It’s all you need!

netX 90 and netRAPID 90 – perfect partners for compact multiprotocol devices

www.hilscher.com
THE NEXT GENERATION OF COMMUNICATION

With the philosophy of continuous growth based on its own resources, Hilscher is a reliable partner for its customers.

The combination of hardware and software offers a technology package which is unique. Hilscher is the technology leader for multiprotocol ASICS and your trustable partner for communication.

Hans-Jürgen Hilscher
CEO

Sebastian Hilscher
CTO

"With our experience and the third generation of slave chips, the netX 90 sets new standards in the industrial communication market."
Sebastian Hilscher
CTO

MORE THAN 4000 CUSTOMERS WORLDWIDE USING NETX TECHNOLOGY

TECHNOLOGY LEADER FOR MULTIPROTocol ASICS

OVER 150 NETX 90 DESIGNS IN THE FIRST 6 MONTHS

PROVEN TECHNOLOGY - OVER 5 MILLION NETX SOLD

> 500 EVALUATION BOARDS IN USE
DO YOU REALLY NEED ...

... a hardware without software or a protocol stack without hardware?
Reduce your development risk with harmonized hardware and software from one supplier.

... to spend extra space and money for an FPGA or a separate APP CPU in your design?
Reduce your design costs and footprint by using a single SoC with built-in communication and application processors.

... different hardware designs for each protocol?
Reduce your product diversity by using a flexible multiprotocol solution in exactly one design for all networks.

... a demanding SoC design and qualification process or a time consuming part obsolescence management?
Ensure a fast time-to-market and reduce your product maintenance costs by using a fully tested and preloaded design.

WHAT YOU REALLY NEED ...

... is one chip for all protocols from one supplier!
• Smallest multiprotocol SoC with additional Cortex-M4 application processor
• Supports all Industrial Ethernet, Fieldbus and IIoT standards
• Harmonized hardware, software and services

... is one tested and preloaded design!
• Fully tested netX 90 based hardware platform
• Different memory options supporting various use cases
• Preloaded with your specific content – ready-to-use
**HIGHLIGHTS & BENEFITS**

**NETX 90**
- Preloaded & Ready-to-use
- Fully tested design
- Scalable memory
- Preloaded & Ready to use
- We fulfill all 100 Mbit/s standards

**QSPI FLASH**
- SD RAM

---

**NETRAPID 90**
- Security
- Backup mode
- Diagnostic
- Internet of Things
- Multiprotocol
- Communication
- Low-power
- Application
- Predesigned & Ready-to-use
- EnDat 2.2
- Modbus
- EtherCAT
- C-Link IE Build Basic
- EtherNet/IP
- Mqtt
- POWERLINK
- TSN
- OPC UA

* We fulfill all 100 Mbit/s standards
Three Good Reasons ...

Innovative Architecture
- Strict separation of real-time communication and the customer application on individual Cortex-M4 Cores.
- Optimized hardware design for lowest BOM costs due to integrated DC/DC converter, On-Chip Flash and integrated Fast Ethernet.

Rich Peripheral Set
- Enhanced feature set with industry related peripherals for sensor, encoder, IO-Link or motion control.
- Connectivity to interface sensor-specific ICs or submodules with fast I/O processing for electronic controls.

Built-in Security
- Security with HTTPS, OPC UA / MQTT security and secure boot mechanism by built-in hardware acceleration.
- FIPS 140-2 compliant built-in cryptographic algorithms for highest encryption with different key lengths of up to RSA-4096, ECC-512, and AES-256.

NETX 90 INSIGHTS

10 x 10mm
144 Pin BGA
2 x ARM® CORTEX® M4
15 MB Flash, 640 KB RAM
Integrated Phys
< 1 Watt
3.3 V Only
THREE GOOD REASONS ...

Ready-to-use netX 90 design
- Fully tested netX 90 design ensures a fast time-to-market without development risk.
- Rapid prototyping without time-consuming iteration process in the development phase.
- No demanding BGA manufacturing and qualification process.

Reduced design and production costs
- PCB complexity is encapsulated in netRAPID 90 and does not affect the baseboard design.
- Can be preloaded with customer-specific content, which reduces production effort and costs.
- No time-consuming and costly part obsolescence management.

Modular and scalable platform
- Different memory options allow different applications in one single baseboard design.
- Well prepared for new emerging technologies like security or TSN*.

NETRAPID 90 ESSENTIALS

OPTIONAL QSPI FLASH
OPTIONAL SDRAM
50 MHz SPI
32 x 15 x 4 MM
-20°C … +85°C
3.3 V / 350 MA
SOLDERABLE

*RTE_CH0
*32mm
*32mm
*15mm

*100 Mbit/s
"With its flexible and innovative technology, netX 90 and netRAPID 90 are the perfect platform for compact multiprotocol devices and can be used in nearly any field device, whether encoder, sensor, motor control or I/O block."

Christof Hunger
Product Manager Embedded Modules
Comprehensive set of integrated peripherals

- Connect sensor-specific ICs, valves or IOs via SPI, UART, I2C and CAN.
- Build sensor applications using the highly flexible GPIO unit, equipped with three independent 10ns timers, input capture and IRQ unit.
- Define your specific pinning and functionality by using the flexible and customizable multiplex matrix.

ALL YOU NEED ...

... FOR YOUR SENSOR
ALL YOU NEED ...

**Integrated encoder IPs**
- Best-in-class for encoder applications, thanks to smallest footprint, extended temperature range and integrated encoder IPs.
- Develop highly synchronized encoders with lowest cycle times, using integrated hardware IPs for BiSS, SSI and EnDat.
- Realize redundancy or safety applications, as all encoder IPs are doubled for dual-channel usage.
- Build traditional mixed signals encoders, using 2 x 2 sampling ADCs, UART and GPIO.

... FOR YOUR ENCODER
ALL YOU NEED ...

Ready-to-use IO-Link Gateway Technology

• Optimized technology platform consisting of netX 90 and netIOL hardware chipset with already mapped IO-Link to Real-Time Ethernet software bundle.

• netX 90 and netIOL hardware for lowest BIOM and best-in-class performance:
  • 400µs IO-Link cycle time with 230.4kBaud at 8 ports
  • Synchronized IO-Link to Real-Time Ethernet network

• Additional diagnostics to detect plant errors:
  • Voltages and currents from each IO-Link pin
  • On-chip temperature
  • Supply voltage

• Access to diagnosis and configuration with additional OPC UA Server.

... FOR YOUR IO-LINK GATEWAY

For more information see Hilscher's netFIELD technology
ALL YOU NEED …

Integrated motor peripherals

• Build up demanding applications with hard real-time requirements in terms of timescale and synchronization, e.g. motors with integrated electronics or basic frequency inverters.

• Simultaneous motor and encoder measurement thanks to four ADC controllers with sample & hold and DMA.

• Complete drive electronics with netX 90 and smart motor driver IC on smallest footprint - two CPUs of netX 90 (100 MHz ARM Cortex-M4F and 100 MHz xPIC) are 100% free for motor control.

• For field oriented motor control and dynamic control loops, supporting any modulation scheme, e.g. PWM with 10ns resolution.

… FOR YOUR MOTOR CONTROLLER
ALL YOU NEED …

Demanding Real-Time Ethernet communication

• Develop a compact multiprotocol device using your specific high-end host processor.

• Connect your host processor via fast SPI up to 50 MHz or traditional 8/16 Bit parallel interface.*

• Communicate via Standard Ethernet or Webserver on the same cable as the Real-Time Ethernet network.

• Realize minimum cycle times using hardware SYNC and IRQ options.

... FOR YOUR COMPANION SOLUTION

CPU

Host Processor
With driver for common OS or driver toolkit for non or own OS

Ethernet PHYs, DC/DC and PoR

netX 90

Integrated Ethernet on chip

Optional: SDRAM QSPI

ALL YOU NEED … FOR YOUR COMPANION SOLUTION

Demanding Real-Time Ethernet communication

• Develop a compact multiprotocol device using your specific high-end host processor.

• Connect your host processor via fast SPI up to 50 MHz or traditional 8/16 Bit parallel interface.*

• Communicate via Standard Ethernet or Webserver on the same cable as the Real-Time Ethernet network.

• Realize minimum cycle times using hardware SYNC and IRQ options.

*netX 90 only
DIFFERENT SOFTWARE PACKAGES

FUNCTION OPTIMIZED COMMUNICATION
- For small footprint and low cost devices
- No external QSPI Flash or SDRAM needed
- Simple Firmware Update Server

FUNCTION OPTIMIZED COMMUNICATION AND APPLICATION
- APP uses external QSPI Flash and may use SDRAM

FULL FEATURED COMMUNICATION
- For highest standards, e.g. IoT and Security
- COM needs external QSPI Flash and SDRAM
- Advanced Webserver with custom webpages

COMMON SOFTWARE STRUCTURE

Real-Time Ethernet API to exchange cyclic IO data and to use acyclic protocol services

Network Services:
- Get access from the application to TCP/IP, UDP or Raw Ethernet
- Build custom webpage content

IIoT data via OPC UA Server or MQTT Client functionality
NETX STUDIO CDT

netX Studio CDT (C/C++ Development Tooling)
• Eclipse-based Integrated Development Environment to develop, configure and debug your netX 90 based application.
• Ready-to-use code examples, documentation with Doxygen and source control with SVN.
• Graphical user interface to define a specific pin assignment and hardware configuration for your application.
• Components and tools to set up the prebuilt communication firmware in three simple steps.

“With netX Studio CDT, we succeed in lifting the netX ecosystem to a new level of usability and simplicity. netX Studio works out-of-the-box and it is free-of-charge!”

Nico Mäding
Department Manager
netX Technology

FLEXIBLE PIN ASSIGNMENT

PIN ASSIGNMENT (netX 90)
PREPARED FOR NEW EMERGING TECHNOLOGY

netX 90 – The platform for secure devices on field level

- Hardware based root of trust with integrated hardware acceleration supporting crypto standards (ECC, RSA, AES and SHA).
- Secure communication with OPC UA/MQTT security or between EtherNet/IP endpoints with CIP Security based on TLS and DTLS.
- User Authentication by secure password management.
- Enhanced security settings for secure boot, firmware signing and firewall management adjustable by netX Studio CDT.

SECURITY CONCEPT

1. Development: Write your code.
2. Encryption: Encrypt the code with a private key.
3. Download: Download the encrypted code and public key to the device.
4. Verification: Perform Verification during start-up phase of netX 90.
netRAPID 90 – preloaded with customer content
- OEMs can easily create and update their specific netRAPID 90 via a secure cloud interface:
  - OEM specific serial numbers
  - OEM specific MAC addresses
  - OEM specific software content, e.g. APP firmware, hardware configuration, webpages, images, ...
- Order-related access to Hilscher’s production process.

Digital Twin via Hilscher Production Tracking System
- Relevant master data is collected during Hilscher production process:
  - Article identification
  - Serial number
  - MAC addresses
  - Firmware versions
  - Test results & data ... and more
- Secure access for OEMs for monitoring and maintenance purposes.

PREPARED FOR NEW EMERGING TECHNOLOGY
SMART PRODUCTION
PREPARED FOR NEW EMERGING TECHNOLOGY

Time-critical traffic over standard Ethernet with TSN
Hilscher already implemented 100 Mbit/s Time-Sensitive-Networking standards for netX 90.

- IEEE 802.1Qbv: Enhancements for scheduled traffic
  Bandwidth reservation for high priority scheduled traffic.
- IEEE 802.1Qbu: Frame Preemption
  Suspends the transmission of a non-time-critical frame and allows time-critical frames to be transmitted.
- IEEE 802.1AS-Rev: Timing and synchronization for time-sensitive applications
  Timing synchronization between all nodes and the master which holds the most exact clock.

TIME-SENSITIVE-NETWORKING

PROFINET 2.4 with PROFINET over TSN
Hilscher device already part of PI TSN demo

German Testbed for TSN

International Testbed for TSN

Hilscher testing their TSN implementation since three years

OPC UA FLC Member and running OPC UA PUB/SUB TSN devices on SPS 2019

Hilscher already announces a commitment to CC-LINK IE TSN in 2018
“Especially the netRAPID 90 offers a very attractive combination of design flexibility and integrated ready-to-use features, thus allowing a rapid and cost efficient time-to-market. It is a future-proof investment.”

Stefan Gallmann
Senior Vice President Sales
YOUR BENEFITS WITH NETX 90

**Future-proof solution**
- Built-in security and diagnostic features enables a secure-by-design concept as outlined in IEC 62443.
- Ready for future network requirements such as Time-Sensitive-Networking (TSN) with flexible adaptable communication architecture.

**Extensive ecosystem**
- Focus on the interaction between hardware and software to improve time-to-market.
- Hilscher delivers the range of software protocol stacks as prebuilt firmware, e.g. pre-certified.
- Additional utility tools to set up the protocol stack in three user-friendly steps.

**INTEGRATION COSTS NETX 90**

**Multiprotocol Solution**
- All major Fieldbus and Real-Time Ethernet communication protocols for factory automation with only one single ASIC.

**Unified Software and Toolkits**
- All netX based products use the same software toolkit, drivers and host interfaces – application remains untouched.

**Reduced Development Effort**
- Same host interface and software across product portfolio saves development time.

YOUR BENEFITS WITH NETX 90

**Future-proof solution**
- Built-in security and diagnostic features enables a secure-by-design concept as outlined in IEC 62443.
- Ready for future network requirements such as Time-Sensitive-Networking (TSN) with flexible adaptable communication architecture.

**Extensive ecosystem**
- Focus on the interaction between hardware and software to improve time-to-market.
- Hilscher delivers the range of software protocol stacks as prebuilt firmware, e.g. pre-certified.
- Additional utility tools to set up the protocol stack in three user-friendly steps.

**INTEGRATION COSTS NETX 90**

**Multiprotocol Solution**
- All major Fieldbus and Real-Time Ethernet communication protocols for factory automation with only one single ASIC.

**Unified Software and Toolkits**
- All netX based products use the same software toolkit, drivers and host interfaces – application remains untouched.

**Reduced Development Effort**
- Same host interface and software across product portfolio saves development time.
YOUR BENEFITS WITH NETRAPID 90

Ready-to-use netX 90 design
• Fully tested netX 90 design ensures a fast time-to-market without development risk.
• Rapid prototyping without time-consuming iteration process in the development phase.
• No demanding BGA manufacturing and qualification process.

Modular and scalable platform
• One hardware design fits all Real-Time Ethernet, Fieldbus and IIoT standards.
• Different memory options allow different applications in one single baseboard design.
• Well prepared for new emerging technologies like security or TSN*.

Reduced design and production costs
• PCB complexity is encapsulated in netRAPID 90 and does not affect the baseboard design.
• Can be preloaded with customer specific content, which reduces production effort and costs.
• No time consuming and costly part obsolescence management.

INTEGRATION COSTS NETRAPID 90

*100 Mbit/s
HARDWARE COSTS

Rapid development of your cost optimized device
• Reduced hardware costs:
  PHYs, DC/DC, PoR, Flash already integrated in netX 90.

Reduced Engineering costs
• Reduced efforts and complexity for layouts and PCB design.
  ❑ Less components
  ❑ Less effort
  ❑ Short time-to-market

PRODUCT COSTS

Crystal
Resistors, Capacitors, etc.
Power Converter
Read-Only Memory
Random-Access Memory
PHY
System-on-Chip

integrated in netX 90

Break-Even-Range

Product volume

Total costs for overall volume

netX 90
netRAPID 90
Break-Even-Range

Product volume
**OPEN & FLEXIBLE PROGRAMMING PLATFORM**

**Development: Starterkit**
- Everything included for your development: Development Board, 5h support, 15 netX samples and time limited stacks.

**Software: Loadable Firmware agreement**
- Agreement for Fieldbus and Real-Time Ethernet stacks.

**Hardware: Delivery contract**
- General terms of usage of the module or chip.

**Support: Support order sheet**
- Order sheet and conditions for support hours for module or chip.

**Optional preloaded with OEM Firmware & Application**
- Be free in pinning and software development for the application processor of your netX or netRAPID design.

**netRAPID as a ready-to-use communication module with firmware already loaded.**

**Ready-to-use Communication Module**
- Buy netRAPID 90 already preloaded with a communication protocol in mixed numbers.
- No need to purchase protocol stacks separately.

**Companion Solution with defined functionality**
- Predefined pinning with 50 MHz SPI to an external host processor, UART diagnostic interface and SYNC 0/1.
- Internal APP processor of netX 90 is deactivated.

**Easy handling like a module**
- As preloaded communication module no need to sign delivery or license contracts.
- Including communication firmware and full product support.
WHICH HARDWARE TO BUY?

Evaluation Boards
- NXHX 90-JTAG* – netX 90 Development Board
- NRPEB H90 – netRAPID 90 Development Board

Sample Box
- netX 90
- netRAPID 90

WHAT TO READ?

Technical Reference Guide
- Comprehensive guide with all technical features and insights on netX 90.

Design-In Guide
- Guide for hardware designs with netX 90 and netRAPID 90, including sample schematics.

Get familiar with netX technology

Start building up a Fieldbus network

Develop your application software

Start prototype production

Learn production handling

Evaluate and perform tests

Please see the following page for individual support options.

netX Studio CDT – Getting Started Guide
- Short explanation and getting started tutorial for netX Studio CDT. Helps to set up evaluation boards and to get familiar with industrial communication based on netX technology.

Production Guide
- Document with production guidelines and handling instructions.

YouTube: HilscherAutomation

*Also available as: MXSK 90 – netX 90 Starterkit
## IMPROVE YOUR KNOWLEDGE

<table>
<thead>
<tr>
<th>Services</th>
<th>Standard trainings</th>
<th>Workshops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Certification</td>
<td>LFW training</td>
<td>Design-In</td>
</tr>
<tr>
<td>Certification</td>
<td>Protocol stacks</td>
<td>Trouble shooting</td>
</tr>
<tr>
<td>Schematic review</td>
<td>PROFINET</td>
<td>netX 90 Workshops</td>
</tr>
<tr>
<td>Integrity test ANSI X3.263-1995</td>
<td>EtherCAT</td>
<td>netRAPID 90 Workshops</td>
</tr>
<tr>
<td>Plugfest visits</td>
<td>EtherNet/IP</td>
<td></td>
</tr>
<tr>
<td>Interoperability tests</td>
<td>Sercos</td>
<td></td>
</tr>
</tbody>
</table>

You need help? Contact us!
Sales@hilscher.com
Sales.US@hilscher.com

Brauchen Sie Hilfe? Schreiben Sie uns!
Sales@hilscher.com
Sales.CH@hilscher.com

Besoin d'aide? Écrivez-nous!
Sales.FR@hilscher.com

Ti serve aiuto? Contattaci!
Sales.IT@hilscher.com

您需要帮助吗? 请联系我们!
Sales.CN@hilscher.com

연락주세요!
Sales.KR@hilscher.com

 연락주십시오!
Sales.JP@hilscher.com
### Technical Data NETX 90

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARM Processor</td>
<td>Cortex-M4 at 100 MHz with MPU</td>
</tr>
<tr>
<td>SRAM</td>
<td>576 kB</td>
</tr>
<tr>
<td>Flash</td>
<td>64 kB</td>
</tr>
<tr>
<td>Power Supply</td>
<td>+3.3 V / 350 mA</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>32 x 15 x 4 mm</td>
</tr>
<tr>
<td>LED</td>
<td>SYS-System (RUN/RDY), COM-Status 0/1 (COM 0/1), Ethernet-Status Link, Activity (LINK RX/TX)</td>
</tr>
<tr>
<td>Memory Options</td>
<td>8 - 32 MB QSPI Flash, 8 - 16 MB SDRAM</td>
</tr>
<tr>
<td>Host Interface</td>
<td>50 MHz SPI-Slave</td>
</tr>
<tr>
<td>Diagnostic Interface</td>
<td>Ethernet, UART RxD/TxD</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>2x Ethernet 100 BASE-TX, 1x Fieldbus EtherCAT, Ethernet/IP, PROFINET OPC-UA, MQTT</td>
</tr>
<tr>
<td>Immunity</td>
<td>EN 61000-4-3, DIN EN 61000-4-8, Surge - IEC 61000-4-5, Burst - IEC 61000-4-4, ESD - IEC 61000-4-2</td>
</tr>
<tr>
<td>Certification</td>
<td>CE Sign, RoHS</td>
</tr>
<tr>
<td>SoC Features</td>
<td>Communication Application</td>
</tr>
<tr>
<td>ARM Processor</td>
<td>Cortex-M4 at 100 MHz with MPU</td>
</tr>
<tr>
<td>SRAM</td>
<td>576 kB</td>
</tr>
<tr>
<td>Flash</td>
<td>64 kB</td>
</tr>
<tr>
<td>Power Supply</td>
<td>+3.3 V / 350 mA</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>32 x 15 x 4 mm</td>
</tr>
<tr>
<td>LED</td>
<td>SYS-System (RUN/RDY), COM-Status 0/1 (COM 0/1), Ethernet-Status Link, Activity (LINK RX/TX)</td>
</tr>
<tr>
<td>Memory Options</td>
<td>8 - 32 MB QSPI Flash, 8 - 16 MB SDRAM</td>
</tr>
<tr>
<td>Host Interface</td>
<td>50 MHz SPI-Slave</td>
</tr>
<tr>
<td>Diagnostic Interface</td>
<td>Ethernet, UART RxD/TxD</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>2x Ethernet 100 BASE-TX, 1x Fieldbus EtherCAT, Ethernet/IP, PROFINET OPC-UA, MQTT</td>
</tr>
<tr>
<td>Immunity</td>
<td>EN 61000-4-3, DIN EN 61000-4-8, Surge - IEC 61000-4-5, Burst - IEC 61000-4-4, ESD - IEC 61000-4-2</td>
</tr>
<tr>
<td>Certification</td>
<td>CE Sign, RoHS</td>
</tr>
</tbody>
</table>

* Depends on the thermal characteristics of the embedded design and the targeted mission profile (see netX 90 Design-In Guide)
**KNOW YOUR PROJECT**

- **APPLICATION**
- **TIME TO PROTOTYPE**
- **TIME TO MARKET**
- **YEARLY VOLUME**

**PROTOCOL STACKS**
- CANopen
- DeviceNet
- PROFIBUS
- Modbus
- CC-Link IE
- Ethernet/IP
- SERCOS
- POWERLINK
- MASTER
- SLAVE

**ARTICLE DESCRIPTION / CODE**

**PRICE INDICATION**

**NOTES**

**GET IN CONTACT**

Hilscher Gesellschaft für Systemautomation mbH
Phone: +49 (0) 6190 9907-790
E-mail: sales@hilscher.com
HEADQUARTERS

Germany
Hilscher Gesellschaft für Systemautomation mbH

Rheinstraße 15
65795 Hattersheim
Phone: +49 (0) 6190 9907-0
Fax: +49 (0) 6190 9907-50
E-mail: info@hilscher.com