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## **Rheinmetall: Comprehensive competence in weapon systems and ammunition**

As a performance-driven global player, Rheinmetall has unique expertise and innovative strength in armour, artillery, air defence, medium-calibre, mortar and infantry ammunition and systems. Visitors to Eurosatory 2014 in Paris can take a closer look at Rheinmetall's comprehensive weapon systems competence – a constant core capability throughout the Group's 125-year history.

Rheinmetall supplies the world's armed forces with customized services and an unparalleled range of products that includes environment-friendly and insensitive ammunition as well as state-of-the-art effectors. Prominent examples are the Group's extensive portfolio of 40mm ammunition, the new family of insensitive 60mm mortar bombs, medium-calibre Ahead airburst ammunition, 105mm and 155mm artillery ammunition and propulsion systems and, last but not least, programmable 120mm tank rounds that are fully compatible with Rheinmetall's 120mm smoothbore gun, which of course serves as the main armament of the Leopard 2 and M1A1 Abrams main battle tanks in service with many armed forces worldwide.

### **Infantry ammunition**

The Group's broad portfolio of 40mm x 46 (low velocity/LV and medium velocity/MV) and 40mm x 53 high velocity (HV) ammunition underscores Rheinmetall's compelling lead in the 40mm field. This ranges from practice ammunition and non-lethal variants to highly effective service ammunition, including 40mm x 46 MV and 40mm x 53 HV time-delayed airburst rounds.

Rheinmetall supplies the Canadian armed forces with the 40mm Close Area Suppression Weapon (CASW) system. In addition, the Group has developed the Cerberus grenade launcher and Hydra automatic grenade launcher, each specifically designed for firing medium-velocity ammunition. Both feature a hydraulic shock absorber that reduces the recoil force to the level of LV ammunition. Rheinmetall's versatile Vingmate fire control system family makes the company a "one-stop-shop" in the market for 40mm systems.

### **New insensitive 60mm patrol mortar bombs**

Rheinmetall's new family of 60mm ammunition is the latest generation of enhanced-range, enhanced-performance mortar ordnance. It is designed to meet all current and foreseeable future mission requirements.

This innovative ammunition family is optimized for insensitivity, either meeting or surpassing all STANAG 4439 requirements. It encompasses service and practice cartridges, including insensitive high explosive (IHE), high explosive (HE), different types of smoke/obscurant as well as two illumination variants (visible light and infrared). The newly developed HE-PFF (pre-formed fragmentation) variant matches

the performance of a conventional 81mm IHE, offering outstanding battlefield effectiveness while reducing the burden on the dismounted soldier.

The propelling charge system is identical in all variants, and – depending on customer specifications – can be produced with Extruded Impregnated (EI) powder in a combustible case. The loading system and firing tables can be adapted to meet customer requirements. Furthermore, the obturation performance of the rounds has been improved, resulting in an extended maximum effective range. Moreover, the entire ammunition family meets all STANAG requirements for safety and environmental protection.

### **Medium-calibre**

Deployable on land, at sea or in the air, Rheinmetall automatic cannons, weapon systems and ammunition cover the full gamut of current and foreseeable future threat scenarios. The main product groups are vehicle-mounted weapons, aircraft cannon systems, naval guns and air defence systems, including the accompanying tactical and practice ammunition in calibres ranging from 20mm to 35mm.

Decades of design, development and production of automatic cannons have resulted in a number of modern, high-precision weapon systems featuring operational reliability, cost efficiency and easy handling. The existing weapon technology is also being used to develop externally driven 7.62 and 12.7mm machine guns for RCWS and coaxial applications.

Rheinmetall's full-calibre frangible armour piercing (FAP) ammunition combines maximum versatility and operational effectiveness. Moreover, this technology is also available in a high-penetration sub-calibre version known as the "frangible armour piercing discarding sabot" (FAPDS).

Thanks to FAP technology, the round breaks up upon impact with soft and hard targets. On the one hand, the projectile's lethality is due to its penetrating power; on the other, to the effects of fragmentation. Consisting of a tungsten heavy metal alloy, it is insensitive and contains no cobalt. Rheinmetall's FAP ammunition is suitable for air-to-air, air-to-surface, surface-to-air, and surface-to-surface applications.

It is effective against semi-hard and soft targets, and lends itself to military operations in urban terrain.

Compared with conventional HE ammunition, FAP and FAPDS are more versatile and more effective. The Group's 25mm x 137 FAP round is thus particularly well suited for modern combat aircraft. Rheinmetall FAP ammunition is now in the final phase of testing for the new Joint Strike Fighter F-35. Furthermore, FAP ammunition can be used to replace old 20mm x 102 HE rounds.

In the 25mm x 137 calibre domain, modern FAPDS and APFSDS could supersede old HE and AP ammunition – though upgrading directly to even more effective 30mm x 173 ammunition may be the better option. Two variants of this ammunition, the Frangible Missile Piercing Discarding Sabot (FMPDS) and the Training Practice Tracer, are also on display. The FMPDS was developed for the Goalkeeper Close-In Weapon System (CIWS) to serve as an anti-ship-missile effector.

Rheinmetall developed the PELE round in order to increase the effectiveness of conventional medium-calibre ammunition. PELE stands for "penetrator with

enhanced lateral effect". Crucial to its success is the specially engineered projectile, which combines two materials with different levels of density. Containing neither a fuse nor explosives, the round's lethality derives from its high penetrating power coupled with fragmentation, blast and incendiary effects. PELE is available in full- and sub-calibre versions.

All this makes PELE a truly multipurpose ammunition: when the shooting starts, it is the perfect answer for army, air force and naval operations, enabling successful engagement of dismounted personnel and lightly armoured vehicles. It also lends itself to combat missions in built-up areas. Moreover, PELE is suitable for use on firing ranges, as there is no risk of unexploded rounds. Other major advantages: PELE ammunition is cost-efficient as well as safe to handle and store.

The company's proprietary ABM airburst rounds feature a programmable fuse. The optimum combination of a high rate of fire and state-of-the-art ammunition technology makes Rheinmetall's MK30-2/ABM automatic cannon a highly effective, highly reliable weapon system that is universally deployable. At ranges of up to 3,000 metres, the MK30-2/ABM is extremely effective against land, air and naval targets. Rheinmetall's 30mm x 173 ammunition family is also qualified for the widely used MK44 (Bushmaster II) cannon. In the 35mm x 228 domain, Rheinmetall can supply mechanized infantry forces using the Bushmaster III with a complete ammunition suite including Airburst ammunition.

### **Oerlikon Ahead ammunition technology for short-range air defence (SHORAD)**

Each round of Rheinmetall's 35mm x 228 Ahead ammunition contains a lethal payload of heavy metal spin-stabilized sub-projectiles. These are unleashed in the path of an oncoming target at a programmable, predefined point in time. A short burst of Ahead ammunition produces a dense cloud of lethal sub-projectiles. These penetrate the outer skin of the target, causing lethal damage to its interior.

AHEAD airburst technology is designed to bring down targets at greater distances with fewer rounds fired, making it a much more cost-effective solution than conventional ammunition. The technology can be used in ammunition ranging in calibre from 30mm to 76mm. Ahead technology is suitable for ground, air force and naval applications. As an alternative option, Ahead rounds can also be fired in non-fused mode, in which they behave like frangible rounds upon impact and are able to penetrate and destroy hard targets very effectively. Therefore, Ahead is actually two types of ammunition in one.

### **105mm artillery ammunition**

Rheinmetall's new 105mm M1130 base-bleed (BB) and M1131 boat tail (BT) projectiles are insensitive high explosive rounds, qualified under the aegis of the Advanced Cannon Artillery Ammunition Programme (ACA2P). Their effectiveness against soft targets exceeds that of a 155mm high explosive round. The round is in series production.

### **155mm artillery ammunition**

The Group's family of 155 mm ammunition encompasses a wide array of projectiles for neutralizing various targets at extremely long ranges as well as executing a variety of battlefield tasks. The product range includes high explosive and insensitive high explosive (IHE) rounds, IHE base-bleed rounds, illumination projectiles for

illuminating the infrared and visual spectrum of the combat zone, multi-spectral smoke/obscurant (MS) projectiles, and practice rounds. This fully STANAG-qualified ammunition family was specially developed for the PzH 2000 self-propelled howitzer, an excellent Rheinmetall system now used by a number of nations.

Rheinmetall's suite of 155mm Assegai artillery ammunition comprises insensitive munition (IM), high explosive (HE), conventional HE, screening smoke, illumination, infrared illumination and many other projectiles. The projectiles are supplied with a boat tail assembly that can be replaced in the field with a base bleed unit. When fired from a 39 calibre-gun, Assegai BB rounds exceed a range of 30 kilometres. When fired from a 52 calibre gun, Assegai BB rounds can attain range of over 40 kilometres. Fully compliant with the Joint Ballistics Memorandum of Understanding (JBMoU), the whole Assegai projectile family is qualified in accordance with STANAG norms and is in series production.

The extended range V-LAP exceeds a range of 44 kilometres when fired from a 39 calibre gun. When fired from a 52 calibre gun, V-LAP exceeds a range of 55 kilometres.

At Eurosatory 2014 visitors can get find out more about the versatile 155mm ammunition family at the Rheinmetall pavilion.

### **120mm tank rounds**

Rheinmetall is well known for its 120mm smoothbore gun, which serves as the main armament of the Leopard 2 as well as of the Abrams M1A1 main battle tank in service with many armed forces.

The Group's new 120mm tank round, the HE Temp. DM11, is optimized for the modern battlefield. The DM11 is characterized by (a) the programmability of the loaded cartridge, and (b) a precisely programmable airburst function at ranges of engagement of up to five kilometres. The necessary technical modifications (programmability) are offered as a retrofit-kit and can be installed in any main battle tank equipped with a 120mm smoothbore gun and an up-to-date fire control unit.

Rheinmetall's lower-priced HE SQ ("high explosive super quick") RH31 features an impact function without delay that requires no modification of the system.

A number of Leopard 2 and M1 user nations have already placed orders for both ammunition types. Under the name "Multi Purpose (MP) DM11", the US Marine Corps already uses the DM11 for engaging non-armoured and lightly armoured targets in asymmetric conflict situations, for example in Afghanistan. A new full-calibre training round with similar ballistics, the RH88, will be qualified by the end of 2014.

The 120mm x 570 DM78 is a qualified cartridge that is set to supersede all previously introduced KE practice rounds. It is based on innovative acceleration and discarding technology, enabling a particularly low-cost design. In addition, the DM78 can be used in all of the same temperature zones as the KE service ammunition DM63 (C2 to A1).

The very low pressure level produced by the DM78 keeps erosion to a minimum, resulting in long barrel life. Moreover, because it has the same safety features as its predecessors in the DM38 family and the DM48, the new cartridge can be used at ranges of over 2,000 metres.

## **Broad experience from development to production**

Since its inception in 1889, Rheinmetall has been a driving force in the development and production of weapons and ammunition ranging from small arms to high energy laser effectors.

Rheinmetall also has unique experience in running international operations. Today the Düsseldorf-based Group operates ammunition production plants in Germany, Switzerland, Austria, Italy, the USA, Canada and South Africa.

Jointly owned by Germany's Rheinmetall and the Swiss company RUAG, the Nitrochemie Group enjoys a global reputation for excellence. Its core competencies are the development and production of propellants and propelling charges for large-, medium-, and small-calibre ammunition as well as combustible components such as the MCS modular propelling charge system for artillery applications.

In 2001 the company signed its first long-term supply agreement with BAE Systems (GCSM) for propellants, combustible cartridge cases, and associated customized services. In 2003 the agreement was extended to include the supply of propellants for small arms ammunition, appointing Nitrochemie as the principal supplier of propellants for Her Majesty's Armed Forces. In the ensuing years Nitrochemie has produced and delivered some 7,000 tonnes of propellant. Rheinmetall propellants are used in 155mm artillery charges L8/L10/M3/M4, the 105mm ammunition L36 charge, 4.5" IAHE ammunition, 120mm L18 and L3 charges, 81mm mortar, 30mm RARDEN and all calibres of small arms ammunition.

In September 2009 the Rheinmetall subsidiary was awarded a second ten-year supply contract with GCSM in support of the UK MoD MASS contract. The contracting principal utilizes best practice to secure the supply chain and to mitigate associated risk through business continuity planning and sustainable development – core values of GCSM.

For many years now Rheinmetall has been a partner of South Africa's armed forces and defence industry. Incorporated in 2008, Rheinmetall Denel Munition (Pty) Ltd. is a joint venture of Germany-based Rheinmetall Waffe Munition GmbH (51 %) and Denel (Pty) Ltd. of South Africa.

An internationally acknowledged player, Rheinmetall Denel Munition produces artillery, mortar and infantry systems and operates various large production sites. Besides South Africa, Rheinmetall Denel Munition primarily serves customers in Asia, the Middle East and South America. Rheinmetall and its South African subsidiary are thus able to supply their respective core markets with the Group's complete, comprehensive array of products.

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