

Atlas Copco Ground Engineering Products

Mustang geotechnical drilling rig



Mustang 4-F1 for geothermal drilling

Atlas Copco

Mustang 4-F1

– dedicated to geothermal drilling

Geothermal heat pumps, or ground source heat pumps as they are also known, have been used successfully in Europe for more than three decades. Residential and office complexes alike have enjoyed sizeable reductions in energy costs thanks to them. The Atlas Copco Mustang rigs have offered drilling solutions to the market for almost 30 years and is now ready to take on the challenge of making geothermal heating accessible for the wider audience.

In many countries local authorities are beginning to replace their fossil fuel fired systems with ground sourced energy alternatives. Moreover, with the price of energy rising, households are turning to new ways of heating and cooling their properties.

That is why geothermal drilling has become an interesting business opportunity, especially for water well contractors. Moreover, with this opportunity comes a challenge - accessing residential properties to drill without churning up the garden or blocking access ways.

Now Atlas Copco has the solution - the compact Mustang 4-F1 geothermal drilling rig.

A one-stop turnkey solution

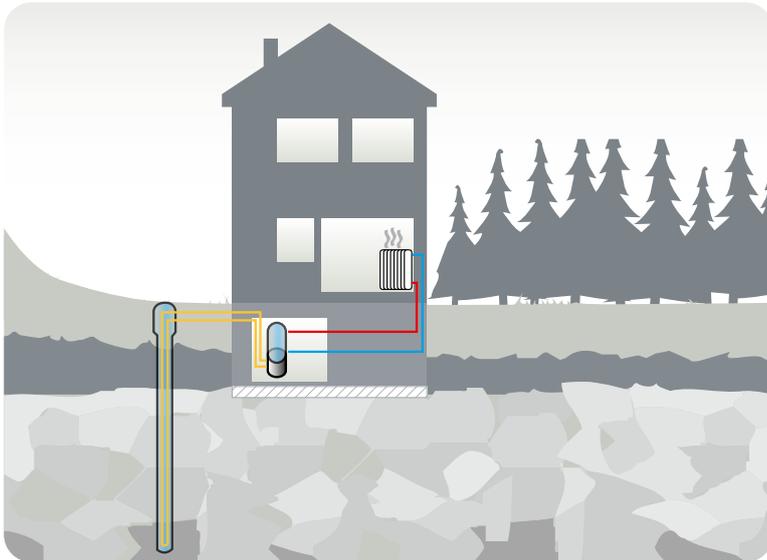
Atlas Copco has been manufacturing geothermal drilling equipment for more than three decades. Not only do we offer the top-grade compact DTH drilling rig on the market, we also offer a complete drilling package. This includes the Atlas Copco compressor, market leading Secoroc rock drilling tools, including the world's largest selection of DTH hammers and bits, as well as Symmetrix and Odex overburden drilling systems. Moreover, we supply the casings and drill rods as well as the oils and lubricants needed. Only Atlas Copco can deliver such a unique in-house turnkey solution for your geothermal drilling operation.

Compact and dedicated to geothermal drilling

The powerful Mustang 4-F1 drilling rig is equipped with everything you need for drilling geothermal holes. It can drill down to 150 meters (490 ft) with 5" to 6" DTH equipment. It is also compact, it has rubber crawler pads, it is one-man operated, it is easy to transport between sites and can access tight and ground-sensitive sites with a minimum of disturbance.

Get in – get out smoothly

Aimed at the residential market, the Mustang 4-F1 drilling rig is designed to get in and out of tight spots. The rig is highly manoeuvrable and thanks to the crawler system, it can easily be driven on and off a truck. Once on site,



Geothermal heating and cooling

this compact rig makes its way around houses and gardens with the minimum of disturbance. With the rubber crawler pads, the rig's 6000 kg (13k lb) is evenly distributed - 0.5 kg/cm² (7.1 psi) to be exact - so lawns and drives have little to show for it. Then, when it is time to move on, the feed and tilt-able rod rack easily folds down for a quick departure.

Green in many ways

Not only is the lawn left green, the Mustang 4-F1 also has a green Tier 3 Deutz diesel engine. Its load-sensing valves and pressure-compensating pumps guarantee low fuel consumption while harmful and unpleasant exhaust fumes are kept to a minimum. Noise pollution is also minimized with the "silent" Atlas Copco compressor. The 35 bar (507 psi) rated air and lubricating system allows an adequate lubrication of the DTH hammer. By using of Atlas Copco lubricants, this in turn minimizes the risk for soil pollution. In addition, by utilizing a multi purpose

diverter head attached to the casing top opening, rock cuttings from the drill hole are blown directly into a waste container, which reduces debris around the site.

One-man operated with no-fuss solutions

Thanks to the user-friendly control panel, a single operator can run this rig. All the gauges and levers are ergonomically designed and easy to use and read. For example, with a pull of a lever, the Mustang 4-F1's positioning device moves the feed accurately and safely into place. The position of the compact tilt-able rod rack, winch and rod breaker facilitate quick and easy rod changes and guarantees high productivity. In addition the rig provides ITH tool service with a 7 bar (101 psi) pneumatic connector on board for on-site bit grinding which allows for extended bit life and high performance drilling. Moreover, standard non threaded casings can be welded together on-site thanks to the rig-mounted

hydraulically operated welder. With the help of the variety of different rod guides, easy collaring, exceptional feed control and "hold-back", the risk of the drill getting stuck is minimal. However, despite this, should the worst come to the worst the Secoroc COP backhammer can save the day and retrieve the valuable string and hammer from the hole.



Secoroc COP backhammer

Product features

The Mustang 4-F1 rig is based upon the vast knowledge and expertise that Atlas Copco has built up over years in underground and surface drilling. Here are a few of the innovative solutions.

Winch

Rods can be lifted into place with the aid of the main winch. This winch can handle up to one ton of equipment.



Rod handling features

The tiltable rod rack have space for 40 rods (outer diameter 76 mm (3") and length 3 m (10ft)). The rod holders and breaker provide a variety of wrenches and guides that facilitate quick and easy rod changes during production.



ITH tool service

Optional hydraulic welder unit and pneumatic connector for bit grinding.

Operators panel

The compact, centered operator's panel with easily accessible controls for better ergonomics and safe operation.

The Deutz air-cooled diesel engine

The Deutz D914L05 2V diesel engine has an output of 72.5 kW (97 hp), and powers the pressure compensated hydraulic pumps. To maintain safe operation, these pumps power one main function each on the drilling rig. The engine is Tier 3 classified in accordance with the current Federal non-road emission standards. (Optional 86,5 kW Deutz D914L06-2v)





Atlas Copco rotation unit

The field-proven DHR 48H rotation units offer speeds of up to 125 rpm and torque of up to 5 700 Nm (4 200 lb ft) for optimal penetration. Add to that a pull capacity of 42 kN (9.5 k lbf) and pull length of 3.9 m (12.8 ft), and the rotation unit can effortlessly lift the drillstring up, out of the hole. This rotation unit also comes with a floating spindle which keeps the wear of the rod thread to a minimum.

Off hole shift

The Mustang rig comes with an "off hole shift function" which by use of a hydraulic cylinder moves the rotation unit sideways, all for free access to the drill center and easy "hole service". In geothermal applications this could be i.e. installation of collector hoses or for regular water wells it could be water flow test, well splitting or installation of pumps.

Casing lifting device

For recovery of casings, the rig is equipped with a casing lifting device designed with a lifting capacity of 12 tonnes (26.5 k lb) and variety of jaws to handle most common casings used in geothermal applications.

Products that complete the package

Secoroc rock drilling tools

As market leader in rock drilling tools, Atlas Copco offers the best DTH equipment on the market today. Secoroc hammers are ideal for high performance drilling as the valveless airflow allows deeper drilling and faster penetration in water-saturated holes than any other hammer type. The 4", 5" and 6" versions are ideal for geothermal drilling.



Symmetrix overburden drilling systems

Whether drilling in unconsolidated ground or a deep layer of overburden, Symmetrix is the ideal tool. By using retrievable Symmetrix, holes are drilled and cased in one single operation. With the help of the rotation unit, the Symmetrix drillstring and retrievable casing are removed as cement is poured into the hole. In especially difficult conditions, the mounted casing extractors facilitate casing removal. Moreover, when drilling through solid rock, drill-through Symmetrix drills as far as you wish without having to change drilling equipment.



Odex overburden drilling systems

Odex is an eccentric retrievable drilling system that's ideal for short holes up to 273 mm (10 3/4") in diameter. Well drillers often have an Odex drill bit at hand for simultaneous casing of water and geothermal wells. The advantage is that Odex drills and installs the casing quickly and efficiently. While the ingenious bit system allows the complete drill bit to be retrieved – ready to drill the next hole.



Atlas Copco Compressor

The Atlas Copco Compressor is by far one of the most efficient compressors on the market today. T3 diesel engines optimize fuel consumption thanks to the exclusive FuelXpert system and the components last longer with Oiltronix lubrication.



Technical specifications

Rotation unit DHR 48H68 - 2 3/8" API Reg Box

Gearbox with two hydraulic motors. Incl floating splined spindle and serial /parallel valves

Data at 90 l/min (24 gpm), 175 bar (2 500 psi):	serial	parallel	serial*	parallel*	mode
Speed range	0-80	0-40	0-100	0-50	r/min
Torque	2 850 (2 100)	5 700 (4 200)	2 280 (1 680)	4 560 (3 360)	Nm (lb ft)
Hydraulic rotation motors	2 x OMSS 250 / 2xOMSS 200*				
Length x width x height	550 x 354 x 273 mm (22 x 14 x 11")				
Weight	166 kg (366 lb)				

*optional rotation unit

Feed BMI 3.9 HD

Feed beam with hyd. motor, transmission and automatic break

Pull force	42.2 kN (9.5 k lbf)
Feed force	42.2 kN (9.5 k lbf)
Travel length	3 900 mm (154")
Total length	5 640 mm (222")
Speed	26 m/min (85 ft/min)
Hydraulic motor	Danfoss OMSS 200
Off-hole shift sideways	270 mm (11")

Diesel engine D914L05 2V

Deutz 4-stroke aircooled direct injected diesel engine

Model	D914L05 2V
Rated power	72.5 kW (97.2 hp) at 2 300 r/min
Torque	333 Nm (246 lb ft) at 1 500 r/min
Fuel consumption	215 g/kWh at 2 500 r/min > apprx 8 l/h (0.353 lb/hp-hr apprx 2.1 gal./h)
Fuel tank capacity	80 l (21 gal.)
Cylinders	5, in line
Bore / Stroke	102 / 132 mm (4 / 5.2")
Displacement	5393 cm ³ , 5.393 l (329 in ³ , 1 425 gal.)
Electrical system	24 V
Weight	360 kg (794 lb)

Main hoist

Cable rope	10 mm x 30m (0.4" x 98ft)
Pull on 1st layer	10 kN (2.25 k lbf)
Speed on 1st layer	38 m/min (125 ft/min)
Incl. automatic brake and shut-off for minimum rope on drum.	

Foam pump

Hydraulically driven 3-cylinder foam/water pump with control valves, suction and delivery hoses.

Capacity (valid for clean water - 0m. suction lift)	30 l / 25 bar (8 gal. / 363 psi)
Hydraulic motor	Danfoss OMM 12.5

Crawler U/F25 1/68 rubber pads

Crawler width	2 250 mm (89")
Length c/c	1 945 mm (77")
Track width	300 mm (12")
Operation angle max	30°
Speed on level ground	2.2 km/h (1.4 miles/hour)
Hydraulic motor	Rexroth A2FE 32
Ground clearance	240 mm (9")
Pad weight distribution	0.5 kg/cm ² (7.1 psi)

Mud pump

Hydraulically driven screw type with control valves, suction and delivery hoses.

Capacity	660 l/min (174 gal./min), max 25 bar (363 psi)
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Mud pump (option)

Hydraulically driven centrifugal type with control valves, suction and delivery hoses.

Capacity	1 000 l/min (264 gal./min), max 12 bar (174 psi)
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Additional features

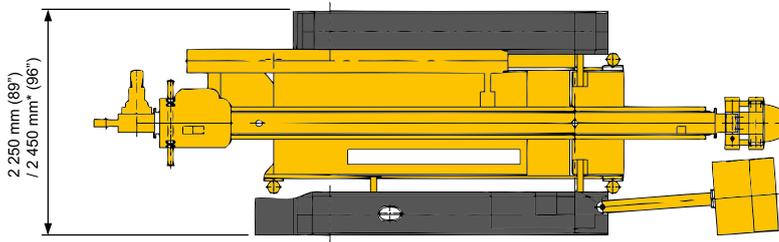
Hold-back system. Provides correct down-force; drilling speed increases and bit life improves. Includes gauges and regulators

DTH lubrication. Down-the-hole hammers require lubrication for proper operation. Mustang lubrication system (Venturi) includes injection system for correct dosage. Oil vessel 10 l (2.6 gallon). Max pressure 35 bar (507 psi).

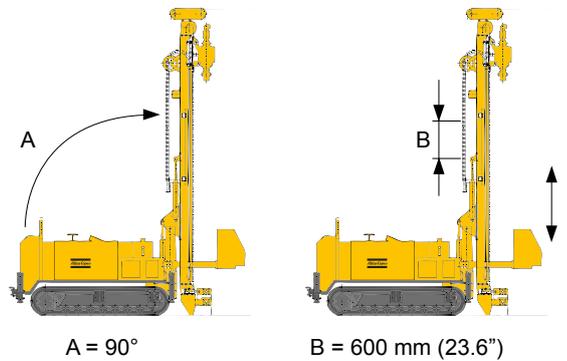
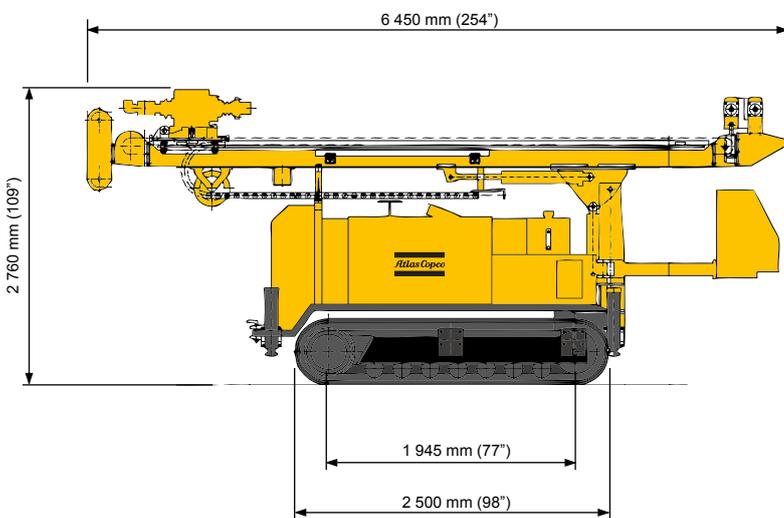
Break-out table. WW version with fixed wrench 65 mm (2.6") key grip. Max opening 310 mm (12.2").

Work lights. 3 pcs 100 W flood lights, mounted in top of mast and on canopy.

Rig cleaning device. Hose and spray lance connects to the water / foam system. For use with C-35 foam pump.



* including mud pump



The complete Atlas Copco Mustang range

Mustang range

Mustang 4	Mustang 5	Mustang 9	Mustang 13
4-F1, -F2, -F3	5-F4	9-E1, -E3	13-E1, -E3
4-F4	5-T1, -T3	9-F1, -F3	13-H1, H3, H5
4-N2, -N3	5-P4	9-F4	13-T1, -T3
4-S1, -S2, -S3		9-H5	
4-T1, -T3		9-T1, -T3	

Feed Lifting Capacity	
4	42 kN (9.5 k lbf)
5	49 kN (11.0 k lbf)
9	90 kN (20.2 k lbf)
13	130 kN (29.2 k lbf)

Carrier	
E	Crawler Excavator
F	Crawler Fixed
H	Crawler Heavy Duty
N	Crawler Narrow
P	Pendulum
S	Skid
T	Truck / Trailer

Mustang 4 - F 1

Positioning Device	
1	Fixed column
2	Fixed column + manual turntable
3	Fixed column + hydraulic turntable
4	Articulated boom & feed
5	Articulated boom & feed, HD version



Atlas Copco Geotechnical Drilling and Exploration
www.atlascopco.com

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