MasterFlow
Well-founded Expertise for Wind Power
Master Builders Solutions from BASF

Building on partnership. Our Master Builders Solutions experts find innovative and sustainable solutions to meet your specific construction needs. Our global experience and network help you to be successful – today and tomorrow.

Master Builders Solutions
The Master Builders Solutions brand brings all of BASF’s 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 BASF 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 BASF 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, chemical solutions for underground construction, waterproofing solutions, sealants, concrete repair and protection solutions, performance grouts, performance flooring solutions.
BASF is the world’s leading chemical company: The Chemical Company. Our portfolio ranges from chemicals, plastics and performance products to agricultural products, fine chemicals, oil and gas. As a reliable partner, BASF helps customers to be more successful in virtually all industries. With high value products and intelligent solutions, we play an important role in finding answers to global challenges such as climate protection, energy efficiency, nutrition and mobility.

BASF the leading supplier of chemical systems and formulations for the construction industry. Our continuous innovations and tailor-made solutions ensure that our customers stay at the forefront of technology.

The BASF Admixture Systems division specifically helps customers in the ready-mix, precast and other concrete industry products. The use of BASF’s admixtures can be tailored to achieve the best concrete mix for the foundation design and geotechnical conditions, whilst minimizing the CO₂ footprint of the concrete. Our range of superplasticizers, curing agents, release agents, air entraining agents, accelerators and corrosion-inhibiting admixtures provide the flexibility for material innovation to address these challenges whilst increasing productivity and delivering whole-life cost benefits, thus saving our customers time and money.

For the construction of modern, giant wind turbines we offer high-performance MasterFlow Exagrout materials, adhesives and sealants. Whether having to absorb the enormous vibrations, wave actions, torque and wind power, whatever the type of the foundation in on- or offshore installations: BASF’s special new MasterFlow Exagrouts master all challenges during the entire lifetime of the wind turbines.

Based on our long term technological experience and our innovative power, we strive continuously to develop new products to meet our customers’ ever increasing requirements. We support wind turbine manufacturers with innovative epoxy systems and specialized coatings materials for rotor blades – Baxxodur™ and Oldodur.

With BASF’s global presence and technical expert network, we can guarantee our customers solid support in all regions of the world.
The latest technical developments in the construction of wind turbines are giant towers capable of producing more and more renewable energy. The foundations of these towers need to meet ever higher quality requirements while at the same time the construction period needs to be reduced.

Wind power turbines are high, slender constructions that are dynamically exposed to high wind loads and other service stresses. The interaction of the machine with the load transferring components of the installation – tower, foundation and anchors – requires therefore special attention in the design of a wind turbine.

The most important loads acting on a wind turbine structure are:

- Axial load
- Vibration
- Rotation
- Bending
- Torsion

All these loads need to be transferred/absorbed by the grout connecting the tower to the foundation structure. A careful design and selection of the grouting material is therefore of utmost importance. Safe and durable installation of wind turbines largely depend on high performance building materials which connect the tower to its base/foundation.

BASF’s specially developed ultra-high performance materials – MasterFlow Exagrouts – meet all these requirements, have faster installation times and lead to long term maintenance-free operation of on- and offshore wind farms.

Fatigue resistant MasterFlow Exagrouts:
- Ultra-high final strengths
- Excellent long term durability

Opportunity for wider weather windows:
- MasterFlow Exagrouts are applicable down to +0 °C
- Rapid strength development, even at cold temperatures

MasterFlow Exagrouts are validated by many testing institutes:
- For grouted connections in offshore installations
- For grouting onshore wind turbines to the foundation

Improved risk management:
- Products installed by licensed contractors
- BASF provides extended warranty

Cost effective installations:
- MasterFlow Exagrouts can considerably reduce the overall installation time

Faster return on investment:
- MasterFlow Exagrouts safeguard project completion on time
- Wind turbines may even be earlier connected to the grid
- Even earlier electricity production is possible
Our reference in the Baltic Sea – Rødsand II:
Off the coast of South Sealand (Denmark)
Gravity Based Foundation Systems: MasterFlow 9500
used to connect the tower to the foundation
Our reference in the Liverpool Bay (United Kingdom) – Gwynt Y Môr:
160 turbines installed on monopile – transition piece foundations.
Grouting works continued at temperatures as low as 2°C.
© FoundOcean Ltd
MasterFlow 9500  
Exagrout for Offshore Wind Turbines

**MasterFlow 9500** is a new generation of ultra high strength, high modulus, fatigue resistant, cement-based Exagrout for grouting offshore wind turbine installations. The material has been especially formulated for large scale pump applications:

- Grouting of wind turbine installations where excellent fatigue resistance is required, e.g. in grouted connections in monopile, tripod or jacket type foundations.
- Grouting under very harsh conditions, e.g. offshore applications or below water grouting, at temperatures as low as 0 °C.
- All void filling from 25 mm to 600 mm where high strength and fatigue resistance is important, e.g. with gravity based foundations.

**MasterFlow 9500** exhibits long term durability and guarantees a fast, secure and cost effective installation of the offshore wind farm, thus saving you time and money.

---

**Fatigue resistance in water**

- DNV-OS-C502 ($C_1 = 10$, in water)
- Test serie 1: in water, 0.35 Hz, 6 specimens, broken
- Test serie 2: in water, 0.35 Hz, 6 specimens, broken
- Test serie 3: in water, 0.35 Hz, 1 specimen, unbroken
- DNV-OS-C502 ($C_1 = 10$, in water, $C_5 = 0.85$)

---

**Axial load test vs. time**

- First slip (1,123 kN)
- Step 12 (1,379 kN)
- Step 14 (1,287 kN)

---

Gravity based foundation  
Monopile foundation  
Tripod foundation  
Jacket foundation
Excellent durability:
- High fatigue resistance, absorbing dynamic loads
- Zero autogenous shrinkage; volume stable
- High flexural strength, even without the addition of fibres
- Freeze/thaw resistant
- Very low porosity and water absorption

Secure installation:
- Ultra-high axial load capacity
- Excellent long term load transfer
- Certified by Det Norske Veritas (DNV)
- High ultimate strengths
- Installation by BASF licensed contractors

Fast and cost effective installation:
- Rapid strength build-up, even at cold temperatures as low as 0 °C
- Short overall installation times and earlier operation of wind farm
- Faster energy production, earlier return on investment, safeguard project completion on time

Our reference in the Store Belt – North of Sprogø Island (Denmark)
Gravity Based Foundation Systems: MasterFlow 9500 used to connect the tower to the foundation
Our reference in the Irish Sea (United Kingdom) – West of Duddon Sands
108 turbines, installed on monopile – transition piece foundations.
Foundation installation and grouting in a record time of just 6 months.

© FoundOcean Ltd
Our reference in South Lanarkshire (United Kingdom) – Clyde windfarm in Central Scotland: 154 wind turbines installed and grouted in one of the largest onshore windfarms in Europe.
MasterFlow 9300 is an ultra high strength, fatigue resistant, cement-based Exagrout with metallic aggregates for grouting onshore wind turbine installations.

MasterFlow 9300 has been especially formulated for:

- Grouting of wind turbine installations, e.g. under the load transfer plate or T-flanges of pre-stressed towers.

MasterFlow 9300 strength development

- Grouting under very harsh conditions, e.g. at temperature ranging from as low as 2 °C to 30 °C.
- All void filling from 30 mm to 200 mm where high strength, fatigue resistance and high modulus is important.

MasterFlow 9300 Exagrout shows excellent long term durability and guarantees safe and cost effective onshore wind farm installations.

**Excellent durability:**
- Contains metallic aggregates
- Excellent abrasion resistance
- High toughness index
- Freeze/thaw resistant
- Very low porosity and water absorption

**Secure installation:**
- Autogenous swelling; volume stable
- No need for permanent post-tensioning of anchors
- Excellent long term load transfer
- High ultimate strengths
- Installation by BASF Licensed Contractors

**Fast and cost effective installation:**
- Rapid strength build-up, even at temperatures as low as +2 °C
- Earlier pre-stressing of anchors at all temperature ranges
- Short overall installation times and earlier operation of the wind farm

Concrete foundation ready to install the turbine. Grouting the T-flange of the wind turbine. Hardened MasterFlow 9300 Exagrout & pre-stressed bolts.
Wind turbines are special – their safe and durable installation largely depends on the correct design and interaction of all components – and require high performance MasterFlow Exagrouts to guarantee long term and maintenance free operation of the wind farm.

Minimizing risks and optimizing the electricity generation are at the heart of any investor in wind energy, whether the wind park is operated in on- or offshore conditions.

BASF helps the wind industry to be more successful by better understanding the needs of our partners and reducing the risks involved in the construction and exploration of modern wind farms.

For us, managing risks means amongst others:

- **MasterFlow** Exagrouts installed by BASF Licensed Contractors
- Independent documentation of the material properties
- Detailed installation methods as part of the Quality Assurance
- Certification by DNV
- On-site consultancy
- Production of **MasterFlow** Exagrouts to highest quality standards
- Extended warranties for correctly installed and operated windfarms
- Compulsory training of BASF Licensed Contractors

With its global presence, BASF offers this high level risk management for all your projects – on- or offshore – independent of the country or region where the wind farm is being built.
Our reference in Department of Tacuarembó – Cuchilla de Peralta (Uruguay) – Peralta II: MasterFlow 9300 used to connect 25 wind turbines to the concrete foundations
Our reference in South Lanarkshire (United Kingdom) – Clyde windfarm in Central Scotland: 154 wind turbines installed and grouted in one of the largest onshore windfarms in Europe
Our reference in the Baltic Sea – Rødsand II: Off the coast of South Sealand (Denmark)
Gravity Based Foundation Systems: MasterFlow 9500 used to connect the tower to the foundation
Master Builders Solutions from BASF 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

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 water tight concrete

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

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

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 (02/2015).

® = registered trademark of BASF group in many countries.

EEBE 1506en