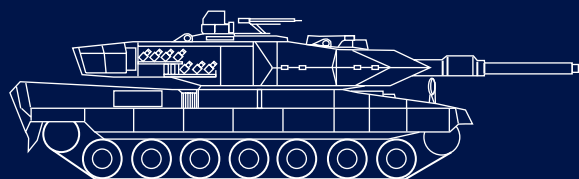
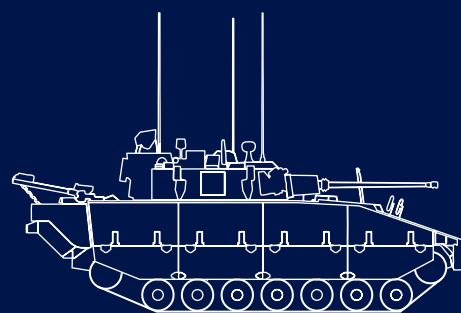
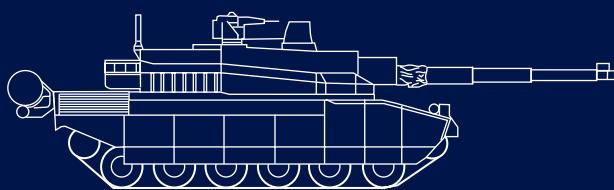
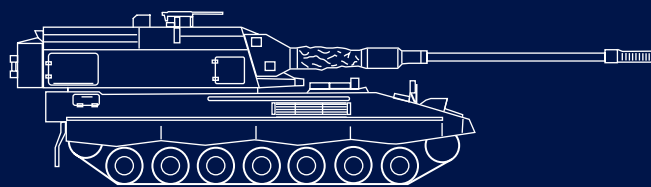




Innovative Power Transmission



Transmissions
for Military Tracked Vehicles

EXPERIENCE

- More than 140 years' experience in design, manufacture and maintaining transmission technologies
- Over 70 years' know-how and experience in the field of transmissions for military tracked vehicles
- RENK – World's market leader in transmissions for medium to heavy military tracked vehicles

INNOVATION

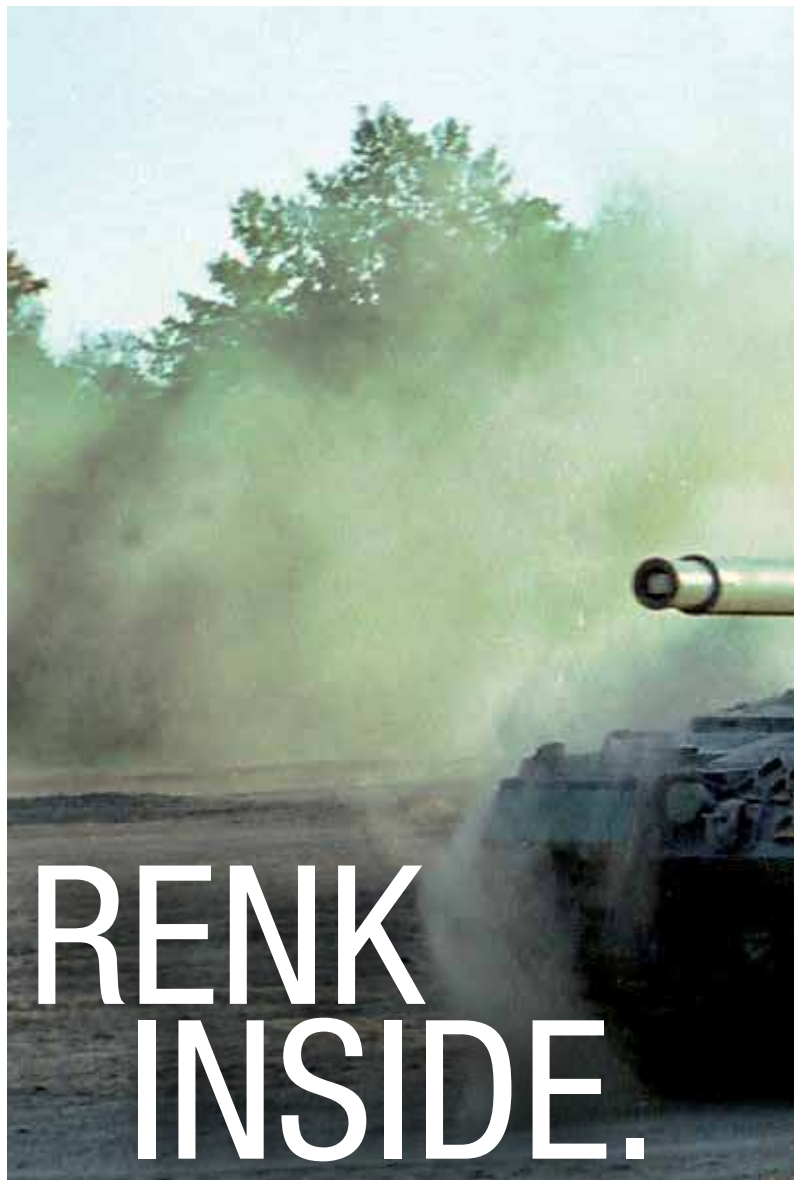
- State-of-the-art and future hybrid transmission technologies
- Secure for the future and support for decades
- Easy to maintain integrated logistic concept

TECHNOLOGY

- RENK transmissions: the key link between engine and tracks; drive, steer and brake

REFERENCES

- RENK transmissions in service with more than 30 armies world wide
- Used in more than 40 types of military tracked vehicles



**RENK
INSIDE.**

RENK – World Leading

RENK designs and manufactures transmissions for military ‘tracked’ vehicles. Each RENK transmission ‘drives’, ‘steers’ and ‘brakes’ the complete vehicle, all from one single drop-in assembly. This is the technology of RENK know-how and expertise.

Tracked armoured vehicles require an especially highly developed transmission technology. RENK can look back at over 70 years of experience in this sector. 1965 marked the year that RENK invented the hydrostatic-hydrodynamic steering drive – a concept universally acknowledged as second to none.

With continuous sustained investment and innovation it is no surprise that RENK, together with its subsidiary RENK France, is the world’s leading supplier of transmissions for military tracked vehicles, with an impressive range of modern products, technology and manufacturing facilities.



*Main Battle Tank Leopard 2 A5
Source: KMW*

Technologies for Superior Mobility

Motion for Missions

The main operational advantage of tracked vehicles is their superior mobility especially in heavy terrain. High performance and reliable transmissions are the requirement and therefore the decisive element between engine and track – determining the mission efficiency of the vehicle system, responsible for all the drive, steer and brake functions.

Founded in 1873, based in Augsburg, Germany, RENK AG has continuously committed itself to manufacturing advanced transmission technologies for a variety of specialist applications. Today RENK AG is one of the world's leading manufacturers of power transmission engineering and is the market leader in transmissions for military tracked vehicles. RENK and its French subsidiary RENK FRANCE develop and produce vehicle specific transmission solutions principally for medium to heavy tracked vehicles.

As transmissions are RENK's core business, RENK can confidently be relied upon to develop, manufacture, support and serve our international customers and to continue to provide superior products for military tracked vehicles for the next decades and beyond.

Today, RENK offers a broad range of automatic transmissions of high efficiency, low weight and low life-cycle cost for military tracked vehicles in a power range from 300 to 1,300 kW. RENK is supplying gearboxes and transmissions to the Armed Forces of more than 30 nations.

RENK transmissions are in the most modern infantry fighting vehicles (IFV), main battle tanks (MBT) as well as all applicable family vehicles.

Key elements providing maximum mobility for tracked vehicles are integrated within the new generation:

- Full load powershift transmission of planetary design either in 4-, 5-, 6- or 8-speed versions
- 1:1 reversing gear stage (for unrestricted installation)
- Torque converter with automatic lock-up clutch, for maximum performance
- Superimposed steering system, infinitely variable
- Fully integrated vehicle brake system comprising non-wearing brake retarder and mechanical service and parking brakes
- Electronic/electrical remote driver control with fully automatic gear selection and optional manual gear shift
- Full data bus compatibility with extensive monitoring and support options
- Prepared for vehicle drive-by-wire solutions
- Final drive options, including close coupled arrangements for minimal vehicle width



Infantry Fighting Vehicle PUMA (Germany)

Source: PSM/KW/RLS

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Product Range

Type	Vehicle Installation		Typical vehicle weight*	Power in kW	Power in hp	Page
	Front	Rear				
HSWL 106	•		25 – 35 t	300 – 530	400 – 700	9
HSWL 256	•		35 – 45 t	500 – 800	700 – 1,100	10
HSWL 284C	•		50 – 60 t	700 – 1,100	950 – 1,500	11
HSWL 295		•	50 – 70 t	800 – 1,200	1,100 – 1,600	12
HSWL 354		•	50 – 70 t	900 – 1,300	1,200 – 1,800	13
RK 304S		•	50 – 70 t	650 – 1,050	900 – 1,400	14
RK 325	•		50 – 70 t	800 – 1,200	1,100 – 1,600	15
ESM 350		•	40 – 55 t	600 – 900	800 – 1,200	16
ESM 500		•	50 – 70 t	750 – 1,200	1,000 – 1,600	17

Guide only: Please contact RENK with specific vehicle details. Vehicle installation is typical; Alternative option on request.

RENK transmission arranged as a powerpack



Source: MTU

Steering, Braking and Shifting

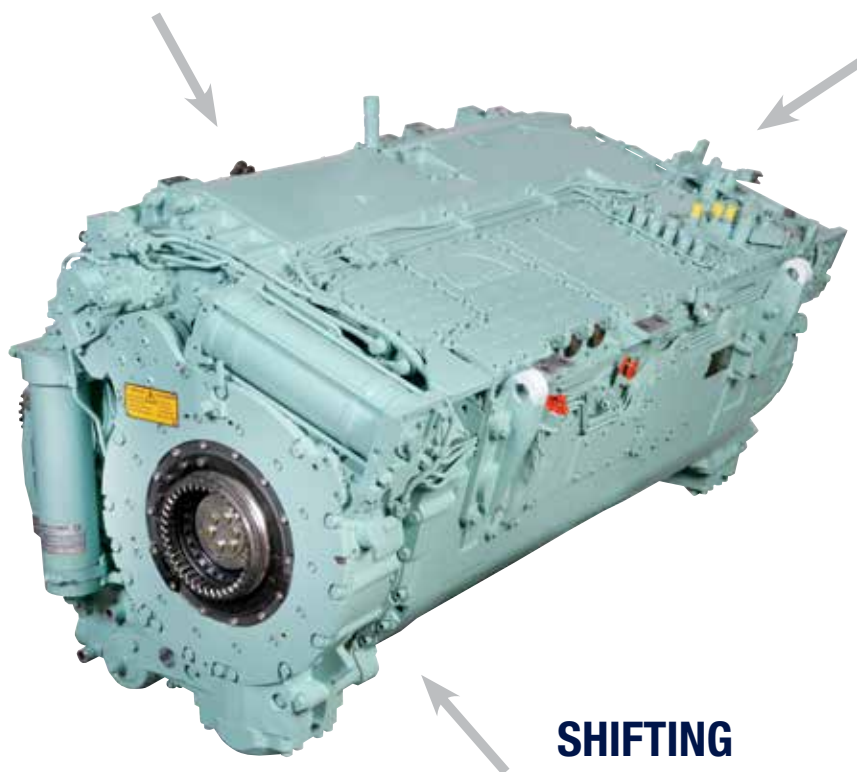
Meeting the highest military requirements and all safety demands is 'daily business' at RENK. All the brake system, including brake pressure accumulators (where applicable) are delivered pre-installed and piped as part of the RENK integrated product; all steering is fully integrated, as well as all necessary pumps and controls. RENK provides the one complete 'drop-in' product for all steering, gear-shifting and braking functions of the vehicle.

STEERING

- Highest mobility under all driving conditions
- Safe in all terrains
- Highly reliable and precise control

BRAKING

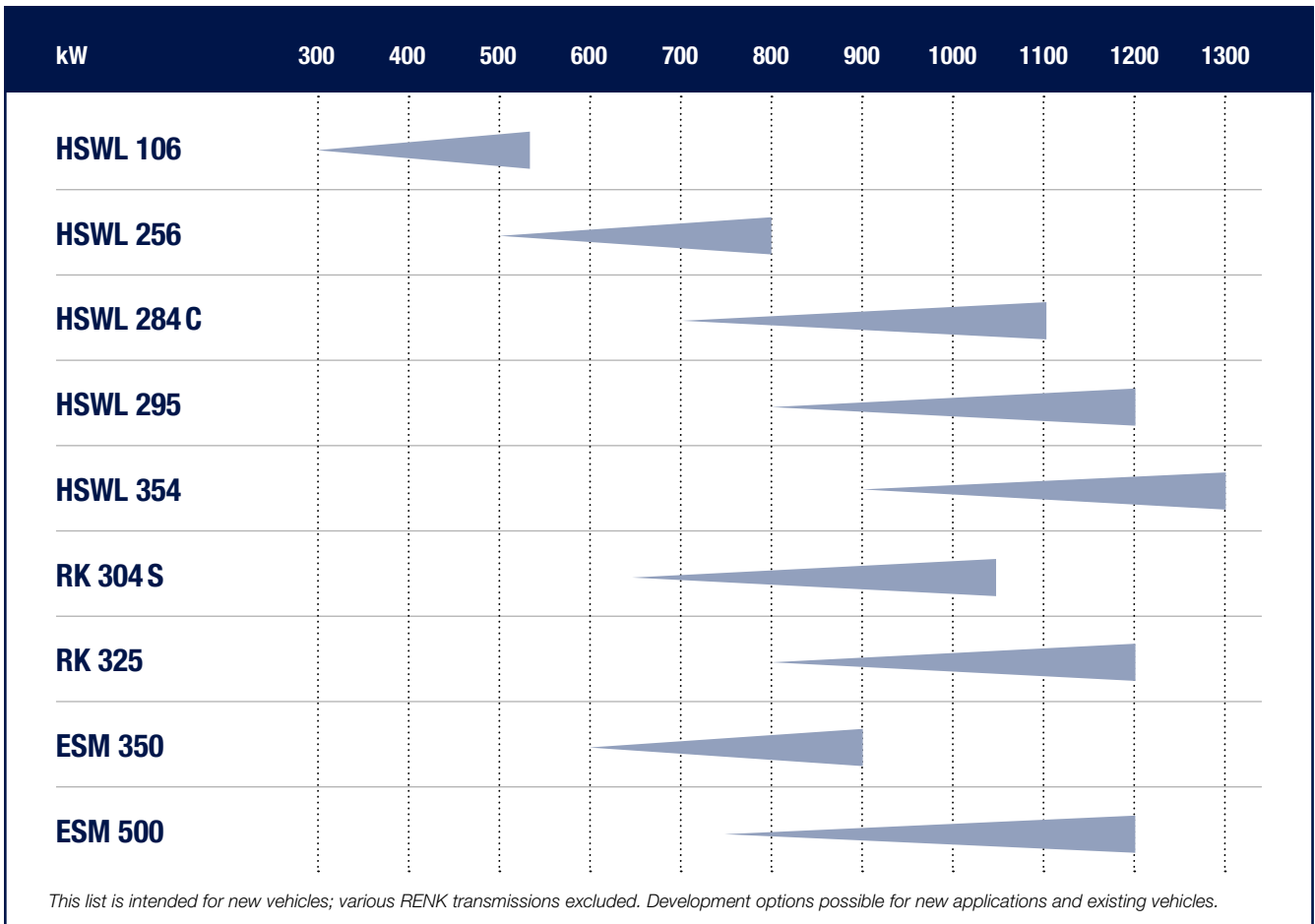
- Fully advanced braking equipment
- Integrated into one system, with powerful retarder
- Low life-cycle cost
- Easy to maintain



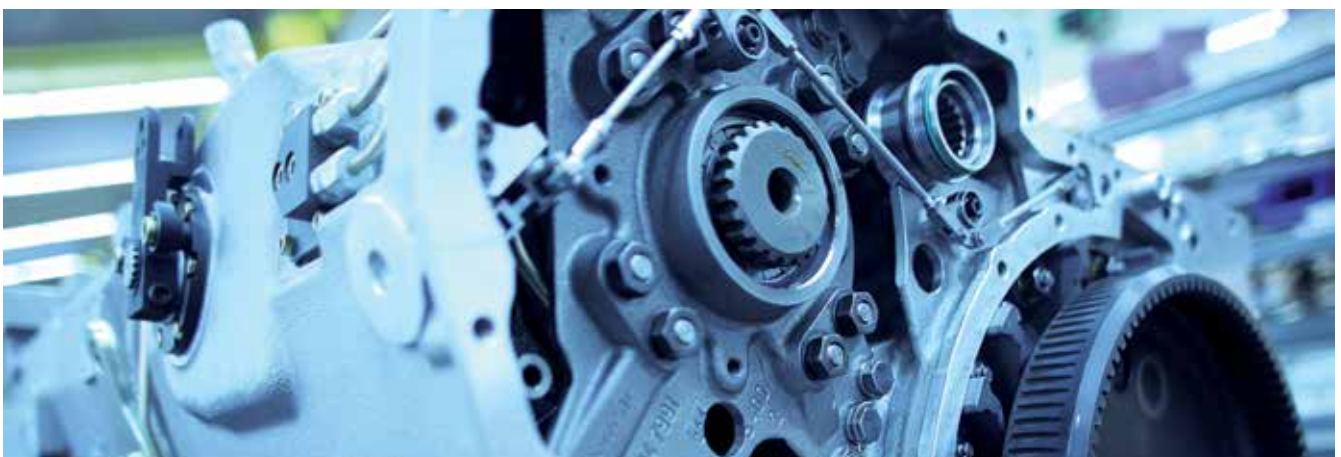
SHIFTING

- Fully automatic gear shifting
- 4-8 speed high performance
- Excellent efficiency
- Highest mobility under all driving conditions
- Built to highest reliability and durability standards

RENK Transmissions – Initial Selection Guide



Maximum ratings apply for new transmissions, dependent on vehicle weight and speed.
Please contact RENK for exact limits and full details.



HSWL 106

25 – 35 t



RENK HSWL 106

for 25 – 35 t tracked vehicles

Power range 300 – 530 kW (700 HP)

Power-shift transmission

6 speed forward

6 speed reverse

The HSWL 106 transmission features the latest developments of RENK and ensures highest mobility and performance of the vehicle, including under difficult operating conditions or driver stress situations. It is ideal for high-performance tracked vehicles and includes an excellent brake system.

The reliability is extraordinarily high and attributes to the safety of both vehicle and, most importantly, the crew. The HSWL 106 meets all propulsion system requirements for a modern tracked armoured vehicle.



Armoured Personnel Carrier ULAN (Austria)



Infantry Fighting Vehicle PIZARRO (Spain)

HSWL 256

35 – 45 t



RENK HSWL 256

for 35–45 t tracked vehicles

Power range 500–800 kW (1,100 HP)

Power-shift transmission

6 speed forward

6 speed reverse

Latest state-of-the-art, the RENK HSWL 256 transmission for the most advanced mid-weight fighting vehicles, PUMA for the German Army, new family of vehicles for the British Army. The new generation HSWL 256 has been developed and built based on RENK's experience and continuous development. The HSWL 256

transmission combines a most compact design with regard to size and volume while also using optimal weight components with long-term durability and high performance to drive, brake and steer the vehicle over a wide range of vehicle weights. This transmission is proved for the latest generation of medium weight vehicles.



Infantry Fighting Vehicle PUMA (Germany)

Source: PSM/KMW/RLS



New AJAX family of vehicles (U.K.)

Source: General Dynamics

HSWL 284C

50 – 60 t



RENK HSWL 284C

for 50–60 t tracked vehicles

Power range 700–1,100 kW (1,500 HP)

Power-shift transmission

4 speed forward

4 speed reverse

This transmission is a fully proved modern development with advanced technology for the coming decades. It ensures highest mobility, performance and acceleration of the vehicle in every terrain. The electronic automatic gear shift relieves crew stress under difficult operating conditions. The advanced brake system

enhances maximum vehicle drivability. Extraordinary high reliability and durability contribute to the safety of both the vehicle and most importantly, personnel.



HOWITZER 2000 (Netherlands)



HOWITZER 2000 (Germany)

HSWL 295

50–70 t



RENK HSWL 295

for 50–70 t tracked vehicles

Power range 800–1,200 kW (1,600 HP)

Power-shift transmission

5 speed forward

5 speed reverse

The HSWL 295 is the transmission of choice for main battle tanks. Extremely compact with the powerpack arranged in U-configuration with the engine across the vehicle. Highly proven in extreme operation conditions it features five speeds forward and reverse. This transmission meets the highest requirements for new-build main battle tanks and retrofit programs.



Main Battle Tank ALTAY (Turkey)



Main Battle Tank K2 (Korea, RoK)



Main Battle Tank LECLERC Tropicalise (U.A.E.)

HSWL 354

50 – 70 t



RENK HSWL 354

for 50 – 70 t tracked vehicles

Power range 900 – 1,300 kW (1,800 HP)

Power-shift transmission

4 speed forward

4 speed reverse

The HSWL 354 is a highly proven and reliable transmission as used in the excellent Leopard 2 main battle Tank and Leopard 2 family. The latest version, volume produced since 1983, has been in service with 18 countries to date, all fully supported by RENK for new-build vehicles of the highest standard.



Main Battle Tank LEOPARD 2 A7+

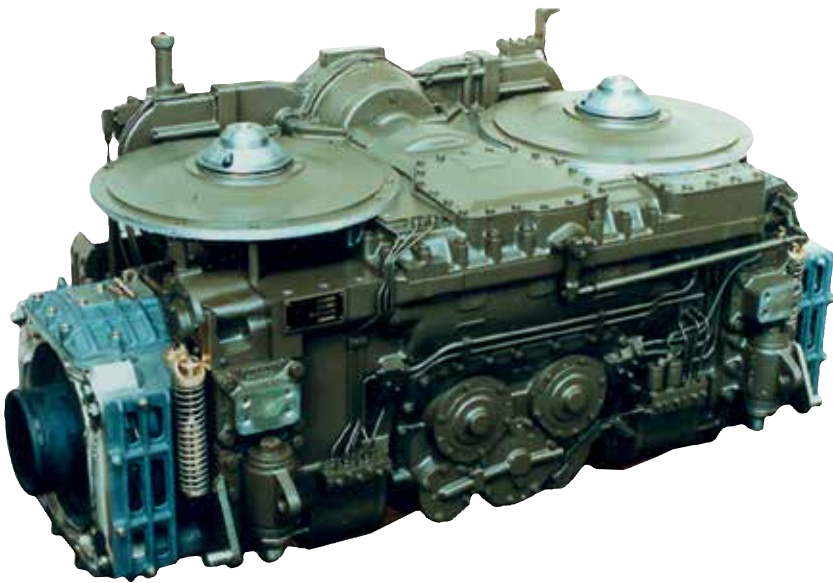
Source: KVVV



Armoured Recovery Vehicle BÜFFEL

RK 304S

50–70 t



RENK RK 304S

for 50–70 t tracked vehicles

Power range 650–1,050 kW (1,400 HP)

Power-shift transmission

4 speed forward

4 speed reverse

This transmission is a fully proved modern development with advanced technology for the coming decades. It ensures highest mobility, performance and acceleration of the vehicle in every terrain. The electronic automatic gear shift relieves crew stress

under difficult operating conditions. The advanced brake system enhances maximum vehicle drivability. Extraordinary reliability and durability contribute to the safety of both the vehicle and most importantly, personnel.



Main Battle Tank M60 (Turkey)



Main Battle Tank ARJUN (India)

RK 325

50–70 t



RENK RK 325
for 50–70 t tracked vehicles
Power range 800–1,200 kW (1,600 HP)

Power-shift transmission
5 speed forward
5 speed reverse

The RK 325 transmission is designed for front installation in L-configuration for main battle tanks (MBT's) and family vehicles. It ensures highest mobility, performance and acceleration of the vehicle in every terrain. The electronic automatic gear shift unit

and the advanced brake system enhance maximum vehicle drivability. An excellent choice of transmission for world's leading tracked vehicles.



Main Battle Tank MERKAVA IV (Israel)



Main Battle Tank MERKAVA IV (Israel)

ESM 350

40 – 55 t



RENK ESM 350
for 40–55 t tracked vehicles
Power range 600–900 kW (1,200 HP)

Power-shift transmission
8 speed forward
4 speed reverse

The ESM 350 is a high-performance transmission developed and in serial production by RENK France for T-type main battle tanks (T-72 incl. derivatives), featuring eight speeds, infinitely variable superimposed steering system and a high-performance brake.

It is suitable for T-type tank new-build programs as well as upgrade programs. The integration process is easy, preserving the original silhouette of the vehicle. RENK France also offers a complete powerpack solution.



Main Battle Tank PT-91M (Malaysia)



Main Battle Tank PT-91M (Malaysia)

ESM 500

50–70 t



RENK ESM 500

for 50–70 t tracked vehicles

Power range 750–1,200 kW (1,600 HP)

Power-shift transmission

5 speed forward

2 speed reverse

The ESM 500 is an excellent transmission for modern main battle tanks. It features five forward speeds and two reverse speeds. It is equipped with a high-performance braking system with secondary

retarder and carbon friction brakes. The ESM 500 is developed and manufactured by RENK France for the French LECLERC MBT.

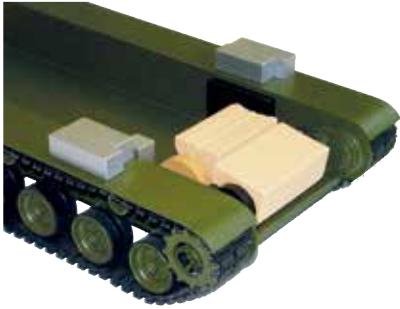


Main Battle Tank LECLERC

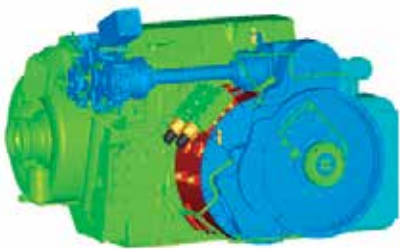


Main Battle Tank LECLERC

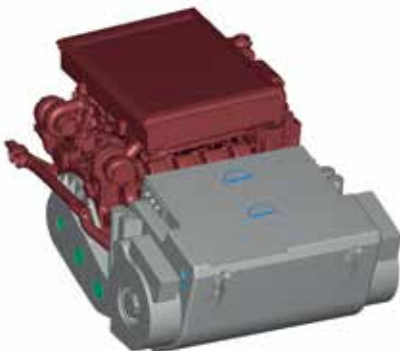
Electric Drive Systems



Concept of RENK EMT 'serial' drive close arranged to the main diesel generator



CAD model of the RENK REX Drive demonstrator, for trials



Hybrid powerpack concept



Twin electric motor and gear system assembly

RENK: Informed and Leading

RENK is a knowledgeable leader in electric propulsion for military tracked vehicles, patenting the all-important concept of using a 'serial' electric system for driving and steering in combination with 'cross-drive' mechanics, over 25 years ago.

RENK design of modern generation systems, new drive concepts and physical proof of concept by actual test-bed running means RENK has a key understanding of real usable technology and demands in this specialised field.

The latest RENK electric technology is the REX Drive. A parallel drive combined mechanical-electro transmission system for military tracked vehicles that demand advanced modern power management and distribution and redundant steer control. A concept taking the best of electric drive, balanced with highest-performing mechanical attributes. Optimal hybrid performance for tracked vehicles requiring high-load electric power.



RENK REX Drive demonstrator under test

RENK Final Drives

The Final Drives are an important key component of the propulsion system. Left and right mounted Final Drives transfer all the propulsion, all the braking and all steering functions from the Transmission to each track. RENK offers a range of state-of-the-art Final Drives for optimal vehicle Safety, Durability and Performance.

RENK designs and supplies

- Coaxial Final Drives
- Offset Final Drives
- Two-Speed Final Drives

RENK designs and manufactures the highest quality range of purpose designed and warranted, durable Final Drives for operation in the harshest of off-road conditions.

Purpose matched to required vehicle speed, vehicle growth weight and impact shocks of cross-country performance in the worst exposed conditions of mud, water, sand and extremes of heat, to our Customers specifications. RENK Final Drive solutions meet the highest demands and safety standards of the very latest high speed tracked vehicles.

Final Drives

- Purpose matched to RENK transmissions
- Designed for Vehicle Weight Growth
- Maximum Strength and Reliability
- Multi-sealed for Highest Durability
- Fully interchangeable Left and Right



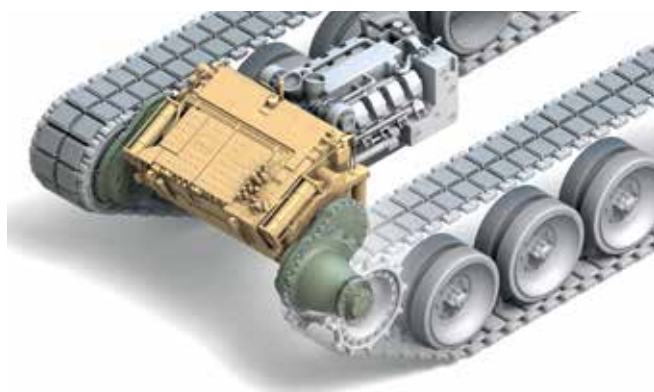
Coaxial Final Drives



Two-Speed Final Drives
(RENK patents 2001)



Offset Final Drives



Transmission & Final Drive assembly

Electronics and Monitoring

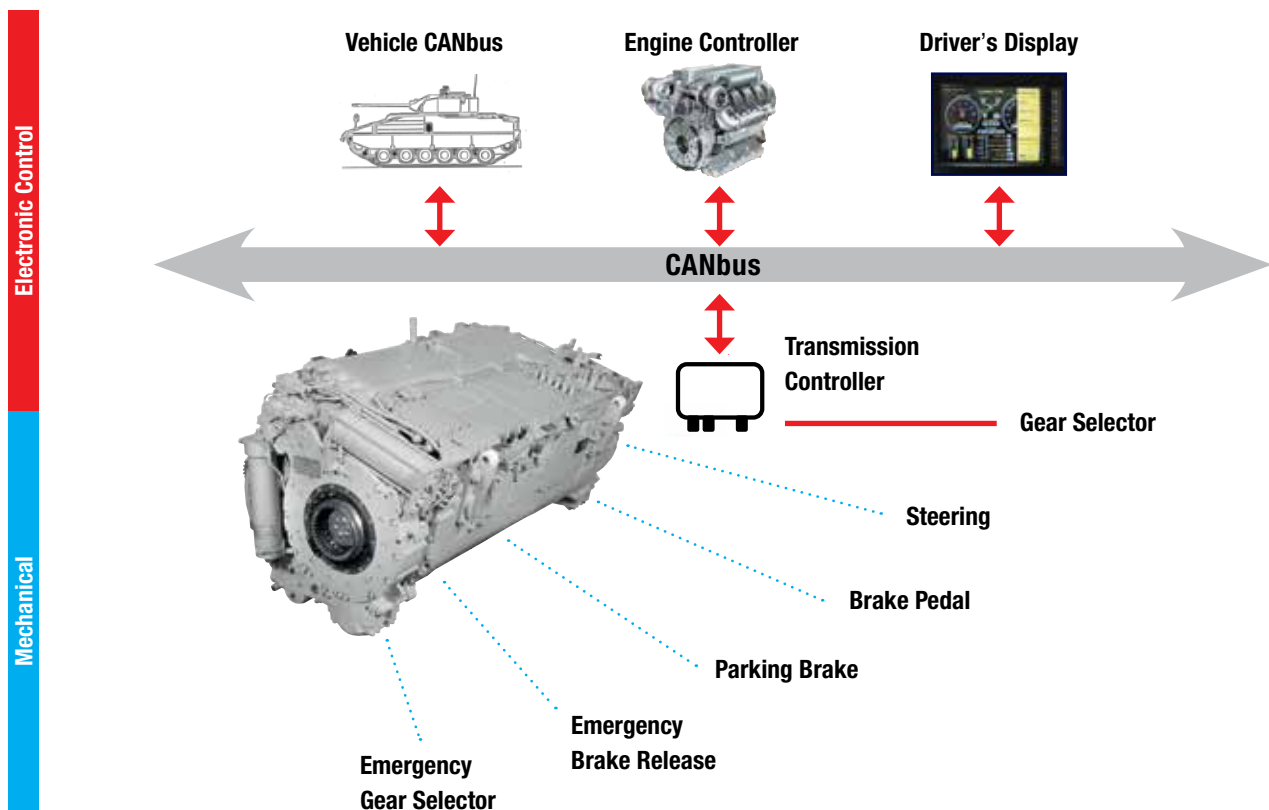
RENK's dedicated vehicle transmission electronics team, complete with modern laboratories, provides the expertise behind the controls and monitoring of every RENK transmission:

- Fully advanced digital electronics
- Gear shift points adapted to driving style
- Emergency control functions
- Extensive reporting outputs
- Full monitoring of RENK 'mechanically actuated' brake and steer systems

The driver's gear selector, with direction of travel, neutral and pivot turn selection, fully proved for military use, provides the command input. System communications with RENK digital electronics provides control inputs for high-performance safe operations and optimisation of whole powerpack performance. Emergency mechanical gear selector and steer-to-stop safety system. Extensive CANbus data to vehicle systems, health and usage monitoring, provides the customer data for timely driver information and maintenance actions.

Customer Options

- Commanders controls, emergency brake
- Transmission diagnostic unit with digital graphical displays, for depot maintenance and in-vehicle checks (RENK TDS-G)
- RENK diagnostic software for PC use
- Transmission data recorder (notebook download of detailed data) for trials and specific in-service use
- Transmission data module dedicated to every transmission for overview record keeping (RENK TDM)
- RENK driver's steering wheel, adjustable, with full digital display and functionality
- Preparation for vehicle drive-by-wire



Test and Support

Every RENK transmission is full load tested for all drive, steer and brake functions before it leaves RENK factory, with the mass and inertia of the hull replicated at in-service weight. This high level of RENK test is a repeatable 'health check' for each transmission throughout its life, assuring optimal in-service, trouble-free performance and to customer specifications, on every delivery.

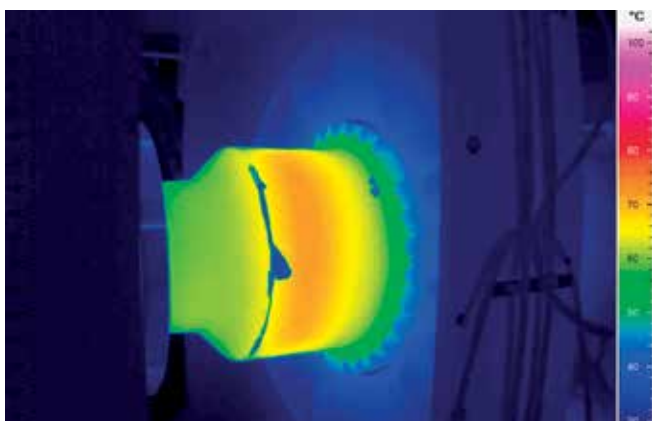
Our expert RENK team provide full engineering and support services to the Vehicle Builder and End-User, from first hull concept requirements through to build, test, delivery, initial vehicle support for Customer first trials, to Serial Production and years of use.

RENK offers a full service of specialist engineering, with emphasis on the needs of our Customer, for initial vehicle trials and through life support of fielded equipment.

- Full load transmission testing with simulated vehicle masses
- Accelerated product endurance testing
- Trials data collection and evaluation
- Full Customer trials support, in field
- Special purpose developments of in-service products e.g. for increases in vehicle weight
- Expert advice and lifetime support



RENK inclination test bed



Heat transfer test



RENK test bed

RENK Full Integrated Logistics Support



ILS Management

- MTBF data calculation
- Logistic support analysis
- Recommended field support

TRAINING

At your place or ours.



SERVICE

RENK service engineers and technicians provide on-site or remote support in the event of any problem, big or small.

UPGRADES

RENK will rejuvenate your systems to the newest technology – such as by installing new electronic controls, repairing or completely replacing components, to re-set your product to 'as-new'.



COMMISSIONING

For the installation of your transmissions RENK provides skilled personnel for on-site support and advice.



Source: FSM/KM/RLS

PARTS PACKAGES

Custom-tailored packages for scheduled usage and availability.

TOOLS

- Special tool packages
- Lifting / handling equipment
- Repair shop equipment

REPAIRS AND OVERHAULS AT RENK

Our work shop will repair damaged equipment by installing RENK OEM parts quickly and knowledgeably.



OEM PARTS

Only inspected and genuine parts backed by the quality and assurance of an OEM throughout the life of your vehicle.



M&R CONTRACTS

Maintenance contracts transfer responsibility to RENK for all necessary work.

TRIALS SUPPORT

As required, our engineers will fully support initial vehicle operations.

OBSOLESCENCE MANAGEMENT

RENK offers full obsolescence management by trained staff.

DOCUMENTATION

- User manuals
- Repair manuals
- Illustrated part catalogues
- Wear limit catalogues
- Training manuals and documentation



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