



WE MAGNETISE THE WORLD

COMMERCIAL VEHICLE SYSTEMS



Engine-cooling Systems

Electromagnetic Fan Clutches

The advantages at a glance

- Compact design.
- High efficiency.
- No „morning sickness“.
- Precise fan control.
- Demand-oriented cooling reduces fuel consumption and CO₂ output.
- The RPM characteristic of the eddy-current stage can be specified according to customer requirements.
- Low noise level in comparison to rigid drives: The specified noise limit values are clearly fallen below.
- Simple installation and removal.
- Maintenance-free drive means low downtime.
- Long service life.
- High efficiency.

Additional advantages of the 3-speed version

- Especially in countries with low temperatures, the 3-speed solution prevents overcooling of the engine.
- Rapid engine warm-up.



Fan clutches for installation with open radiator-fan bearing frame (2-speed / 3-speed)

	2-speed	3-speed
Torque	Up to 1,200 Nm	135 – 400 Nm
Fan diameter	Up to approx. 1,800 mm	Up to approx. 1,200 mm
Voltage	12 V and 24 V	12 V and 24 V

Fan clutches for installation at the water pump (2-speed / 3-speed)

	2-speed	3-speed
Torque	Up to 220 Nm	135 – 180 Nm
Fan diameter	Up to approx. 800 mm	Up to approx. 800 mm
Voltage	12 V and 24 V	12 V and 24 V

Fan clutches for engine-mounted installation (2-speed / 3-speed)

	2-speed	3-speed
Torque	Up to 1,200 Nm	135 – 400 Nm
Fan diameter	Up to approx. 1,800 mm	Up to approx. 1,200 mm
Voltage	12 V and 24 V	12 V and 24 V

Angle Gearboxes and Electromagnetic Fan Clutches

The advantages at a glance

- Easy to service.
- Long service life through integrated gearbox ventilation.
- Optimized ball bearings.
- Long oil-change intervals.
- Noise reduction.

Combination fan clutches (2-speed / 3-speed) downstream of the angle gearbox – LLW100

	2-speed	3-speed
Advantages	<ul style="list-style-type: none"> ■ Tried-and-tested over 100,000 times ■ Very compact design of complete system 	
Torque	Up to 220 Nm	Up to 135 Nm
Fan diameter	Up to approx. 800 mm	Up to approx. 800 mm
Voltage	12 V and 24 V	12 V and 24 V



Combination fan clutches (2-speed / 3-speed) upstream of the angle gearbox – LLW202 / LLW203

	2-speed	3-speed
Advantages	<ul style="list-style-type: none"> ■ Increased gearbox service life ■ Increased oil service life through reduced gearbox-oil temperature ■ Reduced loading of components 	
Torque	Up to 300 Nm	Up to 300 Nm
Fan diameter	Up to approx. 800 mm	Up to approx. 965 mm
Voltage	12 V and 24 V	12 V and 24 V



Angle gearboxes for fan clutches – LLW200

Advantages	<ul style="list-style-type: none"> ■ Low weight: 12 kg ■ Noise-reduced: Significantly below the required industrial limit values ■ New integrated ventilation increases the service life of the shaft seals ■ 100 % recyclable
Application	Visco and electromagnetic fan clutches
Torque	300 Nm nominal torque
Fan diameter	Up to approx. 800 mm



We also provide other individual solutions - Please contact us.

Kendrion Engine-cooling Systems

Safety, efficiency, comfort, durability and environmental protection are the main demands placed on the drive technology of commercial vehicles. For almost 40 years, these subjects have

been the focus of Kendrion Commercial Vehicle Systems. We offer intelligent solutions for all leading vehicle manufacturers, particularly in the area of engine cooling.

Efficient engine cooling means saving fuel

The primary units of Kendrion engine-cooling systems are electronically controlled electromagnetic fan clutches, available in 2- and 3-speed versions. These clutch systems enable demand-meeting engine cooling to be realized. After all, maximum fan speed is only required occasionally. Switching the units down to a

lower speed range saves energy. So, the essential strength of the system, its efficiency, is a result of its function: Demand-meeting engine cooling at high efficiency has significant potential in cutting down fuel costs.

Accurate heat removal depending on individual output curve

Depending on the application, Kendrion technology adapts to the customer's output curve and can thus ensure accurate, very swift heat removal: Kendrion LINNIG fan clutches fully engage the fan within 0.5 seconds, and thus draw off heat immediately. The maximum engine power is always available without the reduction of

engine output in case of imminent overheating. Because of the linear speed characteristic of the fan drive, speed increases up to the maximum engine capacity are not required, as can be the case with Visco clutches.

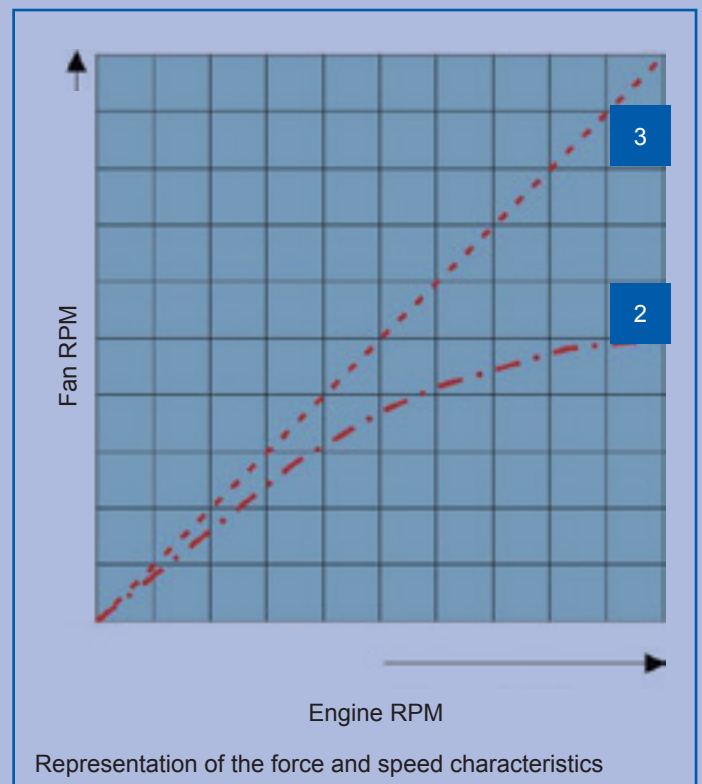
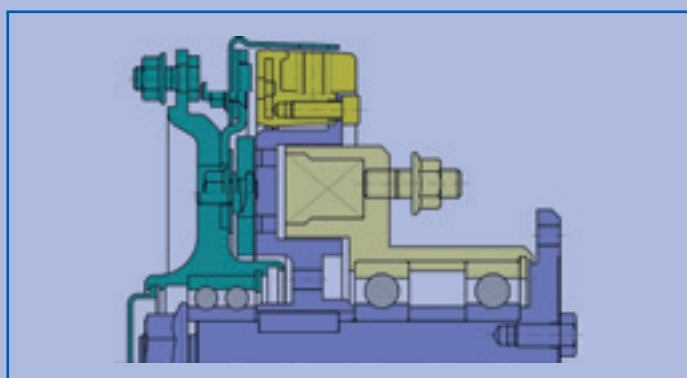
Operating method of the Kendrion LINNIG 2-speed electromagnetic fan clutch

Kendrion fan clutch technology is available in 1-speed, 2-speed and 3-speed versions.

The 2-speed fan clutch has two speed ranges:

Reduced speed (2): When the electromagnetic clutch is deactivated (disengaged), the fan blade can reach speeds of up to 1,200 RPM by means of a contact- and wear-free operating eddy current system.

1:1 ratio (3): When the electromagnetic clutch is activated via a temperature sensor, the fan blade runs synchronous with the drive pulley.

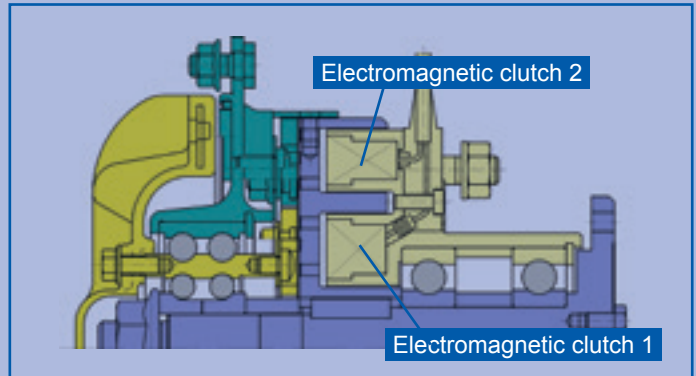


Operating method of the Kendrion LINNIG 3-speed electromagnetic fan clutch

The 3-speed fan clutch has three speed ranges:

In the 3-speed version, the eddy current system can be activated and deactivated. This enables very low fan speed and thus swift warming-up of the engine.

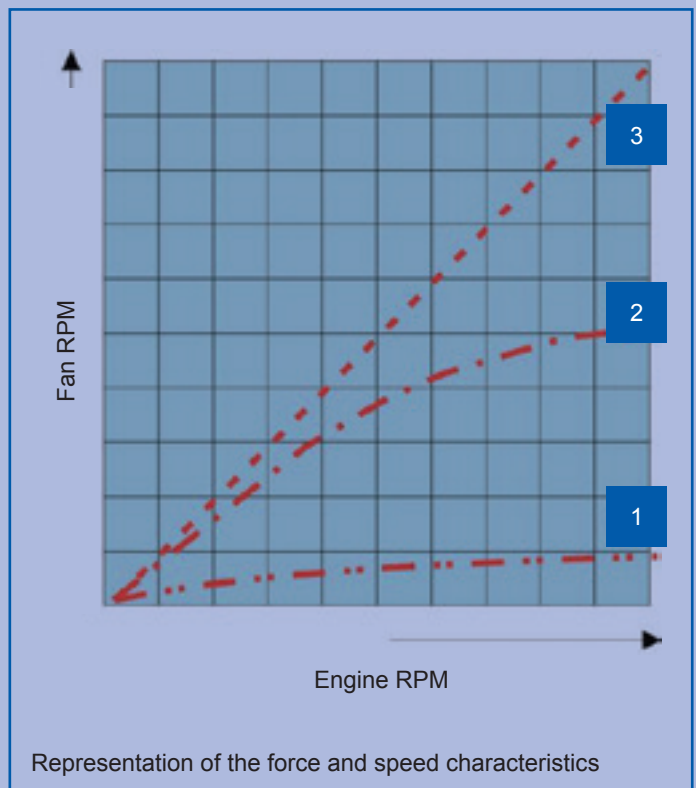
The 3-speed system comprises two electromagnetic clutches, which can be activated individually or together in order to provide the desired functionality.



Very low speed (1): When both electromagnetic clutches are deactivated, the fan blade runs at a speed below 100 RPM, owing to the interior friction conditions.

Medium speed (2): When the inner electromagnetic clutch 1 is activated via the first temperature sensor, the fan blade can reach speeds of up to 1,200 RPM by means of a contact- and wear-free operating eddy current system.

1:1 ratio (3): When the outer electromagnetic clutch 2 is activated via the second temperature sensor, the fan blade runs synchronous with the drive pulley.



Various installation possibilities

Depending on vehicle type and installation situation, the following possibilities are given:

- Installation with open radiator-fan bearing frame
- Installation at the water pump
- Engine-mounted installation
- Installation with angle gearbox

Angle Gearbox with the LLW203 Fan Clutch

Fan clutch upstream of angle gearbox - A highly innovative arrangement!

Kendrion combination of fan clutch upstream of the angle gearbox allows for lateral radiator installation in busses/coaches, thus enabling a more flexible and efficient design of the cooling system. The alternative arrangement of the clutch represents an important optimization: The classic arrangement was to position the fan clutch „downstream“ of the angle gearbox between gearbox and fan. Now, it is also possible to position the clutch „upstream“ of the gearbox. As engine start-up and shut down then take place with the clutch disengaged and the cooling fan only has to be operated at the 1:1 engine speed ratio in extreme cases, the average gearbox speed is reduced in this array. The extremely posi-

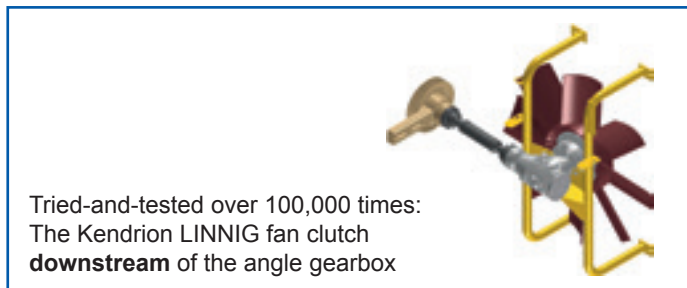
tive results are reduced gearbox loading, along with lower noise levels and increased service life of the complete system.

Due to the alternative arrangement and the associated reduction of the gearbox speed, the use of an idler damper can even be omitted in special cases. Thanks to the ratio reduction, the universal shaft is also subject to far less loading. Together with an integrated gearbox ventilation and optimized gearbox bedding, the new angle gearbox generation can certainly meet increasing customer requirements in terms of service life.






Efficiency and environmental protection – It all makes perfect sense!

The improved service-friendliness and oil-change intervals of up to 250,000 km also add to a reduction of vehicle downtime, which then again increases the overall efficiency of the complete sys-

tem. Of course, only common gearbox oils are used. After removal, the Kendrion LINNIG angle gearbox is 100% recyclable, and can also be reprocessed as a replacement part.



Accessories

Idler without damping	This Kendrion LINNIG idler is used without damping, especially in combination the LLW 200 – Series.	
Idler with damping	The Kendrion LINNIG idler with integrated damper eliminates vibrations from the pulley drive, thus prevents noise and gives the drive longer service life.	
Deflection roller	Tried-and-tested over 100,000 times, Kendrion LINNIG's deflection roller contributes to efficient belt management, particularly with frequently occurring, high belt loads.	
Universal shaft	The universal shaft supplements the portfolio of Kendrion's engine-cooling systems.	
Fan blades	Kendrion also supplies matching fan blades.	

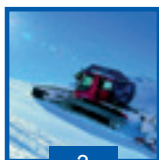
Interested in Other Areas of the Kendrion Commercial Vehicle Systems Portfolio?



1



2



3



4



5



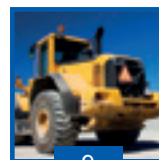
6



7



8



9



10

Industries

- | | |
|-----------------------------------|-----------------------------|
| 01 Busses/Coaches | 06 Rail Vehicles |
| 02 Trucks | 07 Municipal Vehicles |
| 03 Off Highway | 08 Agricultural Engineering |
| 04 Fire-prevention Technology | 09 Construction Machinery |
| 05 General Mechanical Engineering | 10 Industrial Engines |

Product Portfolio



a



b



c



d



e



f



g



h



i



j

For more information, please log on to www.kendrion.com



WE MAGNETISE THE WORLD

Service is not a task for us, it's a part of doing good business.

After delivery and installation, Kendrion customers will certainly not be left alone. Our qualified personnel will gladly answer any technical questions.

Expect swift and competent service over our hotline:

+49 7544 964-0.

Kendrion Commercial Vehicle Systems – Global Production Sites and Sales Locations

Kendrion (Markdorf) GmbH Commercial Vehicle Systems

Riedheimer Strasse 5
88677 Markdorf
Germany

Phone: +49 7544 964-0
Fax: +49 7544 6218
webinfo.markdorf@kendrion.com
www.kendrion.com

Kendrion LINNIG India Pvt. Ltd.

Klaus Union Campus
Gat no 1197
Near Ghotawade Phata, Village Pirangut
Taluka Mulshi, Dist Pune 412 108
India

sameer.deshmukh@kendrion.com

Kendrion (São Paulo) Sistemas Automotivos Ltda.

R. Silvério Finamore, 920
Cond. Industrial, Galpão 03
13290-000 Louveira, S.P.
Brazil

Phone: +55 19 3848 9900
vendas.saopaulo@kendrion.com

Kendrion Toluca, S.A. de C.V.

Camino a Ocotitlan No. 110
Col. La Estación
Mexicaltzingo, Toluca,
Edo. de México, 52180
Mexico

Phone: +52 (722) 263 2735
Fax: +52 (722) 263 2739
ventas@linnig.com.mx

Kendrion Linnig Drive Tech. (Nanjing) Co. Ltd.

Qi Xia Economic Development Zone,
Runhua Road 14#
210034 Nanjing
China

Phone: +86 25 83318982
Fax: +86 25 83308976
linnig@linnig.com.cn

Kendrion (Shelby) Inc.

1100 Airport Road
Shelby, NC 28150-3699
USA

Phone: +1 704 482 9582
Fax: +1 704 481 1741
sales.shelby@kendrion.com