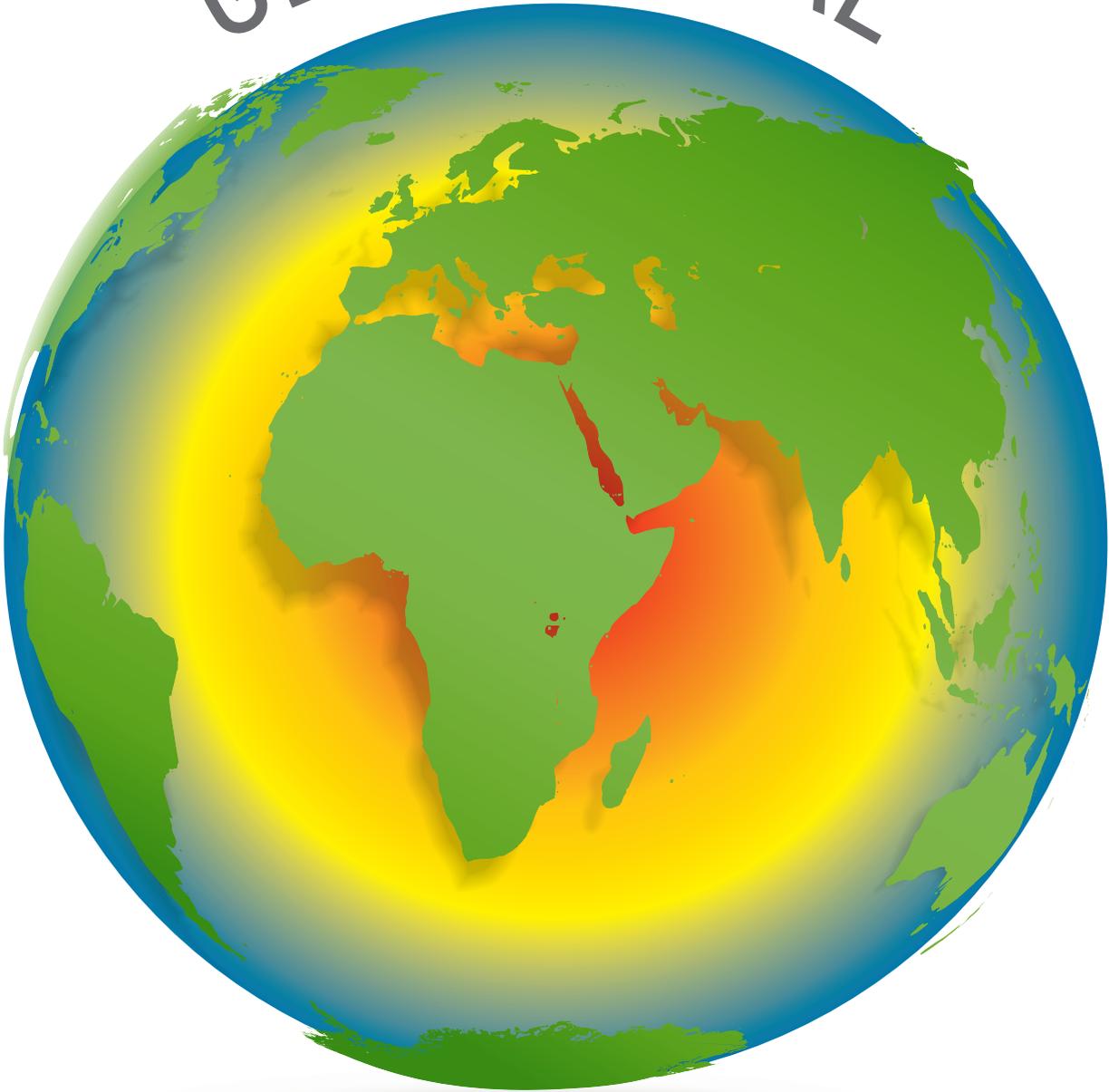


GEO THERMAL



COMACCHIO
DRILLING HI-TECH

GEO THERMAL



Drilling Solutions



Hydraulic crawler mounted drilling rigs specifically suitable to perform drillings for the installation of borehole heat exchangers (BHE) and water well drilling. These units use all rotary and/ or rotary percussive drilling systems and Down the Hole Hammer (D.T.H). Among these specific units the GEO 909 GT is the unique one with a patented automatic loading system for drilling rods and casings.

Passione
Passion

Qualità
Quality

Innovazione
Innovation



SINGLE HEAD

DOUBLE HEAD



GEOTHERMAL

More than 20 years experience gained in various countries of the world have led to the development of a complete range of specific hydraulic drilling rigs aimed to perform the installation of geothermal heat exchangers.

Twelve different models ranging from 7 to 22 tons weight (15,400 to 48,500 lb), designed to be used with single drill string, double drill string (with or without automatic loading system) allow to easily meet the most various drilling needs, soil configurations and working conditions.

Being in direct touch with the users through thirty years working experience has enabled **COMACCHIO** to develop this specific type of drilling rigs that base their efficiency on few principles:

Fulfilment of drilling project in the shortest possible time,

Power and reliability

reduce positioning time on the job site,

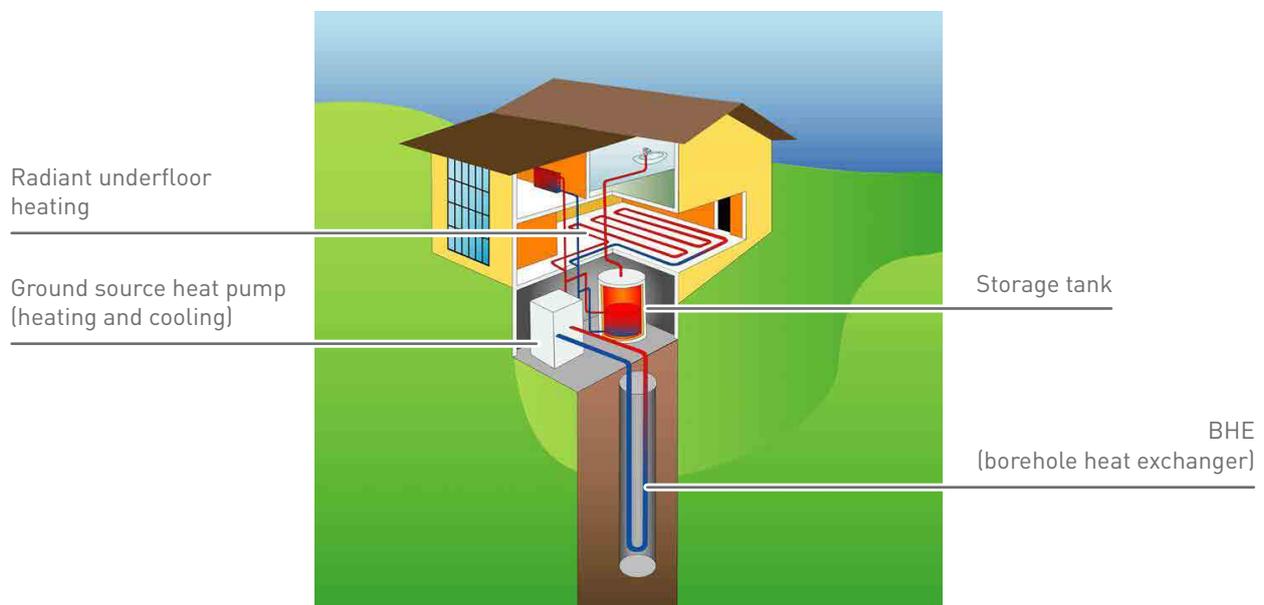
Easiness of movement and positioning

create easy and clean operating conditions and optimize working processes and time,

Special equipment features

....thus creating a high quality dedicated product for **GEOTHERMAL**.

Installation schematics



Drillings that use the “single drill string” system are usually used in the following conditions:

- In case of ROCKY TERRAIN



The drilling system that is mainly used comprises a Down the Hole Hammer (D.T.H.) pneumatically operated through a remote air compressor that provides the compressed air necessary to activate the hammer and to bring drill cuttings to surface at the same time.

In some cases the rock layer can be preceded by a loose soil layer, that's why in order to stabilise the hole drillers generally perform some pre-drilling using various casing systems. The most common systems utilize ODEX-type down-the-hole hammers or similar equipment that allow to execute drilling operations in such soil conditions by driving the casings at the same time (that are then welded together and left permanently in the ground). This method is particularly efficient and economical when the pre-drilling holes reach 15-30 meters depth (49,2 / 98,4 ft).

- In case of SOFT SOIL (clay, sand etc.)



The most commonly used drilling system is the direct circulation system with bentonitic mud or polymers. These fluids are injected by an appropriate pump that can be activated by the hydraulic circuit of the drilling rig or can be remote. Their main function is to seal the different underground water layers that would otherwise get into communication and be contaminated, to lubricate the drilling tools and to bring to surface the drill cuttings. This system is becoming less widespread due to new restrictive norms that tend to exclude the use of bentonitic mud /polymers in favour of casings (“double drill string” system), in order to preserve and protect the integrity of underground water supplies, both during the drilling processes and during the cementation of the heat exchangers.

In both cases the drill cuttings are conveyed and collected through special systems in order to avoid the pollution of the environment in which the drilling is performed.

GEO 500 - GEO 501



GEO 500

Engine Power	55 - 85 kW (74 - 114 HP)	
Mast Feed stroke	3.500 mm	11,5 ft
Feed force	4.500 daN	10,116 lbs
Retract force	6.500 daN	14,612 lbs
Rotary Torque	450 - 1.400 daNm	3,319 - 10,326 lb*ft
Rotary Speed range	70 - 380 rpm	
Clamp range	45 - 260 mm	1,8 - 10,2 in
Weight	7.000 - 8.500 kg	15,400 - 18,700 lbs



GEO 501

Engine Power	115 kW (154 HP)	
Mast Feed stroke	3.500 mm	11,5 ft
Feed force	4.500 daN	10,116 lbs
Retract force	6.500 daN	14,612 lbs
Rotary Torque	450 - 1.400 daNm	3,319 - 10,326 lb*ft
Rotary Speed range	90 - 380 rpm	
Clamp range	45 - 260 mm	1,8 - 10,2 in
Weight	9.000 - 10.500 kg	19,800 - 23,100 lbs

GEO 500 / GEO 501 are hydraulic drilling rigs equipped with oscillating track carriage and articulations on the mast, allowing an easy access to difficult terrains, able to perform:

- **Drillings into rock** \varnothing 4" $\frac{1}{2}$ - 5" up to 180-200 meters depth (590 - 656 ft) using 4" DTH hammer and pre-drillings with ODEX DTH hammer up to 15-30 meters depth (49,2 - 98,4 ft).
- **Drillings in soft soil** \varnothing 4" $\frac{3}{4}$ - 5" up to 120-150 meters depth (394 - 492 ft) using tri-cone / tri-blade tools and an appropriate external mud pump.

GEO 600

Engine Power	55 - 85 kW (74 - 114 HP)	
Mast Feed stroke	3.500 mm	11,5 ft
Feed force	4.500 daN	10,116 lbs
Retract force	6.500 daN	14,612 lbs
Rotary Torque	450 - 1.400 daNm	3,319 - 10,326 lb*ft
Rotary Speed range	75 - 980 rpm	
Clamp range	45 - 300 mm	1,8 - 11,8 in
Weight	6.500 - 8.000 kg	14,000 - 17,500 lbs



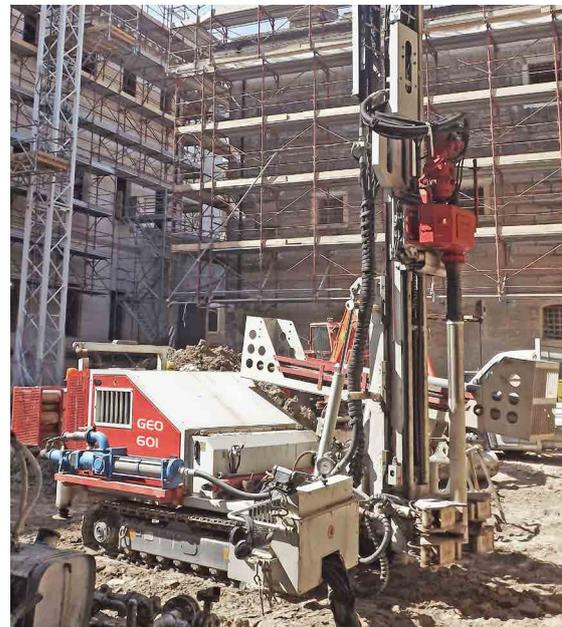
SINGLE HEAD

Small-medium size hydraulic drilling rig, benchmark for the Scandinavian market, able to perform various tasks, such as:

- **Drillings into rock** \varnothing 4" 1/2 - 5" up to 180-200 meters depth (590 - 656 ft) using 4" DTH hammer and pre-drillings with ODEX DTH hammer up to 15-30 meters depth (49,2 - 98,4 ft).
- **Drillings in soft soil** \varnothing 4" 3/4 - 5" up to 120-150 meters depth (394 - 492 ft) using tri-cone / tri-blade tools and an appropriate external mud pump.

GEO 60I

Engine Power	115 kW (154 HP)	
Mast Feed stroke	3.500 mm	11,5 ft
Feed force	4.500 daN	10,116 lbs
Retract force	6.500 daN	14,612 lbs
Rotary Torque	450 - 2.400 daNm	3,319 - 17,701 lb*ft
Rotary Speed range	57 - 980 rpm	
Clamp range	45 - 300 mm	1,8 - 11,8 in
Weight	7.000 - 9.500 kg	15.500 - 21.000 lbs



DOUBLE HEAD

Small-medium size hydraulic drilling rig, more powerful version of the GEO 600, able to perform various tasks such as:

- **Drillings into rock** \varnothing 4" 1/2 - 5" up to 180-200 meters depth (590 - 656 ft) using 4" DTH hammer and pre-drillings with ODEX DTH hammer up to 15-30 meters depth (49,2 - 98,4 ft).
- **Drillings in soft soil** \varnothing 4" 3/4 - 5" up to 120-150 meters depth (394 - 492 ft) using tri-cone / tri-blade tools and an appropriate mud pump activated directly by the drilling rig hydraulic circuit.



GEO 602 - GEO 655



GEO 602

Engine Power	115 kW (154 HP)	
Mast Feed stroke	4.000 mm	13,1 ft
Feed force	6.500 daN	14,613 lbs
Retract force	9.500 daN	21,357 lbs
Rotary Torque	450 - 2.400 daNm	3,319 - 17,700 lb*ft
Rotary Speed range	70 - 980 rpm	
Clamp range	45 - 320 mm	1,8 - 12,6 in
Weight	9.000 - 10.500 kg	20,000 - 23,000 lbs

Small-medium size hydraulic drilling rig, more powerful version of the GEO 601, able to perform various tasks such as:

- **Drillings into rock** \varnothing 8 - 10" up to 200 meters depth (656 ft) using 6" - 8" DTH hammer and pre-drillings with ODEX DTH hammer up to 30 - 40 meters depth (98 - 131 ft).
- **Drillings in soft soil** \varnothing 8" - 10" up to 180 - 200 meters depth (590 - 656 ft) using tri-cone / tri-blade tools and an appropriate mud pump activated directly by the drilling rig hydraulic circuit.



GEO 655 with automatic pipe handling system

Engine Power	85 kW (114 HP)	
Mast Feed stroke	4.500 - 7.500 mm	14,7 - 24,6 ft
Feed force	4.500 daN	10,116 lbs
Retract force	6.500 daN	14,612 lbs
Rotary Torque	450 - 1.400 daNm	3,319 - 10,325 lb*ft
Rotary Speed range	70 - 190 rpm	
Clamp range	45 - 220 mm	1,8 - 8,6 in
Weight	11.000 - 13.000 kg	24,000 - 28,700 lbs

Based on the main features of the GEO 601, the GEO 655 is distinguished by a PATENTED automatic drilling rods loading system with 198 meters (650 ft) capacity that allows one single driller to operate the machine, thus reducing operating costs and improving safety.

- **Drillings into rock** \varnothing 4" 1/2 - 5" up to 180-200 meters depth (590 - 656 ft) using 4" DTH hammer and pre-drillings with ODEX DTH hammer up to 15-30 meters depth (49,2 - 98,4 ft).
- **Drillings in soft soil** \varnothing 4" 3/4 - 5" up to 120-150 meters depth (394 - 492 ft) using tri-cone / tri-blade tools and an appropriate mud pump activated directly by the drilling rig hydraulic circuit.

GEO 900 - GEO 901

GEO 900 with/without automatic pipe handling system

Engine Power	126 - 160 kW (169 - 214 HP)	
Mast Feed stroke	4.000 - 5.030 mm	15,7 - 16,5 ft
Feed force	7.000 - 19.500 daN	15,736 - 43,837 lbs
Retract force	14.500 - 19.500 daN	32,597 - 43,837 lbs
Rotary Torque	600 - 3.600 daNm	4,425 - 26,552 lb*ft
Rotary Speed range	20 - 140 rpm	
Clamp range	45 - 360 mm	1,8 - 14 in
Weight	14.000 - 20.000 kg	30,800 - 44,100 lbs



SINGLE HEAD



Based on the main features of the GEO 655, the GEO 900 is distinguished by its higher performance combined with a PATENTED automatic drilling rods loading system with up to 200 meters (656 ft) capacity that allows one single driller to operate the machine, thus reducing operating costs and improving safety.

- **Drillings into rock** \varnothing 10" - 12" up to 300 meters depth (984 ft) using 6" - 8" DTH hammer and pre-drillings with ODEX DTH hammer up to 50-60 meters depth (164 - 197 ft).
- **Drillings in soft soil** \varnothing 10" - 12" up to 300 meters depth (984 ft) using tri-cone / tri-blade tools and an appropriate mud pump activated directly by the drilling rig hydraulic circuit.

GEO 901

Engine Power	188 - 225 kW (255 - 306 HP)	
Mast Feed stroke	4.000 mm	13,7 ft
Feed force	12.000 daN	26,977 lbs
Retract force	20.000 - 30.000 daN	44,961 - 67,442 lbs
Rotary Torque	600 - 4.800 daNm	4,425 - 35,402 lb*ft
Rotary Speed range	31 - 140 rpm	
Clamp range	45 - 520 mm	1,8 - 20 in
Weight	19.000 - 22.000 kg	42,000 - 48,500 lbs



DOUBLE HEAD



Based on the main features of the GEO 900, the GEO 901 is distinguished by its higher performance.

- **Drillings into rock** \varnothing 10" - 12" up to 400 meters depth (1.312 ft) using 6" - 8" DTH hammer.
- **Drillings in soft soil** \varnothing 10" - 12" up to 400 meters depth (1.312 ft) using tri-cone / tri-blade tools and an appropriate mud pump activated directly by the drilling rig hydraulic circuit.

GEOHERMAL

The drillings that use the “**double drill string**” system are also called “with double head”. This system allows to stabilise the hole throughout the entire depth in a fast and efficient way and at the same time it preserves the underground water by preventing the layers located at different depth from getting into communication thanks to the use of casings. The system consists of a lower rotary head rotating (generally counter clockwise) the outer drill string (casings) and an upper rotary head rotating clockwise the inner drill string (drilling rods) and the related drilling tool. The continuous movement and the counter rotation of the two rotary heads allow a rapid and homogeneous penetration and facilitate the ascent of the drill cuttings. A crown bit is fitted at the bottom of the casings, whereas the rods can mount down-the-hole hammers, tri-cones or tri-blades at their base, depending on the drilling method being used.

This system is generally implemented in the following conditions:

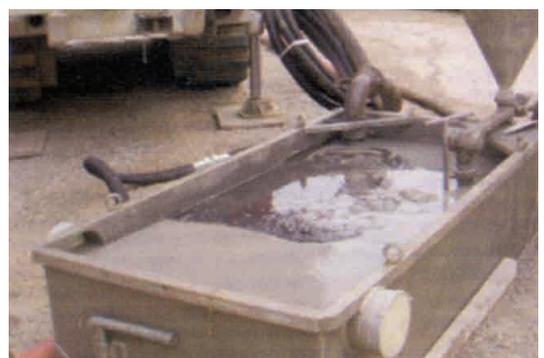
- In case of **LOOSE ROCKY TERRAIN**

In presence of loose terrain, gravel and alluvial formations the tool fitted to the inner drill string is mainly a down-the-hole hammer (D.T.H.) pneumatically operated through a remote air compressor that provides the compressed air necessary to activate the hammer and at the same time to bring to surface the drill cuttings that are conveyed in the air gap between the inner and outer drill string.



- In case of **SOFT SOIL (clay, sand etc.)**

The system can be efficiently used also in soft soil conditions, but the tool fitted on the inner string has to be a tri-cone or a tri-blade with direct circulation of bentonitic mud or polymers. These fluids are injected by an appropriate pump that can be activated by the hydraulic circuit of the drilling rig or can be remote. Their main function is to lubricate the drilling tools and to bring to surface the drill cuttings.



In both cases the drill cuttings are conveyed and collected through special systems in order to avoid the pollution of the environment in which the drilling is performed.



DOUBLE HEAD



GEO 602 GT - 900 GT



GEO 602 GT

Engine Power	115 kW (154 HP)	
Mast Feed stroke	8.300 mm	27,2 ft
Feed force	6.500 daN	14,613 lbs
Retract force	9.500 daN	21,357 lbs
Rotary Torque	600 - 2.400 daNm	4,425 - 17,701 lb*ft
Rotary Speed range	57 - 190 rpm	
Clamp range	45 - 320 mm	1,8 - 12 in
Weight	10.000 - 12.000 kg	22,000 - 26,500 lbs

Small-medium size hydraulic drilling rig, based on the size of the GEO 601, the version called GEO 602 is equipped with a more powerful mast and a double head system able to perform:

- **Drillings in loose soil** with \varnothing 5" $\frac{1}{2}$ - 6" casings up to 70-80 meters depth (230 - 262 ft) and drillings using only the DTH hammer up to 180-200 meters depth (590 - 656 ft).
- **Drillings in loose soil** with \varnothing 5" $\frac{1}{2}$ - 6" casings and tri-cone / tri-blade tools with mud circulation up to 100 meters depth (328 ft), using an external mud pump.



GEO 900 GT

Engine Power	126 - 160 kW (169 - 214 HP)	
Mast Feed stroke	7.950 - 8.950 mm	26,1 - 29,4 ft
Feed force	7.000 - 19.500 daN	15,737 - 43,838 lbs
Retract force	14.500 - 19.500 daN	32,597 - 43,838 lbs
Rotary Torque	600 - 3.600 daNm	4,425 - 26,552 lb*ft
Rotary Speed range	20 - 140 rpm	
Clamp range	45 - 360 mm	1,8 - 14 in
Weight	12.000 - 15.500 kg	26,500 - 34,000 lbs

High-performance hydraulic drilling rig with double head system able to fulfil:

- **Drillings in loose soil** with \varnothing 5" $\frac{1}{2}$ - 6" casings up to 150-160 meters depth (492 - 564 ft) and drillings using only the DTH hammer over 300 meters depth (984 ft).
- **Drillings in loose soil** with \varnothing 5" $\frac{1}{2}$ - 6" casings and tri-cone / tri-blade tools with mud circulation up to 200 meters depth (656 ft), using a mud pump activated directly by the drilling rig hydraulic circuit.

GEO 90I GT

Engine Power	188 - 225 kW (255 - 306 HP)	
Mast Feed stroke	8.500 mm	27,9 ft
Feed force	12.000 daN	26,977 lbs
Retract force	20.000 - 30.000 daN	44,961 lbs
Rotary Torque	600 - 4.800 daNm	4,425 - 35,402 lb*ft
Rotary Speed range	31 - 140 rpm	
Clamp range	45 - 360 mm	1,8 - 14,2 in
Weight	18.500 - 22.500 kg	40,785 - 49,604 lbs



High-performance hydraulic drilling rig with double head system able to fulfil:

- **Drillings in loose soil** with \varnothing 5" $\frac{1}{2}$ - 6" casings up to 180 -200 meters depth (590 - 656 ft) and drillings using only the DTH hammer over 400 meters depth (1.312 ft).
- **Drillings in loose soil** with \varnothing 5" $\frac{1}{2}$ - 6" casings and tri-cone / tri-blade tools with mud circulation up to 300 meters depth (984 ft), using a mud pump activated directly by the drilling rig hydraulic circuit.



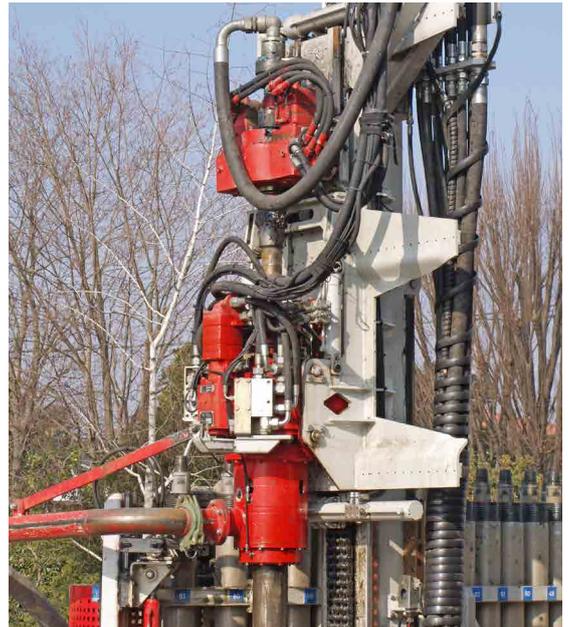
GEO 909 GT

Patented



GEO 909 GT automatic carousel rods/casings

Engine Power	147 - 160 kW (197 - 214 HP)	
Mast Feed stroke	9.670 mm	31,7 ft
Feed force	14.500 - 19.500 daN	32,597 - 43,838 lbs
Retract force	14.500 - 19.500 daN	32,597 - 43,838 lbs
Rotary Torque	600 - 3.600 daNm	4,425 - 26,552 lb*ft
Rotary Speed range	20 - 110 rpm	
Clamp range	85 - 200 mm	3,3 - 8,6 in
Weight	19.000 - 21.000 kg	42,000 - 46,300 lbs
Rods and casings carousel capacity		
Nr.64 pipes Ø 140 mm/rods Ø 89 mm L 2.000 mm		
Nr.64 pipes Ø 152 mm/rods Ø 89 mm L 2.000 mm		



Unique in the world and exceptional in many ways, the GEO 909 GT was awarded a Special mention for Technical Innovation at the International SAMOTER show in 2008. Its design is based on the main features of the GEO 900 GT, but it's distinguished by a PATENTED automatic loading system for both drilling rods and casings with 122 meters capacity (400 ft) that allows one single driller to operate the machine, thus reducing operating costs and improving safety. The machine can perform:

- **Drillings in loose soil** with Ø 5" ½ - 6" casings up to 150-160 meters depth (492 - 564 ft) and drillings using only the DTH hammer over 300 meters depth (984 ft).
- **Drillings in loose soil** with Ø 5" ½ - 6" casings and tri-cone / tri-blade tools with mud circulation up to 200 meters depth (656 ft), using a mud pump activated directly by the drilling rig hydraulic circuit.

MC 20 GT

Engine Power	188 kW (255 HP)	
Mast Feed stroke	4.300 mm	14,1 ft
Feed force	10.000 daN	22,48 lbs
Retract force	10.000 daN	22,48 lbs
Rotary Torque	720 - 2.370 daNm	5,31 - 17,48 lb*ft
Rotary Speed range	20 - 220 rpm	
Clamp range	45 - 300 mm	1,8 - 11,8 in
Weight	17.200 kg	38,000 lbs



High-performance hydraulic drilling rig with double head system able to fulfil:

- **Drillings in loose soil** with \varnothing 5" 1/2 - 6" casings up to 150-160 meters depth (492 - 564 ft) and drillings using only the DTH hammer over 300 meters depth (984 ft).
- **Drillings in loose soil** with \varnothing 5" 1/2 - 6" casings and tri-cone / tri-blade tools with mud circulation up to 200 meters depth (656 ft), using a mud pump activated directly by the drilling rig hydraulic circuit.





Comacchio s.r.l.

Via Callalta, 24/B - 31039 Riese Pio X (TV) (Italy)

Tel +39 0423 7585 - Fax + 39 0423 755592

www.comacchio.com