

## AXLEPOWER POWERED BY THE ROAD

- **Power your refrigeration unit from the road**  
Run your refrigeration unit electrically 100% of the time
- **Fully sustainable refrigeration**  
A unit powered by harvested electric energy means fully electric operation
- **Maximize fleet flexibility**  
Autonomous cooling with tractor independent technology
- **Invest in reliability**  
Combining the proven technology of two market leaders
- **Smart made simple**  
Intelligent management capabilities let you use the system with confidence and ease



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Thermo King – by Trane Technologies (NYSE: TT), a global climate innovator – is a worldwide leader in sustainable transport temperature control solutions. Thermo King has been providing transport temperature control solutions for a variety of applications, including trailers, truck bodies, buses, air, shipboard containers and railway cars since 1938

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TRANE  
TECHNOLOGIES

# AXLEPOWER

— Powered by the road —



ENERGY RECOVERY SYSTEM FOR SUSTAINABLE  
INNER-CITY AND INTER-REGIONAL DELIVERIES



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# Refrigeration powered by free and sustainable energy

## RECOVER LOST ENERGY TO POWER YOUR REFRIGERATION UNIT

A lot of energy is lost when your vehicles are on the road. That energy can be harvested and used to keep your load at optimum temperature. Thermo King's AxlePower technology redresses the balance: turning lost energy into a power source for trailer refrigeration. Developed in partnership with BPW, the system benefits from decades of experience in refrigerated transport.

AxlePower integrates seamlessly into your existing fleet and delivers **low-noise**, high-powered performance in both hybrid and fully electric powered units.

The system's electric operation results in **lower fuel consumption** and **less maintenance costs**. On top of this, the system also heightens your fleet's flexibility, unlocking late-night and last-mile deliveries in zero-emission city districts. All of this makes AxlePower not only a flexible power source for your fleet but also affordable and sustainable. Combined with **smart power management capabilities**, your drivers can take on any journey with complete confidence.



# Power your refrigeration unit from the road

Designed to harvest energy from a trailer's braking and movement, AxlePower enables you to turn off the unit's engine on almost every journey. During routine operation, power is captured and stored in the AxlePower Energy-e Pack for use whenever it is needed. A process that removes the unit's CO<sub>2</sub> emissions, while also reducing the fuel needed to power the transport refrigeration unit.



LESS FUEL  
LESS EMISSIONS  
OR EVEN ALL-ELECTRIC  
THAT IS THE AXLEPOWER  
ADVANTAGE

## Access the inner cities

The ability to turn off the unit's engine means your vehicle's CO<sub>2</sub> emissions are reduced significantly. This allows your fleet to make deliveries in the Low and Zero Emission Zones of the city centre and prepares you better for future regulations.

## Save fuel

With the ability to capture and utilize free energy, AxlePower makes it possible to save potentially thousands of litres of fuel per unit per year.

## Reduce your running costs

Recovering the energy generated by braking helps ensure the brake pads of both the tractor and trailer wear at a slower pace. This also means longer service intervals for your unit with engine usage greatly reduced.

## Avoid the sustainability premium

Able to operate with any tractor, AxlePower makes your existing refrigerated trailer fleet compatible with LEZ and ULEZ – thereby maximizing your operational flexibility.

## Preserve the highest possible resale value

With full operational flexibility, and the ability to reduce wear and tear on your unit's engine, AxlePower helps to significantly extend the operational lifetime of your existing refrigerated trailer fleet.

# Fully flexible trailer cooling

Thanks to its independent system cooling entirely mounted on the trailer, Advancer AxlePower becomes a plug and play system that lets you maximize your fleet flexibility.

AxlePower operates **tractor-agnostic**, enabling you to mix and match trailers and tractors easily for a hassle free integration into your fleet. As the system is completely located on the trailer, it works with **any tractor power source**: diesel, LNG, CNG, hydrogen or fully electric vehicles.

By generating and storing power on the road, AxlePower **doesn't require a dedicated charging infrastructure**. This helps prevent extra downtime associated with battery charging at the depot or during loading/unloading and makes AxlePower **suitable for any journey**.



# Reduced noise and air pollution

European cities are committed to reducing noise and air pollution in the inner-city. With Advancer AxlePower, your trailer can run a fully compliant and quiet operation to deliver anytime, anywhere.

## ENGINELESS OPERATION

Powering units with electricity from a battery reduces noise to a minimum.

## DRIVER COMFORT

Turning off the unit's engine also makes refrigerated transport deliveries more enjoyable to drivers.

## READY FOR THE FUTURE, TODAY

Running on all-electric mode makes every AxlePower trailer meet demanding Ultra Low Emission Zones or Low Emission Zones (LEZ), so you can deliver anytime, anywhere.

## DELIVERY IN SILENCE

With AxlePower running continuously on electric throughout the delivery phase, noise is kept to a minimum, allowing for late night or early morning operation in urban environments.

SMART POWER MANAGEMENT

# Automatic battery charge control

With AxlePower, you have access to Smart Power Management, which combines fully autonomous operation with multiple options for fine-tuning performance. The system delivers simplicity and convenience to give you a hassle-free experience across every journey.

## NO DRIVER INTERVENTION

Smart Power Management automates tasks and requires no driver intervention at all.

## BATTERY CHARGING EFFICIENCY

AxlePower ensures this is performed in the most efficient way possible without manual involvement. The system can be switched between recuperation, passive, and active modes to maintain minimum battery charge.

## SIMPLIFIED MANAGEMENT CONTROL

Fleet Managers can quickly set and adjust the limits for minimum battery charge, depending upon distance and point of delivery.



## REAL-TIME INTERACTION

The settings for AxlePower can be changed on demand by Fleet Managers via Thermo King's TracKing web portal and TK Reefer app, as well as BPW Group's CargoFleet portal.

## SIMPLE DAILY MANAGEMENT

Battery charge parameters are set once to accommodate your most demanding journeys and are only changed for the extraordinary.

## PRIORITY BALANCING

Smart Power Management also enables you to take on shore power when available, carefully balancing what goes to both the battery and the unit.



SMART POWER MANAGEMENT

# Smart switching between charging modes

AXLEPOWER CAN BE SWITCHED  
BETWEEN DISTINCT MODES:



- 1 RECUPERATION MODE**  
Energy is recovered when the tractor is braking or going downhill, charging up the battery and providing you with zero-emission energy to power the unit.  
There is no impact on the tractor's overall fuel consumption – while ensuring continuous electric-only operation of the unit.
- 2 PASSIVE MODE**  
Used when there is ample battery charge or when the refrigerated vehicle is being employed to transport dry, non-temperature sensitive products.  
Cargo is protected and AxlePower's Smart Power Management enters a passive state until AxlePower energy is needed again.
- 3 ACTIVE MODE**  
The system detects that there is insufficient battery charge and energy generation to power the unit. The vehicle's engine will need to pull a little harder, so the activated axle generators can maintain speed and harvest enough power.  
This is done predominantly on long, flat roads with little braking. Active mode is only used for as long as needed and not a second longer. When travelling uphill, this mode is switched off to ensure the smallest possible impact on tractor fuel consumption.

# Advancer AxlePower technology revealed

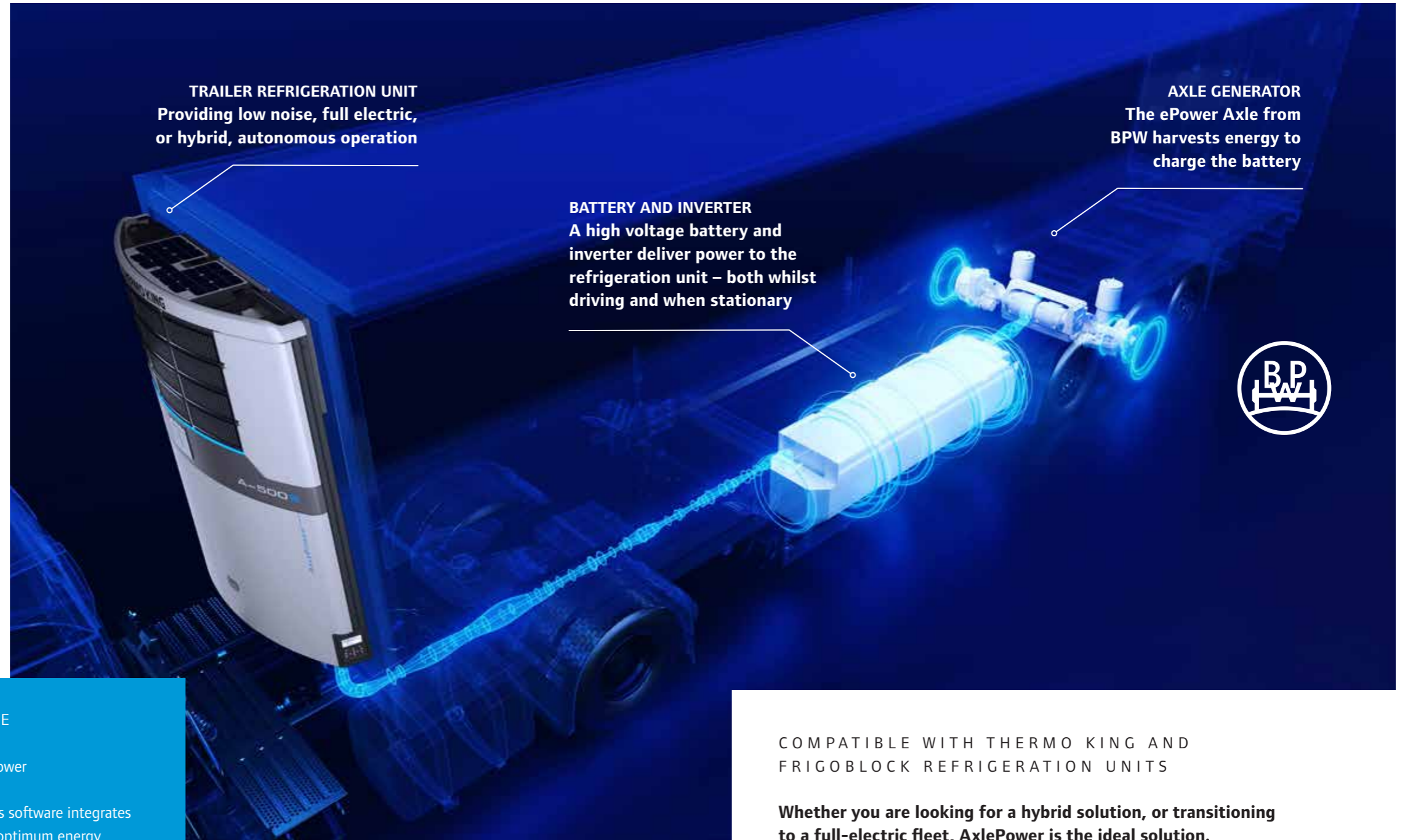
## KEY COMPONENTS OF THIS TECHNOLOGY SOLUTION

### REFRIGERATION UNIT

The unit draws power from the Energ-e Pack, running 100% on electric power. That means less noise, less emissions, and less fuel.

### ENERG-E PACK

The High Voltage battery holds at least two hours of autonomous operation and has rapid battery charge. Two varieties, a Standard (19 KW) or an Extended (38 KW) Autonomy Pack, were created with the help of real-world telematics so you can get the best fit for your fleet.



**TRAILER REFRIGERATION UNIT**  
Providing low noise, full electric, or hybrid, autonomous operation

**BATTERY AND INVERTER**  
A high voltage battery and inverter deliver power to the refrigeration unit – both whilst driving and when stationary

**AXLE GENERATOR**  
The ePower Axle from BPW harvests energy to charge the battery



## BPW ePOWER AXLE & SOFTWARE

The hallmarks of BPW's ePower Axle are two-fold: power generation by two generators and control software.

Made in close collaboration with Thermo King, BPW's software integrates seamlessly into the Energ-e Pack controls to ensure optimum energy management. By adhering to the highest development standards in accordance with applicable automotive regulations (ASIL-Level A), BPW creates a system for greater safety and reliability.

COMPATIBLE WITH THERMO KING AND FRIGOBLOCK REFRIGERATION UNITS

**Whether you are looking for a hybrid solution, or transitioning to a full-electric fleet, AxlePower is the ideal solution.**

### HYBRID

AxlePower is compatible with a range of Thermo King hybrid solutions:

- The Advancer range of A-360, A-400, and A-500 units
- The full SLXi range of single and multi-temp units

### FULL-ELECTRIC

For full-electric fleets, AxlePower is compatible with the all new Advancer—e and with Frigoblock's HK, available in single & multi-temp. A combination that offers the ideal mix of temperature control and power efficiency for semi-trailers combinations.



# Battery performance tracked in real time

## REDUCE BATTERY ANXIETY

With AxlePower, the rich insight available from Thermo King Connected Solutions is extended to track different aspects of battery performance. Covering metrics such as battery status and charge, the data removes the anxiety for both drivers and fleet owners that their unit will run out of power at an inconvenient moment.

Accessed via TrackKing web portal and TK Reefer app, as well as BPW Group's CargoFleet portal, this connectivity is easily customized to the needs of your business and provides tools for **monitoring, reporting, and automation**:



**1** **MONITORING**  
Where you can actively view metrics such as battery level, and the battery's remaining run-time, to support drivers and remove 'charge anxiety'.

**2** **REPORTING**  
Where you can review the system's performance, across a range of configurations and technical functions, to optimize future usage.

**3** **AUTOMATION**  
Where you can remotely set and adjust the parameters for charging the Energ-e Pack, which in turn initiate automated responses.

## ENHANCED BATTERY LEVEL OPTIMIZATION

- Receive notifications of any change to the battery level of the Energ-e Pack for your electric refrigeration unit
- Access different axle generator modes to optimize battery charging in line with different journeys and drivers
- Review live power source and battery autonomy data, to optimize logistics planning

## FLEET OPTIMIZATION

- Use insights into battery status, autonomy, and full charging time to better manage fleet utilization levels
- Maintain a clear, real-time view of your complete trailer fleet and their operational condition
- Analyze the historical performance of your electric units, and enjoy full traceability of your fleet operations

## LOAD PROTECTION

- Proactively and remotely change power source if electric only is not sufficient to meet a specific delivery window
- Maintain visibility on your electric unit's battery level, and take proactive measures to protect load when necessary

## DOWNTIME PREVENTION

- With full visibility of any alarms triggered, you can take immediate action to prevent further damage and decrease downtime
- Connected Solutions apps not only detail what is happening, they also provide you with a recommended 'next action'

## LOGISTICS FLOWS OPTIMIZATION

- Know the coupled/uncoupled status of your trailers in real-time, to ensure the right load is always allocated to the right vehicle
- Customize the refrigeration unit's behavior from a distance, based on load condition, vehicle location, and state of the electric unit
- Gain the insight needed to define the ideal charging strategy for your fleet to further optimize fleet journey planning



# Road tested so you don't have to

In developing AxlePower, Thermo King has put years of real-world machine data to work so we understand how our equipment is used and operated. This has given us valuable insights into factors ranging from daily operating duration to box temperature management.

## ALL-ELECTRIC URBAN DELIVERIES

Utilize every suitable tractor in your fleet for inner-city distribution, while always ensuring the right temperature – even during long stops or heavy traffic.

## INTER-REGIONAL JOURNEYS

Travel between supply chain hubs and local distribution centres with confidence, knowing that non-diesel power is always available on demand for any delivery.

## LONG-HAUL ROUTES

To help minimize night stops, AxlePower enables drivers to complete long-distance, inter-depot routes in the most cost-effective way possible to maximize your profitability.

## Based on these scenarios, we've created two distinct Energy-e Pack options:

### STANDARD AUTONOMY PACK

Suitable for most scenarios, this pack features a robust and reliable battery able to accommodate multiple trips per day:

- Supports the regular period of stationary time associated with deliveries
- Enables typical ranges to be driven in Low Emission Zones (LEZs)
- Possibility to plug into shore power at any loading and unloading locations

### EXTENDED AUTONOMY PACK

This pack provides twice the autonomy for your refrigeration unit to ensure cargo load safety:

- Supports long stationary times in heavy traffic
- Enables long distances to be travelled in LEZs
- Maximizes cost savings by collecting a higher amount of energy at shore power locations



# Thermo King & BPW: experts in their respective fields

## INNOVATION AND EXCELLENCE IN ACTION

The development of AxlePower brings together the axle generator, energy storage, power management system and refrigeration unit developed by two global leaders in their respective fields:



**BPW Group:** founded in 1898, BPW are leading running gear specialists and mobility partner with a global network of service partners spanning over 60 countries.



The world leader in transport temperature control systems, with an extensive portfolio of innovative, sustainable cooling solutions.

### The ideal partnership

As one of the first companies to turn the axle into the new engine compartment, develop an electric drive axle, and a generator axle, BPW is the perfect partner for helping Thermo King extend its vision for emission-free refrigerated transport.

In return, Thermo King's AxlePower provides BPW with the opportunity to advance its own mission of helping customers save fuel and cut CO<sub>2</sub> emissions, while increasing equipment uptime. A single solution made available by two technology leaders, supported by a dense and highly trained service network.

### RELIABLE TECHNOLOGY

Based on detailed insights into operating profiles and refrigeration needs, this partnership builds on decades of experience in efficient transport refrigeration.

### HARMONIZED PERFORMANCE

Featuring exhaustively tested components, every aspect of AxlePower has been optimized to work in perfect, coordinated symmetry.

### AN EXTENSIVE SUPPORT NETWORK

AxlePower customers can confidently rely on the two biggest service organizations in the fields of axle technology and transport refrigeration.



## Professional support at your service 24/7

The combination of Thermo King's international dealer network and BPW's extensive servicing infrastructure ensures you'll always be ready for business.

### THERMO KING DEALERS DELIVER:

- Over 500 authorized service points in 75 countries
- 1,400 fully trained and certified technicians
- Service points open every day of the year – find your closest at: [dealers.thermoking.com](http://dealers.thermoking.com)
- A flexible range of service contracts that provide everything from administrative tasks to 24/7 real-time monitoring of your fleet.

### WITH BPW YOU GET:

- Access to spare parts for your trailer at any time
- A spare parts network spanning 170+ branches and 3,200 service partners dedicated to rapid assistance and ensuring parts availability

### PROTECT AND ENHANCE YOUR AXLEPOWER INVESTMENT WITH GENUINE THERMO KING AND BPW SERVICE PARTS

**AxlePower helps equip your fleet for a more fuel efficient and sustainable future. That's why you need to be confident that every component has been rigorously tested to the highest possible standards, including:**

- The battery pack, with the potential need to upgrade or replace in line with demand
- Replacement parts, including the axle generator and inverter filter

With Thermo King and BPW genuine parts, you can always be sure that reliability and durability have been built in as standard.