

AC & DC VARIABLE SPEED DRIVE SYSTEMS

FOR LAND & OFFSHORE DRILLING, PRODUCTION AND MARINE INDUSTRY

- 3 Phase 6 pulse AC Drives through 2000 HP. Water cooled through 4000 HP.
- 3 Phase 12 pulse AC Drives through 2000 HP utilizing dual winding transformers for input into converters. Water cooled through 4000 HP.
- 6 Phase 12 pulse AC Drives through 2000 HP utilizing M&I's **60 HARMONIC LITE™** technology (patent pending).
- DC - SCR Drive Systems utilizing digital PLC controls up to 3200 HP.
- DC - SCR Drive Systems utilizing proven analog technology up to 3200 HP.

M&I eDRIVE AC DRIVES – 6 OR 12 PULSE UP TO 4000 HP

M&I's compact designed, AC variable speed Drives (variable Frequency Drives) utilize a roll out power module design. Air cooled units are provided from 270 Amp to 2200 amp and water cooled through 4000 amps. Some of the features include:

- Advanced AC drive technology utilizing Eaton FX9000 Seventh generation technology
- High speed fiber optic communication between drives (12 Mbit/second)
- Compact design, 1200 amps only 32" wide, 30" deep cabinet size
- Over voltage and under voltage stall protection
- Ambient compensated, auto power reduction upon over temperature and overload
- Communication capabilities include Ethernet, Device net, Profibus, & CAN bus
- Voltage capability through 690 VAC
- Roll out power module design for quick change out.

M&I's Drives feature a standard non-regenerative front end that can easily support a multi-pulse configuration for reduced harmonics. A fully-regenerative front end is also available as an option. Our AC Drives are available in both a single and multiple VFD configurations with common DC bus for multiple inverters.

The inverter mechanically consists of two units, the Power Unit and the Control Unit. The Power Unit contains an inverter bridge which consists of IGBT switches and produces symmetrical, three-phase PWM-modulated AC voltage to the motor.

The control unit is a high performance microprocessor with keypad and PC serial interface. The microprocessor controls the motor based on the information it receives through measurements, parameter settings, control I/O and the control keypad. The motor and application control

block controls the motor control ASIC which, in turn, calculates the IGBT states. Gate drivers amplify these signals for driving the IGBT inverter bridge.

The control keypad constitutes a link between the user and the inverter. The control keypad is used for parameter setting, reading status data and giving control commands. It is detachable and can be operated externally and is connected via a cable to the inverter. Instead of the control keypad, a PC can be used to control the inverter if connected through a similar cable.

The basic control interface and the parameters (the Basic Application) are easy to use. Custom parameters and interface are available for special applications.

Optional I/O expander boards that increase the number of inputs and outputs to be used are also available.

M&I's Drive is equipped with a serial port that utilizes all the popular protocols such as DeviceNet, Modbus, Ethernet, and Profibus. Drive interfaces allow for command over all parameters, diagnostics, and operations.

Protective Features

- Overvoltage Protection
- Undervoltage Protection
- Ground Fault Protection
- Motor Phase Supervision
- Overcurrent Protection
- Unit Overtemperature Protection
- Motor Overload Protection
- Motor Stall Protection
- Motor Underload Protection
- Short Circuit Protection of +24V and +10V Reference Voltages

Performance Features

- Ratings: 300 to 1500 HP at 460 VAC
450 to 2200 HP at 690 VAC
- Overload: 150% for 60 sec
- Peak Current: Is for 2 sec every 20 sec
- Output Frequency: 0-320 Hz
- Control Method:
Frequency Control V/f
Open Loop: Sensorless Vector Control
Closed Loop: Frequency Control
Closed Loop: Vector Control
- Ambient Operating Temperature
-10° C to 40° C: IH
-10° C to 40° C: IL



1200 Amp Module (Frame 13)
28" wide

Options

- Dynamic and regenerative braking
- 12 pulse technology
- Serial communication - all common protocols
- Built to IEEE, ABS, DNV, SOLAS & IEC



AC Drive System installed in Powerhouse including 6-VFD Drives



2200 HP AC Drive Unit (Frame 14)

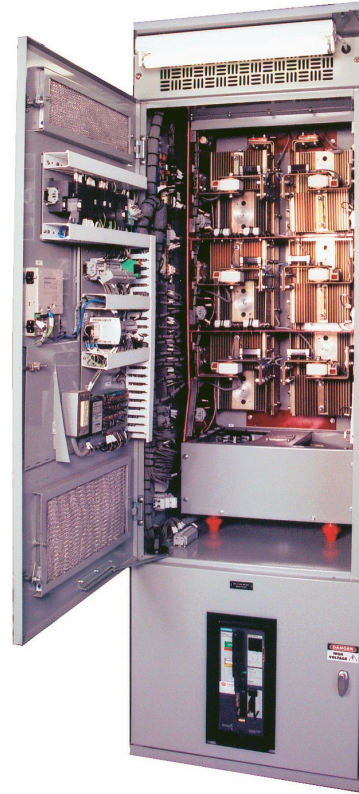
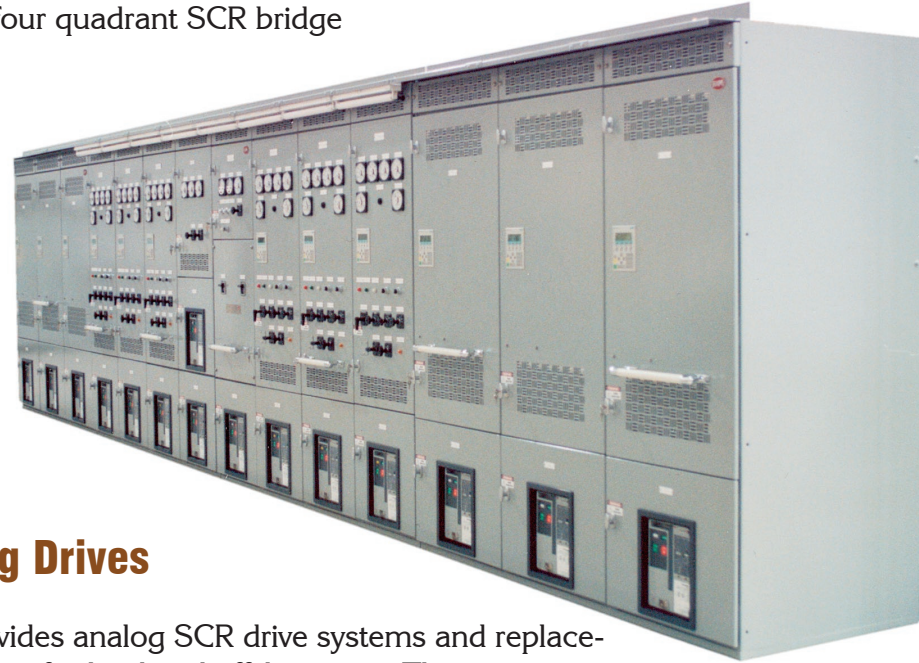


DC DRIVES - UP TO 3200 HP

Digital Drives

M&I's Digital DC Drives utilize proven technology and components such as Wago or Siemens PLC controllers. These systems are easily adaptable to communicate with a local network or Ethernet. The bridge is easily accessible from the front for maintenance and all high voltage components are protected by safety barriers.

- Advanced microprocessor technology
- Programmable regulator, PLC
- Connectability to various operator interfaces including touch screen
- Full four quadrant SCR bridge
- Regenerative braking
- Electronic armature reversing
- Automatic field weakening

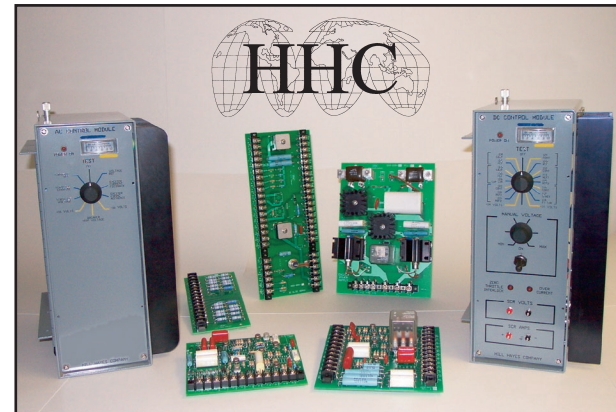


SCR Drive Up to 3000 HP

Analog Drives

M&I provides analog SCR drive systems and replacement parts for land and offshore rigs. These systems and components are a direct replacement for analog systems built over the past 20 years.

- Complete analog SCR systems utilizing proven technology
- Designed to meet IEEE, ABS, SOLA & DNV
- Drawout circuit breaker available
- Series or shunt type systems available
- Front access up to 1600 amps
- Available with power & control building for land rigs



AC & DC Drive Systems

ISO 9001-2000 CERTIFIED

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