# Technical Specifications
# For the
# Electronic Percussion Fuze for Shell 155MM
# (Without Booster Pellet)

Doc No: 3094/PYRO/R&D

Date 30/09/2025

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## 1. Technical Specifications

This document establishes the performance, design and acceptance requirements for the Electronic Percussion Fuze for Shell 155MM (Without Booster Pellet) with Self Destruction Mechanism.

### 1.1 Description of the Product

It is the Point Detonating and Self-Destructive Electronic Fuze used for 155MM Ammunition. The outer dimensions of the fuze are as per Annexure-I. Fuze should be supplied with required electrical initiators and explosive components except the Booster Pellet.

### 1.2 Function Mode

The Fuze should be designed to function upon impact with the target. The Fuze should have two modes of operation i.e. Point Detonation Super Quick (PDSQ) and Point Detonation Delay (PD Delay).Fuze Functioning can be selected between two modes with the help of a selector switch provided on the Fuze Body.

- **Point Detonating Super Quick(PDSQ) :** When set to PDSQ, the fuze functions instantly on impact.
- **Point Detonating Delay(PDD) :** When set to PD Delay mode, the fuze should functions after set delay of minimum 0.04 sec of post impact
- **Self-Destruction (SD) :** The FUZE should incorporate self-destruction feature to initiate munitions in case the FUZE fails to function in the primary mode.Self-destruction time should be in the range of 190 to 210 Sec or it should be programmable as per customer requirement.
- **Explosive Ordnance Discharge (EOD) :** Fuze should have the features incorporated for safe handling in case of total failure.

### 1.3 Safety Mechanism

- **Safety & Arming :** Fuze should have safe & arm device preventing unintended arming and should get armed only after achieving setback & spin forces.
- **Battery Activation :** Battery should always be in inactive mode and should be activated only in the launch environment i.e. on receipt of the setback force & Spin.
- **Electronic Arming Safety :** Fuze should have safety feature incorporated so that it should not function in case of round struck in the barrel.

1.4 Technical Data

- Overall length:150.64 mm (Max)
- Weight: 1035 grams Max
- Intrusion Thread: 2"-12UNS-1A
- Intrusion Depth: 56.1mm(max)
- Cross Section Diameter: 61.20/ 60.80 mm
- Power supply: Reserve Battery
- Temperature range of use: -30°C to + 55°C
- Temperature range of storage: -40°C to + 70°C
- Shelf life: 10 years minimum
- Fuze should comply Mil-STD-331 & MIL-STD-1316

1.5 Critical Subassemblies:

- Battery
- Electric Initiator
- Firing Control Circuit
- Safety & Arming Device

1.6 Packaging : FUZE to be packed individually in hermetically sealed plastic containers. 20 such containers will be packed in metal boxes that have Styrofoam inner trays.

## 2. Manufacturer Levels Tests and Qualification

2.1 Environmental Test:

The following environmental tests have to be conducted during the design qualification phase at firm's premises in presence of OFDR rep. The Fuze must not be initiated and must be safe to handle after the following testing in accordance with MIL-STD-331.

| # | Test Description & quantity | Test Parameters | Acceptance Criteria |
|---|---|---|---|
| 1 | Jolt – 3 Nos<br>(As per MIL-STD-331 A1) | i) No of Jolts : 1750 impacts<br>ii) Jolt drop height : 102±5 mm<br>iii) Pulse rate:35±5 impacts/minute<br>iv) Fuze : Bare Fuze with all explosive components (Booster pellet will be supplied by OFDR) | No explosive component should be initiated. |

| # | Test Description & quantity | Test Parameters | Acceptance Criteria |
|---|---|---|---|
| 2 | Jumble – 3 Nos<br><br>(As per MIL-STD-331 A2.1) | i) Pulse Rate:30 ± 2 revolutions per min for a total 3600 ± 10 revolutions<br>ii) Duration:02 hours<br>iii) Fuze : Bare fuze with all explosive components (Booster pellet will be supplied by OFDR) | No explosive component should be initiated. |
| 3 | Drop Safety(1.5 Mtr) – 5 Nos<br><br>(As per MIL-STD-331 A4.1) | i) Height of Drop :1.5m<br>ii) Drop Surface:Mild Steel Plate of 75 mm thick<br>iii) Fuze: Bare & unpacked Fuze with all explosive components except Booster Pellet. | No explosive component should be initiated. |
| 4 | Vibration – 3 Nos<br><br>(As per MIL-STD-331-B1) | i) Fuze: Packed fuzes (03 live & 17 Dummy Fuzes to be packed in Service Package & placed diagonally). (Booster Pellet to be replaced with inert pellet)<br>ii) Swept logarithmically from 05 Hz to 500 Hz to 05 Hz in 15 minutes for 8 sweeps per axis. Displacement and acceleration level 5g acceleration peak. | No explosive component should be initiated. |

2.1.2 Dynamic Firing of Environmentally Tested Fuzes

a) Fuzes after being exposed to the above environmental tests mentioned in para 2.1, will be conditioned at specified temperature as per below table for 6 hrs and then subjected to Dynamic firing test. In dynamic firing fuze should not be prematurely functioned.

| # | Test | Qty | Conditioning | Fuze Marking |
|---|---|---|---|---|
| (a) | Jolt | 03 | Ambient | 1P to 3P |
| (b) | Jumble | 03 | Ambient | 4P to 6P |
| (c) | Transport Vibration | 01 | Ambient | 7P |
| | | 01 | -30°C | 8P |
| | | 01 | + 55°C | 9P |
| (d) | Drop | 05 | Ambient | 10P to 14P |

Radiographic Examination to be conducted before and after environmental tests. There should not be any evident of explosive initiation or unsafe condition for handling.

## 2.2 Fuze Qualification in Manufacturing Lots

### 2.2.1 Visual Inspection: Features for Visual Examination and Acceptance

| Sl. No | Description | Sample Size | Acceptance Criteria |
|---|---|---|---|
| 1 | Cracks in Fuze Body | 100% | Not Allowed |
| 2 | Wrench Slots | 100% | Should be Present |
| 3 | Mode Selector Slot alignment | 100% | Mode Selector Slot should align with Mode Marking |
| 4 | Fuze Surface Finish | 100% | Free from Local patches/peel off |
| 5 | Lot Marking | 100% | Clear traceability marking |

### 2.2.2. Dimensional Inspection

a) Critical Dimensions: NA

b) Major Dimensions:

| Sl.No | Dimension/Feature | Inspection Method |
|---|---|---|
| 1 | Length 150.64 mm Max | General Engg.Method |
| 2 | Length 56.1 mm Max | -do- |
| 3 | Dia 43.0 mm ±0.2 | -do- |
| 4 | Thread 2"12UNS 1A | Go & No-Go Gauges (To be provided by the firm) |
| 5 | Dia 61.1 mm ±0.1 | General Engg.Method |
| 6 | 1035 gms Max (Weight of assembly) | Weighing Scale |

c) Minor Dimensions: NA

2.2.3 Controlled Dynamic Test up to first initiator level to be conducted as per details given below:

Qty: Minimum 08 Nos (IS:2500-Part-I, Special Inspection Level-II) of Electronic Module with Battery, Safe Arming Device & first initiator shall be randomly selected from the each manufacturing batch duly cleared by the firms QA. These components shall be assembled to suit controlled dynamic trial and shall be subjected for ET TESTs as mentioned below followed by firing using field simulated conditions i.e. at minimum setback & minimum spin. Modules should function in SD mode/spin decay mode.

- Low Temperature: -30 °C for 4 hours
- High Temperature Test: + 55°C for 4 hours

- Random Vibration: 20Hz-100Hz at 6dB/octave so as to reach $0.04g^2$ /Hz at 100Hz, $0.04g^2$ /Hz constant from 100 Hz to 2000 Hz. Duration 30sec in all 3 axes.

Environment tests followed by controlled dynamic trial schedule chart for Qty. 08 Nos. are as follows. Functioning of assembled modules shall be verified in self-destruction mode only.

| ENTEST | No. of modules under test | No. of Modules withdrawn | Controlled Dynamic trial |
|---|---|---|---|
| High Temperature | 8 | 2 | 2 |
| Low Temperature | 6 | 2 | 2 |
| Random Vibration | 4 | 2 | 2 |
| Drop 1.5 m on 75mm thick steel plate | 2 | 2 | 2 |

Observation: Modules should function in the spin decay mode/ specified SD time.

3. Dynamic Firing Tests: Dynamic proof firing involves the following tests
   (a) Environmental Test followed by Dynamic Proof
   (b) Non Arming Proof/Safety Test.
   (c) Delay Test.
   (d) Absence of Premature Test (PDSQ)

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Annexure - I

# ELECTRONIC PERCUSSION FUZE, 155MM