LEOPARD 2 A8

The world's leading main battle tank

KNDS

/ LEOPARD 2 A8: The leading Main Battle Tank

With the LEOPARD 2 A8, KNDS presents the most modern main battle tank in the world. It is currently being manufactured new for Hungary, and upgrade programs are being implemented for the Federal Republic of Germany, as well as Sweden, Denmark etc.

The LEOPARD 2 is the backbone of European armored formations, and is also proving itself successfully in Arabia, the Far East, and North and South America. A superb basic concept and the successful upgrading for numerous countries are the foundations of this success. The evolving requirements maintain the KNDS focus on continual development and upgrades. The successful deployment of the LEOPARD 2 in war and crisis situations proves the high operative value of this weapon system. The armed forces of Canada and Denmark successfully used the LEOPARD 2 in Afghanistan, and the Federal Republic of Germany used it in Kosovo. In addition, the LEOPARD 2 has always been able to prove its superiority in various international comparison trials.

As a system manufacturer and developer of the LEOPARD 2, KNDS offers its customers not only an outstanding and effective main battle tank, the company also offers full support and logistics for successful introduction and efficient use of the system into numerous individual armies. In addition to modern simulators, training equipment, vehicle families like recovery, engineering and bridge laying tanks, KNDS also supplies special tools, modern test equipment, spare parts and the respective documentation for the system.

As the industrial partner for the international LEOPARD Users Club, called LEOBEN, KNDS provides development, configuration and obsolescence management for all partners during use. For KNDS, the safety guarantee of supply and maintenance of the system well into the future is a natural obligation to all contract partners. For example, the LEOPARD 1 was introduced in 1963. But still today, it is proving itself in the service of the Brazilian army, and continues to be provisioned and supported by KNDS.

Wherever the latest version of LEOPARD 2 has participated in international competitive trials, it was the winner:

Switzerland: against Abrams M1

Sweden: against Abrams M1A1

Sweden: against Abrams M1A2 & Leclerc

Greece: against Abrams M1A2, Leclerc, Challenger 2, T80 U & T84

Turkey: against Abrams M1A2, Leclerc & T84

Norway: against K2 Black Panther

User nations:

/ Designed, qualified and proven for demanding missions

A key characteristic of the main battle tank is its capability to display military dominance on the battlefield and to remain operational, even under the most difficult conditions. It must therefore, not only be resistant to every possible military threat, but must also stay constantly ready under the most extreme environmental conditions. The demands on the MBT system increase with every new region and every operation in which the LEOPARD 2 is deployed. Initially designed for deployment in Germany, today the LEOPARD 2 asserts itself just as much in the polar regions of northern Europe as in the heights of the Andes of Latin America, the tropical regions of the Pacific, or the hot Arabian desert.

Optimised for deployment and refined by many international competitive trials under extreme conditions, the LEOPARD 2 A8 distinguishes itself by reliability, superiority and ease of deployment on the battlefield. These are the features that every soldier demands of his weapons, because no deployment, neither in Afghanistan nor in Kosovo, leaves room for extensive logistics.

The LEOPARD 2 A8 is the result of all these experiences. With the LEOPARD 2 A8, soldiers are able to perform their duties for days on end, efficiently and well protected, in extreme heat or cold.

The LEOPARD 2 A8 has already successfully passed several extensive and very demanding trials in the Arabian and Nordic region; in particular, the following severe trials were undertaken:
- September – October 2010: Qatar
- April – October 2011: United Arab Emirates
- June – July 2012: Kingdom of Saudi Arabia
- July – August 2016: Oman
- February – March 2022: Norway

10 rounds / min firing exercise on different targets in Qatar

Test trials in light dunes in UAE

Test trials in soft sand in the Kingdom of Saudi Arabia

Test trials in deep snow in Norway

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Reasons why KNDS is the preferred partner

- Europe's leading Original Equipment Manufacturer (OEM) and system house for mission-proven ground combat systems, providing cutting edge technologies for MBTs, training and simulation, service and lifetime support, with products tested and qualified by the German MoD
- The sole OEM for LEOPARD 1 and LEOPARD 2 including design, configuration management and system responsibility for all LEOPARD production and upgrade programs over the last 50 years
- Proven expert in know-how transfer for production, maintenance and service in international projects
- Industrial prime contractor to LEOBEN, the international life-cycle management board for LEOPARD MBT users, governed by the German MoD
- Due to our tradition and leadership in technology development, KNDS has a strong interest in long lasting relationships

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Reasons why the LEOPARD 2 A8 is the preferred MBT

- State of the art technology in production, and winner of all competitive trials, proven in all climatic zones worldwide
- Best protected MBT, in combination with excellent mobility
- Unmatched first-round hit probability from stationary position and on the move against stationary and moving targets
- Highest fire power even over long distances, provided by the L55 / L55 A1 smooth bore gun
- Continuous system improvements, guaranteed OEM spare part availability and cost effective future upgrades due to 22 user nations and the LEOPARD Users Club, "LEOBEN"

/ Superior Fire Power

The outstanding firepower of the LEOPARD 2 A8 is ensured by the smooth bore gun. With the 120 mm L55 A1 gun, the LEOPARD 2 operates the most powerful 120 mm tank gun in the world. In combination with advanced Kinetic Energy (KE) ammunition from various producers, maximum penetration capability is achieved. The range of engagement has consequently been increased over 5,000 meters with the LEOPARD 2 A8.

The optimised fire control system is the keyfeature for the high first-round hit probability, both from a stationary position and on the move against static and moving targets. Due to the independent, fully stabilised panoramic surveillance capability for the commander and the gunner by day and night, the MBT has a short reaction time, and is able to engage different targets rapidly by means of its hunter-killer capability.

The high-performance ammunition for the main gun (sub-calibre armor piercing KE projectile and programmable High Explosive (HE) projectiles, both fin-stabilised), enables the LEOPARD 2 to successfully neutralise targets over long distances:

- Infantry fighting vehicles and 2nd generation main battle tanks up to 3,000m
- 3rd generation main battle tanks up to 2,000m
- Hovering helicopters up to 2,500m
- Light-armored vehicles and troops up to 5,000m
- Maximum combat range over 5,000m

As a secondary armament, a 7.62 mm coaxial machine gun is located to the left of the main gun. Additionally, a modular remote-controlled weapon station (e.g. FLW 200, Protector) can be mounted on the turret. Different standard machine guns (calibre 7.62 mm or alternatively .50 calibre or a 40 mm grenade launcher) can be integrated. With the day and night vision of the remote-controlled weapon station, the crew has an additional observation option to improve the situational awareness of the MBT. The wide-angle elevation of the remote-controlled weapon station up to 70° allows the crew to engage identified targets at high-elevation positions. In addition an optional spotlight can be installed on top of the remote-controlled weapon station in order to illuminate targets or to give an advance warning non-lethal.

Firing exercise of LEOPARD 2 A8

Remote Controlled Weapon Station FLW 200, ready for three different calibers of machine guns

/ Command and control

The main battle tank is the key weapon system of the armored ground forces. Its presence indicates direct assertiveness and superiority, its effect is decisive in combat, and its mobility is superior to all other ground systems.

Efficient and precise operational command is the prerequisite for deploying the tank quickly and effectively. Accordingly, KNDS started with the integration of computerized command systems as long as 25 years ago. For this reason, the LEOPARD 2 A8 provides digital data radio communication, inertial and GPS navigation, digital map display, and numerous further functions. However, the integration of military command systems into the LEOPARD 2 is much more than just handing over a laptop to the commander. The systems can be networked, and battle-relevant data can be gathered automatically and made available in digitally encoded format. Information from various weapon systems needs to be presented in such a way that a commander can use this system at the same time as controlling the tank. In this way, the duties of the crew are simplified by the command system.

Modern command systems were successfully integrated for Sweden, Spain, Greece, Germany and Qatar. Here it was possible to further evolve operability and integration, and therefore today the LEOPARD 2 A8 provides the most modern integration.

Both the commander and the gunner have an independent glass-optical direct view. This ensures successful engagement over long distances. Additionally, both sight systems have their own cooled 3rd generation thermal imagers with laser range-finders and are fully stabilised for engagements on the move. This capability, in combination with the "Hunter-Killer" functionality, allows the gunner of the LEOPARD 2 A8 to engage a target while the commander is already selecting the next.

This "visual" situation for the commander is enhanced by the global view of a C4I system (command, control, computer, communication and information) and fits into the linked subsystems of the LEOPARD 2 A8 itself. This ensures mastery of information for the operators, and enables them to exchange all relevant information between vehicles and units. KNDS is familiar with the relevant standards for information interoperability, and fully supports the customer in defining and realising controlled and standardised interoperability with other allied forces, as well as interoperability with radios and other C4I communication devices that are already in service.

Thanks to its experience and its fleet of vehicles, KNDS can not only provide integration into the LEOPARD 2 A8, but also offers:

- C4I system kits
- Integration or full-featured command and control systems on all levels starting from the LEOPARD 2 MBT up to the battalion command posts (or even higher).

This KNDS capability ensures the best support for maximising the performance and effectiveness of the LEOPARD 2 A8.

In addition, the LEOPARD 2 A8 has also been supplemented with the SPECTUS driver assistance system (SPECtral Technology for Unlimited Sight) for observing front and rear area of the LEOPARD 2 A8. This next generation passive display device combines the images from a powerful daylight camera and a third generation thermal imaging camera continuously into one overall picture. Even in total darkness, dust clouds or minimum temperature differences in the surroundings, SPECTUS provides the crew a detailed view. For the driver, this new sight system always provides the best picture from a wide frequency range of the electromagnetic spectrum. Furthermore, the switchable IR headlights provide a clear picture for the driver with a minimum of radiation as part of the vision system – even under extreme conditions.

/ Simple operation for complex tasks

LEOPARD 2 in Norway

Rapid reaction in combat, recognition and assignment of targets, use of various sensors, reliable weapon operation, rapid determination of the tactical situation, simple communication – these features distinguish a highly effective weapon system such as the LEOPARD 2. The ability to fulfil these requirements reliably, even in difficult situations, requires optimum system operability. In addition to combat, the crew of the LEOPARD 2 can fulfill a multiplicity of tasks, which in other weapon systems require entire units and the corresponding support.

The versatility of the LEOPARD 2 and its crew is distinguished by the superior firepower, the universally operational mobility, capability of controlling large areas of land at day or night, locating targets, as a command vehicle – in the focal point of combat forming a central cell for communication and command, crossing NBC-contaminated areas and mastering engineer duties. All these duties are handled by a 4-man crew, which must guarantee the tank's action readiness for days on end. This is possible only because the LEOPARD 2 has always been developed taking into account ergonomic aspects, and the simple operability of the system has been oriented to the needs of the soldiers. Easy handling and simple training are seen as the key to success.

Easy exchangeable between combat protection ...

... and all-round duell kit configuration.

Exceptional capabilities:

- Hunter-killer function
- Integrated C4I system
- 24 h combat day verification
- Sustainability for crew and system

/ Well-balanced protection and survivability

The LEOPARD 2 A8 is the best-protected MBT in the world for tank-to-tank engagements. The benchmark for its protection is its ability to withstand its own superb weapon system. Based on the latest asymmetrical conflicts and MBT operations in urban areas, and depending on the specific mission profile, KNDS has developed improved protection kits that can be mounted within one day by means of multifunctional protection kit interfaces, with the help of a forklift or an Armored Recovery Vehicle (ARV). The add-on protection is effective in addition to the superior level of basic protection.

Different kits of additional add-on armor are available for special missions/requirements, and can also be ordered at a later point in time, without any technical restrictions if the vehicle is equipped with the multifunction protection kit interfaces, but is not fitted with the specific add-on armor kit.

By saving lives In-Theatre, today's operations by the Danish and Canadian Armies in Afghanistan have proven the excellent design of KNDS's protection technology for LEOPARD 2.

Examples of Add-on Armor Kits are:

- Duel protection kit against MBT
- All-round protection kit against Rocket Propelled Grenades (RPG)
- Mine protection kit
- Improvised Explosive Device (IED) protection kit

Further systems improve the survivability of the LEOPARD 2 A8 on the battlefield and are part of the standard delivery kit:

- NBC protection system for operations in contaminated areas
- 76 mm multi-purpose grenade launcher tubes on each side of the turret for smoke or special ammunition
- Fire warning, suppression and extinguishing systems for the crew and engine compartment
- Installation of spall liner

Active Protection System – the solution for tomorrow's threats

KNDS as the OEM of LEOPARD 2 and system integrator offers besides the proven, in-house developed passive protection solutions also the possibility for integrating the Active Protection System (APS) TROPHY. The additional benefit of an APS in general is to neutralizing most known types of chemical energy (CE/shaped charges) threats, i.e. ATR, ATGMs and also top-attack threats.

KNDS started integration of TROPHY in 2014 with full system demonstration in 2019, followed by an contract with German Army for the development and integration of APS TROPHY on LEOPARD 2.

Therefore, KNDS brings in its extensive knowledge and experience to adopt APS-Systems onto and into the System "Main-Battle Tank". These covers especially the areas of performance, system compatibility, logistics and safety and – naturally – the overall operability of the LEOPARD 2.

/ Sustainability and effectiveness on the battlefield

The LEOPARD 2 was originally designed to operate in central European regions. With increasing numbers of user nations, and the respective climatic conditions in these countries, additional upgrades and improvements became necessary to cover extreme temperatures either for hot and dry, hot and humid, or extremely cold regions. KNDS has put special focus over the last decades on optimizing the LEOPARD 2 with special technical kits for operation in these climatically demanding areas.

Beside several internal optimizations for technical components, further systems have been adapted to improve the sustainability and effectiveness of the crew of the LEOPARD 2 A8 on the battlefield.

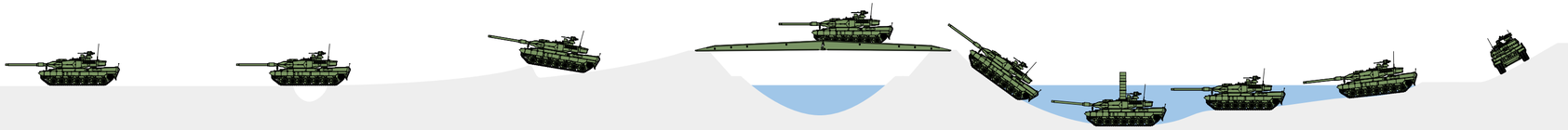
- 20 kW Auxiliary Power Unit for the electrical power supply of the MBT, including the cooling units in silent watch mode without using the main power pack
- 8 kW Cooling Units in the chassis as well as the turret in order to increase the sustainability, reaction capability, and effectiveness of the crew over a longer period during the mission, as well as ensuring the proper functioning of the electronic components in hot climatic zones
- Internal insulation measures, also against internal heat sources
- Optimised cyclone filters to improve the sustainability of the engine air filtration system
- Removable camouflage system (visual and infrared) with insulation capabilities against solar thermal radiation, covering nearly the whole surface of the MBT

/ Unique mobility

Mobility with high starting acceleration is one of the key characteristics of the LEOPARD 2, and is one of the guarantors of self-protection in the battlefield. Therefore the LEOPARD 2 MBT is equipped with a powerful 12-cylinder multi-fuel engine from MTU, providing 1,500 hp. The use of this power pack, in combination with the RENK transmission, results in a high power-to-weight ratio which provides very high velocity. A superior reverse speed of approx. 30 km/h compared with other MBT's, combined with the ability to make pivot turns, enables the LEOPARD 2 to maintain its superiority while also carrying out tactical withdrawal and retreat engagements. For operations with maximum protection in urban scenarios, or in rough terrain like soft sand, dunes, desert, and mountain areas, KNDS has developed an optimised final drive to provide enhanced torque for better acceleration and agility.

The sophisticated suspension system with hydraulic shock absorbers, torsion bars, friction dampers, and the rubber-bushed connector track decouples the crew and the vital components of the system from the influences of the terrain. Almost every geological environment can be mastered with a LEOPARD 2. Beside rough terrains, also lakes and rivers up to a depth of 4 meters can be crossed.

LEOPARD 2 in submerged operation for crossing water obstacle



60 km/h forward
28 km/h reverse
Maximum speed

3.00 m
Ditch-crossing ability

1.05 m
Vertical obstacle climbing ability

MLC 70 – 80
Load class

60%
Grade ascending ability

4.00 m
Submerged mobility

2.00 m
Deep fording

1.00 m
Fording

30%
Side slope

/ LEOPARD 2 A8
general performance data

Crew size: 4

Max. reverse / forward: 28 km/h / 60 km/h (road) depending on final drive

Range: < 400 km (road)

Forward slope: 60 %

Side slope: 30 %

Ditch crossing: 3.0 m

Vertical obstacle: 1.05 m

Fording / submerged mobility: up to 4.0 m

Ammunition: 42 rounds

Multi-purpose grenade launcher system 12 x 76 mm

Length (12 o'clock position): 10,968 mm

Width: 3,774 mm

Height (PERI): 3,180 mm

Weight: 61.5 t – 64.3 t

Load class: MLC 70 – 80

NBC protection system

Internal components:

- Battlefield management system including interface to hybrid navigation system
- Digital intercom and external tank-infantry phone
- Electrical gun laying system

Not shown / not integrated optional modules:

- Battle proven modular all-around protection-kit (360° protection against RPG)
- Battle proven protection kit against mines and IED's
- Roof protection with sliding hatches
- Mobile camouflage system (visual / IR)
- Frontal engineering equipment
- TROPHY Active Protection System: Modern APS against Anti Tank Missiles and man-launched Propelled Grenades (e.g. RPG 7)

1 | Main gun fully stabilized

- Smooth bore 120 mm long version (L55 A1)
- Vertical elevation: –7.4º up to +17.4º
- Horizontal n x 360°
- Fuse programmable high explosive ammunition

2 | Remote controlled weapon station

- Elevation: -10º up to +70º (360º)
- Day vision: CCD-camera
- Night vision: thermal imager
- Machine gun or grenade launcher 40 mm
- Smoke grenade launcher system 76 mm (optional)
- 75 W spot light (optional)
- Laser range finder

3 | Coaxial MG fully stabilized

- GPMG, 7.62 mm

4 | CDR sight periscope RTWL

- Elevation: -15º up to +45º
- Glass optical direct view: 14.6x / 3.8x / 2x
- Thermal imager ATTICA, 3rd gen.: sensed wavelength: 3 – 5 µm or 8 – 12 µm
- Laser range finder, eye save
- CCD overview camera

5 | Gunner sight EMES 15

- Glass optical direct view: 12x / 3x
- Thermal imager ATTICA 3rd gen.: sensed wavelength: 3 – 5 m or 8 – 12 m
- Laser range finder, eye save

6 | Auxilary Telescope Fero Z18

- Magnification 8x

7 | Combat-protection

- Superior technology

8 | Power pack

- MTU Multi-fuel power pack
- 47,600 ccm, 1,500 hp

9 | Auxiliary power unit

- 20 kW electrical output

10 | Cooling systems

- 8 kW Turret Cooling and NBC System
- 8 kW Crew Compartment Colling System

11 | Drivers sight

- Modern day and night cameras for the driver with mergeable images (front and rear side)

/ Training and Simulation

Platoon	Tactical Training Center Combat Support
Crew	Tactical Training Center Combat Support
Individual	Command & Control Gunnery Training Driver Training (virtual, live)

Well-trained MBT commanders and crews are the most important prerequisites for a successful military operation. KNDS offers a variety of modular Training & Simulation (T&S) equipment, which enables armor schools and tank battalions to train their MBT crews according to the individual skill levels. Basic training starts with teaching new tank crews how to handle the MBT and continues to develop step by step the skills required for the MBT crews to operate as a part of a platoon in joint operations together with other weapon systems. KNDS's T&S equipment ensures the right training level for each crew member according to his skills and demanded tasks.

LFME Training System

KNDS provides training solutions that match the customers' requirements exactly. They are the result of a thorough Training-Need-Analysis in close cooperation with the customer. Training solutions range from planning through implementation up to the delivery of turnkey training centers and may cover maintenance and support concepts also. A long-term cooperation with the customer and support of all training devices even after delivery are essential parts of KNDS's philosophy. In this process, the customer benefits directly from the experience KNDS has gained through decades during the in-service life of its training equipment. KNDS training solutions are designed for plug-and-play DIS/HLA-compliant networking to allow the best and most realistic platoon, company and Joint Operations Training.

LEOPARD 2 Turret Trainer

The KNDS turret trainer for commander, gunner and loader uses exact turret replicas to provide an authentic environment to the crew. A fully functional weapon simulator with breech movement and re-usable training ammunition and a large 360-degree display system for all crew tasks above hatch provide absolute realism to the trainees.

The full mission driving simulator, with its driver cabin mounted on a 6-degrees-of-freedom motion system allows training of all situations including dangerous and critical driving tasks in any terrain under combat conditions. Almost 90% of the overall training can be done in this simulator. This leads to short training cycles, and saves costs due to reduced wear and tear of the original vehicles. In the final phase of the driver training, the Driver Training Tank allows intensive training of the driver in the original MBT-chassis, under instruction of an experienced Driver-Instructor.

LEOPARD 2 Driver Training Tank

KNDS's Live Firing Monitoring Equipment (LFME) supports the instructor during the entire real-live firing process. It provides the instructor with all relevant video, audio and technical data of the tank during live firing without restricting the mobility of the MBT. With the recorded data, LFME allows a detailed and objective after-action-review of hits and missed shots and clearly shows how to improve first hit ratio. Beside a much faster learning curve, the benefit is a significant saving of ammunition. More than 15 armies worldwide rely on training devices from KNDS.

/ Customer Service Support (CSS)

Besides the fact that the LEOPARD 2 MBT and its family vehicles are designed and qualified as an extremely reliable and robust system, the logistics support provides the high overall system reliability.

KNDS has performed the complete logistics analysis for the LEOPARD 2, and maintains and administers the relevant logistics data according to the requirements of each nation. Logistics support is not just a one-time task; instead, it is our philosophy to support the system for decades. Therefore, LEOPARD user nations coordinate their maintenance activities via the LEOPARD users club, called LEOBEN.

This includes common logistics and common or new developments for modifications and replacements to overcome obsolescence. This provides synergetic effects in terms of time, money and experience for all members. KNDS is the industrial partner for the international LEOBEN Club, ensuring full lifetime support for national service support contracts.

KNDS provides the following services:

- 24 hr support by the KNDS experts via tele-maintenance
- Use & supply of the latest technology in tools, diagnostic & test equipment
- Complete spare part support & maintenance
- Field service for normal operations and missions, also in theatre (e.g. Afghanistan)
- Trainers with a military background as well as training & simulation equipment
- Configuration system engineering & obsolescence management
- High technical expertise in a wide range up to complex electronic, optronic and radar systems
- Expertise in maintenance for armored vehicles (tracked & wheeled) and know-how transfer for maintenance
- Advanced database for documentation and logistic analysis
- Logistic frame contracts with more than 20 nations within LEOBEN for common spare parts
- Post Production Support (PPS) Contracts for specific spare parts
- Computer aided fleet availability monitoring

ILME – Integrated Logistics Management Environment

The Integrated Logistics Management Environment (ILME) is KNDS's answer to the complexity and diversity of modern weapon systems. ILME encompasses the weapon system entirety with respect to maintenance, care and operation. Relevant information for specific maintenance or repair task is presented in a consistent way.

The integrated expert system (TE-XPS) guides the maintenance personnel systematically through the diagnosis of the weapon system. Corresponding 3D-views and representations support him to complete his tasks. The connection-plan tool (VPT) automatically creates interactive wiring diagrams based on information from the TE-XPS, which show the corresponding cabling of integrated components.

With ILME, KNDS enables the user's maintenance personnel with a modular and future-oriented integrated platform for maintenance and repair tasks to support the weapon system in the best possible way.

MainTent – the flexible on-site support

As a special service for our customers KNDS offers the so-called MainTent as an unique mobile maintenance building for assuring the top-of-the class service phase right from the transition after delivery.

MainTent is highly scalable to each user's needs and comes in the standard version with a height of up to 7 meters and one crane with lifting power of 6.3 tons. Since MainTent consists of separate segments – each approx. 6 meters long – the maintenance capacity can be fully adjusted to the expected number of vehicles.

And finally: MainTent can be rebuilt at another location at any time with a realization time usually less than 3 months.

KNDS successfully offered and operated MainTent for the German Armed Forces as well as for the Hungarian Army.

KNDS

KNDS Deutschland
GmbH & Co. KG

Krauss-Maffei-Str. 11
80997 Munich, Germany
Fon: +49/89/8140 50
Fax: +49/89/8140 4900
Mail: info@knds.de
Web: www.knds.com

24EN | 1802A03