500	.535	.880	2.018	1.088	.868	.535	.500	.804	.758	.811	.755	.818
K24B-16F	L24B-16F	1-12"x1049	1.805	1.511	1.398	1.514	1.558	.500	.535	.880	1.944	1.014	.868	.535	.500	1.054	1.008	.801	1.005	1.058
K24B-20B	L24B-20B	1-12"x1049	1.805	1.511	1.398	1.514	1.558	.500	.535	.880	1.934	1.004	.850	.535	.500	1.204	1.258	1.143	1.258	1.350
K24L-4A	L24L-4A	1-12"x188	1.805	1.511	1.110	1.514	1.558	.500	.535	.755	1.886	.964	.683	.385	.300	.287	.288	.172	.258	.285
K24L-16H	L24L-16H	1-12"x188	1.805	1.511	1.110	1.514	1.558	.500	.535	.755	1.844	1.014	.868	.535	.500	1.054	1.008	.751	1.008	1.066
K24L-20J	L24L-20J	1-12"x188	1.805	1.511	1.110	1.514	1.558	.500	.535	.755	1.834	1.004	.820	.535	.500	1.204	1.258	.973	1.258	1.320
K32D-4A	L32D-4A	2"x265	2.105	2.011	1.896	2.014	2.058	.500	.535	.861	2.893	1.183	.858	.388	.350	.287	.288	.172	.285	.285
K32D-20B	L32D-20B	2"x265	2.105	2.011	1.856	2.014	2.058	.500	.535	.861	2.076	1.148	.930	.535	.500	1.304	1.298	1.143	1.258	1.330
K32D-24B	L32D-24B	2"x265	2.105	2.011	1.856	2.014	2.058	.500	.535	.861	2.004	1.074	.930	.535	.500	1.558	1.514	1.388	1.511	1.605
K32L-4A	L32L-4A	2"x188	2.105	2.011	1.612	2.014	2.058	.500	.535	.758	2.003	1.163	.868	.385	.350	.297	.258	.172	.285	.285
K32L-20J	L32L-20J	2"x188	2.105	2.011	1.612	2.014	2.058	.500	.535	.758	2.078	1.148	.838	.535	.500	1.304	1.298	.973	1.298	1.330
K32L-24L	L32L-24L	2"x188	2.105	2.011	1.612	2.014	2.058	.500	.535	.758	2.004	1.074	.930	.535	.500	1.558	1.514	1.110	1.511	1.605



APPROVED: 2-8-09

REVISED: CHANGED "H" DIMENSION AND ADDED NOTE 9, SEE APPENDIX A 2-6-09

FED SUP CLASS
4730

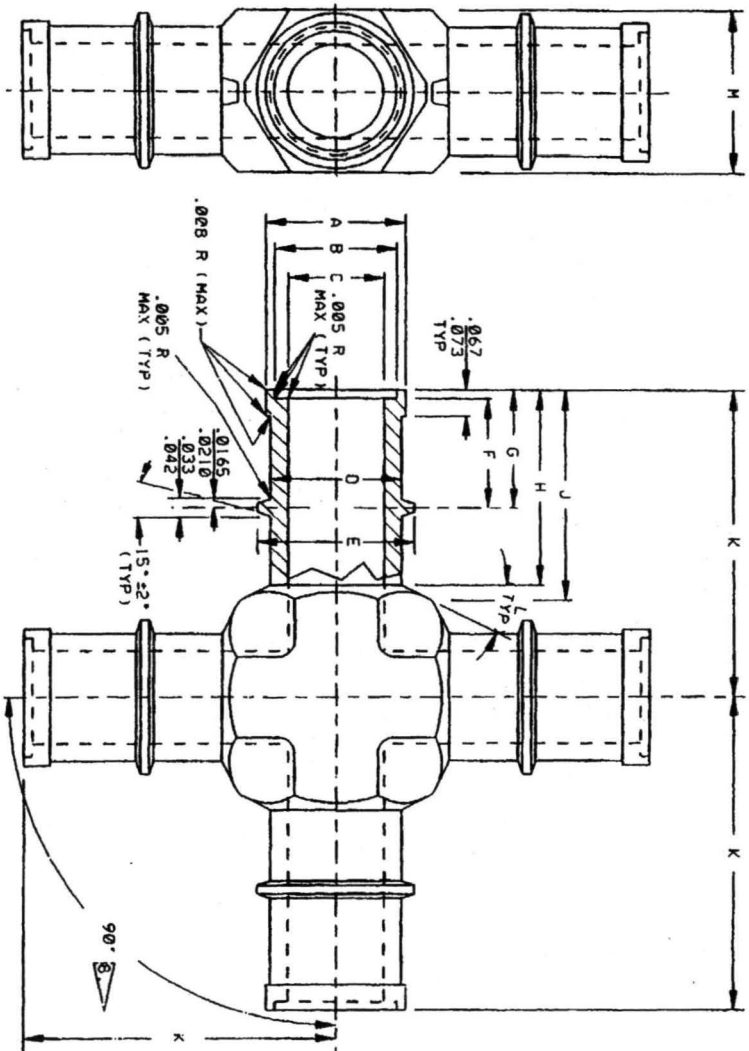
GP425G AMEND 2

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FED SUP CLASS
4730

GP-425



APPROVED: 5-1-90

REVISED: ○

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	STANDARD PART
COORDINATION STATUS	KC153
KSC DE	SHEET 1 OF 3
CROSS, BUTTWELD TUBE	

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

- SCHEDULE:**
- ADD "A" AFTER DASH NUMBER TO DENOTE .035" TUBE WALL.
 - ADD "B" AFTER DASH NUMBER TO DENOTE .049" TUBE WALL.
 - ADD "C" AFTER DASH NUMBER TO DENOTE .058" TUBE WALL.
 - ADD "D" AFTER DASH NUMBER TO DENOTE .065" TUBE WALL.
 - ADD "E" AFTER DASH NUMBER TO DENOTE .072" TUBE WALL.
 - ADD "F" AFTER DASH NUMBER TO DENOTE .095" TUBE WALL.
 - ADD "G" AFTER DASH NUMBER TO DENOTE .109" TUBE WALL.
 - ADD "H" AFTER DASH NUMBER TO DENOTE .120" TUBE WALL.
 - ADD "J" AFTER DASH NUMBER TO DENOTE .134" TUBE WALL.
 - ADD "K" AFTER DASH NUMBER TO DENOTE .156" TUBE WALL.
 - ADD "L" AFTER DASH NUMBER TO DENOTE .188" TUBE WALL.
- MATERIAL:** SEE PROCUREMENT SPECIFICATION.
CORROSION RESISTANT STEEL (CLASS 316), CODE "K"
- FINISH:** SURFACE SHALL BE 125 RMS MAXIMUM PER ANS1 B46.1 UNLESS OTHERWISE SPECIFIED.
- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.
 6. ALL DIAMETRAL DIMENSIONS SHALL BE CONCENTRIC WITH "C" BORE WITHIN .005 T.I.R.
 7. FITTINGS PROVIDED HEREIN SHALL BE WELDED TO CORRESPONDING TUBE SIZES USING AUTOMATIC WELDING EQUIPMENT (ASTRO-ARC CO. OR EQUIVALENT).
- ▶ FOR TUBE SIZES UP TO AND INCLUDING .375" OD, TOLERANCE IS ±2-1/2". FOR ALL OTHERS, TOLERANCE IS ±1-1/2".
- EXAMPLE OF PART NOS.** KC153K4A = CROSS, BUTTWELD TUBE, FOR 1/4" X .035 WALL TUBING.

DASH NO.	TUBE SIZE REF	A ±.003	B +.005 -.000	C ±.003	D +.005 -.000	E ±.003	F ±.005	G ±.005	H +.015 -.005	J (REF)	K ±.016	L (REF)	M (REF)	R ±.005
K4A	1/4" X .035	.285	.255	.172	.258	.297	.350	.385	.656	.680	.920	15	.438	.030
K6A	3/8" X .035	.410	.380	.297	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K6C	3/8" X .058	.410	.380	.251	.383	.428	.350	.385	.718	.742	1.110	15	.563	.030
K8B	1/2" X .049	.546	.506	.393	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K8E	1/2" X .072	.546	.506	.347	.509	.554	.350	.385	.780	.812	1.280	15	.750	.030
K12D	3/4" X .065	.816	.756	.611	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K12G	3/4" X .109	.816	.756	.523	.759	.804	.500	.535	.868	.909	1.640	15	1.063	.030
K16F	1" X .095	1.066	1.006	.801	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K16H	1" X .120	1.066	1.006	.751	1.009	1.054	.500	.535	.868	.909	1.810	15	1.313	.030
K20B	1 1/4" X .049	1.330	1.256	1.143	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K20J	1 1/4" X .134	1.330	1.256	.973	1.259	1.304	.500	.535	.930	1.036	2.090	30	1.625	.060
K24B	1 1/2" X .049	1.605	1.511	1.398	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24J	1 1/2" X .134	1.605	1.511	1.218	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24K	1 1/2" X .156	1.605	1.511	1.174	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K24L	1 1/2" X .188	1.605	1.511	1.120	1.514	1.559	.500	.535	.930	1.034	2.280	30	1.875	.060
K32D	2" X .065	2.105	2.011	1.866	2.014	2.059	.500	.535	1.055	1.298	3.060	45	2.500	.375
K32L	2" X .188	2.105	2.011	1.620	2.014	2.059	.500	.535	1.055	1.298	3.060	45	2.500	.375

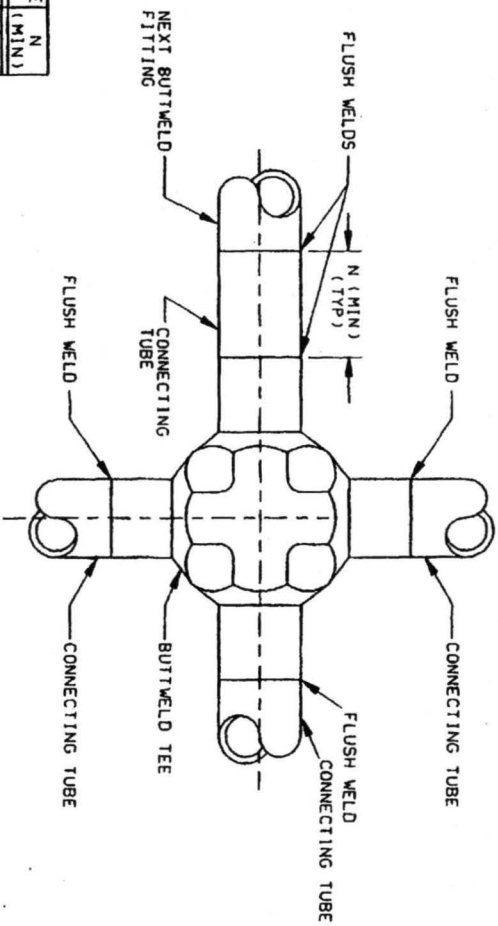
CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	STANDARD PART
COORDINATION STATUS	KC153
KSC DE	SHEET 2 OF 3

KSC FORM 32-85 (CG 4/92)

REVISED:
 APPROVED: 5-1-90



FED SUP CLASS
4730



**BUTTWELD CROSS
APPLICATION DATA**

TUBE SIZE REF	N (MIN)
1/4"	1.44
3/8"	1.44
1/2"	1.44
3/4"	1.44
1"	1.44
1 1/4"	1.63
1 1/2"	1.63
2" X .065	1.75
2" X .188	4.25

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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	<h2 style="margin: 0;">CROSS, BUTTWELD TUBE</h2>	STANDARD PART KC153 SHEET 3 OF 3
PROCUREMENT SPEC. KSC-F-124		
COORDINATION STATUS KSC DE		
APPROVED: 5-1-90		
REVISED: ○		

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
NONE

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

ENLARGED VIEW

TUBE OD REF	A DIA	B DIA MIN	R TOL.	R RAD
1/8	.200	.140		
3/16	.302	.245		
1/4	.359	.300		.032
5/16	.421	.320		
3/8	.484	.440	±.015	.046
1/2	.656	.555		.062
5/8	.781	.665		
3/4	.937	.800		.078
1	1.187	1.080		.093
1 1/4	1.500	1.400		
1 1/2	1.721	1.600	+ .020 - .010	
1 3/4	2.106	1.850		.109
2	2.356	2.100		

NOTES:

1. THIS DESIGN STANDARD ESTABLISHES DIMENSIONS GOVERNING THE FORMING OF TUBE FLARES THAT ARE TO BE USED WITH STANDARD FLARED TUBE FITTINGS WITH SEAL RINGS.
2. THE MINIMUM FLARE SEALING SURFACE AS DEFINED BY DIAMETER B AND 74° ± 1-1/2° CONE SHALL BE CONCENTRIC WITH THE OUTSIDE DIAMETER OF THE TUBE WITHIN .007 FULL INDICATOR READING.
3. THE FLARE SEALING SURFACE SHALL NOT EXHIBIT CONCAVE AREAS EXCEEDING .001 OR CONVEX AREAS EXCEEDING .002. SURFACE ROUGHNESS SHALL NOT EXCEED 63/ IN ACCORDANCE WITH ANSI B46.1.
4. DEBURR EDGES OF TUBING BEFORE FLARING; RADIUS OR CHAMFER EDGE OF ID .010 MAX AND EDGE OF OD 20% TO 50% OF TUBING WALL THICKNESS. EDGES TO BE FREE OF CHATTER MARKS.
5. DIMENSIONS ARE IN INCHES.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC. NONE

COORDINATION STATUS

KSC DE

TUBING, FLARED

STANDARD DIMENSIONS FOR

DESIGN STANDARD

KC154

SHEET 1 OF 1

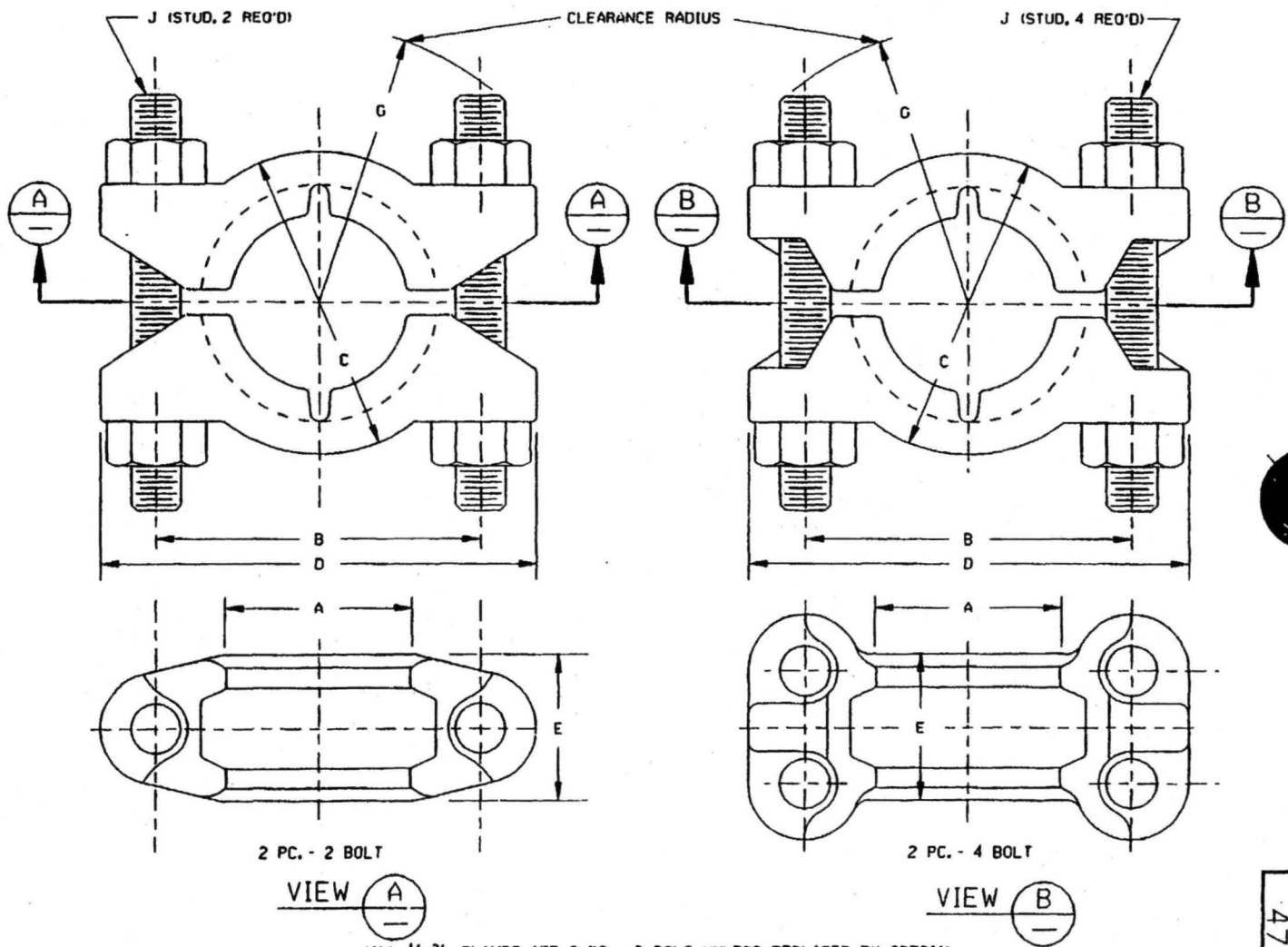
REVISED: ① REV NOTE 2, 4-10-91

APPROVED: 8-12-65

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

KSC FORM 32-85 (CG 4/92)

CUSTOMER: PROCUREMENT SPEC. NONE	CLAMP ASSEMBLY	STANDARD PART KC155
COORDINATION STATUS KSC DE		
JOHN F. KENNEDY SPACE CENTER		SHEET 1 OF 3



(ALL 1/2-3/4 CLAMPS ARE 2 PC. - 2 BOLT UNLESS REPLACED BY SPECIAL 2 PC. - 4 BOLT CLAMPS, ALL OTHERS ARE 2 PC. - 4 BOLT STYLE)



FED SUP CLASS
4730

APPROVED: 9-19-67

REVISED: (F) CHANGED APPROVED VENDOR ON SHEET 2. 10-2-92



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

MATERIAL CODE: CLAMP HALVES SHALL BE IN ACCORDANCE WITH MATERIAL CODES SHOWN ON SHEET 3.

STUD MATERIAL FOR CARBON STEEL CLAMPS SHALL BE SA-193-B7.
 STUD MATERIAL FOR STAINLESS STEEL CLAMPS SHALL BE SA-193-B8 FOR MATERIAL CODE C. MATERIAL CODE D SHALL HAVE STUD MATERIAL IN COMPLIANCE WITH THE DIMENSIONAL AND TOLERANCE SPECIFICATIONS OF SA-193 AND MATERIAL SPECIFICATION PER SB-574 ALLOY N10276.

NUT MATERIAL FOR CARBON STEEL CLAMPS SHALL BE SA-194-GR2 OR 2H.
 NUT MATERIAL FOR STAINLESS STEEL CLAMPS SHALL BE SA-194-GR8.

TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.

- NOTES:**
1. ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 2. ALL DIMENSIONS ARE IN INCHES.
 3. TOLERANCE: SEE KC161.
 4. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 5. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 6. PASSIVATE STAINLESS STEEL CLAMPS PER QQ-P-35 TYPE VI OR VII.
- 7. HUB SIZES 1/2GR4/5, 3/4GR4/5, AND 1GR11 ARE NOT TO BE USED FOR NEW DESIGN.
 - 8. MATERIAL CODES B AND C FOR 5" CLAMP SIZE ARE SA351-CF8 (4 BOLT) #48003).
 - 9. SA-182-F316 CLAMPS ARE NON-STOCK SPECIAL ORDER ITEMS AND SHALL NOT BE USED FOR NEW DESIGN.
 - 10. 1-1/2" CLAMP SIZE (-2) IS NOT INTERCHANGEABLE WITH 1" CLAMP SIZE (-8).
 - 11. MATERIAL CODE B FOR 1" CLAMP SIZE IS SA-351-CA15. MATERIAL CODE C FOR 1" CLAMP SIZE IS SA-351-CF8M.
 - 12. MATERIAL CODE C HAS STUDS PER SA-193-B8 AND SHOULD ONLY BE USED IN ENVIRONMENTS NOT SUBJECT TO EXTREME CORROSION.
 - 13. MATERIAL CODE D HAS STUDS PER SB-574 ALLOY N10276 AND SHOULD ONLY BE USED IN ENVIRONMENTS SUBJECT TO EXTREME ACIDIC CORROSION.
14. A CLAMP ASSEMBLY SHALL CONSIST OF 2 CLAMP HALVES, 4 STUDS, AND 8 NUTS. EXCEPT 2PC. 2 BOLT CLAMP ASSEMBLIES SHALL HAVE 2 STUDS AND 4 NUTS.
 15. DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 16. ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS. BASIC PART NUMBER KC155-3A



APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FWY PO BOX 2291 HOUSTON, TX 77252-2291.

ALTERNATE SOURCES:

OTECO EQUIPMENT COMPANY 2811 TROUT STREET P.O. BOX 1849 HOUSTON, TX 77251-1849	REFLANGE, INC. 5730 CENTRALCREST HOUSTON, TX 77092
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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. NONE	CLAMP ASSEMBLY	KC155
COORDINATION STATUS KSC DE		SHEET 2 OF 3

REVISED: (F) CHANGED APPROVED SOURCE: 10-2-92

APPROVED: 9-19-67

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

KSC FORM 32-85 (CG 4/92)

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER
 PROCUREMENT SPEC. NONE
 COORDINATION STATUS
 CLAMP ASSEMBLY
 STANDARD PART KC155
 SHEET 3 OF 3

DASH NO.	HUB SIZE	CLAMP SIZE	DIMENSIONS											-A SA-266 CL. III NORM.	-B SA-182 F316	-C SA-182 F304	-D SA-182 F304
			A	B	C	D	E	F	G	J	K	M	N	GRAYLOC STK NO.	GRAYLOC STK NO.	GRAYLOC STK NO.	GRAYLOC STK NO.
1	1/2GR4	1/2-3/4	1.188	2.625	2.812	3.625	1.000	2.125	2.250	.375	3.000	1.000	---	50019	---	48500	48500
	1/2GR5																
	3/4GR4																
	3/4GR5																
2	1GR11	1-1 1/2	2.687	5.000	4.500	6.500	2.000	3.250	4.000	.625	5.000	3.125	1.625	49500	49533	48501	48501
	1-1/2GR14																
3	2GR14	2	3.187	5.750	5.062	7.500	2.000	3.625	4.500	.750	5.250	3.500	1.812	49501	49534	48502	48502
	2GR20																
4	2-1/2GR20	2 1/2-3	4.375	7.500	6.875	9.250	2.375	4.500	5.250	.750	6.000	3.500	1.812	49502	49535	48503	48503
	2-1/2GR25																
	3GR25																
	3GR27																
5	4GR31	4	5.375	8.500	8.125	10.500	2.375	5.250	6.000	.875	7.000	4.062	2.062	49503	49536	48504	48504
	4GR34																
	4GR40																
6	5GR52	5	6.875	10.250	9.750	12.375	3.000	6.125	7.375	1.000	8.000	4.438	2.313	50214	48003	48003	48003
	5GR46																
	5GR40																
7	6GR52	6	8.375	12.625	12.000	15.000	3.500	6.625	8.750	1.125	9.375	4.812	2.437	49508	49537	48506	48506
	6GR62																
8	1GR4	1	1.687	3.187	2.813	4.250	1.375	2.250	2.625	.500	3.500	2.313	1.250	49760	---	49761	49761
	1GR5																
	1GR7																
	1GR11																



FED SUP CLASS
4730

APPROVED: 9-19-67

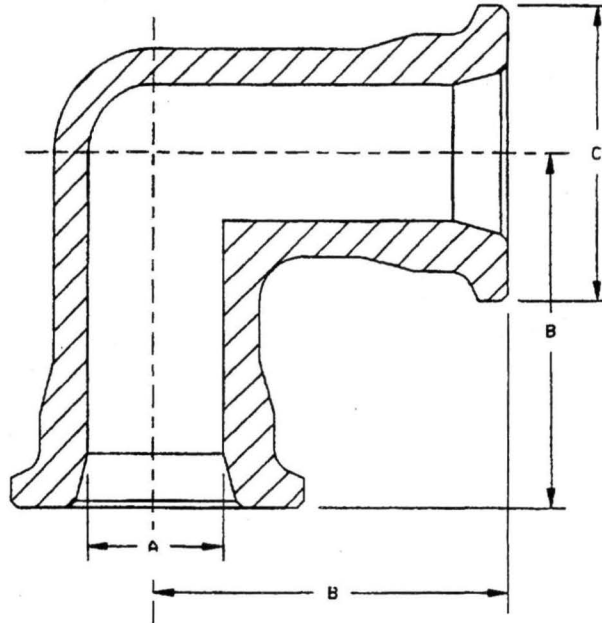
REVISED: (F) CHANGED APPROVED VENDOR ON SHEET 2. 10-2-92

GP-425



FED SUP CLASS
4730

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- MATERIAL CODE: SEE SHEET 2.
- TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.
- NOTES:
1. ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 2. ALL DIMENSIONS ARE IN INCHES.
 3. TOLERANCE: SEE KCI61.
 4. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 5. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 6. DASH NUMBERS 1 TO 5 ARE NOT TO BE USED FOR NEW DESIGN. SEE DASH NUMBERS 21 TO 24.
 7. DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 8. ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS. BASIC PART NUMBER KC156-3A



APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FWY PD BOX 2291 HOUSTON, TX 77252-2291

ALTERNATE SOURCES: OTECO EQUIPMENT COMPANY 2811 TROUT STREET P.O. BOX 1849 HOUSTON, TX 77251-1849
REFLANGE, INC. 5730 CENTRALCREST HOUSTON, TX 77092

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	ELBOW, 90° PIPE HUB
COORDINATION STATUS	
KSC DE	STANDARD PART KC156
	SHEET 1 OF 2

KSC FORM 32-85 (CG 4/92)

REVISED: (E) CHANGED APPROVED SOURCE. 10-2-92

APPROVED: 9-19-67



FED SUP CLASS
4730

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67
67
67
67
67

DASH NO.	PIPE SIZE	HUB SIZE	DIMENSIONS			-A	-B
			A	B ±1/32	C	SA-105 GR11	SA-182 F-316SS
1	1/2	1/2-3/4GR5	.625	2.000	1.562	54105	54152
2	1/2	1/2-3/4GR4	.500	2.000	1.562	54102	54149
3	3/4	3/4GR5	.625	2.000	1.562	54105	54152
4	3/4	3/4GR4	.500	2.000	1.562	54102	54149
5	1	1-1/4-1 1/2GR11	1.125	4.000	3.125	54106	54153
6	1 1/2	1 1/4-1 1/2GR14	1.610	4.000	3.125	54107	54156
7	2	2GR20	2.063	4.000	3.625	54117	54129
8	2	2GR14	1.610	4.000	3.625	54114	54162
9	2 1/2	2 1/2GR25	2.672	5.375	5.000	54119	54145
10	2 1/2	2 1/2GR20	2.063	5.375	5.000	54118	54163
11	3	3GR27	3.063	5.375	5.000	54122	54146
12	3	3GR25	2.672	5.375	5.000	54119	54145
13	4	4GR40	4.063	6.000	6.000	54125	54174
14	4	4GR34	3.688	6.000	6.000	54126	54172
15	4	4GR31	3.250	6.000	6.000	54127	54168
16	5	5GR52	5.313	8.000	7.500	54144	54213
17	5	5GR46	4.750	8.000	7.500	54382	54391
18	5	5GR40	4.063	8.000	7.500	54123	54147
19	6	6GR62	6.065	9.000	9.250	54130	54182
20	6	6GR52	5.313	9.000	9.250	54131	54181
						-A	-B
						SA-148	SA-351
						GR90/60	CFBM
21	1/2, 3/4	1GR4	.500	3.000	2.000	54798	54804
22	1/2, 3/4, 1	1GR5	.625	3.000	2.000	54799	54805
23	3/4, 1	1GR7	.906	3.000	2.000	54800	54414
24	1	1GR11	1.125	3.000	2.000	54801	54807
						-A	-B
						SA-105	SA-182
						GR11	F-316SS

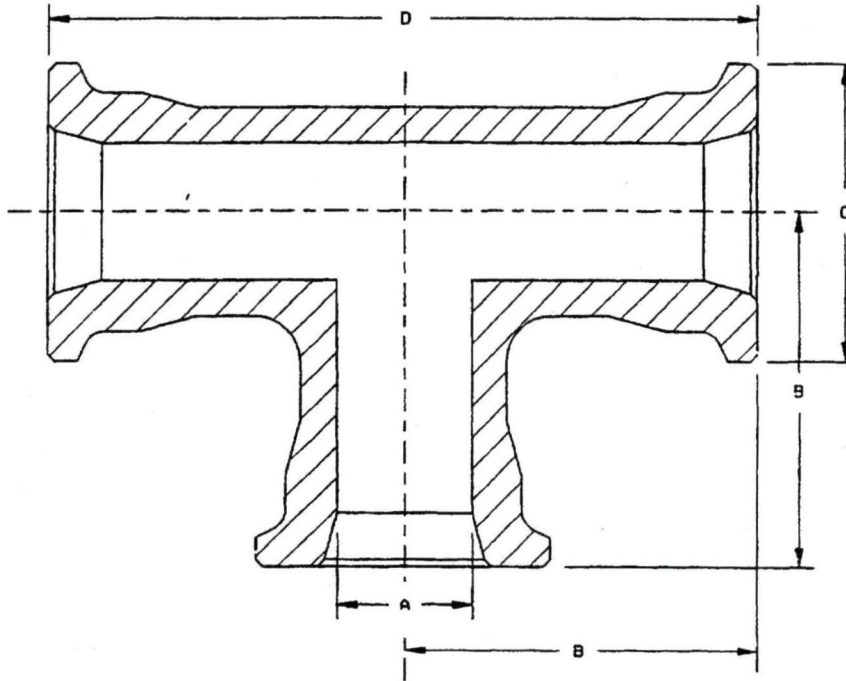


APPROVED: 9-19-67
 REVISED: (E) CHANGED APPROVED VENDOR ON SHEET I. 10-2-92

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. NONE	ELBOW, 90° PIPE HUB	KC156
COORDINATION STATUS		SHEET 2 OF 2
KSC DE		



FED SUP CLASS
4730



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- MATERIAL CODE: SEE SHEET 2.
- TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.
- NOTES:
1. ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 2. ALL DIMENSIONS ARE IN INCHES.
 3. TOLERANCE: SEE KC161.
 4. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 5. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 6. DASH NUMBERS 1 TO 5 ARE NOT TO BE USED FOR NEW DESIGN. SEE DASH NUMBERS 21 TO 24.
 7. DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 8. ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS. BASIC PART NUMBER KC157-3A

┌ MATERIAL CODE
└ DASH NUMBER

APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FWY
PO BOX 2291 HOUSTON, TX 77252-2291

ALTERNATE SOURCES: OTECO EQUIPMENT COMPANY REFLANGE, INC.
2811 TROUT STREET 5730 CENTRALCREST
P.O. BOX 1849 HOUSTON, TX 77092
HOUSTON, TX 77251-1849

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	STANDARD PART
COORDINATION STATUS	KC157
KSC DE	SHEET 1 OF 2

KSC FORM 32-85 (CG 4/92)

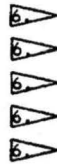
REVISED: (E) CHANGED APPROVED SOURCE. 10-2-92

APPROVED: 9-19-67



FED SUP CLASS
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DASH NO.	PIPE SIZE	HUB SIZE	DIMENSIONS				-A SA-105 GR11	-B SA-182 F-316SS
			A	B ±1/32	C	D ±1/16	GRAYLOC STK NO.	GRAYLOC STK NO.
1	1/2	1/2-3/4GR5	.625	2.000	1.562	4.000	54167	54239
2	1/2	1/2-3/4GR4	.500	2.000	1.562	4.000	54164	54238
3	3/4	3/4GR5	.625	2.000	1.562	4.000	54167	54239
4	3/4	3/4GR4	.500	2.000	1.562	4.000	54164	54238
5	1	1-1/4-1 1/2GR11	1.125	4.000	3.125	8.000	54169	54241
6	1 1/2	1 1/4-1 1/2GR14	1.610	4.000	3.125	8.000	54173	54242
7	2	2GR20	2.063	4.000	3.625	8.000	54179	54244
8	2	2GR14	1.610	4.000	3.625	8.000	54178	54243
9	2 1/2	2 1/2GR25	2.672	5.375	5.000	10.750	54196	54246
10	2 1/2	2 1/2GR20	2.063	5.375	5.000	10.750	54180	54245
11	3	3GR27	3.063	5.375	5.000	10.750	54197	54247
12	3	3GR25	2.672	5.375	5.000	10.750	54196	54246
13	4	4GR40	4.063	6.000	6.000	12.000	54358	54352
14	4	4GR34	3.688	6.000	6.000	12.000	54357	54316
15	4	4GR31	3.250	6.000	6.000	12.000	54356	54354
16	5	5GR52	5.313	8.000	7.500	16.000	54232	54373
17	5	5GR46	4.750	8.000	7.500	16.000	54363	54372
18	5	5GR40	4.063	8.000	7.500	16.000	54228	54233
19	6	6GR62	6.065	9.000	9.250	18.000	54206	54254
20	6	6GR52	5.313	9.000	9.250	18.000	54203	54253
						-A SA-148 GR90/60	-B SA-351 CF8M	
21	1/2-3/4	1GR4	.500	3.000	2.000	6.000	54791	54795
22	1/2-3/4.1	1GR5	.625	3.000	2.000	6.000	54792	54796
23	3/4.1	1GR7	.906	3.000	2.000	6.000	54793	54412
24	1	1GR11	1.125	3.000	2.000	6.000	54794	54797
						-A SA-105 GR11	-B SA-182 F-316SS	



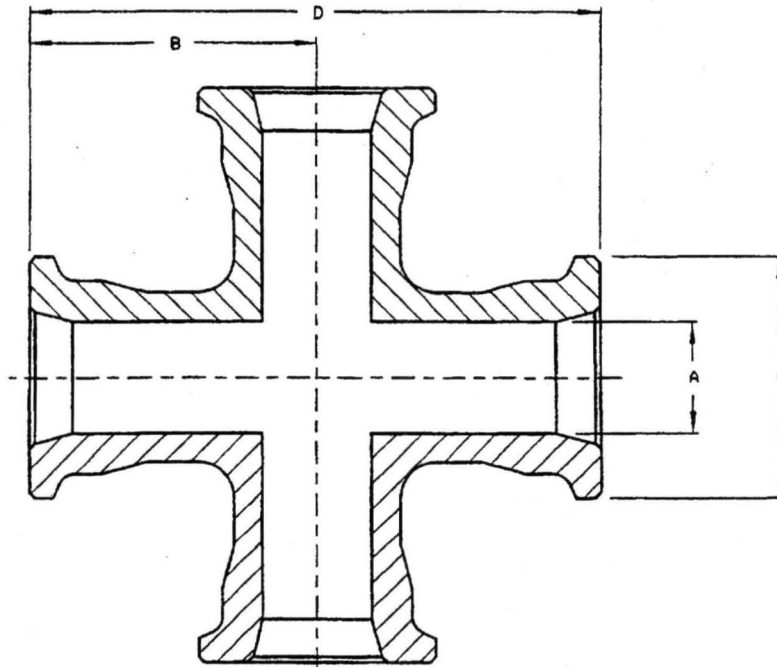
REVISED: (E) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92

APPROVED: 9-19-67

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	STANDARD PART
COORDINATION STATUS KSC DE	TEE, PIPE HUB KC157
	SHEET 2 OF 2



FED SUP CLASS
4730



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- MATERIAL CODE: SEE SHEET 2.
- TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.
- NOTES:
- ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 - ALL DIMENSIONS ARE IN INCHES.
 - TOLERANCE: SEE KC161.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - DASH NUMBERS 1 TO 5 ARE NOT TO BE USED FOR NEW DESIGN. SEE DASH NUMBERS 21 TO 24.
 - DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 - ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS.

BASIC PART NUMBER KC157-3A



APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FWY
PO BOX 2291 HOUSTON, TX 77252-2291

ALTERNATE SOURCES: OTECO EQUIPMENT COMPANY REFLANGE, INC.
2811 TROUT STREET 5730 CENTRALCREST
P.O. BOX 1849 HOUSTON, TX 77092
HOUSTON, TX 77251-1849

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
NONE

COORDINATION STATUS

KSC DE

CROSS, PIPE HUB

STANDARD PART

KC158

SHEET 1 OF 2

REVISED: (E) CHANGED APPROVED SOURCE. 10-2-92

APPROVED: 9-19-67



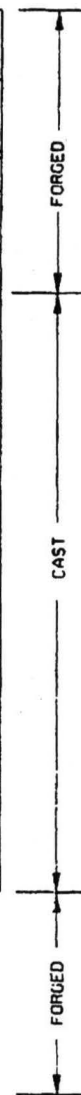
FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.	PIPE SIZE	HUB SIZE	DIMENSIONS				-A SA-105 GR11	-B SA-182 F-316SS
			A	B ±1/32	C	D ±1/16	GRAYLOC STK NO.	GRAYLOC STK NO.
1	1/2	1/2-3/4GR5	.625	2.000	1.562	4.000	54212	54262
2	1/2	1/2-3/4GR4	.500	2.000	1.562	4.000	54207	54257
3	3/4	3/4GR5	.625	2.000	1.562	4.000	54212	54262
4	3/4	3/4GR4	.500	2.000	1.562	4.000	54207	54257
5	1	1-1 1/4-1 1/2GR11	1.125	4.000	3.125	8.000	54208	54263
6	1 1/2	1 1/4-1 1/2GR14	1.610	4.000	3.125	8.000	54209	54264
7	2	2GR20	2.063	4.000	3.625	8.000	54210	54268
8	2	2GR14	1.610	4.000	3.625	8.000	54211	54267
9	2 1/2	2 1/2GR25	2.672	5.375	5.000	10.750	54221	54272
10	2 1/2	2 1/2GR20	2.063	5.375	5.000	10.750	54216	54269
11	3	3GR27	3.063	5.375	5.000	10.750	54220	54273
12	3	3GR25	2.672	5.375	5.000	10.750	54221	54272
13	4	4GR40	4.063	6.000	6.000	12.000	54225	54279
14	4	4GR34	3.688	6.000	6.000	12.000	54226	54278
15	4	4GR31	3.250	6.000	6.000	12.000	54227	54274
16	5	5GR52	5.313	8.000	7.500	16.000	54219	54307
17	5	5GR46	4.750	8.000	7.500	16.000	---	---
18	5	5GR40	4.063	8.000	7.500	16.000	54214	54222
19	6	6GR62	6.065	9.000	9.250	18.000	54230	54283
20	6	6GR52	5.313	9.000	9.250	18.000	54231	54282

-A
SA-148
GR90/60

-B
SA-351
CF8M



REVISED: (E) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92

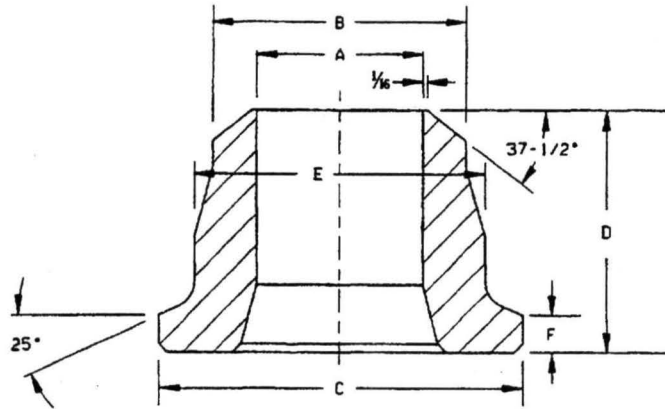
APPROVED: 9-19-67

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. NONE	TEE, PIPE HUB	KC158	
COORDINATION STATUS		SHEET 2 OF 2	
KSC DE			

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730



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- MATERIAL CODE:** ADD A AFTER DASH NO. TO DENOTE SA-105-GR11.
 ADD B AFTER DASH NO. TO DENOTE SA-182-F316L.
 ADD D AFTER DASH NO. TO DENOTE SA-182-F316.
- SCHEDULE CODE:** ADD J AFTER MATERIAL CODE TO DENOTE SCHEDULE 40.
 ADD K AFTER MATERIAL CODE TO DENOTE SCHEDULE 80.
 ADD L AFTER MATERIAL CODE TO DENOTE SCHEDULE 160.
 ADD M AFTER MATERIAL CODE TO DENOTE SCHEDULE XXS.
- TEMPERATURE RANGE:** SEE MATERIAL SPECIFICATION.
- NOTES:**
- ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 - ALL DIMENSIONS ARE IN INCHES.
 - TOLERANCE: SEE KC161.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - DASH NUMBERS 1 TO 4 ARE NOT TO BE USED FOR NEW DESIGN. SEE DASH NUMBERS 13 TO 15.
 - KC DASH NO. 1A ANS 2A MAY BE SA-107-61T GRADE 1030 INSTEAD OF SA-105-GR11.
 - DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 - ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS.

BASIC PART NUMBER KC159-3AJ



APPROVED SOURCE:

COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FWY
 PO BOX 2291
 HOUSTON, TX 77252-2291

ALTERNATE SOURCES:

OTECO EQUIPMENT COMPANY REFLANGE, INC.
 2811 TROUT STREET 5730 CENTRALCREST
 P.O. BOX 1849 HOUSTON, TX 77092
 HOUSTON, TX 77251-1849

REVISED: (E) CHANGED APPROVED SOURCE. 10-2-92

APPROVED: 9-19-67

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	STANDARD PART
COORDINATION STATUS	HUB, BUTTWELD
KSC DE	KC159
	SHEET 1 OF 3



FED SUP CLASS
4730

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DASH NO.	PIPE SIZE	ANSI/ASME B36.10 SCHEDULE	HUB SIZE	DIMENSIONS						-A SA-105 GR11	-B SA-182 F-316L	-D SA-182 F-316
				A	B	C	D	E	F	GRAYLOC STK NO.	GRAYLOC STK NO.	GRAYLOC STK NO.
1	1/2	40	1/2GR5	.622	.840	1.562	1.500	1.063	.133	52076	52666	52796
		80		.546						52077	52667	52797
		160	1/2GR4	.466						52078	52668	52798
		XXS		.252						52079	52669	52800
2	3/4	160	3/4GR5	.614	1.050	1.562	1.500	1.063	.133	52083	52673	52803
		XXS	3/4GR4	.434						52084	52674	52804
3	1	40	1GR11	1.049	1.315	3.125	2.375	2.375	.500	52108	52700	52805
		80		.957						52109	52701	52806
		160		.815						52110	52702	52807
		XXS		.599						52111	52703	52808
4	1-1/4	40	1-1/4GR14	1.388	1.660	3.125	2.375	2.375	.437	52126	52705	52809
		80		1.278						52099	52706	52810
		160	1.160	52127						52707	52811	
		XXS	1-1/4GR11	.896						.500	52094	52708
5	1-1/2	40	1-1/2GR14	1.610	1.900	3.125	2.375	2.375	.437	52100	52710	52813
		80		1.500						52101	52711	52814
		160		1.337						52102	52712	52815
		XXS		1.100						52103	52713	52816
6	2	40	2GR20	2.067	2.375	3.625	2.750	2.875	.437	52104	52721	52821
		80		1.939						52105	52722	52822
		160	1.689	52115						52723	52823	
		XXS	2GR14	1.503						52113	52724	52824
7	2-1/2	40	2-1/2GR25	2.469	2.875	5.000	3.250	4.000	.500	52215	52730	52825
		80		2.323						52216	52731	52826
		160	2.125	52218						52732	52827	
		XXS	2-1/2GR20	1.771						52219	52733	52828
8	3	40	3GR27	3.068	3.500	5.000	3.250	4.000	.500	52204	52740	52844
		80		2.900						52205	52741	52845
		160	2.624	52226						52742	52846	
		XXS	3GR25	2.300						52227	52743	52847
9	3-1/2	40	4GR34	3.548	4.000	6.000	3.625	5.000	.500	52240		52838
		80		3.364						52241		52839
		XXS	4GR31	2.728						52243		52841

REVISED: (E) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92
APPROVED: 9-19-67

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. NONE	HUB, BUTTWELD	KC159	
COORDINATION STATUS		SHEET 2 OF 3	
KSC DE			

KSC FORM 32-85 (CG 4/92)



FED SUP CLASS
4730

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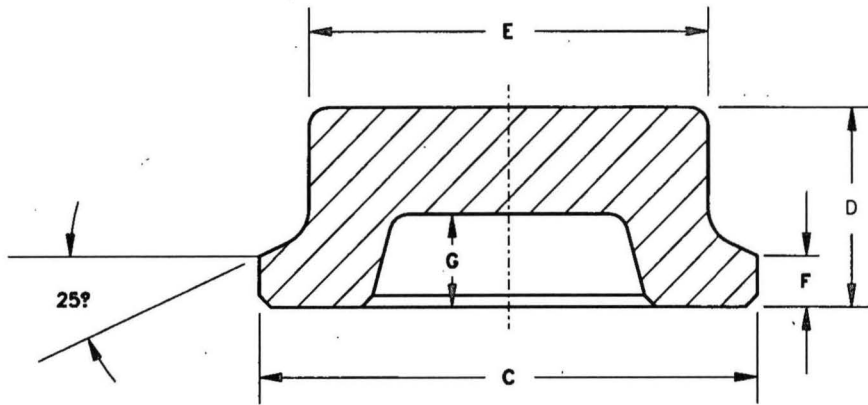
DASH NO.	PIPE SIZE	ANSI/ASME B36.10 SCHEDULE	HUB SIZE	DIMENSIONS						-A SA-105 GR11	-B SA-182 F-316L	-D SA-182 F-316	
				A	B	C	D	E	F	GRAYLOC STK NO.	GRAYLOC STK NO.	GRAYLOC STK NO.	
10	4	40	4GR40	4.026	4.500	6.000	3.625	5.000	.500	52302	52750	52851	
		80		3.826						52303	52751	52852	
		160	4GR34	3.438						52311	52752	52853	
		XXS	4GR31	3.152						52314	52753	52854	
11	5	40	5GR52	5.047	5.563	7.500	4.375	6.500	.625	52380		52867	
		80		4.813						52381		52868	
		160	5GR46	4.313						52385		52871	
		XXS	5GR40	4.063						52383		52870	
12	6	40	6GR62	6.065	6.625	9.250	4.625	7.750	.750	52400	52763	52874	
		80		5.761						52401	52764	52875	
		160	6GR52	5.189					.812	52413	52765	52876	
		XXS		4.897						52414	52766	52877	
13	1/2	40	1GR5	.622	.840	2.000	1.750	1.500		.313	52192		55955
		80		.546							52193		53439
		160	1GR4	.466					52194			53686	
		XXS		.252					52195			53437	
14	3/4	40	1GR7	.824	1.050	2.000	1.750	1.500	.313	52196		53440	
		80		.742						52233		53218	
		160	1GR5	.614						52198		53442	
		XXS	1GR4	.434						52199		53447	
15	1	40	1GR11	1.049	1.315	2.000	1.750	1.500	.313	53225		53231	
		80		.957						53226		53232	
		160	1GR7	.815						53227		53233	
		XXS	1GR5	.599						53228		53234	

APPROVED: 9-19-67 REVISED: (E) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. NONE	HUB, BUTTWELD	KC159	
COORDINATION STATUS		SHEET 3 OF 3	
KSC DE			



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MATERIAL CODE: SEE SHEET 2.

TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.

- NOTES:
- ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 - ALL DIMENSIONS ARE IN INCHES.
 - TOLERANCE: SEE KC161.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - DASH NUMBERS 1 TO 3 ARE NOT TO BE USED FOR NEW DESIGN. SEE DASH NUMBERS 18 TO 21.
 - DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 - ALL PARTS NOT MANUFACTURED BY GRAYLOC PRODUCTS MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAYLOC PRODUCTS PART NUMBER.
 - DASH NUMBERS 13, 14, AND 15 ARE NOT FOR NEW PROCUREMENT. SEE DASH NUMBERS 22, 23 AND 24.

EXAMPLE OF PART NOS.

BASIC PART NUMBER KC160-3A



APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: GRAYLOC PRODUCTS 11835 CHARLES ST., HOUSTON, TX 77041-2411. CAGE CODE: OTEH9.

ALTERNATE SOURCES:

OTECO, INC. 2828 TROUT STREET P.O. BOX 1849 HOUSTON, TX 77093 CAGE CODE: 64414	OCEANEERING REFLANGE 11911 FM529 ROAD HOUSTON, TX 77041-3000 (REFLANGE INC. ACQUIRED BY OCEANEERING in 2003)
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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
NONE

COORDINATION STATUS

KSC DE

HUB, BLIND PIPE

STANDARD PART

KC160

SHEET 1 OF 2

REVISED: (1) REV APPROVED & ALTERNATE SOURCES AND NOTE B, (2) ADDED NOTE 9. 5-30-12
APPROVED: 9-19-67



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DASH NO.	HUB SIZE	DIMENSIONS					-A SA-105* GR11	-B SA-182 F-316SS
		C	D	E	F	G	GRAYLOC STK NO.	GRAYLOC STK NO.
1	1/2-3/4GR4	1.562	1.250	1.063	.133	.438	59045	59378
2	1/2-3/4GR5	1.562	1.250	1.063	.133	.438	59047	59380
3	1-1 1/4-1 1/2GR11	3.125	2.125	2.375	.500	.562	59050	59300
4	1 1/4-1 1/2GR14	3.125	2.125	2.375	.437	.688	59000	59305
5	2GR14	3.625	2.000	2.875	.437	.688	59053	59310
6	2GR20	3.625	2.000	2.875	.437	.688	59002	59315
7	2 1/2GR20	5.000	2.500	4.000	.500	.688	59022	59320
8	2 1/2GR25	5.000	2.500	4.000	.500	.688	59020	59325
9	3GR27	5.000	2.500	4.000	.500	.938	59006	59330
10	4GR31	6.000	2.875	5.000	.500	.938	59024	59345
11	4GR34	6.000	2.875	5.000	.500	.938	59060	59340
12	4GR40	6.000	2.125	5.000	.500	1.000	59010	59335
13	5GR52	7.500	2.875	6.500	.625	1.000	58992	59354
14	5GR46	7.500	2.875	6.500	.625	1.125	59148	59279
15	5GR40	7.500	3.500	6.500	.625	1.000	58990	59347
16	6GR52	9.250	3.500	7.750	.812	1.000	59064	59350
17	6GR62	9.250	2.875	7.750	.750	1.000	59014	59349
18	1GR4	2.000	1.750	1.500	.313	.438	58955	59497
19	1GR5	2.000	1.750	1.500	.313	.438	58922	59525
20	1GR7	2.000	1.750	1.500	.313	.563	58915	59523
21	1GR11	2.000	1.750	1.500	.313	.563	59592	59524
22	5GR52	7.500	2.875	6.500	.625	1.000	58992	134751
23	5GR46	7.500	2.875	6.500	.625	1.125	59148	134752
24	5GR40	7.500	3.500	6.500	.625	1.000	58261	59347

* 1/2" AND 3/4" SIZES MAY BE FURNISHED FROM SA-107-GR 1030 UNLESS OTHERWISE SPECIFIED.

APPROVED: 9-10-67 REVISED: (E) REV DIM "D" ON 5,6,10, & 11, REV DIM "G" ON 11 & 14, ADDED FLAG NOTE TO 13,14, & 15, ADDED 22, 23, & 24. 5-30-12

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. NONE	HUB, BLIND PIPE	KC160	
COORDINATION STATUS		SHEET 2 OF 2	
KSC DE			



FED SUP CLASS
NONE

GRAYLOC CLAMPS

DIMENSION	SIZE	TOLERANCE
A	1/2" THRU 3" 4" THRU 6"	±.031 ±.063
B	1/2" THRU 6"	±.063
C	FOR REFERENCE ONLY	
D	1" THRU 3" 4" THRU 6"	±.250 ±.375
E	1/2" THRU 3" 4" THRU 6"	±.250 ±.375
F,G,J,K	FOR REFERENCE ONLY	
M	1/2" THRU 3" 4" THRU 6"	±.250 ±.375
N	1/2" THRU 6"	±.031

GRAYLOC HUBS

DIMENSION	SIZE	TOLERANCE
A	1/2" THRU 3" 4" THRU 6"	±.031 ±.063
B	1/2" THRU 5" 6"	+0.094-.031 +.156-.031
C	1/2" THRU 6"	±.063
D	BUTTWELD 1/2" THRU 6" BLIND 1/2" THRU 5" BLIND 6"	±.063 +.063 +.125
E	1/2" THRU 6"	±.063
F	1/2" THRU 6"	±.031
G	1/2" THRU 6"	+.125 -.063
25° CLAMPING SURFACE ON HUB	1/2" THRU 6"	±1°
BUTTWELD BEVEL IN ACCORDANCE WITH ANSI B16.25		

NOTE: TOLERANCE ON ANGLES, WHERE APPLICABLE SHALL BE ±1°.

GRAYLOC SEAL RINGS

DIMENSION	SIZE	TOLERANCE
A	4 THRU 34 40 THRU 62	±.031 ±.063
C	4 THRU 34 40 THRU 62	±.031 ±.125
D	FOR REFERENCE ONLY	
E	4 THRU 62	±.016
F	4 THRU 34 40 THRU 62	+0.031-.000 +0.063-.000

GRAYLOC FITTINGS

DIMENSION	SIZE	TOLERANCE
A	1/2" THRU 3" 4" THRU 6"	±.031 ±.063
B	1/2" THRU 6"	±.031
C	1/2" THRU 6"	±.063
D	1/2" THRU 6"	±.063

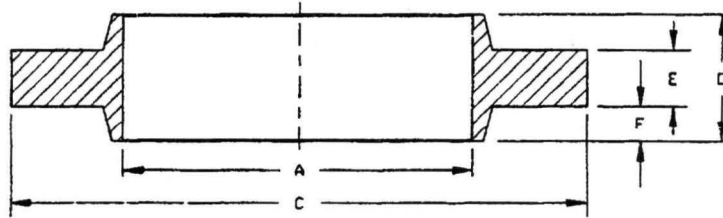
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APPROVED: 1-6-69 REVISED: (B) REV & REDRAWN B-1-90

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		DESIGN STANDARD
PROCUREMENT SPEC. NONE	DIMENSION TOLERANCES FOR HUB STYLE FLANGE FITTINGS	KC161
COORDINATION STATUS KSC DE		SHEET 1 OF 1



FED SUP CLASS
4730



NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

MATERIAL CODE:

ADD A AFTER DASH NO. TO DENOTE AISI 1018 THRU 1030 TEFLON COATED.
 ADD B AFTER DASH NO. TO DENOTE TYPE 316 SS SILVER PLATED. DO NOT SPECIFY FOR NEW DESIGN.
 ADD D AFTER DASH NO. TO DENOTE AISI 630 TYPE 17-4PH, TEFLON COATED.

TEMPERATURE RANGE:

PARTS MADE FROM AISI 1018-1030 ARE TEFLON COATED 0.001 TO 0.003 THICK FOR SERVICE TEMPERATURES OF -50°F TO +350°F.
 PARTS MADE FROM 17-4PH, TEFLON COATED, ARE FOR SERVICE TEMPERATURES OF -452°F TO +450°F.

NOTES:

1. ALL MATERIALS ARE PER AISI SPECIFICATIONS
2. ALL DIMENSIONS ARE IN INCHES.
3. TOLERANCE: SEE KC161.
4. STOCK NUMBERS FOR UNCOATED RINGS OR FOR RINGS WITH DIFFERENT COATINGS THAN SPECIFIED BELOW WILL NOT CORRESPOND TO STOCK NUMBERS FOR STANDARD RINGS.
5. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
6. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
7. DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
8. ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS.

BASIC PART NUMBER KC162-3A



APPROVED SOURCE:

COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FWY
 P.O. BOX 2291, HOUSTON, TX 77001-2291.

ALTERNATE SOURCES:

OTECO EQUIPMENT COMPANY REFLANGE, INC.
 2811 TROUT STREET 5730 CENTRALCREST
 P.O. BOX 1849 HOUSTON, TX 77092
 HOUSTON, TX 77251-1849

REVISED: (E) CHANGED APPROVED SOURCE. 10-2-92

APPROVED: 9-19-67

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	STANDARD PART KC162
COORDINATION STATUS	RING, PIPE HUB SEAL
KSC DE	SHEET 1 OF 2



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY FOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.	RING SIZE	DIMENSIONS					GRAYLOC STK NO.	GRAYLOC STK NO.	GRAYLOC STK NO.
		A	C	D	E	F			
1	4	.500	1.000	.375	.125	.125	50554	50800	51230
2	5	.625	1.094	.375	.125	.125	50563	50801	51231
3	7	.906	1.375	.375	.125	.125	50701	50802	51232
4	11	1.125	1.734	.375	.125	.125	50551	50803	51233
5	13	1.500	2.375	.375	.125	.125	50698	50837	51234
6	14	1.610	2.625	.563	.250	.156	50553	50804	51235
7	20	2.063	3.250	.750	.250	.250	50557	50807	51236
8	25	2.672	4.000	.750	.250	.250	50570	50810	51237
9	27	3.063	4.250	.750	.250	.250	50622	50811	51238
10	31	3.250	4.500	.750	.250	.250	50561	50812	51239
11	34	3.688	5.000	.750	.250	.250	50562	50813	51240
12	40	4.063	5.500	1.000	.250	.375	66240	50814	51241
13	46	4.750	6.188	1.000	.250	.375	66041	66376	51245
14	52	5.313	6.625	1.000	.250	.375	50623	50815	51242
15	62	6.065	7.875	1.375	.375	.500	50566	50816	51243
16	23	2.375	3.500	.750	.250	.250	50569	66375	66175

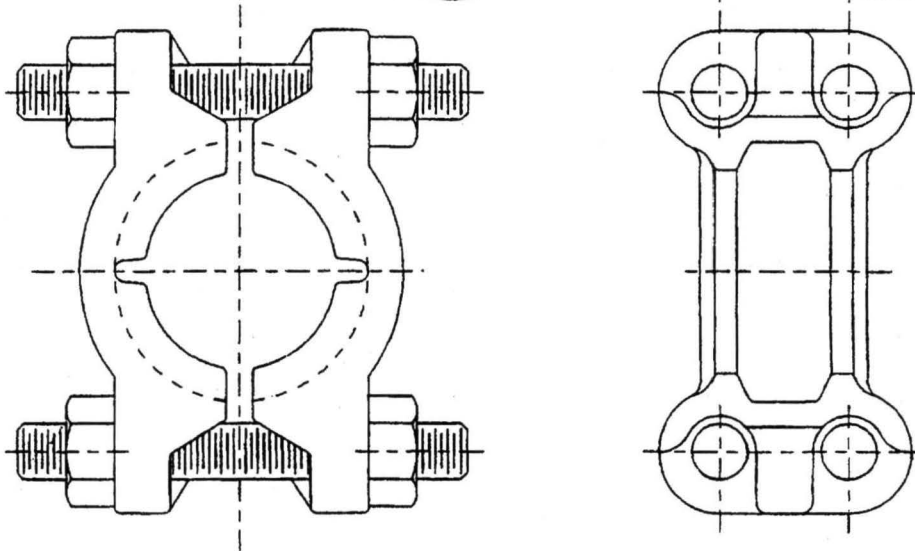
REVISED: (F) CHANGED APPROVED SOURCE ON SHEET 1.10-2-92

APPROVED: 9-19-67

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	RING, PIPE HUB SEAL
COORDINATION STATUS	
KSC DE	STANDARD PART KC162
	SHEET 2 OF 2



FED SUP CLASS
NONE



GENERAL NOTES:

1. A COMPLETE KC163 PIPE CONNECTION ASSEMBLY CONSISTS OF THE FOLLOWING COMPONENTS:
 (A) TWO KC HUBS OR A COMBINATION HUB AND FITTING.
 (B) ONE KC162 SEAL RING.
 (C) ONE KC155 CLAMP ASSEMBLY, 4 BOLT, OR 2 BOLT.
2. EXTREME CAUTION SHOULD BE EXERCISED TO PREVENT TIGHTENING OF THE STUD BOLTS WHILE THE ASSEMBLY IS UNDER PRESSURE OR MECHANICAL LOADS.
3. SPECIAL CARE SHOULD BE EXERCISED DURING ASSEMBLY OF THE CONNECTION SO THAT NO DAMAGE OCCURS TO THE SEALING SURFACES.
4. NO WELDING IS RECOMMENDED ON THE CLAMPS OR SEAL RINGS. THE SEAL SURFACE OF THE KC HUBS SHOULD BE PROTECTED DURING WELDING TO AVOID WELD SPLATTER AND OTHER DAMAGE. DURING STRESS RELIEVING THE SEAL SURFACES OF THE CARBON STEEL HUBS SHOULD BE PROTECTED AGAINST SCALING WITH A HIGH TEMPERATURE GRAPHITE PASTE, SIMILAR TO KEY- PASTE.
5. THIS IS A DESIGN STANDARD AND SHALL NOT BE USED AS A PART NUMBER.
6. GRAYLOC SIZES 1/2GR4/5, 3/4GR4/5, 1GR11, 1-1/4GR14, AND 1-1/4GR11 ARE NOT TO BE USED FOR NEW DESIGN.

ASSEMBLY NOTES:

1. ALL PROTECTIVE COATINGS AND FOREIGN MATTER MUST BE CLEANED FROM ALL SEALING SURFACES BEFORE INSTALLATION.
2. KC CONNECTIONS SHALL BE MADE UP WITH NO LUBRICATION APPLIED TO HUBS, FITTINGS, SEAL RINGS OR CLAMPS. LUBRICATION SHALL BE APPLIED TO BOLTS ONLY. CARE SHALL BE TAKEN TO PREVENT LUBE FROM ENTERING CONNECTION.
3. THE HUBS SHOULD BE ALIGNED BEFORE ASSEMBLY TO THE EXTENT THAT THE CLAMP SEGMENTS CAN PULL THE MATING HUBS UNIFORMLY AGAINST THE RING RIB USING THE RECOMMENDED BOLT PRELOAD SHOWN IN TABLE 1.
4. WHEN TIGHTENING, THE SPACING BETWEEN THE CLAMP EARS SHOULD BE APPROXIMATELY THE SAME.
5. TO PROPERLY PRELOAD THE KC CONNECTION AGAINST FLUID PRESSURE AND GASKET LOADS, THE FOLLOWING TORQUE VALUES ARE RECOMMENDED FOR THE VARIOUS SIZES OF STUDS AS LISTED IN TABLE 1 FOR APPROXIMATELY 20,000 PSI TENSILE STRESS IN THE STUDS.
6. THE TORQUE VALUES LISTED IN TABLE 1 ARE FOR WELL LUBRICATED STUDS ONLY.

APPROVED: 9-14-67 REVISED: (C) REV & REDRAWN 8-1-90

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		DESIGN STANDARD
PROCUREMENT SPEC. NONE	PIPE CONNECTION ASSY INSTALLATION OF	KC163
COORDINATION STATUS KSC DE		SHEET 1 OF 3



FED SUP CLASS
NONE

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THERE TO.

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PIPE SIZE (IN.)	SCHEDULE	HUB SIZE	KC159 BUTTWELD HUB	KC160 BLIND HUB	KC162 SEAL RING	KC156 ELBOW	KC157 TEE	KC158 CROSS	KC155 CLAMP
1/2	40	1/2GR5	-1	-2	-2	-1	-1	-1	-1
	80								
	160	1/2GR4		-1	-1	-2	-2	-2	
	XXS								
3/4	160	3/4GR5	-2	-2	-2	-3	-3	-3	-1
	XXS	3/4GR4							
1	ALL	1GR11	-3	-3	-4	-5	-5	-5	-2
1/2	40	1GR5	-13	-19	-2	-22	-22	---	-8
	80								
	160	1GR4		-18	-1	-21	-21	---	
	XXS								
3/4	40	1GR7	-14	-20	-3	-23	-23	---	-8
	80								
	160	1GR5		-19	-2	-22	-22	---	
	XXS								
1	40	1GR11	-15	-21	-4	-24	-24	---	-6
	80								
	160	1GR7		-20	-3	-23	-23	---	
	XXS								
1/4	40	1-1/4GR14	-4	-4	-6	-6	-6	-6	-2
	80								
	160	1-1/4GR11		-3	-4	-5	-5	-5	
	XXS								
1 1/2	ALL	1-1/2GR14	-5	-4	-6	-6	-6	-6	-2
2	40	2GR20	-6	-6	-7	-7	-7	-7	-3
	80								
	160	2GR14		-5	-6	-8	-8	-8	
	XXS								
2 1/2	40	2-1/2GR25	-7	-8	-8	-9	-9	-9	-4
	80								
	160	2-1/2GR20		-7	-7	-10	-10	-10	
	XXS								
3	40	3GR27	-8	-9	-9	-11	-11	-11	-4
	80								
	160	3GR25		-8	-8	-12	-12	-12	
	XXS								

APPROVED: 9-14-67
 REVISED: (C) REV & REDRAWN 8-1-90

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		DESIGN STANDARD
PROCUREMENT SPEC. NONE	PIPE CONNECTION ASSY INSTALLATION OF	KC163
COORDINATION STATUS KSC DE		SHEET 2 OF 3



FED SUP CLASS
NONE

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

PIPE SIZE (IN.)	SCHEDULE	HUB SIZE	KC159 BUTTWELD HUB	KC160 BLIND HUB	KC162 SEAL RING	KC156 ELBOW	KC157 TEE	KC158 CROSS	KC155 CLAMP
3 1/2	40	4GR34	-9	-11	-11	-14	-14	-14	-5
	80			-10	-10	-15	-15	-15	
	XXS	4GR31							
4	40	4GR40	-10	-12	-12	-13	-13	-13	-5
	80	4GR34		-11	-11	-14	-14	-14	
	160	4GR31		-10	-10	-15	-15	-15	
	XXS	4GR31							
5	40	5GR52	-11	-13	-14	-16	-16	-16	-6
	80	5GR46		-14	-13	-17	-17	-17	
	160	5GR40		-15	-12	-18	-18	-18	
	XXS	5GR40							
6	40	6GR62	-12	-17	-15	-19	-19	-19	-7
	80	6GR52		-16	-14	-20	-20	-20	
	160	6GR52							
	XXS	6GR52							

TABLE I

KC155 CLAMP ASSEMBLY, 4 BOLT

TORQUE REQUIREMENTS	
STUD SIZE	TORQUE RANGE (FT LBS)
1/2	15-20
3/8	30-40
1/4	50-65
3/16	80-105
1	120-165
1 1/8	180-235

TABLE II

KC155 CLAMP ASSEMBLY, 2 BOLT

TORQUE REQUIREMENTS	
STUD SIZE	TORQUE RANGE (FT LBS)
3/8	6-8

ABOVE VALUES ARE FOR LUBRICATED STUDS

REVISED: (C) REV & REDRAWN 8-1-90

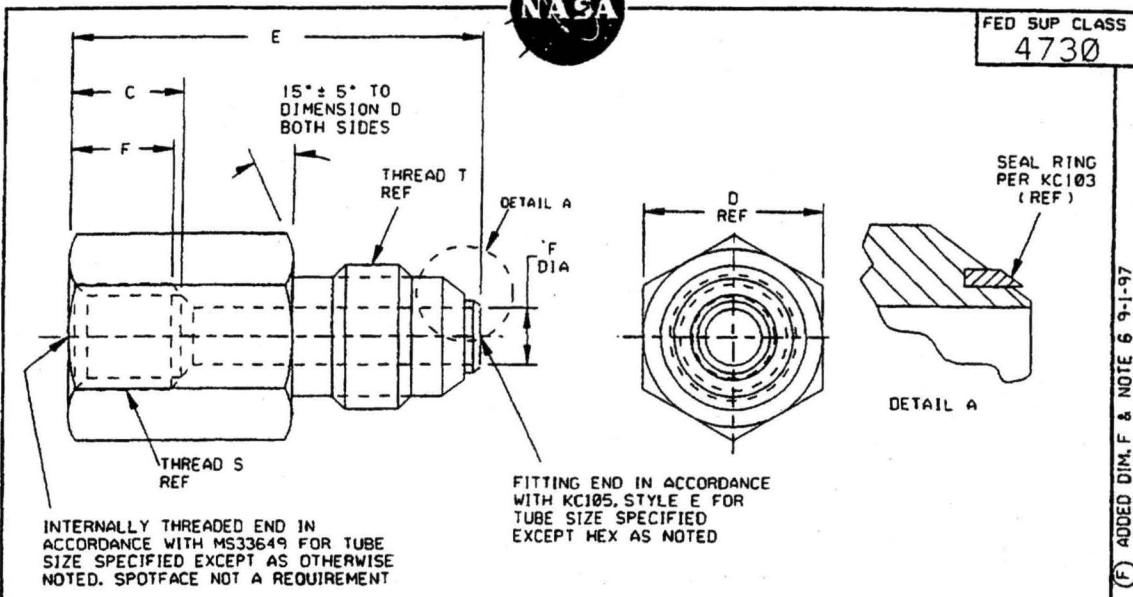
APPROVED: 9-14-67

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	DESIGN STANDARD KC163
COORDINATION STATUS KSC DE	SHEET 3 OF 3

PIPE CONNECTION ASSY
INSTALLATION OF



FED SUP CLASS
4730



INTERNALLY THREADED END IN ACCORDANCE WITH MS33649 FOR TUBE SIZE SPECIFIED EXCEPT AS OTHERWISE NOTED. SPOTFACE NOT A REQUIREMENT

FITTING END IN ACCORDANCE WITH KC105, STYLE E FOR TUBE SIZE SPECIFIED EXCEPT HEX AS NOTED

DASH NO.		INTERNALLY THREADED END				EXTERNALLY THREADED END		D HEX	E +.000 -.032	F DIA		
CRES STEEL	AL ALLOY	TUBE OD	THREAD S REF	C ±.016	F DIA 6	TUBE OD	THREAD T REF					
K4-8	D4-8	¼	7/16-20	.609	.493	½	3/4-16	1.000	1.016	.172	±.003 -.004	
K6-12	D6-12	⅜	9/16-18		.482	¾	1-1/16-12			1.375		1.266
K8-12	D8-12	½	3/4-16	.734	.593			1	1-5/16-12		1.625	±.016
K8-16	D8-16			.593		1.688						
K12-16	D12-16	¾	1-1/16-12	.922	.656			1.922	.609	±.005		

MATERIAL: SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2024-16, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X"

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

F MIN IS THE FULL THREAD DEPTH REQUIREMENTS

EXAMPLE OF PART NOS.
 KC164K4-8 = BUSHING; ¼" TUBING, FOR INTERNAL THREADS, AND ½" TUBING, FOR EXTERNAL THREADS; CORROSION RESISTANT STEEL
 KC164D6-12 = BUSHING; ⅜" TUBING, FOR INTERNAL THREADS, AND ¾" TUBING, FOR EXTERNAL THREADS; ALUMINUM ALLOY

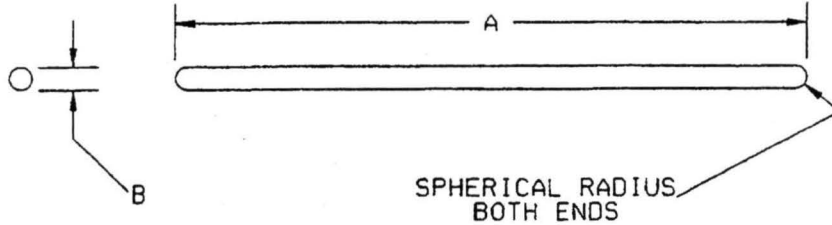
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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	BUSHING - SCREW THREAD REDUCER FOR SEAL RING	KC164
COORDINATION STATUS KSC DE		SHEET 1 OF 1

APPROVED: 4-12-66
 REVISED: (D) 8-1-90 (E) DASH NUMBER CHANGE 1-2-91 (F) ADDED DIM. F & NOTE 6 9-1-97



FED SUP CLASS
NONE



DASH NO.	TUBE OD REF	A DIM ±.016	B DIA (STOCK TOLERANCES)
-4	¼	1.094	.080
-6	⅜	1.453	
-8	½	2.000	
-10	⅝	2.326	.091
-12	¾	2.859	
-16	1	3.750	
-20	1¼	4.750	
-24	1½	5.500	
-28	1¾	6.750	.125
-32	2	7.500	

MATERIAL: CORROSION RESISTANT STEEL WIRE, TYPE 302, 304, OR 305 PER ASTM A580 ANNEALED

FINISH: NONE

CODE: NONE

- NOTES:
1. DIMENSIONS ARE IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 2. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS SPECIFIED HEREIN.
 3. REFERENCE DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON DATE OF INVITATION FOR BID.

EXAMPLE OF PART NUMBER: KC165-4 = RETAINING WIRE FOR ¼" OD TUBE SWIVEL FITTING.

REVISED: (E) REV & REDRAWN 8-1-90

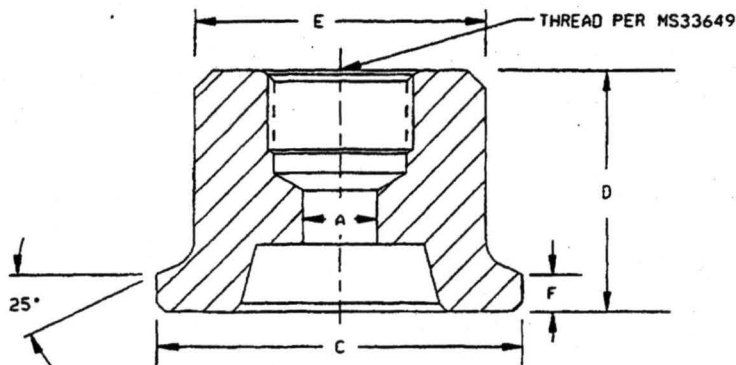
APPROVED: 12-1-75

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. NONE	WIRE, RETAINING SWIVEL NUT	KC165
COORDINATION STATUS KSC DE		SHEET 1 OF 1

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



FED SUP CLASS
4730



MATERIAL CODE: ADD A AFTER DASH NO. TO DENOTE SA-105-GR11.
ADD B AFTER DASH NO. TO DENOTE SA-182-F316.

TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.

- NOTES:
- ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 - ALL DIMENSIONS ARE IN INCHES.
 - TOLERANCE: SEE KC161.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - HUB PRESSURE RATING IS THE LOWER OF EITHER THE VENDOR'S PRESSURE LIMIT ON THE HUB OR KSC'S PRESSURE LIMIT ON THE FITTING WHICH SCREWS INTO THE THREADED HOLE.
 - THIS SIZE IS NOT TO BE USED FOR NEW DESIGN. SEE KC167 FOR NEW DESIGN.
 - DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 - ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS. BASIC PART NUMBER KC166-3A



APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY 10777 NW FWY
P.O. BOX 2291, HOUSTON, TX 77001-2291.

ALTERNATE SOURCES: OTECO EQUIPMENT COMPANY REFLANGE, INC.
2811 TROUT STREET 5730 CENTRALCREST
P.O. BOX 1849 HOUSTON, TX 77092
HOUSTON, TX 77251-1849

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISED: (C) CHANGED APPROVED SOURCE. 10-2-92
APPROVED: 2-6-76

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	STANDARD PART KC166
COORDINATION STATUS KSC DE	HUB, TAPPED BLIND
	SHEET 1 OF 2



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.	HUB SIZE	MS33649 THREAD SIZE	OPERATING PRESSURE RATING (PSIG)		DIMENSIONS						MATERIAL CODE		
			-A	-B	A	C	D	E	F	-A SA-105 GR11	-B SA-182 F-316		
-1		-4	9600	9600	.172							1-4708-1	1-4709-1
-2		-6	6900	6900	.297							1-4708-5	1-4709-5
-3	IGR4	-8	7400	7400	.391							1-4708-9	1-4709-9
-4		-12	6500	6500								1-4708-13	1-4709-13
-5		-4	9600	9600	.172							1-4708-2	1-4709-2
-6		-6	6900	6900	.297							1-4708-6	1-4709-6
-7	IGR5	-8	7400	7400	.391							1-4708-10	1-4709-10
-8		-12	6500	6500								1-4708-14	1-4709-14
-9		-4	8784	8180	.172	2.000	1.750	1.500		.313		1-4708-3	1-4709-3
-10		-6	6900	6900	.297							1-4708-7	1-4709-7
-11	IGR7	-8	7400	7400	.391							1-4708-11	1-4709-11
-12		-12	6500	6500								1-4708-15	1-4709-15
-13		-4	4264	4340	.172							1-4708-4	1-4709-4
-14		-6	4264	4340	.297							1-4708-8	1-4709-8
-15	IGR11	-8	4264	4340	.391							1-4708-12	1-4709-12
-16		-12	4264	4340								1-4708-16	1-4709-16

CUSTOMER: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC. NONE

COORDINATION STATUS HUB, TAPPED BLIND

KSC DE

STANDARD PART KC166

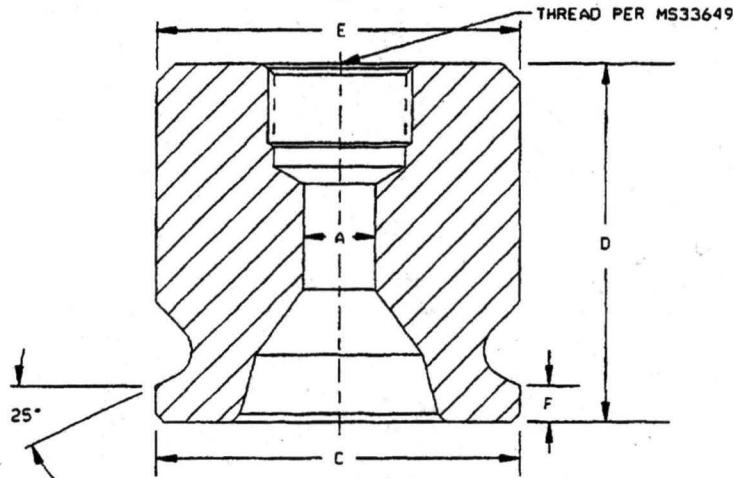
SHEET 2 OF 2

APPROVED: 2-6-76

REVISED: (C) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92



FED SUP CLASS
4730



MATERIAL CODE: ADD A AFTER DASH NO. TO DENOTE SA-105-GR11.
ADD B AFTER DASH NO. TO DENOTE SA-182-F316.

TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.

- NOTES:
1. ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 2. ALL DIMENSIONS ARE IN INCHES.
 3. TOLERANCE: SEE KC161.
 4. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 5. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 6. HUB PRESSURE RATING IS THE LOWER OF EITHER THE VENDOR'S PRESSURE LIMIT ON THE HUB OR KSC'S PRESSURE LIMIT ON THE FITTING WHICH SCREWS INTO THE THREADED HOLE.
 7. SEE KC166 FOR PREFERRED CONFIGURATION OF HUBS TAPPED WITH THREAD SIZES MS33649-4, -6, -8.
 8. DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 9. ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS. BASIC PART NUMBER KC167-3A

MATERIAL CODE
DASH NUMBER

APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FWY
P.O. BOX 2291, HOUSTON, TX 77001-2291.

ALTERNATE SOURCES: OTECO EQUIPMENT COMPANY 2811 TROUT STREET P.O. BOX 1849 HOUSTON, TX 77251-1849
REFLANGE, INC. 5730 CENTRALCREST HOUSTON, TX 77092

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
NONE
COORDINATION STATUS
KSC DE

HUB, TAPPED

STANDARD PART

KC167

SHEET 1 OF 3

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT RECORDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

REVISED: (C) CHANGED APPROVED SOURCE. 10-2-92

APPROVED: 2-6-76



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.	HUB SIZE	MS33649 THREAD SIZE	OPERATING PRESSURE RATING (PSIG)		DIMENSIONS					MATERIAL CODE		
			MAT'L CODE		A	C	D	E	F	-A	-B	
			-A	-B						SA-105 GRII	SA-182 F-316	
										GRAYLOC STK NO.	GRAYLOC STK NO.	
-1	IGR4	-4	9600	9600	.172						1-4695-7	1-4725-7
-2		-6	6900	6900	.297						1-4695-1	1-4725-1
-3		-8	7400	7400	.391						1-4695-3	1-4725-3
-4		-12	6500	6500	.500						1-4695-5	1-4725-5
-5		-16	5300	5300	.500						1-4695-21	1-4725-21
-6	IGR5	-4	9600	9600	.172	2.000	3.000	2.000	.313	1-4695-8	1-4725-8	
-7		-6	6900	6900	.297					1-4695-2	1-4725-2	
-8		-8	7400	7400	.391					1-4695-4	1-4725-4	
-9		-12	6500	6500	.609					1-4695-6	1-4725-6	
-10		-16	5300	5300	.625					1-4695-22	1-4725-22	
-11	IGR7	-4	8784	8180	.172					1-4695-9	1-4725-9	
-12		-6	6900	6900	.297					1-4695-11	1-4725-11	
-13		-8	7400	7400	.391					1-4695-13	1-4725-13	
-14		-12	6500	6500	.609					1-4695-19	1-4725-19	
-15		-16	5300	5300	.844					1-4695-23	1-4725-23	
-16	IGR11	-4	4264	4340	.172					1-4695-10	1-4725-10	
-17		-6	4264	4340	.297					1-4695-12	1-4725-12	
-18		-8	4264	4340	.391					1-4695-14	1-4725-14	
-19		-12	4264	4340	.609					1-4695-20	1-4725-20	
-20		-16	4264	4340	.844					1-4695-24	1-4725-24	
-21	1 1/2 GR14	-4	6547	6040	.172	3.125	3.250	3.125	.437	1-4695-25	1-4725-25	
-22		-6	6547	6040	.297					1-4695-26	1-4725-26	
-23		-3	6547	6040	.391					1-4695-27	1-4725-27	
-24		-12	6500	6040	.609					1-4695-29	1-4725-29	
-25		-16	5300	5300	.844					1-4695-30	1-4725-30	

APPROVED: 2-6-76
 REVISED: C CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. NONE	HUB, TAPPED
COORDINATION STATUS KSC DE	
STANDARD PART KC167	
SHEET 2 OF 3	



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY MANNER SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED AS IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY BE RELATED THERETO.

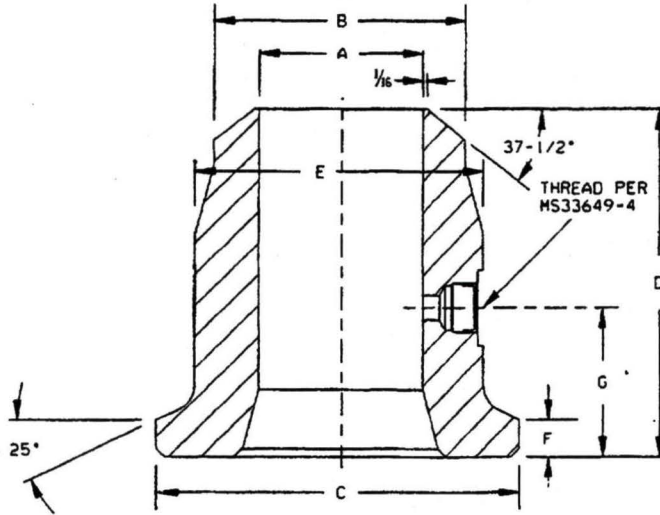
DASH NO.	HUB SIZE	MS33649 THREAD SIZE	OPERATING PRESSURE RATING (PSIG)		DIMENSIONS					MATERIAL CODE	
			MAT'L CODE		A	C	D	E	F	-A	-B
			-A	-B						SA-105 GR11	SA-182 F-316
									GRAYLOC STK NO.	GRAYLOC STK NO.	
-26	2GR20	-4	4870	4640	.172	3.625	3.500	3.625	.437	I-4695-31	I-4725-31
-27		-6	4870	4640	.297					I-4695-32	I-4725-32
-28		-8	4870	4640	.391					I-4695-33	I-4725-33
-29		-12	4870	4640	.609					I-4695-35	I-4725-35
-30		-16	4870	4640	.844					I-4695-36	I-4725-36
-31		-20	4870	4640	1.078					I-4695-55	I-4725-55
-32		-24	4600	4600	1.312					I-4695-56	I-4725-56
-33		-32	4600	4600	1.781					I-4695-58	I-4725-58
-34	2 1/2- 3GR25	-4	6617	6000	.172	5.000	4.250	5.000	.500	I-4695-37	I-4725-37
-35		-6	6617	6000	.297					I-4695-38	I-4725-38
-36		-8	6617	6000	.391					I-4695-39	I-4725-39
-37		-12	6500	6000	.609					I-4695-41	I-4725-41
-38		-16	5300	5300	.844					I-4695-42	I-4725-42
-39		-20	5200	5200	1.078					I-4695-59	I-4725-59
-40		-24	4600	4600	1.312					I-4695-60	I-4725-60
-41		-32	4600	4600	1.781					I-4695-62	I-4725-62
-42	4GR31	-4	7969	7120	.172	6.000	5.000	6.000	.500	I-4695-43	I-4725-43
-43		-6	6900	6900	.297					I-4695-44	I-4725-44
-44		-8	7400	7120	.391					I-4695-45	I-4725-45
-45		-12	6500	6500	.609					I-4695-47	I-4725-47
-46		-16	5300	5300	.844					I-4695-48	I-4725-46
-47		-20	5200	5200	1.078					I-4695-63	I-1725-63
-48		-24	4600	4600	1.312					I-4695-64	I-4725-64
-49		-32	4600	4600	1.781					I-4695-66	I-4725-66
-50	6GR52	-4	5944	5080	.172	9.250	5.500	9.250	.812	I-4695-49	I-4725-49
-51		-6	5944	5080	.297					I-4695-50	I-4725-50
-52		-8	5944	5080	.391					I-4695-51	I-4725-51
-53		-12	5944	5080	.609					I-4695-53	I-4725-53
-54		-16	5300	5080	.844					I-4695-54	I-4725-54
-55		-20	5200	5080	1.078					I-4695-67	I-4725-67
-56		-24	4600	4600	1.312					I-4695-68	I-4725-68
-57		-32	4600	4600	1.781					I-4695-70	I-4725-70

REVISED: (C) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92
APPROVED: 2-6-76

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. NONE	HUB, TAPPED	KC167
COORDINATION STATUS KSC DE		SHEET 3 OF 3



FED SUP CLASS
4730



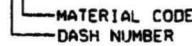
NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

MATERIAL CODE: ADD A AFTER DASH NO. TO DENOTE SA-105-GR11.
ADD B AFTER DASH NO. TO DENOTE SA-182-F316.

TEMPERATURE RANGE: SEE MATERIAL SPECIFICATION.

- NOTES:
1. ALL MATERIALS ARE PER ASTM SPECIFICATIONS
 2. ALL DIMENSIONS ARE IN INCHES.
 3. TOLERANCE: SEE KC161.
 4. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 5. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 6. HUB PRESSURE RATING IS THE LOWER OF EITHER THE VENDOR'S PRESSURE LIMIT ON THE HUB OR KSC'S PRESSURE LIMIT ON THE FITTING WHICH SCREWS INTO THE THREADED HOLE.
 7. THIS PIPE SIZE DOES NOT HAVE A STANDARD VENDOR HUB.
 8. DO NOT USE THIS STANDARD FOR ITEMS WHICH CANNOT BE IDENTIFIED BY THE LIMITATIONS CONTAINED HEREIN.
 9. ALL PARTS NOT MANUFACTURED BY GRAY TOOL CO. MUST BE CERTIFIED BY THE MANUFACTURER TO BE INTERCHANGEABLE WITH THE GRAY TOOL PART NUMBER.

EXAMPLE OF PART NOS. BASIC PART NUMBER KC168-3A



APPROVED SOURCE: COMMERCIAL PARTS CAN BE PURCHASED FROM: VETCO-GRAY INC. 10777 NW FW P.O. BOX 2291, HOUSTON, TX 77001-2291.

ALTERNATE SOURCES: OTECO EQUIPMENT COMPANY 2811 TROUT STREET P.O. BOX 1849 HOUSTON, TX 77251-1849
REFLANGE, INC. 5730 CENTRALCREST HOUSTON, TX 77092

REVISED: ① CHANGED APPROVED SOURCE. 10-2-92

APPROVED: 2-6-76

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. NONE	HUB, PRESSURE TAPPED	KC168	
COORDINATION STATUS KSC DE		SHEET 1 OF 3	



FED SUP CLASS
4730

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DASH NO.	PIPE SIZE	PIPE SCHED.	HUB SIZE	OPERATING PRESSURE RATING (PSIG)		DIMENSIONS							MATERIAL CODE				
				MAT'L CODE		A	B	C	D	E	F	G	-A SA-105 GR11	-B SA-182 F-316			
				-A	-B								GRAYLOC STK NO.	GRAYLOC STK NO.			
-1	1/2	40	1GR5	9600	9600	.622	.840							I-4839-A1	I-4839-B1		
-2		80				.546								I-4839-A2	I-4839-B2		
-3		160	.466			I-4839-A3								I-4839-B3			
-4		XXS	.252			I-4839-A4								I-4839-B4			
-5	3/4	40	1GR7	8784	8180	.824	1.050	2.000		2.688	.313	2.188		I-4839-A5	I-4839-B5		
-6		80				.742								I-4839-A6	I-4839-B6		
-7		160	1GR4			.614								I-4839-A7	I-4839-B7		
-8		XXS	1GR5			.434								I-4839-A8	I-4839-B8		
-9	1	40	1GR11	4211	4340	1.049	1.315		4.313					I-4839-A9	I-4839-B9		
-10		80				.957								I-4839-A10	I-4839-B10		
-11		160	1GR7			.815								I-4839-A11	I-4839-B11		
-12		XXS	1GR5			.599								I-4839-A12	I-4839-B12		
-13	1 1/2	40	1 1/2 GR14	6547	6040	1.610	1.900	3.125		3.250		2.313		I-4839-A17	I-4839-B17		
-14		80				1.500								I-4839-A18	I-4839-B18		
-15		160				1.338								I-4839-A19	I-4839-B19		
-16		XXS				1.100								I-4839-A20	I-4839-B20		
-17	2	40	2GR20	4870	4640	2.067	2.375	3.625	4.500	3.688				I-4839-A21	I-4839-B21		
-18		80				1.939								I-4839-A22	I-4839-B22		
-19		160				1.689								I-4839-A23	I-4839-B23		
-20		XXS				2GR14								9600	9600	1.503	I-4839-A24
-21	2 1/2	40	2 1/2-3GR25	6617	6000	2.469	2.875	5.000	5.000	5.000	.500	2.375		I-4839-A25	I-4839-B25		
-22		80				2.323								I-4839-A26	I-4839-B26		
-23		160	2 1/2-3GR20			9600								9600	2.125	I-4839-A27	I-4839-B27
-24		XXS	1.771			I-4839-A28								I-4839-B28			
-25	3	40	2 1/2-3GR27	3635	3480	3.068	3.500	5.000	5.000	5.000	.500			I-4839-A29	I-4839-B29		
-26		80				2.900								I-4839-A30	I-4839-B30		
-27		160	2 1/2-3GR25			6617								6000	2.626	I-4839-A31	I-4839-B31
-28		XXS	2.300			I-4839-A32								I-4839-B32			
-29	3 1/2	40	4GR34	4637	4340	3.548	4.000	6.000	5.375	6.000	.500	2.688		I-4839-A33	I-4839-B33		
-30		80				3.364								I-4839-A34	I-4839-B34		
-31		XXS				4GR27								2.728	I-4839-A35	I-4839-B35	

REVISED: (D) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92

APPROVED: 2-6-76

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC.	HUB, PRESSURE TAPPED	STANDARD PART	
NONE		KC168	
COORDINATION STATUS		SHEET 2 OF 3	
KSC DE			



FED SUP CLASS
4730

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DASH NO.	PIPE SIZE	PIPE SCHED.	HUB SIZE	OPERATING PRESSURE RATING (PSIG)		DIMENSIONS							MATERIAL CODE									
				MAT'L CODE		A	B	C	D	E	F	G	-A	-B								
				-A	-B								SA-105 GR11	SA-182 F-316								
				GRAYLOC STK NO.	GRAYLOC STK NO.																	
-32	4	40	4GR40	2493	2460	4.026	4.500	6.000	5.000	6.000	.500	2.688	I-4839-A36	I-4839-B36								
-33		80			3.826														I-4839-A37	I-4839-B37		
-34		160	4GR34	4637	4340	3.438															I-4839-A38	I-4839-B38
-35		XXS	4GR31	7969	7120	3.152																I-4839-A39
-36	5	40	5GR52	2703	2580	5.047	5.563	7.500	5.250	7.500	.625	2.938	I-4839-A40	I-4839-B40								
-37		80				4.813																I-4839-A41
-38		160	5GR46	5149	4720	4.313															I-4839-A42	I-4839-B42
-39		XXS	5GR40	7839	6700	4.063																I-4839-A43
-40	6	40	6GR62	3192	2960	6.065	6.625	9.250	6.000	9.250	.750	3.250	I-4839-A44	I-4839-B44								
-41		80				5.761																
-42		160	6GR52	5944	5080	5.189															I-4839-A46	I-4839-B46
-43		XXS				4.897																I-4839-A47

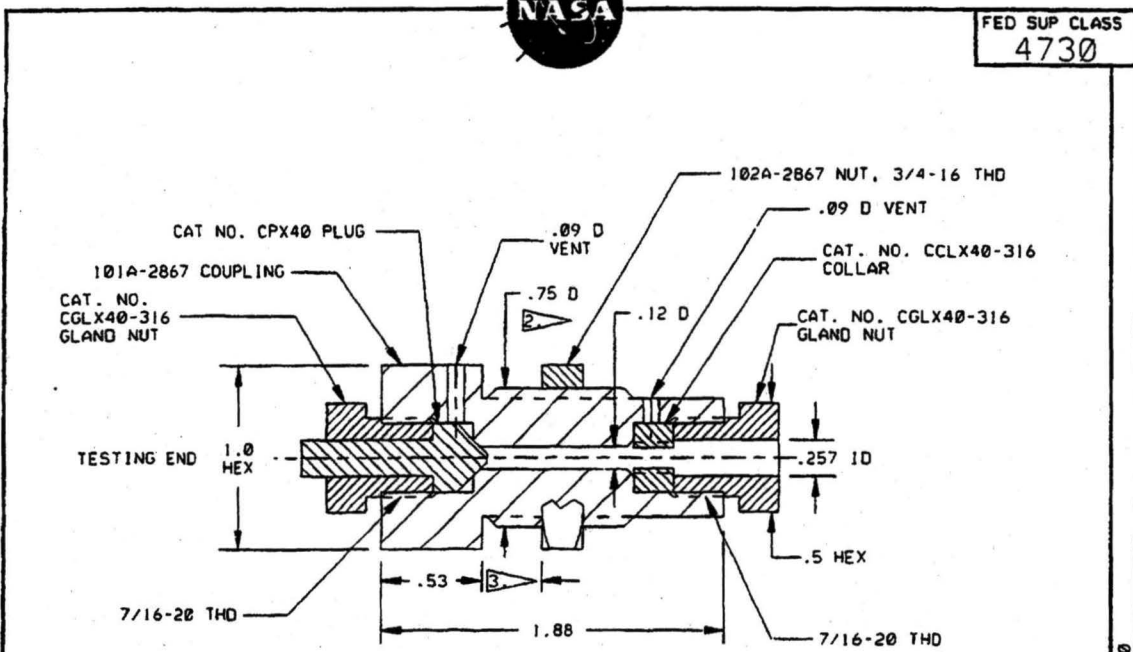
REVISED: (D) CHANGED APPROVED SOURCE ON SHEET 1. 10-2-92
APPROVED: 2-6-76

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC.	HUB, PRESSURE TAPPED	STANDARD PART	
NONE		KC168	
COORDINATION STATUS		SHEET 3 OF 3	
KSC DE			



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



- MATERIAL:** ALL MATERIAL SHALL BE CLASS 316 STAINLESS STEEL.
- FINISH:** PASSIVATE.
- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. ALL DIMENSIONS ARE REFERENCE ONLY.
 3. 1/8 D HOLE REQUIRED FOR PANEL MOUNTING.
 4. 0.38 MAXIMUM PANEL THICKNESS.
 5. TORQUE GLAND NUTS TO 20 FT LBS.
 6. CONFIGURATION SHOWN IS THAT OF TEST PORT BUT ASSEMBLY MAY BE USED AS HIGH PRESSURE BULKHEAD COUPLING.
 7. WHEN COUPLING IS USED AS TEST PORT, FLUID PRESSURE IS BLED DOWN THRU VENT BY LOOSENING GLAND NUT NOT MORE THAN ONE TURN.
 8. ASSEMBLY WEIGHT FOR KC169 IS APPROXIMATELY 0.30 LBS.
 9. COUPLING ASSEMBLY IS SIMILAR TO AUTOCLAVE ENGINEERS INCLUDING CATALOG NO. 20BFX4466-316 EXCEPT FOR PLUG. THIS STANDARD INCLUDES ALL PARTS ILLUSTRATED ABOVE.
- USE LIMITS:**
1. 20,000 PSIG MAXIMUM PRESSURE.
 2. TO BE USED WITH 1/4" X .109 STAINLESS STEEL TUBING.
- SUGGESTED SOURCE:** COMMERCIAL PARTS CAN BE PURCHASED FROM AUTOCLAVE ENGINEERS, 2930 WEST 22ND STREET, P. O. BOX 4007, ERIE, PA 16512

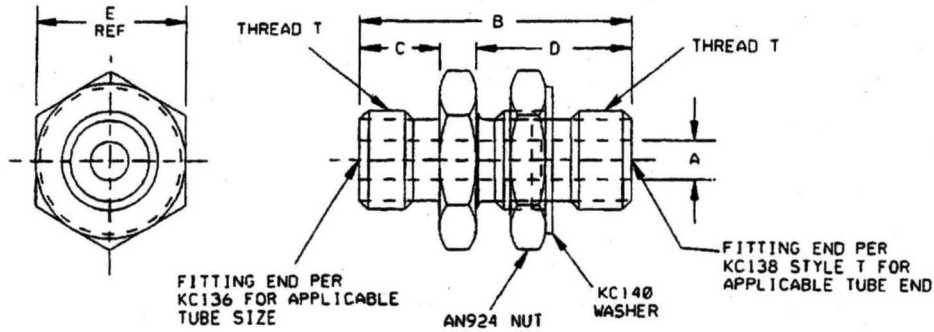
REVISED: (A) REV & REDRAWN 8-1-90

APPROVED: 7-13-76

CUSTODIAN:		JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC.	NONE	COUPLING ASSEMBLY, BLKHD SUPER PRESSURE PORT	
COORDINATION STATUS			
KSC DE		STANDARD PART	KC169
		SHEET 1 OF 1	



FED SUP CLASS
4730



NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO.		TUBE OD REF	THREAD T REF	A REF	B +.000 -.060	C REF	D REF	E REF	BULKHEAD NUT		WASHER	
CRE STEEL	AL ALLOY								FOR CRE STEEL ASSY *	FOR AL ALLOY ASSY	FOR CRE STEEL ASSY	FOR AL ALLOY ASSY
K4	D4	1/4	7/16-20	.172	1.252	.389	.703	.688	AN924-K4	AN924-D4	KC140C4	KC140D4
K6	D6	3/8	9/16-18	.297	1.436	.420	.766	.813	AN924-K6	AN924-D6	KC140C6	KC140D6
K8	D8	1/2	3/4-16	.391	1.636	.521	.875	1.000	AN924-K8	AN924-D8	KC140C8	KC140D8
K10	D10	5/8	7/8-14	.484	1.873	.567	1.016	1.125	AN924-K10	AN924-D10	KC140C10	KC140D10
K12	D12	3/4	1-1/16-12	.609	2.172	.636	1.156	1.375	AN924-K12	AN924-D12	KC140C12	KC140D12
K16	D16	1	1-5/16-12	.844	2.208	.672		1.625	AN924-K16	AN924-D16	KC140C16	KC140D16
K20	D20	1 1/4	1-5/8-12	1.078	2.208	.672		1.875	AN924-K20	AN924-D20	KC140C20	KC140D20
K24	D24	1 1/2	1-7/8-12	1.312	2.256	.720		2.125	AN924-K24	AN924-D24	KC140C24	KC140D24
K28	D28	1 3/4	2-1/4-12	1.547	2.308	.772		2.500	AN924-K28	AN924-D28	KC140C28	KC140D28
K32	D32	2	2-1/2-12	1.781	2.423	.887		2.750	AN924-K32	AN924-D32	KC140C32	KC140D32

MATERIAL: SEE PROCUREMENT SPECIFICATION.
 ALUMINUM ALLOY, 2014-T6, CODE "D"
 CORROSION RESISTANT STEEL (CLASS 316), CODE "K" (WAS CODE "C")
 *AN924 CRES NUTS MAY BE EITHER 304, CODE "J" OR 316, CODE "K".

FINISH: SEE PROCUREMENT SPECIFICATION.
 SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 - DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 - FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 - MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

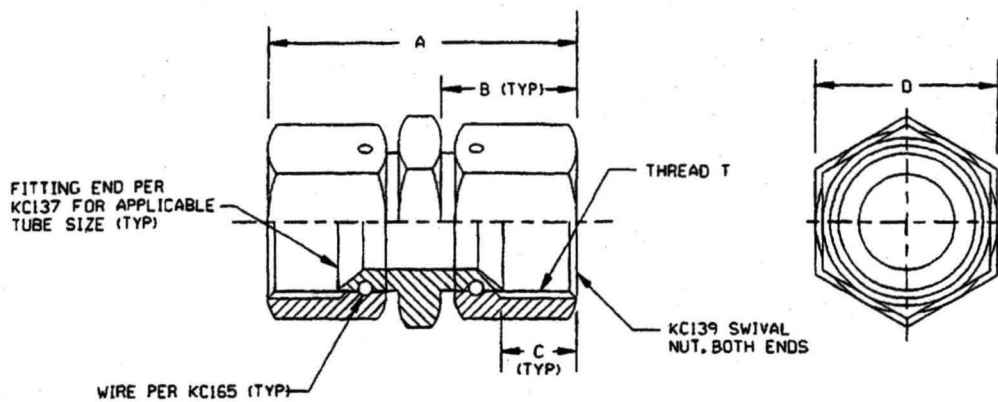
EXAMPLE OF PART NOS. KC170K8 = UNION, ADJUSTABLE END, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC170D12 = UNION, ADJUSTABLE END, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	UNION, ADJUSTABLE END	KC170	
COORDINATION STATUS KSC DE		SHEET 1 OF 1	

REVISED: ⑥ REV NUT MAT'L. 4-10-91
 APPROVED: 11-1-83



FED SUP CLASS
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DASH NUMBER	TUBE OD REF	THREAD T REF	A REF	B ±.031	C REF	D REF	SWIVEL NUT		RETAINING WIRE	
							FOR CRE STEEL ASSY	FOR AL ALLOY ASSY		
K4	D4	¼	7/16-20	1.61	.73	.36	⅞	KC139K4	KC139D4	KC165-4
K6	D6	⅜	9/16-18	1.97	.85	.39	1⅜	KC139K6	KC139D6	KC165-6
K8	D8	½	3/4-16	2.05	.90	.44	1	KC139K8	KC139D8	KC165-8
K10	D10	⅝	7/8-14	2.25	.97	.51	1⅞	KC139K10	KC139D10	KC165-10
K12	D12	¾	1-1/16-12	2.49	1.09	.58	1¾	KC139K12	KC139D12	KC165-12
K16	D16	1	1-5/8-12	2.74	1.19	.61	1¾	KC139K16	KC139D16	KC165-16
K20	D20	1¼	1-5/8-12	2.99	1.31	.64	1¾	KC139K20	KC139D20	KC165-20
K24	D24	1½	1-7/8-12	3.10	1.37	.65	2⅞	KC139K24	KC139D24	KC165-24
K28	D28	1¾	2-1/4-12	3.83	1.72	.89	2½	KC139K28	KC139D28	KC165-28
K32	D32	2	2-1/2-12	3.97	1.78	.95	2¾	KC139K32	KC139D32	KC165-32

MATERIAL: SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2024-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X"

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

EXAMPLE OF PART NOS. KC171K4 = UNION ASSEMBLY, ¼" OD TUBING, CORROSION RESISTANT STEEL
KC171D8 = UNION ASSEMBLY, ½" OD TUBING, ALUMINUM ALLOY

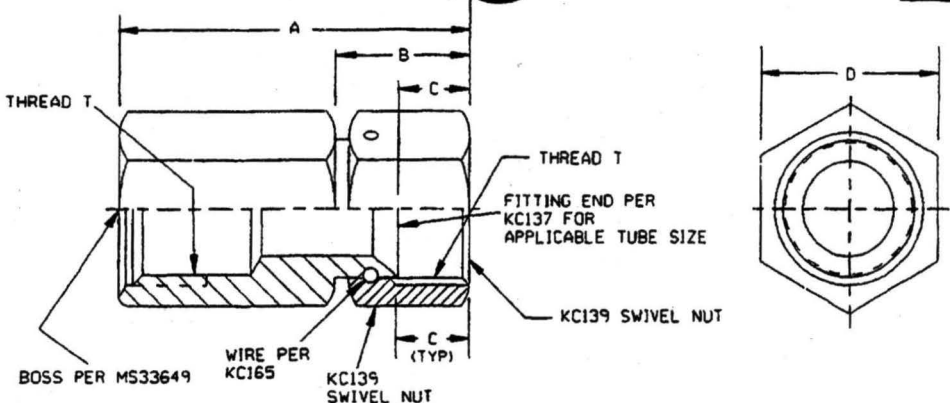
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REVISED: (A) REV & REDRAWN 8-1-90
APPROVED: 11-1-83

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	UNION ASSEMBLY, DOUBLE SWIVEL NUT
COORDINATION STATUS	
KSC DE	STANDARD PART KC171 SHEET 1 OF 1



FED SUP CLASS
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DASH NUMBER	TUBE OD REF	THREAD T REF	A +.000 -.060	B REF	C REF	D REF	SWIVEL NUT		RETAINING WIRE	
							FOR CRE STEEL ASSY	FOR AL ALLOY ASSY		
K4	D4	1/4	7/16-20	1.61	.73	.36	1/16	KC139K4	KC139D4	KC165-4
K6	D6	3/8	9/16-18	1.72	.85	.39	1/8	KC139K6	KC139D6	KC165-6
K8	D8	1/2	3/4-16	1.96	.90	.44	1	KC139K8	KC139D8	KC165-8
K10	D10	5/8	7/8-14	2.15	.97	.51	1 1/8	KC139K10	KC139D10	KC165-10
K12	D12	3/4	1-1/16-12	2.41	1.09	.58	1 1/2	KC139K12	KC139D12	KC165-12
K16	D16	1	1-5/16-12	2.59	1.19	.61	1 5/8	KC139K16	KC139D16	KC165-16
K20	D20	1 1/4	1-5/8-12	2.81	1.31	.64	1 3/4	KC139K20	KC139D20	KC165-20
K24	D24	1 1/2	1-7/8-12	3.06	1.37	.65	2 1/4	KC139K24	KC139D24	KC165-24
K28	D28	1 3/4	2-1/4-12	3.83	1.72	.89	2 5/8	KC139K28	KC139D28	KC165-28
K32	D32	2	2-1/2-12	3.88	1.78	.95	2 7/8	KC139K32	KC139D32	KC165-32

MATERIAL: SEE PROCUREMENT SPECIFICATION. ALUMINUM ALLOY, 2024-T6, CODE "D" CORROSION RESISTANT STEEL (CLASS 316), CODE "X"

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

- REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
- DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
- FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
- REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
- MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

EXAMPLE OF PART NOS. KC172K4 = ADAPTER, SWIVEL NUT, 1/4" OD TUBING, CORROSION RESISTANT STEEL
KC172D8 = ADAPTER, SWIVEL NUT, 1/2" OD TUBING, ALUMINUM ALLOY

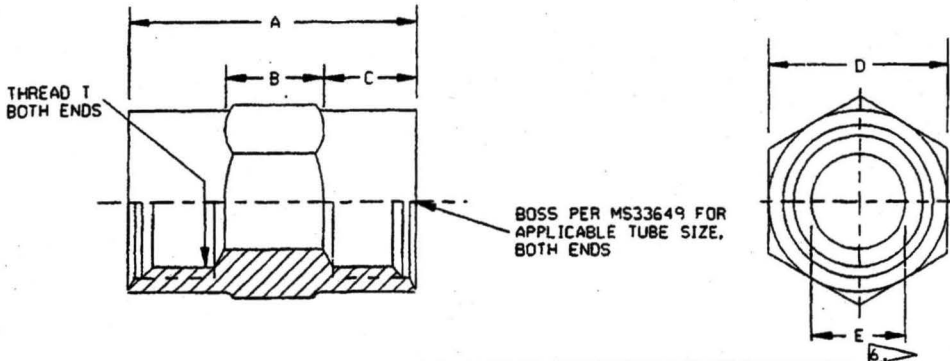
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REVISED: (A) REV 8 REDRAWN 8-1-90
APPROVED: 11-1-83

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER	
PROCUREMENT SPEC. KSC-F-124	STANDARD PART KC172
COORDINATION STATUS	SHEET 1 OF 1
KSC DE	ADAPTER, SWIVEL NUT



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DASH NUMBER	TUBE OD REF	THREAD T REF	A +.030 -.000	B REF	C ±.010	D REF	E MIN	
K4	D4	1/4	7/16-20	1.188	.375	.406	.688	.168
K6	D6	3/8	9/16-18	1.188	.375	.406	.813	.293
K8	D8	1/2	3/4-16	1.434	.437	.500	1.000	.387
K10	D10	5/8	7/8-14	1.563	.500	.594	1.125	.480
K12	D12	3/4	1-1/16-12	1.813	.625	.594	1.375	.604
K16	D16	1	1-5/16-12	1.875	.687	.594	1.625	.839
K20	D20	1 1/4	1-5/8-12	2.000	.750	.625	2.000	1.073
K24	D24	1 1/2	1-7/8-12	2.250	.812	.719	2.250	1.307
K28	D28	1 3/4	2-1/4-12	2.500	.875	.750	2.625	1.542
K32	D32	2	2-1/2-12	2.750	1.000	.875	3.000	1.776

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "X"

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

- NOTES:
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AT THE OPTION OF THE MANUFACTURER, DRILL THRU UP TO THE MINOR DIAMETER OF THE APPLICABLE THREAD SIZE CALLED FOR BY MIL-S-8879 AND IN COMPLIANCE WITH MS33649.

EXAMPLE OF PART NOS.
KC173K4 = COUPLING, TUBE, 1/4" OD TUBING, CORROSION RESISTANT STEEL
KC173D8 = COUPLING, TUBE, 1/2" OD TUBING, ALUMINUM ALLOY

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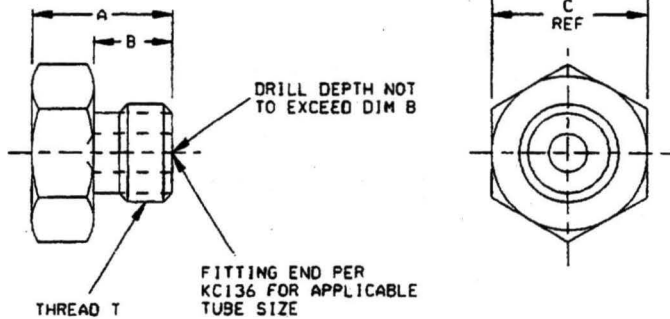
REVISED: (A) REV. J. REDRAWN 8-1-90
APPROVED: 11-1-83

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	COUPLING, TUBE	KC173	
COORDINATION STATUS KSC DE		SHEET 1 OF 1	



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DASH NO.	TUBE OD REF	THREAD T REF	A ±.016	B REF	C REF	
						CRE STEEL
K4	D4	1/4	7/16-20	.67	.389	.688
K6	D6	3/8	9/16-18	.73	.420	.813
K8	D8	1/2	3/4-16	.80	.521	1.000
K10	D10	5/8	7/8-14	.93	.567	1.125
K12	D12	3/4	1-1/16-12	1.09	.636	1.375
K16	D16	1	1-5/16-12	1.12	.672	1.625
K20	D20	1 1/4	1-5/8-12	1.20	.672	1.875
K24	D24	1 1/2	1-7/8-12	1.27	.720	2.125
K28	D28	1 3/4	2-1/4-12	1.35	.772	2.500
K32	D32	2	2-1/2-12	1.43	.887	2.750

MATERIAL: SEE PROCUREMENT SPECIFICATION.
ALUMINUM ALLOY, 2024-T6, CODE "D"
CORROSION RESISTANT STEEL (CLASS 316), CODE "X"

FINISH: SEE PROCUREMENT SPECIFICATION.

SCREW THREAD: SEE PROCUREMENT SPECIFICATION.

NOTES:

1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
5. MARKING OF FITTINGS SHALL BE CONSISTENT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD AND PART NUMBER DESIGNATIONS AS SHOWN ON THIS DRAWING.

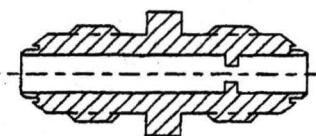
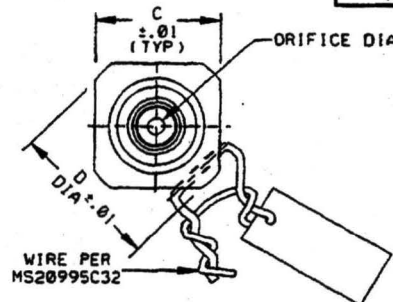
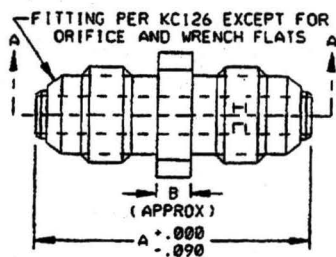
EXAMPLE OF PART NOS.
 KC174K8 = PLUG, 1/2" OD TUBING, CORROSION RESISTANT STEEL
 KC174D12 = PLUG, 3/4" OD TUBING, ALUMINUM ALLOY

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. KSC-F-124	PLUG, HEX HEAD	STANDARD PART
COORDINATION STATUS KSC DE		KC174
		SHEET 1 OF 1

REVISED: (B) 8-1-90 (C) 1-2-91 (D) REV A DIM FOR -12, 4-10-91
 APPROVED: 11-1-83



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SECTION A-A

- MATERIAL:** SEE PROCUREMENT SPECIFICATION. CORROSION RESISTANT STEEL (CLASS 316). CODE "X".
- OPERATING PRESSURE:** 6600 PSIG (MAXIMUM) FOR ALL SIZES EXCEPT 6500 PSIG (MAXIMUM) FOR 1" SIZE FITTINGS.
- FINISH:** SEE PROCUREMENT SPECIFICATION.
- SCREW THREAD:** SEE PROCUREMENT SPECIFICATION.
- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD PART NUMBER DESIGNATIONS AND ORIFICE DIAMETER AS SHOWN ON THIS DRAWING AND SHALL BE LEGIBLY STAMPED OR EMBOSSED ON A STAINLESS STEEL TAG APPROXIMATELY 1" X 2" X .017". THE TAG SHALL BE LOCKWIRED TO EACH FITTING AS SHOWN.
 6. CLEAN, PROTECT & INSPECT PER KSC-C-123, LEVEL 300A, TEST METHOD 1. PRIOR TO INSTALLATION IN FLUID SYSTEMS. CERTIFICATION REQUIRED.
 7. THIS DRAWING SUPERCEDES KENNEDY SPACE CENTER DRAWINGS 79K80236 AND 79K80239. FITTINGS PER 79K80239 ARE EQUIVALENT TO THOSE OF KC175 AND SHALL BE USED UNTIL EXISTING SUPPLY IS DEPLETED.
 8. ALL ORIFICES SHALL BE FLOW TESTED WITH NITROGEN AND CERTIFIED IN ACCORDANCE WITH FLAG NOTE 9. CERTIFICATION MUST INCLUDE FLOW RATE, TEMPERATURE, AND PRESSURE.

EXAMPLE OF PART NOS.

KC175K4-.030 - ORIFICE, UNION, 1/4" OD TUBING, .030" DIAMETER

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APPROVED: 1-2-91 REVISED: (C) ADDED SUPERCEDES COLUMN TO SHTS 2 THRU 4. CHANGED NOTES 6 & 7 9-1-97

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	ORIFICE, UNION, FLARED TUBE FOR SEAL RING		KC175
COORDINATION STATUS			SHEET 1 OF 4
KSC DE			



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▶ FLOW RATES ARE CALCULATED FOR AIR OR NITROGEN BY USE OF THE EQUATION:
 $FLOW (SCFM) = 16.5 \times ORIFICE \ AREA (SQ. \ IN.) \times 1000 \ PSIA \ UPSTREAM \ PRESSURE \ AT \ 70^{\circ}F.$ THIS EQUATION IS LIMITED TO THE CONDITION WHERE
 DOWNSTREAM PRESSURE IS 53% OF UPSTREAM PRESSURE OR LESS.

TOLERANCE ON GIVEN FLOW RATES:

FOR ORIFICE DIAMETERS .0055 TO .030 TOLERANCE IS $\pm 20\%$
 FOR ORIFICE DIAMETERS .031 TO .090 TOLERANCE IS $\pm 15\%$
 FOR ORIFICE DIAMETERS .091 & ABOVE, TOLERANCE IS $\pm 10\%$.

TO DETERMINE FLOW RATES FOR UPSTREAM PRESSURES OTHER THAN 1000 PSIA,
 MULTIPLY GIVEN FLOW RATES BY:

$$\frac{NEW \ UPSTREAM \ PRESSURE \ PSIA}{1000 \ PSIA}$$

GIVEN FLOW RATES ARE WITHIN TOLERANCE OVER AN UPSTREAM TEMPERATURE SPAN
 OF $\pm 30^{\circ}F.$ TO DETERMINE FLOW RATES FOR TEMPERATURES OTHER THAN $70^{\circ}F.$,
 MULTIPLY GIVEN FLOW RATES BY:

$$\sqrt{\frac{530}{460 + NEW \ TEMP \ ^{\circ}F}}$$

TO OBTAIN FLOW RATES FOR : HELIUM - MULTIPLY GIVEN FLOW RATE BY 2.69
 HYDROGEN - MULTIPLY GIVEN FLOW RATE BY 3.8
 OXYGEN - MULTIPLY GIVEN FLOW RATE BY 0.95

DASH NO. CRE STEEL	TUBE OD REF	FLOW RATE SCFM ▶	A DIM	B DIM	C DIM	D DIM	SUPERCEDES P/N
K4	1/4	BLANK	1.265	.16	.68	.81	79K80236-1, 79K80239-1
K4-.0055	1/4	.39	1.265	.16	.68	.81	79K80236-2, 79K80239-2
K4-.006	1/4	.46	1.265	.16	.68	.81	79K80236-3, 79K80239-3
K4-.007	1/4	.63	1.265	.16	.68	.81	79K80236-4, 79K80239-4
K4-.008	1/4	.83	1.265	.16	.68	.81	79K80236-5, 79K80239-5
K4-.009	1/4	1.05	1.265	.16	.68	.81	79K80236-6, 79K80239-6
K4-.010	1/4	1.30	1.265	.16	.68	.81	79K80236-7, 79K80239-7
K4-.0125	1/4	2.02	1.265	.16	.68	.81	79K80236-8, 79K80239-8
K4-.015	1/4	2.92	1.265	.16	.68	.81	79K80236-9, 79K80239-9
K4-.0175	1/4	3.97	1.265	.16	.68	.81	79K80236-10, 79K80239-10
K4-.020	1/4	5.18	1.265	.16	.68	.81	79K80236-11, 79K80239-11
K4-.025	1/4	8.10	1.265	.16	.68	.81	79K80236-12, 79K80239-12
K4-.030	1/4	11.66	1.265	.16	.68	.81	79K80236-13, 79K80239-13
K4-.035	1/4	15.87	1.265	.16	.68	.81	79K80236-14, 79K80239-14
K4-.040	1/4	20.73	1.265	.16	.68	.81	79K80236-15, 79K80239-15
K4-.045	1/4	26.24	1.265	.16	.68	.81	79K80236-16, 79K80239-16
K4-.050	1/4	32.40	1.265	.16	.68	.81	79K80236-17, 79K80239-17
K4-.055	1/4	39.20	1.265	.16	.68	.81	79K80236-18, 79K80239-18
K4-.060	1/4	46.65	1.265	.16	.68	.81	79K80236-19, 79K80239-19
K4-.065	1/4	54.75	1.265	.16	.68	.81	79K80236-20, 79K80239-20
K4-.070	1/4	63.50	1.265	.16	.68	.81	79K80236-21, 79K80239-21
K4-.075	1/4	72.89	1.265	.16	.68	.81	79K80236-22, 79K80239-22
K4-.080	1/4	82.94	1.265	.16	.68	.81	79K80236-23, 79K80239-23

APPROVED: 11-16-92 REVISED: C ADDED SUPERCEDES COLUMN. 9-1-97

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.

CUSTODIAN:

JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
KSC-F-124

COORDINATION STATUS
KSC DE

ORIFICE, UNION,
FLARED TUBE FOR SEAL RING

STANDARD PART


KC175

SHEET 2 OF 4



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DASH NO. CRE STEEL	TUBE OD REF	FLOW RATE SCFM 	A DIM	B DIM	C DIM	D DIM	SUPERCEDES P/N
K4-.085	1/4	93.63	1.265	.16	.68	.81	79K80236-24, 79K80239-24
K4-.090	1/4	105	1.265	.16	.68	.81	79K80236-25, 79K80239-25
K4-.095	1/4	117	1.265	.16	.68	.81	79K80236-26, 79K80239-26
K6	3/8	BLANK	1.390	.27	.81	.93	79K80236-32, 79K80239-32
K6-.010	3/8	1.30	1.390	.27	.81	.93	79K80236-33, 79K80239-33
K6-.018	3/8	4.20	1.390	.27	.81	.93	79K80236-34, 79K80239-34
K6-.026	3/8	8.76	1.390	.27	.81	.93	79K80236-35, 79K80239-35
K6-.034	3/8	14.98	1.390	.27	.81	.93	79K80236-36, 79K80239-36
K6-.042	3/8	22.86	1.390	.27	.81	.93	79K80236-37, 79K80239-37
K6-.050	3/8	32.40	1.390	.27	.81	.93	79K80236-38, 79K80239-38
K6-.058	3/8	43.59	1.390	.27	.81	.93	79K80236-39, 79K80239-39
K6-.066	3/8	56.45	1.390	.27	.81	.93	79K80236-40, 79K80239-40
K6-.074	3/8	70.96	1.390	.27	.81	.93	79K80236-41, 79K80239-41
K6-.082	3/8	87.14	1.390	.27	.81	.93	79K80236-42, 79K80239-42
K6-.090	3/8	105	1.390	.27	.81	.93	79K80236-43, 79K80239-43
K6-.098	3/8	124	1.390	.27	.81	.93	79K80236-44, 79K80239-44
K6-.106	3/8	146	1.390	.27	.81	.93	79K80236-45, 79K80239-45
K6-.114	3/8	168	1.390	.27	.81	.93	79K80236-46, 79K80239-46
K6-.122	3/8	193	1.390	.27	.81	.93	79K80236-47, 79K80239-47
K6-.130	3/8	219	1.390	.27	.81	.93	79K80236-48, 79K80239-48
K6-.138	3/8	249	1.390	.27	.81	.93	79K80236-49, 79K80239-49
K6-.146	3/8	276	1.390	.27	.81	.93	79K80236-50, 79K80239-50
K6-.154	3/8	307	1.390	.27	.81	.93	79K80236-51, 79K80239-51
K6-.162	3/8	340	1.390	.27	.81	.93	79K80236-52, 79K80239-52
K6-.170	3/8	375	1.390	.27	.81	.93	79K80236-53, 79K80239-53
K6-.178	3/8	411	1.390	.27	.81	.93	79K80236-54, 79K80239-54
K6-.186	3/8	448	1.390	.27	.81	.93	79K80236-55, 79K80239-55
K6-.188	3/8	458	1.390	.27	.81	.93	79K80236-56, 79K80239-56
K8	1/2	BLANK	1.578	.26	1.00	1.12	79K80236-62, 79K80239-62
K8-.010	1/2	1.30	1.578	.26	1.00	1.12	79K80236-63, 79K80239-63
K8-.020	1/2	5.18	1.578	.26	1.00	1.12	79K80236-64, 79K80239-64
K8-.030	1/2	11.66	1.578	.26	1.00	1.12	79K80236-65, 79K80239-65
K8-.040	1/2	20.73	1.578	.26	1.00	1.12	79K80236-66, 79K80239-66
K8-.050	1/2	32.40	1.578	.26	1.00	1.12	79K80236-67, 79K80239-67
K8-.060	1/2	46.65	1.578	.26	1.00	1.12	79K80236-68, 79K80239-68
K8-.070	1/2	63.50	1.578	.26	1.00	1.12	79K80236-69, 79K80239-69
K8-.080	1/2	82.94	1.578	.26	1.00	1.12	79K80236-70, 79K80239-70
K8-.090	1/2	105	1.578	.26	1.00	1.12	79K80236-71, 79K80239-71

APPROVED: 11-16-92. REVISED: C ADDED SUPERCEDES COLUMN. 9-1-97

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER

PROCUREMENT SPEC.
KSC-F-124

COORDINATION STATUS
KSC DE

ORIFICE, UNION,
FLARED TUBE FOR SEAL RING

STANDARD PART


KC175

SHEET 3 OF 4



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

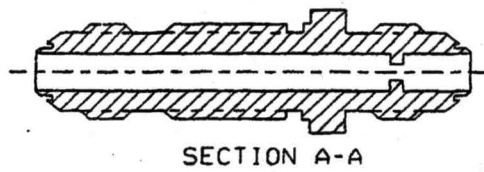
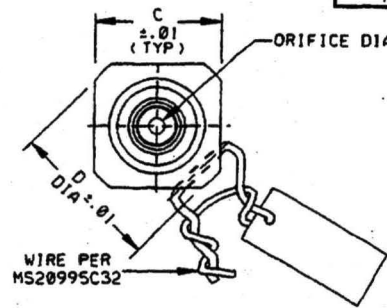
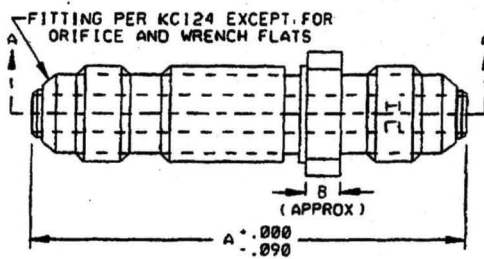
DASH NO. CRE STEEL	TUBE OD REF	FLOW RATE SCFM 	A DIM	B DIM	C DIM	D DIM	SUPERCEDES P/N
K8-.100	1/2	130	1.578	.26	1.00	1.12	79K80236-72, 79K80239-72
K8-.110	1/2	157	1.578	.26	1.00	1.12	79K80236-73, 79K80239-73
K8-.120	1/2	187	1.578	.26	1.00	1.12	79K80236-74, 79K80239-74
K8-.130	1/2	219	1.578	.26	1.00	1.12	79K80236-75, 79K80239-75
K8-.140	1/2	254	1.578	.26	1.00	1.12	79K80236-76, 79K80239-76
K8-.150	1/2	292	1.578	.26	1.00	1.12	79K80236-77, 79K80239-77
K8-.160	1/2	332	1.578	.26	1.00	1.12	79K80236-78, 79K80239-78
K8-.170	1/2	375	1.578	.26	1.00	1.12	79K80236-79, 79K80239-79
K8-.180	1/2	420	1.578	.26	1.00	1.12	79K80236-80, 79K80239-80
K8-.190	1/2	468	1.578	.26	1.00	1.12	79K80236-81, 79K80239-81
K8-.200	1/2	518	1.578	.26	1.00	1.12	79K80236-82, 79K80239-82
K8-.210	1/2	571	1.578	.26	1.00	1.12	79K80236-83, 79K80239-83
K8-.220	1/2	627	1.578	.26	1.00	1.12	79K80236-84, 79K80239-84
K8-.230	1/2	686	1.578	.26	1.00	1.12	79K80236-85, 79K80239-85
K8-.240	1/2	746	1.578	.26	1.00	1.12	79K80236-86, 79K80239-86
K8-.250	1/2	810	1.578	.26	1.00	1.12	79K80236-87, 79K80239-87
K12	3/4	BLANK	2.125	.39	1.37	1.56	79K80236-93, 79K80239-93
K12-.100	3/4	130	2.125	.39	1.37	1.56	79K80236-94, 79K80239-94
K12-.120	3/4	187	2.125	.39	1.37	1.56	79K80236-95, 79K80239-95
K12-.140	3/4	254	2.125	.39	1.37	1.56	79K80236-96, 79K80239-96
K12-.160	3/4	332	2.125	.39	1.37	1.56	79K80236-97, 79K80239-97
K12-.180	3/4	420	2.125	.39	1.37	1.56	79K80236-98, 79K80239-98
K12-.200	3/4	518	2.125	.39	1.37	1.56	79K80236-99, 79K80239-99
K12-.220	3/4	627	2.125	.39	1.37	1.56	79K80236-100, 79K80239-100
K12-.240	3/4	746	2.125	.39	1.37	1.56	79K80236-101, 79K80239-101
K12-.260	3/4	874	2.125	.39	1.37	1.56	79K80236-102, 79K80239-102
K12-.280	3/4	1014	2.125	.39	1.37	1.56	79K80236-103, 79K80239-103
K12-.300	3/4	1164	2.125	.39	1.37	1.56	79K80236-104, 79K80239-104
K16	1	BLANK	2.203	.38	1.62	1.87	79K80236-110, 79K80239-110
K16-.100	1	130	2.203	.38	1.62	1.87	79K80236-111, 79K80239-111
K16-.140	1	254	2.203	.38	1.62	1.87	79K80236-112, 79K80239-112
K16-.180	1	420	2.203	.38	1.62	1.87	79K80236-113, 79K80239-113
K16-.220	1	627	2.203	.38	1.62	1.87	79K80236-114, 79K80239-114
K16-.260	1	874	2.203	.38	1.62	1.87	79K80236-115, 79K80239-115
K16-.300	1	1164	2.203	.38	1.62	1.87	79K80236-116, 79K80239-116
K16-.340	1	1495	2.203	.38	1.62	1.87	79K80236-117, 79K80239-117
K16-.380	1	1868	2.203	.38	1.62	1.87	79K80236-118, 79K80239-118
K16-.420	1	2282	2.203	.38	1.62	1.87	79K80236-119, 79K80239-119

APPROVED: 11-16-92 REVISED: C ADDED SUPERCEDES COLUMN. 9-1-97

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	ORIFICE, UNION, FLARED TUBE FOR SEAL RING	KC175
COORDINATION STATUS KSC DE		SHEET 4 OF 4



FED SUP CLASS
4730



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- MATERIAL:** SEE PROCUREMENT SPECIFICATION. CORROSION RESISTANT STEEL (CLASS 316), CODE "X".
- OPERATING PRESSURE:** 6600 PSIG (MAXIMUM) FOR ALL SIZES EXCEPT 6500 PSIG (MAXIMUM) FOR 1" SIZE FITTINGS.
- FINISH:** SEE PROCUREMENT SPECIFICATION.
- SCREW THREAD:** SEE PROCUREMENT SPECIFICATION.
- NOTES:**
1. REMOVE BURRS AND SLIVERS. BREAK SHARP EDGES UNLESS OTHERWISE NOTED.
 2. DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCE DECIMALS ±.016.
 3. FOR DESIGN FEATURE PURPOSES, THIS DRAWING TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN.
 4. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON THE DATE OF INVITATION FOR BID.
 5. MARKING OF FITTINGS SHALL BE CONSISTANT WITH PROCUREMENT SPECIFICATION USING APPLICABLE KC STANDARD PART NUMBER DESIGNATIONS AND ORIFICE DIAMETER AS SHOWN ON THIS DRAWING AND SHALL BE LEGIBLY STAMPED OR EMBOSSED ON A STAINLESS STEEL TAG APPROXIMATELY 1" X 2" X .017". THE TAG SHALL BE LOCKWIRED TO EACH FITTING AS SHOWN.
 6. CLEAN, PROTECT & INSPECT PER KSC-C-123, LEVEL 300A, TEST METHOD 1, PRIOR TO INSTALLATION IN FLUID SYSTEMS. CERTIFICATION REQUIRED.
 7. THIS DRAWING SUPERCEDES KENNEDY SPACE CENTER DRAWINGS 79K80237 AND 79K80240. FITTINGS PER 79K80237 AND 79K80240 ARE EQUIVALENT TO THOSE OF KC176 AND SHALL BE USED UNTIL EXISTING SUPPLY IS DEPLETED.
 8. ALL ORIFICES SHALL BE FLOW TESTED WITH NITROGEN AND CERTIFIED IN ACCORDANCE WITH FLAG NOTE 9. CERTIFICATION MUST INCLUDE FLOW RATE, TEMPERATURE, AND PRESSURE.

EXAMPLE OF PART NOS. KC176K4-.030 • ORIFICE, UNION, BLKHD, 1/4" OD TUBING, .030" DIAMETER

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	ORIFICE, UNION, BLKHD, FLARED TUBE FOR SEAL RING	KC176	
COORDINATION STATUS		SHEET 1 OF 4	
KSC DE			

APPROVED: 11-16-92 REVISED: (B) ADDED SUPERCEDES COLUMN TO SHTS 2 THRU 4. CHANGED NOTES 6 & 7. 9-1-97



FED SUP CLASS
4730

▶ FLOW RATES ARE CALCULATED FOR AIR OR NITROGEN BY USE OF THE EQUATION:
 $FLOW (SCFM) = 16.5 \times ORIFICE \ AREA (SQ. \ IN.) \times 1000 \ PSIA \ UPSTREAM \ PRESSURE \ AT \ 70^{\circ}F.$ THIS EQUATION IS LIMITED TO THE CONDITION WHERE
 DOWNSTREAM PRESSURE IS 53% OF UPSTREAM PRESSURE OR LESS.

TOLERANCE ON GIVEN FLOW RATES:

FOR ORIFICE DIAMETERS .0055 TO .030 TOLERANCE IS ± 20%
 FOR ORIFICE DIAMETERS .031 TO .090 TOLERANCE IS ± 15%
 FOR ORIFICE DIAMETERS .091 & ABOVE, TOLERANCE IS ± 10%.

TO DETERMINE FLOW RATES FOR UPSTREAM PRESSURES OTHER THAN 1000 PSIA,
 MULTIPLY GIVEN FLOW RATES BY:

$$\frac{NEW \ UPSTREAM \ PRESSURE \ PSIA}{1000 \ PSIA}$$

GIVEN FLOW RATES ARE WITHIN TOLERANCE OVER AN UPSTREAM TEMPERATURE SPAN
 OF ± 30°F. TO DETERMINE FLOW RATES FOR TEMPERATURES OTHER THAN 70°F,
 MULTIPLY GIVEN FLOW RATES BY:

$$\sqrt{\frac{530}{460 + NEW \ TEMP \ ^{\circ}F}}$$

TO OBTAIN FLOW RATES FOR : HELIUM - MULTIPLY GIVEN FLOW RATE BY 2.69
 HYDROGEN - MULTIPLY GIVEN FLOW RATE BY 3.8
 OXYGEN - MULTIPLY GIVEN FLOW RATE BY 0.95

DASH NO. CRE STEEL	TUBE OD REF	FLOW RATE SCFM ▶	A DIM	B DIM	C DIM	D DIM	SUPERCEDES P/N
K4	1/4	BLANK	2.062	.16	.68	.81	79K80237-1, 79K80240-1
K4-.0055	1/4	.39	2.062	.16	.68	.81	79K80237-2, 79K80240-2
K4-.006	1/4	.46	2.062	.16	.68	.81	79K80237-3, 79K80240-3
K4-.007	1/4	.63	2.062	.16	.68	.81	79K80237-4, 79K80240-4
K4-.008	1/4	.83	2.062	.16	.68	.81	79K80237-5, 79K80240-5
K4-.009	1/4	1.05	2.062	.16	.68	.81	79K80237-6, 79K80240-6
K4-.010	1/4	1.30	2.062	.16	.68	.81	79K80237-7, 79K80240-7
K4-.0125	1/4	2.02	2.062	.16	.68	.81	79K80237-8, 79K80240-8
K4-.015	1/4	2.92	2.062	.16	.68	.81	79K80237-9, 79K80240-9
K4-.0175	1/4	3.97	2.062	.16	.68	.81	79K80237-10, 79K80240-10
K4-.020	1/4	5.18	2.062	.16	.68	.81	79K80237-11, 79K80240-11
K4-.025	1/4	8.10	2.062	.16	.68	.81	79K80237-12, 79K80240-12
K4-.030	1/4	11.66	2.062	.16	.68	.81	79K80237-13, 79K80240-13
K4-.035	1/4	15.87	2.062	.16	.68	.81	79K80237-14, 79K80240-14
K4-.040	1/4	20.73	2.062	.16	.68	.81	79K80237-15, 79K80240-15
K4-.045	1/4	26.24	2.062	.16	.68	.81	79K80237-16, 79K80240-16
K4-.050	1/4	32.40	2.062	.16	.68	.81	79K80237-17, 79K80240-17
K4-.055	1/4	39.20	2.062	.16	.68	.81	79K80237-18, 79K80240-18
K4-.060	1/4	46.65	2.062	.16	.68	.81	79K80237-19, 79K80240-19
K4-.065	1/4	54.75	2.062	.16	.68	.81	79K80237-20, 79K80240-20
K4-.070	1/4	63.50	2.062	.16	.68	.81	79K80237-21, 79K80240-21
K4-.075	1/4	72.89	2.062	.16	.68	.81	79K80237-22, 79K80240-22
K4-.080	1/4	82.94	2.062	.16	.68	.81	79K80237-23, 79K80240-23

APPROVED: 11-16-92 REVISED: (6) ADDED SUPERCEDES COLUMN, 9-1-97

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CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART	
PROCUREMENT SPEC. KSC-F-124	ORIFICE, UNION, BLKHD FLARED TUBE FOR SEAL RING	KC176	
COORDINATION STATUS KSC DE		SHEET 2 OF 4	



FED SUP CLASS
4730

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.

DASH NO. CRE STEEL	TUBE OD REF	FLOW RATE SCFM	A DIM	B DIM	C DIM	D DIM	SUPERCEDES P/N
K4-.085	1/4	93.63	2.062	.16	.68	.81	79K80237-24, 79K80240-24
K4-.090	1/4	105	2.062	.16	.68	.81	79K80237-25, 79K80240-25
K4-.095	1/4	117	2.062	.16	.68	.81	79K80237-26, 79K80240-26
K6	3/8	BLANK	2.234	.27	.81	.93	79K80237-32, 79K80240-32
K6-.010	3/8	1.30	2.234	.27	.81	.93	79K80237-33, 79K80240-33
K6-.018	3/8	4.20	2.234	.27	.81	.93	79K80237-34, 79K80240-34
K6-.026	3/8	8.76	2.234	.27	.81	.93	79K80237-35, 79K80240-35
K6-.034	3/8	14.98	2.234	.27	.81	.93	79K80237-36, 79K80240-36
K6-.042	3/8	22.86	2.234	.27	.81	.93	79K80237-37, 79K80240-37
K6-.050	3/8	32.40	2.234	.27	.81	.93	79K80237-38, 79K80240-38
K6-.058	3/8	43.59	2.234	.27	.81	.93	79K80237-39, 79K80240-39
K6-.066	3/8	56.45	2.234	.27	.81	.93	79K80237-40, 79K80240-40
K6-.074	3/8	70.96	2.234	.27	.81	.93	79K80237-41, 79K80240-41
K6-.082	3/8	87.14	2.234	.27	.81	.93	79K80237-42, 79K80240-42
K6-.090	3/8	105	2.234	.27	.81	.93	79K80237-43, 79K80240-43
K6-.098	3/8	124	2.234	.27	.81	.93	79K80237-44, 79K80240-44
K6-.106	3/8	146	2.234	.27	.81	.93	79K80237-45, 79K80240-45
K6-.114	3/8	168	2.234	.27	.81	.93	79K80237-46, 79K80240-46
K6-.122	3/8	193	2.234	.27	.81	.93	79K80237-47, 79K80240-47
K6-.130	3/8	219	2.234	.27	.81	.93	79K80237-48, 79K80240-48
K6-.138	3/8	249	2.234	.27	.81	.93	79K80237-49, 79K80240-49
K6-.146	3/8	276	2.234	.27	.81	.93	79K80237-50, 79K80240-50
K6-.154	3/8	307	2.234	.27	.81	.93	79K80237-51, 79K80240-51
K6-.162	3/8	340	2.234	.27	.81	.93	79K80237-52, 79K80240-52
K6-.170	3/8	375	2.234	.27	.81	.93	79K80237-53, 79K80240-53
K6-.178	3/8	411	2.234	.27	.81	.93	79K80237-54, 79K80240-54
K6-.186	3/8	448	2.234	.27	.81	.93	79K80237-55, 79K80240-55
K6-.188	3/8	458	2.234	.27	.81	.93	79K80237-56, 79K80240-56
K8	1/2	BLANK	2.468	.26	1.00	1.12	79K80237-62, 79K80240-62
K8-.010	1/2	1.30	2.468	.26	1.00	1.12	79K80237-63, 79K80240-63
K8-.020	1/2	5.18	2.468	.26	1.00	1.12	79K80237-64, 79K80240-64
K8-.030	1/2	11.66	2.468	.26	1.00	1.12	79K80237-65, 79K80240-65
K8-.040	1/2	20.73	2.468	.26	1.00	1.12	79K80237-66, 79K80240-66
K8-.050	1/2	32.40	2.468	.26	1.00	1.12	79K80237-67, 79K80240-67
K8-.060	1/2	46.65	2.468	.26	1.00	1.12	79K80237-68, 79K80240-68
K8-.070	1/2	63.50	2.468	.26	1.00	1.12	79K80237-69, 79K80240-69
K8-.080	1/2	82.94	2.468	.26	1.00	1.12	79K80237-70, 79K80240-70
K8-.090	1/2	105	2.468	.26	1.00	1.12	79K80237-71, 79K80240-71

REVISED: (B) ADDED SUPERCEDES COLUMN. 9-1-97

APPROVED: 11-16-92

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		
PROCUREMENT SPEC. KSC-F-124	ORIFICE, UNION, BLKHD FLARED TUBE FOR SEAL RING	STANDARD PART
COORDINATION STATUS KSC DE		KC176
		SHEET 3 OF 4



FED SUP CLASS
4730

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DASH NO. CRE STEEL	TUBE OD REF	FLOW RATE SCFM	A DIM	B DIM	C DIM	D DIM	SUPERCEDES P/N
K8-.100	1/2	130	2.468	.26	1.00	1.12	79K80237-72, 79K80240-72
K8-.110	1/2	157	2.468	.26	1.00	1.12	79K80237-73, 79K80240-73
K8-.120	1/2	187	2.468	.26	1.00	1.12	79K80237-74, 79K80240-74
K6-.130	1/2	219	2.468	.26	1.00	1.12	79K80237-75, 79K80240-75
K8-.140	1/2	254	2.468	.26	1.00	1.12	79K80237-76, 79K80240-76
K8-.150	1/2	292	2.468	.26	1.00	1.12	79K80237-77, 79K80240-77
K8-.160	1/2	332	2.468	.26	1.00	1.12	79K80237-78, 79K80240-78
K8-.170	1/2	375	2.468	.26	1.00	1.12	79K80237-79, 79K80240-79
K8-.180	1/2	420	2.468	.26	1.00	1.12	79K80237-80, 79K80240-80
K8-.190	1/2	468	2.468	.26	1.00	1.12	79K80237-81, 79K80240-81
K8-.200	1/2	518	2.468	.26	1.00	1.12	79K80237-82, 79K80240-82
K8-.210	1/2	571	2.468	.26	1.00	1.12	79K80237-83, 79K80240-83
K8-.220	1/2	627	2.468	.26	1.00	1.12	79K80237-84, 79K80240-84
K8-.230	1/2	686	2.468	.26	1.00	1.12	79K80237-85, 79K80240-85
K8-.240	1/2	746	2.468	.26	1.00	1.12	79K80237-86, 79K80240-86
K8-.250	1/2	810	2.468	.26	1.00	1.12	79K80237-87, 79K80240-87
K12	3/4	BLANK	3.046	.39	1.37	1.56	79K80237-93, 79K80240-93
K12-.100	3/4	130	3.046	.39	1.37	1.56	79K80237-94, 79K80240-94
K12-.120	3/4	187	3.046	.39	1.37	1.56	79K80237-95, 79K80240-95
K12-.140	3/4	254	3.046	.39	1.37	1.56	79K80237-96, 79K80240-96
K12-.160	3/4	332	3.046	.39	1.37	1.56	79K80237-97, 79K80240-97
K12-.180	3/4	420	3.046	.39	1.37	1.56	79K80237-98, 79K80240-98
K12-.200	3/4	518	3.046	.39	1.37	1.56	79K80237-99, 79K80240-99
K12-.220	3/4	627	3.046	.39	1.37	1.56	79K80237-100, 79K80240-100
K12-.240	3/4	746	3.046	.39	1.37	1.56	79K80237-101, 79K80240-101
K12-.260	3/4	874	3.046	.39	1.37	1.56	79K80237-102, 79K80240-102
K12-.280	3/4	1014	3.046	.39	1.37	1.56	79K80237-103, 79K80240-103
K12-.300	3/4	1164	3.046	.39	1.37	1.56	79K80237-104, 79K80240-104
K16	1	BLANK	3.093	.38	1.62	1.87	79K80237-110, 79K80240-110
K16-.100	1	130	3.093	.38	1.62	1.87	79K80237-111, 79K80240-111
K16-.140	1	254	3.093	.38	1.62	1.87	79K80237-112, 79K80240-112
K16-.180	1	420	3.093	.38	1.62	1.87	79K80237-113, 79K80240-113
K16-.220	1	627	3.093	.38	1.62	1.87	79K80237-114, 79K80240-114
K16-.260	1	874	3.093	.38	1.62	1.87	79K80237-115, 79K80240-115
K16-.300	1	1164	3.093	.38	1.62	1.87	79K80237-116, 79K80240-116
K16-.340	1	1495	3.093	.38	1.62	1.87	79K80237-117, 79K80240-117
K16-.380	1	1868	3.093	.38	1.62	1.87	79K80237-118, 79K80240-118
K16-.420	1	2282	3.093	.38	1.62	1.87	79K80237-119, 79K80240-119

REVISED: (B) ADDED SUPERCEDES COLUMN, 9-1-97

APPROVED: 11-16-92

CUSTODIAN: JOHN F. KENNEDY SPACE CENTER		STANDARD PART
PROCUREMENT SPEC. KSC-F-124	ORIFICE, UNION, BLKHD FLARED TUBE FOR SEAL RING	KC176
COORDINATION STATUS KSC DE		SHEET 4 OF 4

APPENDIX

APPENDIX A: KC-152 Fitting Dimensional Change Justification

Background

Allan Aircraft discovered a problem with the dimensions of the KC-152 reducer fittings while attempting to manufacture them and informed NASA Fluid Design, NE-F2. The KC-152 drawing has various reducers ranging in size from 1/4" to 2" diameter. The particular fitting that fell apart was a K24B-12D (1.5" to 3/4" reducer). Other sizes of the KC-152 fitting were evaluated and errors in the drawing were found between conversions of 79K80266 (Union, Butt-weld Reducer) to KSC-GP-425 (Fluid Fitting Engineering Standards). The dimension errors have been present since 1990, and the K12G-4A fitting has had dimension errors since 1979. Some sizes cannot be manufactured with the listed dimensions while others have an under-sized wall thickness in the transition region. No known problems have occurred in any of the in-service KC-152s. KC-152 is a KSC drawing and is manufactured by multiple vendors. In addition, old versions of the 79K80266 were evaluated for previous changes that may have caused the issues in KSC-GP-425.

Summary

The butt-weld reducer fitting series, KC-152, was found to have errors in the drawing KSC-GP-425. Of the 39 reducers analyzed per ASME B31.3, two failed the criteria, four have thin-walls but passed, and four cannot be manufactured as dimensioned. The report, KSC-TA-9724, details the analysis and makes initial recommendations for correcting the fittings. TA-B2B initiated an initial safety alert, NA-KSC-2008-01, to notify KSC and other potential users of the possible discrepancies within the fitting dimensions.

The dimensional analysis of each fitting was discussed. Due to multiple drawing dimension changes in the past and the vast discrepancies of the transitional wall thickness from fitting to fitting, NE-F2, TA-B2B and NE-M1 decided to utilize the 79K80266 rev.E drawing values as the baseline fitting dimensions. It was also decided to make the transition wall thickness equally proportioned to the wall thickness of the larger end opening for all fittings. NE-M1 and TA-B2Bs analysis and report shows that if the transition wall thickness is sized to at least equal the large end wall thickness, then the fitting meets ASME B31.3. A joint discussion between NE-F2, TA-B2B and NE-M1 concluded that the transition wall thickness should be at least 1.25x's the thickness of the large opening wall thickness. This thickness ratio was determined to allow for a larger margin of safety without interfering with the butt weld area heat affected zone.

Once a thickness ratio was determined, new dimensions were used to create a ProE model to verify the transition area thickness. The new dimensions were achieved by decreasing the "H" value of the fitting. The "H" value is a depth dimension on the inner portion of the larger end of the fitting. This allows for all the fittings to have a transition wall thickness 25% larger than the wall of the large diameter end. The validity of the new values was confirmed by the predominant vendor Allan Aircraft in January 2009.

APPENDIX B: KC-116 Fitting Dimensional Change Justification

Background

Allan Aircraft discovered a problem with the dimensions of the KC 116 NPT-Flared Tube adapter fitting while attempting to manufacture it and informed NASA Fluid Design, NE-F2. The KC 116 drawing defines various NPT-Flared Tube adapters ranging in size from 1/4" to 2" diameter. The particular fitting in question is the KC 116 / 20-20 adapter. The specific discrepancy between the KC 116 standard and an industry standard SAE AS 4309 / 20-20 is in the size of the wrench hex. KC 116 / 20-20 specifies wrench hex size of 1.75" whereas SAE AS 4309 / 20-20 specifies a wrench hex size of 1.688". More detailed research into older versions of KSC Fluid Fitting Engineering Standards (NASA / KSC-GP 425) has shown that the change of wrench hex size for the KC 116 / 20-20 fitting had occurred in the GP 425-E revision. No reason for this change was documented.

Summary

Inquiry into the details of the specific adapters has shown that all SAE AS 4309 / 20-XX series use a wrench hex size of 1.688". The KC 116 / 20-XX also use the more common 1.688" wrench hex size except for the KC 116 / 20-20 which is the only fitting that utilizes the 1.75" wrench hex size. Approach to standardizing the dimension of KSC 116 / 20-20 was twofold: stress analysis, and other dimensional fitting standards including international standards and current SAE standards.

Stress analysis of the KC 116 / 20-20 fitting focused on the strength of the design and stress induced damage to the wrench hex during maximum torque installation (1800 in-lbs). Both cases, 1.688" and 1.75", were analyzed for potential distortion of the wrench hex flats during maximum torque installation procedure. For illustration of this effect see Figure 1.

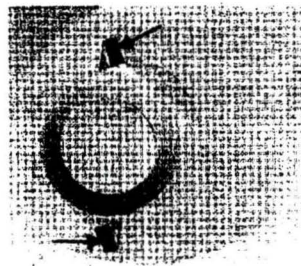


Figure 1: Stress concentration due to clearance; dark shaded areas, indicated by arrows, designate where stress exceeds elastic deformation limit and permanent damage to fitting occurs due to plastic deformation of fitting material.

The results of the calculations show less than 5% difference in induced stress thus resulting in only minor difference in deformation to the wrench hex flats. This difference in deformation of the wrench hex flats is negligible. Since the body of the fitting does not change between the two

wrench hex options, the stresses induced due to internal pressure are identical and therefore within the original design limits. Stress limitations were thus eliminated as the cause for using the 1.75" wrench hex size as opposed to the 1.688" wrench hex size.

Second criterion investigated in order to determine the possible change in the design of KC 116 / 20-20 involved examination of dimensioning of similar fittings and comparison of the KC 116 fitting standard with other U.S. and world wide dimensioning standards such as: ASME, ANSI, SAE, DIN, ISO, and JIS. Careful examination of each standard yielded nearly the same result. For a given style of an adapter, the mechanical fastening system remains the same, i.e. the wrench hex on a specific size fitting remains constant for each variation of that particular fitting. In many instances, DIN, ISO, and JIS standards follow an SAE standard for sizing the wrench hex. Examination of the SAE J512, SAE J513, and SAE J514 standards for the AS4309 style fitting shows that the 20- family of fittings retains a wrench hex size of 1.688".

Recommendation

After considerable discussion, research, and analysis, no reasonable cause for retaining the 1.75" wrench hex dimension on the KC 116 / 20-20 fitting could be found. Therefore a recommendation to change the wrench hex size to 1.688" on the KC 116 / 20-20 fitting to more closely follow the SAE established standard dimensions is warranted. This change will allow KSC engineering to closely follow the established norms and practices of the rest of the fluid engineering community and remain in compliance with the current ISO and SAE standards.

APPENDIX C: Fitting Assembly Numbers

Background

In the past, the specifying of fluid fittings and their associated components (including seal rings, o-rings, nuts, and washers) has been both time consuming and error prone. For several years, engineering has been simplifying the process by utilizing fitting assemblies (or, "convenience assemblies") which include these fittings' associated components. Unfortunately, a lack of part numbers and documentation describing these assemblies has reduced the effectiveness of this solution.

Summary

In order to streamline drafting, modeling, and procurement activities related to the specifying of fluid fittings, assemblies that include associated component(s) may now be called out using an appended part number as outlined below.

Fitting Assembly Numbering

Part Number Example 1	AS1250K12	-	A	
Part Number Example 2	AS4307K08	-	A	B
Part Number Example 3	KC176K8	-	A	W
Part Number Example 4	AS4301K0601	-	A	
Part Number Example 5	<u>AS4315K12</u>	-	<u>A</u>	<u>BW</u>

Field

- 1 Fitting Part Number** _____
 The SAE, KC, or Allan Aircraft fitting part number (including applicable dashes).
- 2 Assembly** _____
 The fitting assembly includes:
 - 1 AS1097 PTFE (Teflon) seal ring for every AS1098 flared tube end
 - 1 preformed packing (material specified in field 3) for every AS4320 boss end
 - 1 AN924 nut and 1 NAS1149 washer for AS1099 bulkhead-type fittings
 - 1 AS4326 stainless steel coupling nut for AS4301 reducer-adapter fittings
- 3 O-Ring Material/Additional Components** _____
 The following o-ring materials may be specified:
 - B - for Buna N per AS28778
 - T - for PTFE (Teflon) per AS9956
 - V - for Viton per AS3209
 The following additional components may be specified:
 - W - for 1 additional washer (2 total)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER GP-425, Rev. G	2. DOCUMENT DATE September 8, 1997
3. DOCUMENT TITLE Fluid Fitting Engineering Standards		
4. NATURE OF CHANGE <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)</i>		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME <i>(Last, First, Middle Initial)</i>	b. ORGANIZATION	
c. ADDRESS <i>(Include Zip Code)</i>	d. TELEPHONE <i>(Include Area Code)</i>	7. DATE SUBMITTED
8. PREPARING ACTIVITY		
a. NAME Director of Engineering Development	d. TELEPHONE <i>(Include Area Code)</i> (407) 867-2565	
c. ADDRESS <i>(Include Zip Code)</i> National Aeronautics and Space Administration, Mail Code: DE Kennedy Space Center, FL 32899		