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MODULATED LAND DRILLING RIG F 400-EA / DEA P2, AC VFD DRIVEN



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**MODULATED LAND DRILLING RIG
F 400-EA / DEA P2, AC VFD DRIVEN**

FIELD OF APPLICATION

The **F 400-EA / DEA P2** modulated winterized land drilling rig is designed for working in the following temperature range: -45 to +50 Celsius degrees. The **F 400-EA / DEA P2** modulated 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 **F 400- EA / DEA P2** land drilling rig can drill gas / oil wells down to a depth of 18,045 ft (5500 m) with 5” drill pipes or under conditions involving a limit of 900,000 lbs (4,000 kN) for the max. hook load.

DESCRIPTION

F 400-EA/ DEA P2 is a fully winterized, modulated layout 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 deg. 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 V DC. 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-44 E drawworks, MRL-275 Rotary Table and the three GMP 3PN 2000-2EA 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 **F 400-EA / DEA P2** modulated 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 12 lines	900,000 lbs (400 mton/ 4000 kN)
• Recommended working depth (for a hook load limit of 400 mton) with drill pipes of 5 in	18,045 ft (5,500 m)
• Number of drilling lines	12
• 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	6 (2 pcs. for draw-works, 1pc. for rotary table and 2 x 3 pcs. for unitized mud pumps)

• Draw works type	TF-44E 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	99000 lbs (44 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 V436-180 Disc Brake with Electronic Drilling System EDS 4C, 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	MA 400, "U" section foldable, free Standing-Non guyed mast, designed for TOP DRIVE installation.
max. hook load with 12 lines	900,000 lbs (400 mton/ 4000 kN)
clear mast height (from the working floor up to the crown block beam)	152.60 ft (46.50 m)
section number	5 sections including 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 88,60 ft (27 m)	18,045 ft (5,500 m)
drill collars	886 ft (270 m)
racking board height	- 25.6 m from the drill floor level for 88,60 ft (27 m) drill stand. - 26.6 m; 23.6 m; 22.6 m from the drill floor level for other drill stand lengths.
Derrickman Escape Device	line-installed with seat, brake etc. for emergency escaping beyond rig limits.

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• Top drive system	VARCO TDS 11 SA	• Crown block type	(6+1).35.GF-500
max. hook load	500 USton (455 mton)	max. static load on 12 lines	1,124,000 lbs (500 mton)
max. working pressure	7500 PSI (500 bar)	number of sheaves	7 for 1.3/8" (35 mm) line diameter
number of electric AC VFD driving motors	2		
electric AC VFD driving motor power	400 HP	• Hook block type	6.35.MCA-500
max. torque under discontinuous-regime conditions	54948 lb-ft (49.50 kN.m)	max. static load on 12 lines	1,124,000 lbs (500 mton)
max. torque under continuous-regime conditions	20,000 lb-ft (74.5 kN.m)	number of sheaves	6 for 1.3/8" (35 mm) line diameter
torque under continuous-regime conditions as follows:			
at 110 rpm	37468 lb-ft (50.8 kN.m)	• Swivel type	CH-400
at 228 rpm	18217 lb-ft (24.7 kN.m)	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
• Substructure type	fixed		
max. load of the rotary table beams	900,000 lbs (400 mton)	• Unitized mud pump type	GMP 3 PN – 2000 – 2 EA, mounted provided with insulated walls and roofs, heating and ventilations systems for extreme cold weather operation.
max. load at the setbacks	540,000 lbs (240 mton)	number of unitized pump	3
simultaneously-applied max. load	1,440,000 lbs (640 mton)	number of AC VFD electric motors/ pump	3
working floor height	32.80 ft (10 m)	electric motor type	AC VFD MABEExelIT3 500S 170-6; 1140 HP (850 kW) / 1000 rpm
clear height under the rotary table beams	27.56 ft (8.40 m)	mud pump type	3 PN – 2000-2 EA
		number of mud pumps	3
		max. power at the pump inlet shaft	2000 HP
		max. working pressure (with liners of 5 in)	7500 PSI (500 bar)
		total max. theoretic flow rate (with liners of 7.½ in)	3x826 GPM = 2478 GPM (3x52.1 = 156.30 l/s)
• 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		
electric motor type	AC VFD MABEExelIT3 500S 170-6; 1140HP (850 kW)/1000 pm		
rotary table electric motor number	1		
rotary table speeds	1 forward and 1 reverse, stepless AC VFD speed adjusting		
rotary table brake	inertia brake with air clutch		



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• Air compressor unit type	BPAC 8 mounted on one skid
air compressor type	SSR MU-45 screw el-compressor
number of air compressors	3
max. flow rate at 13 bar pressure for one compressor	201.30 CFM (5.7 cu.m/min)
discharge max. pressure	188.55 PSI (13 bar)
nominal pressure	174 PSI (12 bar)
air tanks capacity	4 x 2 cu.m = 8 cu.m

• Fuel system	c/w fuel tanks and el-pumps pipes and connections
total volume of stored fuel, as follows:	913 BBL (145 cu.m)
daily tank	25 BBL (4 cu.m)
storage tank	120 BBL (19 cu.m)
storage tank	705 BBL (4x28 cu.m = 112 cu.m)
daily tank (divided; it supplies the Diesel engines of the electric power generating sets)	63 BBL (5 x 2 = 10 cu.m)

• Mud system	
total mud volume	7 x 55 cu.m = 385 cu.m (2422 BBL)
number of mud tanks	7
total water volume	60 cu.m (377.3 BBL)
Trip Tank capacity	15 cu.m (94.3 BBL)
cleaning tank capacity	40 cu.m (252 BBL),
mud specific weight	1100 ÷ 2200 kg/cu.m
number of cleaning stages	4
shale shaker type	Derrick FLO-LINE PRIMER Shale Shaker.
desander and desilter type	Derrick FloLine Cleaner Model503.
degasser type	Vacuometric - Derrick Vacu-Flo 1200 Degasser.
slam transporter	Centrifugal separator module and slam transporter c/w screw transporter and centrifugal pumps.
stand pipe type	4" x 50 MPa Double stand pipe
mud tanks type	modules provided with insulated walls and roofs, heating and ventilation systems for extreme cold weather operation.

• Electric power system (for main equipments drive) c/w:	containerized, insulated, heated and ventilated.
VFD Station (SDACRN)	for nine (9) AC VFD electro motors 1140 HP (850 kW)/ 1000 rpm
Sincronizing, control and coupling Station (SSCG)	1 for five electro generators
Medium Voltage Station (SMT)	1
Electro Transformers Station (ST)	2
Motor Control Center (MCC) auxiliary consumers	1 (EA); 3x400 V/230 V, 50 Hz si 12 V c.c. for auxiliary services and lighting.

• Electric system for lighting and auxiliary aggregata	conceived for having its "zero" earthed normally manufactured (dust and rain proof) and explosion-proof
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.
supply voltage for:	
power receivers	3 x 380 V x 50 Hz
normal-lighting receivers	220 a.c.V x 50 Hz
safety-lighting receivers	12 V



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• Instrumentation	M/D TOTCO Instrumentation system: indicators and recorders for all drilling parameters
• Power Devices	
Hydraulic Power tong for make up-break out drill pipes of sizes: 3.1/2"; 5"; 5.1/2".	Weatherford 6.6-30 type.
Hydraulic Power tong for make up-break out casings of sizes: 5.1/2"; 5.3/4"; 6.5/8"; 8.5/8"; 9.5/8"; 10.3/4"; 12.3/4"; 16.3/4"; "20.	Weatherford 24-50 type.
Weatherford Hydraulic Power Unit (HPU) for hydraulic tongs supply	50 HP; 380 V/ 50 Hz
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"; 6.5/8"; 7".
Drill collars handling device	Pulling device for drill collars 5kN (1124 lbs)
Pipe Rack handling device	HT 125S telescopic hydraulic boom Stationary power device; 125 kN nominal load / 3 m radius; 18.4 kN max. load/ 11.45 m max. radius; platform angle of rotation 360°; telescopic arm length (retrieved/extended) 6.7 m / 12.7 m.
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.
• Rig heating system	two air heating generators and afferent pipes on the rig modules and houses.
• Rig ventilation system	electric ventilators installed in rig house, well cellar, mud system and mud pumps houses.
• Rig working temperature	-45 to +50 Celsius degrees
• Rig Storage temperature	-60 Celsius deg.





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LAY-OUT FOR THE F 400-EA/DEA P2
MODULATED LAND DRILLING RIG
(operations in arctic regions)



