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Poster version 2.0

Dyneema®
With you when it matters

International standards for personal armor

NIJ 0101.04

Table Ballistic requirements Penetration / Back Face Signature

Performance level	Test bullet	Bullet mass (gram)	Distance muzzle – target (m)	Velocity (m/s)	Performance requirements			
					Shots/panel 0° NATO impact angle	Shots/panel 30° NATO impact angle	Maximum Back Face Signature (mm)	Total shots per bullet threat
1	.22 caliber LR LRN	2.6	5	329 ± 9	4	2	44	24
	.380 ACP FMJ RN	6.2	5	322 ± 9	4	2	44	24
2A	9 mm FMJ RN	8.0	5	341 ± 9	4	2	44	24
	.40 S&W FMJ	11.7	5	322 ± 9	4	2	44	24
2	9 mm FMJ RN	8.0	5	367 ± 9	4	2	44	24
	.357 Magnum JSP	10.2	5	436 ± 9	4	2	44	24
3A	9 mm FMJ RN	8.0	5	436 ± 9	4	2	44	24
	.44 Magnum SJHP	15.6	5	436 ± 9	4	2	44	24
3*	7.62 mm NATO Ball	9.6	15	847 ± 9	6	0	44	12
4*	.30 caliber M2 AP	10.8	15	878 ± 9	1	0	44	2

** 2 panels per bullit type*

bullets NIJ 0101.04

NOTES

- Backing is conditioned Roma Plastilina® nr 1.
- Calibration of backing conducted with steel ball (diameter 63.5 ± 0.05 cm, mass 1.043 ± 0.005 kg), dropped from 2 m height, average indentation of 5 drops must be 19 ± 2 mm.
- Shape of impact pattern is given, shot 4 and 5 have an impact angle of 30° NATO.
- Back face deformation is maximal 44 mm, measured at impact nr 1 and impact nr 2 or 3, per sample.
- Bullet manufacturer is not specified.
- All armor panels (including carriers) will be sprayed for 3 minutes on both sides before tests starts.
- For NIJ 0101.04 level 1, 2A, 2, 3A six complete armors (front and back) need to be provided for certification tests. All vests should be size conform NIJ 0101.04 template for size Large.
- For NIJ 0101.4 level 3 four panels need to be delivered, all inserts should have dimensions minimal 254 mm × 305 mm.
- For NIJ 0101.04 level 4 nine panels need to be delivered, all inserts should have dimensions minimal 203 mm × 254 mm.
- The numbers of samples to be provided include those for ballistic limit testing (V50). The test method is explained in the standard.
- NIJ 0101.04 level 3 and level 4 can be certified stand alone or in conjunction with a ballistic resistant vest. Panels of NIJ 0101.04
  level 4 will not be tested for the ammunition as specified in NIJ 0101.04 level 3.
- No temperature tests.
- Minimal distance to edge of sample is 76 mm.
- Minimal distance to previous impact is 51 mm.

NIJ 0101.06

Table ballistic requirements Penetration / Back Face Signature

Test variables						Performance requirements				Shot requirements				
Armor Type	Test Bullet	Bullet Mass (gram)	Bullet Manufacturer	Conditioned Armor Test Velocity* m/s	New Armor Test Velocity* m/s	Hits Per Panel at 0° Angle	Maximum BFS Depth	Hits Per Panel at 30° or 45° Angle[1]	Shots Per Panel	Panel Size	Panel Condition	Panels Required	Shots Required	Total Shots Required
IIA	9 mm FMJ RN	8.0	Remington 23558	355 ± 9	373 ± 9	4	44 mm	2	6	Large	New Conditioned	4 2	24 12	144
										Small	New Conditioned	4 2	24 12	
	.40 S&W FMJ	11.7	Remington 23686	325 ± 9	352 ± 9	4	44 mm	2	6	Large	New Conditioned	4 2	24 12	
										Small	New Conditioned	4 2	24 12	
II	9 mm FMJ RN	8.0	Remington 23558	379 ± 9	398 ± 9	4	44 mm	2	6	Large	New Conditioned	4 2	24 12	144
										Small	New Conditioned	4 2	24 12	
	.357 Magnum JSP	10.2	Remington 22847	408 ± 9	436 ± 9	4	44 mm	2	6	Large	New Conditioned	4 2	24 12	
										Small	New Conditioned	4 2	24 12	
IIIA	.357 SIG FMJ FN	8.1	Speer 4362	430 ± 9	448 ± 9	4	44 mm	2	6	Large	New Conditioned	4 2	24 12	144
										Small	New Conditioned	4 2	24 12	
	.44 Magnum SJHP	15.6	Speer 4453 or 4736	408 ± 9	436 ± 9	4	44 mm	2	6	Large	New Conditioned	4 2	24 12	
										Small	New Conditioned	4 2	24 12	
III	7.62 mm NATO FMJ	9.6	US/NATO M80 ammunition	847 ± 9	-	6	44 mm	0	6	All	Conditioned	4	24	24
IV	.30 Caliber M2 AP	10.8	US Military	878 ± 9	-	1 to 6	44 mm	0	1 to 6	All	Conditioned	4 to 24	24	24
Special	Each test threat to be specified by armor manufacturer or procuring organization.					Armor performance and shot requirements shall depend on armor type.								

[1] Each armor that is to be shot at angles other than 0° shall be shot once at a 30° angle and once at a 45° angle.

NOTES

- Backing is conditioned Roma Plastilina® nr 1.
- Calibration of backing conducted with steel ball (diameter 63.5 ± 0.05 cm, mass 1.043 ± 0.005 kg), dropped from 2 m height, average indentation of 5 drops must be 19 ± 2 mm (with no indentation outside the range 16 – 22 mm).
- For flexible armor 28 complete vests must be provided for certification tests.
- For level 3 nine armor panels must be provided.
- 7 to 37 armorpanels must be provided for level 4 (depending on how many impacts the plate can resist according to panel manufacturer.
- These numbers include samples for Ballistic limit testing (V50). The testmethod can be found in this standard.
- Flexible samples will be tested as "new" and in conditioned status.
- The conditioning (also called "environmental conditioning") includes putting the vests inside a tumbler for 10 days, at 65°C and 90% relative humidity. This tumbler rotates with 5.0 ± 1.0 rpm. Total completed rotations must be equal to 72000 ± 1500.
- Hard armor panels will be conditioned by 1) 10 day stay at 65°C and 85% relative humidity followed by 2) a thermal cycle which ranges between from -15°C to 90°C in 24 hours and finally 3) a drop test in which the panel is dropped on a hard surface twice using a pivot arm.
- For new samples back face signature is maximal 44 mm. In a single case BFS ≤ 50 mm is allowed, when special formulated conditions are fulfilled.
- For flexible conditioned samples excessive back face signature is not a failure.
- Minimum shot to edge distance is 51 mm. When two threats are specified the minimum shot-to-edge distance is 76 mm for the heavier threat.
- For flexible armor the impact of shot 1-3 must be located in the range of the minimum shot-to-edge distance +19 mm from the edge of the sample. Shot 4, 5 & 6 must be located within 100 mm diameter circle.
- For hard armor the shots shall be placed on the panel in any patterns that fits shot-to-edge and shot-to-shot spacing requirements.
- All new flexible vests and hard armor panels shall be immersed for 30 minutes before shooting tests start. Conditioned vests shall not be immersed.

bullets NIJ 0101.06

HOSDB 2007

Table ballistic resistance

Soft ballistics

Performance level	Calibre	Ammunition description	Bullet mass (gram)	Distance muzzle – target (m)	Velocity (m/s)	Size small (2 panels per bullet type)		Size Medium (1 panel per bullet type)		Size Large (3 panels per bullet type)		Total shots per bullet threat	UPL (mm)
						Shots/panel 0° NATO impact angle	Shots/panel 45° NATO impact angle	Shots/panel 0° NATO impact angle	Shots/panel 45° NATO impact angle	Shots/panel 0° NATO impact angle	Shots/panel 45° NATO impact angle		(mm)
HG1A	9 mm	9 mm FMJ Dynamit Nobel DM11A1B2	8.0	5	365 ± 10	2	1	6	0	4	2	30	44
	.357 Magnum	Soft Point Flat Nose Remington R357M3	10.2	5	390 ± 10	2	1	6	0	4	2	30	44
HG1	9 mm	9 mm FMJ Dynamit Nobel DM11A1B2	8.0	5	365 ± 10	2	1	6	0	4	2	30	25
	.357 Magnum	Soft Point Flat Nose Remington R357M3	10.2	5	390 ± 10	2	1	6	0	4	2	30	25
HG2	9 mm	9 mm FMJ Dynamit Nobel DM11A1B2	8.0	5	430 ± 10	2	1	6	0	4	2	30	25
	.357 Magnum	Soft Point Flat Nose Remington R357M3	10.2	5	455 ± 10	2	1	6	0	4	2	30	25
HG3	5.56 × 45 mm NATO 1 in 7" twist	Federal Tactical Bounded 5.56 mm (.223") LE223T3 Law Enforcement Ammunition	4.01	10	750 ± 15	2	1	6	0	4	2	30	25

bullets HOSDB 2007

Table ballistic resistance

Hard ballistics

Performance level	Calibre	Ammunition description	Bullet mass (gram)	Distance muzzle – target (m)	Velocity (m/s)	Panel (2 panels per bullet type)		Total shots per bullet threat	Back Face Signature (mm)
						Shots/panel 0° NATO impact angle	Shots/panel 45° NATO impact angle		(mm)
RF1	7.62 1 in 12" twist	BAE Systems Royal Ordnance Defence Radway Green NATO ball L2A2	9.3	10	830 ± 15	3	0	6	25
RF2	7.62 1 in 12" twist	BAE Systems Royal Ordnance Defence Radway Green Nato Ball L40A1 7.62 × 51 mm High Power (HP)	9.7	10	850 ± 15	3	0	6	25
SG1	Shotgun 12 Gauge True cylinder	Winchester 1 oz. Rifled Lead Slug 12RS15 or 12RSE	28.4	10	435 ± 25	1	0	2	25

NOTES

- Backing is conditioned Roma Plastilina® nr 1.
- Calibration of backing conducted with steel ball (diameter 63.5 ± 0.05 cm, mass 1.043 ± 0.005 kg), dropped from 1.5 m height, average indentation of 3 drops must be 15 ± 1.5 mm.
- For full certification of vests complete armor samples (front and rear) must be produced in three sizes.
- For size Large (L) one complete armor vest must be provided.
- For size Medium (M) three complete armor vests must be provided.
- For size Small (S) two complete armor vests must be provided.
- Fixed impact pattern per size.
- Shot with impact angle of 45° is directed to edge of sample.
- The Upper Prediction Limit (UPL) of the Back Face Signature (BFS) must be equal or less than the maximum allowable BFS for the threat level, based on 18 impacts on vests in template size Medium.
- No wet test.
- No temperature test.
- Minimal distance to edge of sample is 50 mm.
- Minimal distance to previous impact is 50 mm.

HOSDB 2007

Table stab and spike resistance

Performance level	Energy Level E1	Maximal penetration depth (mm)		# Drop tests per level		Energy level E2	Maximal penetration depth (mm)		# Drop tests per level	
	(Joule)	*Knife*	*Spike*	*Knife*	*Spike*	(Joule)	*Knife*	*Spike*	*Knife*	*Spike*
KR1	24	7	Not tested	30	0	36	20	Not tested	10	0
KR1 + SP1	24	7	0	30	10	36	20	Not tested	10	0
KR2	33	7	Not tested	30	0	50	20	Not tested	10	0
KR2 + SP2	33	7	0	30	10	50	20	Not tested	10	0
KR3	43	7	Not tested	30	0	65	20	Not tested	10	0
KR3 + SP3	43	7	0	30	10	65	20	Not tested	10	0

NOTES

- Stabbing is performed by drop test with knife blade or spike attached into drop mass with total weight of 1900 gram.
- Backing is based on stack of foam and rubber sheets (4 layers 6 mm Neoprene, 1 layer 30 mm Plastazote and 3 layers 6 mm rubber) or Roma plastilina® nr 1 in case for curved armor panels).
- Calibration of foam / rubber based backing conducted with steel ball (diameter 63.5 ± 0.05 cm, mass 1.043 ± 0.005 kg), dropped from 1.5 m heigth, average rebound height must be 425 ± 75 mm, Calibration of plastilina based backing as in ballistic tests.
- For certification three armour panels, all in size Large, must be provided (1 complete armor sample and one front or back panel).
- One knife penetration not exceeding 30 mm is allowed at E2.
- One spike penetration is allowed.
- No fixed impact pattern, all impacts need to 50 mm from the edge and 50 mm from any previous impact.
- Additional impacts with angle of 45° at discretion of test house.
- Measurements of penetration depth of knife impact is conducted by either:
  1) measurement of the length of the knife protruding from the rear surface of the sample;
  2) measurement of the width of the cut in the wear face of the armor or the body side layer of the protective element within the armor cover, table is available to convert this width into penetration depth.

knife blade and spike HOSDB 2007

VPAM – personal armor

Table Requirements Ballistic Performance / Edition May 14, 2009

Performance level	Calibre	Ammunition description	Bullet mass (gram)	Distance muzzle – target (m)	Velocity (m/s)	Number of shots per sample						Number of samples per level Vstop tests	Number of samples per level V50 tests	Total number of samples per level
						0° NATO	65° NATO	Contact shot	Climate Test[1]	-20°C Test[1]	+70°C Test[1]			
1	.22 Long Rifle	Winchester L/RN	2.6 ± 0.1	10	360 ± 10	3 + 1 [2]	3	3	3	3	3	6	3	9
2	9 mm Luger	FMJ/RN/SC, tinned DAG DM41	8.0 ± 0.1	5	360 ± 10	3 + 1 [2]	3	3	3	3	3	6	3	9
3	9 mm Luger	FMJ/RN/SC, tinned DAG DM41	8.0 ± 0.1	5	415 ± 10	3 + 1 [2]	3	3	3	3	3	6	3	9
4	.357 Magnum	FMJ/CB/SC Geco	10.2 ± 0.1	5	430 ± 10	3	3	0	3	3	3	10	0	10
	.44 Magnum Remmington	FMJ/FN/SC Speer	15.6 ± 0.1	5	440 ± 10	3	3	0	3	3	3			
5	.357 Magnum	FMs/CB DAG (Special)	7.1 ± 0.1	5	580 ± 10	3	3	0	3	3	3	5	0	5
6	7.62 × 39 AK47	FMJ/PB/FeC PS, cold hardened	8.0 ± 0.1	10	720 ± 10	3	3	0	3	3	3	5	0	5
7	.223 Remington	FMJ/PB/SCP MEN, SS109	4.0 ± 0.1	10	950 ± 10	3	3	0	3	3	3	10	0	10
	.308 Winchester	FMJ/PB/SC MEN, DM111	9.55 ± 0.1	10	830 ± 10	3	3	0	3	3	3			
8	7.62 × 39	FMJ/PB/HCI BZ	7.7 ± 0.1	10	740 ± 10	3	3	0	3	3	3	5	0	5
9	.308 Winchester	FM/PB/HC MEN/CBC, FNB P80	9.70 ± 0.1	10	820 ± 10	3	3	0	3	3	3	5	0	5
10	7.62 × 54R	FMJ/PB/HCI B32	10.4 ± 0.1	10	860 ± 10	3	3	0	0	3	3	5	0	5
11	.308 Winchester	FMJ/PB/WC Nammo AP8	8.4 ± 0.1	10	930 ± 10	3	3	0	3	3	3	5	0	5
12	.308 Winchester	FMJ/PB/WC SWISS P AP	12.7 ± 0.1	10	810 ± 10	3	3	0	3	3	3	5	0	5

[1] See notes on climate and temperature test conditions.
[2] See notes on extra edge impact.

NOTES

- Backing is Weibel plastilina.
- Calibration of backing is conducted with steel ball (diameter 63.5 ± 0.05 cm, mass 1.039 ± 0.005 kg), dropped from 2.000 ± 0.005 m, average indentation of 5 drops must be 20.0 ± 2.0 mm.
- The samples can have dimensions of 35 cm × 40 cm or the smallest size with the produced vest sizes.
- Back face signature requirements for covert vests is 20 mm + average of the back face signature calibration tests, for overt vests is equal to the average of the back face signature calibration tests.
- In addition to maximum indentation also requirement is given on volume of indentation. This is not allowed to be higher than the equivalent of 79 J.
- Calculation method for maximal volume V_{max}:

  $V_{max} = (0.134 \times d_{av}^2 - 1.13) \times E_{max}$

  Where d_{av} is the average indentation depth of the calibration (in mm) and E_{max} is the prescribed maximal Energy level.
- Samples will be conditioned for minimal 16 hours either at -20°C, +20°C, +70°C, or will be conditioned at +40°C in combination with 90 – 95% relative humidity (climate test).
- Subclasse 1 requires also one impact at 30 ± 5 mm from edge.
- Specific impact patterns are mentioned in the standard for each impact angle, in that figure also the minimal distance to edge and previous impact are given.
- No wet test is required.
- V50 test must be evaluated conform Kneubuhl.

German Schutzklasse edition October 2008

Table ballistic resistance

Performance level	Calibre	Ammunition description	Bullet mass (gram)	Distance muzzle – target (m)	Velocity (m/s)	Number of shots per panel						Number of samples per level Vstop tests	Number of samples per level V50 tests	Total number of samples per level
						0° NATO	65° NATO	Contact shot	Climate Test[1]	-20°C Test[1]	+70°C Test[1]			
SK L	9 mm × 19	FMJ/RN/SC, tinned DAG DM41 SR	8.0 ± 0.1	5	360 ± 10	3 + 1[2]	3	3	3	3	3	6	3	9
SK1	9 mm × 19	FMJ/RN/SC, tinned DAG DM41 SR	8.0 ± 0.1	5	415 ± 10	3 + 1[2]	3	3	3	3	3	10	3	13
		Law enforcement QD-PEP II/s MEN	6.0 ± 0.1	5	460 ± 10	0	3	3	0	0	0			
		Law enforcement Action 4 RUAG	6.1 ± 0.1	5	460 ± 10	0	3	3	0	0	0			
SK2	.357 Magnum	FMs/CB DAG (Special)	7.1 ± 0.1	5	580 ± 10	3	3	0	3	3	3	5	0	5
SK3	.223 Remington	FMJ/PB/SCP MEN, SS109	4.0 ± 0.1	10	950 ± 10	3	3	0	3	3	3	10	0	10
	.308 Winchester	FMJ/PB/SC MEN, DM111	9.55 ± 0.1	10	830 ± 10	3	3	0	3	3	3			
SK4	.308 Winchester	FMJ/PB/HC FNB, P80	9.70 ± 0.2	10	820 ± 10	3	3	0	3	3	3	5	0	5

[1] See notes on climate and temperature test conditions.
[2] See notes on extra edge impact.

NOTES

- Backing is Weibel plastilina.
- Calibration of backing is conducted with steel ball (diameter 63.5 ± 0.05 cm, mass 1.039 ± 0.005 kg), dropped from 2.000 ± 0.005 m, average indentation of 5 drops must be 20.0 ± 2.0 mm.
- The samples can have dimensions of 35 cm × 40 cm or the smallest size with the produced vest sizes.
- Back face signature requirements for covert vests is 20 mm + average of the back face signature calibration tests, for overt vests is equal to the average of the back face signature calibration tests.
- In addition to maximum indentation also requirement is given on volume of indentation. This is not allowed to be higher than the equivalent of 79 J.
- Calculation method for maximal volume V_{max}:

  $V_{max} = (0.134 \times d_{av}^2 - 1.13) \times E_{max}$

  Where d_{av} is the average indentation depth of the calibration (in mm) and E_{max} is the prescribed maximal Energy level.
- Samples will be conditioned for minimal 16 hours either at -20°C, +20°C, +70°C, or will be conditioned at +40°C in combination with 90 – 95% relative humidity (climate test).
- Subclasse 1 requires also one impact at 30 ± 5 mm from edge.
- Specific impact patterns are mentioned in the standard for each impact angle, in that figure also the minimal distance to edge and previous impact are given.
- No wet test is required.
- V50 test must be evaluated conform Kneubuhl.

bullets German Standard for body armor

International standards for vehicle armor

VPAM standard APR 2006 *Edition May 12, 2010*

Classification of test levels

Test level	Type of weapon	Calibre	Ammunition and projectile			Test conditions	
			Type	Mass (g)	Manufacturer Type	Shot distance (m)	Bullet Velocity (m/s)
1	K/L	22 Long Rifle	L/RN	2.6 ± 0.1	Winchester	10 + 0.5	360 ± 10
2	K	9 mm Luger	FMJ/RN/SC, tinned	8.0 ± 0.1	DAG, DM 41	5 + 0.5	360 ± 10
3	K	9 mm Luger	FMJ/RN/SC, tinned	8.0 ± 0.1	DAG, DM 41	5 + 0.5	415 ± 10
4	K	357 Magnum	FMJ/CB/SC	10.2 ± 0.1	GECO	5 + 0.5	430 ± 10
		44 Rem. Mag	FMJ/FN/SC	15.6 ± 0.1	Speer	5 + 0.5	440 ± 10
5	K	357 Magnum	FMs/CB	7.1 ± 0.1	DAG Special	5 + 0.5	580 ± 10
6	L	7.62 x 39	FMJ/PB/FeC	8.0 ± 0.1 core 3.6	PS cold hardened	10 + 0.5	720 ± 10
7	L	223 Rem.	FMJ/PB/SCP	4.0 ± 0.1	MEN, SS 109	10 + 0.5	950 ± 10
		308 Win.	FMJ/PB/SC	9.55 ± 0.1	MEN, DM 111	10 + 0.5	830 ± 10
8	L	7.62 x 39	FMJ/PB/HCI	7.7 ± 0.1 core 4.1 hardness 65 HRC	BZ	10 + 0.5	740 ± 10
9	L	308 Win.	FMJ/PB/HC	9.70 ± 0.2 core 4.0 ± 0.1 hardness 62 ± 2 HRC	MEN/CBC, FNB, P 80	10 + 0.5	820 ± 10
10	L	7.62 x 54 R	FMJ/PB/HCI	10.4 ± 0.1 core 5.3 hardness 63 HRC	B32	10 + 0.5	860 ± 10
11	L	308 Win.	FMJ/PB/WC	8.4 ± 0.1 core 5.9	Nammo, AP8	10 + 0.5	930 ± 10
12	L	308 Win.	FMJ/PB/WC	12.7 ± 0.1 core 5.58 hardness 1330 HV 10	SWISS P AP	10 + 0.5	810 ± 10
13	L	50 Browning	FMJ/PB/HC	43.0 ± 0.5 core 35.0 hardness 55 ± 2 HRC	SWISS P Penetrator	[1]	930 ± 20
14	L	14.5 x 114	FMJ/PB/HCI	63.4 ± 0.5	B32	[1]	911 ± 20
The rates of twist can be gathered from the dimension sheets (TDCC) of the C.I.P.							

[1] arbitrary shot distance, depending on velocity, oscillation (yaw) and impact point

Legend bullet types

AP	Armor Piercing	**JSP**	Jacketed Soft Point	**DAG**	RUAG Ammotec, Germany
CB	Coned Bullet	**L**	Full Lead	**FNB**	FN Herstal, Belgium
FeC	Iron Core	**LR**	Long Rifle	**Geco**	RUAG Ammotec, Germany
FMJ	Full Metall Jacket with steel jacket	**PB**	Pointed Bullet	**MEN**	Metallwerke Eisenhütte Nassau, Germany
FMJ[1]	Full Metal Jacket with copper jacket	**RN**	Round Nose	**Nammo**	Nammo AS, Norway
FMs	Full Brass	**SC**	Soft Core	**Speer**	Federal Cartridge Company, USA
FN	Flat Nose	**SCP**	Lead Core with Steel Tip		
HC	Hardened Steel Core	**SJHP**	Semi Jacketed Hollow Point		
I	Incendiary	**WC**	Tungsten Core		

STANAG 4569 / AEP 55 *Volume 1*

Table Test conditions and projectiles summary for KE and artillery edition February 2005

Level	KE Threat				Artillery Threat (FSP 20 mm)		
	Ammunitions	Vproof* (m/s)	Azimuth	Elev.	Vproof (m/s)	Azimuth	Elev.
1	7.62 mm x 51 NATO ball 5.56 mm x 45 NATO SS109 5.56 mm x 45 M193	833 900 937	0 - 360°	0° - 30°	(520)**	0 - 360°	0° - 18°
2	7.62 mm x 39 API BZ	695	0 - 360°	0° - 30°	(630)**	0 - 360°	0° - 22°
3	7.62 mm x 54R B32 API 7.62 mm x 51 AP (WC core)	854 930	0 - 360°	0° - 30°	(770)**	0 - 360°	0° - 30°
4	14.5 mm x 114 API/B32	911	0 - 360°	0°	960	0 - 360°	0° - 90°
5	25 mm x 137 APDS-T. PMB 073	1258	± 30°	0°	960	0 - 360°	0° - 90°

** Vproof = Figures are mean values: tolerance of striking velocity for the individual shot is ± 20 m/s.*
*** Levels 1, 2 and 3 artillery threat for information purpose only.*

bullets STANAG 4569

STANAG 4569 / AEP 55 *Volume 2*

Table floor protection levels for logisitc and light armored vehicle occupants for grenade and blast mine threats, edition September 2006

Level	Grenade and Blast Mine Threat		
1	Hand grenades, unexploded artillery fragmenting sub-munitions, and other small anti personnel explosive devices detonated anywhere under the vehicle		
2	2a	Mine Explosion pressure activated under any wheel or track location	6 kg (explosive mass) Blast AT Mine
	2b	Mine Explosion under center	
3	3a	Mine Explosion pressure activated under any wheel or track location	8 kg (explosive mass) Blast AT Mine
	3b	Mine Explosion under center	
4	4a	Mine Explosion pressure activated under any wheel or track location	10 kg (explosive mass) Blast AT Mine
	4b	Mine Explosion under center	

STANAG 2920

NOTES

- The definition of V50 is the velocity at which the estimated probability of perforation is 0.5.
- The sample can be tested with backing or without backing material, suitable retention systems are given in the standard.
- In case no backing material is used, a witness plate of 0.5 mm thick aluminium alloy must be placed to witness penetration or a detector to observe a fragment with sufficient momentum to pass completely the witness plate.
- A complete penetration is recorded in case the witness plate is perforated / the detector has recorded a projectile behind the target or in case a backing is used, any projectile has passed completely through the target material and is captured or has passed through this backing material.
- Impacts on the target material should be at least 5 calibers from any material edges, joins, holes or previous impacts.
- The target material must be conditioned for 24 hours at 20±2°C and 65±5% relative humidity.
- A valid V50 is calculated using an even number of shots, at least 6. Half of the shots must have perforated the target material, half the shots must have stopped in the target material. The highest recorded velocity of the group must not be more than 40 m/s higher than the lowest of the group. The V0 is the arithmetic mean of the group of velocities.

NOTES

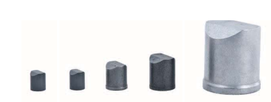
- For RCCs the length is adjusted to meet indicated weight
- For RCCs the material is AISAI 4340 heat treated to Rockwell "C" hardness of 29 ± 2

Fragment Simulating Projectile (FSP)

Projectile type	Rockwell Hardness C	Weight (gram)
Caliber .22 – type 1	30 ± 1	1.1 ± 0.03
Caliber .22 – type 2	27 ± 3	1.1 ± 0.03
Caliber .30	30 ± 1	2.84 ± 0.03
Caliber .50	30 ± 1	13.39 ± 0.13
20 mm	30 ± 1	52.73 ± 0.26

Right Circular Cylinder (RCC)

Weight (grain)	Outside diameter (inches)	Length (inches)
2	0.111 ± 0.001	0.111
4	0.134 ± 0.001	0.147
16	0.219 ± 0.001	0.221
64	0.344 ± 0.001	0.355



Fragment Simulating Projectiles

Right circular cylinders

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