A FEW FIGURES …
- There is currently one line which has been operational since 2011 and has 10 stations.
- 14 6-car trains are currently used on this line. They are 108-m-long and 2.83-m-wide, with a seating capacity of 210 and a total capacity of 1,290.
- The line is operationnal from 5:00 AM to 11:00 PM and trains stop at the stations every 3 to 5 minutes. Thus, there are averagely 25,000 passengers per hour.
- 2 more lines with 26 new stations are planned for 2020. From then on, the network should be 40-km-long.
CURRENT COLLECTOR DEVICE

With its integrated fuse box, this current collector is a proven design in third-rail collection equipment, because it provides:

- **Bottom contact**
- Retraction and interlocking by pneumatic mechanism
- An easy vertical adjustment after repfiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- Simple and low cost fixing on to the lateral bogie side

Estimated weight: 33 kg
Rated voltage: 750 V DC

A FEW FIGURES ON THE MRT NETWORK …

- One 25-km-long single line with 18 stations so far
- Average daily ridership: 300,000 passengers
- 19 3-car Siemens Modular Metro trainsets currently used, with a top speed of 80 km/h and a third rail system
- 4 more lines planned for the coming years, with a network extension by 75%
ABOUT THE IRIGO NETWORK …

Irigo, the transportation network of Angers, was inaugurated in 2011 and brings together taxis, bus lines and tram lines. Regarding trams, Line A also began operation in 2011. It is 12.3 km long with 25 stations. Average daily ridership is 31,000 passengers.

17 Citadis 302 trainsets currently run on Line A. Their nickname, « rainbow trams », is merely linked to the fact that they are multicolor. These trainsets run thanks to ground-level power supply and have an average speed of 20 km/h. Top speed is 50 km/h.

Line B should be 16 km long and built by 2020.

CURRENT COLLECTOR DEVICE

This current collector is a proven design in third-rail collection equipment for train application with a ground-level power supply system:

- Top contact
- Retraction and interlocking by electrical mechanism
- Simple and low cost fixing on to the car body

Rated voltage : 750 V DC
Orléans Tram – Line A
Operators: Keolis/Semtao

IN A FEW WORDS ...

The Orléans tram line, which began operation first in 1877, was then inaugurated a second time in 2000 after being fully renovated.

Line B is to begin operation in June 2012. Thus, there is so far one single line, Line A, which is 19.3 km long and has 24 stations. It goes through 3 different towns.

The trainsets used are Citadis 301 & Citadis 302. They averagey carry 42,000 passengers a day and have a top speed of 70 km/h.

CURRENT COLLECTOR DEVICE

This current collector is a proven design in third-rail collection equipment for train application with a ground-level power supply system:

- Top contact
- Retraction and interlocking by electrical mechanism
- Simple and low cost fixing on to the car body

Rated voltage: 750 V DC
ABOUT THE CITURA NETWORK...

Citura, the transportation network of Reims, was inaugurated in 2011 and brings together bus lines and tram lines. The 2 tram lines have a total length of 19.4 km and have 23 stations.

The 18 trainsets used are Alstom Citadis TGA 302 with various possible colors. They averagely carry 42,500 passengers a day and have an average speed of 20 km/h – top speed is 70 km/h. These 5-car trainsets run everyday from 5:00 AM to 0:30 AM thanks to a ground-level power supply system, with a continuous power of 480 Kw.

CURRENT COLLECTOR DEVICE

This current collector is a proven design in third-rail collection equipment for train application with a ground-level power supply system:

- Top contact
- Retraction and interlocking by electrical mechanism
- Simple and low cost fixing on to the car body

Rated voltage: 750 V DC
A FEW FIGURES ...

- A 14.8-km-long network with 29 stations
- Average daily ridership: 54,900 passengers
- 21 43-m-long trams used on the line
- Frequency of the trams during peak hours: 6 min
- It takes about 47 min to go from one end of the line to the other.

This current collector is a proven design in third-rail collection equipment for train application with a ground-level power supply system:

- Top contact
- Retraction and interlocking by electrical mechanism
- Simple and low cost fixing on to the car body
- Rated voltage: 750 V DC
Al Sufouh Tram - Dubai
Operator: Dubai Roads and Transport Authorities

A FEW WORDS ON THE PROJECT …
- A 14.5-km-long first line with 19 stations planned for 2014
- The line should open 20 hours a day.
- Forecast daily ridership: 180,000 to 200,000 passengers
- 25 Alstom Citadis 402 have been ordered for the network. These trams are 44 m long, with an average speed of 20 km/h and a top speed of 50 km/h. Total capacity is 300 passengers.
- The line will be equipped with a ground-level power supply system.

CURRENT COLLECTOR DEVICE

This current collector is a proven design in third-rail collection equipment for train application with a ground-level power supply system:
- Top contact
- Retraction and interlocking by electrical mechanism
- Simple and low cost fixing on to the car body
Rated voltage: 750 V DC

ep.mersen.com
Beijing Subway – Line 8
Operator: Beijing Mass Transit Railway Operation Corp., Ltd

ABOUT LINE 8 ...

Line 8 is 15.2 km long and currently has 10 stations. It develops from the stretch of the former Olympic Line, which had been opened in 2008 with 4 stations. This stretch underwent a first extension in 2011 and should be further extended by 2015.

Line 8 is open everyday from 5:30 AM to 11:00 PM and current average daily ridership reaches 155,900 passengers.

CURRENT COLLECTOR DEVICE

With its integrated fuse box containing two-body fuses in parallel, this current collector is a proven design in third-rail collection equipment, because it provides:

- Top contact
- Retraction and interlocking by manual means with removable handle
- An easy vertical adjustment after reprofiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.

Estimated weight: 31 kg
Rated voltage: 750 V DC
Namma Metro, Bengaluru - India
Operator: BMRCL

ABOUT NAMMA METRO …

- There is currently 1 line, that is partly operational, with 6 stations. There should be 4 lines fully operational with a total of 41 stations by 2017.

- The Namma metro network is 42.3 km long and should extend by nearly 70 km in the coming years (2017).

- The trains used are 3-car trainsets with an average speed of 32 km/h and a top speed of 80 km/h. They averagely carry 24,968 passengers a day and run thanks to a third rail system with a voltage of 750 V DC.

CURRENT COLLECTOR DEVICE

With its separated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- Bottom contact
- Rubber articulation, shock absorbing
- Retraction and interlocking by pneumatic mechanism
- An easy vertical adjustment after repolishing of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe
- Fast and easy carbon shoe replacement
- Simple and low cost fixing under the bogie frame

Weight M-car: 37 kg, Weight T-car: 35 kg
Rated voltage: 750 V DC
A FEW FIGURES …

- About 60 stations spread out over 7 lines forming a 50-km-long network

- 5 to 6 different ranges of trainsets used between 1976 and nowadays, with an average speed of 24.9 km/h and a top speed reaching 72 km/h

- Annual ridership ranges between 125 million and 160 million passengers.

With its copper shoe, this current collector is a proven design in third-rail collection equipment, because it provides:

- Bottom contact
- Retraction and interlocking by pneumatic mechanism
- A microswitch for retracted position
- A fast and easy copper shoe replacement
- Simple and low cost fixing on to the lateral bogie side

Rated voltage: 750 V DC
Cairo Metro – Line 3
Operator: Egyptian Railway Authority

THE FIRST AFRICAN METRO NETWORK ...
- There are currently 3 lines including 2 with a third rail system and 1 with a pantograph system. The network is 69.8 km long with 57 stations.
- The trains used are 9-car trainsets with a top speed of 100 km/h. They follow one another every 2:30 min and averagely carry 4 million passengers a day.
- There should be 3 new lines built by 2022.

CURRENT COLLECTOR DEVICE

With its integrated fuse box containing one-body fuses, this current collector is a proven design in third-rail collection equipment, because it provides:
- **Top contact**
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- **Easy cast iron shoe replacement**
- Simple and low cost fixing on to the lateral bogie side

Estimated weight: 28 kg
Rated voltage: 750 V DC
Guangzhou Metro – Line 6
Operator: Guangzhou Metro Corporation

A FEW FIGURES ...
- A 236-km-long network with 8 lines, 144 stations and 1,002 trains
- Averagely 5 million users a day and 1.64 billion passengers per year
- Trains run everyday from 6:15 AM to 11:00 PM with a voltage of 1,500 V DC.
- By 2020, the network should be extended by nearly 450 km with 10 more lines.

CURRENT COLLECTOR

This current collector is a proven design in third-rail collection equipment, because it provides:

- **Bottom contact**
- **Rubber articulation, shock absorbing**
- **Retraction and interlocking by pneumatic mechanism**
- An ultimate protection, without any electrical risk or damage to the bogie, given by a **weak link** (a frangible element) if there is an obstacle in front of the shoe.
- **Fast and easy carbon shoe replacement**
- **Simple and low cost fixing on to the lateral bogie side**

Rated voltage: **1,500 V DC**

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A FEW FIGURES...
- There is one single 20-km-long line with 13 stations so far. It began operation in 2000.
- There are currently 124 trainsets used.
- The second line is currently under construction and should have 22 stations. Thus, the network should extend by 35.75 km. In addition of this, 144 more trainsets should be delivered.
- 4 other new lines are also planned for the coming years.

CURRENT COLLECTOR DEVICE

This current collector provides:

- Top contact
- Rubber articulation, shock absorbing
- A good and reliable level of insulation because of its location inside an insulating frame.
- A shoe retraction with interlocking by a manual and removable handle.
- A fast and easy carbon shoe replacement. Different shoe material could be used.
- An easy vertical adjustment after reprofiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.

Estimated weight with the braided cable: 24 Kg.
Rated voltage: 750 V DC
Izmir Metro - Turkey
Operator: Izmir Metrosu A.S.

A FEW FIGURES ...

The 77 trains used on the Izmir metro lines averagely carry 30 million passengers per year, that is averagely 173,000 passengers a day. The trainsets used are 3.76-m-long, 2.35-m-wide and 2.65-m-high, with a seating capacity of 44 passengers and a total capacity of 184 passengers. Top speed reaches 80 km/h with an acceleration of 1 m/s.

CURRENT COLLECTOR DEVICE

With its separated fuse box, this current collector is a proven design in third-rail collection equipment, because it provides:

- Bottom contact
- Retraction and interlocking by manual means with removable handle
- A fast and easy cast iron shoe replacement
- An easy vertical adjustment after repainting of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- Simple and low cost fixing on to the lateral bogie side through an insulating frame

Estimated weight: 23 kg
Rated voltage: 750 V DC

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IN A FEW WORDS ...

There are currently 161 MF 2000 trainsets used on 3 of the Paris metro lines – these were delivered in 2008.

The MF 2000 trains are 5-car trainsets with a capacity ranging from 481 to 1,000 passengers. They are more spacious and eco-friendly than the former Paris metro trainsets, with a length of 75.8 m and an empty weight of 125.7 t.

Continuous power is 1,800 kW, while top speed is 70 km/h with an acceleration of 0.9 m/s.
IN A FEW WORDS …

MP05s are electric rubber-tired multiple units with automatic operation used on the Paris metro lines since 2011 in order to replace former MP89 trains. It is undeniably a model for technological innovation in railway industry.

About 80 MP05s were ordered for 2 of the Paris metro lines so far. These are formed of 6 to 8 cars and passenger capacity is nearly 800. The trainsets are 90.3 m long, 2.5 m wide and 3.5 m high. Top speed is 80 km/h, with a starting acceleration of 1.35 m/s.

With its separated fuse box, this current collector is a proven design in third-rail collection equipment, because it provides:

- Lateral contact
- Fast and easy carbon surmoulded shoe replacement
- An auto unlatching system after refolding
- High protection thanks to an insulating box made of self-extinguishing material
- Simple and low cost fixing on to the lateral bogie side
- Low maintenance cost

Estimated weight: 28 kg
Rated voltage: 750 V DC
IN A FEW WORDS ...

MP05s are electric rubber-tired multiple units with automatic operation used on the Paris metro lines since 2011 in order to replace former MP89 trains. It is undeniably a model for technological innovation in railway industry.

About 80 MP05s were ordered for 2 of the Paris metro lines so far. These are formed of 6 to 8 cars and passenger capacity is nearly 800. The trainsets are 90.3 m long, 2.5 m wide and 3.5 m high. Top speed is 80 km/h, with a starting acceleration of 1.35 m/s.

NEGATIVE CURRENT COLLECTING DEVICE

This current collector is a proven design in third-rail collection equipment, because it provides:

- Top contact
- Very low maintenance cost

Estimated weight: 18 kg
Rated voltage: 750 V DC

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ABOUT THE FIRST METRO SYSTEM IN BRAZIL ...

- The network, that began operation in 1975, is now 74.3 km long with 5 lines and 64 stations.
- In 2012, average daily ridership came to 4 million passengers.
- The trains run everyday from 4:40 AM to midnight or 1:00 AM.
- 7 more lines with 114 new stations in total are planned for the coming years.

CURRENT COLLECTOR DEVICE

With its integrated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- **Bottom** contact
- Retraction and interlocking by **manual means** with removable handle
- An easy vertical adjustment after repurfiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- A fast and easy **carbon shoe** replacement
- Simple and low cost fixing on to the lateral bogie side
- Very low maintenance cost

Estimated weight: 24 kg
Rated voltage: 750 V DC

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Shenzhen Metro – Line 3

Operators: Shenzhen Metro Co., Ltd/MTR Corporation Limited

A FEW FIGURES...

- The Shenzhen metro network is 178.44 km long and has 5 lines with a total of 137 stations.
- Average daily ridership is 342,000 users while annual ridership reaches 459.8 million passengers.
- 7 new lines with 140 more stations should be built by 2020.
- Line 3, aka Longgang Line, is 41.66 km long and has 30 stations. It is equipped with a third rail system, with a voltage of 1,500 V DC.

CURRENT COLLECTOR

With its separated fuse box, this current collector is a proven design in third-rail collection equipment, because it provides:

- Bottom contact
- Rubber articulation, shock absorbing
- Retraction and interlocking by pneumatic mechanism
- An easy vertical adjustment after reprofiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- Fast and easy carbon shoe replacement
- Simple and low cost fixing on to the lateral bogie side

Estimated weight: 33 kg
Rated voltage: 1,500 V DC

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ABOUT THE C151 TRAINS ...

-396 C151 trains have come into service so far. These 6-car trainsets have a seating capacity of 300 passengers and a total capacity of 1,200 passengers.

- The C151s are 23.65-m-long, 3.2-m-wide and 3.69-m-high, with a weight ranging from 32 to 39 t. Top speed is about 90 km/h, with an acceleration of 3.6 km/h/s. The trains run thanks to a third rail system – the voltage being 750 V DC.

- Motorization : 135 kW, 375 V, 430 A, 2,050 rpm

CURRENT COLLECTOR DEVICE

With its separated fuse box and its carbon shoe, this current collector is a proven design in third-rail collection equipment, because it provides:

- **Bottom contact**
- Retraction and interlocking by manual means with removable handle
- An easy vertical adjustment after reprofiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- Simple and low cost fixing on to the lateral bogie side through an insulating frame

Rated voltage : 750 V DC
Taipei Metro
Operator: Taipei Rapid Transit Corporation

ABOUT TAIPEI RAPID TRANSIT SYSTEM ...

- Taipei Rapid Transit System began operation in 1996 and is now 114.6 km long with 96 stations spread out over 10 lines.

- While average daily ridership is about 1.6 million passengers, annual ridership reached 566.4 million passengers in 2011.

- Trainsets from various ranges are used on the Taipei metro network. The trains run 18 hours a day thanks to a third rail system with a voltage of 750 V DC. Top speed is 80 to 90 km/h.

- Regarding further extensions, the network length should more than double by 2020.

CURRENT COLLECTOR DEVICE CR381

With its separated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- Bottom contact
- Rubber articulation, shock absorbing
- Retraction and interlocking by pneumatic mechanism
- An easy vertical adjustment after reprofiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe
- Fast and easy shoe replacement
- Simple and low cost fixing under the bogie frame

Weight M-car: 37 kg, Weight T-car: 35 kg
Rated voltage: 750 V DC
A FEW FIGURES ...

- The Tehran metro network began operation in 1999, and currently has 4 lines with a total of 69 stations. It is 120 km long.

- Annual ridership in 2008 was 459.1 million passengers. Average daily ridership in 2011 was about 2 million passengers.

- The trainsets used are 137 m long with 7 cars, and a top speed of 80 km/h. They run thanks to a third rail system with a rated current of 750 V.

- 6 more lines should be built in the coming years. The first one should begin operation in 2013.

With its integrated fuse box containing one-body fuses and its cast iron shoe, this current collector is a proven design in third-rail collection equipment, because it provides:

- Top contact
- An easy vertical adjustment after reprofiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- Simple and low cost fixing on to the lateral bogie side

Estimated weight: 21 kg
Rated voltage: 750 V DC
ABOUT THE TIANJIN METRO ...

- The Tianjin metro network is currently 78.9 km long with 3 lines and 39 stations, that began operation in 2006 after the former network got fully renovated.

- In 2010, annual ridership came to 41.8 million passengers.

- By 2020, 7 more lines should be built including Line 2 which is to begin operation in 2013. Line 2 should be 23.5 km long with 20 stations and 6 connections with other lines, including one connection with Tianjin Binhai Airport.

CURRENT COLLECTOR DEVICE

With its integrated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- Top contact
- Rubber articulation, shock absorbing
- Retraction and interlocking by manual means with removable handle
- Fast and easy carbon shoe replacement

Rated voltage: 750 V DC
IN A FEW WORDS …

- The Toronto metro network began operation in 1954 and is now 70 km long, with 69 stations spread out over 4 lines.

- Average daily ridership on working days: more than 1 million passengers.

- 706 trains currently run on the Toronto metro lines. These are either 4-car or 6-car trainsets that run thanks to a third rail system with a voltage of 600 V DC. The trains follow one another every 2 to 6 minutes.

- 6 new stations are currently under construction and further extensions are scheduled under the MoveOntario 2020 plan.

CURRENT COLLECTOR DEVICE

With its integrated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- Top contact
- Manual retraction system
- Equipped with a workshop plug
- Fast and easy fuse checking
- Fast and easy cast iron shoe replacement
- Simple and low cost fixing on to the lateral bogie side

Rated voltage: 750 V DC
Working temperature: -40°C to 60°C
ABOUT THE TOULOUSE METRO AND VAL 208 TRAINS

The Toulouse metro network was inaugurated in 1993 and is now 27.5 km long with 2 lines with 37 stations. Annual ridership in 2011 was 100 million passengers. The trains run from 5:00 AM to midnight or 1:00 AM with a frequency ranging between 1 min during peak hours and 6 min.

There are currently 210 trainsets used. These are VAL 208, which are rubber-tired trains, with a rated current of 750 V and a continuous power of 520 kW. VAL 208 are 26 m long, 2.08 m wide and 3.27 m high with a weight of 28 t. Total capacity is nearly 160 passengers and top speed reaches 80 km/h. Current collection is made by a current collecting shoe on the side conductor rail.

With its integrated fuse box containing two-body fuses, this current collector is a proven design in third-rail collection equipment, because it provides:

- Lateral contact
- Fast and easy carbon shoe replacement
- Simple and low cost fixing on to the lateral bogie side

Rated voltage : 750 V DC
Estimated weight : 40 kg
With its integrated fuse box containing two-body fuses, this current collector is a proven design in third-rail collection equipment, because it provides:

- Lateral contact
- Fast and easy carbon shoe replacement
- Simple and low cost fixing on to the lateral bogie side

Rated voltage: 750 V DC
Estimated weight: 40 kg

ABOUT THE PROJECT …

The first line of the Uijeongbu metro system will be equipped with rubber-tired trainsets. It will thus be the 12th metro line in the world to be equipped with such trains. Inauguration is scheduled for June 2012.

Line 1 will be 10 km long. The entire line will be built on a viaduct and go from Jangam District (East) to Buyong Elementary School (West) with 14 stations. The trainsets used will be 2-car VAL 208 trains – there will be 15 of them at first. Forecast hourly ridership is 5,000 passengers for each direction.

Line 1 of the Uijeongbu metro will be interconnected with the metro network of Seoul, the South Korean capital city.
ABOUT SKYTRAIN …

The Skytrain network was inaugurated in 1985. Its name is linked to the fact that trains mostly run on elevated tracks. The network is now 68.7 km long with 3 lines and 48 stations.

Trains are fully automated and run thanks to a third rail system. They are also equipped with electric or linear induction motors. There are currently 298 trains used – they averagely carry 406,300 passengers a year, running 20 hours a day and following one another every 2 to 7 minutes. Average speed is 45 km/h while top speed is 90 km/h.

A fourth line should begin operation in 2016 and further extensions are planned by 2020.

CURRENT COLLECTOR DEVICE

With its separated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- Dual lateral contact
- Manual retraction system
- Very high primary level of insulation
- Rubber articulation, shock absorbing
- Fast and easy carbon shoe replacement
- Simple and low cost fixing on to the lateral bogie side

Rated voltage : 1,000 V DC
Working temperature : -40°C to 60°C

ep.mersen.com
Wuhan Metro – Line 1
Operator: Wuhan Metro Group Co., Ltd.

A FEW FIGURES …

- There is 1 single line which began operation in 2004 so far. Line 1 is 28.87 km long with 27 stations. 3 other lines are under construction and there should even be 9 lines in total by 2017.

- In 2011, annual ridership came to 73 million passengers. Average daily ridership is nearly 220,000 passengers.

- As of 2012, 132 trainsets are used on Line 1. These trains have a seating capacity of 176 passengers while the total capacity reaches 1,276 passengers. Average speed is 36.6 km/h, top speed is 100 km/h.

CURRENT COLLECTOR DEVICE

With its integrated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- Bottom contact
- Retraction and interlocking by manual means with removable handle
- An easy vertical adjustment after reprofiling of the wheels
- An ultimate protection, without any electrical risk or damage to the bogie, given by a weak link (a frangible element) if there is an obstacle in front of the shoe.
- Fast and easy carbon shoe replacement

Estimated weight: 18 kg
Rated voltage: 750 V DC
IN A FEW WORDS …

- The first line of the Zaragoza tram began operation in 2011 - it is 12.8 km long and has 11 stations. The 21 trainsets currently used on this line – CAF Urbos 3 – are 33-m-long and 2.65-m-wide, with a total capacity of 200 passengers and a seating capacity of 54 passengers.

- 2 more lines should be built and begin operation by 2015. Forecast average daily ridership is 100,000 passengers.

- Most of the trainsets used run thanks to a pantograph system, excepted in the historical district.

CURRENT COLLECTOR DEVICE

This device has been made for the new generation of trams with a super capacitor to feed current when the tram is stopped at a passenger station.

With its separated shoe fuse, this current collector is a proven design in third-rail collection equipment, because it provides:

- Static contact
- Retraction and interlocking by electrical mechanism
- Simple and low cost fixing under the bogie frame

Rated voltage: 750 V DC
ABOUT LINE 15 …

- Line 15 is 22 kms long and currently has 13 stations.
- By 2015, there should be 5 more stations built and the length of the line should therefore reach 38.3 km.
- The average daily ridership is 207,600 passengers.
- The 6-car trains used on this line run thanks to a third rail system.

The MERSEN Earth Return Current Unit provides a simple, efficient and economical protection of axle box bearings.

- Protected against dust penetration, water splash and shock
- Permanence of contact
- Very low maintenance cost
- Fast and easy brush replacement
- Low cost and simple fixing on the bogie

Axial mounting
Estimated weight : 4.5 kg
Nominal current : 600 A
**EARTH RETURN CURRENT UNIT**
3 BOXES 20x40 600 A

The **MERSEN** Earth Return Current Unit provides a simple, efficient and economical protection of axle box bearings.

The Earth Return Current Unit is made with a main body in copper-aluminium alloy providing the guide way of 3 independent brushes of rectangular cross section 20 x 40 ,Self-recoiling springs apply a constant pressure on each of the 3 brushes.

The slip dink is made of CuSn8Ni3p.

This assembly is **SEALED** and protected against dust and water penetration.

Axial mounting

Nominal current : 600 A

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**Chennai Metro**
Operator: Chennai Metro Rail Ltd.

A FEW FIGURES ON THE PROJECT ...

- A **54.1-km-long network with 2 lines and 41 stations planned for 2015**, and then further plans for a **117.1-km-long network formed by 5 lines in total**

- Planned rolling stock: **42 86.5-m-long trains in a first time**

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**ep.mersen.com**
Alstom Citadis trams are low-floor trams mostly formed of 3 to 7 cars, with a length ranging from 23 to 45 m. They have a minimum capacity of 127 passengers and can carry up to 255 passengers. As of 2012, there are 1,600 Citadis trams used in the whole world. Motor voltage is 0.75 kV while continuous power is 720 kW.

The concept of Citadis allows through standardized modules and personalized front face design the production of different trams according to customers’ expectations. Citadis trams are mass-produced in France and other countries as well.
Combino Trams

Distribution: Germany/Poland/Japan/Taïwan/Australia

EARTH RETURN CURRENT UNIT
2 BRUSHES 16x25

The Mersen Earth Return Current Unit provides a simple, efficient and economical protection of axle box bearings.

The Earth Return Current Unit is made with a main body in copper-aluminium alloy providing the guide way of 2 independent brushes of rectangular cross section 16 x25, 2 Self-recoiling springs apply a constant pressure on both brushes.

Axial mounting
Estimated weight : 3.5 kg
Nominal rated current: 200 A

ABOUT COMBINO TRAMS …

Combino trams, that were produced from 1998 to 2009, are low-floor trams mainly made of aluminium. They are very modular in terms of length and width. Thanks to their diesel-electric drive, the Combino Duo trams are able to circulate in non-electrified areas.

There are currently 580 Combino trams used in the world. As their length ranges from 19 to 54 m, they can carry between 100 and 250 passengers. Top speed is 70 km/h and voltage reaches nearly 700V.
EP 20 by Velnii - Russia
Manufacturing place: NEVZ factory, Russia

A FEW WORDS ON THE PROJECT …

New EP 20 locomotives were designed by the All-Russia Research and Development Institute of Electric Locomotive Engineering, VELNII. Russian Railways ordered 200 EP 20 in total, and the first part of the trains should be delivered and put into service by 2012.

The EP 20 is a new high-tech train and the first Russian locomotive with a top speed reaching 200 km/h. Thanks to its asynchronous traction system and IGBT transistors, the EP 20 is even more energy-efficient and maintenance requirements are far lower.

The MERSEN Earth Return Current Unit provides a simple, efficient and economical protection of axle box bearings.

The Earth Return Current Unit is made with a main body in copper-aluminium alloy providing the guide way of 4 independent brushes of rectangular cross section 20 x 40, 4 Self-recoiling springs apply a constant pressure on each of the 4 brushes.

This assembly is SEALED and protected against dust and water penetration.

Axial mounting
Estimated weight : 15 kg
Nominal current : 800 A

ep.mersen.com
Juniper Trains in the UK

Operators: South West Trains/First ScotRail/Gatwick Express

ABOUT JUNIPER TRAINS ...

Coradia Juniper trains are electric multiple unit trains that have been used on British railways since 2000, on the suburban as well as the outer suburban network. There are currently 78 of them.

These trains run either thanks to overhead wires with a voltage of 25 kV AC or a third rail system at 750 V DC current. Depending on the range (Class 334, Class 458 or Class 460), the trainsets are composed of 3 to 8 cars.

Some Coradia Junipers of the Class 458 and Class 460 ranges are to be reformed or even merge with each other in order to boost passenger capacity with new trainsets having up to 10 cars. These should be delivered in 2013 and begin operation in 2014.

EARTH RETURN CURRENT UNIT

2 BRUSHES 20x40 OR 25x50

The MERSEN Earth Return Current Unit provides a simple, efficient and economical protection of axle box bearings.

- Protected against dust penetration, water splash and shock
- Permanence of contact
- Very low maintenance cost
- Fast and easy copper graphite brush replacement
- Low cost and simple fixing on the bogie

Radial mounting

Estimated weight : 2 kg
Nominal current : 400 A or 625 A
Regiolis Multipurpose Trains - SNCF
Distribution: Northern, Northeastern & Southwestern France

ABOUT THE REGIOLIS TRAINS …

The Regiolis are self-propelled multiple units pertaining to the Coradia range, a new generation of regional trains already used in 9 European countries. The Regiolis trains will circulate in 11 French regions as from 2013. The SNCF, the National Corporation of French Railways, has yet ordered 171 Regiolis trainsets.

These multipurpose trains are undeniably a masterpiece of Alstom. They are modular in terms of length, motorization and comfort according to travel distance. What is more, the Regiolis trainsets combine a top speed of 160 km/h with 15% energy savings in comparison with the trains currently used.

The MERSEN Earth Return Current Unit provides a simple, efficient and economical protection of axle box bearings.

The Earth Return Current Unit is made with a main body in copper-aluminium alloy providing the guide way of 3 independent brushes of rectangular cross section 20 x 40, 3 Self-recoiling springs apply a constant pressure on each of the 3 brushes.

This assembly is SEALED and protected against dust and water penetration.

Axial mounting

Nominal current : 600 A
IN A FEW WORDS ...

The CRH3, which top speed is 300 km/h, was the third high-speed train put into service in China and runs on the Beijing-Tianjin line as well as on the Wuhan-Guangzhou line, that are respectively 114 and 922 km long.

There are currently 60 CRH3 trainsets used on the Chinese Railways. These are 3.26-m-wide and can carry up to 600 passengers spread out in 8 cars.

EARTH RETURN CURRENT UNIT 600 A HIGH-SPEED TRAIN

This Earth Return Current Unit consists of a brush housing providing the guide way of 3 independent brushes of rectangular cross section 20mm x 40mm, and closed by a reinforced cover, made of an insulating material.

3 self-recoiling springs apply a constant pressure on each of the 3 brushes. Pressure systems are independent and are fixed on the brush housing. They can be easily removed.

Brushes are made of a mix of copper and carbon powders compressed under high pressure, grade MC79P. Each brush has 4 copper braided cables, and of a dumper device made of an absorbing material placed between the brush and a rigid plate receiving the spring.

For each Earth Return Current Unit a connecting cable is provided for the electrical connection either to the bogie frame, either to the power equipment, depending of the ERCU function. The device can also be equipped with a speed sensor.

Axial mounting
Estimated weight : 5 kg
Nominal current : 600 A
Amsterdam metro
Operator: GVB

A FEW FIGURES ...

- A 42.5-km-long network, with 52 stations spread out over 4 lines and an average daily ridership of 214,000 passengers
- 106 trains from 3 different series, with an average speed of 35 km/h and a top speed of 70 km/h
- 1 new line with 8 more stations and a new series of trains (23 M5) planned for 2017

FUSE BOX
This is an individual box, fitted directly on the roof. There is a IP 66 watertight compartment to protect the fuse. The insulating fuse box is made of a sheet moulding composite, which is an unsaturated polyester resin having 30 % of fibber glass.

Characteristics of the two-body fuses:
- Operating voltage: 750 V DC
- Current rating: 350 A/600 A
Beijing Subway – Line 6
Operator: Beijing MTR Corp. Ltd

ABOUT THE BEIJING SUBWAY...

- The Beijing subway, which began operation in 1969, was the very first Chinese metro network. It now has nearly 200 stations spread out over 15 lines. The total network length is 372 km.

- Lines are open everyday from 5:00 AM to 11:00 PM and the average annual ridership is 2.18 billion passengers. Average daily ridership during peak hours reaches 7.57 million passengers.

FUSE BOX

Nominal line voltage: Un = 1 500 V DC (1000V min – 1800V max)
RMS current: the total RMS current of whole train is 1 300 A.

Fuse characteristics:
Operating voltage: 1 500 V DC
Current rating: 500 A x 4
Bodies: 4 cylindrical bodies, diameter 90 mm, length 254 mm
Budapest Metro
Operator: BKV Zrt.

A FEW FIGURES ...

- As the Budapest metro began operation in 1896, it is the second oldest metro network in Europe and nowadays 32.1-km-long.
- There are currently 42 stations spread out over 3 lines. A fourth line with 14 more stations should open in 2014.
- Average daily ridership: 1.27 million passengers

FUSE BOX

The same fuse box is used on motor and trailer cars. This is an individual box, fitted directly on the bogie by a supporting frame. There is a watertight compartment to protect the fuse.

Protection Degree: IP 55 according to IEC 529 standard.

Material: The insulating fuse box is made of a sheet moulding composite, which is an unsaturated polyester resin having 30% of fibber glass. It offers good mechanical properties, excellent fire resistance, low smoke emission, and a low level of toxic combustible products. It is the same material as for the current collector device.

Estimated weight including fuses: 8 kg

SHOE FUSE BOX

 Operator: BKV Zrt.

FUSE BOX

The same fuse box is used on motor and trailer cars. This is an individual box, fitted directly on the bogie by a supporting frame. There is a watertight compartment to protect the fuse.

Protection Degree: IP 55 according to IEC 529 standard.

Material: The insulating fuse box is made of a sheet moulding composite, which is an unsaturated polyester resin having 30% of fibber glass. It offers good mechanical properties, excellent fire resistance, low smoke emission, and a low level of toxic combustible products. It is the same material as for the current collector device.

Estimated weight including fuses: 8 kg
IN A FEW WORDS ...

There are currently 161 MF 2000 trainsets used on 3 of the Paris metro lines – these were delivered in 2008.

The MF 2000 trains are 5-car trainsets with a capacity ranging from 481 to 1,000 passengers. They are more spacious and eco-friendly than the former Paris metro trainsets, with a length of 75.8 m and an empty weight of 125.7 t.

Continuous power is 1,800 kW, while top speed is 70 km/h with an acceleration of 0.9 m/s.

FUSE BOX

This is an individual box, fitted directly on the bogie. There is a watertight compartment to protect the fuse. The insulating fuse box is made of a sheet moulding composite, which is an unsaturated polyester resin having 30 % of fibber glass.

Characteristics of the one-body fuses:
- Operating voltage: 750 V DC
- Current rating: 700 A
MP 05 - Paris
Operator: RATP

IN A FEW WORDS ...

MP05s are electric rubber-tired multiple units with automatic operation used on the Paris metro lines since 2011 in order to replace former MP89 trains. It is undeniably a model for technological innovation in railway industry.

About 80 MP05s were ordered for 2 of the Paris metro lines so far. These are formed of 6 to 8 cars and passenger capacity is nearly 800. The trainsets are 90.3 m long, 2.5 m wide and 3.5 m high. Top speed is 80 km/h, with a starting acceleration of 1.35 m/s.

FUSE BOX

This is an individual box, fitted directly on the bogie. There is a watertight compartment to protect the fuse. The insulating fuse box is made of a sheet moulding composite, which is an unsaturated polyester resin having 30 % of fibber glass.

Characteristics of the one-body fuses:

Operating voltage: 750 V DC
Current rating: 700 A
A FEW FIGURES ...

- The Santiago metro network has much developed since it began operation in 1975. It is currently 103-km-long with 108 stations spread out over 5 lines.

- The network is in service everyday from 6:00 AM to 11:00 PM. Average daily ridership is 2.3 million passengers.

- By 2017, there should be 2 more lines and 28 more stations. The network is to be extended by about 35 km.

FUSE BOX

This is an individual box, fitted directly on the bogie. There is a watertight compartment to protect the fuse. The insulating fuse box is made of a sheet moulding composite, which is an unsaturated polyester resin having 30% of fibber glass.

Characteristics of the one-body fuses:

Operating voltage: 750 V DC

Current rating: 700 A
### Shanghai Metro

**Operator:** Shanghai Shentong Metro Group

#### A FEW FIGURES ...

As of 2010, the Shanghai metro network is 420-km-long, has 12 lines and 278 stations. The Shanghai metro accounts for 75% of daily commutes in town with a daily ridership of more than 6 million passengers.

The network should have 18 lines and 524 stations by 2050. Its length should more than double in the coming decades.

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**FUSE BOX**

Nominal line voltage: \( \text{Un} = 1500 \text{ V DC} \) (1000V min – 1800V max)

RMS current: the total RMS current of whole train is 1300 A.

Fuse characteristics:

- **Operating voltage:** 1500 V DC
- **Current rating:** 500 A x 4
- **Bodies:** 4 cylindrical bodies, diameter 90 mm, length 254 mm
Amsterdam metro
Operator: GVB

A FEW FIGURES ...
- A 42.5-km-long network, with 52 stations spread out over 4 lines and an average daily ridership of 214,000 passengers
- 106 trains from 3 different series, with an average speed of 35 km/h and a top speed of 70 km/h
- 1 new line with 8 more stations and a new series of trains (23 M5) planned for 2017
A FEW FIGURES …

- **759** trains mostly measuring 154.2 m, with a top speed of 78 km/h
- A **71**-km-long network with **68** stations spread out over **4** lines
- Trains circulate up to **20 hours** a day
- Average daily ridership on working days: **1.11 million** passengers

Rated current: **750 A**

This device is composed of 1 power pole and 3 positions:

- Pole 1: Position Collector
  - Insulating Position
  - Position Workshop

This switch is actuated thanks to an electrical motor.

\[ U_{\text{motor}} = 750 \text{ V DC} \]
A FEW FIGURES ON THE PROJECT ...

- 3 lines forming a 60-km-long network planned for 2020, then a total of 5 lines forming a 231.5-km-long network between 2020 and 2050.

- The 22 first stations will be operational from 2014.

- Forecast average daily ridership (2014): 235,000 passengers

MANUAL EARTHING SWITCH

$U_{\text{motor}} : 750 \text{ V DC}$

5 power poles and 3 positions: Position Earth (1,200 A), Position Workshop (500 A), Position Collector (250 A)
ABOUT THE INSPIRO TRAINS ...

As they combine a large transport capacity with low operating costs and the eco-friendly aspect, the Inspiro trains are undeniably unique, practical and innovative at the same time. They were developed in compliance with the latest security standards and are modular in terms of size, capacity and motorization. The rate of recycling is 94.5%. The Warsaw metro will be the first equipped with the new Siemens Inspiro (35 trains expected in 2012). These trains will be 11.8-m-long, 2.7-m-wide and 3.7-m-high, with a weight of 165 t and a top speed of 90 km/h. The total passenger capacity will be 1,436 including 256 seats. The trains will also be equipped with a 750 V DC third rail system.

SWITCH

Rated current : 1200 A
This device is composed of 1 power pole and 3 positions:

Pole 1:
- Position Collector
- Insulating Position
- Position Workshop

This switch is actuated manually.

$U_{\text{motor}} = 750 \text{ V DC}$
Lightning Arresters – French National Railways

Total Length of the French Railways: 32,000 km

Operator: SNCF

10kA model

Mersen proposes to use a zinc oxide varistor combined with a fuse and an electric signaling system. Thanks to this system, it is now possible:

- To vastly improve the quality of power line protection by better peak let-through in overvoltage conditions. This is due to zinc oxide’s non-linearity factor, which is more suitable than silicon carbide’s.
- To eliminate the now superfluous air spark-gap because leakage current is significantly reduced, making it easier to install the product.
- To lengthen the product’s life span and improve peak let-through over time, because ZnO retains its initial properties better and longer.
- To avoid disturbing operation when the product has aged due to lightning striking too many times or too hard.
- To simplify maintenance. The defective device is immediately isolated and the blown fuse detection device trips a micro-switch to give remote warning of the state of the system. The element to be replaced is identified immediately.

THE FRENCH RAILWAY NETWORK ...

The French railway network is 32,000 km long in total and includes 14,800 kilometers of electrified lines and 1,850 kilometers of high-speed lines. 14,000 trains - regional trains as well as very-high-speed trains - run on the network every day in average.

Annual passenger ridership reaches 1.1 billion, while annual rail freight came to 40 billion tkms in 2007.