



FRAGMENTATION DEVICES FOR VEHICLE BLAST TESTING



Data Sheet



DTG-5 Test Grenade & Single Frag Sabots for VSAG-12 & PAS-300 Testing

Description

The Hephaestus 3D-printed DTG-5 grenade is a VSAG12 and PAS300:2015 compliant fragmentation jacket. These are designed to provide a fully repeatable & traceable blast threat for ballistic validation of armour systems in line with the requirements of VSAG12 threat levels VS-UB-1b and VS-RB-1b & PAS:300 2015 threat levels UB-B and RB-B for vehicle protection. These grenades are designed as a repeatable ballistic surrogate for the M67 & HG85 (& formerly the L2A2) anti-personnel grenades. They provide ballistically matched performance to the average performance of the real-world specification grenade systems with the benefit of providing fair and repeatable benchmark of performance.

The jackets are provided with no explosive fill for ease of transport and storage with simple construction allowing easy on-site filling with the required 200g C4 explosive. On delivery the fragmentation load is already in place in the jacket with correct mass and grade of fragments.

Sabots to suit the DTG-5 fragmentation are also available to facilitate low cost material screening activity by means of a ballistic trial prior to conducting costly blast testing.

All surrogate product lines by Hephaestus are scrutinised to ensure the highest levels of consistency, in the case of the DTG-5 the jackets are checked for conformity via mass checks and dimensional batch testing. Additionally, each batch of fragmentation is supplied with independent certification of hardness and strength.



Validated performance

To qualify the Hephaestus DTG-5 the required tests were conducted during December 2017 at Radnor Ranges, Wales, UK. The following images show the results confirming the required device performance

Technical details



Figure 1; Images showing the rear face of the 12.7mm (L) and 8mm (R) test plates for DTG-5 qualification as defined in PAS-300. No penetrations of the thicker panel and >50% penetration of the thinner panel as required in the standard performance criteria.

	Fragmentation Qty	Fragmentation Size	Material	Performance
3D Printed DTG-5	507	5mm Sphere	AISI 4230 55 (+/-3) HRC Grade 100	>50% penetration 8mm 6082 @300mm 0% Penetration 12.7mm 6082 @300mm

Test Standards Applicable

VSAG-12 & PAS-300

Related products & Supply

The DTG-5 surrogates are an off the shelf item with moderate stock levels held, MOQ is usually 10units with pricing and lead times to be confirmed on enquiry. Shipment and export can be arranged based on the laws relevant to the destination, within the UK the units will be shipped via standard courier services. To ensure these products are only used in the process of developing and proving armour concepts, we will require an end user statement and company information to perform background checks where necessary, this is purely to ensure these devices are unable to find their way into illegitimate usage.

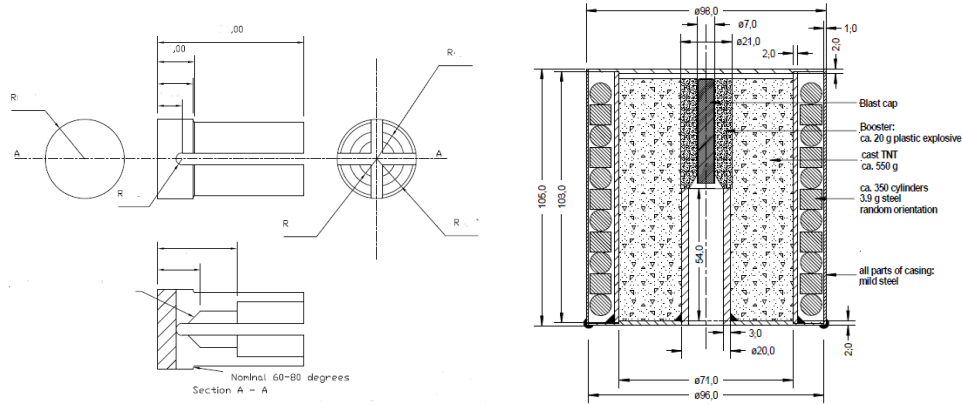
Sabots and individual ball projectiles are available for gun-launched pre-test material down-selection and evaluation.



Figure 2 Single Fragment sabot (suit 0.50")



Data Sheet



DM31 Test Grenade & Single Frag Sabots for STANAG 4569 /AEP-55 Testing

Description

The Hephaestus DM31 Surrogate test grenade is a STANAG4569 / APE-55 Vol2 Ed2 compliant armour test device. These are designed to provide a fully repeatable & traceable blast threat for ballistic validation of armour systems in line with STANAG for vehicle protection. The test grenades are supplied un-filled and with full certification of the fragments metallurgical properties.

The jackets are provided with no explosive fill for ease of transport and storage with simple construction allowing easy on-site filling with the required 550g TNT and 200g booster. On delivery the fragmentation load is already in place in the jacket with correct mass and grade of fragments.

Sabots and individual DM31 fragments are also available to facilitate low cost material screening activity by means of a ballistic trial prior to conducting costly blast testing.

All surrogate product lines by Hephaestus are scrutinised to ensure the highest levels of consistency, in the case of the DM31, the fragments are checked for conformity via mass checks and dimensional batch testing. Additionally, each batch of fragmentation is offered with independent certification of hardness and strength as well as full mill traceability of the stock material. This level of quality assurance eases results analysis (especially in the case of an unexpected failure) as it the properties of the fragments can be traced to a known value with proven provenance. Validated performance

The Hephaestus DM31 is validated against 500Bhn Steel to MIL-A-46100.

All fragment stock is supplied with mill traceability, as well as independent hardness and UTS certification. Each grenade is batch numbered and fully trackable.



Technical details

	Fragmentation Qty	Fragmentation Size	Material	Performance
DM31 Surrogate	350	3.9g (+/- 0.3g) 0.75-0.9AR chopped steel rods	Low carbon steel certified hardness and UTS	Perforation of 6mm MIL-A-46100 500Bhn steel @ 800mm- 0% Perforation of 8mm MIL-A- 46100 500Bhn steel @ 800mm-

Test Standards Applicable

STANAG 4569 / AEP-55 Vol2 Ed2

Related products & Supply

The DM13 surrogates are an off the shelf item with moderate stock levels held, MOQ is usually 10units with pricing and lead times to be confirmed on enquiry. Shipment and export can be arranged based on the laws relevant to the destination, within the UK the units will be shipped via standard courier services. To ensure these products are only used in the process of developing and proving armour concepts, we will require an end user statement and company information to perform background checks where necessary, this is purely to ensure these devices are unable to find their way into illegitimate usage.

Sabots and individual ball projectiles are available for gun-launched pre-test material down-selection and evaluation.

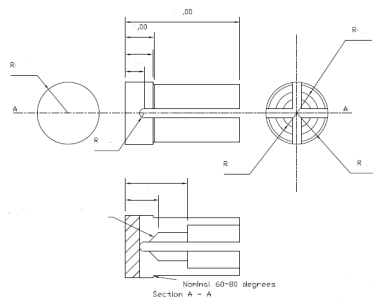


Figure 3 Single Fragment sabot (suit 0.50")



Data Sheet



DM-51 Replica Grenade for VPAM, VSAG-12 & PAS-300 Testing

Description

The Hephaestus 3D-printed DM51 test grenade (DM51H) is an accurate replica of the hard to source (and now discontinued) Dehil DM51 fragmentation grenade. The surrogate is reverse engineered from genuine DM51 grenades using 3D CT scanning to ensure the highest level of critical dimensional accuracy. The fragmentation has been subjected to metallurgical analysis to provide an accurate match to the original device.

The Hephaestus DM51 are designed to provide a fully repeatable & traceable blast threat for ballistic validation of armour systems in line with the requirements of VPAM and VSAG standards for vehicle protection amongst others. By bringing production in-house we can guarantee and certify fragmentation properties backed up with independent certification and traceability. This is especially important in the field of blast testing to help understand anomalous results.

The jackets are provided with no explosive fill for ease of transport and storage with simple construction allowing easy on-site filling with the required 60g of PETN explosive. On delivery the fragmentation load is already in place in the jacket with correct mass and grade of fragments.

All surrogate product lines by Hephaestus are scrutinised to ensure the highest levels of consistency, in the case of the DM51H the jackets are checked for conformity via mass checks and dimensional batch testing. Additionally, each batch of fragmentation is supplied with independent certification of hardness and strength.



Validated performance

The Hephaestus DM51 replica is regularly validated against genuine charges using aluminium witness sheets

Technical details

	Fragmentation Qty	Fragmentation Size	Material	Performance
3D Printed DM51	~6500	~2mm Sphere	Proprietary Steel	On request

Test Standards Applicable

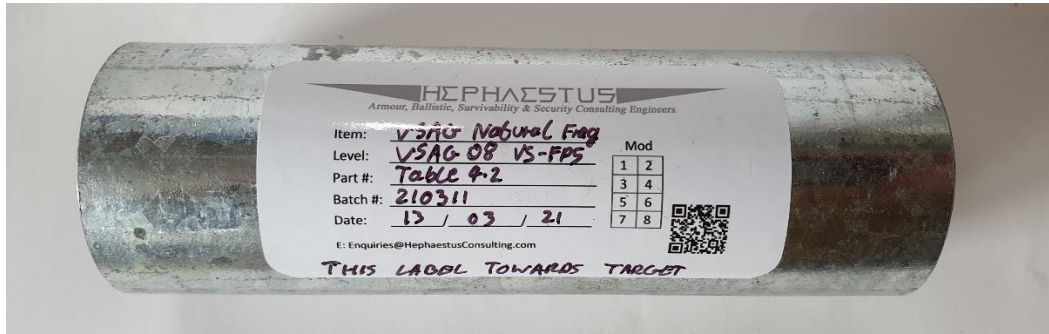
VPAM ERV2008, VSAG-12 & PAS-300

Related products & Supply

The DM51 surrogates are an off the shelf item with moderate stock levels held, MOQ is usually 10units with pricing and lead times to be confirmed on enquiry. Shipment and export can be arranged based on the laws relevant to the destination, within the UK the units will be shipped via standard courier services. To ensure these products are only used in the process of developing and proving armour concepts, we will require an end user statement and company information to perform background checks where necessary, this is purely to ensure these devices are unable to find their way into illegitimate usage.



Data Sheet



VS-FP5 Natural fragmentation 'Scaffold Pole' Device for VSAG-08 Testing

Description

The Hephaestus VS-FP5 natural fragmentation 'Scaffold Pole' Device is a VSA08 compliant fragmentation body designed to provide a repeatable natural fragmentation / improvised device threat for ballistic validation of armour systems in line with the requirements of VSAG08 threat levels VB-FP5 in accordance with Table 4.2 of the standard.

As these devices are ductile walled they naturally result in a greater variability in results (especially against soft target materials) than a conventional grenade with pre-formed fragmentation. The Hephaestus bodies are carefully manufactured to close tolerances and low defect tolerance to reduce this variance as much as possible. Less than 50% of manufactured bodies are released for use.

The fragmentation bodies are provided with no explosive fill for ease of transport and storage with simple construction allowing easy on-site filling with the required 190g PE4 or equivalent explosive. All bodies have a Polypropylene, push-fit detonator holder / centraliser installed in one end.

To fill the body place upright on a bench with the detonator holder against the work surface. Hand stem explosive in small amounts, tamping in place with an appropriate tool ensuring that all air gaps are eliminated. Note – 190g of PE4 does not fill the full length of the body. Depending on the planned orientation of the device relative to the target it may be useful to mark the fill line on the outside of the body.



Figure 4 PP Det-Holder inserted into body

The VS-FP5 scaffold pipe devices have an internal welded seam as a result of the tube manufacture process. This is marked externally on each body and should be orientated **away from the target** to reduce variability in the fragmentation pattern. The device data label should be orientated **towards the target** as this is placed diametrically opposite the welded seam by convention.

All surrogate product lines by Hephaestus are scrutinised to ensure the highest levels of consistency. This is especially important for the VS-FP5 scaffold pole / pipe bomb device which by its nature is not a precision machined item. All VS-FP5 bodies are supplied to a weight tolerance of 595+/- 1g (excluding det holder). This ensures bodies are free from stamped lettering, excessive zinc coating, out of roundness and other dimensional variance, which results in inconsistent performance.



Technical details & performance

	Body Weight	Body Length	Material	NEQ & Fill
VS-FP5 Scaffold Pole Device	595 +/- 1g	150mm	BS EN19 Scaffold tube	190g PE4 or equivalent (i.e. Demex)

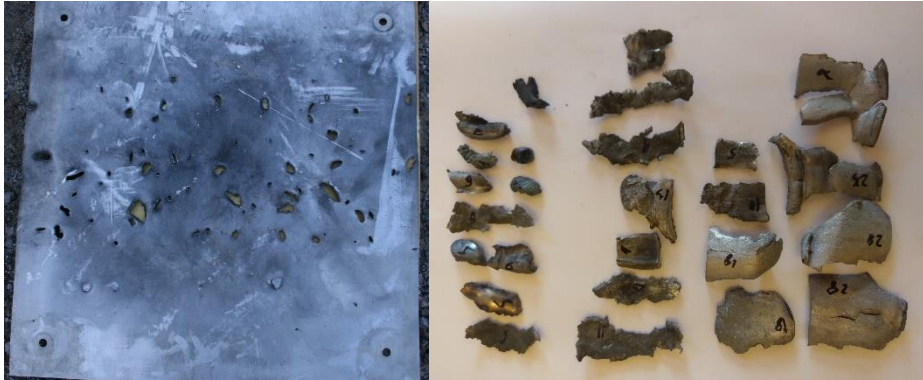


Figure 5; Images showing fragmentation pattern against 6mm 500Bhn steel and exemplar recovered fragmentation

Test Standards Applicable

VSAG 08

