Axiom®II Variable Speed Drive

Precise, reliable surface control of Induction or Permanent Magnet Motors

Applications

Control of induction or permanent magnet motors (PMMs) used with

- Electric submersible pumps (ESP)
- Electric submersible progressing cavity pumps (PCP)
- Horizontal pumping systems (HPS)

Data acquisition and integration

Interface to remote SCADA

Benefits

- Superior reliability reduces drive downtime
- A wider range of lift system options using a single drive
- Integrated output filter reduces drive footprint
- Optimized motor efficiency with vector control for PMMs reduces OPEX

Features

Open loop vector control of PMMs

Scalar control of induction motors (IMs)

TouchSafe components

Advanced human machine interface (AHMI)

Specialized ESP application software

- Gas Lock Ride Thru
- Current Limit
- Pump Unfreeze

Data integration and communications interface

DriveWorksEZ ® custom programming software

The Axiom II variable speed drive (VSD) intelligently controls induction motors or permanent magnet motors used in ESP and electric submersible PCP applications. The flexibility of motor options combined with advanced software makes the Axiom II VSD capable of operating and controlling submersible pump systems efficiently even in the most challenging well conditions.

Flexibility and enhanced safety considerations are built into the design of the Axiom II VSD. It incorporates an integrated sine wave output filter minimizing the drive's total footprint. With industry-leading electrical efficiency, this VSD provides a near sinusoidal electrical waveform output to downhole equipment.

Axiom II VSD internal components are all rated TouchSafe as per IP20 standard. To further reduce personnel exposure, power is absent in the drive cabinet when the disconnect switch (mounted in the input junction box) is switched off. SCADA, analog, and digital I/O interconnections are made easily without exposure to any high voltage, through an integral control box mounted externally to the drive cabinet side.

While the Axiom II VSD is capable of controlling motors using both scalar and vector methods, it is the proprietary vector control algorithm that enables the superior performance and efficiency of Levare PMMs.

Running on a high-speed processor in the Axiom II drive, the vector control algorithm is able to resolve the applied three-phase stator current into two components: a magnetizing current and a torqueing current. Adding specific downhole motor characteristics as input, the algorithm permits independent control and adjustment of the two quantities.

In this manner, unlike scalar control, vector control is able to optimize current and power consumption across the full spectrum of motor load encountered during PMM-ESP operation.

The AXIOM II VSD controller is further equipped with additional advanced software that supports drive performance in response to challenging well conditions such as gas and solids. Specialized algorithms are available to the operator that help the downhole pump system overcome conditions such as gas lock, scale buildup, or difficulty at startup.

The AXIOM II VSD is available in multiple size ratings from 112 A to 1,100 A in 6, 12, or 18-pulse design when superior harmonic mitigation is needed; with either 380 V or 480 V input voltage rating. Enclosed in a NEMA 3R or NEMA 4 cabinet, the AXIOM II VSD is fully certified under UL and CSA standards.

Specifications

Input voltage	480 V -25% / +10% 380 V -15% / +15%
Full power range	93 – 914 kVA at 480 V 73 – 723 kVA at 380 V
Input frequency	47 – 63 Hz
Efficiency	>95% across all speeds
Output frequency	10 – 240 Hz (0.1 Hz resolution)
Inverter output	PWM
Output distortion	<5% after PWM filter
Intermittent overload	150% for 1 minute
Temperature	Operational -40°C to 55°C air temperature
Altitude	Full rating to 1,000 meters
Noise	<75 db at 1 meter
Humidity	To 100% as all units have heaters
SCADA/ I/O built in (i.e., more options available with additional cards)	• RS485 (115 kbps) MODBUS Slave SCADA interface for monitoring and control • 5 digital inputs (24 V DC) • 3 analog inputs (0-10 V DC / 4-20 mA) • 1 fault relay (Form C) • 3 relay outputs (Form A) • 2 analog outputs (0-10 V DC / 4-20 mA)
Fault and event logging	Incorporated in the AHMI with SD card

Special Application Software Algorithms

Gas Lock Ride Thru

The Gas Lock Ride Thru function works to break or eliminate gas-lock conditions. When enabled and specific conditions of underload are detected, this application steps the drive through multiple predetermined current threshold levels and detection time windows until gas-locking conditions are overcome.

Current Limit

The Current Limit function acts to reduce motor frequency when motor current during operation exceeds a predetermined upper threshold.

Pump Unfreeze Function

The Pump Unfreeze applications enable operator control to free a stuck downhole pump system by means of either controlled reversal of direction (JOG mode) or controlled application of variable torque level (TORQUE mode).

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