2420

Integrated Performance AC Drive

UNICO

2420

Integrated Performance AC Drive

Overview

The 2420 is an all-digital pulse-width-modulated (PWM) AC drive that provides superior control of three-phase AC motors. Its revolutionary technology and design make it the optimum solution where superior performance, flexibility, and ease of operation are important.

Motor-Independent Design

A unique design incorporating a proprietary digital current regulator and a state-of-the-art controller allows the 2420 to operate any AC induction, AC synchronous, or brushless DC motor without the current-loop setup required by conventional drives. Digital space vector control can be selected for reduced motor noise and low current ripple.

Application Flexibility

The 2420 is extremely flexible and can accommodate a wide range of servo applications. It can be configured to control torque, velocity, or position in applications requiring either constant-, variable-, or extended-torque. Extensive controller options enable the analog and digital I/O, feedback, and serial communication capabilities of the drive to be tailored to the requirements of the application.

Auto Tuning

Once routine electrical connections have been made, simple-to-use auto-tuning features adjust virtually all motor and inertial parameters to the given motor and connected load. Simply enter a few values from the motor nameplate, and the advanced setup routines do the rest. The drive is completely tuned within minutes.

Integrated Design

The convenient, integrated design of the 2420 provides space, cost, and energy savings in many applications. The drive package incorporates both rectifier and inverter units. The rectifier is comprised of a full-wave diode bridge, a link choke, a bus-charging circuit, a dynamic braking circuit, and a capacitor bank. The inverter consists of a six-IGBT, four-quadrant PWM amplifier that operates from the DC bus of the rectifier.

Energy Savings

Applications that operate in a cyclic fashion may regenerate energy from inertial loads. That energy may be dissipated into a resistor using the dynamic braking control within the unit. Optional capacitor banks can alternately be used to store and recycle the regenerative energy.

Overview *(continued)*

Power Quality
The 2420 incorporates a link choke that provides near-unity overall power factor and low harmonic line currents at all motor speeds.

Application-Specific Software
Application software determines the specific features and operation of the 2420. A wide variety of general-purpose and application-engineered software options enables each drive to be tailored to specific customer requirements. Software is available for such applications as test stands, elevators, press feeders, winders, rotary cutoffs, spindles, flying cutoffs, and wire drawing, to name a few. Further customization is possible with many programs using UEdit™, a Windows-based programming tool that allows users to extend an application using ladder diagrams and function blocks.

Optically Isolated Digital I/O
All digital inputs and outputs are optically isolated. Depending upon the controller, as many as 32 individually isolated digital I/O are locally provided, each of which can be programmed by the application to be an input or output. The voltage of each can be selected from a wide range of AC and DC values.

Transducer/Transducerless Design
The 2420 can operate with or without a feedback transducer. An incremental encoder is typically used for feedback, although absolute encoders, resolvers, and serial sincos encoders are also supported. Transducerless operation is offered for less demanding velocity-loop applications.

Features & Benefits

General
- All-digital control for zero drift and repeatable motor operation
- 24-bit DSP computational power for fast, dynamic response
- High-switching-frequency IGBT devices for quiet operation
- Digital current regulator for high-speed operation and fast response
- Digital space vector control for reduced motor noise and low current ripple
- Flux vector control for full torque from zero to rated speed
- Servo loop operation for precise velocity, position, or torque control
- Field weakening at constant horsepower up to four times base speed

Ease of Installation, Setup, and Maintenance
- Complete, self-contained package requires few option boards
- Identical control boards across full power range reduces spare parts
- Snap-in signal connections for ease of wiring
- Automated setup feature requires no chart recorders or meters
- Software calibration and adjustment eliminates tuning components
- Software input and output scaling eliminates potentiometers
- Automated hardware configuration check

Ease of Use
- Full keypad for easy entry of application-specific setup adjustments
- Two line by 24-character/line descriptive, plain-English display
- Process variable display in bar graph and engineering units
- Comprehensive plain-language, self-diagnostic message display
- Real-time motion information and historical fault log
- RS-232/422/485 for communication with process controllers
- Optional DriveLink™ software for managing the drive from a personal computer

Reliable Operation
- Tolerant of AC line fluctuations
- Extensive electronic protection circuits reduce failures
- Optically isolated signals for high noise immunity
- S-curve acceleration reduces shock and extends equipment life
- Fiber-optics for noise-free serial communication
- Designed to meet or exceed accepted international standards

Specifications

Electrical

Input Supply

Line voltage:	200 to 240 or 380 to 480 V AC, three-phase Phase sequence insensitive
Voltage tolerance:	–10% of minimum, +10% of maximum
Frequency:	47 to 63 Hz
Power factor:	Displacement: 1.00 at all loads and speeds Overall: 0.94 at rated load

Output Rating

Voltage:	Zero to input voltage, three-phase
Frequency:	Zero to 120 Hz without transducer Zero to 480 Hz with transducer
Switching frequency:	Programmable from 2.0 to 12.0 kHz

Service Conditions

Efficiency:	97% nominal at rated switching frequency

Overload current:

Torque	*Overload (1 min)*	*Maximum*
Constant	150% of rated	200% of rated
Variable	120% of rated	140% to 160% of rated

Conversion

Rectifier unit:	Full-wave, six-pulse
Inverter unit:	Six-IGBT, four-quadrant, PWM
Regeneration:	Dynamic braking transistor with resistors or capacitor bank energy storage

Environmental

Operating temperature:	32° to 131° F (0° to 55° C)
Storage temperature:	5° to 158° F (–15° to 70° C)
Relative humidity:	95% maximum, noncondensing
Altitude:	To 3,300 ft. (1,000 m) without derating

Performance

Position Control

Bandwidth:	50 Hz
Settle time:	10 ms

Velocity Control

Bandwidth:	100 Hz with transducer 10 Hz without transducer
Range:	Zero to base speed at full torque Base speed to 480 Hz at constant power with transducer Base speed to 120 Hz at constant power without transducer
Regulation:	±0.001% of base speed, down to zero, with transducer ±0.5% of base speed, 2 Hz and above, without transducer

Torque Control

Bandwidth:	300 Hz with DCR control 100 Hz with DSV control
Regulation:	±3.0% of maximum with transducer ±10% of maximum without transducer

Control Modules

A Standard or Expandable Control Module may be used. Optional communication modules (see next page) provide additional capabilities.

Common Features:
- Three ±10 V DC or 4 to 20 mA 12-bit analog inputs
- Two ±10 V DC 12-bit analog outputs
- Two programmable contact outputs
- Clock synchronization channel
- RS-422/485 synchronous serial port (1 Mbaud)
- RS-232/422/485 asynchronous serial port (up to 57.6 kbaud)
- One optional communication module provision

Standard Control Module:
- Eight optional configurable I/O points
- One optional feedback interface provision

Expandable Control Module:
- Two programmable isolated inputs
- 16 or 32 optional configurable I/O points
- One incremental encoder interface
- Two optional feedback interface provisions

Specifications
(continued)

Communication Modules

Seven optional communication modules are available:

Serial Communications:
- Two isolated RS-232/422/485 synchronous/asynchronous serial ports (up to 1 Mbaud)

Fiber-Optic Communications:
- One isolated fiber-optic synchronous/asynchronous serial port (up to 1 Mbaud)
- One RS-232/422/485 synchronous/asynchronous serial port (up to 1 Mbaud)

Remote I/O Communications:
- Dual Remote I/O interface

Modbus Plus Communications:
- Modbus Plus interface

ControlNet Communications:
- ControlNet interface

Profibus Communications:
- Profibus DP interface

Ethernet Communications:
- Ethernet interface

Transducer Options

A variety of motor-mounted transducers are available to provide feedback of motor position, velocity, and acceleration.

Incremental Encoder: Two quadrature channels with marker pulse operating up to a maximum frequency of 300 kHz per channel

Single-Turn Resolver: Up to 14-bit resolution

Multiturn Absolute Encoder: 24-bit resolution with RS-422/485 synchronous serial communication

Inputs and Outputs

Input Converters: 2.5 to 28 V DC @ 30 mA, 90 to 140 V AC @ 11 mA, or 180 to 280 V AC @ 5 mA

Output Converters: 5 to 60 V DC @ 3 A, 12 to 140 V AC @ 3 A, or 24 to 280 V AC @ 3 A

Relay Converters: 250 V AC @ 8 A, normally open or normally closed

Control Module Relay Contacts: Form A 250 V AC @ 5 A

Optional Analog Interface Module: Two ±10 V DC inputs and two ±10 V DC outputs

Protection

- Ground fault
- Drive thermal overload
- Software circuit breaker
- DC bus overvoltage
- DC bus undervoltage
- DC bus fuse and blown fuse
- Instantaneous overcurrent
- Motor thermal overload
- Braking unit overcurrent
- Heat sink overtemperature
- Phase loss
- Power transistor fault
- Control undervoltage
- Excessive position error
- Uncommanded motion
- Motor overspeed
- Feedback transducer failure
- Memory malfunction
- Processor not running fault
- Serial communication error

Power Range

Input Voltage	Constant-Torque Applications	Variable-Torque Applications
230 V AC	1 1/2-25 hp (1.1-18 kW)	2-30 hp (1.5-22 kW)
380 V AC	1 1/2-50 hp (1.1-37 kW)	2-60 hp (1.5-45 kW)
460 V AC	1 1/2-50 hp (1.1-37 kW)	2-60 hp (1.5-45 kW)

Consult factory for other powers. Other voltages require appropriate derating or adjustment of the switching frequency.

2420.20 5/02

UNICO–Worldwide

Corporate Headquarters
UNICO, Inc.
3725 Nicholson Road
P. O. Box 0505
Franksville, Wisconsin
53126-0505
USA
voice: 262.886.5678
fax: 262.504.7396
www.unicous.com

United States
Novi, Michigan
248.380.7610
New Lenox, Illinois
815.485.5775
Sandy, Utah
801.501.7586

Canada
Mississauga, Ontario
905.602.4677

South America
El Tigre, Venezuela
58.83.414.024

Europe
Milton Keynes, England
44.1.908.260000
Siegen, Germany
49.271.5015.0

Asia
Osaka, Japan
81.66.945.0077
Beijing, China
86.106.218.6365