

Threat Levels

English
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- PTI - TR „Ballistische Schutzwesten“, 3/2008-Rev.10/08
- NIJ - Standard 0101.06
- HOSDB - Body Armor Standards for UK Police
- VPAM - Test guideline „Ballistische Schutzwesten“
- GOST R 50744-95 Ballistic Standard
- CEN prEN ISO 14876 - Protective Clothing, Body Armor

Threat Levels

The possible threat is due to the large number of various rifle and pistol caliber munitions available today. This requires a careful and suitable analysis of the threats faced, and the best possible means of overcoming these.

The most common weapons and munitions can be categorized according to energy, or energy density. This categorization forms the basis of threat analysis and helps us to establish the framework for a protection and testing requirement, as well as a suitable standard to which the body armor should be certified to.

Various Standards and Norms, including various test procedures, test munitions and requirements, define levels of protection.

PTI	The Institute for Police Technology German Standard
NIJ	National Institute of Justice American Standard
VPAM	Vereinigung der Prüfstellen für angriffshemmende Materialien und Konstruktionen
HOSDB	Home Office Scientific Development Branch UK Standard
GOST	Gossudarstwenny Standart Russian Standard
CEN	Comité Européen de Normalisation European Standard

Symbols & Units

m	Weight
v	Velocity
E	Energy
ED	Energy Density
[g]	Weight in gram
[mm]	Length in millimeter (1 mm = 0,039 in)
[ft]	Length in feet
[in], ["]	Length in inch
[m/s]	Velocity in meter per second
[J]	Energy in joule
[J/mm ²]	Energy Density in joule per square millimeter

Abbreviations

AP	Armor Piercing
BT	Boat Tail
CB	Coned Bullet
DAG	formerly Dynamit Nobel AG, now RUAG Ammotec
FeC	Fe-Core
FMJ	Full Metal Jacket
FMs, MsF	Full Ms
FN	Flat Nose
FNB	FN Herstal, S.A., Belgium
Geco	RUAG Ammotec GmbH, Germany
HC, HK	Hard Core
I	Incendiary
JHP	Jacketed Hollow Point
JSP	Jacketed Soft Point
LR	Long Rifle
LRN	Lead Round Nose
MEN	Metallwerk Elisenhütte GmbH, Germany
Nammo	Nammo AS, Norway
PB	Pointed Bullet
RN	Round Nose
RUAG	RUAG Ammotec Ltd., Switzerland
SC	Soft Core
SCP	Soft Core Penetrator
SJHP	Semi Jacketed Hollow Point
SJSP	Semi Jacketed Soft Point
Speer	Federal Cartridge Company, USA
S&W	Smith & Wesson
TMJ	Total Metal Jacket
WC	Wolfram-Carbide
WK	Soft Core

Threat Levels (SK) - Germany, according to TR „Ballistische Schutzwesten“ (March 2008, Rev. Oct. 2008)

Threat Level	Caliber	Bullet Description	Bullet Weight [g]	Bullet Velocity [m/s]	Bullet Energy [J]) ¹
L	9 mm x 19	FMJ/RN/SC DAG, DM 41SR	8,0 ± 0,1	360 ± 10	518
1	9 mm x 19	FMJ/RN/SC DAG, DM 41SR	8,0 ± 0,1	415 ± 10	689
	9 mm x 19	MEN, QD-PEP II/s	6,0 ± 0,1	460 ± 10	635
	9 mm x 19	RUAG, Action 4	6,1 ± 0,1	460 ± 10	645
2	.357 Magnum	FMs/CB, DAG, Spezial	7,1 ± 0,1	580 ± 10	1194
3	.223 Rem.	FMJ/PB/SCP, MEN, SS 109	4,0 ± 0,1	950 ± 10	1805
	.308 Win.	FMJ/PB/SC, MEN, DM 111	9,55 ± 0,1	830 ± 10	3290
4	.308 Win.	FMJ/PB/HC, FNB, P 80	9,45 ± 0,1	820 ± 10	3177

)1 Muzzle energy E_0 at nominal values for bullet weight and bullet velocity

Threat Levels - US, according to NIJ Standard-0101.06 (2008)

Threat Level	Caliber	Bullet Description	Bullet Weight [g]	Bullet Velocity [m/s]) ⁴	Bullet Energy [J]) ⁵
IIA	9 mm Luger	FMJ RN, Remington	8,0	373 ± 9,1 (355 ± 9,1)	557 (504)
	.40 S&W	FMJ, Remington	11,7	352 ± 9,1 (325 ± 9,1)	725 (618)
II	9 mm Luger	FMJ RN, Remington	8,0	398 ± 9,1 (379 ± 9,1)	634 (575)
	.357 Mag	JSP, Remington	10,2	436 ± 9,1 (408 ± 9,1)	969 (849)
IIIA	.357 SIG	TMJ, Speer	8,1	448 ± 9,1 (430 ± 9,1)	813 (749)
	.44 Mag	SJHP, Speer	15,6	436 ± 9,1 (408 ± 9,1)	1483 (1298)
III	7.62 mm NATO	FMJ-SPIRE PT BT) ¹) ²	9,6	847 ± 9,1 (847 ± 9,1)	3444 (3444)
IV	30.06 M2 AP	FMJ-SPIRE PT AP) ³	10,8	878 ± 9,1 (878 ± 9,1)	4163 (4163)

)1 Verify that jacket is ferrous (use of a magnet is acceptable).

)2 Bullet may be obtained from U.S. military/NATO M80 ammunition, or from other manufacturers meeting the specifications for the projectile in the M80 cartridge.

)3 May be obtained from U.S. Military M2 AP ammunition

)4 Upper value indicates new armor test velocity, value in brackets indicates conditioned test velocity

)5 Muzzle energy E_0 at nominal values for bullet weight and bullet velocity

Threat Levels, according to VPAM test guideline „Ballistische Schutzwesten“ (2008)

Threat Level	Caliber	Bullet Description	Bullet Weight [g]	Bullet Velocity [m/s]	Bullet Energy [J]) ¹
1	22 Long Rifle	L/RN, Winchester	2,6 ± 0,1	360 ± 10	169
2	9 mm Luger	FMJ/RN/SC, verzinkt DAG, DM 41	8,0 ± 0,1	360 ± 10	518
3	9 mm Luger	FMJ/RN/SC, verzinkt DAG, DM 41	8,0 ± 0,1	415 ± 10	689
4	.357 Magnum	FMJ/CB/SC Geco	10,2 ± 0,1	430 ± 10	943
	.44 Rem. Mag.	FMJ/FN/SC Speer	15,6 ± 0,1	440 ± 10	1510
5	.357 Magnum	FM/SC DAG, Spezial	7,1 ± 0,1	580 ± 10	1194
6	7,62 x 39	FMJ/PB/FeC PS	8,0 ± 0,1	720 ± 10	2074
7	.223 Rem.	FMJ/PB/SCP MEN, SS 109	4,0 ± 0,1	950 ± 10	1805
	.308 Win.	FMJ/PB/SC MEN, DM 111	9,55 ± 0,1	830 ± 10	3290
8	7,62 x 39	FMJ/PB/HCI BZ	7,7 ± 0,1	740 ± 10	2108
9	.308 Win.	FMJ/PB/HC FNB, P 80	9,45 ± 0,1	820 ± 10	3177
10	7,62 x 54 R	FMJ/PB/HCI B32	10,4 ± 0,1	860 ± 10	3846
11	.308 Win.	FMJ/PB/WC Nammo, AP 8	8,4 ± 0,1	930 ± 10	3633
12	.308 Win.	FMJ/PB/WC SWISS P AP	12,7 ± 0,1	810 ± 10	4166
13	50 Browning	FMJ/PB/HC SWISS P Penetrator	43,0 ± 0,5	930 ± 20	18595
14	14,5 x 114	FMJ/PB/HCI B32	63,4 ± 0,5	911 ± 20	26309

)1 Muzzle energy E_0 at nominal values for bullet weight and bullet velocity.

Threat Levels - UK, according to HOSDB Body Armour Standards for UK Police (2007)

Threat Level	Caliber	Bullet Description	Bullet Weight [g]	Bullet Velocity [m/s]	Bullet Energy [J]) ¹
HG1/A	9mm	9mm FMJ Dynamit Nobel, DM11A1B2	8,0	365 ± 10	533
	0.357" Magnum	Soft Point Flat Nose Remington R357M3	10,2	390 ± 10	776
HG1	9mm Calibre	9mm FMJ Dynamit Nobel, DM11A1B2	8,0	365 ± 10	533
	0.357" Magnum	Soft Point Flat Nose Remington R357M3	10,2	390 ± 10	776
HG2	9mm Calibre	9mm FMJ Dynamit Nobel, DM11A1B2	8,0	430 ± 10	740
	0.357" Magnum	Soft Point Flat Nose Remington R357M3	10,2	455 ± 10	1056
HG3	Carbine 5.56x45 NATO 1 in 7" Twist	Federal Tactical Bonded 5.56mm (.223), LE223T3 Law Enforcement Ammunition	4,01	750 ± 15	1128
RF1	Rifle 7.62mm Calibre 1 in 12" Twist	BAE Systems Royal Ordnance Defence Radway Green, NATO Ball L2 A2	9,3	830 ± 15	3203
RF2	Rifle 7.62mm Calibre 1 in 12" Twist	BAE Systems Royal Ordnance Defence Radway Green, Nato Ball L40A1 7.62 X 51mm High Power (HP)	9,7	850 ± 15	3504
SG1	Shotgun 12 Gauge True Cylinder	Winchester 1 oz. Rifled Lead Slug, 12RS15 or 12RSE	28,4	435 ± 25	2687

)1 Muzzle energy E_0 at nominal values for bullet weight and bullet velocity.

Threat Levels - Russia, according to GOST R 50744-95 Ballistic Standard

Threat Level	Caliber	Bullet Description	Bullet Weight [g]	Bullet Velocity [m/s]	Bullet Energy [J]) ¹
1	9 x 18	Makarov PM	5,9	290 - 315	293
	7,62 x 38	Nagant Revolver	6,8	265 - 285	276
2	5,45 x 18	PSM	2,5	310 - 325	132
	7,62 x 25	Tokarev TT	5,5	415 - 445	545
2a	12 gauge	Shotgun Hunter	35,0	390 - 410	2942
3	5,45 x 39	AK-74	3,4	870 - 890	1347
	7,62 x 39	AKM	7,9	710 - 725	2076
4	5,45 x 39	AK-74	3,4	870 - 890	1347
	7,62 x 54 R	Sniper Rifle SVD	9,6	825 - 835	3347
5	7,62 x 39	AKM	7,9	710 - 725	2076
6	7,62 x 54 R	Sniper Rifle SVD	9,6	820 - 835	3347

)1 Muzzle energy E_0 at maximum bullet velocity.

Threat Levels - according to CEN prEN ISO 14876 - Protective Clothing, Body Armour

Threat Level	Caliber	Bullet Description	Bullet Weight [g]	Bullet Velocity [m/s]	Bullet Energy [J]) ¹
1	9 x 19	Full Metal Steel Jacket	8,0 ± 0,2	360 ± 10	518
2	9 x 19	Full Metal Steel Jacket	8,0 ± 0,2	415 ± 10	689
3	9 x 19	Full Metal Steel Jacket	8,0 ± 0,2	425 ± 10	723
	.357" Magnum	Full Metal Jacket (coned bullet)	10,2 ± 0,2	430 ± 10	943
4	5,56 x 45	M 193	3,6 ± 0,2	970 ± 15	1694
	7,62 x 51	NATO Ball	9,4 ± 0,2	830 ± 15	3238
5	7,62 x 51	AP Hardened steel core	9,7 ± 0,2	820 ± 15	3261
S	12/70 gauge	Brenneke solid lead slug	32 ± 0,5	425 ± 25	2890

)1 Muzzle energy E_0 at nominal values for bullet weight and bullet velocity.

Threat Levels - Overview (sorted by energy density of test ammunition)

Test ammunition	m [g]	v ₀ [m/s]	E ₀ [J]	ED [J/mm ²]	PTI	VPAM	NIJ	HOSDB	GOST	CEN
9 x 18 Makarov PM	5,9	315	293	4,6					1	
5,45 x 18 PSM	2,5	325	132	5,7					2	
7,62 x 38 Nagant Revolver	6,8	285	276	6,1					1	
22 Long Rifle, L/RN	2,6	360 ± 10	167	6,9		1				
9 mm Luger, FMJ/RN/SC	8,0	360 ± 10	518	8,1		2				
9 x 19 FMJ	8,0	360 ± 10	518	8,1						1
9 mm x 19, FMJ/RN/SC	8,0	360 ± 10	518	8,1	L					
9mm FMJ	8,0	365 ± 10	533	8,4				HG1/A		
9 mm Luger, FMJ RN	8,0	373 ± 9,1	557	8,8			IIA			
.40 S&W, FMJ	11,7	352 ± 9,1	725	8,9			IIA			
9 mm Luger, FMJ RN	8,0	398 ± 9,1	634	10,0			II			
9 mm x 19, QD-PEP II/s	6,0	460 ± 10	635	10,0	1					
Shotgun 12 gauge, True Cylinder	28,4	435 ± 25	2687	10,0				SG1		
9 mm x 19, Action 4	6,1	460 ± 10	645	10,1	1					
12/70 gauge, Brenneke	32	425 ± 25	2890	10,7						S
9 mm x 19, FMJ/RN/SC	8,0	415 ± 10	689	10,8	1					
9 mm Luger, FMJ/RN/SC	8,0	415 ± 10	689	10,8		3				
9 x 19 FMJ	8,0	415 ± 10	689	10,8						2
12 gauge Shotgun Hunter	35,0	410	2942	10,9					2a	
9 x 19 FMJ	8,0	425 ± 10	723	11,4						3
9mm FMJ	8,0	430 ± 10	740	11,6				HG2		
0.357" Magnum	10,2	390 ± 10	776	12,0				HG1/A		
7,62 x 25 Tokarev TT	5,5	445	545	12,0					2	
.357 SIG, TMJ	8,1	448 ± 9,1	813	12,6			IIIA			
.357" Magnum FMJ/CB	10,2	430 ± 10	943	14,6						3
.357 Magnum, FMJ/CB/SC	10,2	430 ± 10	943	14,6		4				
.357 Mag, JSP	10,2	436 ± 9,1	969	15,0			II			
.44 Mag, SJHP	15,6	436 ± 9,1	1483	15,1			IIIA			
.44 Rem. Mag., FMJ/FN/SC	15,6	440 ± 10	1510	15,4		4				
0.357" Magnum	10,2	455 ± 10	1056	16,4				HG2		
.357 Magnum, FMs/CB, DAG, Spezial	7,1	580 ± 10	1194	18,5	2					
.357 Magnum, FMs/CB	7,1	580 ± 10	1194	18,5		5				
7,62 x 39, FMJ/PB/FeC	8,0	720 ± 10	2074	45,5		6				
7,62 x 39, AKM	7,9	725	2076	45,5					3	
7,62 x 39, AKM (AP)	7,9	725	2076	45,5					5	
7,62 x 39, FMJ/PB/HCI	7,7	740 ± 10	2108	46,2		8				
5,56 x 45 NATO	4,01	750 ± 15	1128	46,5				HG3		
5,45 x 39, AK-74	3,4	890	1347	57,7					3	
5,45 x 39, AK-74 (AP)	3,4	890	1347	57,7					4	
.308 Win., FMJ/PB/HC	9,45	820 ± 10	3177	66,1		9				
.308 Win., FMJ/PB/HC, FNB, P 80	9,45	820 ± 10	3177	66,1	4					
.308 Win., FMJ/PB/SC	9,55	830 ± 10	3290	68,4		7				
.308 Win., FMJ/PB/SC, MEN, DM 111	9,55	830 ± 10	3290	68,4	3					
5,56 x 45, M 193	3,6	970 ± 15	1694	69,8						4
Rifle 7.62mm Calibre,1 in 12" Twist	9,3	830 ± 15	3203	70,2				RF1		
7,62 x 51, NATO Ball	9,4	830 ± 15	3238	71,0						4
7,62 x 51 AP	9,7	820 ± 15	3261	71,5						5
.223 Rem., FMJ/PB/SCP, MEN, SS109	4,0	950 ± 10	1805	71,6	3					
.223 Rem. FMJ/PB/SCP	4,0	950 ± 10	1805	71,6		7				
7,62 x 54 R, Sniper Rifle	9,6	835	3347	73,4					4	
7,62 x 54 R, Sniper Rifle (AP)	9,6	835	3347	73,4					6	
7.62 mm NATO	9,6	847 ± 9,1	3444	75,5			III			
.308 Win., FMJ/PB/WC	8,4	930 ± 10	3633	75,6		11				
Rifle 7.62mm Calibre,1 in 12" Twist	9,7	850 ± 15	3504	76,8				RF2		
7,62 x 54 R, FMJ/PB/HCI	10,4	860 ± 10	3846	84,3		10				
.308 Win., FMJ/PB/WC	12,7	810 ± 10	4166	86,7		12				
30.06 M2 AP	10,8	878 ± 9,1	4163	91,3			IV			
50 Browning, FMJ/PB/HC	43	930 ± 20	18595	146,8		13				
14,5 x 114, FMJ/PB/HCI	63,4	911 ± 20	26309	159,3		14				