



# MasterProtect 9000

Highly Durable Coating System  
for Offshore Foundations





## Product at a Glance



“We have investigated the offshore coating market and concluded that in terms of properties, economics and ease of application, MasterProtect 9000 is the best offshore coating system available. MasterProtect 9000 is the optimum protection for our offshore foundation Hexabase structure.”

Dr.-Ing.Siear Qaimi, ThyssenKrupp Steel Europe AG, Emilio Reales, MOG GmbH, Germany



# MasterProtect 9000: Highly Durable Polyurethane Coating System for Offshore Structures

**MasterProtect 9000** is the first coating system for offshore structures which ensures a 25-year protection. A high-build PU membrane forms the basis of **MasterProtect 9000**, which provides the properties for an excellent durability in offshore environments. The flexibility of the membrane ensures long term integrity even after years of exposure to marine environment, weathering, vibrations and thermal expansion cycles. The high chemical and mechanical resistance of **MasterProtect 9000** provides the necessary protection against offshore attacks of seawater, waves, abrasion, and impacts, especially encountered in the splash and submerged zones. The result is a continuous protection against steel corrosion.

The fields of application for **MasterProtect 9000** are situated in the two most critical areas of offshore foundations: i.e.

- Splash zone
- Submerged foundation

Due to the novel chemical concept of the high-build polyurethane membrane, and highly hydrophobic nature of the system, **MasterProtect 9000** fulfills the requirements for all offshore and marine structures, e.g.:

- Wind turbine foundations and transformer platforms
- Oil and gas structures
- Jetties

The use of **MasterProtect 9000** reduces time and costs during application. The complete system can be applied in only one day, allowing a highly efficient application and manufacturing phase. During the service life of the offshore structures of typically 25 years, maintenance costs are under control while fewer galvanic anodes provide the ultimate required level of protection. **MasterProtect 9000** applied to the entire structure will further allow to design for lower corrosion allowance and thus thinner steel structures.

## Product benefits at a glance:



### High flexibility

Ensures full steel protection in marine environments



### Rapid drying

Complete system can be applied in just one day



### Cost reduced foundations

Less corrosion allowance even with fewer anodes



### Secure Installation

Foundation fully encapsulated with high-build coating



### Proven high quality

Approved acc. NORSOK M-501 and ISO 20340



### Excellent durability

≥ 25 years



# MasterProtect 9000 – For the Two Most Critical Areas



Atmospheric  
zone

① Splash zone

② Submerged  
zone

## Coating systems according to NORSOK M-501

Protection systems for offshore structures are classified into different application categories which each require specific characteristics

System 1: Carbon steel with operating temperatures below 120°C  
- structural steel  
- exteriors of equipment, vessels, piping, wind turbine towers, ...

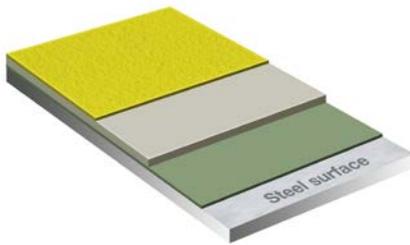
① System 7A: Carbon and stainless steel in the splash zone

② System 7B: Submerged carbon and stainless steel at temperatures  $\leq 50^\circ\text{C}$



# MasterProtect 9000 Systems

## 1 Splash zone NORSOK M-501 System 7A\*



<b>Top coat</b>	MasterProtect TC 9681 thickness: 60 to 80 µm
<b>Membrane</b>	MasterProtect M 9000 thickness: 1.2 to 3.0 mm
<b>Primer</b>	MasterProtect P 9637 thickness: 25 µm

## 2 Submerged zone NORSOK M-501 system 7B\*



### Primer MasterProtect P 9637

- EP based zinc primer for anodic protection
- Excellent bonding
- 2C-EP based zinc primer
- Drying time 20-30 min (RT), fast curing even at low temperatures
- High degree of corrosion protection by providing additional galvanic action

### Membrane MasterProtect M 9000

- Flexible and crack bridging
- High mechanical and chemical resistance
- Highly hydrophobic
- Sprayed PUR elastomer, tack-free after 30 sec. solvent free
- Very high permanent resistance to salt water
- Exceptional low temperature elasticity
- Noise-dampening effect coming from the elastic and high-build nature

### Top coat MasterProtect TC 9681

- UV-stable
- Abrasion resistant
- 2C-Polyaspartic Top Coat
- RAL 1023 (high-vis color)
- high wear resistance
- Smooth surface reducing dirt retention
- Fast drying (60 min)

**MasterProtect P 9637** is the first layer of the system, and offers an active anodic protection against corrosion of the structure. The application using airless spray equipment is fast and easy. The subsequent layer of **MasterProtect M 9000** can be applied after just 30 minutes at 20°C.

**MasterProtect M 9000** is the second layer of the system and the heart of it. The unique properties of the high-build PU membrane resists thermal expansion of the steel structure, salts, impact etc., and ensures a 25-year durability of the system. MasterProtect M 9000 is spray applied with special hot-spray equipment and can be re-coated with the top coat after 30 minutes at 20°C

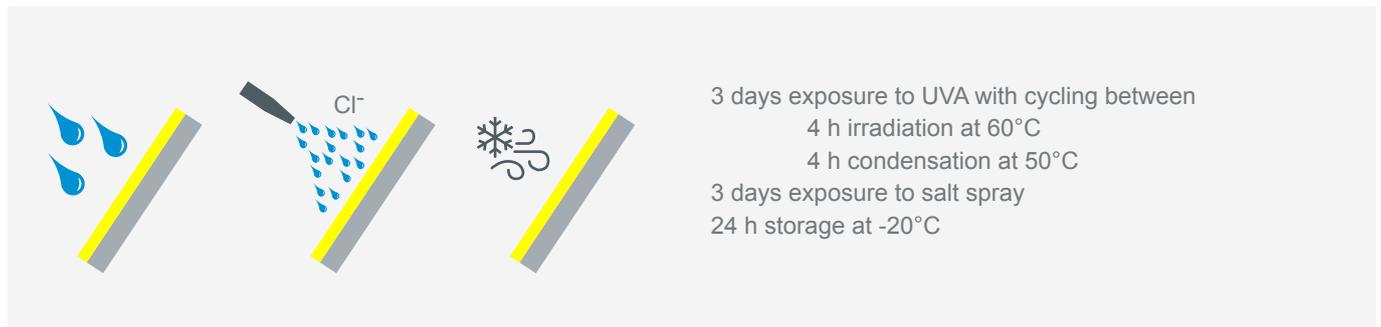
**MasterProtect TC 9681** provides the high-vis color of the offshore structure and further protects the membrane against UV light and ingress. Various colors are available to meet local standards and regulations. The application is fast and easy with airless spray equipment. The product dries in just 60 minutes at 20°C, for a quick handling of the structures and exposure to the elements.

\*Other exposure areas of the foundation may be protected with a modified system build-up using the same components



NORSOK M-501 compliance testing was conducted at the Fraunhofer IFAM testing institute. Test specimens were subjected to corrosion protection tests in accordance with the requirements of ISO 20340. Coated steel specimens were tested before and after exposure to cyclic and cathodic disbonding testing.

The cyclic testing consists of an exposure to various subsequent exposure conditions. After such exposure the condition of the coating is validated and compared to the non-exposed specimens.



In the cathodic disbonding test, thick organic coatings are treated under cathodic protection in seawater and their respective time degradation is monitored by EIS measurements (electrochemical impedance spectroscopy).

<b>Evaluation before exposure: MasterProtect 9000 Offshore system</b>			
		<b>Average of 3 specimens</b>	<b>NORSOK M-501 requirement</b>
DIN EN ISO 2808	Film thickness [µm]	1,2–2,0 mm	NA
DIN EN ISO 4624	Adhesion strength [MPa]	7,5 MPa	> 5 MPa
<b>Evaluation after exposure (duration: 4200 hours): MasterProtect Offshore system</b>			
DIN EN ISO 4624	Adhesion strength	6,2 MPa	> 5 MPa
Corrosion at the scribe	Visual corrosion	< 4 mm	Acc. DIN EN 20340 < 8 mm
DIN EN ISO 4628-2	Degree of blistering	0 (SO)	0 (SO)
DIN EN ISO 4628-3	Degree of rusting	Ri = 0	Ri = 0
DIN EN ISO 4628-4	Degree of cracking	Ri = 0	Ri = 0
DIN EN ISO 4628-5	Degree of flaking	0 (SO)	0 (SO)
DIN EN ISO 4628-6	Chalking	0	< 2 mm
Visual inspection		No cracks	No cracks
Cathodic disbonding	Delamination at the scribe	< 5 mm	Acc. DIN EN 20340 < 8 mm



# MasterProtect 9000 Improves Offshore Protection

The corrosion of offshore steel structures is often the result of:

- ca. 50% Cracking of the paint
- ca. 50% Mistakes during application (surface preparation, time window between 2 layers, temperature range, etc.)

The **MasterProtect 9000** system overcomes these defaults and ensures the long term durability of the structure.



Micro cracks often occur with traditional coatings in areas with special shapes and in the vicinity of the welding of two elements, resulting in corrosion.

Due to the high elasticity and flexibility of **MasterProtect 9000**, micro cracking does not occur after application nor after many years in service.



All 3 layers of the **MasterProtect 9000** system can be spray applied, and while being fast curing reduce the waiting time between subsequent layers optimizing the overall application time.

Furthermore the fast curing reduces the risk for any problem to occur during the critical curing phase, when the material is weak.





## Durability of MasterProtect 9000

These 5 main properties guarantee that the **MasterProtect 9000** can last 25 years without special maintenance in the harsh offshore environment.

- **Elongation  $\geq$  250 %**
- **High-build – 1,2 to 3 mm**
- **Fast application – 1 day for full system**
- **Highly hydrophobic**
- **High shore hardness, high tear strength**



### 15 YEARS

Lifetime of a conventional epoxy system

#### **Sacrificial anode**

Corrosion allowance according to classification society is 0.3 mm per year.

Difference between the estimated service time of the offshore structure (25 years) and lifetime of corrosion protection system of 10 years.

The design of the foundation thus needs to consider 3 mm additional steel for corrosion allowance. This results in higher steel thickness and weight as theoretically necessary for the structural integrity.

#### **Maintenance**

Higher maintenance and repair costs are to be considered in case of failure.

### 25 YEARS

Lifetime of MasterProtect 9000 offshore system

#### **Sacrificial anode**

Corrosion allowance according to classification society is 0.3 mm per year.

As there is no difference between the estimated service time of the offshore structure (25 years) and lifetime of corrosion protection system there is a strongly reduced need for galvanic anodes.

Corrosion allowance should only be considered for contingency reasons if the structure is completely coated down to the sea bed.

#### **Maintenance**

Lower maintenance and repair costs as the risk for failures with the galvanic anodes is significantly reduced.

**25 %** cost saving with MasterProtect 9000 when compared with a traditional design using EP-coatings



# MasterProtect 9000: Cost Reduction of Offshore Foundation Contract

Highly Durable Polyurethane Coating System for offshore structures



## Benefits in operation

- Long-term lifetime > 25 years.
- Highly hydrophobic for a continuous long lasting seawater resistance.
- Support of bubble curtains as high-build coating system provides additional noise reduction during offshore pile-driving.
- No embrittlement of **MasterProtect 9000**, as the coating system remains permanently elastic even at very low temperatures.
- The coating is highly impact and abrasion resistant.
- Up to 80% reduction of the sacrificial anode mass, when structure is coated down to the seabed.
- Considerable weight and cost saving potential of the steel structure. Possible reduction of the corrosion allowance when the structure is fully coated to the seabed.
- The signal yellow top coat is particularly UV-stable and retains its color fidelity.
- Smooth top coat minimizing dirt retention



## Benefits during application

- Minimizing manpower – increased number of cycles in serial production.
- Fast reaction and short curing times. All coats can be applied within regular working shift (8h).
- Active zinc primer provides additional galvanic protection.
- Spray applied products for ease of application, and quality of works.
- Primer and top coat meet the EU directive for low VOC content. The Polyurethane membrane is 100% solvent free.
- Layer thicknesses of 500 µm - 3000 µm may be applied in one cycle, due to the fast reaction time of the membrane.
- Foundations can be transferred from the fabrication hall to external storage area shortly after application of the final layer.



# Master Builders Solutions

The Master Builders Solutions brand brings all of our expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry. The know-how and experience of a global community of construction experts form the core of Master Builders Solutions.

We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, performance flooring solutions and solutions for on- and offshore wind energy.

## Our comprehensive portfolio

- Concrete admixtures
- Cement additives
- Chemical solutions for underground construction
- Waterproofing solutions
- Sealants
- Concrete repair and protection solutions
- Performance grouts
- Wind turbine grouts
- Performance flooring solutions





# Master Builders Solutions for the Construction Industry

## MasterAir

Complete solutions for air entrained concrete

## MasterBrace

Solutions for concrete strengthening

## MasterCast

Solutions for the manufactured concrete product industry

## MasterCem

Solutions for cement manufacture

## MasterEase

Low viscosity for high performance concrete

## MasterEmaco

Solutions for concrete repair

## MasterFinish

Solutions for formwork treatment and surface improvement

## MasterFlow

Solutions for precision grouting

## MasterFiber

Comprehensive solutions for fiber reinforced concrete

## MasterGlenium

Solutions for high performance concrete

## MasterInject

Solutions for concrete injection

## MasterKure

Solutions for concrete curing

## MasterLife

Solutions for enhanced durability

## MasterMatrix

Advanced rheology control for concrete

## MasterPel

Solutions for hydrophobization, anti-efflorescence and surface protection

## MasterPolyheed

Solutions for mid-range concrete

## MasterPozzolith

Solutions for water-reduced concrete

## MasterProtect

Solutions for concrete protection

## MasterRheobuild

Solutions for high strength concrete

## MasterRoc

Solutions for underground construction

## MasterSeal

Solutions for waterproofing and sealing

## MasterSet

Solutions for set control

## MasterSphere

Solutions for guaranteed freeze-thaw resistance

## MasterSuna

Solutions for sand and gravel in concrete

## MasterSure

Solutions for extraordinary workability retention

## MasterTop

Solutions for industrial and commercial floors

## Master X-Seed

Advanced accelerator solutions for concrete

## Ucrete

Flooring solutions for harsh environments



## QUANTIFIED SUSTAINABLE BENEFITS ADVANCED CHEMISTRY BY MASTER BUILDERS SOLUTIONS

Let the numbers do the talking: We have portrayed some of our most eco-efficient product solutions for concrete and precast production, construction, civil engineering, and flooring.

[sustainability.master-builders-solutions.com](https://sustainability.master-builders-solutions.com)



### Master Builders Solutions Deutschland GmbH

Donnerschweer Straße 372

26123 Oldenburg, Deutschland

Tel: +49 (0)441 3402-0

E-Mail: [construction-systems-de@mbcc-group.com](mailto:construction-systems-de@mbcc-group.com)

[www.master-builders-solutions.com](http://www.master-builders-solutions.com)

The data contained in this publication are based on our current knowledge and experience. They do not constitute the agreed contractual quality of the product and, in view of the many factors that may affect processing and application of our products, do not relieve processors from carrying out their own investigations and tests. The agreed contractual quality of the product at the time of transfer of risk is based solely on the data in the specification data sheet. Any descriptions, drawings, photographs, data, proportions, weights, etc. given in this publication may change without prior information. It is the responsibility of the recipient of our product to ensure that any proprietary rights and existing laws and legislation are observed (01/2021).

® = registered trademark of MBCC Group companies in many countries

MBS-01-2021-WTG-0038-EN