Development Of An Electronic Time Fuze For Self-Propelled Long Range Howitzer

SeongHun Kim

May 21, 2009
Contents

- Company Background
- Fuze Capability
- Fuze Needs
- Electronic Time Fuze, HW101
- Fuze Setter
- Summary & Conclusion
Company Background

Hanwha Group
- Top 10 Largest Biz. Group in Korea

Hanwha Corporation
- Subsidiary of the Hanwha Group
- Founded in 1952, largest fuze company in Korea
- Sales : $570million
- Employees : 2,800 persons
Company Background

Defense Business

- 40mm Grenade Launcher Cartridge
- Hand Grenade

- Illuminating Cartridge
  60mm/81mm/4.2”/155mm

- GMLRS
- 130mm/227mm MLRS
- 2.75” Rocket

- Mortar Bomb
- Scattering Bomb for Aircraft
- 155mm Penetrating Bomb

- High Explosives

- Illumination Cartridge

- Rocket

- Propellants

- Fuzes

- Grenades

- Undersea Equipments

- TASS
- TACM
- OPTIC

- Charge, Propelling 155mm/8inch

- Mechanical/Electronic Fuze
  Impact, Time, Proximity,
  Multi-function

- Application
  Naval, Mortar, Tank, Howitzer
  Missile

- Short-range, Surface to Air
- Portable, Surface to Air
- Torpedo
Fuze Capability

Participating today in leading next generation fuzes Development of electronic & mechanical fuze for:

Artillery Ammunition
- 105mm/155mm/203mm

Mortar Ammunition
- 60mm/80mm/120mm

Tank Ammunition
- 120mm

Medium Caliber Ammunition
- 20mm/25mm/35mm/40mm

Submunition
- 120mm
- 2.75” MPSM, MLRS

Rocket & Mine
- MLRS
- NSDA

Missile
- Fuzes & ESAD

MEMS Safe & Arming Device
TCF
GPS Fuze
Smart Fuze
G-hardened ESAD
Non-lethal Weapon Fuze
Korean army needs an electronic time fuze for artillery and for high fire rate of self-propelled howitzer.

K9 Self-Propelled Howitzer
- 155mm-52caliber, 40km Range
- Automatic Fire Control System
- Automatic Shell Loading System
- Ammunition: K310 DPI CM BB etc
- Fuze: KM577A1 MTSQ etc
- Propellant: Modular Charge etc
Electronic Time Fuze, HW101

Development by Hanwha investment for Korean army needs and global export

Use in all types of 105 to 203mm HE, cargo, illuminating and smoke projectiles

Time set either manually or by using an inductive fuze setter over a range from 0.5 to 199.9 seconds

The HW101 fuze is suitable for the latest generation of enhanced range munitions
# Electronic Time Fuze, HW101

<table>
<thead>
<tr>
<th>Operation</th>
<th>Mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD ET</td>
<td>PD</td>
<td>PD</td>
</tr>
<tr>
<td>ET/ET</td>
<td>ET/ET/PD</td>
<td>PD</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1s</td>
<td></td>
</tr>
<tr>
<td>Set</td>
<td>Inductive &amp; manually</td>
<td></td>
</tr>
<tr>
<td>* Set range: 0.5~199.9s (0.1s increment)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Ballistic Environment | 1,300~30,000G 2,500~30,000RPM |
| Oper. Temp.           | -43°C ~ +63°C          |
| Safety               | 400caliber             |
| Standards            | Mil-Std-1316, Mil-Std-331 |
Electronic Time Fuze, HW101

Dual setting system & high accuracy design for user’s requirements

- Dual setting system
  - Uncabled setting by inductive means
  - Manual setting by three setting rings
  - Unlimited setting storage time
    (no use of battery for setting)

- Electronics
  - High G ruggedized by crystal based devices
  - Hybrid IC for small size
  - Time algorithms for high accuracy
Electronic Time Fuze, HW101

G-hardened modular design of subass’y for common use artillery fuze

- **Power Supply**
  - Reserve battery for long storage

- **Safety & Arming Device**
  - Two independent environment locks
  - Electronic arming not arm until 0.45s

- **Explosive train**
  - Out-of-line explosive train prior to 400caliber
  - 27g RDX Booster (for HE)
Electronic Time Fuze, HW101

High G test by gas gun system

- High G demonstration of parts and assemblies

Electronic function test by special instrument

- Electronic function demonstration of assemblies
Electronic Time Fuze, HW101

Environmental test: MIL-STD-331

- Vibration
- Temperature & Humidity (28 days)
- Salt Fog
- Waterproofness
- Thermal
- Jolt/Jumble/ 1.5m Drop/ 12m Drop

Hanwha
# Electronic Time Fuze, HW101

## Field test: Full charge validation

<table>
<thead>
<tr>
<th>Caliber</th>
<th>Weapon</th>
<th>Projectile</th>
<th>Charge/Zone</th>
<th>Setting(s)</th>
<th>Accuracy(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>155mm</td>
<td>K9 Howitzer (52cal)</td>
<td>K310</td>
<td>K676 MCS</td>
<td>35</td>
<td>Requirement: $&lt;\pm 0.1$</td>
</tr>
<tr>
<td></td>
<td>M198 Class (52cal)</td>
<td>K310</td>
<td>K676 MCS</td>
<td>109</td>
<td>Recorded: $&lt;\pm X.XX$</td>
</tr>
<tr>
<td></td>
<td>KH179 (39cal)</td>
<td>KM549A1</td>
<td>KM203/8S</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>105mm</td>
<td>KM101A1</td>
<td>KM1</td>
<td>KM67/7</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>203mm</td>
<td>KM115</td>
<td>KM106</td>
<td>KM2/5</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
Electronic Time Fuze, HW101

Field test: Submunition expelling validation

K9-K310 DPICM-MCS
# Fuze Setter

**Developed for hand held use and vehicle mounted use**

## Features
- Interface with user via LED & keypad
- Low power consumption
- Over 3,000 setting operations

### Technical Specifications

<table>
<thead>
<tr>
<th>Operation</th>
<th>Mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Seven seg. LED</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td>16 keypads</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td>Set time</td>
<td>Power capacity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oper. Temp.</th>
<th>-43°C ~ +63°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Lithium Battery Auxiliary External Power</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standards</th>
<th>Mil-Std-810F, Mil-Std-461E</th>
</tr>
</thead>
</table>
Fuze Setter

Setter can be integrated with automatic shell loading system and fire control system.

Setting operation

Interface with user via LED & keypad
Have two mode: Set Mode, Read Mode

Display | Time set | PD set | Power
---|---|---|---
1999 | — | — | —
Fuze Setter

EMC test: MIL-STD-461F

Environmental test: MIL-STD-810E
- Thermal
- Leakage
- Transport
- Vibration
Summary & Conclusion

Wide operational flexibility
- HW101 and HW101A1 fuzes
- Inductive mean setting
- Fuze setter operation
  . Hand hold or vehicle mounted
  . Integrated with auto shell loading system
    and fire control systems
Improved performance with high time accuracy
Low cost achievement by modular design
Proved reliability by real fire test