MK 20mm HS 820 Ammunition

Issue March 1962

Rheinmetall- G.m.b.H.- Düsseldorf
MK 20mm HS 820 Ammunition

General

**Rheinmetall** 20mm ammunition for automatic guns, for AA and Infantry use,
present substantial properties which -

- give greatest safety in transport, handling and storage
- ensure reliable functioning on impact and self-destruction
- obtain maximum destructive effect on various targets
- show intense luminosity of tracer, therefore facilitate exact observation of fire
- establish similar trajectories with all types of projectiles

**Types of Ammunition:**

Practice Shells

H.E. Incendiary Shells

Armour-Piercing Shells with Hard Metal Core
Components of Cartridge

The cartridge consists of the following parts:

Shell 1, with rotating band 1a of sintered metal

Cartridge case 2 of steel, with extraction groove 2a and crimping 2b

Propellant charge 3, nitrocellulose

Propellant charge bottom primer 4

Same type of cartridge case is used for all types of projectiles.
MK 20mm HS 820, Ammunition

Shell 20mm, DM 48 Al
Practice-, Tracer

Shell 20mm, DM 51 Al
H.E. Incendiary, Tracer, self-destruction-fuse

Weight of cartridge: ca. 317 gr
Weight of projectile: 120 gr
Muzzle velocity: 1055 m/s
Gas pressure: 3400 kg/cm²
Tracer, of orange colour
   Luminous track: burnout time ca. 3 sec.
   Glowing track: up to 400 m

Shell DM 51 Al, H.E. Incendiary-, Fuse: Impact fuse, with muzzle safety device, self destroying
Weight of charge: 6.5 gr Hexal 60/40
MK 20mm HS 820, Ammunition

Shell 20mm,
Armour piercing-, Tracer,
with hard metal core

Weight of cartridge: ca. 312 gr
Weight of projectile: 110 gr
Muzzle velocity: 1145 m/s
Gas pressure: 3700 kg/cm²
Tracer, of orange colour
Luminous track: burnout time ca. 3 sec.
Glowing track: up to 200 m
Identification of Shells

Markings can be altered to suit customer's requirements

Shell, 20mm, DM 48 A1
Practice -, Tracer

Shell, 20mm, DM 51 A1
H.E. incendiary, Tracer,
self-destruction - fuse

Shell 20mm,
Armour piercing -, Tracer,
with hard metal core
Shell 20mm, H.E. Incendiary, Tracer, self-destructive

Wt. of complete projectile: 120 gr
Wt. of charge: 6.5 gr Hexal 60/40

Fragmentation of Shell

Wt. of body, empty: 93.7 gr

<table>
<thead>
<tr>
<th>Fragments, groupe</th>
<th>Wt. of fragments gr</th>
<th>Number of fragments</th>
<th>Wt. of fragments per groupe gr</th>
<th>Groupe share of total in percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 - 0.5</td>
<td>188</td>
<td>35.0</td>
<td>37.35</td>
</tr>
<tr>
<td>2</td>
<td>0.5 - 1.0</td>
<td>23</td>
<td>18.0</td>
<td>19.21</td>
</tr>
<tr>
<td>3</td>
<td>1.0 - 2.0</td>
<td>3</td>
<td>4.0</td>
<td>4.27</td>
</tr>
<tr>
<td>4</td>
<td>2.0 - 3.0</td>
<td>3</td>
<td>7.0</td>
<td>7.47</td>
</tr>
<tr>
<td>5</td>
<td>3.0 - 5.0</td>
<td>3</td>
<td>12.0</td>
<td>12.81</td>
</tr>
<tr>
<td>6</td>
<td>5.0 - 10.0</td>
<td>3</td>
<td>16.0</td>
<td>17.08</td>
</tr>
<tr>
<td>Total of fragments</td>
<td>223</td>
<td>92.0</td>
<td>98.19</td>
<td></td>
</tr>
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</table>
### MK 20 mm HS 820, Ammunition

<table>
<thead>
<tr>
<th>Specification</th>
<th>Shell 20mm DM 48 A1 Practice-, Tracer</th>
<th>Shell 20mm DM 51 A1 H.E. Incendiary, Tracer, self-destruction-fuse</th>
<th>Shell 20mm Armour piercing-, Tracer, with hard metal core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wt. of projectile</td>
<td>gr</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Wt. of cartridge</td>
<td>gr</td>
<td>317</td>
<td>317</td>
</tr>
<tr>
<td>Wt. of propellant</td>
<td>gr</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Wt. of charge</td>
<td>gr</td>
<td>-</td>
<td>6,5</td>
</tr>
<tr>
<td>Muzzle-velocity</td>
<td>m/s</td>
<td>1050</td>
<td>1050</td>
</tr>
<tr>
<td>Gas pressure</td>
<td>kg/cm²</td>
<td>3400</td>
<td>3400</td>
</tr>
<tr>
<td>Tracer, colour</td>
<td>orange</td>
<td>orange</td>
<td>orange</td>
</tr>
<tr>
<td>Burnout-time</td>
<td>sec</td>
<td>ca 3</td>
<td>ca 3</td>
</tr>
<tr>
<td>Glowing track</td>
<td>m</td>
<td>up to 400</td>
<td>up to 400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>up to 200</td>
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</table>
Firing Table for Ground Targets  
20mm Ammunition

<table>
<thead>
<tr>
<th>Range m</th>
<th>Elevation</th>
<th>Time of Flight sec</th>
<th>Remaining Velocity m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1050,0</td>
</tr>
<tr>
<td>100</td>
<td>0,5</td>
<td>0,097</td>
<td>1008,2</td>
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<tr>
<td>200</td>
<td>1,0</td>
<td>0,198</td>
<td>966,7</td>
</tr>
<tr>
<td>300</td>
<td>1,5</td>
<td>0,304</td>
<td>925,6</td>
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<tr>
<td>400</td>
<td>2,0</td>
<td>0,415</td>
<td>885,0</td>
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<tr>
<td>500</td>
<td>2,6</td>
<td>0,530</td>
<td>844,2</td>
</tr>
<tr>
<td>600</td>
<td>3,2</td>
<td>0,652</td>
<td>803,4</td>
</tr>
<tr>
<td>700</td>
<td>3,9</td>
<td>0,780</td>
<td>762,7</td>
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<td>800</td>
<td>4,6</td>
<td>0,914</td>
<td>722,2</td>
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<td>900</td>
<td>5,4</td>
<td>1,057</td>
<td>681,4</td>
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<tr>
<td>1000</td>
<td>6,2</td>
<td>1,208</td>
<td>640,1</td>
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<tr>
<td>1100</td>
<td>7,1</td>
<td>1,370</td>
<td>598,4</td>
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<tr>
<td>1200</td>
<td>8,1</td>
<td>1,543</td>
<td>557,2</td>
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<tr>
<td>1300</td>
<td>9,2</td>
<td>1,729</td>
<td>517,4</td>
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<tr>
<td>1400</td>
<td>10,4</td>
<td>1,930</td>
<td>479,8</td>
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<tr>
<td>1500</td>
<td>11,7</td>
<td>2,146</td>
<td>444,6</td>
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<tr>
<td>1600</td>
<td>13,2</td>
<td>2,380</td>
<td>412,5</td>
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<tr>
<td>1700</td>
<td>14,8</td>
<td>2,631</td>
<td>383,9</td>
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<tr>
<td>1800</td>
<td>16,7</td>
<td>2,901</td>
<td>359,2</td>
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<tr>
<td>1900</td>
<td>18,7</td>
<td>3,188</td>
<td>339,5</td>
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<tr>
<td>2000</td>
<td>21,0</td>
<td>3,490</td>
<td>323,7</td>
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<tr>
<td>2100</td>
<td>23,5</td>
<td>3,805</td>
<td>311,0</td>
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<tr>
<td>2200</td>
<td>26,3</td>
<td>4,133</td>
<td>300,4</td>
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<tr>
<td>2300</td>
<td>29,3</td>
<td>4,472</td>
<td>290,6</td>
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<tr>
<td>2400</td>
<td>32,5</td>
<td>4,822</td>
<td>281,6</td>
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<tr>
<td>2500</td>
<td>36,0</td>
<td>5,183</td>
<td>273,2</td>
</tr>
</tbody>
</table>

Muzzle velocity: 1050 m/s  
Weight of Shell: 120 gr  
Spec. Weight of Air: 1225 g/m³
Comparision of Trajectories

M.K. 20mm HS 820, Ammunition

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= Shell 20mm, Armour piercing-, with hard metal core
Wt. of projectile 110gr.
Muzzle velocity 1135 m/sec

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= Shell 20mm, H.E. Incendiary-, DM 51 A1
Wt. of projectile 120gr
Muzzle velocity 1055 m/sec

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Trajectory height (m)

Trajectory range (m)
Armour-piercing, performance

Projectile: Shell 20mm, Armour-piercing, with hard metal core

Wt. of projectile: 110 gr

Muzzle velocity = 1135 m/s (Firing range = 100 m)
Muzzle velocity = 810 m/s (Firing range = 800 m)

○ = Perforation
+ = No perforation
Description of Fuse "Rh"
Shell, MK 20mm HS 820

General:

The mechanism of the fuse guarantees

1.) Safety of storage, handling, and transport.
2.) Safety zone of 6m in front of the muzzle against obstacles comparable to aluminium plate of 2mm.
3.) High sensitive ignition effect on impact also by small angles of impact. Test range 50m, against obstacles comparable to 1mm steel plate or 1mm aluminium plate.
4.) Self destruction after approx. 8.5 sec. time of flight.

Operation of Fuse

1.) Safety on transport
In transport the slider is kept in an absolutely locked position by arresting spring and safety pins. The percussion pin resting on the slider is thereby also kept locked.

2.) Muzzle safety device
When the round is fired the pellet due to centrifugal force runs through the bore of the holding piece and is received by the hole of the slider. By this the slider which rests originally in position "a" by force of gravity is now caused to slide into opposite direction to release percussion pin into striking position.
3.) Ignition on impact

When shell hits the target the diaphragm will be pressed in and the percussion pin released 3 will be forced into the detonator cap 8 by the ram 7. The detonator cap ignites the explosive charge which disintegrates the shell.

4.) Self-destruction

Due to centrifugal force the tightened spring 10 is arrested by the pellet safety device 9 during a time of flight of approx. 85 sec. Slackening rotating force enables spring to overcome pellet safety device and to force percussion pin 3 into the detonator cap. The self destruction is effected.
Fuse "Rh" for Shell, MK 20mm HS 820

SCALE 5:1
Description of Fuse AZZDM 131 A1
Shell, MK 20mm HS 820

General:
The mechanism of the fuse guarantees
1) Safety of storage, handling, and transport
2) Safety zone of 6m in front of the muzzle against obstacles comparable to aluminium plate of 2mm
3) High sensitive ignition effect on impact also by small angles of impact. Test range 50m against obstacles comparable to 1mm steel plate or 1mm aluminium plate ~ *0.397" per m*
4) Self destruction after approx. 8.5 sec. time of flight

Operation of Fuse

1) Safety on transport
Absolute safety on transport is ensured by a slider T which is kept in a fixed position by a closely wound spiral 2 of thin aluminium band. The percussion pin 3 rests on the slider and is also thereby locked.

2) Muzzle safety device
When shell is fired the centrifugal force slowly loosens the spiral 2 and the slider T is thus allowed to release the percussion pin 3 into firing position not before shell has been in free flight for min. 6 meters.

3) Ignition on impact
When target is hit by the shell the diaphragm 4 will be pressed in, and the percussion pin 3 is by a ram 5 forced into the detonator cap 6 which ignites the explosive charge and disintegrates the shell.

4) Self destruction
Mounted on a plate 8 is a rotation-dependent lever mechanism which after a approx. 8.5 sec. time of flight, releases a clog 7 and allows loosening of spring pressure 8 on a bush 9 which then lets the percussion pin 3 to be forced into the detonator cap 6 to effect self-destruction of the shell.
HISPANO SUIZA
Ammunition
GENERAL

HISPANO SUIZA ammunition 20 and 30 mm for automatic guns, for AA and Infantry, whose principal characteristics are:

- Complete safety in storage, in transport and handling, when firing
- Absolute reliability of functioning on impact and self-destruction
- Great explosive and destructive power
- Constant luminosity of tracer facilitating observation of fire
- Concordance with trajectories of the various types of ammunition

There are 3 groupes:

- Practice shells
- High explosive shells
- Armour-piercing shells
STRUCTURE OF CARTRIDGE

The cartridge consists of the projectile (1) the driving band (2) and the cartridge case (3) containing the propellant charge (5).

Shells of the same calibre and type of weapon are generally the same exterior shape, and present the same ballistic properties on the practical range.

The driving band (2) is of copper or sintered metal.

The cartridge case (3) is of copper or steel. It has at its base an extraction groove (3a) and at the head the crimping (3b) of the projectile. The bottom contains the mechanical electric primer (4).

The propellant charge (5) is nitrocellulose
### Available

<table>
<thead>
<tr>
<th></th>
<th>804</th>
<th>820A</th>
<th>820L</th>
<th>831A</th>
<th>831L</th>
</tr>
</thead>
<tbody>
<tr>
<td>20mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30mm</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

For aircraft gun

For AA/Infantry gun

### PRACTICE SHELLS

- Type EP
- Type ET

### HE. SHELLS

- Type UIA
- Type UIAT

### ARMOUR-PIERCING SHELLS

- Type RT
- Type RI
- Type RINT
- Type RIA
- Type RID
REMARKS: Shells: UIA, UIAT, RIA are filled with TRINALITE, a patented explosive made exclusively by HISPANO SUIZA.

TRINALITE has the H.E. effect of TNT, plus an incendiary and blast action due to its greater calorific power.

- TRINALITE compressed = 1380 kcal/kg
- TNT compressed = 950 kcal/kg
Practice shells have the same ballistic properties on a practical range as live shells.

This category comprises 2 types:

Type EP - inert shell without tracer
Type ET - inert shell with tracer (luminous track)
Effect of H.E. incendiary shell, type UIA 20 and 30 mm behind the target
H.E. shells are provided with a mechanical fuse functioning on impact or ensuring the automatic destruction of the shell.

This category comprises 2 types:

Type UIA  H.E. incendiary shell with high blast effect
Type UIAT  H.E. incendiary shell with blast effect with tracer
This category comprises 5 types:

Type RT  armour-piercing shell with tracer
Type RI  armour-piercing incendiary shell with ignition device
Type RINT  armour-piercing incendiary shell with hard metal core
Type RIA  armour-piercing incendiary shell with self-destruction bottom fuse
Effect behind the target and armour plating of an armour-piercing incendiary double effect shell, type RID 20 and 30 mm
HISPANO SUIZA AMMUNITION

Standard markings can be altered to suit customer's requirements.

EP  ET  UIA  UIAT

RT  RI  RINT  RIA  RID
### CHARACTERISTICS

<table>
<thead>
<tr>
<th>Designation</th>
<th>Types of ammunition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>804</td>
</tr>
<tr>
<td>Capacity</td>
<td>120 cart.</td>
</tr>
<tr>
<td>Weight: cartridges</td>
<td>31 kg</td>
</tr>
<tr>
<td>packing</td>
<td>11 kg</td>
</tr>
<tr>
<td>total</td>
<td>42 kg</td>
</tr>
<tr>
<td>Overall dimensions</td>
<td>300 mm</td>
</tr>
<tr>
<td>Height of case</td>
<td>240 mm</td>
</tr>
<tr>
<td>Width of case</td>
<td>580 mm</td>
</tr>
<tr>
<td>Length of case</td>
<td>414</td>
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