

UHPC

Ultra High Performance Concrete made of NANODUR[®] Compound 5941



Low vibration beds for machine tools



Structural elements and façade panels



Supplier of NANODUR Compound 5941 binder

Dyckerhoff GmbH is one of the leading cement manufacturers in Germany. NANODUR Compound 5941 is a cementitious binder for an easy and safe production of UHPC elements using locally available aggregates and conventional mixing technology. NANODUR Compound 5941 is delivered worldwide to business clients, in bulk trucks or sea vessel.

www.dyckerhoff.com/nanodur



Conception and organizational processing

The company durcrete GmbH is a research and engineering company with many years of experience in UHPC technology, in structural and dynamic analysis of concrete elements and in conceptual design of prefab plants. On behalf of Dyckerhoff GmbH, durcrete provides support for concrete based applications on NANODUR Compound 5941.

www.durcrete.com



Photos: left – raw body bed of roll grinding machine by machine tool factory Georg, Germany (© durcrete);
right – façade made by Doha Cladding Solutions, Qatar (© DCS/Ayman Badr)

Advantages of UHPC with NANODUR Compound 5941

Material Supply

NANODUR Compound 5941 is available without any distributor at the Dyckerhoff GmbH in Germany. Local mineral aggregates can be used air-dry and must not be oven-dry. Admixtures can be purchased locally. Depending on the application, fibers can be added. Testing is possible in local laboratories. No license fee for patents or long-term delivery contracts are required for this UHPC technology.

Production

No special mixing equipment is required. Ordinary compulsory or pan mixers are adequate. Moisture content of aggregates and admixtures should be constant and measured in order to control the total amount of water. The filling level of the mixer ranges at around max. 50 % compared to ordinary concrete. Mixing time is between 8 to 12 minutes. NANODUR concrete is self-compacting without any vibration.

Physical Characteristics

For example mix proportions and typical characteristic values, see Dyckerhoff's NANODUR Compound product brochure.

Typical Recipe

| Material | | Amount kg/m ³ | Amount kg/t |
|--|---------------------|-----------------------------|----------------|
| NANODUR Compound 5941 grey (premix of 59 % NANODUR cement [620 kg/m ³] and 41 % stone dust < 0.25 mm [430 kg/m ³]) | | 1,050 | 429 |
| Chips (air-dry crushed hard stone) 1/3, 2/5 or 4/8 mm (basalt, diabase, gabbro, quartz, granite etc.) | | 880 | 360 |
| Pit sand 0/2mm (air-dry, dust-free, sharp) | | 430 | 174 |
| PCE superplasticizer (e.g. MasterBuildersSolution ACE 430 or ACE 520, Ha-Be Pantarhit, or other suitable products from Chryso, SIKA, GCP, Cugla, Aditibras or other suppliers of admixtures) | | ca. 14 | 5.8 |
| Shrinkage reducer (e.g. 'Eclipse floor' from GCP or Rheomac 895 from MasterBuilderSolution or similar product) | | ca. 6 | 2.5 |
| Water to be added Total water content (incl. PCE-water content) | (w/c = 0.26 / 0.27) | 155 160 – 170 | 63 |
| Total: | | 2,500 | 1,000 |



Services

- Production of the ready-to-use NANODUR Compound 5941 for UHPC at the Dyckerhoff cement plant Neuwied, Germany
- Presentation of the performance of NANODUR concrete possible at Dyckerhoff's R&D facility in Wiesbaden, Germany (will be organized by durcrete)
- Worldwide delivery to clients by truck (silo or flatbed) or in containers
- 1 mix design with new mineral aggregates and admixtures (door delivery) is free, additional testing will be charged at costs.

Samples

- Sample up to 100 kg free of charge, additional material has to be paid
- Sample transport at customers' responsibility
- Pick-up place: Dyckerhoff GmbH
Rheinstrasse 159
56564 Neuwied, Germany
- HS code of NANODUR Compound 5941: 38 24 50 90
Please note: Information about the import procedure are not provided!
- Required: customer ID and order number of a parcel service
- Detailed information about requested shipping documents to be provided prior to shipment

Delivery and Prices ex works Neuwied

- **Bulk material** in silo trucks up to 25 t (common)
- **25 kg paper sacks** (for Long distances > 1,000 km and overseas; 1,000 kg/pallet)
 - Size of pallet (Euro): 1,200 mm x 800 mm x 144 mm; 20-24 kg weight
 - Full container load: 20" container with 20 pallets (= 20 t NANODUR Compound 5941)
- **Big bags** (1 ton) only on special request and sufficient delivery time of minimum 4 weeks:
 - Size of pallet (CP 9): 1,140 mm x 1,140 mm x 156 mm; ~ 26 -30 kg weight
 - Full container load: 20" container with 18 pallets (= 18 t NANODUR Compound 5941)

| NANODUR Compound 5941 | grey | white |
|------------------------------|-------------|--------------|
| Bulk material > 20 tons | 402.00 €/t | 432.00 €/t |
| 25 kg paper sacks > 50 tons | 452.00 €/t | 482.00 €/t |

Freight charges upon request!

Safety data sheet

<https://res.dyckerhoff.com/deliveryprogram/files/germany/SD/2xx65xxxSDen.pdf>



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durcrete

Maschinenbauteile und Elemente
aus Ultra High Performance Concrete UHPC

Services

- Support for concrete based applications on NANODUR Compound 5941 on behalf of Dyckerhoff GmbH
- General consulting and first services free of charge
- Development of recipes with special demands
- Design and calculation of concrete elements for machinery industry and construction business
- Conceptual design of prefab plants
- Training of staff
- Services offered worldwide in German and English
- Terms and Conditions according to special agreement



Modern façade panels in different optics with pigments and special post-treatment (© Hibeton)



Cladding Façade in Germany by Drössler (© durcrete)



Shading roof for Lusail Plaza Qatar (© DCS/Ayman Badr)

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Machine bed for grinding machine (© durcrete)

FAQ



Panels for interior and exterior use made by Hibeton for Magnum Business Center, Kaunas, Lithuania (© Hibeton)

What is NANODUR concrete?

NANODUR concrete is an **Ultra High Performance Concrete (UHPC)**. Basis is the cementitious binder NANODUR Compound 5941 from Dyckerhoff GmbH in Germany. The concrete has to be mixed in a professional prefab plant with local available aggregates (sand and natural stone).

Are there limits for the use of NANODUR Compound 5941?

NANODUR concrete is a **Self-Compacting Concrete (SCC)**, dry concrete recipes with low slump are not possible with NANODUR Compound 5941. For such applications as overlays for bridge rehabilitation, we recommend other, better adapted binders and formulations. Contact durcrete for more information.

Does a dry concrete premix exist?

There is no dry premix available, where only water has to be added. NANODUR concrete is a product for professionals and not for do-it-yourself purposes.

Can ready-made façade panels or structural elements be bought in Germany?

No German prefab plant will export prefab elements for construction purposes. Main problem is the fact that there is no possibility of replacement in case of damage during transport or erection within a short time. Further, it is more economical to ship the binder alone rather than the finished product.

What is the economic advantage?

UHPC is an expensive product for special applications, where the special characteristics are essential. If you can solve your technical challenge already with ordinary concrete or with GFRC-Panels, NANODUR concrete is no more competitive nor is any other UHPC.

Can I adjust the recipe to fit my needs?

The binder is available in grey or white. Recipes can be individually adapted, e.g. recipes only with sand (maximum diameter: 2 mm). Colorful aggregates, pigments, plastic fibers, steel fibers etc. can be added to meet your individual requirements. The surface can be washed-out concrete, sand blasted concrete, photo print and so on. Please note that the amount of cement paste represents about 50 % of the visible area, the size of aggregates is limited to a maximum diameter of about 8 mm.

How is the surface quality?

The surface is identical to the formwork or mold. Special attention has to be given to dark shades on the surfaces, caused by special ingredients e.g. ultrafine slag cement. Most applications use a painting or light coating for surface finishing of architectural concrete surfaces.



Two types of façade panels made by Hibeton, implemented at University Sports Center, Kaunas, Lithuania (© Hibeton)

Can steel fibers be used?

In structural applications, steel fibers are required for ductility. Also, some codes recommend using steel fibers. Common fiber content is between 60 kg/m³ of ordinary steel fibers up to 240 kg/m³ of micro fibers. Steel fibers cost between 2.00 to 3.00 €/kg and influence the price of the final product. Fibers have also an effect on the viscosity and workability of the fresh concrete. Instead of steel fibers, polymer macro-fibers may be used. Contact durcrete for more information.

Can NANODUR concrete be used for security applications?

We have special recipes and test reports for very thin elements which are resistant to bullets, blast waves and burglary. If there are no restrictions to weight or space, NANODUR concrete is no more competitive nor is any other UHPC.

Is an application in GFRC possible?

NANODUR Compound 5941 is not to be used as a binder in **Glass Fiber Reinforced Concrete** (GFRC). Glass fibers and textile fabrics are difficult to work into the stiff mixture with low viscosity. The high portion of fine Portland cements and the dense structure allow nearly no carbonation, so special attention to the long-lasting alkaline attack on the glass fiber is needed.

Which panel thickness is possible?

Only cladding systems are applicable.

- | | |
|--|--|
| ▪ Panels with 8 mm max. size 0.5 m x 0.8 m: | no fibers, fixing with nails or screws |
| ▪ Panels with 20 mm max. size 2.0 m x 4.0 m: | with fibers, special fixings |
| ▪ Panels with 30 to 50 mm max. size 2.0 m x 4.0 m: | no fibers, fixing with anchor pins like natural stone or undercut anchor |
| ▪ Panels with 40 to 70 mm max. size 4,0 m x 6,0 m: | reinforced or steel fibers, fixing with anchorage systems |

Where can I buy NANODUR Compound 5941?

The material is protected by patents. It is produced in Germany and sold directly by Dyckerhoff worldwide. There are no local dealers.

Address Dyckerhoff GmbH
Biebricher Strasse 68
65203 Wiesbaden, Germany

For contact details see page 3 of this brochure.



Pallets loaded into a container