



UNDERSTANDING TRAILER AIR SUSPENSIONS

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For The Road Ahead™

 **HENDRICKSON**

The Evolution of Hendrickson Trailer Suspension Systems

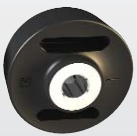


A pioneer in the heavy-duty transportation industry, Hendrickson, through unrelenting pursuit of innovation and quality for more than 95 years, remains the quintessential manufacturer of truck, tractor and trailer suspensions, axles, springs and bumpers.



A true innovator in the industry, Hendrickson is always at the brink of new and exciting products to adapt to an ever-changing market. With goals of reliability, exceptional quality and durability, Hendrickson has proven to be the favored choice in the trailer suspension market.

Received patent for TRI-FUNCTIONAL® bushing and sold first primary suspensions to trailer market



1979

Introduced HT™ trailer air suspension



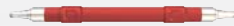
1990

Introduced INTRAAX® — first integrated trailer axle and suspension system in North America



1995

Began production of axles for INTRAAX® and VANTRAAX®



Introduced VANTRAAX, first integrated slider air suspension system



1998

Introduced revolutionary P90™ spindle



Launched HUS® wheel-end system



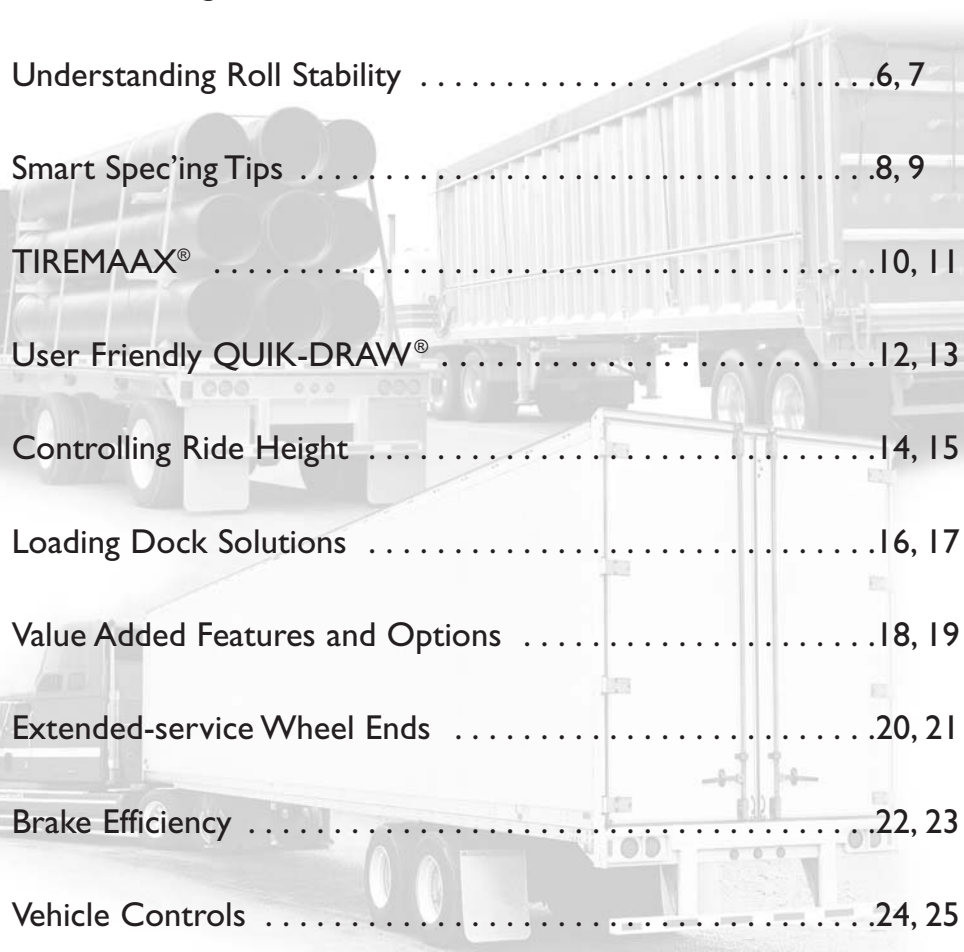
2001

Introduced QUANTUM™ advanced suspension through wheel-end technology



2008

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Overview

Air Suspensions

The popularity of air suspensions continues to grow in nearly all segments of the trailer industry. In 1996, air suspension acceptance accounted for 36 percent of the industry. Today air suspension usage averages about 75 percent.

Truckers operating vocational trailers realized the advantages of air suspensions early. As a result, the migration to air suspensions leveled off in applications that show high percentages of acceptance such as in flatbeds and drop decks. However, air suspensions continue to gain popularity for tankers and has become the suspension of choice for aluminum and combo flatbeds.

Many benefits drive the steady movement to air suspensions. Fleet managers experience reduced maintenance costs and a higher resale value on their equipment by specifying air suspensions. This higher resale stems from reduced shock and vibration transmitted to the trailer from the wheels and road. In simple terms, there is less “wear and tear” on the equipment. Fleets also experience enhanced tire life and improved fuel economy.

Shippers look for better cargo protection. Drivers like the flexibility of air suspensions, which allow them to haul a wide variety of freight while maintaining a smooth ride. Unlike a steel spring, the air spring’s stiffness adjusts to the amount of weight carried by the trailer.

Drivers continue to insist on a better ride. In today’s business climate, recruiting and retaining good drivers holds more importance than ever, and driver satisfaction remains a key to success.

As technology advances, air suspensions become lighter and more price competitive. In addition, air suspensions increase the resale or trade-in value of a trailer. As the benefits of technological advances add up, more and more fleets and owner operators continue to make air suspensions standard equipment.

Steadily gaining in market share, air suspensions spawned an emerging advance in the form of system integration — and Hendrickson leads the pack. In 1995, Hendrickson introduced INTRAAX®, the industry’s first integrated trailer air suspension, axle and brake system.



INTRAAX®





Compared to most other suspension products (merely assemblies of ordinary components), INTRAAX® epitomizes this truly optimized design, which tunes each element to work as part of a harmonious system. Benefits include higher standards of ride control, braking performance and overall product durability. In addition to these advantages of unmatched performance and minimal maintenance, INTRAAX also offers remarkable weight savings that translates into increased payload for the fleets. In 1997, Hendrickson introduced VANTRAAX®, a tandem air slider system designed for dry vans and reefer trailers. Integrated systems have proven popular with both OEMs and fleets. A new era in Hendrickson air suspension technology was launched in 2007 with QUAANTUM™. Designed for a variety of trailer needs, all QUAANTUM components, including air springs, shock absorbers, brakes and wheel ends, work together to form a completely cohesive system. QUAANTUM is a virtually maintenance-free, integrated suspension system offering industry leading hubcap-to-hubcap limited warranties.

Haulers find life much easier because of extended warranty coverage provided by Hendrickson. Fleets benefit due to weight savings and durability inherent in the design of our integrated systems.

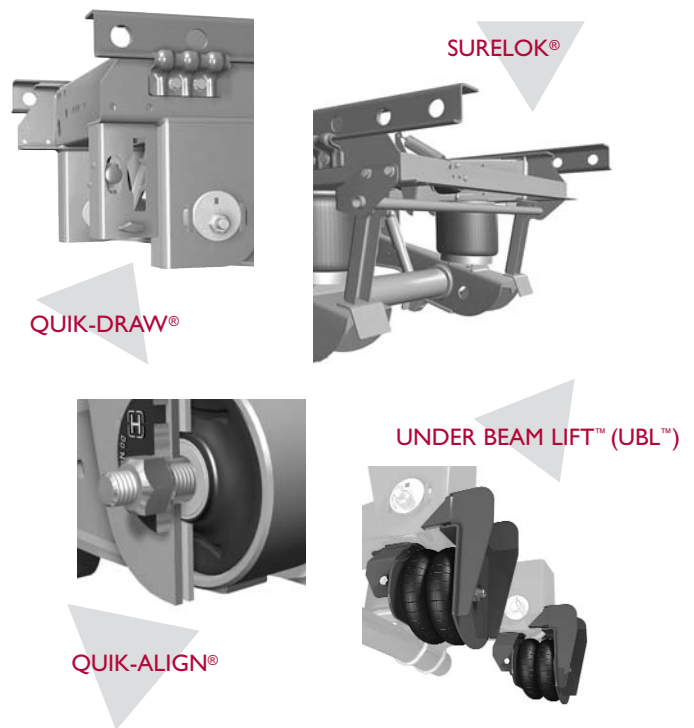


QUAANTUM™ FX

Hendrickson's trailer suspensions are the finest integrated air suspension systems available today. INTRAAX, VANTRAAX and QUAANTUM deliver an extremely smooth ride whether the trailer is loaded or unloaded. This softer ride helps to reduce driver fatigue and minimizes road vibration to help diminish damage to cargo and wear and tear on the trailer chassis. Operators maximize load equalization across axles regardless of axle spacing and cargo type. Hendrickson trailer suspensions come standard with a variety of

time and money saving equipment. Features such as QUIK-DRAW® for easy pin pulling on slider boxes, Cam Tube System and QUIK-ALIGN® for easy axle alignment are both standard on Hendrickson suspension systems. Hendrickson suspensions also have an array of value-added options to help customize your suspension to your specific needs.

Value-Added Features and Options



Understanding Air Suspensions addresses in detail the advantages of riding on Hendrickson air suspensions. We believe fleet managers and owner operators will quickly see for themselves how the choice of a Hendrickson system gives them an edge in today's competitive market.



Understanding Ride

Some significant benefits associated with air suspensions include maintaining consistent ride quality, enhancing driver comfort and providing cargo protection over a broad range of payloads.



How is ride quality measured?

The industry measures ride quality by the degree of isolation the suspension provides the vehicle from road inputs without compromising vehicle control. How well a suspension isolates or protects a trailer reflects in the extent of road forces and vibration reaching the vehicle and its cargo when in service. Minimizing these forces and vibrations results in less cargo damage and lower trailer maintenance cost.

What factors control ride quality?

Major influences on trailer cargo protection include the suspension's natural frequency and travel. In general, suspensions with lower natural frequencies reduce the forces transmitted to the trailer and improve ride. The travel of the suspension is closely tied to the natural frequency. As the natural frequency drops, the amount of suspension jounce or up-travel must be increased in order to maintain acceptable ride quality.

Natural frequency comprise the spring rate of the suspension and the amount of weight the suspension is supporting. The spring rate of the suspension is a measure of the suspension vertical stiffness, or how much the suspension deflects under load. For a given payload, the natural frequency of a suspension will be increased if the spring rate or stiffness of the suspension is increased, and it will be decreased if the suspension spring rate is decreased.

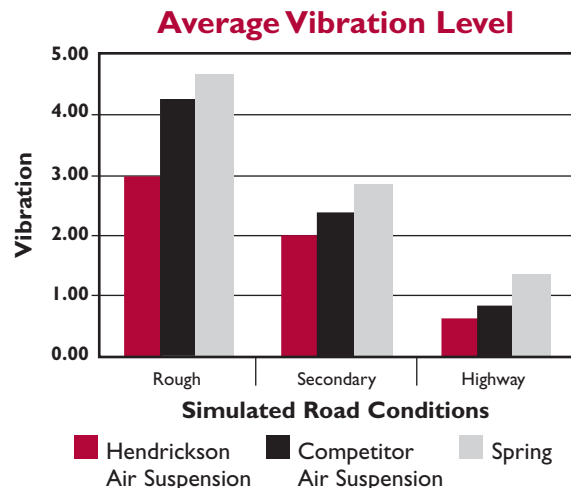
Why air suspensions work better

Air suspensions are capable of achieving very low natural frequencies and providing very high levels of trailer and cargo protection. Suspension geometry and air spring design work together to produce natural frequencies below 1.5 Hz. Recalling that lower natural frequencies create lower cargo forces, typical mechanical suspensions have natural frequencies that range from 2 to 5 Hz, depending on payload.

An air suspension changes its spring rate to match the load it supports, a spring ride does not. Thus, air suspensions deliver benefits that a spring suspension cannot offer:

First, when the spring rate changes with the load, the natural frequency of the suspension remains at a constant, low level resulting in consistent cargo protection regardless of payload.

Second, the suspension static height, therefore the trailer static height, stays constant preventing loss of suspension jounce (up travel) when loading the trailer. This becomes important when trying to maintain required isolation levels for suspensions with low natural frequencies.



For all road conditions, Hendrickson air suspensions deliver superior ride quality and cargo protection.





Not all air suspensions are equal

Just because a trailer has an air suspension doesn't mean it delivers a good ride. The ride quality and vehicle control a suspension provides is a result of the design of the suspension as an integrated system. The suspension system must work together with the trailer in its application to give optimum system performance.

A Hendrickson air suspension is designed to achieve optimum suspension system performance. Hendrickson does this by designing a complete series of integrated suspension systems to meet virtually any trailer application.

The Hendrickson Advantage

Integrated suspension systems

Some air suspension designs are simply a compromise of off-the-shelf components combined into a workable suspension geometry. At Hendrickson, the core of suspension system performance is in the details of the development of an integrated suspension system. Each suspension system is designed to provide the optimum combination of ride quality and vehicle control. Suspension geometry, travel, load capacity, suspension spring rate and damping levels are all interdependent characteristics that the suspension engineer manages when developing an integrated suspension design. No single element alone can determine ride quality. Rather, all of these factors must be carefully considered when designing a suspension with superb ride characteristics.

Hendrickson controls the design details of the air spring and shock absorber and their positions on the suspension. Air springs are specified for load capacity and to provide a spring rate and length

matched to the suspension travel requirements. Hendrickson shock absorbers meet specific targets for damping levels based on suspension geometry, application and actual fleet experience. Designing the details into our suspension systems results in a superlative combination of ride quality and vehicle control under varying conditions using premium, serviceable components and systems.

Hendrickson Trailer Suspension Systems designs and manufactures truly integrated suspension systems that are optimized for all your trailer needs.



Understanding Roll Stability

A vehicle's ability to resist rollover determines its roll stability. A vehicle loses its ability to resist rollover when the tires on one side lift off the ground. Many elements of a vehicle's design play a factor in determining its roll stability.

Roll stability for a trailer can largely be determined by the height of the center of mass of the trailer and the axle track. These factors can have the greatest impact on the roll stability of the trailer. For example, changing the trailer's axle track from 71.5 to 77.5 inches can improve its roll stability by eight percent. Reducing the

height of the trailer's center of mass from 70 to 65 inches can also improve roll stability by eight percent.

Chassis flexibility, the suspension, tire and axle deflections are all factors that need to be considered when determining a trailer's roll stability. Hendrickson's trailer suspensions provide the cargo protection of an air suspension along with roll stability performance equal to a steel leaf-spring suspension.

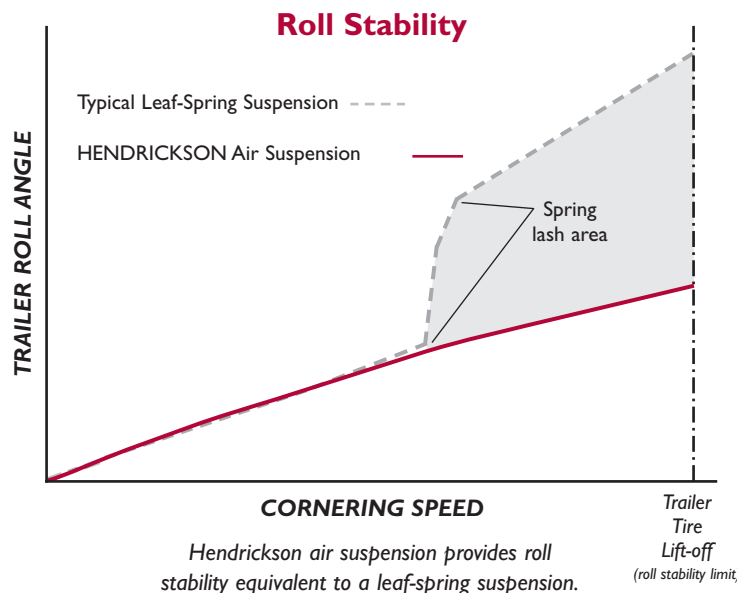
The Hendrickson Advantage

Hendrickson trailer air suspensions provide a soft ride for driver comfort, as well as cargo and equipment protection. At the same time, a Hendrickson air suspension provides roll stability equivalent to a leaf-spring suspension. This is evident in the accompanying chart, which shows that while air and leaf-spring suspensions exhibit different degrees of roll, both suspensions reach tire lift-off at approximately the same cornering speed. (In addressing this phenomenon, we considered a Hendrickson air system and a typical leaf-spring suspension.)

Since both suspensions reach roll stability limit at approximately the same cornering speed, both suspensions are considered to provide the same roll stability performance.

However, suspension vertical stiffness can be quite different especially between air and leaf-spring suspensions. The vertical stiffness of a leaf-spring suspension can be four to five times stiffer than a Hendrickson air suspension. While a soft ride seems to be in conflict with roll stability, in reality it is not. The answer lies in the fundamental difference between the suspension

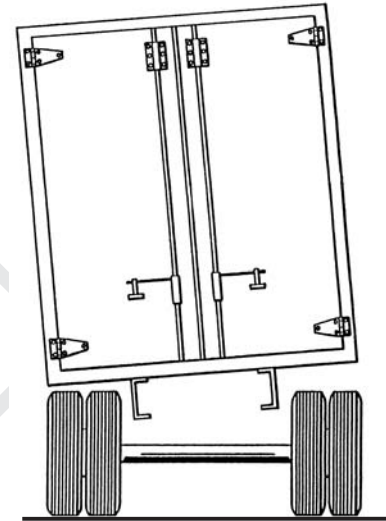
types. Since air suspensions provide a considerably softer ride than leaf-spring suspensions, they must rely on other means to achieve roll stiffness. This other means, commonly referred to as "auxiliary roll stiffness," comes from the axle on Hendrickson trailer air suspensions.





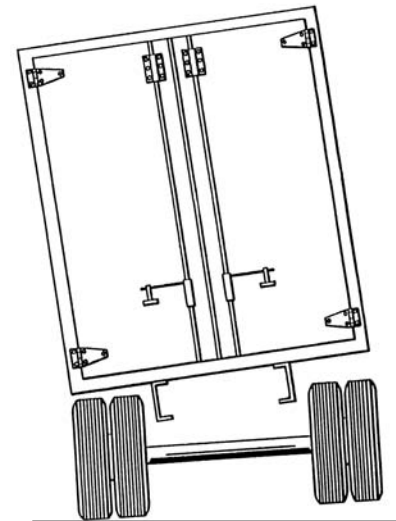
Hendrickson air suspensions resist trailer roll by utilizing the axle in a manner similar to a torsion bar. The axle tube provides the necessary trailer roll resistance that is equal to or greater than what can be provided by a leaf-spring suspension. At the same time, the air suspension eliminates the spring lash of a mechanical suspension resulting in a lower roll angle for air suspensions. This allows Hendrickson's air suspensions to have roll stability characteristics similar to spring, while providing a ride that is significantly superior to a leaf-spring suspension.

What this brings to fleets and owner operators is the ideal combination of ride softness and roll stability — in other words, the ultimate in cargo protection and comfort.



Low-speed cornering event

- Trailer roll resisted by suspension



High-speed cornering event

- Tire lift-off
- Approaching roll stability limit



Smart

Spec'ing Tips

The decisions fleets and owner operators make about the equipment they run generates a dramatic impact on operations and profitability. Recognizing the importance of wise spec'ing choices, Hendrickson lists eight tips outlining how choosing a Hendrickson trailer suspension can make a difference.

TIP #1

Look for a suspension brand with a good reputation. A proven track record is a good indication of how your ownership experience will be, and how you will be treated after the sale. It can also help down the road when the trailer is sold.

As the market leader, Hendrickson Trailer Suspension Systems, builds its reputation on air suspension system excellence. Hendrickson's brand equity is very strong in the market, and we believe our name will help you retain a premium on your trailer resale.

TIP #2

Look for fully integrated systems (suspension, axle and brakes). We're not just talking about assemblies of components but systems that are truly integrated, where each element is designed and tuned to work optimally as part of the entire system. Not only does this help ensure that your system will perform well, but it keeps weight down and offers the convenience of a single source for warranty and technical support.

Hendrickson offers the finest integrated air suspension systems available. In 1995, Hendrickson introduced INTRAAX®, the first integrated trailer air suspension, axle and brake system. Two years later, Hendrickson introduced VANTRAAX®, a tandem ride slider system designed for dry vans and reefer trailers. Hendrickson continued to integrate more components into a single suspension system with the launch of QUAANTUM™. QUAANTUM launches a new era of virtually maintenance free suspension systems with industry leading warranties that include the integrated suspension, air springs, shock absorbers, brakes and wheel ends.

TIP #3

Select a product with a good performance record in the field. A good warranty and solid support are important, but it's better to never have your trailer down for warranty work at all.

Hendrickson offers excellent technical support and the most extensive warranties in the industry.

TIP #4

Look for systems providing minimal maintenance requirements. This includes a minimum number of fasteners, bushings and other wear items. Check for fastener retorque requirements — again, the fewer the better.

Hendrickson suspensions are designed with very few wear items to minimize maintenance. In many applications, our TRI-FUNCTIONAL® bushings last the life of the trailer. Unlike most other suspension brands, our current designs have no retorque requirements. With Hendrickson suspensions, routine maintenance is generally as simple as a visual inspection.



TFII



TFIII





5

TIP #5

As for those items that are most likely to need replacing over time, such as air springs and shock absorbers, check to see how quickly and easily they can be replaced. Check for ease of access to those parts and for parts availability in the aftermarket.

Maintenance on Hendrickson suspensions is very easy, thanks to thoughtful designs. Hendrickson parts are very accessible in the industry. This is due to the vast number of distributors that stock Hendrickson Genuine Parts and the large number of suspension units we have operating around the world.



TIP #6

Be sure to consider suspension system weight. This is especially important if trailers tend to gross out in weight rather than max out in cube space. Even if you are not spec'ing for heavy loads, a lightweight suspension can help improve fuel efficiency and improve flexibility in accepting back-haul loads.

Hendrickson delivers the lightest air suspensions in the industry. A lower suspension system weight will help maximize your payload and add to your fuel efficiency.



QUAANTUM™ FX



VANTRAAX®



INTRAAX®

TIP #7

Always consider the application requirements when spec'ing a system. Capacity and duty cycles in large measure, will determine what suspension system rating will be needed. Over or under spec'ing can cause problems. Over spec'ing a suspension adds unnecessary cost and weight, while under spec'ing a system can lead to premature wear and suspension damage as well as ride quality and control problems. Know how the vehicle will be used. Lots of empty backhauls could suggest that a lift kit, such as Hendrickson's Under Beam Lift™ (UBL™) could be used to help reduce tire wear.

Hendrickson's INTRAAX®, VANTRAAX® and QUAANTUM™ suspension families can support all your application requirements, from standard hauling to extreme heavy-duty, from tankers to flatbeds, from dumps to vans. Whatever the job, we have the right suspension for your application.

TIP #8

Look for features and options that make a system easier and more efficient to use. Slider pin-pull assist mechanisms, pivot connections that facilitate axle realignment and dock walk prevention devices are popular. They can save fleets headaches by improving operating efficiency.

Hendrickson's integrated suspension systems feature value-added items such as QUIK-DRAW®, QUIK-ALIGN® and SURELOK®. These features help improve vehicle efficiency and add to driver satisfaction.



TIREMAAX®

The majority of truckers agree that tires represent the most important maintenance item on a trailer.

They agree that the simple activities of maintaining proper tire pressure and checking for irregular wear could extend tire life substantially, reduce maintenance and save thousands of dollars annually.

Tires remain the number one reason for trailer road breakdowns weighing in at 48 percent of 63,789 road calls, according to a recently published survey. The Technology and Maintenance Council (TMC) reports a study of tire pressures on 35,128 vehicles revealed 56 percent at more than five psi off target pressure and more than seven percent under inflated by 20 psi or more.

In terms of fuel economy, an industry rule of thumb attributes a one percent reduction in miles per gallon for every 10 psi under specified inflation pressure. Truckers know the pitfalls of improper tire inflation: reduction in tread and casing life; increase in rolling resistance, which burns more fuel and poor ride and handling.



Even properly maintained tires are subject to air loss through punctures, road hazards and changes in ambient temperature. Irregular tread wear can develop when the pressure of joined dual tires differs by as little as five psi.

Without enough air, tires flex too much causing excessive heat, rolling resistance and corresponding drop in fuel economy. Tires wear unevenly and become more prone to damage from road hazards and curbing.

Tire disintegration, exemplified by zipper rips and the dreaded “alligators,” black shards of rubber seen along highways, presents more extreme examples of problems caused by under inflation.

While many tire maintenance and inflation systems have been introduced over the years, most have proven to be extremely complex, costly and sometimes less than reliable.

Fleet managers and owner operators continue to struggle with finding ways to maintain proper tire inflation, when simply putting a little air in the right place at the right time can save a lot of effort and expense on trailer operations.

The Hendrickson Advantage

Hendrickson brings a breath of fresh air to low tire pressure pitfalls with affordable Hendrickson TIREMAAX®, tire inflation systems. Two versions of the popular system are available, TIREMAAX CP (Continuous Pressure) features a simple mechanical design, while TIREMAAX EC (Electronic Control) provides full system programming and monitoring.



TIREMAAX delivers a basic, responsive approach that utilizes the trailer air supply to maintain tire inflation to a preset level. This provides a tool to help minimize costly, excessive tire wear and improve productivity and fuel mileage.

TIREMAAX systems detect low tire pressure and alert the operator to the occurrence. They respond by directing air to a tire when the inflation pressure dips below a pre-set level.

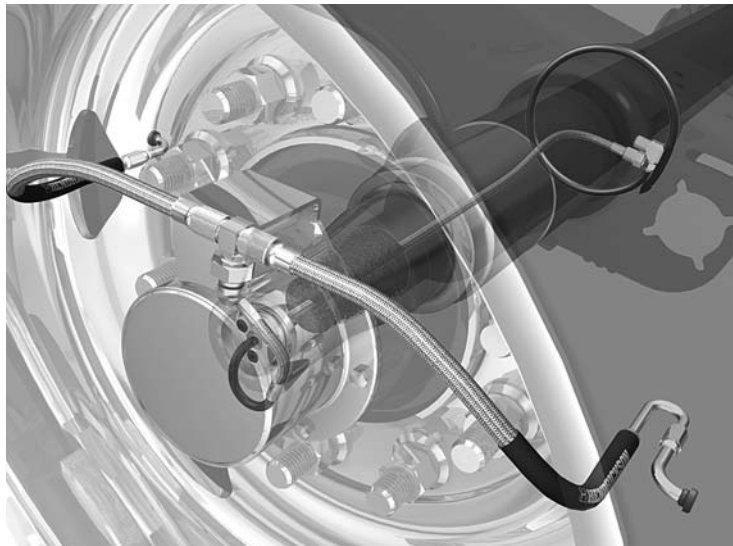




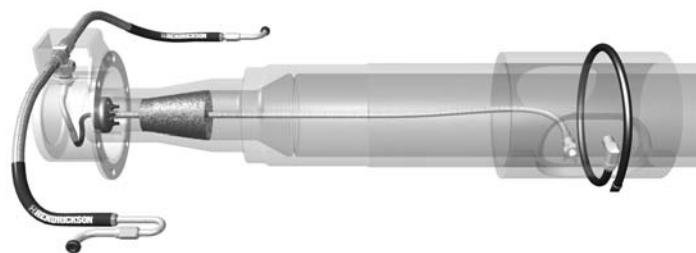
With the Hendrickson TIREMAAX® EC system, continuous air pressurization to the tires is not required. EC activates only when needed, lessening air demand, reducing stress on seals and lines and prolonging system life. TIREMAAX EC is designed to provide full system programming and monitoring.

Customers who prefer the simplicity of a continuous pressure system choose TIREMAAX CP. With robust components and no electronics, transducers or pressure switches, TIREMAAX CP is easy to maintain.

With both TIREMAAX systems, air travels from the supply tank through air lines inside the axle to the wheel ends that eliminates the need to pressurize the axle tube and neutralizes another source for wheel-end contamination. A bolt-in, ball bearing rotary union allows air to flow from a non-rotating axle spindle to the rotating hubcap fitting. Tough, braided stainless steel hoses connect from a hubcap tee to the tires.



All TIREMAAX systems come with a signal light, designed for installation in view of the driver. It alerts the operator to system status and maintenance activity. Check valves prevent tire pressure loss back through the system. Manual fill and pressure checks may be accomplished at the hose ends.



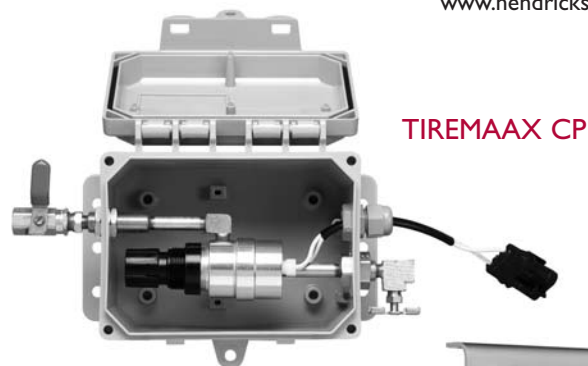
TIREMAAX connects all tires to the trailer air supply and may be combined with any of an extensive array of wheel-end configurations and spindles available on INTRAAX®, VANTRAAX® and QUAANTUM™.

Hendrickson TIREMAAX systems provide a cost-effective approach to blow away your low tire pressure problems.

For additional information:

- TIREMAAX
Tire Inflation System — L1017
- TIREMAAX EC Technical
Procedure Hendrickson
Tire Inflation System — L818
- TIREMAAX CP Technical
Procedure Hendrickson
Tire Inflation System — L995

Download current literature at www.hendrickson-intl.com



TIREMAAX CP



TIREMAAX EC



User Friendly

QUIK-DRAW®

Drivers often struggle to reposition a slider under a trailer. The net result is unhappy, unproductive and sometimes injured drivers. The most common reason for this situation is difficulty in retracting the lock pins that hold the slider in a given position on the trailer. Even if the mechanical linkage used to retract the lock pins functions properly, the lock pins can become jammed or bound against the positioning holes in the trailer's body rails. The forces causing this binding can be due to a number of reasons such as the trailer sitting on uneven ground or the parking brakes being set while the lock pins are pushed tightly against the front or rear of the body rail holes. To aggravate these situations still further, sometimes the body rail holes wear grooves into the unhardened lock pins creating a mechanical interlock between the lock pins and the body rails.

When this binding occurs, the driver may not be able to exert enough force against the pull handle of the lock pin retraction mechanism to disengage the pins. The driver then goes back to the cab, releases the parking brakes and moves the rig slightly in an attempt

to center the pins better in the body rail holes. This action may have to be repeated until a position is found that allows the pins to be pulled. Particularly frustrating with a conventional mechanism, a single jammed pin can prevent the handle from being pulled even if the other three pins are free to move.

Sometimes, in an effort to bypass this time-consuming and inconvenient process, the driver will exert extra effort against the pull handle in an attempt to force the jammed pins free, risking back and shoulder injuries. These injuries can result in lost time and worker compensation claims.

Occasionally after repositioning a slider, a driver forgets to re-engage the slider's lock pins. When this happens, the slider may violently thrust against the slider restraint bar at the first braking. This can result in a damaged slider, trailer or payload and possibly even the loss of the slider from beneath the trailer. These last items present serious safety concerns as well as impediments to driver productivity and satisfaction.

The Hendrickson Advantage



Hendrickson addresses these concerns by tapping trailer air power to make true fingertip slider pin release a reality with QUIK-DRAW®. With versions for VANTRAAX® van and reefer slider systems and INTRAAX® - SP

platform sliders, QUIK-DRAW triggers with a simple pull of a knob.

QUIK-DRAW relieves your drivers from the tugging, jerking and hammering associated with releasing locked or jammed slider pins. With pins released in seconds,

slider repositioning becomes faster and more efficient — getting your rigs back on the road sooner.

Standard on all VANTRAAX suspension systems, the patented van-style QUIK-DRAW features an actuator consisting of a fabric-reinforced rubber tube. Fittings at each end attach to the inboard ends of our slider's hardened lock pins. One actuator per axle controls the two lock pins with the conventional mechanical linkage components completely eliminated. When the knob of the valve is pulled, these unique actuators are pressurized by the trailer's compressed air supply. Once pressurized, the actuators increase in diameter and shorten





QUIK-DRAW allows drivers to disengage the slider's lock pins using only fingertip effort.

in length, exerting a powerful pulling force — several times greater than most conventional mechanisms — to retract the pins. If the pins are free to move, they all retract, and the slider can then be repositioned. However, even if one or more pins are bound, the actuators continue to apply pressure. When the driver returns to the cab to reposition the slider, movement of the trailer above the slider will “jiggle” the jammed pins free, and the actuators will then retract those pins. The slider can then be repositioned without difficulty.



As an additional feature, pins automatically reset with the release of the trailer parking brakes. We equip the valve of the VANTRAAX® version with an air-pilot reset plumbed to the parking brake circuit. If the driver forgets to reset the lock pins before driving away, simply releasing the parking brake dumps air from the QUIK-DRAW® actuators, shifts the valve knob to the “pins engaged” position and allows the coil springs to reset the pins in the body rails. Even if the lock pins do not align perfectly with the body rail holes, the pressure of the QUIK-DRAW coil springs, pushing the pins outward will be maintained until engagement occurs. Thus, the pins will be forced out through the next available set of body rail holes as the slider moves past.

The durability and reliability of the QUIK-DRAW system enhance its simplicity. Most moving parts of a conventional mechanism have been eliminated in the van version. Hendrickson makes the actuators from the same sturdy material as an air spring and tucks them inside the slider frame to protect from road debris. The actuator valve meets stringent durability and environmental conditions — operating in temperatures to minus 40 degrees. The valve is mounted in a recessed manner on a bracket with a shield to protect the valve from road debris, snow and ice.



An air-activated QUIK-DRAW comes standard on INTRAAX®-SP platform slider systems featuring a proven air chamber actuator with automatic reset. The chamber fits neatly inside the slider cross member for added protection.

What this means to the fleet owner and owner operator:

- 1. Improved driver productivity** - QUIK-DRAW permits a driver to efficiently reposition a slider with a single operation — even if the lock pins jam — eliminating the need for multiple trips between the cab and trailer.
- 2. Enhanced driver satisfaction** - Drivers can easily disengage lock pins. Simply pull a valve and pins will retract. No tugging, jerking or hammering.
- 3. Automatic reset** - In the event drivers forget to re-engage the lock pins, QUIK-DRAW automatically resets them when the trailer brakes are released.
- 4. Reduced weight** - The QUIK-DRAW van style, is the lightest in the industry compared to other lock pin release mechanisms.



Controlling

Ride Height

Fleets and owner operators specify trailer air suspensions for many reasons including smooth ride regardless of payload, minimizing cargo damage, load equalization and flexibility to haul a wide variety of freight. To realize these benefits, the trailer suspension must be set at its proper ride height.



Ride height is defined as the measurement from the suspension-mounting surface (the bottom of trailer frame or slider box) to the center of the axle (figure 1). Air suspensions are designed to operate at specific ride heights. Maintaining a suspension's proper ride height remains a

critical element of air suspension trailer performance. The heart and soul of any air suspension system is its height control valve (HCV). The HCV maintains the trailer at its designed ride height by automatically adding and exhausting air to the trailer's suspension to compensate for changes in the trailer's load.

Operating an air suspension at an incorrect ride height can create improper load equalization, reduce ride quality, damage cargo / vehicle and result in premature suspension and component wear. Air suspensions set too high will

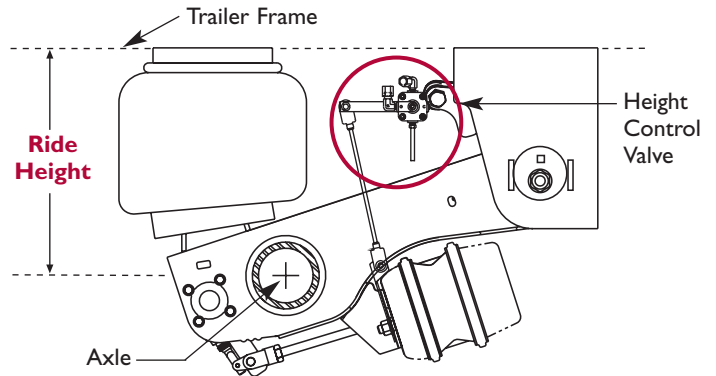


Figure 1

cause shocks and air springs to be fully extended. A suspension with a ride height set too low experiences a harsh ride due to the constant thumping against the air spring bumpers.

When height control valves and ride height settings are improperly adjusted or otherwise tampered with, premature component wear may occur. To operate properly, suspensions must ride at their specific designed ride height. While poor ride, premature component wear or appearance might be signs of improper height settings, avoid changing ride height until a careful measurement is taken. This is the only way to be assured of proper ride height settings. The correct ride height will allow for the proper amount of suspension travel, keeping your trailer performing at peak operating efficiency.

Precise air flow regulation delivered

To deliver the ride quality and other benefits truckers expect, trailer air suspension systems require precise air flow management — a key element perfected by Hendrickson's standard height control valve (HCV) and integral HCV with automatic dump valve.

Spec'ed from the OEM on new vehicles or through the aftermarket, Hendrickson's HCV's offer a choice

of superb designs to keep your trailers at correct ride height. In addition, the universal valve retrofits to all tractor, truck and trailer air suspensions regardless of manufacturer, model or year.

Using an advanced Shear-Seal® design to assure accurate air flow, Hendrickson HCV's deliver superior performance and durability. A precise, highly repeatable





dead band and high air flow with a proportional response optimize ride-height control to deliver superior ride quality, while prolonging air spring and shock absorber life.

Specially designed and tested for optimum performance with Hendrickson air suspensions, our HCV's help you maintain outstanding load stability over the road. In addition, Hendrickson HCV's minimal dead band and high flow rate provide compatibility with on-board trailer weight scales.

All Hendrickson HCV's

- **Operating pressure**
 - 130 psi (9 bar) maximum
- **Operating temperature**
 - -40°F to +150°F (-40°C to +65°C)
- **Maximum flow rate**
 - 350 L/Min (12.4 cfm)
- **Delivery ports**
 - 1/4-inch NPT fittings
 - Dual delivery ports
- **Maximum handle movement**
 - +/- 75° for fill or exhaust
- **Options**
 - Air fittings
 - Mounting brackets
- **Dead Band**
 - +/- 2°

HCV with Integral dump

Our HCV with integral dump features a high-flow design for rapid exhaust to save drivers time and effort as they load, unload and get back on the road.

The dump valve automatically discharges the air springs with the setting of the trailer parking brake and begins to air up with release of the brake. Integrating the dump function in the HCV eliminates components and simplifies plumbing maintenance and installation.

Exhaust Function

- **Automatic**
 - Dumps when trailer parking brake engages
- **Dump flow rate**
 - 875 L/Min (31 cfm)
- **Dump port**
 - Normally closed
- **Dumps full suspension 40 percent faster than HCV with add-on dump valve**
 - Integral = 12 seconds
 - Add-on = 20 seconds



Loading Dock *solutions*

During docked loading and unloading with tow motors or forklifts, three trailer reactions can occur: trailer deck height change, trailer drop and trailer walk. Trailers equipped with air suspensions in a trailing arm arrangement (figure 1) can experience all three phenomena. In addition, all trailers will exhibit a drop of between 1 to 1.5 inches due to tire deflection.

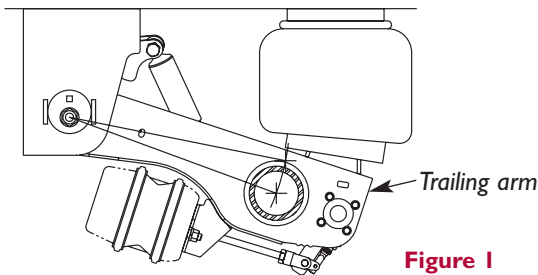


Figure 1

Trailer deck height change refers to the variation in deck height of an air suspension equipped vehicle relative to the dock after dumping the air from the system. In general, air suspension trailers equipped with a dump valve will lower 2.5 to 3.5 inches with air exhausted. The trailer comes to rest on internal air-spring bumpers. Resting on the bumpers, the trailer becomes extremely stable with only significant motion resulting from tire deflection.



Trailer drop, downward trailer travel that results from a forklift entering during cargo transfer, occurs due to the inherently low spring rate that gives the suspension its soft ride. Trailer drop does not include trailer deck height change for air suspensions. Trailer drop does not occur if the air-springs have been dumped and the trailer is resting on the air-spring bumpers. Trailers with mechanical spring suspensions may drop about 1.75 inches.



Trailer walk refers to horizontal trailer movement away from the dock caused by a forklift entering and exiting the trailer for cargo transfer. This horizontal movement can be caused by the suspension trailing arm's downward travel due to trailer drop. Even a mechanical suspension can exhibit walk when a heavily loaded forklift repeatedly enters the trailer with speed and stops abruptly near the front. Similarly, a loaded trailer sitting for an extended period of time can lose air pressure in its air springs, allowing the trailer deck to gradually drop. Again, this can result in forward movement that could shift the trailer away from the dock.

The Hendrickson Advantage

Hendrickson offers several solutions to the trailer industry's loading dock concerns. Because specific applications and requirements vary from fleet to fleet, we provide a variety of solutions to match virtually every loading dock operation.

To maintain dock height, which naturally minimizes drop and walk, look to SURELOK®. Featuring sturdy mechanical support legs that automatically rotate and lock in place over suspension trailing arms when the trailer brakes engage, SURELOK minimizes trailer drop and walk. When using SURELOK, trailer drop is





generally imperceptible. Support legs automatically return to their neutral position when the parking brakes are released.

Used in conjunction with an automatic dump valve, SURELOK® holds the deck height change to about an inch while virtually eliminating drop and walk in almost all loading conditions.



SURELOK holds the trailer at dock height during loading and unloading, limiting the vertical and horizontal movements that result in trailer drop and trailer walk.

When trailer walk is a concern, but deck height is not, dump valves may be the answer.

Controlled by the driver, manual dump valves lower the trailer between 2.5 and 3.5 inches at the door sill. Trailers may descend slowly or experience a slight one-time drop from discharge of residual air in the bags as a forklift initially enters the trailer. During cargo transfer, a manual valve limits trailer drop to tire deflection and minimizes walk.

DST® Technology — Another Valve Option

Integrated into the VANTRAAX® system, DST technology addresses loading dock issues of trailer drop and walk. DST combines refined suspension geometry and optimized plumbing including our patented HEIGHT CONTROL DIFFERENTIAL DUMPVALVE (HCDDV).

DST exhausts more than twice as fast as conventional automatic dump valves, and in most cases, brings the trailer to rest on the internal air spring bumpers before the trailer parking brakes fully engage. The trailer deck height thus falls between 2.5 and 3.5 inches, and DST limits trailer drop to tire deflection and minimizes walk without requiring additional driver intervention.



For the fleet owner, this means more efficient trailer loading and unloading.

For additional information:

- Loading Dock Approach Procedure — B109
- Trailer Loading Dock Terms and Solutions — L816
- SURELOK Flyer — L622
- Dock Stabilizing Technology (DST™) Flyer — L781

Download current literature at www.hendrickson-intl.com



Value Added

Features and Options

Where do fleets and owner operators find a competitive advantage today?

Through reduced maintenance . . . lighter weight . . . increased durability.

For today's and tomorrow's haulers, Hendrickson fuses quality and innovation into all of its products. We put great emphasis on research and development to refine our suspension systems and develop cost-effective options. That adds enduring value to the equipment you depend on every day.

The Hendrickson Advantage

Hendrickson's INTRAAX®, VANTRAAX® and QUAANTUM™ systems exhibit a variety of features and options to help haulers keep one step ahead of the competition. The industry's first standard trailer

Cam Tube System™; an optional factory-applied Soft Coat Finish; our Large-Diameter Axle (LDA™), and the Under Beam Lift™ (UBL™) all exemplify Hendrickson's theory of continuous innovation.

Cam Tube System™

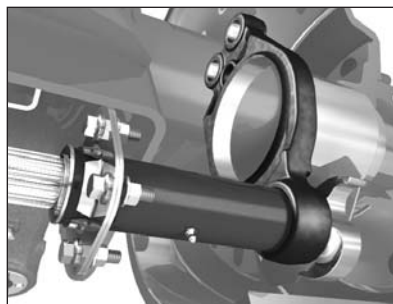


Throughout the trucking industry, S-cam journal service life and ease of maintenance remain among the most criticized features of conventional

trailer S-cam brake designs. With the addition of extended-service brake and hub systems, the need arises to extend maintenance intervals and durability of the cam supports to match.

Industry studies reveal that S-cam bushing life is a function of contaminant levels in the areas where the cam journals contact the bushings. The basic design principle behind our Cam Tube System is to keep contaminants away from the camshaft. The Cam Tube System includes a modular steel cartridge that encloses the S-cam shaft on each wheel-end assembly. We encase the camshaft support bushings and seals at each end of this cartridge.

The spring-loaded seals greatly limit the potential of contaminant entry by providing two redundant barriers to entry. Ozone inhibitors in the seal material prevent degradation by sustaining the life of the rubber. This system holds seven times more grease than conventional designs. Any debris passing the seals becomes effectively diluted, minimizing the potential of damage or wear.



When compared to traditional trailer brake designs that have separate seals surrounding each journal and bushing individually, Hendrickson's Cam Tube System reduces contaminant entry points by 50 percent.





Large-Diameter Axle™ (LDA™)

Since the first handcart, haulers sought lighter weight equipment — more often than not by substituting lighter materials and sacrificing strength for a weight reduction. Hendrickson has developed the LDA™ 5 3/4-inch axle that reduces trailer suspension weight while actually improving component and system strength. By increasing the diameter of today's traditional axle by about three-quarters of an inch, it allows for the use of a thinner axle wall.

The standard axle diameter in Europe, the road proven LDA tube allows use of a slightly thinner wall for more efficient application of materials. In other words — there is significant weight savings and increased bending and torsional stiffness with comparable overall strength to a 5-inch axle tube.

LDA generates a weight savings of between 20 and 27 pounds for each axle, depending on axle capacity. In addition to matching the structural durability of the 5-inch tube, the larger diameter increases bending and torsional stiffness by more than 14 percent. The reduced tube deflection keeps the axle straighter under loads to help improve fuel efficiency and enhance tire wear. Greater torsional rigidity also boosts roll stability.

The largest trailer axle manufacturer worldwide, Hendrickson's state-of-the-art production capabilities — such as friction-welding spindles and induction hardening — already produce axles known for their unmatched straightness and consistent construction.

LDA features the same neutral-toe alignment and long lasting heat-treated components as our 5-inch axles and are available with HN, HP and P90 spindles, as well as an array of wheel-end options.



Soft Coat Finish

The road and weather take their toll on equipment. With many fleets extending trade-in cycles for equipment, haulers look for ways to extend the life of their trailers. Hendrickson's factory-applied Soft Coat Finish is an option that enhances resistance to corrosion and rust keeping suspensions on the road longer.

When stone chips occur on conventionally painted suspensions, water can migrate under the paint leading to rust and corrosion. Remaining soft and pliable, Hendrickson's Soft Coat Finish option cushions impacts from road debris to yield a less susceptible surface to chipping.

Hendrickson technicians apply the Soft Coat Finish before final assembly to clean, non-primed surfaces covering all hard-to-reach areas. It takes the place of a finished coat process. Soft coat paint withstands accelerated corrosion tests, passing 2,000 hours in a salt-spray environment. This exceeds the capacity of most finishes used in the industry today.

UNDER BEAM LIFT™ (UBL™)

Hendrickson's UNDER BEAM LIFT™ (UBL™) lets fleets and owner-operators put the advantages of INTRAAX® to work in their liftable applications. Liftable axles offer operational flexibility, extend tire life, improve trailer maneuverability, allow vehicles to carry more payload and can even save on road tolls. The UBL is a sturdy, lightweight and easy-to-install lift mechanism. When combined with INTRAAX, UBL provides the lightest integrated lift system available today, increasing your productivity and profitability. (See UNDER BEAM LIFT flyer — L727 — for additional information.)



Extended - service

Wheel-End *Options*

As fleets and owner operators focus on reducing operating costs, maintenance intervals and warranty costs, extended-service wheel ends offer excellent potential to fulfill goals pertaining to cost reductions.

Wheel-end damage

Two main factors contribute to wheel-end damage.

High Operating Temperatures: The primary method to reduce wheel-end operating temperature is lubrication. Poor quality or lack of lubricant can damage wheel ends.

Contamination: Contaminants not only affect the integrity of the lubricants but can be critical to the life of the wheel-seal as well. There are four primary conduits for contaminants to enter the wheel end:

- A damaged or worn seal can create a pathway for contaminants to enter and for lubricants to exit the wheel end. Proper seal installation is vital to the life and performance of the seal. When replacing a seal, follow the seal manufacturer's instructions to ensure proper seal positioning.
- Improper bearing adjustment may result in excessive end play or preload, either of which can shorten bearing life. Excessive end play could also shorten seal life.
- Water can enter the hubcap by way of the ventilation ports, thus compromising the integrity of the lubricant. Also, leakage around the mounting surface can occur if hubcap bolts are not installed to the proper torque specification.
- Contamination of the wheel-end interior, prior to initial installation, can also compromise service life. This type of contamination is commonly over-looked during the installation process due to the misconception that "because the hub is new, it is clean inside."

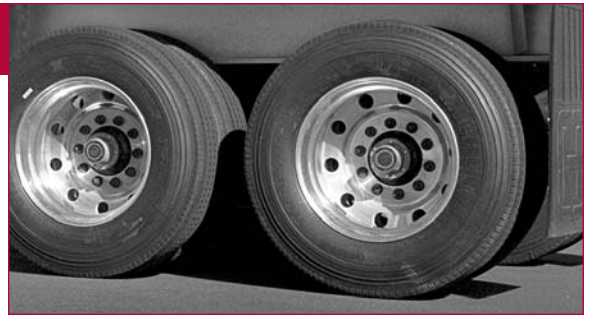
The Hendrickson Advantage

Hendrickson Trailer Suspension Systems provides fully integrated suspensions including extended-service wheel ends. Integrated, modular systems present an opportunity to enhance end-user value in the area of maintenance and operating expenses, as well as improve productivity and operating efficiency. These fully integrated systems also provide the customer with a single source supplier. The following items are contributors to our quality wheel-end products:

- **Companion Parts** — We apply stringent screening requirements and techniques to ensure that we are offering only high quality, dependable wheel-end components.
- **Quality Control** — Clean and dry storage is provided for all wheel-end components.

- **Skilled Labor Force** — Hendrickson's skilled and qualified personnel, combined with our quality control program, allow us to offer outstanding extended wheel-end warranty coverage.
- **Production Control Systems** — Detailed wheel-end installation procedures are controlled throughout the assembly process. No detail is overlooked to bring you the finest quality assembly.
- **Technology** — Digital lubrication guns are used to ensure the correct amount of lubricant is installed into each wheel end. Automated ABS tone ring and sensor testing technology is also utilized.





Through our READY-TO-ROLL® (RTR®) options, Hendrickson offers a variety of extended-service wheel-end packages and a wide array of individual components allowing fleets and owner operators to customize their running gear to meet specific needs and requirements.

Hendrickson Long-Life System™ (HLS™)

A popular RTR® option is HLS™. HLS is a factory-installed wheel end that brings fleets and owner-operators a cost-effective remedy for a leading cause of breakdowns – wheel-end damage.

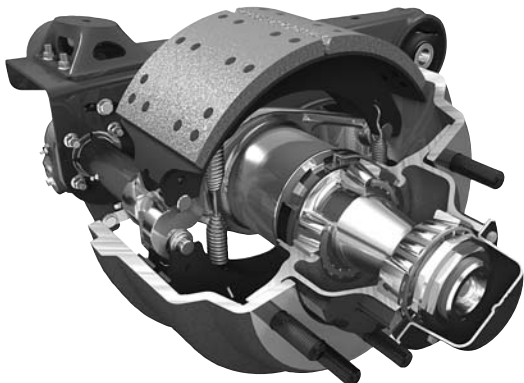
You can choose ductile iron, ADI or aluminum hub materials and HN or HP axles to tailor HLS to the weight and durability requirements of your application. HLS features high-performance components commonly available to the trailer industry including Stemco bearings, a ventless hubcap, synthetic semi-fluid grease and a patented Hendrickson wheel-end ventilation system.

An INTRAAX® or VANTRAAX® system with HLS wheel ends comes with a five-year limited warranty.

For additional information:

- *Hendrickson Long-Life System Flyer* — L823

Download current literature at www.hendrickson-intl.com



Hendrickson Long-Life System™ (HLS™)

Hendrickson Value System™ (HVS™)

Backed by the Hendrickson name, HVS is a low-cost wheel-end solution for cost conscious fleets.

This RTR option is exclusive for INTRAAX and VANTRAAX suspension systems. HVS features components that are commonly available in the industry including Stemco bearings, a ventless hubcap, an oil fill, and a unique Hendrickson wheel-end ventilation system (patent pending). You can choose an HN or HP axle and ADI, ductile iron or aluminum materials to customize your wheel end to your specific needs. All these features are backed with a three-year limited warranty.



Hendrickson Value System™ (HVS™)



Brake Efficiency

In the North American market, rapidly advancing vehicle technology enables tractors and trailers to become increasingly aerodynamic and more fuel-efficient. Simultaneously, the economic realities of the trucking industry lead fleets to demand reductions in periodic maintenance and elimination of major maintenance issues.

As fleets and owner operators strive to increase vehicle efficiency and reduce maintenance costs, they must keep in mind improvements in one area can reveal weaknesses or inefficiencies in another or hinder overall system performance. In vehicle braking systems, the very

factors that dramatically increase vehicle performance also cause brake workloads to increase substantially.

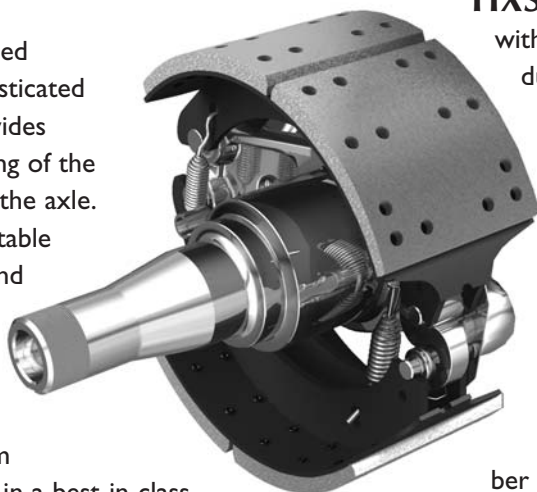
While they may have more than 75 years of design heritage, today's S-cam foundation brake system must "work harder" to meet the demands of modern trailers by more efficiently utilizing air system capacity and maximizing available air chamber actuation stroke. The future holds even greater changes for the vehicle braking system as new regulations and technologies shape the demands of vehicle designs.

The Hendrickson Advantage

Since 1995, Hendrickson delivered more than a million brakes to satisfied customers on our INTRAAX® and VANTRAAX® suspensions. We back all our brakes with extensive performance tests and heavy wear test data. Hendrickson stands ready to assist OEMs and fleets to choose the right braking solution.

At the heart of our advanced S-cam brake design, a sophisticated manufacturing process provides extremely accurate centering of the foundation brake spider to the axle. This results in stable, repeatable brake torque from wheel end to wheel end.

Our forged spider design adds material only where needed and removes it from where it is not. This results in a best-in-class lightweight spider with excellent structural characteristics.



HXS® (Hendrickson Extended Service®) brake shoes optimize geometry to further improve brake balance. Our crown geometry maintains consistent and balanced brake torque on both sides of the axle during the break-in period.

HXS brake shoes use .313-inch thick steel webs with heat-treated roller and anchor pins slots for durability and dimensional stability over the life of the shoe. E-coat paint helps prevent rust jacking.

To eliminate wasted deflection in the actuator support system, Hendrickson's unique, air-chamber bracket comes integrally welded to the suspension trailing arm, which also incorporates a rigid inboard cam support. Besides having very low deflection, the Hendrickson design eliminates the air chamber bracket and cam support welds on the axles — points where other axles commonly fail.

Our patented integrated suspension beam / brake connection allows for a shorter camshaft that results in less twisting deflection. This means a shorter brake stroke generates the required braking force.





Other benefits of reduced brake stroke include:

- Less air consumption during ABS actuation
- Faster application and release times
- More efficient actuation geometry under high brake application pressures
- Enhanced brake reserve when operating in mountainous terrain
- Increased brake reserve during burnishing-in period for new linings
- Maintaining brake adjustment longer – helps avoid out-of-adjustment traffic citations

Hendrickson integrated brake systems come in a variety of models and options that can be tailored to the needs of each fleet. These include:

16.5- x 7-inch standard

Available with many industry-standard lining materials, the standard brake is our robust basic performance product.

16.5- x 7-inch HXS®

The extended service brake of choice for trucking professionals, HXS brakes may be spec'd with industry accepted long-life lining materials.

16.5- x 8.625-inch wide HXS

Hendrickson's wide HXS brakes advance extended service. Offering 58 percent more wearable lining volume and 23 percent greater swept area than standard brakes, 16.5- x 8.625-inch HXS brakes dramatically extend lining life.

Hendrickson's wide HXS brakes provide 11 percent more wearable lining volume than competitors' 16.5- x 8-inch wide brake. Wide HXS brakes may be spec'ed with industry accepted long-life lining materials.

15- x 8.25-inch wide HXS

Engineered specifically for low-ride height applications such as furniture vans and car haulers, Hendrickson's 15- x 8.25-inch wide HXS brakes work with 19.5-inch wheels.

Building on a solid foundation

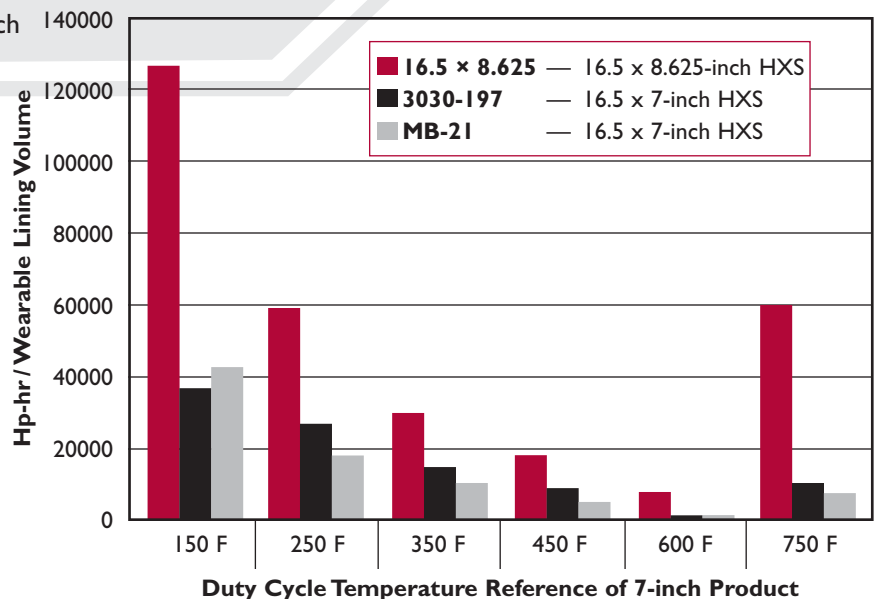
To complete the best trailer braking system on the market today, Hendrickson also offers a full line of automatic slack adjuster and air chamber options. Of special note are long-stroke chambers, which allow end users and fleets to achieve the maximum stroke reserve available in the industry.

For additional information:

- Consolidated Certificate of Compliance for Air Actuated Brakes — L809

Download current literature at www.hendrickson-intl.com

Brake Lining Life



Vehicle Controls

As integrated air suspension systems become more complex, fleets and owner operators seek effective tractor-trailer pneumatic and electronic control mechanisms to take full advantage of system capabilities.

In addition to height control valves, manual dump valves and lift axle controls, many haulers want devices to check trailer load weight; conveniently release slider pins; and automatically or remotely trigger lift axles, dump valves and warning devices.

The Hendrickson Advantage

Hendrickson delivers an array of vehicle control devices to customize suspension operations for specific requirements of fleets and owner operators.

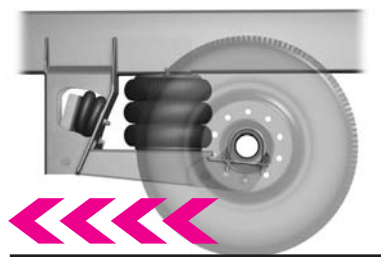
Two popular devices from Hendrickson are the Automatic Lift Axle Control Kit to help Canadian haulers comply with infrastructure-friendly regulations and an automatic Back-up Alarm System. Both exemplify innovative approaches to solving industry concerns.

The Automatic Lift Axle Control eliminates the operator's role in raising and lowering self-steering trailer lift axles. It triggers the axle lift mechanism when the trailer travels rearward and starts the axle dropping with forward movement.

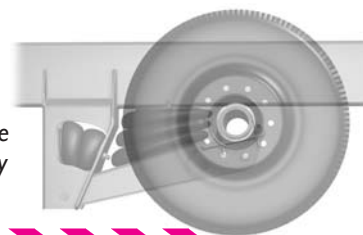
Compatible with any lift mechanism equipped with an electro-pneumatic control, the device's wheel-end sensor reads the ABS tone ring, triggering after three feet of rearward travel to activate the lift mechanism. Eighty feet of forward travel automatically keys the lowering of the axle.



The Automatic Lift Axle Control eliminates the operator's role in raising and lowering self-steering trailer lift axles.



Moving forward 80 ft. automatically triggers lowering of the axle



Moving in reverse 3 ft. automatically keys lifting of the axle





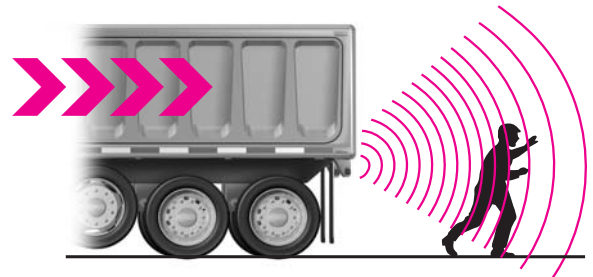
Hendrickson's automatic trailer Back-up Alarm System helps improve awareness of backward vehicle movement in areas of limited maneuverability and visibility. The easy-to-install, stand-alone, automatic system requires no communication with the tractor.



The automatic trailer Back-up Alarm System helps improve awareness of backward vehicle movement in areas of limited maneuverability and visibility.

With rearward trailer movement, the system activates a very loud warning sound to help alert bystanders and other drivers in areas such as congested dock operations, crosswalks and walkways where the vehicle is moving in reverse.

Of course, Hendrickson offers an array of pneumatic and electronic controls including height control valves and load scale kits.



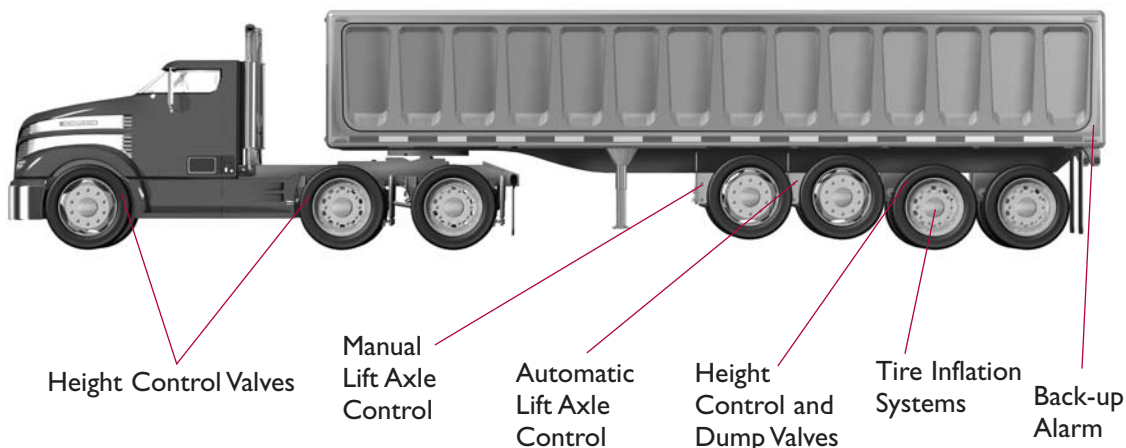
For additional information:

- *Vehicle Controls Quick Reference Guide* — L782
- *Height Control Valve Application Table* — L575

Download current literature at www.hendrickson-intl.com

Hendrickson Vehicle Controls

Simple, effective solutions to your tractor-trailer electronic and pneumatic control needs



Aftermarket

Like most industries, heavy-duty transportation struggles with hit-and-miss aftermarket component manufacturers. Be it toasters, lawnmowers, automobiles or Class 8 rigs, the respective aftermarkets are full of look-alike and knock-off repair parts, many of poor quality.

Knock-offs attract customers with cheaper pricing than components manufactured and distributed by OEMs (original equipment manufacturers). That cost savings can evaporate quickly, if the look-alike part does not fit

correctly causing increases in labor time or fails prematurely producing unexpected downtime.

Ill-fitting replacement components may also sap the performance of original equipment or degrade the overall wear and reliability, ultimately taking money out of your pocket. OEMs support equipment with OE specified parts and equitable warranties. Use of knock-off parts and components, in many cases, can void equipment warranty.

The Hendrickson Advantage



Over the decades, Hendrickson has manufactured hundreds of thousands of air suspensions and integrated suspension, axle and brake

systems for trailers. We design suspensions using quality components and submit those components to rigorous testing. We stand behind Hendrickson Genuine Parts, just as we stand behind our suspension systems.

For example, differences in air spring piston design, flex member length and overall dimensions may not be obvious but remain critical to performance. Other critical dimensions not readily visible include variations in internal bumpers and flex member bias angles.

Hendrickson pioneered the use of a single, large-diameter bushing in air suspensions with our original TRI-FUNCTIONAL® Bushing. Unique void designs and material composition remain critical to maintaining outstanding performance on the road.



Air springs, shocks, bushings, axles, brake systems and air controls — all our components function in unison to provide superior system performance. Insisting on Hendrickson Genuine

Parts ensures the continued reliability and performance you have come to expect from Hendrickson.



TRI-FUNCTIONAL Bushings





With INTRAAX®, we introduced a more efficient brake system using beam-mounted hardware and shorter S-cams. In addition to standard brakes, we offer Hendrickson Extended Service™ (HXS®) brake shoes to enhance lining life while optimizing geometry and further improving brake balance (see page 22).



Hendrickson designs shocks with specific strokes, seal designs, bore diameters and damping characteristics to enhance suspension system performance. A shock with too short a stroke may cause mounting clevises or trailer cross member damage, too long a stroke may allow overextension of the system and damage air springs.



The aftermarket list goes on and on — the unique QUIK-ALIGN® pivot connection with a specially developed shear type bolt is another component that is specifically designed to work with air suspension systems. Me-too parts could result in insufficient torque.

You trusted Hendrickson with your original suspension system investment — trust us for the same outstanding quality and ultimate performance from replacement and repair components. Insist on Hendrickson Genuine Parts to maximize your time on the road and minimize your operation costs.



Hendrickson HCV (VS-227) aftermarket kit

- Universal replacement kit
- Retrofitting all truck, tractor and trailer air suspensions



For additional information:

- *Hendrickson Genuine Parts — L595*
- *Genuine Parts Flyer, Air Spring — L1019*
- *Genuine Parts Flyer, Shocks — L1020*

Download current literature at www.hendrickson-intl.com



Trailer

Suspensions *slider systems*

VANTRAAX® and INTRAAX® - SP

Benefits

- Low maintenance
- Industry's first standard cam enclosure for trailer brake systems
- TRI-FUNCTIONAL® bushings — proven technology for mile after mile of trouble-free service
- Neutral-toe axle — improved mileage and tire life
- Patented axle wrap and window weld for optimal structural integrity
- 10-year limited warranty on axle/beam connection
- 5-year limited structural warranty
- Broad mix-and-match READY-TO-ROLL® offerings let you customize your running gear to meet your specific requirements
- Single source for comprehensive technical support, training and warranty



VANTRAAX®

HKANT 23K • 40K • 46K / HKAT 50K

A comprehensive system for dry-freight, refrigerated and specialty vans

- **Application:** Lightweight, road-proven integrated systems for virtually any trailer design using a sliding bogie — optimized for dry-freight, refrigerated and specialty vans
- **System capacity:** 23 • 40 • 46 • 50,000 pounds
- **Ride height:** 16 or 17 inches
- **Box widths:** 42, 48 and 54 inches
- **Axle spread:** Standard 49-inch closed-space tandem; optional 121-inch widespread on select models
- VANTRAAX® combines the advantages of INTRAAX® with the patented K-2® slider box — accommodates 96- or 102-inch trailer widths and four- or six-inch pinhole configurations
- Standard with QUIK-DRAW®
- 7-year limited warranty on TRI-FUNCTIONAL® bushings — on-highway applications





VANTRAAX® TRIDEM HKAT 69K23 • 69K / 25

- **Application:** Dry, refrigerated and specialty vans
- **System capacity:** 69,000 pounds
- **Suspension capacity:** 23 • 25,000 pounds
- **Ride heights:** 16 and 17 inches
- **Box width:** 42 and 48 inches
- **Axle spread:** 60 and 72 inches
- Allows haulers to go through state and international borders while maintaining compliance



VANTRAAX Ramp Ready HKARL 46K

- **Application:** Haulers delivering where a loading dock is not always possible
- **System Capacity:** 46,000 pounds
- **Ride Height:** 10 or 11 inches
- **Box Width:** 48 inches
- **Axle Spread:** 49 inches
- **Features:** 30-by 6.5-inch ramp bay • Eliminates heavy, expensive spacer tubes



INTRAAX® — SP AAZNT 23K • 46K / AAZL 23K • 46K

Platform Slider Series

Fits neatly between trailer I-beams. Single-axle and tandem configurations give platform slider operators low-maintenance benefits, unprecedented weight savings, and all the benefits of INTRAAX®.

- **Application:** Straight and drop-deck platform trailers
- **System Capacity:** 23 • 46,000 pounds
- **I-Beam Centers:** 37, 38, 43 and 44 inches
- **Axle Spread:** 49, 60 and 72 inches
- Saves as much as 800 pounds compared to comparable air suspension sliding tandems and 200 pounds compared to mechanical sliders
- Standard with brake chamber powered QUIK-DRAW®



Trailer Suspensions *Primary*

INTRAAX® Top-mount AANT 23K

The definitive system for weight-conscious haulers

- **Application:** Straight-frame platforms, container chassis, liquid tankers, bulk tankers, bottom dumps, grain and livestock trailers
- **Capacity:** 23,000 pounds
- **Ride heights:** 12 to 17 inches
- Trims an average of 50 pounds from what was already the lightest, toughest integrated suspension-axle-brake system
- Tapered hanger design allows installation without additional gussets on trailer frames as narrow as four-inches, giving improved installation efficiency
- Standard Large-Diameter Axle (LDA™) provides the straightest trailer axle in the industry



INTRAAX Top-mount AAT 25K • 30K

Reducing weight, improving ride, minimizing maintenance and maximizing productivity

- **Application:** Ideal for platforms, tankers, dumps and loggers
- **Capacities:** 25 • 30,000* pounds
- **Ride heights:** 13.5 to 19 inches
- Lightest in its class



* Axle capacity 25,000 pounds

INTRAAX Low-ride / Liftable AANL 23K

The definitive low-ride system for weight-conscious haulers

- **Application:** Ideal for configurations including platforms, drop-decks, lowboys and specialty trailers
- **Capacities:** 23,000 pounds
- **Ride heights:** 6.5 to 17 inches
- Trims an average of 75 pounds from the proven AAL 23K low-ride integrated suspension-axle-brake system already known throughout the industry for its lightweight operation and durable performance. That's 150 pounds of weight savings per tandem.
- INTRAAX AANL 23K features the Large-Diameter Axle (LDA™)





INTRAAX® Low-ride / Lifiable AAL 25K • 30K

Designed specifically for low-ride heights and liftable axles

- **Application:** Ideal for configurations including platforms, dumps, drop-decks, tankers, B-trains, livestock trailers and specialty trailers
- **Capacities:** 25 • 30,000* pounds
- **Ride heights:** 6.5 to 19 inches
- Lightest integrated liftable system available
- Compact UNDER BEAM LIFT™ (UBL™) allows for closer axle spacing



* Axle capacity 25,000 pounds

INTRAAX Extreme-duty AAEDT / AAEDL 30K

Extreme-duty top-mount and low-ride systems provide the muscle needed for toughest off-road and heavy-hauling applications

- **Application:** Raw wood trailers including loggers and chip vans; dumps, tankers, straight- and drop-deck platforms and specialty trailers
- **Capacity:** 30,000 pounds — suspension and axle
- **Ride heights:** Top-mount, 14 to 17 inches / low-ride, 9 to 19 inches
- The first integrated 30,000 pound structural and axle capacity system for severe-duty and heavy-hauling operations
- Low-pressure air springs with steel pistons and full bottom plate coverage
- High-damping, extended-service shock absorbers
- Heavy-duty options include rear-mount shock absorbers and chain down-stops



INTRAAX
AAEDT



INTRAAX AAEDL

INTRAAX Compact Low-ride AANLS 20K

Brings advantages of system integration in a highly compact,

- **Application:** Autohaulers, moving vans and drop frame trailers
- **Capacity:** 20,000 pounds
- **Ride heights:** 6.25 to 12 inches
- Compact package ideal for the tight confines of the autohauler and drop-frame trailer designs
- System accepts 15- or 16.5-inch brakes allowing choice of 19.5- to 24.5-inch tires
- Air suspension package more than 120 pounds per axle lighter than comparable suspensions

low-ride height suspension



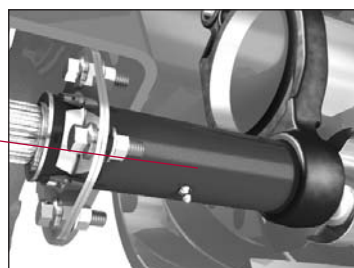
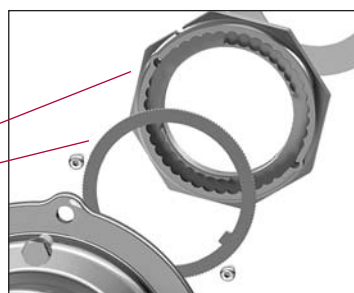
Trailer

Suspensions *Primary*



Benefits

- **Low maintenance**
- **P90™ Spindle** — Industry's lightest parallel spindle, that allows for the flexibility to change between wide base and dual tires
- **PRECISION320™ Nut System** — Enables ultra-precise factory installation to elevate bearing performance
- **Industry exclusive HNP™ and HUS® wheel-end technology** — Durable and lightweight wheel-end technology
- **Standard Cam Tube System™** — Extends brake component life
- **Hendrickson Extended Service™ (HXS®) Brakes** — Extends intervals between brake servicing
- **Industry exclusive system warranties** — Five- and Seven-year limited warranties that include the suspension, long-life shocks, long-life air springs and wheel ends



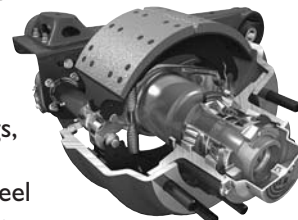
Customer Service
1-866-RIDEAIR



- Features Hendrickson's HNP wheel-end technology — the industry's first new hub design in more than 40 years
- Pre-assembled and sealed by Hendrickson
- Completely rebuildable system featuring twin "N" inner bearings and "R" seal
- Features durable, yet lightweight ADI hub
- **Exclusive** five-year limited warranty on the suspension, long-life shocks, long-life air springs and the HNP wheel ends — **parts and labor**
- G.A.W.R. - 23,000 lbs.



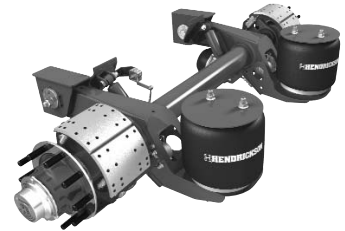
- Features Hendrickson's HUS® unitized wheel-end technology
- Factory assembled and sealed for life
- Virtually maintenance free
- **Exclusive** five-year limited warranty on the suspension, long-life shocks, long-life air springs, and a seven-year limited warranty on the HUS wheel ends — **parts and labor**
- G.A.W.R. - 23,000 lbs.





FX 20NLS

- **Applications:** Compact system ideal for moving vans, autohaulers and drop-frame trailers
- **Ride heights:** 6.25 to 12 inches
- **Capacity:** 20,000 pounds
- Available in both FX5 and FX7 configurations



FX 23NT

- **Applications:** Optimum performance for straight-frame platforms, container chassis, tankers, bottom dumps, grain hoppers and livestock trailers
- **Ride heights:** 12 to 17 inches
- **Capacity:** 23,000 pounds
- Tapered hangers allow installation without additional gussets on trailer frames as narrow as four inches
- Large-Diameter Axle (LDA™) provides the straightest and most consistent trailer axle in the industry
- Available in both FX5 and FX7 configurations



FX 23NL

- **Applications:** Tailored for drop-decks, lowboys, platforms, specialty trailers and liftable applications
- **Ride heights:** 6.5 to 17 inches
- **Capacity:** 23,000 pounds
- Large-Diameter Axle (LDA™) provides the straightest and most consistent trailer axle in the industry
- Available in both FX5 and FX7 configurations



FX 25T

- **Applications:** Ideal solution for platforms and dumps
- **Ride heights:** 13.5 to 19 inches
- **Capacity:** 25,000 pounds
- Available in FX7 configuration



FX 25L

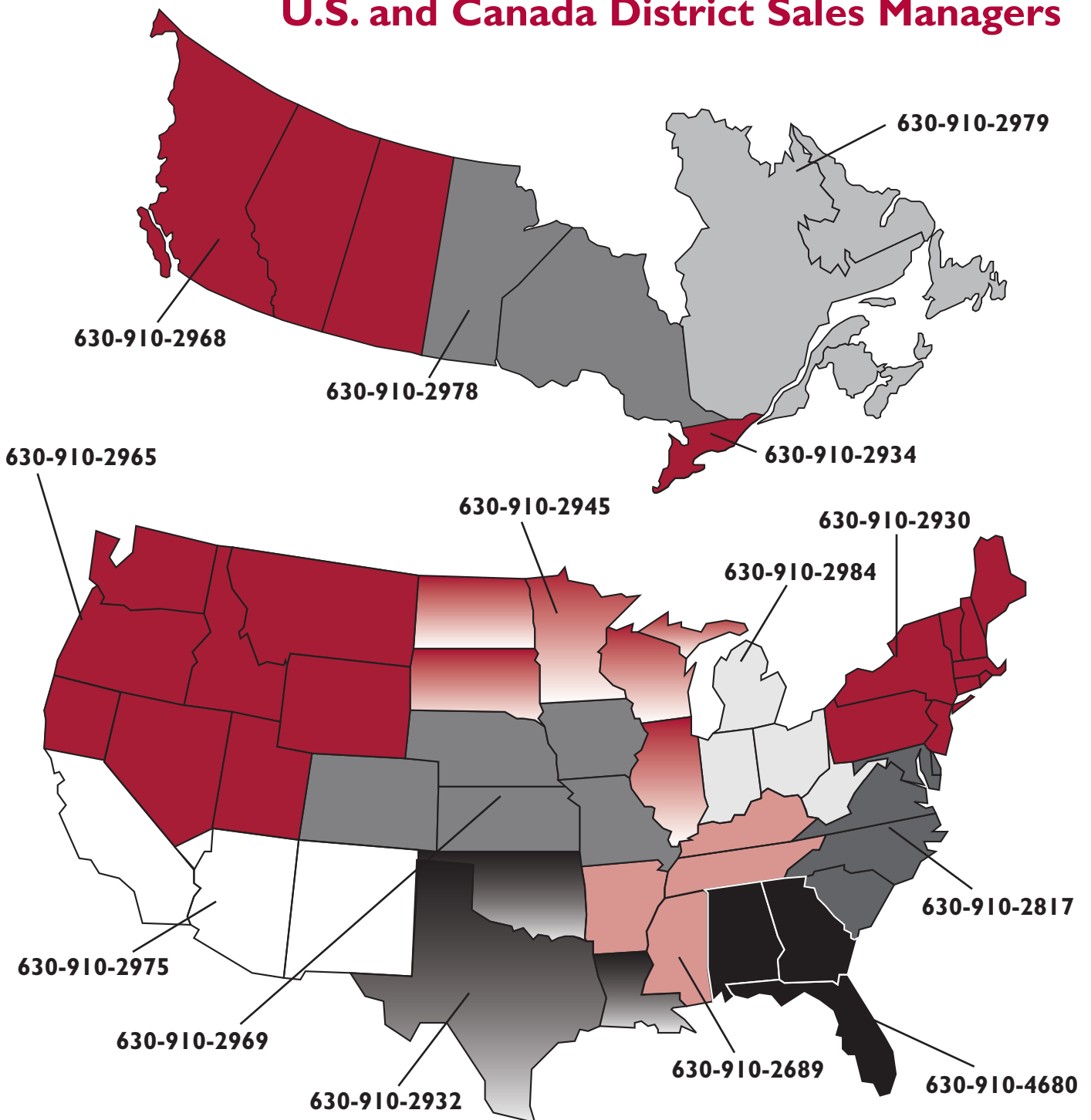
- **Applications:** Designed for drop-decks, platforms, dumps and liftable applications
- **Ride heights:** 6.5 to 19 inches
- **Capacity:** 25,000 pounds
- Available in FX7 configuration



Hendrickson

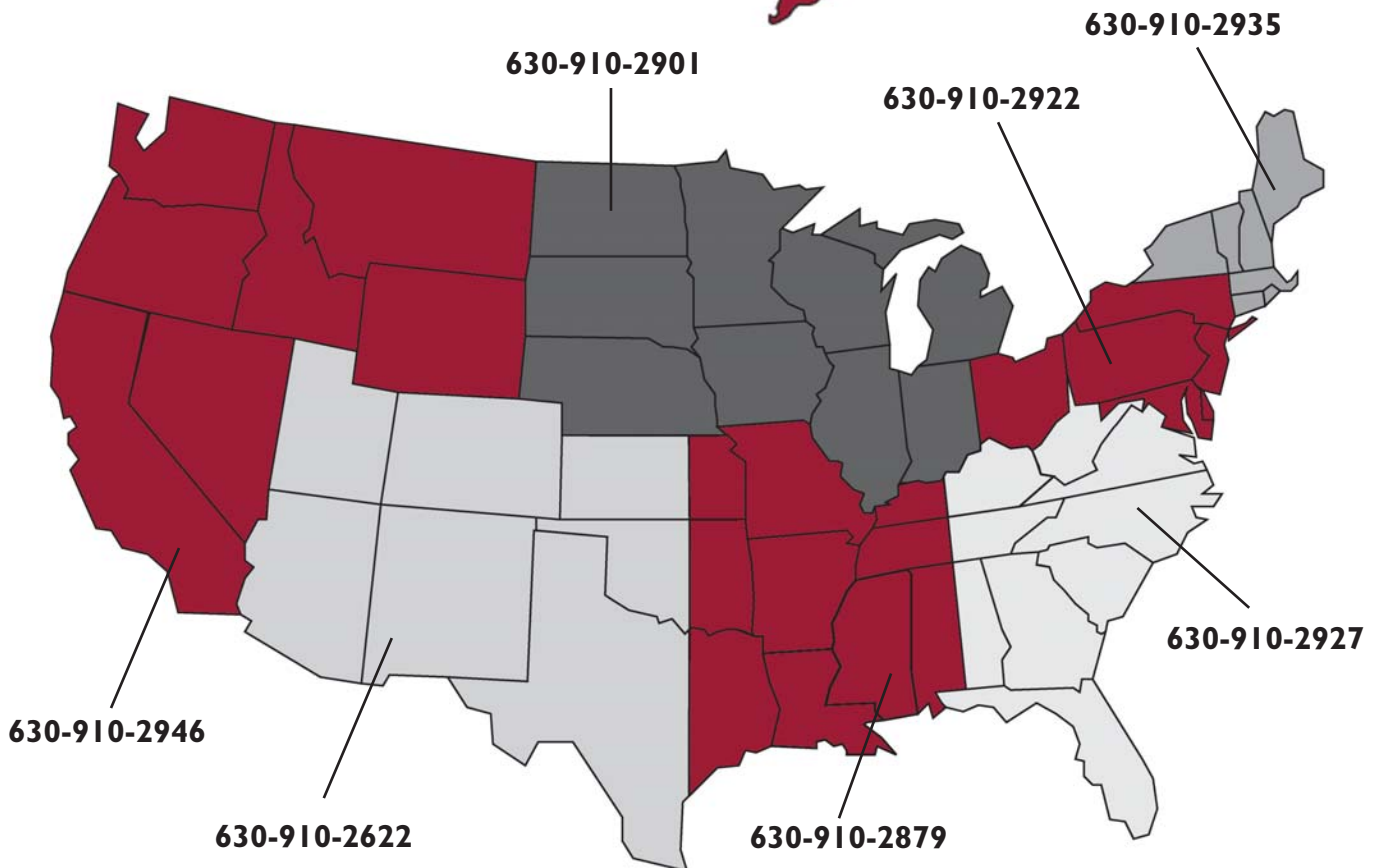
Contacts

U.S. and Canada District Sales Managers





U.S. and Canada Regional Service Managers



Applications

This table is intended as a general reference guide only. For recommendations regarding specific trailer designs and applications, please contact Hendrickson's applications engineering group at 866-RIDEAIR (743-3247) in the United States, 905-789-1030 in Canada, or 52-8-156-1300 in Mexico. Inquiries from all other countries, please call our U.S. office at +1 330-456-7288.

		— Model Recommendations —																																			
		VANTRAAX®						HK	INTRAAX®-SP				INTRAAX®						QUAANTUM™ FX					HT™													
Trailer Type		HKANT 23K	HKANT 40K	HKANT 46K	HKANT 46K	HKAT 50K	HKAT 69K 23	HKARL 46K	HTHKR	AAZNT 23K	AAZNT 46K	AAZL 23K	AAZL 46K	AANT 23K	AAT 25K	AAT 30K	AAEDT 30K	AANLS 20K	AANL 23K	AAL 25K	AAL 30K	AAEDL 30K	FX 20NLS	FX 23NT	FX 23NL	FX 25T	FX 25L	HT190T	HT230	HT250T	HT300	HT190U	HT250U	HT250US	HT300U		
Dry Van and Reefer		○	●	○	○	▲	○	○					○	▲	▲			●	○	○	○	○		○			○	○		▲							
Drop Frame Van																		●	○	▲			●		○	○						○		○		▲	
Auto Hauler																		●	○	▲			●		○							○	○	▲			
Container Chassis													●	○	▲	▲	▲						●		○			○	○		▲					▲	
Chip Van and Logging																																	○	▲			○
Flat or Platform (Stationary)													●	○	▲	▲	▲			○	○	○	○	○	○	○	○		○		○	▲			○	▲	
Flat or Platform (Slider)									●	●	○	○																									
Lowboy and Drop Deck (Stationary)																		●	○	○	○	○			●		●						○	○	○	○	
Lowboy and Drop Deck (Slider)											●	●																									
Dump (Rear and Side Discharge)														●	○	○	▲			●	○	○	○			●	●				○	▲			○	▲	
Dump (Bottom Discharge)													●	○	○	▲	▲		●		▲	▲		●	●	○	○			○	▲		○	○	○	▲	
Tanker													●	○	○	▲	▲		●	○	○	○	○	○	○	○				○	▲			○	▲		
Grain Hopper													●	○	○	▲	▲		●	○	○	○	○	○	○	○		○		○	▲			○	▲		
Livestock													●	○	○	▲	▲		●	○	○	○	○	○	○	○			○						○	▲	

U.S. and Canada — ● = Recommended Suspension • ○ = Other Option

Mexico, Central and South America — ▲ = Recommended Suspension • ▲ = Other Option

For additional information and options, reference —
 Trailer Suspensions Application Guide — L707 or download current literature at www.hendrickson-intl.com



Look to Hendrickson for all your truck and trailer suspension, auxiliary lift axle, spring and bumper needs.



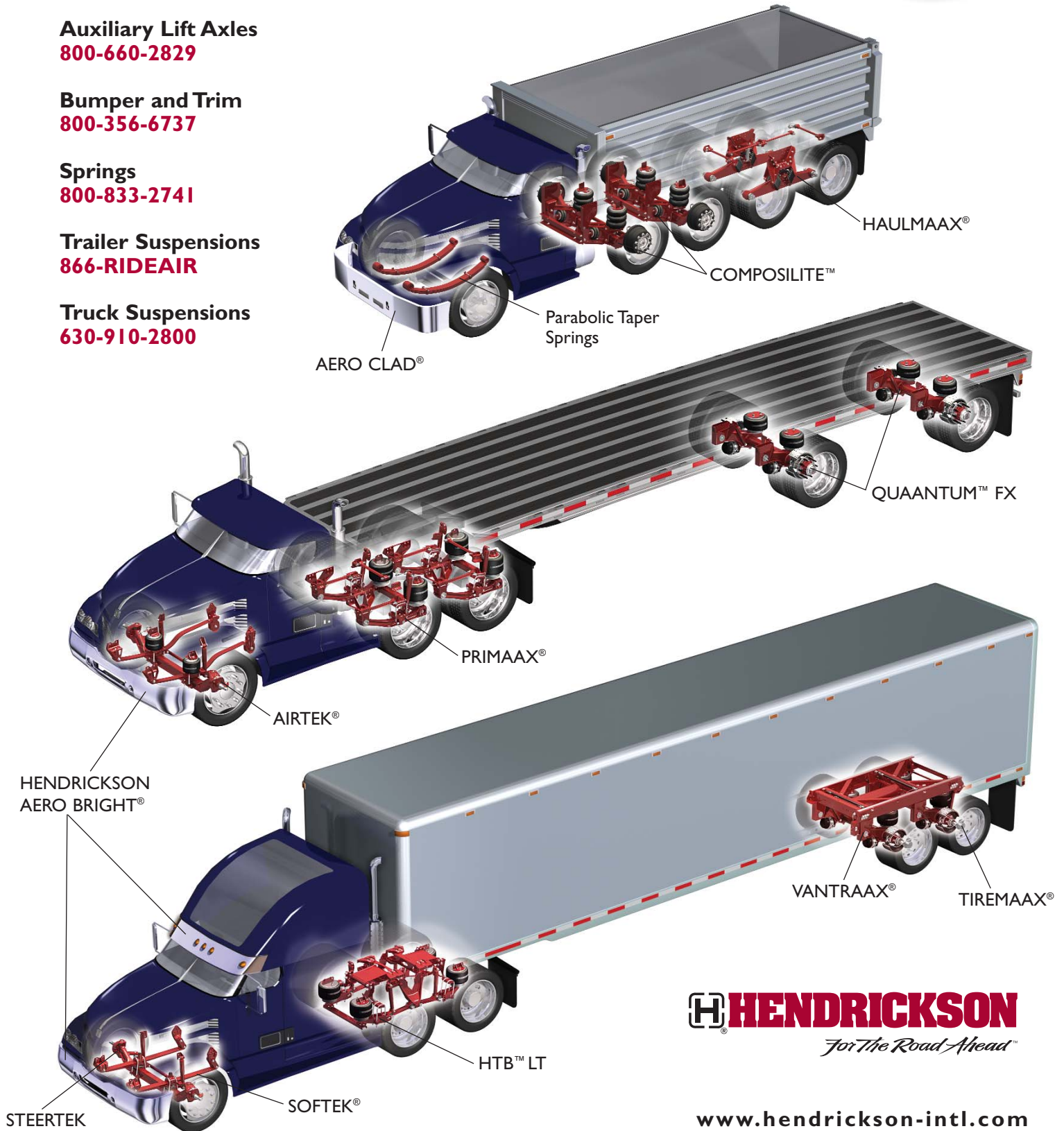
Auxiliary Lift Axles
800-660-2829

Bumper and Trim
800-356-6737

Springs
800-833-2741

Trailer Suspensions
866-RIDEAIR

Truck Suspensions
630-910-2800



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For The Road Ahead™

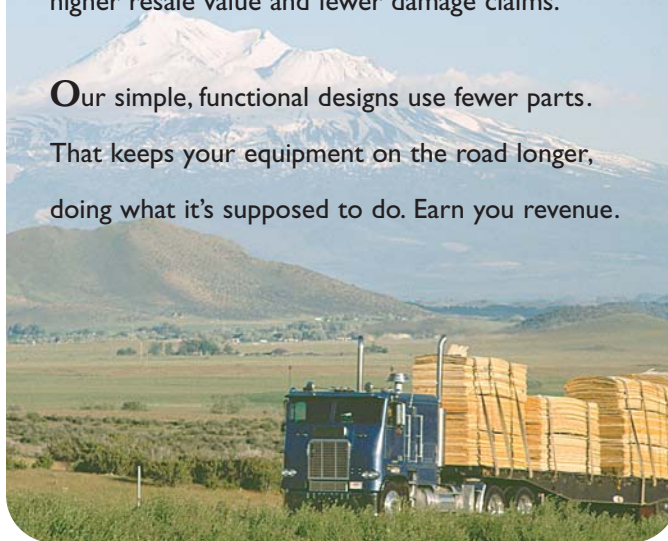
www.hendrickson-intl.com

Hendrickson leads the world in air suspension technology. We lead with the lightest, toughest air suspension systems; with performance, and with durability.

We sell more air suspension systems than any other company in the world. That's plain fact — not hype. Satisfied customers. That's how we know are the leader.

Our unmatched ride protects your cargo and equipment from vibration and damage. That means higher resale value and fewer damage claims.

Our simple, functional designs use fewer parts. That keeps your equipment on the road longer, doing what it's supposed to do. Earn you revenue.



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