



**UPETROM**  
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# LAND DRILLING RIG F 320-EA / DEA-M P1, AC VFD DRIVEN



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## FIELD OF APPLICATION

The **F320-EA/ DEA-M P1** winterized land drilling rig is designed for working in the following temperature range:  
-45 to +50 Celsius degrees.

The **F320-EA/ DEA-M P1** land drilling rig is driven by AC VFD electric motors (AC of variable frequency drive) and can perform the following jobs:

- conventional well drilling with either the rotary table or the top drive system
- drill-string running in and pulling out;
- casing-string running in;
- removal of troubles and damages at the site;
- drilling-mud mixing, solids control and circulation;
- performance of auxiliary jobs as required by the processes of casing, cementing, etc.

The **F320-EA/ DEA-M P1** land drilling rig can drill gas/ oil wells down to a depth of 16,400 ft (5,000 m) with 5" drill pipes or under conditions involving a limit of 720,000 lbs (3,200 kN) for the max. hook load.

## DESCRIPTION

**F320-EA/ DEA-M P1** is a fully winterized, land drilling rig, for arctic operations.

All equipments are mounted in insulated, heated and ventilated houses and modules, providing fast rig mounting and start up, for extreme cold weather operation (minimum working temperature -45 Celsius degrees).

The rig is also designed for operation in warm weather conditions up to +50 Celsius degrees.

The rig is equipped with a foldable „U” section mast designed for top drive installation.

The mast is folded by the means of draw-works and line raising system.

Rig controls are performed from the computerized, heated and air conditioned driller's cabin located on the drill floor.

Driller's cabin is equipped with control joysticks, LCD monitors to visualise all drilling (instrumentation) parameters and video cameras.

The rig drive is electric under AC VFD conditions (variable frequency drive).

Supplying the rig with electric energy is feasible from five units CAT 3512 diesel-electric stations.

Driving is realized under AC conditions, the frequency being adjustable through a numeric control system.

The equipment of synchronization, control and adjustment allows five (5) generator sets to be supplied and can drive nine (9) electric motors AC VFD type of 850 kW through VFD type control station (2 for the drawworks, 1 for the rotary table, 2x3 for the mud pumps), two (2) electric motors for the TDS 11 SA top drive system and other auxiliary/lighting consumers.

The electric lighting system for the drilling rig, the pipe rack and the buildings around the mast is explosion-proof.

The electric emergency-lighting system is supplied at 12 VDC.

The electric system is equipped with a CAT 3406 stand-by generator set of 292 kW/ 365 kVA/50 Hz c/w battery start up.

The TF-38 E drawworks, MRL-275 Rotary Table and the three GMP 3PN 1600-2EA Unitized Mud Pumps are driven independently from their own power units electric AC motors of 850 kW x 1,000 rpm.

The rig air system is provided with three Ingersoll-Rand screw air compressors and air tanks of 8 cu.m.

The **F320-EA/ DEA-M P1** drilling rig is equipped with several hydraulic / air powered devices to ease the working jobs on the drill floor.



## SPECIFICATIONS

• Max. working hook load with 10 lines	720,000 lbs (320 mton/ 3200 kN)
• Recommended working depth (for a hook load limit of 320 mton) with drill pipes of 5 in	16,400 ft (5,000 m)
• Number of drilling lines	10
• Drilling line size	1.3/8 in (35 mm)
• Pipe stand max. length	88,60 ft (27 m)
• Operation type	EA/ DEA (AC electric operation)
control system type	VFD (variable frequency drive)
prime electric power generating set type	CATERPILLAR 3512 1370 HP; 1050 kW; air start-up.
number of prime electric power generating sets	5
installed power	5x1460 kVA=7300 kVA; 3 x 660 V; 50 Hz
stand-by electric power generating set type	CAT 3406 with SR4 generator
number of stand-by electric power generating sets	1
stand-by electric generating set installed power	365 kVA; 292 kW; 1,500 rpm 3 x 400/231 V; 50 Hz; battery start-up
A.C. VFD electric operating motor type	MABEExelIT3 500S 170-6
electric motor power / speed	1140 HP (850 kW) / 1000 rpm
voltage / current	660 V / 901 A
number of A.C. electric operating motors	9 (2 pcs. for draw-works, 1pc. for rotary table and 2x2 pcs. for unitized mud pumps)
• Draw works type	TF-38E AC VFD driven and speed adjusting, mounted on heavy duty steel skid in insulated and heated rig house.
max. power of the draw-works input shaft	2300 HP
electric motor type	AC VFD MABEExelIT3 500S 170-6; 1140 HP (850 kW) / 1000 rpm
electric motor number	2
max. line pull	85430 lbs (38 mton)
drum speed number	4+4 Reverse
number of drums	1 with lebus groove for 35 mm (1.3/8") drilling line.
parking & emergency brake	Band brake Hydraulically actuated by LIDAN servo-cylinder, with joystick control in driller's cabin and electric HPU for hydraulic supply.
dynamic brake:	VARCO V336-120 Disc Brake with Electronic Drilling System EDS3C, featuring Weight on Bit (WOB) and Rate of Penetration (ROP) functions.
crown saver	Pneumatic type
cooling system	Forced water cooling system with el-pumps and water tanks.
• Mast type	MU 320, "U" section foldable mast, free Standing-Non guyed mast designed for TOP DRIVE installation.
max. hook load with 10 lines	720,000 lbs (320 mton / 3200 kN)
clear mast height (from the working floor up to the crown block beam)	152 ft (46.33 m)
section number	4 sections plus mast base
mast raising	by means of the mast raising system and the hoisting system of the drilling rig
racking capacity (5 in pipes arranged as pipe stands of 27 m)	16,400 ft (5000 m)
racking board height	84.30 ft (25.7 m) from the drill floor level.
Derrickman Escape Device	line-installed with seat, brake etc. for emergency escaping beyond rig limits.

**LAND DRILLING RIG**  
**F 320-EA / DEA-M P1, AC VFD DRIVEN**

• Top drive system	VARCO TDS 11 SA
max. hook load	500 USton (455 mton)
max. working pressure	7500 PSI (500 bar)
number of electric AC VFD driving motors	2
electric AC VFD driving motor power	400 HP
max. torque under discontinuous-regime conditions	54,948 lb-ft (74.5 kN.m)
max. torque under continuous-regime conditions as follows:	
at 110 rpm	37468 lb-ft (50.8 kN.m)
at 228 rpm	18217 lb-ft (24.7 kN.m)

• Substructure type	fixed
max. load of the rotary table beams	720,000 lbs (320 mton)
max. load at the setbacks	450,000 lbs (200 mton)
simultaneously-applied max. load	1,170,000 lbs (520 mton)
working floor height	32.80 ft (10 m)
clear height under the rotary table beams	27.56 ft (8.40 m)

• Rotary table type	MRL-275
max. opening	27.5 in (698.50 mm)
max. static load	1,100,000 lbs (500 mton)
max. transmitted power	600 HP
max. rotor speed	300 rpm
max. rotor torque (in rotation)	20300 lb-ft (2,800 daNm)
max. static torque of the rotor	86,800 lb-ft (12,000 daNm)
rotary table driving type	independently AC VFD driven
rotary table electric motor type	AC VFD MABEExelIT3 500S 170-6; 1140 HP (850 kW) / 1000 rpm
rotary table electric motor number	1
rotary table speeds	2 forward and 2 reverse by gear box; AC VFD speed adjusting
rotary table brake	inertia brake with air clutch

• Crown block type	(5+1).35.GF-400
max. static load on 10 lines	900,000 lbs (400 mton)
number of sheaves	6 for 1.3/4" (35 mm) line diameter

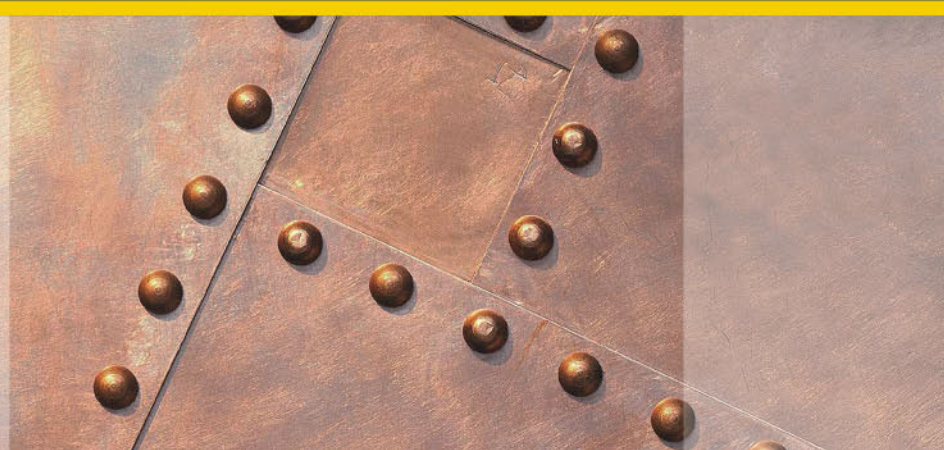
• Hook block type	5.35.MCA-400
max. static load on 10 lines	900,000 lbs (400 mton)
number of sheaves	5 for 1.3/8" (35 mm) line diameter

• Swivel type	CH-320
max. static load	900,000 lbs (400 mton) on 10 lines
min. bore size	3" (76 mm)
max. working pressure	7500 PSI (500 bar)
max. rotation speed	300 rpm
thread for connection between the stem and the sub	6.5/8 in REG-LH type
thread for connection between the sub and the kelly	6.5/8 in REG-LH type
thread for connection to the rotary hose	LP 4 in type

• Unitized mud pump type	GMP 3 PN – 1600 – 2 EA, mounted in insulated house, heated and ventilated for extreme cold weather operation.
number of unitized pump	3
number of AC VFD electric motors/ pump	2
electric motor type	AC VFD MABEExelIT3 500S 170-6; 1140 HP (850 kW) / 1000 rpm
mud pump type	3 PN – 1600-2 EA
number of mud pumps	2
max. power at the pump inlet shaft	1600 HP
max. working pressure (with liners of 5 in)	5076 PSI (350 bar)
total max. theoretic flow rate (with liners of 7.½ in)	3x826 GPM=2478 GPM (3x52.13=156.40 l/s)



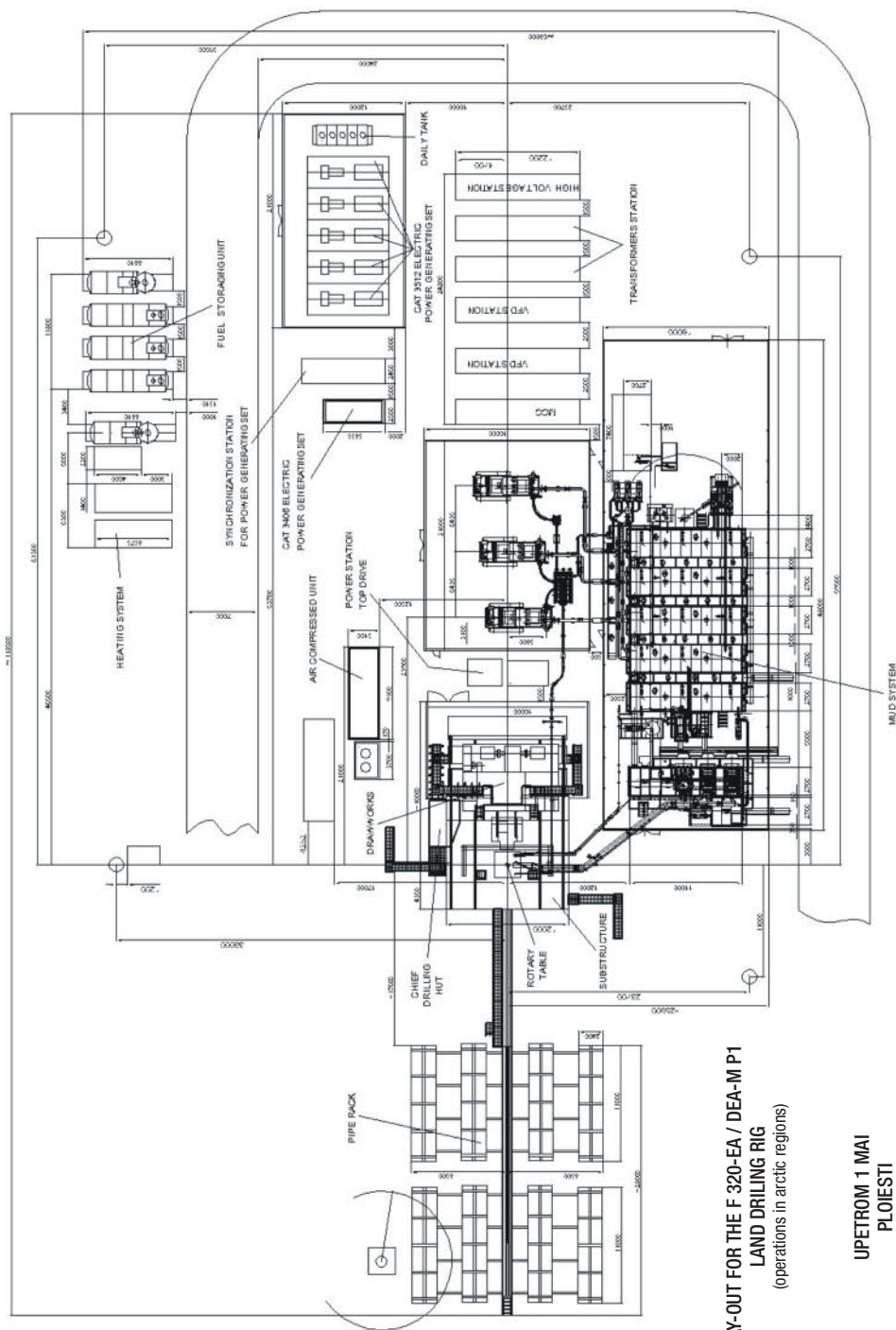
• Air compressor unit type	GPA 8	• Fuel system	c/w fuel tanks and el-pumps pipes and connections.
air compressor type	SSR MU-45 screw el-compressor	total volume of stored fuel, as follows:	723 BBL (115 cu.m)
number of air compressors	3	daily tank	25 BBL (4 cu.m)
max. flow rate at 13 bar pressure for one compressor	201.30 CFM (5.7 cu.m/min)	storage tank	120 BBL (19 cu.m)
discharge max. pressure	188.55 PSI (13 bar)	storage tank	705 BBL (4x28 cu.m = 112 cu.m)
nominal pressure	174 PSI (12 bar)	daily tank (divided; it supplies the Diesel engines of the electric power generating sets)	63 BBL (5 x 2 = 10 cu.m)
air tanks capacity	4 x 2 cu.m = 8 cu.m		
• Mud system		• Electric power system (for main equipments drive) c/w:	containerized, insulated, heated and ventilated.
total mud volume	450 cu.m (2830 BBL)	VFD Station	SDACRN for seven (7) AC VFD electro motors 1140 HP (850 kW)/ 1000 rpm
number of mud tanks	5 x 70 cu.m = 350 cu.m (2200 BBL)	Sincronizing, control and coupling Station (SSCG)	1 for five (5) electro generators
total water volume	45 cu.m (284.3 BBL)	Medium Voltage Station (SMT)	1
Trip Tank capacity	15 cu.m (94.3 BBL)	Electro Transformers Station (ST)	2
cleaning tank capacity	40 cu.m (252 BBL),	Motor Control Center (MCC) auxiliary consumers Station	1 (EA); 3x400 V/230 V, 50 Hz si 12 V c.c. for auxiliary servicies and lighting.
mud specific weight	1100 ÷ 2200 kg/cu.m		
number of cleaning stages	4	• Electric system for lighting and auxiliary aggregata	conceived for having its "zero" earthed normally manufactured (dust and rain proof) and explosion-proof
shale shaker type	Derrick FLO-LINE PRIMER Shale Shaker	lighting system for :	Driller's cabin, Rig house (mast, drill floor), well cellar, mud system modules, mud pumps modules, electric power system containers, rig camp.
desander and desilter type	Derrick FloLine Cleaner Model 503	supply voltage for:	
degasser type	Vacuometric - Derrick Vacu-Flo 1200 Degasser.	power receivers	3 x 380 V x 50 Hz
slam transporter	Centrifugal separator module and slam transporter c/w screw transporter and centrifugal pumps.	normal-lighting receivers	220 a.c.V x 50 Hz
stand pipe type	4" x 50 MPa Double stand pipe	safety-lighting receivers	12 V
mud tanks type	modules provided with insulated walls and roofs, heating and ventilation systems for extreme cold weather operation.		



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F 320-EA / DEA-M P1, AC VFD DRIVEN**

<ul style="list-style-type: none"> <li>Instrumentation</li> </ul>	<p><b>M/D TOTCO Instrumentation system: indicators and recorders for all drilling parameters</b></p>
<ul style="list-style-type: none"> <li>Power Devices</li> </ul>	
Hydraulic Power Tong type	Universe Power Tong for for tubing thread make up-break out of: 9.63" (244.5 mm), 8.63" (219.1 mm), 7.63" (193.7 mm), 7" (177.8 mm), 6.63" (168.3 mm), 5.5" (139.7 mm), 4.5" (114.3 mm), 3.5" (88.9 mm) sizes, c/w 50 HP, 380V, 50 Hz explosion proof HPU.
Drilling tong type	BJ-HT 35 VARCO for the following tubing sizes: 2.3/8" – 3.668"; 2.7/8" – 4.1/4"; 3.1/2" – 5.1/4"; 5.1/4" – 7"; 7" – 10.3/4"; 2.3/8" – 7"; 7" – 8.5/8".
Drilling tong type	BJ-HT 65 VARCO for the following tubing sizes: 3.1/2" – 8.1/4"; 8 – 11.1/4"; 11.3/4" – 14.3/8"; 16" – 17".
Tong balancer	DEC Type Hydraulically actuated with two hydraulic cylinders, line and hydraulic control panel; max. tong – suspending line force 24 kN (5395 lbs).
Torque Cat head for tubing thread make up-break out	DISS Type torque Cat head with hydraulic cylinder and 11 kW / 240 bar HPU, pulling line and sheaves; 120 kN (26077 lbs) max tong line force; 192 kN.m (141600 lb-ft) max. tong torque for 1.6 m manual tong length.
BOP well cellar hoisting system	Ingersoll-Rand Air Powered Hoist to transport and install the BOP stack in the well cellar; max. hoist force 2 x 125 kN = 250 kN (56202 lbs), 12 bar (174 PSI) max. WP.
Power Slips	PSA 150 Blohm & Voss Air Power Slips for 27.5" Rotary table, 10 bar (145 PSI) max. WP; tubular material dimensions: 2.3/8"; 2.7/8"; 3.1/2"; 4.1/2"; 5"; 5.1/2"; 6.3/8"; 7".
Drill collars handling device	Pulling device for drill collars 5 kN (1124 lbs).
Drill Pipe Stands handling device	Drill Pipe Stands handling device electrically driven.
Pipe Rack handling device	150 kN pivoting, telescopic hydraulic boom power device.
Drill floor auxiliary hoisting device	One 50 kN line pull Electric winch Ingersoll-Rand, Explosion proof, operating with mast mounted rotational boom.
Bit feed control and drill string escape device	Automatic Bit Feed and drill string escape device (DAAS): electro-hydraulic driven - max. load. 250 kN; - rate of penetration 0-25 m/h; - weight on bit 0 ... 3 kN; - drill string escape (lifting) speed 25 m/h.
<ul style="list-style-type: none"> <li>Rig heating system</li> </ul>	Air heating, steam heating and afferent pipes on the rig modules and houses.
<ul style="list-style-type: none"> <li>Rig ventilation system</li> </ul>	electric ventilators installed in rig house, well cellar, mud system and mud pumps houses.
<ul style="list-style-type: none"> <li>Rig working temperature</li> </ul>	-45 to +50 Celsius deg.
<ul style="list-style-type: none"> <li>Rig Storage temperature</li> </ul>	-60 Celsius deg.





LAY-OUT FOR THE F 320-EA / DEA-M P1  
LAND DRILLING RIG  
(operations in arctic regions)

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