NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD

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See MAS Distribution List N° 2

STANAG 4425 LAND (EDITION 2) - A PROCEDURE TO DETERMINE THE DEGREE OF INTERCHANGEABILITY OF NATO INDIRECT FIRE AMMUNITION

References:
a. AC/225-D/1387 dated 2 May 1996 (Edition 2) (1st Draft)
b. MAS/309-LAND/4425 dated 9 September 1994 (Edition 1)

1. The enclosed NATO Standardization Agreement which has been ratified by nations as reflected in page iii is promulgated herewith.

2. References listed above are to be destroyed in accordance with local document destruction procedures.

3. AAP-4 should be amended to reflect the latest status of the STANAG.

ACTION BY NATIONAL STAFFS

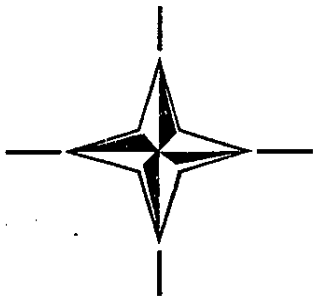
4. National staffs are requested to examine page iii of the STANAG and, if they have not already done so, advise the Defence Support Division of their intention regarding its ratification and implementation.

A. GRØNHEIM
Major General, NOAF
Chairman MAS

Enclosure:
STANAG 4425 (Edition 2)

STANAG No. 4425
(Edition 2)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)



MILITARY AGENCY FOR STANDARDIZATION
(MAS)

STANDARDIZATION AGREEMENT

(STANAG)

SUBJECT: A PROCEDURE TO DETERMINE THE DEGREE OF INTERCHANGEABILITY OF NATO INDIRECT FIRE AMMUNITION

Promulgated on 14 December 1998

A. GRØNHEIM
Major General, NOAF
Chairman, MAS

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Chairman MAS under the authority vested in him by the NATO Military Committee.

2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "In NATO Standardization, the fulfilment by which a member nation formally accepts, with or without reservation, the content of a Standardization Agreement" (AAP-6).

5. Implementation is "In NATO Standardization, the fulfilment by a member nation of its obligations as specified in a Standardization Agreement" (AAP-6).

6. Reservation is "In NATO Standardization, the stated qualification by a member nation that describes the part of a Standardization Agreement that it will not implement or will implement only with limitations" (AAP-6).

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

FEEDBACK

8. Any comments concerning this publication should be directed to NATO/MAS - Bvd Leopold III - 1110 Brussels - BE

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NATO STANDARDIZATION AGREEMENT (STANAG)

A PROCEDURE TO DETERMINE THE DEGREE OF INTERCHANGEABILITY OF NATO INDIRECT FIRE AMMUNITION

Annexes: A - Glossary of Terms

B - Diagram of the Procedure to Determine the Degree of Interchangeability of NATO Indirect Fire Ammunition

C - Weapon and Ammunition Technical Data Detail

D- Examples of Interchangeability Data Formats:

Related Documents:

STANAG 4106	Procedures to Determine the Degree of Ballistic Performance Similarity of NATO Indirect Fire Ammunition and the Applicable Corrections to Aiming Data
STANAG 4110	Definition of Pressure Terms and their Inter-Relationship for Use in the Design and Proof of Cannons and Ammunition
STANAG 4113	Pressure Measurement by Crusher Gauges
STANAG 4114	Measurements of Projectile Velocities
STANAG 4119	Adoption of a Standard (Common) Artillery Firing Table Format
STANAG 4157	Development of Safety Test Methods and Procedures for Fuzes and Unguided Tube Launched Projectiles
STANAG 4187	Fuzing Systems - Safety Design Requirements
STANAG 4224	Large Calibre Artillery and Naval Gun Ammunition Greater than 40mm, Safety and Suitability for Service Evaluation
STANAG 4225	The Safety Evaluation of Mortar Bombs
STANAG 4355	The Modified Point Mass Trajectory Model
STANAG 4367	Thermodynamic Interior Ballistic Model with Global Parameters
STANAG 4369	Design Requirements for Inductive Setting of Electronic Projectile Fuzes

AAP-6	NATO Glossary of Terms and Definitions (English and French)
AEP-35	Technical Data for the Determination of Interchangeability of Components of Artillery and Mortar Systems
AOP-2	The Identification of Ammunition
AOP-6	Land Forces Ammunition Interchangeability Catalogue in Wartime
AOP-8	NATO Fuze Characteristics Catalogue
AOP-14	Land Forces Catalogue of Bilateral Agreements on Interchangeability and Safe Firing of Ammunition during Peacetime Training Exercises.
AOP-15	Guidance on the Assessment of the Safety and Suitability for Service of Munitions for NATO Armed Forces
AOP-22	Design Criteria and Test Methods for Inductive Setting of Electronic Projectile Fuzes
AOP-29	NATO Indirect Fire Ammunition Interchangeability

AIM

1. The aim of this agreement is to standardize a step-by-step procedure for the determination of the degree of interchangeability of NATO indirect fire ammunition.

AGREEMENT

2. Participating nations agree to use the procedure described when determining the degree of interchangeability of NATO indirect fire ammunition.

DEFINITIONS

3. The definitions used for the purpose of this STANAG are given at Annex A.

GENERAL

4. This document specifies the NATO procedure to be used for determining the degree of interchangeability of NATO indirect fire ammunition. Three terms are in general use to describe the use of one nation's ammunition in another nation's weapon: compatibility, interchangeability, and interoperability. These three terms, which are defined in AAP-6, are included at Annex A. For the purpose of this document interchangeability is chosen as the word which best describes, in one Nation's weapon, the exchange of this one Nation's ammunition with another Nation's ammunition.

DETAILS OF THE AGREEMENT

5. The details of the Agreement are given hereunder and are divided into the following four parts:

a. Degrees of ammunition interchangeability.

b. Assessment of interchangeability.

c. Responsibility for interchangeability testing.

d. Ammunition interchangeability documentation.

6. Degrees of ammunition interchangeability. These depend on two assessment characteristics: safety and ballistic data. In principle ammunition is interchangeable providing it is safe within nationally agreed restrictions and is accurate to within 5% of range (10% for mortars). Otherwise the ammunition is graded "do not use".

7. Assessment of interchangeability. Three areas need to be considered to determine the degree of interchangeability of NATO ammunition:

* Assessment of form and fit to determine physical compatibility.

* Assessment of functioning and safety data.

* Assessment of ballistic data to determine delivery accuracy.

Within each area, certain criteria must be evaluated to establish the appropriate degree of interchangeability. A diagram outlining the assessment process is shown at Annex B. The assessment should also take fuzes, effectiveness and logistic considerations into account.

a. Form and Fit. In order to establish physical compatibility, the nationally supplied technical data and interface drawings are analyzed. National technical data and interface drawings following the formats listed in Annex C, are presented in AEP-35 and elsewhere in Panel IV documents. If form and fit do not match, the ammunition is graded "do not use".

b. Functioning and Safety. The following data will be used to assess the functioning and safety of the weapon and ammunition combination:

(1) Nationally supplied technical data and interface drawings;

(2) Nationally supplied safety certification and safety data.

The pressure definitions for use in National safety data are found in STANAG 4110. Function and safety will be assessed Nationally and divided into the categories of "safe", "safe with restrictions" and "do not use".

c. Ballistic data. This assessment, which should be in accordance with STANAG 4106, indicates whether the combination can be fired using existing aiming data or whether simple ballistic corrections are needed. For a definition of "Aiming Data" see Annex A. The following data are required:

(1) Nationally supplied technical data and interface drawings;

(2) Nationally supplied aiming data, ballistic performance parameters and firing test data.

The required National ballistic performance parameters format is found in STANAG 4355. The ammunition will be assessed into one of 3 categories: ballistic match; accurate to within 1% of range; accurate to within 5% of range. If no assessment was made, it will be noted as such in AOP-29.

8. Test requirements. If sufficient data are not available to make a determination for any of above paragraphs 7a, 7b, or 7c, tests are required to demonstrate compatibility of the combination. This is a National responsibility but for ballistic data, see STANAG 4106 which is paraphrased for convenience below; however STANAG 4106 remains the sole authority.

a. Ballistic Match. The results of the ballistic performance analysis must show that there is no significant radial difference between the impact of the interchanged ammunition and that of the National ammunition when fired from the National weapon.

b. Accurate to within 1% of range (within 2% or less than 20 meters for mortars). The results of the ballistic performance analysis must show that the radial error in impact between the interchanged ammunition and the National ammunition does not exceed 1 percent of range (2 percent or 20 meters for mortars), with or without a single input of simple ballistic corrections for each charge to the Nationally supplied ballistic data.

c. Accurate to within 5% of range (within 10% or less than 100 meters for mortars). The results of the ballistic performance analysis must show that the radial error in impact between the interchanged ammunition and the National ammunition does not exceed 5 percent of range (10 percent or 100 meters for mortars), with or without a single input of simple ballistic corrections to the Nationally supplied ballistic data.

9. Responsibility for interchangeability testing. The responsibility for testing data may be assigned in two ways:

a. If tests are required to obtain interchangeability data for a particular weapon and ammunition combination, the Nations involved may agree to provide the materiel or services required to complete the necessary testing and provide the resulting data to Sub-Group 2 of Land Group 4 of the NAAG.

b. A participating Nation may agree to perform interchangeability testing for a particular weapon and ammunition combination on behalf of Sub-Group 2 and to provide the resulting data to the Sub-Panel. The supply of weapons and ammunition for such tests will be co-ordinated by Sub-Group 2 of Land Group 4 of the NAAG.

The costs and logistics of these exchanges are not a subject of this STANAG and are to be covered by agreements between the participating nations.

10. Ammunition interchangeability documentation. Documentation concerning all indirect fire ammunition interchangeability will be maintained and distributed through Sub-Group 2 of Land Group 4 of the NAAG in the form of AOP-29 This will require periodic updates and should be reviewed at least once a year.

a. Technical Documentation. Technical data and interface drawings for the determination of interchangeability of indirect fire weapon systems will be created and maintained by Sub-Group 2 of Land Group 4 of the NAAG as a separate exercise.

b. Format of interchangeability data. AOP-29 will utilize the formats described at Annex D. The tables will list all possible projectile and propelling charge combinations for each participating country using the following code:

(1) Safety

(a) A clear cell indicates that the ammunition of the originating Nation can be used in the Host Nation's weapon under known Host Nation safety restrictions. Thus in principle such ammunition can be interchanged in combat and for peacetime training.

(b) A shaded cell indicates that the ammunition of the originating Nation is considered interchangeable with the Host Nation's weapon but that Host Nation certification does not exist. Thus in principle such ammunition can be interchanged in an emergency in wartime subject to approval at the appropriate level by the host nation.

(c) A black cell indicates DO NOT USE (or does not exist in that Nation).

(2) Ballistics

(a) A plain diagonal bar indicates ballistic match.

(b) A diagonal bar with one dot indicates ballistic accuracy to within 1% of range.

(c) A diagonal bar with two dots indicates ballistic accuracy to within 5% of range.

(d) No diagonal line: accuracy has not been assessed.

(e) A black cell indicates DO NOT USE (or does not exist in that nation).

This interchangeability data format should also be included in National aiming data. The method of promulgating interchangeability information nationally is a matter of National policy and is not covered in the STANAG.

c. Publication. The publication of interchangeability data in NATO user format is the responsibility of the MAS Ammo WP.

IMPLEMENTATION OF THE AGREEMENT

11. This STANAG is implemented when a Nation uses the procedure presented to determine the degree of interchangeability for a particular weapon and ammunition combination and the result is published in AOP-29.

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STANAG 4425
(Edition 2)

GLOSSARY OF TERMS

1. The following terms are defined in AAP-6:

a. Compatibility:

Capability of two or more items or components of equipment or material to exist or function in the same system or environment without mutual interference. (See also interchangeability).

b. Interchangeability:

A condition which exists when two or more items possess such functional and physical characteristics as to be equivalent in performance and durability, and are capable of being exchanged one for the other without alteration of the items themselves, or of adjoining items, except for adjustment, and without selection for fit and performance. (See also compatibility).

c. Interoperability:

The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together.

2. The following terms which are not defined in AAP-6 are used for the purposes of this STANAG:

a. Aiming data:

Aiming data includes firing tables, firing control instruments and fire control computer programmes.

b. Form:

Form concerns itself with the shape, arrangement of parts, visible aspect and overall structure of the ammunition component.

c. Fit:

Fit implies the ability of the interchanged ammunition to correspond exactly in respect of the key interface dimensions with those of the National ammunition.

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d. Function:

Function implies the correct fulfilment of the purpose for which the ammunition is designed, including actions in the weapon from ignition to launch, and the qualitative nature of its effect at the target (e.g. High explosive, smoke, etc.).

e. Ballistic performance:

Ballistic performance is defined as the combination of interior and exterior functioning of the projectile.

f. Simple ballistic corrections:

Simple ballistic corrections are directly relevant to the production of firing data using tabular and graphical firing tables and stand-alone ballistic computers which allow operator intervention. Their relevance and form when automated fire control systems are in use is under review.

Corrections as indicated below:

A difference in	is corrected for by applying a correction to		Reference
	either	or	
Muzzle velocity	Muzzle velocity (meters/second)	Burning rate factor: f_β and Down-tube resistance factor: f_R (percent)	STANAG 4367
Range	Air density (1) (percent)	Form factor: i or Drag factor: f_b (percent)	STANAG 4355
Drift	Correction for drift (percent)	Lift factor: f_L (percent)	
Time of flight	Time of flight (seconds or percent)	Magnus force factor: Q_M (percent)	

(1) When using manual (tabular firing tables)

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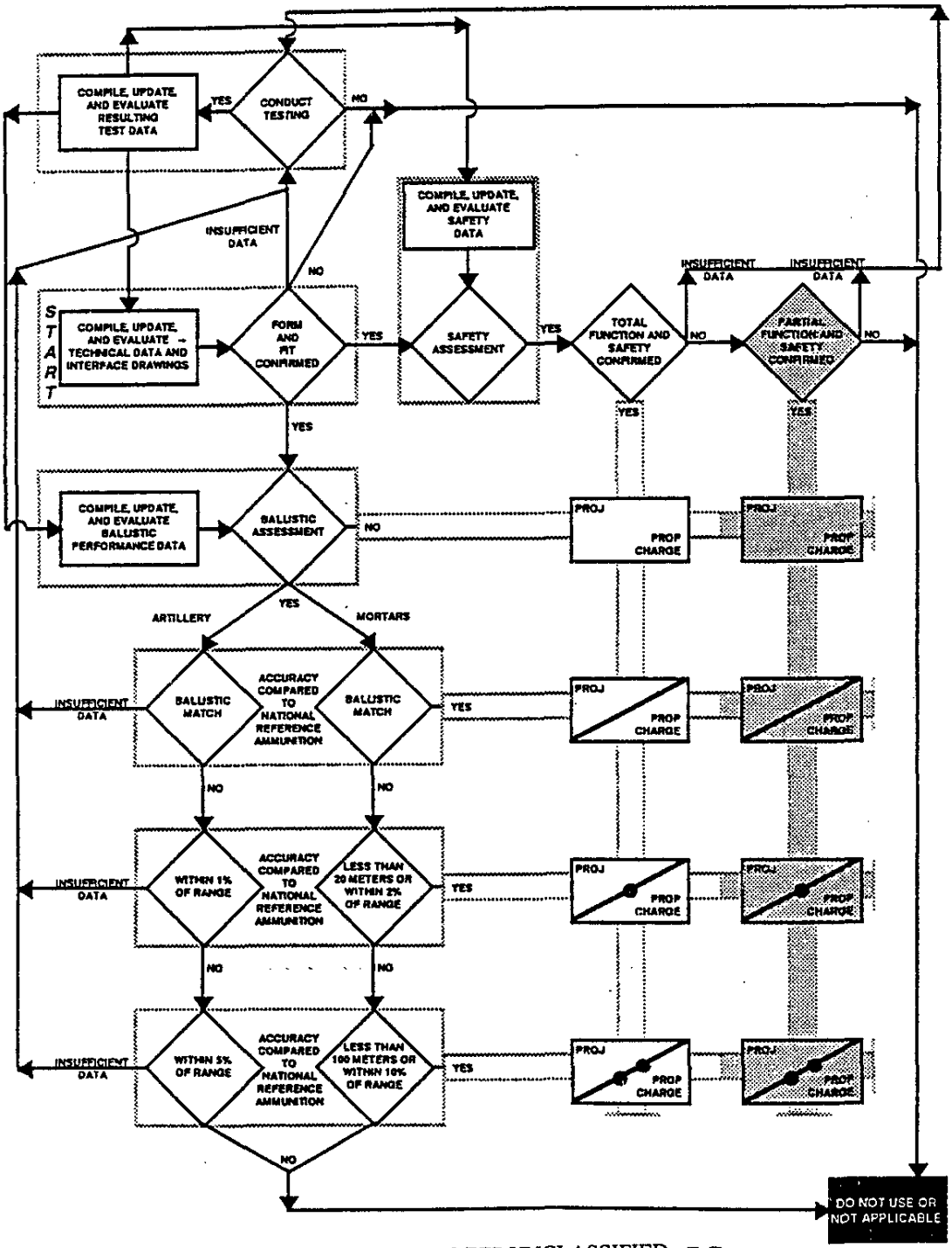
3. Throughout this STANAG, the word ammunition includes a fuzed projectile, propelling charge and primer for which ballistic performance data for a given weapon are described in a given firing table.

ANNEX B to
STANAG 4425
(Edition 2)

DIAGRAM OF THE PROCEDURE TO DETERMINE THE DEGREE OF INTERCHANGEABILITY OF NATO INDIRECT FIRE AMMUNITION



ANNEX C to
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(Edition 2)

WEAPON AND AMMUNITION TECHNICAL DATA DETAIL

Weapon and ammunition technical data detail are given in the following two appendices:

Appendix I: Artillery

Appendix II: Mortars

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ANNEX C to
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(Edition 2)

ARTILLERY

APPENDIX 1 to
ANNEX C to
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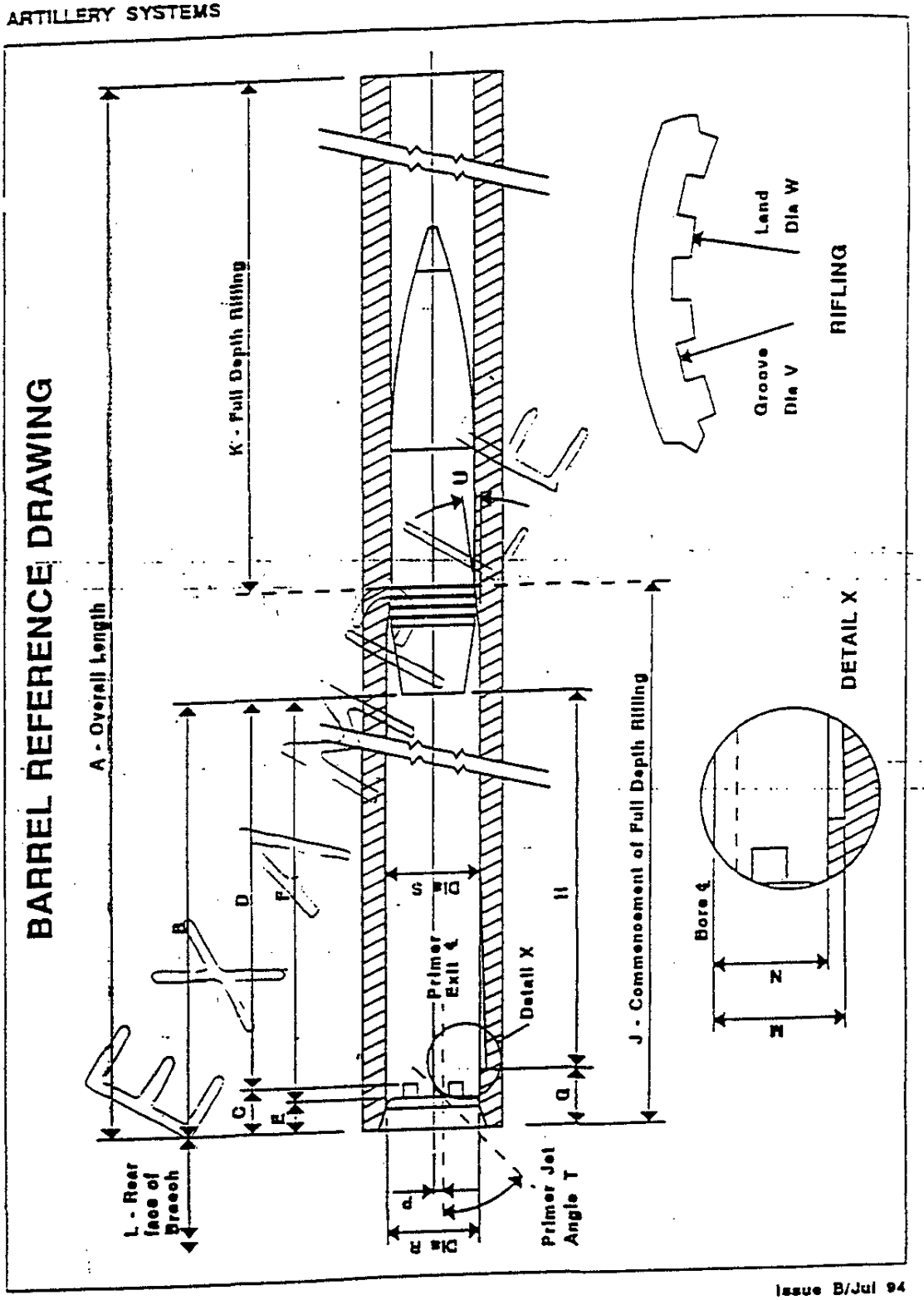
(Edition 2)

ARTILLERY SYSTEMS



APPENDIX 1 to
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(Edition 2)

155mm GUN SYSTEMS

GUN BARREL TUBE DATA

See Reference Drawing Page C-3

DESIGNATION (Equipment)	Country of Origin	Type of Obturator Type of Ammunition	Type of Ignition (Ref Primer)
L22 L121 FH70	UK/IT/GE	Ring Seperate	Percussion DM191A1

Barrel Design Pressure (MPa)	432
Charge Retension Method	Swiss groove

Dimensions:-	
Length A	6022
Length C (Note 1)	N/A
Length E (Note 2)	0
Length G (Note 3)	47
Length J	990
Length K	5032
Length L	
Length M (Note 4)	
Length N	
Length P (Note 5)	
Min Opening Dia. R	170.5

Min Chamber Dia. S	mean 167
Primer Jet Angle T	0°
Forcing Cone Angle U	1 in 10 (5.71°)
Rifling:-	
Number of Grooves	48
Twist (Note 6)	RH 1 in 20, 8°55'
Groove Dia. V	157.48
Land Diameter W	154.94
Depth of Groove	1.27
Width of Groove	6.00
Width of Land	4.15

Reference Projectile	Length B (Note 7)	Length D (Note 7)	Length F (Note 7)	Length H (Note 7)	Chamber Volume (ltrs)(Note 7)
L15A2		N/A	N/A	791.6	18.544
M107		N/A	N/A		18.845
M483A1		N/A	N/A	846.4	19.216
M549A1		N/A	N/A	795.0	18.544

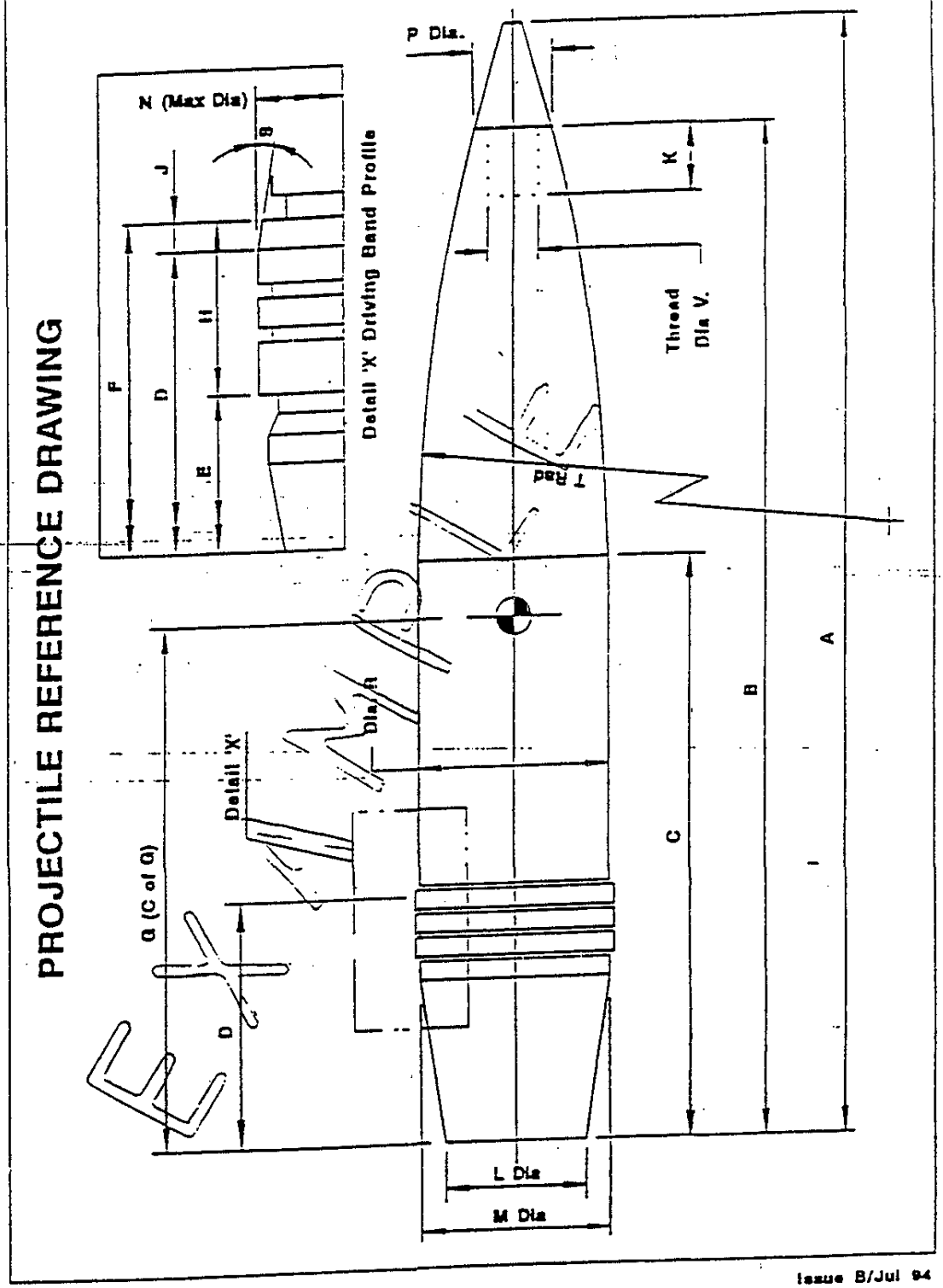
REMARKS:
Dimensions B and H are "at touch point" NOT rammed.

Semi-automatic breech block mechanism. Double baffle muzzle brake.

All dimensions in millimetres unless stated

ARTILLERY SYSTEMS

PROJECTILE REFERENCE DRAWING



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PROJECTILE DATA

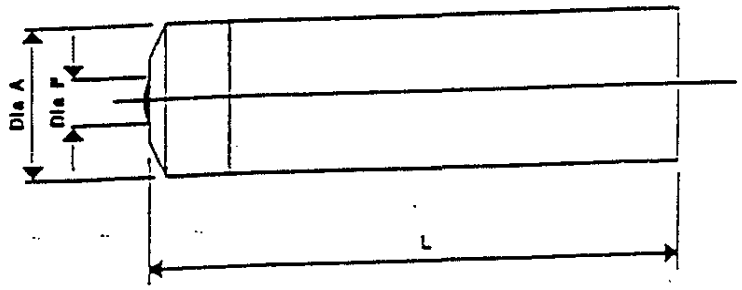
See Reference Drawing Page C-5

DESIGNATION	L15A1/A2	M107	M449A1/E1 /E2	OFUM F2A	
Type/Nature	HE	HE	HE, ICM	White Phosphrus	
Country of Origin	United Kingdom	United States	United States	France	
Design Pressure (MPa)	413				
Identifying Colour	Olive Drab BS 381C/298	Olive Drab Yellow markings	Olive Drab Diamonds Yellow markings	Clear Green circular Red Line, Yellow markings	
Dimensions:-					
Length A/Ref Fuze	778.5	604.52	604.27	740	
Length B (No Fuze)	487.66	324.33	323.60	399.05	
Length C (Note 8)	300.00	240.03	238.00	338.5	
Length G					
Max Cavity Length K					
Thread Dia W/Form	2inch-12UN-2B	2inch-12UNS-1A	2inch-12UNS-1A		
Diameter L	129.6	134.87	133.10		
Diameter M	154.74	154.18	154.74	153.57	
Maximum Body Dia R	154.74	154.74	154.74	154.75	
Diameter P	60.45			70.70	
Ogive Radius T	2921.0			2921.0	
Weight (No fuze) kg	42.56	42.13	43.08	43.250	
Weight Tolerence	42.26-42.86	40.82-42.90		41.55-44.05	
Operational Temp Limit					
Driving Band:-					
Material	Gilding metal	Gilding metal	Gilding metal	Copper	
Length D (Note 9)	134.6	102.87	104.64	146.2	
Length E	106.2	87.63	89.41	122.0	
Length F	143.5	113.54	115.32	159.0	
Length H	37.3	25.91	25.91	37.0	
Length J	8.9	10.67	10.67	12.8	
Maximum Diameter N	158.0	157.99	157.37	160.50	
Lead Angle S	2.5°	2.5°		3.5°	
MOMENT OF INERTIA:-					
Polar (kg m²)	0.149	0.146	.142	0.15	
Transverse (kg m²)	1.903	1.261	1.269	1.66	
SUM-MUNITIONS:-					
Type	N/A	N/A	M43A1 APERS SC	N/A	
Number					
Remarks	A2 has a nylon obturator band	M107B2 is M101 with modified driving band			

All dimensions in millimetres unless stated

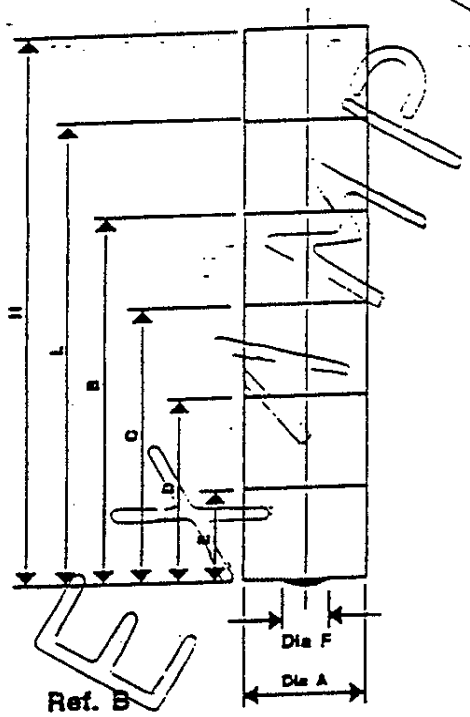
ARTILLERY SYSTEMS

CHARGE REFERENCE DRAWING



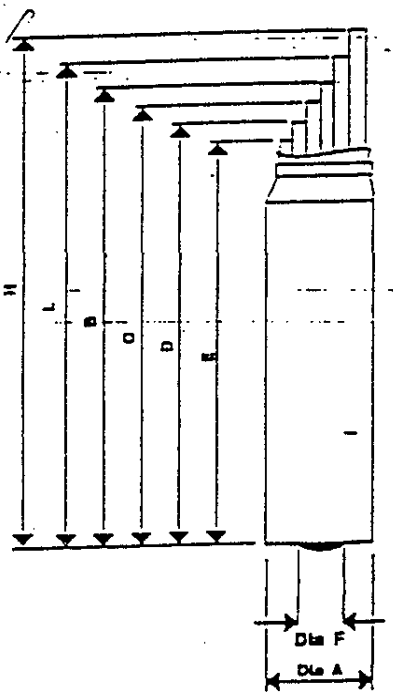
Ref. A

STAND ALONE
(all combustible)



Ref. B

ADJUSTABLE
(all combustible)



Ref. C

ADJUSTABLE
(all combustible)

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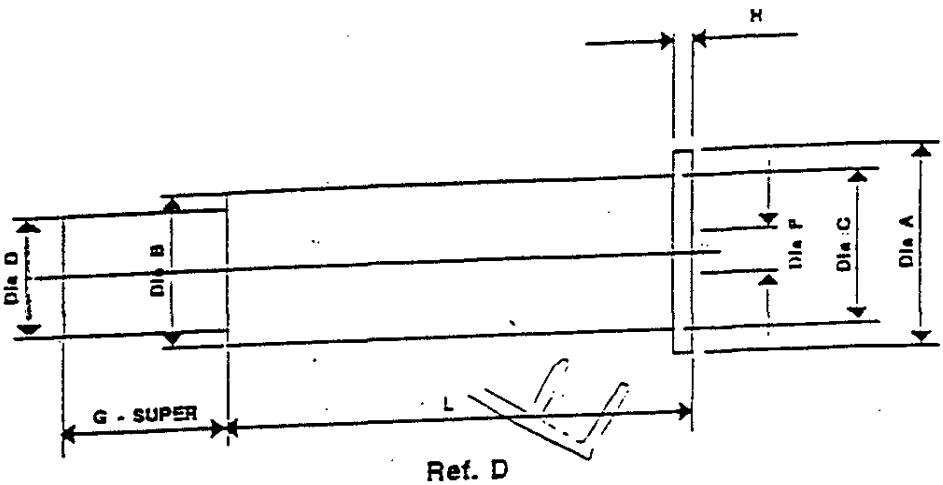
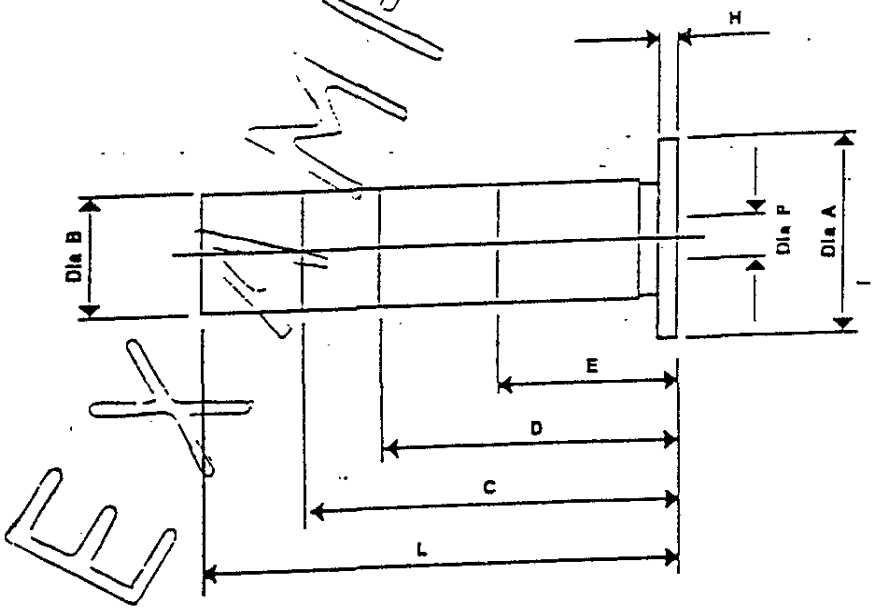
ARTILLERY SYSTEMS

CHARGE REFERENCE DRAWING



Ref. D

CASED
(non combustible)



Ref. E

STUB CASED
(Part combustible)

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(Edition 2)

155mm GUN SYSTEMS

CHARGE DATA

See Reference Drawing Page C-7

DESIGNATION	L8A1 Chg 3	L8A1 Chg 4	L8A1 Chg 5	L8A1 Chg 6
Reference Drawing (A,B,C,D)	Ref. C	Ref. C	Ref. C	Ref. C
Country of Origin	United Kingdom	United Kingdom	United Kingdom	United Kingdom
Propellant Type Increment Weight (kg) Operational Temp Limits	N 06 1.39 nominal -46 to +52	N 06 1.98 nominal -46 to +52	N 06 / NS34-10 1.98 / 1.56 -46 to +52	N 06 / NS34-10 1.98 / 3.98 -46 to +52
Dimensions:- Length L Maximum Diameter A Length B Length C Length D Length E Length H Diameter B Diameter C Diameter D Diameter F (Note 10) Length G	 N/A 150 N/A N/A N/A 535 N/A N/A N/A N/A 50 N/A	 N/A 150 N/A N/A 685 535 N/A N/A N/A N/A 50 N/A	 N/A 150 N/A 750 685 535 N/A N/A N/A N/A 50 N/A	 N/A 150 750 750 685 535 N/A N/A N/A N/A 50 N/A
Type of Igniter Primer Included (Y/N) Primer Nomenclature	Pad L20A1 No DM191A1	Pad L20A1 No DM191A1	Pad L20A1 No DM191A1	Pad L20A1 No DM191A1
Ballistics:- MV @ 21°C (m/s) Std Dev in MV (m/s) Temp Coeff in MV (m/s/°C) Pressure @ 21°C (MPa) Std Dev in Pressure (MPa) Temp Coeff in P (MPa/°C) Std Dev at UFT (MPa) ESCP (MPa) Reference Projectile Reference Cannon	 297 1.63 0.09 68.5 2.0 0.15 L15A1 L22	 354 1.63 0.15 100 2.0 0.22 L15A1 L22	 460 2.00 0.13 146 3.0 0.18 L15A1 L22	 604 2.40 0.20 242 4.5 0.39 L15A1 L22
Charge Container (type/material) (Note 11)	Blue cotton bag with CCC liner and velcro strap fastener.	Blue cotton bag with CCC liner and velcro strap fastener.	Blue cotton bag with CCC liner and velcro strap fastener.	Blue cotton bag with CCC liner and velcro strap fastener.
Means of Adjustment	Remove increments 7-Beige, 6-Dark Violet, 5-Green, & 4-Orange from Blue bag.	Remove increments 7-Beige, 6-Dark Violet & 5-Green, from Blue bag.	Remove increments 7-Beige & 6-Dark Violet from Blue bag.	Remove increments 7-Beige from Blue bag.
Remarks				

APPENDIX 1 to
ANNEX C to
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(Edition 2)

155mm GUN SYSTEMS

CHARGE DATA

See Reference Drawing Page C-7

DESIGNATION	L8A1 Chg 7	M3/A1/C1 Chg 1	M3/A1/C1 Chg 2	M3/A1/C1 Chg 3
Reference Drawing (A,B,C,D)	Ref. C	Ref. B	Ref. B	Ref. B
Country of Origin	United Kingdom	United States	United States	United States
Propellant Type Increment Weight (kg) Operational Temp Limits	N 06 / NS34-10 1.98 / 5.47 -46 to +52	M1 SP 1.038 nominal -46 to +52	M1 SP 1.400 -46 to +52	M1 SP 1.826 -46 to +52
Dimensions:- Length L Maximum Diameter A Length B Length C Length D Length E Length H Diameter B Diameter C Diameter D Diameter F (Note 12) Length G	 750 150 750 750 685 535 N/A N/A N/A N/A 50 N/A	 N/A 127 N/A N/A N/A N/A N/A N/A N/A 50 N/A	 N/A 127 N/A N/A N/A N/A N/A N/A 50 N/A	 N/A 127 N/A N/A N/A N/A N/A 50 N/A
Type of Igniter Primer Included (Y/N) Primer Nomenclature	Pad L20A1 No DM191A1	Pad No M82	Pad No M82	Pad No M82
Ballistics:- MV a 21°C (m/s) Std Dev in MV (m/s) Temp Coeff in MV (m/s/°C) Pressure a 21°C (MPa) Std Dev in Pressure (MPa) Temp Coeff in P (MPa/°C) Std Dev at UFT (MPa) ESCP (MPa) Reference Projectile Reference Cannon	 684 2.8 0.24 332 6.0 0.69 L15A1 L22	 212 35.8 M107 M185	 238 40.7 M107 M185	 277 54.5 M107 M185
Charge Container (type/material) (Note 11)	Blue cotton bag with CCC liner and velcro strap fastener.	Each increment is in a Green cotton bag marked with the zone number and tied together longitudinally by 4 ties	Each increment is in a Green cotton bag marked with the zone number and tied together longitudinally by 4 ties	Each increment is in a Green cotton bag marked with the zone number and tied together longitudinally by 4 ties
Means of Adjustment	Use as supplied, no adjustment necessary.	Remove increments 5, 4, 3 & 2.	Remove increments 5, 4 & 3.	Remove increments 5 & 4.
Remarks				

APPENDIX 1 to
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(Edition 2)

155mm GUN SYSTEMS

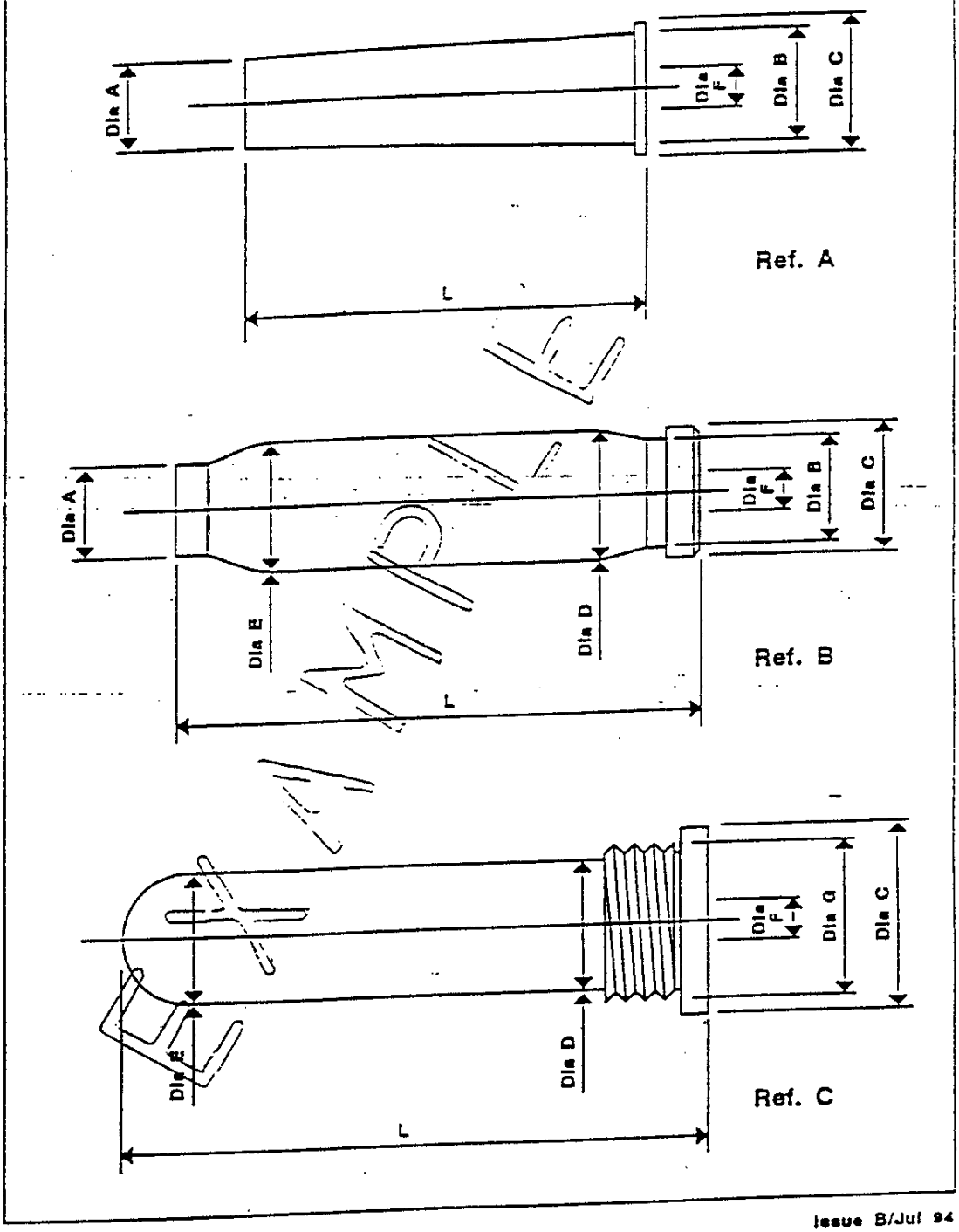
CHARGE DATA

See Reference Drawing Page C-7

DESIGNATION	L10A1	M203		
Reference Drawing (A,B,C,D)	Ref. A	Ref. A		
Country of Origin	United Kingdom	United States		
Propellant Type Increment Weight (kg) Operational Temp Limits	NBQ/2P/S 73-15 12.25 nominal -46 to +52	M30 11.886 nominal		
Dimensions:- Length L Maximum Diameter A Length B Length C Length D Length E Length H Diameter B Diameter C Diameter D Diameter F (Note 10) Length G	 761 152 N/A N/A N/A N/A N/A N/A N/A N/A 50 N/A	 749 152 N/A N/A N/A N/A N/A N/A N/A N/A N/A		
Type of Igniter Primer Included (Y/N) Primer Nomenclature	Pad L23A1 No DM191A1	Pad/Core No M82		
Ballistics:- MV @ 21°C (m/s) Std Dev in MV (m/s) Temp Coeff in MV (m/s/°C) Pressure @ 21°C (MPa) Std Dev in Pressure (MPa) Temp Coeff in P (MPa/°C) Std Dev at UFT (MPa) ESCP (MPa) Reference Projectile Reference Cannon	 827 3.0 0.83 435 4.0 1.071 L15A1 L22	 826 1.34 0.73 328 1.93 1.05 M549 M199		
Charge Container (type/material) (Note 11)	Brown Combustible Cartridge Case with Pink cap	White		
Means of Adjustment	N/A	N/A		
Remarks				

ARTILLERY SYSTEMS

PRIMER REFERENCE DRAWING



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ARTILLERY SYSTEMS

PRIMER DATA

See Reference Drawing Page C-12

DESIGNATION	DM191A1	M82	EAB-L1001	
Type (Note 14) Reference Drawing (A,B,C)	Percussion A	Percussion A	Percussion A	
Country of Origin	Germany	United States	France	
Dimensions:- Length L Diameter A Diameter B Flange Diameter C Maximum Body Diameter D Minimum Body Diameter E Diameter F (Note 15) Thread Diameter G/Form	49.68 11.25 12.30 15.15 N/A N/A 4.65 N/A	49.38 11.25 15.24 N/A N/A N/A	50.0 11.25 12.4 15.15 N/A N/A N/A	
Information:- Separate/In Case Perforated Tube (Y/N) Striker Energy Reqd. (Note 16) Electric Energy Reqd. (Note 17) Output Energy (J) (Note 18)	Separate No N/A	Separate No N/A	Separate No N/A	
Gun Equipment Usage	L22, FH70	M185, M109 M199, M198 L22, FH70		
Remarks				

All dimensions in millimetres unless stated.
If not as Ref Drawing A, B, or C supply reference drawing.

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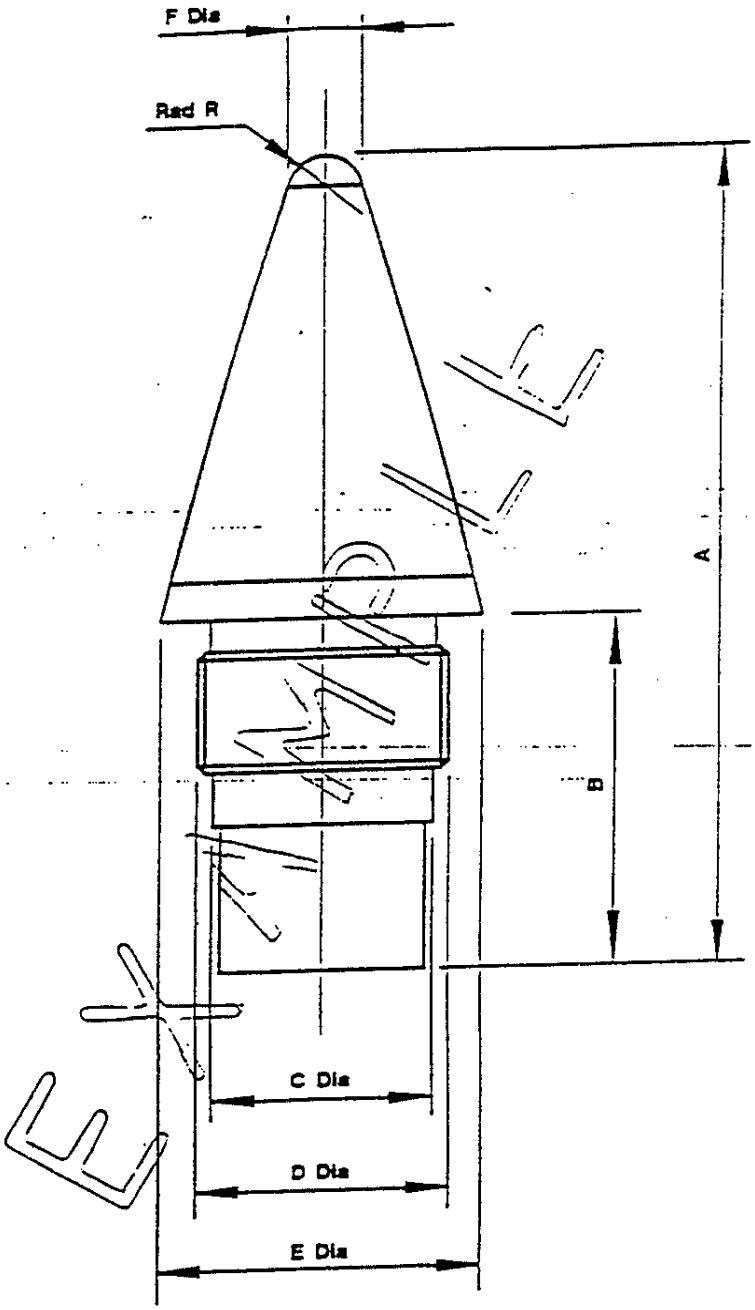
ARTILLERY SYSTEMS

FUZE REFERENCE DRAWING



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(Edition 2)

ARTILLERY SYSTEMS — FUZE DATA

See Reference Drawing Page C-14

DESIGNATION	M557	L116	FU DE F1	
Type (Note 12)	Point Detonating	MRF	Time	
Country of Origin	United States	United Kingdom	France	
Dimensions:- Length A Intrusion B Diameter C (Note 13) Thread Diameter D/Form Maximum Diameter E Nose Diameter F Nose Radius R Weight (kg)	 56.134 43.26 2inch-12UNS-1A	 164.34 68.83 43.43 2inch-12UN-1A 61.34 8.38 or 10.41 0.95	 134.01 38.25 40.604 50.8 pitch 12 60.96 N/A 0.930	
PD Detail: Delay Element (Y/N) Delay Selectable (Y/N) Delay Time (secs)				
Timer: Type Maximum/Minimum (secs) Wrench Required (Y/N) Setting Torque				
Arming: Minimum G level Maximum Permitted G Minimum Arming Distance (m)				
Operational Temp Limits (°C)				
Rad-Haz Protected (Y/N) Nuclear Hardened (Y/N)				
Projectile Usage		L15A1/A2		
Remarks				

All dimensions in millimetres unless stated

APPENDIX 2 to
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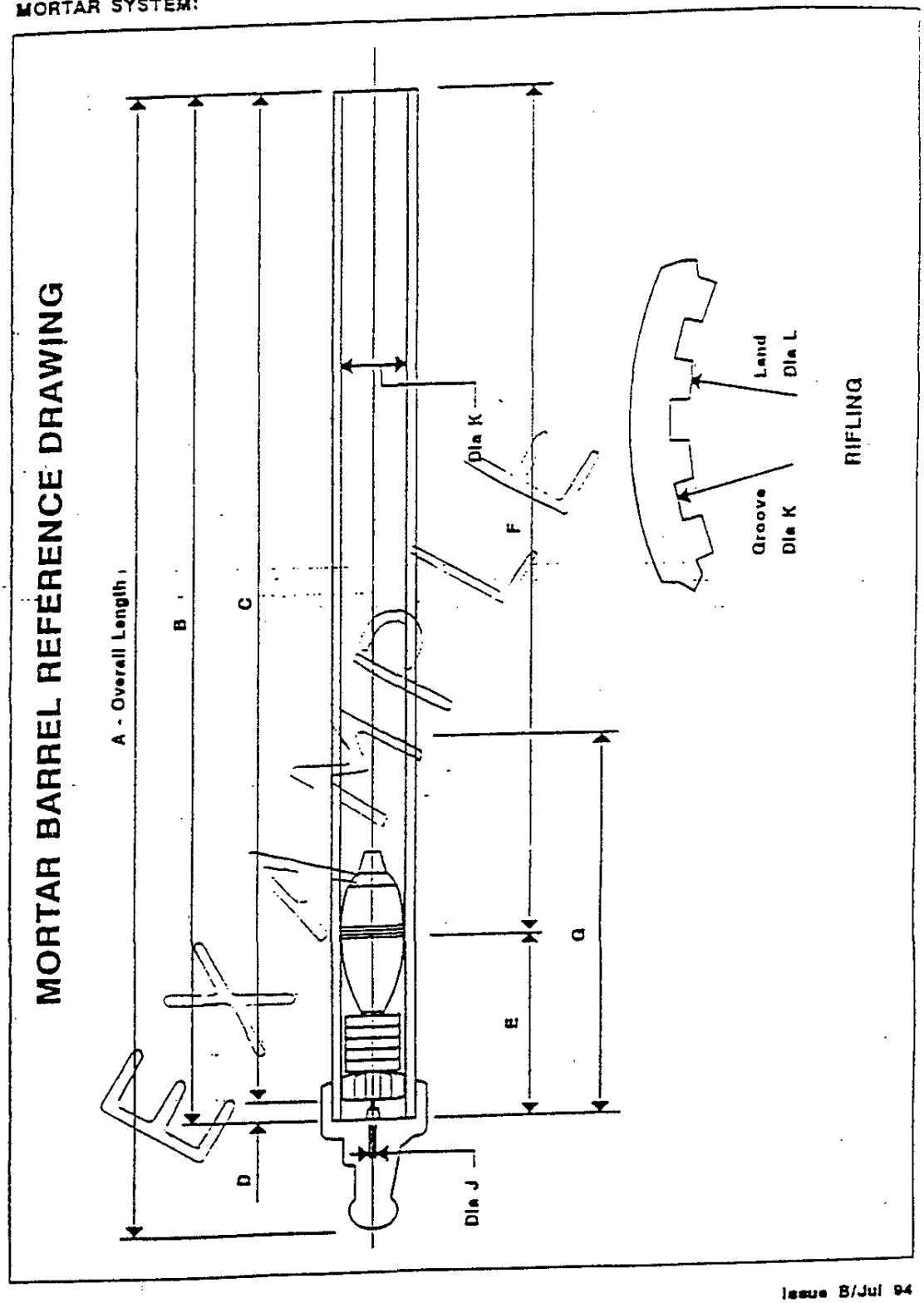
STANAG 4425
(Edition 2)

MORTARS

MORTAR SYSTEM:



APPENDIX 2 to
ANNEX C to
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(Edition 2)

60mm MORTAR SYSTEMS

MOTAR BARREL/TUBE DATA

See Reference Drawing Page C-17

DESIGNATION (Equipment)	Country of Origin	Barrel Design Pressure (MPa)	Type of Ignition
DGIM 5271-33 Mod L	Spain		Percussion

DIMENSIONS:-	
Overall Length A	782
Barrel Length B	650
Length C (Note 1)	624
Length D (Note 2)	26
Max Pressure Zone G	
Pin Diameter J	
Bore Diameter K	60.70

RIFLING:-	
Number of Grooves	N/A (Smooth Bore)
Twist (Note 3)	
Groove Diameter K	
Land Diameter C	
Depth of Groove	
Width of Groove	
Width of Land	

REFERENCE PROJECTILE	Length E Chamber Length	Length F Shot Travel	Chamber Volume (ltrs)
M68 Mod L	208	441	0.587
PL Mod 68 Mod L	208	441	0.587

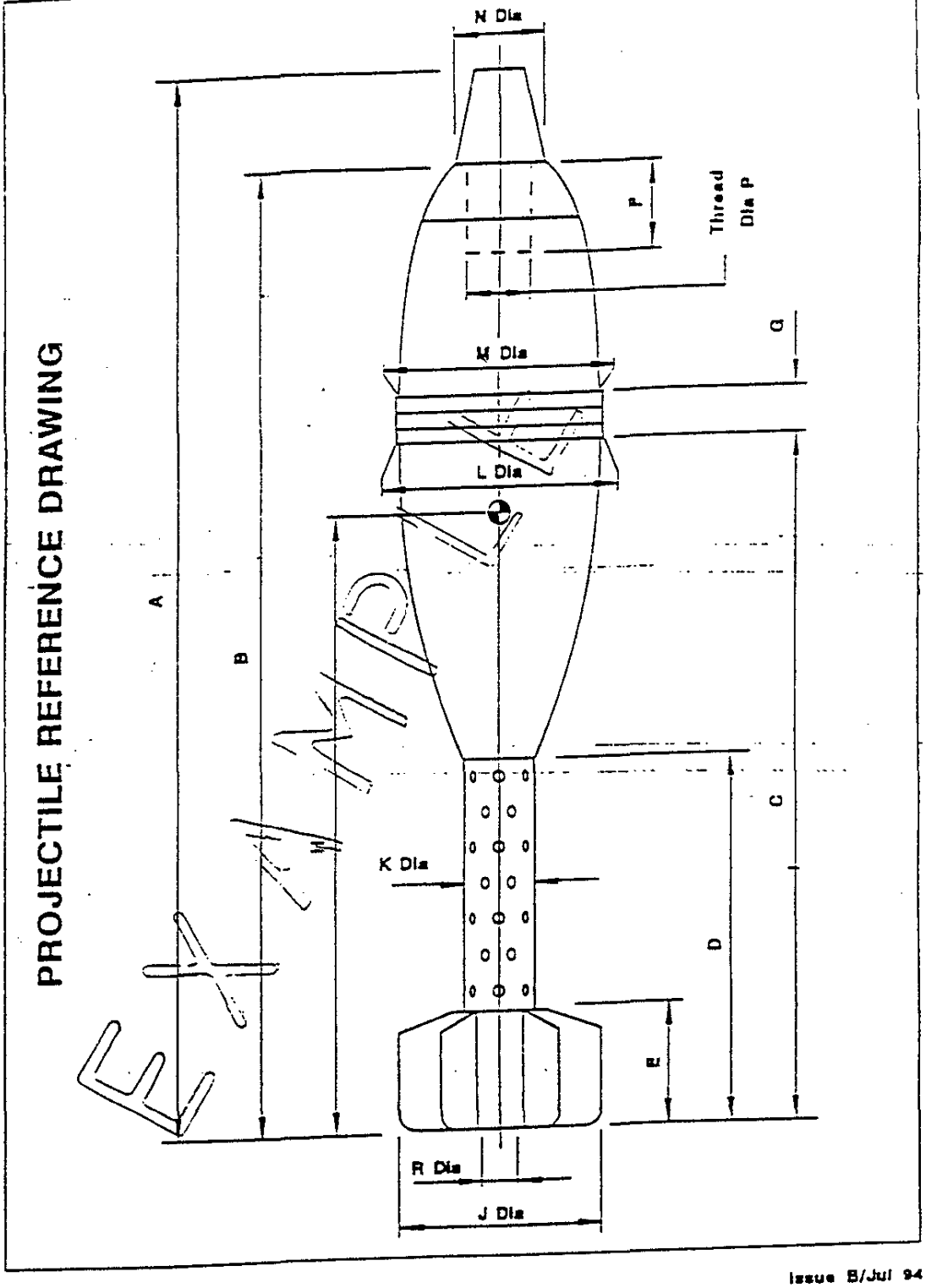
FIRING MECHANISM:-	
- Mode of Firing	Gravity Trigger
- Fire/Safe Lock (Y/N)	Yes
- Retractable Pin (Y/N)	Yes
- Pin Protrusion	1.5
- Pin Radius	1.5
- Pin Energy (cmg)	

REMARKS:

All dimensions in millimetres unless stated

MORTAR SYSTEMS

PROJECTILE REFERENCE DRAWING



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APPENDIX 2 to
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60mm MORTAR SYSTEMS

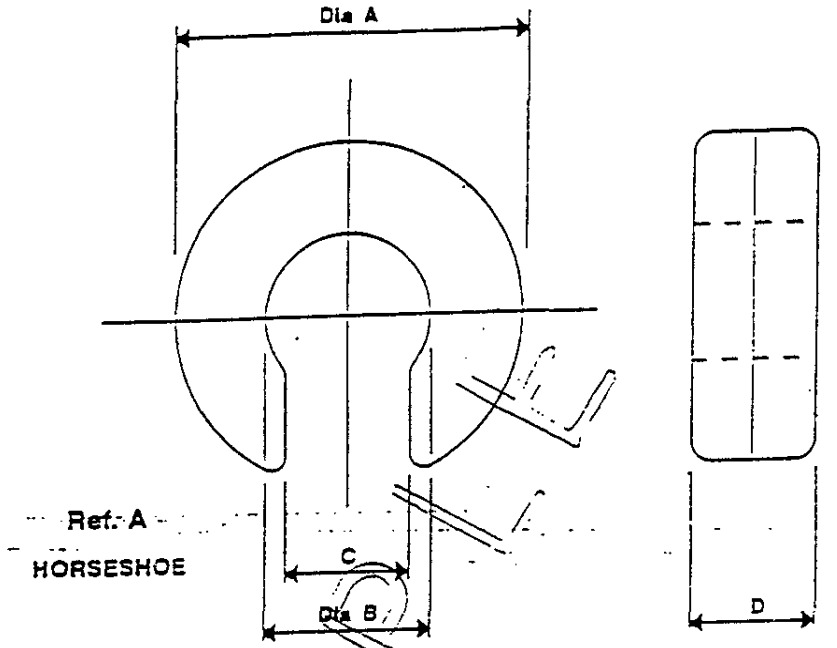
PROJECTILE CHARACTERISTICS

See Reference Drawing Page C-19

DESIGNATION	M-68	PL Mod 68		
COUNTRY OF ORIGIN	Spain	Spain		
TYPE	HE	Practice		
IDENTIFYING COLOUR	Olive Green Grey (Body), Pale Yellow-Greenish (Nose), Pale Grey (Band)	Olive Green Grey (Body), Black (Nose), Pale Grey (Band)		
Design Press (MPa)				
WEIGHT (kg) Nominal (inc Fuze) Tolerance Reference Fuze/Wt	1.428 0.074 M55/0.193	1.428 0.074		
DIMENSIONS Length A/Ref Fuze Length B Length C (Note 4) Length D (Note 5) Length E Maximum Cavity Length F Obturator Width G Centre of Gravity H Fin Diameter J Diameter K Maximum Obturator Dia L Maximum Body Diameter M Diameter N Thread Diameter P/Form Diameter R (Note 6)	183 72 N/A 60 W 22.662/13 tpi 16	183 72 N/A 60 W 22.662/13 tpi 16		
MOMENT OF INERTIA (kg m²) Polar Transverse				
Obturator type Spin-engaged Band (Y/N)	N/A No	N/A No		
Charge Ignition Electric/Percussion Cap Activation Energy	Percussion	Percussion		
Rocket Assisted (Y/N) Burn Time (secs) Delay Time (secs)	No	No		
Tail Discard (Y/N) Distance from muzzle (m)	No	No		
Operational Temp Limits	-30 to +60°C	-30 to +60°C		
Remarks				

MORTAR SYSTEMS

AUGMENTING CHARGE REFERENCE DRAWING



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APPENDIX 2 to
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(Edition 2)

60mm MORTAR SYSTEMS

CHARGE CHARACTERISTICS

See Reference Drawing Page C-21

DESIGNATION	DGIM 6446-8	DGIM 6446-6		
COUNTRY OF ORIGIN	Spain	Spain		
FORM/COLOUR Included in Proj or Externally attached	Pale Brown	Cellophane Externally attached		
DIMENSIONS: Drg Ref. Diameter A Diameter B Opening C Thickness D		A 53.0 20.0 11.5		
PROPELLANT	FIL 356 Flake	M-2 FIL.65 Flake		
NOMINAL CHG Wt (g)	5.00	4.25		
Operational Temp Limits	-30 to +60°C	-30 to +60°C		
Reference Barrel Reference Projectile	DGIM 5271-33 Mod L M-68	DGIM 5271-33 Mod L M-68		
REMARKS				

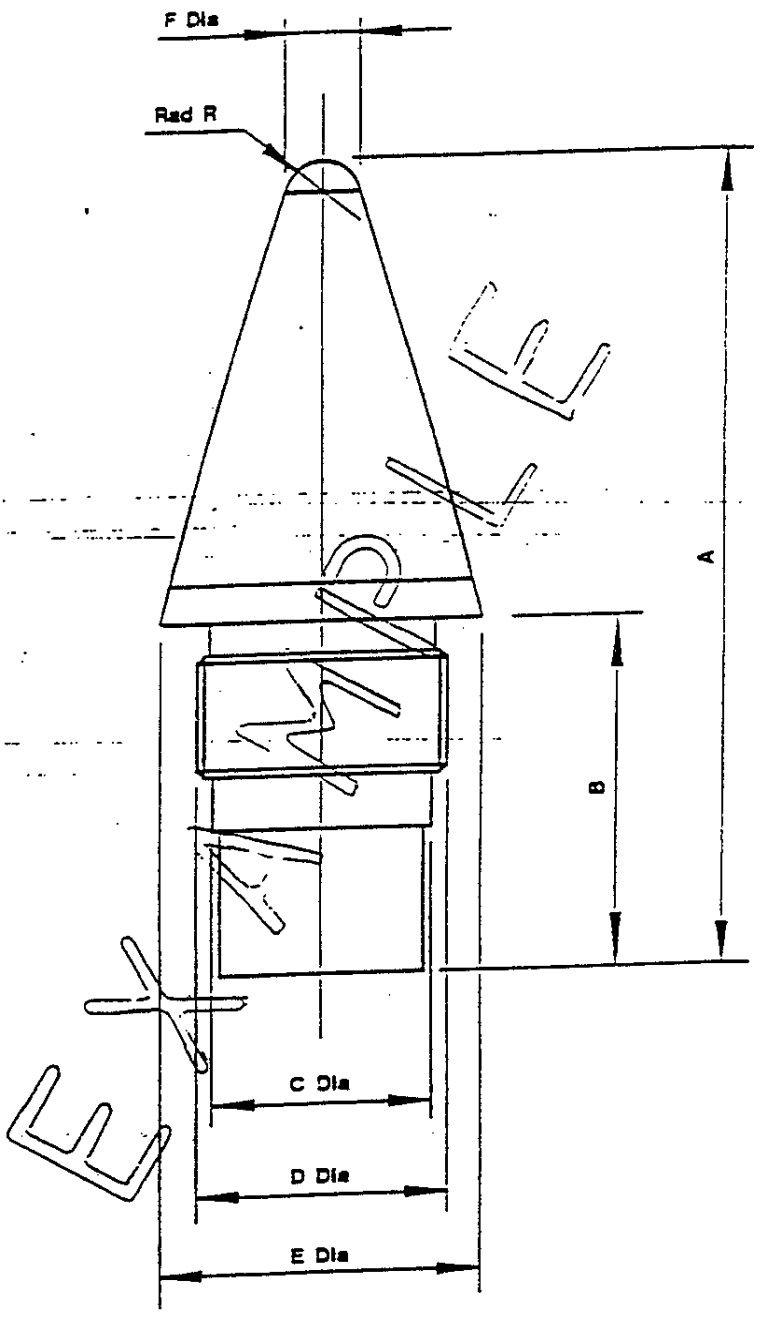
BALLISTICS:

CHARGE	Primary	1	2	3			
COMPOSITION	1x6446-8	1x6446-8 1x6446-6	1x6446-8- 2x6446-6	1x6446-8 3x6446-6			
MV(m/s) @ 21°C Std Dev in MV (m/s) Temp Coeff (m/s/°C) Press(MPa) @ 21°C Std Dev in Press (MPa) Temp Coeff (MPa/°C) Std Dev at UFT (MPa) ESCP (MPa)	58	99	129	156			

CHARGE							
COMPOSITION							
MV(m/s) @ 21°C Std Dev in MV (m/s) Temp Coeff (m/s/°C) Press(MPa) @ 21°C Std Dev in Press (MPa) Temp Coeff (MPa/°C) Std Dev at UFT (MPa) ESCP (MPa)							

MORTAR SYSTEMS

FUZE REFERENCE DRAWING



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See Reference Drawing Page C-23

DESIGNATION	M55 Mod L			
Type (Note 8)	PD			
Country of Origin	Spain			
Dimensions:- Length A Intrusion B Diameter C (Note 9) Thread Diameter D/Form Maximum Diameter E Nose Diameter F Nose Radius R Weight (kg)	 115 72 W 22.662/13tpi			
PD Detail:- Delay Element (Y/N) Delay Selectable (Y/N) Delay Time (secs)	 No N/A N/A			
Timer: Type Maximum/Minimum (secs) Wrench Required (Y/N) Setting Torque	N/A			
Arming: Minimum G level Maximum Permitted G Minimum Arming Distance (m)	 1247 10605 2			
Operational Temp Limits	-30 to +60°C			
Rad-Haz Protected (Y/N) Nuclear-Hardened (Y/N)	N/A N/A			
Projectile Usage	M-68 Mod L PL 68 Mod L			
Remarks				

All dimensions in millimetres unless stated

ANNEX D to
STANAG 4425
(Edition 2)

EXAMPLES OF INTERCHANGEABILITY DATA FORMATS

Given in the following 3 appendices are interchangeability data formats as under:

- Interchangeability Tables are at Appendix I;
- Interchangeability Symbols are at Appendix II;
- Format for Simple Ballistic Corrections are at Appendix III.

APPENDIX 1 to
ANNEX D to
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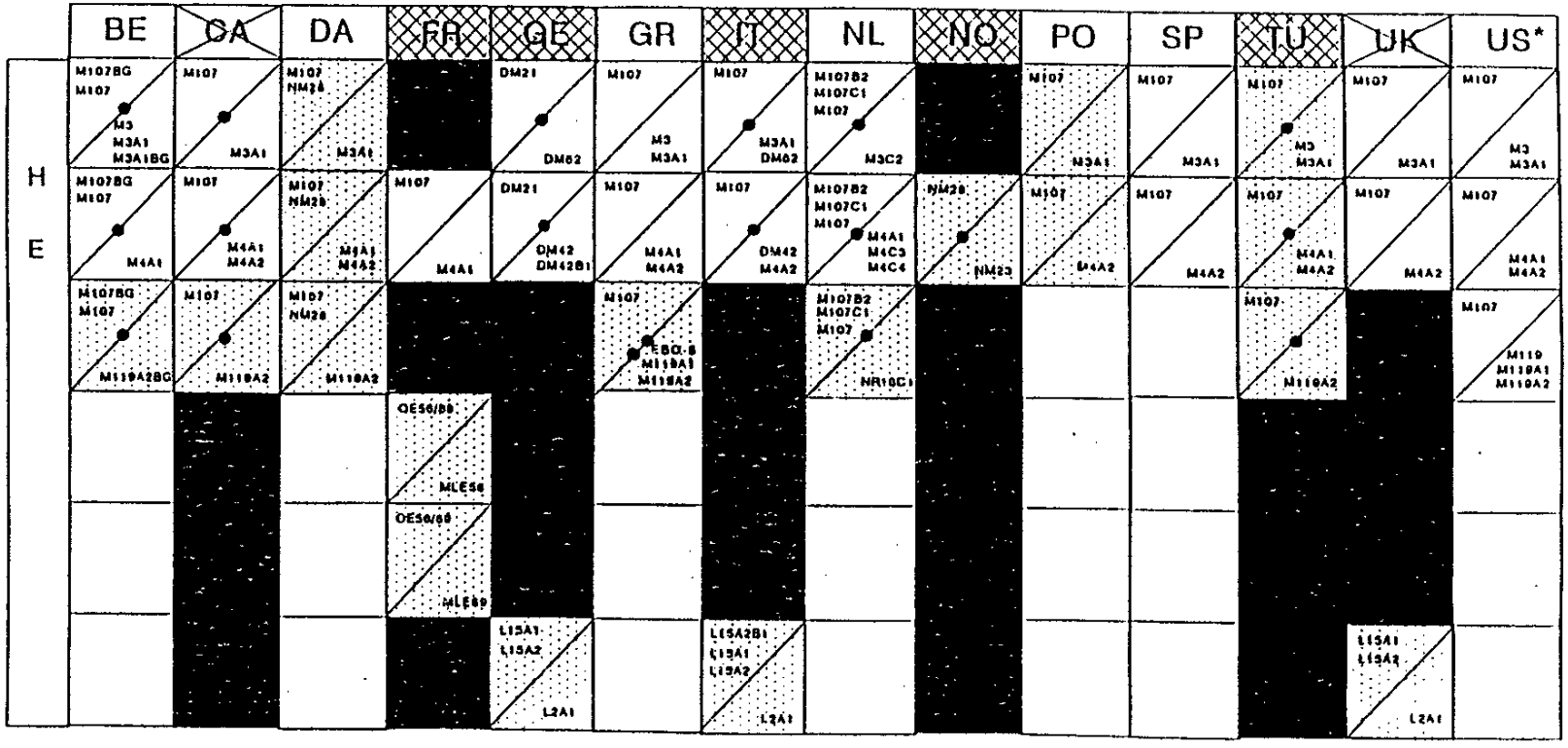
(Edition 2) AOP-29

155MM HOWITZER M109A1/A2/A3/A4 SELF-PROPELLED (M185 CANNON) AMMUNITION INTERCHANGEABILITY



SAFETY — WITH NATIONAL RESTRICTIONS

BALLISTICS — BALLISTIC MATCH

HEADINGS — BE POSSESS WEAPON AGREE DATA

DEEMED INTERCHANGEABLE BUT EITHER LACKING CERTIFICATION OR REQUIRING ADDITIONAL RESTRICTION

RADIAL ERROR IN IMPACT LESS THAN 1% OF RANGE

POSSESS WEAPON DO NOT AGREE DATA

OR NOT APPLICABLE

RADIAL ERROR IN IMPACT LESS THAN 5% OF RANGE

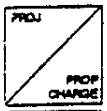
BE DOES NOT POSSESS WEAPON

D-2

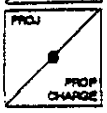
APPENDIX 2 to
ANNEX D to
STANAG 4425
(Edition 2)

INTERCHANGEABILITY SYMBOLS AND DEFINITIONS

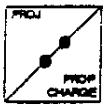
Safe to fire with national restrictions and no ballistic assessment of accuracy has been made.



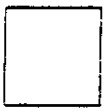
Safe to fire with national restrictions and ballistically matched.



Safe to fire with national restrictions and radial error in impact less than 1% of range (within 2% or less than 20 meters for mortars).



Safe to fire with national restrictions and radial error in impact less than 5% of range (within 10% or less than 100 meters for mortars).



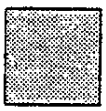
The nation concerned does NOT possess the projectile/ charge combination, but does possess the type of weapon shown on top of the chart. This nation would accept the projectile/charge combination, inserted in the same row, if offered without additional restrictions (empty cell).

Deemed interchangeable but either lacking certification or requiring additional restrictions and no ballistic assessment of accuracy has been made.

Deemed interchangeable but either lacking certification or requiring additional restrictions and ballistically matched.

Deemed interchangeable but either lacking certification or requiring additional restrictions and radial error in impact less than 1% of range (2% or 20 meters for mortars).

Deemed interchangeable but either lacking certification or requiring additional restrictions and radial error in impact less than 5% of range (10% or 100 meters for mortars).



The nation concerned does NOT possess the projectile/ charge combination, but does possess the type of weapon shown on top of the chart. This nation would accept the projectile/charge combination, inserted in the same row, if offered with further restrictions (empty grey cell).

DO NOT USE (or does not exist in that nation).

FORMAT FOR SIMPLE BALLISTIC CORRECTIONS

A difference in		Muzzle Velocity	Range	Drift	Time of Flight
is compensated for by applying a correction to	either	Muzzle velocity (meters/second)	Air density (percent)	Correction for drift (percent)	Time of flight (seconds or percent)
	or	Burning Rate Factor: f_B and Down-tube Resistance Factor: f_R (percent)	Form Factor: i or Drag Factor: f_D (percent)	Lift Factor: f_L (percent)	Magnus Force Factor: Q_M (percent)
Projectile	Charge				