

i 4.0
CONNECTED
INDUSTRY

RECONFIGURATION OF PRODUCT LINE

- NETWORK
- ENGINEERING
- CONDITION MONITORING

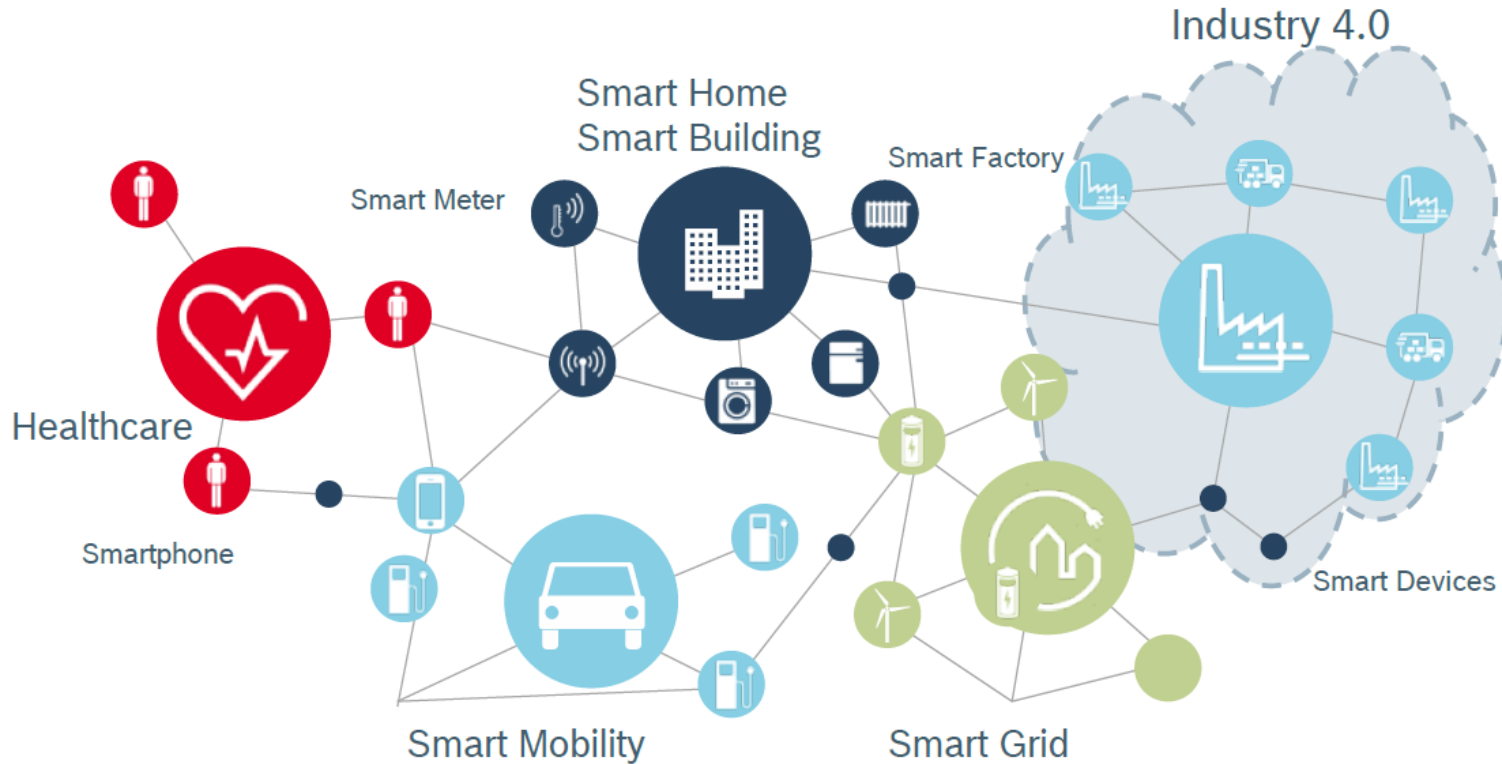


Making Use Of Industry 4.0 Technology Improves Quality

@ Bosch Rexroth

Charlie Chen (DCTW/SLF)

How Do We Understand Connected Industry?



- Humans, machines, objects and systems are connected
- Quality, Cost, Delivery greatly improved by i4.0 optimized Value Stream Design

Challenges Derived From the Market

Market Requirements

Volatile markets



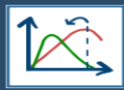
Individual customer requirements



Shorter delivery times



Shorter product life cycles



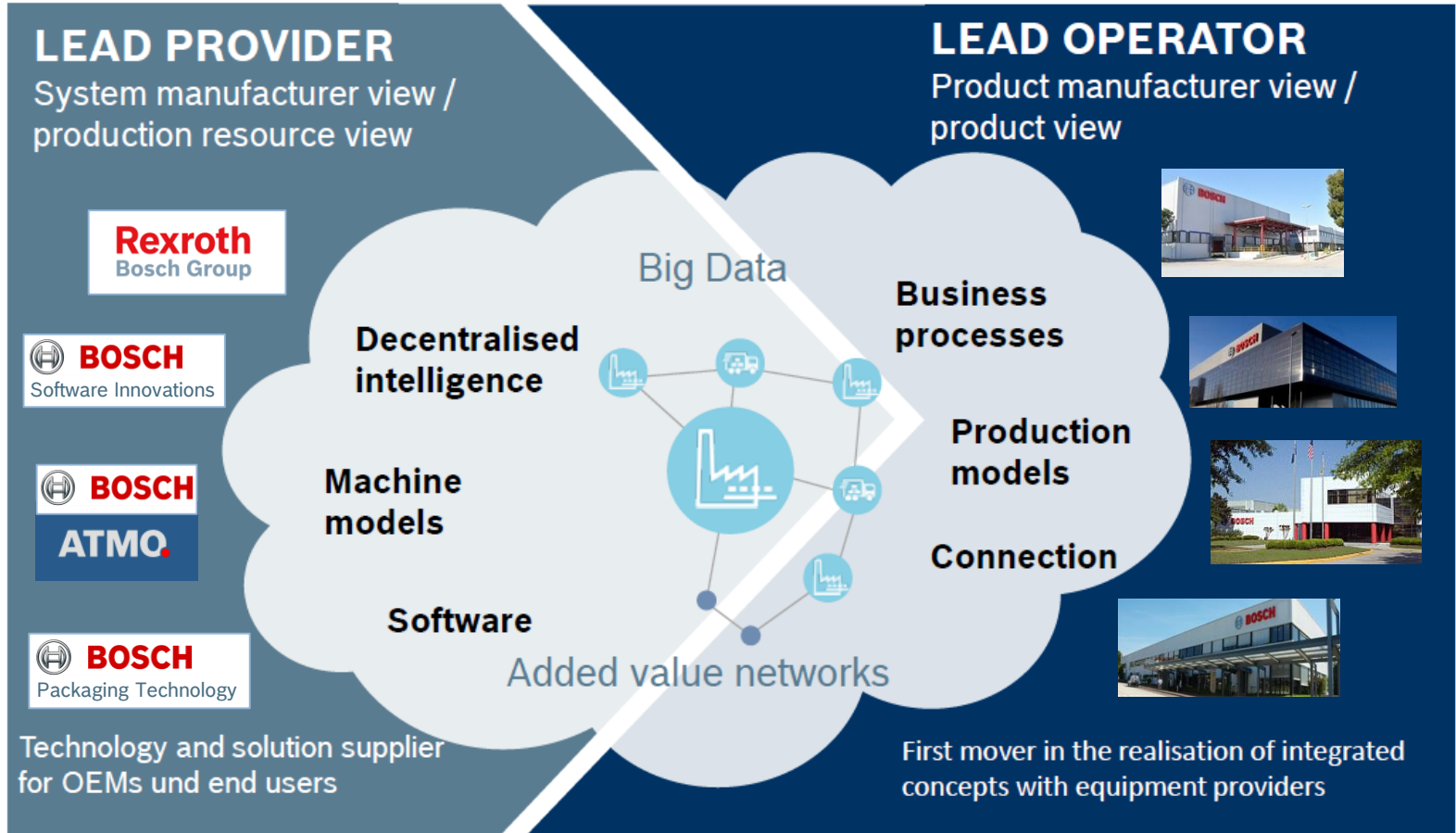
Customer behavior



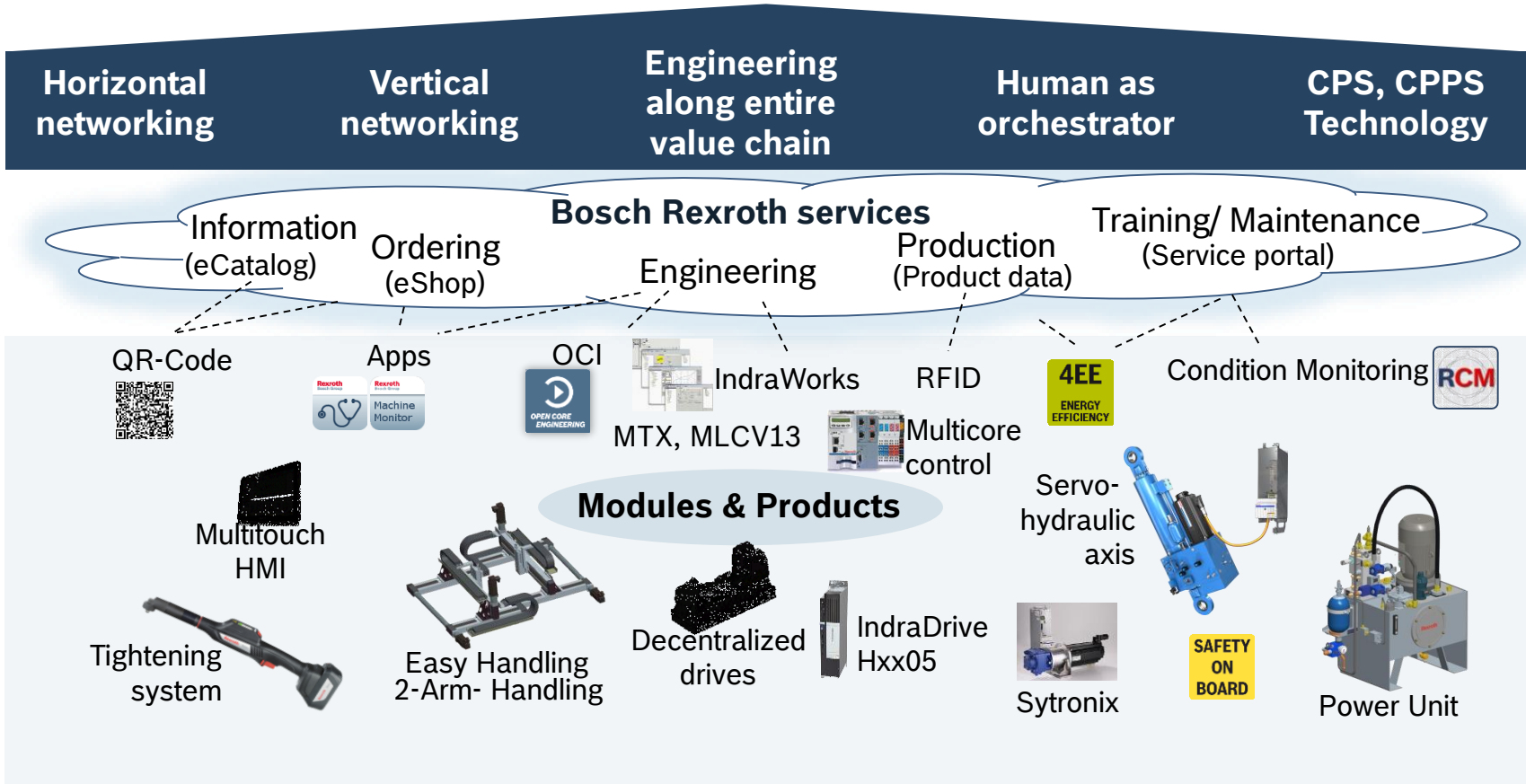
Manufacturers' Requirements

- Higher productivity
- High flexibility
 - minimize set-up time
 - smart individual workpiece in/out
- Quality improvement
- Real-time & preventive service
- Low inventory
- Reduce dependence on labor

We Are in Driver's Seat With a Dual Strategy



Bosch Rexroth i4.0 Product House

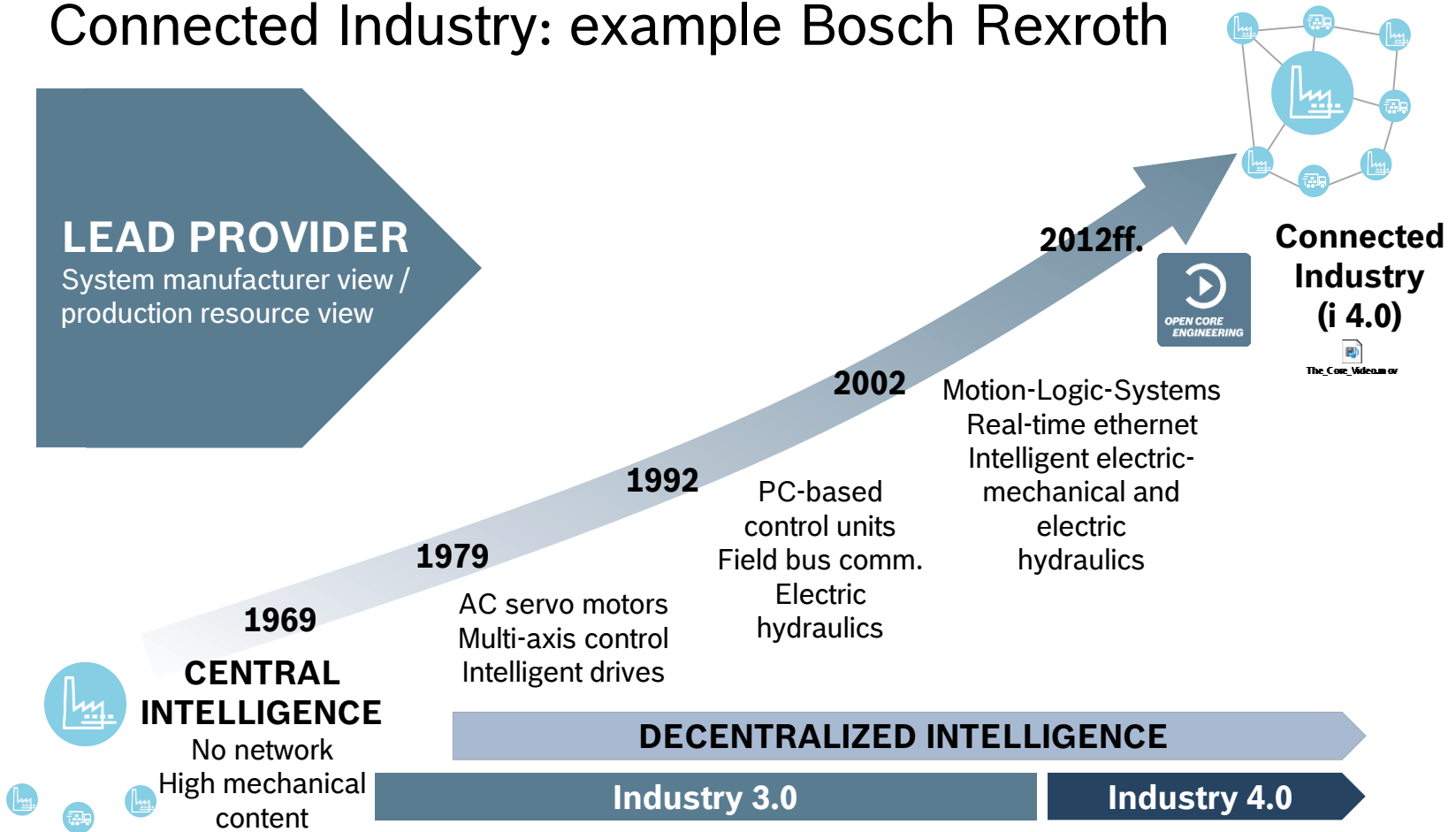


Products “Industry 4.0 ready” by open communication & Bosch Rexroth services

CPS: Cyber Physical System
RCM: Remote Condition Monitoring

CPPS: Cyber Physical Production System
OCI: Open Core Interface

Connected Industry: example Bosch Rexroth



Open Core Engineering – the Key to Industry 4.0



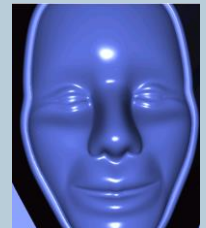
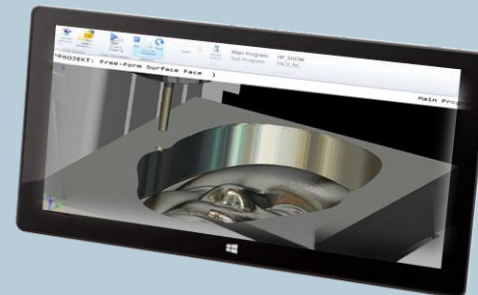
- Award winning **Software Development Kit (SDK)** for engineering environments
- Easily **connects automation and IT-world**
- **direct access to functions and data** of machine controls enables **new services and competitive advantages**

10 JÄHRIGES
JUBILÄUM

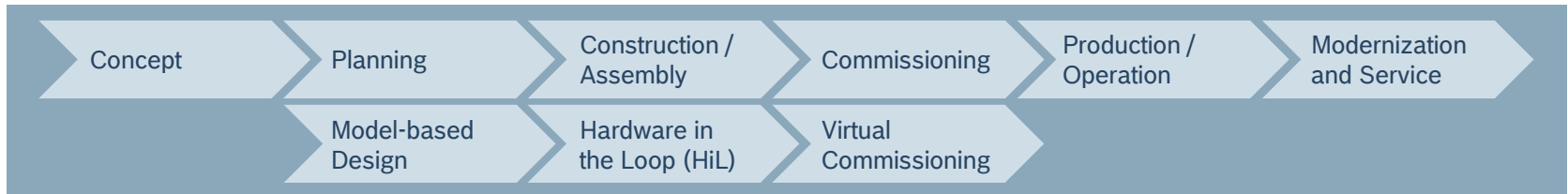
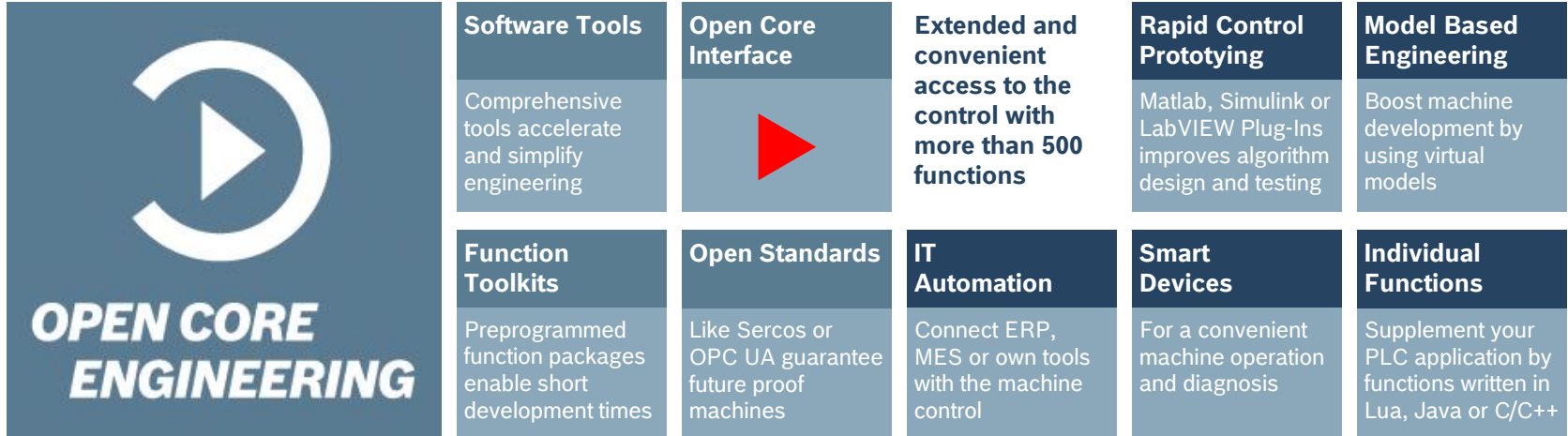


HERMES
AWARD
2 0 1 3

E.g.: Online coupling of manufacturing & simulation to increase productivity

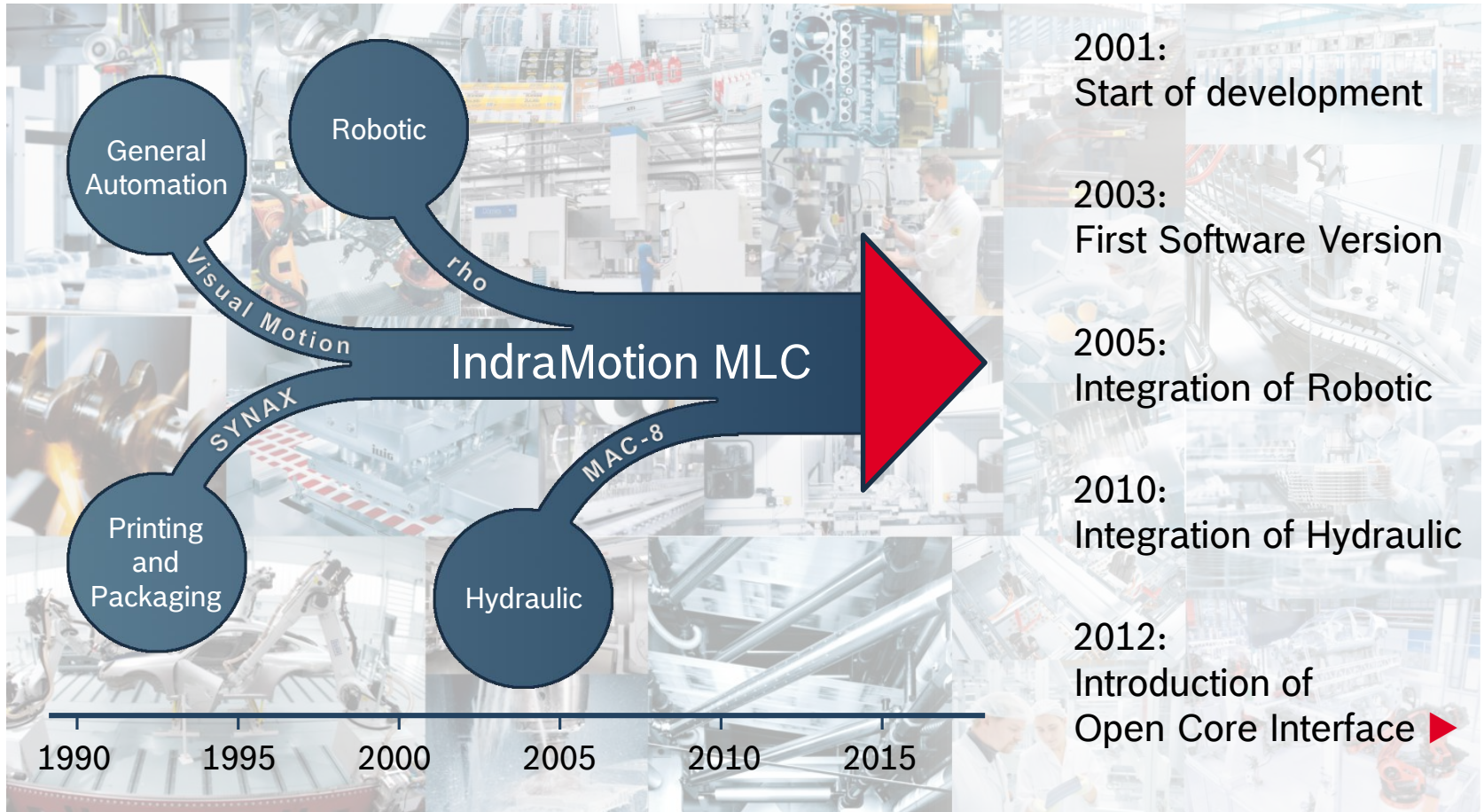


The bridge to Industrie 4.0



Connecting PLC- and IT-based automation

History of IndraMotion MLC



Universal Gateway



The **Open Core Interface ▶** is an extension of the proven and reliable systems **IndraLogic XLC** and **IndraMotion MLC**.

It grants **access to the embedded functions** of the Motion Logic firmware, e. g.

- PLC
- Motion
- Robotic

It serves as a **gateway** between

- **IT-based** and
- **PLC-based** automation

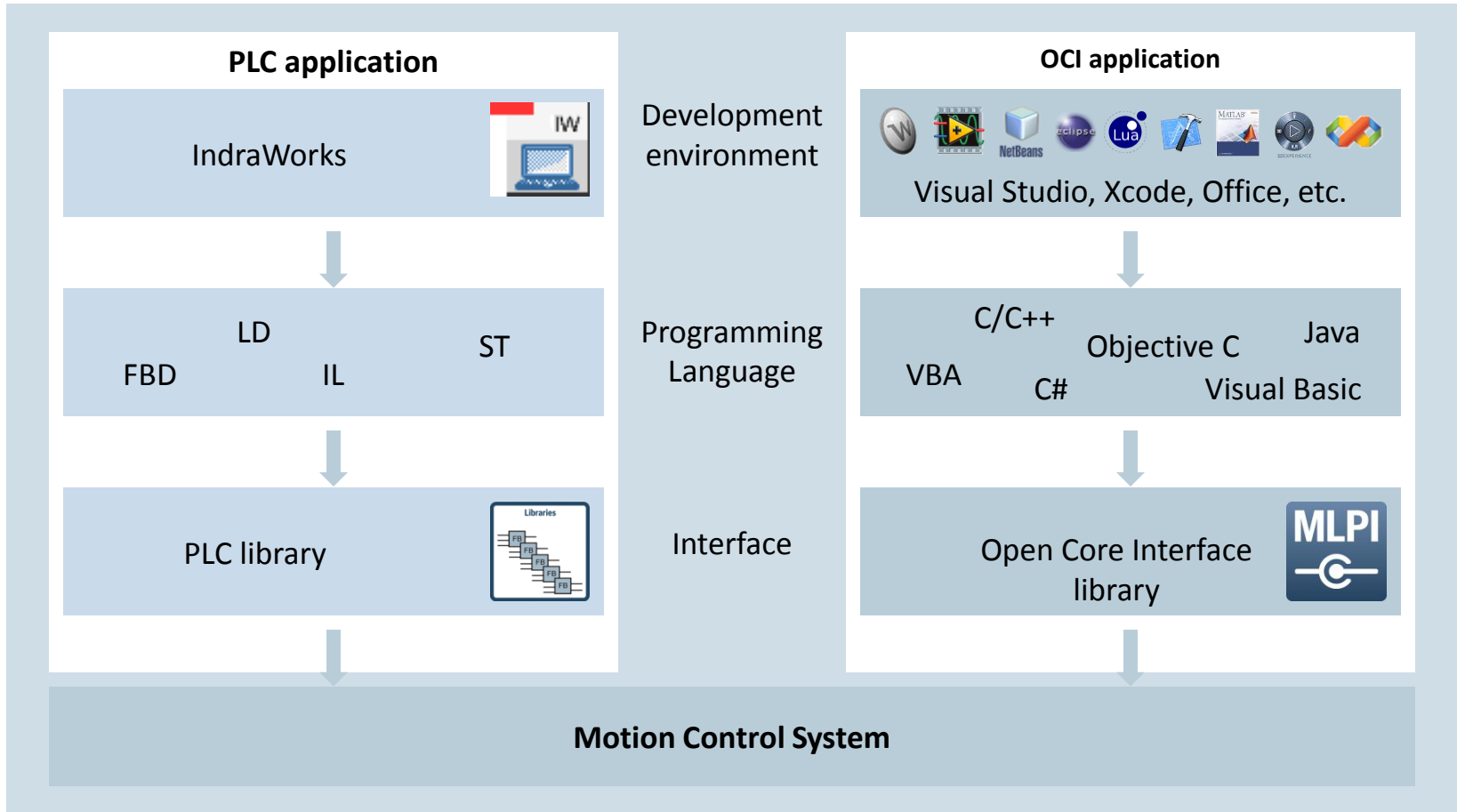
Software Development Kit (SDK)



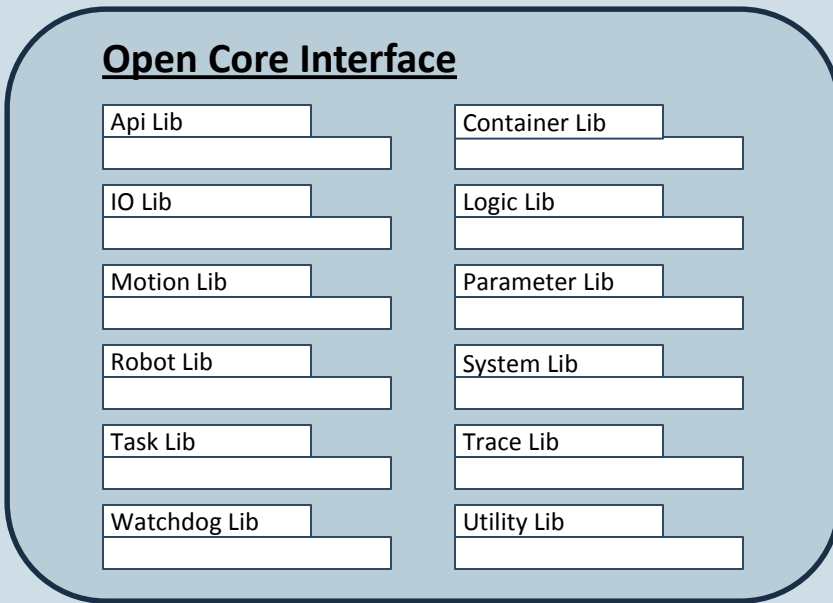
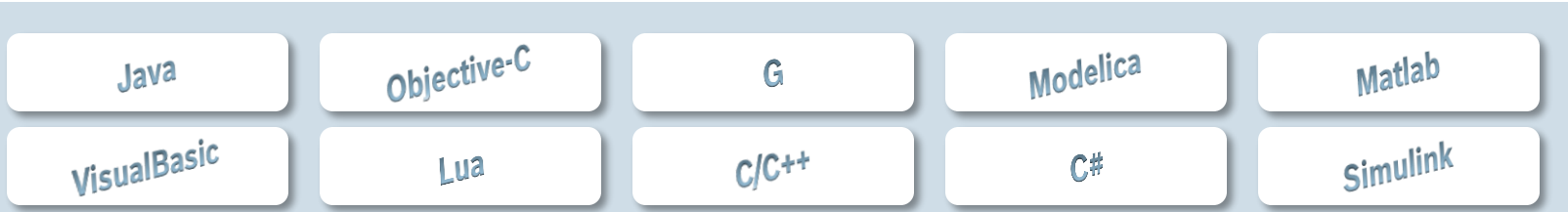
Open Core Interface ► is provided as Software Development Kit (**SDK**)

- **Full documentation**
- **Comfortable integration of Open Core Interface ► libraries** into the respective development environment
- Libraries offer comprehensive functions for **accessing control functions**
- Comprehensive application **examples**

How it works



How it works



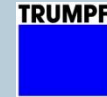
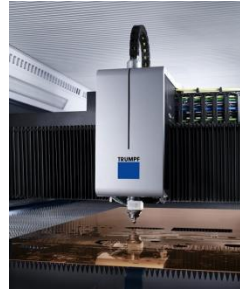
Customers



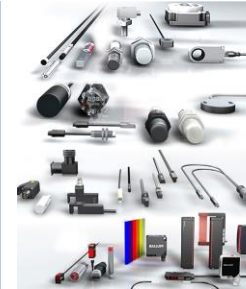
WEISS
GmbH
Germany



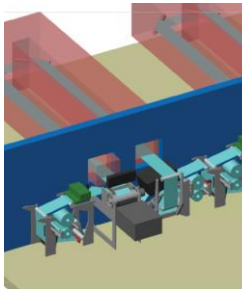
H2 energy
LTD
United
Kingdom



TRUMPF
GmbH + Co. KG
Germany



Balluff
GmbH
Germany



VDL Groep
Netherlands



GLAUB
Automation
&
Engineering
GmbH
Germany



KOSTAL
Solar
Electric
GmbH
Germany



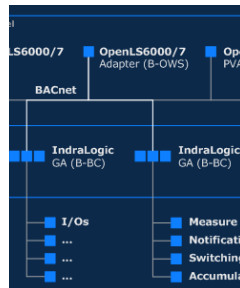
Kraus
Automatisierungs-
technik
GmbH
Germany



ANDEC
Manufacturing
LTD
Canada



Aquamarine
Power
United
Kingdom

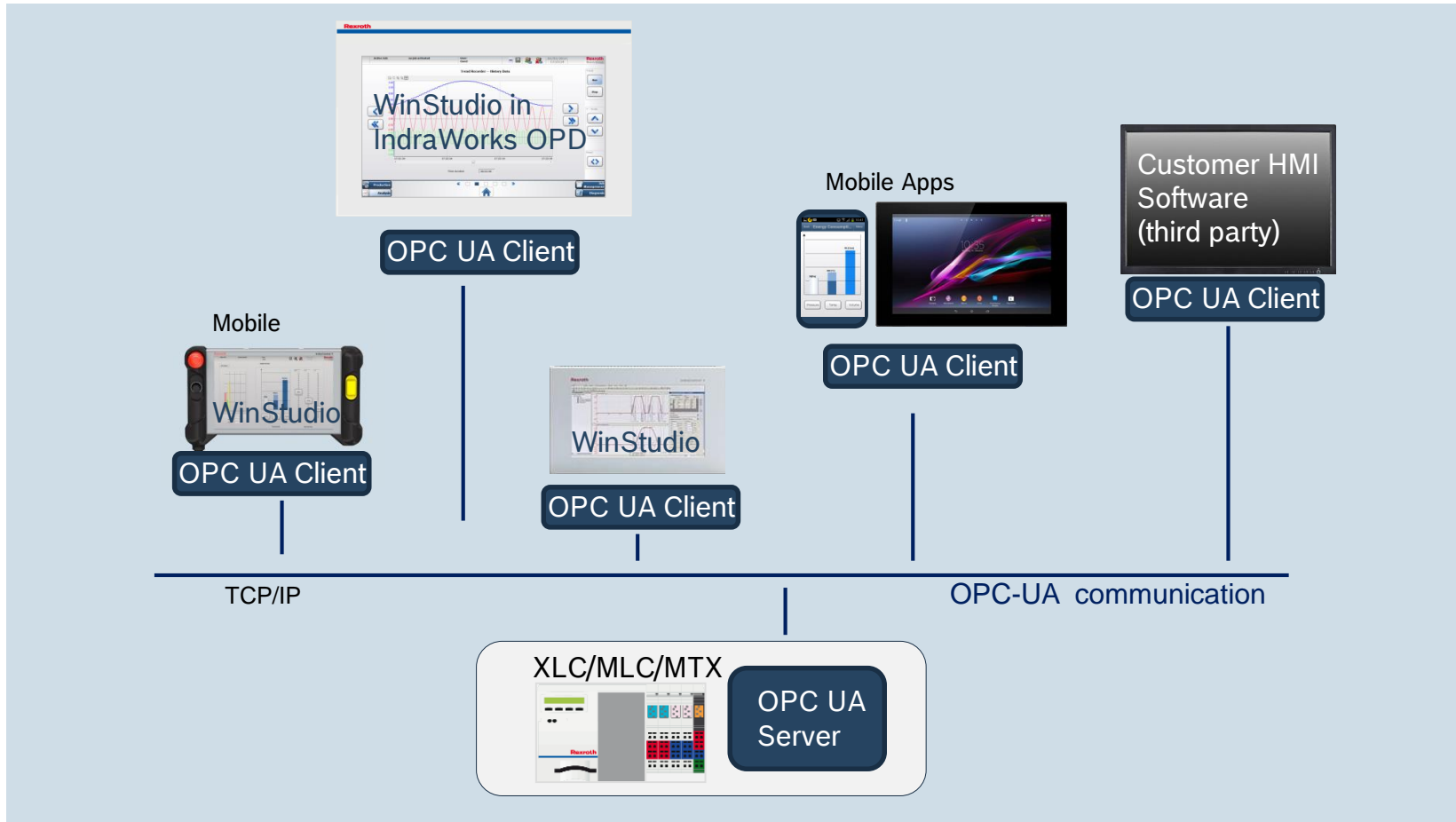


DMS AG
Germany



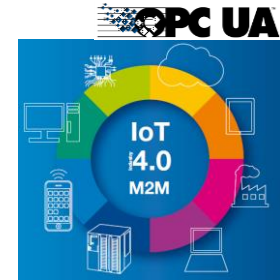
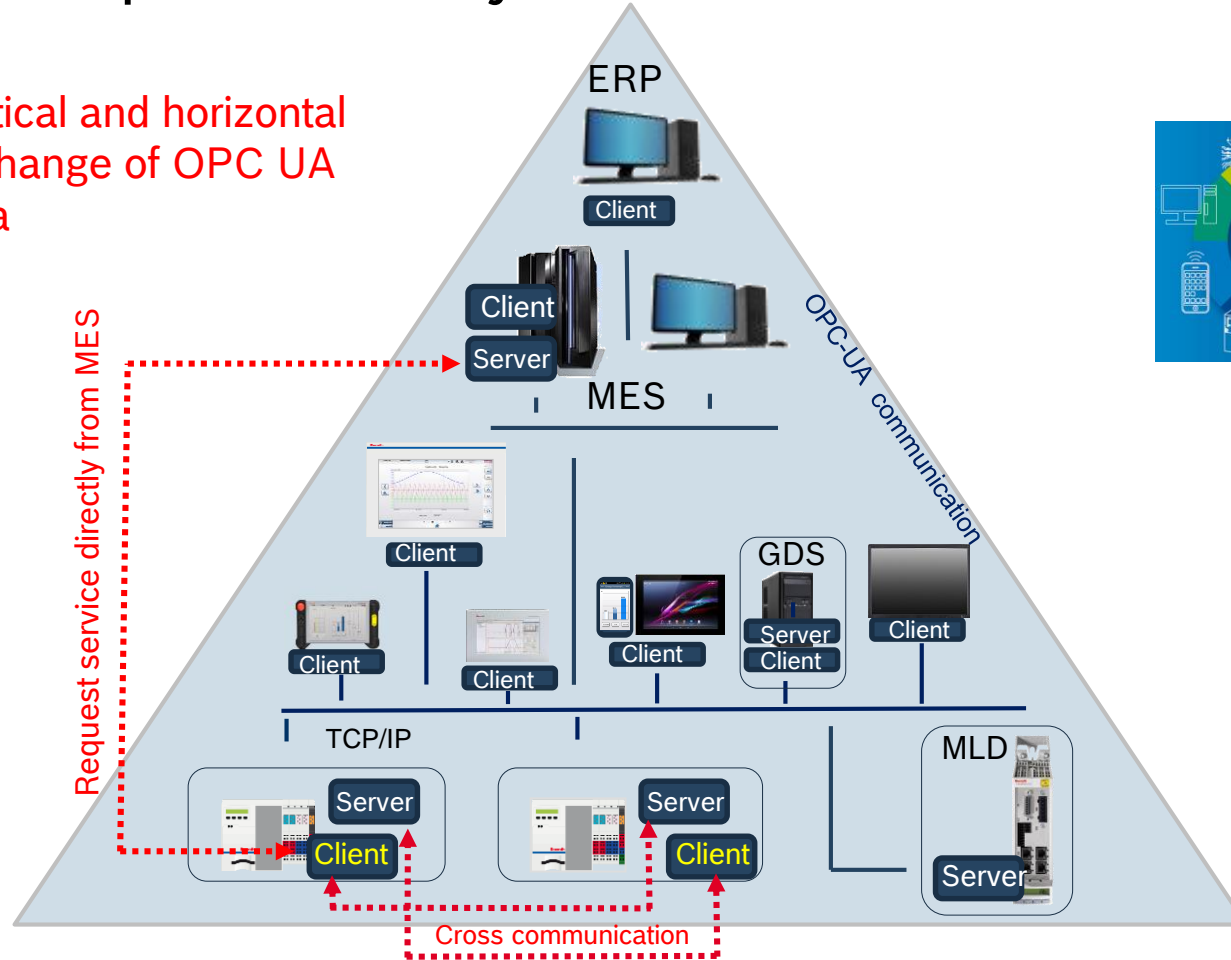
C-FEC
United
Kingdom

HMI data exchange of PLC variables via OPC UA

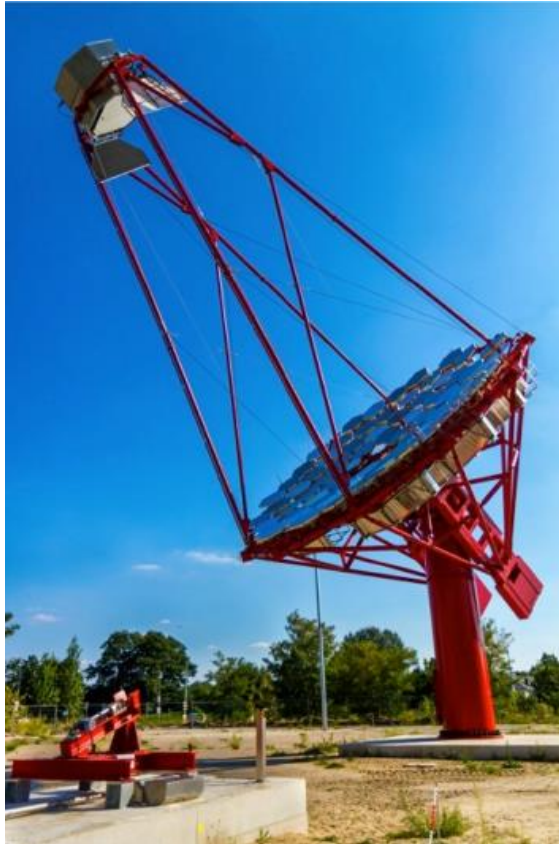


Next steps to Industry 4.0 ...

Vertical and horizontal exchange of OPC UA data

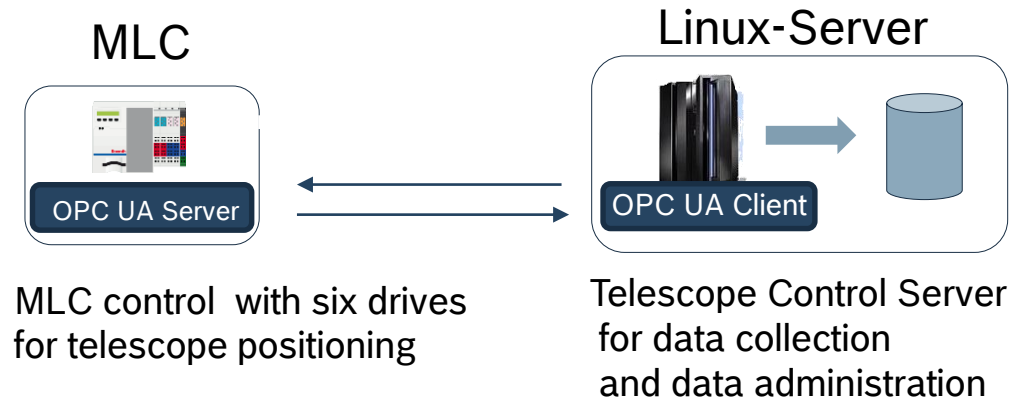


Desy Zeuten - mid size prototyp application “CTA”



CTA is one of the major ground-based astronomy projects being pursued :

- Designed for γ -ray observations
- Prototyp running since 2013 in Berlin – Adlershof.
- All telescope instruments (e.g. camera, mirror control, weather station) are connected to the server via OPC UA
- Construction of 120 telescopes planned in 2016 all over the world (25 mid size telescopes)



More details: <https://accelconf.web.cern.ch/accelconf/icalepcs2011/papers/mopmu026.pdf>

How Will i4.0 Change Our Day-to-day Work?

“ We need new software!

*Customers will enjoy shorter
delivery time.*

*Integrated engineering across the entire
process chain.*

**Quality will
Improve.**

Less manpower and
better technology and
machines will give the
production process
more power.

Commissioning engineers and service personnel won't
need to travel as much, as it will be possible to connect to
the machine directly via the internet.

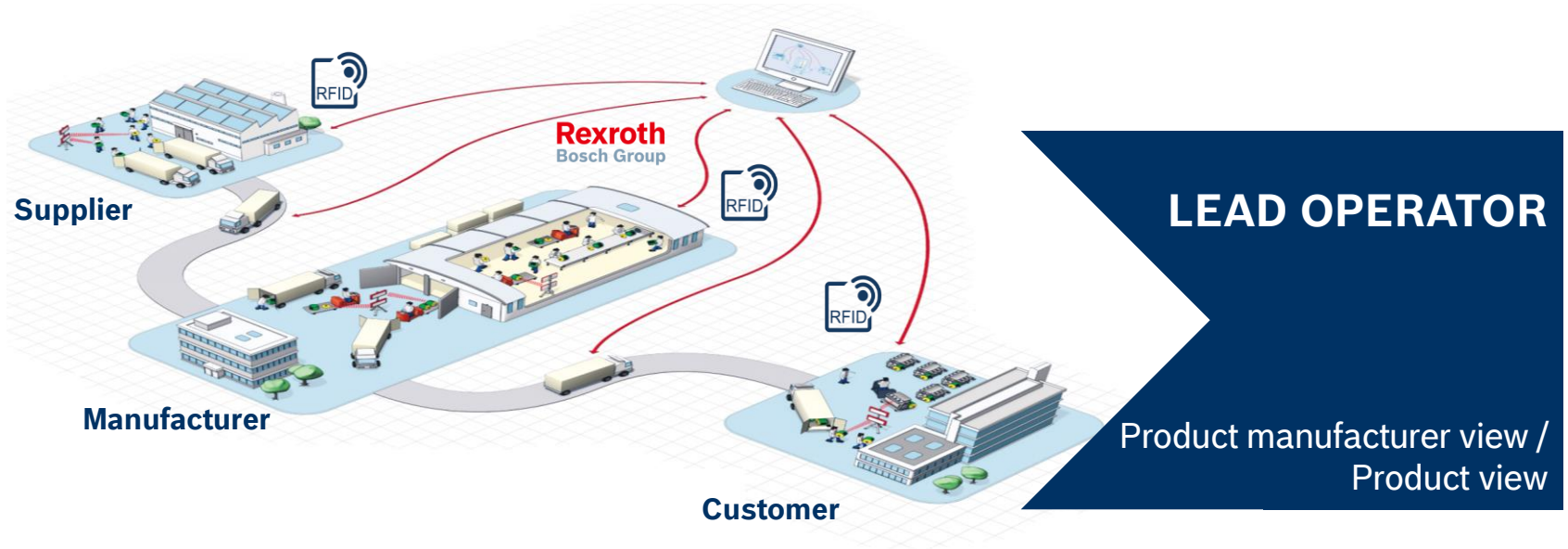
More flexibility is needed.

*Higher level of standardization of
products and production processes.*

Personalized order
with lower **cost** is
reachable.

”

Connected Industry: Example Homburg Plant (HoP2)



+10 %
Productivity

-30 %
Stock
reduction



Challenges from Huge Products Variation in HoP2

Initial situation

- Mono-assembly lines for 11 value streams
- Low agility → High set-up times
- High effort for production control
- High leadtime / stocks at block assembly
- Long training period of employees



Target state

- Multi-product line for 6 product families
- Lot size 1
- Autarkic, intelligent station, knowing it's processes and features
- Intuitive and flexible user interface
- Handling the high complexity in processes

- 6 product families, 200 valve slice variations and more than 2.000 components
- Smart Multiproduct Line to manage variance and productivity

i4.0 Concept @ Homburg Plant

Autarkic, smart working

bench

(horizontal integration
to layout)



User identification &

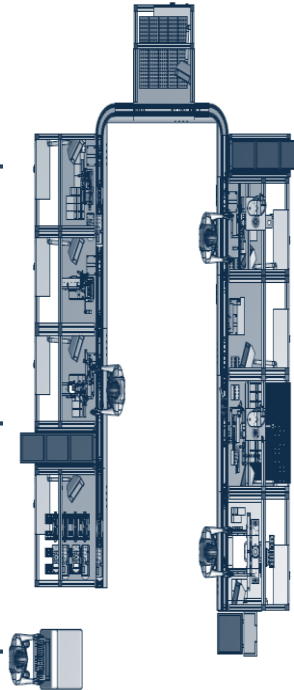
adaption

(language, qualification)



Self guiding product

(configuring bench and
process)



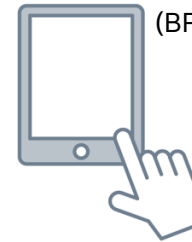
Deviation & malfunction
management

(working schedule
configuration)



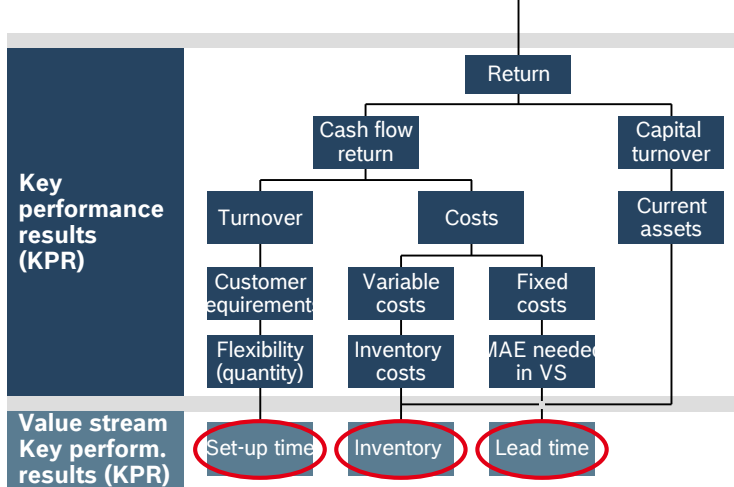
Smart connected
activeCockpit

(BPS / CIP integration)

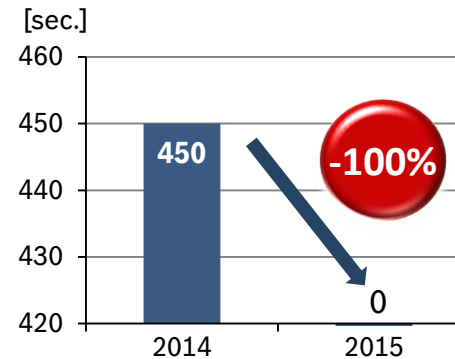


Connecting worker, machine & product to manage product variance

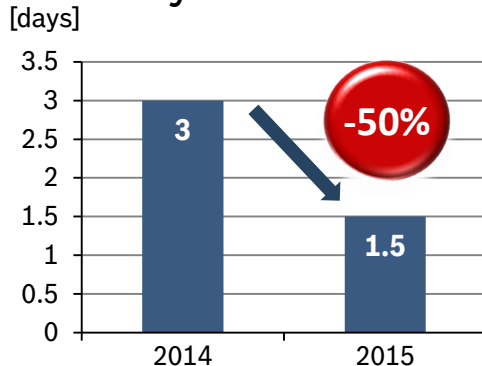
First Success @ Homburg plant



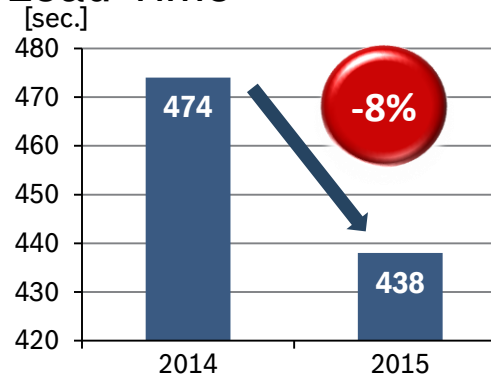
Set-up Time



Inventory



Lead Time



Industry 4.0 Award for Significant Productivity Improvements



- Award for Best Integration of Human, Process, and Machine
- Holistic and cost efficient implementation has led to significant improvements in productivity
- Over 200 different hydraulic valves are assembled within a single value stream

Next Steps: i4.0@HoP2

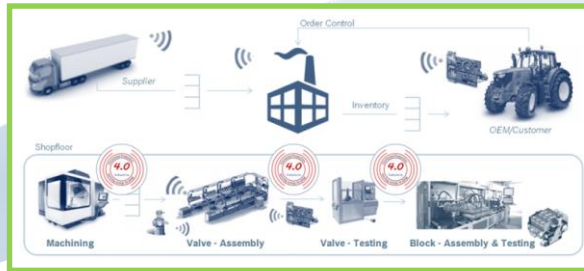
Start Level
(Pilot Application)



Migration Level 1
(Pilot I 4.0 Value Stream & BPS)



Connected Value Stream & BPS

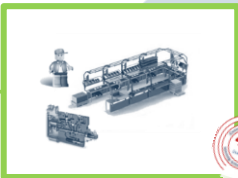


Migration Level 2
Pilot HoP2 IPN 4.0 WujP



Connected International Production Network & Locations

Smart Automation



Connected Assembly Line

2013

2014

2015

2016

2017

Projects to continuously improve competitiveness

i4.0 @ Bosch Rexroth in China

Internal

- Link Wujin Plant to i4.0 production line in Homburg
- i4.0 Coating line for PCBA for Frequency Converter put into operation in Xi'an Plant
- Prepare i4.0 production line for hydraulic pump in Beijing Plant



External

- Support the engineering development of i4.0 system at AMTC Tongji University (Shanghai)
- Automation partner of GAMI (Suzhou) to establish an i4.0 innovation workshop in China
- ...



Integration Platform Smart Automation



I4.0 aspects

- Set up in cycle time (individualized production)
- RFID (UHF) used for “self guiding product”
- Modular design; autonomous stations
- Energy efficiency by monitoring and management; shutdown phases e.g. for the belt conveyor
- Using QR-Code for product identification and to offer services accordingly

**Integration Platform to combine Rexroth technologies
innovative solutions towards I4.0**

Summary

Market Demand

Volatile markets



Individual customer requirements



Shorter delivery times



Shorter product life cycles



Customer behavior



Your Success

- Higher productivity
- High flexibility
 - minimize set-up time
 - smart individual work piece in/out
- Quality improvement
- Real-time & preventive service
- Low inventory
- Reduce dependence on labor



Quality, Cost, Delivery improved!

Our Solutions

- High efficiency (CNC @ metal cutting industry)
- Semi or full automation (TS & Tightening)
- Open & user-friendly platform (Open Core engineering)
- Product lifecycle management (Connected Industry)
- Integrated solution from Bosch (Rexroth, APAS, INST...)
- Proven user experience (Homburg plant, ...)

We offer proven smart solutions, not pipe dreams!

Connected Industry Industry 4.0

Rexroth
Bosch Group



Thank you for your attention

Hydraulics fit for Industry 4.0



主講者：
邱文科

經歷：
力士樂公司
液壓技術25年工作經驗

2015/12/10

I4.0 aspect

未來的工廠

將是人與機器 / 產品 / 工廠 互聯互通

以及整個訂單系統實現互聯互通

來自市場的挑戰

市場需求

不穩定的市場需求



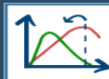
顧客的個性化要求



更短的交貨時間



更短產品生產週期



顧客的行為模式



製造商的要求

- 更高的生產率
- 更高生產靈活性
 - 最少的生產設定時間
 - 聰明的個別工件 in/out
- 質量改善 (降低錯誤)
- 即時及預防性的服務
- 更低的庫存 (降低成本)
- 減少對作業人員的依賴



工業4.0的液壓，是智能型式的油壓系統



configurable
networkable
energy-efficient } Exactly

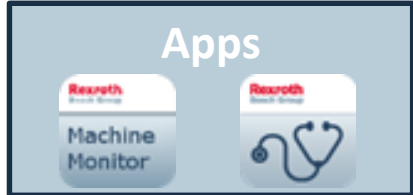
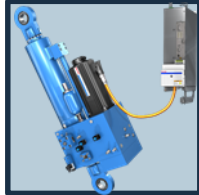
As a modularly designed series ABPAC hydraulic power units are made up of standardized modules and are optimized for Industry 4.0, with features such as:

- Decentralized intelligence
- Open interface
- Connection to mobile devices such as smartphones or tablet PCs
- 分散式的智能
- 開放的介面
- 可與行動裝置或平版連接

Industry 4.0 for Hydraulic

Software for quick networking

快速連網的軟體



Together with digital control technology

數位化控制技術

Remote diagnostics and condition monitoring

遙控診斷和狀態監測

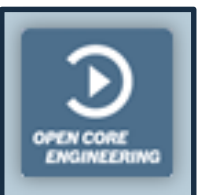
Drives with decentralized intelligence

分散式智能的驅動器

integrates mobile devices and modern communication architectures

結合移動設備和現代化的通訊架構

Hydraulics fit for Industry 4.0



Matched Electro-hydraulic Electro-mechanical

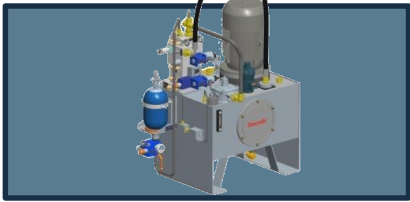
PLC IEC 61131

RFID product

無線射頻辨識

Open Communication

開放式通信



Combination of hydraulics for networked solutions

液壓系統需組合聯網解決方案



Servo-hydraulic axes



Ready-to-install servo-hydraulic axes have an integrated fluid loop and are driven by the same servo drives as the electromechanical versions. Since axes are encapsulated systems, engineers must only connect power and communication cables for assembly and start-up, and start-up can begin. Everything else, for example the parameterization values determined from simulations, are already stored in the drive software and support the plug & run philosophy

Motion Control (Bus system)



With increasing frequency, real time Ethernet protocols in modern machines integrate all actuators and peripherals into each other. Modern motion controls for hydraulic drives support all common protocols, e.g. Sercos, EtherCAT, Ethernet IP, PROFINET RT, Powerlink and Varan. Their software is also based on open standards, e.g. IEC 61131-3 and PLCopen. With this they are an ideal match for the increasingly integrated and technology-overlapping infrastructure of modern production environments - all the way up to Industry 4.0

Industry 4.0 for Hydraulic

Hydraulic Motion Control

Intelligent hydraulics ready for networking



The image shows a white, rectangular Rexroth VT-HMC motion controller. It features a large multi-pin connector on the left side, two RJ45 ports, and a circular connector. The brand name 'Rexroth' is visible on the top left, and 'HMC' is printed near the bottom right. The device is shown from a three-quarter perspective against a light blue background.

i4.0
CONNECTED
INDUSTRY

Optimal control of electro-hydraulic axes

The new VT-HMC motion controller is a digital control system featuring a built-in axis controller and IEC61131-3 programming. A motion-logic system specifically optimized for electro-hydraulic axes – with open programming and interfaces, it is future-proof, scalable, and simple to use.

Integrated Axis Controller



IAC

IAC (Integrated Axis Controller) is designated as a digital controller integrated in the valve with control algorithms with the necessary sensors for:

- Pressure, force control
- Position control
- Flow control

Support the following bus systems:

sercos
the automation bus

PROFI
INDUSTRIAL ETHERNET
NET

EtherNet/IP

EtherCAT
Technology Group

VARAN

Rexroth
Bosch Group

Industry 4.0 for Hydraulic

The intelligent ABPAC standard power unit: configurable, networkable, energy-efficient



A hydraulic power unit as it should be: intelligent, customized, cost-optimized



Hydraulic power units for mechanical engineering are being subjected to higher requirements than ever before: they should be powerful, energy-efficient, and quickly available, yet also intelligent, flexible, and of course, cost-effective at the same time. With the new ABPAC series standard power units, Bosch Rexroth has come up with a convincing answer. With the online configurator, you will find your individual solution faster than ever. Your entry into Industry 4.0?



Augmented Reality shows you more additional information. All you need is a smartphone or tablet (Android or Apple) and the app of Junaino.

1. First step is to download the free app of Junaino
2. After activation of the app, please choose channel "ABPAC brochure"
3. Now hold the camera above any section aligned with the AR symbol and wait until the interactive 3D information is uploaded

Otherwise use the QR code below to get directly to the Junaino-app and the correct channel.



The ABPAC is a clever standard power unit for all areas in which hydraulic solutions are being used and a premium supply unit is required – for example, in general mechanical engineering, machine tools, as well as in presses and material handling.

Short delivery times, a quicker start

The portfolio of components defined in the modular system can reproduce a wide range of customer-specific power unit solutions via the convenient online configurator. The configurator immediately provides you with all the necessary information – from technical data through to prices. Everything is comprehensively documented. If you require individual solutions outside the modular system, your usual Rexroth contact will be happy to assist you at all times.

Delivery times are drastically reduced due to the use of Bosch Rexroth standard components from the GoLo program, standardized manufacturing processes, and a flexible steel construction concept (without welding).

Clever condition monitoring with Open Core Interface
An extended sensor package and open interfaces provide the basis for the web-based visualization of the operating status and condition-based maintenance.

The operating status of the individual components and the entire power unit are calculated directly on the ABPAC through intelligent evaluations of the sensor data.



Rexroth
Bosch Group

產品訊息取得容易，可配置，可連網，節能



(such as multi-Ethernet) can pass on all relevant operating status, and the ADPAC is networked both vertically and horizontally. The WLAN interface makes controlling and monitoring possible by means of a tablet or smartphone. This decentralized condition monitoring concept offers minimum effort when commissioning and maximum comfort during operation – the prerequisite for predictive maintenance.



Easy to configure:
get your own solution with just
a few clicks



Online configurator:

configured faster, delivered faster

The ADPAC is consistently modular in design and can be configured with a few clicks of the online configurator based on the requirements and hydraulic assemblies required. The software tool guides you clearly through the process. It queries the hydraulic and technical key data, such as working pressure, flow, and the type of actuator, and proposes the appropriate assemblies.

Immediately after completing the configuration, the program produces a complete documentation package. You will also receive a 3D model of the power unit, which is compatible with Pro/ENGINEER CAD software, as well as initial information on the price and delivery time. You can quickly and easily jump to customer-specific adaptations at any time. Additional assemblies such as coolers or control systems can also be configured. Could it be easier?



Your advantages at a glance

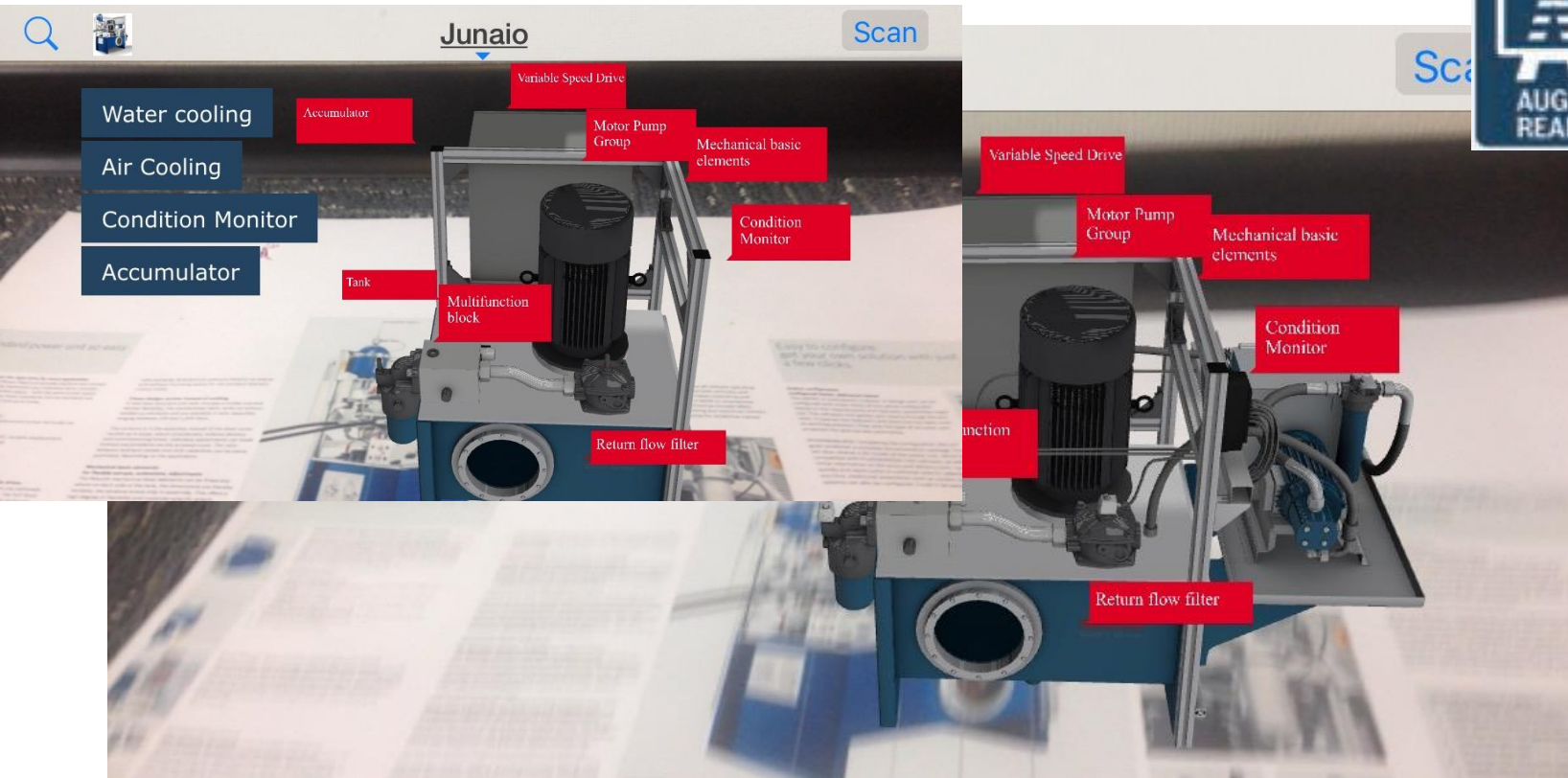
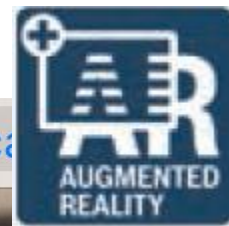
- Online configurator for customized power units together with documentation
- Intelligent condition monitoring via standardized bus interfaces and extended sensor technology
- User-oriented, platform-independent visualizations on smart devices
- Sytronix FC² and 3xP (optional) for increased energy efficiency and reduced noise emission
- Basic functions integrated in the multifunctional block
- Interface to additional hydraulic control concepts
- Wide area of application: metal-cutting machine tools, wood processing, presses, plastics processing machines, etc.
- Products from the GoTo program for optimized delivery times



Technical key data

- Tank capacity 100 to 1,000 liters
- Maximum flow 200 l/min
- Maximum operating pressure 315 bar
- Multifunctional block in 4 variants
- Sytronix modular system as an option (FC² 5030, 5xP 7010)
- Simplified, flexible steel construction

Augmented Reality 擴增實境 (虛擬實境)



謝謝您的關注!

更多的訊息 <http://www.boschrexroth.com/zh/tw>

我們永不放棄，直到找到適合的解決方案。

永遠，是一個漫長的過程。但這並不能阻止我們，我們積極應對每一項挑戰，直到找到解決方案。兩個多世紀以來，這一承諾始終激勵著我們：任何需要移動的，我們都會設計出最適合的傳動與控制方案。

Horst Stanzel 在我們的製造廠工作。該廠位於德國洛爾 (Lohr)。由力士申創立於 1850 年。從那時起，儘管歷經各種挑戰，然而他和世界各地的同事依然滿懷熱情，堅守著這份承諾。正是這種堅持促使我們取得今天的發展。我們打破技術界限，開發最先進的解決方案。

這些方案不僅適用，應用廣泛，還能滿足最緊迫的需求。我們在全世界建立獨立機構或分公司，以此來實現我們的承諾。提升我們的技術能力，我們總是全力以赴實現我們的承諾，服務於我們的社會。這就是每一位力士申人每天在努力實踐的承諾。

“會變和穩定是成功的關鍵所在，儘管這是一項艱鉅的工作，但值得付出。”

Horst Stanzel, 調理工

從鍛鐵作坊到高新技術解決方案的提供者：具有 200 多年悠久歷史的博世力士申。

1795 力士申家族在博澤 Spessart 森林開辦了第一家鍛鐵坊。	1850 從鍛鐵坊到鑄造廠，此舉標誌著新的開始。	1953 為軍用設備提供液壓系統，技術和經驗。	1965 增加電子傳動與控制技術，作為液壓系統的補充。	1972 新的軸向柱塞泵和馬達產品強化了力士申液壓系統。	1977 用於電力發電的液壓技術為可再生能源開採奠定了基礎。	1987 增加的線性傳動技術和風動技術於兩年後完善了自動化產品系列。	2001 業內新電力士申與博世自動化技術合併成博世力士申股份有限公司。	2010 基於市場變化和新業務重新定義了市場的動向。
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