1105

Variable-Frequency AC Drive



UNICO

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Overview

The 1105 provides reliable, efficient, cost-effective variable-frequency (V/Hz) or flux vector control of ordinary three-phase AC motors. It incorporates the latest technologies in insulated gate bipolar transistors (IGBTs), pulse-width modulation (PWM), and digital signal processing (DSP) to deliver optimum motor performance, complete programmability, and simplicity of operation.

Performance Flexibility

The 1105 accommodates a broad range of performance requirements. Units may be configured for constant-torque operation for heavy-duty cyclic loads, variable-torque operation for medium-duty requirements, or extended-torque operation for centrifugal loads such as fans and pumps. The drive operates in a transducerless vector control mode that does not require a feedback device and produces full torque to base speed with full starting torque. For demanding applications, an incremental encoder or resolver interface can be added for precise position, velocity, and torque regulation and improved dynamic performance. Dual- and triple-encoder interfaces are also available for position-following or dual-transducer applications. Variable-frequency control is alternately available for applications that do not require critical velocity or torque control. Several controller options are available to meet differing application requirements.

Motor-Independent Design

The 1105 can operate any standard- or inverter-duty AC induction or synchronous motor, making it ideal for retrofits and new applications alike. A unique, proprietary digital current regulator (DCR) tunes the drive continuously in real time, eliminating the usual current-loop tuning process required by conventional drives. Digital space vector (DSV) control can be selected for reduced motor noise and low current ripple.

Auto Tuning

Once routine electrical connections have been made, simple-to-use auto-tuning features adjust virtually all motor- and load-dependent parameters. No motor maps are required. Simply enter basic motor information from the nameplate, and the advanced setup routines do the rest. The drive is completely tuned within minutes.

Application Software

A wide variety of software options is available to tailor the 1105 to an application, from a fully featured velocity/torque control for general purposes to a host of powerful programs pre-engineered for specific applications. Customization is possible with many programs using UEdit™, a Windows-based programming tool that lets users extend an application using IEC 1131 standard ladder diagrams and function blocks.

Digital Setup, Easy Operation

A keypad and liquid crystal display provide a simple interface for setting and viewing operating parameters and diagnostics. All controller settings are made digitally for precision and repeatability. Readouts and fault messages are displayed in readily understandable language. An optional graphic display provides a variety of visual formats for accessing drive information.

Overview *(continued)*

Multiaxis Operation
A built-in high-speed synchronous communication port allows the motion of multiple slave drives to be precisely coordinated. With optional master/slave software, the velocity ratio and position phasing of the drives can also be controlled. Multiple motors can be operated in parallel from a single drive using variable-frequency control.

Power Quality
A built-in link choke provides near-unity overall power factor and low harmonic line currents at all motor speeds. Units with a constant-torque rating of 50 hp and above provide a six-phase (12-pulse) configuration for further minimizing line harmonics in critical applications. Those units are also available on special order with a nine-phase (18-pulse) configuration.

Protection and Advanced Diagnostics
The 1105 monitors its operating conditions and provides a comprehensive set of overload, short circuit, and other electronic protective features to ensure safe, reliable operation. Faults indications are displayed in plain language. A log maintains a history of fault occurrences and externally triggered events.

Serial Connectivity
A fully isolated RS-422/485 serial interface is provided for connecting the drive to a process controller, communication network, or programmable controller. A variety of popular communication protocols is available. The 100 MHz module also accepts an AnyBus module with numerous industry-standard protocol options and a MaxStream module for wireless communications. An RS-232 connection is also provided on 40 and 100 MHz controllers for connecting a personal computer. Windows-based PCs can set up, monitor, and control a network of drives using optional DriveLink™ or UEdit™ software. Drive Archive™ and Drive Chart™ for the Palm OS make it easy to save and restore setups and capture charts using a handheld computer.

Packaging
Compact and rugged, the 1105 is available either enclosed or as an open chassis for mounting inside an enclosure. Both versions can be foot-mounted to a wall or subplate or flange-mounted through a cutout to dissipate heat outside an enclosure.

Features & Benefits

General
- 24-bit digital signal processor (DSP) for fast, dynamic response
- 512 kilobytes battery backup memory for application setup data
- 1.5 megabytes scratch pad memory and 6.0 megabytes firmware memory
- Clock/calendar maintains accurate time during power outage
- Sine-coded PWM waveform output for improved torque performance
- High-switching-frequency IGBT devices for smooth, 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 starting torque and full torque to base speed
- Variable-frequency operation for simple control of motor speed
- Internal control loop for maintaining speed with sudden load changes
- Automatic field weakening for speeds up to three times base speed
- Integral DC link choke for high power factor and low total harmonic distortion
- Integral/optional dynamic braking for fast deceleration or energy absorption
- Power disturbance ride-through for reducing nuisance trips
- User-programmable analog and digital inputs and outputs
- Through-hole heat sink mounting of chassis units for dissipating heat externally
- Optional NEMA 1 (IP20) and NEMA 3R (IP23) or NEMA 4 (IP66) enclosures

Ease of Installation, Setup, and Maintenance
- Automated setup features require no chart recorders or meters
- Software calibration and adjustment eliminates tuning components
- Digital parameter adjustment for precise and repeatable settings
- Software input and output scaling eliminates potentiometers
- Complete, self-contained package requires minimal option boards
- Identical control boards across full power range reduces spare parts

Ease of Use
- Touch keypad for easy parameter adjustment and access to displays
- Two line descriptive plain-language display with numerical and bar graph readouts
- Comprehensive fault diagnostics displayed in plain language or graphically
- Real-time motion information and time-stamped fault log

Safe, Reliable Operation
- Extensive electronic protection circuits
- Tolerant of AC line voltage and frequency fluctuations
- S-curve acceleration reduces shock and extends equipment life
- Multilevel security code prevents unauthorized parameter changes
- Lockout of local operator controls for safe remote operation

Specifications

Electrical

Input Supply

Voltage:	200 to 240, 380 to 480, or 500 to 600 V AC, three-phase (all units) or six-phase (above 40 hp CT) Phase sequence insensitive
Voltage tolerance:	–40% of minimum, +10% of maximum
Frequency:	47 to 63 Hz
Displacement power factor:	1.00 at all loads and speeds
Overall power factor:	0.95 at rated load for 6-pulse 0.97 at rated load for 12-pulse 0.99 at rated load for 18-pulse

Output Rating

Voltage:	Zero to input supply voltage, three-phase
Frequency:	Zero to 120 Hz for transducerless vector control Zero to 180 Hz for transducer-based vector control Zero to 300 Hz for variable-frequency control
Switching frequency:	16 MHz control: 1, 2, 4, 8, and 16 kHz 20, 40, and 100 MHz controls: 1 to 12 kHz, programmable

Service Conditions

Efficiency:	97% nominal at rated switching frequency

Overload current:

Torque	*Overload (1 min)*	*Maximum*
Constant	150% to 200% of rated	200% of rated
Variable	120% to 150% of rated	140% to 160% of rated
Extended	110% to 120% of rated	120% to 140% of rated

Environmental

Operating temperature:	Control section: 32° to 131° F (0° to 55° C) Heat sink (standard): 32° to 104° F (0° to 40° C) Heat sink (derated): 32° to 122° F (0° to 50° C)
Storage temperature:	–40° to 158° F (–40° to 70° C)
Operating humidity:	95% maximum, noncondensing
Altitude:	To 3,300 ft (1,000 m) without derating

Performance

Frequency Control (16 MHz control)

Range:	Zero to base speed at full torque Base speed to 300 Hz at constant power
Resolution:	0.024% with analog input (12-bit) 0.1 Hz with digital input

Velocity Control (20, 40, and 100 MHz controls)

Range:	Zero to base speed at full torque Base speed to 180 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 (20, 40, and 100 MHz controls)

Starting torque:	Constant torque: zero to 150% of rated Variable torque: zero to 120% of rated Extended torque: zero to 110% of rated
Regulation:	±3.0% of maximum with transducer ±10% of maximum without transducer

Inputs and Outputs

Analog Inputs
Three (3) 12-bit analog inputs (±10 V DC or 0 to 20 mA)

Analog Outputs
Two (2) 12-bit analog outputs (±10 V DC and 0 to 20 mA)

Digital Inputs
Twelve (12) digital inputs (require sink of 1 mA to common)
Converter Interface Module: Provision for input converters rated 2.5 to 28 V DC @ 30 mA, 90 to 140 V AC @ 11 mA, and 180 to 280 V AC @ 5 mA

Digital Outputs
Six (6) digital outputs (open-collector drivers rated 24 V DC @ 500 mA)
Converter Interface Module: Provision for output converters rated 5 to 60 V DC @ 3 A, 12 to 140 V AC @ 3 A, or 24 to 280 V AC @ 3 A; or for normally open or normally closed relay converters rated 250 V AC @ 8 A

Specifications *(continued)*

Serial Communications

Asynchronous

Port(s):	One RS-232/422/485, isolated, and two auxiliary RS-422/485
Protocols:	ANSI-x3.28-2.5-A4 or Modicon RTU, standard

Synchronous

Port:	RS-485 for high-speed master/slave networking

Communication Modules

Anybus:	One module provision Options: CANopen, CC-Link, ControlNet, DeviceNet, Ethernet, Interbus, LonWorks, Modbus Plus, Profibus DPV1, Profibus Master
Bluetooth or MaxStream:	100 MHz control: one module provision 280 MHz control: two module provisions MaxStream options: 900 MHz and 2.4 GHz

Protection

The following hardware conditions are detected. Additional protective features are provided by the application software.

- Ground fault
- Motor phase-to-phase short circuit
- DC bus overvoltage
- DC bus undervoltage
- Instantaneous overcurrent
- Motor overload
- Heat sink overtemperature
- Ambient overtemperature
- Power transistor fault
- Logic power undervoltage
- Memory malfunction
- Processor not running fault

Options

Transducers
A motor-mounted incremental encoder or resolver and corresponding interface may be used for highest performance. The resolver interface provides an encoder emulation for paralleling feedback to other devices. Dual- and triple-encoder options are also available for position-following or dual-transducer applications.

Expanded Analog I/O
An analog interface module may be used instead of a feedback interface to expand the analog I/O capabilities of the drive. The module provides eight additional inputs and four additional outputs.

Dynamic Braking
Dynamic braking is included on all 230 V and 460 V units through 40 hp CT. It is a factory-installed option on all other units. Appropriately sized external braking resistors are required.

Packaged Drives
Drives may be ordered as part of a packaged system including a circuit breaker, operator devices, and additional system components mounted inside a NEMA 4 (IP66) enclosure.

Power Range

Input Voltage	Constant-Torque Applications	Variable-Torque Applications	Extended-Torque Applications
230 V AC	1 1/2-20 hp (1.1-15 kW)	2-25 hp (1.5-18 kW)	—
380 V AC	1 1/2-150 hp (1.1-110 kW)	2-200 hp (1.5-150 kW)	—
460 V AC	1 1/2-150 hp (1.1-110 kW)	2-200 hp (1.5-150 kW)	10-250 hp (7.5-185 kW)
575 V AC	1 1/2-200 hp (1.1-150 kW)	2-250 hp (1.5-185 kW)	10-300 hp (7.5-225 kW)

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

All trade designations are provided without reference to the rights of their respective owners.

Specifications subject to change without notice.

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