

It's all you need!

netX 90 – The Next Generation of Communication

www.hilscher.com



”

“We don’t know your business models of tomorrow, but we can already provide you with the technology you need for it today.”

Hans-Jürgen Hilscher
CEO

”

“Our next-generation technology combines application and secured multiprotocol communication on the smallest footprint.”

Sebastian Hilscher
Manager of netX Technology



HILSCHER IS YOUR PARTNER FOR INDUSTRIAL COMMUNICATION AND IOT

Hilscher Gesellschaft für Systemautomation mbH was founded in 1986. Today, the company has more than 260 employees at 10 locations worldwide. With the philosophy of continuous growth based on its own resources, the company is a reliable partner for its customers.

Hilscher offers **netX** technology for device manufacturers, including development services and customized module manufacturing. In this field, Hilscher is not only recognized as a system partner of major manufacturers. The customer base also includes a variety of engineering firms, solution providers and system integrators. In addition,

Hilscher is represented in all Fieldbus and Real-Time Ethernet organizations.

The industry is facing a paradigm shift worldwide – and Hilscher has always been a pioneer of significant changes. For us, the Industrial Internet and Industry 4.0 are the fourth industrial revolution, one which requires end-to-end communication from the sensor into the cloud. We call this Industrial cloud communication, and **netIOT** is our technology that complements it.

WHAT YOU REALLY NEED...

Do you really need a chip, without software?

There are ASICs on the market as a target for communication, but they come without a matching and tested protocol stack.

Do you really need a protocol stack, without a chip?

There are software stacks available on the market, but they can not compete on performance. And they often require an oversized application CPU.

Do you really need to spend extra space and money for a FPGA?

FPGAs are often offered as a communication solution instead of a flexible multiprotocol chip. But the unit costs and the form factor do not fit to tight budgets and space requirements of embedded devices.

...IS ONE FOR ALL!

Do you really need different hardware for each protocol?

Specific communication ASICs are offered instead of a flexible multiprotocol chip, but they support just one protocol and each new system requires new hardware development.

What you really need:

One chip for all protocols from one supplier!

- Two CPU cores for communication and application
- Supports all RTE systems and IoT communication
- Platform-independent driver interface
- Intuitive configuration tool
- Harmonious hardware, software and services
- Proven technology – 2 million **netX** sold
- One-stop shop – all you need from one supplier



IO-Link

BISS
INTERFACE

OPC UA

TSN
TIME SENSITIVE NETWORKING

PROFINET

ETHERNET
POWERLINK

MQTT

CODESYS

EnDat 2.2

EtherNet/IP

SERCOS
the automation bus

Modbus

EtherCAT

netX Studio

LVDS

netX
network on chip
Hilscher
NETX 90

netX
network on chip
Hilscher
NETX 90

netX 90

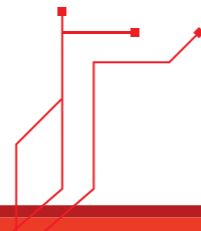
MULTIPROTOCOL SOC FOR : UNDREAMED-OF POSSIBILITIES

ALL YOU NEED...

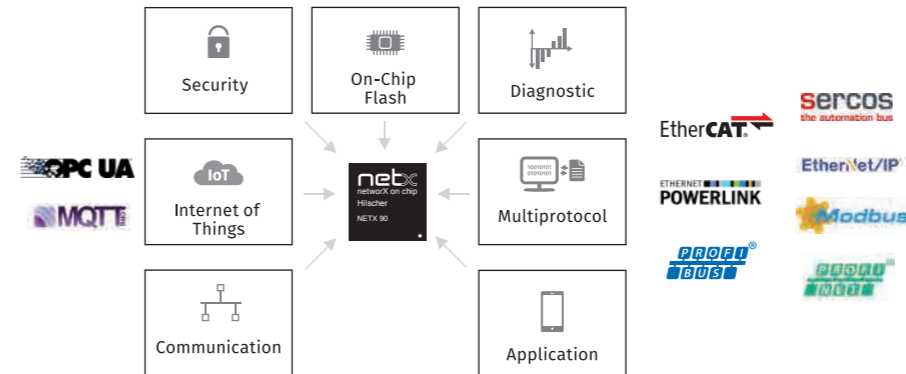
Industrial communication SoC enabled for security

- First industrial Ethernet node in 10x10 mm with two ARM® Cortex® M4 processor cores, on-chip Flash, analog/mixed signal and integrated PHYs.
- Fullfills the highest demand on flexibility, determinism and performance in terms of multi-protocol capability and low latency for short cycle times.
- Simplified and BOM cost-saving product design with the smallest footprint.

- Enables developers to implement a profound secure-by-design concept compliant with the IEC 62443 series for industrial automation security.
- Improves the application design of highly reliable systems due to built-in diagnostics and enhanced data integrity for IIoT-enabled services.



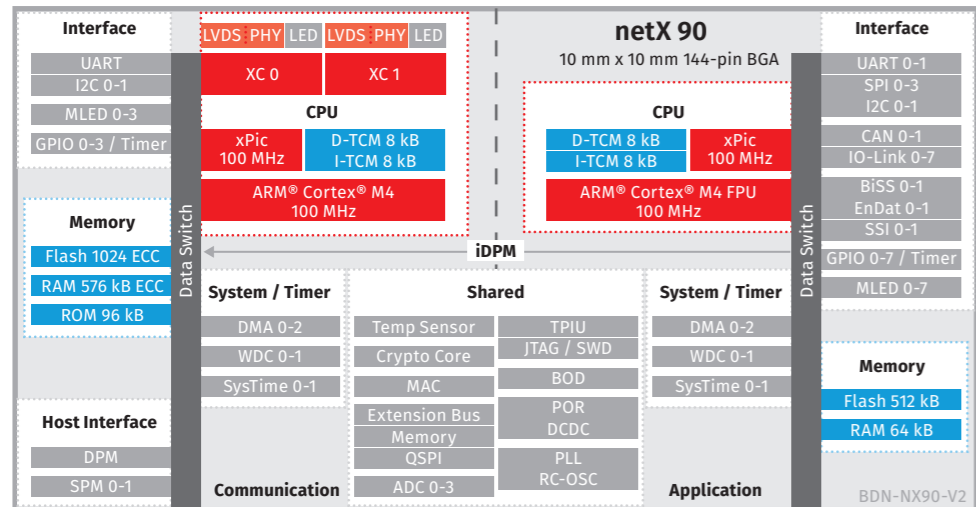
...IS NETX 90



One chip. All protocols. Your application.

- 10X10 MM
- 144 PIN BGA
- 2X ARM® CORTEX® M4 100 MHZ
- 1.5 MB FLASH
- 640KB RAM
- INTEGRATED PHYS
- < 1WATT
- 3.3V ONLY

ALL YOU NEED...



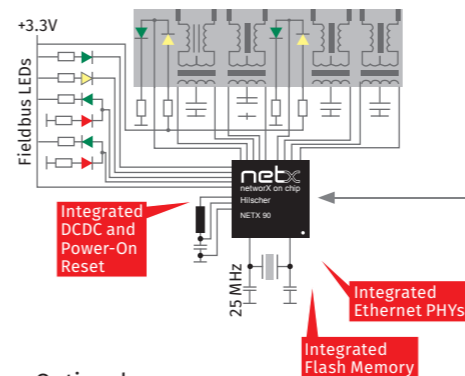
IOT READY

BUILT-IN CRYPTO-GRAPHIC ALGORITHMS FOR HIGHEST ENCRYPTION WITH DIFFERENT KEY LENGTHS.

MORE THAN ENOUGH FLASH AND RAM FOR SOFTWARE COMBINATIONS OF IOT AND RTE STACKS.



...FOR YOUR COMMUNICATION



Rich peripheral set for application designs

Advanced Peripherals

8x IO-Link Master, diagnostic MAC

Encoder

2x BiSS, 2x EnDat, 2x SSI

Serial

4x SPI (up to 50 MHz), 2x UART (up to 10 Mbaud), 2x I2C (up to 3.4 MHz), 2x CAN (2.0B, SJA1000)

IOs

8x GPIO (General Purpose IO) with 3 independent 10 ns timer counters with IRQ support (PWM, IC/OC)

Memory Interface

QSPI, SRAM, SDRAM 16 Bit

Analog

2x2 ADC 12 bit 2 Msps, Brown-Out detection, temperature sensor

ALL YOU NEED...

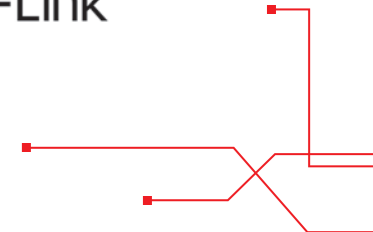
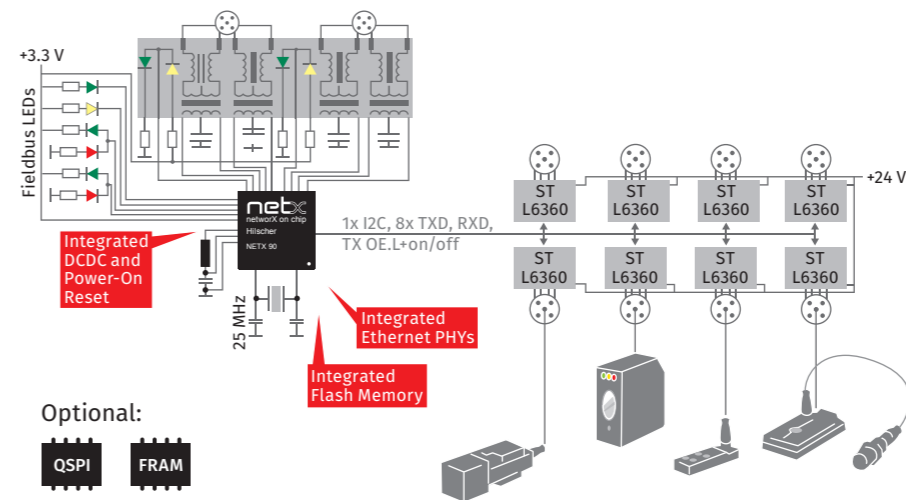
Integrated IO-Link Master functionality

- Supports up to 8 IO-Link Master channels, with 4 digital control signals per channel: TX, TX_ENABLE, RX, WAKEUP.
- The low-level IO-Link stack running on the internal xPIC CPU for maximum flexibility and high deterministic stack operations.

- All components from one supplier:
 - IO-Link Master stack
 - **netX 90** hardware
 - Real-Time Ethernet stack
 - Optional IoT stack
- The market's choice for IO-Link gateways.



...FOR YOUR IO-LINK MASTER



ALL YOU NEED...

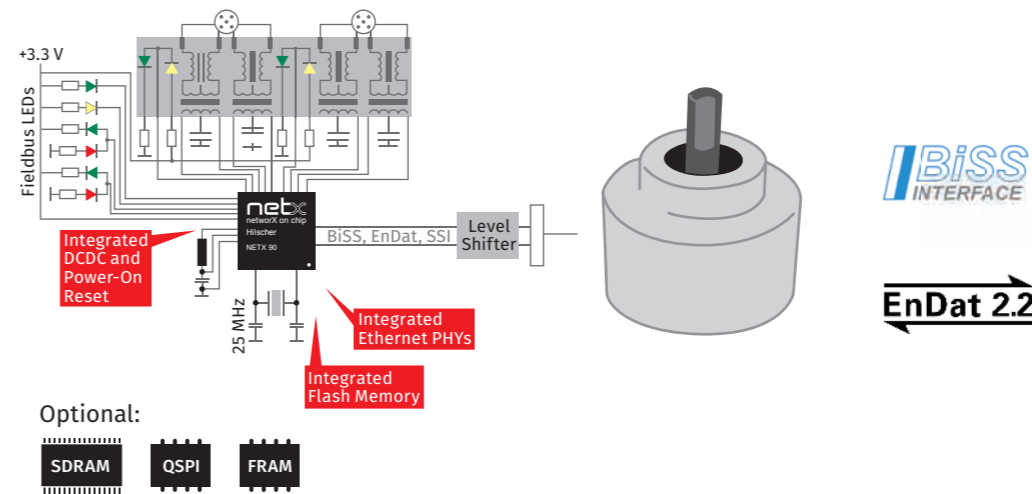
Integrated encoder IPs

- With its 10x10mm footprint, wide temperature range and integrated master IPs for BiSS, SSI and EnDat, the **netX 90** is your choice for encoder applications.
- The **netX 90**, in combination with Hilscher protocol stacks, enables you to build up synchronous encoder devices with the lowest cycle times.

- Each encoder IP is available twice for dual-channel, redundancy or safety purposes.
- 2x2 parallel sampling ADCs, UART and GPIO for traditional mixed signal encoder interfaces.



...FOR YOUR ENCODER



ALL YOU NEED...

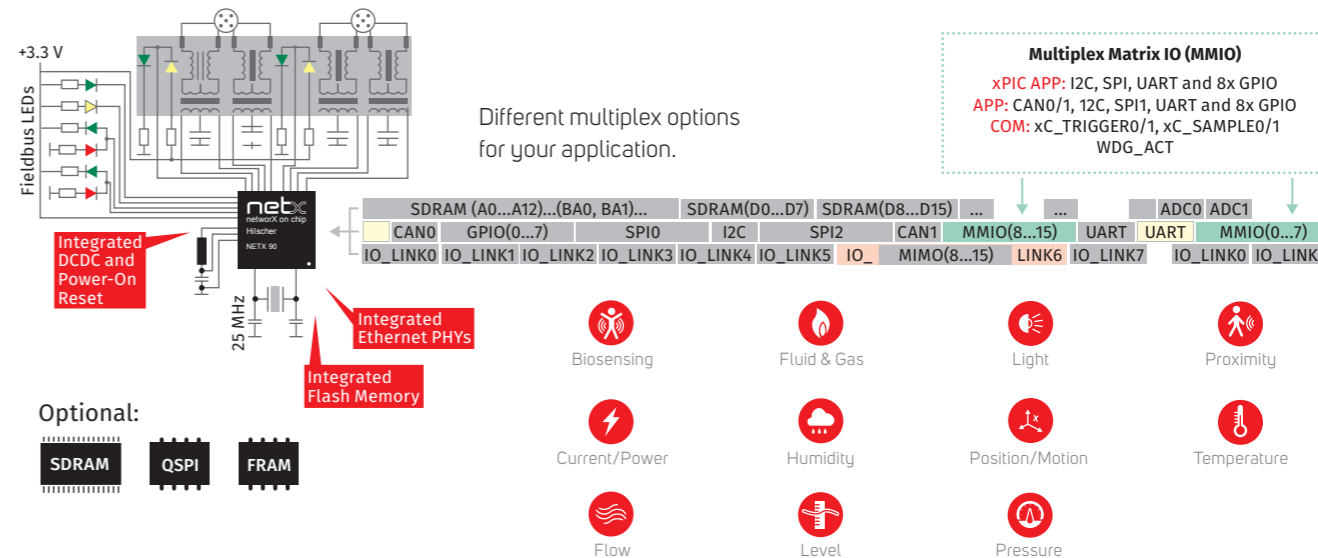
Rich set of standard and advanced peripherals

- There are several SPI, UART, I2C and CAN interfaces to connect different kinds of ICs.
- In combination with our GPIO unit, which is equipped with three independent 10 ns timers, input capture and IRQ unit, it is the solution for your sensor application.
- Plus four 12 Bit 2 Msps ADC channels in which two can be sampled in parallel.

- You choose the valves, remote IO and sensor-specific ICs.



...FOR YOUR SENSOR



ALL YOU NEED...

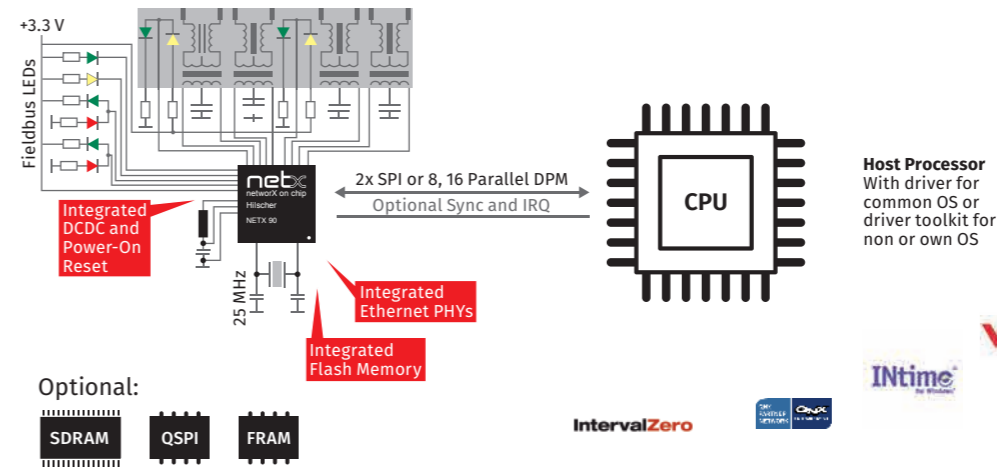
Multiple host interface options

- For flexible high-end applications, the **netX 90** can be equipped with an additional host CPU.
- Supports 8/16 Bit parallel interface or single / dual SPI with up to 125 MHz.
- Dual SPI for high-performant and deterministic cyclic data parallel to a huge amount of acyclic traffic.

- Additional raw Ethernet or socket interface for standard Ethernet communication on the same wire as the Real-Time Ethernet network.
- Sync and IRQ options for minimum cycle times.



...FOR YOUR COMPANION CHIP



IntervalZero



ALL YOU NEED...

Rich software ecosystem

- The **netX 90** comes with a huge software environment, consisting of pre-compiled, pre-certified loadable firmware for the communication CPU. The **netX Studio** build environment is equipped with hardware configuration for the application CPU.
- Freely combinable software from different technology components:
- Ease of use, fast and hassle-free protocol stack implementation that enables application developers to set up a prototype in hours.



Protocol

- PROFINET
- Ethernet/IP
- EtherCAT
- PROFIBUS

IoT

- OPC UA
- MQTT

Web

- Web server
- FTP
- TFTP

Add-On

- IO-Link
- SNMP
- NTP
- netSCRIPT

Diagnostic

- Marshaller
- Diagnostic MAC

...IS SOFT- AND HARDWARE FROM ONE SUPPLIER

Blackbox with:

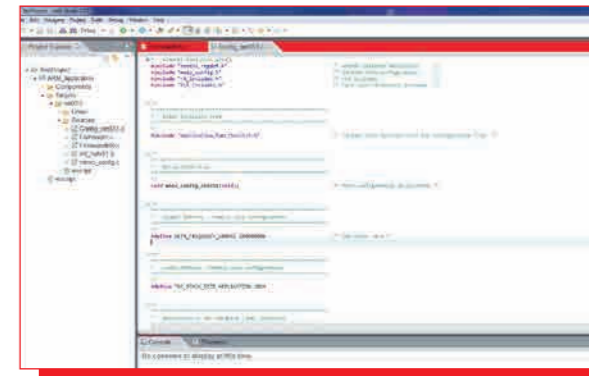
- Real-Time kernel
- Protocol stack
- Microcode (Switch, HUB etc.)
- Pre-compiled
- Pre-certified
- Configurable

Communication

Development with netX Studio:

- Eclipse-based development environment
- GNU C-Compiler
- WAF build system
- OpenOCD debugger support
- Hardware editor
- Utility tools

Application



netX Studio with CDT plugin

ALL YOU NEED...

Trustable partner for industrial communication

As one-stop shop, Hilscher is a supplier for matching hardware and software.

We want to make your development as comfortable as possible. With Hilscher development trainings you will be able to cut down development times significantly.

Our pre-certification process provides the possibility to check your device if whether is ready for certification. And even the certification itself can be arranged by us.

Want more?

We also offer hardware design, software development and production services.



...IS TRUSTABLE DEVELOPMENT SERVICE



Services

- Pre-certification
- Certification
- Schematic review
- Integrity test
ANSI X3.263-1995
- Plugfest visits
- Interoperability tests

Standard trainings

- LFW training
- LOM training
- Protocol stacks
- PROFINET
- EtherCAT
- EtherNet/IP
- SERCOS III

Workshops

- Design-in
- Trouble shooting

ALL YOU NEED...



Over 10 years of multiprotocol ASICs

With this experience and the third generation of slave chips, the **netX 90** sets new standards in the industrial communication market.

The combination of hardware and software offers a technology package which is unique.

Hilscher is the technology leader of multiprotocol ASICs and your trustable partner for communication.



2 Million
netX chips sold

...FOR YOUR EMBEDDED SOLUTION...

netX 90 at a glance

- Two independent Cortex M4 CPUs, one for application, one with loadable firmware for communication.
- Equipped with a built-in security core for the highest data integrity.
- High-performant protocol stacks with additional IoT functionality.
- Gives you an unmatched flexibility and a future-proof solution for your device.
- Flexible CPU subsystem for multiprotocol devices.
- Rich set of standard and advanced peripherals.
- BOM cost-saving design with integrated DCDC, PowerOn Reset, PHYs and Flash.



...IS A READY-TO-USE DESIGN!

IO-Link

BISS
INTERFACE

OPC UA

TSN
Industrial Ethernet

PROFINET

ETHERNET
POWERLINK

MQTT

CODESYS

EnDat 2.2

EtherNet/IP

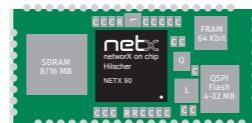
SERCOS
the automation bus

Modbus

EtherCAT

netX studio

LVDS



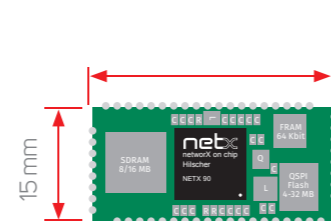
halFSIZE netRAPID

EMBEDDED PLATFORM FOR:
IT & OT COMMUNICATION

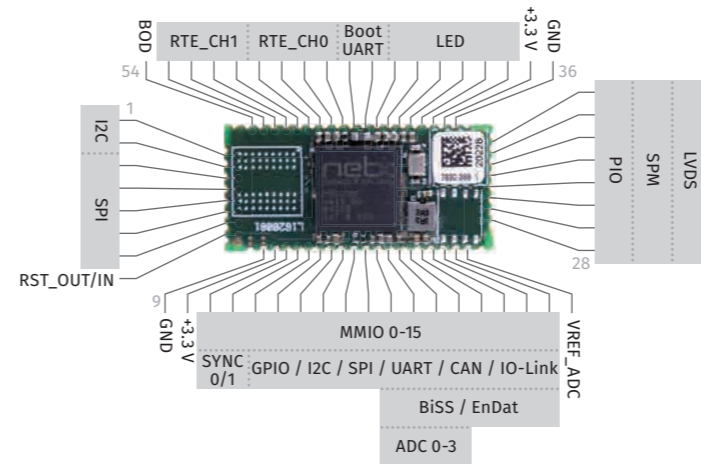
ALL YOU NEED...

Requirements for the next generation

- Flexibility of **netX 90** regarding MMIO mapping and different sets of signals
- Different memory options for complex use cases (QSPI, SDRAM or NVRAM)
- Additional functionality for future requirements, e.g. OPC UA, cloud interfaces, integrated PLC or TSN
- Built-In security
- Usage with host CPU or as stand-alone solution
- Low cost, leveraging synergy effects and fast time to market
- Shipment with "customer-specific" content
- Firmware according to the latest technology standards



...IS A HALFSIZE NETRAPID



Ready-to-solder chip carrier based on netX 90

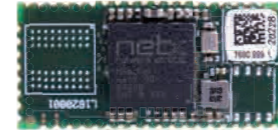
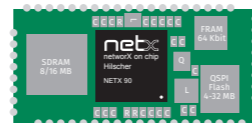
- **Smallest design in different "flavors"**
QSPI Flash extension | SDRAM extension | FRAM extension (64 kbit) | LVDS Backplane
- **Multifunctional platform**
Real-Time Ethernet, LED & Boot-UART | GPIO, encoder, IO-Link & more | I2C, SPI | PIO, host interface or LVDS | Function will be defined by software
- **I4.0 solution for the field level**
Can be enabled with IoT communication | Shipment as customized solutions in "lot size 1"

HALFSIZE NETRAPID...

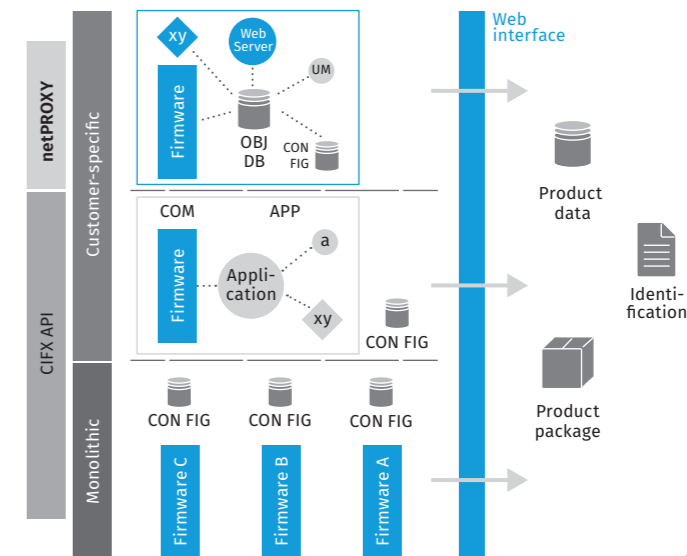
Modular software configuration process

- Different host interfaces:
 - CIFS API: Protocol-specific I/O image
 - **netPROXY**: Generic object interface
- Separate CPUs for application and communication
- Select your software and functionality:
 - Monolithic firmware with CIFS API and fixed functionality
 - Specific firmware with customer application and functionality
 - Specific firmware with **netPROXY**, customized pinout and functionality

- Application development using **netX Studio**
- Network-independent object engineering and pinout definition using **netX Studio**



...AND ITS FLEXIBLE SOFTWARE

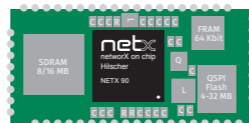
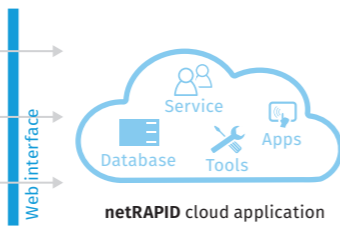
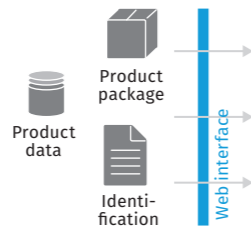


HALFSIZE NETRAPID...

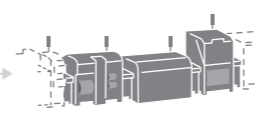
14.0 production process & netRAPID cloud application

For halfsize **netRAPID**, Hilscher has established an Industry 4.0 production process. With this new process, device manufacturers have full flexibility and gain control of their **netRAPID** software.

First device manufacturers design their product-specific software package for **netRAPID**. Via a web interface, this product package will be passed to a cloud application, which triggers the automatic order and production process.



ERP system & Automatic order processing



SMD production & AOXI inspection



Functional test & programming of customer-specific content



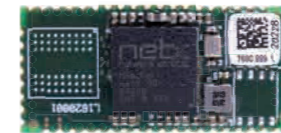
Packaging & In-time delivery

...IN LOT SIZE 1

Automatic order processing & Autonomous robot cell

After receipt of the customer product package, the ERP system will coordinate the SMD production. In an autonomous robot cell, the halfsize **netRAPID**, will be tested and the customer-specific software package will be loaded. Afterwards the robot automatically packs them into trays for in-time delivery.

Means the customer receives **netRAPID** preloaded and ready to use with its own content.

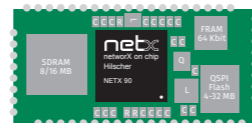


HALFSIZE NETRAPID...

Technology inside

- Multiprotocol platform for extended temperature range
- One compact hardware (32x15x4 mm) for all Real-Time Ethernet protocols
- Host interface via 50MHz SPI
- Diagnostic interface via Ethernet or UART
- Integrated BiSS, EnDat2.2, IO-Link and LVDS interfaces
- Memory options: 4–32 MB QSPI Flash, 8/16 MB SDRAM, 64 kbit FRAM
- 2x ARM® Cortex® M4 each for communication and application
- Built-In security functionality for IoT applications
 - Hardware support for cryptographic operations
 - Mask ROM code assured secure boot level

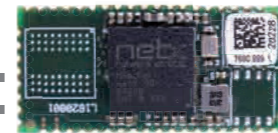
■ Modular software structure for RTE & IOT applications



- Predefined or customer defined software packages
- Configurable pin assignment by the OEM
- Integrated web server, OPC UA or MQTT functionality

...AND YOUR BENEFITS

💡 Reduced footprint & reduced costs due to half size and packed with extra features



💡 Reduced engineering risk & faster time to market compared to a chip-based design

💡 In-time delivery & secured high quality due to fully automated I4.0 production process

💡 Reduced maintenance costs & reduced reaction time due to modular software configuration process

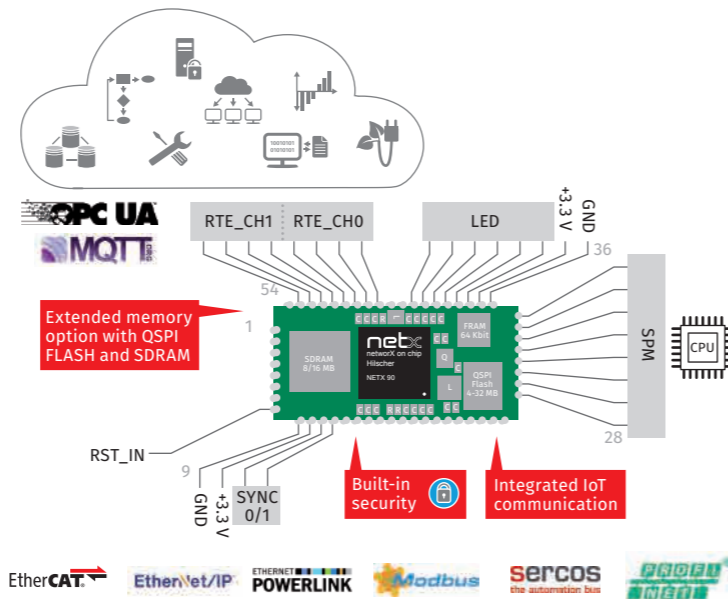
💡 Engineering & production advantages for device families due to same form factor with different assembly options

💡 Future-proof for the next generation of communication due to integrated IoT, security and TSN capabilities

HALFSIZE NETRAPID...

Real-Time Ethernet interface with IoT extension

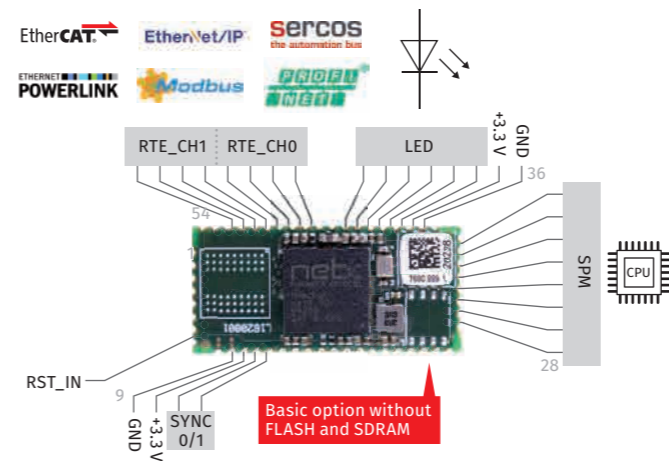
- **netPROXY**-based firmware with protocol-independent object interface to the host
- Product engineering using **netX Studio**
- **Easy-to-integrate SPI host interface**
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- „Secure boot“ based on built-in security functionality



...AS A COMPANION SOLUTION

Low cost Real-Time Ethernet interface

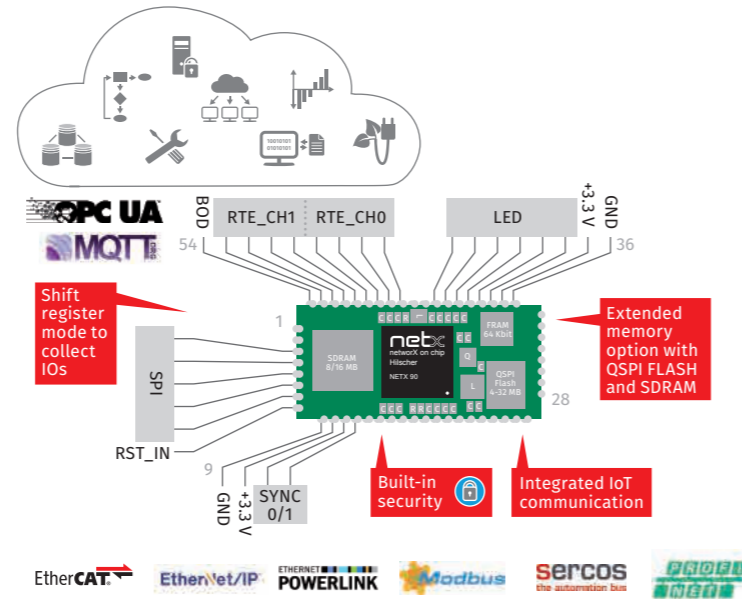
- Predefined firmware with dual-port memory access
- Easy-to-integrate SPI host interface
- Ethernet diagnostic interface
- One design supporting all Real-Time Ethernet slave protocols
- SYNC 0/1 access
- Firmware update via integrated web server



HALFSIZE NETRAPID...

Simple Real-Time Ethernet interface for I/O only with IoT extension

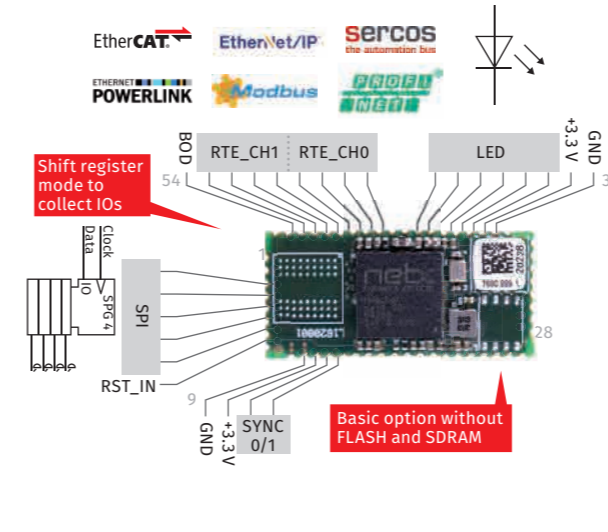
- **netPROXY**-based firmware with protocol-independent object interface to the host
- Product engineering using **netX Studio**
- I/O data collection via external SPI shift register
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- „Secure boot“ based on built-in security functionality



...AS STAND-ALONE SOLUTION

Simple Real-Time Ethernet interface for I/O only

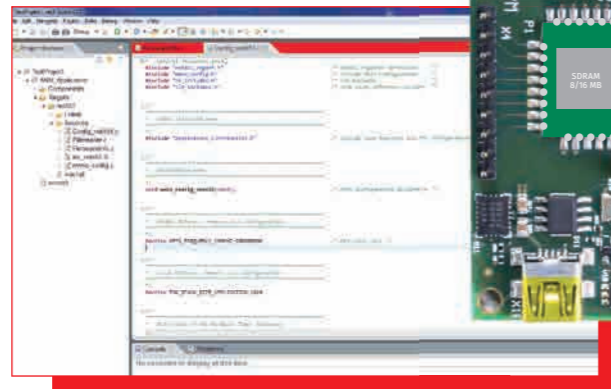
- Predefined firmware without host interface
- I/O data collection via external SPI shift register
- Ethernet diagnostic interface
- One design supporting all Real-Time Ethernet slave protocols
- SYNC 0/1 access
- Firmware update via integrated web server



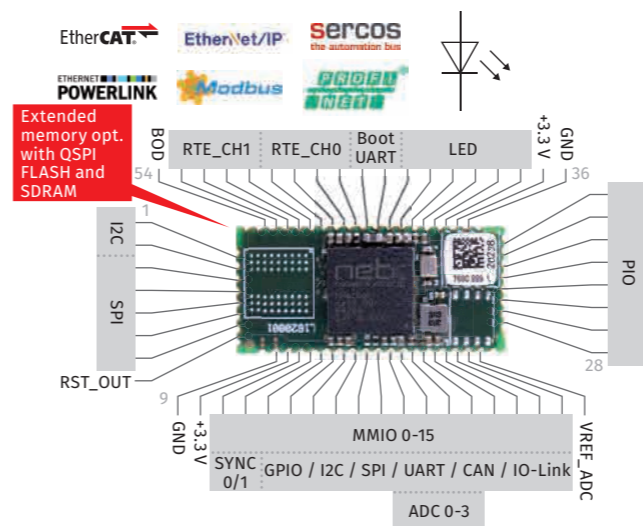
HALFSIZE NETRAPID...

Development with netX Studio

- Eclipse-based development environment
- GNU C-Compiler
- WAF build system
- OpenOCD debugger support
- Hardware editor
- Utility tools



netX Studio with CDT plugin



...AS STAND-ALONE SOLUTION

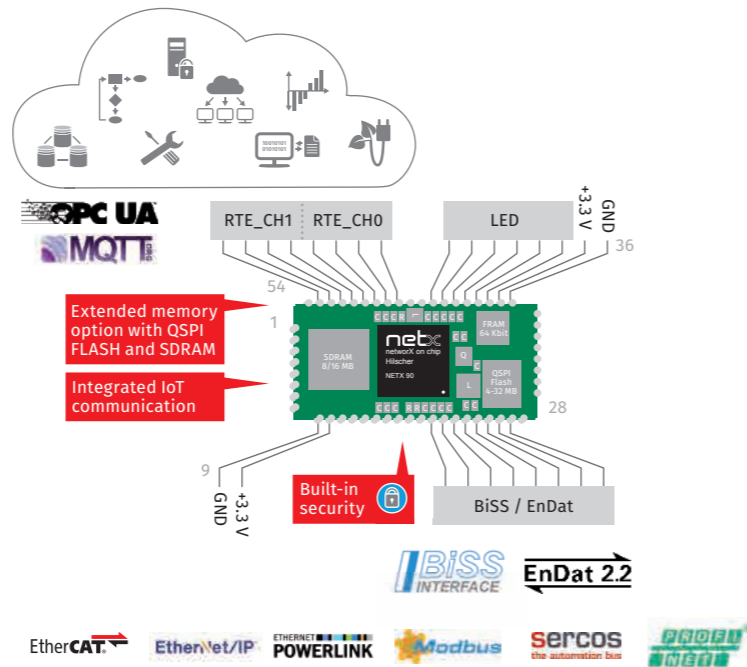
Real-Time Ethernet interface with own application

- Full usage of both internal processors of **netX 90**
- Communication CPU
 - Loadable Real-Time Ethernet firmware
 - Ethernet diagnostic interface
 - One design supporting all Real-Time Ethernet slave protocols
- Application CPU
 - Customer-specific application
 - Definition and usage of PIO and MMIO dependent on desired application
- Development with **netX Studio**

HALFSIZE NETRAPID...

BiSS / EnDat interface for encoder with IoT extension

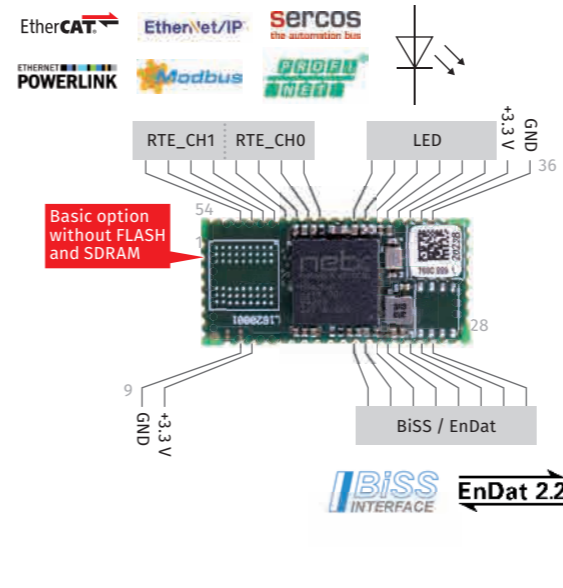
- **netPROXY**-based firmware with protocol-independent object interface to the host
- Product engineering using **netX Studio**
- **Two-channel BiSS / EnDat** interface
- **One design for all Real-Time Ethernet slave protocols**
- Integrated MQTT client and OPC UA server
- „Secure boot“ based on built-in security functionality



...FOR SPECIAL USE CASES

BiSS / EnDat interface for encoder

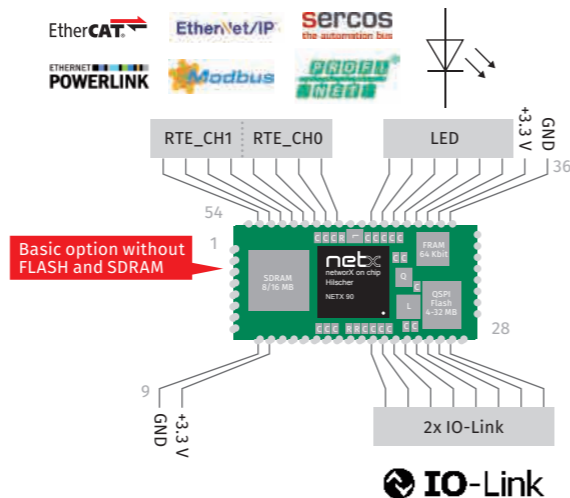
- Predefined firmware with BiSS & EnDat2.2 interface
- Ethernet diagnostic interface
- One design supporting all Real-Time Ethernet slave protocols
- Firmware update via integrated web server



HALFSIZE NETRAPID...

Real-Time Ethernet interface with integrated IO-Link Master

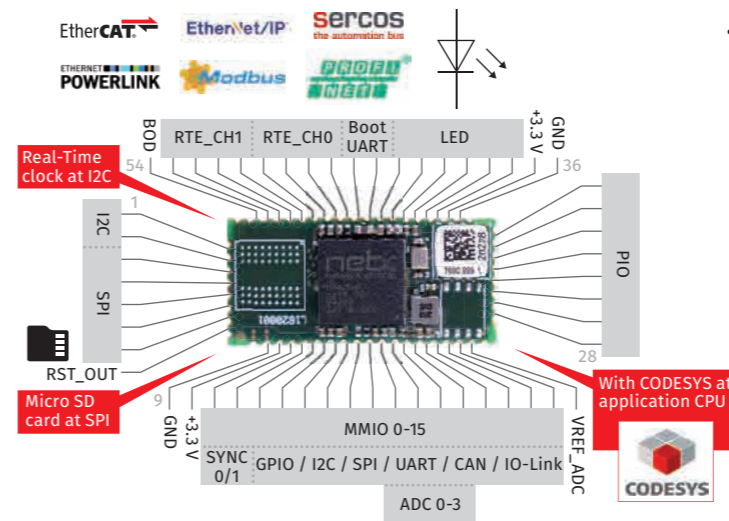
- Predefined firmware with dual channel IO-Link
- Ethernet diagnostic interface
- One design supporting all Real-Time Ethernet slave protocols
- Firmware update via integrated web server



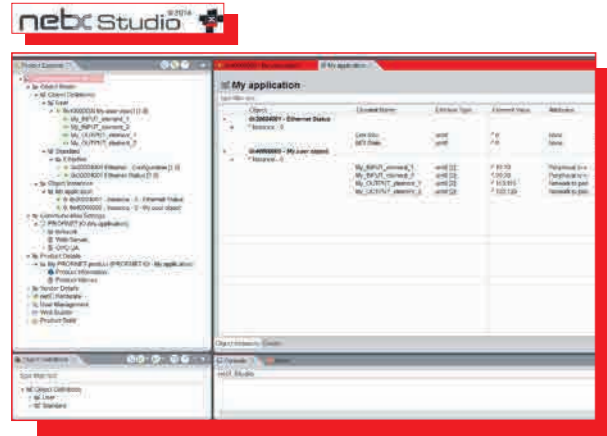
...FOR SPECIAL USE CASES

Real-Time Ethernet interface with integrated CODESYS

- Full usage of both internal processors of **netX 90**
- Communication CPU
 - Loadable Real-Time Ethernet firmware
 - One design supporting all Real-Time Ethernet slave protocols
- Application CPU
 - Predefined CODESYS
 - Fixed peripherals

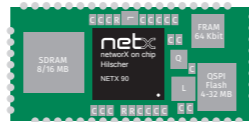


HALFSIZE NETRAPID...



Build your device in 6 simple steps

1. Define your object library
2. Specify your application
3. Set your communication protocol and parameters
4. Add product & vendor information
5. Create your web pages & define your users
6. Define the **netRAPID**-specific hardware configuration



Result:



Database

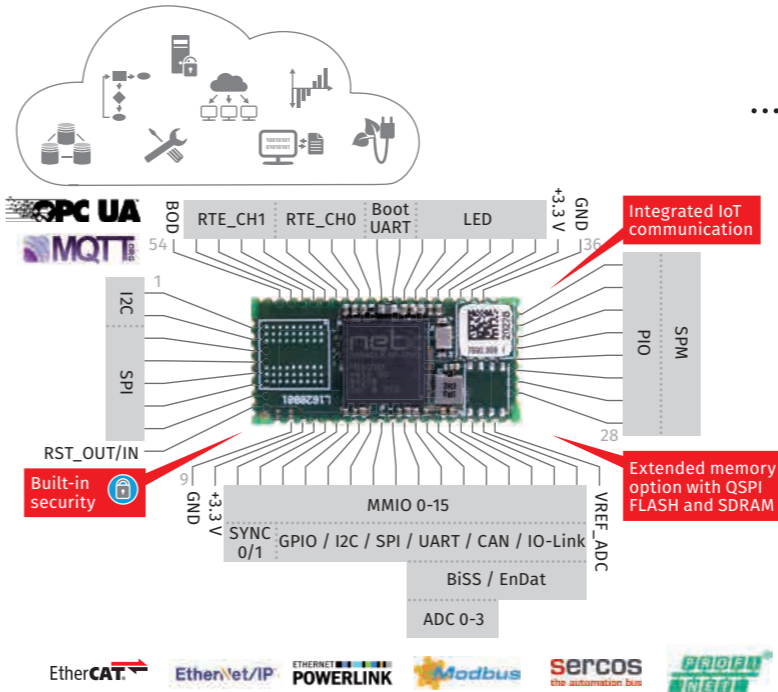


Header file



EDS file

...FOR SPECIAL USE CASES



Free configurable Real-Time Ethernet interface

- **netPROXY**-based firmware with protocol-independent object interface to the host
- Product engineering using **netX Studio**
- One design for all Real-Time Ethernet slave protocols
- Integrated MQTT client and OPC UA server
- Pinout and associated functionality with very high configurability
- „Secure boot“ based on built-in security functionality

BRANCHES

China

Hilscher Systemautomation Co. Ltd.
E-mail: info@hilscher.cn
www.hilscher.cn

Italy

Hilscher Italia S.r.l.
E-mail: info@hilscher.it
www.hilscher.it

Switzerland

Hilscher Swiss GmbH
E-mail: info@hilscher.ch
www.hilscher.ch

France

Hilscher France S.a.r.l.
E-mail: info@hilscher.fr
www.hilscher.fr

Japan

Hilscher Japan KK
E-mail: info@hilscher.jp
www.hilscher.jp

USA

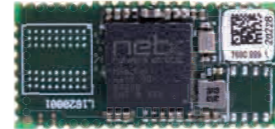
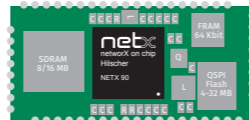
Hilscher North America, Inc.
E-mail: info@hilscher.us
www.hilscher.com

India

Hilscher India Pvt. Ltd.
E-mail: info@hilscher.in
www.hilscher.in

Korea

Hilscher Korea Inc.
E-mail: info@hilscher.kr
www.hilscher.kr



IT'S ALL YOU NEED!

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