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.

Additionally 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)

<table>
<thead>
<tr>
<th>Torque</th>
<th>2-speed</th>
<th>3-speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan diameter</td>
<td>Up to 1,200 Nm</td>
<td>135 – 400 Nm</td>
</tr>
<tr>
<td>Voltage</td>
<td>Up to approx. 1,800 mm</td>
<td>Up to approx. 1,200 mm</td>
</tr>
<tr>
<td></td>
<td>12 V and 24 V</td>
<td>12 V and 24 V</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Torque</th>
<th>2-speed</th>
<th>3-speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan diameter</td>
<td>Up to 220 Nm</td>
<td>135 – 180 Nm</td>
</tr>
<tr>
<td>Voltage</td>
<td>Up to approx. 800 mm</td>
<td>Up to approx. 800 mm</td>
</tr>
<tr>
<td></td>
<td>12 V and 24 V</td>
<td>12 V and 24 V</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Torque</th>
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<th>3-speed</th>
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<tr>
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<td></td>
<td>12 V and 24 V</td>
<td>12 V and 24 V</td>
</tr>
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</table>
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

<table>
<thead>
<tr>
<th>Advantages</th>
<th>2-speed</th>
<th>3-speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque</td>
<td>Up to 220 Nm</td>
<td>Up to 135 Nm</td>
</tr>
<tr>
<td>Fan diameter</td>
<td>Up to approx. 800 mm</td>
<td>Up to approx. 800 mm</td>
</tr>
<tr>
<td>Voltage</td>
<td>12 V and 24 V</td>
<td>12 V and 24 V</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Advantages</th>
<th>2-speed</th>
<th>3-speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque</td>
<td>Up to 300 Nm</td>
<td>Up to 300 Nm</td>
</tr>
<tr>
<td>Fan diameter</td>
<td>Up to approx. 800 mm</td>
<td>Up to approx. 965 mm</td>
</tr>
<tr>
<td>Voltage</td>
<td>12 V and 24 V</td>
<td>12 V and 24 V</td>
</tr>
</tbody>
</table>

Angle gearboxes for fan clutches – LLW200

<table>
<thead>
<tr>
<th>Advantages</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Visco and electromagnetic fan clutches</td>
</tr>
<tr>
<td>Torque</td>
<td>300 Nm nominal torque</td>
</tr>
<tr>
<td>Fan diameter</td>
<td>Up to approx. 800 mm</td>
</tr>
</tbody>
</table>

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 buses/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 positive 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 system. 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?

Industries

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

Product Portfolio

a Electromagnetic Fan Clutches  
b Angle Gears  
c A/C Compressor Clutches  
d Electromagnetic Clutches for Auxiliary Units  
e Pneumatic Clutches  
f Hydraulic Clutches  
g Shutting-speed Regulators  
h Torsional Vibration Dampers  
i Clutches for Special Applications  
j Tensioning and Deflection Rollers

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