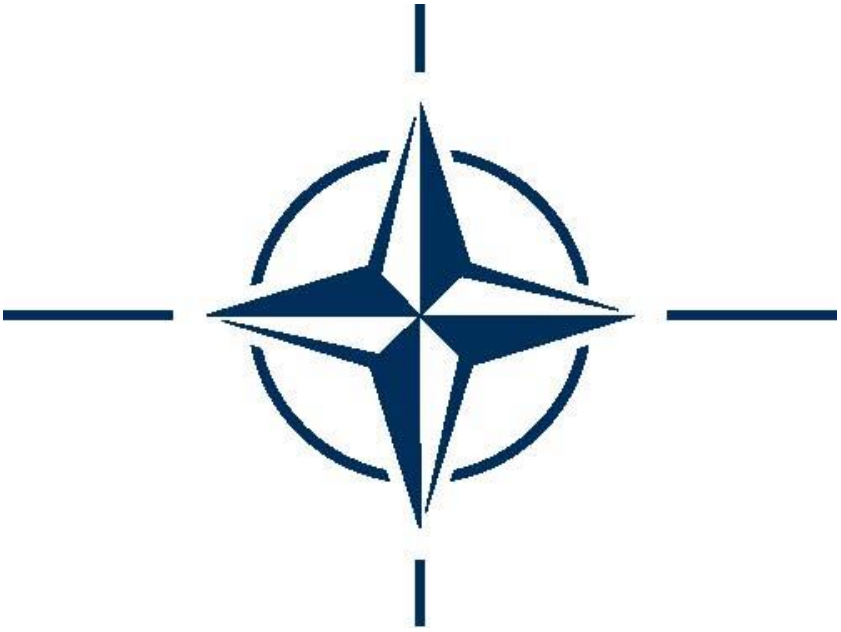
NATO STANDARD

AEP-4687

EXPENDABLE COUNTERMEASURES FOR AIRCRAFT AND UAVS

Edition A, Version 1

DATE
RATIFICATION DRAFT 2



NORTH ATLANTIC TREATY ORGANIZATION

ALLIED ENGINEERING PUBLICATION

Published by the
NATO STANDARDIZATION OFFICE (NSO)

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NATO LETTER OF PROMULGATION

date

1. The enclosed Allied Engineering Publication AEP-4687, Edition A, Version 1, STANDARDIZATION AGREEMENT ON EXPENDABLE COUNTERMEASURES FOR AIRCRAFT AND UAVS, which has been approved by the nations in the NATO AIR FORCE ARMAMENTS GROUP, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 4687.

2. AEP-4687, Edition A, Version 1, is effective upon receipt.

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4. This publication shall be handled in accordance with C-M(2002)60.

Dimitrios SIGOULAKIS
Lieutenant General, GRC (A)
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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CHAPTER 1—INTRODUCTION

1.1 Purpose.

The purpose of this document is:

1. To establish and standardize countermeasure expendable cases to ensure operational interchangeability and interoperability.

2. To define the physical dimensions of expendable cartridge.

3. To define the electrical interface of expendables with dispensing systems.

4. To define a standard cartridge marking scheme.

5. To define an end-cap color scheme for manufacturers to follow which will aid in expendable identification when installed.

6. To specify a standard technical document which will provide; countermeasure functional requirements & characteristics, quality requirements, safety and handling requirements, environmental properties.

1.2 Agreement.

Participating nations agree to adopt the following design, test, and qualification parameters as detailed herein. This STANAG is implemented when a Nation has issued the necessary orders or instructions to authorities and units concerned, putting the procedures detailed in this agreement into effect.

1.3 Acronyms.

Definitions for acronyms found this STANAG are found in Table 1.

Table 1. Definition of Acronyms

Acronym	Definition
DC	Direct Current
EM	Electromagnetic
ID	Identification
IR	Infrared
ISO	International Organization for Standardization
JASP	Joint Aircraft Survivability Program
LAT	Lot Acceptance Test
MSDS	Material Safety Data Sheet
MSIAC	Munition Safety Information Analysis Center
STANAG	Standardization Agreement

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CHAPTER 2—GENERAL REQUIREMENTS

2.1 Physical Interface Requirements.

2.1.1 Dimensions.

1. The dimensions for the external shape and squib position for the 1” x 1” x 8” cartridge shall be as detailed in Annex B.

2. The dimensions for the external shape and squib position for the 1” x 2” x 8” cartridge shall be as detailed in Annex C.

3. The dimensions for the external shape and squib position for the 2” x 2.5” x 8” cartridge shall be as detailed in Annex D.

4. The dimensions for the external shape and printed circuit board for the ∅55mm x 375mm payload cartridge case shall be as detailed in Annex E.

5. The dimensions for the external shape and printed circuit board for the ∅55mm x 375mm 3-payload cartridge case shall be as detailed in Annex F.

6. The dimensions for the external shape for the ∅19mm cartridge case shall be as detailed in Annex G.

7. The dimensions for the external shape and squib position for the ∅36mm cartridge case shall be as detailed in Annex H.

8. The dimensions for the external shape and squib position for the ∅40mm cartridge case shall be as detailed in Annex I.

9. The dimensions for the external shape and squib position for the ∅60mm cartridge case shall be as detailed in Annex J.

10. The dimensions for the external shape and squib position for the Cartridge Impulse 1x1x8 shall be as detailed in Annex K.

11. The dimensions for the external shape and squib position for the Cartridge Impulse 1x2x8 shall be as detailed in Annex L.

12. The dimensions for the external shape and squib position for the Cartridge Impulse 36mm shall be as detailed in Annex M

13. The dimensions for the external shape and squib position for the ∅26mm cartridge case shall be as detailed in Annex N.

14. The dimensions for the external shape and squib position for the ∅50mm cartridge case shall be as detailed in Annex O.

15. The dimensions for the external shape and squib position for the ∅55mm x 200mm cartridge case shall be as detailed in Annex P.

16. The dimensions for the external shape and squib position for the 1.5" X 1.5" x 10.540" cartridge case shall be as detailed in Annex Q.

2.2 Electrical Interface Requirements.

2.2.1 Bridge-wire Resistance.

The bridge-wire resistance of all squibs and impulse cartridges used on expendable countermeasures addressed in this document conform to an electrical resistance of 1.0 +/- 0.2 ohms when measured at ambient temperature.

2.2.2 No Fire Characteristics.

All squibs and impulse cartridges must be capable of withstanding a 1A/1W current for 300 seconds without firing. The impulse cartridge is not required to meet its performance requirements after this test.

2.2.3 All Fire Characteristics.

The maximum current required to fire all squibs and impulse cartridges shall be no more than 4.25 A.

2.2.4 Post Fire Resistance.

The impulse cartridge post fire resistance should exceed 500 ohms at 28V DC. This requirement should be met when fired in a pressure bomb or in its intended payload.

2.2.5 Bridge-wire Function Time.

The squib shall function in 0.5 ms to 15 ms after firing current is initially applied.

2.2.6 Polling Interface.

This STANAG does not specify any requirements relating to squibs and impulse cartridges and their interaction with the dispensers. The electrical and mechanical interface between impulse cartridge and the dispenser electrical contacts requires further consideration.

2.3 Cartridge Marking and End-Cap Color Scheme.

2.3.1 Marking.

The cartridges shall be visibly marked and easily identified on one the side of the expendable case. These markings shall include the following information:

1. Nomenclature: A general naming system defined at the national level for identifying expendables that is clear and concise. This may include information such as expendable type, name, identification code, lot number and even grain number. By way of example, markings on a US Navy flare reads US Navy/NAVAIR, Decoy, IR Countermeasure, MJU-XX, National Stock Number (NSN), Lot Number, and Grain Number.

2. Manufacturer name (ID): An identification code unique to a manufacturer, identifying both the company and factory of origin.

3. Date of manufacture (month, year).

4. Manufacturing lot number.

5. NATO Stock Number

6. Examples. In many cases, the Manufacturer name, Date of manufacture and Manufacturing lot number are incorporated into a single manufacturer code. An example, MIL-STD-1168C, Chapter 4, has a format of LL-NNL-NN-NNNL where the first section LL is a manufacturer code, the second section NNL is a date code, NN is the batch of material, if applicable and NNNL refers to the sequential serial number of the lot. Similar formats exist, for example, RHU20G3456 indicates a lot manufactured by Rheinmetall at Unterluess factory, manufactured in July 2020 and as part of lot 3456.

2.3.2 Color Coding.

Cartridge end caps shall be coded by color, defining both the composition type and function of the countermeasure. A single role countermeasure shall be represented by a single color (e.g. a standard MTV is given solid red). Dual role countermeasures shall be represented by their primary and secondary functions, with the primary function represented by the background and the secondary represented by a central disc (e.g. an Aero MTV will have a solid green background with a central red disc). Multi-role countermeasures having more than two functions will be limited to two colors, a primary represented by the background and a secondary represented by a central disc. It is left to the manufacturing nation to determine the primary and secondary purposes. The colors are set out in Table 2.

1. It is preferred that an abbreviated flare name/ID be present on the end cap using a method that is permanent, easy to identify and read, such as a raised surface, etching or ink marking. However, it is recognized that security, operational and manufacturing requirements may precluded the inclusion of such an end cap marking.

Table 2. Color Coding of Cartridge Endcaps

Expendable Type	End cap	Comments
Area Device	**Yellow**	Pyrotechnically ignited and/or explosively disseminated payload e.g. phosphorus burst, pyrotechnic leaflets, flash device
Aerodynamic / Propelled	**Green**	Self –propelled, or trajectory enhanced by the use metal hardware and/or surface inhibition
Standard MTV	**Red**	Surface burning pellet
Spectral	**White**	Surface burning, gas producing pellet
Pyrophoric Solid	**Purple**	Non – explosive dissemination of payload
Chaff	**Grey**	Passive RF Stores
Expendable Active Decoy	**Oxford Blue**	Active RF Stores
Multiple Payloads	**Brown**	Cartridges containing more than one separately ejected payload or an area effect with multiple elements
Training/Inert	**Orange**	Mass representative inert device for training purposes
Undefined	**Black**	A black end cap may be used for any expendable type when the color coding scheme may impact operational requirements.

2.4 Functional Requirements.

2.4.1 Temperature.

The cartridge should be capable of storage and function under any temperature condition from -46 ºC to +60 ºC as a minimum. The cartridge should function normally after 2 temperature cycles between the extremes of -46 ºC to +60 ºC, each lasting 4 hours. Actual limits shall be provided in the technical documentation.

2.4.2 Vibration.

Vibration spectra are specific to aircraft, dispenser type and location/mounting position on the aircraft. As much information as possible should be given in technical documentation indicating vibrational spectrum of test, method of test, aircraft type and location of dispenser (wing pod, rail, fuselage, etc.).

2.4.3 Blocked Ejection.

Tests related to firing a blocked cartridge shall be described in the associated technical document(s). A document shall describe any tests performed, whether the ejection is partially or fully blocked, detailing expendable ignition, propagation of ignition to other expendables and damage to the dispenser.

2.4.4 Light-Up Time.

Defined as the first indication of emissions of the flare following ejection and is dependent upon flare design requirements. This Ignition Time shall be documented in the Technical Data Sheet. The ignition of the flare shall cause no more than superficial damage in the vicinity of the dispenser.

2.4.5 Reaction Force.

A representative reaction force for the item shall be documented in the Technical Data Sheet. The manufacturer shall provide an average peak reaction force and document the fixture, instrumentation and method used to collect the data. A suitable fixture and methodology for testing a 1x1x8 inch expendable is discussed in JASP Report for S-15-01-001, Common Setback Measurement Tools, available in the Munitions Safety Information Analysis Center (MSIAC) library under reference TR20190365. The technical documentation should include information relating to the peak reaction load of the flare and the total impulse. It is the platform user's responsibility to assess the reaction load, the dispenser type and the mounting configuration on the aircraft to determine the aircraft loading associated with firing an expendable.

2.4.6 Ejection Velocity.

The expendable shall have a minimum ejection velocity of at least 20 m/s. Further details shall be stated in the technical documentation.

2.4.7 Handling (drop-test).

The ability of the payload to be dropped without incident is a critical requirement for handling safety.

1. An unpackaged cartridge is required to be safe and serviceable after a drop of 1m.

2. A packaged cartridge is required to be safe for disposal after a 12 m drop.

3. Further details shall be stated in the technical documentation associated with the flare.

2.4.8 Expendable Life.

Shelf life, service life and flying hours shall be defined and specified in the technical document. The cartridge shall be capable of meeting its performance requirements when used within the minimum values of 5 years of shelf life and 1 year of service life. Further details shall be stated in the technical documentation.

CHAPTER 3—QUALITY ASSURANCE

3.1 Qualification Testing.

3.1.1 Purpose.

Qualification testing is intended to verify the suitability of the design to meet its performance, safety and reliability requirements when functioned within its design operational environment. The manufacturer shall certify to the satisfactory completion of these tests and the actual levels shall be included in the technical documentation.

3.1.1.1 Requirements.

As a minimum, the Qualification Testing shall have been conducted to verify the suitability of the design within following requirements as identified in its performance specification:

1. Temperature
2. Vibration
3. Humidity
4. Blocked ejection
5. Static Function
6. EM Compatibility
7. Handling (drop testing packaged and unpackaged)

3.2 Lot Acceptance (Proofing).

3.2.1 Lot Acceptance Testing.

The manufacturer shall demonstrate that the cartridges have been tested to an accepted standard, eg ISO. The lot sample shall be sufficiently large to demonstrate functional reliability of at least 95% at an 85% confidence level.

3.2.2 Visual and X-Ray Examination.

A sample of the production lot shall be subjected to examination to verify compliance with workmanship and marking requirements.

3.2.3 Functional Testing.

Functional Lot Acceptance Testing shall be conducted to verify the flare payload meets its specified performance requirements for the following characteristics:

1. Infrared intensity profile as a function of time in each IR band for which a specification exists. This may be on a separate sample but must meet the sampling requirements above.
2. Ejection velocity
3. Reaction load
4. Light up time

CHAPTER 4—TECHNICAL DATA SHEET

4.1 Effect on the Environment.

The technical documentation associated with a cartridge shall contain the following information:

4.1.1 Reaction Products.

A list of all reaction products greater than 5g per item and their mass percentage expected from the intended combustion of the payload. If information related to the reaction products of the item is considered restricted, classified per the Security Classification Guide, or proprietary to the manufacturer it shall be noted in the table in Annex A, Section 9, rather than filling in the reaction products.

4.1.2 Non-combustible Hardware.

A list of non-combustible hardware items and their associated weights that are ejected from the cartridge.

4.1.3 Conformity.

A statement of conformity to international standards, eg EEC Directive 76-769.

4.2 Technical Documentation – STANAG 4687 Compliancy Data Sheet.

A technical document shall be available from the manufacturer giving details of the expendable's characteristics within the limitations of commercial and national security. The data shall be at no greater security level than unclassified and commercial in confidence. Where a parameter fails this requirement it shall be marked 'classified' in the documentation. The Technical Data Sheet shall contain:

4.2.1 Cartridge Function.

A short description of the cartridge and its intended function and use.

4.2.2 Conformity.

A statement of conformity stating that the cartridge conforms to the requirements of this STANAG. (Where a cartridge does not fully conform to the STANAG then the statement shall contain a list of exceptions, identifying the relevant paragraph within the STANAG, and the nature of the non-conformity. Where quantifiable parameters lie outside the STANAG requirements, the values should be stated where possible, within commercial and national security limitations.

4.2.3 Standards.

A list of documents relating to the manufacturer, and to national and international standards.

4.2.4 Description of Cartridge Components.

A description of the cartridge, to include the build components, materials, combustion characteristics, and a statement of environmental compliancy.

4.2.5 Qualification.

A list of tests performed during qualification and a second list relating to lot acceptance.

4.2.6 Verification of Quality Standards.

Details of methods and procedures to verify quality standards.

4.2.7 Shelf-Life.

Information relating to the life of the cartridge under different storage and handling conditions.

4.2.8 Packaging.

Information relating to the packaging, handling, transportation and disposal of the cartridge.

4.2.9 Material Safety Data Sheet.

Must include a material safety data sheet as specified in Annex A, Section 10.

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ANNEX A—TECHNICAL DATA SHEET

Technical Data Sheet

A.1 Technical Data Sheet Example. The following is sets out examples of the information included in a flare Technical Data Sheet. *Italics* indicates general information and is not related to any particular flare. It is recognized that each nation has unique naming conventions, standards documents and reporting requirements.

1. Product Name. *Product name, e.g. DSTL-22, ARM-001, LIR-XXX, MJU-7A/B etc.*

2. Description. The description should include the following: build, components, combustion characteristics and environmental compliancy details and procedures.

Item Name/Description	*NSF-XXX (include any variant designation)* *NSN XXXX-XX-XXX-XXXX* *Aircraft Launched Infrared Countermeasure Flare*
Manufacturer	*Mfr Name* *Address* *e-mail poc*
Application	*The NSF-XXX is a high intensity infrared countermeasure in the 1x1x8 form factor and compatible with the AN/ALE-40 series of CMDS and equivalents. It is intended for use on rotary and fixed wing aircraft of medium signature and flight speeds. The flare has been found suitable for use on UH-60, CH-47, C-130 and A-10 aircraft.* *The flare provides a high intensity, high temperature signature and is not spectrally tailored or aerodynamically stabilized.*

a. Components. *The flare assembly consists of an Aluminium outer case, plastic end cap and the infrared flare payload. The infrared flare payload is ejected by an electrically initiated impulse cartridge, (BBU-35/B or equivalent) the flare payload is initiated by a slider/interrupter device which is also activated by the impulse cartridge combustion products. The assembly with the impulse cartridge installed is hermetically sealed. The infrared flare payload is a conventional pyrotechnic mix which is coated with ignition slurry prior to wrapping with foil tape.*

b. Physical Characteristics as follows:

Item	Value
Weight	*190 g*
Ejected payload weight	*150 g*
Size	*25mm x 25mm (square)* *205mm overall length*
Net Explosive content	*115 g nominal*
Hazard Classification & Shipping	*1.3G* *UN 0093* *FLARES, AERIAL*

c. Packaging. *The flares are packaged 30 each in a metal ammunition can (PA-19) with cardboard separators and foam dunnage top and bottom in accordance with drawing XXXXXXX. Two PA-19 cans each are packaged in a wire bound box. The wire bound boxes are palletized.*

3. Conformity with STANAG 4687. This product is in conformance with STANAG 4687 with the exceptions noted below:

STANAG Requirement	Description of exception
End Cap Color	*The cartridge has a black end cap with the nomenclature NSF-XXX stamped in white letter instead of the red end cap noted in the STANAG*
Bridge wire resistance	*The CCU-XXX used with the flare has a bridgewire resistance of .5 +/- .1 ohm. The cartridge still satisfies the 1A/1W minimum no-fire requirement of item 21.*

4. Applicable Documents.

a. Standards:

(1) *ISO/ANSI 9001:2000* *Quality Management System*

(2) *ISO 14001* *Environmental Management System*

(3) *MIL-STD-130* *Identification Marking of US Military Property*

(4) *MIL-STD-810D* *Environmental Test Methods and Engineering Guidelines*

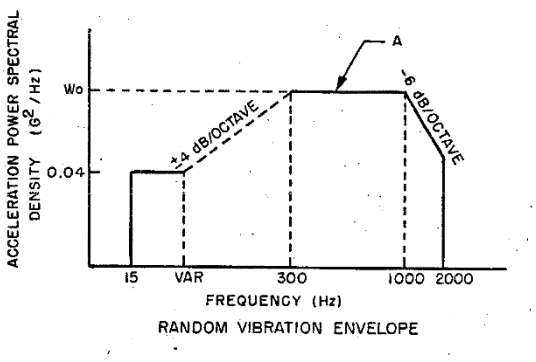
(5) *MIL-STD-1168* *Ammunition Lot Numbering*

b. Manufacturer's Drawings:

(1) *XXXXXX* *Flare, Decoy, NSF-XXX*

(2) *YYYYYYY* *Packaging, Shipping and Storage*

5. Qualification Tests. *The following qualification tests have been successfully performed during the development process.*

Performance Item	Requirement	Verification method
Temperature	*-54C to +71C*	*Test per Mil Std 810C procedure I table 504.1-11 Category 6*
Vibration	*wo = .2 G2/Hz* *var = 89.5 Hz* *cutoff at 2000Hz = .05G2/Hz*  RANDOM VIBRATION ENVELOPE	*Mil Std 810C 514.2 procedure IIC and Procedure 1A*
Shock	*11 ms half sine 15g peak*	*Mil Std 810C*
Altitude	*To 70,000 ft*	*temp altitude method method 520.0 procedure 2*
Reliability	*95% at 86 % confidence*	*Functional Test*
Peak reaction load	*7 KN*	*Measured at ambient in standard test fixture*

6. Lot Acceptance Tests. *The following LAT/Proof tests are conducted in each deliverable lot of flares.*

Performance Item	Requirement	Verification method
Infrared Output, *25 units min per lot*	*In accordance with specification 999999, actual values classified*	*Static IR measurement. Instrumented radiometric tunnel with smoke removal*
Ejection Velocity/Setback *25 units min per lot*	*15-25 m/sec*	*Ejection test measured over first meter of travel.* *Ejection test to be conducted using representative dispenser at ambient conditions*

7. Cartridge Life. *Shelf life is 5 years while in sealed packaging. Service life is 1 year after removal from packaging. Maximum of 100 flight hours.*

8. Packaging, handling, transportation and disposal.

a. *The flare assembly is packaged in Metal Ammunition Containers as described in 4.3 above.*

b. *The packaged flare is safe to handle in the environments defined in paragraph 5 above. It is recommended to wear personal protective equipment such has safety glasses, gloves or anti flash hoods while loading magazines.*

c. *The flares may be transported in their original packaging in accordance with approved shipping regulations appropriate for the 1.3G hazard classification*.

d. *Disposal of the flare should be in accordance with the users established procedures and regulations. See also the material safety data sheet*.

9. Environmental issues.

a. Declaration under EC directive 76/767/EEC:

The listed flare contains dangerous substances named in the annex of the European Communities (EC) council directive 76/769/EEC.

The substances are explicitly identified on the appropriate MSDS.

Lead (III, IV) Oxide, classed as lead compounds other than those listed. Index Number 082-001-006. Contains less than 0.2g.

b. Reaction products. (Note: If this information is classified per the Security Classification Guide or proprietary to the manufacturer it shall be noted and not provided). *The store produces the following emissions upon its intended combustion:*

Element	**g/store**	**Estimated Exhaust Products**
Magnesium	*54.0.*	*Fluoride particulate ~28.5% (39.4g), oxide particulate ~71.5% (63.2g)*
Carbon	*10.0*	*Elemental particulate ~20% (2.0 g), Dioxide~ 40% (13.5g), monoxide ~40%(8.5g)*
Fluorine	*29*	*Fluorides ~100%*
Boron	*0.26*	*Boric oxide particulate ~90% (0.84g) as Boron trifloride ~10% (<0.01g)*
Potassium	*0.03*	*Potassium oxide ~100% (0.06g)*
Nitrogen	*0.04*	*Elemental Nitrogen ~90%, oxides of nitrogen ~10%*

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10. Material Safety Data. Any format which satisfies international health and safety requirements may be used. An example form provided by the US Department of Labor Occupational Safety and Health Administration follows. In general, the same information is required but need not be presented in the same arrangement.

EXAMPLE ON NEXT PAGE:

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health
Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)*	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name	Emergency Telephone Number
Address *(Number, Street, City, State, and ZIP Code)*	Telephone Number for Information
	Date Prepared
	Signature of Preparer *(optional)*

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	%*(optional)*

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Section III - Physical/Chemical Characteristics

Boiling Point		Specific Gravity (H_2O = 1)	
Vapor Pressure (mm Hg)		Melting Point	
Vapor Density (AIR = 1)		Evaporation Rate (Butyl Acetate = 1)	
Solubility in Water			
Appearance and Odor			

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
Extinguishing Media			
Special Fire Fighting Procedures			
Unusual Fire and Explosion Hazards			

(Reproduce locally) OSHA 174, Sept. 1985

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable		
Incompatibility *(Materials to Avoid)*			
Hazardous Decomposition or Byproducts			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
Health Hazards *(Acute and Chronic)*			
Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
Signs and Symptoms of Exposure			
Medical Conditions Generally Aggravated by Exposure			
Emergency and First Aid Procedures			

Section VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled
Waste Disposal Method
Precautions to Be taken in Handling and Storing
Other Precautions

Section VIII - Control Measures

Respiratory Proctection *(Specify Type)*		
Ventilation	Local Exhaust	Special
	Mechanical *(General)*	Other

Protective Gloves	Eye Protection
Other Protective Clothing or Equipment	
Work/Hygienic Practices	

* U.S.G.P.O.: 1986 - 491 - 529/45775

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AEP-4687

Occupational Safety & Health Administrations
200 Constitution Avenue, NW /13/04
Washington, DC 20210

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ANNEX B—1 x 1 x 8 FORMAT

Flare & Chaff Countermeasure 1 x 1 x 8 Format

B.1 Flare and Chaff Countermeasure 1 x 1 x 8 Format. The following figure is an illustration of a general 1 x 1 x 8 format and Table B-1 states the measurements for Type 1 and Table B-2 for Type 2. Please note that when designing countermeasure magazines, original drawings and specific countermeasure dimensioning should be obtained to ensure the required cartridges fit.

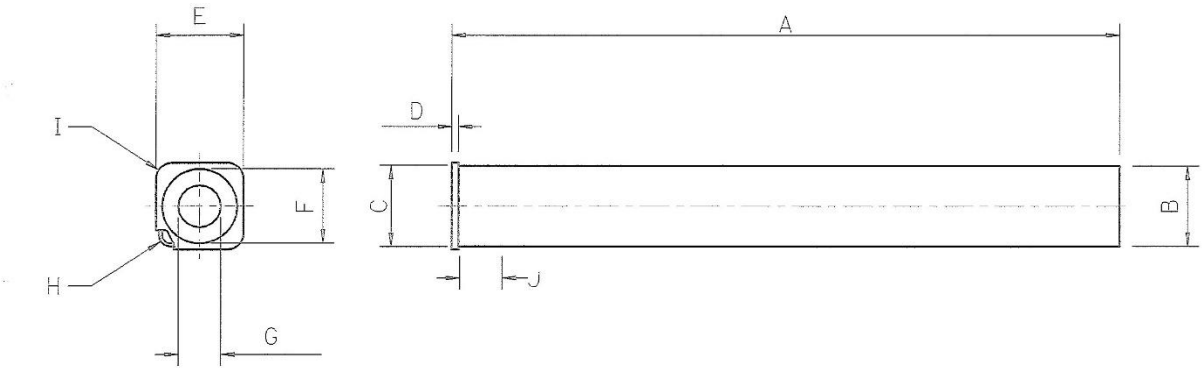

Figure B-1. Flare & Chaff 1 x 1 x 8 Format

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Table B-1. 1 x 1 x 8 **Type 1** Format Specifications

Cartridge						**Maxima**
1" x 1" x 8"				**Length / "**		**8.141/ 206.78**
				Width / "		**0.985/ 25.019**
				Thickness / "		**0.985/ 25.019**
				***C dimension does not include .005 for case straightness**		
	Dimensions					
Flare	**/ mm**	**tolerance**		**/ "**	**tolerance**	
A	**206.78**		**-2.69**	**8.141**		**-0.106**
B	**24.900**		**max**	**0.980**		**max**
C	**25.019**		**-0.381**	**0.985**		**-0.015**
D	**2.032**		**-0.508**	**0.080**		**-0.020**
E	**26.924**		**-0.762**	**1.060**		**-0.030**
F	**22.606**	±	**0.508**	**0.890**	±	**0.020**
G	**12.730**		**+0.610**	**0.501**		**+0.024**
H	**3.048**		**+0.762**	**R .120**		**+0.030**
I	**5.105**		**-3.581**	**R .201**		**-0.141**
J	**22.86**		**MAX**	**0.900**		**MAX**
Chaff						
D	**2.540**		**-0.889**	**0.100**		**-0.035**
H	**3.937**		**-2.413**	**R .155**		**-0.095**
I	**0.381**		**+0.762**	**R .015**		**+0.030**

Table B-2. 1 x 1 x 8 **Type 2** Format Specifications

Cartridge						
1" x 1" x 8"				**Length / "**		**8.141/ 206.78**
				Width / "		**0.985/ 25.019**
				Thickness / "		**0.985/ 25.019**
				***C dimension does not include .005 for case straightness**		
	Dimensions					
	/ mm	**tolerance**		**/ "**	**tolerance**	
A	**206.78**		**-2.69**	**8.141**		**-0.106**
B	**24.900**		**max**	**0.980**		**max**
C	**25.019**		**-0.381**	**0.985**		**-0.015**
D	**2.540**		**-1.016**	**0.100**		**-0.040**
E	**26.92**		**-0.754**	**1.0598**		**-0.0297**
F	**22.606**	±	**0.508**	**0.890**	±	**0.020**
G	**12.730**		**+0.610**	**0.501**		**+0.024**
H	**3.048**		**+0.762**	**R .120**		**+0.030**
I	**5.105**		**-3.581**	**R .201**		**-0.141**
J	**22.86**		**MAX**	**0.900**		**MAX**
Chaff						
D	**2.540**		**-0.889**	**0.100**		**-0.035**
H	**3.937**		**-2.413**	**R .155**		**-0.095**
I	**0.381**		**+0.762**	**R .015**		**+0.030**

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ANNEX C—1 x 1 x 2 FORMAT

Flare & Chaff Countermeasure 1 x 2 x 8 Format

C.1 Flare and Chaff Countermeasure 1 x 2 x 8 Format. The following figure is an illustration of a general 1 x 2 x 8 format and Table C-1 states the measurements for Type 1 and Table C-2 for Type 2.

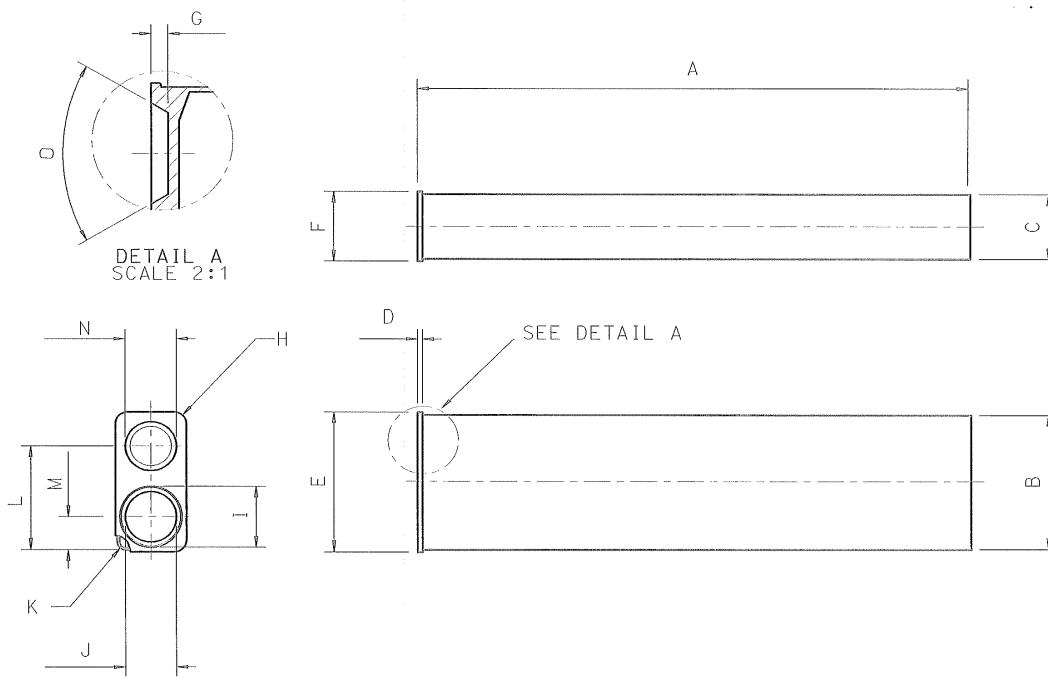

Figure C-1. Flare & Chaff 1 x 2 x 8 Format

ANNEX C TO
AEP-4687

Table C-1. 1 x 2 x 8 **Type 1** Format Specifications

Cartridge					**Maxima**	
1" x 2" x 8"				**Length / "**	**8.136/ 206.654**	
				Width / / "	**2.052/ 52.121**	
				Thickness / "	**0.982/ 24.943**	
	Dimensions					
	/ mm	**tolerance**		**/ "**	**tolerance**	
A	**206.654**		**max**	**8.136**		**max**
B	**52.121**		**max**	**2.052**		**max**
C	**24.943**		**max**	**0.982**		**max**
D	**2.159**		**-0.635**	**0.085**		**-0.025**
E	**54.08**		**-0.76**	**2.129**		**-0.030**
F	**26.518**	±	**0.381**	**1.044**	±	**0.015**
G	**3.175**	±	**0.381**	**0.125**	±	**0.015**
H	**4.775**		**-0.635**	**R 0.188**		**-0.025**
I	**22.987**	±	**0.381**	**0.905**	±	**0.015**
J	**19.101**	±	**0.127**	**0.752**	±	**0.005**
K	**3.175**		**-0.381**	**R 0.125**		**-0.015**
L	**39.497**	±	**0.381**	**1.555**	±	**0.015**
M	**12.319**	±	**0.381**	**0.485**	±	**0.015**
N	**19.05**	±	**0.381**	**0.750**	±	**0.015**
O	**60°**	±	**5°**	**60 °**	±	**5°**

Table C-2. 1 x 2 x 8 **Type 2** Format Specifications

Cartridge					**Maxima**	
1" x 2" x 8"				**Length / "**	**8.136/ 206.654**	
				Width / / "	**2.052/ 52.121**	
				Thickness / "	**0.982/ 24.943**	
	Dimensions					
	/ mm	**tolerance**		**/ "**	**tolerance**	
A	**206.654**		**max**	**8.136**		**max**
B	**52.121**		**max**	**2.052**		**max**
C	**24.943**		**max**	**0.982**		**max**
D	**2.159**		**-0.635**	**0.085**		**-0.025**
E	**54.08**	±	**-0.76**	**2.129**		**-0.030**
F	**26.518**	±	**0.381**	**1.044**	±	**0.015**
G	**3.175**	±	**0.381**	**0.125**	±	**0.015**
H	**4.775**		**-0.635**	**R 0.188**		**-0.025**
I	**22.987**	±	**0.381**	**0.905**	±	**0.015**
J	**19.101**	±	**0.127**	**0.752**	±	**0.005**
K	**3.175**		**-0.381**	**R 0.125**		**-0.015**
L	**39.497**	±	**0.381**	**1.555**	±	**0.015**
M	**12.319**	±	**0.381**	**0.485**	±	**0.015**
N	**19.05**	±	**0.381**	**0.750**	±	**0.015**
O	**60°**	±	**5°**	**60 °**	±	**5°**

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ANNEX D—2 x 2.5 x 8 FORMAT

Flare & Chaff Countermeasure 2 x 2.5 x 8 Format

D.1 Flare and Chaff Countermeasure 2 x 2.5 x 8 Format. The following figure and table illustrate the proper format.

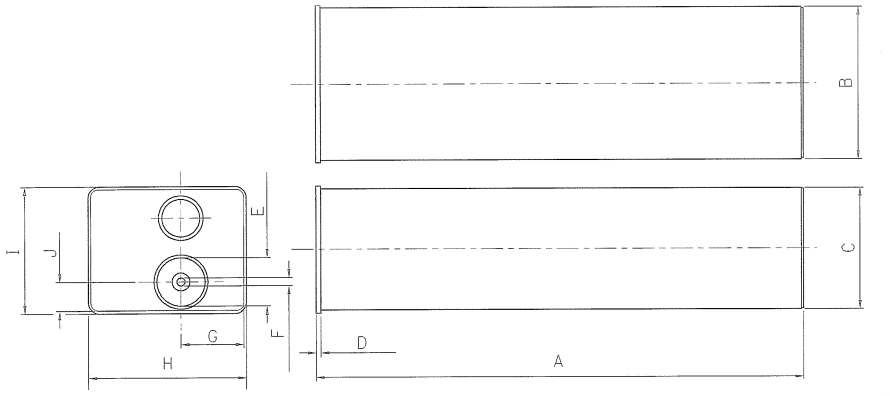

Figure D-1. Flare & Chaff 2 x 2.5 x 8 Format

Table D-1. 2 x 2.5 x 8 Format Specifications

Cartridge					**Maxima**
2” x 2.5” x 8”			**Length / "**		**8.115**
			Width / Ø / "		**2.565**
			Thickness / "		**2.030**
	Dimensions				
	/ mm	**tolerance**	**/ “**	**tolerance**	
A			**8.115**		**-0.040**
B			**2.565**		**-0.020**
C			**2.030**		**-0.020**
D			**0.080**	**±**	**0.010**
E			**0.905**	**±**	**0.010**
F			**NA**		
G			**1.012**	**±**	**0.010**
H			**2.650**	**±**	**0.010**
I			**2.125**		**-0.020**
J			**0.477**	**±**	**0.010**

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ANNEX E TO
AEP-4687

ANNEX E—55mm FORMAT-2 Payloads

Flare & Chaff Countermeasure 55mm Format – 2 Payloads

E.1 Flare and Chaff Countermeasure 55mm Format with Two Payloads. The following figure and table illustrate the proper format.

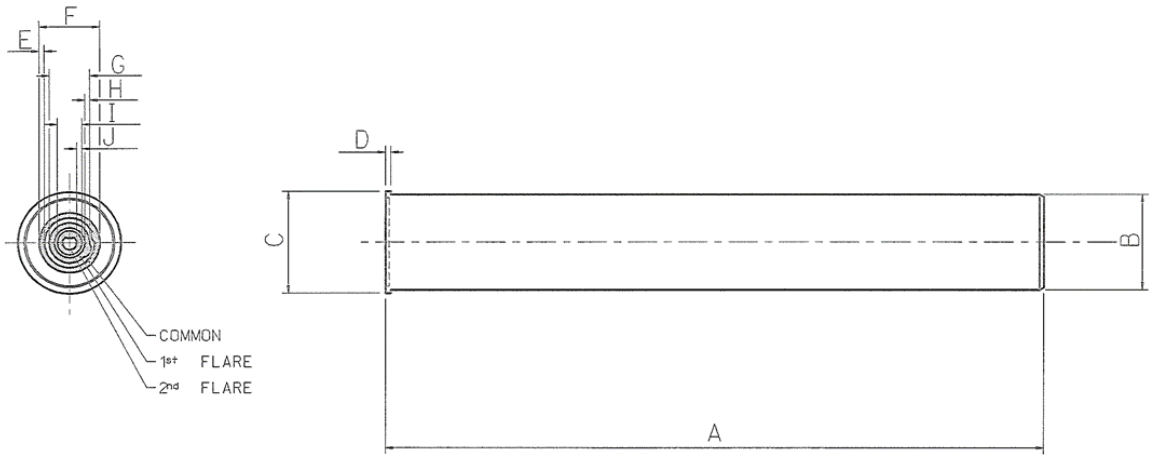

Figure E-1. Flare & Chaff 55mm Format – 2 Payloads

ANNEX E TO
AEP-4687

Table E-1. 55mm Format Specifications – 2 Payloads

Cartridge					**Maxima**
55mm 2 payload			**Length / mm**		**376.5**
			Ø / mm		**55.5**
	Dimensions				
	/ mm	**Tolerance**	**/ “**	**tolerance**	
A	**374.70**	**± 0.30**			
B	**54.90**	**± 0.50**			
C	**58.80**	**± 0.05**			
D	**2.95**	**± 0.05**			
E	**2.90**	**± 0.10**			
F	**34.7**	**± 0.10**			
G	**23.20**	**± 0.10**			
H	**2.90**	**± 0.10**			
I	**14.0**	**± 0.10**			
J	**2.90**	**± 0.10**			

ANNEX F—55mm FORMAT-3 PAYLOADS

Flare & Chaff Countermeasure 55mm Format – 3 Payloads

F.1 Flare and Chaff Countermeasure 55mm Format with 3 Payloads. The following figure and table illustrate the proper format.

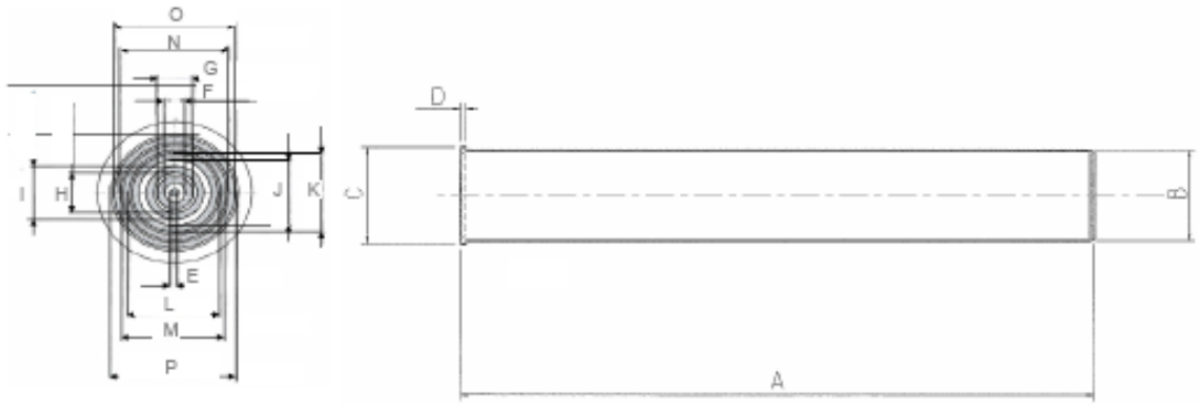

Figure F-1. Flare & Chaff 55 mm Format – 3 Payloads

Table F-1. 55mm Format Specifications – 3 Payloads

Cartridge					**Maxima**
55mm 3 payload			**Length / mm**		**376.5**
			Ø / mm		**55.5**
	Dimensions				
	/ mm	**Tolerance**	**/ “**	**tolerance**	
A	**374.70**	**± 0.30**			
B	**54.90**	**± 0.50**			
C	**58.80**	**± 0.15**			
D	**2.90**	**± 0.10**			
E	**3.00**	**± 0.10**			
F	**8.40**	**± 0.10**			
G	**14.40**	**± 0.10**			
H	**17.30**	**± 0.10**			
I	**23.30**	**± 0.10**			
J	**28.80**	**± 0.10**			
K	**34.80**	**± 0.10**			
L	**36.80**	**± 0.10**			
M	**41.80**	**± 0.10**			
N	**43.80**	**± 0.10**			
O	**48.80**	**± 0.10**		±	
P	**51.00**	**± 0.30**		±	

ANNEX G—19mm FORMAT

Flare & Chaff Countermeasure 19mm Format

G.1 Flare and Chaff Countermeasure 19mm Format. The following figure and table illustrate the proper format.

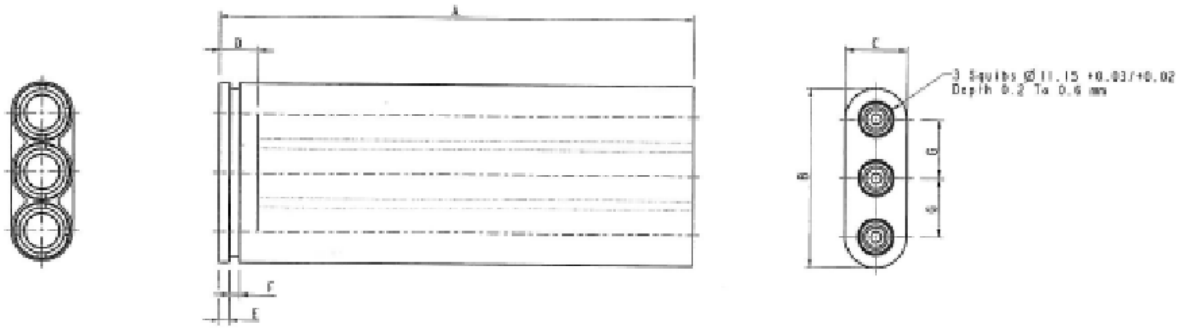

Figure G-1. Flare & Chaff 19mm Format

Table G-1. 19mm Format Specifications

Cartridge						**Maxima**
19 mm				**Length / mm**		**149.3**
				Width / Ø / mm		**56.5**
				Thickness / mm		**19.4**
	Dimensions					
	/ mm		**tolerance**	**/ “**		**tolerance**
A	**149.0**		**+0.3 - 0.1**		±	
B	**56.2**		**+0.3**		±	
C	**19.4**		**- 0.3**		±	
D	**12.00**		**+0.1 - 0.05**		±	
E	**3.25**	±	**0.10**		±	
F	**3.20**	±	**0.10**		±	
G	**18.3**	±	**0.30**		±	

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ANNEX H TO
AEP-4687

ANNEX H—36mm FORMAT

Flare & Chaff Countermeasure 36mm Format

H.1 Flare and Chaff Countermeasure 36mm Format. The following figure and table illustrate the proper format.

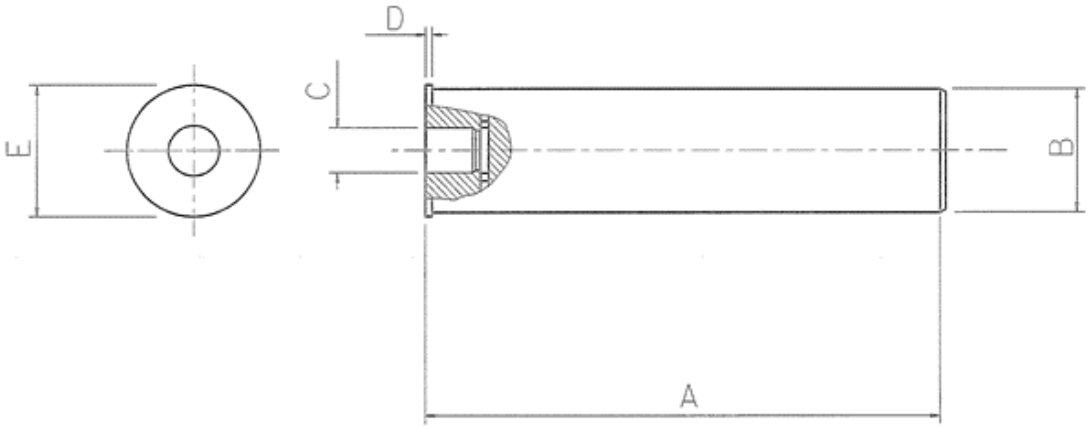

Figure H-1. Flare & Chaff 36mm Format

ANNEX H TO
AEP-4687

Table H-1. 36mm Format Specifications

Cartridge					**Maxima**	
36 mm x 5.8"				**Length / "**	**5.838/ 148.285**	
(1.4" x 5.8")				**Width / Ø / "**	**1.430/ 36.322**	
				Thickness / "		
	Dimensions					
	/ mm	**Tolerance**		**/ “**	**tolerance**	
A	**148.031**	±	**0.254**	**5.828**	±	**.010**
B	**36.068**		**+0.203/-0.127**	**1.420**		**+.008/-.005**
C	**16.205**		**+0.178/-0.203**	**0.638**		**+.007/-.008**
D	**1.625**		**+0.127/-0.152**	**0.064**		**+.005/-.006**
E	**37.846**		**-0.330**	**1.490**		**-0.013**
F		±				
G		±				
H		±				
J		±				
K		±				
Hole depth		±		**0.555**		**max**
Electrode extension		±		**0.095**		**max**
Electrode diameter		±		**0.040**	±	**0.001**
Electrode spacing		±		**0.200**	±	**0.005**

ANNEX I TO
AEP-4687

ANNEX I—40mm FORMAT

Flare & Chaff Countermeasure 40mm Format

I.1 Flare and Chaff Countermeasure 40mm Format. The following figure and table illustrate the proper format.

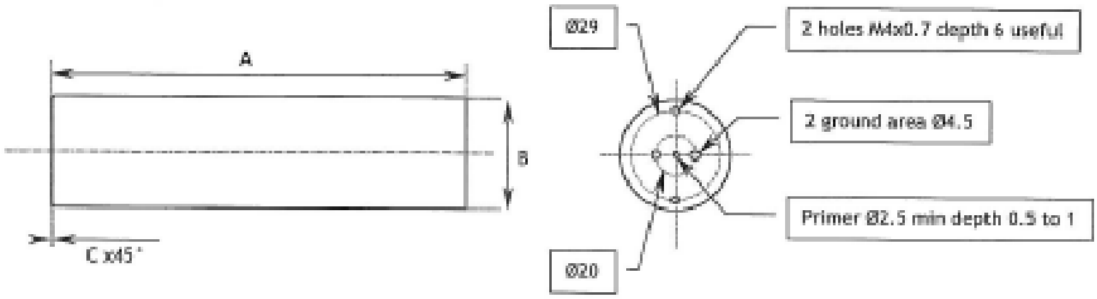

Figure I-1. Flare & Chaff 40mm Format

Table I-1. 40mm Format Specifications

Cartridge						**Maxima**
40 mm				**Length / mm**		
				Width / Ø / mm		
				Thickness / mm		
	Dimensions					
	/ mm		**tolerance**	**/ “**		**tolerance**
A	**150.0**		**0.0, - 0.5**		±	
B	**40.0**		**0.0, - 0.3**		±	
C	**1**		**min**		±	

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**ANNEX J TO
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ANNEX J—60mm FORMAT

Flare & Chaff Countermeasure 60mm Format

J.1 Flare and Chaff Countermeasure 60mm Format. The following figure and table illustrate the proper format.

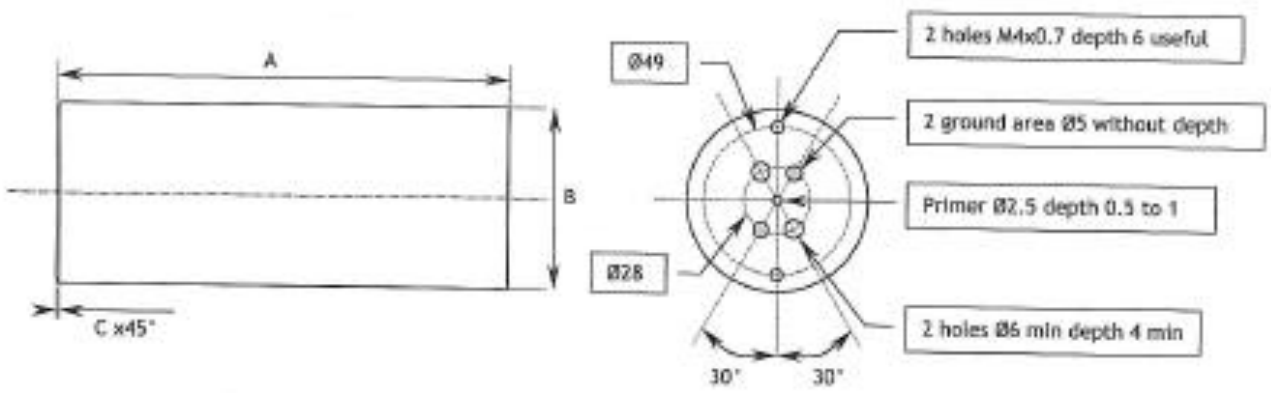

Figure J-1. Flare & Chaff 60mm Format

Table J-1. 60mm Format Specifications

Cartridge						**Maxima**
60 mm				**Length / mm**		
				Width / Ø / mm		
				Thickness / mm		
	Dimensions					
	/ mm		**tolerance**	**/ “**		**tolerance**
A	**150.0**		**0.0, - 0.5**		±	
B	**60.0**		**0.0, - 0.3**		±	
C	**1**		**min**		±	

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ANNEX K—IMPULSE CARTRIDGE (1 x 1 x 8 or 2 x 1 x 8)

Impulse Cartridge 1 x 1 x 8 (or 2 x 1 x 8)

K.1 Cartridge, Impulse 1 x 1 x 8 (or 2 x 1 x 8). The following is meant to illustrate the impulse cartridge for standard flare configurations. There may be instances where internal designs necessitate different dimensions, in these cases the dimensions should be documented. The following figure and table illustrate the dimensions.

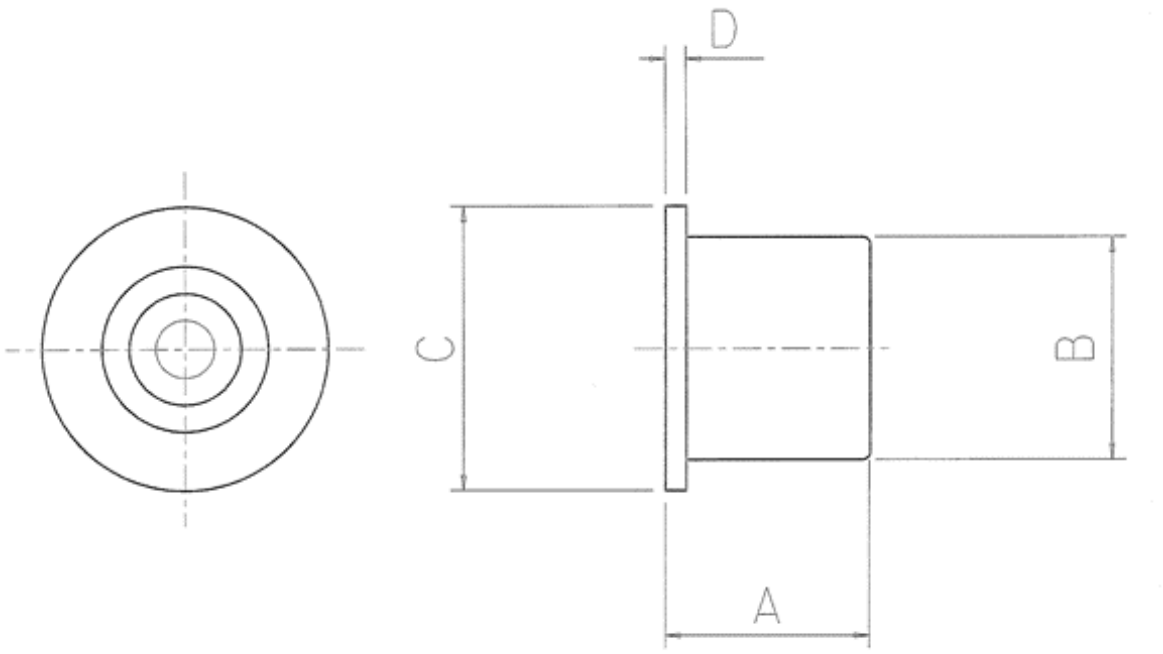

Figure K-1. 1 x 1 x 8 (or 2 x 1 x 8) IC Format

ANNEX K TO
AEP-4687

Table K-1. 1 x 1 x 8 (or 2 x 1 x 8) IC Specifications

Cartridge Impulse						**Maxima**
1 x 1 x 8 **2 x 1 x 8**				**Length / mm (A)**		**0.530 / 13.462**
				Diameter / Ø / mm (B)		**0.500 / 12.7**
	Dimensions					
	/ mm		**tolerance**	**/ “**		**tolerance**
A	**13.081**	±	**0.381**	**0.515**		**±0.015**
B	**12.573**		**+0.102 / -0.051**	**Ø 0.495**		**+0.004 / -.002**
C	**16.129**	±	**+0.000 / -0.508**	**Ø 0.635**		**+0.000 / -.020**
D	**1.143**	±	**0.127**	**0.045**		**±0.005**
	Depth of contact pin below flange			**0.053 – 0.075 (1.5 – 1.91 mm)**		

ANNEX L—IMPULSE CARTRIDGE (1 x 2 x 8 or 1 x 1 x 8)

Impulse Cartridge 1 x 2 x 8 (or 1 x 1 x 8) Format

L.1 Cartridge, Impulse 1 x 2 x 8 (or 1 x 1 x 8) Format. The following is meant to illustrate the impulse cartridge for standard flare configurations. There may be instances where internal designs necessitate different dimensions, in these cases the dimensions should be documented. The following figure and table illustrate the proper dimensions.

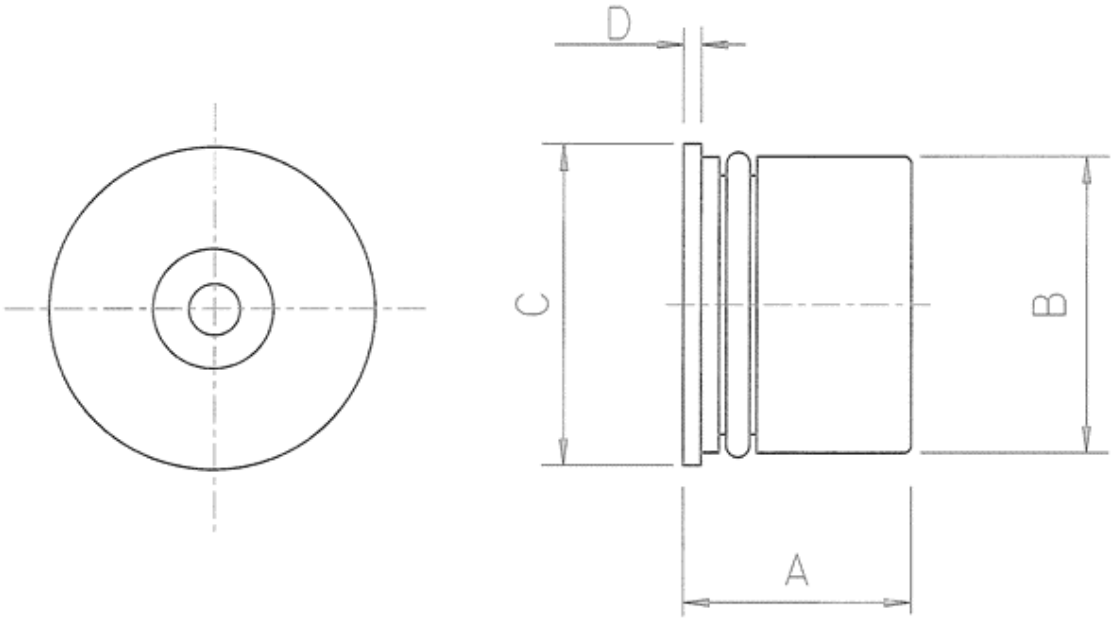

Figure L-1. 1 x 2 x 8 (or 1 x 1 x 8) IC Format

ANNEX L TO
AEP-4687

Table L-1. 1 x 2 x 8 (or 1 x 1 x 8) IC Specifications

Cartridge Impulse						**Maxima**
2 x 1 x 8 **2 x 2.5 x 8**				**Length / mm (A)**		**0.543 / 13.80**
				Diameter / Ø / mm (B)		**0.748 / 18.999**
	Dimensions					
	/ mm		**tolerance**	**/ “**		**Tolerance**
A	**13.80**	±	**MAX**	**0.543**	**±**	**MAX**
B	**18.796**		**+0.203/0.127**	**Ø 0.740**		**+0.008/-.005**
C	**20.447**	±	**0.127**	**Ø 0.805**	**±**	**0.005**
D	**1.143**	**±**	**0.127**	**.045**	**±**	**0.005**
	Depth of contact pin below flange			**0.055 – 0.075 (1.65 ± .25 mm)**		

ANNEX M—IMPULSE CARTRIDGE—36mm

Impulse Cartridge 36mm

M.1 Cartridge, Impulse 36mm Format. The following is meant to illustrate the impulse cartridge for standard flare configurations. There may be instances where internal designs necessitate different dimensions, in these cases the dimensions should be documented. The following figure and table illustrate the proper format.

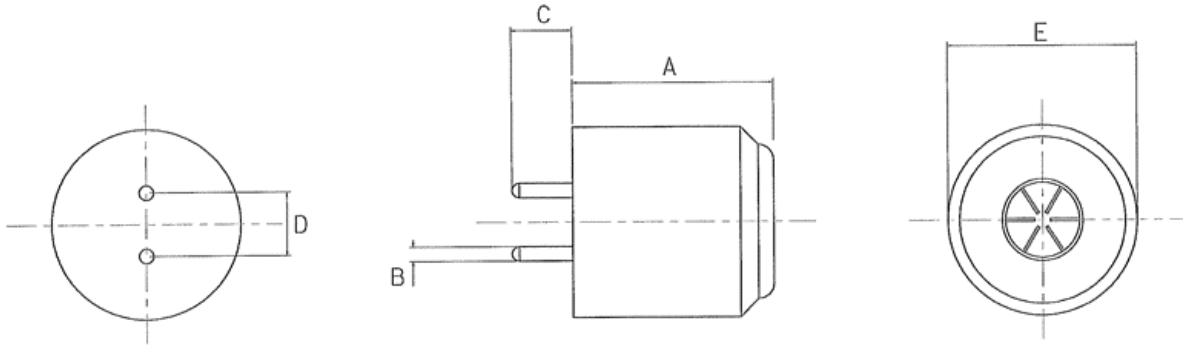

Figure M-1. 36mm IC Format

ANNEX M TO
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Table M-1. 36mm IC Specifications

Cartridge Impulse						**Maxima**
36mm				**Length / mm (A+C)**		**.790 / 20.066**
				Diameter / Ø / mm (E)		**.630 / 16.002**
				Body Length / mm (A)		**.600 / 15.24**
	Dimensions					
	/ mm	**tolerance**		**/ “**		**Tolerance**
A	**14.859**	**±**	**0.381**	**0.585**	**±**	**.015**
B	**Ø 1.00**		**0.05**	**Ø 0.039**		**.002**
C	**4.80**		**+0.10 -0.35**	**0.189**		**+0.004 -0.014**
D	**5.10**		**max**	**0.201**		**max**
E	**Ø 16.002**		**-.254**	**Ø 0.630**	**±**	**-.010**

ANNEX N—26mm FORMAT

Flare & Chaff Countermeasure 26mm Format

N.1 Flare and Chaff Countermeasure 26mm Format. The following figure and table illustrate the proper format.

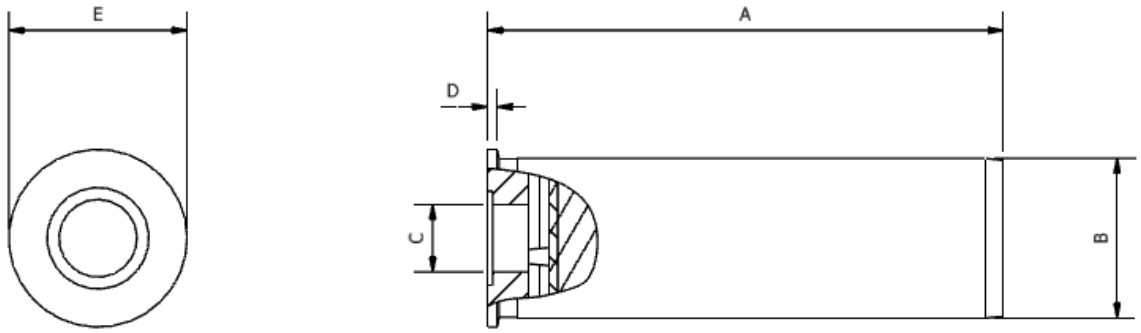

Figure N-1. Flare & Chaff 26mm Format

Table N-1. 26mm Format Specifications

Cartridge					**Maxima**
26mm			**Length / mm**		**86.7**
			Diameter / Ø / mm		**26.8**
			Thickness / mm		
	Dimensions				
	/ mm	**Tolerance**		**/ “**	**tolerance**
A	**86.00**	**±**	**0.20**		**±**
B	**Ø26.675**	**±**	**0.125**		**±**
C	**Ø13.01**	**±**	**0.01**		**±**
D	**1.90**	**±**	**0.20**		**±**
E	**Ø29.50**	**±**	**0.25**		**±**

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ANNEX O—50mm FORMAT

Flare & Chaff Countermeasure 50mm Format

O.1 Flare and Chaff Countermeasure 50mm Format. The following figure and table illustrate the proper format.

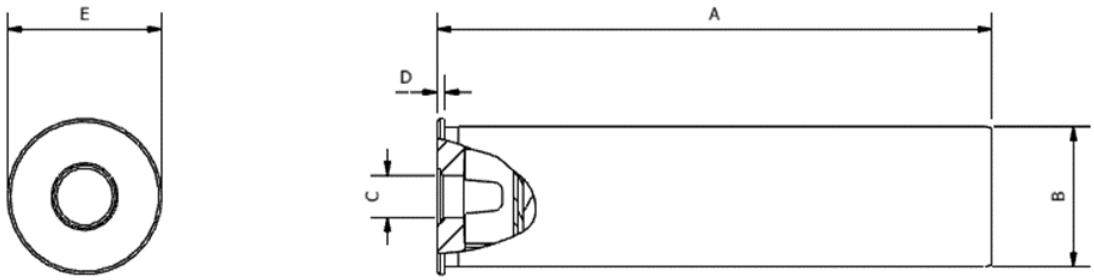

Figure O-1. Flare & Chaff 50mm Format

Table O-1. 50mm Format Specifications

Cartridge						**Maxima**
50mm				**Length / mm**		**199.8**
				Diameter / Ø / mm		**50.2**
				Thickness / mm		
	Dimensions					
	/ mm	**Tolerance**		**/ “**	**tolerance**	
A	**199.70**	**±**	**0.20**		±	
B	**Ø49.925**	**±**	**0.075**		±	
C	**M22 x 1.5**	**±**	**N/A**		±	
D	**2.70**	**±**	**0.10**		±	
E	**55.50**	**±**	**0.20**		±	

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ANNEX P TO
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ANNEX P—55 mm FORMAT-Single Payload

Flare and Chaff Countermeasure 55mm Format – Single Payload

P.1 Flare and Chaff Countermeasure 55mm Format – Single Payload. The following figure and table illustrate the proper format.

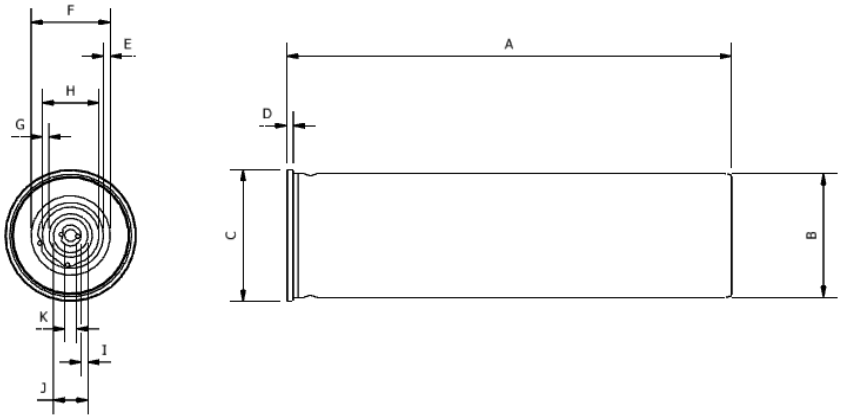

Figure P-1. Flare & Chaff 55mm Format

Table P-1. 55mm Format Specifications

Cartridge					**Maxima**
55mm single payload			**Length / mm**		**199.8**
			Width / Ø / mm		**55.6**
			Thickness / mm		
	Dimensions				
	/ mm	**Tolerance**		**/ “**	**tolerance**
A	**199.70**	**±**	**0.30**		**±**
B	**Ø55.20**	**±**	**0.10**		**±**
C	**Ø58.80**	**±**	**0.05**		**±**
D	**2.95**	**±**	**0.05**		**±**
E	**3.00**	**±**	**0.50**		**±**
F	**Ø35.50**	**±**	**0.20**		**±**
G	**3.00**	**±**	**0.50**		**±**
H	**Ø25.50**	**±**	**0.20**		**±**
I	**3.00**	**±**	**0.50**		**±**
J	**Ø15.50**	**±**	**0.20**		**±**
K	**5.50**	**±**	**0.20**		**±**

ANNEX P TO
AEP-4687

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ANNEX Q—1.5 x 1.5 x 10.540 FORMAT

Flare Countermeasure 1.5 X 1.5 X 10.540 Format

Q.1 Flare Countermeasure 1.5 x 1.5 x 10.540 Format. The following figure and table illustrate the proper format.

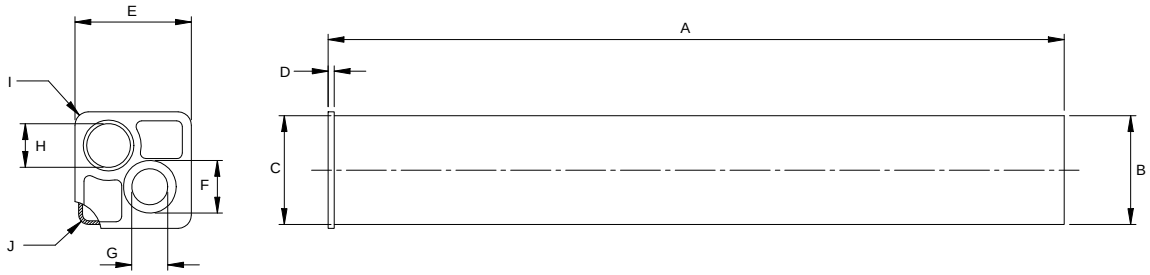

Figure Q-1. Flare & Chaff 1.5 X 1.5 X 10.540 Format

Table Q-1. 1.5 X 1.5 X 10.540 Format Specifications

Cartridge					**Maxima**
1.5” x 1.5” x 10.465”			**Length / "**		**10.540**
			Width / □ / “		**1.550**
			Thickness / "		**1.550**
	Dimensions				
	/ mm	**tolerance**	**/ “**	**tolerance**	
A		±	**10.530**		**±0.01**
B		±	**1.540**		**±0.005**
C		±	**1.550**		**-0.005**
D		±	**0.080**		**±0.005**
E		±	**1.650**		**±0.01**
F		±	**0.750**		**-0.02**
G		±	**0.512**		**-0.004**
H		±	**0.622**		**-0.002**
I		±	**R.188**		**±0.005**
J		±	**R .143**		**±0.005**

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