



Weatherford[®]

ePAC[™] II Variable Speed Drive for Progressing Cavity Pumping



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The critical challenge in optimizing progressing cavity pumping (PCP) wells is to match the rotational speed of the pump to the varying production capacity of the well while protecting the system from mechanical damage. Conventional variable speed drives (VSDs) cannot deliver full torque at low speeds resulting in inefficient production and stalled wells.

What is needed is infinitely variable speed control with controlled torque throughout the speed range.

Weatherford meets this need with the ePAC II PCP controller providing precision torque and speed control.

Precision control of both speed and torque in all applications and well conditions.

Features

- Limits rod torque
- PCP specific firmware
- Reduces power consumption
- Minimizes equipment wear
- maximum torque from zero to base speed
- High speed operation up to 300 Hz
- Downhole pump protection
- Gauge option controls low fluid level without pumpoff
- Reduces backspin time
- Flexible configuration
- Simple operation and setup

Drive reliability requires the proper enclosure to protect the sensitive electronics from foreign material as well as extreme temperature variations. The ePAC II unit uses an engineered package with through-hole mounting of the amplifier heat sink to both reduce the heat and the overall size of the cabinet.

The enclosure layout provides additional room for optional internal components while Type 3R protection and electric door interlocks enhance the safety of the package.

Data Protection

- Drive keypad can archive and store the drive parameters in the event you need to transfer the information to another drive or reload the values
- PC interface software allows you to transfer drive parameters to PC for storage and reference
- Multilevel password protection allows critical drive parameters to be accessible only with a password

Cost Savings

- Underspeed detection protects the system in case of a stall condition such as a stuck pump
- Dual motor capability allows large PCPs to be operated by a single drive
- User torque limit protects against downhole breakage
- Energy saving feature minimizes power use
- Auto restart minimizes downtime

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Interfaces

- Keypad/display
- Modbus® remote terminal unit (RTU) serial

Performance

- Configurable auto restart after power loss or fault condition
- Normal stop with deceleration time and DC injection hold allows rod string to unwind downhole minimizing top side backspin
- Speed search feature minimizes backspin while controlling torque on system
- Differential pressure sensing of pump inlet and casing gas pressure prevents pumpoff conditions
- Low torque detection indicates a rod break, belt failure or plugged sand screen
- Low flow detection for enhanced pump protection (requires surface flowmeter input)
- Quick start menu setup decreases startup time
- Reliable operation
- Enhanced bus voltage control minimizes over voltage trips caused by backspinning loads
- Multiple readout display
- Configurable control methods (open loop vector or V/Hz)

Dimensional Data

Encl. Size	HP 460 V	HP 380 V	Max Amps	Height		Width		Depth		Weight	
				in.	cm.	in.	cm.	in.	cm.	lbs.	kg.
1	5-30	5-25	40	36	91.44	24	60.96	20	50.8	100	45.36
2	40-50	40	67	48	121.92	24	60.96	21	53.34	180	81.65
3	60-100	50-75	125	48	121.92	30	76.2	23	58.42	210	95.25
4	125-150	100-125	180	72*	182.88	36	91.44	24	60.96	450	204.12

*Enclosure is 60 inches (175.26 cm.) high with 12 inch (30.48 cm.) floor mount stand

Drive Protection

- Ground fault
- Motor phase-to-phase short circuit
- AC input overvoltage
- AC input undervoltage
- Instantaneous overcurrent
- Motor overload
- Heat sink over temperature
- Power transistor fault
- Logic power undervoltage
- Inlet and outlet phase loss protection
- Motor runaway
- Memory malfunction
- Processor running fault



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Specifications

Electrical	
Input Supply	
Three-Phase Voltage	230, 380, 480 Vac (+10% to 15%)
Three-Phase Frequency	50 to 60 Hz (±5%)
Single-Phase Voltage	230, 480 Vac (±10% to 15%)
Single-Phase Frequency	50 to 60 Hz (±5%)
Power Factor	
Overall	1.00 displacement power factor 0.94 overall power factor at all speeds
Output Rating	
Voltage	Zero to input voltage, three-phase
Frequency	Zero to 120 Hz flux vector control Zero to 300 Hz variable frequency control
Switching Frequency	Programmable, 2 to 15 kHz varies with Hp
Overload Current	110 to 120% of rated for one minute (normal duty)
Conversion	
Rectifier Unit	Six-diode, three-phase (six-pulse) full wave bridge below 40 Hp Diode-SCR (12-pulse) full-wave bridge for 40 Hp and above
Inverter Unit	Six-IGBT, four-quadrant, trap or sine wave output
Environmental	
Operating Temperature	-40° to 122°F (-40° to 40°C)
Storage Temperature	-4° to 140°F (-20° to 60°C)
Relative Humidity	5% to 95%, noncondensing
Inputs and Outputs	
Analog Inputs	Three 12-bit analog inputs: one 4 to 20 mA, two 0 to 10 Vdc
Pulse Input	0 to 32 kHz (flow volume configurable)
Analog Outputs	Two 12-bit analog outputs (4 to 20 mA)
Pulse Output	0 to 32 kHz
Digital Inputs	Eight digital inputs (requires sink of 1 mA to common)
Digital Outputs	Three programmable relay outputs (1 A @ 250 Vac) One fault contact
Serial Communications	
Modbus Port	EIA RS-232 and RS-422/485, 1200 to 19200 baud
Enclosure	
UL Listed Package	Type 3R Engineered for all weather conditions Door interlocked breaker main disconnect Front mounted keypad and controls in secondary door Control transformer Panel mount enclosure (sizes one to three) Floor mount enclosure (sizes four and five)
Optional	
	24 Vdc power supply for external analog signals Communication (Ethernet) Inlet line reactor IEEE-519 rated inlet harmonic package Long lead filter (DV/DT)



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