

# Rexroth NYCe 4000 Excellence in motion control

Modular, compact and cost saving





Bosch Rexroth is the worldwide leader in all relevant drive, control and motion technologies – with industry-specific automation systems and innovative control components.



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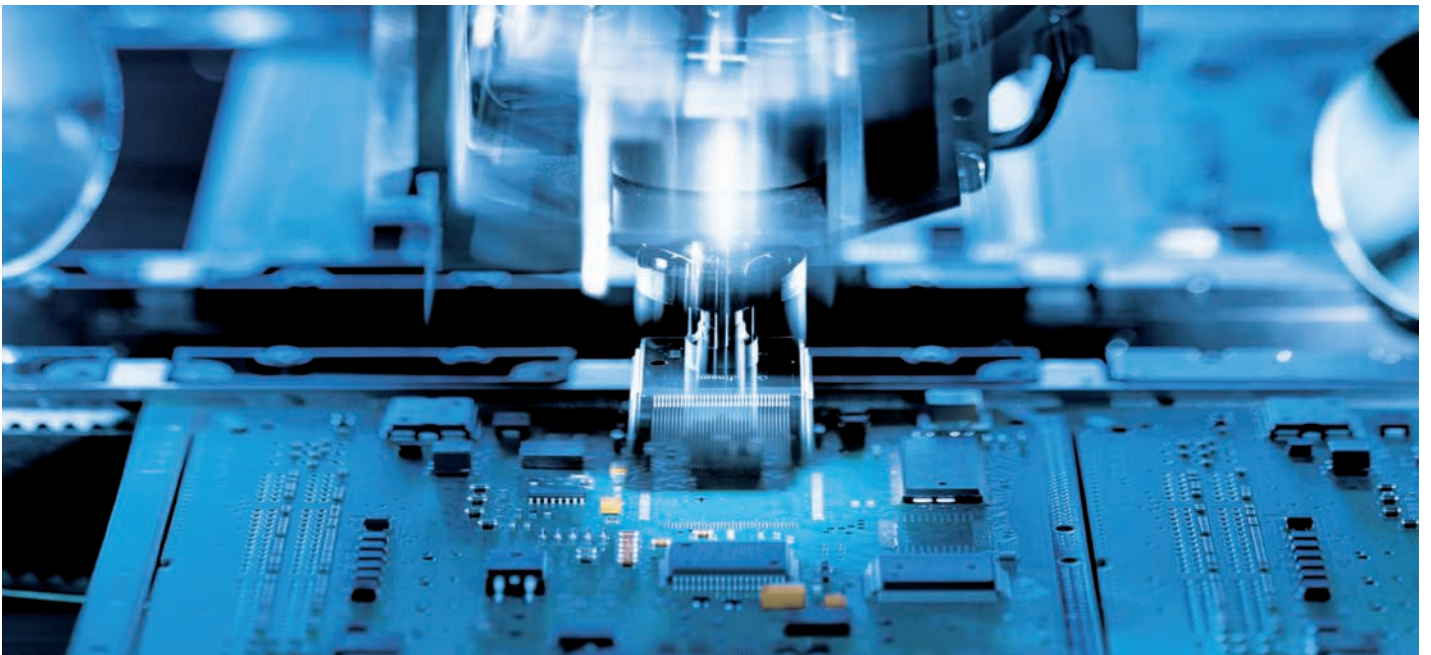
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Further information: [www.boschrexroth.com/nyce](http://www.boschrexroth.com/nyce)



# Rexroth NYCe 4000 – short time to market

**Rexroth has extended its range of motion control systems with the NYCe 4000 – a rugged, functional-rich, yet compact multi-axis industrial motion control system with integrated drive technology. NYCe 4000 controls complex equipment and is offered in a single unit that significantly reduces space requirements and cabling, and cuts system and integration costs. It also extends machine availability and greatly improves serviceability.**

Market introduction is always critical. The timely introduction of new products to market has consequences on reaching target markets with the desired value. It is very important that, during the development and production of new equipment, your motion control system enables you to reach your business goals.

Bosch Rexroth and the NYCe 4000 motion control system help you reduce your time to market:

## **Design support**

Our mechatronic experts can assist during the design phase of your new machine. With our expertise in mechatronics we can help you perfect your prototype machine in an early development stage. This saves valuable time and results in optimal machine performance.

## **Implementation support**

During the implementation phase our application engineers are available for support. With their in-depth knowledge of the NYCe 4000 control system, they will optimize the performance of your specific application.

## **Training**

Bosch Rexroth provides standard training courses for the complete NYCe 4000 product line. Training can be held in our Competence Centre, or at customer site, the most effective way of becoming familiar with all features of the NYCe 4000 system.

## **Head start and future proof**

Motion control is often regarded as essential competence for machine builders. NYCe 4000 provides the technology with functionality and flexibility as if it was your own design. Using NYCe 4000 will save you valuable effort, time and money. Not only do you streamline development of your machine through expert motion control, but you also enhance your ability to keep pace with new developments throughout its life-cycle.

## **Simulation**

NYCe 4000 includes a simulation environment. This is a valuable tool for your application software developers to test their applications without having a control system or machine connected. They can simply test the application on a PC at a very early stage, even before the new machine is available.

# Optimize cost of ownership

In a highly competitive market it is important to optimize the efficiency and yield of your machine. The NYCe 4000 products with their optimized performance focused system architecture introduce a structural method of integrating and maintaining motion control in your machine, enabling efficiency of operation without sacrificing machine functionality.

## Modular machines

Imagine you are building a compact machine composed of several functional sub-modules and options, and you also need to deliver quickly to your customer.

This will result in foreseeable pressure on your machine assembly resources, as every machine is different and must be built and tested in a very short time.

Now imagine that you are able to define full-functioning modules, each with their own compact control. These modules are fully tested, and can be put on assembly stock. As soon as you receive a customer order you can assemble your machine quickly since all modules are fully pre-tested including the control. The time it takes to assemble and test will be reduced significantly.

The NYCe 4000 is a very compact motion control platform, well suited to fit into small function modules of your machine, enabling modular machine concepts.

## Integrated connectivity panel

Connectivity and cabling in a machine are factors that often include significant hidden costs. Cabling from all devices in a machine (motors, encoders,

sensors, relays, switches) are usually connected to the control platform.

In most control systems external drives as well as an I/O distribution board are needed. The distribution board is required because connectors are always specific and can never be plugged directly onto the control system or on the drive. Additionally, industrial cabling between the control system and the drive, as well as cabling between the control system and the distribution board is usually required. The new, streamlined solution is the NYCe 4000 with integrated drives, which offers an integrated customer or machine specific distribution board.

The NYCe 4000 saves costs, takes up less space and improves machine uptime by removing part of the vulnerable cabling.



# Increase machine performance

Faster machines require improved control algorithms to compensate for mechanical shortcomings. The NYCe 4000 motion control system contains extremely fast control loops with position loops as fast as 32 kHz (31.25  $\mu$ s). State of the art control algorithms with feed forward control, filters and notches can all be set by the user, even when the machine is moving. User friendly tuning software, specific

control algorithms and the possibility to include your own control algorithms, assure that even the most demanding applications can rely on optimal control algorithms.

As machines become faster, the motion aspect needs to be faster and more accurate, as does the interaction between motion and I/O in the machine. Therefore NYCe 4000 integrates functions

that directly link motion and I/O action, such as latches, markers and event handling.

Quickly responsive and programmable applications can be integrated in the NYCe 4000 system. Using the sequencer, running on the motion control unit, C-applications can be downloaded and run in real-time directly on the NYCe 4000.



# Improve machine availability

A machine is expected to run continuously, without getting into an error state. In case this still happens, it is of utmost importance that the machine is up and running as soon as possible. The NYCe 4000 series contains several key features designed to improve your machine availability.

## Monitoring

In order to optimize performance and prevent a machine from going into an error state, machine data needs to be monitored continuously. The NYCe 4000 series supports several levels of monitoring. The standard method is based on software triggering reacting to a signal that is generated by your machine. This signal can be a digital input or an analog input value that reached a predefined limit or a temperature in the system. The system automatically generates events on motion related exceptions, i.e. large position errors, reaching

end-switches etc. All exceptional situations can be connected to a user-configurable control system response.

Another monitoring feature is based on the sample-synchronized logging of data. With the use of standard software tooling you can look in detail to the performance of your motion system at any moment in time with dependable values. You can, for example, log several axes positions and when small deviations from the expected value are detected you might decide to do preventive maintenance or replace machine parts preventively. Using these features, the user can avoid machine stops by responding fast to exceptional situations.

## Diagnostics

When an error occurs several diagnostics tools will assist you in identifying the location of the error. In case the error occurs outside the NYCe 4000 control system (i.e. low servo power voltage, encoder cable break etc.) an error will be generated in the application. Whenever an error occurs inside the control system, the LED on the front of the control system module indicates the erroneous module. When an error occurs on the NYCe 4000 system, the defective module can be exchanged by a spare one. This can be done without removing any cabling and without setting jumpers or switches. Once the new module has been inserted, the NYCe 4000 automatically reconfigures the module and will run the original software, thus allowing fast module exchange at minimal risk.

# NYCe 4000 for your industry

The Rexroth NYCe 4000 Motion Control System targets applications where low-power servo axes and stepper axes are driven and where high demands are placed on motion control. It fills a need in a wide range of applications in industries like semiconductor, medical, solar and flat panel display, where speed and accuracy combined with efficiency, performance and fast time to market are essential.

The NYCe 4000 was developed in tight cooperation with semiconductor metrology and die bonder partners as well as medical equipment providers to ensure highest performance, flexibility and serviceability.

## Typical applications

- front-end semiconductor manufacturing
- back-end semiconductor assembly
- electronics assembly/pick-and-place
- semiconductor test and inspection
- MEMS/micro systems technology
- solar cell manufacturing
- flat panel display manufacturing
- special machine tools
- special robotics and manipulators
- surface treatment
- patient tables
- diagnostic equipment and more...

## Linear Transport System

### Solar cell production

In solar cell manufacturing machines, carriers have to be moved independently from one process station to the other in a vacuum environment. Using the principle of inverted linear motors, Rexroth has developed the Linear Motion System (LMS) in which the NYCe 4000 plays an essential role. It drives the separate carriers and processes the incoming position data of hall sensors, enabling high speed and high precision movements of the carriers in vacuum.

### Features

- controlling non-contact magnetic carriers over several coils
- positioning in vacuum with high speed and high accuracy
- realizing inline production processes
- specific control algorithms offer next to the control of single carriers also the possibility to create a train of carriers

### Benefits

- accurate positioning system
- cable free carrier movement
- low maintenance motion system
- proven concept that shortens the time to market



Source: OTB Solar

## Test and inspection

### Microscopy

Controlling a positioning stage in vacuum, for example inside an electron microscope requires very precise positioning in combination with fast movements, as well as constant ultra low-speed movements. Specific control algorithms have been implemented on the NYCe 4000 to control piezo motors.

### Features

- piezo motors and specific control algorithms
- avoid unwanted heat generation
- pulse function for ultra low speed
- non-linear compensation
- point-to-point movements

### Benefits

- fast and accurate movements
- ultra low speed, very high positioning accuracy
- high repeatability
- also in vacuum
- easily linearized control



Source: FEI COMPANY

## Front-end semiconductor manufacturing

### Die bonding and bumping

Die attach and die bumping applications require very high positioning precision in the horizontal plane. Due to the fragile materials placed, movement in the vertical direction needs very sensitive force control. The NYCe 4000 control system offers high accuracy alignment, high positioning accuracy and high force accuracy. It also supports a wide variety of motors used in this application such as stepper, piezo and servo motors.

### Features

- position-force adjustment
- piezo motors control
- motion, vision and I/O in one network
- optical alignment
- open system

### Benefits

- high accuracy alignment
- high positioning accuracy
- high force accuracy
- configuration choices

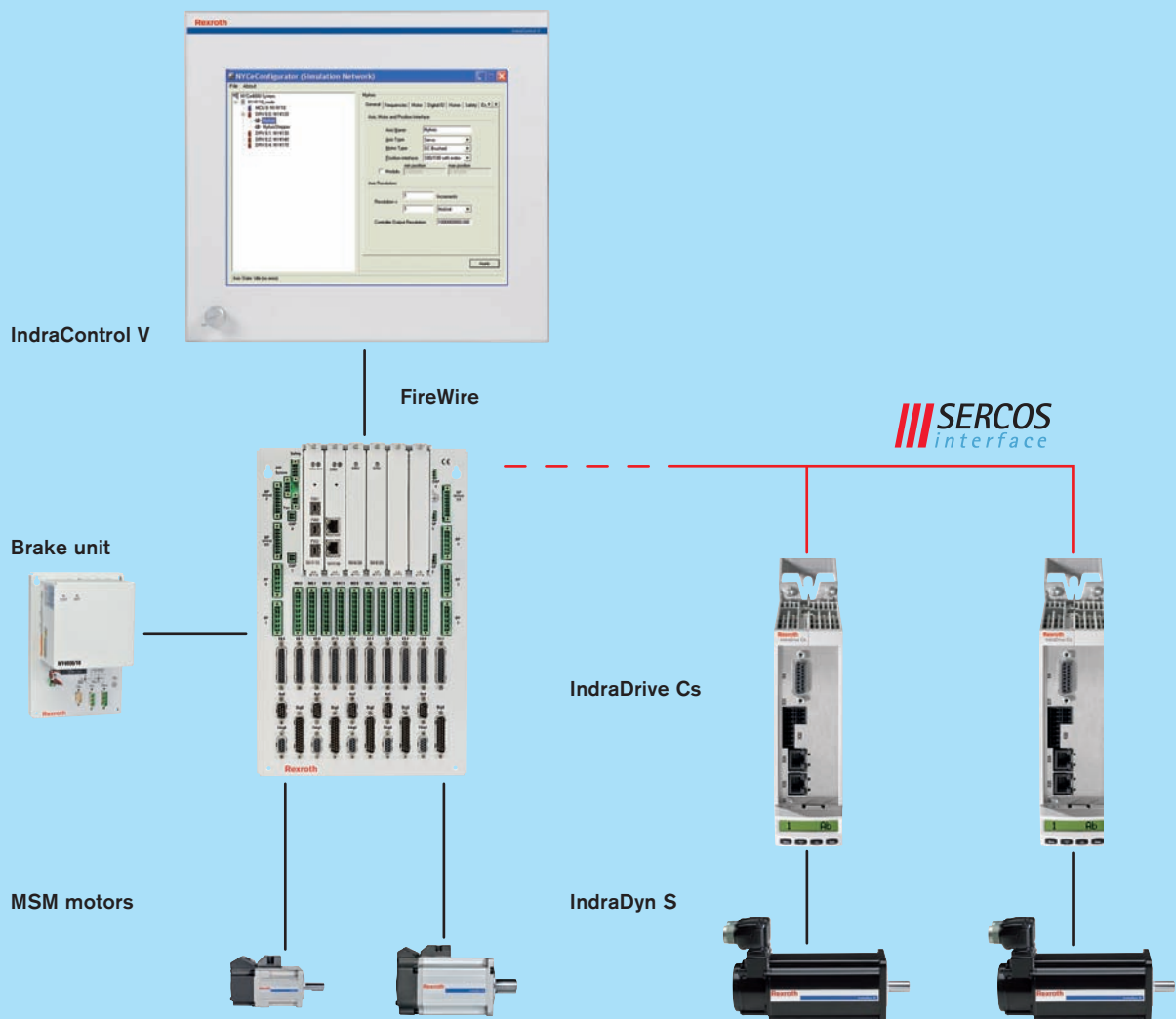


Source: S.E.T. (SUSS MicroTec)

# NYCe 4000 architecture

The NYCe 4000 system architecture is designed to take complexity of requirement and simplicity of operation into account. The modular architecture allows fast and error free design-in. Using a standard PC and the motion control unit, a wide range of

motors and encoders are supported. Programming the system is simple using standard building blocks. For specific applications you can build your own application supported by a wide range of tools.



### Interfacing

In order to work with the NYCe 4000 you simply need a standard industrial PC. The PC should run on Windows XP and requires an IEEE1394 interface (FireWire) for communication with the motion control system. The PC can be connected to one or more motion control systems.

On the PC the user interface is running as well as (part of) the application software controlling the machine.

All real-time motion control functionality as well as real-time parts of the application are implemented on the motion control systems.

The motion control systems have integrated digital and analog I/O as well as integrated drive units supporting various motor types. Various standard motion control system configurations are available supporting different numbers of drive units.

Via a SERCOS III interface, the NYCe 4000 can be connected to high power amplifiers, like the Rexroth IndraDrive Cs.



### Motion control system

In the NYCe 4000 motion control system (node) three basic elements can be distinguished:

- housing and connectivity panel
- motion control unit
- one or more drive units

Depending on the number of drives and the connectivity panel, different node configurations are available. For OEMs the connector choice and backplane form factor can be customized for a perfect fit to the machine.

The NYCe 4000 system is designed to offer maximum flexibility with minimum space usage. For example, a 2 axis system supports brushed and brushless servo motors, as well as stepper motors, requiring just 0.9 dm<sup>3</sup>!

Changing drives on the NYCe 4000 is simple. Unplugging connectors is not necessary, the drives can simply be removed from the node and replaced without setting jumpers, updating software, or configuration settings. This is all handled automatically when the system is restarted.



### Motor support

The NYCe 4000 series supports 6 different motor types using one single drive. All it takes is just setting a configuration parameter to the selected motor type.

Supported motor types are:

- brushed DC motors
- brushless DC servo motors (trapezoidal control)
- brushless AC servo motors (sinusoidal control)
- two-phase stepper motors
- piezo motors
- linear motors

The NYCe 4000 also fully supports external amplifiers like Rexroth IndraDrive Cs, in case required for extra power or for the control of an additional motor type.

This support also includes power enable and error handshaking.

### Encoder support

In order to further optimize the flexibility of the NYCe 4000 a wide range of encoders is supported:

- incremental quadrature 5 V S0/S90 encoders
- analog 10 V absolute encoder
- EnDat 2.1
- EnDat 2.2
- Hiperface®
- SinCos
- Yaskawa

- Panasonic
- Rexroth MSM

The range of encoders provides maximum flexibility in selecting the optimal motor/encoder combination for the best performance of the application.

### Position-velocity controller

The NYCe 4000 motion control system has a position-velocity control loop and a current control loop. These control loops are configurable using the NYCe 4000 tuning toolset.

The control loop is a very extensive controller with various feed-forward parameters, lead/lag, low pass, and notch filters. The control loop is integrated in the NYCe 4000 drive module and can run at a speed of 32 kHz. This ensures maximum performance in speed and accuracy.

When the standard controller is not optimal for a specific application, because of mechanical constructional algorithms, or the usage of multiple (encoder) inputs that need to influence the behavior, a special controller can be built by the user. Using MATLAB® Simulink® package, the controller can be defined. Interfaces between the controller and the NYCe 4000 system are offered as Simulink terminators. These interface blocks allow access to encoder and I/O values, error

handling, and the communication between the user defined controller and the NYCe 4000 system.

Next to the NYCe 4000 specific library blocks, the standard Simulink library blocks can be used. This enables the user to quickly build and test specific controllers. After developing the controller, it can be downloaded to the Motion Controller. Switching axis configuration parameters from “standard controller” to “user controller” simply activates the controller for a specific axis.

### Programming the system

The NYCe 4000 application software has an open architecture which allows the user to access all integrated functionality for movements, I/O handling, exception handling and synchronization. The application software provides access to all configuration and tuning parameters, and it offers functionality to download firmware or gateway for field upgrades.

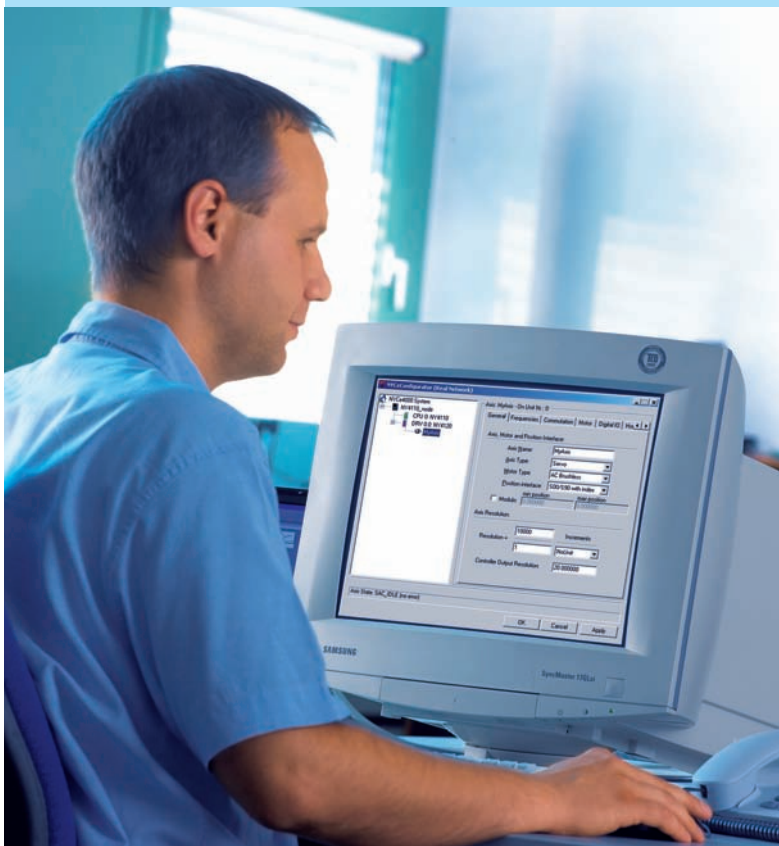
There are two levels of motion programming for axes in a system:

- **Programming at pilot level (PLT):** This programming method uses kinematical models rather than a set of single axes. The pilot software implements mechanisms for which the user has to supply the kinematical models. This allows the user to program all movements of the mechanism in cartesian space. The trajectory generators of the NYCe 4000 calculate the 3D trajectory and via kinematical transformations determine the movement of each axis in the

mechanism. The pilot programming supports reference frames for relative position programming and calibration functionality at mechanism level.

- **Single axes control (SAC):** This programming method looks at all axes as single axes, and programmed movement commands affect just one axis. To enable implementation of synchronized movements, functions for grouping axes are available. It is also possible to program the system using application specific trajectory generators. For moving axes, functions like homing, point-to-point, jogging and spline are available. Furthermore the system includes functions for system configuration, parameters setting, I/O handling and user specific exception handling.

The application software, written in C/C++, is normally run on the controlling PC. In order to enable real-time programming, or stand-alone usage, the application software can also run directly on the motion control node, called sequence programming. This is very similar to the application programming on the PC and is also done in the C-programming language.



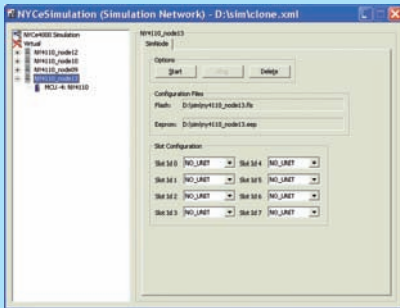
# Fast and easy implementation with excellent software tools

The NYCe 4000 system is supported by an extensive toolset that simplifies configuring, tuning

or testing the NYCe 4000 system in a machine environment. All tools use the same interface

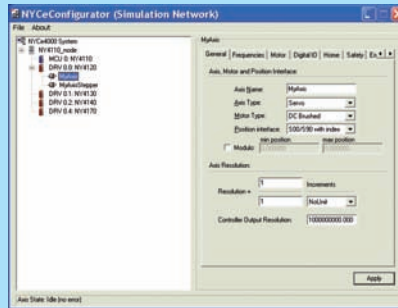
to the NYCe 4000 programming system as the application environment. All tools run on the PC.

## Simulation software



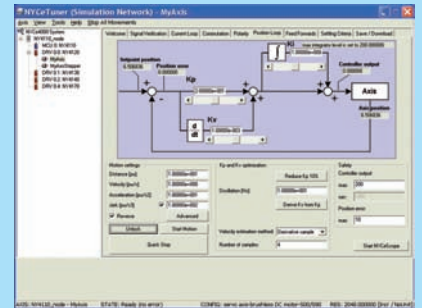
The simulation software enables the user to test the application and exceptional situations, without use of the actual machine.

## NYCeConfigurator



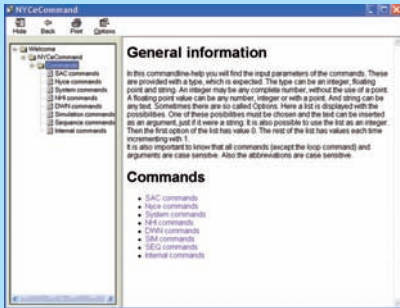
The NYCeConfigurator guides the user smoothly through the configuration process. Many aspects can be configured, allowing maximum flexibility of the NYCe 4000 motion control system.

## NYCeTuner



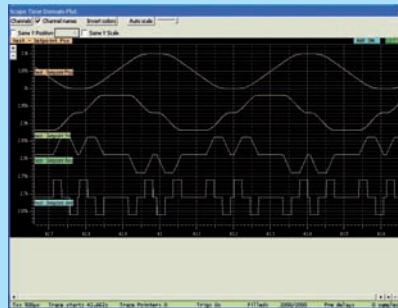
NYCeTuner facilitates the set up and tuning of axes. Movement profiles can be generated for very accurate tuning. This can be done in time- and frequency domain.

## NYCeCommand



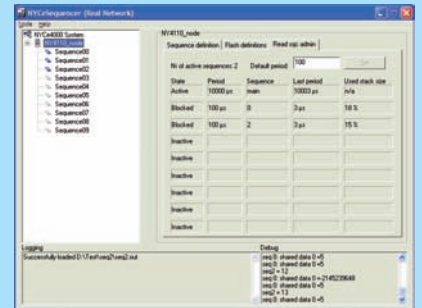
With NYCeCommand motion and I/O commands can be executed using simple parameters, without the use of a C-programming environment.

## NYCeScope



Resembling a real oscilloscope, NYCeScope captures a wide range of variables and displays them time synchronously.

## Sequence programming



In case a fast deterministic response is required, applications can be run on the motion control unit.

## Simulation software

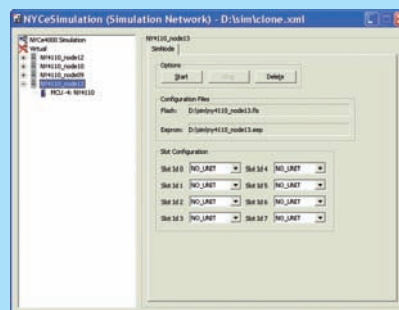
Application software needs to be tested extensively before it can be implemented in a machine. Even more importantly the response to a wide range of exceptional situations needs to be tested and verified. Testing consumes significant development time. This is mainly influenced by two factors:

- availability of a fully functional test machine
- complexity of generating exceptional situations on the machine.

Using the NYCe 4000 simulation environment, testing time can be significantly reduced.

Application testing on a machine can be reduced, so machine availability is no longer an issue.

Secondly, the simulation environment has a programming interface that allows the user to feed inputs, axes related data, and error situations into the simulation system. This allows for testing of all application responses to exceptional situations without abusing or damaging a physical machine.



## NYCeConfigurator

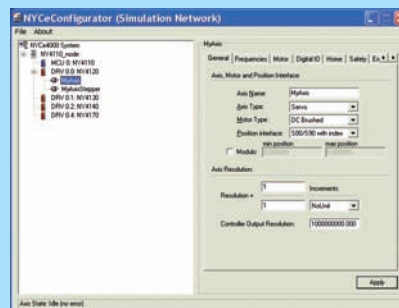
The NYCe 4000 system is a very flexible motion control system, and as a consequence the user can configure many aspects of the system.

Some examples of configuration include:

- on node level: axis names, emergency and safety inputs
- on drive level: digital input/outputs, error inputs
- on axis level: motor type, encoder type, response to error conditions, safety parameters

The NYCe Configurator guides the user through this configuration process.

The result of this process is a configuration that can be stored in the flash memory on the NYCe 4000 system, or on the hard disk of the PC. This allows the user to build one configuration and reuse it on other systems when needed.



### NYCeTuner

The NYCeTuner is used to setup and tune axes in the NYCe 4000 system. Various parameters that influence the behavior of an axis can be set. These include:

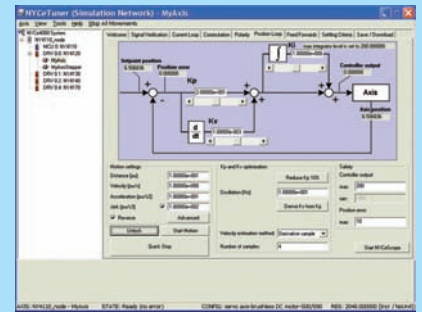
- current control parameters
- PID (proportional, integral and derivative) and feed forward parameters
- control filters
- enhanced parameters
- stepper control parameters and many more

Furthermore the NYCeTuner can generate movement profiles to test the latest parameter sets. This enables the user to tune axes exactly the way these were intended to behave. Tuning can be done in time – as well as in frequency domain.

NYCeTuner supports two levels of tuning, the wizard and the expert level:

- The wizard level guides the user step-by-step in setting the right parameters in the right order. User advice is offered for support.
- In expert level it is assumed that the user is familiar with the system, so direct access is available to all parameters in one screen to enable a quick overview and fast parameter access.

When the tuning process has ended, the new parameters can be stored in the controllers flash memory or on the hard disk of the PC.



### NYCeCommand

The NYCeCommand is a dialog tool that enables the user to execute motion and I/O commands, without the use of a C-programming environment. The commands have the same names and input parameters as in "C" and all C-commands are supported.

The user is able to enter a single command in the command line, which is immediately executed when entered. It is also possible to create script files holding many commands which enable the user to build small test or demo applications. Furthermore, NYCeCommand has an extensive online-help function describing all commands and the command parameters.



## NYCeScope

The NYCeScope allows you to trace any variable of a node, axis or drive which is extremely useful for:

- current loop tuning
- position loop tuning
- performance monitoring
- I/O monitoring
- error monitoring

The NYCeScope software tool has been designed to resemble a real oscilloscope. Using the dialog screen, variables can be selected and presented on the screen, and triggers can be set. There are several ways to display the results; time domain pictures can be displayed showing all selected channels, a FFT (Fast Fourier Transform) frequency plot or Bode/Nyquist can be selected.

All captured and displayed signals are timed synchronously, even if they originate from different control systems within the same configuration. The NYCeScope also allows the user to capture a wide range of signals from the system such as motion related data as well as all variables in the system like I/O and axis state diagrams or drive temperature.

When further analysis of the captured data is required, this data can be stored in a file on the PC where it can be further processed by other software packages.

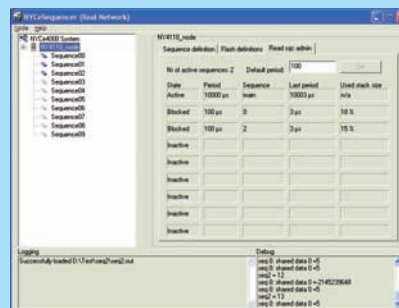


## Sequence programming

When a fast deterministic response is required, NYCe 4000 offers the possibility to run (part of) the application on the motion control unit instead of on the PC. These applications are also programmed in the C-language and supports I/O, SAC and PLT commands. The user can download many sequences to the motion control units flash memory. The motion controller is able to support 8 active sequences at any moment.

Sequences can synchronize with sequences on other nodes and with applications running on the PC.

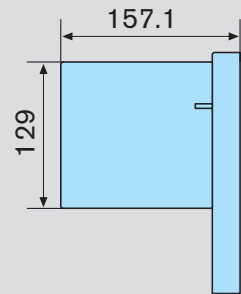
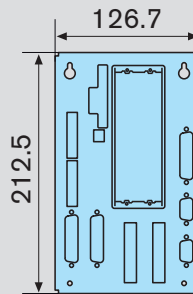
Next to the usage of sequences for fast real-time response, this functionality is also used to build stand-alone systems with application software without a PC. In this situation all application software is stored in flash in the motion control unit and starts automatically at power-up.



## NYCe 4000 housing units

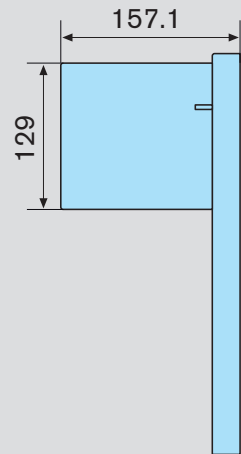
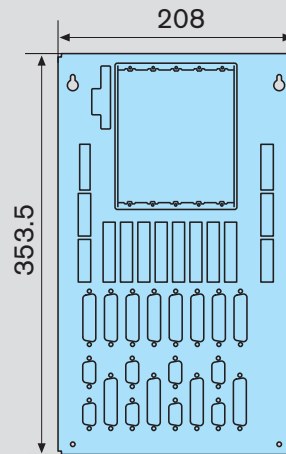
### NY4012

- motion control system for 2 axes
- vertical mounting



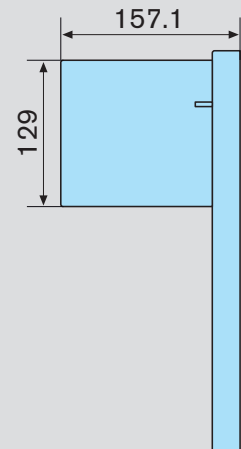
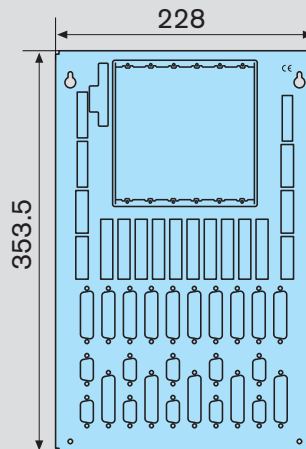
### NY4042

- motion control system for 8 axes
- vertical mounting



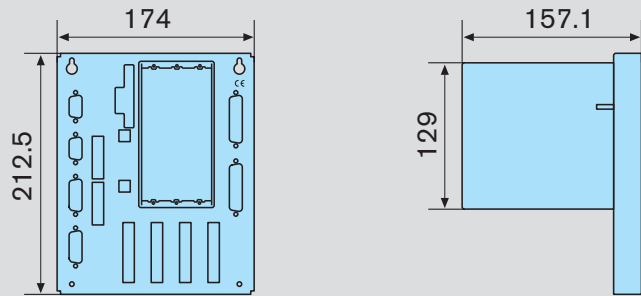
### NY4052

- motion control system for 10 axes
- vertical mounting



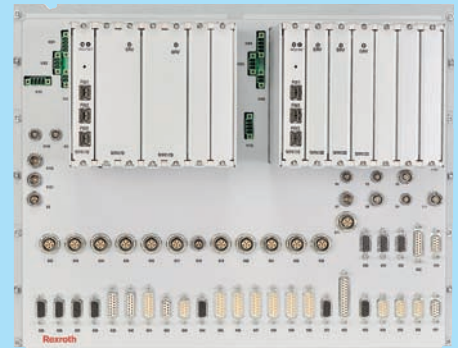
## NY4072

- motion control system for LMS applications
- vertical mounting

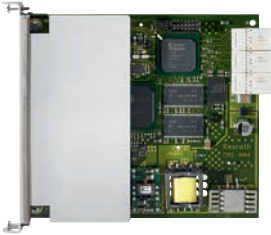



## Customized housing

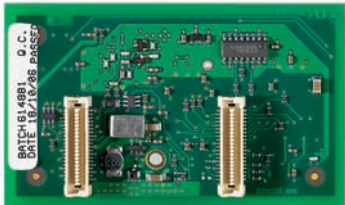
Specific housing can be developed, optimized to your specific dimension or connectivity

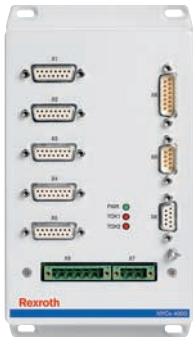


# NYCe 4000 control units – plug-in modules

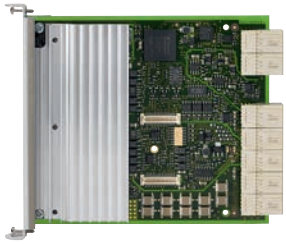
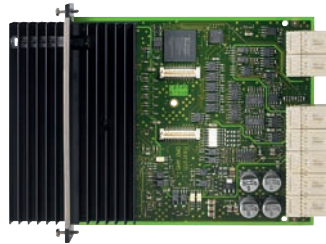
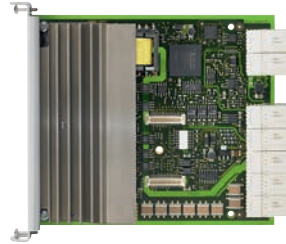
Technical data	NY4110 – Motion control unit	NY4111 – Motion control unit with CAT5
		
Board type	MCU (Motion Control Unit)	MCU (Motion Control Unit)
Position in housing	always in first slot	always in first slot
Interface	3 * IEEE1394B (3 * STP)	3 * IEEE1394B (1 * STP, 2 * CAT5)
Input voltage	24 V	24 V
Power supply	isolated for on board- and drive logic	isolated for on board- and drive logic
Sample frequency	1, 2, 4 or 8 kHz	1, 2, 4 or 8 kHz
Axes control	up to 10 axes	up to 10 axes
I/O	2, safety and emergency signals	2, safety and emergency signals
Software control	implements standard motion control functionality	implements standard motion control functionality
	stores and runs the application	stores and runs the application

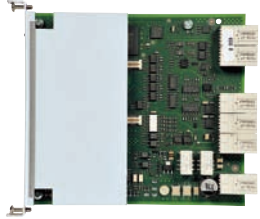
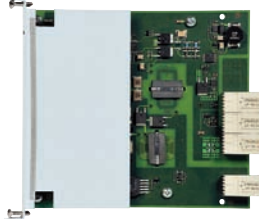
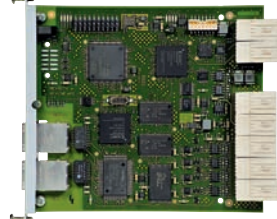
# NYCe 4000 control units – add-on modules

Technical data	NY4199 – SinCos option module
	
Board type	plug-on option module
Board function	dual SinCos input and interpolation module for support of 2 axes
Position	to be mounted on NY4120, NY4130, NY4140 or NY4170 drive modules
Number of channels	2
Input frequency	max. 400 kHz
Interpolation factor	selectable between 4 and 4096 for a full signal period
Input voltage	1 V <sub>tt</sub> , absolute value in 0 to 5 V range

Technical data	NY4960 – LMS-MUX
	
Product description	interface between the position sensors in a Linear Motion System (LMS) track and the NYCe 4000 LMS control system
Number of sensor inputs	5 SinCos sensors
Input voltage	1 V <sub>tt</sub> or 10 V <sub>tt</sub>
Number of outputs	2 multiplexed analogue outputs to the NY4120/10 or NY4140/10 drive modules
Number of PTC inputs	2 PTC temperature sensors
Number of PTC status outputs	2 digital 24 V
Input voltage	24 VDC
Output voltage	+ 5 V, + 5 V / - 5 V or + 15 V / - 15 V for powering the sensors units

# NYCe 4000 drive units – plug-in modules

Technical data	NY4120 – PWM drive	NY4130 – DC drive	NY4140 – High voltage drive
			
Board type	PWM (Pulse Width Modulation) drive module	low power DC drive module	PWM high voltage drive module
Number of axes	2	2	1
Motor type	brushless DC/AC servo motors	–	brushless DC/AC servo motors
	brushed DC motors	brushed DC motors	brushed DC motors
	two-phase stepper motor	–	–
Input voltage	15 to 75 V	min. + 15 V / – 15 V, max. + 30 V / – 30 V	48 to 150 V
PWM frequency	16 to 96 kHz	–	16 to 32 kHz
Output voltage	15 to 75 V	0 to 48 V	48 to 150 V
Nominal current	7 A	1 A for + 30 V / – 30 V, 2 A for + 15 V / – 15 V per drive	7 A
I peak	20 A per axis, per drive	4 A max.	20 A
Current control loop	standard	–	standard
Temperature protection	standard	standard	standard
Over current detection	standard	–	standard
S0/S90 encoder cable break detection	standard	standard	standard
I/O	6 x RS422 encoder inputs for each axis (2 x S0, S90 and Index)	6 x RS422 encoder inputs for each axis (2 x S0, S90 and Index)	3 x RS422 encoder inputs for each axis (S0, S90 and Index)
	2 analog inputs (12 bit)	2 analog inputs (16 bit)	1 analog input (12 bit)
	2 analog outputs (16 bit)	2 analog outputs (16 bit)	2 analog outputs (16 bit)
	8 digital inputs	10 digital inputs	8 digital inputs
	4 digital outputs	4 digital outputs	2 digital outputs
	–	2 stop-alarm inputs	–
	2 fast digital inputs	2 fast digital inputs	2 fast digital inputs
	2 fast digital outputs	2 fast digital outputs	2 fast digital outputs
6 x 5 V digital inputs, to be used as Hall input, S0/S90 counter input or general purpose digital input	6 x 5 V digital inputs, to be used as counter input or general purpose digital input	3 x 5 V digital inputs, to be used as Hall input, S0/S90 counter input or general purpose digital input	
Standard encoder interfaces (on board)	digital S0/S90 with index pulse	digital S0/S90 with index pulse	digital S0/S90 with index pulse
	absolute or incremental (Rexroth MSM motors)	absolute or incremental (Rexroth MSM motors)	absolute or incremental (Rexroth MSM motors)
	EnDat 2.2	EnDat 2.2	EnDat 2.2
Optional encoder interfaces (using the SinCos option module NY4199)	EnDat 2.1	EnDat 2.1	EnDat 2.1
	Hiperface	Hiperface	Hiperface
	SinCos	SinCos	SinCos

Technical data	NY4170 – High voltage piezo drive	NY4171 – High voltage piezo supply	NY4150 – SERCOS III drive link
			
Board type	high voltage piezo drive	high voltage piezo supply	SERCOS III drive link
Number of axes	2 (1 piezo stack, 1 external drive)	–	Support for up to 8 Rexroth IndraDrive C or IndraDrive Cs units. Please note that for the IndraDrive C a control unit that supports SERCOS III is necessary. Motor and encoder support is determined by selecting the applicable control unit in the IndraDrive.
Motor type	high voltage stack piezo actuators	–	
Input voltage	- 15 V and + 150 V	24 V ± 5 %	
PWM frequency	–	–	
Output voltage	- 15 V to + 150 V	- 15 V and + 150 V	
Nominal current	100 mA	200 mA	
I peak	200 mA		
Current control loop	–		
Temperature protection	standard		
Over current detection	standard		
S0/S90 encoder cable break detection	standard		
I/O	6 x RS422 encoder inputs for each axis (2 x S0, S90 and Index)		
	2 analog inputs (16 bit)		
	2 analog outputs (16 bit)		
	10 digital inputs		
	4 digital outputs		
	2 stop-alarm inputs		
	2 fast digital inputs		
	2 fast digital outputs		
	6 x 5 V digital inputs, to be used as counter input or general purpose digital input		
Standard encoder interfaces (on board)	digital S0/S90 with index pulse		
	absolute or incremental (Rexroth MSM motors)		
	EnDat 2.2		
Optional encoder interfaces (using the SinCos option module NY4199)	EnDat 2.1		
	Hiperface		
	SinCos		

# NYCe 4000 – auxiliary components for a perfect match

## NY4901

### Network cable strain relief

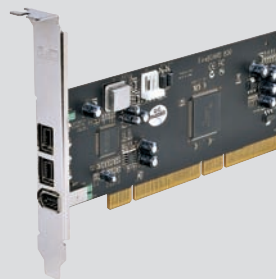
Designed to remove any strain on the network cables. It can be mounted on the motion controller card NY4110.



## NY4915

### FireWire-B PCI interface module

Plug-in card for the PC to create a FireWire connection.



## NY4950

### FireWire B cable

Available in various lengths and with several connectors.



## NY4950/99

### Chokes

To minimize electromagnetic interference use of chokes is recommended.



## NY4920 and NY4920/10

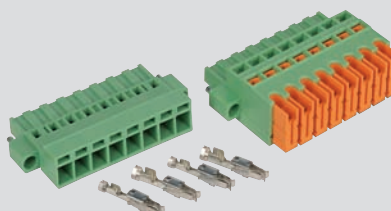
### 4920 motor connectors for 1 drive position

2 x plug component with 8 positions.

### 4920/10 connectors for system connection

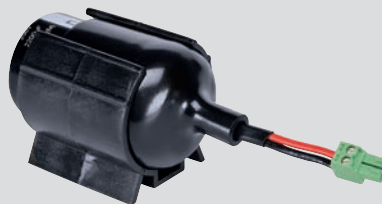
1 x 24 V power plug connector with 3 positions.

1 x safety plug connector with 4 positions.



**NY4921****Capacitor kit**

For optimal functionality at high currents.

**NY4922****Fan unit**

For active cooling, Rexroth offers fan units. Various versions are available, depending on the number of drives.

**NY4930****Brake unit**

A cost effective solution to safely process superfluous energy. It can flexibly be mounted anywhere in the machine and is available in the ranges 15 V - 24 V - 36 V , 48 V - 60 V - 72 V and 96 V - 120 V - 150 V.

**NY4900****Cover plate for non-used slots**

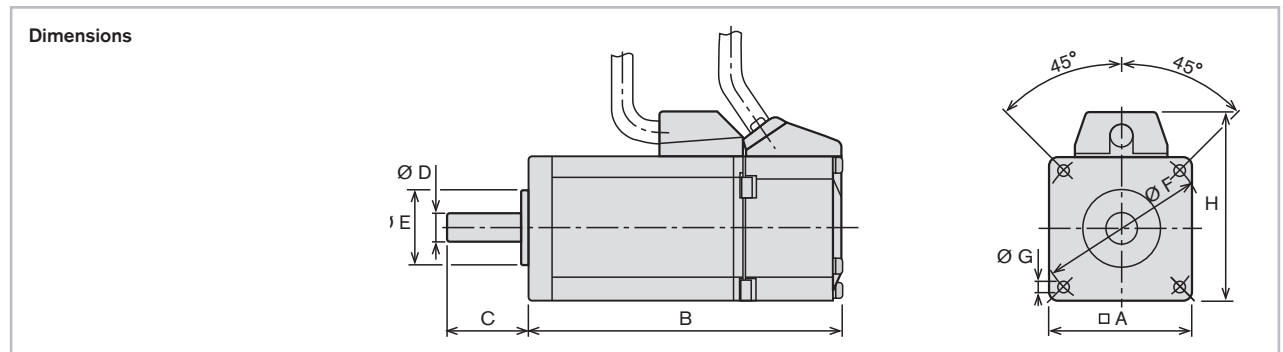
If slots in your NYCe 4000 remain unused, they can be closed with this cover plate.



## NYCe 4000 – motors

The NYCe 4000 supports a wide range of motors. The following Rexroth MSM motors have been optimized for the NYCe 4000 specifically. Some motors are available in a reduced voltage version. This enables the usage of these motors with NYCe 4000 still reaching high speeds.

A whole range of other Rexroth motors are also compatible with the NYCe 4000, e.g. IndraDyn L and IndraDyn S (MSK) motors. For details, see the product catalog "Drive system Rexroth IndraDrive".



MSM motors for NYCe 4000	Continuous Power	Continuous torque at standstill	Maximum speed 48 V DC drive power	Maximum speed 72 V DC drive power	Dimensions							Protection category	
	$P_N$ [W]	$M_o$ [Nm]	rpm	rpm	A [mm]	B without/ with brake [mm]	C [mm]	Ø D [mm]	Ø E [mm]	Ø F [mm]	Ø G [mm]		H [mm]
MSM019A-0300-NN-M0-CH1	50	0.16	2,900	4,500	38	72/102	25	8	30	45	3.4	51	IP54 (shaft IP40)
MSM019B-R300-NN-M0-CH1	100	0.32	2,200	3,500	38	92/122	25	8	30	45	3.4	51	
MSM031B-R300-NN-M0-CH1	200	0.64	1,700	2,500	60	79/115,5	30	11	50	70	4.5	73	
MSM031C-R300-NN-M0-CH1	400	1.3	1,500	2,200	60	98.5/135	30	14	50	70	4.5	73	
MSM041B-0300-NN-M0-CH1	750	2.4	700	1,000	80	112/149	35	19	70	90	6	93	

# Product overview and order codes

Type name	Description	Ordering code
Standard housing units		
NY4010	NYCe 4000 system for 1 drive module including system and I/O backplane	NYS04.1-ST-01-NNNN
NY4011	NYCe 4000 machine mount system for 2 axes	NYS04.1-ST-01-MAMO
NY4040	NYCe 4000 system for 4 drive modules including system and I/O backplane	NYS04.1-ST-04-NNNN
NY4050	NYCe 4000 system for 5 drive modules including system and I/O backplane	NYS04.1-ST-05-NNNN
NY4012	NYCe 4000 system for 1 drive module including system and I/O backplane	NYS04.1-ST-01-ULNN
NY4042	NYCe 4000 system for 4 drive modules including system and I/O backplane	NYS04.1-ST-04-ULNN
NY4052	NYCe 4000 system for 5 drive modules including system and I/O backplane	NYS04.1-ST-05-ULNN
NY4072	NYCe 4000 LMS system for 2 drive modules	NYS04.1-ST-02-LMSN
Plug-in modules		
NY4110	MCU module	NYM04.1-MCU-NNNN
NY4111	MCU module with FW-CAT5	NYM04.1-MCU-FCAT
NY4120	2 axes servo and stepper PWM drive module	NYM04.1-2PW-NNNN
NY4120/10	2 axes servo and stepper PWM for LMS	NYM04.1-2PW-LMS
NY4130	2 axes low power DC drive module	NYM04.1-2LD-NNNN
NY4140	1 axis high voltage servo drive module	NYM04.1-1HV-NNNN
NY4140/10	1 axis high voltage servo drive module for LMS	NYM04.1-1HV-LMS
NY4150	SERCOS III Master module	NYM04.1-SE3-MAST
NY4170	1 axis high voltage Piezo drive	NYM04.1-1LD-PIST
NY4171	High voltage Piezo supply	NYM04.1-PSU-PIST
NY4171/10	High voltage Piezo supply with 5/15 Volt option	NYM04.1-PSU-PIAM
Add-on modules		
NY4199	SinCos option module	NYM04.1-ESC-NNNN
NY4960/00	LMS-MUX for 2 axes, 1 V sensors, + 5 V powersupply	NYA04.1-LMS-MUX2-1Vtt-5V
NY4960/10	LMS-MUX for 2 axes, 10 V sensors, + / - 5 V powersupply	NYA04.1-LMS-MUX2-10Vtt-5V
NY4960/20	LMS-MUX for 2 axes, 10 V sensors, +/- 15 V powersupply	NYA04.1-LMS-MUX2-10Vtt-15V
NY4930/00	Brake unit 15-24-36 Volt	NYA04.1-BRK-36V
NY4930/10	Brake unit 48-60-72 Volt	NYA04.1-BRK-72V
NY4930/20	Brake unit 96-120-150 Volt	NYA04.1-BRK-150V
Accessories		
NY4900	Cover plate for non-used slots	NYA04.1-COVRPL-NO-USED
NY4901	5 pcs Network cable strain relief for NY4110	NYA04.1-STRAIN-RELIEF-5PCS-4110
NY4915	FireWire-B PCI interface module	NYA04.1-1394B-INT-MOD
NY4916	1394b 3 port (POF, FW, CAT5)	NYA04.1-1394B-INT-CAT-POF
NY4950	FireWire B cable 0.5 meters	NYA04.1-1394B-CABLE-B-B-00.5M
NY4950/10	FireWire B cable 1.0 meters	NYA04.1-1394B-CABLE-B-B-01.0M
NY4950/20	FireWire B cable 2.0 meters	NYA04.1-1394B-CABLE-B-B-02.0M
NY4950/30	FireWire B cable 4.5 meters	NYA04.1-1394B-CABLE-B-B-04.5M
NY4950/99	Set of 10 chokes for 1394b cables	NYA04.1-CHOKES-10PCS-1394B
NY4920	Connector set for 1 drive position	NYA04.1-CAP-CONSET-1DRIVE
NY4920/10	Connector set for 1 system power	NYA04.1-CAP-CONSET-SYSPW
NY4921/00	Capacitor kit 100 V	NYA04.1-CAP-100V
NY4921/10	Capacitor kit 200 V	NYA04.1-CAP-200V
NY4922/00	Fan unit for 1 drive	NYA04.1-FAN-1UNIT
NY4922/10	Fan unit for 2 drives	NYA04.1-FAN-2UNIT
NY4922/20	Fan unit for 3 drives	NYA04.1-FAN-3UNIT
NY4922/30	Fan unit for 4 drives	NYA04.1-FAN-4UNIT
NY4922/40	Fan unit for 5 drives	NYA04.1-FAN-5UNIT
Software		
NYCe 4000 SR-BTS	NYCe 4000 standard software release V2.0	SWA-NY4000-STA-02V00-EN-CD650
NYCe 4000 SR-BTS	NYCe 4000 standard software release V2.1	SWA-NY4000-STA-02V01-EN-CD650
NYCe 4000 SR-BTS	NYCe 4000 standard software release V2.2	SWA-NY4000-STA-02V02-EN-CD650
NYCe 4000 SR-LMS	NYCe 4000 standard software LMS release V1.1	SWA-NY4000-LMS-01V01-EN-CD650
NYCe 4000 SR-BTS	NYCe 4000 standard software LMS release V2.0	SWA-NY4000-LMS-02V00-EN-CD650
NYCe 4000 CCS	Code composer studio 3.1	SWA-NY4000-CCS-03V01-EN-CD650
NYCe 4000 CCS	Code composer studio 3.3	SWA-NY4000-CCS-03V03-EN-CD650
Demo System		
NY4705	NYCe 4000 demo system with 3 motors and power supplies	NYS04.1-ST-04-DEMO

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