FRANKIPILE NG®

High Pile Loads
Optimum Adaptation to Foundation Soil
Low-noise Manufacturing Process
Application possibilities
The FRANKIPILE NG® can be used in a wide range of foundation soil conditions as a deep foundation element for all types of constructions such as, e.g. bridges, roads, tunnels, industrial and office buildings, dock bases, craneways, wind power plants and many more. It offers particular advantages in places where high loads have to be transferred or where good, load-bearing foundation soil only occurs very deep down in the ground. Where very high loads have to be transferred in restricted areas, a further development is available in the form of the Megapile, which enables pile loads of up to $R_{u,K} = 6000 \, \text{kN}$, depending on the foundation soil (see separate brochure). The pile system has a wide variety of designs enabling it to be ideally adapted individually to the various types of foundation soil conditions and building site situations. Vertical piles as well as sloping piles tilted up to 4:1 are available.

Due to its base expansion the FRANKIPILE NG® is also well suited to absorbing tensile loads.

The dimensioning and the manufacturing of the FRANKIPILE NG® are carried out according to DIN 1054 and DIN EN 12699. For preliminary dimensioning, dimensioning curves are given for the FRANKIPILE NG® in the “EA-piles” for both non-cohesive and cohesive soils.

Manufacturing process
The FRANKIPILE NG® is a cast-in situ concrete foundation pile with a recovered driving pipe. This is closed watertight underneath by means of a stopper made of dry concrete or grit. A free fall pile hammer working in the pipe strikes onto this stopper, thereby driving the pipe into the ground. The resulting pile driving work (number of strikes/m) is a measure of the load-bearing capacity of the ground at the respective pile location. After reaching the target depth and the pile driving criteria respectively, the stopper is detached and the necessary base concrete quantity is rammed down. Finally a reinforcing cage is adjusted, concrete filled in and the driving pipe pulled up again.

Should the in-situ ground have insufficient load-bearing capacity at the intended settling depth, ground improvement can be carried out before manufacturing the pile base by means of gravel pre-compression. In this case the ground is improved in a corresponding area below and above the pile settling depth by means of ramming down gravel.

Environmental friendliness
The manufacturing of the FRANKIPILE NG® takes place with low emissions due to internal pile driving. In the case of favourable boundary conditions it is also possible to carry out the foundation work with this pile system in the proximity of existing buildings. Due to the full earth displacement it is not necessary to transport earth, this therefore excludes the earth becoming loosened. The pile system has proven itself many times in building projects on contaminated sites.

Economic efficiency
The specific adaptation of the possible design variations to the foundation soil and the building site situation result in optimum utilisation with regard to the load-bearing capacity and pile length. Its almost 100-year application in building works is based on its perfected technology, high manufacturing standards and excellent economic efficiency.
FRANKIPILE NG®
without gravel pre-compression

1 Set driving pipe in place, fill in stopper concrete and ram in
2 Ramming in the driving pipe through inner ramming with free fall pile hammer
3 Formation of the pile base through ramming down the concrete
4 Fitting the reinforcing cage and concreting the shaft
5 Capping the pile head, arranging the connecting reinforcement

GW

non load-bearing foundation soil

load-bearing foundation soil

FRANKIPILE NG®
with gravel pre-compression

1 Ramming in the driving pipe through inner ramming with free fall pile hammer until the load-bearing foundation soil is reached
2 Ramming down the gravel whilst pulling the pipe
3 Ramming back the pipe into the gravel previously rammed down
4 Forming a pile base through ramming down concrete
5 Capping the pile head; arranging the connecting reinforcement

GW

non load-bearing foundation soil

load-bearing foundation soil

FRANKIPILE Rig

Specification
- Very high pile loads
- Very low settlement
- Full ground displacement
- Optimum adaptation to the foundation soil
- Base expansion
- Diameter 42, 51, 56, 61, 71 cm

Applications
- All types of constructions
- Contaminated foundation soil
- Fluctuating foundation soil conditions

Inclination up to max. 6:1 depending on rig type

Inclination up to, 4:1 depending on rig type

Rammed out base of the FRANKIPILE NG®
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Benefits:
- No excavated material needs to be transported
- Relatively low concrete consumption
- Concrete is bought on site
  (no long transportation routes from a finished part factory)
FRANKIPILE NG® in cohesive ground, pile diameter 56 cm

Test load of a FRANKIPILE NG® in non-cohesive ground, pile diameter 51 cm

Technical data

**Characteristic pile resistance \( E_k \) pressure**

<table>
<thead>
<tr>
<th>Driving pipe diameter ( D )</th>
<th>Working load in non-cohesive ground</th>
<th>Working load in half-solid cohesive ground</th>
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<tbody>
<tr>
<td>mm</td>
<td>kN</td>
<td>kN</td>
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<tr>
<td>710</td>
<td>6000</td>
<td>4000</td>
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</tbody>
</table>

\(*_{E_k} (1054 : 2005), applied load (1054 : 1978)*

**Characteristic pile resistance \( E_k \) tension**

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Pile loads up to 6000 kN, power plant, Wilhelmshaven

Comparison

Comparison foundation of the silos (Nk = 680.4 MN) with two systems

- **Bored piles**
  - Foundation plate ø 45 m
  - 124 Bored piles, ø 1.20 m
  - 29 m
  - 8,800 m³ ← concrete volume: piles + foundation → 2,400 m³

- **Ring foundation**
  - ø 29.6 m
  - 22 m
  - 106 Megapiles, ø 0.71 m

Cones penetration test

Since 2009, the FRANKIPILE NG® can also be produced with a shaft diameter of 71 cm. We call this FRANKIPILE NG a Megapile.

**Megapile**

With a slim shaft diameter of just 71 cm, characteristic actions (Ek) of up to 6000 kN can be carried with the usual limited amount of settlement, depending on the construction ground.

**Application options**

The Megapile can be used as a foundation element for buildings with high vertical loads e.g. power plants, bridges and industrial buildings, on a wide range of soils. Static proof loads up to 15 MN.

**Dimensioning**

The FRANKIPILE NG® are dimensioned and produced according to Eurocode 7 and the national standards and recommendations DIN 1054, DIN EN 12699 and EA piles.

**Efficiency**

The high load-bearing capacity means that the foundations can be designed to be much smaller than other pile systems even when the support loads are very high.

**Environment friendliness**

- Low-emission production thanks to inner pile driving system
- Full earth displacement
- Can be used at contaminated sites
- Relatively low concrete consumption
Dynamic proof load of a Megapile, Pile Ø 71 cm, Power plant Wilhelmshaven

Absorbable char. Bending torque with C35/45 concrete

Resistance - Settlement – Line

Bending torques