

IM & HAZARD CLASSIFICATION TESTING



TNO innovation
for life

The experimental facilities of TNO are fully equipped to perform all required Insensitive Munitions and UN classification testing according to inter-nationally accepted regulations.

INSENSITIVE MUNITIONS

Insensitive Munitions (IM) considerably reduce the severity of a possible accident with munitions in operational use, transport or storage. Today, new munitions have to fulfill IM requirements. Understanding the munitions' behaviour when submitted to external treats, is therefore of major importance. To test the Safety and Suitability for Service including the IM performance of new munitions a series of STANAG prescribed experiments must be performed. TNO has the right knowledge, facilities and equipment in place to perform the complete range of required experiments according to specification. The TNO experimental capabilities for IM testing, following STANAG 4439, include:

- Fragment impact
- Bullet impact
- Fast cook-off
- Slow cook-off
- Sympathetic Reaction
- Shaped charge impact

Further, all tests needed for qualification of energetic materials following STANAG 4170 are present at TNO. TNO is also capable to deliver the required expertise for development of the right test set-ups and support services to monitor and record test data. TNO is a strategic partner of the Dutch Ministry of Defense and thus relies on their support and experience with access to outdoor test ranges and facilities.

FRAGMENT IMPACT

One of the most challenging IM experiments is the high velocity fragment impact test. At TNO the 18.6 gram projectile is accelerated up to 2700 m/s in order to hit the test object at a velocity of 2530 m/s. To monitor the fragment velocity and orientation just prior impact high speed cameras and video are used. This capability is an example of TNO's experience, which is of great value in the development process of new munitions which need to comply with IM and UN regulations.



Laboratory for Ballistic Research

HAZARD CLASSIFICATION

TNO is also one of the competent authorities for hazard classification of energetic substance and munitions following UN test series 1 to 7 for the transport of dangerous good. In addition to the above mentioned large-scale experiments, TNO maintains state-of-the-art thermal and chemical laboratories in support of the classification of energetic materials and munition. Small-scale munition experiments, like drop tests are all available in-house.

LABORATORY FOR BALLISTIC RESEARCH

The TNO Laboratory for Ballistic Research (LBR) has a track record of several decades in ballistic research. The LBR is ISO/IEC 17025 accredited and also has a NEN-EN-ISO 9001:2008 management certificate. It includes three indoor firing ranges and a target bunker that can handle any type of KE/HE projectile (between 5.56 mm and 76 mm) or weapon system (smaller or equal to 105 mm). The target bunker allows for detonations of up to 25 kg TNT equivalent HE material. Experiments can be recorded using:

- Multiple X-ray pulsers (up to 1200 kV)
- Shimadzu High Speed Video Camera (1 million fps with 100 frame capacity)
- IMACON ultrahigh-speed cameras (100 million fps with 8 frame capacity)
- High speed cameras for measuring 3D deformation and strain (9800 fps)



Outdoor fast cook-off experiment

Fully automated measurement procedures guarantee the constant high quality of our test results.

These large experimental facilities are located in Ypenburg, The Netherlands. Thermal and chemical laboratories are located just a few kilometers away in Rijswijk. Additional, smaller bunkers are available in Rijswijk for experiments up to 5 kg TNT equivalent HE material.

In summary, TNO has excellent testing facilities to assist you in the field of insensitive munition and hazard classification testing. This capability, in combination with the expertise in a broad field of functioning, safety and IM aspects of energetic materials and munitions, makes TNO a valuable partner in your future munition development projects.



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TNO

TNO is an independent innovation organisation that connects people and knowledge in order to create the innovations that sustainably boost the competitiveness of industry and wellbeing of society.

TNO focuses its efforts on seven themes including Defence, Safety and Security: TNO works on a safe and secure society by creating innovations for people working in defence organisations, the police, emergency services and industry.

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