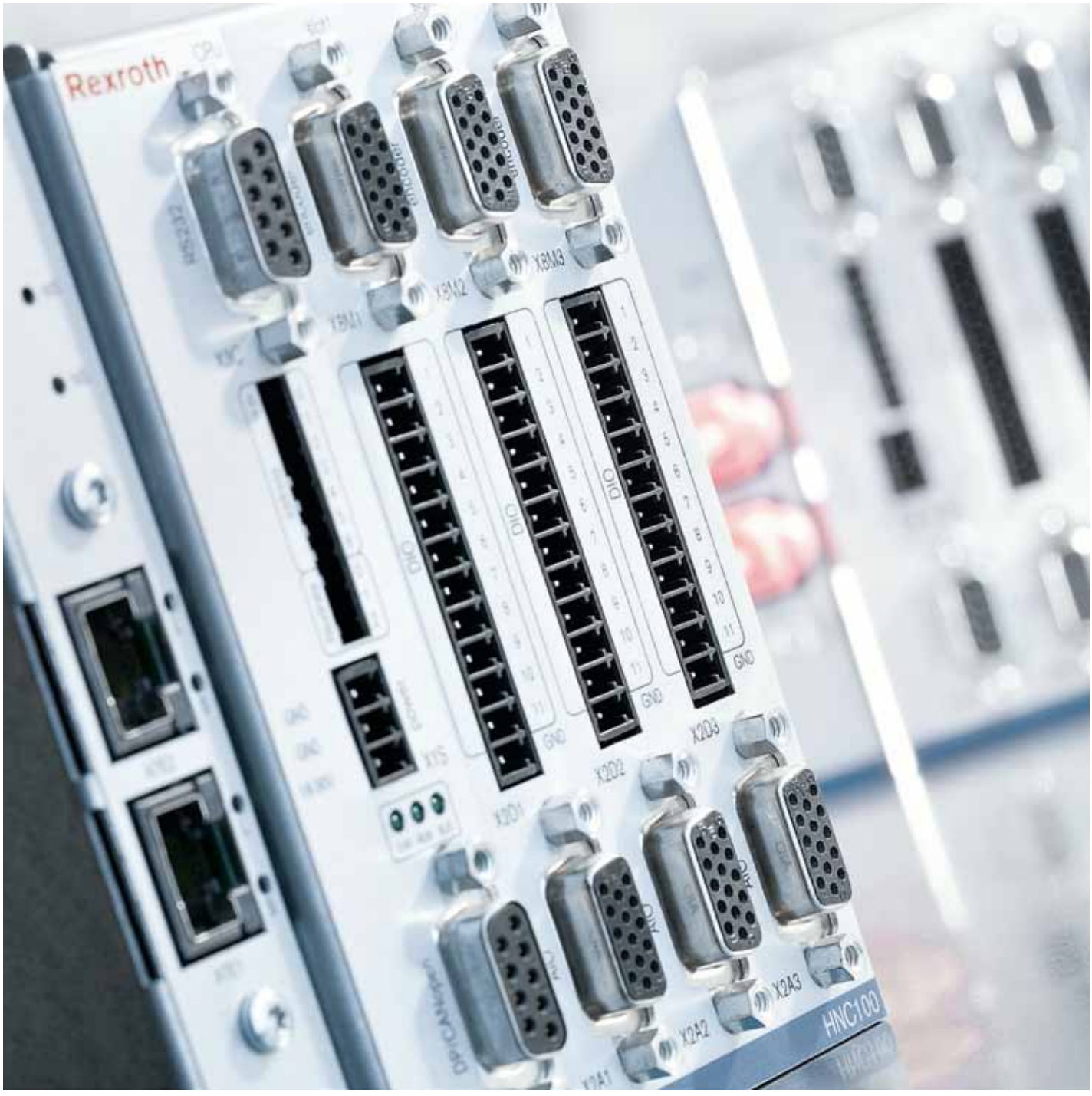
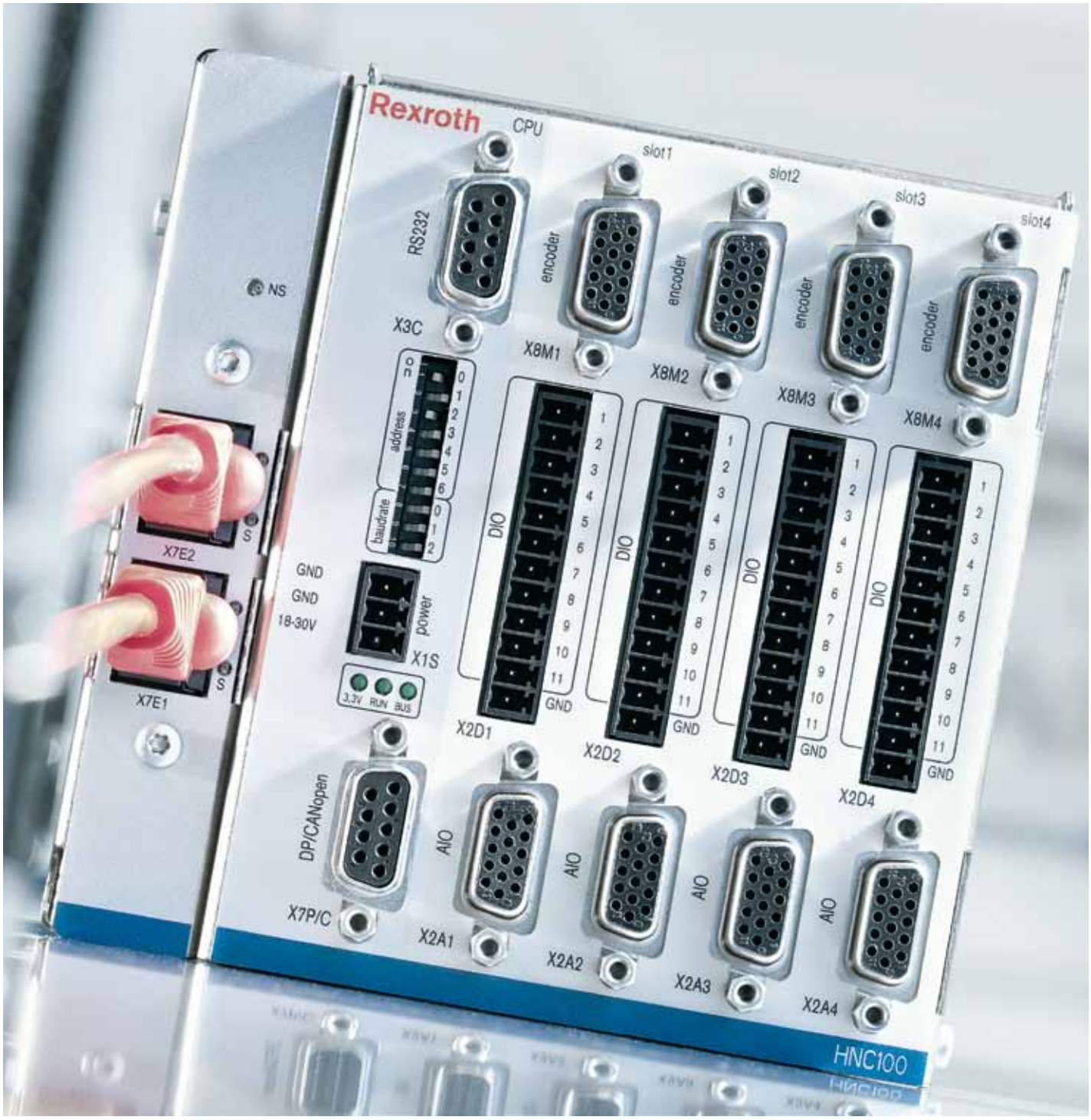
The Drive & Control Company

Rexroth
Bosch Group

HNC100-3X
Programmable motion control for electrohydraulic drives



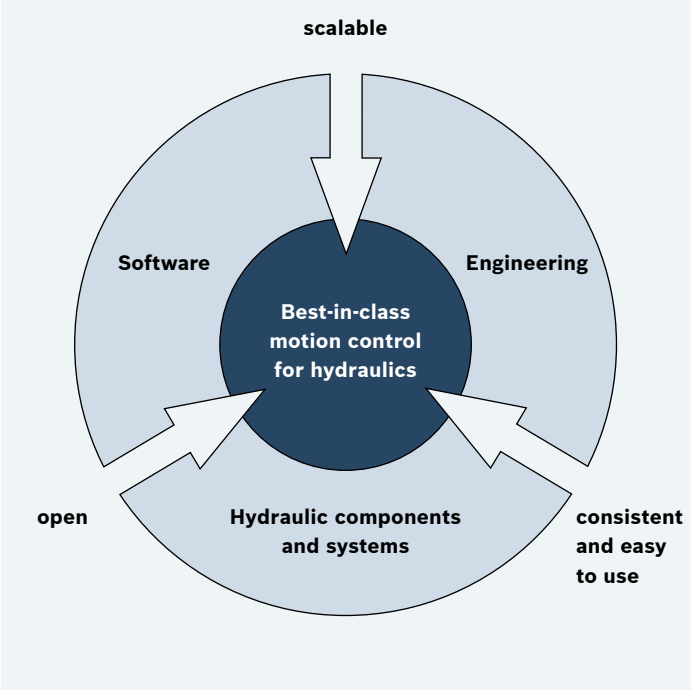

Rexroth
CPU
slot1
slot2
slot3
slot4
RS232
encoder
X3C
X8M1
X8M2
X8M3
X8M4
NS
X7E2
X7E1
address
baudrate
GND
GND
18-30V
power
X1S
3,3V RUN BUS
DIO
X2D1
X2D2
X2D3
X2D4
DP/CANopen
X7P/C
AIO
X2A1
X2A2
X2A3
X2A4
HNC100

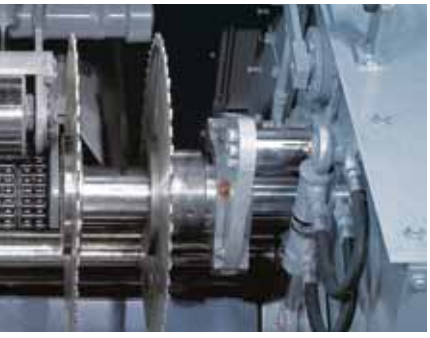
Technology optimized to hydraulics – experience from thousands of applications

Hydraulics features a unique power density and robustness for numerous applications. With a wide range of Motion Control systems Rexroth opens up modern automation to hydraulic drives. What counts here is the experience gained in many thousands of applications, for this know-how significantly simplifies engineering and brings about fast, flexible and reliable solutions.

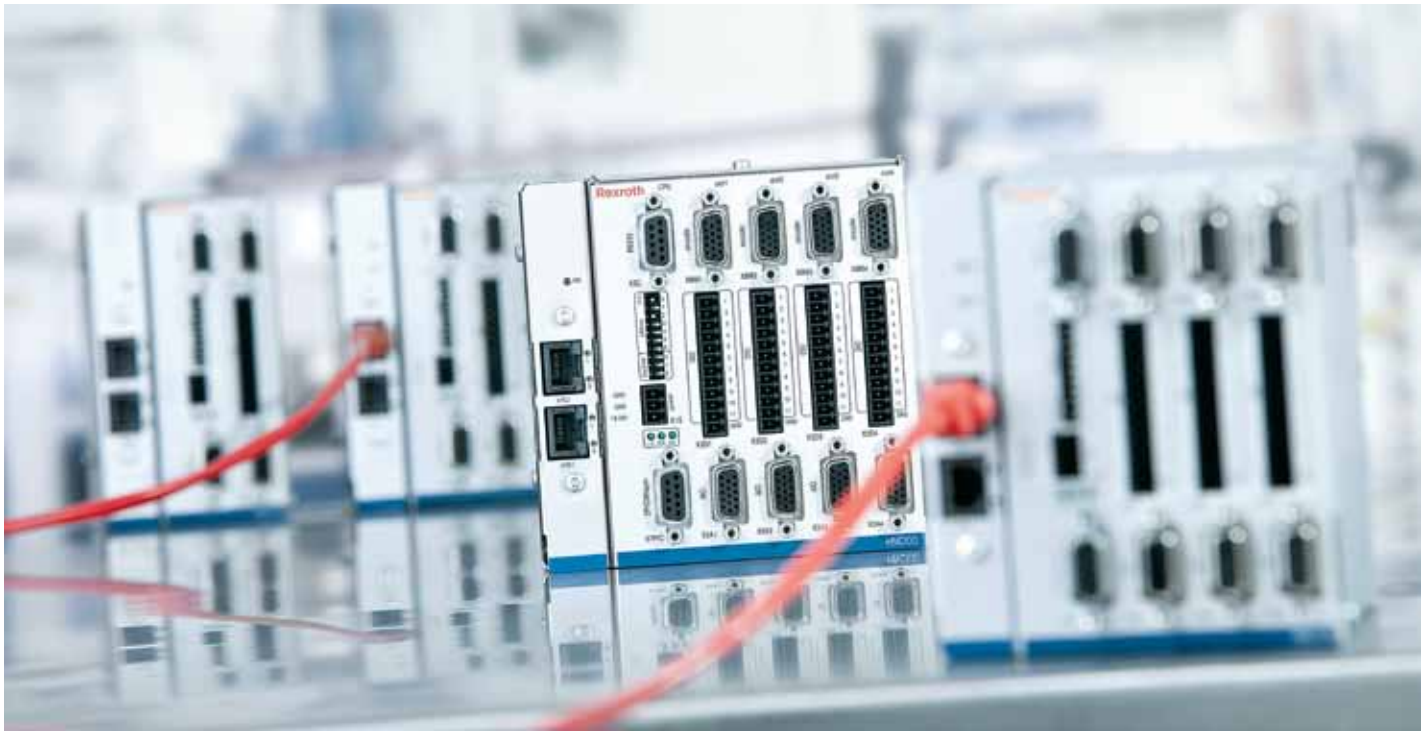
Consistent ease of application
The easy handling of Motion Control, the operator units and the drive decisively accelerates commissioning.

Rexroth opens up the entire productivity potential of electric, hydraulic and hybrid drives for both, decentralized and central architectures. With industry- and application-specific function libraries you will achieve optimum production results more easily and faster. Associated motion control software covers the special aspects of hydraulics and separates drive physics from automation equipment. As a result, all drives behave identical for both, the control and the operator.





◀ **Rexroth offers optimal control performance for nearly all industrial sectors in steelworks, forming and rolling mill technology, material handling and testing technology as well as in plastics processing, woodworking and paper-making or special machines.**



Engineering

HMI

Motion Control – integrated

Logic Control (PLC)

DFEC
pumps with pressure and flow control (p/Q)

IAC-P
valves with pressure and flow control (p/Q)

Motion Logic Control

I/O units (4 axes)

The perfect solution for your application: Motion controls for electrohydraulic drives

Scalable in hardware and software
From single-axis controls integrated in the drive and multi-axis controls installed in the control cabinet through to the complete machine control with integrated PLC, Rexroth always perfectly meets the requirements of any type of hydraulic application. The proven bundled I/O strategy covers a wide variety of interfaces to offer you the optimum solution for your specific application.

This fine scalability of hardware and software from Rexroth standardizes automation across all drive technologies.

Flexible parameterization, simple commissioning and transparent diagnostics of all drives via the control shortens commissioning times and cuts total cost of ownership for the user.

IAC-R
valves with p/Q and axis control

– standard

HACD-2X
standard axis control for control cabinet installation, 3 control loops

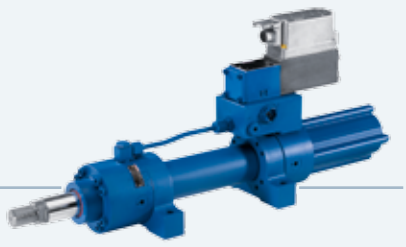
– programmable

HNC100-3X
scalable, programmable NC axis control for 1 – 4 axes

– advanced

MAC-8
Modular motion control for 2 – 32 axes

Hydraulic axes



Open to any solution
Also with regard to control solutions for hydraulic drives Rexroth consequently counts on open interfaces and programming standards. Motion controls support all common field buses and Ethernet protocols and fit seamlessly into a wide variety of automation environments.

HNC100-3X:
Open to your ideas

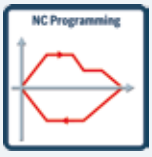
The HNC100-3X is Rexroth's "all-rounder" in hydraulic drive control. Due to its distinct variety of interfaces and free programmability it meets any requirement and can be easily and flexibly integrated into every control architecture.

▶ **Openness ...**

... in communication:
Supports all common field bus and Ethernet protocols

EtherNet/IP · TCP/IP · PROFINET · PROFIBUS

... in programming:
Flexible configuration of motion sequences thanks to free programmability

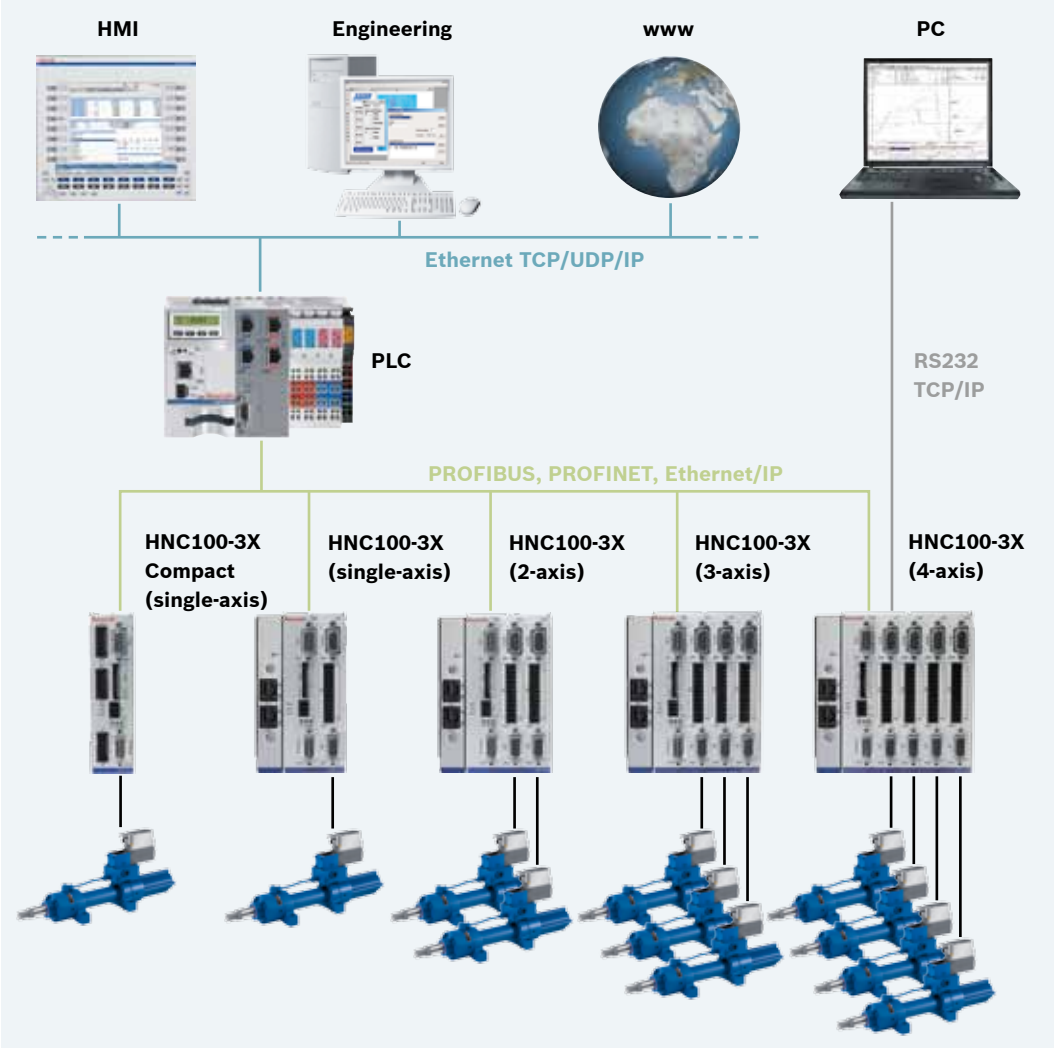


... in control technology:
Open access to controller parameters

By supporting field bus and Ethernet technology, the HNC100-3X can be easily integrated into existing control architecture and, in addition, features excellent servicing and diagnostics options.

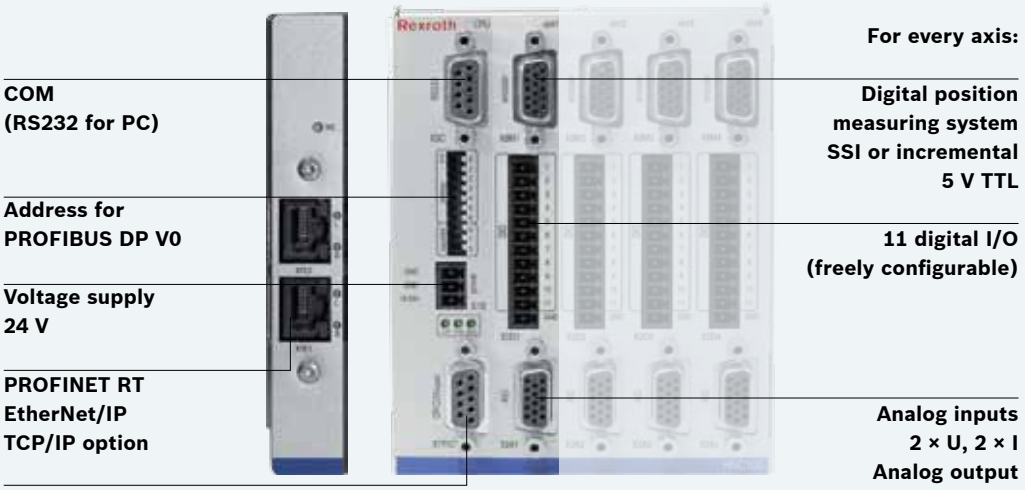
In addition, free programming as well as the open access to all control parameters allows any kind of motion sequences to be realized, thus ensuring maximum flexibility, efficiency and know-how protection for your application.

- **Control and instrumentation system, HMI, engineering: Ethernet-based communication between controls, HMI and higher-level systems**
- **Controls: Higher-level machine control for logic control**
- **Drive controllers: Decentralized hydraulic drive controllers for motion control**
- **1 to 4 hydraulic axes**



HNC100-3X:
Scalable, decentralized, robust

With its HNC100-3X product family Rexroth consequently pursues and improves its proven bundled-I/O strategy to provide you with the optimum variety of interfaces for your specific application. This offers you even greater flexibility in the selection of a suitable control concept for your application. From the compact version for single-axis applications to the modular construction kit for up to 4 electrohydraulic axes, Rexroth has available a consistently scalable portfolio for different requirements.



The HNC100-3X conforms to CE according to EMC Directive 2004/109/EC and the German Electromagnetic Compatibility Act. In conjunction with its resistance to vibration and shock and its thermal resistance in accordance with EN 60068-2/IEC 68-2/DIN 40046 it is ideal for use in harsh industrial environments.

The HNC100-3X for up to 4 axes offers bundled I/O that are tailored to the application at hand with the required number of analog and digital interfaces as well as SSI and incremental sensor information.

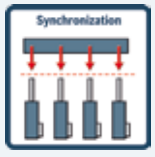
	Compact	1-Achs	2-Achs	3-Achs	4-Achs
Height **Depth** **Width – basis** **Width – Ethernet**	120 mm 108 mm 34 mm -	120 mm 124 mm 48 mm 71 mm	120 mm 124 mm 65 mm 88 mm	120 mm 124 mm 82 mm 105 mm	120 mm 124 mm 99 mm 122 mm
Input	4 digital 3 analog (1 x U, 2 x I) 1 SSI	4 analog (2 x U, 2 x I) 1 SSI or incremental encoder	8 analog (4 x U, 4 x I) 1 SSI or incremental encoder	12 analog (6 x U, 6 x I) 1 SSI or incremental encoder	16 analog (8 x U, 8 x I) 1 SSI or incremental encoder
Output	2 digital 2 analog (2 x U)	2 analog (1 x U, 2 x U)	4 analog (2 x U, 2 x U)	5 analog (3 x U, 2 x U)	6 analog (4 x U, 2 x U)
Configuration I/O	8 digital	11 digital	22 digital*	33 digital*	44 digital*
Bus communication	PROFIBUS DP/V0	PROFIBUS DP/V0 PROFINET EtherNet/IP	PROFIBUS DP/V0 PROFINET EtherNet/IP	PROFIBUS DP/V0 PROFINET EtherNet/IP	PROFIBUS DP/V0 PROFINET EtherNet/IP
Parameterization and diagnosis	RS232, bus communication	RS232, Ethernet, bus communication	RS232, Ethernet, bus communication	RS232, Ethernet, bus communication	RS232, Ethernet, bus communication

*max. 20 digital outputs

Perfect Implementation: All functions on board – activate them as required!

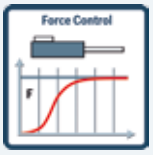
Controller functions

Best-in-class control
Optimized for hydraulic axes

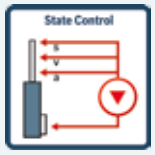


Synchronization control
Optimized for the synchronization of hydraulic axes

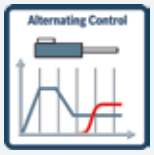
Position-dependent braking
Open-loop controlled positioning with deceleration to target



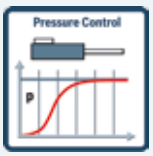
Force control
PIDT1-controller, differential pressure evaluation



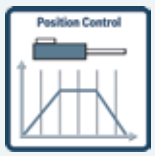
State control, negative damping
Position, acceleration, pressure



Alternating control
Positioning with automatic transition to closed-loop force control and back



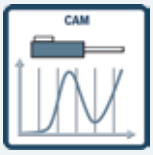
Pressure control
PIDT1-controller, pressure limitation



Position control
Characteristic curve adjustment, linear gain curve correction, fine positioning

A reliable tool for programmers: This platform has proven in demanding hydraulic applications for more than 15 years and is continuingly improved. Featuring variably adjustable scan times of up to 0.5 ms per axis, the HNC100-3X offers significantly improved controller performance. With a comprehensive selection of on-board control, technology and monitoring functions as well as NC commands the HNC100-3X provides you with all modules required for your application to ensure efficient engineering. And it is optimized to suit the specific characteristics of hydraulics.

Technology functions



Curve functionality
allows the generation of curves as polygon, e.g. ‘force vs. travel’ or ‘travel vs. travel’

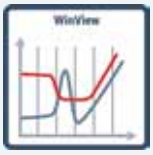
Switching mechanism (cams)
for process data

Industry-specific solution
for secondary-controlled drives, punching axes

Free programmability

NC programming
Application-specific adjustment of motion sequences

Monitoring



Diagnosis – WinView
Multi-channel plot and data logger, numerical display, signal monitoring

Monitoring
Cable break, following error, traversing range limits

WIN-PED software tool: Faster results

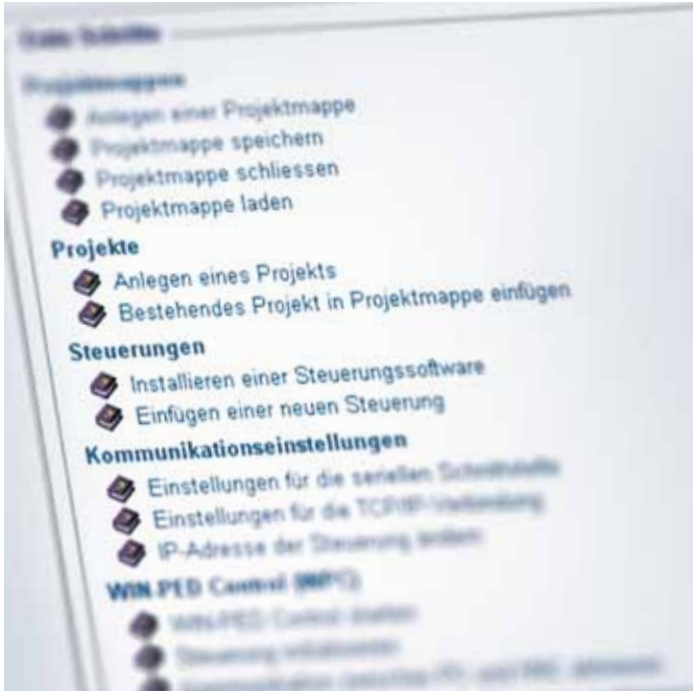
Rexroth is the specialist in the field of hydraulics – from open and closed-loop control technology through to drive technology. We make our know-how available to you fast and quickly. WIN-PED 7 is the solution.

▼ **Project start – engineering step by step, easily and intuitively. WIN-PED supports you with a comprehensive online help.**

WIN-PED 7

The software tool ensures efficient engineering for a simple and fast realization of your application. The operator software is convincing by its particularly intuitive user interface and is available as free download.

▼ **Project view – direct access to all functions, control parameters and editors.**

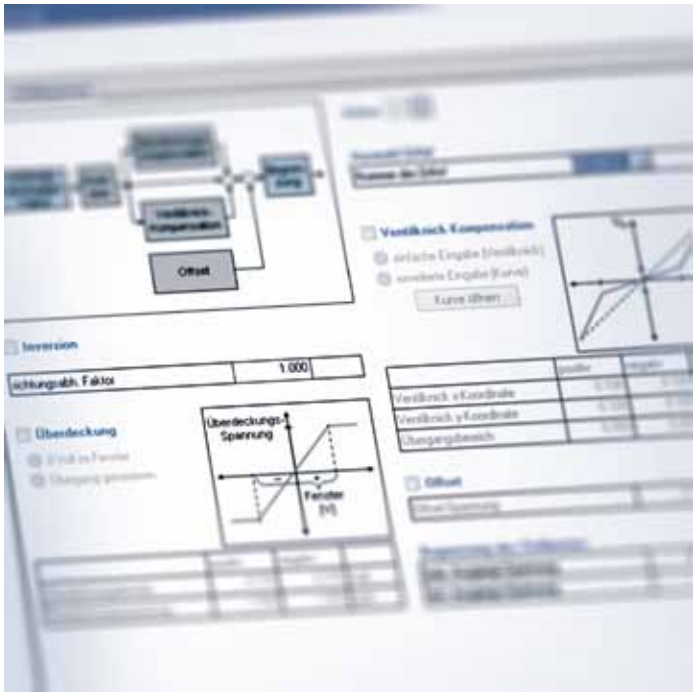


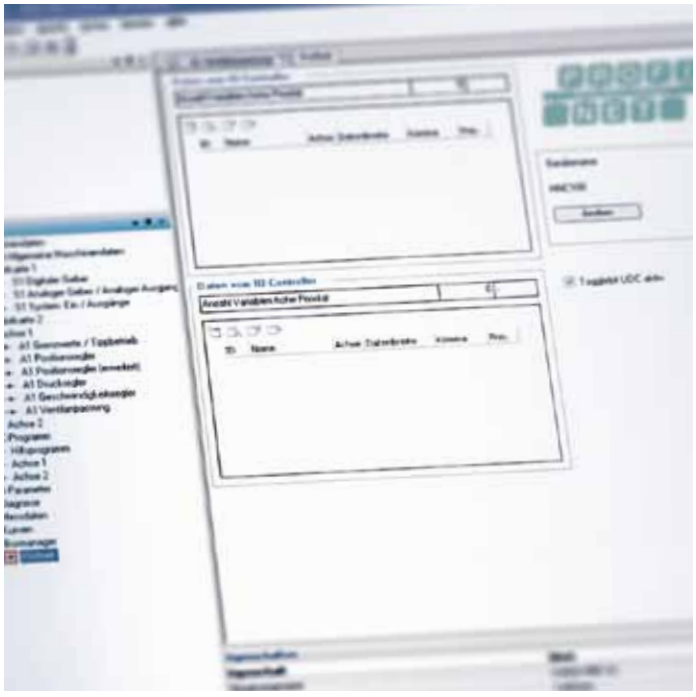
▼ **Editor – utilize and protect your know-how. Create your own complex motion sequences.**

Everything on the radar

The more exacting the task, the more efficient must be the diagnosis options. The tool WinView integrated in WIN-PED 7 records all PLC and process variables in up to 16 channels in real time and saves them continuously on a PC. This allows long-term records for a machine, simplifies the analysis of sporadic errors, thus accelerating the restart after faults.

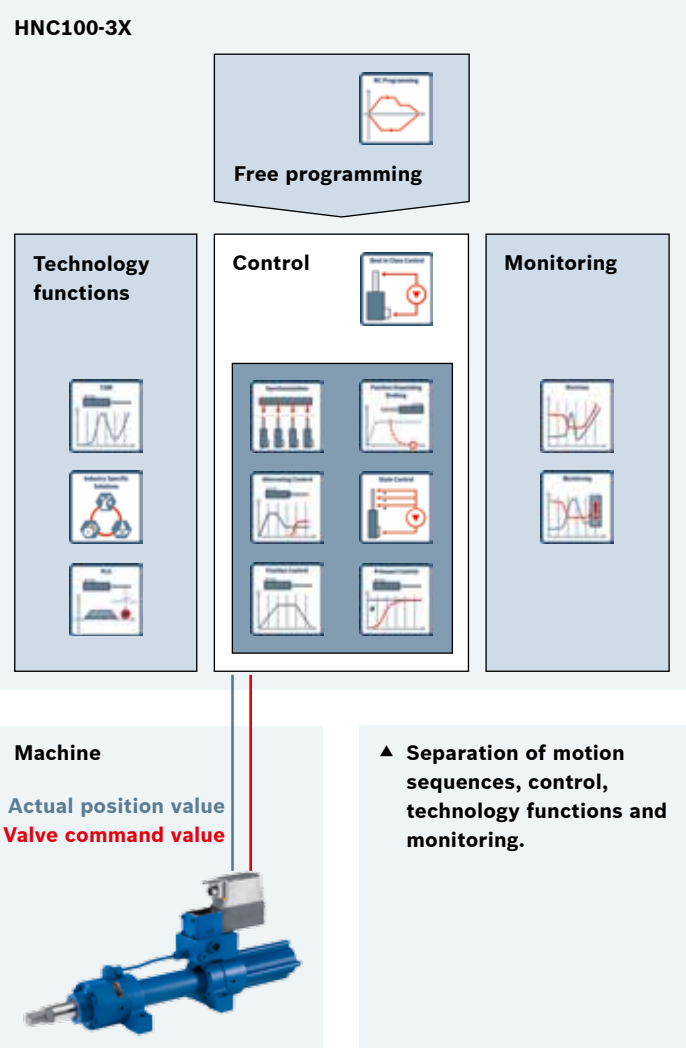
▼ **Busmanager – establish your communication between the HNC100-3X and the control level in a flash.**





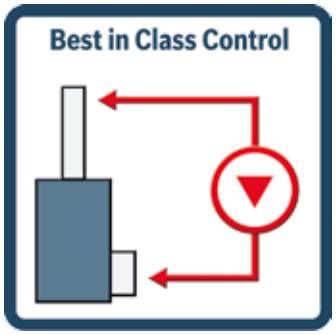
Unique base of experience: Control and motion sequences optimized to suit hydraulics

Rexroth has gained unique expertise in the interaction of hydraulics and motion control technology in thousands of applications. The HNC100-3X integrates flexible sequence programming, hydraulics-optimized controller concepts, clearly structured monitoring as well as simple and intuitive operation. You can therefore concentrate on the essentials: the motion sequences for your application.



▲ **Separation of motion sequences, control, technology functions and monitoring.**

◀ **Highest flexibility through NC programming: The user can freely determine the motion sequences of the axes.**



Predefined, hydraulics-specific NC commands

- force/pressure control
- force/pressure limitation
- transition position/pressure control
- controller output limitation

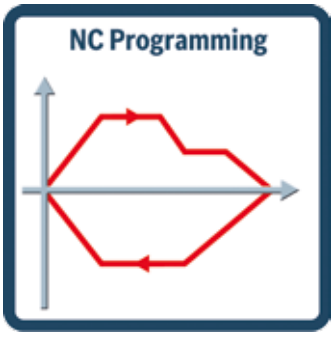
Protection of application know-how

The machine manufacturer's individual application know-how is password-protected against unauthorized access.

Distinct expertise – best-in-class motion control for hydraulics

Benefit from the Rexroth experts' comprehensive experience that has been gained in thousands of applications:

- Improve the productivity of your installations!
- Increase the availability of your machines!
- Increase energy-efficiency of your production!



Simple programming

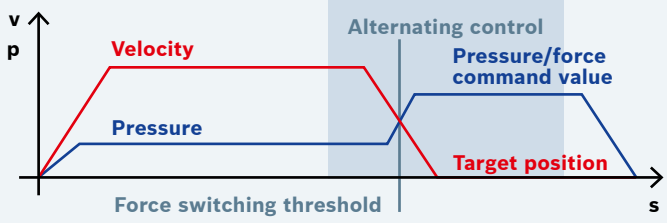
The example of an alternating position/pressure control shows how you can create the function in the NC program with only a few, simple commands. These commands are structured in line with the syntax according DIN 66025, which is common in machine tools:

A hydraulic axis moves at a given command velocity until the target position is reached. If a defined force threshold is exceeded while traveling (example: press), a jerk-free changeover to force control is carried out, but the transversing movement can nevertheless be stopped at any time.

The G28 command allows a changeover from position control to pressure/force control. When, while approaching the target position (R200) at traversing velocity (R202), the changeover position (R202) and the pressure/force threshold (R210) are reached, an automatic changeover to pressure/force control takes place. The pressure/force command value (R210) forms the basis for corrections. The pressure/force increase rate is determined by R212.

```
; R200 = target position
; R201 = enable changeover position to pressure/force control
; R202 = traversing velocity to target position
; R210 = switching threshold for changing over to force control
; R211 = pressure/force command value
; R212 = pressure/force ramp

;============================================================
;  Alternating control of position to pressure/force control
;============================================================

L00
IF S1.DI.5=1 JMP L100          ; Start of movement
JMP L00

L100
G28 XR200 R201 FR202 UR210 SR211 FR212
                               ; travel to target position

L110
IF S1.DI.5=1 JMP L110          ; wait until input is reset

Stop                           ; Stop traversing movement
JMP L00
M02                            ; Program end
```

Velocity and pressure profile of a hydraulic axis with alternating control



Technical data

HNC100-3X		Compact single-axis	Single-axis	2-axis	3-axis	4-axis
1	**Installation**			**Basic data**		
1.1	Depth/height/width/width incl. Ethernet connect.	108/120/34/– mm	124/120/48/71 mm	124/120/65/88 mm	124/120/82/105 mm	124/120/99/122 mm
1.2	Installation			Industrial standard 35 mm EN 60715 top hat rail		
1.3	Voltage supply			18 to 30 VDC, residual ripple < 1.5 Vpp		
1.4	Current consumption	500 mA		1 to 4 A (depending on HNC variant and components to be supplied)		
1.5	Operating temperature			0° C to 50° C		
1.6	Standardization			CE		
2.	**Analog I/O**			**Interfaces**		
2.1	Voltage inputs (±10 V, 12 bit)	1	2	4	6	8
2.2	Current inputs (4 ... 20 mA, 12 bit)	2	2	4	6	8
2.3	Voltage outputs (±10 V, 14 bit)	2	2	4	5	6
2.4	Outputs (4 ... 20 mA or ±10 V, 14 bit)	–	1	2	3	4
3.	**Digital I/O**			**Interfaces**		
3.1	Inputs (24 VDC, Ii = 20 mA per input)	4	11 optional assignment	22 opt. assignment (≤20 dig. outputs)	33 opt. assignment (≤20 dig. outputs)	44 opt. assignment (≤20 dig. outputs)
3.2	Outputs (24 VDC, Imax = 20 mA per input)	2				
4.	**Measuring system**					
4.1	SSI encoder (Gray code)	1		1 per axis (SSI or incremental)		
4.2	Incremental encoder	–				
5.	**Communication/bus/network interfaces**			**Interfaces**		
5.1	RS232	●	●	●	●	●
5.2	TCP/IP service interface (option)	–	●	●	●	●
5.3	PROFIBUS DP/V0 (option)	●	●	●	●	●
5.4	PROFINET RT (option)	–	●	●	●	●
6.	**Hydraulic controller functions**			**Service/parameterization/visualization/automation interfaces**		
6.1	Extended position controller	●	●	●	●	●
6.2	Pressure controller	●	●	●	●	●
6.3	Velocity controller	●	●	●	●	●
6.4	Valve adjustment	●	●	●	●	●
7.	**Further functions**					
7.1	Alternating control (position/pressure/force)	●	●	●	●	●
7.2	Synchronization	–	–	2 axes	2 axes; 2 × individual or 1 × 3 axes	1 × 2 axes; 2 × individual axis or 1 × 3 axes; 1 × individual axis or 1 × 4 axes
7.3	Ramp function	●	●	●	●	●
7.4	Profile sequence generation	●	●	●	●	●
7.5	Mathematical operations	●	●	●	●	●
7.6	Curve function	●	●	●	●	●
7.7	Virtual cams	●	●	●	●	●
8.	**Monitoring functions**					
8.1	Control error monitoring	●	●	●	●	●
8.2	Cable break monitoring of analog signals	●	●	●	●	●
8.3	Cable break monitoring of digital encoders	●	●	●	●	●
8.4	Monitoring of traversing range limits	●	●	●	●	●
8.5	Synchronization error	●	●	●	●	●
9.	**Operator software**			**Parameterization/visualization/application development/diagnostics**		
9.1	Visualization/diagnosis			WinView (free download)		
9.2	Application configuration			WIN-PED (free download)		

HNC100-3X – function determines form

Depending on the requirements and the intended use, the HNC100-3X is available with different functions. The “type code” helps you to make the right selection:

VT-HNC100□-3X/□-□-□□/□□□

Variant

▶ Compact, for 1 axis with SSI sensor	**C**
▶ for 1 hydraulic axis	**1**
▶ for 2 hydraulic axes	**2**
▶ for 3 hydraulic axes	**3**
▶ for 4 hydraulic axes	**4**

Component series

▶ 30 to 39: unchanged technical data and connected load	**3X**

Bus connection

▶ PROFIBUS DP	**P**
▶ Ethernet/IP[1)]	**E**
▶ PROFINET RT[1)]	**N**

Position transducer[2)]

▶ Incremental/SSi (standard)	**I**
▶ SSI, only for form C (= Compact)	**S**

Additional component placement

▶ No components	**00**
▶ TCP/IP[1)]	**E0**

Option

▶ Without synchronization	**000**
▶ Synchronization 2-axis variant	**G02**
▶ Synchronization 3- axis variant	**G03**
▶ Synchronization 4- axis variant	**G04**

1) Not available with Compact variant

2) All axis electronics are provided with the same position transducer evaluation

You can find detailed information and online help on the HNC100-3X on the Internet at: www.boschrexroth.com/hnc100

Rexroth doesn’t leave you alone: Support for engineering, training, commissioning and after-sales

For all questions relating to the HNC100-3X Rexroth offers direct support in the following areas: Dimensioning of hydraulic drives, tailored training, free, application-related programming as well as commissioning on site. In addition, Rexroth offers comprehensive online support such as technical documentation, free software download and direct user support by e-mail.

The training courses tailored individually to the needs of the users take two to three days. The objective: Imparting the know-how required for the application so that the user can create NC programs on his own and carry out commissioning.

If the NC program is to be created by Rexroth, we will solve this task in close cooperation with the customer on the basis of jointly worked out specifications. And for commissioning, Rexroth offers additional service support.

Internet support: www.boschrexroth.com/hnc100
The comprehensive download section on Rexroth websites provides latest software updates and information on tools and configurations. Apart from exhaustive documentation, it includes detailed answers to all questions relating to digital control electronics.

Whether you wish to update the software WIN-PED 7, require information on Rexroth firmware, learn more about latest tools and configuration or generally wish to deepen your knowledge of the HNC100 – benefit from the comprehensive download section of the Rexroth websites!

Individual support
Contact our specialists by e-mail at
support.nc-systems@boschrexroth.de

HNC100-3X for hydraulic drives – worldwide at home in a wide variety of applications

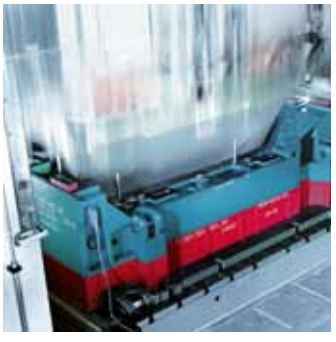
The success confirms that motion control systems from Rexroth are unique in the field of hydraulics. Rexroth products are developed by product, application and service specialists and used all over the world. Follow the course to success with this unique application know-how and support!

Be it in presses, steelworks and rolling mill technology, material handling or special machinery – Rexroth offers the optimum Motion Logic system.

Plastics processing machines
- injection molding machines
- blow-molding machines
- rubber injection presses
- calenders
- core-molding machine

Special machines
- packaging machines
- bending machines
- calenders
- shears
- lifting gear
- assembly machines

Steelworks and rolling mill technology
- drawing systems
- oscillating molds
- rolling mill machines



- rotary furnace controls
- handling equipment

Presses
- drawing and extrusion presses
- press brakes and cutting presses
- punching machines
- hydraulic forming systems
- tube bending machines
- assembly presses
- tile presses

Machine tools
- grinding and milling machines
- drilling machines
- bending machines

Woodworking machines
and many more

The Drive & Control Company

Rexroth
Bosch Group

Bosch Rexroth AG
Zum Eisengießer 1
97816 Lohr, Germany
Phone +49 9352-18-0
Fax +49 9352-18-40
www.boschrexroth.com

Find your local contact person here:
www.boschrexroth.com/addresses

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