



## Deliverable D2.3

# Development of a versatile, compact drilling machine to operate in urban areas

## WP2

**Grant Agreement number** 792355  
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### *Dissemination Level*

<b>PU</b>	Public	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	<b>X</b>
<b>CI</b>	Classified, as referred to in Commission Decision 2001/844/EC	

## Summary

The report D2.3 “Development of a versatile, compact drilling machine to operate in urban areas” is a public document delivered in the context of WP2, Task 2.3: “Versatile and compact machine for more efficient drilling in built environment”.

The drilling machine and equipments were conceived to tackle and overcome the problems and the barriers analyzed in task 1.1 “Review and identification of the different barriers (technical, social, cultural, economic and legislative) for shallow geothermal applications in building renovation”.

In the framework of Task 2.2 (“Innovative head for heat exchanger installation”), ThyssenKrupp Infrastructures has developed a compact vibro-rotating head (VibroDrill) to be used inside buildings (low height rooms, cellars, underground parking garages, etc.) and inner courtyards or gardens. With vibrating frequencies of more than 100 Hz (>6000 bpm) it is able to drill through nearly all underground conditions, even concrete floors in rooms, basements and underground parking garages as well as layers of clay, gravel, sand and soft rock. Furthermore, the required flow of the flushing media (such as water or air) is low, avoiding flooding and contaminating sites that are undesired especially when drilling in susceptible environments, such as inside historical buildings.

At the same time, Hydra conceived and designed a novel versatile and compact drilling rig to be coupled with the VibroDrill head. With its low weight and small dimensions, the drilling machine is able to reach difficult accessible areas. A modular design has been studied allowing even the separation of the mast from the machine basis with the power pack and the water pump. The machine design allows for several degrees of freedom in such a way to drill multiple boreholes without changing its position.

The drilling machine has been equipped with a low-emission engine resulting in a huge pollutants emission reduction.

Hydra has also developed a semi-automatic drilling rod handling system in order to speed up the non-productive times (i.e. mounting/dismounting of casings, shafts and installation of heat exchangers).

The performance of the whole drilling equipment (rig, head, loading) has been tested at Hydra test site.

The operating parameters of the head (frequency, amplitude) and the machine (torque, piling pressure, drilling fluid injection flow and pressure) has been analyzed in order to maximize drilling speed: such parameters will be further tuned according to the different soil types in the demonstration sites.