

JUNGHANS 40mm MIRA/SPICA

Next Generation 40mm Infantry Grenade (IG) Fuzes



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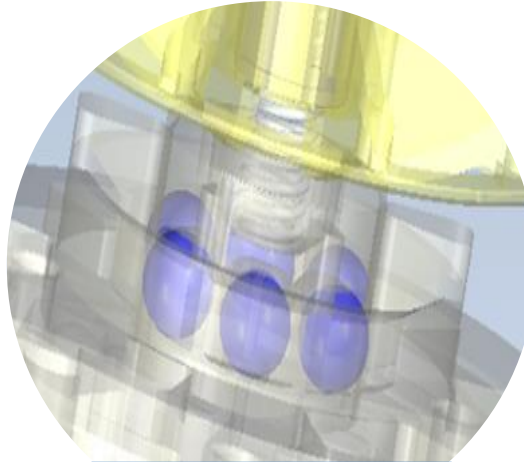
- Typical Problems with 40mm IG Fuzes
- JUNGHANS answers
 - MIRA/SPICA 40mm Fuze Family
 - MIRA/SPICA Main Objectives
- MIRA/SPICA specifications
- Technical state
- Way ahead



Typical problems with 40mm IG Fuzes



Modularity & Versatility



Self Destruct



Temperature Range



Integration



Sensitivity

Typical problems with 40mm IG Fuzes

Safety

- Partial arming in environment
- Missing reliable self destruct
- (dangerous) duds
- jamming mechanical Self Destruct; stored energy!

Functional Reliability

- Problem with mechanical initiation on wide range of targets
- Lack in graze angle sensitivity

Terminal Effect

- Comparably low reaction speed (esp. relevant on Dual Purpose (DP) rounds)

Airburst

- Need for weapon integration
- High energy demand (problems in temp. range due to batteries)
- Impact of environment (heat, dust,...)

Cost vs. Function

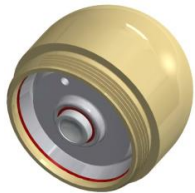
- Missing optimization for mass production
- Low modularity

MIRA is (together with its Medium Velocity (MV) variant SPICA) a program initiated by JUNGHANS, established to develop a cost efficient, reliable and innovative Fuze Family with high modularity for 40mm IG ammunition.

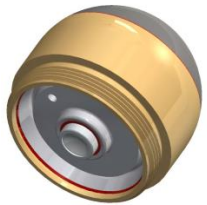
The different Fuzes are:



- Spin-decay Self Destruct **MIRA SSD**: The base variant, featuring a low cost Fuze with a mechanical Self Destruct, optimized for extremely low probability of jamming.

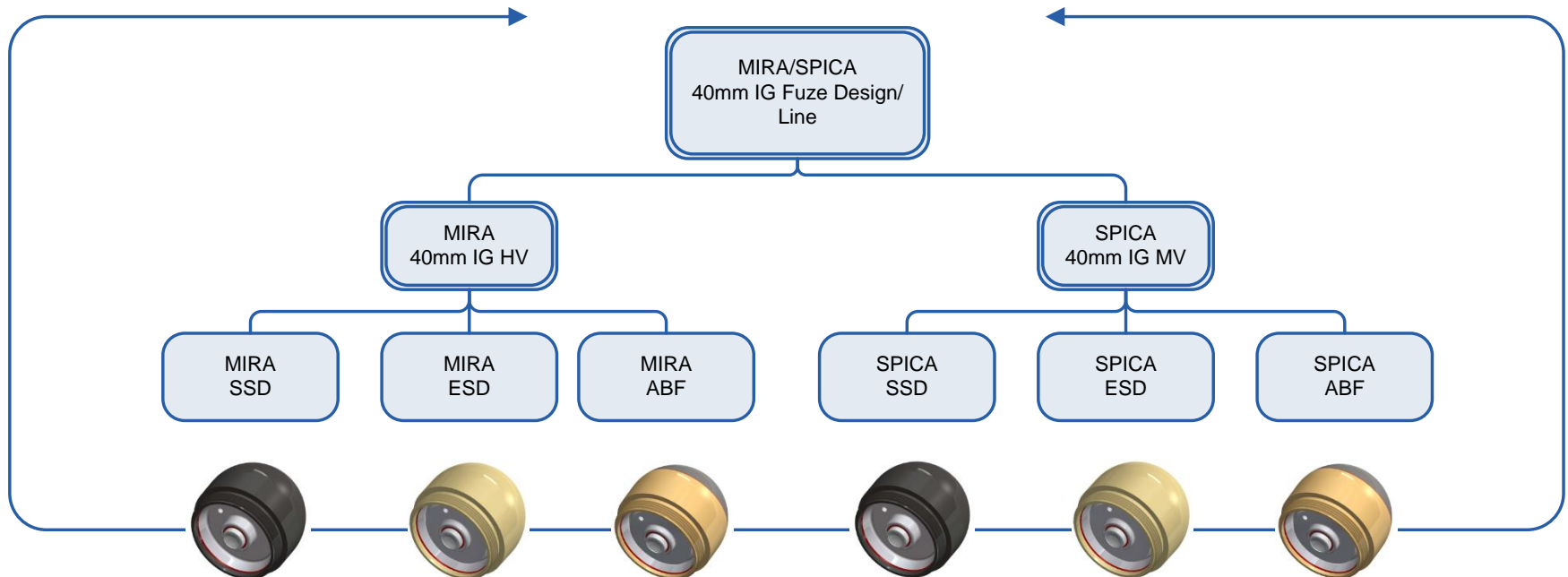


- Electronic Self Destruct **MIRA ESD**: This Fuze features a superior electronic Self Destruct with a factory-settable delay of up to 33 seconds as well as an extremely fast and sensitive Point Detonating (PD) function. For this the Fuze has redundant electronic impact sensors.



- Air Burst Function **MIRA ABF**: This Fuze offers, additionally to the ESD, a programmable Airburst function, settable from 0,1s up to 20s in 1mS time increments. It has the completely new developed XMI (eXtended **M**agnetic Induction) programming technology implemented.

MIRA and SPICA 40mm IG Fuze Family



Use in 40mm Automatic Grenade Launcher



Use in 40mm Grenade Launcher



- Complete new Fuze line in final phase of qualification, all Fuzes for both High Velocity and Medium (120m/s) Velocity*

- Fuze types (modular)



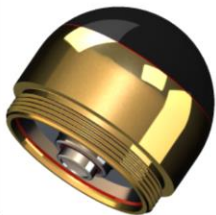
- **SSD (Spin Decay mechanical Self Destruct)**

- Low price offer
- High quality and reliability self destruct



- **ESD (Electronic Self Destruct)**

- Time based electronic self destruct (delay standard 20s, can be adjusted to customer demand)
- Additional electronic impact sensing (multi-directional sensor) => dramatically increased angle sensitivity



- **ABF (programmable AirBurst Function)**

- 3rd Gen XMI (eXtended Magnetic Induction) programming
- High weapon and Fire Control Unit (FCU) independence with low energy demand (no reserve battery needed)
 - High tactical versatility, non-intrusive for weapon system
 - Full temperature independence (full function across temperature range)

- **Market availability 2017 (phased approach)**

*Low Velocity (LV) modification available for ESD and ABF

High Reliability: Less than 1% possible duds

- Higher for ESD and ABF

Innovative Design: Optimised for high volume production

- modularity

Robust Design: Survives highest environmental stress (vibration profiles)

- Lightweight moving parts

Low Cost

- Cast parts
- Easy assembly

Modularity and Scalability with electronic supplements:

- Electronic Self Destruct with maximum precision
- Electronic impact sensors in order to counter basic problems of mechanical Fuzes for 40mm IG (graze angle sensitivity)
- Programmable Airburst of the latest generation

MIRA SSD Specification

Compliance with all mandatory specifications

- Safety: 12m drop, jolt, jumble, detonator safety, progressive arming, muzzle safety distance, all armed distance
- Helicopter and Fixed Wing vibration, logistical vehicle vibration, 28 days temperature/humidity, temperature shock, salt spray, water tightness, 1.5m drop and loose cargo

No mal-assembly; impossible to assemble in armed position

Reliable PD system

- initiates on 2mm aluminium, 12.5mm cardboard, natural ground at 300m and 3mm steel at 60° NATO

Spin Decay System

- activates at a spin of 6,000 rpm nominal; therefore reaching all ranges up to 2.200m (and above) is assured
- optimized to prevent jamming on impact on problematic targets (like rocks) in specified angles

Complies with STANAG 4403, Fuze mass 63g

Functional temperature: -46°C to +71°C

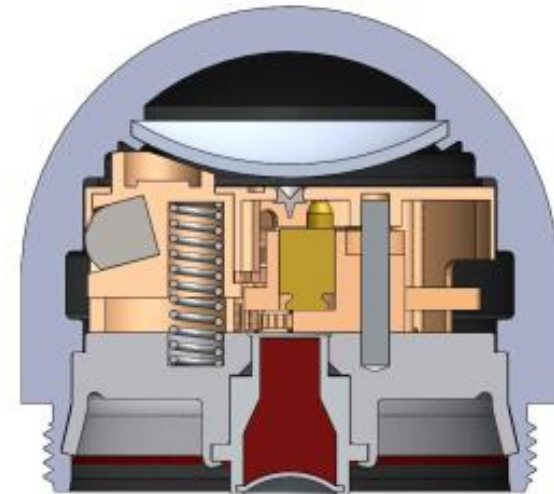
Shelf Life: 10 years minimum

Less than 1% possible duds

PD function on specified targets: Better than 95%

PD and SD combined: Better than 99%

Modularity & Versatility Self Destruct



Same as MIRA SSD with the following additions:

Highly precise electronic system for Self Destruct: Factory Setting for SD delay (20s); up to $33s \pm 0.1s$

Ultrafast Dual Mode Impact Sensor

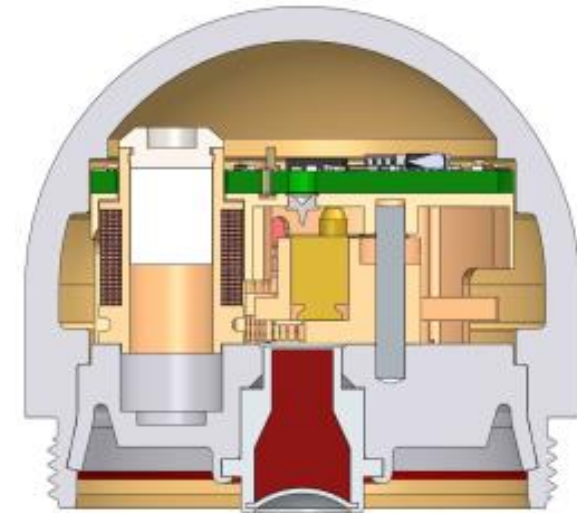
- electronic PD Sensor for superior PD function in extreme graze angles
- Angle sensitivity up to 80° NATO (3mm and also thicker and harder steel)

The mechanical PD as in MIRA SSD is still implemented (mechanical PD Backup)

Energy provision is fully done with a Setback Generator (possible through energy efficient electronics)

- Wide temperature independence (-46°C - $+71^{\circ}\text{C}$)

Modularity & Versatility
Sensitivity
Temperature Range



Same as MIRA SSD and ESD with the following additions:

Superior XMI Airburst programmability

- Extended Magnetic Induction (out of barrel, weapon independent and virtually unjammable while non-reactive to environmental interference)
- No need for setter directional adjustment (benefit for remote weapon station)

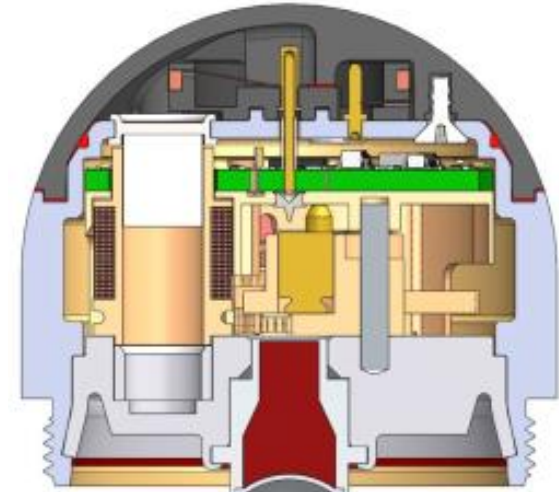
Time of Airburst programmable from 200ms up to 20s in increments of 1ms

Time precision $\pm 4\text{ms}$ or $\pm 0.25\%$ of the set time (depending on which is the bigger value)

Programming with the XMI Setter, compatible with all major FCUs (and usable in a standalone setup for MV)

Full temperature range for Airburst (-46°C - $+71^{\circ}\text{C}$)

Modularity & Versatility
Sensitivity
Temperature Range
Integration



40mm SPICA is the MV variant of MIRA:

Function in MV (120m/s)

The entire base is identical, just some minimal diversion for single parts

- Rotor Masses (all)
- “Slug” in SD-Mechanism (SSD)

The Setback Generator is identical

The Fuze electronics are identical

Therefore: Maximum modularity and highest transparency for the user

An LV variant of ESD and ABF is available; Proof of Concept (live firings) conducted in late 2015 (USA)

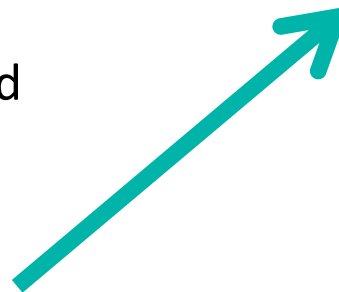
- All 6 base designs have been developed in parallel
- End of development (currently beginning of qualification phase) in February 2017
- Company qualification will be passed by Q2 and Q4 of 2017
- MIRA/SPICA is fully available in qualified design Q4 2017



40mm Airburst from H&K GMG



- Serialization Q2-4 2017
- Market availability Q4 2017
- Parallel:
 - Coordination of integration in FCUs
 - Different systems
 - First live demonstration of full integration in February 2017
- Programmers for development and demonstration are fully available
- Serial programmer for FCU available in Q2 2017



Future:
> Corrected Airburst
> 40 mm Prox



Thank you for your attention.

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