

## Honeywell NX Series Variable Frequency Drives

The Drive for  
all Applications

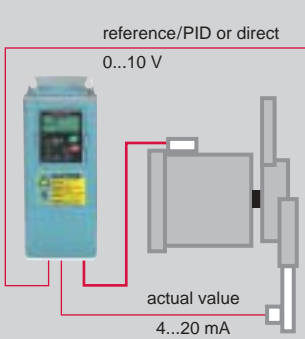
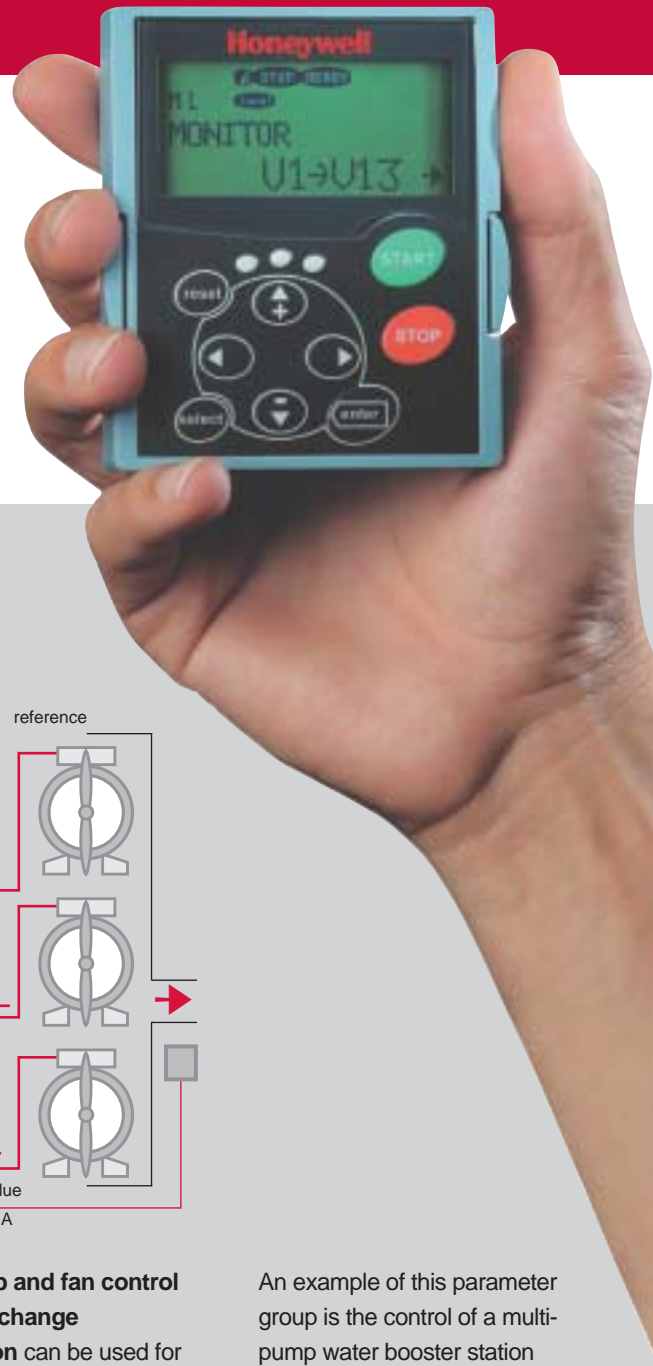


*Honeywell NX-Series*



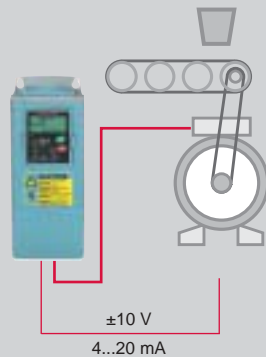
Choose from a wide range of customized special applications too, including elevator, winder, high-speed, torque control and torque control with closed loop. Please see your Honeywell authorized distributor for more detail.

**The NXS is specifically designed for open-loop control applications (e.g. fans, pumps, and compressors).**

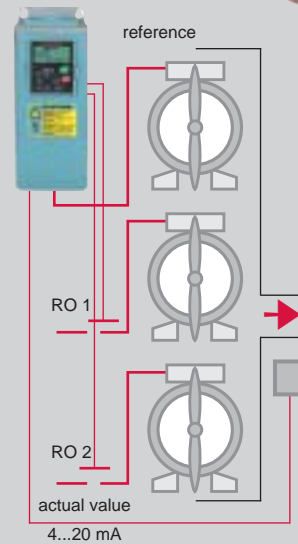


**The PID control application** features two I/O terminal control sources. Source A is the PID controller and source B is a direct frequency reference. The PID controller reference can be supplied via an analog input, from a potentiometer or the panel.

The actual value can be obtained from an analog input or from a mathematical function of the analog inputs. Typical PID control applications include those where one variable must be kept constant (such as pressure in water supply line) despite changes in the load. All outputs are programmable, and eight parameter groups are standard.



**The multi-purpose control application** incorporates a frequency reference that can be obtained with an analog input, or from the joystick control, a potentiometer, or a mathematical function of the analog inputs. A variety of multistep and jogging speeds can be programmed. All outputs are programmable, and eight parameter groups are provided. With its extensive range of parameters, this is the most versatile and flexible of all the applications.



**The pump and fan control application with autochange** can be used for controlling one variable speed drive and a total of four auxiliary drives.

The PI regulator controls the rate of the variable speed drive and provides start and stop signals to the auxiliary drives. All outputs are freely programmable.

A parameter group for multi-pump and fan control functions is available in addition to the eight standard parameter groups.

An example of this parameter group is the control of a multi-pump water booster station that provides nearly constant supply pressure across a wide flow demand.

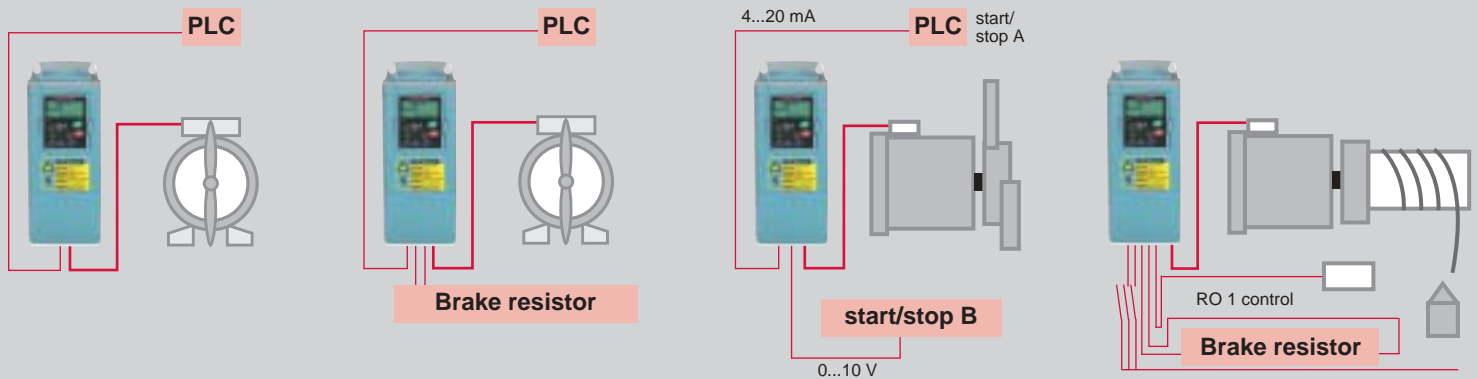
This application uses external contactors to switch between the motors connected to the frequency converter. The autochange feature alternates the starting order of the pumps.

# Applications

The NX Series can be easily adapted to a variety of needs using the preinstalled application package.

All applications can support a fieldbus system without any additional software. Typical uses include pumps and fans,

compressors, conveyors, winders, cranes and hoists, and elevators. Choose the right application for your needs from this guide:



**The basic application** is set as factory default. The I/O signals are fixed, not programmable. A single parameter group containing 18 parameters is available. The frequency reference can be provided either as a current or as a voltage signal, or directly from the control panel. This is the most popular application.

**The standard application** features the same control signal logic as the basic application plus the ability to freely program all digital inputs and outputs. Eight parameter groups are available, including basic, input signal, output and supervision, drive control, frequency, motor control, protection and auto-restart parameters.

**The local/remote application** is an ideal choice for operation with two active control sources. The source of the frequency reference can be freely programmed. The active control source is selected with a digital input. All outputs are programmable, and eight parameter groups are standard.

**The multi-step speed control application** allows selecting the reference between several fixed speeds. Nine programmable speeds include basic, seven multistep, and jogging. The speed is selected by a digital input signal. The basic speed reference can be provided either as a current or as a voltage signal.

All inputs and outputs are programmable, and the eight parameter groups are standard.

**Note:** NXL models only include the multipurpose control application.

# NX Series – the Drive for all Applications

From simple HVAC applications to closed-loop process control applications, you'll soon discover that the Honeywell NX Series is the right drive for all scenarios.

You can depend on an NX Series drive to control anything from simple fans, pumps, and compressors, to elevators, cranes, or winders. NXS models offer the greatest application versatility for multiple control applications. NXL models meet simple application needs in the low-horsepower range.

Together, these versatile performers feature modular, easily adaptable hardware, precise semiconductor technology, and a flexible, pre-installed application package that supports a fieldbus system. And that makes NX Series drives the single best solution for a wide range of HVAC and industrial applications.

## **For distributors/contractors**

For the distributor or contractor, the NX Series offers a range of new application capabilities and possibilities for keeping stock to a minimum.

Since the NX is a functional replacement for its predecessor, the CX Series, existing drawings, installation and training material can be easily adapted. In addition, a wide selection of option cards offers new possibilities for reconfiguring the drive to future requirements. The wide voltage range, high overload capacity, and a user-friendly alphanumeric control panel make choosing the correct drive very easy.

## **For OEM customers**

For the OEM customer, the modular construction and wide selection of option cards make the NX Series a drive that can be easily incorporated into almost any application. The versatile programming tool can work with your control sequence or the drive can replace the local controller.

## **For system designers**

The flexible I/O configuration and the dynamic performance of the NX Series make it ideal for a wide range of system applications, including drives used in HVAC and industrial markets. The NX Series can be configured to operate with several different fieldbuses, making it easy to communicate with a variety of control systems. And the powerful control unit can be used for local control tasks, freeing the control system for general control tasks.



# Drives and the Electrical Environment

Most drive installations require additional equipment such as controllers and sensors. This equipment is often installed in close proximity to the drive, creating the potential for interference.

There are two main types of interference:

- Low frequency — harmonic
- High frequency — electro-mechanical Interference

NXS drives are specifically designed to prevent interference.

## Harmonic currents

All current and voltage waveforms can be expressed as the sum of the basic frequency (50 or 60 Hz) and higher multiples. In a balanced three-phase system, only odd harmonics will be present: the even ones are usually cancelled out.

Non-linear loads draw currents that are not sinusoidal, and can generate these harmonics.

Typical sources include rectifier bridges in power electronics, switch-mode power supplies in office equipment, and fluorescent lamps. For a three-phase rectifier load, the harmonic currents present are  $6 \times n \pm 1$ , i.e. 5, 7, 11, 13, 17, 19, etc. The magnitude of these currents decreases as their frequency increases.

The additional harmonic current does not carry power, though it is an added

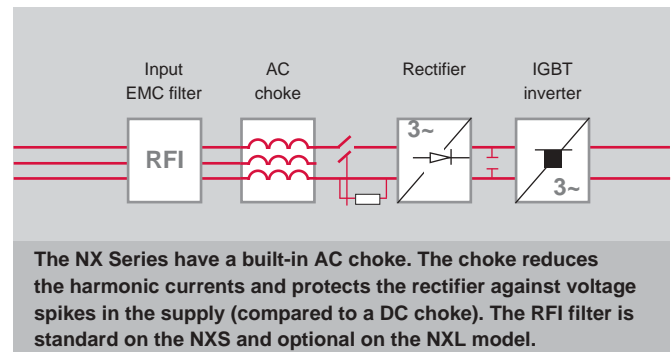
current flowing in the cables. Typical effects include overloaded conductors, decreased power factor, and disturbance of measuring systems.

The voltages created by these currents flowing in the transformer also may damage other equipment or interfere with power line communication equipment.

## Eliminating the problem

The magnitude of the harmonic currents decreases as their frequency increases. Focusing on the lower frequencies can control or limit these effects.

Additional line impedance in the form of a choke has a significant effect. Drives without input line chokes generate significantly higher levels of harmonics. An AC choke has the added effect of protecting the drive against spikes in the supply. All NXS drives have built-in AC chokes.



The NX Series have a built-in AC choke. The choke reduces the harmonic currents and protects the rectifier against voltage spikes in the supply (compared to a DC choke). The RFI filter is standard on the NXS and optional on the NXL model.

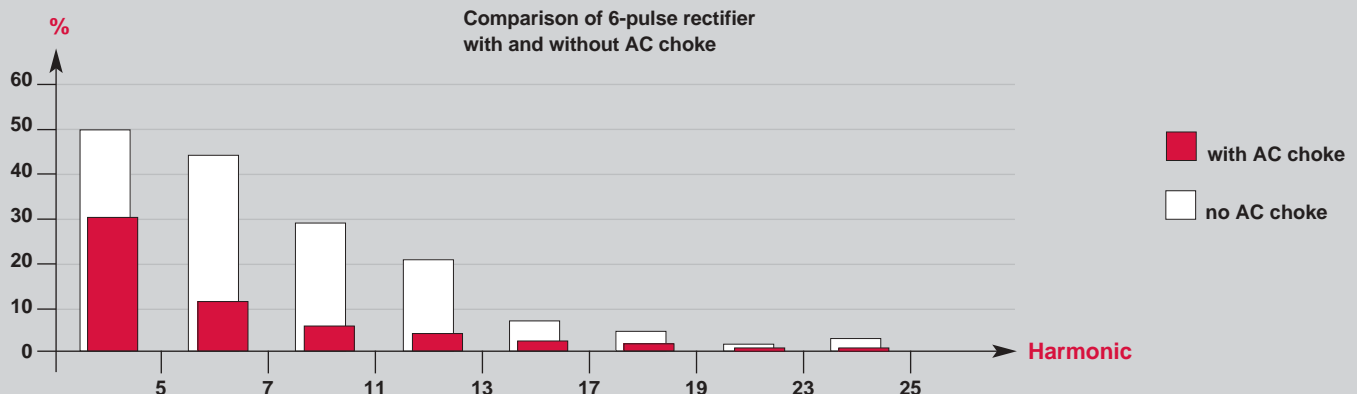
## High-frequency interference

High-frequency interference consists of either radiated or conducted disturbances at frequencies above 9 kHz. Standards exist for 150 kHz to 1000 MHz.

These disturbances can be created by switching elements in any device (e.g., the crystal clocks in a computer, switch-mode power supplies, and the output devices in drives). The high frequency noise emitted from any device may influence measuring systems, communication systems, and interfere with radio receivers.

NXS Drives are designed to operate in a variety of environments, and are made with industrial-level resistance to RFI.

Current Harmonics



## The Modular Design

### Control unit

The control unit features a control panel for setting parameters and controlling the function of the drive, along with an enhanced microprocessor and ASIC circuitry. The display provides such information as the actual values of current, power and voltage. In the local control mode, it can also be used for starting and stopping the drive. If necessary, the display can be mounted directly on the enclosure door.

The control unit provides five slots for various I/O cards. A wide selection of cards is available, ranging from cards

with simple analog and digital inputs to smart fieldbus cards. (See Form # 63-9251 for a list of option cards and features.) The option cards are interchangeable between both the NXS and the NXL.

The control unit is usually powered from the power unit. However, it also can be powered from an external 24 V dc supply, maintaining access to the stored data and other parameters (for example, in fieldbus applications) even if the main supply is disconnected.

### Power unit

The power unit is available in 200-240, 380-500, and 525-690 three-phase AC input voltage ranges. It includes all power circuit components necessary to operate the drive, and is connected to the control unit with a multipole connector.

All drives up to 40 Hp are equipped with a built-in brake chopper and an optional resistor. This resistor is designed for a two-second full torque rapid stop once every minute. An external brake resistor can be installed as an option.

### Enclosure class

The standard enclosure class for NXS drives is NEMA1 (IP21). Models are also available in NEMA12 (IP54). NXL drives are shipped as an open chassis panel-mount-only device.



Power and control are separated in two units.

# Advanced Features

## NX

Years of experience are behind the design of and manufacturer of these reliable, robust drives.

The NX Series extends the CX Series' reputation for reliability, with the same high level of resistance to electromagnetic interference.

The NX Series' two different control units—the NXS and NXL—both feature standard, open-loop, sensorless vector control software sufficient for the majority of applications.

Both control units incorporate the same application packages, control panels, I/O cards and can connect to the same PC tools package.

Easy programming and commissioning simplify start-up. The NX default control I/O includes the most common control inputs and outputs. For maximum compatibility, the wiring terminals of the NX Series match the previous CX Series settings. Setting parameters is easy too, using either the control panel or the PC tools for the NX.

An optimal solution is available for most application needs. The modular design allows the choice of only the needed functions and features for specific applications. A wide selection of option cards offers new possibilities for future reconfigurations.

### **NX Series features include:**

- Integrated AC choke for maximum protection and minimum harmonics
- Integral RFI filter for first environment, restricted distribution (residential and light commercial) as well as second environment (industrial)
- Factory tested at maximum temperature and load
- Flexibility in communication with multiple fieldbus options: LonWorks , ModBus, DeviceNet and ProfiBus
- Highly flexible I/O configuration
- Multi-application software package pre-installed
- Versatile PC tools for loading, adjusting and comparing parameters
- Slim, space-saving “bookshelf” design for side-by-side installation
- Continuous self-supervising runtime and alarm system enhances reliability and safety
- Control logic can be powered from an external auxiliary supply, maintaining power to the control panel, internal drive functions and fieldbuses
- Parameter transfers between drives and applications
- Multilingual control display

# Advanced Features

## NXS and NXL

### NXS

#### Applications

The standard NXS drive is most often supplied with the following pre-engineered applications:

- **Basic**
- **Standard**
- **Local/Remote Control**
- **Multi-step Speed Control**
- **PID Control**
- **Multi-purpose Control**
- **Pump and Fan Control with Autochange**

Several customized, special-purpose applications are also available for elevators, cranes or winders etc. All NXS applications are similar to the CX configurations.

### NXL

The NXL is a slim, compact and easy-to-use frequency converter for the 1/2–3 Hp power range. The installation is flexible and easy using the mounting components shipped with the unit. Choose traditional back installation or DINrail, suitable for very limited space.

At the core of the NXL is sensorless vector control technology, coupled with current measurements of all three output phases. Fieldbus control using RS485 (Modbus) is standard. All common fieldbus cards and I/O expander cards available for the NX range of products can be used in the NXL. The NXL also incorporates PID control as standard, enhanced with special features such as a sleep function.

### User-friendly features:

#### NXS and NXL models

- Simple to operate
- Smart preset parameters: In most cases, just enter the motor ratings and the NX does the rest
- All applications have a minimum number of parameters
- Simple quick-connect control terminals
- Wide variety of I/O cards for different applications
- RS232C port for connection to PC
- Comprehensive manuals available in English, Spanish, and French
- Multilingual control panel, similar operation for all power ratings



NXS Series



NXL Series

# Advanced Motor Control

## NXS

Sensorless vector control technology is at the core of the NXS, along with an adaptive motor model and a sophisticated ASIC. The motor flux model is based on the measurement of all three output phase currents and the voltage level obtained from the ASIC. The model automatically identifies motor parameters for both the sensorless vector mode and the U/f mode, keeping track of changes in the parameters over time.

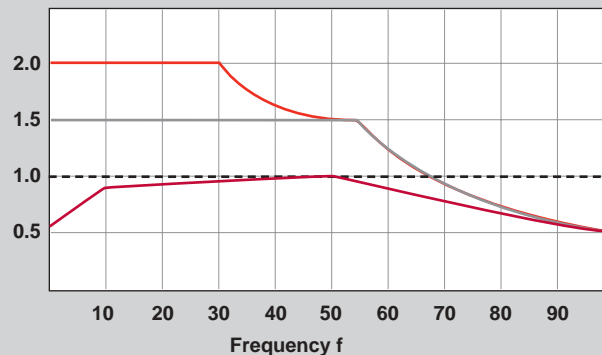
The vector control is carried out in a system of stator flux coordinates, which is resistant to small variations in measurements and motor parameters. No demanding or complicated calculations are required. The ASIC circuit also supervises the internal buses and some external functions, freeing the processor for other tasks.

### Vector control without feedback

The vector calculations are carried out every single millisecond, based on the instantaneous values of the phase currents and their phase angles. These values are then transmitted to the motor model to calculate the torque and the flux. The calculation excludes integrators that can

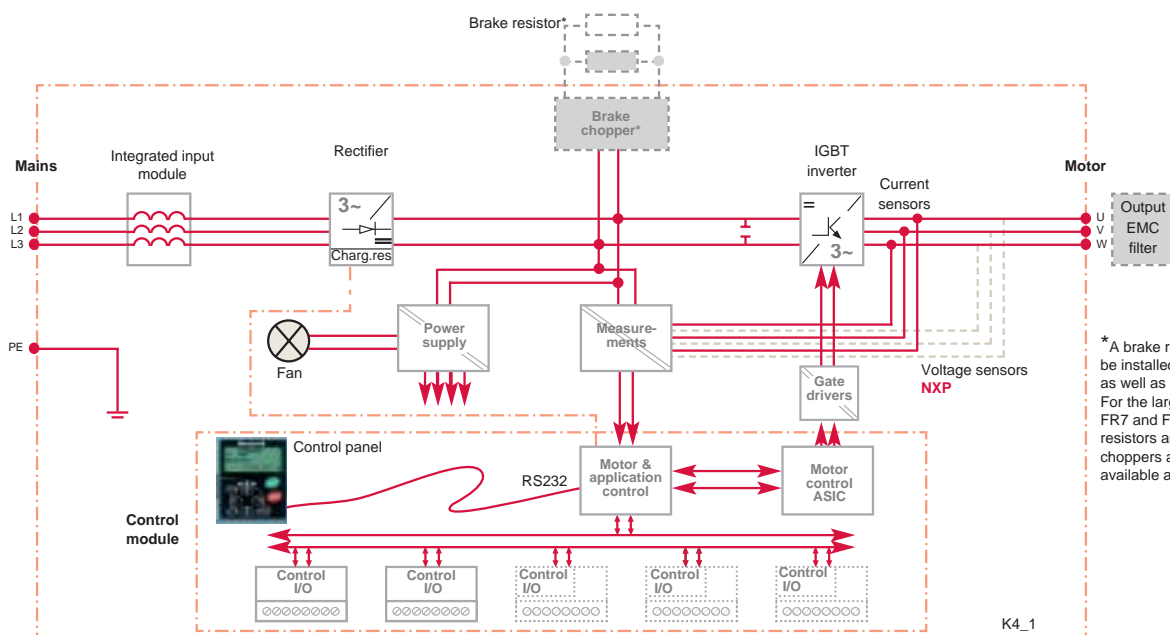
cause drift problems due to inaccuracies in parameters, measurements, or changes in motor values. The motor voltage is obtained from the ASIC, preventing errors in measurements. The adaptive motor model also incorporates the converter and the motor cable, providing the precise status of the motor at all times.

Torque T



Example of the loadability of a standard motor supplied by a frequency converter

- Starting torque
- Overloadability
- - - Nominal torque of the motor
- Continuous loadability of the motor when supplied by a frequency converter



\* A brake resistor may be installed internally as well as externally. For the larger frames FR7 and FR8, brake resistors and brake choppers are available as options.

# Graphical Tools

A number of Windows®-based PC programs are available for working with the NX Series (e.g. commissioning and loading applications).

## NCDrive

NCDrive is a full featured commissioning and control application for the NX Series. It provides the following functions:

- Parameter adjust, compare and save
- Trending for up to six signals
- Fault finding/trouble shooting

NCDrive requires a PC equipped with a Pentium II processor, 32 MB free RAM, 10 MB free disk space and Windows 95/98 or 2000.

## NCLoad

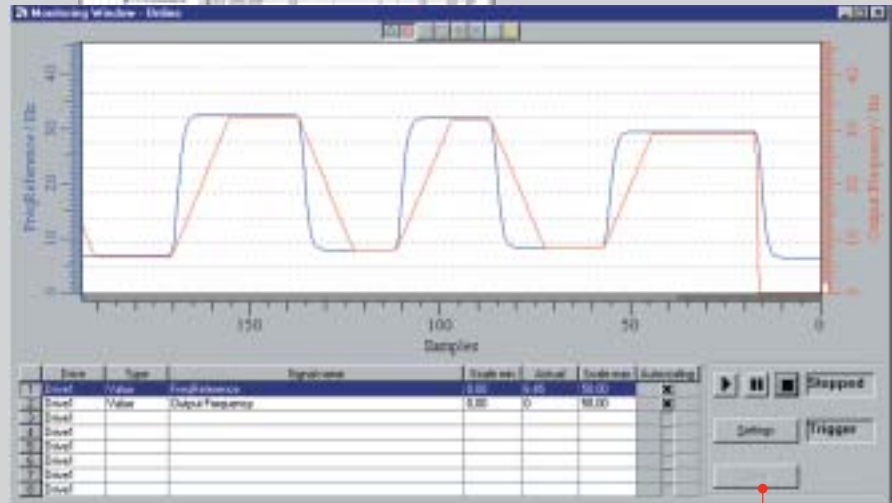
NCLoad is a tool for loading software into the drive, including:

- System software (the operating system)
- Application software
- Option card software

NCLoad is a simple but powerful tool, and should only be used by trained personnel.

### Parameter window

Adjust and compare and save parameters



### Monitor window

Up to eight user-selectable variables can be monitored simultaneously.

