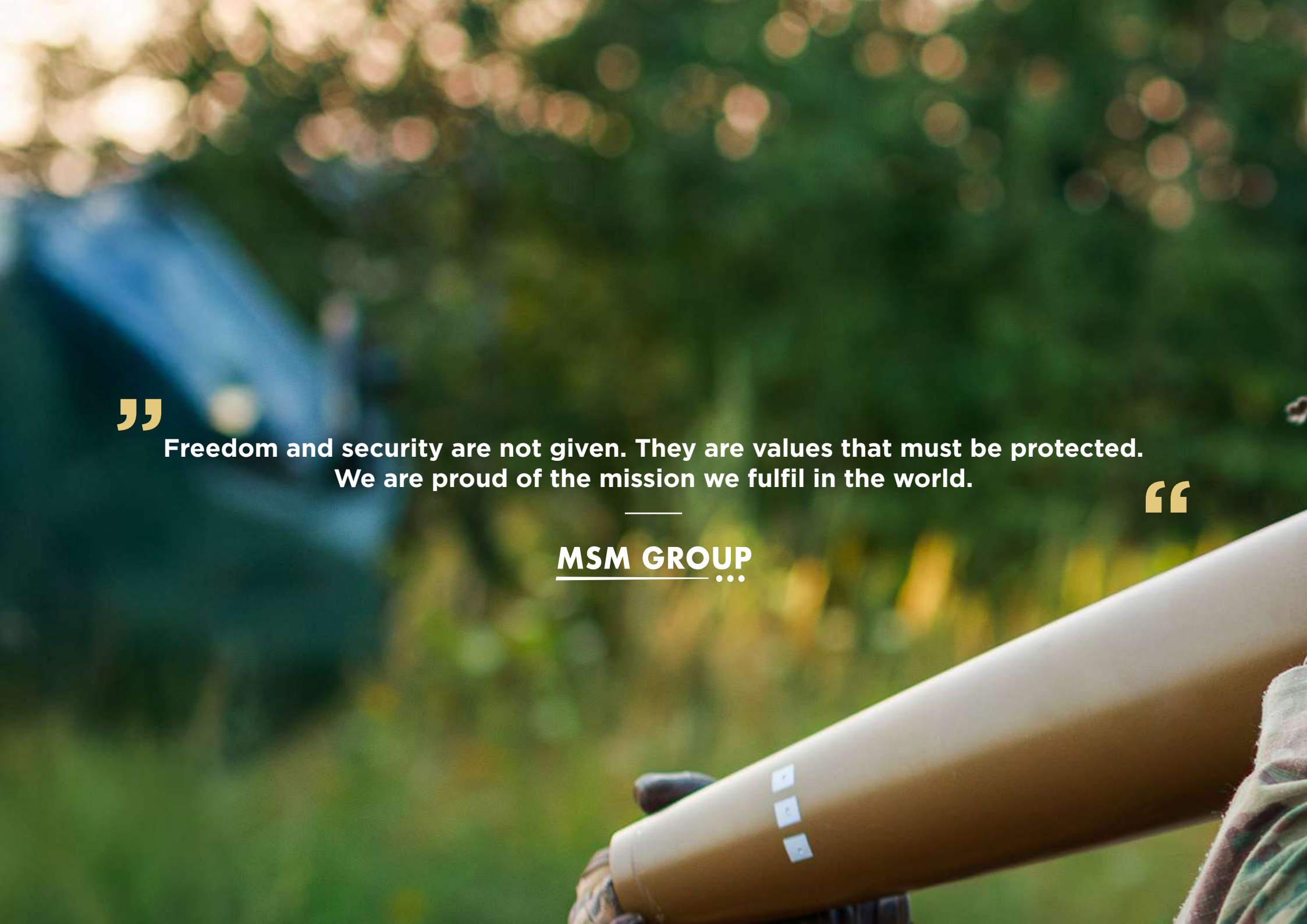
MSM GROUP

DEFENCE AND SECURITY
PRODUCT CATALOGUE

DEDICATED TO DEFENCE


Freedom and security are not given. They are values that must be protected.
We are proud of the mission we fulfil in the world.
MSM GROUP


155 mm
HE ERFB-BT
OFd M3
01-24-1003M

Heart. Heritage. Horizon.

The **Aerospace** division develops, manufactures and modernises civil and military aerospace equipment.

The **Ammo+** division specialises in small-calibre ammunition, mainly for the civilian market, hunting and target shooting.

The **Defence** division develops, manufactures and markets military and special vehicles, off-road vehicles, weapons and weapon systems, medium and large-calibre ammunition for combat vehicles, artillery and tanks.

The **Business Projects** companies have strong potential and interesting business opportunities.

The companies in the **Mobility** division are among the world's oldest manufacturers of transport equipment.




MSM GROUP

MSM GROUP is one of the main companies in the **CSG Defence** division. It is a European leader in the development and production of defence and civil equipment, specialising in artillery and tank ammunition. MSM GROUP unites traditional companies with a long history in the defence sector, thus having the entire production, service and supply cycle in its own hands.

ZVS

Development and **production** of ammunition for military purposes, in particular large calibre artillery ammunition and pyrotechnic components.

VOP NOVÁKY

Revision, modernisation and **life extension**, storage and disposal of ammunition, development and production of practice ammunition and mortar ammunition.

FMGranada

Development and **manufacture** of single and two-base propellants and propellant charges, rigid and liquid TNT, rockets, artillery, mortar and tank ammunition.

VÝVOJ Martin INNOVATION SPECIALISTS

Development, design and **manufacture** of mobile and modular towers, navigation systems and specialised military and civil containers.

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

PORTFOLIO

THE MAIN PORTFOLIO

ARTILLERY 155 MM
VMK

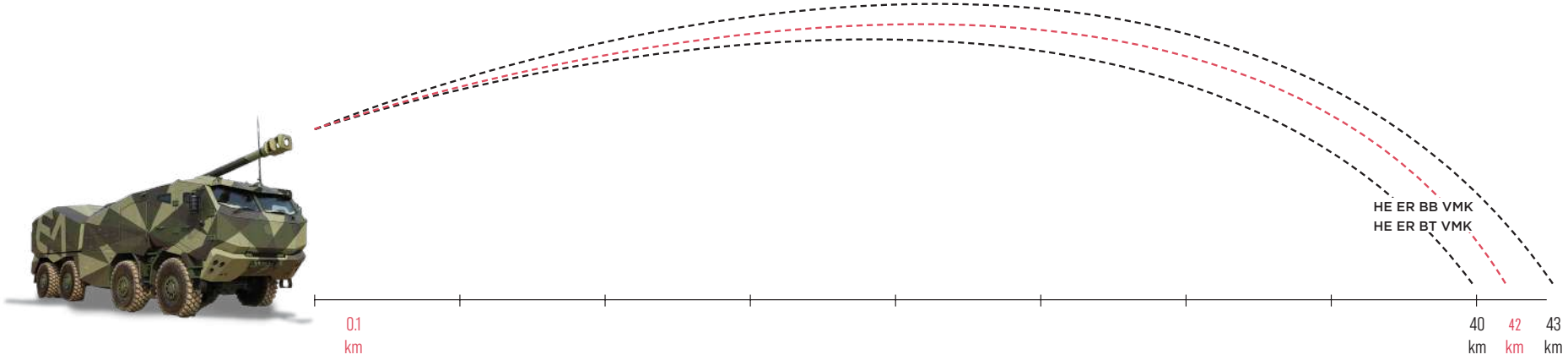
HE ER BB VMK / HE ER BT VMK

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

PACKING

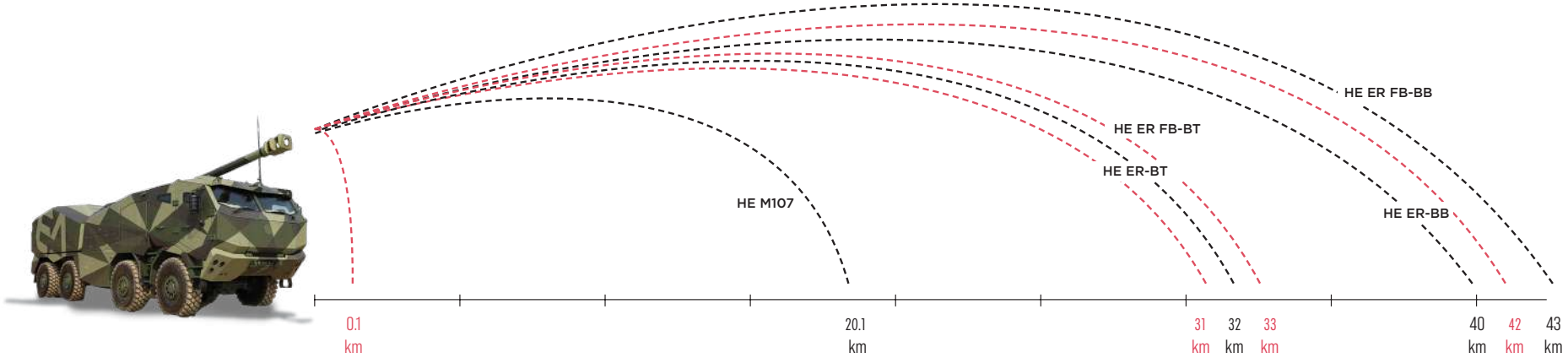
Type of round	**HE ER BT VMK**	**HE ER BB VMK**
Number of pcs on one wooden pallet (pcs)	8	8
Dimensions of wooden pallet (mm)	370x950x790	370x950x790
Weight of wooden pallet (kg)	365	365
UN packing code	0169	0169

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. The 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.

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	8.1	8.1	10	10
Explosive filling	TNT / Comp.B	TNT	TNT	TNT / Comp.B	TNT / Comp.B	TNT	TNT
Maximum allowed service pressure (MPa)	283	440	440	440	440	395	395
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/+71	-50/+50	-50/+50	-63/+71	-63/+71	-50/+50	-50/+50
Storage/Transport (°C)	-54/+62	-54/+62	-54/+62	-54/+62	-54/+62	-54/+62	-54/+62

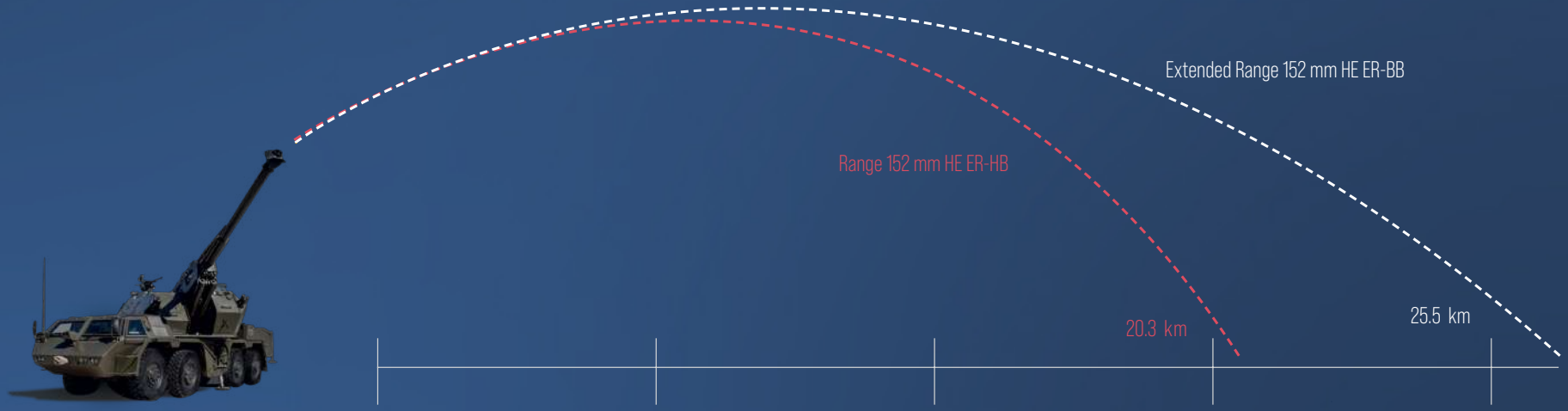
PACKING

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 (pcs)	8	8	8	8	8	8	8
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 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.

MSM GROUP offers 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 NATO artillery standard guns like M101, M2A2, M56 Pack howitzers and similar compatible weapons.

105 mm HE M1 The projectile is a hollow high-strength steel forging with boat tail base and welded base cover, an effective ogive and a single copper metal drive belt. Causes fragmentation effects and shock waves.

105 mm Illum M314A3 The interior contains the firing cartridge, the ignition cartridge, the canister with flares and its parachute. Ammunition is designed to light up an area during nighttime or low visibility conditions. This type of ammunition is often used in military operations to reveal the location of enemy forces or to provide visibility for troops.

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

MSM GROUP produces the following types of 105 mm tank ammunition:

105 HE R-105-60 standard high explosive charge with blast and fragmentation effect.
105 TPCSDS-T G141 use for firing and aiming practice.
105 HEAT-T M456A1 high explosive cumulative charge with the tracer for penetration effect.
105 TP-T M490 use for firing and aiming practice.
105 APFSDS-T C512 armor piercing fin-stabilized discarding sabots with tracer projectile capable of penetrating heavy armor.

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 armor piercing fin-stabilized discarding sabots with tracer projectile capable of penetrating heavy armor.
HEAT-MP-T high explosive cumulative charge with the tracer for penetration effect.
HE-T G201 standard high explosive charge with blast and fragmentation effect.
TPCSDS-T G151, TP-T use for firing and aiming practice.

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 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.

MSM GROUP offers 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. The 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 (g)	1,420	1,420	1,290 3 30	1,420	1,150	1,150
Weight of main charge	268 g (HTX)	214 g (TNT)	_	200 g	_	_
Weight of primary propelling charge (g)	5.0	5.0	_	5.0	5.0	5.0
Weight of augmenting charge (pair) (g)	2x3.05 ± 0,5	2x3.05 ± 0,5	_	2x3.05 ± 0,5	2x3.05 ± 0,5	2x3.05 ± 0,5
Length of the bomb with fuze (mm)	293 ± 2	293 ± 2	284	294 ± 2	267	267
Range (at 21°C) - elevation 85° (m)	102	102	_	80	80	80
Range (at 21°C) - elevation 45° (m)	3,098	3,098	_	1,200	1,200	1,200
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 the 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 (MPa)	126	128	140
Fuze	Point Detonated – MZ-95M	Point Detonated – MZ-95M	MZ-81M
Operation/Use temperature (°C)	-50/+50	-50/+50	-50/+50

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 during the training

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 1**22 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.

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

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

Range	
Maximum range (m)	1,230
Minimum range (m)	80

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

Range

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

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 Comp B
Case material	STEEL

Ballistic characteristics	
Muzzle speed (m/s)	503
Chamber pressure (MPa)	≤ 83

Range	
Approximate max. range (m)	7,600

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 (kg)	2.81
Length max. (cm)	40.7
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 (kg)	6.35
Length max. (cm)	53.34
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 (kg)	10.7
Length max. (cm)	67
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

MSM GROUP develops and produces 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 these 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

MSM GROUP has 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

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.

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

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 “SQ” or delayed function “D”.

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 (°C)	-40/+50

PACKING

Fuze	KZ-984
Number of pcs on one wooden pallet (pcs)	240
Dimensions of wooden pallet (mm)	1250x942x878
Weight of wooden pallet (kg)	740
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 (mm)	23.8
Max. diameter (mm)	30
Thread	27.151 x 1/14“
Weight (kg)	0.069

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 (mm)	24
Max. diameter (mm)	30
Thread	27.178 x 14 TPI. Class 2.
Weight (kg)	0.088

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 (mm)	50
Max. diameter (mm)	Ø15.15
Cartridge diameter (mm)	Ø11.25
Total weight (g)	30,5
Black powder weight (g)	1,7
Max. pressure (MPa)	≤ 450

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 %

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 salvoes 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 (dB)	> 110
Danger area (m)	< 100

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

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 (m)	< 100
Sound effect created (dB)	> 110

Semi-combustible cartridge	
Cartridge weight (kg)	9.5
Cartridge length (mm)	408
Length of the steel cartridge case (mm)	140

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

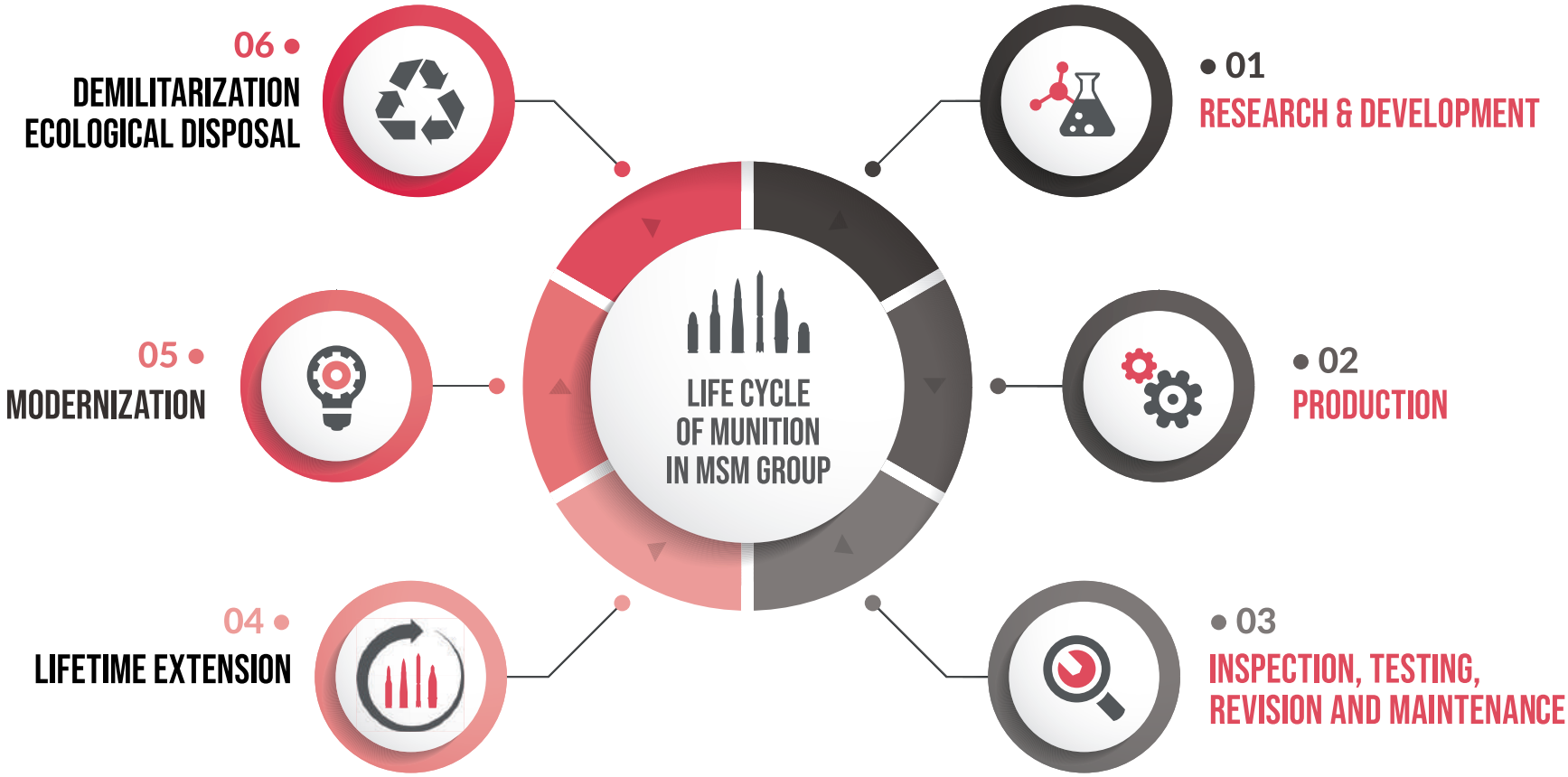
Temperature limits	
Storage / Transport (°C)	-30/+50
Use (°C)	-30/+50

Type	155 mm ECv
Weight of special plug (kg)	15.0 ± 0.4
Charge	2 pcs of Modular Charge ECv
Sound effect created (dB)	> 110
Danger area (m)	< 100
Firing with muzzle brake on	Additional accessory is needed: muzzle break delimiter

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

MSM GROUP IS A SERVICE PROVIDER

IN THE AREA OF MUNITION LIFE CYCLE



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. The 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 & EVELOPMENT

Research & Development of different types of ammunition, ammunition elements and related products and technologies in NATO or Non-NATO calibers is one of the 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 minimiz ing damage to the environment

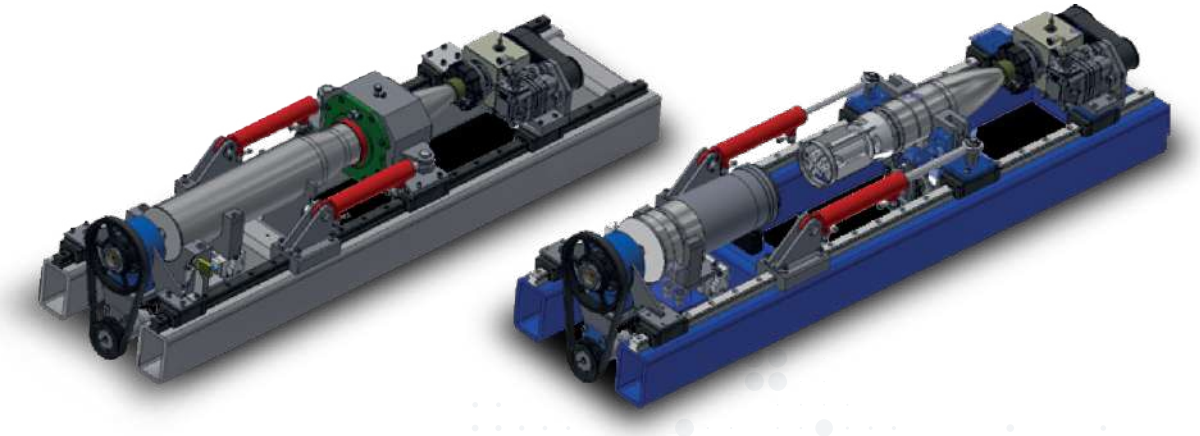
AMMO SERVICES

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

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 (°C)	15÷45
Operation humidity	0 %÷70 %


ZVS
VOP
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