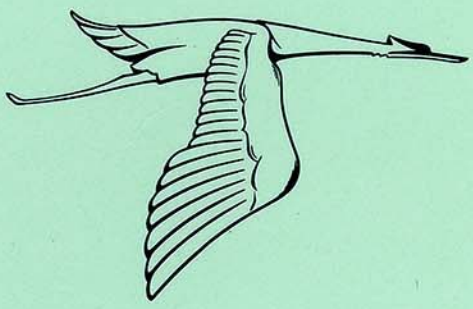
PATTON

HISPANO SUIZA
20 mm Ammunition type 820 A
for Anti-Aircraft and Infantry Gun



HISPANO SUIZA

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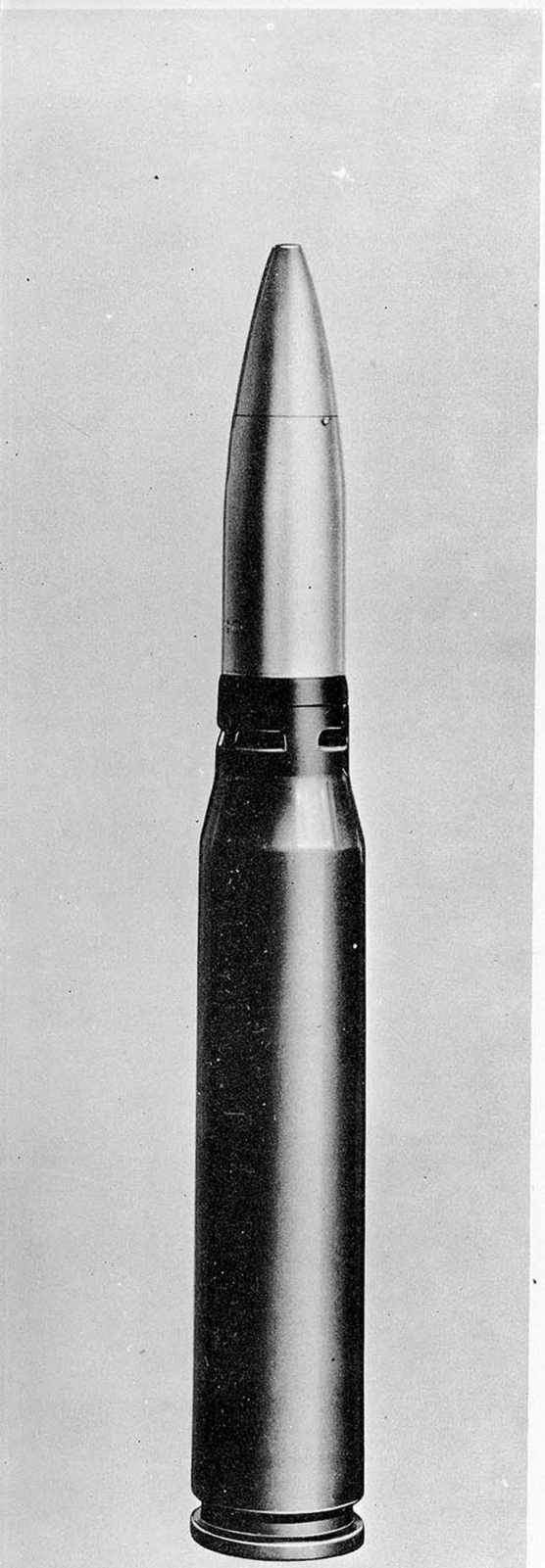
20 mm Ammunition type 820 A
for Anti-Aircraft and Infantry Gun

N° 206 MU/AN
830/648 - 6203

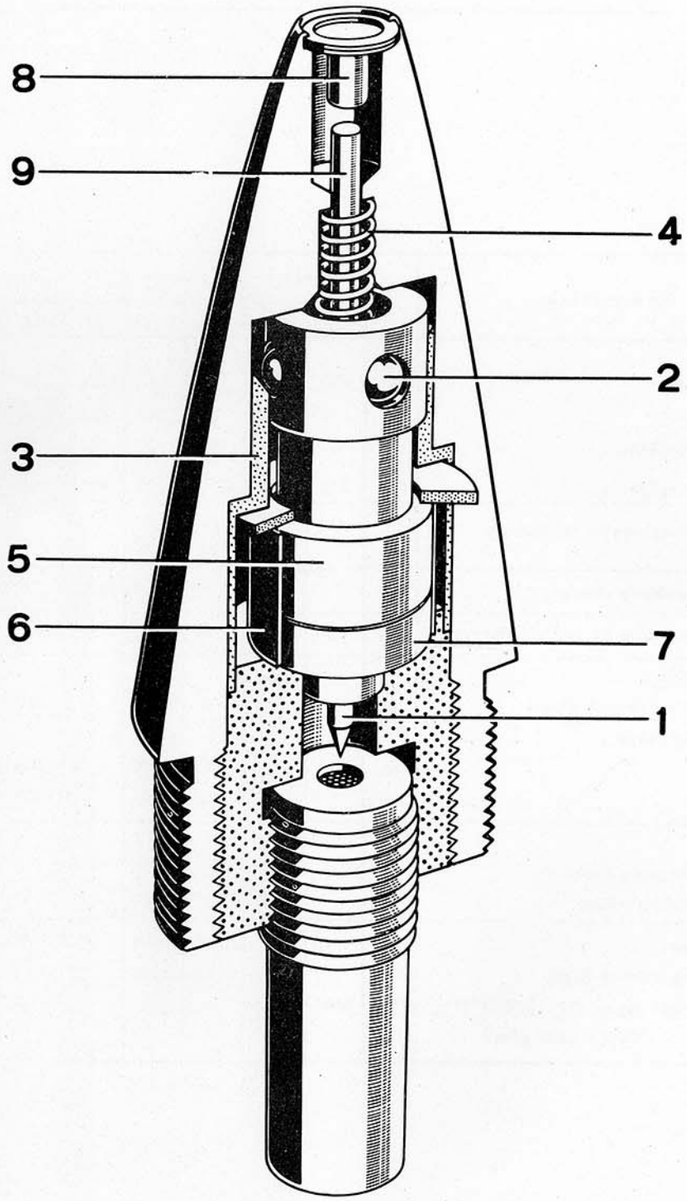


CARTOUCHES 20 mm HISPANO SUIZA

HISPANO SUIZA 20 mm 820 A AMMUNITION

for anti-aircraft and infantry guns

Designation		Exercice		Explosive		Splinter			
		EP	ET	UIA	UIAT	RI	RIA	RT	RINT
Weight of shell	g	120	120	120	120	134	126	134	112
Weight of case	g	142	142	142	142	142	142	142	142
Weight of propellant	g	52	52	52	52	52	52	52	54
Weight of cartridge	g	314	314	314	314	328	320	328	308
Weight of high explosive incendiary charge	g			10	8,5		4,5		
Weight of incendiary charge	g					3,5			3
Muzzle velocity with 85 calibre barrel	m/s	1050	1050	1050	1050	1000	1025	1000	1140
Self-destruction :									
Minimum and maximum times	s			6-10	6-10		6-10		
Corresponding range :									
Minimum	m			2900	2900		2700		
Maximum	m			3800	3800		3600		
Tracer :									
Average burning time	s		3		2,5			3	1
Corresponding range	m		2000		1700			2000	900
Practical range	m			2000	2000				
Corresponding time of flight	s			3,06	3,06				
Maximum range	m	7200	7200						
Air density $\Delta O = 1208\ g/m^3$									



Fuse of 20 mm type 820 A shell

DESCRIPTION OF THE MECHANICAL FUSE

of the high explosive shell type 820 A

The mechanism of the fuse guarantees :

1) Absolute safety in storage, handling and transport.
2) Muzzle safety of about 10 m, by means of a delayed arming device.
3) Non-functioning in rain (inert fuse will not function on cardboard 0.5 mm thick)
4) Explosion of the shell on impact even at high impact angles and low speeds, the fuse becoming more sensitive as the shell approaches self-destruction.
5) Self-destruction of the shell.

OPERATION OF THE FUSE

1) Safe

The striker (1) is forced by the spring (4) against the circular bolt (5). This is pressed on the striker and held firmly in place by the spiral spring (7). The sleeve (6) stops the spring unwinding in the absence of centrifugal force.

2) Arming the fuse

During the period of positive acceleration, (when the shell is in the gun barrel), the whole fuse mechanism is blocked.

As soon as the acceleration becomes negative (as the shell leaves the barrel), the striker (1) due to the centrifugal action of the balls (2) rolling on the pressure ring (3), is pushed forward to compress the spring (4), freeing the circular bolt (5) against which it was forced.

Simultaneously, and still under the action of the centrifugal force, the sleeve (6) moves aside and allows the spiral spring (7) to unwind, thus giving a rotary movement to the bolt (5).

The time required to rotate the latter several times and free it from the spring encricling it constitutes the

MUZZLE SAFETY.

The striker being no longer restrained, the mechanism will function either on impact or through self-destruction.

3) Non-functioning in rain

The flat head (8) of the mechanism is designed to resist raindrops or impact on 0.5 mm thick cardboard.

4) Functioning on impact

As soon as the shell hits the target the hammer (8) strikes the bar (9). This transmits the blow to the head of the striker and onto the balls which, forced against the pressure cone, are driven back to to their original position. The spring, acting on the striker, drives this into the detonator which detonates instantaneously.

As the impulse of the striker is not the direct result of the shock of the impact, but of the spring force after the balls have been driven back, the fuse has a

SLIGHT MECHANICAL DETONATION DELAY.

Furthermore, as the shell approaches the target,

THE SENSITIVITY OF THE FUSE INCREASES.

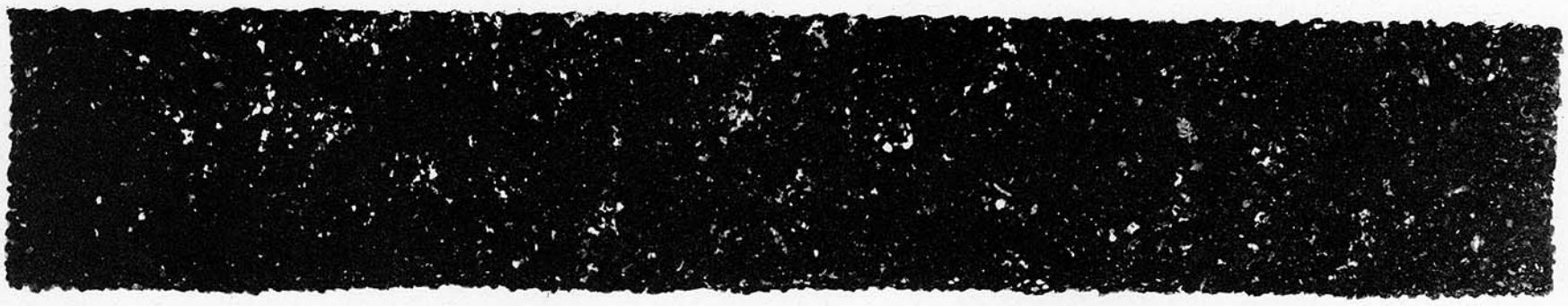
Since the centrifugal force acting on the balls diminishes with the square of the speed of rotation, if the target is very distant a very much reduced impact shock will suffice to detonate the shell with unchanged power (due to the spring).

5) Self-destruction

As the speed of rotation of the shell falls during its flight, so the centrifugal force on the balls is reduced. Hence these slowly return towards their original position until the point where the spring is released. Under the pressure of the spring, of the striker hits the detonator, thus causing the self-destruction of the shell if it has not hit its target.

SHELL type 820 A UIA

FRAGMENTATION



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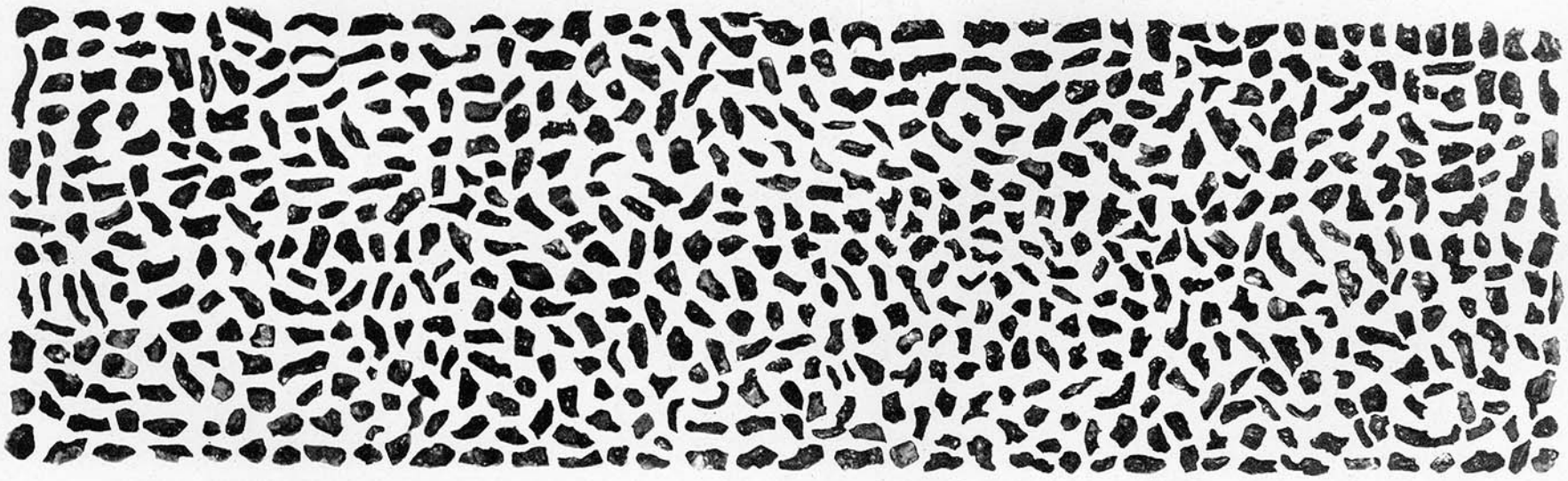


2

3

4

5

6

Natural size

SHELL type 820 A UIA

FRAGMENTATION

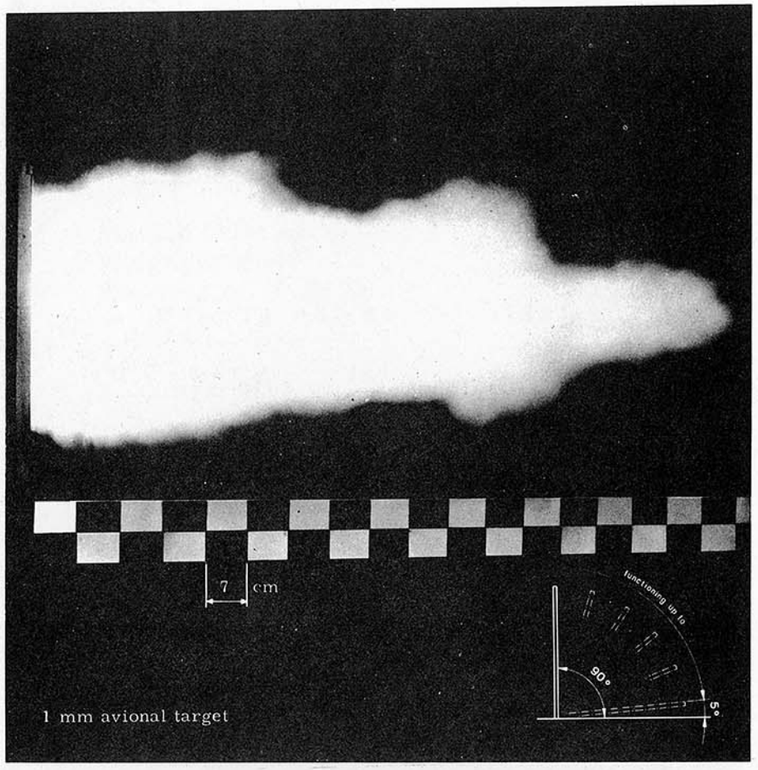
SHELL type 820 A UIA

Characteristics

Explosive, incendiary shell with self-desturction
Weight of the high explosive incendiary charge 10 g trinalite
Weight of complete shell 120 g

FRAGMENTATION

Fig.	Description	Weight in g	Total wt	Proportion
1	powder	0.05	14.0	12.7 %
2	460 splinters	0.05 - 0.15	40.4	36.7 %
3	98 splinters	0.15 - 0.5	18.3	16.7 %
4	26 splinters	0.5 - 1.5	15.2	13.9 %
5	3 splinters	1.5 - 5	5.6	5.1 %
	587 splinters		93 5	85.1 %
6	1 fuse		14.5	13.1 %
	1 detonator		2.0	1.8 %
	Weight of metal		110.0	100 %
	Explosive incendiary charge		10.0	
	Weight of complete shell		120.0	



Effect behind the target of a high explosive incendiary shell type UIA 20 mm

Effect behind armour-plate of a splinter-incendiary shell type RIA 20 mm

HISPANO SUIZA 20 mm AUTOMATIC GUN

Type 820 A - 85 calibres

Firing table - on the ground

Muzzle velocity	1050 m/s
Weight of shell	120 g
Air density (Δ O)	1208 g/m^2

Range m	Angle of fire A o/oo	Time of Flight s	Residual speed m/s
0	0	0	1050
100	0,47	0,10	1008
200	0,95	0,20	967
300	1,48	0,30	926
400	2,02	0,41	886
500	2,62	0,53	846
600	3,24	0,65	807
700	3,90	0,78	769
800	4,61	0,91	732
900	5,37	1,05	697
1000	6,18	1,20	663
1100	7,06	1,35	630
1200	8,00	1,52	599
1300	9,10	1,69	569
1400	10,09	1,87	541
1500	11,26	2,06	514
1600	12,52	2,26	489
1700	13,87	2,47	465
1800	15,33	2,69	443
1900	16,91	2,92	423
2000	18,61	3,16	404
2100	20,44	3,41	386
2200	22,40	3,68	370
2300	24,53	3,96	355
2400	26,79	4,24	342
2500	29,22	4,54	330

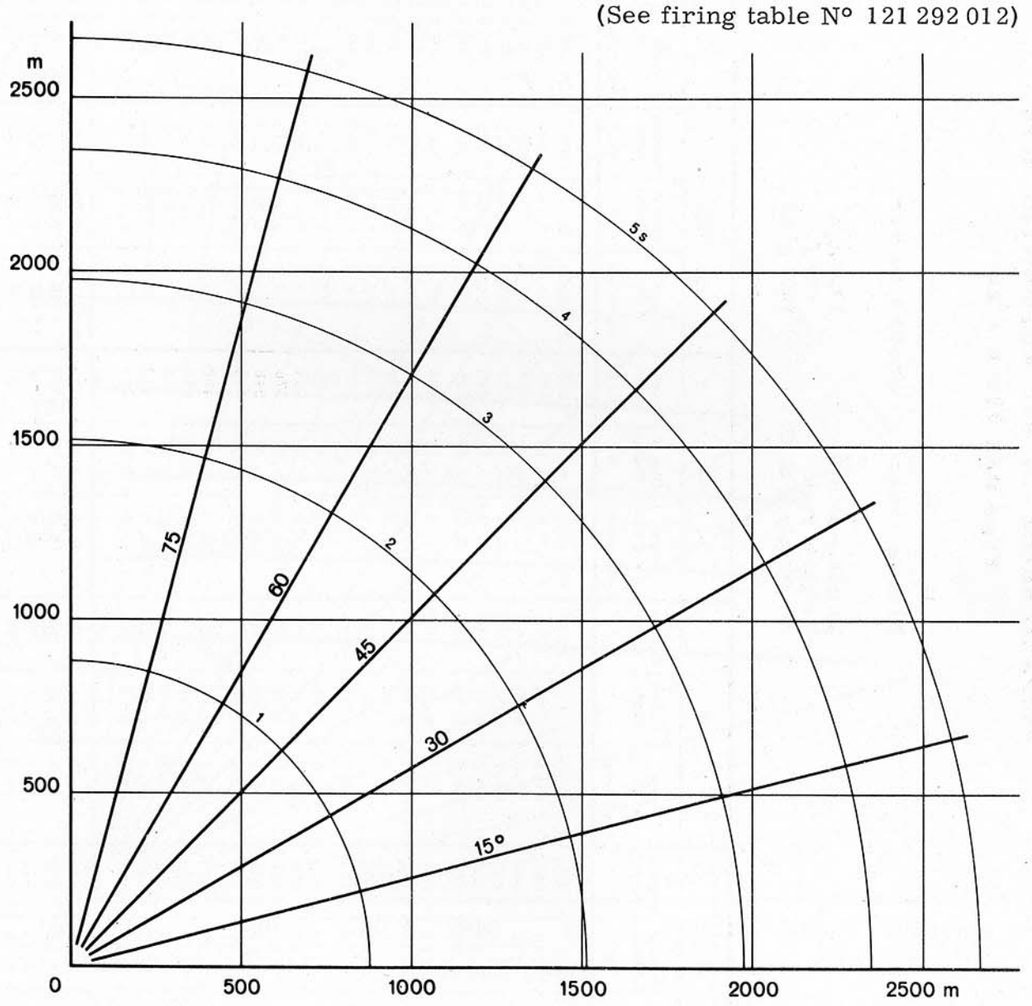
Maximum range : 7 200 m

TRAJECTORY TABLE

HISPANO SUIZA 20 mm ammunition type 820 A

Muzzle velocity	1050 m/s
Weight of shell	120 g
Air density (Δ O)	1208 g/m^3

(See firing table N° 121 292 012)



HISPANO SUIZA 20 mm AUTOMATIC GUN

Type HSS 820 A - 85

Firing table - ground to air

Muzzle velocity 1050 m/s
Weight of shell 120 g
Air density (Δ O) 1208 g/m3

Angle of Fire	0°			15°			30°			45°			60°			75°		
range m	Angle of drop degree-min	Time of Flight s	Residual speed m/s	Angle of drop degree-min	Time of Flight s	Residual speed m/s	Angle of drop degree-min	Time of Flight s	Residual speed m/s	Angle of drop degree-min	Time of Flight s	Residual speed m/s	Angle of drop degree-min	Time of Flight s	Residual speed m/s	Angle of drop degree-min	Time of Flight s	Residual speed m/s
0	0° 00,0	0	1050	0° 00,0	0	1050	0° 00,0	0	1050	0° 00,0	0	1050	0° 00,0	0	1050	0° 00,0	0	1050
100	01,6	0,10	1008	01,5	0,10	1008	01,4	0,10	1008	01,1	0,10	1008	00,7	0,10	1008	00,3	0,10	1008
200	03,2	0,20	967	03,1	0,20	967	02,7	0,20	967	02,2	0,20	966	01,6	0,20	966	00,8	0,20	966
300	05,0	0,30	926	04,7	0,30	926	04,2	0,30	926	03,4	0,30	925	02,4	0,30	925	01,2	0,30	925
400	06,8	0,41	886	06,6	0,41	885	05,8	0,41	885	04,7	0,41	885	03,3	0,41	885	01,6	0,41	885
500	08,8	0,53	846	08,5	0,53	846	07,5	0,53	846	06,1	0,53	846	04,2	0,53	846	02,1	0,53	846
600	10,9	0,65	807	10,5	0,65	807	09,3	0,65	808	07,5	0,65	808	05,2	0,65	808	02,6	0,65	808
700	13,3	0,78	769	12,7	0,78	770	11,2	0,78	771	09,1	0,78	771	06,3	0,78	772	03,1	0,78	772
800	15,6	0,91	732	15,0	0,91	734	13,2	0,91	735	10,7	0,91	736	07,5	0,91	736	03,6	0,91	737
900	18,1	1,05	697	17,4	1,05	699	13,4	1,05	700	12,5	1,05	701	08,7	1,05	702	04,3	1,05	703
1000	20,9	1,20	663	20,0	1,20	665	17,8	1,20	667	14,4	1,20	668	10,0	1,20	669	04,9	1,20	670
1100	23,8	1,35	630	22,8	1,35	633	20,3	1,35	635	16,4	1,35	637	11,4	1,35	638	05,6	1,35	639
1200	27,0	1,52	599	25,8	1,51	602	23,0	1,51	604	18,6	1,51	607	12,9	1,51	608	06,3	1,51	609
1300	30,4	1,69	569	29,1	1,68	572	25,9	1,68	576	20,9	1,68	578	14,5	1,68	580	07,1	1,68	581
1400	34,1	1,87	541	32,6	1,86	545	29,0	1,86	548	23,4	1,86	551	16,2	1,85	553	07,9	1,85	554
1500	38,0	2,06	514	36,4	2,05	518	32,4	2,05	522	26,1	2,04	525	18,1	2,04	527	08,8	2,04	529
1600	42,2	2,26	489	40,5	2,25	494	35,9	2,24	498	29,0	2,24	501	20,1	2,23	503	09,8	2,23	505
1700	46,8	2,47	465	44,8	2,46	470	39,7	2,45	474	32,1	2,44	478	22,2	2,44	480	10,8	2,43	482
1800	51,7	2,69	443	49,8	2,67	449	43,9	2,66	453	35,4	2,66	456	24,5	2,65	459	11,9	2,65	460
1900	57,0	2,92	423	54,6	2,90	428	48,4	2,89	432	39,0	2,88	436	27,0	2,87	439	13,2	2,87	440
2000	1° 02,9	3,16	404	1° 00,1	3,14	409	53,2	3,13	413	42,8	3,12	417	29,7	3,11	420	14,5	3,10	421
2100	09,0	3,41	386	05,9	3,39	391	58,4	3,37	396	47,0	3,36	399	32,5	3,35	402	15,9	3,34	403
2200	15,6	3,68	370	12,2	3,65	375	1° 04,0	3,63	379	51,5	3,62	383	35,6	3,60	385	17,4	3,60	387
2300	22,8	3,96	355	19,0	3,93	360	10,0	3,90	364	56,3	3,88	367	38,9	3,87	370	19,0	3,86	371
2400	30,4	4,24	342	26,3	4,21	346	16,4	4,18	350	1° 01,5	4,16	353	42,5	4,15	355	20,8	4,14	356
2500	38,6	4,54	330	34,1	4,51	333	23,3	4,48	337	07,0	4,45	339	46,3	4,43	341	22,6	4,42	343

Maximum range 7 200 m

DIAGRAM OF PENETRATION OF ARMOUR PLATE

shell type RI - RT 820 A

Treated armour plate
R = 180 kg/mm2

Examples
15 mm armour at 32°
25 mm armour at 53°

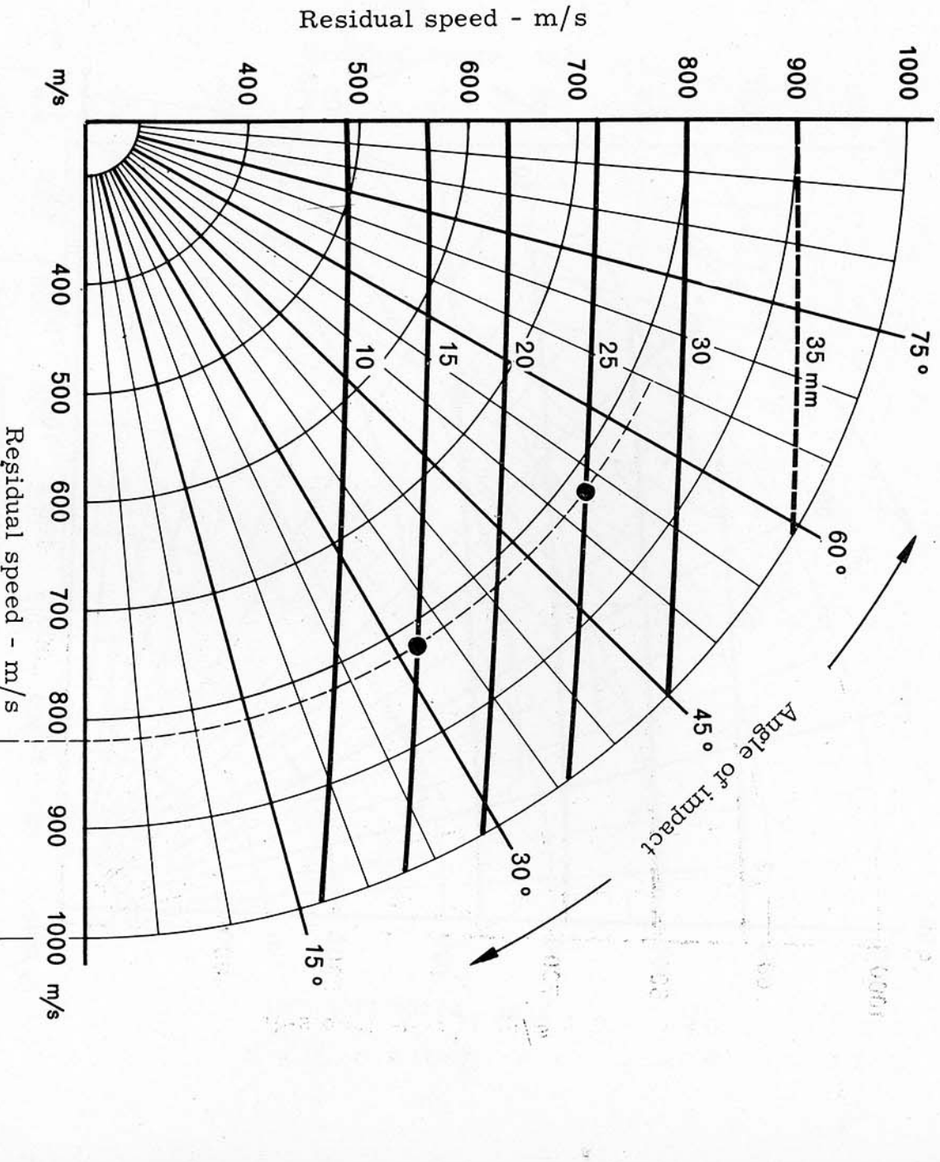


DIAGRAM OF PENETRATION OF ARMOUR PLATE

Shell type RIA 820 A

Treated armour plate

R = 180 kg / mm²

Example

15 mm armour at 36°

25 mm armour at 47°

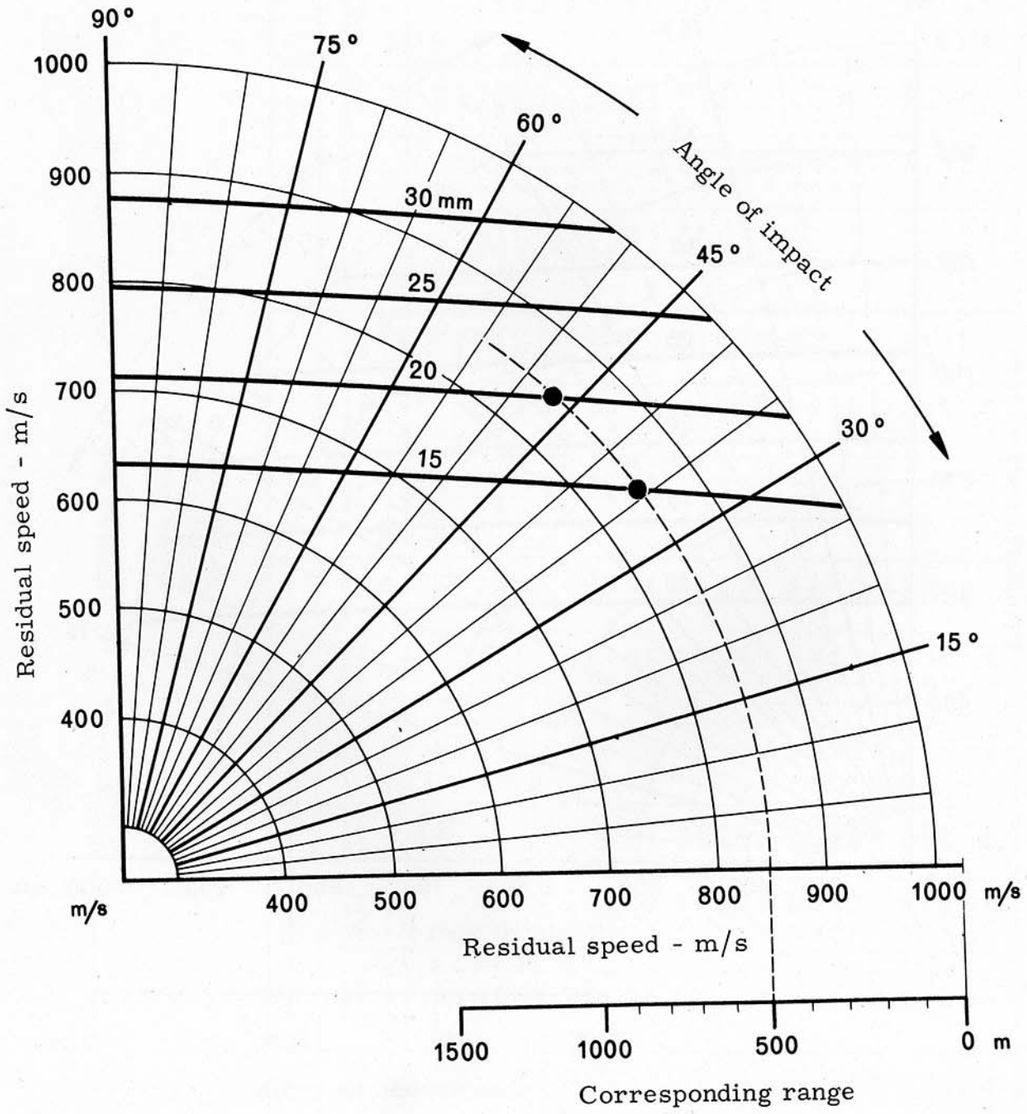


DIAGRAM OF PENETRATION OF ARMOUR PLATE

Shell type RINT 820 A

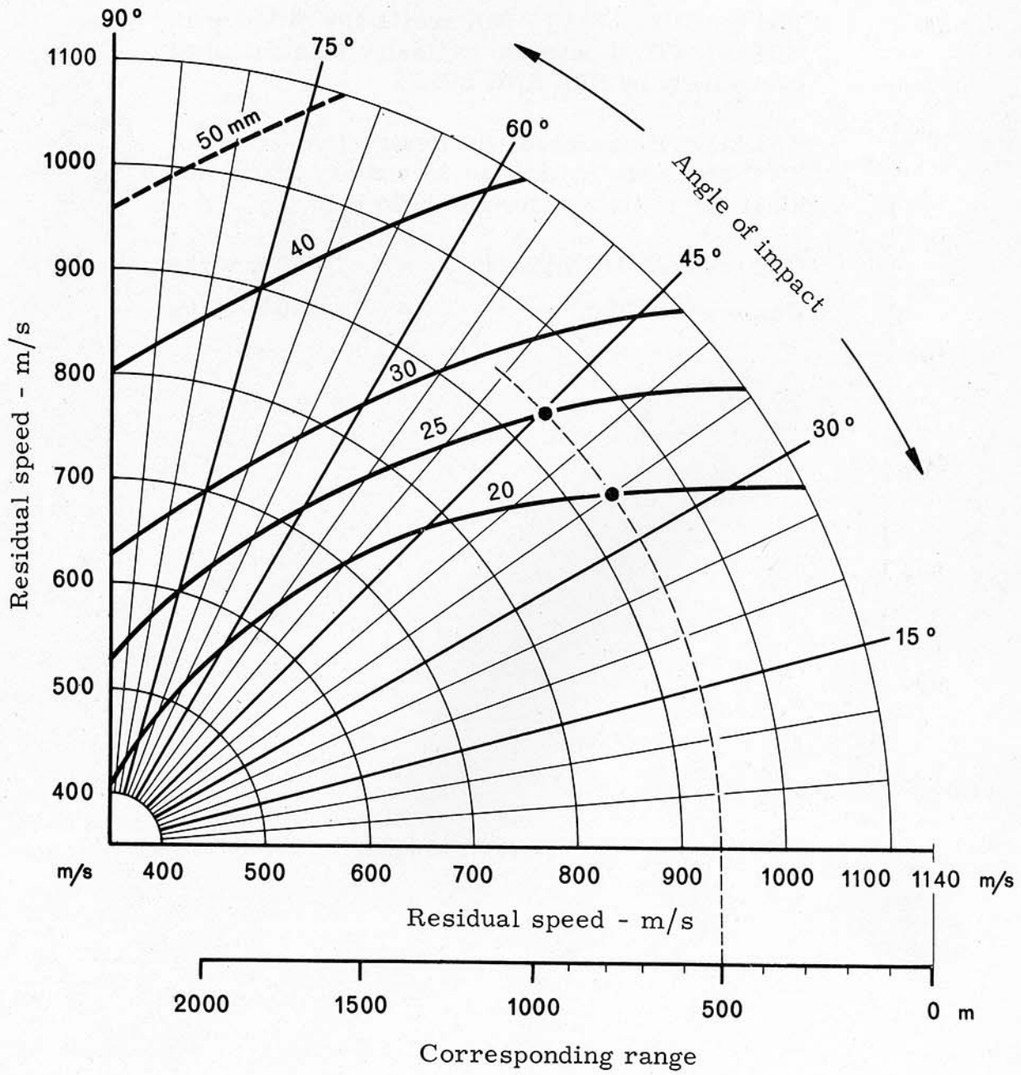
Treated armour plate

R = 180 kg / mm²

Example

20 mm armour at 35°

25 mm armour at 45°



REMARKS

The type UIA, UIAT, RIA shells are filled with TRINALITE, a patented explosive manufactured exclusively by HISPANO SUIZA.

TRINALITE possesses the destructive effect of TNT and adds to this an incendiary effect and blast due to its greater calorific value.

Compressed TRINALITE	=	1380 kcal/kg
Compressed TNT	=	950 kcal/kg

Panzerdurchschlagsleistung

Geschoß: Hartkernpanzergranate

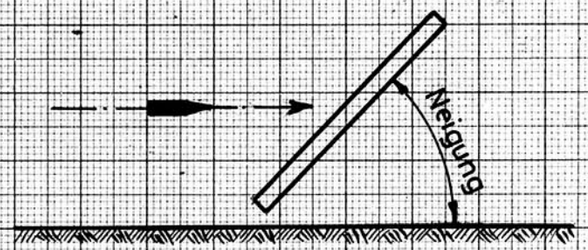
Geschoßgewicht: 110 g

V_0 = 1135 m/s (Schußentfernung 100 m)

V_0 = 810 m/s (Schußentfernung 800 m)

● Durchschuß

\+ Kein Durchschuß



Pz-Plattenstärke in mm

60 50 40 30 20 10 0

Pz-Platten-Neigungswinkel in Grad

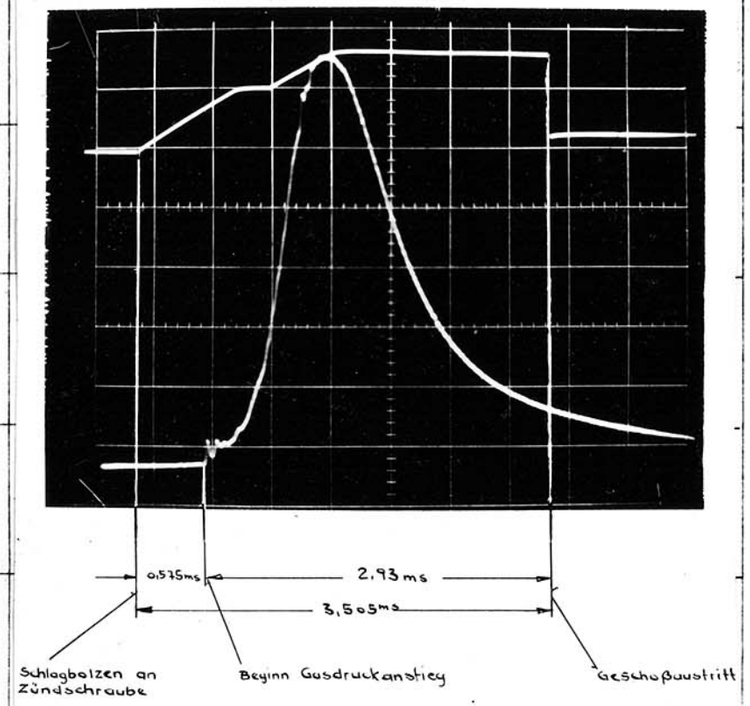
90 80 70 60 50 40 30 20

Härtewerte der Pz-Platte in HB30

356 341 348 337 363 350 376 425 425

WK-Bm 259

Gasdruckverlauf - Messung
Meßlauf der MK 20mm HS-820
p = f(t)
Gg = 120g



p

Gasdruck (kg/cm^2)

3825
3400
2975
2550
2125
1700
1275
850
425
0

0,5 1,0 1,5 2,0 2,5 3,0 3,5

0,575ms
2,93ms
3,505ms

Schlagbolzen an Zündschraube

Beginn Gasdruckanstieg

Geschoßaustritt

t

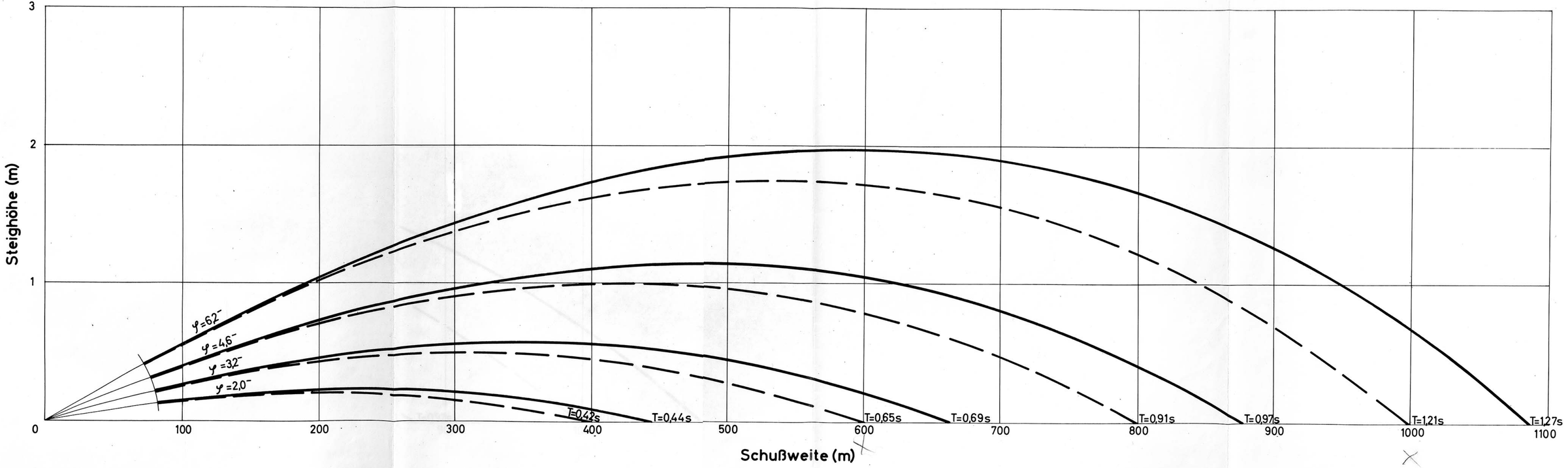
WK-Bm 264

M.K. 20mm HS820

Flugbahnvergleich

——— = 20mm Hartkerngeschoß
Gg = 110 g; V_o = 1135 m/s

– – – – = 20mm Sprengbrandgeschoß DM 51 A1
Gg = 120 g; V_o = 1055 m/s



WK-Bm 265

Inhaltszettel

30 St. 20 mm Hartkern-Panzergranatpatronen

A.P. W/S Trace for Armor Piercing shot

Diese Patronen sind mit blinder L'spur laboriert, da L'spuren noch nicht verfügbar waren. Die Patronen sind nur zur Erprobung der Durchschlagsleistung auf kurze Entfernungen vorgesehen.

Munitionsart		type of ammunition	
Patronengewicht		weight of cartridge	
Geschossgewicht		weight of shell	
Muendungsgeschwindigkeit		muzzle velocity	
Gebrauchsgasdruck		normal gas pressure	
Geschoss	Heullenwerkstoff	shell	materiel of shell
	Fuehrungsring		driving band
	Sprengstoff		explosive
	Hartkern		hard corps
Zuender	Art	fuse	type of fuse
	Vorrohrsicherheit		muzzle safety
	Selbstzerlegung		selfdestruction
L Spur	Glimmspur		inert tracer
	Leuchtspur		tracer
	Farbe		color
Huelse	Huelsenwerkstoff	case	materiel of case
	Oberflaechenbehandlung		surface treatment
Treibladungszuender		propellant primer	
Treibladung	Pulverart	propellant	type of powder
	Ladungsgewicht		weight of sk propellant

Ueb Granate DM 48 ohne L spur n.Zchng.130110 001 amerik.Bez.: P	practice ammunition without tracer drawing nbr. 130110 001 US designation : P HS(french) " : E
Ueb Granate DM 48 A1 mit L spur n.Zchng. 130061 001 amerik.Bez.: PT	practice ammunition with tracer drawing nbr. 130061 001 US designation : PT HS(french) " : ET
Sprbr Granate DM 51 mit L spur n. Zchng. 130 122 001 amerik.Bez.:HE	High explosive with incendiary charge and tracer drawing nbr. 130 122 001 US designation : HE HS(french) " : UIAT
Pz Ueb Hartkerngranate mit L spur n. Zchng. WK Bm 279 100 amerik.Bez. - - -	practice armor pearcing with tracer drawing nbr. WK Bm 279 100 US designation : - - - - HS(french) " : don t exist
Pz Hartkerngranate mit L spur n.Zchng.WK Bm 199 100 amerik.Bez.: APT	armor pearcing hard corps with tracer drawing nbr. WK Bm 199 100 US designation : APT HS(french) " : RINT
Pz Hartkerngranate ohne L spur n.Zchng. - - - - amerik.Bez. AP	armor pearcing hard corps without tracer drawing nbr - - - - US designation : AP HS(french) " : don t exist

Munitionsart		type of ammunition	
Patronengewicht		weight of cartridge	
Geschossgewicht		weight of shell	
Muendungsgeschwindigkeit		muzzle velocity	
Gebrauchsgasdruck		normal gas pressure	
Geschoss	Huellenwerkstoff	shell	materiel of shell
	Fuehrungsring		driving band
	Sprengstoff		explosive
	Hartkern		hard corps
Zuender	Art	fuse	type of fuse
	Vorrohrsicherheit		muzzle safety
	Selbstzerlegung		selfdestruction
L Spur	Glimmspur		inert tracer
	Leuchtspur		tracer
	Farbe		color
Huelse	Huelsenwerkstoff	case	materiel of case
	Oberflaechenbehandlung		surface treatment
Treibladungszuender		propellant primer	
Treibladung	Pulverart	propellant	type of powder
	Ladungsgewicht		weight of propellant

Ueb Granate DM 48 ohne L spur n.Zchng.130110 001 amerik.Bez.: P	practice ammunition without tracer drawing nbr. 130110 001 US designation : P HS(french) " : E
Ueb Granate DM 48 A1 mit L spur n.Zchng. 130061 001 amerik.Bez.: PT	practice ammunition with tracer drawing nbr. 130061 001 US designation : PT HS(french) " : ET
Sprbr Granate DM 51 mit L spur n. Zchng. 130 122 001 amerik.Bez.:HE	High explosive with incendiary charge and tracer drawing nbr. 130 122 001 US designation : HE HS(french) " : UIAT
Pz Ueb Hartkerngranate mit L spur n. Zchng. WK Bm 279 100 amerik.Bez. - - -	practice armor pearcing with tracer drawing nbr. WK Bm 279 100 US designation : - - - - HS(french) : does not exist
Pz Hartkerngranate mit L spur n.Zchng.WK Bm 199 100 amerik.Bez.: APT	armor pearcing hard corps with tracer drawing nbr. WK Bm 199 100 US designation : APT HS(french) " : RINT
Pz Hartkerngranate ohne L spur n.Zchng. - - - - amerik.Bez. AP	armor pearcing hard corps without tracer drawing nbr - - - - US designation : AP HS(french) " : does not exist