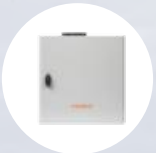
Stop Corrosion. Save Costs. Protect Concrete Structures.

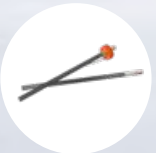
Next-Generation Cathodic Protection

24



1

1



284

Hauptstätterstraße Underground Parking Garage, Stuttgart: 5,000 m²

Challenge: Elevated chloride and CO_2 exposure

Solution: Installation of anode mesh systems and rod anodes, including decentralized control by Noxeco

Result: Long-term corrosion protection with continuous monitoring

Contents

4 **Causes of Reinforced Concrete Damage**
Why reinforced concrete structures age earlier than expected.

6 **A Financially Sustainable Solution**
Cost efficiency today. Reliability for decades.

9 **CP Installation in Practice**
Minimal effort. Maximum protection.

12 **The CP Principle**
Powerful protection through low-voltage current.

14 **The Noxeco Expertise**
Digital CP systems. Simpler, more efficient, smarter.

16 **Reference Projects**
Satisfied clients from all regions.

22 **Planning, Consulting and Ongoing Service**
Innovative concepts. Carefully considered from start to finish.

25 **The Benefits of Partnering with Noxeco**
Install, protect – and breathe easy.

Why Reinforced Concrete Structures Age Earlier Than Expected.

Corrosion of reinforcement steel is one of the most common causes of damage in concrete structures. Moisture, salts, and CO_2 are the main contributing factors.

Corrosion Caused by Salts
Moisture is one of the main triggers of corrosion. In parking structures, for example, vehicles can carry up to 10 liters of salt-contaminated water into the building during snowfall via their wheel wells.

The salts dissolved in the water penetrate through pores, cracks, or joints until they reach the reinforcement steel. Corrosion begins once the steel is exposed. As rust expands in volume, internal stresses develop within the concrete, causing the first surface spalling to appear. Freeze-thaw cycles further accelerate this process.

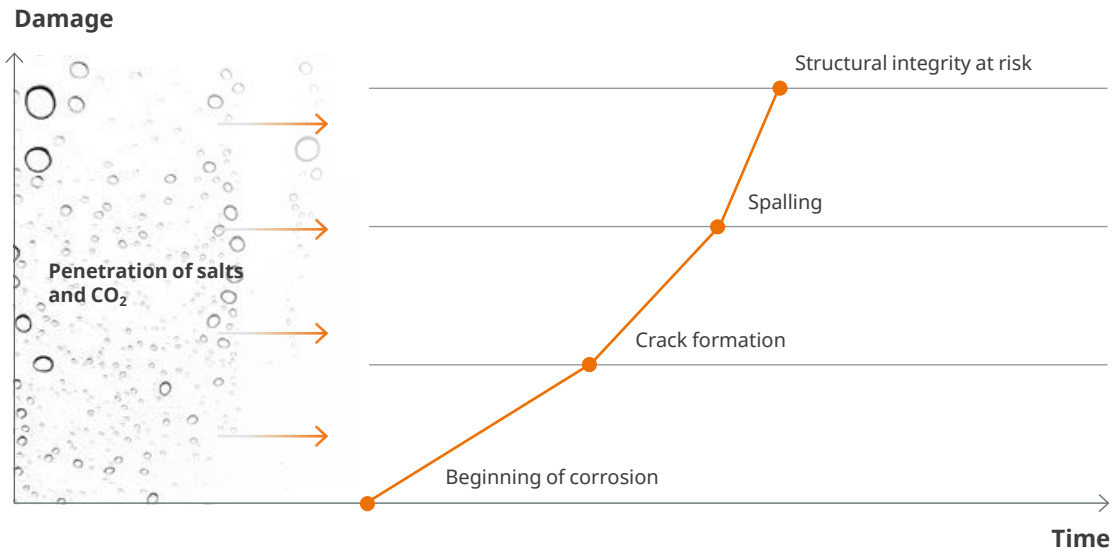
Corrosion can remain unnoticed inside the concrete for a long time. Damage is often only detected once larger areas have already been affected.

CO_2 Damage in Concrete Structures
Carbon dioxide (CO_2) can also attack reinforced concrete. When the gas penetrates the concrete, the pH value decreases – a process known as carbonation. As a result, the steel loses its protective alkaline environment and becomes vulnerable to corrosion.

The combination of chlorides and CO_2 is particularly critical. In such cases, corrosion progresses significantly faster and can drastically reduce the service life of the structure.

Structures Particularly Affected by Corrosion:
- Parking structures
- Underground parking garages
- Bridges
- Tunnels
- Industrial buildings
- Harbor structures

Life Cycle of Reinforced Concrete



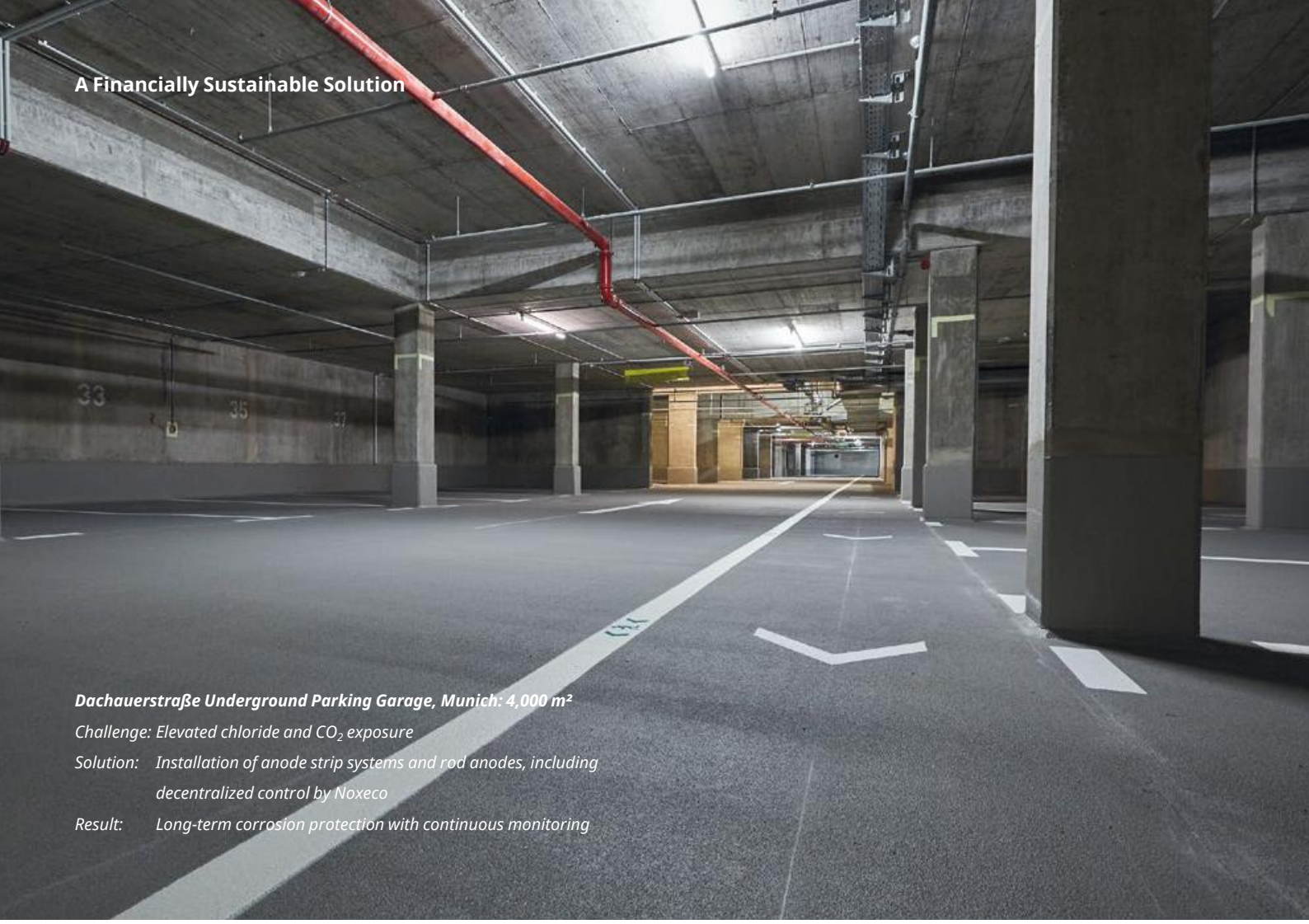
Don’t Let It Get This Far

Cracks and rust stains begin to spread:
Chlorides and CO_2 penetrate the concrete. The concrete loses its protective function, and the reinforcement steel begins to corrode.

Widespread concrete spalling occurs:
Corroding steel becomes visible, and the load-bearing capacity of the reinforcement decreases. In the worst case, the structure may need to be closed.

Structural elements lose their load-bearing capacity:
Extensive rehabilitation work – or even demolition – may become necessary.

As soon as the first cracks or rust stains become visible, it is time to take action. At this stage, the load-bearing capacity of the reinforcement is usually still intact. Modern CP systems can permanently stop corrosion with comparatively little effort.



Dachauerstraße Underground Parking Garage, Munich: 4,000 m²
Challenge: Elevated chloride and CO_2 exposure
Solution: Installation of anode strip systems and rod anodes, including decentralized control by Noxeco
Result: Long-term corrosion protection with continuous monitoring

Cost Efficiency Today. Reliability for Decades.

With cathodic corrosion protection, corrosion is stopped permanently – instead of requiring repeated repairs. And all at manageable cost.

Complex Rehabilitation Through Concrete Removal
In the past, there was only one solution when reinforcement corrosion occurred: remove the contaminated concrete, expose the reinforcement steel, remove the rust, apply repair mortar, and recoat the surface.

It sounds like a lot of work – because it is. As a result, costs are high. Long closure periods for the structure are another major drawback. Dust and noise pollution must also not be underestimated.

In addition, this type of repair is not a permanent solution. Protective coatings typically last only 10 to 15 years. After that, carbonation and chloride ingress begin again.

Fast Rehabilitation with Cathodic Corrosion Protection
When rehabilitation is carried out using cathodic protection (CP), chloride-contaminated concrete can remain in place. Only minimal intervention at the surface is required to stop corrosion. At the same time, corrosion is prevented electrochemically. Even if chlorides or carbon dioxide penetrate the concrete again in the future, no further damage will occur. The reinforcement remains permanently protected.

There is, however, one limitation: in cases of advanced corrosion where reinforcement steel must be replaced or supplemented, concrete removal remains unavoidable.

CP – The Most Economical Solution Overall

	Conventional Rehabilitation	Rehabilitation with CP
Downtime	up to several weeks	rehabilitation often possible while the facility remains in operation
Work effort	significant; damaged concrete must be removed and replaced	low effort; anodes are installed at the surface
Intervention in the structure	severe	minimal
Material consumption	high; concrete replacement, formwork, repair mortar	low; only minor surface intervention required
Service life of the rehabilitation measure	typically 10 to 25 years, depending on chloride exposure and coating quality	• 50 to 100 years, depending on the design specification • individual electronic components and sensors may need replacement in the event of failure
Risk of recurring damage	high	very low
CO_2 footprint	high; due to concrete removal, transport, and new concrete application	low; minimal material use and minimal intervention
Operational safety	no monitoring sensors; damage remains undetected	real-time monitoring for maximum operational safety
Long-term cost efficiency	often expensive due to repeated rehabilitation work	highly cost-effective due to permanent corrosion prevention

Minimal effort for maximum protection.

With a cathodic corrosion protection solution from Noxeco, there's no need for invasive structural intervention. Installation requires only minimal work on the surface, significantly reducing costs. Example: rehabilitation of an underground parking garage.

1

Surface preparation by milling, shot blasting, or high-pressure water jetting

2

Installation of the anode material, creation of the connections, and installation of the sensors

3

Embedding the anode material in concrete or repair mortar, including sealing

4

Cabling, conduit installation, and installation of the Noxeco components


noxeco


noxeco
noxeco
noxeco

Executed with precision. Permanently protected against corrosion.

Powerful protection through low electrical current.

Cathodic corrosion protection is based on an electrochemical reaction. This effectively gives the steel a protective shield against corrosion.

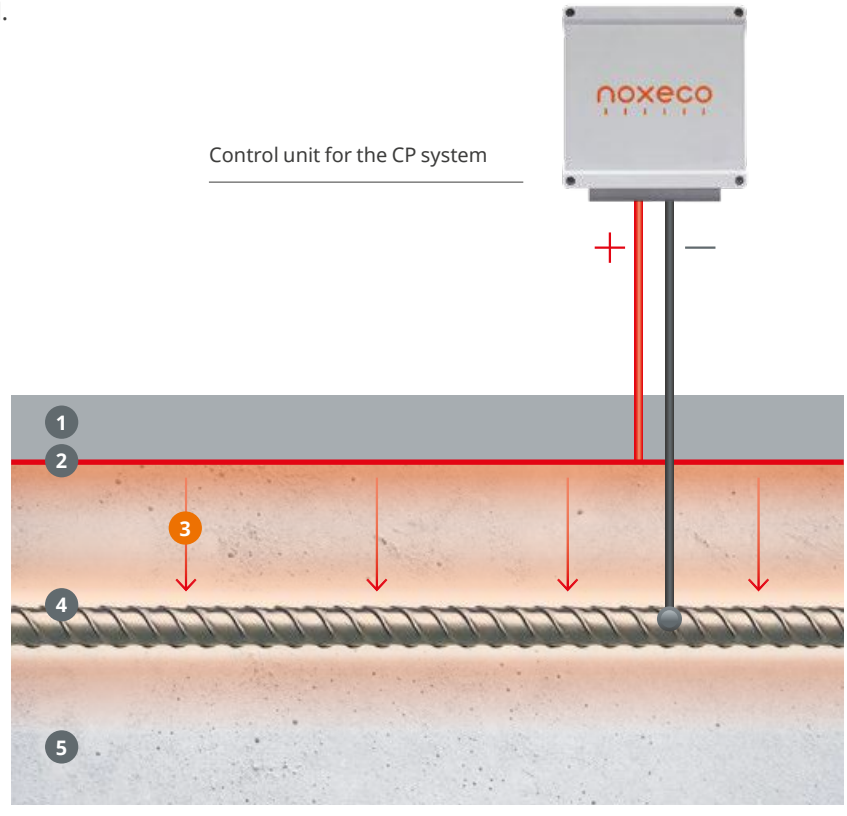
How cathodic corrosion protection works

1. Establishing the connection
The Noxeco Smartbox is connected to the steel reinforcement in the concrete and to an anode, for example a titanium mesh.

2. Protective current flows
The system sends a very low electrical current through the concrete.

3. Corrosion is stopped
The protective current prevents the steel from continuing to corrode – the reinforcement remains permanently protected.

100 % corrosion protection What more could you ask for?



1. Embedding mortar
2. Anode
3. Protective current flow
4. Reinforcement
5. Concrete

Illustration of the technical current direction (plus > minus)

Depending on the structure, we select the appropriate anode type for your project. Here, titanium strips (grey lines) serve as the anode.

Detailed information about the anode system can be found on our website.

Digital CP systems.
Simpler, more efficient, smarter.

Take advantage of Noxeco's technological edge. Our Power-over-Ethernet solutions reduce material usage and shorten installation time.

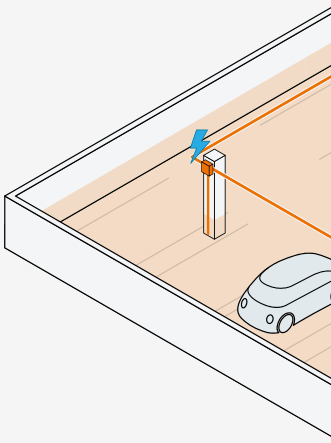
Ideal for every structure: Noxeco CP solutions
Noxeco CP solutions combine deep technical expertise with a forward-looking technological approach. All systems are prepared for future expansion. Depending on the structure, you can choose between a CP system with LAN cabling, wireless connectivity, or a combination of both.

Less is more
Noxeco CP solutions are based on Power over Ethernet. Instead of separate power and data cables, everything runs through a single line.

Smart plug-in system
If a component needs to be replaced, only the plug-in board is exchanged. There is no need to disconnect the cabling or replace the entire box.

Scalable remote control
Whether managing one CP system or a hundred – with Noxeco Vision, you always have all data at a glance. You can centrally control and monitor all systems via screen while simultaneously managing all system-related documentation and measurement data within one integrated platform.

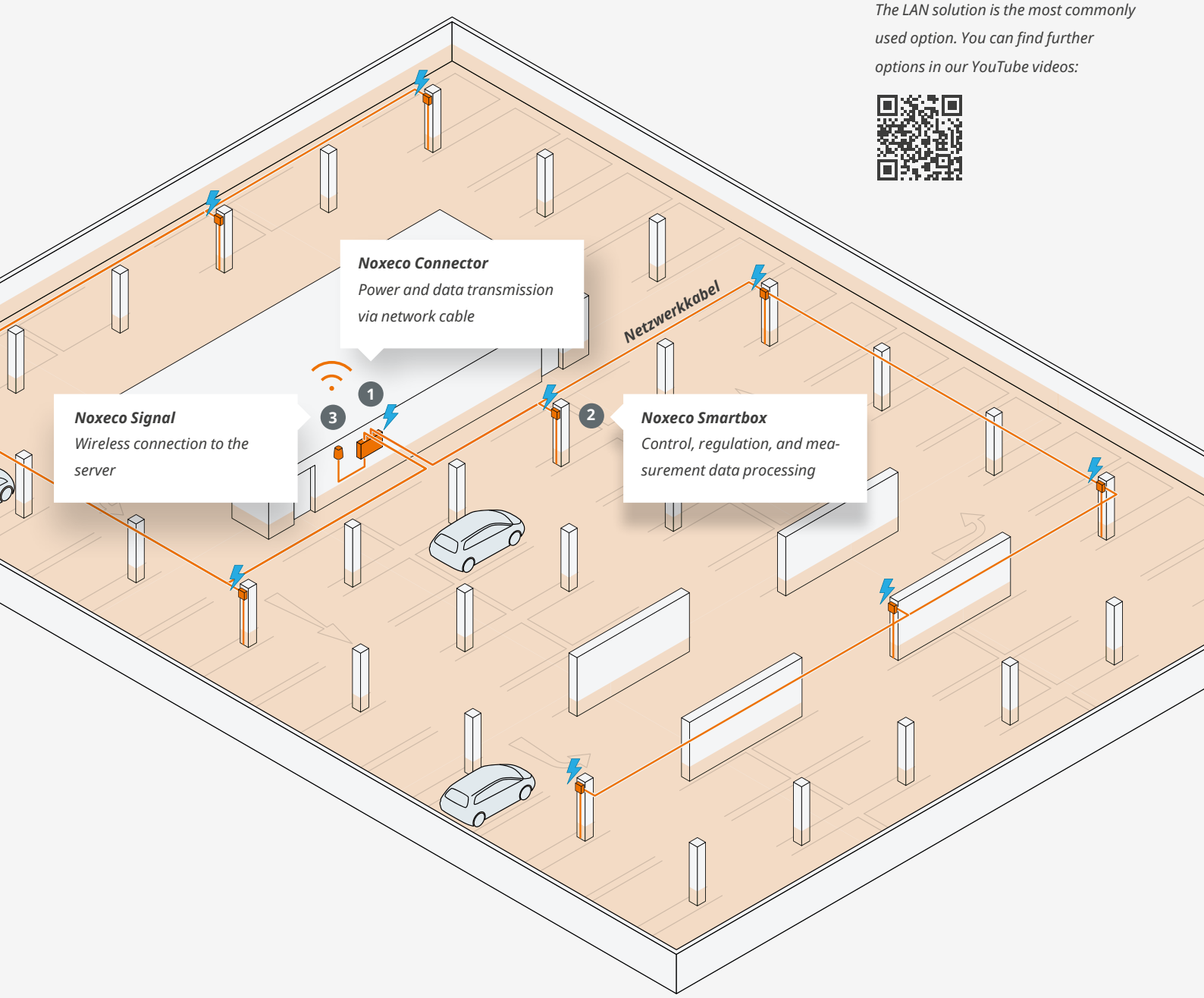
Your advantages with Noxeco:
– 80 % less cabling
– less material
– less installation effort and therefore fewer sources of error
– reduced fire load
– lower maintenance requirements



Thanks to Power over Ethernet: 80%

Noxeco components: Connector, Smartbox, Signal, and Vision

The LAN solution is the most commonly used option. You can find further options in our YouTube videos:



Example application:
Noxeco CP solution via LAN

The power flows from the 1 **Noxeco Connector** via the network cable to the 2 **Noxeco Smartboxes**. These are responsible for control, regulation, and measurement data processing. Each Smartbox can monitor and control several areas separately, depending on the reinforcement and environmental conditions.

The measurement values collected by the Smartbox are sent back via the network cable to the 1 **Noxeco Connector**. The Connector stores the data and forwards it to the antenna, 3 **Noxeco Signal**. This transmits the data to the server via the mobile network. From there, the system can be controlled and monitored online via 4 **Noxeco Vision**.

4 ***Noxeco Vision***
Remote maintenance and monitoring

Trusted by clients across all regions.

Clients in Germany and abroad trust us as their partner. We are passionately committed to our customers, protect valuable assets, and take responsibility.

Complete overview of our references: https://noxeco.com/referenzen

Underground parking garage Lauingerstraße, Munich: 660 m² floor slab

Initial situation: Risk of corrosion to the steel reinforcement in the floor slab, the ramp, and parts of the column and wall bases due to chloride-contaminated water

Solution: Installation of a CP system to protect the 660 m² floor slab and ramp, as well as the base areas up to approx. 50 cm above the top edge of the floor slab. Eight Smartboxes protect the entire parking garage.

Léonard Tunnel, Brussels: 6,000 m² ceiling surface

Initial situation: Corrosion damage caused by de-icing salts and exhaust fumes

Solution: Installation of a CP system with anode strips. Sixty-six Smartboxes protect the entire tunnel.

Hofdienergarage parking garage, Stuttgart: 13,000 m² parking deck area

Initial situation: Risk of corrosion to the steel reinforcement in the parking decks due to chloride-contaminated water caused by de-icing salt ingress

Solution: Installation of a CP system using carbon fabric as the anode material. A total of 126 Smartboxes protect approximately 13,000 m² of parking deck surfaces across six levels, permanently preventing further reinforcement corrosion.


noxeco


SZ05
SZ06
SZ13
SZ15
SZ09
SZ10
SZ16


noxeco


noxeco


FLUKE 115 TRUE RMS MULTIMETER
1.918
FLUKE 115 TRUE RMS MULTIMETER
2.826
NOXECO KKS 203
2.04V
2.82A


noxeco
noxeco
noxeco


noxeco
noxeco

Innovative concepts.
Thought through from start to finish.

Not everything that is possible makes sense. We assess the condition of the structure, analyze the requirements, and develop the best solution for your project. In doing so, we combine technology, cost efficiency, and practical usability into one coherent concept.

„For us, collaboration simply means working together. Together with general planners, specialist planners, and clients, we tackle the tasks that are the highest priority for preserving the structure.“

Markus Sieder, Managing Partner,
Noxeco

CP solutions from a single source

We understand the requirements of general planners and clients. For many years, we have been developing and implementing tailored CP solutions. This is how we work:

1. Assessment
We analyze the on-site situation and collect all technically relevant data.

2. Concept
We develop a technically and economically sustainable CP concept tailored to the actual on-site requirements.

3. Tendering and planning
Upon request, we support you as the general planner in preparing specifications and evaluating bids.

4. Installation
Our specialists or experienced contractors from our partner network install the system.

5. Commissioning and acceptance
A qualified Noxeco planner supervises the commissioning process on site.

6. Operation and maintenance
Upon request, we also take care of system control and ongoing maintenance.

Greater planning reliability through 3D visualization
Using 3D scanning, we create a virtual representation of your structure – from capturing the existing condition to generating precise 3D building models with exact measurements. This simplifies further planning and helps keep costs under control.

Certified specialist contractors we work with:

BAYER BWI · Heinrich Schmid · W&F WAYSS & FREYTAG BAUINSTANDHALTUNG · CHEMBAU · geiger · PR KKS · instakorr SÜD


noxeco

Install, protect – breathe easy!

With Noxeco, you protect your concrete structure better for the long term:

Permanent protection against corrosion
Corrosion is stopped before costly damage occurs.

Minimal intervention
Only minor impact on the building structure.

Low-maintenance solution
Simple plug-in system and fully automated real-time monitoring.

Excellent environmental performance
Reduced CO_2 emissions thanks to lower concrete and cement consumption.

Long-term asset preservation
With a Noxeco CP solution, your reinforced concrete structure is protected against corrosion damage for decades.

Do you have any questions?

We would be happy to explain in a personal consultation which solution is best suited for your structure.

Give us a call or send us an email.

T +49 89 94 46 60 46
info@noxeco.com

Schedule an appointment now!


noxeco
noxeco
noxeco


noxeco
noxeco
noxeco

Noxeco GmbH
August-Horch-Straße 5
55129 Mainz

T +49 89 94 46 60 46
info@noxeco.com
noxeco.com

More on our website:
noxeco.com

linkedin.com/company/
noxeco

Legal Notice
Noxeco GmbH
August-Horch-Straße 5
D-55129 Mainz

Commercial Register: HRB 51522
Register Court: Mainz Local Court

Responsible pursuant to Section 18 para. 2 MStV:
Markus Sieder, Managing Partner

Ausgabe: 2026

Services
Analysis and assessment of corrosion conditions • Planning of CP systems for reinforced concrete structures • Support with tendering and project implementation • Supervision of installation by specialist contractors • Commissioning and monitoring of the systems

Areas of application
Parking garages and underground car parks • Bridges and transport infrastructure structures • Industrial and infrastructure facilities • Buildings with reinforced concrete structures