

DEFENCE AND SECURITY PRODUCT CATALOGUE

DEDICATED TO DEFENCE

Heart. Heritage. Horizon.

The **Aerospace** division covers Czech and Slovak companies operating in the aviation industry, civil and military aircraft, airborne and communications systems, aircraft upgrades, and air defence.



The **AMMO+** division comprises companies offering small-caliber ammunition for various categories of pistols, revolvers, machine guns, and shotguns.



The **Defence** division is represented by new and traditional companies operating in Czechia, Slovakia, Spain, and other European countries. They cover developing, producing, and selling military and special wheeled and tracked vehicles, heavy off-road trucks, weapons, and unique weapon systems. The companies also develop and manufacture ammunition of medium and large calibers for combat vehicles, artillery, and tanks.

The **Business Projects** division includes companies with strong potential or representing an exciting business opportunity.



The **Mobility** division belongs to the oldest producers in the field of means of transport in the world.



MSM GROUP

One of the significant companies in the **CSG Defence division**. The company is one of the world's largest ammunition producers, ammunition life cycle service providers, and **civil** and **defence technology** development specialists.



Development and **production** of ammunition for military purposes, especially tank, and artillery, large caliber ammunition.



Revision, modernization, and **extension** of the life cycle of ammunition, ammunition storage, and disposal services.



Comprehensive portfolio of high-performance ammunition, single-base propellants for medium caliber ammunition, and EOD equipment for armed and security forces.



Production of military containers, specialized containers for civilian customers, mobile and modular air traffic control towers and radio navigation systems.

Ammunition products and services in this catalogue by **ZVS, VOP, FM Granada**

THE MAIN PORTFOLIO

- 01| ARTILLERY AMMUNITION
- 02| TANK AMMUNITION
- 03| MORTAR BOMBS
- 04| MEDIUM CALIBER AMMUNITION
- 05| ROCKETS
- 06| WEAPONS
- 07| RECOILLESS RIFLE AMMUNITION
- 08| PROPELLANTS & EOD CHARGES
- 09| FUZES
- 10| PYROTECHNICAL COMPONENTS
- 11| PRACTICE AMMUNITION
- 12| LIFE CYCLE (SPECIFIC SERVICE -
INSPECTION, TESTING, REVISION)





TNT

155 mm
M107
01-18-1003M

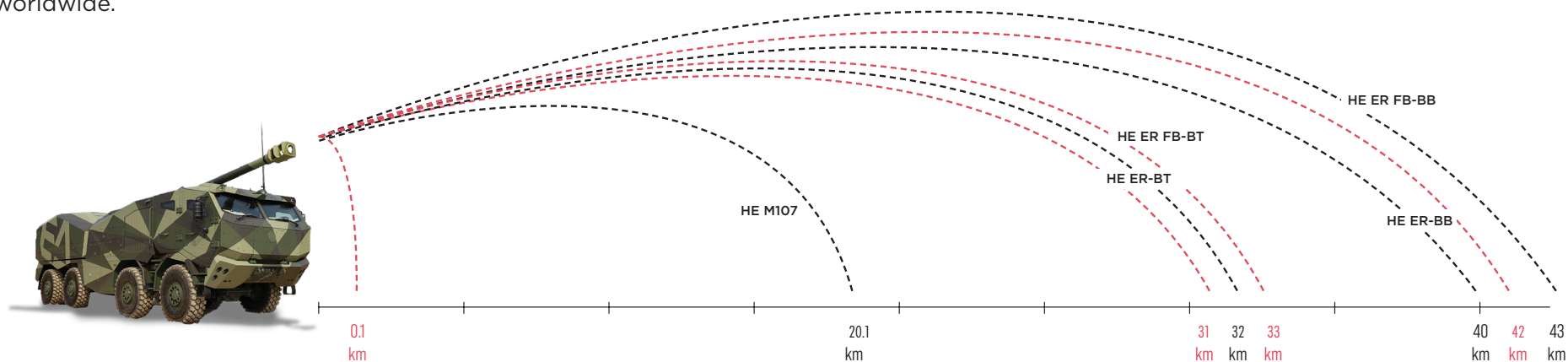
THE MAIN PORTFOLIO

ARTILLERY 155 MM AMMUNITION

155 mm artillery ammunition from the portfolio of MSM GROUP is a product that can be used in many of the currently used 155 mm guns and howitzers worldwide. Our ammunition has been tested in 155 mm weapon systems such as ZUZANA, NORA B-52, G5/G6, M109, M198, FH-70, and KRAB. The ammunition can be used against infantry, lightly armored targets, and structures.

MSM GROUP offers a wide variety of 155 mm ammunition for maximum flexibility and user comfort during training and operational use. Our portfolio offers High Explosives of different types - standard M107 projectiles of a different design - with nubs, boat tails, and base bleed units - to ensure an extended range of 43 km. Our 155 mm ammunition is supplied with point detonating fuzes of our design - KZ 984. The KZ 984 fuze fulfils all NATO standards and requirements for 155mm ammunition, but we can offer our customers other fuze types - proximity, time, and multi-purpose along with our NATO standard partners.

Our projectiles can be supplied with **various propelling charges** depending on the customer's demand - M3A1, M4A2, M119, M203, and modern Bi-Modular charge system, ensuring the best and most advanced firing capabilities. Our 155mm ammunition is currently in service in more than 18 countries worldwide.



TECHNICAL DATA

| Type of round | HE M107 | HE ER-BT (OFd MK) | HE ER-BB (OFd MK-DV) | HE ER FB-BT (OFd M3) | HE ER FB-BB (OFd M3-DV) | HE ER-BT (OFd MKM) | HE ER-BB (OFd MKM-DV) |
|----------------------------------|------------------------|---------------------|----------------------|----------------------|-------------------------|---------------------|-----------------------|
| Type | High Explosive (HE) | High Explosive (HE) | High Explosive (HE) | High Explosive (HE) | High Explosive (HE) | High Explosive (HE) | High Explosive (HE) |
| Caliber (mm) | 155 | 155 | 155 | 155 | 155 | 155 | 155 |
| Length without fuze (mm) | 607 | 828,5-831,7 | 837,5-840,7 | 828.5 | 793.1 | 816,5-819,7 | 825,5-828,7 |
| Length with fuze (mm) | max. 691 | max. 917 | max. 926 | max. 831.7 | max. 796.3 | max. 905 | max. 914 |
| Weight with fuze (kg) | 42.91 | 44.0 | 47.0 | 44.0 | 46.9 | 40.3 | 43.55 |
| Type of guiding ring | Copper | Copper | Copper | Copper | Copper | Copper | Copper |
| Weight of explosive filling (kg) | TNT 6.63 / Comp.B 7.00 | 9.9 | 9.9 | 9.9 | 8.6 | 10 | 10 |
| Explosive filling | TNT / Comp.B | TNT | TNT | TNT / Comp.B | TNT / Comp.B | TNT | TNT |
| Maximum allowed service pressure | 283 MPa | 440 MPa | 440 MPa | 440 MPa | 440 MPa | 395 MPa | 395 MPa |
| Thread dimensions | 2"-12UNS-1A | 2"-12UNS-1A | 2"-12UNS-1A | 2"-12UNS-1A | 2"-12UNS-1A | 2"-12UNS-1A | 2"-12UNS-1A |

Temperature limits

| | | | | | | | |
|------------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Use (°C) | -63 °C / +71°C | -50°C / +50°C | -50°C / +50°C | -63°C / +71°C | -63°C / +71°C | -50°C / +50°C | -50°C / +50°C |
| Storage/Transport (°C) | -54°C / +62°C | -54°C / +62°C | -54°C / +62°C | -54°C / +62°C | -54°C / +62°C | -54°C / +62°C | -54°C / +62°C |

PACKING

| Type of round | HE M107 | HE ER-BT (OFd MK) | HE ER-BB (OFd MK-DV) | HE ER FB-BT (OFd M3) | HE ER FB-BB (OFd M3-DV) | HE ER-BT (OFd MKM) | HE ER-BB (OFd MKM-DV) |
|------------------------------------|-------------|-------------------|----------------------|----------------------|-------------------------|--------------------|-----------------------|
| Number of pcs on one wooden pallet | 8 pcs | 8 pcs | 8 pcs | 8 pcs | 8 pcs | 8 pcs | 8 pcs |
| Dimensions of wooden pallet (mm) | 977x779x390 | 765x360x1032 | 765x360x1050 | 765x360x1032 | 765x360x1050 | 765x360x1020 | 765x360x1038 |
| Weight of wooden pallet (kg) | 358 | 367 | 391 | 367 | 390 | 337 | 363 |
| UN packing code | 0168 | 0168 | 0168 | 0168 | 0168 | 0168 | 0168 |

ARTILLERY 155 MM VMK

HE ER BB VMK / HE ER BT VMK

High Explosive Extended Range projectile with Base Bleed has the same projectile body with an explosive charge and the same fuze as the HE ER-BT projectile. But unlike the HE ER-BT projectile, the HE ER-BB projectile uses a discharge gas generator (Base Bleed), which ensures an extended range of up to 40,000 meters when fired from a 52 caliber gun. The 155mm projectile can be filled with high explosive like TNT and comp B.

Projectiles are designed to partially or completely destroy targets or temporarily slow down the progress of enemy forces, thereby limiting their combat effectiveness. 155 mm HE ER BT projectiles primarily allow the destruction of stationary targets, places with a high concentration of troops, field shelters, lightly armored targets, weapon systems, military equipment, transport equipment, etc. The effect of projectiles in the target is the kinetic energy of the shrapnel from the metal parts of the projectile body and the action of the pressure wave created by the explosion of the projectile.

All shooting tests are performed according to STANAG 4761 - AAS3P-20

The projectile is designed according to ballistic memoranda and is intended for a 155 mm howitzer. Can be used in 155 mm PzH2000, Zuzana 2000, Zuzana 2, Nora, Krab.



TECHNICAL DATA

| Projectile | HE ER BT VMK | HE ER BB VMK |
|-------------------------------------|--------------|---------------|
| Projectile weight (kg) | 43,55 kg | 46 kg |
| Projectile length without fuze (mm) | 791,2-794,6 | 793,1 – 796,3 |
| HE charge type | TNT | TNT |
| HE charge weight (kg) | 8,6 | 8,6 |
| Propellant type | - | - |
| Propellant weight | - | - |

Temperature limits

| | | |
|------------------------|---------------|---------------|
| Use (°C) | -46°C / +63°C | -46°C / +63°C |
| Storage/Transport (°C) | -51°C / +71°C | -51°C / +71°C |

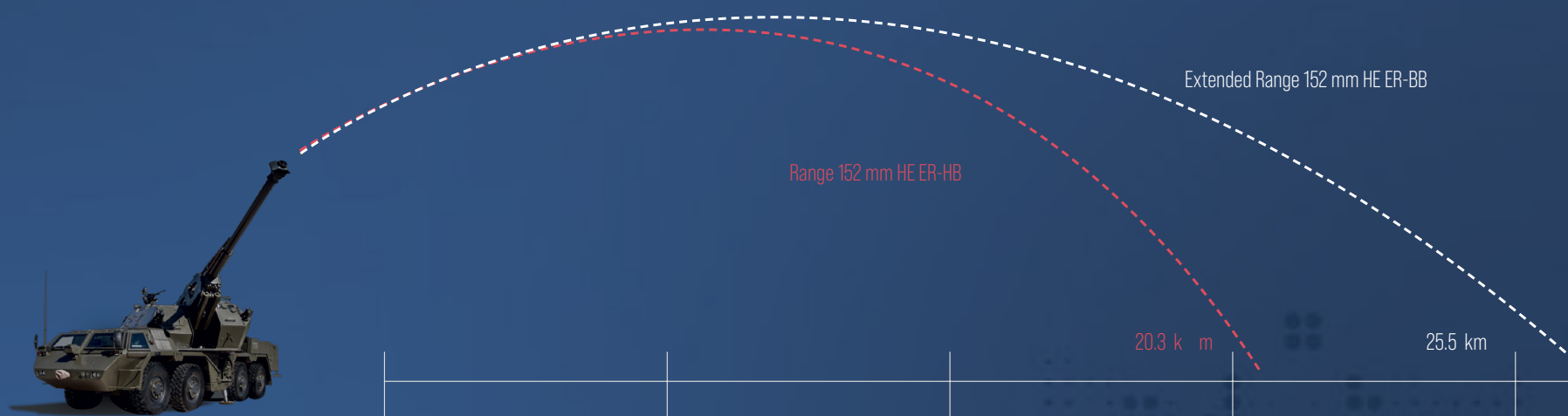
PACKING

| Type of round | HE ER BT VMK | HE ER BB VMK |
|------------------------------------|--------------|--------------|
| Number of pcs on one wooden pallet | 8 | 8 |
| Dimensions of wooden pallet (mm) | 370x950x790 | 370x950x790 |
| Weight of wooden pallet (kg) | 365 | 365 |
| UN packing code | 0169 | 0169 |

ARTILLERY 152 MM AMMUNITION

152 mm artillery ammunition from the MSM GROUP portfolio is the product originally designed for a 152 mm self-propelled gun-howitzer DANA (SpGH-77). However, this ammunition can be used with any 152 mm howitzer designed to withstand the pressure generated by the ammunition. The ammunition can be used against infantry, lightly armored targets, and structures.

MSM GROUP offers its customer a unique solution of an extended range of 152 mm ammunition which ensures the firing range of 20 km for boat tail (BT) projectiles and 25.5 km for base bleed (BB) projectiles. All projectiles for our 152 mm ammunition are supplied with PD fuzes of our own design – KZ 88M. The fuze fulfils all NATO standards requirements for 152 mm ammunition. Our 152 mm ammunition has been supplied to more than 12 countries worldwide. MSM GROUP is one of the few companies producing such ammunition within the NATO and EU territory and it ensures maximum production quality.



TECHNICAL DATA

| Type of round | 152 mm HE ER-HB | 152 mm HE ER-BB |
|--------------------------------------|-----------------------------------|-----------------|
| Weapons | 152mm SpGH 77; D-20+ 2S3 Akatsiya | 152 mm SpGH 77 |
| Projectile weight (kg) | 43.46 | 43.46 |
| Projectile length without fuze (mm) | 778 | 778 |
| Muzzle velocity (m.s ⁻¹) | 695 | 740 |
| Max. pressure (MPa) | 245 | 280 |
| High explosive type | TNT | TNT |
| High explosive type (kg) | 7.9 | 7.9 |
| Cartridge type | Ž-546 | P 760 |
| Propellant weight (kg) | 8.1 | 8.9 |

ARTILLERY 122 MM AMMUNITION

122 mm artillery ammunition for 122 mm D-30 and 2S1 GVOZDIKA

Semi-fixed 122 mm HE ammunition for 122 mm towed howitzer D-30 and self-propelled weapon system 2S1 GVOZDIKA consists of the HE projectile and cartridge case with a propelling charge. The HE projectile is equivalent to the original 53 OF 462, developed in the former USSR. Propelling charges can be used in full or reduced to ensure a wide variety of use in the whole range.

We offer both complete rounds, a projectile with a full charge (equivalent to the original round 3VOF5) and a projectile with a reduced charge (equivalent to the original round 3VOF6). Our 122 mm ammunition has been supplied to more than 9 countries worldwide. MSM GROUP is one of the few companies producing such ammunition within the NATO and EU territory and it ensures maximum production quality.



TECHNICAL DATA

Projectile (equivalent 53 OF 462)

| | | |
|---|----|-----------------|
| Weight of entire projectile | kg | 21.76 |
| Weight of HE charge /TNT/ | kg | 3.6 |
| Total length of projectile without fuze | mm | 496.36 - 504.7 |
| Total length of projectile with fuze | mm | 552.17 - 564.61 |

Cartridge with full charge

| | | |
|--------------------------------------|----|-----------------------|
| Weight of cartridge with full charge | kg | 7.835 |
| Average weight of full charge | kg | 3.8 |
| Powder charge | | Nitrocellulose powder |
| Total length of cartridge | mm | 447 ± 1.55 |
| Weight of steel cartridge case | kg | 3.66 ± 0.18 |

Cartridge with reduced charge

| | | |
|---|----|-----------------------|
| Weight of cartridge with reduced charge | kg | 6.435 |
| Weight of reduced charge | kg | from 0,6 to 2.5 |
| Powder charge | | Nitrocellulose powder |

Primer screw: KV-4

| | | |
|--------|----|-------|
| Weight | kg | 0.069 |
|--------|----|-------|

PACKING

Projectile (equivalent 53 OF 462)

| | | |
|---------------------------------------|-----|------------------------------------|
| Weight of empty wooden box | kg | 21.0 |
| Weight of full wooden box with 2 pcs | kg | 83 full charge - 80 reduced charge |
| Dimensions of wooden box | mm | 1,205 x 434 x 250 |
| Pallet unit dimensions | mm | 1,205 x 850 x 1,310 |
| Number of wooden boxes in pallet unit | pcs | 10 |

ARTILLERY 105 MM AMMUNITION

Half-ripple cartridges are used for the 105 mm M52 howitzer and M52A1 (M49 cannon), M101 and M101A1 (M2A1 and M2A2 cannons), M108 (M103 cannon) and M56 Pack howitzers.

Causes fragmentation effects and shock waves.

105 mm HEM1 The projectile is a hollow high-strength steel forging with a ship-tail base and welded base cover, an effective ogive and a single gold-plated metal drive belt.

105 mm Illum M314A3 The interior contains the firing cartridge, the ignition cartridge, the canister with flares and its parachute. The parachute is stored in a tube with a metal side that is divided into two halves. At the selected time, the fuze works by igniting the ejection charge, which then ignites the incendiary charge. The jetting charge creates pressure that pushes down on the necked container and the tube halves. The three shear pins are then broken to allow the base plate, parachute and canister to slide out, with the base plate shifted to one side due to the unbalanced condition. When this happens, the incendiary charge ignites the flash, which is magnesium nitrate and sodium bound together by resin.



TECHNICAL DATA

Projectile

| | |
|------------------------------|---------------------------------|
| Type | 105 mm HE M1 |
| Length (mm) | 440 |
| Mass (kg) | 14.5÷15.6 |
| Explosive charge (2 options) | TNT 2.2kg Composition B 2.3kg |

Round components

| | |
|-------------------------------|--------------------|
| Case (type/material) | M14/Brass |
| Primer | Percussion |
| Fuze | KZ-984 |
| Propelling charge | Single base powder |
| Approximate maximum range (m) | 11,270 |

Temperature limits

| | |
|------------------------|----------|
| Storage/Transport (°C) | -62/ +71 |
| Use (°C) | -40/ +51 |

PACKING

| Type of round | | 105 mm HE M1 |
|----------------------------|-----|--------------|
| Units per package | pcs | 2 |
| Packaging dimensions | mm | 922x307x195 |
| Complete packaging weight | kg | 68 |
| Pallet dimensions 24 units | mm | 1210x950x930 |
| Full pallet weight | kg | 860 |

TECHNICAL DATA

Projectile

| | |
|------------------------------------|---------------------|
| Type | 105 mm ILLUM M314A3 |
| Length (mm) | 460 |
| Mass (kg) | 14.8 |
| Expelling charge-Black powder (kg) | 0.06 |

Illuminating canister

| | |
|-------------------------------|--------------------|
| Average luminosity (cd) | 450,000 |
| Average time luminosity (s) | 50 |
| Case (type/material) | M14 / Brass |
| Primer | Percussion |
| Fuze | Time Fuze |
| Propelling charge | Single base powder |
| Approximate maximum range (m) | 11,270 |

Temperature limits

| | |
|------------------------|----------|
| Storage/Transport (°C) | -54/ +62 |
| Use (°C) | -40/ +62 |

PACKING

| Type of round | | 105 mm ILLUM M314A3 |
|----------------------------|-----|---------------------|
| Units per package | pcs | 2 |
| Packaging dimensions | mm | 922x307x195 |
| Complete packaging weight | kg | 68 |
| Pallet dimensions 24 units | mm | 1210x950x930 |
| Full pallet weight | kg | 860 |

TANK 105 MM AMMUNITION

We produce the following types of 105 mm tank ammunition:

105 HE, R-105-60, 105 HEAT-T, M456A1, 105 TP-T, M490, 105 APFSDS-T, C512.

USE: against bunkers, fortifications, light armor and personnel, against armored and semiarmored, use for various purposes, such as disrupting explosive devices or ammunition. 105 TPCSDS-T G141 and 105 TP-T, M490 use for **firing and aiming practice**.



TECHNICAL DATA

| Projectile | HE R-105-60 | TPCSDS-T G141 | HEAT-T M456A1 | TP-T M490 | APFSDS-T C512 |
|-------------------------------------|-------------|---------------|---------------|-----------|---------------|
| Type | HE | TPCSDS-T | HEAT-T | TP-T | APFSDS-T |
| Subprojectile | — | Steel core | — | — | Tungsten core |
| Length (mm) | 443.5 | 647 | 647 | 647 | 647 |
| Mass (kg) | 12.1 | 3.925 | 10.3 | 10.3 | 5.92 |
| Explosive charge-Composition B (kg) | 2.7 | — | 0.97 | — | — |

Round components

| | | | | | |
|----------------------|----------------------|--------------------|--------------------|--------------------|--------------------|
| Case (type/material) | M148L / Brass | M148L / Brass | M148A1 / Brass | M148A1 / Brass | M148L / Brass |
| Primer | Electric | Electric | Electric | Electric | Electric |
| Fuze | KZ-984 or equivalent | — | PIBD | — | — |
| Propelling charge | Single base powder | Single base powder | Triple base powder | Triple base powder | Single base powder |
| Effective range (m) | 11,300 | 8,000 | 8,200 | 8,200 | 36,700 |

Temperature limits

| | | | | | |
|------------------------|-----------|-----------|-----------|-----------|-----------|
| Storage/Transport (°C) | -54 / +62 | -38 / +51 | -54 / +62 | -63 / +71 | -38 / +51 |
| Use (°C) | -40 / +52 | -32 / +51 | -40 / +60 | -40 / +51 | -32 / +51 |

PACKING

| Type of round | | HE R-105-60 | TPCSDS-T G141 | HEAT-T M456A1 | TP-T M490 | APFSDS-T |
|----------------------------|-----|----------------|----------------|----------------|----------------|----------------|
| Units per package | pcs | 2 | 2 | 2 | 2 | 2 |
| Packaging dimensions | mm | 1162x356x221 | 1162x356x221 | 1162x356x221 | 1162x356x221 | 1230x196x196 |
| Complete packaging weight | kg | 68 | 51 | 68 | 68 | 68 |
| Pallet dimensions 24 units | mm | 1200x1100x1030 | 1200x1100x1030 | 1200x1100x1030 | 1200x1100x1030 | 1200x1100x1030 |
| Full pallet weight | kg | 825 | 625 | 825 | 825 | 825 |

TANK 120 MM AMMUNITION

We produce the following types of 120 mm tank ammunition:

APFSDS-T, TPCSDS-T, HEAT-MP-T, TP-T, HE-T.

Use: High velocity kinetic energy round for use against armored targets and personnel, firing and aiming practice, against bunkers, fortifications, light armor. Our production capacity is 160 rounds/day for all types.



TECHNICAL DATA

| Projectile | APFSDS-T | HEAT-MP-T | HE-T G201 | TPCSDS-T G151 | TP-T |
|-------------------------------------|---------------|-----------|-----------|---------------|------|
| Type | APFSDS-T | HEAT-MP-T | HE-T | TPCSDS-T G151 | TP-T |
| Subprojectile | Tungsten core | – | – | Steel core | – |
| Length (mm) | 686 | 726 | 647 | 496.6 | 726 |
| Mass (kg) | 7.2 | 15 | 16.8 | 4 | 15 |
| Explosive charge-Composition B (kg) | – | 1.8 | 3.2 | – | – |

Round components

| | | | | | |
|-------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Case (type/material) | Combustible / NC | Combustible / NC | Combustible / NC | Combustible / NC | Combustible / NC |
| Primer | Electric | Electric | Electric | Electric | Electric |
| Fuze | – | PIBD | PD728 | – | – |
| Propelling charge | Double base powder | Triple base powder | Single base powder | Single base powder | Triple base powder |
| Approximate maximum range (m) | > 4,000 | > 4,000 | 3,000 | 8,000 | > 4,000 |

Temperature limits

| | | | | | |
|------------------------|-----------|-----------|-----------|-----------|-----------|
| Storage/Transport (°C) | -40 / +71 | -40 / +63 | -40 / +63 | -40 / +63 | -40 / +63 |
| Use (°C) | -40 / +65 | -40 / +52 | -40 / +52 | -40 / +52 | -40 / +52 |

PACKING

| Type of round | | APFSDS-T | HEAT-T-MP-T | HE-T G201 | TPCSDS-T | TP-T |
|----------------------------|-----|---------------|-------------------------|---------------|---------------|---------------|
| Units per package | pcs | 1 | 1 | 1 | 1 | 1 |
| Packaging dimensions | mm | 1230x196x196 | 1230x196x196 | 1230x196x196 | 1230x196x196 | 1230x196x196 |
| Complete packaging weight | kg | 30 | 35 | 45 | 36 | 25 |
| Pallet dimensions 20 units | mm | 1230x1145x990 | 25 units: 1230x1145x990 | 1230x1145x990 | 1230x1145x990 | 1230x1145x990 |
| Full pallet weight | kg | 775 | 900 | 905 | 725 | 900 |

TANK 125 MM AMMUNITION

125 mm family ammunition

125 mm ammunition is designed for 125 mm smoothbore guns D-81 (2A46) and their modifications, usually used like main tank guns on tank types T-72, T-80, and T-90. The semifixed ammunition consists of the projectile and semi-combustible cartridge.

We offer 125 mm ammunition with the following types of projectiles - HE - standard high explosive charge with blast and fragmentation effect, HEAT-T - high explosive shaped charge with the tracer for penetration effect, HE-T - with high explosive charge and tracer but with 2 self-destruct fuzes for training purposes, BLANK round - used for training of personnel - loading, handling and firing with a low danger area and APFSDS-T round - armour piercing fin-stabilized discarding sabots with tracer projectile capable of penetrating heavy armour up to 550 mm RHA on 2000 m. Our 125 mm ammunition has been supplied to more than 11 countries around the world and MSM GROUP is one of the few companies producing such ammunition within the NATO and EU territory and it ensures the maximum quality of production.



TECHNICAL DATA

| Type | HE | HE-T PRACTICE | HEAT-T | APFSDS |
|--------------------------------------|------------|---------------|------------|-------------------------|
| Projectile length without fuze (mm) | 614-617 | 614-617 | 598-601 | 590-593 |
| Muzzle velocity (m.s ⁻¹) | 840 | 840 | 905 | 1690 |
| High explosive charge - type | TNT | TNT | RDX or HMX | — |
| High explosive charge - weight (kg) | 3.05 | 3.05 | 1.65 | — |
| Propellant type (cartridge case) | Ž-40, Ž-52 | Ž-40, Ž-52 | Ž-40, Ž-52 | — |
| Accuracy | — | — | — | 0.5 m x 0.5 m at 2000 m |

PACKING

| Type of round | | HE | HE-T PRACTICE | HEAT-T | APFSDS |
|---------------------------|-----|---------------|---------------|-------------|---------------|
| Units per package | pcs | 1 | 1 | 1 | 1 |
| Packaging dimensions | mm | 832x535x289 | 832x535x289 | 832x430x270 | 815x490x295 |
| Complete packaging weight | kg | 60 | 60 | 55 | 52 |
| Pallet dimensions 8 units | mm | 1075x832x1143 | 1075x832x1143 | — | 815x1200x1255 |
| Full pallet weight | kg | 514 | 514 | — | 440 |

MORTAR BOMBS

60 mm Mortar Munitions

Mortar bombs are designed for defeating lightly armoured targets, machine gun nets, field fortifications, infantry units in trenches, and units hidden behind natural obstacles, especially in mountainous and woody terrains.

The 60 mm NATO standard mortar bombs are intended for fire from the 60 mm Ultralight Commando Mortar and from the 60 mm mortar LR.

Each bomb is packed separately into a water-proof plastic case and 10 pcs in wooden transport boxes. The ammunition is transported in the prescribed storage package or separately in the specific water-resistant covers only.



TECHNICAL DATA

| Type | HEI | HEF | JUMP | SMK | ILL-IR | ILL-V |
|-------------------------------------|-----------------------------|-----------------------------|--------------|----------------|----------------|----------------|
| Weight of mortar bomb | 1,420 g | 1,420 g | 1,290 3 30 g | 1,420 g | 1,150 g | 1,150 g |
| Weight of main charge | 268 g (HTX) | 214 g (TNT) | – | 200 g | – | – |
| Weight of primary propelling charge | 5.0 g | 5.0 g | – | 5.0 g | 5.0 g | 5.0 g |
| Weight of augmenting charge (pair) | 2x3.05 ± 0,5 g | 2x3.05 ± 0,5 g | – | 2x3.05 ± 0,5 g | 2x3.05 ± 0,5 g | 2x3.05 ± 0,5 g |
| Length of the bomb with fuze | 293 ± 2 mm | 293 ± 2 mm | 284 mm | 294 ± 2 mm | 267 mm | 267 mm |
| Range (at 21°C) - elevation 85° | 102 m | 102 m | – | 80 m | 80 m | 80 m |
| Range (at 21°C) - elevation 45° | 3,098 m | 3,098 m | – | 1,200 m | 1,200 m | 1,200 m |
| Fuze type | AF-66/ AR-MDH/ DM 111 | AF-66/ AR-MDH/ DM 111 | – | AR-MDH | AR-MDH | AR-MDH |

MORTAR BOMBS

81 mm, 98 and 120 mm Mortar Ammunition

The 81 mm and 98 mm HE mortar ammunition were developed together with mortars for Slovak MOD, and 120 mm mortar ammunition was developed in the former Czechoslovakia. All HE mortar ammunition has a high explosive charge of Hexotol for increasing the blast and fragmentation effect against TNT charge. All shells utilize our MZ-95M or MZ-81M fuzes developed in Slovakia according to NATO standard requirements.

Both fuzes are nose-point detonating fuzes designed for high-explosive mortar ammunition. The fuzes can be set on super quick or delayed action according to the required effect on the target (fragmentation/blast effect). The fuzes have transport safety pins and mask safety.



TECHNICAL DATA

| Type of round | 81 mm | 98 mm | 120 mm |
|----------------------------------|--------------------------|--------------------------|---------------------|
| Type | High Explosive (HE) | High Explosive (HE) | High Explosive (HE) |
| Caliber (mm) | 81 | 98 | 120 |
| Length without fuze (mm) | max. 413,6 | 543-545 | max. 665,5 |
| Length with fuze (mm) | max. 492,1 | max. 624,3 | max. 737 |
| Weight with the fuze (kg) | 5.0 | 9.2 | 16 |
| Weight without the fuze (kg) | 4.3 | 8.5 | 15.3 |
| Type of guiding ring | labyrinthine | labyrinthine | labyrinthine |
| Weight of explosive filling (kg) | 0.72 | 1.46 | 2.66 |
| Explosive Filling | TNT / HEXOTOL | TNT / HEXOTOL | TNT |
| Projectile designed for weapon | Mortar 81mm | Mortar 98mm | Mortar 120mm |
| Maximum allowed service pressure | 126 Mpa | 128 Mpa | 140 Mpa |
| Fuze | Point Detonated – MZ-95M | Point Detonated – MZ-95M | MZ-81M |
| Operation/Use temperature | -50°C up to +50°C | -50°C up to +50°C | -50°C up to +50°C |

PACKING

| Type of round | | 81 mm | 98 mm | 120 mm |
|------------------------------------|-----|-------------|-------------|---------------|
| Number of pcs on one wooden pallet | pcs | 12 | 8 | 24 |
| Dimensions of wooden pallet | mm | 640x534x573 | 780x770x550 | 1056x888x1080 |
| Weight of wooden pallet | kg | 100 | 132 | 620 |

MEDIUM CALIBER AMMUNITION

30x165 mm Ammunition

30x165 mm is ammunition designed originally for the BMP-2 main gun caliber of 30x165 mm, however, the compatibility has been ensured for all - 2A38, 2A42, and 2A72 guns. It is ammunition designed for light target engagement with a wide variety of use depending on the type used.

MSM GROUP currently offers its customers a wide range of 30x165 mm ammunition with the following types:

- HE-T** with high explosive filling with blast and fragmentation effect
- AP-T** with armour piercing projectile capable of penetrating light armour
- HEI-T** with high explosive filling with a blast, fragmentation and incendiary effect
- APHC** with armour piercing tungsten hardcore projectile capable of increased penetration of medium armour
- HE-T Practice** ensuring the mitigation of collateral damage in case of misfire

Our 30x165 mm ammunition has been supplied to more than 12 countries around the world and MSM GROUP is one of the few companies producing such ammunition within NATO and the EU territory and it ensures the maximum quality of production.



TECHNICAL DATA

| Type | AP (AP-T) | APHC | HEI (HEI-T) | HE (HE-T) | HE-T TRAINING |
|--------------------------------------|-------------|-----------------|--------------------------|-----------------------|--------------------------|
| Weight of round (kg) | 0.858 | 0.835 | 0.835 | 0.835 | 0.835 |
| Length of round (mm) | 288.5-291.8 | | | | |
| Muzzle velocity (m.s ⁻¹) | 970 | 1050 | 960 | 960 | 960 |
| Self-destruction time (s) | – | – | 9.0-14.0 | 9.0-14.0 | 5.5-9.5 |
| Fuze | – | – | Impact, self-destructive | Impact, self-destruct | 2x self-destructive only |
| Penetration RHA | – | 70 mm per 100 m | – | – | – |

MEDIUM CALIBER AMMUNITION

30x173 mm Ammunition

The **30 mm** ammunition is designed for the GTS-30N main gun and other **30x173 mm** caliber weapons.

TP-T with a tracer is intended for training purposes for verification of weapon function and operator verification for weapon and ammunition control.

API-T is an armour piercing projectile capable of penetrating light armour and with an incendiary effect.

HEI-T - is a projectile with a tracer and a high explosive charge with for use in live combat conditions. The projectile includes an igniter, which contains an auto-destruct and mask safety as required by STANAG.



TECHNICAL DATA

| Type | TP | TP-T | MP-T/SD | HEI-T/SD | API-T | APFSDS-T |
|--------------------------------------|-------|-------|------------------------------|----------|-----------------------------|------------------------------|
| Weight of round (kg) | 0.835 | 0.835 | 0.835 | 0.835 | 0.85 | 0.706 |
| Length of round (mm) | 290 | | | | | 281 |
| Muzzle velocity (m.s ⁻¹) | 1070 | | | | | 1430 |
| Self-destruction time (s) | – | – | 4.7 | 6 | – | – |
| Fuze | – | – | Impact | Impact | – | – |
| Penetration RHA | – | – | 10 mm RHA/ 60° NATO / 1000 m | – | 40 mm RHA/ 0° NATO / 1000 m | 115 mm RHA/ 0° NATO / 1000 m |

ROCKETS

122 mm HE rockets “GRAD” for 122 mm MLRS

122 mm HE rocket and **122 mm HE rocket with extended range** was developed for 122 mm MLRS (multiple rocket launcher systems) BM-21 GRAD and RM-71. But it can be used with any equivalent rocket launcher with a similar design and characteristics. The HE rockets are intended for use against enemy manpower in the open and in field shelters, for making passages in minefields and communications lines, against hostile artillery, and for destroying armored material.

MSM GROUP offers its customers a standard 122 mm HE rocket with a 20 km range and a 122 mm HE rocket with an extended range of 40 km. All of our rockets are supplied with an MRV-U fuze, the standard fuze compatible with “GRAD.” The fuze is a nose, a mechanical point detonating with selectable SQ or delayed action. The warhead has an internal part with iron prefabricated fragments for a higher fragmentation effect.

Our 122 mm rockets have been supplied to more than 8 countries worldwide. MSM GROUP is one of the few companies producing such ammunition within the NATO and EU territory and it ensures maximum production quality.



TECHNICAL DATA

| Type | GRAD Original | GRAD Extended range |
|------------------------|---------------|---------------------|
| Length | 2,875 mm | 2,875 mm |
| Total Mass | 66 kg | 69 kg |
| Warhead Mass with Fuse | 19.1 | 19.1 |
| Propellant Mass | 20.45 kg | 27.3 kg |
| Burning Time | 2.0 s | 2.7 s |
| Max. Velocity | 690.6 m/s | 1,100 m/s |
| Max. Range | 20.3 km | 40.2 km |

WEAPONS

ANTOS Ultralight Portable 60 mm mortar system

The 60 mm mortar is an extremely light weapon designed for paratroops and special units. Most parts are made of aluminum alloys and plastic materials. The firing mechanism is a trigger type with a fixed striker. The handgrip with a trigger allows easy carrying and firing in oval and flat trajectories. The liquid sight shows the range for both charges directly. The modular design enables the production of various configurations.



TECHNICAL DATA

| | |
|---|---------|
| Caliber | 60 mm |
| Weapon length | 905 mm |
| Barrel length | 536 mm |
| Barrel length with breech ring | 790 mm |
| Range of aimed elevation | 40°-85° |
| Mortar weight | 5.3 kg |
| Mortar weight with spare parts and accessories in storage package | 22 kg |

Range

| | |
|---------------|---------|
| Maximum range | 1,230 m |
| Minimum range | 80 m |

ANTOS-LR 60 mm long range mortar

ANTOS-LR is an 60 mm mortar assembled from high strength aluminum titan alloys and plastic components. Standardized mortar caliber 60.7 mm allows the use of the 60 mm mortar munitions produced by MSM and selected mortar munitions from NATO countries.

The 60 mm mortar ANTOS-LR is designed to increase the firepower of paratroops, reconnaissance, and special units. It operates as an artillery support weapon at the squad or platoon level. It is intended to neutralize and destroy infantry troops and their means of fire located in unprotected trenches and shelters.



TECHNICAL DATA

| | |
|--|----------|
| Caliber | 60.7 mm |
| Barrel length | 1,000 mm |
| Total weight including sight | <15.9 kg |
| Aiming angles in traverse, no change of bipod position | +/-6 |
| Elevation | 40°-85° |

Range

| | |
|--|---------|
| Minimum range (+21°C, 85°, primary charge 0) | 102 m |
| Maximum charge (+21°C, 45°, full charge 3) | 3,098 m |

106 MM RECOILLESS RIFLE AMMUNITION

106 MM HEAT M344A1

The **106 mm M344A1** is a fixed round, with the projectile rigidly secured to the perforated steel cartridge cases by eight equally spaced ball-point crimps. When fired in the M40 recoilless rifle, the round compensates forces, canceling the weapon's recoil. On impact with a target, the piezoelectric element generates an electrical charge to initiate the PIBD fuze and detonate the projectile charge. The resultant detonation produces a high-velocity particle jet to penetrate the target armor.



TECHNICAL DATA

| Type | |
|------------------|------------|
| HEAT M344A1 | |
| Explosive charge | 1.8 KG bxp |
| Case material | STEEL |

| Ballistic characteristics | |
|----------------------------------|----------|
| Muzzle speed | 503 m/s |
| Chamber pressure | ≤ 83 MPA |

| Range | |
|------------------------|---------|
| Approximate max. range | 7,600 M |

| Primer | |
|---------------|------------|
| Type | PERCUSSION |
| Model | M57 |

PROPELLING CHARGES

155 MM M3A1

The **M3 series propelling charges** are the green bag type designed for use in 155 mm howitzers for firing in Zones 1 through 5. The full charge consists of approximately 2.49 kilograms of propellant including a base charge and four unequal increments is loaded in cloth bags. The bags are fastened together with four cloth straps sewn to the base and tied on top of Increment 5. Charge M3 is assembled without flash reducer pads. Charge M3A1 includes 3 flash reducer pads containing potassium nitrate or potassium sulfate. An ounce pad is assembled forward of the base charge and there are two 28.3 grams pads forward of Increments 4 and 5. The igniter charge of the M3A1 is 99.2 grams of clean-burning igniter (CBI) in a red cloth bag sewn to the rear of the base section. The igniter charge of the M3 is 85 grams of black powder.



TECHNICAL DATA

| Type | Green bag, separate loading |
|-----------------------------|--|
| Weight | 2.81 kg |
| Length max. | 40.7 cm |
| Colour | Green with black markings |
| Propellant | M1 (2.54 kg explosive) |
| 155 mm Howitzer with cannon | M1, M1A1, M45, M126 M126A1, M185, M199 |

155 MM M4A2

The **M4A2 (white bag) Propelling Charge** is a separate loading charge used in 155mm howitzers for firing in Zones 3, 4, 5, 6, and 7. The full M4A2 Propelling Charge consists of 6 kg, of M1 propellant and is divided between a base charge and four unequal increments loaded in white cloth bags. The increments are connected by four cloth tapes sewn to the base and tied on top of the increment. The igniter contains a clean-burning igniter (CBI) in a red cloth pad sewn to the bottom of the base charge. A flash reducer pad containing potassium sulfate or potassium nitrate is installed at the front end of the base pad (Increment 3). The seams in the base pad are inverted so that the edges of the cloth are inward to reduce residue after firing.



TECHNICAL DATA

| Type | White bag, separate loading |
|-----------------------------|--|
| Weight | 6.35 kg |
| Length max. | 53.34 cm |
| Colour | White with black markings |
| Propellant | M1 (6.08 kg explosive) |
| 155 mm Howitzer with cannon | M1, M1A1, M45, M126 M126A1, M185, M199 |

155 MM M119A2

This propelling charge is a **Zone 7 red bag charge** for firing in 155mm Howitzers containing M185 and M199 cannon. The M119A2 Propelling Charge is a single increment red bag charge which contains a base igniter pad with 113.4 grams of CBI powder and a center spot of 14,1 grams of black powder. The charge is approximately 73,6 centimeters long by 15.2 centimeters in diameter and contains 9,4 kilograms of M6 propellant. The forward end of the charge has an 85 grams lead foil liner and four pockets sewn longitudinally to the circumference. Each of the four pockets contains 113.4 grams of potas-sium sulfate to act as a flash reducer.



TECHNICAL DATA

| Type | Red bag, separate loading |
|-----------------------------|----------------------------------|
| Weight | 10.7 kg |
| Length max. | 67 cm |
| Colour | Red with black markings |
| Propellant | M6 (9.5 kg explosive) |
| 155 mm Howitzer with cannon | M185 (M109A1/A2/A3), M199 (M198) |

PROPELLANTS

DEVELOPMENT AND PRODUCTION OF PROPELLANTS

We develop and produce **high-performance single-base propellants** and **Spherical propellants** for both medium-caliber (12.7 to 35 mm) and large caliber ammunition, as well as 60, 81 and 120 mm mortar ammunition. All of our propellants are produced in compliance with EU REACH regulations and offer:

- Excellent ballistic performance
- Optimized surface treatment with increased density
- Free NGL extrusion technology
- Improved stability

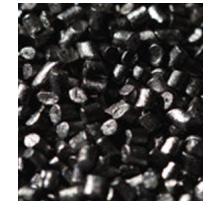
We have extensive experience and a proven track record in the manufacture of propellants, among others:

- 12.7x99 mm NATO
- 20X128 mm TP, HEI
- 20x139 mm TP, HE
- 25x137 mm TP-T, HE
- 30x173 mm TP, MP
- 35x228 mm TP, HEI
- Special R&D for other calibers

FMG develops and manufactures high performance single base propellants and also spherical propellants for medium caliber that always meet the highest level of customer satisfaction in terms of innovation, performance and safety.

In our propellant manufacturing plant founded in 1987, we design, develop and manufacture propellants applying the latest technology, improving extrusion and surface treatments, obtaining products to meet the most demanding market requirements.

A large customer base of medium caliber ammunition manufacturers attached to NATO as well as its allied countries, use our propellants, manufactured according to their requirements or jointly developing the product in our facilities.



CHARGE SYSTEM

BI-MODULAR

BMCS is a further developmental stage of the design of charge systems for separated ammunition. These are the 2nd generation modular charges. The complete Bi-Modular Charge System (BMCS) represents in its design substance the solution of charge systems by two types of modules: A bottom Charge module and a TOP Charge module. The bottom Charge module serves for covering small ranges of fire (it consists of one Zone-1 module and two Zone-2 modules). The TOP Charge module serves for covering of long and maximum ranges of fire (it comprises three to six modules - Zone - 3, 4, 5, and 6).

BMCS is advantageous over conventional cloth bag charges because of simpler operation and reduced logistics during storage, transportation, and a war scenario.



FUZES

KZ-984 Fuze



KZ-984 fuze is an artillery muzzleloader. It is designed for use in 155 mm caliber fragmentation artillery ammunition. It is a mechanic detonator, muzzle-operated, impact-operated with immediate or delayed function.

The detonator is of the mechanical type with a detonating safety. It is used for target destruction with a fragmentation effect. It is possible to set the fuze for instantaneous function “O” or delayed function “Z”.

TECHNICAL DATA

| Fuze | KZ-984 |
|----------------------|------------------------------|
| Type | Point Detonation (PD) |
| Fuze length | 143 |
| Fuze weight | 0,7 |
| Thread | 12“-12UNS |
| Painting and marking | according to AOP-2 Edition D |
| Ammunition | HE |
| Use temperature | -40°C up to +50°C |

PACKING

| Fuze | KZ-984 |
|------------------------------------|-----------------|
| Number of pcs on one wooden pallet | 240 |
| Dimensions of wooden pallet | 1250x942x878 mm |
| Weight of wooden pallet | 740 kg |
| UN Code of product | UN 0107 |
| ADR Code | 1.2 B |



MZ-95M Fuze

MZ-95M fuze is designed for 81 mm, and 98 mm mortar bombs. It is a mechanical point detonating fuze with a detonator's reinforced cap and mask safety. Depending on the requested effect, it is possible to set the fuze for immediate or delayed function.

TECHNICAL DATA

| Fuze | MZ-95M |
|----------------------|------------------------------|
| Type | Point Detonation (PD) |
| Fuze length | 125 |
| Fuze weight | 0,671 |
| Thread | 1,5"-12 TPI |
| Painting and marking | according to AOP-2 Edition D |
| Ammunition | HE |
| Use temperature | -50°C up to +50°C |

PACKING

| Fuze | MZ-95M |
|------------------------------------|---------|
| Number of pcs on one wooden pallet | – |
| Dimensions of wooden pallet | – |
| Weight of wooden pallet | – |
| UN Code of product | UN 0107 |
| ADR Code | 1.2 B |

PYROTECHNICAL COMPONENTS

PRIMING SCREW KV-4

Priming screw (mechanical type) serves for powder filling charge initiation in the cartridge by firing-pin device of a weapon. It is used in ammunition for projectiles of 100, 122, 152 mm caliber weapons systems.



TECHNICAL DATA

| Type | KV-4 |
|-----------------------|----------------|
| Type of priming screw | mechanical |
| Height | 23.8 mm |
| Max. diameter | 30 mm |
| Thread | 27.151 x 1/14" |
| Weight | 0.069 kg |

PRIMING SCREW GUV-7

Combined priming screw (of mechanical-electrical type) serves for initiation of powder filling charge of the cartridge by firing-pin and electrically. It is used in ammunition for projectiles of 125 mm caliber weapons systems.



TECHNICAL DATA

| Type | GUV-7 |
|-----------------------|---------------------------|
| Type of priming screw | mechanical-electrical |
| Height | 24 mm |
| Max. diameter | 30 mm |
| Thread | 27.178 x 14 TPI. Class 2. |
| Weight | 0.088 kg |



PRIMER M82

M82 ZVS primer is dedicated for initiation of propelling charges of types M3A1, M4A2, M119A1/2, M203, BMCS and others on all 155 mm howitzers compatible with JBMoU.

TECHNICAL DATA

| Type | M82 |
|---------------------|-----------|
| Total height | 50 mm |
| Max. diameter | Ø15.15 mm |
| Cartridge diameter | Ø11.25 mm |
| Total weight | 30,5 g |
| Black powder weight | 1,7 g |
| Max. pressure | ≤ 450 MPa |

SENSITIVITY

| Lower sensitivity | |
|-------------------------------|------------------------------------|
| Upper value | Initiating energy ≥ 1,08 J - 100 % |
| Lower value | Initiating energy ≤ 0.29 J - 0 % |
| Higher sensitivity - standard | |
| Upper value | Initiating energy ≥ 1.03 J - 100 % |
| Lower value | Initiating energy ≤ 0.17 J - 0 % |

EOD CHARGES

LARGE CALIBER PERFORATION CHARGES

USE

- Demolition of supporting structures
- Removal of rocks
- Disposal of ammunition including ammunition buried to a depth up to 2 meters in diverse terrains
- Perforation for various purposes

CHARACTERISTICS

- Ready to use
- Anti-magnetic and safe for use
- Easy to initiate
- High perforation capacity in proportion to the explosive mass
- The charge support allows its use in the vertical or horizontal position
- The type of interference material whether sand, earth, asphalt, concrete, etc..., has little influence in most interference materials



TECHNICAL DATA

| Type | | CPD-106 | CPD-200 |
|------------------|----|----------|--------------|
| Diameter | mm | 122 | 215 |
| Height | mm | 230 | 375 |
| Mass | kg | 3.16 | 18.5 |
| Explosive weight | kg | HWC 1.85 | HT+HWC 10.20 |
| Perforation | mm | 500 | 1 000 |
| Stand-off | mm | 400 | 800 |

Temperature limits

| | | |
|------------------|-----------|-----------|
| Use/Storage (°C) | -30 / +52 | -30 / +52 |
|------------------|-----------|-----------|

PACKING

| Type | | CPD-106 | CPD-200 |
|-------------------|----|-------------|---------|
| Unity per package | kg | 4 | 1 |
| Pack dimensions | kg | 475x432x345 | |
| Pack weight | mm | 23.0 | 30.5 |

SMALL CALIBER PERFORATION CHARGES

USE

- Cutting of supporting structures
- Removal of rocks
- Disposal of ammunition
- Perforations for multiple purposes

CHARACTERISTICS

- Anti-magnetic
- Safe handling and easy initiation
- High piercing power in proportion to the small amount of explosive contained
- Possibility to use horizontally or vertically



TECHNICAL DATA

| Type | | CPD-21 | CPD-42 | CPD-64 |
|-----------------------------|----|-----------|------------|------------|
| Dimensions | mm | Ø 30 h 61 | Ø 51 h 102 | Ø 90 h 140 |
| Mass | g | 42 | 313 | 985 |
| Explosive weight | g | 18 | 147 | 520 |
| Perforation | mm | 100 | 160 | 250 |
| Stand-off | mm | 50 | 150 | 225 |
| Operation / Use temperature | °C | -30 / +52 | | |

PACKING

| Type | | CPD-21 | CPD-42 | CPD-64 |
|-------------------|-----|-------------|--------|--------|
| Units per package | pcs | 140 | 40 | 15 |
| Pack dimensions | mm | 542x403x176 | | |
| Pack weight | kg | 19.0 | 17.5 | 21.0 |

EOD CHARGES

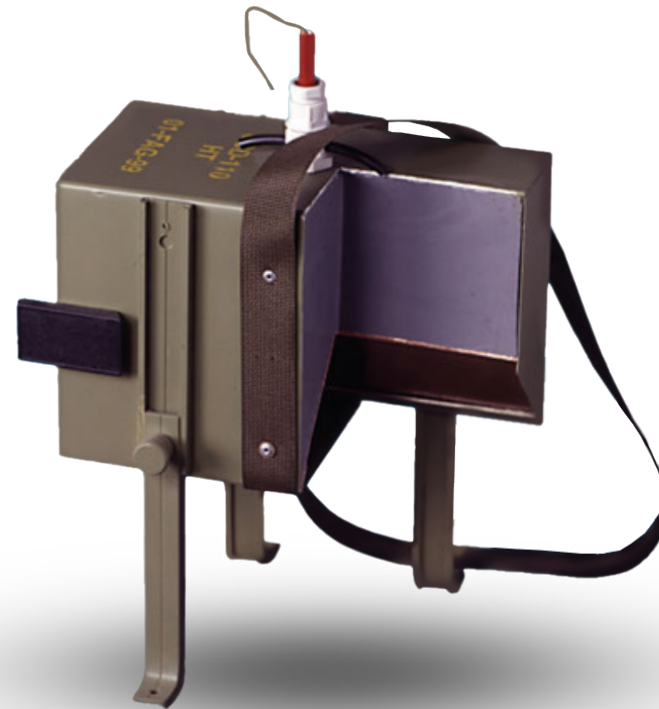
LARGE CALIBER CUTTING CHARGES

USE

- Demolition of pillars or columns
- Cutting of supporting structures
- Demolition of buildings
- Disposal of ammunition
- Removal of obstacles

CHARACTERISTICS

- Ready to use
- Safe handling and easy initiation
- Including an adequate support system
- Highly efficient in proportion to the small amount of explosive contained





PACKING

| Type | | CCD |
|-------------------------|-----|-------------|
| Units per package | pcs | 2 |
| Packing dimensions | mm | 475x432x345 |
| Complete packing weight | kg | 23.5 |

TECHNICAL DATA

| Type | | CCD |
|-------------------------|----|---------------|
| Dimensions | mm | 256x180x190.5 |
| Mass | kg | 6.2 |
| Explosive charge-HT+HWC | kg | 4.402 |
| Deep cutting | mm | 100 |
| Stand-off | mm | > 110 |

Temperature limits

| | | |
|-------------|------|----------|
| Use/Storage | (°C) | -30/ +52 |
|-------------|------|----------|

TNT BLOCKS

P-200 / P-100

USE

TNT prismatic blocks are used for felling trees and all kinds of demolition work.

CHARACTERISTICS

- Watertight
- Operation by detonator number 8 or detonating cord
- Encased in ABS plastic



TECHNICAL DATA

| Type | | P-200 | P-100 |
|------------------------|----|--------------|--------------|
| Dimensions | mm | 53,2x43,2x70 | 53,2x43,2x38 |
| Mass | kg | 0.23 | 0.12 |
| Explosive weight - TNT | kg | 0.20 | 0.10 |

Temperature limits

| | | | |
|--------------------------|--|-----------|-----------|
| Storage / Transport (°C) | | -30 / +62 | -30 / +62 |
| Use (°C) | | -30 / +60 | -30 / +60 |

PACKING

| Type | | P-200 | P-100 |
|-------------------|-----|-----------------|-------|
| Units per package | pcs | 112 | 168 |
| Pack dimensions | mm | 542 x 403 x 176 | |
| Pack weight | kg | 23.0 | 23.0 |

PRACTICE AMMUNITION



122 mm ECv enables shooting during tactical exercises, demonstration shootings, ceremonial salvos and in areas where live or spare ammunition cannot be used. It reduces the cost of training howitzer weapon set operators.

125 mm CV is a practice/imitation ammunition designed for tank cannon D-81, which perfectly imitates the loading and firing of combat ammunition. Energy created during shooting is sufficient for automatic function of the weapon in extreme temperatures. In regards of the minimal danger zone (100 m), the costs for training are only a fraction of the costs necessary for firing with a combat warhead.

152 mm ECv round perfectly enables training the activity of loading and shooting with the utilization of live ammunition. Special plug ensures the complete burning of the propellant during firing. The energy created during firing is sufficient to ensure the automatic functioning of the weapon system even in extreme conditions. Considering the minimal danger area (100 meters) no firing range is demanded for training and the cost of training is just a fraction of the cost needed for live ammunition firing.

155 mm ECv ammunition perfectly enables training procedures for loading ammunition, operator's firing procedures, allows conducting firing on tactical exercises, firing demonstrations and ceremonial salvos or on ultra-short-ranges where ammunition with projectile cannot be used. The danger area is only up to 100 m from a gun muzzle. A complete 155 mm ECv ammunition consists of one special blank plug instead of a projectile and two modular charges ECv.

TECHNICAL DATA

| Type | 122 mm ECv |
|-----------------------------|----------------------|
| Weight of special plug (kg) | 5,8 |
| Length of special plug (mm) | 447 |
| Charge | Nctp 2,4 x 0,9/8-4/1 |
| Sound effect created | > 110 dB |
| Danger area | < 100 m |

Temperature limits

| | |
|--------------------------|-------------|
| Storage / Transport (°C) | -25 / +40°C |
| Use (°C) | -25 / +40°C |

| Type | 152 mm ECv |
|-----------------------------|----------------------------------|
| Weight of special plug (kg) | 12,5 ± 4 |
| Charge | Bi- or Uni modular Charge System |
| Medium gas pressure | 200Mpa |
| Sound effect created | > 110 dB |
| Danger area | < 100 m |

Temperature limits

| | |
|--------------------------|-------------|
| Storage / Transport (°C) | -30 / +50°C |
| Use (°C) | -30 / +50°C |

| Type | 125 mm ECv |
|--------------------------------------|------------|
| Weight of special plug (kg) | 10.4 |
| Length of projectile (mm) | 500 |
| Weight of the propelling charge (kg) | 6 |
| Danger area | < 100 m |
| Sound effect created | > 110 dB |

Semi-combustible cartridge

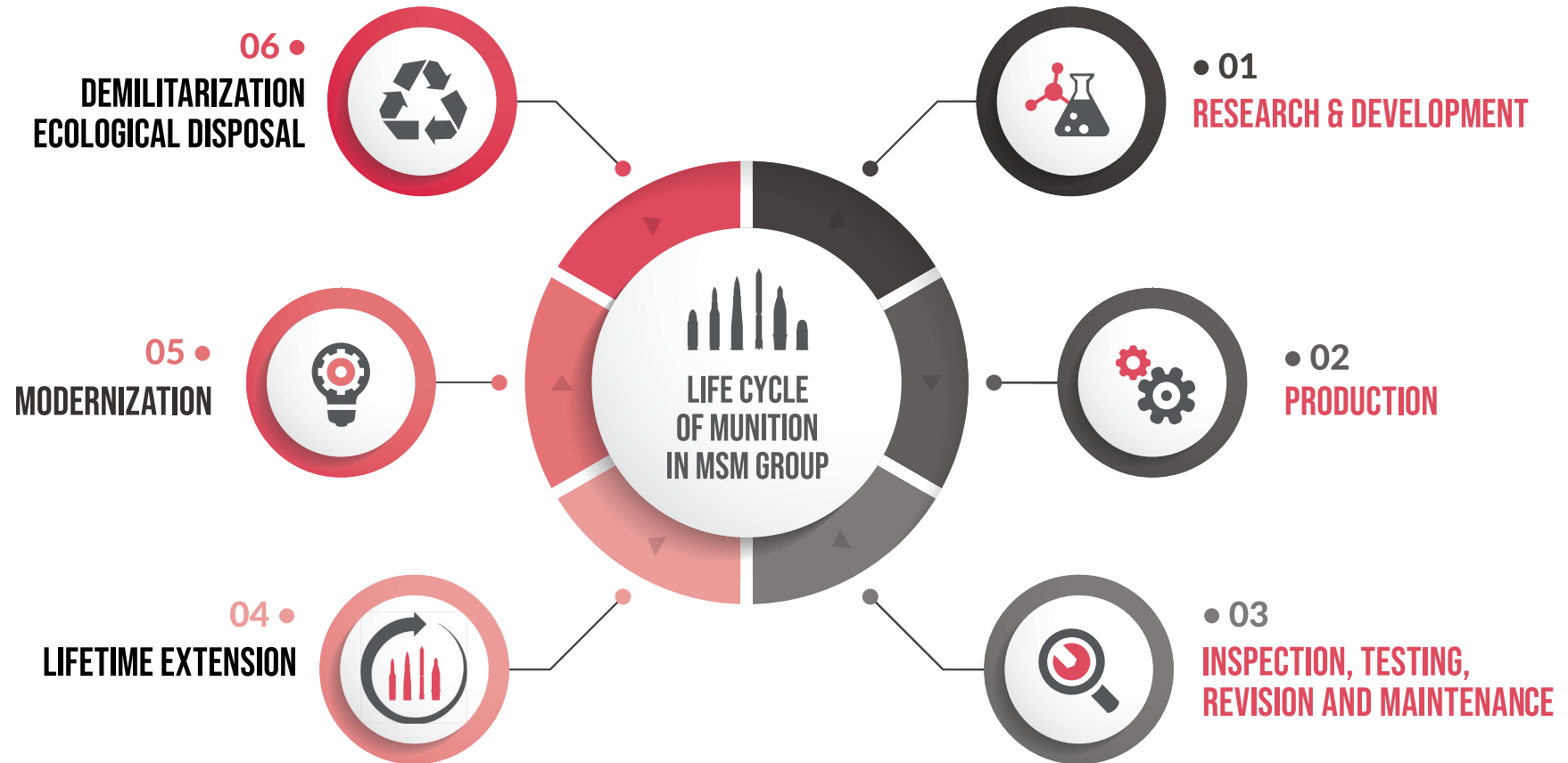
| | |
|---|-----|
| Cartridge weight (kg) | 9,5 |
| Cartridge length (mm) | 408 |
| Length of the steel cartridge case (mm) | 140 |

| Type | 155 mm ECv |
|-----------------------------|--|
| Weight of special plug (kg) | 10.9 ± 0.4 |
| Charge | 2 pcs of Modular Charge ECv |
| Sound effect created | > 110 dB |
| Danger area | < 100 m |
| Firing with muzzle brake on | Additional accessory is needed: muzzle break delimiter |

Temperature limits

| | |
|--------------------------|-------------|
| Storage / Transport (°C) | -40 / +50°C |
| Use (°C) | -40 / +50°C |

MSM GROUP IS A SERVICE PROVIDER IN THE AREA OF MUNITION LIFE CYCLE



We have **more than 70 years** of experience in ammunition development, production, and complete services in this field.

A long tradition in MSM locations for ammunition production processes with significant effects such as the deeply skilled personnel, support industries, development fields, education, etc. Where ever possible, **MSM GROUP** uses the most modern techniques and equipment to ensure a high level of safety and quality in order to meet the customer's needs. **MSM GROUP** has been fully certified since November 2017 EUCERT (The management systems certification body Eucert) and EN ISO 9001, EN ISO 14001, and EN ISO 18001 standards. Our excellent management systems in the areas of **quality assurance, occupational safety, environmental, and health demonstrate our competence in the life cycle of munition.**

● 01 RESEARCH & DEVELOPMENT

Research & Development of different types of ammunition, ammunition elements and related products and technologies in NATO or Non-NATO calibers is one of our core competencies:

- Small and medium caliber ammunition
- Artillery, tank and mortar ammunition
- Ammunition elements (fuzes, primers, charges etc.)
- Tandem warheads
- AntiTank Guided Rockets
- Special tools, equipment and technologies for production and disposal
- Others products according to the specific requirements of the customers

● 02 PRODUCTION

The **production** portfolio consists of the following product group:

- Small caliber ammunition
- Medium caliber ammunition
- Tank ammunition
- Mortar ammunition
- Artillery ammunition
- Ammunition element (fuzes, primers, charges etc.)
- Anti-Tank Guided rockets
- Tandem and special warheads
- Production lines and equipment
- Special disposal technologies

● 03 INSPECTION, TESTING AND MAINTENANCE

MSM GROUP provides independent **test and evaluation services** to assess the safety of munitions.

- Ammunition is inspected by experts and if identified/ classified as nonconforming demilitarized as needed
- Production proof activities ensure continuing compliance with system safety and performance requirements prior to acceptance into the service use
- Munition safety assessments; to ensure that the munition and its sub-systems meet safety requirements

● 04 LIFE CYCLE EXTENSION

Prolonging the **life-cycle of ammunition** and ammunition tour after an exhaustive inspection. The main activities in this field are:

- Main technical parameters checking and testing
- Surface areas renovation
- Cartridge case renovation including recalibration
- Final testing and examinations including fire tests

● 05 MODERNISATION

The **modernisation** can be performed directly as a requirement of the customer or after the analysis of ammo material. According to the test results, the report for the customer about the ammo material status with a deal proposal for this material is processed.

- More resistant material
- New surface protection rounds and cartridges
- The range extension
- The maximizing of the effect on the target
- Various missiles variants HE, Illumination, Thermobaric
- Replacement of outdated components (e.g. igniters, fuzes)

● 06 DEMILITARIZATION & ECOLOGICAL DISPOSAL

The **ordnance disposal** is intended for ammo either after technical warranty or not suitable for major overhaul operation. Disposal is carried out by the equipment developed, designed and manufactured by MSM GROUP.

- The technology is approved by the respective environmental authority
- All gained material is given to the industrial usage
- Disassemblies involving any risks are always performed with safety first as our primary principle.
- MSM GROUP is able to rapidly and safely dispose of such products in a cost-effective manner while minimizing damage to the environment



AMMO SERVICES

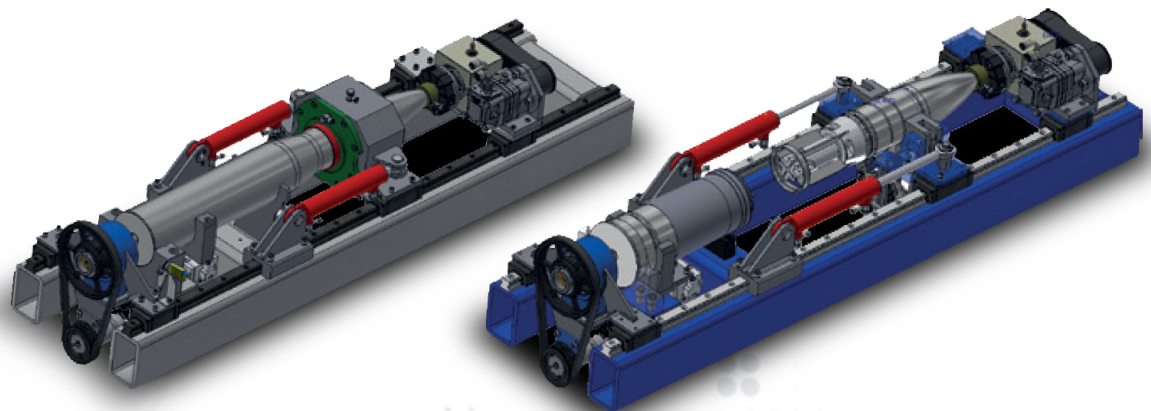
HYDRA 100

The purpose of the **HYDRA 100** device is delaboration or revision of both fixed and separated-loading artillery ammunition. It enables the disassembly of initiators and a safe separation of the projectile from the cased propelling charge of fixed ammunition with a maximum pulling power of 50kN. The process parameters are defined based upon the respective caliber and the type of the shell. The unit can be adjusted to a different caliber by changing the clamping jaws for fixation of both the cased propelling charge and the shell and by changing the type-specific tools for disassembly of fuzes. In order to change caliber for separate-loading ammunition, the head of the puller is replaced with a clamp with jaws specific to the diameter of the shell.

Operation:

Fixed ammunition: The device enables unscrewing the front fuze (if there is one), to unscrew the ignitor and to pull the projectile out of the cartridge case. The operating staff inserts the round in the clamping jaws of the delaboration device, a sensor detects its presence and the round is fixed automatically. When the operating staff presses the START buttons, the operation unit slides in the armored cell and the trap door is closed automatically. Right after the door is shut, the device starts to proceed with the delaborating activities. When finished, the trap door of the armored cell opens and the operation unit automatically slides out and the clamping jaws are released. The staff then can safely remove the different components.

Separate-loading ammunition: First, the operation unit is set to separate-loading ammunition mode. Based on the type of ammunition, it is necessary to change the clamping jaws for both projectile and the cased propelling charge, the drive with specific grasp key for unscrewing and holding of the primer screw and the drive with the specific grasp key for the unscrewing of the ignitor. The staff enters the parameters of ammunition via the interface of a communication panel. The shell and the cased propelling charge are manually inserted in the clamping jaws. The jaws are operated by a sensor. Launching of disassembly operations occurs in the same way as for delaboration of fixed ammunition.



TECHNICAL DATA

| | |
|---------------------------------------|--|
| Dimensions (W x L x H) | 2 150 x 2 420 x 2 500 mm |
| Weight | 6 500 kg |
| Armor resistance | STANAG 4569 Annex B, level 3 |
| MAX pressure in the hydraulic circuit | 200 bar |
| Input power | 26 kVA |
| Voltage system | 400/230V AC TN-S 3xL+N+PE 24/15/8, 2DC |
| MAX pull force | 50 kN |

Performance (duration of delaboration cycle)

| | |
|----------------------------|---------|
| Fixed ammunition | 17s /pc |
| Separate-loaded ammunition | 17s /pc |

Working environment

| | |
|--------------------------------|--|
| Device | V2 (according to STN 33 2000-5-51:2012-05) |
| Switchboard and hydraulic unit | basic |
| Operation temperature | 15÷45 °C |
| Operation humidity | 0 %÷70 % |

1,100+ EMPLOYEES **4** COMPANIES **3** COUNTRIES

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