CONTROL TECHNIQUES

MDS
Modular Drive System

The Modular Drive System, MDS, is a powerful and cost-effective solution for applications with multiple axes. The MDS employs a unique backplane architecture that provides a common bus platform for one of three sizes of power modules and up to eight drive modules. The same MDS modules can operate on a 230V or 460V AC input. Plus, there are five different sizes of drive modules to meet the needs of almost any multiple axis application.

FM control modules, also used in our EN series drives, can be snapped to the front of an MDS drive module to extend drive functionality to the level required by the application. Ethernet, DeviceNet and Profibus FM controls are available for fieldbus communications.

NEW ANALOG POSITION MODE

In Analog Position Mode the drive moves to an absolute motor position in proportion to the voltage (±10 VDC) received in the Analog Input. **Note:** *Analog full scale voltage and position are programmable.*

- **200 to 525 VAC, 3Ø input**

- **Up to 750 lb-in continuous torque**

- **True Common Bus Architecture**
  - **Reduced Part Count and Install Cost**
  - **Innovative backplane makes installing multiple drives quick and easy**

- **Easy install, setup and operate**
  - **Pluggable connectors, Standard D-Shell and Screw Terminals**
  - **State-Space Observer Control, which allows 10:1 inertia mismatch out of the box, and 50:1 with tuning**
  - **Free PowerTools software, and upgrades**

  FREE Software

- **Accepts FM control modules for positioning control and enhanced programming capabilities**

- **Programmable, optically-isolated I/O**

- **Field programmable flash memory firmware, upgrades are free**

- **Auto-Tune support for any servo motor with encoder feedback**

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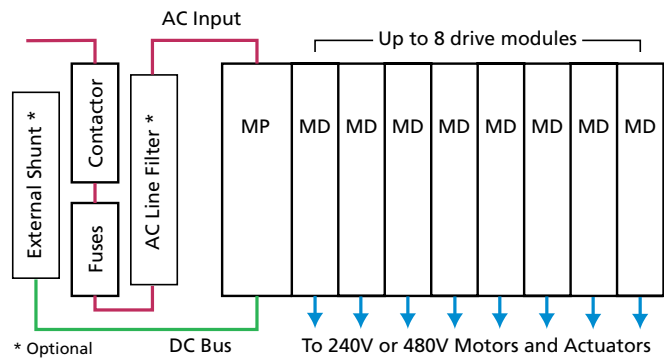
INNOVATIVE BACKPLANE

The MDS backplane provides a single AC input for the Power Module, and distributed DC bus and Logic Power for the Drive Modules. Installation time is minimized because the DC bus and Logic Power lines are an integral part of the backplane, so no extra wiring is needed. Fuses come installed on the backplane. Other than connecting motors, the installation is completed when the backplane is mounted on the panel and the power and drive modules are snapped into place and tightened down with a screwdriver.

AC Input — Up to 8 drive modules

External Shunt * | Contactor | AC Line Filter * | MP | MD | MD | MD | MD | MD | MD | MD | MD

Fuses

* Optional   DC Bus   To 240V or 480V Motors and Actuators

A very compact installation is possible because the backplane allows drives to be mounted directly next to one another. The use of a single, common power supply for multiple drives also minimizes installation space, and reduces cost, because with an MDS there is only one AC Input, one AC Contactor, one set of AC Fuses, and one AC Line Filter.

2 YEAR Digital Drive Warranty   5 YEAR Extended Warranty

PROFI® PROCESS FIELD BUS   DeviceNet

MODBUS   EtherNet/IP™

POWER MODULE

MDS is a true common bus system. A single Power Module provides the AC rectification and generates DC bus power for the Drive Modules. This eliminates the problems associated with "pseudo" common bus systems, where each drive has its own power supply. MDS doesn't have power-up conflicts.

Bus inductance is minimized with the use of bus bars, and by having a compact installation. Applications with quick deceleration and/or large loads are easily handled by an integrated microprocessor-controlled shunt transistor, which can be connected to an external resistor to dissipate regenerative energy. For emergency stops, the system can quickly be de-energized via an input that allows the user to instantly activate the shunt transistor. MDS allows for true power supply optimization.

Power Modules are available in three ratings and are designed to accommodate the total, simultaneous demand of the axes. In other words, the sizing of the Power Module is based on the maximum continuous and peak loads of the application at a given time—not the sum of the maximum drive power ratings, as rarely are all axes operating simultaneously or at peak power.

DRIVE MODULE

Five different-sized drive modules are available to provide a full range of performance-matched solutions for a variety of applications, whether needing high acceleration and cycle rates, or heavy torque and load handling capacity (up to 750 lb-in cont. torque). Like all of our "Motion Made Easy" drives, the MDS Drive Modules utilize our "State-Space" control, which enables drives to operate with a 10-to-1 inertia mismatch right out of the box, and up to a 50-to-1 inertia mismatch with optimization.

The MDS Drive Modules can operate in any of three modes: Velocity, Torque or Pulse. In the Velocity Mode the Drive Modules can run in Analog, Preset Velocity or Summation Sub-Modes. The Pulse Mode is able to interpret the signals as Pulse/Pulse, Pulse/Direction or Pulse/Quadrature from either Differential or Single-Ended outputs.

For a "Motion Made Easy" solution, our MDS Drive Modules accept the same FM control modules as our EN Series drives. These modules extend control capability of the base drives for advanced applications such as conveyor synchronization and high-speed labeling.

FM MODULES

FM control modules provide MDS Drive Modules with "snap on" functionality for indexing (FM-2), programming (FM-3), and advanced programming (FM-4) applications. The modular approach allows users to choose the level of advanced machine control they need, based on application parameters, not the drive "spec". Because these sophisticated "snap-on" controls are not built into the drive, users can stock drives and not costly controls.

EASY INSTALLATION
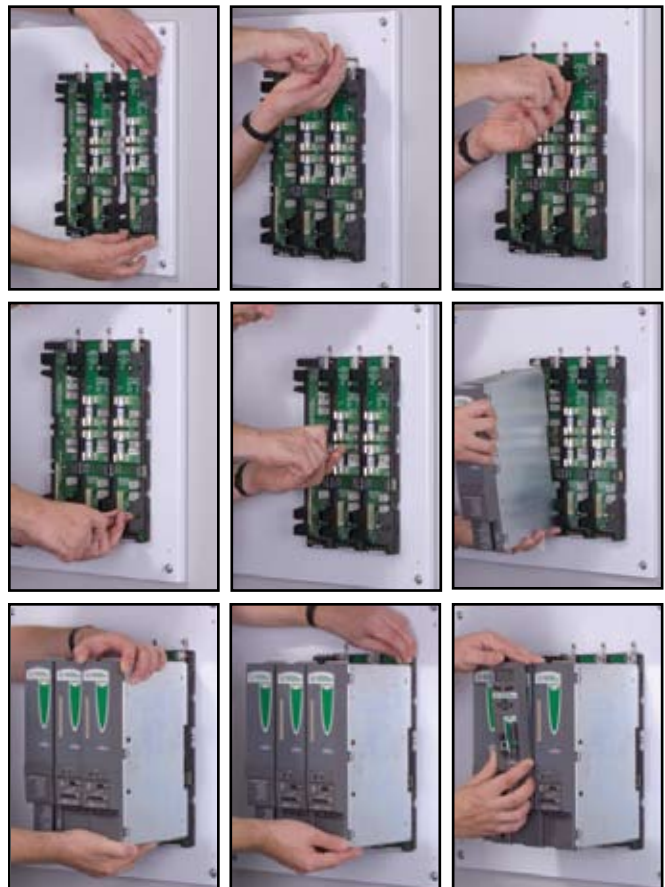
***MDS** installation is a snap.*

The backplanes of the drive and power modules snap together and are mounted to the panel with screws. The drives are also grounded with screws. After tightening the bus bar screws, the modules are snapped into place and secured. Wiring is limited to a single AC power connection and wiring the motors to the drives. An external shunt resistor connection is also provided. Advanced control capability is provided by adding FM control modules to the system.

CONTROL TECHNIQUES

MDS
Base Drive Operation

The MDS drives can be easily implemented with single and multi-axis controllers, PLCs and host controllers for medium power applications. The analog torque or velocity modes can be used with classic position controllers using analog outputs and encoder inputs. The pulse mode is ideal for use with low-cost PLC stepper controllers. This drive works in a variety of applications where a host control provides a command signal determining the desired motion profile.

The drive is configurable for eight flexible modes of operation, and the parameters for each mode can be adjusted to tailor the drive to the specific application using Windows™-based PowerTools Pro software.

Position Tracker™ – Analog Mode

Analog Torque Mode

Analog Velocity Mode

Digital Velocity Preset

Pulse Mode
- Pulse/Pulse
- Pulse/Direction
- Pulse/Quadrature

Summation of Analog Velocity and Digital Velocity

- **Programmable I/O**
  - **5 optically-isolated inputs (1 dedicated)**
  - **3 optically-isolated outputs**
  - **1 analog input ±10 VDC, 14-bit**
  - **2 analog output ±10 VDC, 10-bit**
- **Programmable encoder output, (up to 8,192 lines per revolution)**
- **Separate stop and travel limit decel ramps**
- **Torque, travel, following error and velocity limits**
- **8 user defined speed presets with individual accel/decel rates**
- **2 programmable torque level outputs**
- **In motion velocity output**
- **Software oscilloscope**

MDS Series

STANDARD CONTROL MODES

Analog Velocity/Torque Mode

- MC Controller
- Position Controller

± 10 VDC

Digital Velocity Preset

- PLC
- User Logic

Digital I/O

Pulse Mode

- PLC
- Master Axis
- Synchronized Encoder

Digital I/O

Summation of Analog Velocity and Digital Velocity

- PLC
- User Logic
- Analog Trim

Digital I/O

± 10 VDC

Position Tracker™ – Analog Mode

- PLC
- Analog Feedback

± 10 VDC

± 10 VDC

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MDS Series

The operating mode of the drive is simply selected with one click in the PowerTools Pro Setup view.
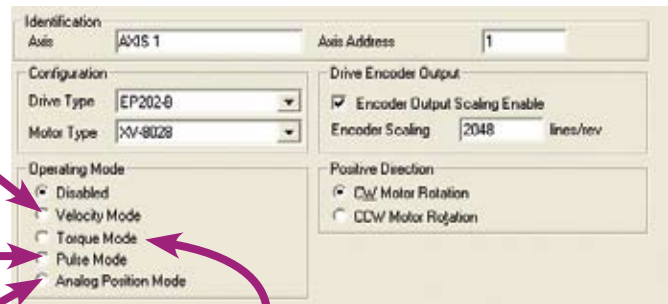
VELOCITY MODE

Analog— In Analog Velocity Mode the drive develops a velocity command in proportion to the voltage (±10 VDC) received on the Analog Input. *Note: Analog full scale voltage and offest are programmable.*

Preset Velocity— In this mode one of up to eight digital velocities can be selected using the digital I/O or Modbus. Each preset has its own accel/decel ramps. No analog source is required!

> *Application Examples*
> - Clutch-brake replacement
> - Phase control with a differential
> - Automatic feed control
> - Spindle speed control

Velocity Summation— This mode combines the features of Analog Velocity and Preset Velocity in one mode. It allows running a preset velocity and trimming it with an analog input, or vice versa, allowing advanced applications to be solved simply and elegantly without complex controllers.

> *Application Examples*
> - Loop/dancer arm control
> - Phase advance/retard
> - Speed trimming

PULSE MODE

In Pulse Mode the drive will receive pulses from a master source (single-ended or differential), which can be interpreted in three ways:

- Pulse/Pulse
- Pulse/Direction
- Pulse/Quadrature

> *Application Examples*
> - PLC pulse command outputs
> - Electronic gearing
> - Stepper drive replacement
> - Web line ratio control

TORQUE MODE

In Analog Torque Mode the drive develops a torque command in proportion to the voltage (±10 VDC) received in the Analog Input. *Note: Analog full scale voltage and offest are programmable.*

> *Application Examples*
> - With position/velocity controller
> - Tension control

POSITION TRACKER™ ANALOG MODE

In this Analog Mode the drive moves to an absolute motor position in proportion to the voltage (±10 VDC) received in the Analog Input. *Note: Analog full scale voltage and position are programmable.*

> *Application Examples*
> - Position Control with simple analog signal
> - Replaces expensive PLC position control modules

FLEXIBLE I/O FUNCTIONALITY

The digital I/O of the drive is completely programmable with the ability to map one or more I/O functions to the I/O points.

Input Functions	Output Functions
Stop	Drive OK
Reset	At Velocity
Travel Limit (+ and -)	Travel Limits (+ and -)
Torque Limit Enable	In Motion (+ and -)
Torque Mode Enable	Power Stage Enabled
Velocity Presets (3)	Torque Limit Active
Brake Release	Velocity Limiting Active
Brake Control	Fault
Enable Analog Position	Brake
Teach Analog Position	Shunt Active
Define Analog Position	Torque Level 1 or 2 Active
	Foldback Active