

Fuze Safety in accordance with STANAG as basis for modular and universal Fuze Design



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Safety related STANAGs

- STANAG 4187
Safety of Fuze System,
Muzzle Safety,
Safety and Functional Analysis
- STANAG 4297
Safety and Functional Analysis
- STANAG 4157
MIL STD 331
Approval procedure

STANAG 4187

Main Requirements i.a.w. safety (1)

- 7.a Inclusion of safety features
 - two independent safety features operating functionally isolated from other processes
 - prevent arming until the specified safe separation distance

- 7.b Operation of Safety Features Using Environmental Stimuli.
 - stimulus derived from different environments
 - avoid any environment stimulus that may be experienced by the fuze prior to the commencement of the launch cycle
 - depending on sensing an environment after first motion

STANAG 4187

Main Requirements i.a.w. safety (2)

- 7.c Prevention of unintentional Arming
 - not capable of being armed manually
 - not rely solely upon defined operating drills or procedures to provide safety
 - no single credible circumstance can result in arming before launch
 - not capable of arming except as a consequence of a sequence of actions defined by the order of the sensed environments during launch
 - use of environmentally derived energy generated upon launch or deployment in preference to prelaunch stored energy, in order to enable or arm the system.

- 7.e Fuze Setting.
 - If fuze setting is safety critical (eg. arming time, function time, or proximity broadcast turn on time) uncontrolled alteration of the set value shall be prevented.

STANAG 4187

Main Requirements i.a.w. safety (3)

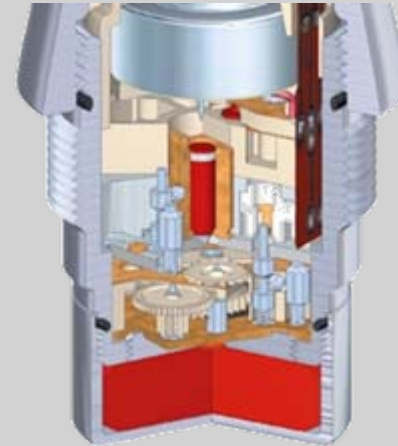
- 9.a Use of Interrupted Explosive Trains.
 - one interrupter (barrier, shutter, slider, rotor) shall isolate the primary explosive from subsequent elements of the explosive train.
 - The interrupter(s) shall be directly locked mechanically in the safe position by at least two independent safety features of the fuzing system until the start of the arming sequence.

- 12 Safety Design Requirements to provide non-armed Assurance during Assembly and Installation
 - Prevention of assembly of the fuzing system in an armed condition.

Examples of Realization of Safety Requirements in the past respectively in service fuzes

- Mechanical (Example Artillery)
 - Double Bolt System (launch shock)
 - Rack with Escapement (spin)
 - Rotor with primary explosives

- Other Fuzes similar, but not modular

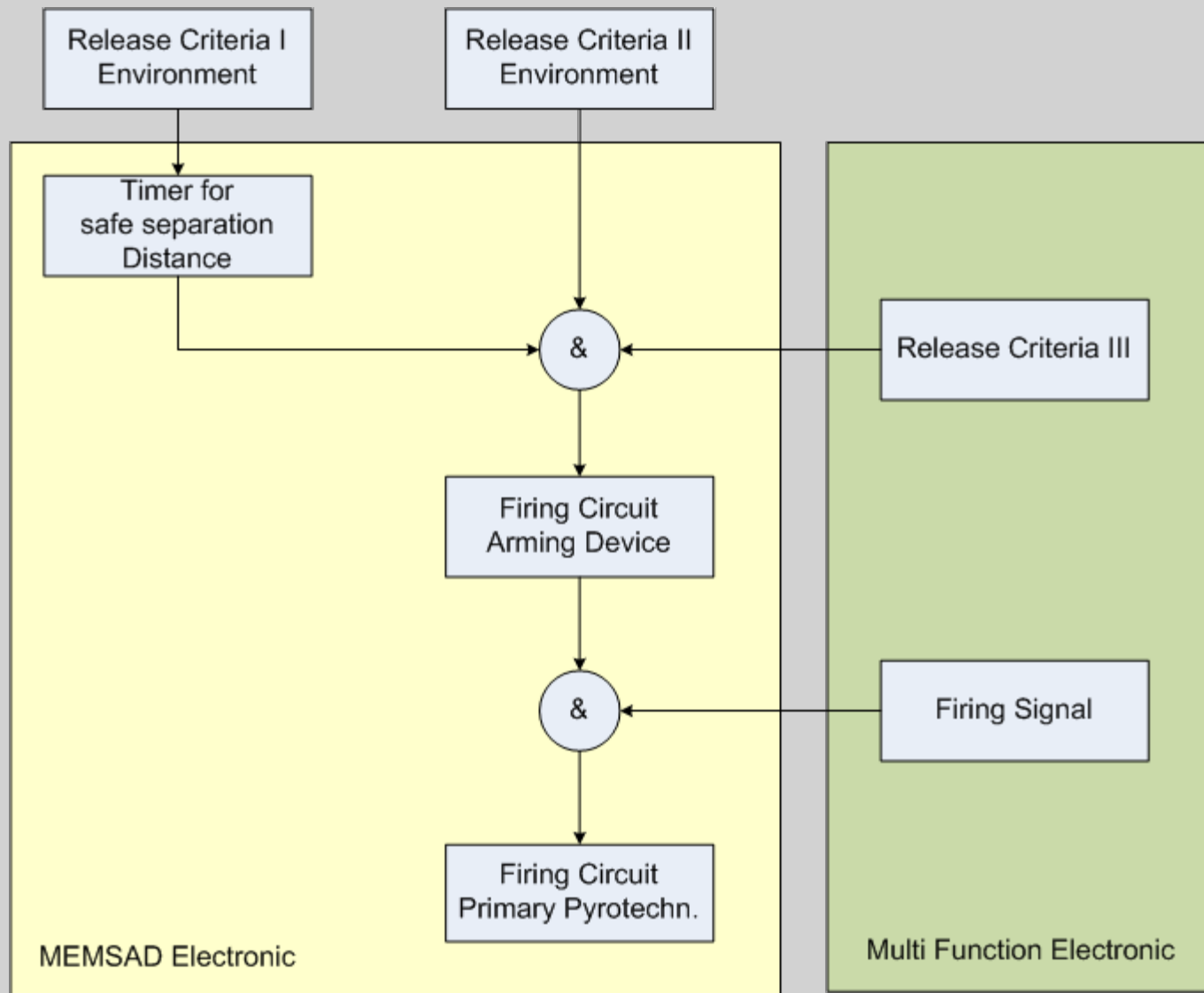


**SAD
Artillery
Fuze**

Requirements for modular Concept


- STANAG Compliance
- SAD as a Module for different kind of Fuzes
 - Unique operation with different sensors
- SAD miniaturized to get volume for additional components inside the Fuze
 - Miniaturized Pyrotechnics
 - Miniaturized Mechanics
 - Use of miniaturized Electronics
- Certitude at Fuze setting
- Assurance for Assembly only at non-armed status

Realisation of modular Concept



Modular Concept i.a.w. STANAG 4187

- Two independent Sensors for different Environments
- Only Environment Stimuli after Launch
- No Possibility of arming manually
- Arming after safe separation Distance / Muzzle Safety
- Fuze setting with triple check i.a.w. STANAG 4369 considered in Criteria III
- Mechanically locked interrupter inside the arming procedure
- Pin as Assurance for non-arming Assembly

 **JUNGHANS Miniaturized Electro-Mechanical Safe and Arm Device** is especially developed to realize the modular Concept

Application at universal Fuze Design

	Artillery Fuze	Mortar Fuze	Bomb Fuze
Environment I	Double Bolt System with Launch switch	Double Bolt System with Launch switch	Drop Switch
Environment II	Spin Sensor	Environment Sensor	Environment Sensor
Criteria III	Multi Function Electronic	Multi Function Electronic	Multi Function Electronic
Firing Signal	Multi Function Electronic	Multi Function Electronic	Multi Function Electronic

- **JUNGHANS** Miniaturized Electro-Mechanical Safe and Arm Device

 makes fuzes "smarter"

- Increased Overflight Safety
- Reduced Volume
- Universal Application
- Insensitive Munition



For better

Fuze Reliability & Fuze Safety

Flexibility at Fuze Development

"Smart Fuzing – Adding Intelligence To Fuzing Solutions"



JUNGHANS *microtec* GmbH

Thank you for your kind attention!

Questions?