

RENEWABLE ENERGY

Teknos Solutions for Wind Turbines

TEKNOS IN BRIEF

Founded in 1948, Teknos has operated for over 70 years, evolving into one of Europe's leading suppliers of industrial coatings with a strong position in retail and architectural coatings.

Teknos is a global coatings company with operations in more than 20 countries in Europe, Asia, and the USA.

Teknos is a family owned business, which enables the Company to take on long-term business views to facilitate flexible and quick decision making. The family ownership is reflected in Teknos' values and corporate culture.

Teknos is widely known as an innovative and technology oriented Customer-focused company. We are proud of our reputation, our heritage and especially our professional and strongly committed employees - the key resource in Teknos' success story.

Teknos' "Global-Local service" concept for our customers

Through our Global-Local service strategy, we strive to provide a high-level of local customer service as to ensure fast and accurate deliveries. For the areas where we are present, the services concept includes local Sales, tinting possibilities, technical support and R&D service in local language.

Outstanding technical service is an important part of our Global-Local service concept. We aim to support our customers at our very best to utilize all the benefits that our technically advanced and cost effective products have to offer.

OUR CUSTOMER PROMISES

Technically
advanced
products

Great
technical
service

Reliable
delivery

Consistent
quality

Local
presence

Quality and Environment

Comprehensive attention to environmental issues is one of the cornerstones of Teknos' business. We continuously work to develop our products to make them more environmentally friendly and take environmental impacts into account in all our endeavours.

Teknos' production facilities are certified and operated in accordance with the quality and environmental management systems of the standards ISO 9001 and ISO 14001.

Teknos' core products are based on water-borne, low-solvent or full solvent-free formulations, all developed with the aim to minimize impact on the environment and improve health and safety. Our compliance with the REACH chemicals legislation supports our fulfillment of safety requirements for both humans and environment – an integral of the Teknos' product development program.



TEKNODUR COMBI 3560

An innovative fast curing and high solids product optimized for wind turbine structures

Low VOC emissions

Thanks to its high solids content, which can be adjusted to a full 100%, the TEKNODUR COMBI 3560 series emits less VOC than seen for water-borne polyurethane paint products.

Fast throughput by rapid curing

The curing profile of the TEKNODUR COMBI 3560 series is made adjustable to ensure that it meets our customers' needs at the utmost satisfaction. The actual drying/curing time at room temperature can be selected from less than one hour and up to several hours when required. Immediately after drying, the work pieces are ready for the next step in the process. This significantly shortens the throughput time in the paint shop, saving time and money. Additional savings are achieved by lower energy costs as the short drying process does not require for the extended elevated temperatures of conventional methods.

Less layers, direct to metal solutions

In pursuit of higher efficiency and quality, more and more paint shops are exploring the possibilities of the direct-to-metal, DTM, solutions. The TEKNODUR COMBI 3560 product family contains anti-corrosion pigments and fulfils the ISO 12944 requirements for one-layer paint systems. For outer surfaces of wind turbine structures two-layer systems are available up to corrosivity category C5-M/High. With a three-layer system it is possible to reach NORSOK M-501 requirements.

Appealing looks that last

The TEKNODUR COMBI 3560 coats are tough with high impact resistant, effectively reducing the need for touch-up repair work. The finished coat gives good resistance to weathering and resistance to a number of chemicals.

The various products in the new series are suited to a wide range of applications, either as a direct-to-metal alternative or in combination with a compatible primer. Certain variants of TEKNODUR COMBI 3560 can be applied directly to shot-blasted steel, aluminium surfaces, thermally sprayed zinc coatings and concrete substrate.

The TEKNODUR COMBI 3560 product family is the perfect solution for paint applicator and designer that strive to reduce VOC emissions along with reduced production costs and while still ensuring a high-quality level.





TEKNOS' PAINT SYSTEMS FOR WIND TURBINE TOWERS AND STRUCTURES

Teknos is providing strong evidence of its expertise in the surface treatment of wind turbine structures. Alongside traditional solvent-based products, Teknos has developed alternative water-based and high solids solvent-based paints for turbine structure surfaces. The adoption of the EU's VOC directive on the restriction on solvent emissions has fostered this development.

A successful surface treatment requires that the work must have been systematically planned when the time comes to select the combination of paints to be used. We have developed our paint systems to meet EN ISO 12944, EN ISO 20340 and NORSOK M-501.

Teknos has an extensive product range and we can provide the correct paint systems for the structures in different environments, including onshore and offshore wind power turbine structures.

Summary of paint systems for exterior and interior surfaces of wind turbine steel and cast iron structure

| Paint system/Corrosivity category | Type | DFT (µm) | VOC (g/m²) | Drying time (h) | Paint volume (L/100m²) |
|---|------------------|----------|------------|-----------------|------------------------|
| HIGH SOLIDS SYSTEM C3-high Exterior, Interior surfaces | PUR | 200 | 62 | 1,5 | 26 |
| HIGH SOLIDS SYSTEM C3-high Exterior, Interior surfaces | EP(Zn)+PUR | 200 | 98 | 3 | 30 |
| STANDARD SYSTEM C4-high Exterior | EP(Zn)+EP+PUR | 240 | 158 | 9 | 41 |
| STANDARD SYSTEM C5M-high Exterior, Interior surfaces | EP(Zn)+EP+EP+PUR | 320 | 197 | 10 | 53 |
| FAST DRYING – HIGH SOLIDS SYSTEM C5M-high | EP(Zn)+PUR | 300 | 129 | 3,5 | 43 |
| ULTRA FAST DRYING / ULTRA HIGH SOLIDS SYSTEM C5M-high | TSM+PUR | 300 | 75 | 1,5 | 37 |
| FAST DRYING – HIGH SOLIDS SYSTEM C5M-high NORSOK M-501 | EP(Zn)+PUR+PUR | 280 | 120 | 4 | 40 |

Exterior and interior surfaces of structures

FAST DRYING – HIGH SOLIDS SYSTEM C3-high:

| Product name | Type | DFT (μm) | Volume solids (%) | Theo. Spreading (m^2/L) | VOC (g/l) | VOC (g/m^2) | Drying time (h) | Paint volume ($\text{L}/100\text{m}^2$) |
|---------------------|------|--------------------------|----------------------|--|-------------------------|---------------------------|--------------------|--|
| TEKNODUR COMBI 3560 | PUR | 200 | 77 | 3,9 | 240 | 62 | 1,5 | 26,0 |
| Total | | 200 | | | | 62 | 1,5 | 26 |

Exterior and interior surfaces of structures

FAST DRYING – HIGH SOLIDS SYSTEM C3-high, A3.11

| Product name | Type | DFT (μm) | Volume solids (%) | Theo. Spreading (m^2/L) | VOC (g/l) | VOC (g/m^2) | Drying time (h) | Paint volume ($\text{L}/100\text{m}^2$) |
|---------------------|---------|--------------------------|----------------------|--|-------------------------|---------------------------|--------------------|--|
| TEKNOZINC 80 SE | EPZn(R) | 60 | 50 | 8,3 | 450 | 54 | 2 | 12 |
| TEKNODUR COMBI 3560 | PUR | 140 | 77 | 5,5 | 240 | 44 | 1 | 18,2 |
| Total | | 200 | | | | 95 | 3 | 30 |

Exterior surfaces of structures

STANDARD SYSTEM C4-high, A4.15

| Product name | Type | DFT (μm) | Volume solids (%) | Theo. Spreading (m^2/L) | VOC (g/l) | VOC (g/m^2) | Drying time (h) | Paint volume ($\text{L}/100\text{m}^2$) |
|------------------------|---------|--------------------------|----------------------|--|-------------------------|---------------------------|--------------------|--|
| TEKNOZINC 80 SE | EPZn(R) | 60 | 50 | 8,3 | 450 | 54 | 1 | 12 |
| TEKNOPLAST PRIMER 7-01 | EP | 120 | 66 | 5,5 | 320 | 58 | 2 | 18,2 |
| TEKNODUR 0050 | PUR | 60 | 56 | 9,3 | 430 | 46 | 6 | 10,7 |
| Total | | 240 | | | | 155 | 9 | 40 |

Exterior and interior surfaces of structures

STANDARD SYSTEM C5M-high, A5M.65

| Product name | Type | DFT (μm) | Volume solids (%) | Theo. Spreading (m^2/L) | VOC (g/l) | VOC (g/m^2) | Drying time (h) | Paint volume ($\text{L}/100\text{m}^2$) |
|------------------------|---------|--------------------------|----------------------|--|-------------------------|---------------------------|--------------------|--|
| TEKNOZINC 80 SE | EPZn(R) | 60 | 50 | 8,3 | 450 | 54 | 1 | 12 |
| TEKNOPLAST PRIMER 7-01 | EP | 100 | 66 | 6,6 | 320 | 48 | 1 | 15,2 |
| TEKNOPLAST PRIMER 7-01 | EP | 100 | 66 | 6,6 | 320 | 48 | 2 | 15,2 |
| TEKNODUR 0050 | PUR | 60 | 56 | 9,3 | 430 | 46 | 6 | 10,7 |
| Total | | 320 | | | | 197 | 10 | 53 |

Exterior and interior surfaces of structures

FAST DRYING – HIGH SOLIDS SYSTEM C5M-high

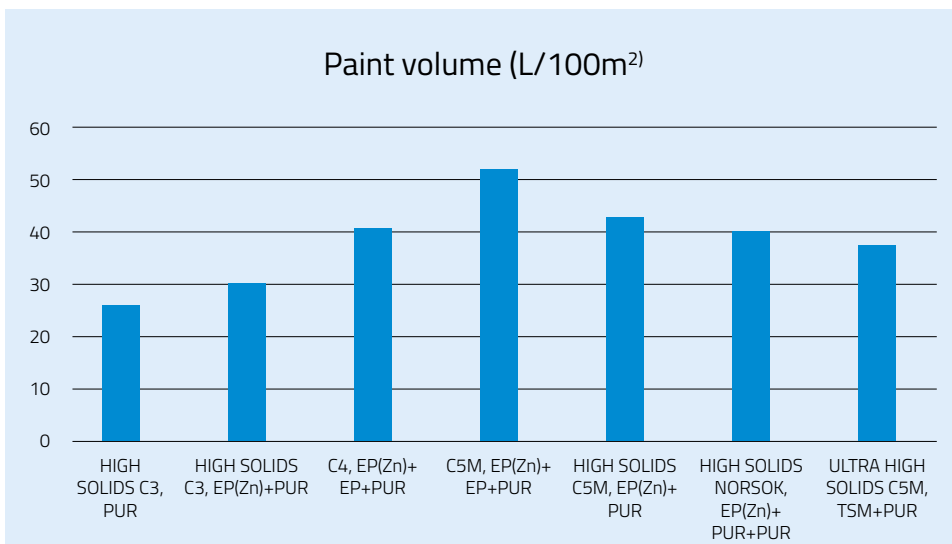
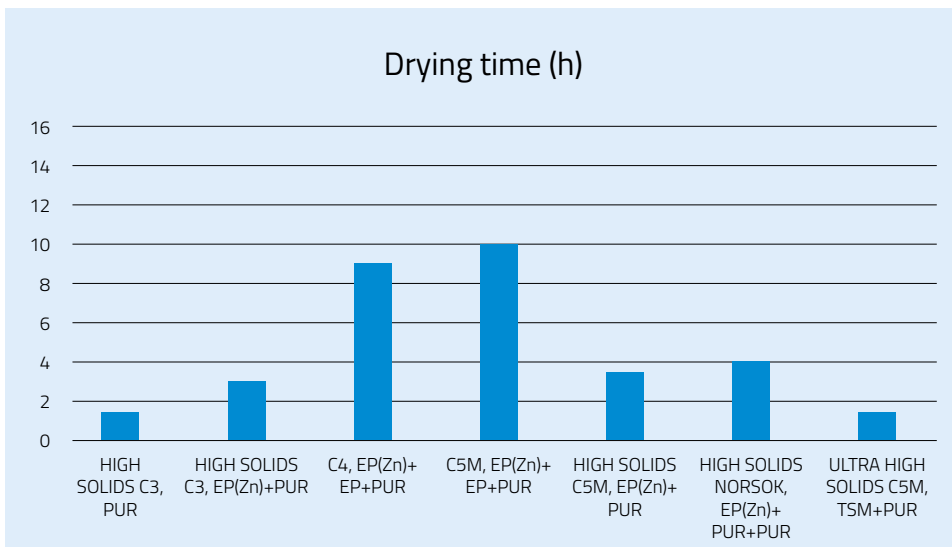
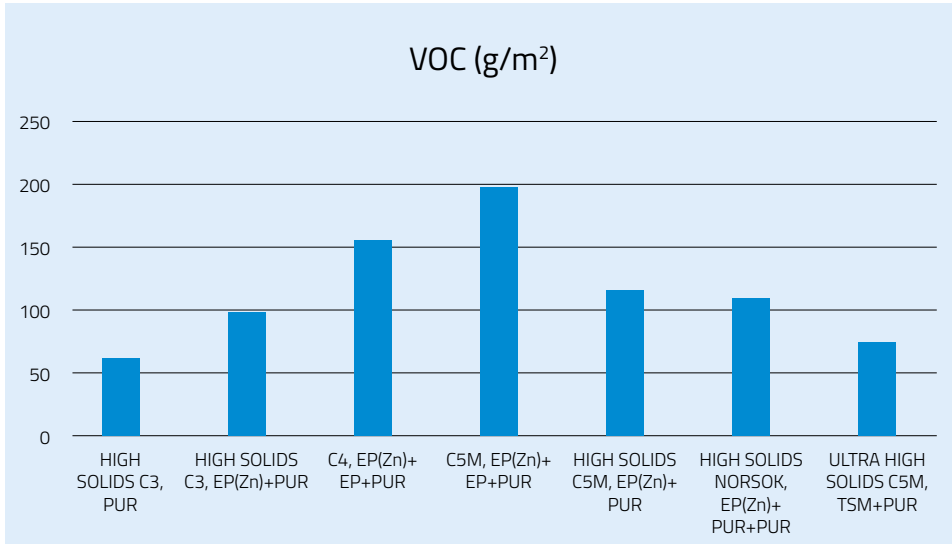
| Product name | Type | DFT (μm) | Volume solids (%) | Theo. Spreading (m^2/L) | VOC (g/l) | VOC (g/m^2) | Drying time (h) | Paint volume ($\text{L}/100\text{m}^2$) |
|---------------------|---------|--------------------------|----------------------|--|-------------------------|---------------------------|--------------------|--|
| TEKNOZINC 80 SE | EPZn(R) | 60 | 50 | 8,3 | 450 | 54 | 2 | 12 |
| TEKNODUR COMBI 3560 | PUR | 240 | 77 | 3,2 | 240 | 75 | 1,5 | 31,2 |
| Total | | 300 | | | | 126 | 3,5 | 42 |

* 23°C 50%RH

Exterior and interior surfaces of structures

ULTRA FAST DRYING – ULTRA HIGH SOLIDS SYSTEM C5M-high

| Product name | Type | DFT (μm) | Volume solids (%) | Theo. Spreading (m^2/L) | VOC (g/l) | VOC (g/m^2) | Drying time (h) | Paint volume ($\text{L}/100\text{m}^2$) |
|---------------------|------|--------------------------|----------------------|--|-------------------------|---------------------------|--------------------|--|
| TSM (Zn, ZnAl) | TSM | 60 | 100 | 16,7 | 0 | 0 | | 6,0 |
| TEKNODUR COMBI 3560 | PUR | 240 | 77 | 3,2 | 240 | 75 | 1,5 | 31,2 |
| Total | | 300 | | | | 75 | 1,5 | 37 |



Fast drying – high solids system c5m-high

NORSOK M-501 System no. 1

| Product name | Type | DFT (µm) | Volume solids (%) | Theo. Spreading (m ² /L) | VOC (g/l) | VOC (g/m ²) | Drying time (h) | Paint volume (L/100m ²) |
|---------------------|---------|----------|-------------------|-------------------------------------|-----------|-------------------------|-----------------|-------------------------------------|
| TEKNOZINC 90 SE | EPZn(R) | 60 | 53 | 8,8 | 450 | 51 | 2 | 11,3 |
| TEKNODUR COMBI 3560 | PUR | 110 | 77 | 7,0 | 240 | 34 | 1 | 14,3 |
| TEKNODUR COMBI 3560 | PUR | 110 | 77 | 7,0 | 240 | 34 | 1 | 14,3 |
| Total | | 280 | | | | 120 | 4 | 40 |

Splash zone, TP and jackets for wind turbine foundations

NORSOK M-501 System no. 7A

| Product name | Type | DFT (µm) | Volume solids (%) | Theo. Spreading (m ² /L) | VOC (g/l) | VOC (g/m ²) | Drying time (h) | Paint volume (L/100m ²) |
|-----------------------|------|----------|-------------------|-------------------------------------|-----------|-------------------------|-----------------|-------------------------------------|
| TEKNOMASTIC 80 PRIMER | EP | 200 | 82 | 4,1 | 200 | 49 | 4 | 24,4 |
| TEKNOMASTIC 80 PRIMER | EP | 200 | 82 | 4,1 | 200 | 49 | 4 | 24,4 |
| TEKNOMASTIC 80 PRIMER | EP | 200 | 82 | 4,1 | 200 | 49 | 6 | 24,4 |
| Total | | 600 | | | | 146 | 14 | 73 |

Submerged, MP and jackets for wind turbine foundations

NORSOK M-501 System no. 7B

| Product name | Type | DFT (µm) | Volume solids (%) | Theo. Spreading (m ² /L) | VOC (g/l) | VOC (g/m ²) | Drying time (h) | Paint volume (L/100m ²) |
|-----------------------|------|----------|-------------------|-------------------------------------|-----------|-------------------------|-----------------|-------------------------------------|
| TEKNOMASTIC 80 PRIMER | EP | 175 | 82 | 4,7 | 200 | 43 | 4 | 21,3 |
| TEKNOMASTIC 80 PRIMER | EP | 175 | 82 | 4,7 | 200 | 43 | 4 | 21,3 |
| Total | | 350 | | | | 85 | 8 | 43 |



High strength system for heavy loaded areas, e.g. boat landing structures

Polyurea system – Ultra fast drying

Exceptional mechanical and weathering properties for heavy duty applications

| Product name | Type | DFT (μm) | Volume solids (%) | Theo. Spreading (m^2/L) | VOC (g/l) | VOC (g/m^2) | Drying time (h) | Paint volume ($\text{L}/100\text{m}^2$) |
|--------------|------|--------------------------|----------------------|--|-------------------------|---------------------------|--------------------|--|
| TEKNOPUR 300 | PUR | 3 000 | 100 | 0,3 | 0 | 0 | 0,01 | 300,0 |
| Total | | 3 000 | | | | 0 | 0,01 | 300 |

TEKNOS' PAINT SYSTEM FOR WIND TURBINE BLADES AND FIBERGLASS STRUCTURES

Teknos is an expert in producing paints and coatings for metal surfaces, and also for fiber-glass reinforced composites. One of the best examples of Teknos' recent product development is the paints and coatings specially developed for wind turbine blades.

The Teknos product family for wind blades consists of a full range of products, from priming to finishing paints, and putties. Teknos's advanced coatings technologies enhance the efficiency, performance and longevity of wind blades. This paint protection system for wind blades has been proven in different environment to perform in atmospheres ranging from challenging to harsh.

TEKNODUR 3572-02 High-performance paint system for wind turbine blades

APPLICATIONS

Surface of wind turbine blades or other fiber glass components.

PRODUCTS

- TEKNOPOX 2118 Putty
- TEKNODUR 3572-09 Primer
- TEKNODUR 3574 Pinhole Filler
- TEKNODUR 3572-02 Topcoat
- TEKNOSOLV 9521/9526 Thinners
- TEKNOCLEAN 6496 for 2K-equipment cleaning

APPLICATION CONDITIONS

Humidity must be below 70% RH at ambient temperature (15– 30°C) or at elevated temperatures.



DNV-GL Approved Blade system (no. WP 1520022 HH)

Fast drying system: Blades

| Product name | Type | DFT [μm] | Volume solids [%] | Theo. Spreading [m ² /L] | VOC [g/L] | VOC [g/m ²] | Drying time [h] | Paint volume [L/100m ²] |
|------------------|------|----------|-------------------|-------------------------------------|-----------|-------------------------|-----------------|-------------------------------------|
| TEKNODUR 3572-09 | PUR | 80 | 75 | 9,4 | 235 | 25 | 1 | 10,7 |
| TEKNODUR 3572-02 | PUR | 80 | 70 | 8,8 | 260 | 30 | 1 | 11,4 |
| Total | | 160 | | | | 55 | 2 | 22 |

FEATURES

- Excellent adhesion and pull-off strength
- High solids content and low VOC emissions
- Designed for fast application with 2K-equipment
- Smooth surface with desired gloss level
- Excellent weather and abrasion resistance

BENEFITS

- Significantly improved application efficiency
- No need for elevated curing temperature
- Fast drying in normal room temperature
- Extended blade and film life cycle
- Suitable for different environments



Courtesy of ABB

TEKNOS' PAINT SYSTEMS FOR WIND TURBINE COMPONENTS

Teknos has a long tradition of developing and supplying paint products for components within the wind power industry. With both wet paint systems as well as powder coating solutions for generators, transformers and electrical motors, Teknos has been there since the early start of the modern wind turbine design.

Teknos products for wind turbine components are based on water-borne, low-solvent or full solvent-free formulations and a wide range of powder coating solutions designed for both smooth and blasted surfaces. For materials such as steel, including thin plate structures, cast iron, aluminum and fiberglass substrate, Teknos products range meets the most Corrosivity categories and special functionality to ensure a design life aimed for.

Please contact Teknos for the optimal coating specification that meets your design requirements.





Da Ban Cheng wind farm in the People's Republic of China

TEKNOS' TECHNICAL SERVICE

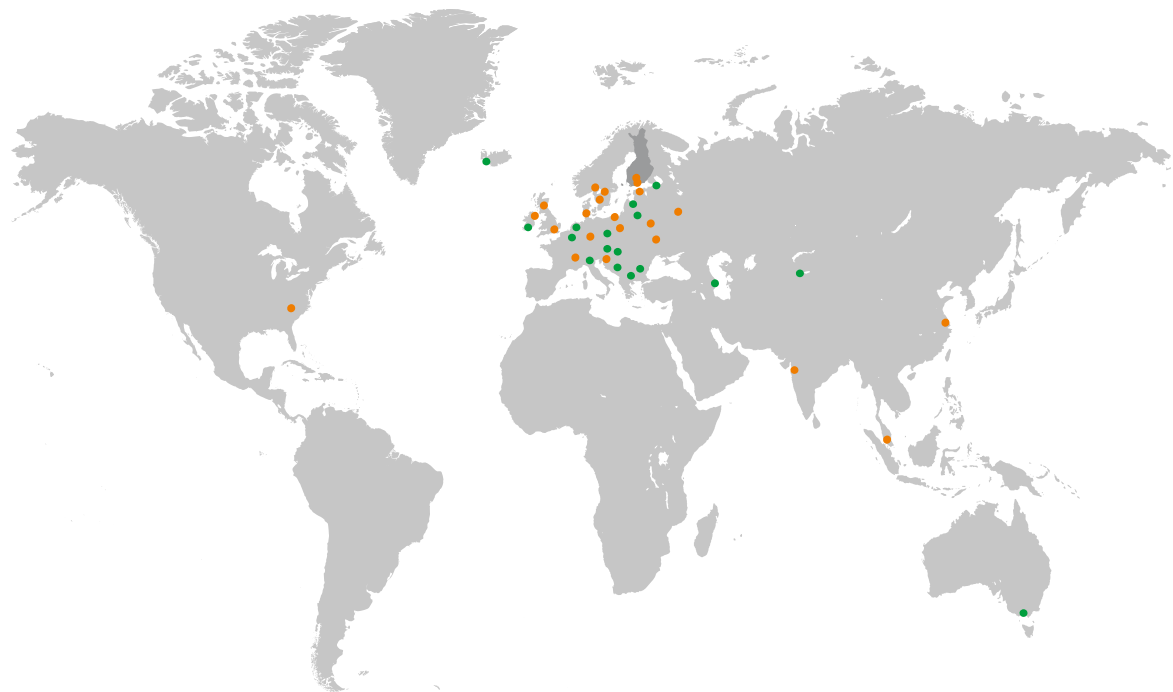
According to research, up to 95% of the painting problems are caused by improper surface preparation and insufficient quality in the application process. This indicates why good surface preparation and optimal application work play a crucial role, when our customers are looking for long-lasting protective paint systems.

Teknos' technical service engineers have a wide and deep experience in the industrial painting field and will readily assist to ensure the very best performance when using Teknos paint products.



THE TEKNOS GROUP

Teknos is a global coatings company with operations in more than 20 countries in Europe, Asia, and the USA. It employs approximately 1,700 people and makes annual net sales of approximately EUR 400 million. Teknos is one of the leading suppliers of industrial coatings with a strong position in retail and architectural coatings. Teknos wants to make the world last longer by providing smart, technically advanced paint and coating solutions to protect and prolong. Teknos always works in close cooperation with its customers. It was established in 1948, and is one of Finland's largest family-owned businesses. For further information, visit www.teknos.com



● GROUP COMPANIES

● NETWORK OF DEALERS

www.teknos.com