



CONNECTIONS FOR TRANSPORTABLE AND STATIC BULK STORAGE TANKS

AIGA 024/10

Asia Industrial Gases Association

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1 Introduction

In many Asian countries, there are no clear standards for product inlet/outlet connections for transportable and static storage vessels for bulk liquefied and compressed gases. The prevalence of large numbers of alternative connections within the industry and the consequent dependence on adaptors to connect between them is regarded as being potentially hazardous. Hence there is a high risk of the wrong product(s) being introduced to the consumer's supply system.

The hazards associated with connecting the wrong products to the consumer's supply system include loss of production, property damage and injury to personnel.

There is a need for standardization of the product connections for bulk liquefied and compressed gases to eliminate filling errors at source and the incorrect product delivery to the consumer's supply systems.

Adoption of these standards should mitigate the risks associated with filling transportable equipment and or static tanks with the incorrect product and also minimize the need for using adapters.

2 Scope

This document is pertinent to connections associated with the filling and discharge of transportable and static storage vessels for bulk liquefied and compressed gases.

It applies specifically to the following list of gases for industrial and medical applications

Liquefied oxygen
Liquefied nitrogen
Liquefied argon
Liquefied carbon dioxide
Liquefied nitrous oxide
Bulk gaseous hydrogen
Bulk gaseous helium

3 Definitions

<i>Adaptor :</i>	A device enabling two different yet acceptable CONNECTIONS for the SAME PRODUCT (See Table 1, 2 and 3) to be coupled for product transfer.
<i>Connection :</i>	A recognized standard device and its mating device that discriminate between products defined in the scope of this document and typically mounted on the inlets/outlets of a transportable and static storage vessel(s) and or their transfer hoses.
<i>Pressure :</i>	In this document, bar shall indicate gauge pressure unless otherwise noted, i.e. (bar, abs) for absolute pressure and (bar, dif) for differential pressure.
<i>Shall :</i>	The use of the word "shall" in this document implies a very strong concern or instruction.
<i>Should :</i>	The use of the word "should" in this document indicates a recommendation.
<i>Static storage vessel :</i>	Static storage vessels are designed to be mounted on foundation typically at production and consumer sites.

<i>Transportable storage vessel(s):</i>	Transportable storage vessel(s) are designed with a permanent chassis or designed to be transported on a chassis such as an ISO frame. Multiple vessels may be mounted on a single chassis.
<i>Transfer hose :</i>	Transfer hoses may be considered as an extension to the transportable or static storage vessel connections. They may also be considered as adaptors provided they meet the intent as per the definition.

4 Connections

4.1 Guidelines for connection selection

- Connections must discriminate and thus be product specific and must not be in conflict. “In conflict” meaning that the same connection is used for dissimilar products by different suppliers or in different geographic regions.
- Connections must be constructed of material compatible with the product service.
- Connections must be of reliable design and construction to eliminate failure during product transfer. Connections should be designed so that they cannot be modified easily to accommodate the transferring of other product.

4.2 Acceptable standard connections

4.2.1 Liquefied oxygen, nitrogen and argon

Based on a survey of the connections in use in Asia and on the guidelines in this document, the following 3 categories of connections are classified as the **ACCEPTABLE STANDARD CONNECTIONS** for continued use.

- CGA – ACME threaded type
- Indexed plate type
- Ramped bayonet claw type

It is further recommended that the national gas associations adopt a single connection standard from those listed above giving priority to fill connections for transportable storage vessels.

Table 1: Acceptable standard connections for liquefied oxygen, nitrogen and argon

Product	Type	Connection No. / size	Appendix No.
Liquefied argon	CGA	AR-15 (1 ½")	A
		AR-25 (2 ½")	B
	Index plate	DN-40-LAR (40 mm)	K(i),K(iv), K(v), K(vi)
	Ramped bayonet claw	1.25" RH (1 ¼")	L
Liquefied nitrogen	CGA	NI-15 (1 ½")	C
		NI-25 (2 ½")	D
	Index plate	DN-40-LIN (40 mm)	K(ii), K(iv), K(v), K(vi)
	Ramped bayonet claw	1.5" LH (1 ½")	M
Liquefied oxygen	CGA	OX-15 (1 ½")	E
		OX-30 (3")	F
	Index plate	DN-40-LOX (40 mm)	K(iii), K(iv), K(v), K(vi)
	Ramped bayonet claw	1.5"RH (1 ½")	N

4.2.2 Liquefied carbon dioxide and nitrous oxide

Based on a survey of the connections in use in Asia and on the guidelines in this document, the following categories of connections are classified as the **STANDARDS** for continued use.

Table 2: Standards for liquefied carbon dioxide and nitrous oxide

Product	Type	Connection no. / size	Appendix No.
Liquefied carbon dioxide	CGA	CO ₂ -1 ½"	G
		CO ₂ - 3"	H
Liquefied nitrous oxide	CGA	N ₂ O-10 (1")	O
		N ₂ O- 15 (1 ½")	P

4.2.3 Bulk compressed hydrogen and helium gas

Based on a survey of the connections in use in Asia and on the guidelines in this document, the following categories of connections are classified as the **STANDARD CONNECTIONS** for continued use.

Table 3: Standards for bulk hydrogen and helium gas

Product	Type	Connection no. / size	Appendix No.
Bulk hydrogen	CGA	CGA 1350 (1")	I
Bulk helium	CGA	CGA 1340 (1")	J

5 Safety precautions

5.1 General

- Any product conversion of transportable or static storage vessels should only be carried out by qualified personnel following documented procedures.
- Connections should be adequately affixed to transportable and static storage vessels as well as transfer hoses such that they cannot be easily removed.
- Cautions should be taken to ensure that transfer hoses cannot be misused and result in the transfer of incorrect product. Adequate controls are required to ensure that transfer hoses are fitted with the correct connections.

5.2 Identification and labelling

- Connections should be adequately identified for the product service
- Proper labelling for transportable and static storage vessels is also critical for proper product identification. All labelling should be clearly visible, in the appropriate languages and meet the guideline in AIGA 017/05 –‘Labelling of gas containers and associated equipment’.

5.3 Control of the use of adaptors

- The use of adaptors should be limited and if possible eliminated.
- Strict procedure and control should be in place to control the fabrication, storage and the use of adaptors.
- Can only be designed to adapt between **ACCEPTABLE STANDARD CONNECTIONS** for same product service.

Adaptors should be permanently constructed by means such as welding, silver soldering or brazing.

6 Supplier responsibility

Prior to fill and delivery of transportable and static storage vessels, the product supplier has the responsibility to ensure that the containers are correctly labelled and fitted with the appropriate connections.

Connections should be visually inspected prior to filling to verify that there is no damage and that they are suitable for the service intended.

Suppliers should ensure that the correct mating connections are available at receiving / delivery sites thus mitigating the use of adaptors.

Suppliers are responsible for developing and implementing appropriate procedures for the fabrication, storage and use of adaptors.

Suppliers should provide adequate training for all personnel involved in transferring of bulk liquefied and compressed gases included but not limited to the requirement of this standard.

7 Implementation

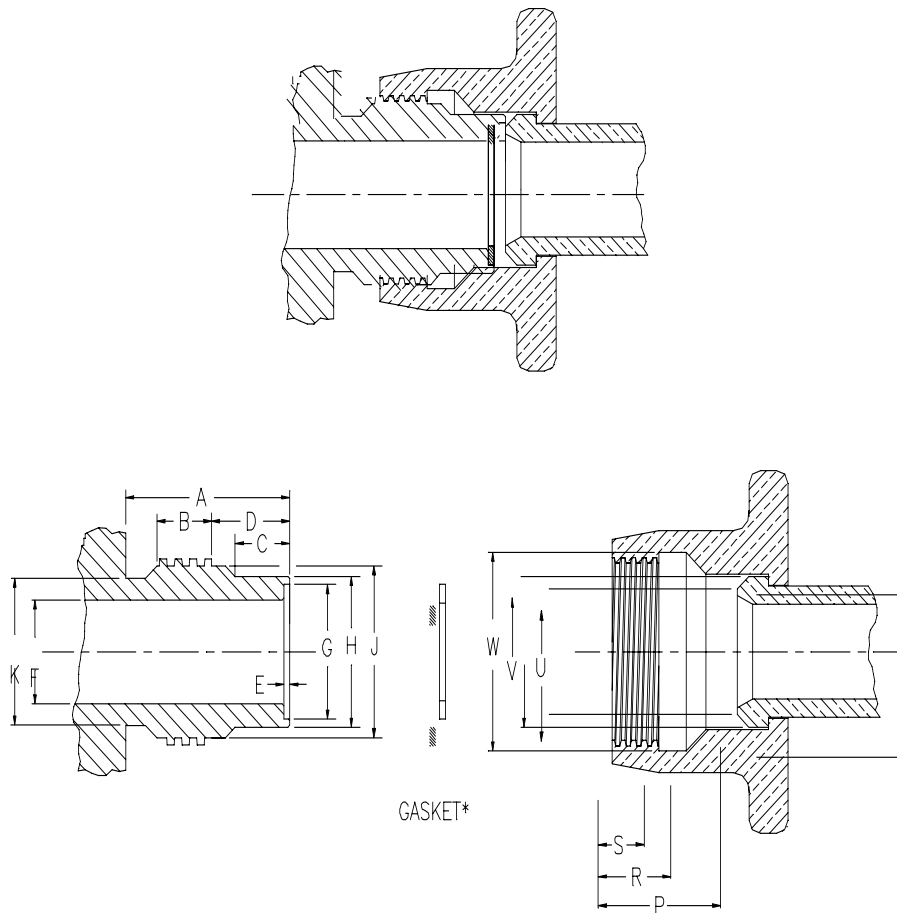
National gas associations and product suppliers should adopt this standard in its entirety with full compliance not later than December 2010.

8 References

AIGA 017/05	Labelling of gas containers and associated equipment
CGA: V-6 -2008 5 th edition	Standard bulk refrigerated liquid transfer connections
CGA: V-10 -2010 4 th edition	High pressure gas trailer connections

Appendix A - CGA Connection No. AR-15 -Liquid argon

1-½ in (38 mm) Liquid argon connection



FIXED END

THREAD	2.7 - 4 STUB ACME-2G-RH-EXT
MAJOR DIA.	2.7000 - 2.6875 (68.580 - 68.263)
PITCH DIA.	2.6117 - 2.5868 (66.337 - 65.705)
MINOR DIA.	2.5300 - 2.5051 (64.262 - 63.630)
A	2.250 (57.15) MIN
B	0.870 - 0.740 (22.10 - 18.80)
C	0.800 (20.32) MIN
D	1.230 - 1.270 (31.24 - 32.26)
E	0.078 - 0.109 (1.98 - 2.77)
F	1.50 (38.1) DIA.
G	1.930 (49.02) MIN DIA.
H	2.200 (55.88) MAX DIA.
J	2.500 (63.50) MAX DIA.

HOSE NUT AND HEADPIECE

THREAD	2.7 - 4 STUB ACME-2G-RH-INT
MINOR DIA.	2.5500 - 2.5625 (64.770 - 65.088)
PITCH DIA.	2.6250 - 2.6500 (66.675 - 67.310)
MAJOR DIA.	2.7200 - 2.7450 (69.088 - 69.723)
N	2.250 (57.15) MIN DIA.
P	2.040 - 1.920 (51.82 - 48.77)
R	1.380 (35.05) MIN
S	1.020 - 0.740 (25.91 - 18.80)
U	1.830 (46.48) MAX DIA.
V	2.180 (55.37) MIN DIA.
W	2.745 (69.72) MIN DIA.

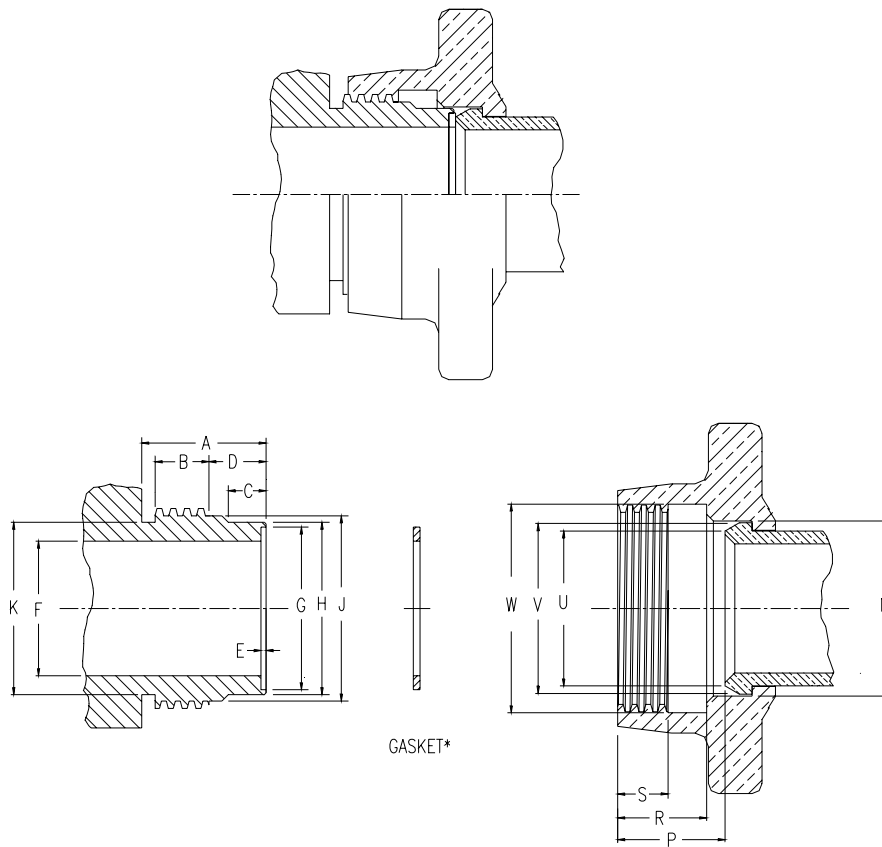
*See Section 3.1.

NOTE: Dimensions are shown in inches (mm).

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Appendix B —CGA Connection No. AR-25 – Liquid argon

2-½ in (64 mm) Liquid argon connection standard



FIXED END

THREAD	3-13/16 - 4 ACME-2G-RH-EXT
MAJOR DIA.	3.8125 - 3.8000 (96.838 – 96.520)
PITCH DIA.	3.6715 - 3.6445 (93.256 – 92.570)
MINOR DIA.	3.5425 - 3.5020 (89.980 – 88.951)
A	2.250 (57.15) MIN
B	1.020 - 0.840 (25.91 – 21.34)
C	0.680 (17.27) MIN
D	1.000 - 1.090 (25.40 – 27.69)
E	0.078 - 0.109 (1.98 – 2.77)
F	2.50 (63.5) DIA.
G	3.015 (76.58) MIN DIA.
H	3.200 (81.28) MAX DIA.
J	3.500 (88.90) MAX DIA.
K	3.500 (88.90) MAX DIA.

HOSE NUT AND HEADPIECE

THREAD	3-13/16 - 4 ACME-2G-RH-INT
MINOR DIA.	3.5625 - 3.5750 (90.488 – 90.805)
PITCH DIA.	3.6875 - 3.7145 (93.663 – 94.348)
MAJOR DIA.	3.8325 - 3.8525 (97.346 – 97.854)
N	3.250 (82.55) MIN DIA.
P	2.010 - 1.920 (51.05 – 48.77)
R	1.630 (41.40) MIN
S	1.020 - 0.840 (25.91 – 21.34)
U	2.900 (73.66) MAX DIA.
V	3.180 (80.77) MIN DIA.
W	3.855 (97.92) MIN DIA.

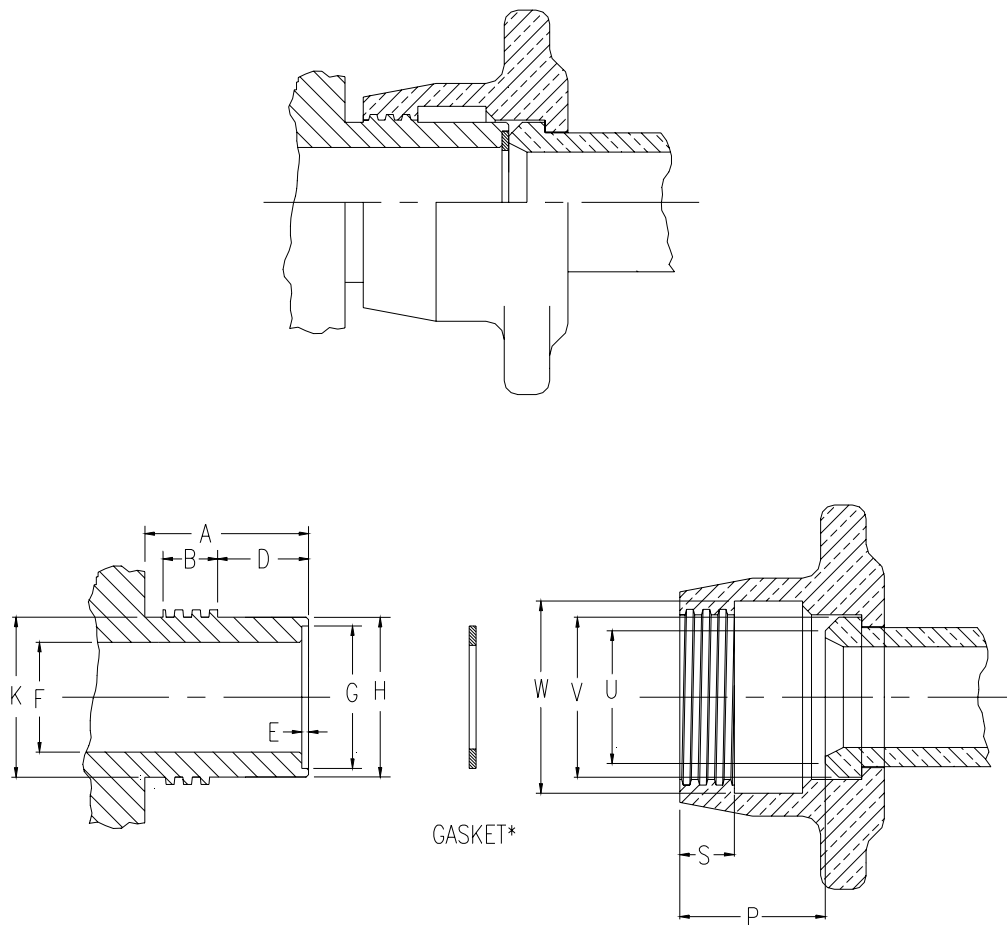
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Appendix C—CGA Connection No. NI-15 – Liquid nitrogen

1-½ in (38 mm) Liquid nitrogen connection standard



FIXED END

THREAD	2.4 - 4 STUB ACME-2G-RH-EXT
MAJOR DIA.	2.4000 - 2.3875 (60.960 – 60.643)
PITCH DIA.	2.3124 - 2.2879 (58.735 – 58.113)
MINOR DIA.	2.2300 - 2.2055 (56.642 – 56.020)
A	2.250 (57.15) MIN
B	0.870 - 0.740 (22.10 – 18.80)
D	1.230 - 1.270 (31.24 – 32.26)
E	0.078 - 0.109 (1.98 – 2.77)
F	1.50 (38.1) DIA.
G	1.930 (49.02) MIN DIA.
H	2.205 (56.01) MAX DIA.
K	2.200 (55.88) MAX DIA.

HOSE NUT AND HEADPIECE

THREAD	2.4 - 4 STUB ACME-2G-RH-INT
MINOR DIA.	2.2500 - 2.2625 (57.150 – 57.468)
PITCH DIA.	2.3250 - 2.3495 (59.055 – 59.677)
MAJOR DIA.	2.4200 - 2.4445 (61.468 – 62.090)
P	2.040 - 2.000 (51.82 – 50.80)
S	1.020 - 0.740 (25.91 – 18.80)
U	1.830 (46.48) MAX DIA.
V	2.180 (53.54) MIN DIA.
W	2.445 (62.10) MIN DIA.

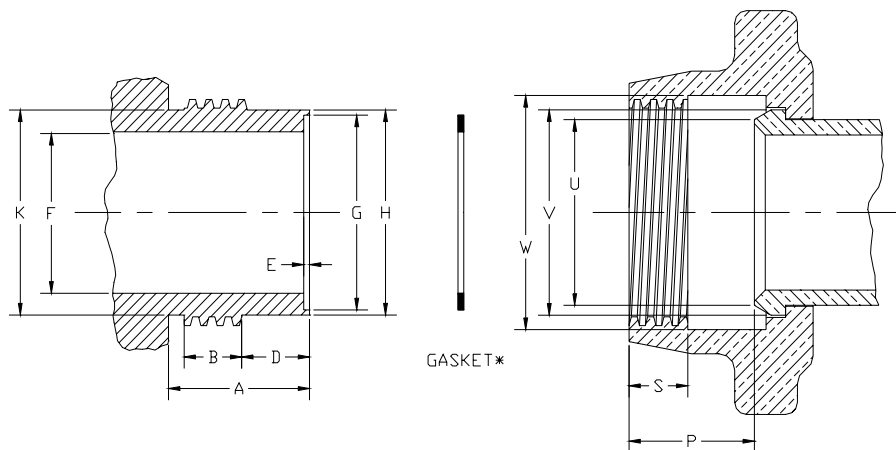
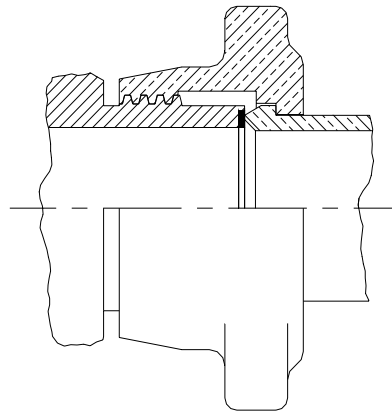
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Appendix D— CGA Connection No. NI-25 – Liquid nitrogen

2-½ in (64 mm) Liquid nitrogen connection standard



FIXED END

THREAD	3-½ - 4 ACME-2G-RH-EXT
MAJOR DIA.	3.5000 - 3.4875 (88.900 – 88.583)
PITCH DIA.	3.3600 - 3.3338 (85.344 – 84.679)
MINOR DIA.	3.2300 - 3.1907 (82.042 – 81.044)
A	2.250 (57.15) MIN
B	1.020 - 0.840 (25.91 – 21.34)
D	0.950 - 1.030 (24.13 – 26.16)
E	0.078 - 0.109 (1.98 – 2.77)
F	2.50 (63.5) DIA.
G	3.015 (76.58) MIN DIA.
H	3.190 (81.03) MAX DIA.
K	3.190 (81.03) MAX DIA.

HOSE NUT AND HEADPIECE

THREAD	3-½ - 4 ACME-2G-RH-INT
MINOR DIA.	3.2500 - 3.2625 (82.550 – 82.868)
PITCH DIA.	3.3750 - 3.4012 (85.725 – 86.619)
MAJOR DIA.	3.5200 - 3.5400 (89.408 – 89.916)
P	1.960 - 1.770 (49.78 – 44.96)
S	1.020 - 0.840 (25.91 – 21.34)
U	2.900 (73.66) MAX DIA.
V	3.180 (80.77) MIN DIA.
W	3.540 (89.92) MIN DIA.

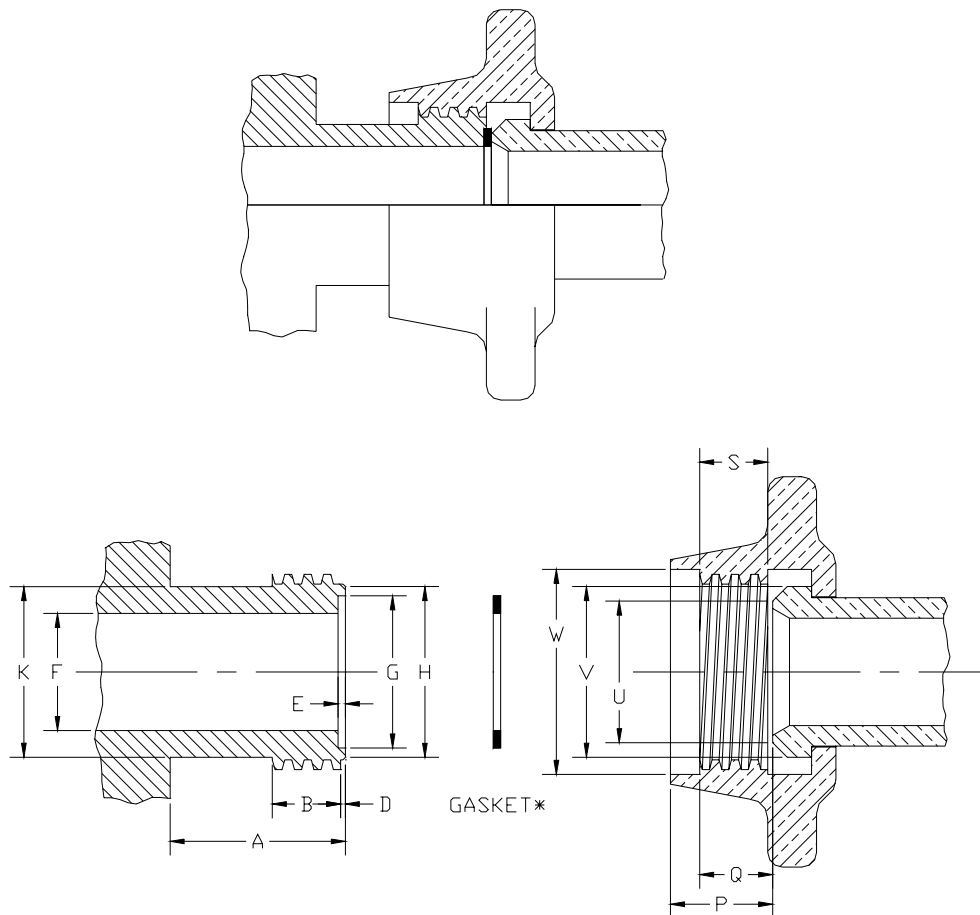
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Appendix E— CGA Connection No. OX-15 – Liquid oxygen

1-½ in (38 mm) Liquid oxygen connection standard

**FIXED END**

THREAD	2-½ - 4 ACME-2G-RH-EXT
MAJOR DIA.	2.5000 - 2.4875 (63.500 – 63.183)
PITCH DIA.	2.3624 - 2.3379 (60.005 – 59.383)
MINOR DIA.	2.2300 - 2.1933 (56.642 – 55.710)
A	2.125 (53.98) MIN
B	1.020 - 0.840 (25.91 – 21.34)
D	0.046 - 0.093 (1.17 – 2.36)
E	0.078 - 0.109 (1.98 – 2.77)
F	1.50 (38.10) DIA.
G	1.930 (49.02) MIN DIA.
H	2.190 (55.63) MAX DIA.
K	2.190 (55.63) MAX DIA.

HOSE NUT AND HEADPIECE

THREAD	2-½ - 4 ACME-2G-RH-INT
MINOR DIA.	2.2500 - 2.2625 (57.150 – 57.468)
PITCH DIA.	2.3750 - 2.3995 (60.325 – 60.947)
MAJOR DIA.	2.5200 - 2.5400 (64.008 – 64.516)
P	1.812 (46.02) MAX
Q	0.980 - 0.735 (24.89 – 18.67)
S	1.020 - 0.840 (25.91 – 21.34)
U	1.830 (46.48) MAX DIA.
V	2.172 (55.17) MIN DIA.
W	2.540 (64.52) MIN DIA.

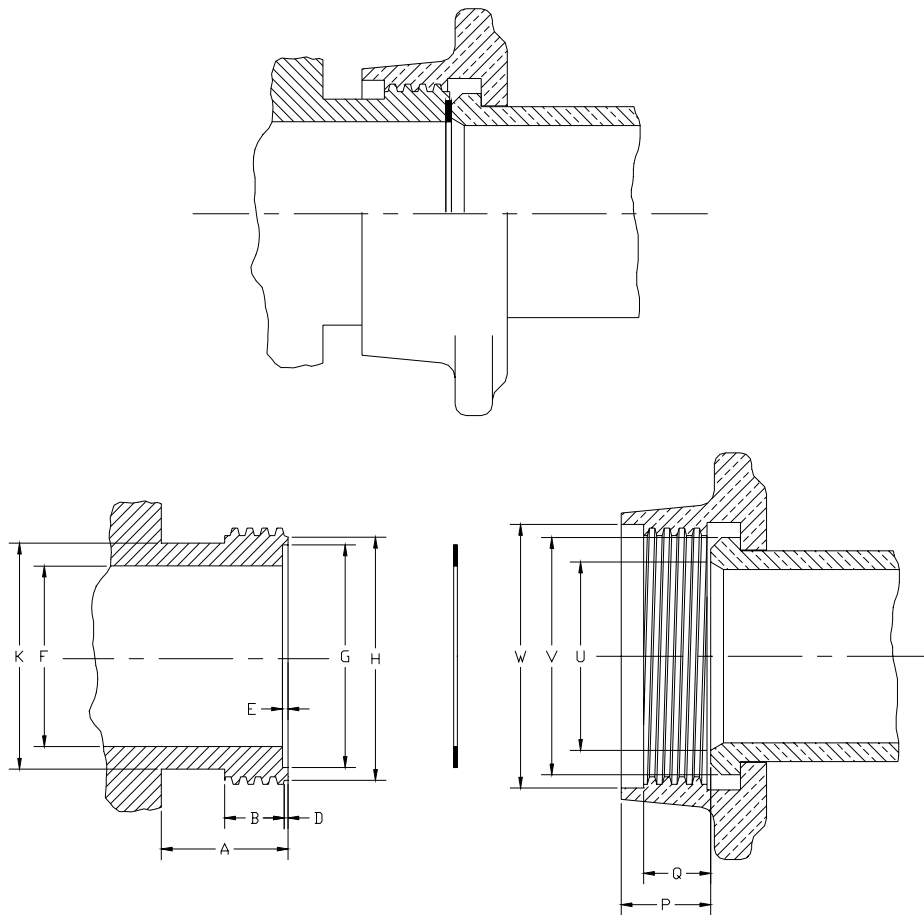
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Appendix F— CGA Connection No. OX-30 – Liquid oxygen

3 in (76 mm) Liquid oxygen connection standard



FIXED END

THREAD	4- $\frac{1}{4}$ - 4 ACME-2G-RH-EXT
MAJOR DIA.	4.2500 - 4.2375 (107.950 – 107.633)
PITCH DIA.	4.1090 - 4.0813 (104.369 – 103.665)
MINOR DIA.	3.9800 - 3.9385 (101.092 – 100.038)
A	2.000 (50.80) MIN
B	1.020 - 0.980 (25.91 – 24.89)
D	0.046 - 0.078 (1.17 – 1.98)
E	0.078 - 0.109 (1.98 – 2.77)
F	3.00 (76.2) DIA.
G	3.685 (93.60) MIN DIA.
H	3.940 (100.80) MAX DIA.
K	3.940 (100.80) MAX DIA.

HOSE NUT AND HEADPIECE

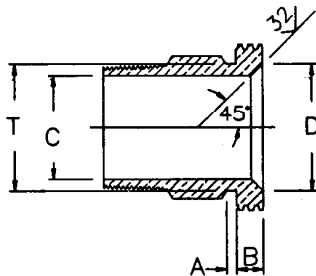
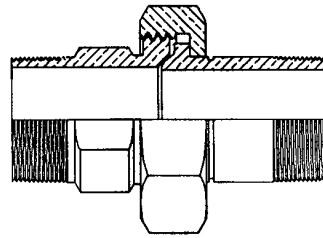
THREAD	4- $\frac{1}{4}$ - 4 ACME-2G-RH-INT
MINOR DIA.	4.0000 - 4.0125 (101.600 – 101.918)
PITCH DIA.	4.1250 - 4.1527 (104.775 – 105.479)
MAJOR DIA.	4.2700 - 4.2900 (108.458 – 108.966)
P	1.937 (49.20) MAX
Q	1.080 - 1.045 (27.43 – 26.54)
S	1.250 - 0.850 (31.75 – 21.59)
U	3.620 (91.95) MAX DIA.
V	3.922 (99.62) MIN DIA.
W	4.290 (108.97) MIN DIA.

*See Section 3.1.

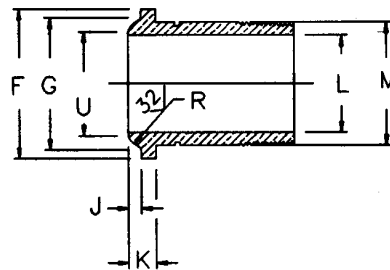
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Appendix G – CGA Connection No. Carbon dioxide 1-1/2"

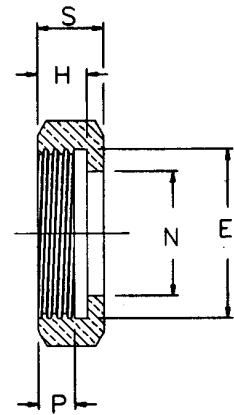
Standard for CO₂ liquid and vapour transfer



FIXED END



HEADPIECE



HOSE NUT

THREAD 2.250-6 ACME-2G-RH-EXT
 MAJOR DIA. 2.2500-2.2414
 PITCH DIA. 2.1547-2.1335
 MINOR DIA. 2.0634-2.0316

A .187
 B .490-.510
 C 1.500 DIA.
 D 1.910-1.930 DIA.
 E 2.312 MIN. DIA.
 F 2.065-2.075 DIA.
 G 1.955-1.965 DIA.
 H .850-.870
 J .240-.260

THREAD 2.250-6 ACME-2G-RH-INT
 MINOR DIA. 2.0830-2.0917
 PITCH DIA. 2.1667-2.1879
 MAJOR DIA. 2.2700-2.2900

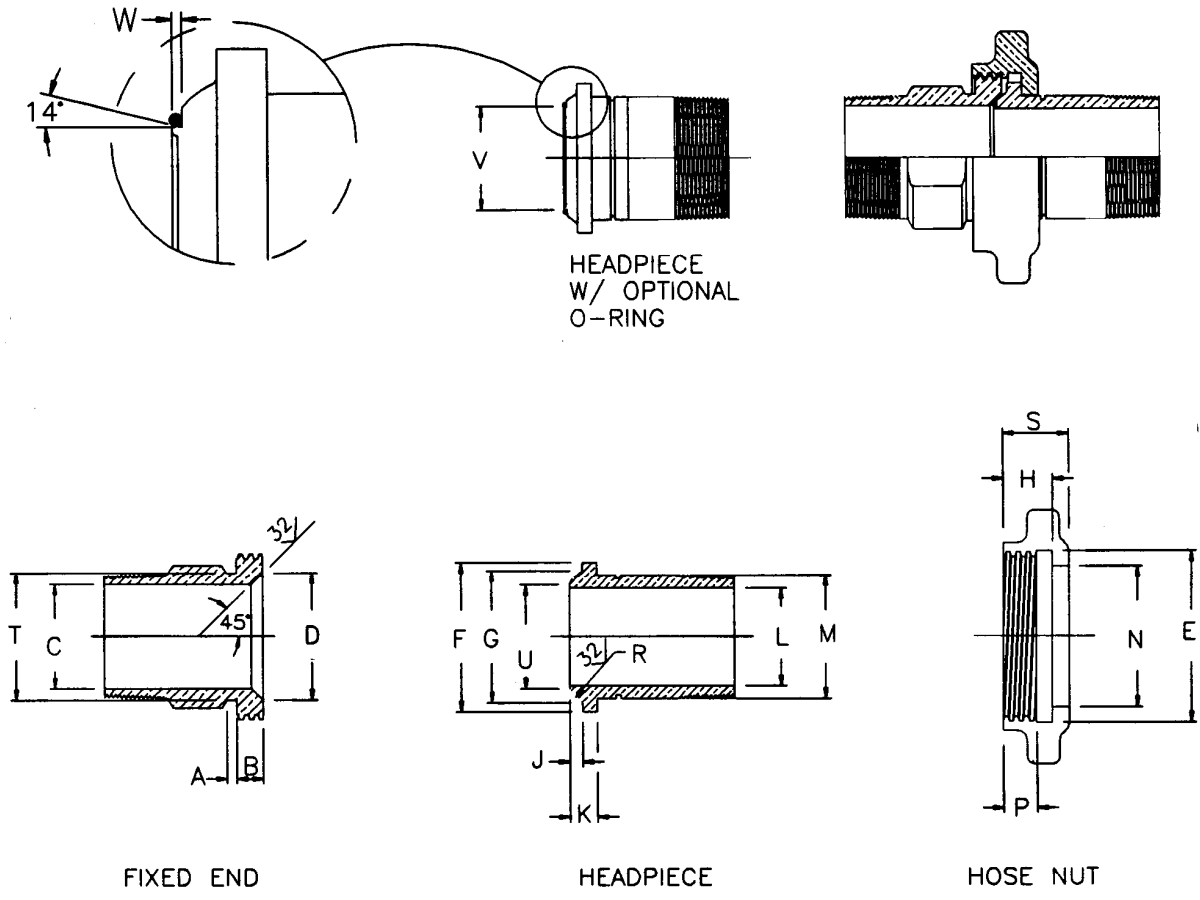
K .468
 L 1.375 DIA.
 M 1.895-1.905 DIA.
 N 1.920-1.930 DIA.
 P .600-.620
 R .500 R.
 S 1.090-1.110
 T 1.937 DIA.
 U 1.501-1.511 DIA.

NOTE: DIMENSIONS ARE SHOWN IN INCHES. UNSPECIFIED TOLERANCES ARE ± 0.015

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Appendix H – CGA Connection No. Carbon dioxide 3"

Standard for CO₂ liquid and vapour transfer



THREAD	4.500-6 ACME-2G-RH-EXT	THREAD	4.500-6 ACME-2G-RH-INT
MAJOR DIA.	4.5000-4.4917	MINOR DIA.	4.3334-4.3417
PITCH DIA.	4.3997-4.3747	PITCH DIA.	4.4167-4.4417
MINOR DIA.	4.3134-4.2759	MAJOR DIA.	4.5200-4.5400
A	.187	K	.593
B	.490-.510	L	2.875 DIA.
C	3.000 DIA.	M	3.495-3.505 DIA.
D	3.552-3.572 DIA.	N	3.520-3.530 DIA.
E	4.562 DIA. MIN.	P	.740-.760
F	3.995-4.005 DIA.	R	.500 R.
G	3.620-3.630 DIA.	S	1.370-1.390
H	.990-1.010	T	3.562 DIA.
J	.300-.320	U	3.102-3.112 DIA.
		V	3.014-3.024 DIA.
		W	.080-.084

NOTE: DIMENSIONS ARE SHOWN IN INCHES. UNSPECIFIED TOLERANCES ARE ±.015

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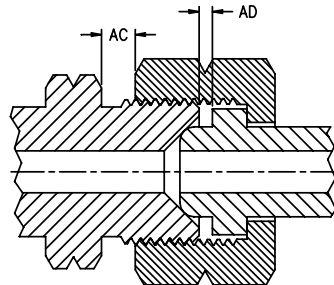
Appendix I - CGA Connection No. 1350 – Bulk hydrogen
1.00-11.5 NPS-LH-EXT

LIMITED STANDARD HIGH PRESSURE GAS TRAILER CONNECTION
 FOR PRESSURES UP TO 3000 psig (20 680 kPa) FOR

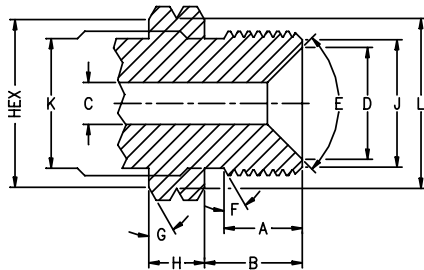
Carbon Monoxide ←
 Hydrogen

Ethane (R170)
 Methane (R50)

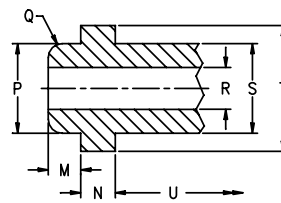
Ethylene (R1150)
 Natural Gas



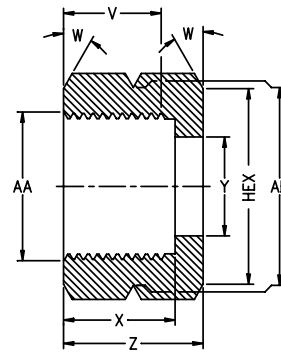
CLEARANCE AC .300 (REF)
 STAND OFF AD .116 (REF)



OUTLET (TRAILER SIDE)



NIPPLE



HEXAGON NUT

THREAD	1.00-11.5 NPS-LH-EXT	
MAJOR DIA	1.2930-1.2810	(32.842-32.537)
PITCH DIA	1.2369-1.2311	(31.417-31.270)
MINOR DIA	1.2930 Max.	(32.842) Max.
THREAD LENGTH	A .625 ±.010	(15.88 ±.25)
BOSS LENGTH	B .875 ±.010	(22.23 ±.25)
DRILL DIA	C .375	(9.53)
SEAT DIA	D 1.000	(25.40)
SEAT ANGLE	E 90°	
UNDERCUT ANGLE	F 45°	
HEX CHAMFER	G 30° x 1.500	(38.10)
HEX LENGTH	H .500 ±.010	(12.70 ±.25)
CHAMFER DIA	J 45° x 1.140	(28.95)
UNDERCUT DIA	K 1.160	(29.46)
GROOVE DIA	L 60° x 1.520	(38.61)
HEX	1.500 ±.010	(38.10 ±.25)

NOSE LENGTH	M .290	(7.37)
SHOULDER LENGTH	N .310	(7.87)
NOSE DIA	P .803	(20.39)
NOSE RADIUS	Q .125	(3.18)
DRILL DIA	R .375	(9.53)
SHANK DIA	S .875-.870	(22.23-22.10)
SHOULDER DIA	T 1.125	(28.57)
SHANK LENGTH	U 1.00 Min.	(25.4) Min.

THREAD	1.00-11.5 NPS-LH-INT	
MINOR DIA	1.201-1.211	(30.50-30.76)
PITCH DIA	1.2386-1.2462	(31.460-31.653)
MAJOR DIA	1.2947 Min.	(32.885) Min.
FULL THREAD	V .875	(22.23)
CHAMFER DIA	W 30° X 1.75	(44.45)
BORE DEPTH	X 1.000 ±.010	(25.40 ±.25)
DRILL DIA	Y .885	(22.48)
HEX	Z 1.75 ±.010	(44.45 ±.25)
LENGTH	1.250	(31.75)
C'SINK DIA	AA 90° x 1.330	(33.78)
GROOVE DIA	AB 60° x 1.77	(44.96)

All dimensions are in inches (millimeters).

Ⓛ In the United States, the fill pressure of carbon monoxide is limited. See 49 CFR 173.302(f).

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Appendix J – CGA Connection No. 1340 – Bulk helium

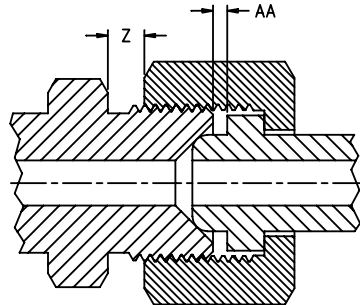
1.00-11.5 NPS-RH-EXT

LIMITED STANDARD HIGH PRESSURE GAS TRAILER CONNECTION
FOR PRESSURES UP TO 3000 psig (20 680 kPa) FOR

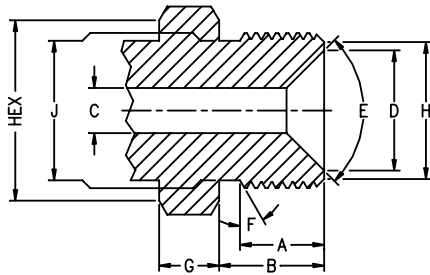
Argon
Neon

Helium
Nitrogen
Xenon

Krypton
Tetrafluoromethane (R14)

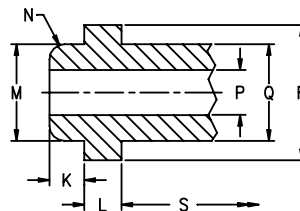


CLEARANCE Z .300 (REF)
STAND OFF AA .116 (REF)



OUTLET (TRAILER SIDE)

THREAD	1.00-11.5 NPS-RH-EXT	
MAJOR DIA	1.2930-1.2810	(32.842-32.537)
PITCH DIA	1.2369-1.2311	(31.417-31.270)
MINOR DIA	1.2930 Max.	(32.842) Max.
THREAD LENGTH	A .625 ±.010	(15.88 ±.25)
BOSS LENGTH	B .875 ±.010	(22.23 ±.25)
DRILL DIA	C .375	(9.53)
SEAT DIA	D 1.000	(25.40)
SEAT ANGLE	E 90°	
UNDERCUT ANGLE	F 45°	
HEX LENGTH	G .500 ±.010	(12.70 ±.25)
CHAMFER DIA	H 45° x 1.140	(28.95)
UNDERCUT DIA	J 1.160	(29.46)
HEX	1.500 ±.010	(38.10 ±.25)



NIPPLE

NOSE LENGTH	K .290	(7.37)
SHOULDER LENGTH	L .310	(7.87)
NOSE DIA	M .803	(20.39)
NOSE RADIUS	N .125	(3.18)
DRILL DIA	P .375	(9.53)
SHANK DIA	Q .875-.870	(22.23-22.10)
SHOULDER DIA	R 1.125	(28.57)
SHANK LENGTH	S 1.00 Min.	(25.4) Min.

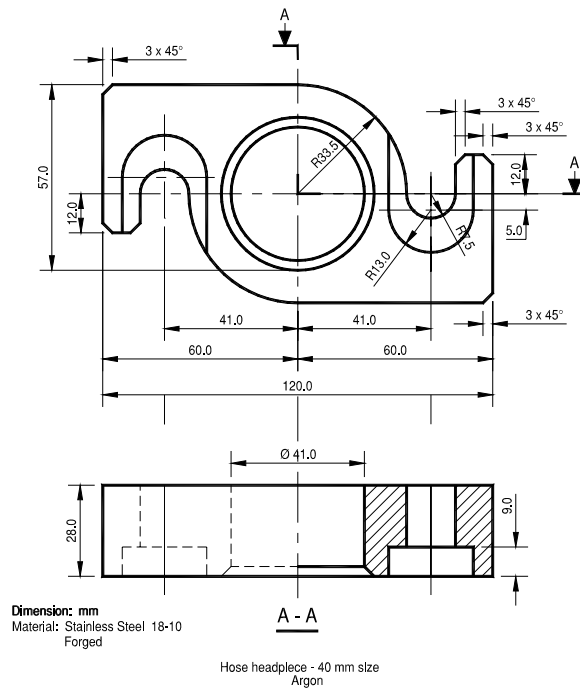
HEXAGON NUT

THREAD	1.00-11.5 NPS-RH-INT	
MINOR DIA	1.201-1.211	(30.50-30.76)
PITCH DIA	1.2386-1.2462	(31.460-31.653)
MAJOR DIA	1.2947 Min.	(32.885) Min.
FULL THREAD	T .875	(22.23)
CHAMFER DIA	U 30° x 1.75	(44.45)
BORE DEPTH	V 1.000 ±.010	(25.40 ±.25)
DRILL DIA	W .885	(22.48)
HEX	1.75 ±.010	(44.45 ±.25)
LENGTH	X 1.250	(31.75)
C'SINK DIA	Y 90° x 1.330	(33.78)

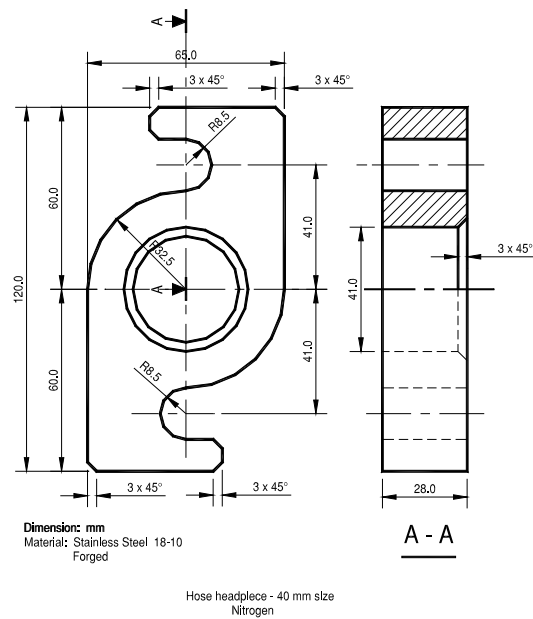
All dimensions are in inches (millimeters).

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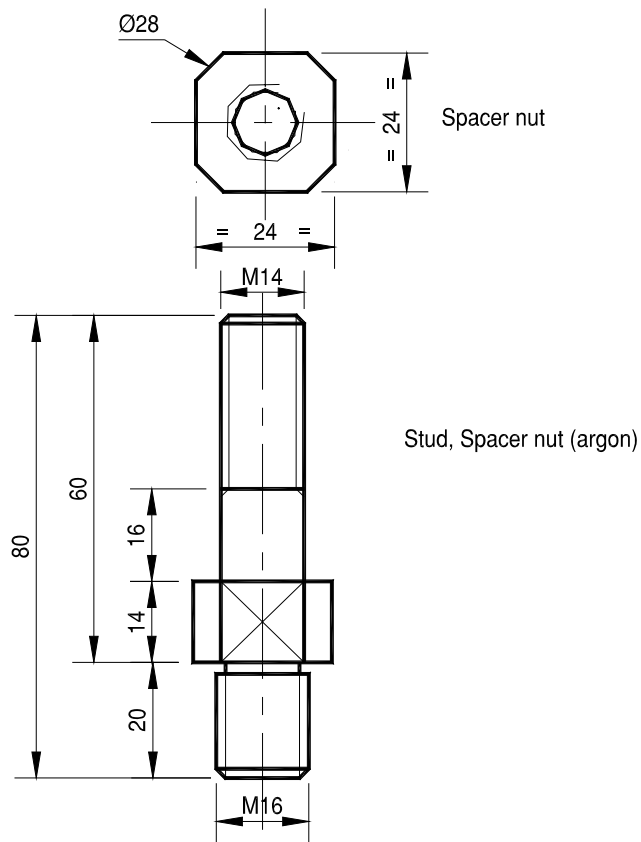
Appendix K (i) Index Plate - DN 40 LAR– Liquid argon



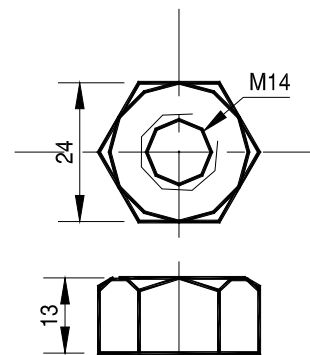
Appendix K (ii) Index Plate - DN 40 LIN – Liquid nitrogen



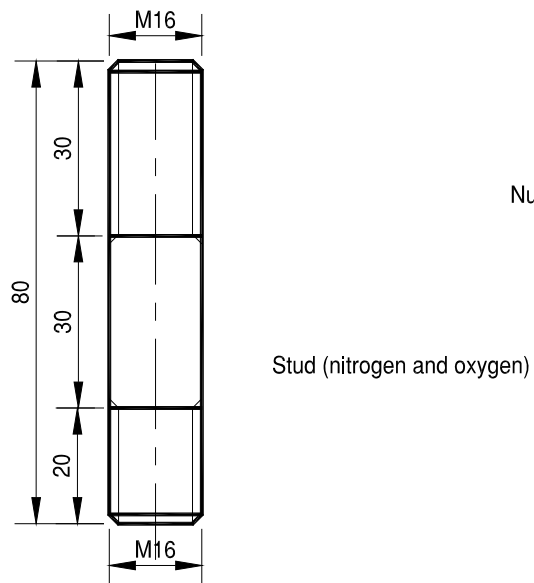
Appendix K (v) Index Plate – Studs



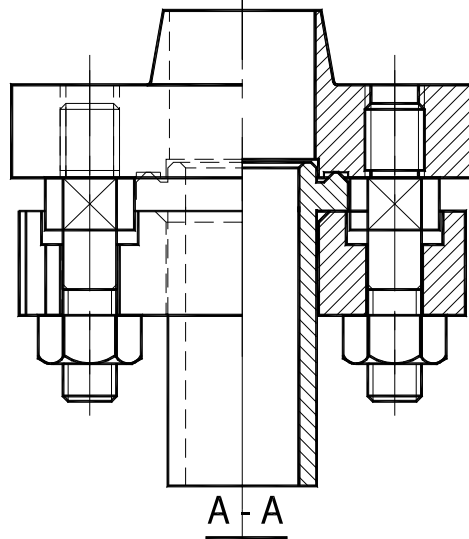
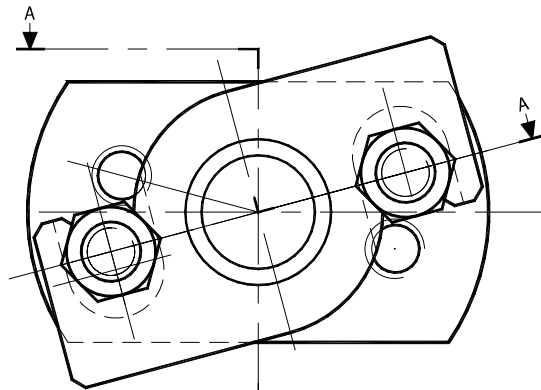
Dimensions: mm
Material: Stud - Stainless Steel
Nut - Bronze



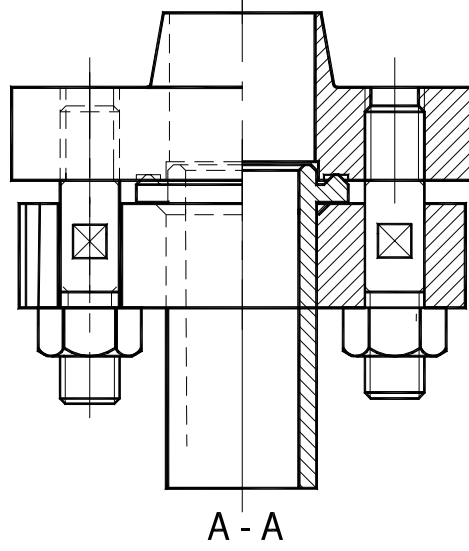
Nut (Common for argon,
nitrogen and oxygen)



Appendix K(vi) Index Plate – Complete coupling views

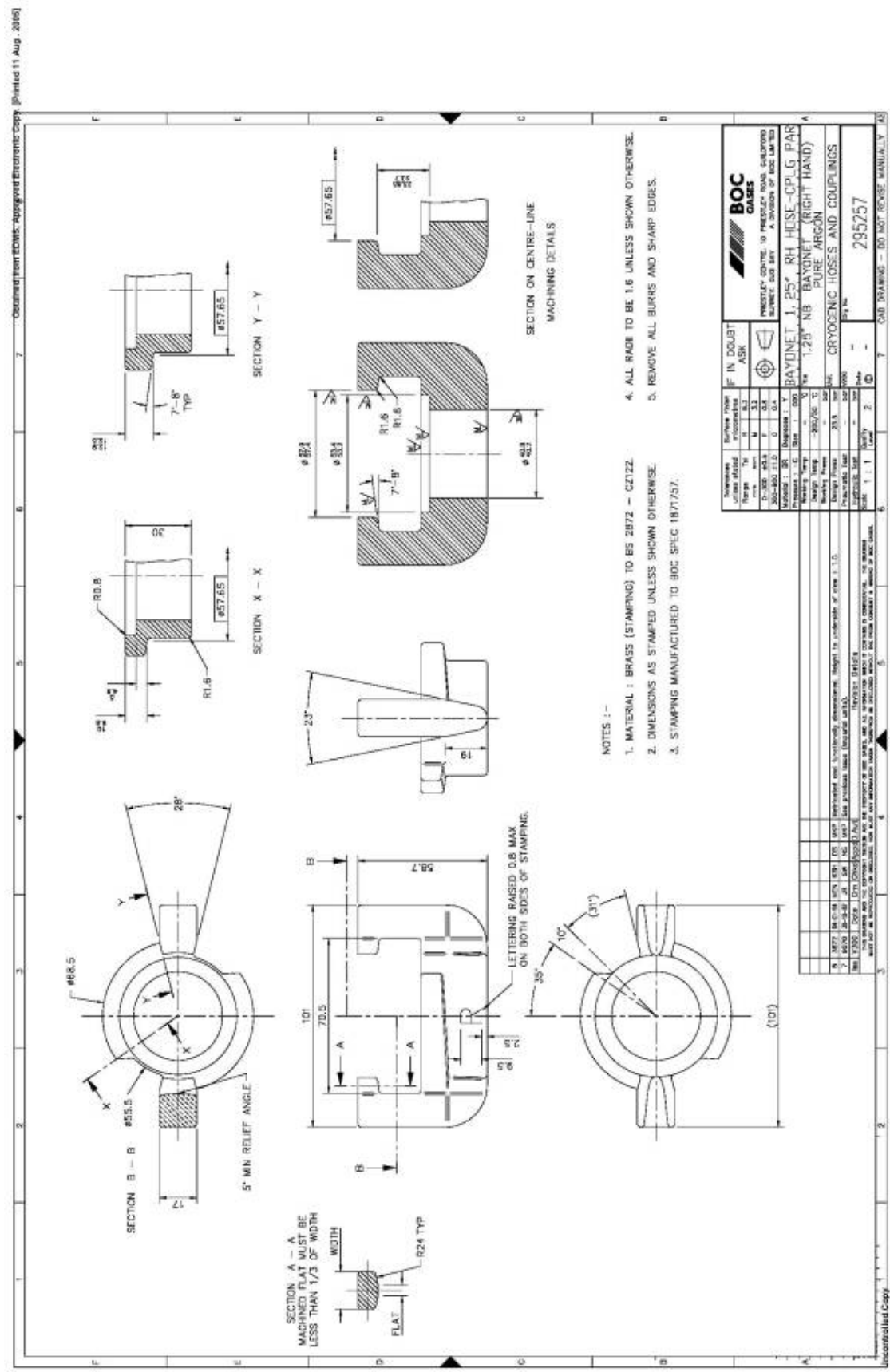


Indexed plate type
Complete coupling 40 mm size
Argon

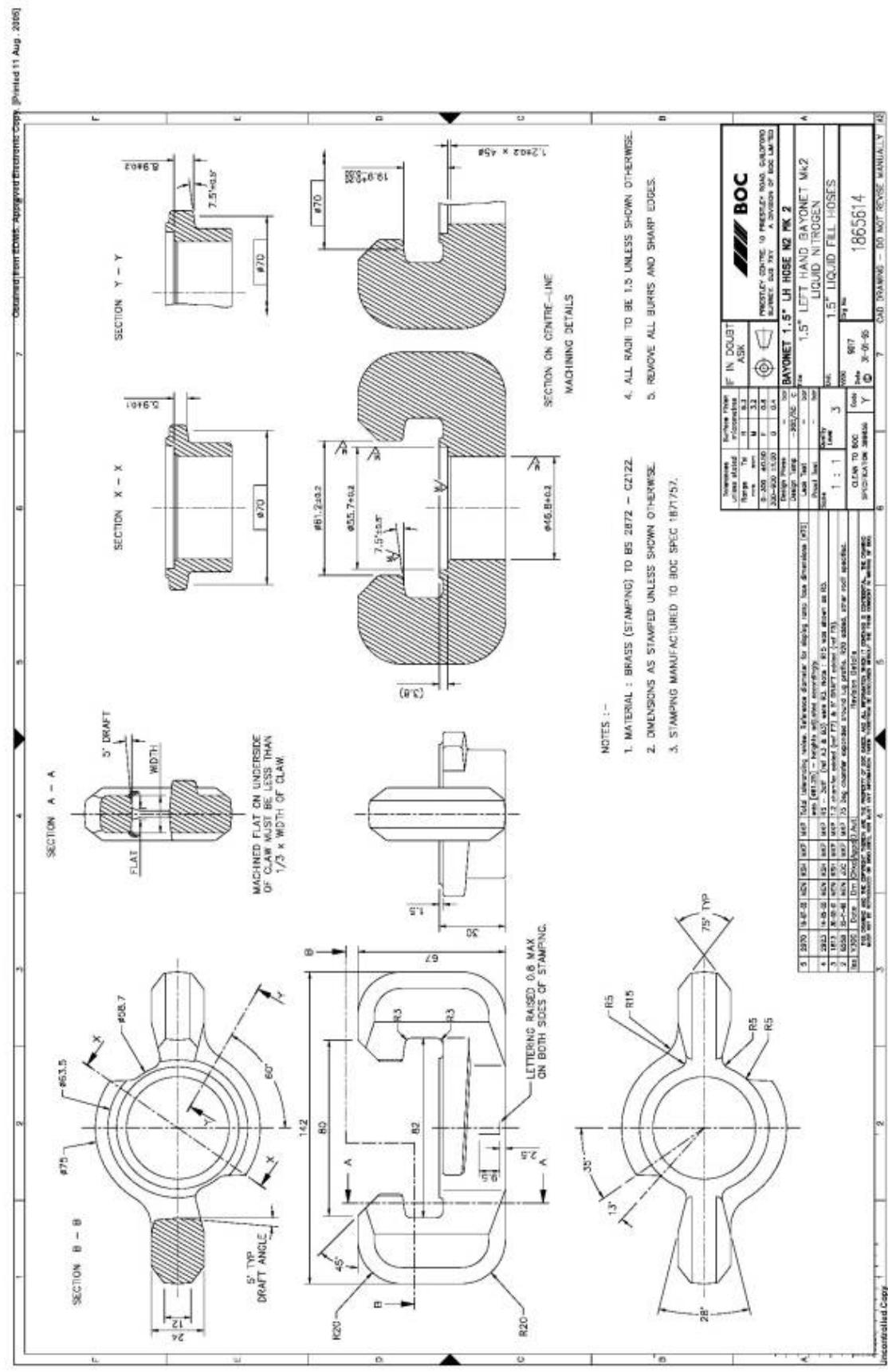


Indexed plate type
Complete coupling 40 mm size
Nitrogen

Appendix L - Ramped bayonet claw coupling – Liquid argon
1.25" RH – Liquid argon

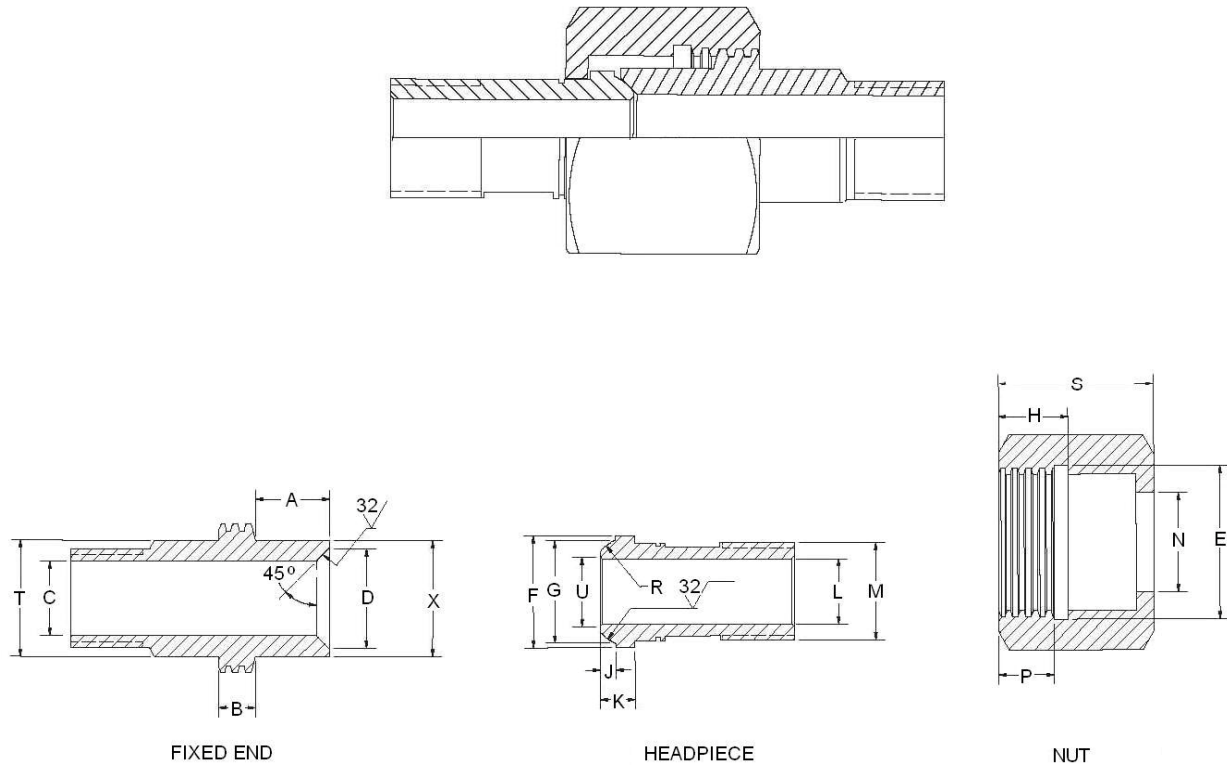


Appendix N – Ramped bayonet claw coupling – Liquid oxygen
1.5" RH - Liquid oxygen



Appendix O – CGA Connection No. N₂O-10

**1 in (25mm) Nitrous Oxide
Standard for nitrous oxide liquid and vapour transfer**



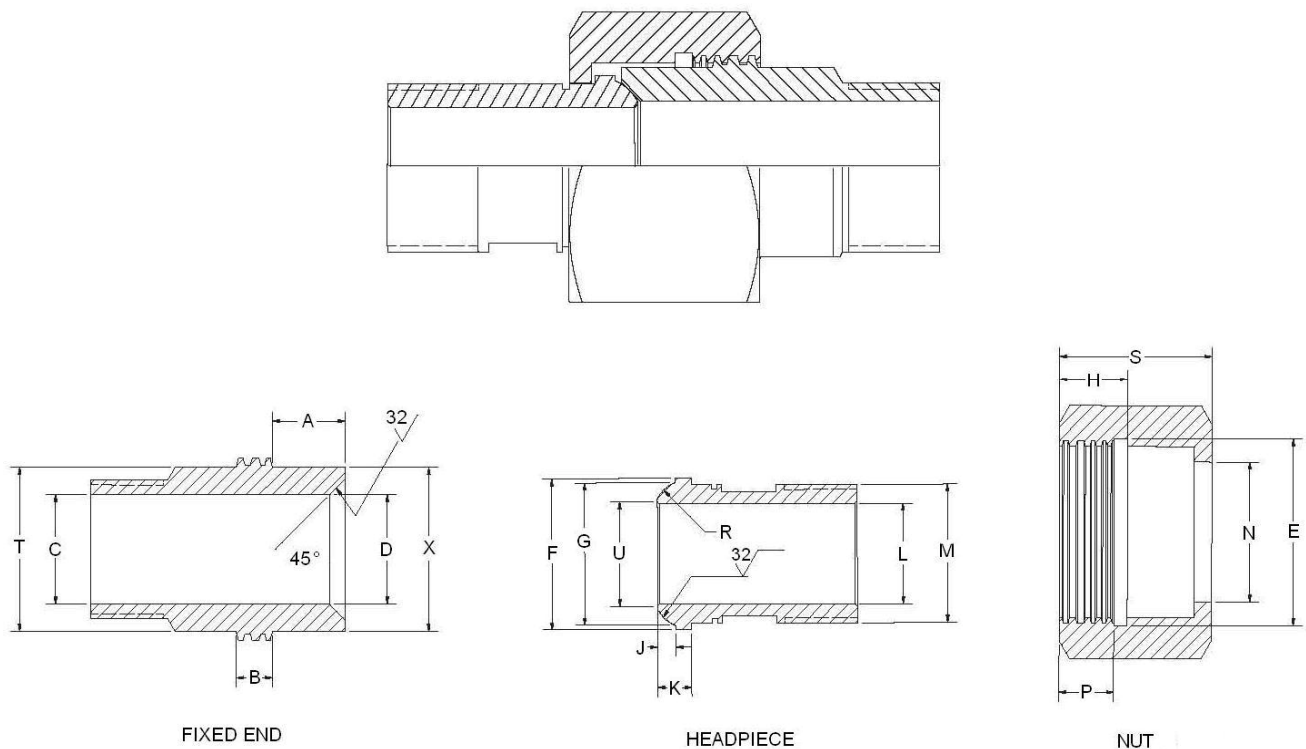
FIXED END		NUT AND HEADPIECE	
THREAD	2.000 - 6 ACME - 2G - RH - EXT	THREAD	2.000 - 6 ACME - 2G - RH - INT
MAJOR DIA.	2.000 - 1.9917 (50.800 - 50.5892)	MINOR DIA.	1.8333 - 1.8417 (46.5658 - 46.7791)
PITCH DIA.	1.9054 - 1.8847 (48.3972 - 47.8714)	PITCH DIA.	1.9167 - 1.9374 (48.6841 - 49.2099)
MINOR DIA.	1.8133 - 1.7822 (46.0578 - 45.2679)	MAJOR DIA.	2.0200 - 2.0400 (51.308 - 51.816)
A	1.000 (25.4)	K	.468 (11.887)
B	.490 - .510 (12.446 - 12.954)	L	.875 (22.225) DIA.
C	1.000 (25.4) DIA.	M	1.310 - 1.320 (33.274-33.528) DIA.
D	1.333 - 1.353 (33.782 - 34.366) DIA.	N	1.330 - 1.340 (33.782-34.036) DIA.
E	2.0625 (52.3875) MIN DIA.	P	.740 - .760 (18.796 - 19.304)
F	1.490 - 1.500 (37.846 - 38.100) DIA.	R	.500 (12.700) R
G	1.385 - 1.395 (35.179 - 35.433) DIA.	S	2.090 - 2.110
H	.9375 (23.8125)	T	1.5625 (39.6875) DIA.
J	.200 - .220 (5.080 - 5.588)	U	1.058 - 1.068 (26.873 - 27.127) DIA.
X	1.5625 (39.688) DIA.		

NOTE—Dimensions are shown in inches (mm). Unspecified tolerances are ± .015.

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Appendix P – CGA Connection No. N₂O-15

**1-1/2 in (38 mm) Nitrous Oxide
Standard for nitrous oxide liquid and vapour transfer**



FIXED END		NUT AND HEADPIECE	
THREAD	2.500 - 6 ACME - 2G - RH - EXT	THREAD	2.500 - 6 ACME - 2G - RH - INT
MAJOR DIA.	2.5000 - 2.4917 (63.50 - 63.2892)	MINOR DIA.	2.3333 - 2.3417 (59.2658 - 59.4791)
PITCH DIA.	2.4041 - 2.3824 (61.0641 - 60.5130)	PITCH DIA.	2.4167 - 2.4384 (61.3841 - 61.9353)
MINOR DIA.	2.3133 - 2.2807 (58.7578 - 57.9298)	MAJOR DIA.	2.5200 - 2.5400 (64.008 - 64.516)
A	1.000 (25.400)	K	.468 (11.887)
B	.490 - .510 (12.446 - 12.954)	L	1.375 (34.925) DIA.
C	1.500 (38.1) DIA.	M	1.895 - 1.905 (48.133 - 48.387) DIA.
D	1.910 - 1.930 (48.514 - 49.022) DIA.	N	1.920 - 1.930 (48.768 - 49.022) DIA.
E	2.5625 (65.0875) MIN DIA.	P	.740 - .760 (18.796 - 19.304)
F	2.065 - 2.075 (52.451 - 52.705) DIA.	R	.500 (12.700) R
G	1.955 - 1.965 (49.657 - 49.911) DIA.	S	2.090 - 2.110 (53.086 - 51.0794)
H	.9375 (23.8125)	T	2.25 (57.15) DIA.
J	.240 - .260 (6.096 - 6.604)	U	1.501 - 1.511 (38.1254 - 38.3794) DIA.
X	2.250 (57.15) DIA.		

NOTE—Dimensions are shown in inches (mm). Unspecified tolerances are $\pm .015$.

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