



# Locomotives

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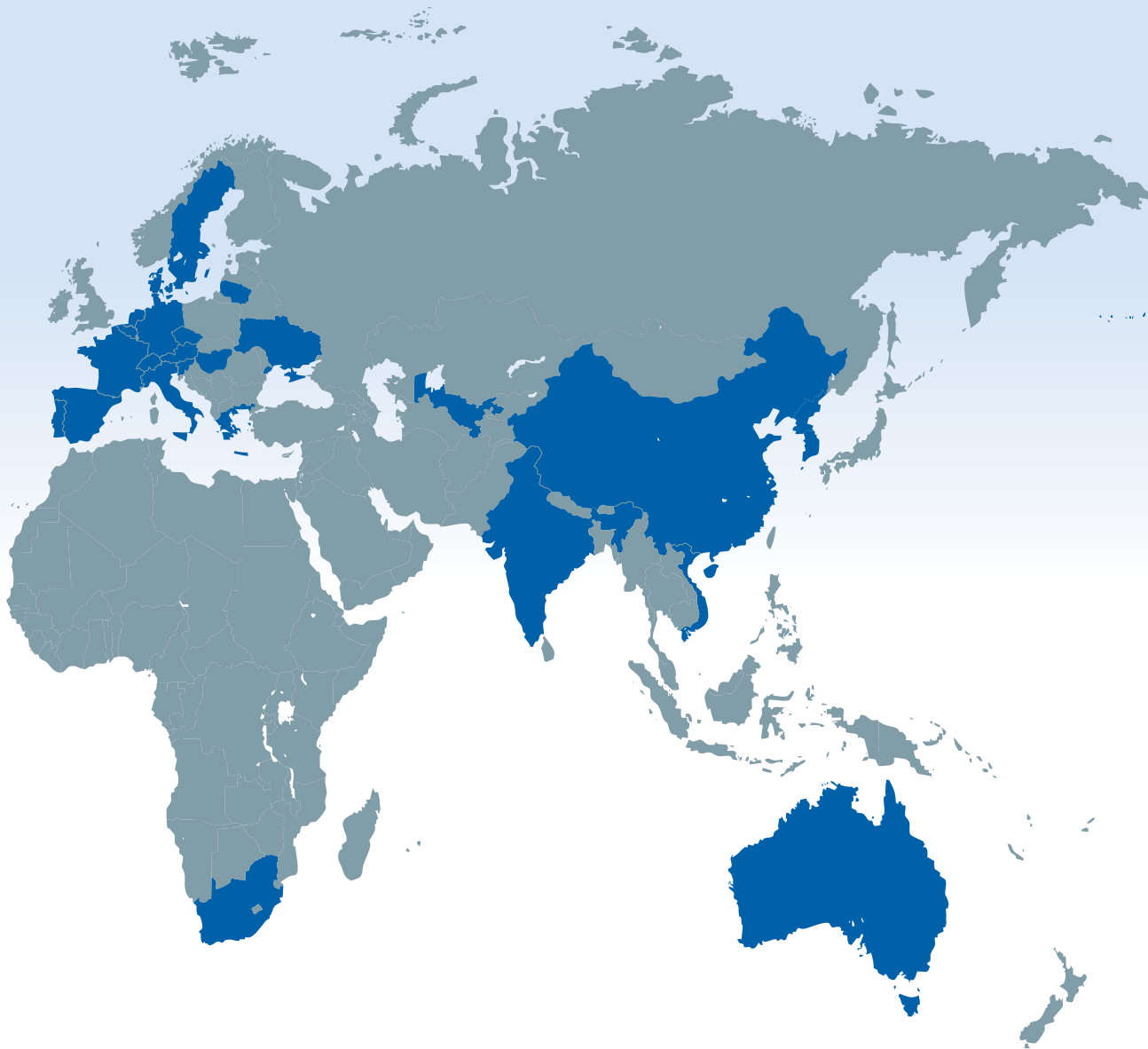
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### **Successful locomotive concepts for cost-effective and environmentally compatible rail operations**

All around the world, locomotives made by Siemens take passengers and freight to their destinations both quickly and safely. Since Werner von Siemens presented the world's first electric locomotive in Berlin in 1879, his name has been a symbol of quality and reliability. Leveraging the experience that has grown from this tradition, we have consistently built up our competence in the field of electric and diesel-electric locomotives. This expertise offers our customers maximum cost-efficiency from the very beginning through optimum and sustained availability.

Mobility is unthinkable without flexibility. Therefore, the bandwidth of our products enables a comprehensive service, adapted to a wide variety of customer requirements. On a worldwide scale, we supply locomotives and propulsion technology for high-speed passenger service as well as for heavy-duty freight service for any power system.

Successful locomotives and vehicle concepts, such as those of the Euro-sprinter® family introduced in 1993, are constantly being developed. Today, more than 1,400 Euro-sprinter are providing safe transportation in 15 countries. Our multi-system compatible family members make a key



contribution to the opening up of the European railway system. Only recently, for example, has the Eurosprinter been put into operation in the Portuguese broad-gauge network.

And the fact that a Class 1216 Eurosprinter of Austrian Federal Railways set the new speed world record at 357 km/h on September 2, 2006 is further proof of the quality and performance of Siemens locomotives.

For the rail traffic of tomorrow, we develop advanced platforms such as the Eurorunner® and the Asiarunner®. Die Eurorunner is now considered the most environmentally compatible diesel locomotive and underscores our responsibility and the continuity of our innovative technology.

We developed the light Asiarunner especially for the markets of Asia, South Africa and Australia. It is designed for operation on narrow-gauge tracks, caters to a wide variety of clearance envelopes and meets the requirement of low axle loads.

The Siemens name guarantees the continuous optimization of this versatility and also the high level of quality we offer, thereby ensuring our customers' success.

# Three-System Universal Locomotive HLE 18

for Belgian State Railways SNCB/NMBS



Type	HLE 18
Year	2009 – 2010
Wheel arrangement	Bo'Bo'
Power system	AC 25 kV / 50 Hz; DC 3 kV; DC 1.5 kV
Rating	[kW] 5,000; DC 1.5 kV 3,000
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 200
Weight	[t] 88
Track gauge	[mm] 1,435
Numbers built	60

In December 2006, Siemens won the first order for electric locomotives from the state-owned railway operator SNCB/NMBS. The order comprised a total of 60 locomotives, with an option for an additional 60 locomotives. The vehicles are being built in the Siemens locomotive plant in Munich. The units will be delivered between 2009 and June 2010.

## Scope of application

The locomotives are designed for passenger service. They will partly substitute existing locomotives or be used to create additional capacity in the Belgian railway networks. It is also planned to obtain the certification for operation in the networks of neighboring countries so that the units may also be used for cross-border service.

## Technical features

This is a four-axle multi-system locomotive built on the Eurosprinter platform.

## Benefits

The Eurosprinter HLE 18 runs at a maximum speed of 200 km/h and can operate on conventional as well as high speed lines. The characteristic feature of these advanced locomotives is their multi-system capability that permits cross-border traffic.

# Universal Locomotive LE 4700

for Portuguese Railways CP



Type	LE 4700	
Year	2007 – 2009	
Wheel arrangement	Bo'Bo'	
Power system	25 kV / 50 Hz	
Rating	[kW]	4,600
Starting tractive effort	[kN]	300
Maximum speed	[km/h]	140
Weight	[t]	87
Track gauge	[mm]	1,668 / 1,435
Numbers built	25	

In January 2006, Portuguese Railways CP ordered 15 electric locomotives from Siemens. The locomotives with the class designation LE 4700 are based on the Europrinter platform and were designed for the Portuguese broad-gauge network. An option for a further 10 vehicles was exercised in July 2007.

## Scope of application

The 4,600 kW powerful vehicles are designed for use both in passenger and freight traffic and are equipped for future conversion to the European standard gauges.

## Technical features

Locomotive body and the driver's cab were designed according to current European legislation pertaining to TSI crash standards. Key parts of the drive and braking systems are of redundant design and can be partially switched off to ensure operability of the unit even in the case of a fault. The locomotive is designed for operation in Southern Europe at temperatures up to +45 °C. In addition to the diagnostics displays and an analog operating state display, the locomotive is equipped with country-specific train control systems (CONVEL), a train radio system and operations control systems.

## Benefits

Thanks to a wheelset exchange feature, the newly developed bogies allow simple adaptation to both track gauges used in Portugal, i.e. standard gauge and broad gauge. The vehicles replace old vehicles in the Portuguese fleet, thereby increasing the operator's efficiency and effectiveness.



# Electric Double Locomotive HXd1

for Chinese Railways CR



Type	HXd1	
Year	2006 – 2007	
Wheel arrangement	2 (Bo'Bo')	
Power system	25 kV / 50 Hz	
Rating	[kW]	9,600
Starting tractive effort	[kN]	760
Maximum speed	[km/h]	120
Weight	[t]	2 x 92 (100)
Track gauge	[mm]	1,435
Numbers built	180	

In December 2004, Siemens and its partner CSR Zhuzhou Electric Locomotives Company Ltd. received an order for 180 double locomotives from the Chinese Ministry of Railways, with the vehicles to be built by the Chinese partner in China.

## Scope of application

The double locomotives that run at a maximum speed of 120 km/h are used in heavy-duty freight traffic, especially to haul coal trains along the 620 km line between Datong and Qinhuangdao.

## Technical features

This locomotive is the successor of the 20 double locomotives DJ1 that were delivered in 2002 and 2003 and have proven their value through their reliability and performance in daily service.

## Benefits

Thanks to their advanced technology, these locomotives, which were specially designed to haul coal trains, make a considerable contribution to the reduction of the energy consumption while increasing the transport capacity.



# Three-System High-Performance Locomotive Rh 1216

for Austrian Federal Railways ÖBB



Type	Rh 1216	
Year	2005 – 2007	
Wheel arrangement	Bo'Bo'	
Power system	AC 15 kV / 16.7 Hz; AC 25 kV / 50 Hz; DC 3 kV	
Rating	[kW]	6,000
Starting tractive effort	[kN]	304
Maximum speed	[km/h]	230
Weight	[t]	87
Track gauge	[mm]	1,435
Numbers built	50	

In 2003, Austrian Federal Railways ordered a design modification of the Rh 1116 that has been available since 1997. The purpose was to extend the scope of application of the universal high-performance locomotives for the European 3 kV network such as exists, for example, in Italy. The three-system locomotive Rh 1216, which has its own class designation, is thus a logical consequence of ÖBB's Taurus family, following the single- and two-system variants Rh 1016 and Rh 1116.

## Scope of application

The Rh 1216 locomotive is suitable for use in national and international passenger and freight operations. The locomotive was designed to operate on the 15 kV/16.7 Hz, 25 kV/50 Hz and 3 kV/DC electrified lines up to 230 km/h. It is thus a perfect solution for the entire European standard gauge network. In addition, it can run – with reduced power – in the 1.5 kV/DC electrified network of the Netherlands and in the south of France.

## Technical features

Based on the technical modifications, the vehicle represents another evolutionary step of the Euro-sprinter family and combines the proven components of the Rh 1116 with the multi-system functionality of the third-generation Eurosprinter. For example, the quiet and low-maintenance high-performance drive system with separate brake disk shaft is complemented with water-cooled IGBT inverters and the Sibas 32 control system. The Rh 1216 uses the same aerodynamic Taurus design as the Rh 1016/1116.

## Benefits

The Rh 1216 is the first European AC/DC-capable, high-speed, high-performance locomotive. It will initially operate in Austria, Germany, Italy, the Czech Republic, the Slovak Republic and Slovenia. Upon customers' request, additional country packages can be implemented for Hungary, Croatia, Poland, Switzerland and other European countries.

## High-Performance Locomotive 183

for Vogtlandbahn GmbH



Type	183
Year	2007
Wheel arrangement	Bo'Bo'
Power system	AC 15 kV / 16.7 Hz;
Rating	[kW] 6,000
Starting tractive effort	[kN] 304
Maximum speed	[km/h] 230
Weight	[t] 87
Track gauge	[mm] 1,435
Numbers built	4

In January 2007, Siemens received its first electric locomotive order from Vogtlandbahn, a subsidiary of Länderbahn. The order comprises four Europrinter locomotives that were delivered as early as November 2007. Running at up to 230 km/h, the vehicles will be used in passenger service, e.g. on the Regensburg – Munich line. The proven technology of the production locomotives and the short delivery times were decisive factors for winning the order.

## Three-System High-Performance Locomotive Rh 1216

for RTS Transport Service GmbH



Type	Rh 1216
Year	2007
Wheel arrangement	Bo'Bo'
Power system	AC 15 kV / 16.7 Hz; AC 25 kV / 50 Hz; DC 3 kV
Rating	[kW] 6,000
Starting tractive effort	[kN] 304
Maximum speed	[km/h] 230
Weight	[t] 87
Track gauge	[mm] 1,435
Numbers built	2

As the first private railway operator in Austria, RTS Rail Transport Service GmbH ordered two four-system high-performance locomotives in December 2006. The vehicles are primarily used to haul slag trains between Linz steelworks and the cement plant in Lorüns. Another application is the shuttling of work trains. RTS selected the Siemens locomotives due to the short delivery time of four months, the existing certifications and the widespread maintenance facilities in Austria.

# Three-System High-Performance Locomotive SZ 541

for Slovenian State Railways SZ



Type	SZ 541
Year	2005 – 2007
Wheel arrangement	Bo'Bo'
Power system	AC 15 kV / 16.7 Hz; AC 25 kV / 50 Hz; DC 3 kV
Rating	[kW] 6,000
Starting tractive effort	[kN] 304
Maximum speed	[km/h] 230
Weight	[t] 87
Track gauge	[mm] 1,435
Numbers built	32

Slovenian State Railways SZ placed an order in July 2004 for 20 three-system locomotives based on the Europrinter family and exercised an option for another 12 vehicles in January 2008. SZ is the second customer after Austrian Federal Railways to decide in favor of this locomotive platform. The Class SZ 541 is suitable for operation in both national and international passenger and freight sectors. It is to be deployed in Slovenia, Germany, Italy, Croatia, Austria and Hungary. In addition, service in other countries (e.g. the Czech Republic, Slovak Republic) is also technically possible.

# Class 189 Four-System High-Performance Locomotive

for Railion Deutschland AG



Type	Class 189	
Year	2003 – 2005	
Wheel arrangement	Bo'Bo'	
Power system	AC 15 kV / 16.7 Hz; AC 25 kV / 50 Hz; DC 3 kV; DC 1.5 kV	
Rating	[kW]	AC 6,400; DC 3 kV 6,000; DC 1.5 kV 4,200
Starting tractive effort	[kN]	300
Maximum speed	[km/h]	140
Weight	[t]	86
Track gauge	[mm]	1,435
Numbers built	100	

In 1999, Railion Deutschland AG ordered 100 Class 189 four-system locomotives for freight operations. These were developed directly from the Class 152 and form the multi-system platform of the Europrinter family.

## Scope of application

The locomotives are designed for use in cross-border freight operations. They are able to operate not only in AC systems with 15 kV / 16.7 Hz and 25 kV / 50 Hz but also in DC systems with 1.5 kV and 3 kV.

## Technical features

The Class 189 provides individual axle control and achieves a maximum speed of 140 km/h. In AC systems, the DC link voltage is generated by four-quadrant choppers. In DC systems, the overhead line voltage is fed directly to the DC link. The use of water-cooled high voltage IGBT traction converters (6.5 kV) marks the transition to the third generation of the Europrinter family. The controls of the Class 189 locomotive are designed in conformance with the other vehicles German Rail plans to use for its cross-border services.

In compliance with the scope of application of a freight locomotive, the bogies are equipped with nose-suspended drives and disc brakes.

## Benefits

This locomotive type will be provided with all the equipment required for operation in the other European countries. The locomotives will be prepared for homologation in Germany, Austria, Hungary, Switzerland, Denmark, Sweden, Norway, Italy, France, the Netherlands, Luxembourg, Belgium, Poland, the Czech Republic, and the Slovak Republic.

# Multi-system High-Performance Locomotive ES64F4/ES64F1 DC

für Mitsui Rail Capital Europe MRCE



Type	ES64F4	ES64F1 DC
Year	2007 – 2009	2007 – 2009
Wheel arrangement	Bo'Bo'	Bo'Bo'
Power system	AC 15 kV / 16.7 Hz; AC 25 kV / 50 Hz; DC 3 kV; DC 1.5 kV	DC 3 kV
Rating	[kW] AC 6,400; DC 3 kV 6,000; DC 1.5 kV 4,200	6,000
Starting tractive effort	[kN] 300	300
Maximum speed	[km/h] 140	140
Weight	[t] 87	87
Track gauge	[mm] 1,435	1,435
Numbers built	30	20

In September 2006, Mitsui Rail Capital Europe ordered 50 Eurosprinter multi-system locomotives. 30 four-system units will operate in different corridors. 20 more locomotives will be delivered as DC 3 kV versions and are designed for operation in Poland or in Poland and Italy. The Eurosprinter platform and the operating experience with numerous European customers made it possible to leverage a successful and proven platform approach that can be extended by additional homologations in Europe.

## Two-System Locomotive E 474

for Del Fungo Giera DFG



Type	E 474
Year	2007
Wheel arrangement	Bo'Bo'
Power system	AC 15 kV / 16.7 Hz; DC 3 kV
Rating	[kW] AC 6,400; DC 3 kV 6,000
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 140
Weight	[t] 87
Track gauge	[mm] 1,435
Numbers built	4

Siemens will deliver four E 474 multi-system locomotives to the Italian railway operator Del Fungo Giera. The Eurosprinter locomotives are certified for Italy and Switzerland where they will be used primarily in freight traffic. This extends the capacity for the customer and more cost-effective operations in cross-border freight traffic.



## Three-System High-Performance Locomotive 441

for Hector Rail AB



Type	441
Year	2005
Wheel arrangement	Bo'Bo'
Power system	AC 15 kV / 16.7 Hz; AC 25 kV / 50 Hz; DC 3 kV
Rating	[kW] 6,400
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 140
Weight	[t] 86
Track gauge	[mm] 1,435
Numbers built	2

In November 2005, the Swedish private rail company Hector Rail AB ordered two multi-system Europrinter. This makes Hector Rail the first operator in Sweden to own modern electric locomotives to increase the performance capability of its fleet. The locomotives will be used on a 1,100-km-long line which stretches from central to northern Sweden. The topographically demanding route requires high utilization of the tractive effort as well as high operational availability. The low-maintenance drive concept and the high level of energy recovery contribute to a substantial reduction in operating costs.

## Two-System High-Performance Locomotive Re 474

for Swiss Federal Railways SBB Cargo



Type	Re 474
Year	2004 – 2005
Wheel arrangement	Bo'Bo'
Power system	AC 15 kV / 16.7 Hz; DC 3 kV
Rating	[kW] AC 6,400; DC 3 kV 6,000
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 140
Weight	[t] 87
Track gauge	[mm] 1,435
Numbers built	12

Swiss Federal Railways SBB Cargo ordered 12 Europrinter type two-system locomotives from Siemens in December 2003. These Re 474s are being used in cross-border freight traffic between Switzerland and Italy. The Re 474 has a Swiss and Italian homologation. For the operator, this means an optimization of operations and increased economic efficiency in cross-border service.

# Four-System High-Performance Locomotive ES64F4

for Dispolok GmbH



Type	ES64F4	
Year	2003 – 2006	
Wheel arrangement	Bo'Bo'	
Power system	AC 15 kV / 16.7 Hz; AC 25 kV / 50 Hz; DC 3 kV; DC 1.5 kV	
Rating	[kW]	AC 6,400; DC 3 kV 6,000; DC 1.5 kV 4,200
Starting tractive effort	[kN]	300
Maximum speed	[km/h]	140
Weight	[t]	87
Track gauge	[mm]	1,435
Numbers built	45	

As the most advanced rental locomotive of the Dispolok fleet, the ES64F4 is used for cross-border service in Germany, Austria, Slovenia, Italy and Switzerland. The numerous European homologations make the Eurosprinter a real pan-European locomotive for interoperable passenger and freight service.



# High-Performance Locomotives Rh 1016/1116

for Austrian Federal Railways ÖBB



Type	Rh 1016	Rh 1116
Year	1999 – 2001	1999 – 2006
Wheel arrangement	Bo'Bo'	Bo'Bo'
Power system	15 kV / 16.7 Hz	15 kV / 16.7 Hz; 25 kV / 50 Hz
Rating	[kW] 6,400	6,400
Starting tractive effort	[kN] 300	300
Maximum speed	[km/h] 230	230
Weight	[t] 86	86
Track gauge	[mm] 1,435	1,435
Numbers built	50	282

In 1997, Austrian Federal Railways ordered four-axle Rh 1016 and Rh 1116 high-performance locomotives, representing the second Europrinter generation, from Siemens AG Austria. The Rh 1016 locomotive is designed to operate on 15 kV/16.7 Hz electrified lines in Austria and Germany. The 1116 version is additionally equipped to permit operation on 25 kV/50 Hz lines in countries such as Hungary. Both locomotive types meet the highest expectations for heavy-duty freight and high-speed passenger trains.

## Two-System High-Performance Locomotive 1116

for Mittelweserbahn GmbH MWB



Type	1116
Year	2003 – 2004
Wheel arrangement	Bo'Bo'
Power system	15 kV / 16.7 Hz; 25 kV / 50 Hz
Rating	[kW] 6,400
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 230
Weight	[t] 86
Track gauge	[mm] 1,435
Numbers built	2

As the first private railway operator in Germany, Mittelweserbahn ordered a two-system high-performance locomotive from the Europrinter family in April 2003. The follow-up order for a second vehicle was placed in December 2004. The locomotives are used in cross-border container traffic between Germany and Austria. High performance, reliability and short delivery times were decisive for the order.

# High-Performance Locomotive 1047

for Hungarian State Railways MÁV and Raab-Oedenburg-Ebenfurter-Eisenbahn ROeEE



Type	1047 MÁV	1047 ROeEE
Year	2002	2002
Wheel arrangement	Bo'Bo'	Bo'Bo'
Power system	15 kV / 16.7 Hz; 25 kV / 50 Hz	15 kV / 16.7 Hz; 25 kV / 50 Hz
Rating	[kW] 6,400	6,400
Starting tractive effort	[kN] 300	300
Maximum speed	[km/h] 230	230
Weight	[t] 86	86
Track gauge	[mm] 1,435	1,435
Numbers built	10	5

Up to September 2002, Siemens supplied 10 four-axle high-performance locomotives of type 1047 to Hungarian State Railways (MÁV) as well as five locomotives to Raab-Oedenburg-Ebenfurter-Eisenbahn. They correspond to the type ES64U2 and are suitable for passenger and freight operations. The units are certified for unlimited use in Austria, Hungary, and Germany. The modular construction made it possible to deliver the units within seven and eight months, respectively.

# Two-System High-Performance Locomotive 1116

for HUPAC AG



Type	1116
Year	2000
Wheel arrangement	Bo'Bo'
Power system	15 kV / 16.7 Hz; 25 kV / 50 Hz
Rating	[kW] 6,400
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 230
Weight	[t] 86
Track gauge	[mm] 1,435
Numbers built	3

Until April 2001, Siemens supplied three Eurosprinter locomotives to the Swiss combined transport provider HPAC. The two-system locomotive is used in cross-border freight operations between Switzerland and Germany. Siemens was the first manufacturer of electric locomotives to receive the homologation for both countries in April 2002. The vehicles are equipped to operate seamlessly from the German seaports to Switzerland and across the Alps to the Italian border.

## Two-System Universal Locomotive ES64U2

for Dispolok GmbH



Type	ES64U2	
Year	2000 – 2004	
Wheel arrangement	Bo'Bo'	
Power system	15 kV / 16.7 Hz; 25 kV / 50 Hz	
Rating	[kW]	6,400
Starting tractive effort	[kN]	300
Maximum speed	[km/h]	230
Weight	[t]	86
Track gauge	[mm]	1,435
Numbers built	60	

The two-system electric locomotive ES64U2 is part of the Dispolok fleet and is rented by various customers for cross-border operations in Germany and Austria.

The Eurosprinter can be used for heavy-duty freight as well as for fast passenger traffic. The locomotive is equipped and certified with respect to traction and protection systems for Germany, Austria and Switzerland and is also suitable for operation on the AC-powered lines in the Czech Republic and the Slovak Republic.

## Class 182 Two-System High-Performance Locomotive

for Railion Deutschland AG



Type	Class 182	
Year	2001	
Wheel arrangement	Bo'Bo'	
Power system	15 kV / 16.7 Hz; 25 kV / 50 Hz	
Rating	[kW]	6,400
Starting tractive effort	[kN]	300
Maximum speed	[km/h]	230
Weight	[t]	86
Track gauge	[mm]	1,435
Numbers built	25	

The Class 182 high-performance locomotives are members of the second-generation Eurosprinter family, the development of which started with the Class 152 freight locomotive. The multi-system locomotives are among the most powerful and fastest four-axle production locomotives. Special attention was paid to the aerodynamic exterior design of the locomotive as well as to the ergonomic driver's cab.

# Class 152 Freight Locomotive

for Railion Deutschland AG



Type	Class 152
Year	1997 – 2001
Wheel arrangement	Bo'Bo'
Power system	15 kV/16.7 Hz
Rating	[kW] 6,400
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 140
Weight	[t] 88
Track gauge	[mm] 1,435
Numbers built	170

In 1995, Railion Deutschland AG awarded a supply contract for 170 freight locomotives. The Class 152 locomotive is mainly used in heavy freight operations and is the first representative of the second Eurosprinter generation. Owing to its modular construction, the Class 152 is also future-proof, e.g. it can be equipped with new train protection systems such as RTCS.

# Electric Double Locomotive DJ 1

for Chinese Railways CR



Type	DJ 1
Year	2000 – 2001
Wheel arrangement	2 (Bo'Bo')
Power system	25 kV/50 Hz
Rating	[kW] 2 x 3,200
Starting tractive effort	[kN] 700 (760)
Maximum speed	[km/h] 120
Weight	[t] 2 x 92 (100)
Track gauge	[mm] 1,435
Numbers built	20

In 1997, a financing agreement was signed between the Ministry of Railways and the Chinese government to secure a technology transfer contract with Siemens AG. Siemens built the first 3 double locomotives in Austria and the remaining 17 locomotives in the context of the joint venture with the Chinese locomotive plant Zhuzhou Electric Locomotive Company Ltd. These vehicles were the first modern, reliable electric locomotives with three-phase AC propulsion technology to be deployed in China. They are used for heavy-duty freight operations with unit coal trains on the Daqing line.



# High-Performance Locomotive ES64F

for Dispolok GmbH



Type	ES64F
Year	2000
Wheel arrangement	Bo'Bo'
Power system	15 kV / 16.7 Hz
Rating	[kW] 6,400
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 140
Weight	[t] 86
Track gauge	[mm] 1,435
Numbers built	2

These high-performance electric locomotives ES64F have been used in Dispolok's rental business since 2000. Both of them were sold to ITL Eisenbahngesellschaft mbh, Germany, in spring 2005. The vehicle is designed for heavy-duty freight as well as for passenger traffic. Thanks to its high performance and tractive effort, the locomotive can also be used to haul heavy double-deck cars in push-pull operation.

# Universal Locomotive 8100/8200

for Korean National Railroad KNR



Type	8100/8200
Year	1998 / 2002 – 2008
Wheel arrangement	Bo'Bo'
Power system	25 kV / 60 Hz
Rating	[kW] 5,200
Starting tractive effort	[kN] 330
Maximum speed	[km/h] 150
Weight	[t] 88
Track gauge	[mm] 1,435
Numbers built	2 / 83

In November 1995, Siemens AG and former Daewoo Heavy Industries Ltd. agreed to build two prototype locomotives of type 8100 for the Korean National Railroad. Then in March 2002, Siemens won the contract to build ten more locomotives of type 8200. The two vehicle types replace the existing DC locomotives of KNR and are suitable for heavy-duty freight and passenger operations. The trial phase proved so successful that Korean National Railroad not only exercised its option for another 17 locomotives but ordered 73 additional locomotives.

# High-Performance Locomotive 120

for Greek State Railways OSE



Type	120
Year	1996 – 1997, 2004 – 2005
Wheel arrangement	Bo'Bo'
Power system	25 kV/ 50 Hz
Rating	[kW] 5,000
Starting tractive effort	[kN] 300
Maximum speed	[km/h] 200
Weight	[t] 80
Track gauge	[mm] 1,435
Numbers built	30

In early 1996, Greek State Railways (OSE) placed an order with Siemens as the general contractor to build six high-performance locomotives. These were the first electric locomotives in Greece. In late 1997, a follow-up order was signed for another 24 locomotives. The multi-system locomotives are used to establish a link with the European railway network on the route from Thessaloniki to the border with the Former Yugoslavian Republic of Macedonia (F.Y.R.O.M.).

# High-Performance Locomotive EG 3100

for Railion Denmark A/S



Type	EG 3100
Year	1998 – 2000
Wheel arrangement	Co'Co'
Power system	15 kV/ 16.7 Hz; 25 kV/ 50 Hz
Rating	[kW] 6,500
Starting tractive effort	[kN] 400
Maximum speed	[km/h] 140
Weight	[t] 132
Track gauge	[mm] 1,435
Numbers built	13

In 1997, former Danish State Railways, now Railion Denmark A/S, placed an order for 13 high-performance locomotives for cross-border service. The locomotives are used for freight trains on the land link that connects Sweden to Germany via Denmark and form the basis for fast pan-European freight operations between Central Europe and Scandinavia. The adhesion mass of 132 tons provides sufficient traction for 2,000-ton trains on 15.6‰ ramps in all weather conditions.

# High-Performance Universal Locomotive S 252

for Spanish National Railways RENFE



Type	S 252	
Year	1993 – 1996	1993 – 1996
Wheel arrangement	Bo'Bo'	Bo'Bo'
Power system	AC 25 kV / 50 Hz; DC 3 kV	DC 3 kV
Rating	[kW] 5,600	5,600
Starting tractive effort	[kN] 300	300
Maximum speed	[km/h] 220	220
Weight	[t] 89	87
Track gauge	[mm] 1,668	1,668
Numbers built	16	44

Spanish National Railways purchased broad-gauge locomotives that were essentially of the same construction as the 15 locomotives running on the Madrid-Seville line. The locomotives are being used for interregional passenger and freight services throughout the electrified broad-gauge network in Spain, running exclusively on a voltage of 3 kV DC. The suitability of the units for broad and standard gauge, multiple power systems and universal use make this concept a pioneering approach for the development of a European locomotive.

# High-Performance Universal Locomotive S 252

for Spanish National Railways RENFE



Type	S 252	
Year	1992 – 1993	
Wheel arrangement	Bo'Bo'	
Power system	AC 25 kV / 50 Hz; DC 3 kV	
Rating	[kW] 5,600	
Starting tractive effort	[kN] 300	
Maximum speed	[km/h] 220	
Weight	[t] 89	
Track gauge	[mm] 1,435	
Numbers built	15	

In March 1989, a consortium led by Siemens won the order to supply 75 high performance universal locomotives. Siemens was responsible for the electrical part and today's Siemens locomotive plant in Munich for the mechanical part. The first 15 locomotives were completely manufactured in Germany. The standard-gauge S 252 is now in service on the new route between Madrid and Seville which was inaugurated in April 1992. It is mainly used for hauling the variable-gauge Talgo trains between Madrid and Cordoba or between Madrid and Seville.



# High-Performance Universal Locomotive LE 5600

for Portuguese Railways CP



Type	LE 5600	
Year	1993 – 1995	
Wheel arrangement	Bo'Bo'	
Power system	25 kV/50 Hz	
Rating	[kW]	5,600
Starting tractive effort	[kN]	300
Maximum speed	[km/h]	220
Weight	[t]	87
Track gauge	[mm]	1,668
Numbers built	30	

In December 1990, Portuguese Railways (CP) commissioned a consortium – headed by Siemens – to design and supply 30 universal locomotives. Siemens' partners were Sorefame and Siemens SA Portugal, as well as today's Siemens locomotive plant in Munich. The LE 5600 proves its value in heavy-duty freight traffic, as well as in rapid passenger service.

# Freight Locomotive ER20CF

for Lithuanian Railways LG



Type	ER20CF
Year	2007 – 2009
Wheel arrangement	Co'Co'
Diesel engine rating	[kW] 2,000
Starting tractive effort	[kN] 450
Maximum speed	[km/h] 120
Weight	[t] 138
Track gauge	[mm] 1,520
Numbers built	34

In July 2005, Siemens received an order from Lithuanian Railways (Lietuvos Geležinkeliai) for the supply of 34 diesel-electric locomotives. It also contained an option for ten more vehicles. Delivery is to take place between summer 2007 and spring 2009.

## Scope of supply

These six-axle Class ER20CF units are built to haul trains weighing up to 6,000 tons in multiple running on the main lines of Lithuanian Railways. As many as three locomotives can run in multiple.

## Technical features

The ER20s are based on the Eurorunner platform for diesel locomotives. The diesel engines develop a rating of up to 2,000 kW and a maximum speed of 120 km/h.

## Benefits

The high starting tractive effort and passive safety of this locomotive are outstanding. Other important criteria for the operator were the vehicle's low fuel consumption, low emissions and reduced life cycle costs.

# Universal Locomotive Rh 2016

for Austrian Federal Railways ÖBB



Type	Rh 2016	
Year	2004	
Wheel arrangement	Bo'Bo'	
Diesel engine rating	[kW]	2,000
Starting tractive effort	[kN]	235
Maximum speed	[km/h]	140
Weight	[t]	80
Track gauge	[mm]	1,435
Numbers built	100	

Since 1998, ÖBB has ordered a total of 100 diesel-electric locomotives with a rating of 2,000 kW at the wheel rim in several batches from Siemens AG Austria.

## Scope of application

The multi-purpose locomotives are designed for universal use in both freight and passenger services.

## Technical features

As the launching customer, ÖBB planned the replacement of its existing mainline diesel-electric locomotives and presented a list of requirements that is representative for European mainline diesel-electric locomotives and exemplary in its environmental standards. For this reason, Siemens developed the Rh 2016 as the base vehicle for the versatile Eurorunner product platform. It corresponds to the Class ER20. Fuel-saving, low-emission diesel engines offer customers a perfect alternative in view of the expected emission limits for railbound vehicles. The AC power transmission supplies the onboard power supply system with minimum extra effort and provides excellent efficiency over the entire range of speeds and tractive efforts; given the expected development of energy costs, this is a decisive factor in the selection of a power transmission technology.

## Benefits

Ecofriendliness, high efficiency, low track wear, and a passive safety are significant advantages for the customers. Adhering to the exemplarily strict Austrian legislation for noise emission, the Rh 2016 is the world's quietest diesel-electric locomotive in the 2 MW class.

# Universal Locomotive ER20

Based on the proven modularity of the Eurorunner platform, we offer our customers the most advanced diesel locomotives for a wide range of applications while enabling rapid customization to specific operator requirements. Its environmental compatibility, high efficiency, high degree of passive safety and particularly short delivery times make the Eurorunner ER20 a popular choice among European private railway operators and leasing companies.

Type	ER20	
Wheel arrangement	Bo'Bo'	
Diesel engine rating	[kW]	2,000
Starting tractive effort	[kN]	235
Maximum speed	[km/h]	140
Weight	[t]	80
Track gauge	[mm]	1,435



## Osthannoversche Eisenbahnen AG OHE

After a delivery time of only three months, all vehicles are being deployed in freight operations across Germany.

Type	270081	
Year	2007	
Numbers built	3	



## Regentalbahn AG

The locomotives will be mainly deployed in high-speed regional services on the Munich – Oberstdorf – Lindau and Hof – Regensburg routes.

Type	223	
Year	2007	
Numbers built	12	



## Westfälische Landes-Eisenbahn GmbH WLE

Ordered in February 2007 the Eurorunner was already delivered in March 2007 and is being used for freight operations throughout Germany.

Type	22	
Year	2007	
Numbers built	1	





#### Veolia Verkehr GmbH

The locomotives are intended for Veolia's own pool of locomotives and are being used in passenger service on the Hamburg – Sylt route.

Type	DE 2000
Year	2005
Numbers built	3



#### Eisenbahnen und Verkehrsbetriebe Elbe-Weser GmbH EVB

These ER20s are hauling container trains on the Hamburg – Bremen – Bremerhaven route.

Type	420
Year	2004 – 2007
Numbers built	4



#### Steiermärkische Landesbahn STLB

The Eurorunner type ER20 is being used in long-distance freight traffic. Deciding factors for placement of this order included the ease of maintenance due to the same design as the Rh 2016 locomotives operated by ÖBB, and the existing homologation in Austria.

Type	2016
Year	2004 – 2005
Numbers built	2



#### LTE Logistik- und Transport GmbH

The vehicles operate in cross-border freight traffic and run, for example, between the OMV refinery in Burghausen (Upper Bavaria) via Braunau, Linz and Vienna (Austria) and the aluminum plant in Ziar nad Hronom (Slovak Republic).

Type	2016
Year	2004
Numbers built	2



Eisenbahn-Bau- und Betriebsgesellschaft Pressnitztalbahn mbH PRESS

These units are now being used in freight traffic all over Germany. With an axle load of 20 tons, they are suitable for service on secondary lines.

Type	253
Year	2004
Numbers built	2



Dispolok GmbH

Certified to operate in Germany and Austria, these Eurorunner locomotives complement the vehicle pool of Dispolok GmbH.

Type	ER20
Year	2003 – 2004
Numbers built	10

Universal Locomotive Series 8000

for Kowloon-Canton Railways Corporation Hong Kong KCRC



Type	Serie 8000	
Year	2001 – 2003	
Wheel arrangement	Bo'Bo'	
Diesel engine rating	[kW]	2,000
Starting tractive effort	[kN]	235
Maximum speed	[km/h]	140*
Weight	[t]	80
Track gauge	[mm]	1,435
Numbers built	5	

\*throttled to KCRC's max. operating speed

In 2001, Kowloon-Canton Railway Corporation KCRC ordered five diesel-electric locomotives of the Eurorunner family, which are based on the Rh 2016 locomotives of Austrian Federal Railways. The modular design of the Eurorunner made customization for die specific conditions in Hong Kong easy. As multi-purpose locomotives, the Eurorunner are used in freight traffic in Hong Kong and on the mainland as well as for maintenance and recovery operations in the rail transit network. For urban operations, the locomotives' particularly low emissions and low noise were key decision criteria.

# Universal Locomotive AR15 VR

for Vietnam Railway VNR



Type	AR15 VR
Year	2006
Wheel arrangement	Co'Co'
Diesel engine rating	[kW] 1,500
Starting tractive effort	[kN] 260
Maximum speed	[km/h] 120
Weight	[t] 81
Track gauge	[mm] 1,000
Numbers built	16

In October 2004, the Vietnam Railway ordered 16 diesel-electric locomotives. The 16 vehicles will be completely manufactured and assembled in the Siemens locomotive plant in Munich.

## Scope of application

The AR15 VR was designed for passenger and freight transport on the meter-gauge Hanoi – Da Nang – Ho Chi Minh City main line. It is a single-track route with passing loops and runs along the coast to the South China Sea. It rises up to 500 m above sea level and is characterized by curve radii as narrow as 97 m.

## Technical features

The locomotives are the first representatives of the Asiarunner family. These six-axle AC three-phase locomotives can reach a maximum speed of 120 km/h. The AR15 VR engine develops 1,500 kW of power. The power available at the wheel rim is around 1,220 kW. Up to three locomotives can operate in multiple.

## Benefits

The AR15 VR is a modular design, built from tried-and-tested systems and components. It can be flexibly adapted to satisfy individual customer demands concerning performance, capacity and intended use. The name Asiarunner stands for the orientation of this locomotive platform to the narrow-gauge railway market in Southeast Asia. However, the concept also meets the market requirements in Africa, Australia and South America.



# Freight Locomotive 3800 Class

for Queensland Rail QR



Type	3800 Class	
Year	2007 – 2010	
Wheel arrangement	Bo'Bo'Bo'	
Power system	25 kV/ 50 Hz	
Rating	[kW]	4,000
Starting tractive effort	[kN]	525
Maximum speed	[km/h]	80
Weight	[t]	132
Track gauge	[mm]	1,067
Numbers built	45	

Queensland Rail, Australia’s largest railway operator, first placed an order for 20 electric freight locomotives in April 2006 and then another for 25 in 2008. These new units are being designed and built in the locomotive plant in Munich. The electric equipment is largely the same as that used on the 3700 Class. Delivery is scheduled for 2008 and 2009.

**Scope of application**

The new electric freight locomotives of the 3800 Class support the railway operator QR in its plans to increase the transport capacity for coal from 157 million tons to 250 million tons by 2010.

**Technical features**

The components of the 3700 Class, combined with a new mechanical system, made it possible to increase the tractive effort further to 525 kN. The locomotives are equipped with air brakes and a remote control system (Distributed Power, DP) according to AAR standard. The entire mechanical part is designed for the special environmental conditions, above all for the high dust contamination in coal transport operations.

**Benefits**

The locomotives that are especially designed to haul coal trains feature advanced technology to achieve a considerable increase of the transport capacity. The permitted load per locomotive is 1.7 times higher than with the existing vehicles of Queensland Rail. While the electric equipment offers the same benefits with respect to life cycle costs as the 3700 Class project, the newly developed mechanical system features additional improvements with respect to robustness and maintainability. The weight was increased to the maximum 132 tons permitted for QR’s coal lines, resulting in higher productivity of the vehicles.

# Freight Locomotive 3700 Class

for Queensland Rail QR



Type	3700 Class	
Year	2005 (prototypes) / 2007 – 2011	
Wheel arrangement	Bo'Bo'Bo'	
Power system	25 kV / 50 Hz	
Rating	[kW]	4,000
Starting tractive effort	[kN]	500
Maximum speed	[km/h]	80
Weight	[t]	126
Track gauge	[mm]	1,067
Numbers built	3 prototypes / 60	

In March 2003, Queensland Rail placed the order for a complete modernization of the locomotives of the 3100/3200 Class. After three prototypes, the follow-up order for 60 production locomotives was placed in 2005. The retrofit comprises the entire traction, auxiliaries and control system. The work was carried out at the consortium partner United Group Rail Ltd. in Australia.

## Scope of application

The vehicles are specially designed for coal transport operations in Queensland. In this application, the locomotives must meet the highest requirements with respect to tractive effort and reliability since they are exposed to high temperatures, heavy rain-fall and extreme dust contamination.

## Technical features

The equipment is specially designed for the narrow vehicle clearance profile and the special requirements of QR's coal train routes. The dustproof components provide outstanding performance for a narrow-gauge railway. Special features include the remote control (Distributed Power, DP) and the rheostatic brake with 4 MW of continuous braking effort.

## Benefits

Compared to existing locomotives, the modernized vehicles feature an increase of 35% in power and of 33% in tractive effort. The continuous tractive effort is even 80% higher. This enables three 3700 Class locomotives to haul the same trains that used to require five 3100/3200 Class locomotives. These trains can weigh about 13,000 metric tons and can be two kilometers long.

The low-maintenance AC three-phase traction system by Siemens using IGBT converters has greatly reduced the maintenance effort and increased the reliability of the vehicle. The power electric brake permits safe downhill operation of the loaded train with low wear.

# Switching Locomotive R156

for New York City Transit NYCT



Type	R156	
Year	2008 – 2009	
Wheel arrangement	Bo'Bo'	
Diesel engine rating	[kW]	640
Starting tractive effort	[kN]	90
Maximum speed	[km/h]	40
Weight	[t]	52
Track gauge	[mm]	1,435
Numbers built	28	

New York City Transit operates the largest mass transit network in the world, with a fleet of more than 6,000 subway cars. The maintenance of the network requires locomotives that comply with the strict OSHA regulations.

**Scope of application**

The locomotive is used as a switching locomotive as well as for the maintenance of the underground rail network.

**Technical features**

Compliance with the specific NYCT requirements for the locomotive body made it necessary to use a partly self-supporting body design. The three-phase AC equipment with the IGBT compact converter is based on the technical concept of the R160 subway cars.

**Benefits**

The locomotive allows maintenance runs within the widely ramified low tunnel system while ensuring compliance with the OSHA guidelines. The maintenance personnel appreciates the fully enclosed body design of the locomotive that permits maintenance on the diesel engine within the locomotive at the numerous satellite depots.

# Freight Locomotive BB 475000

for French National Railways SNCF



Type	BB 475000
Year	2006 – 2015
Wheel arrangement	Bo'Bo'
Diesel engine rating	[kW] 2,000
Starting tractive effort	[kN] 250
Maximum speed	[km/h] 120
Weight	[t] 84
Track gauge	[mm] 1,435
Numbers built	400

In February 2004, state-owned French National Railways SNCF placed an order for the supply of 400 diesel locomotives of the type BB 475000 with a consortium consisting of Alstom Transport SA (consortium leader) and Siemens. The order includes an option for an additional 100 locomotives. Siemens is supplying the traction equipment and control systems and building 130 bodies of the fixed batch in its Munich plant. This project is the largest single order placed by a European railway company in 30 years for the procurement of diesel locomotives.

## Scope of application

The locomotives will be operated primarily as freight locomotives in France.

## Technical characteristics

The design of the new BB 475000 diesel locomotive for SNCF reflects especially the expertise of the two consortium partners that has been demonstrated with the following locomotives:

- the Rh 2016 diesel-electric locomotive built by Siemens AG for Austrian Federal Railways (ÖBB)
- the BB 427000 electric locomotive built by Alstom Transport SA for SNCF

Mechanical parts and bogies are taken from the electric locomotive of the type BB 427000 and combined with components of the Rh 2016 diesel locomotive, including the electrical block, the diesel engine (MTU 16V 4000 R41), the cooling system, the braking resistor, the control system and the cab displays from Siemens.

## Benefits

The use of advanced and proven traction components based on the Rh 2016 for ÖBB, combined with the structural part of the BB 427000 from Alstom, was instrumental in SNCF's purchasing decision. This combination is a perfect match for the specific requirements of the customer SNCF (optimized maintenance and spare part management, ease of operation for the driver, etc.). The BB 475000 will replace diesel locomotive series from the years 1960 to 1970 of SNCF and ensure freight traffic within the regional zones.

## Electric Locomotive O'zbekiston

for Uzbek Railway Company UTY



Type	O'zbekiston	
Year	2003 – 2004	
Wheel arrangement	Bo'Bo'Bo'	
Power system	25 kV/ 50 Hz	
Rating	[kW]	6,000
Starting tractive effort	[kN]	470
Maximum speed	[km/h]	120
Weight	[t]	138
Track gauge	[mm]	1,520
Numbers built	12	

The agreement for the equipment of twelve locomotives for Uzbek Railways was signed in June 2002. Main supplier is the Chinese locomotive factory CSR Zhuzhou Electric Locomotives Company Ltd. Siemens supplied the traction equipment including the locomotive control unit, as well as assembly/commissioning support. The locomotives are used in freight and passenger service on the new Tashkent – Samarkand line. The vehicles replace the existing ones of older Russian design and considerably shorten travel times on the new line.

## Universal Electric Locomotive DS3

for Ukrainian State Railways Ukrzaliznycja UZ



Type	DS3	
Year	2002 (prototype) / 2004	
Wheel arrangement	Bo'Bo'	
Power system	25 kV/ 50 Hz	
Rating	[kW]	4,800
Starting tractive effort	[kN]	310
Maximum speed	[km/h]	160
Weight	[t]	90
Track gauge	[mm]	1,520
Numbers built	1 prototype / 100	

In March 2004, Siemens received an order from Ukrainian locomotive manufacturer GP NPK Elektrovozostroeniya for electrical equipment for 100 universal locomotives of type DS 3. The vehicles were built for the state administration of Ukrainian Railways, Ukrzaliznyzija. Final customers of the locomotives are the six single railway operators of UZ. The electric locomotive DS 3 was designed, built and tested together with GP NPK Elektrovozostroeniya in Dnepropetrovsk. The 90-ton locomotive is the first electric locomotive with a three-phase drive system and compact IGBT converter to be used in Ukraine. The DS 3 feeds the passenger coaches via a train supply bus.



## Freight Locomotive GT 42 CUAC

for Pacific National PN



Type	GT 42 CUAC	
Year	2004	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	2,424
Starting tractive effort	[kN]	600
Maximum speed	[km/h]	100
Weight	[t]	120
Track gauge	[mm]	1,067
Numbers built	13	

The broad application of this proven locomotive type at Queensland Rail convinced the private operator Pacific National also to purchase 13 locomotives of this type in 2004. Pacific National uses this locomotive type to haul freight trains in the network of Queensland Rail. The use of commutatorless three-phase motors enables these narrow-gauge locomotives to provide the necessary starting and continuous tractive efforts while ensuring maximum utilization of adhesion coefficients.

## Freight Locomotive GT 42 CUAC

for Queensland Rail QR



Type	GT 42 CUAC	
Year	1999 – 2001 / 2004	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	2,424
Starting tractive effort	[kN]	600
Maximum speed	[km/h]	100
Weight	[t]	120
Track gauge	[mm]	1,067
Numbers built	49	

The Australian rail company Queensland Rail (QR) ordered 38 diesel-electric locomotives with three-phase traction of type GT 42 CUAC in order to handle their transport tasks more economically. 11 more locomotives were ordered in 2003. The locomotives are used to transport coal from the open-cast mining areas in the Northeast of the country through the coastal region to the Pacific seaports. The commonly used lines in narrow Cape gauge place specific requirements on the design of high-performance freight locomotives.

# Freight and Passenger Locomotive WDG4/WDP4 and GT 46 MAC/PAC

for Indian Railways IR



Type	WDG4	WDP4	GT 46 MAC	GT 46 PAC
Year	2000 – 2008	2000 – 2008	1998 – 2000	2000 – 2001
Wheel arrangement	Co'Co'	(Bo1) (1Bo)	Co'Co'	(Bo1) (1Bo)
Diesel engine rating	[kW] 2,985	2,985	2,985	2,985
Starting tractive effort	[kN] 540	270	540	270
Maximum speed	[km/h] 120	160	120	160
Weight	[t] 126	119	126	119
Track gauge	[mm] 1,676	1,676	1,676	1,676
Numbers built	81	47	21	10

In 1999, Indian Railways presented its diesel-electric freight locomotive WDG4 with three-phase traction. This locomotive type is the variant GT 64 that was built locally under license. The locomotives are used on the main lines in Central India as well as in the southern and southwestern parts of the country. The use of proven technology from the SD 70 MAC makes it possible to leverage the totality of operating experience from the large locomotive fleets in the USA also for operation in India.



## Freight Locomotive SD 90 MAC Phase 2

for Canadian Pacific and Union Pacific



Type	SD 90 MAC Phase 2	
Year	2000	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	4,475
Starting tractive effort	[kN]	890
Maximum speed	[km/h]	128
Weight	[t]	190
Track gauge	[mm]	1,435
Numbers built	44	

The SD 90 MAC Phase 2 is a further development of the 6,000-HP variant of the SD 90 MAC and aims at cutting cost at the vehicle level. After building two prototypes for EMD, EMD and Siemens produced 4 locomotives for Canadian Pacific and 40 units for Union Pacific. This locomotive is used in heavy freight service in North America. One SD 90 MAC Phase 2 can replace two existing SD 40-2s. This provides substantial fuel savings in addition to reduced emissions.

## Freight Locomotive SD 90 MAC

for Commercial Investment Trust CIT



Type	SD 90 MAC	
Year	1999 – 2000	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	3,210
Starting tractive effort	[kN]	820
Maximum speed	[km/h]	128
Weight	[t]	190
Track gauge	[mm]	1,435
Numbers built	40	

In 1999, the leasing company CIT ordered 40 locomotives of the type SD 90 MAC with a 4,300-HP rating. These units are leased to cover peak demands with other operators. The SD 90 MAC is a multi-purpose locomotive that is primarily used for freight traffic.

## Freight Locomotive SD 70 MAC

for Transportación Ferroviaria Mexicana TFM



Type	SD 70 MAC	
Year	1999 – 2000	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	3,150
Starting tractive effort	[kN]	780
Maximum speed	[km/h]	113
Weight	[t]	188
Track gauge	[mm]	1,435
Numbers built	75	

In 1999, TFM ordered a total of 75 locomotives of the proven SD 70 MAC family from Siemens and EMD. TFM also uses the SD 70 MAC in heavy freight service, partly for cross-border traffic in the network of Kansas City Southern.

## Freight and Passenger Locomotive SD 70 MAC/HEP

for Alaska Railroad ARR



Type	SD 70 MAC	SD 70 MAC HEP
Year	1999 – 2000	2004 / 2007
Wheel arrangement	Co'Co'	Co'Co'
Diesel engine rating	[kW] 2,835	3,150
Starting tractive effort	[kN] 780	780
Maximum speed	[km/h] 113	113
Weight	[t] 188	188
Track gauge	[mm] 1,435	1,435
Numbers built	16	8 / 4

Together with its North American partner Electro Motive Division (EMD), Siemens supplied 16 freight locomotives of the type SD 70 MAC to Alaska Railroad. In 2004, the customer ordered an additional eight locomotives of this type but with the requirement that these vehicles should also be suitable for passenger service. The variant SD 70 MAC HEP provides the on-board power supply for passenger trains without the need for a separate diesel generator set. The SD 70 MAC locomotive type is used for heavy freight duty. Alaska Railroad uses the locomotive type SD 70 MAC HEP to haul the prestigious passenger trains taking passengers from cruise ships on day trips.

## Freight Locomotive SD 90 MAC

for Canadian Pacific CP



Type	SD 90 MAC	
Year	1998 – 1999	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	3,210
Starting tractive effort	[kN]	820
Maximum speed	[km/h]	128
Weight	[t]	190
Track gauge	[mm]	1,435
Numbers built	61	

In 1998, Canadian Pacific ordered a total of 61 vehicles with 4,300-HP from Siemens and EMD. As a multi-purpose locomotive, the SD 90 MAC is operated by Canadian Pacific for freight duty in the entire network from Vancouver to Montreal.

## Freight Locomotive SD 70 MAC

for CSX Transportation CSXT



Type	SD 70 MAC	
Year	1997 – 2000/2004	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	3,150
Starting tractive effort	[kN]	780
Maximum speed	[km/h]	113
Weight	[t]	188
Track gauge	[mm]	1,435
Numbers built	220	

Since 1997, Siemens and its partner EMD have been supplying SD 70 MAC freight locomotives to the U.S. railroad company CSX Transportation, which operates the largest rail network in the eastern United States with more than 23,000 miles of track. A total of 220 locomotives were built for this customer. The rail network of CSXT spans 23 U.S. states and two neighboring Canadian provinces, where the SD 70 MAC locomotives are used for freight traffic.

## Freight Locomotive SD 90 MAC

for Union Pacific UP



Type	SD 90 MAC 4300 HP	SD 90 MAC 6000 HP
Year	1996 – 1999	1998 – 1999
Wheel arrangement	Co'Co'	Co'Co'
Diesel engine rating	[kW] 3,210	4,475
Starting tractive effort	[kN] 820	890
Maximum speed	[km/h] 128	128
Weight	[t] 190	190
Track gauge	[mm] 1,435	1,435
Numbers built	309	22

In spring 1994, Union Pacific placed an order for diesel-electric locomotives from EMD and Siemens. These vehicles are based on the SD 80 MAC. This locomotive is already designed to allow the use of various diesel engine variants. UP selected the variants with 4,300 and 6,000 HP. Several follow-up orders increased the customer's fleet of 4,300-HP SD 90 MAC to a total of 309 locomotives, which are primarily used in freight operations. UP still also operates 22 vehicles SD 90 MAC Phase 1 with 6,000 HP.

## Freight Locomotive SD 80 MAC

for Conrail (now CSXT and NS)



Type	SD 80 MAC
Year	1996
Wheel arrangement	Co'Co'
Diesel engine rating	[kW] 3,750
Starting tractive effort	[kN] 820
Maximum speed	[km/h] 128
Weight	[t] 190
Track gauge	[mm] 1,435
Numbers built	30

In May 1994, the American rail freight company Conrail ordered 30 diesel-electric locomotives of the type SD 80 MAC with 5,000 HP from EMD and Siemens. Although this order called for a completely new design, reliable elements of the SD 70 MAC were adopted and refined. The SD 80 MAC locomotives are being used for heavy freight duty in the Northeastern United States.



# Freight Locomotive SD 70 MAC

for Burlington Northern Santa Fé (BNS)



Type	SD 70 MAC	
Year	1993 – 2000	
Wheel arrangement	Co'Co'	
Diesel engine rating	[kW]	2,835
Starting tractive effort	[kN]	780
Maximum speed	[km/h]	113
Weight	[t]	188
Track gauge	[mm]	1,435
Numbers built	786	

Together with its American partner EMD (Electro Motive Division), Siemens supplied the first production diesel-electric freight locomotives with three-phase AC propulsion technology. The initial order placed by the U.S. railroad company Burlington Northern (BN) in 1993 for a total of 350 locomotives marked the largest single order in U.S. railroad history. Successful operation has since led to follow-up orders, bringing today's total number of locomotives equipped with Siemens three-phase technology to 786.



# Dual-Mode Locomotive Class 38

for South African Railways Spoornet



Type	Class 38	
Year	1992 – 1994	
Wheel arrangement	Bo'Bo'	
Diesel engine rating	[kW]	780
Continuous rating in DC 3 kV mode	[kW]	1,500
Starting / continuous tractive effort	[kN]	260 / 181
Maximum speed	[km/h]	100
Weight	[t]	74
Track gauge	[mm]	1,067
Numbers built	50	

In mid-1990, South African Railway (Spoornet) awarded a Siemens-led consortium the largest order ever placed by a railway company for dual-mode locomotives. As dual-mode or hybrid locomotives, the Class 38 locomotives are especially suited for combined yard and freight service within the same roundtrip, since they eliminate the otherwise necessary changing of locomotives when switching from electrified to non-electrified line sections.

# Dual Mode Locomotive DE 30 AC/DM 30 AC

for Long Island Rail Road LIRR



Type	DE 30 AC	DM 30 AC
Year	1997 – 1998	1997 – 1998
Wheel arrangement	Bo'Bo'	Bo'Bo'
Diesel engine rating	[kW] 2,237	2,237
Rating in DC 650 V mode	[kW] 2,150	2,150
Starting tractive effort	[kN] 360	360
Maximum speed	[km/h] 161	161
Weight	[t] 128	128
Track gauge	[mm] 1,435	1,435
Numbers built	23	23

In cooperation with its American partner EMD, Siemens is supplying the American market with the most advanced DM 30 AC passenger train locomotives. The locomotives are used in commuter service in the New York metropolitan area. A marked decrease in noise and a substantial improvement in fuel economy compared to the previously used locomotives set standards for ecofriendliness. The DM 30 AC is also capable of operating alternatively on the third rail (650 V) as an electric locomotive, so that it can be used in the tunnels leading into New York City.



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

