Cantenary systems for urban and mainline mass transit

Cantenary systems

TRAFFIC
WELCOME TO EUROPOLES

Whether for high-speed lines for the ICE, or for commuter train lines – Europoles offers you the optimal pole solution for catenary systems in applications for urban and mainline mass transit.

CONTENTS

Europoles – Poles and masts are our passion ............................................ 04
We are always there for you .......................................................................... 06
Intercity rail traffic – Networking the metropolises ............................... 08
Poles for high-speed lines – The C-Mast system ....................................... 10
Fastening technology ....................................................................................... 12
Europoles as a partner for major international projects ........................ 13
A city’s arteries – Local public transport ..................................................... 14
Spun concrete poles – Exciting technology, cost effectiveness, and innovative capacity .................................................................................. 16
Standard construction – The classic ............................................................. 17
Creativity without limits – Design for all requirements ......................... 18
Surfaces and visual appearance – Customisation as a design principle ............................................................................................. 19
Bracket fastening – Variable options ........................................................... 20
Decorative lighting brackets .......................................................................... 20
Steel poles – The all-rounders ........................................................................ 21
Pole types – Limitless variability in solid steel wall design .................... 22
Infrastructure slim fit – Our slender solution ........................................... 24
Coating – Creative, versatile, and colourful ............................................... 25
Foundation options – A solid base for the highest demands ............... 26
Barriers for level crossings made from GRP – More security in road traffic .......................................................... 28
EUROPOLES – POLES ARE OUR PASSION

Europoles is a leading European pole manufacturer with over 1,500 employees. Our many sales offices and production facilities mean that we are nearly always in the vicinity of our customers in Europe, and we have a presence in the Middle East and Africa as well.

Over our company’s 120 years of history, we have developed an extensive array of specialist knowledge when it comes to pole solutions. We possess engineering know-how for load-bearing systems ranging from the design phase to turnover delivery.

It is our passion to take on new challenges. Our business units have extensive knowledge of the standards and special requirements in many different regions and countries of the world. We are a long-term partner that designs and implements individual solutions for our customers.

Our leading position with respect to the pole construction materials of steel, pre-stressed spun concrete and glass-fibre-reinforced plastic (GRP) gives us an independent selection of the best possible material for each particular application. This may also include hybrid solutions. We are constantly developing these materials further and combining them with new, state-of-the-art production techniques. Whether it involves new concrete qualities, steels, laser welding or surface finishing methods – we advance innovation along with customer value.

Lighting
The Lighting business unit offers a broad spectrum of pole types. From standard poles to customer-specific solutions, everything comes to you from the same source. Whether the products are design-oriented or functional – from consultation through to structural analysis – we go by what the customer desires. We provide you with support for the details involved in pole footings and in connecting the lamps, floodlights or cameras to the load-bearing system. Besides steel as a raw material, we also offer concrete and GRP and can therefore meet your needs adequately.

Energy
In the Energy business unit, we offer a broad product portfolio for all voltage levels. Whether for concrete, steel or hybrid solutions (steel with GRP, concrete with steel) – what is of the essence to us is providing every customer as well as every location/route with a design that matches the specific circumstances. From routeing considerations to footing/base solutions, traverses, assemblies and even on-site project management. We accompany our customers as a consultant until they have achieved their goals.

Electricity for telecommunications installations, for illuminating entire streets, on rough terrain or in remote off-grid areas. Europoles has developed a system that is completely independent of the power grid, producing its own power in an environmentally-friendly way. The system generates electricity using wind and solar power as well as fuel cells. This gives you flexibility in using resources and lets you make plans with confidence. The flexibility of these modern technologies ensures that you will always have electricity flowing. Remote system monitoring offers you additional security and comfort.

Surfaces & Design
Europoles is the expert in special surface finishes. Give your poles an innovative finish. Whether it is a silky gloss, coarse or fine-textured finish required, we are flexible in turning your wishes into reality. Special anti-graffiti or anti-poster surface finishes ensure that nothing sticks on your pole – except for its beautiful appearance.

Communications
The Communications business unit designs and produces pole and roof stations for mobile communications customers. We offer complete solutions from a single source, from initial operation of the station to its subsequent service needs, be they inspections, swaps or software updates. This reduces the interfaces and expense for the customer when coordinating the various trades and services necessary for the smooth construction and efficient operation of mobile communications stations. We possess the required know-how, from planning the stations to the final hand-over and systems technology – making everything available from a single source and thus ideal for the customer.

Mobility
The Mobility business unit – rail, road, airport, seaport – provides its customers with high-tech solutions. Be it railway poles for high-speed routes or the most reliable lowering systems for airports – extremely high demands such as these have to be met reliably. Here as well, for the sake of the best solution for our customer, we resort to pre-stressed concrete, steel or, for railway crossing barriers, ultra-light GRP material.

Buildings & Security
In architecture, poles become columns. Design columns or storey supports – they all have one thing in common: extremely high load-bearing capacity combined with a slender form. We make it possible to achieve greater visibility and new design potential. World-renowned buildings have already put this to use, applying new design concepts.

Europoles is a long-term system partner in all of its business units – from the design phase to implementation. We put our decades of experience to good use for the benefit of our customers.
WE ARE ALWAYS THERE FOR YOU...

...in every project phase, with know-how and energy. This is how we safeguard your project and free up time for your key tasks. No other company in the world satisfies as many different pole design demands as Europoles. This is a wealth of experience that you should take advantage of... so that your project runs its course with no worries involved.

Our customers – our strengths

From small and medium-sized companies, to large corporate groups
- Companies that openly enter the market and exploit new chances
- Need innovative and precisely matched solutions
- Have achieved recognition with their competence and stability, and that expect the same from their partners

We are keenly aware of and fully appreciate
- Research and development, innovations, patents
- Project competence
- Capacity and investments

We are kind to the environment and to company budgets
- Reduced emissions – and materials and processes that are easy on resources
- Cost-benefit ratios that are optimized over the long run

We arouse enthusiasm by all means
- Know-how, international competence, extensive experience, certifications
- Advanced technologies: spun concrete, laser welding, fibreglass rotation processes, sophisticated surface finishing

We are an attractive business partner and employer
- Highly motivated and eager-to-work teams with project experience
- Comprehensive consulting, planning, structural design and engineering, manufacturing, surface finishing, logistics, construction services, and maintenance

...AND (ALMOST) ANYWHERE

Headquarter: Neumarkt i.d.OPf, Deutschland
Manufacturing locations:
Concrete: Deutschland, Oman, Marokko
Steel: Deutschland, Polen, Schweiz
FRP: Deutschland
Office / branch:
Deutschland, Großbritannien, Frankreich, Spanien, Polen, Algerien, Türkei, Marokko, Oman
INTERCITY RAIL TRAFFIC – NETWORKING THE METROPOLISES

New tracks are being laid in Europe. Borders have fallen; countries are growing together. There is an active expansion of rail infrastructure taking place. As a result, new infrastructure system solutions are being demanded from manufacturers and providers in order to meet the wide range of operators’ needs.

Europoles – the leading manufacturer of catenary poles
Europoles has been producing spun concrete poles since the end of the 1950s and, to date, has provided over 100,000 concrete poles for the German railway system. During that time, concrete pole technology has been continually developed.

Europoles has the most up-to-date expertise and many years of experience in this industry. We provide effective carrier systems which make rail traffic attractive and economical.

HIGH SPEED LINE PROJECTS (Speeds up to 330 km/h)
- Nuremberg – Ingolstadt
- Madrid – Seville
- Cologne – Frankfurt/Main
- Munich – Augsburg
- Hannover – Berlin
- Kassel – Würzburg
- Karlsruhe – Basel
- Erfurt – Ilmenau
- Halle – Leipzig
POLES FOR HIGH-SPEED LINES – THE C-MAST SYSTEM

High-speed rail traffic has special requirements for catenary carrier systems. At speeds of 330 km/h, moving trains cause massive air currents which must not be allowed to affect the function of the catenary installations.

In order to meet these requirements, Europoles, in cooperation with Deutsche Bahn, developed the C-Mast system, which is especially designed for this application. Today, this modular pole system is standard on all high-speed rail routes in Germany.

Thanks to the pre-stressed spun concrete construction with high-strength C80/95 concrete quality, the poles are maintenance-free and offer long-lasting corrosion protection. Their slender design makes it possible to erect the poles easily, even in tight spaces. A simple and fast foundation method was developed with the large pipe foundation. With their high stiffness, the poles exhibit the lowest static and dynamic deformation, thus preventing oscillation after the passage of trains.

Thanks to this design, there is almost no maintenance or follow-up costs in the long term for the carrier systems. Operators have long-term benefits from the high cost effectiveness of the entire system.
With our in-house statics and design department, we are able to call upon many years of empirical values in pole construction and foundation. Armed with this knowledge, we advise our customers on economical system solutions for poles and foundations specifically for their projects.

Abroad, we work together with competent partners locally on project planning and execution. These local partnerships greatly simplify the implementation of country-specific requirements and guidelines, thus saving a lot of time.

With our spun concrete plants in Germany, Morocco, and Oman, we are able to manufacture economically and in close proximity to our projects. We guarantee our high quality standards in all project phases, from planning support to the local production of poles – worldwide.

FASTENING TECHNOLOGY

In Germany, the poles are equipped with screw sockets for fastening add-on components. Their advantages are:

- high defined load-bearing capacity
- long lifetime thanks to being embedded in concrete
- simple connection to the earthing system of the pole ensures easy earthing
- allows the economical design of the mechanised catenary installation

With the fastening height of the add-on components determined in the planning process, the correct height of the components is preset following the calibration of the poles. As a result, mechanised construction of the catenary installation is possible. The quick installation contributes significantly to the cost effectiveness of the system.

For international projects, many customers require a flexible fastening height for the add-on components. A variety of methods are available for this. They include traditional steel couplings, tension bands, and bolts in drill holes.

EUROPOLES AS A PARTNER FOR MAJOR INTERNATIONAL PROJECTS

Europoles impresses above all through its high production capacities, rapid ability to deliver, and constant monitoring of quality demands through internal and external testing.

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A CITY’S ARTERIES —
LOCAL PUBLIC TRANSPORT

In today’s modern, populous cities, public transportation is one of the most important aspects of mobility. But public transportation is also playing an increasingly important role outside of these urban environments. Rail solutions are currently undergoing a renaissance. New technologies have increased the efficiency and cost effectiveness of this infrastructure.

Europoles offers the right pole solutions for catenary systems for local public transport, oriented to the individual requirements of each customer. We support our clients with comprehensive project management, from planning to project finish.

Steel or concrete, conical or cylindrical, circular, rhombic, or multi-sided poles. Beyond conventional standard poles, Europoles manufactures tailor-made carrier systems which integrate perfectly into the cityscape. Along with creative freedom, there is also technical variety. Extraordinary shapes, special colours, or special surface structures can be easily realised, as can solutions with multiple functions, such as catenary poles which also hold street lighting. Especially for the often cramped spaces in the urban environment, Europoles offers space-saving complete solutions with slender poles and foundations.

Due to its many years of experience in this field, Europoles can combine innovation, design, quality, and cost effectiveness in its products. Consultation, statics, production, delivery, and foundation work from a single source – and one that guarantees planning confidence, fast project handling, and high cost effectiveness.
SPUN CONCRETE POLES – EXCITING TECHNOLOGY, COST EFFECTIVENESS, AND INNOVATIVE CAPACITY

Particularly in an urban environment, concrete poles offer significant advantages, such as scratch and impact resistance, resistance to extreme environmental influences and vandalism. They also impress with extremely low lifecycle costs. Quality individualized Just as it does with the poles for intercity railways, Europoles also manufactures concrete poles for local public transportation using the proven centrifugal process. The concrete pole plant in Neumarkt works with the most up-to-date spun concrete technology. Despite their enormous load capacity, overhead lines made from spun concrete have very small diameters and an impressively slender silhouette. The hollow space in the interior of the pole offers a well-protected space for supply and disposal lines. Special solutions and adjustments to local conditions are developed by our team of expert structural and design engineers.

Robust and stable
Poles from Europoles made from prestressed spun concrete stand out through their extremely robust design. The centrifugal process produces an absolutely smooth and pore-free concrete surface. In addition, its prestressing gives the pole a high stiffness. Spun concrete poles are not only immune to vandalism and the effects of fire, they are also resistant to oscillations from overhead lines. Even aggressive environmental effects such as frost or air pollution do not damage the poles. Together with the scratch and impact resistant surface, these characteristics provide a very long lifetime with low maintenance and thus significant cost savings over the long term.

Long service life – positive ecological footprint
Spun concrete is a material with lots of amazing features: with a long life and an outstanding ecological footprint, it offers high planning reliability and the opportunity to invest in an environmentally friendly, high-class product. Poles made from spun concrete are up to 100% recyclable. Highly qualified personnel work to provide constant innovation, further development, and the highest quality. Fast and flexible production and on-time delivery are a matter of course for us.

Pre-stressed spun concrete poles are manufactured in a round-conical form with C80/95 concrete quality. All poles have CE certification. The manufacture and static dimensioning of the poles takes place in accordance with the respective country-specific standards.

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Deflection 1.5% Additional lengths and tensile force capacities on request

17

STANDARD CONSTRUCTION – THE CLASSIC
CREATIVE WITHOUT LIMITS – DESIGN FOR ALL REQUIREMENTS

Depending on individual requirements, any rotationally symmetric cross-section is possible: circular, elliptical, rectangular, and multi-sided. There is no limit to creativity and variety. We always give our customers room for their ideas. We can flexibly realise special solutions such as poles for the historical reproduction of the Giebichenstein Bridge in Halle, Germany.

The following forms can be implemented:

SURFACES AND VISUAL APPEARANCE – CUSTOMISATION AS A DESIGN PRINCIPLE

Spun concrete poles from Europoles offer many options for creating a unique look. A wide palette of colours and structures allow great freedom in surface design.

Surfaces and colours
There is no limit to the creative freedom – even on the surface, anything is possible!
The concrete poles can be given an individual and unique look through colouring of the white cement, special additives, and subsequent surface handling such as sandblasting, chiseling, granulating, or polishing, as well as through special inlays.
Catenary poles for light rail traffic – Unlimited variability in solid steel

The design of catenary poles ranges from round-conical to round stepped poles to multi-sided and rhombic steel poles. Every pole is structurally designed in accordance with customer requirements and equipped with the add-on components needed. Depending on local requirements, we offer extensive integration with traffic management systems, signage, signalers, and lighting. Customised projects are a welcome challenge for which we will happily offer you the right solution.

Solid steel wall poles are known for their especially long service lives. They offer an impressive torsion bearing capacity and guarantee the highest operational reliability. We support you in all services related to the carrier systems, from planning to realisation. Our range of services includes integrated consulting, planning, construction and statics, production, coating, logistics, and maintenance of your catenary installation projects.

The poles are hot-dip galvanised inside and out to protect against corrosion in accordance with DIN EN ISO 1461 and can be coated with the desired colour in the plant.

We will be glad to answer your questions regarding planning the pole foundation. Possible foundation options can be found on page 26 and 27.
POLE TYPES – LIMITLESS VARIABILITY IN SOLID STEEL WALL DESIGN

Round-conical poles
The round-conical catenary pole consists of shaped, seam-welded steel plate which can be manufactured to a length of up to 14.3 metres without cross welding. Due to new manufacturing options, the smallest top end and foot diameters can be realised with large wall thickness. Despite carrying high loads, Europoles poles offer a slender pole design, which means they fit easily in the modern urban space. Thus, Europoles meets the increasing aesthetic demands of the cityscape.

Round-stepped poles
The round-stepped catenary poles are flanged and peripherally welded on the butt joints. The dimensions are oriented on the available pipe diameters. The pipe lengths and cross-section changes are selected to create an appealing and attractive overall pole image.

Multi-sided poles
Solid steel poles with a multi-sided cross-section (triangular to hexagonal) can be manufactured up to a length of 14.3 metres without cross welding. Despite high wall thicknesses, the poles impress with their slender construction, which allows them to be ideally integrated into the cityscape.

Design solutions – room for your ideas
We would be pleased to work with you to develop design solutions that enhance the cityscape. Whether for the reproduction of a historic pole design or the development of a modern pole, with our in-house engineering, Europoles is an ideal partner for creating special designs. From initial consultation through to engineering calculations, production, and delivery, we will help you realise your projects.

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**Basic Processing Guidelines**

<table>
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<tr>
<th>Corrosive Categories</th>
<th>C1 – C3</th>
<th>C4 – C5</th>
<th>DESERT AREAS</th>
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<tr>
<td>Grinding off zinc run-off projections on zinc-plated poles/tubes</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Mechanical smoothing/dressing with zinc-plated poles/tubes</td>
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<td>12944 / 55633</td>
<td>goes beyond DIN</td>
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<td>Prime examples</td>
<td>City and rural areas</td>
<td>Industry and coast</td>
<td>Desert</td>
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<tr>
<td>Duration of protection</td>
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**Coating – Creative, Versatile, and Colourful**

Europoles is your expert for standard and special coatings using wet painting and powder coating. Depending on location, we will recommend the most economical coating solution for your project. The coating version will be determined according to the local corrosivity categories.

**Anti-poster**
- Protects all pole surfaces
- Transparent coating system
- Posters and stickers will not adhere to your pole

**Anti-graffiti**
- Protects your poles from graffiti, markers, and ink
- Outstanding resistance to weather, high UV, and chemicals
- Creates a permanent barrier coat thanks to a homogeneous surface
- The protected surface can be repeatedly cleaned with a special cleaner without needing recoating
- Graffiti and paint can be easily removed from this surface

**Infrastructure Slim Fit – Our Slender Solution**

### Octagonal

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<tr>
<th>Lengths [m]</th>
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### Round-conical

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FOUNDATION OPTIONS – A SOLID BASE FOR THE HIGHEST DEMANDS

Depending on the requirements of the local conditions – for example soil conditions and space requirements – Europoles offers the right pole foundation for your catenary system. We have compiled an overview of the most common foundation versions for light rail and intercity transport.

- **Pole outer pipe foundation**
  - No excavation is necessary
  - Short pole insertion length possible
  - Well suited for poorly supporting soils
  - Fast and simple erection

- **Pole inner pipe foundation**
  - No excavation is necessary
  - Compact space requirements
  - Well suited for poorly supporting soils
  - Fast and simple erection

- **Borehole foundation**
  - Fast and easy erection
  - Simple installation, with little mechanical work
  - Excavation is necessary

- **Block foundation with base plate**
  - Block foundation with base plate
  - Excavation is necessary
  - Additional work for base plate and anchor rods
  - Simple pole installation and exchange
  - Shorter pole length

- **Block foundation with sleeve**
  - Excavation is necessary
  - Increased time required
  - Simple execution with little equipment required

Filled narrow joint between pole and pipe
Positioning guide for centering the mast
Steel pipe, rammed or lowered into a borehole (pipeline pipe)

Opening for filling the joint Mounting rod
Narrow but sufficient filled joint between pole and pipe
Rammed pipe, with or without Peine section

Borehole without additional components
Filled joint between pole and earth, as per borehole

Borehole, without additional components
Filled narrow joint between pole and pipe
Positioning guide for centering the mast
Steel pipe, rammed or lowered into a borehole (pipeline pipe)
BARRIERS FOR LEVEL CROSSINGS MADE FROM GRP – MORE SECURITY IN ROAD TRAFFIC

We deliver half-length, full-length, and pedestrian barrier poles: all of which must be easily visible and must reliably provide the required protection. Europoles, with its FRP level-crossing barrier poles, that are available as round and rectangular sections, fulfills precisely these requirements. As Q3 supplier for Deutsche Bahn AG for many years, these barriers fulfill the strict technical regulations of German National Railways and have proved widely popular both in Germany and around the world.

FRP level-crossing barrier poles are available in standard white. Dying of the polyester resin, however, enables a great diversity of RAL color shades. Painting afterward is not necessary.

Every Europoles barrier pole is provided with a weather-resistant, highly reflective signal film that focuses incident light and reflects it without glare. Various types, colors, and dimensional patterns of the film are available, depending on country specifications.

Various special features can be integrated into these FRP poles: e.g. LED illumination and pole-fracture monitoring – which makes customized design and solutions possible.

Flexible owing to modular design
These barrier poles are modular in design and are available in various lengths. Pole sections A and B are individually exchangeable and can be newly configured as required. Special solutions are available upon request.

Our customers:
Deutsche Bahn AG | Scheidt & Bachmann GmbH | Siemens AG | Pintsch Bamag GmbH | Dr. techn. Josef Zelisko GmbH (Knorr Bremse)

Our references:
Germany | Austria | Saudi Arabia | Italy | Switzerland | Netherlands | Norway | Great Britain | Hungary | Greece | Poland

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Various mounting fixtures can be used to attach Europoles FRP barrier poles to any type of motor drive system. Europoles engineering staff develop any adapter solutions necessary.
The centrifugal manufacturing process provides Europoles FRP poles with a dense and absolutely smooth surface that is impervious to the weather. Such poles are also not subject to corrosion. In addition to their great ultraviolet resistance, this leads to a service life of at least 25 years. This material is perfectly suited for all requirements placed on barrier poles, since FRP has excellent vibration-attenuation properties and can therefore resist great dynamic loads. This protects not only the pole, but also the motor drive system.

Owing to their long service lives and lack of subsequent costs for maintenance and repair, Europoles FRP barrier poles are a highly cost-effective solution and are absolutely maintenance-free. The FRP profile section is rugged against dents, which reduces damages to a minimum from transport, installation, and vandalism. The low intrinsic weight of the poles and their modular design with maximum segment lengths of 6 meters reduce costs for the motor drives and counter-weights, and for transport. Handling and installation are possible by only one person.

Owing to the great resistance of fiberglass-reinforced plastics (FRP) to vibrations, Europoles barrier poles for level crossings do not suffer from uncontrolled fatigue fracture. At level railway crossings with barriers, this plus in safety can save lives. Even in case of a crash, Europoles has provided for the safety of those involved. If a vehicle crashes through a closed barrier, it will break at pre-defined planned fracture points, at a short distance from the pole mounting point. These design features prevent the pole from bending and intruding into the track or roadway zones. Unlike splintering breaks, these planned fractures are smooth and prevent further injuries – and minimize damage to the vehicles involved.

As excellent electrical insulation, FRP also provides maximum personal safety for the case that the pole comes into contact with the train catenary power lines. In addition, FRP is highly fire resistant – which is the reason that our FRP products are also widely used at airports, with their stringent safety regulations.

As a result of increasingly strict safety regulations on the international railway market, Europoles has developed a pole-breakage monitoring system for round barrier poles. This system is based on a copper stranded conductor permanently embedded by centrifuging into the wall of the pole during production. This conductor is completely maintenance-free and reliably detects any fracture along the entire pole length, by interruption of a safety circuit.

If a vehicle crashes through the barrier pole, a transmitted signal will stop any approaching train. This signal is sent exclusively upon such fracture of a barrier pole.

Special features:

- Absolutely maintenance-free copper stranded conductor, embedded by centrifuging
- Savings in costs and time by minimal expense for inspection of the barriers