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How to transform borders into connections?
Vectron. The locomotive that's forging new paths.

Creating Corridors

Creating Corridors

With liberalized markets, widely varying national requirements and changing customer needs, today rail-based passenger and freight transportation has to be more flexible than ever. New paths are needed – both in terms of ideas and geography.



Vectron – the new locomotives for those who want to – and have to – meet Europe’s current and future requirements and transportation needs. Vectron was developed based on information from interviews with many different operators, and on experience gained from more than 1,900 Europrinters and Eurorunners in operation. Ensured viability into the future, investment security, environmental compatibility and fungibility were most important to operators. Vectron responds to these needs by combining proven strengths with future-oriented strategies and innovations. Come aboard and discover the locomotive that forges new paths – to ensure a successful future for your freight, regional or intercity traffic.

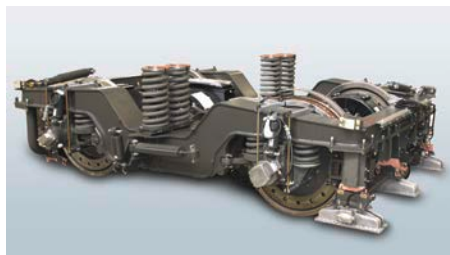


Planning with more certainty

Europe is changing. The choice of the right locomotive today will dictate your success tomorrow. Equip yourself for a changing future – with Vectron, your plans and investment are secure. After all, Vectron combines mature and proven technology with market-oriented modularity and flexibility. This translates into a new freedom of motion in all phases of your vehicle's lifecycle.

Practical modularity. Vectron focuses on what's most important – your success. That's why the new vehicle concept makes no compromises when it comes to modularity. Modularized matching parts such as front end, driver's cab, braking equipment, and control technology ensure standardized operability and controllability as well as optimized lifecycle costs. The car bodies and bogies of the electric and diesel-electric version of the Vectron differ, based on a well-planned concept. All Vectron variants have an engine room layout with a wide straight gangway. This is not only maintenance-friendly, but provides a straight, panic-proof escape route for the driver, which can be vital for survival in an emergency situation.

Expandable speed ranges. Expand the deployment range of your vehicles. The bogie concept of the electric Vectron offers increased flexibility. With suitably preconfigured gear ratios, the entire



*Vectron electric locomotives:
One bogie for all speeds up to 200 km/h*

speed range can be used with one bogie. This makes it easy to increase the speed subsequently in the Intercity area, for instance during the course of upgrading a freight train locomotive to a passenger train locomotive.

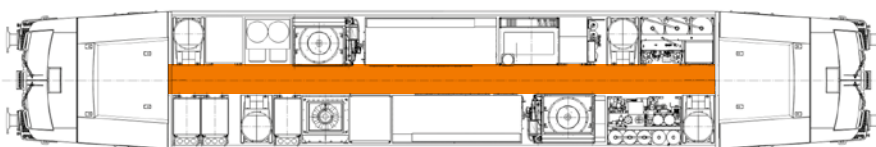
Vectron is equipped with the pinion hollow shaft drive – a concept, which is familiar from the Eurorunner. This type of traction, which has better characteristics over a wide range of speeds, has now been further developed for the electric

Vectron in the high-performance class as well. The bogie is designed with wheel brake disks and a standard pivot solution that proved its value in the Europrinter F4. Existing interfaces ensure simple configuration with different train protection antennae and speed sensors.

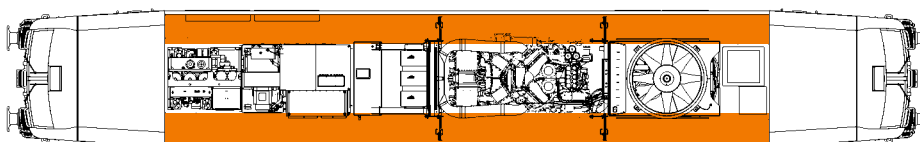
The diesel variant of the Vectron is equipped with an enhanced version of the Eurorunner bogie. Consequently, no components are overdimensioned.

Reduced wheel wear. With Vectron, you benefit from optimized lifecycle costs. These can be even further improved by using an active rotary damper (ADD). Vectron can be equipped optionally with an ADD for all speed ranges. This reduces transverse forces on the track through active guidance of the bogie when traveling through curves, thereby reducing wheel wear. This represents a worthwhile investment, particularly for highly demanding traction applications.

Vectron



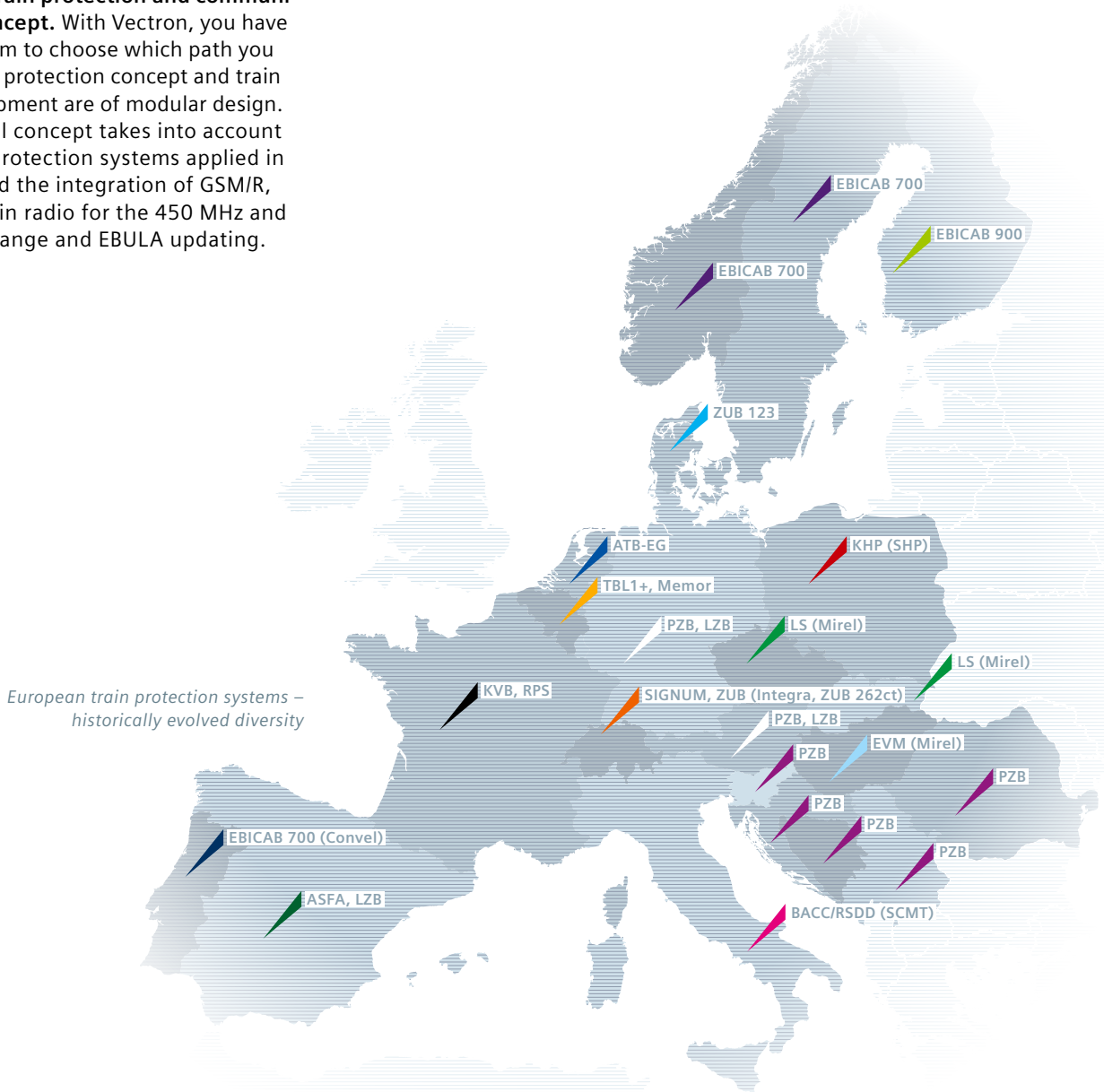
Vectron DE



Maintenance-friendly engine room layouts with panic-proof straight gangways



Modular train protection and communication concept. With Vectron, you have the freedom to choose which path you take. Train protection concept and train radio equipment are of modular design. The overall concept takes into account the train protection systems applied in Europe and the integration of GSM/R, analog train radio for the 450 MHz and 160 MHz range and EBULA updating.



European train protection systems – historically evolved diversity



Acting more sustainably

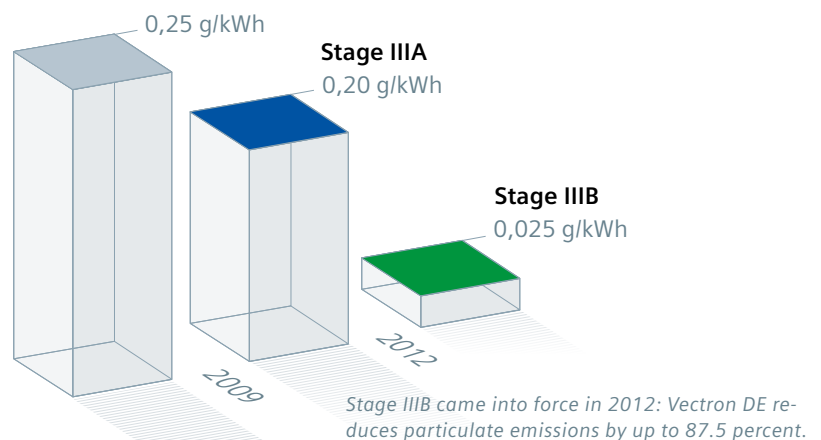
Rapid resumption of operation. You need to keep moving to stay ahead. But should something ever happen, you can get your Vectron quickly back on the track, thanks to the crash-absorbing front end of modern Siemens design which has been proven in multiple applications in Belgium (HLE18), Portugal (LE 4700), and Lithuania (ER20CF). The front end is of standard bolt on design in order to be quickly dismantled and exchanged if this is ever necessary. It can also be preassembled as a finished spare unit and stored for easy availability. Short downtimes for repairs and fast return to revenue service are also rewarded by insurance companies in the form of lower premiums.

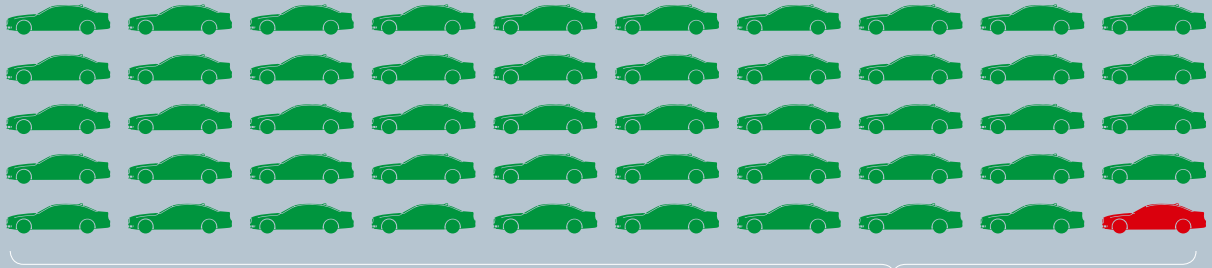
Future oriented conformity to standards. Keep up with the times, now and tomorrow. With Vectron you're prepared for the changing standards landscape. Vectron meets the Technical Specifications for Interoperability in Europe (TSI) TSI HS RST, TSI LOC&PAS, TSI Noise, TSI PRM, TSI CCS and TSI SRT. The Vectron diesel locomotive meets the emissions limit values of EU97/IIIB.

Exemplary environmental friendliness. In more and more countries, pollutants, diesel particulates as well as noise emissions are very strictly regulated. By complying with these strict environmental requirements, you position yourself as a green mobility provider. Environmental compatibility is given with the well thought-through Vectron concept. This starts in the manufacture of the Vectron, with energy saving production facilities, and goes on to include the comprehensive use of environmentally friendly materials, coolants, and water-soluble coatings. No glass-fiber reinforced plastics are used.

With the electrical Vectron locomotives, highly efficient regenerative braking, low-energy shutdown, and optimized system design minimize energy consumption. At the end of the locomotive's service life, you are left with almost nothing, thanks to its exemplary 98 percent recyclability (recyclable materials 94 percent, thermal use 4 percent).

Lowest emissions. It makes more sense to prevent emissions in the first place, rather than produce them and then having to get rid of them. Reduce particulate emissions by up to 87.5 percent with Vectron, the first diesel-electric





85,000 kg

Residual materials

Environmentally friendly through the entire life cycle:
 With a total weight of 85 t and a 98% recycling quota, all that remains of a Vectron electric locomotive is about 1,700 kg of residual materials – the weight of a mid-size passenger car.



locomotive on the market to come standard-equipped with the newest diesel engine and particulate filter required for Stage IIIB. Like all Siemens diesel locomotives, Vectron undercuts the requirements of TSI Noise. Its outside noise level for stationary and starting noise is 10 dB(A) quieter than the TSI limit value, comparable to the excellent ER20 values.

Testing with our own fleet. Our customers expect proven quality from the first day of operation. To make sure we could provide it, we built nine Vectron locomotives just for ourselves; eight electric and one Vectron DE. After many rides at the test centers in Wegberg-Wildenrath and Velim, these locomotives are now traveling throughout Europe in an extensive trial program.

Total performance. Put your trust in a stable partner. Vectron incorporates 130 years of experience in the development, manufacture, and operation of rail vehicles. Whether drives, transformers, and converters for traction systems, locomotives, or bogie manufacture – production facilities with a long tradition ensure quality and reliability from a single source. Of critical importance for getting off to a quick start is the innate stability of Vectron. This is ensured by extensive optimization and pre-testing in Siemens' own system test center as well as at our test center for rail systems in Wegberg-Wildenrath.



Vectron being tested in the Vienna Arsenal Climate Chamber



Winter testing in the far north of Scandinavia near Kiruna



Components

- Dynamic braking resistor
- Train protection cabinet
- Engine cooling plant
- Diesel engine
- Particle filter
- Engine air intake system
- Alternator
- Electric cabinet with central blower
- Brake equipment
- Battery box
- Fuel tank
- HEP-Container or Train-protection cabinet



Diesel locomotive

Wheel arrangement	Bo'Bo'
Diesel engine power (kW)	2,000 / 2,200 / 2,400
Starting tractive effort (kN)	275
Max. speed (km/h)	160
Fuel tank volume (l)	4,000
Weight* (t)	approx. 83
Track gauge (mm)	1,435 to 1,668
Max. axle load (t)	22

* based on variant and equipment

Option examples

- ▮ Active rotary damper
- ▮ Separate control unit at the side
- ▮ External power supply 1- and 3-phase on one / both sides
- ▮ Thermoelectric hot/ cold box
- ▮ Rear-view system (camera)
- ▮ Remote data transmission
- ▮ Pressure protection
- ▮ Oil-free compressor



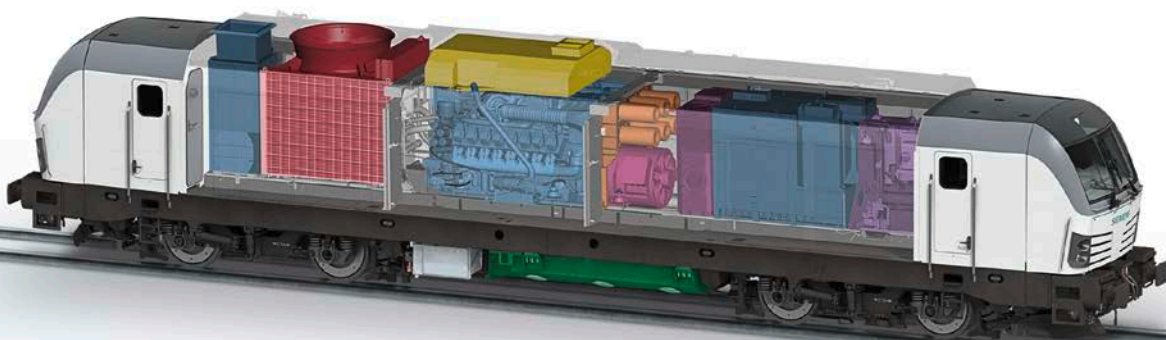
Transporting more ecologically

The Vectron DE combines proven and innovative technologies, and integrates experience from other applications. As the successor to the proven Eurorunner locomotive series, the Vectron will also set new standards in environmental friendliness. Its EU97/IIIB diesel engine makes it the trendsetter in emission reduction.

Improved efficiencies. Thanks to its proven diesel-electric drive with AC technology, the Vectron DE is 5–10 percent more efficient than diesel-hydraulic locomotives over the entire operating and performance range. Light, resiliently-mounted traction motors are easy on rails.

Highly maintenance-friendly. The Vectron DE uses identical parts wherever possible, without compromising user benefits. Particular attention was paid to easy accessibility and replacement of components. All this makes the Vectron DE especially maintenance-friendly.

Optimized balance between costs and environmental protection. High-performance capacitors replace heavy, environmentally harmful starter batteries. Braking energy is consequently used to power auxiliary systems and the train energy supply (head end power) in passenger transportation. Depending on overall conditions, this permits up to 10 percent energy savings. The result is a substantial improvement in the environmental balance, with a simultaneous reduction in operating costs.



Vectron. Creating Corridors

Components

- Brake rack
- Traction-motor blowers
- Fire-extinguishing system
- Auxiliary equipment rack
- Low-voltage equipment cabinet
- Dynamic braking resistor
- Oil and water cooler
- Auxiliary transformer rack
- Traction converter
- Compressed-air equipment rack
- AC high-voltage equipment cabinet
- DC high-voltage equipment cabinet
- Train protection cabinet 3
- Train protection cabinet 1/2
- Shunting module **



Multi-system locomotive

Wheel arrangement	Bo'Bo'
Voltage system	AC 25 kV, 50 Hz AC 15 kV, 16.67 Hz DC 3 kV DC 1.5 kV
Max. power (kW)	6,400
Starting tractive effort (kN)	300
Max. speed (km/h)	160 / 200
Weight* (t)	approx. 87
Track gauge (mm)	1,435 to 1,668



AC locomotive, high power

Wheel arrangement	Bo'Bo'
Voltage system	AC 25 kV, 50 Hz AC 15 kV, 16.67 Hz
Max. power (kW)	6,400
Starting tractive effort (kN)	300
Max. speed (km/h)	160 / 200
Weight* (t)	approx. 85
Track gauge (mm)	1,435 to 1,668



* based on equipment and ballasting

** does not apply to Vectron MS



Option examples

- ▮ Sanding axle 2 and 3
- ▮ Axle isolating switches (MS, AC high power)
- ▮ Active rotary damper
- ▮ Auxiliary driver's control panel
- ▮ External power supply 1- and 3-phase on one / both sides
- ▮ Thermoelectric hot / cold box
- ▮ Rear-view system (camera)
- ▮ Remote data transmission
- ▮ Fire-extinguishing system
- ▮ Pressure protection
- ▮ Oil-free compressor

AC locomotive, medium power

Wheel arrangement	Bo'Bo'
Voltage system	AC 25 kV, 50 Hz AC 15 kV, 16.67 Hz
Max. power (kW)	5,600
Starting tractive effort (kN)	300
Max. speed (km/h)	160
Weight* (t)	approx. 82
Track gauge (mm)	1,435 to 1,668



DC locomotive, medium power

Wheel arrangement	Bo'Bo'
Voltage system	DC 3 kV
Max. power (kW)	5,200
Starting tractive effort (kN)	300
Max. speed (km/h)	160 / 200
Weight* (t)	approx. 80
Track gauge (mm)	1,435 to 1,668



Operating more efficiently

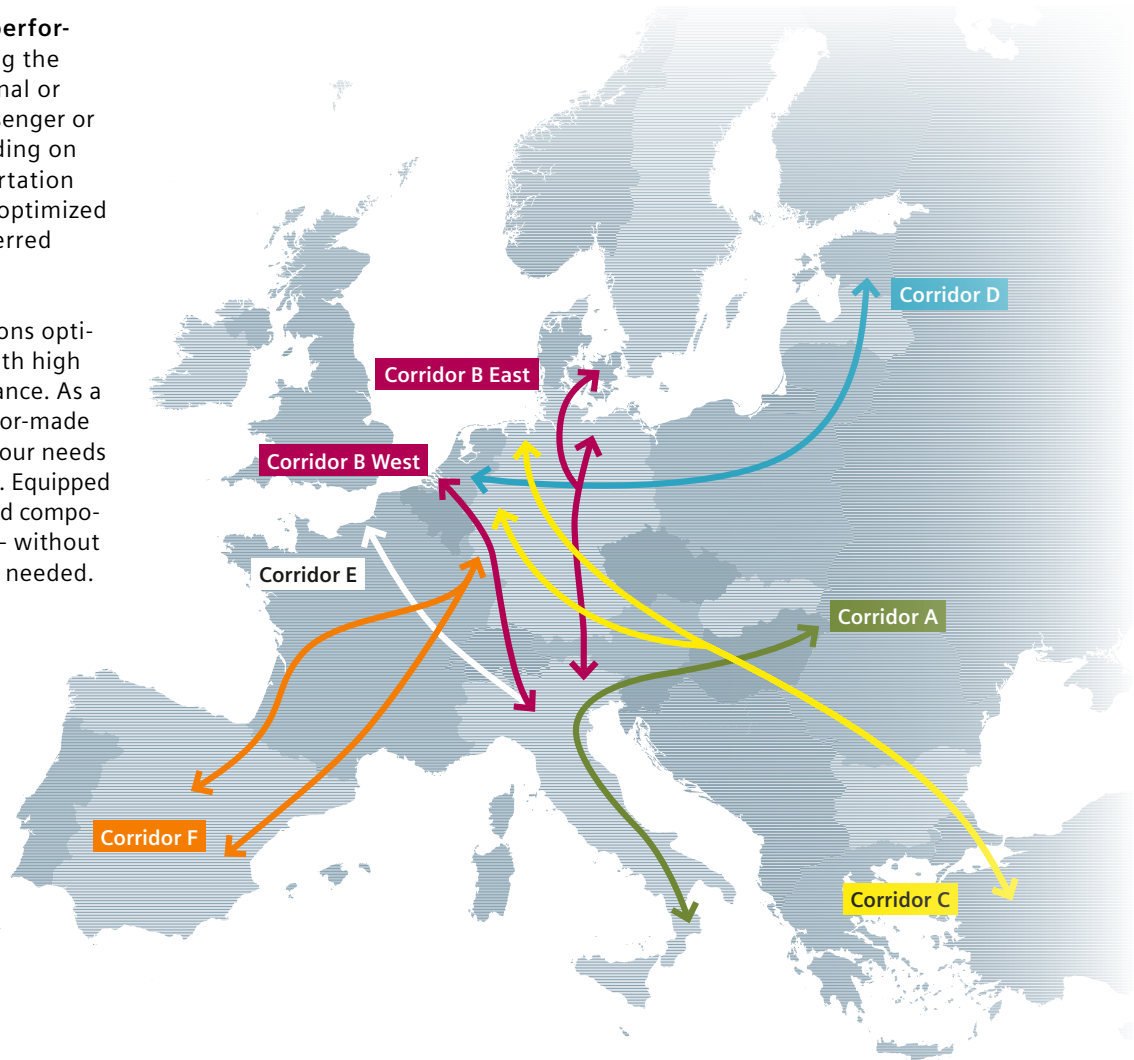
Demands placed on national and international operators are growing. Grow with them, and make the most of today's and tomorrow's business opportunities. Efficiently and economically, with a locomotive that adapts to fit your needs. The Vectron's innovative concept increases your ability to react to changing conditions, today, tomorrow, and throughout the entire lifecycle.

Precise fit. Invest only in what you need, and solve your traction problems efficiently and cost-effectively. The electric Vectron locomotive gives you pure traction in AC, DC, and multisystem (MS) versions in the 5.2 MW or 5.6 MW and 6.4 MW power classes. The Vectron DE rounds out the portfolio as a modern and highly environmentally friendly diesel locomotive. Locomotives can be scaled

with country and equipment packages, for an exact fit for your transportation needs. Preferred variants, certified according to standards and readily available, ensure short delivery times, without additional time for development and certification. This makes ordering even smaller quantities economical.

National and interoperable performance. Make your mark among the competition, whether in national or transnational Europe-wide passenger or freight transportation. Depending on the specialization and transportation task, Vectron offers customer-optimized national or interoperable preferred variants.

Vectron offers AC and DC versions optimized for specific countries, with high efficiency in price and performance. As a national operator, you get a tailor-made product, optimally adapted to your needs and those of your country of use. Equipped with exactly the performance and components you need in your region – without costly extra systems that aren't needed.



Main European freight traffic corridors according to TRENDS



And if your area of operation changes, you stay flexible with Vectron. The locomotives can be quickly adapted to new applications at any time, and fitted for cross-border operations. A suitable pre-fit package enables high-power AC locomotives to be modified to multisystem locomotives. This not only protects your investment, but also ensures high retained value.

Lifelong adaptability. Vectron is second- and third-user capable. Locomotives can be adapted to changing operational requirements and purposes throughout Europe – over the entire lifecycle. The result is high retained value, which can be retained over the long-term through ongoing service.

Easier financing. Make use of your growth opportunities. Vectron is adaptable, and so is its financing. Rely on extensive industry knowledge, detailed financing expertise, and worldwide cooperation with many partners. Our individual financing solutions are configured for the needs of operators in the private and public sector, and make Vectron a future-safe investment with long-term value. And by the way, Vectron's high retained value makes for comparatively low monthly finance payments.

Operates with no overhead lines, too. In container terminals or on siding track, it is sometimes desirable to use electric locomotives to perform feed movements without overhead lines. Until now, it has been necessary to use a diesel shunting locomotive for this. With the shunting module, these tasks can now be performed by Vectron itself – eliminating the cost for a separate shunting locomotive. The shunting module is based on the basic Vectron principles of maximizing flexibility and fungibility. The module is available as an option or for retrofitting on medium- and high-power Vectron AC as well as on the Vectron DC. In addition remote control is available to ease work.

Choosing with greater independence

Different voltages, different train protection systems, increasing transportation distances – demands on the routes are changing. Change with them, and leave behind technical headaches on continental European track networks and ERTMS corridors. Vectron creates a new freedom in transnational rail transportation. The interoperable Vectron locomotives permit cross-border connections whenever your business requires.



High-performance variants. The importance of international traffic in the main European corridors is increasing. Serve today's main routes as well as tomorrow's growth regions. The high-performance Vectron variants for pure AC, pure DC, or flexible multisystem operation let you operate in four different voltage systems. For non-electric sections, the Vectron DE is the ideal solution.

Cross-border train protection concept. It's a fact – if you want to efficiently manage the flow of goods within the European Union, you have to be able to use different rail systems across borders. Another fact – over 20 different train protection systems as well as the coexistence of ERTMS and national systems make this a very complex challenge.

Cross those borders: Vectron's innovative train protection concept guarantees flexibility now and in the future and is designed for low-cost ERTMS migration. Easily exchangeable national systems that can be configured for specific countries are for the first time connected to an ETCS kernel via a smart, flexible link. The concept, comprising a train protection cabinet for the ETCS basic system and national systems, saves space and costs.

What's more, with the electric Vectron locomotives, a corresponding pre-equipment package guarantees that cabling systems and installation places for all train protection systems used in Central Europe are already provided on board. With this equipment already in place, it is now possible to add or omit train protection systems without problem. You profit not only from vastly reduced effort and costs for certification but also gain valuable time that you can use for productive operations.

Pioneering national packages. Discover new flexibility in national deployment. Thanks to its new national package concept, the electric Vectron, for instance, can be upgraded and converted for use on different corridors – simply and at low cost. National packages comprising pantographs, traction equipment, train protection system, train radio, and country-specific items of equipment allow pan-European operation on ERTMS and other corridors. Your vehicles will be ready to be deployed for new services within a short time. Preferred variants with basic certification also allow a fast start.

Seamless fleet integration. Form high-performance train units: Vectron has multiple traction capability. All Vectron locomotives, regardless whether AC, DC, MS or DE, have multiple traction capability and are compatible not only with all other Vectron locomotives, but also with all modern Siemens locomotives. SAT, TAV, TBO and optionally also the Austrian remote control concept are available for push-pull train services.



Wide-ranging combination options.

Vectron's flexible coupling options offer extended possibilities. The headstock is designed for the classic screw coupling with draw hook and side buffers. However, central buffer couplings can also be integrated as an alternative, allowing heavier loads to be hauled in freight transport or permitting train splitting in passenger services. You can choose whatever features you want right from the start, or later in the form of a straightforward conversion.

Longer, cost-effective train sets boost revenues and profit per train. This is especially interesting when overloaded routes or inadequate terminal capacities lead to bottlenecks on the existing infrastructure. With Vectron, you are pre-equipped for the future, thanks to its superior performance and tractive force as well as its smart slip control.

Standardized operability. Good working conditions are a prerequisite for good work. Vectron is therefore fitted with a driver-oriented, ergonomic central desk, featuring an outstanding combination of pleasant haptics and elegant design. The operating concept conforms to the principle of uniformity, with the same layout of the control elements used across all variants. Permanently defined installation places for subsequent integration of train protection systems are already provided in the driver's desk, which has a durable, modular construction. This means that all Vectrons have standard operation across multiple locomotives, which reduces conversion, training, and familiarization times.

Needs-based service. There are many different maintenance tasks. Railcover is our targeted response. This modular service concept is based on service experience from maintenance projects around the world since 1881. Select from a wide range of carefully designed modules to create a service package that meets your specific needs.



The driver's desk is also prepared for subsequent conversion or upgrading. Converting from high sun shades to low ones and vice versa is easily possible.

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The information in this document con-
tains general descriptions of the technical
options available, which do not have to
be present in all individual cases. The
required features should therefore be
specified in each individual case at the
time of closing the contract.